DOSA

DENIS O'SULLIVAN & ASSOCIATES

CONSULTING ENGINEERS

RESIDENTIAL DEVELOPMENT AT CASTLEPARK, MALLOW, CO. CORK

SURFACE WATER MANAGEMENT PLAN

DATE 17/10/2024

REVISION 2

JOB NO. 6621

Joyce House, Barrack Square, Ballincollig, Co. Cork

T 021 4871781 E info@dosa.ie W www.dosa.ie

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Contents

1 Introduction

DOSA Consulting Engineers were engaged as Engineers for the proposed development at Castlepark, Mallow, Co. Cork. The purpose of this Drainage Impact Assessment report is to provide details of the Storm Water elements associated with the proposed development.

Following the Opinion received from Cork County Council from the Section 32B meeting, the report has been amended to address concerns raised relating to the overall SuDS strategy.

1.1 Site Location

The subject site which is currently undeveloped is located on the southeast of Mallow town. The site is a greenfield site characterised by its undulating topography and its steep slope rising from the southern & end. The Blackwater River runs along the site's southern edge, with the L-1220-0/St, Joseph's Road & Scoil Aonghusa CNS to the north, farmland and stand-alone detached farmhouse to the east and the existing Castle Park Village estate to the west.

A snapshot of the proposed site is outlined in Figure 1.1 below.

Figure 1.1 – Context Map

1.2 Scope of Assessment

This report deals with the following aspects associated with this development:

- Existing Site
- Site Investigations
- Soil Type Classification
- Storm Water Drainage Design
- Sustainable urban Drainage Systems (SuDS)
- Flood Risk Assessment and Exceedance Flows
- SuDS Maintenance

1.3 Site Topography

The topography of the site slopes southwards towards the River Blackwater. It comprises one large single plot across which the levels vary from +87.5m O.D. along the boundary with the L-1220-0/St Joseph's Road to +43m O.D. at its most elevated southern extremity.

Figure 1.3 – Site Topography

1.4 Existing Hydrological Environment

The site is within hydrometric area 18 (Blackwater (Munster)). Hydrometric area No. 18 includes the surface catchment drained by the River Blakwater and all streams entering tidal water in Youghal Bay.

The site itself is in the catchment of the Blackwater River (EPA Sub Catchment SC-090). The surface water catchment divide is shown on Figure 2.

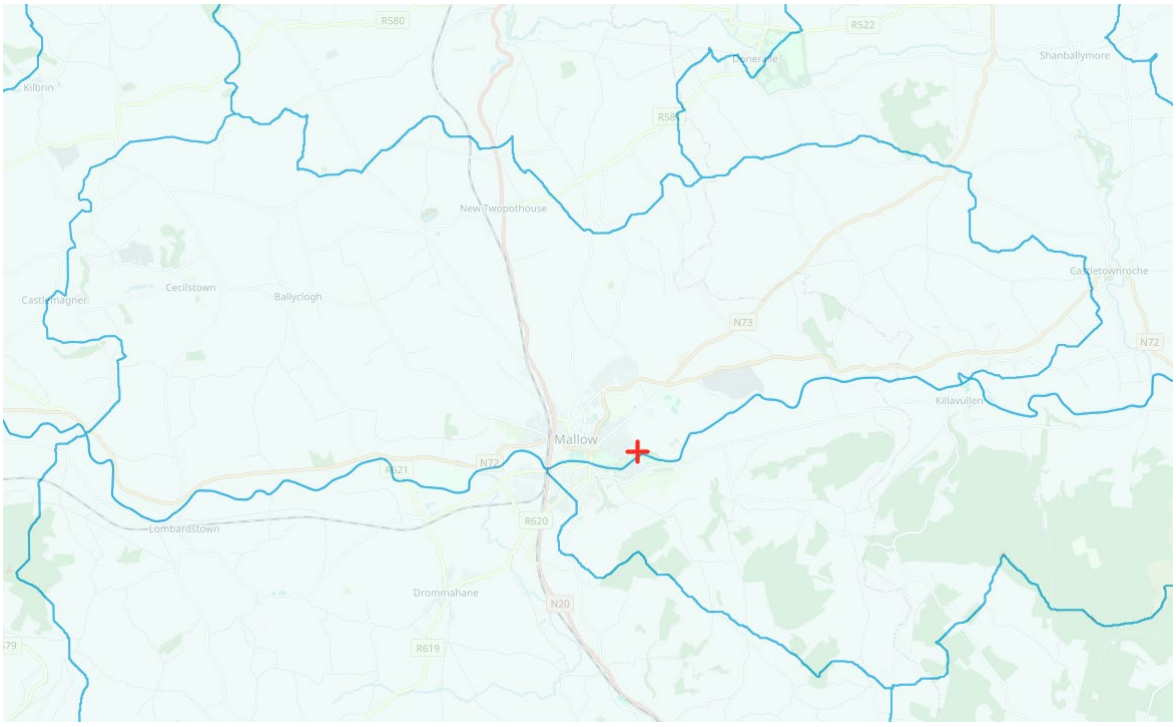


Figure 1.4 – EPA Sub Catchment Map

1.5 Proposed Development

The development will consist of the construction of 469 no. residential units (comprising a mix of 1, 2, 3, and 4 bed semi-detached, townhouse, and duplex/apartment units), creche, and all associated ancillary site development works including vehicular access, parking, footpaths, drainage, amenity areas, and a wastewater treatment plant at Castlepark, Castlelands (townland), St Jospeh's Road, Mallow, Co. Cork.

Figure 1.4 – Proposed Development

1.6 Principle Design Considerations

During the design of the storm water drainage for the proposed site, including SuDS, the following key documents / standards were taken into consideration.

- Cork County Council Development Plan
- CIRIA report C753 The SuDS Manual-v6
- Greater Dublin Strategic Drainage Study (GDSDS)
- Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas Water Sensitive Urban Design - Best Practice Interim Guidance Document, (CDP Objective 9.4) - The Department of Housing, Local Government and Heritage.
- Inland Fisheries Irelands Planning for Watercourses in the Urban Area – (CDP Para 11.221)- IFI

2 Surface Water Design Overview

The proposed storm water drainage system has been designed to cater for all surface water runoff from all hard surfaces within the proposed development including roadways, roofs, parking areas etc. The development has been split into 3 No. catchment areas.

Surface water generated from the proposed residential development will be conveyed through a proposed surface water network including SuDS and attenuated / managed on site prior to final discharge at Qbar greenfield run-off rates. .

Surface water discharge rates from the proposed surface water drainage network will be controlled by a vortex flow control devices (Hydrobrakes or equivalent) and associated detention basins. Surface water discharge will also pass via a full retention fuel / oil separators (sized in accordance with permitted discharge from the site). The storm sewer network was designed using Innovyze MicroDrainage modelling software. Outputs from the storm sewer design can be found in the Appendices of the Infrastructure Report.

The proposed surface water drainage network will collect surface water runoff from the site via a piped network prior to discharging off site via the detention basins, flow control devices and separator arrangement as noted above. Prior to entering the system, the stormwater generated will be treated through a number of nature-based solutions in line with adopted SuDs measures.

All flow velocities within the network fall within the limits of 0.75 and 3m/sec as set out in "Recommendations for Site Development Works" as published by the Department of Environment. The storm water network and infiltration basin are designed to accommodate the 100-year return period plus an additional 20% to account for the effects of climate change.

2.1 Proposed Sustainable Urban Drainage (SuDS) Strategy

For the proposed development a "SuDS triangle" was utilised to ensure all three functions are provided for within the SuDS strategy.

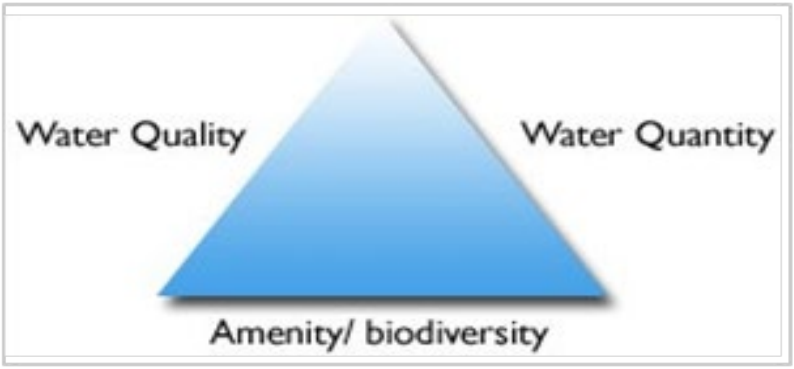


Figure 2.1– SuDS Triangle

By considering the three functions of the triangle, a SuDS system will allow for water quality treatment through natural processes by.

- Encouraging infiltration (where appropriate) and attenuating peak flows.
- Improving water quality by providing treatment to storm water prior to discharge.
- Providing habitat and function where possible for those using the area (including wildlife).

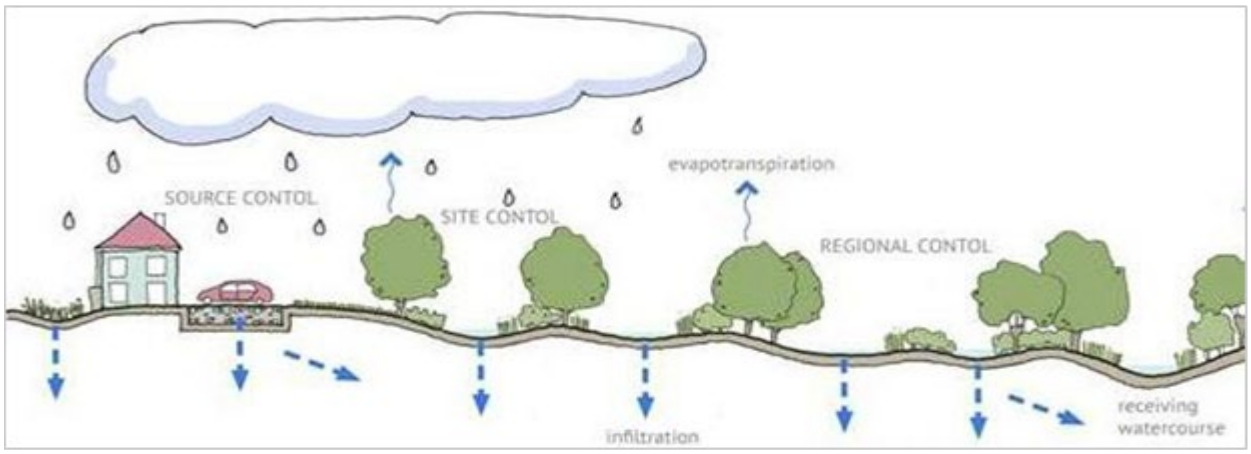


Figure 2.2– SuDS Treatment Train

The principles of a SuDS treatment train were used during the design of the surface water drainage system. The treatment train as illustrated in the image below provides an understanding of prevention and source control to reduced water run-off from a site and improve water quality.

Criterion 1: River Water Quality Protection

Satisfied by providing stormwater attenuation tanks and treatment of surface water run-off by SUDS features such full retention fuel/oil separators at surface water discharge points.

Criterion 2: River Regime Protection

Satisfied by attenuating surface water run-off in association with flow control devices prior to discharge off site at Greenfield runoff rate. Site critical duration storm used to assess attenuation volume.

Criterion 3: Level of Service (Flooding) for the Site

Satisfied by reviewing available flood hazard information (e.g., Lee CFRAM Study) relating to the site's proximity to tidal and fluvial flood plains (up to 1 in 100-year flood event).

Criterion 4: River Flood Protection

Satisfied by attenuating surface water discharge to greenfield runoff rates, addressing flood risk associated with the 1 in 100-year storm and avoiding development in flood plains.

Following a comprehensive review of the design of the storm water drainage system we considered all options under the SuDS guidance policies referred to in the Greater Dublin Drainage Strategy. A preliminary feasibility of the applicable SuDS Techniques was conducted using the facility on the website of Irishsuds.ie (Guidance and Tools). The preliminary analysis indicated that the following techniques were possibly suitable Attenuation Tanks, Basins, Permeable Paving, Soakaways, Swales and Rainwater Harvesting.

Each proposal was examined and evaluated on its merits / suitability under site specific constraints for use in the proposed development site. Our design approach summary is as follows:

2.2 SuDS Appraisal

The SUDS selection process used for this site is in accordance with SUDS selection flow chart, Volume 3, Section 6.5, Figure 48 of the GDSDS. The characteristics of the site are utilised to select the various SUDS techniques that would be applicable.

The following methodologies are being implemented as part of a SuDS treatment train approach:

2.2.1 Permeable Pavement

Permeable pavement reduces the overall impermeable area of the hard-standing area, which will reduce the impact of the discharge and improve the quality of the effluent from the proposed development.

Permeable paving has been proposed in a number of areas namely private driveways. No area containing permeable paving will be included in areas that will be taken in charge by the Local Authority. Driveways are in individual private ownership. In order to propose permeable paving, the detailed design required obtaining infiltration results. It is proposed to infiltrate runoff through the subsurface media. An average of 30 m^2 of paving will be provided to each private dwelling. In order to infiltrate the runoff a permeable sub-stratum of 300mm permeable stone with a void ratio of approximately 30% is required. Full design calculations for the permeable paving are included in Appendix B.

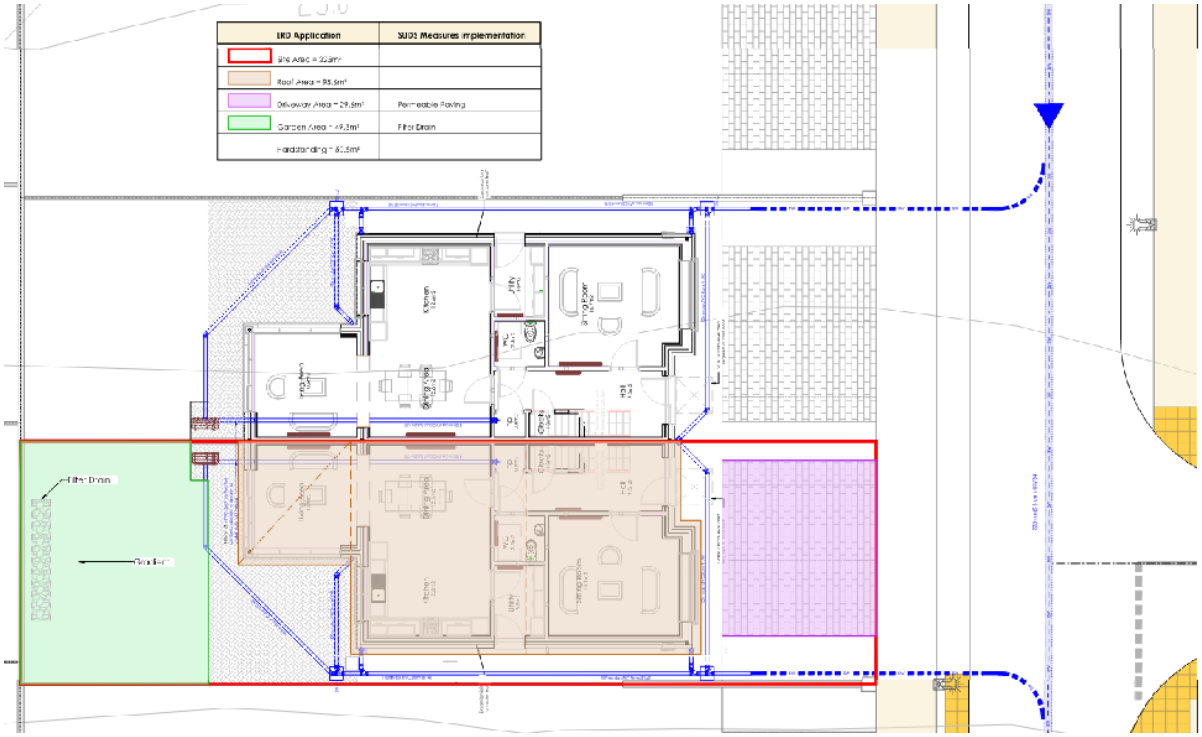


Figure 2.3– Typical Private Dwelling Layout

LRD Application	SUDS Measures implementation
Site Area = 225m²	
Roof Area = 95.6m²	
Driveway Area = 29.6m²	Permeable Paving
Garden Area = 49.3m²	Filter Drain
Hardstanding = 50.5m²	

Figure 2.4– Typical Private Dwelling Site and Breakdown of Areas

The inclusion of permeable paving (approx. 30 m^2 reduces the impermeable area of each private dwelling site by approx. 13% and has a direct correlation and reduction in net contributing runoff areas to be attenuated).

2.2.2 Rainwater Harvesting

In relation to rainwater harvesting an option is to provide a water butt with each individual dwelling. This could be located to the rear of each unit. This water butt will only have the ability to catch the rear sloping side of the dwelling and the reuse would be for watering plants. The intension would be that these are provided retrospectively by the homeowner.

2.2.3 Infiltration Basins

It is proposed to incorporate infiltration basins in green spaces to compliment the SuDs strategy. These are vegetated depressions designed to store runoff on the surface and infiltrate it gradually into the ground. They are dry except in periods of heavy rainfall.

2.2.4 Filter Drain

Trenches filled with permeable material and a perforated collection pipe at the invert with an optional permeable 'sandy' topsoil at surface. These will treat, convey and attenuate runoff at source, and can infiltrate to the ground where the subgrade is suitable. These systems will allow some form of storage for small rainfall events and can result in water evaporation and adsorption in small quantities, therefore there will be less run-off from these areas in small rainfall events thus mimicking the natural response for this catchment. These will be located along the proposed pedestrian/cycle pathways and will allow groundwater to recharge to its natural state.

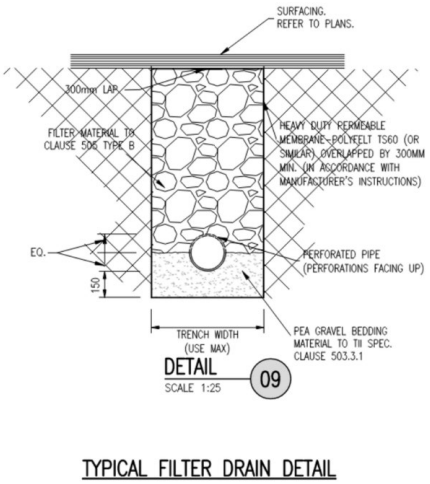


Figure 2.2.4– Typical Filter Drain Detail

The runoff and infiltration from the filter drains in the public areas have not been incorporated in any reduction of areas from an attenuation storage calculation perspective. Theoretically the installation of these filter drains contribute to a possible volumetric reduction in required attenuation but this potential reduction has not been factored into the attenuation calculations.

2.2.5 Tree Pits

Trees can be planted within a range of infiltration SuDS components to improve their performance, as root growth and decomposition increase soil infiltration capacity. Alternatively, they can be used as standalone within soil-filled tree pits, tree planters or structural soils, collecting and storing runoff and providing treatment via filtration and phytoremediation. Tree pits and planters will be designed to collect and attenuate runoff by providing additional storage within the underlying structure. The soils around trees can also be used to filter out pollutants from runoff directly. Tree pits are proposed to be in green space areas to treat and control runoff, while at the same time providing amenity value to adjacent pedestrian, and residential zones. It is also proposed, where possible to fit tree pits along the estate road to drain and treat surface water runoff from the road network. This will allow for treatment of first flush and low flows while high flows will discharge into the surface water network during extreme rainfall events. Rain water gullies will still be provided downstream of any tree pit to drain runoff during an extreme rainfall event.

Trees Pits are proposed as indicated on Drawing No. 6648-0028.

Calculations in relation to the infiltration rates of same are included in Appendix B. The proposed detail is as per Fig 2.7 below.

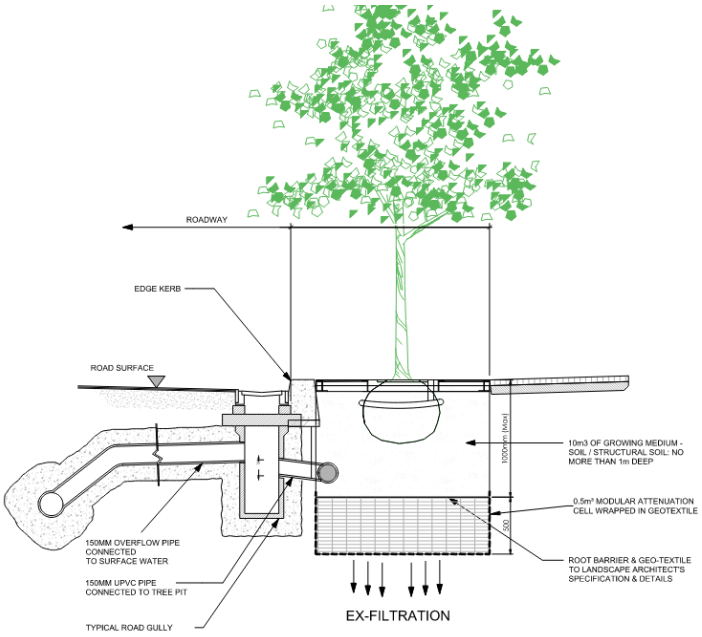


Figure 2.7– Tree Pit Detail

The analysis of these pits and associated infiltration/storage capacity would indicate that these tree pits could cater for the treatment and storage of runoff from approximately 20m^2 of adjacent impermeable pavement. From an overall calculation perspective however, this benefit has been omitted from the proposed attenuation storage required for the proposed development.

2.2.6 Detention Basin

The proposed attenuation system will provide treatment to the storm water before it passes to the local drainage network. The basin has been designed to be 'off-line' which provides treatment even in low flow conditions This minimises maintenance requirements and maintenance costs.

The system attenuates surface water to restrict the outflow to the equivalent of the existing agricultural runoff. This ensures the development will not give rise to any impact downstream of the site.

2.2.7 Flow Control Device

It is proposed to provide a hydrobrake, or similar approved, at the outfall of the surface water catchment to restrict the outflow of water from the subject site. The hydro-brakes will be fitted with a pull cord bypass and a penstock valve installed on the inlet to the manhole for maintenance purposes. The restricted outlet will be designed to the following

Catchment Ref	Basin Ref	Restricted Outlet
Catchment No. 1	Basin No. 1	35.30 l/sec
Catchment No. 2	Basin No. 2	5.70 l/sec
Catchment No. 3	Basin No. 3	3.50 l/sec

2.2.8 Petrol Interceptor

It is proposed to provide a petrol interceptor upstream of the attenuation tanks to ensure that any remaining hydro-carbons or pollutants within the runoff from trafficked areas are treated prior to outfall to the existing watercourse. It is proposed to provide a Conder Bypass Separator Types or similar approved.

In conclusion the water quality from this catchment should be of a high quality due to the above-mentioned measures, which are applied in a treatment train to treat the water before discharge at a restricted rate to the local network.

The above measures ensure a suitable management train is provided.

2.2.9 Swales

Broad, shallow drainage channels covered in grass which can treat, convey and attenuate runoff, at source, and can infiltrate to the ground where the subgrade is suitable. Swales can also promote biodiversity. This will be located adjacent to roads and hard-standing areas on the southern portion of the site receiving water from the adjoining roads and footpaths. There is no proposal to provide swales.

2.2.10 Rain Gardens

Rain Gardens are small, planted areas with stormwater controls that collect and treat stormwater runoff. Shallow landscaped basins make use of soils and vegetation in order to remove pollutants. This treated runoff would be collected in these basins and form part of a wider SuDS approach but are not proposed within the development.

2.2.11 Green / Sedum Roofs

Green and Sedum roofs involve covering a roof of a building with vegetation laid over a drainage layer and a waterproofing membrane. They are designed to intercept and store rainwater and therefore, reduce surface water runoff. They are suited to the flat type of roof on apartment buildings for example, There isn't scope to provide same in this development.

2.2.12 Raised Planters

It is proposed, as part of the landscaping of the development, to install raised planters within the courtyard areas of proposed apartment block units as an additional SuDS source control. This allows a small volume of water to be stored within the planter and integrated within the proposed surface water network of the development. The planter will have an overflow outlet pipe in times of storm events. The raised planters are to be installed as a SuDS measure that will have ecological and aesthetic benefits. As there are no apartment buildings proposed it is not anticipated that this strategy will be applied.

2.2.13 Existing Ditches, Trees and Hedgerows Within Site

Within the site where possible, existing ditches, trees and hedgerows are to be maintained. Incorporating these existing drainage features into the proposed overall SuDS strategy would provide for greater storage volume capacity within the site and will assist in the conveyance and

treatment of the generated surface water runoff. The retention of existing trees and hedgerows will also assist in the reduction of surface water runoff by evapotranspiration. Any existing ditches that are to be retained, particularly along the existing field boundaries shall be cleaned out and assessed during the construction of the development. All ditches and existing drainage features being retained shall be incorporated into the proposed overall surface water network for the overall site.

2.3 Management Train

The management train commences with source control through the provision of permeable paving where possible and rain-water butts in the rear gardens. This will also reduce the water consumption required of each housing unit. This employment of these source controls along with the usage of localised tree pits will aid to reduce the peak runoff rate, placing less stress on the facilities downstream.

The second stage of the management train, site control, is provided by the introduction of the hydrocarbon interceptors and swales in open areas which provide a degree of treatment before discharging to the attenuation system.

The attenuation tanks and detention basins offer a third stage of treatment, regional control, by slowing the storm water discharge down and removing additional silts which may remain in the storm water.

3 *Surface Water System*

The existing watercourse on the southern boundary of the site has been chosen as the suitable surface water discharge point for the proposed development. The existing development discharges to same and it is proposed to connect upstream to the existing network so that there are no new outfalls proposed.

In order to reduce the effects of the surface runoff on potential flooding, a Stormwater Management Plan will be applied to surface water discharges into adjacent watercourses. The Stormwater Management Plan can be applied to control the rate of runoff from new development. The maximum permitted surface water outflow from the new development is to be restricted to that of the existing Greenfield site by the usage of attenuation storage.

Control of runoff by attenuation methods requires a hydraulic control to restrict the magnitude of flows passing downstream, together with an upstream storage capacity to contain the volume of runoff held back by the hydraulic control. The flows are proposed to be attenuated in the surface water system by adopting detention basins along with restricted outlets as the control devise. The storage volume required has been designed using the computer aided design package Windes 10.4.

The attenuation strategy for the site is for the detention of flows in interlinked detention basins.

3.1 Surface Water Drainage Network

The surface water drainage network for the proposed development was modelled using the Microdrainage software application. The surface water pipe lengths, slopes, contributing impermeable areas, upstream invert levels, upstream cover levels and pipe diameters were entered into the model using the drawings supplied.

3.2 Design Criteria:

The proposed surface water drains have been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), the Department of the Environment's Recommendations for Site Development Works for Housing Areas, the Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal" and BS EN 752: 2008 Drain and Sewer Systems Outside Buildings.

- Return period for pipe work design 2 years
- Return period for attenuation design 100 years
- Soil Type 2
- Allowable Outflow 44.50 l/second
- Time of entry 5 minutes
- M5 – 60 18.800mm
- Ratio "r" 0.250
- Pipe Friction (Ks) 0.6 mm
- Minimum Velocity (based on pipe flowing full) 1.0 m/s
- Rainfall Runoff from Roads and Footpaths 100%
- Rainfall Runoff from Roofs 80%
- Rainfall Runoff from Driveways 80%

- Rainfall Runoff from Green Areas 20%
- Rainfall Depth Factored for Climate Change (as per GDSDS) 20%

(in accordance with GDSDS Volume 2, Chapter 6, Table 6.2 – see below)

Climate Change Category	Characteristics
River flows	20% increase in flows for all return periods up to 100 years
Sea level	400+mm rise (see Climate Change policy document for sea levels as a function of return period)
Rainfall	10% increase in depth (factor all intensities by 1.1)
	Modify time series rainfall in accordance with the GDSDS climate change policy document

Table 6.2 Climate Change Factors to be Applied to Drainage Design

3.3 Storm Water Outfall

Storm water from the proposed development shall discharge into the existing watercourse located below the southern boundary of the site. It will connect to the existing network via a hydro brake manhole, which will limit the amount of water discharging to the network. The amount of water discharged from the hydro brake manhole will be determined by using the allowable Greenfield Runoff rate for the developable area of the site. It is to be noted that all on site storm water storage facilities have been sized to cater for all storm water generated within the site boundary of the development.

3.4 SuDS Calculations

Calculations of the various SuDS elements proposed are contained in Appendix B of this report. This report should also be read in conjunction with the Infrastructure Report submitted as part of the application. Detention Basin Sizes and Petrol Interceptor Sizing/Specifications have been included as part of the Stormwater Network Design in the Infrastructure report. The nature-based SuDS principles proposed will have a positive impact from a sustainable impact. Previously the volumetric attenuation capacity was calculated ignoring the benefits of all SuDS elements. As a result, the attenuation requirements are sizeable. The submitted redesign reduces the runoff from the site (and thus the attenuation volume required) by

- Introduction of permeable paving in private driveways

A contingency has been built in but providing Suds measures and not including their volumetric benefits in the attenuation calculations, namely

- Filter drains along public paths
- Tree-pit infiltration and storage

4 Site Investigations

DOSA Consulting Engineers and Priority Geotechnical Engineers conducted Site Investigations in February 2024.

The purpose of the site investigation was to investigate subsurface conditions using a variety of investigative methods. The scope of the site investigation works undertaken for this project included the following:

- Visit project site to observe existing conditions.
- Excavate. Trial Pits to a maximum depth of 2.30m BGL.
- Geotechnical Laboratory testing

4.1 Subsurface Exploration

During the ground investigation a programme of intrusive investigation were undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in- situ testing were undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be conducted on the soil samples recovered during excavation and drilling.

The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

4.2 Trial Pits

The trial pits were excavated using a 21T tracked excavator as indicated in the Site Investigations Report. The trial pits were conducted to assess and classify the insitu ground material to obtain representative samples of the materials. The location of the trial pits were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged, and photographed by and prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered, and the characteristics of the strata encountered and presented on the trial pit logs.

4.3 Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.

Chemical testing as required by the specification, including pH, sulphate and organic matter content testing are being conducted by Element Materials Technology Laboratory in the UK.

Geotechnical testing consisting of moisture content, Atterberg limits and Particle Size Distribution (PSD) tests were conducted.

4.4 Ground Conditions

4.4.1 General

The ground conditions encountered during the investigation are summarised with reference to insitu and laboratory test results.

4.4.2 Groundwater

No groundwater was noted during the investigation.

Based on the information contained within the report, there will be no perceptible impacts from groundwater levels on proposed SuDS throughout the site.

4.4.3 Soil Infiltration Rate

The Soil Infiltration rates are indicated in the Appendices of the Report with an average rate of 1.57 x 10-4 m/second across the 3 test holes.

5 Existing Site Hydrology

The main hydrological feature of the area is the Blackwater River which flows in an easterly direction to the south of the site before discharging into Youghal harbour. The Caherduggan & Spa streams join the Blackwater River Lee in Mallow town. Figure 4-1 below illustrates the main hydrological features associated with the site.

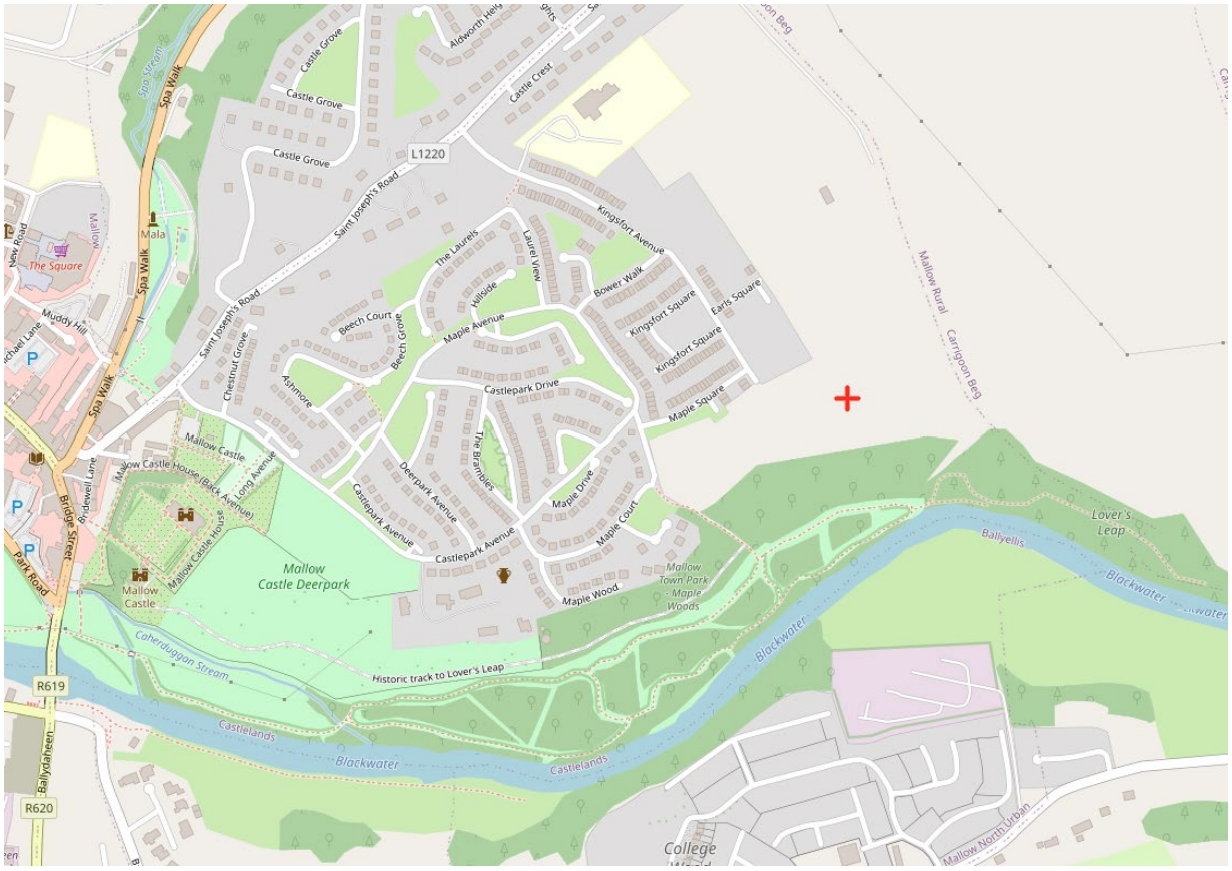


Figure 4.1: Hydrological Features of the Area

6 *Maintenance Regime for SuDS Devices*

The SuDS features proposed above for the site will require the following maintenance:

6.1 Permeable Paving

The permeable paving has a design life equivalent to standard block paving. The surface blocks require routine maintenance. There are four levels of cleaning that can be carried out on a paved area:

1. General dirt should be removed by regular dry brushing.
2. Where the paving has become dull, showing a loss of colour, a wet wash with a stiff bristle brush and garden hose can be adequate.
3. For more stubborn areas a power washer can be used, taking care not to remove the jointing materials (sand or mortar). The washer should be on a medium pressure setting or lower and should not be aimed directly at the paving surface, but at an angle of 30° approximately.

Cleaning detergents can be used; however, some detergents are acidic and overuse can damage some paving products. It is advisable to follow the manufacturer's instructions and rinse the areas fully. The resulting runoff should be carefully channelled to either drainage points or containers from where it can be safely disposed. Replace any washed-out jointing sand with new dried sand once the paving has dried.

6.1.1 Wet Swales:

Requires regular inspection of inlets and outlets, vegetation, mulching and the removal of nuisance plants and rubbish as necessary. Trees and vegetation should be trimmed every 2 years. Swale surface should be spiked, scarified and removed of 'thatch' every 3 years with regular inspection of surface infiltration to avoid areas of ponding. Repair erosion at inlets and outlets and re-turf surfacing as required. Wet swales will be maintained from adjacent access roads.

6.1.2 Detention Basins

The detention basins will require regular maintenance to ensure continuing operation to design performance standards. This will be relatively straightforward for landscape contractors and does not generally require any additional works above what is necessary for a standard public open space.

6.1.3 Tree Pits

Maintenance of trees will be greatest in the first few years, which will include regular inspection of tree condition including inlets and outlets, removal of invasive vegetation and possibly irrigation during long dry periods.

6.1.4 Filter Drains

Inspection of the system should be conducted monthly on the inlet / outlet pipework and any control systems for blockages. Inspection of pre-treatment systems including should be conducted every 6 months for catch pits manholes prior to the filter drain with removal of silt or other build-ups. Removal of silt build-up may be required more frequent. Annual cleaning of roof runoff gutters

etc should be part of the generally maintenance of the drainage system to ensure debris is removed prior to entering the network. Perforated pipework should be cleared of blockage if required.

6.1.5 Hydrobrake Manhole:

Normally little maintenance is required as there are no moving parts within a hydrobrake, however, after installation, hydrobrakes should be inspected to ensure the hydrobrake orifice is not blocked on a monthly basis for three months and thereafter at six monthly intervals and hosed down if required. Remove rubbish or debris from hydrobrake if present. Hydro-Brake Flow Controls are fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.

6.1.6 Petrol Interceptor:

Systems should be visually inspected for every rainfall event for 30 days after installation and the amount of sediment measured to give the operator an idea of the expected rate of deposition. Systems should then be inspected every 6 months to verify the appropriate level of maintenance. Floating debris and solids should be removed, and the sump cleaned with a conventional sump vacuum cleaner. Filter media should be replaced, and sediments, oils and grease should be removed where required.

The permeable paving has a design life equivalent to standard block paving. The surface blocks require routine maintenance. There are four levels of cleaning that can be conducted on a paved area:

1. General dirt should be removed by regular dry brushing.
2. Where the paving has become dull, showing a loss of colour, a wet wash with a stiff bristle brush and garden hose can be adequate.
3. For more stubborn areas a power washer can be used, taking care not to remove the jointing materials (sand or mortar). The washer should be on a medium pressure setting or lower and should not be aimed directly at the paving surface, but at an angle of 30° approximately.

Cleaning detergents can be used; however, some detergents are acidic, and overuse can damage some paving products. It is advisable to follow the manufacturer's instructions and rinse the areas fully. The resulting runoff should be carefully channelled to either drainage points or containers from where it can be safely disposed. Replace any washed-out jointing sand with new dried sand once the paving has dried.

The attenuation tanks will require regular maintenance to ensure continuing operation to design performance standards.

7 Flood Risk

According to the GSI and floodinfo.ie resources, there are no historic records of flooding near the site.

7.1 Fluvial risk

The proposed development is located approximately 100m north of Blackwater River. The entirety of the proposed development site is in Flood Zone C, an area at low risk of flooding (less than 0.1% Annual Exceedance Probability - AEP). The applicant is the owner of lands on the southern boundary of the development site which are within Flood Zone A, are at high risk of flooding (more than 1%AEP). It is proposed that a footpath could be installed by the applicant which would facilitate connection from the proposed development to the existing riverside amenity path to the south. Therefore, the proposed use at this area is for an open space and footpath, a water compatible use and, as such, appropriate for development in Flood Zone A. The extreme flood water level from Blackwater River is at 46.37m AOD for the 0.1%AEP. All highly and less vulnerable development is proposed above this level, between 61.75m AOD and 85.15m AOD. The risk of fluvial flooding to the development is therefore low.

A Justification Test will not be required for the proposed development.

7.2 Pluvial risk

The development is located on a sloping greenfield site. St Joseph's Road north of the site lies on a ridge and forms the local high point. There are limited catchments upstream the development site and as such no overland flows from outside the development would enter the site and cause risk of pluvial flooding.

7.3 Groundwater risk

The site is underlain by Dinantian pure unbedded limestone which is a Regionally Important karstified bedrock aquifer (Rkd) dominated by diffuse flow. This type of bedrock is highly productive, and groundwater can travel over large distances through the karstified faults and joints. The nearest Geological Survey Ireland (GSI) mapped karst feature is approx. 500m west of the site near the N72, at an elevation below 50m AOD.

There is no groundwater level monitoring available within the site. Due to the karstified nature of the bedrock the local groundwater flow direction may not reflect the topography, however the regional groundwater flow direction will be towards rivers. Therefore, the groundwater flow direction beneath the site is likely to be south towards the River Blackwater.

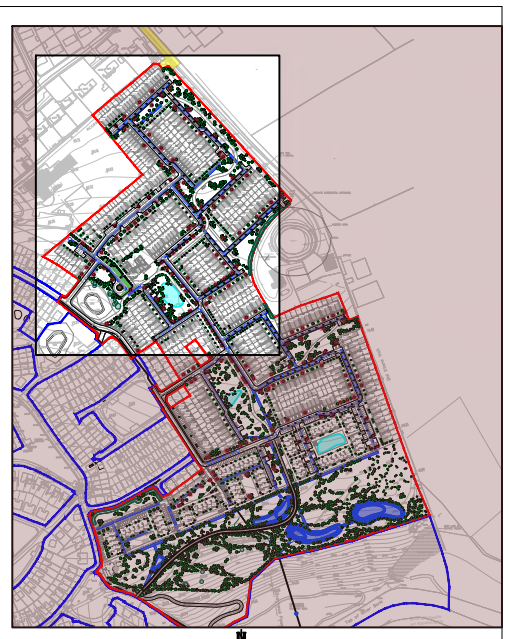
The GSI groundwater flooding maps do not indicate risk of flooding at the site.

Taking the above into consideration, the risk of groundwater flooding to the site is considered low.

Please refer to the Site-Specific Flood Risk Assessment (Document No. 305321-ARUP-ZZ-XX-RP-CF-000001- Flood Risk Assessment) complied by Arup for further details.

Appendix A –Schematic SuDS Train

Note:
See Drawing Number 6621-2037 for SUDS Details



Site Layout - Key Plan
Scale : 1:5000

Legend:
- Tree Pit
- Filter Drain
- Permeable Paving
- Stormwater Attenuation areas
- Infiltration Basin

Proposed SUDS Layout 1 of 3
Scale : 1:500

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS
Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84
021 4871781
info@dosa.ie
www.dosa.ie

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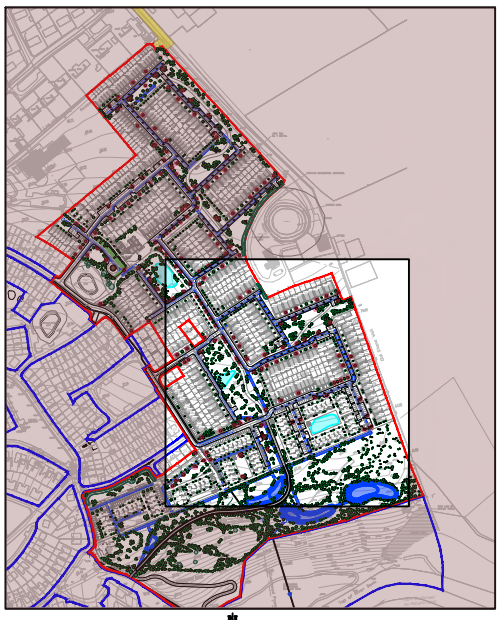
B	K.M.	S.O'G	S.O'G	27.09.'24	Issued for LRD Application
A	G.S.	S.O'G	S.O'G	18.12.23	Issued for Pre Planning Application

CLIENT: Reside (Castlepark) Ltd.

PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Schematic SUDS Layout 1 of 3

SHEET	SCALE	PROJECT NO.	DRAWING NO.	STATUS/ISSUE
A1	1:500	6621	2027	B



Site Layout - Key Plan
Scale : 1:5000

Legend:
- Tree Pit
- Filter Drain
- Permeable Paving
- Stormwater Attenuation areas
- Infiltration Basin

Note:
See Drawing Number 6621-2037 for SUDS Details

Proposed SUDS Layout 2 of 3
Scale : 1:500

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

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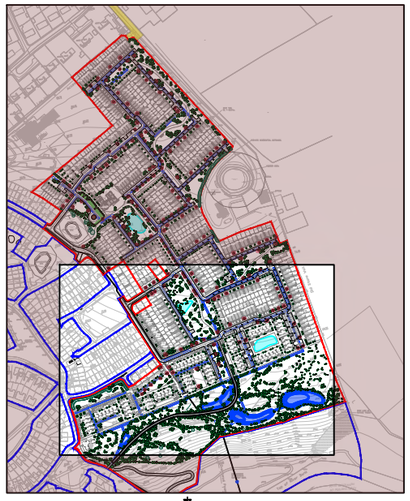
REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
B	K.M.	S.O'G	S.O'G	27.09.'24	Issued for LRD Application
A	G.S.	S.O'G	S.O'G	18.12.23	Issued for Pre Planning Application

CLIENT: Reside (Castlepark) Ltd.

PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Schematic SUDS Layout 2 of 3

SHEET	SCALE	PROJECT NO.	DRAWING NO.	STATUS/ISSUE
A1	1:500	6621	2028	B



Site Layout - Key Plan
Scale : 1:5000

Legend:

- Tree Pit
- Filter Drain
- Permeable Paving
- Stormwater Attenuation areas
- Infiltration Basin

Note:
See Drawing Number 6621-2037 for SUDS Details

Proposed SUDS Layout 3 of 3
Scale : 1:500

DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Co Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

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REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
B	K.M.	S.O'G	S.O'G	27.09.24	Issued for LRD Application
A	G.S.	S.O'G	L.O'T	15.11.23	Issued for Pre Planning Application

CLIENT: Reside (Castlepark) Ltd.

PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Schematic SUDS Layout 3 of 3

SHEET	SCALE	PROJECT NO.	DRAWING NO.	STATUS/ISSUE
A1	1:500	6621	2029	B

Appendix B –SuDS Calculations

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = **4.0** m^2
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.360**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.8** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = **300** mm
Width of pit	w = **1000** mm
Length of pit	l = **1000** mm
Percentage free volume	V_{free} = **30** %
Soil infiltration rate	f = **157.×10^{-6}** m/s
Wetted area of pit 50% full	a_{s50} = l × d + w × d = **600000** mm^2

Table equations

Inflow (cl.3.3.1)	I = M100 × A
Outflow (cl.3.3.2)	O = a_{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Note: The following Z2 table values are user defined.

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m^3)	Outflow (m^3)	Storage required (m^3)
5	0.36;	6.8;	1.90;	12.9;	0.05;	0.03;	0.02
10	0.51;	9.6;	1.96;	18.8;	0.08;	0.06;	0.02
15	0.62;	11.7;	1.97;	23.0;	0.09;	0.08;	0.01
30	0.79;	14.9;	1.98;	29.4;	0.12;	0.17;	0.00
60	1.00;	18.8;	1.94;	36.5;	0.15;	0.34;	0.00
120	1.22;	22.9;	1.91;	43.7;	0.17;	0.68;	0.00
240	1.48;	27.8;	1.87;	52.0;	0.21;	1.36;	0.00
360	1.67;	31.4;	1.84;	57.7;	0.23;	2.03;	0.00
600	1.90;	35.7;	1.80;	64.4;	0.26;	3.39;	0.00
1440	2.42;	45.5;	1.74;	79.3;	0.32;	8.14;	0.00

Required storage volume	S_{req} = **0.02** m^3
Soakaway storage volume	S_{act} = l × d × w × V_{free} = **0.09** m^3

PASS - Soakaway storage volume

Time for emptying soakaway to half volume	t_{s50} = S_{req} × 0.5 / (a_{s50} × f) = 1min 47s

PASS - Soakaway discharge time less than or equal to 24 hours

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = **23.7** m^2
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.360**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.8** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = **300** mm
Width of pit	w = **5800** mm
Length of pit	l = **5100** mm
Percentage free volume	V_{free} = **30** %
Soil infiltration rate	f = **24.9×10^{-6}** m/s
Wetted area of pit 50% full	a_{s50} = l × d + w × d = **3270000** mm^2

Table equations

Inflow (cl.3.3.1)	I = M100 × A
Outflow (cl.3.3.2)	O = a_{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Note: The following Z2 table values are user defined.

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m^3)	Outflow (m^3)	Storage required (m^3)
5	0.36;	6.8;	1.90;	12.9;	0.30;	0.02;	0.28
10	0.51;	9.6;	1.96;	18.8;	0.45;	0.05;	0.40
15	0.62;	11.7;	1.97;	23.0;	0.55;	0.07;	0.47
30	0.79;	14.9;	1.98;	29.4;	0.70;	0.15;	0.55
60	1.00;	18.8;	1.94;	36.5;	0.87;	0.29;	0.57
120	1.22;	22.9;	1.91;	43.7;	1.04;	0.59;	0.45
240	1.48;	27.8;	1.87;	52.0;	1.23;	1.17;	0.06
360	1.67;	31.4;	1.84;	57.7;	1.37;	1.76;	0.00
600	1.90;	35.7;	1.80;	64.4;	1.53;	2.93;	0.00
1440	2.42;	45.5;	1.74;	79.3;	1.88;	7.03;	0.00

Required storage volume	S_{req} = **0.57** m^3
Soakaway storage volume	S_{act} = l × d × w × V_{free} = **2.66** m^3

PASS - Soakaway storage volume

Time for emptying soakaway to half volume	t_{s50} = S_{req} × 0.5 / (a_{s50} × f) = 58min 21s

PASS - Soakaway discharge time less than or equal to 24 hours

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = **30.0** m^2
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.360**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.8** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = **1000** mm
Width of pit	w = **1000** mm
Length of pit	l = **1000** mm
Percentage free volume	V_{free} = **95** %
Soil infiltration rate	f = **157.×10^{-6}** m/s
Wetted area of pit 50% full	a_{s50} = l × d + w × d = **2000000** mm^2

Table equations

Inflow (cl.3.3.1)	I = M100 × A
Outflow (cl.3.3.2)	O = a_{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Note: The following Z2 table values are user defined.

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m^3)	Outflow (m^3)	Storage required (m^3)
5	0.36;	6.8;	1.90;	12.9;	0.39;	0.09;	0.29
10	0.51;	9.6;	1.96;	18.8;	0.56;	0.19;	0.38
15	0.62;	11.7;	1.97;	23.0;	0.69;	0.28;	0.41
30	0.79;	14.9;	1.98;	29.4;	0.88;	0.57;	0.32
60	1.00;	18.8;	1.94;	36.5;	1.10;	1.13;	0.00
120	1.22;	22.9;	1.91;	43.7;	1.31;	2.26;	0.00
240	1.48;	27.8;	1.87;	52.0;	1.56;	4.52;	0.00
360	1.67;	31.4;	1.84;	57.7;	1.73;	6.78;	0.00
600	1.90;	35.7;	1.80;	64.4;	1.93;	11.30;	0.00
1440	2.42;	45.5;	1.74;	79.3;	2.38;	27.13;	0.00

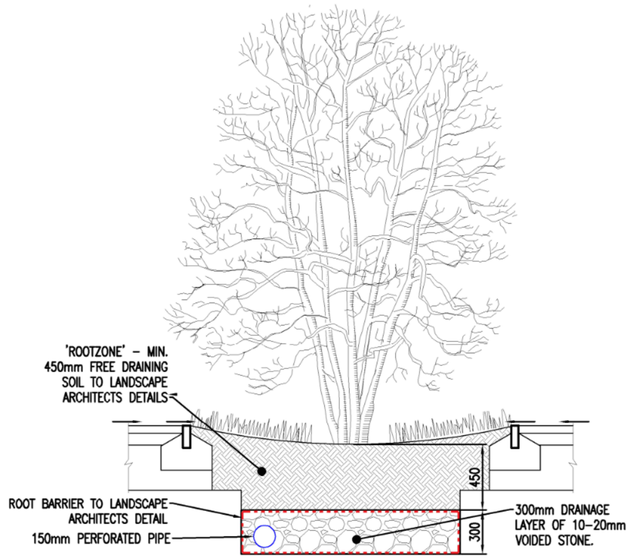
Required storage volume	S_{req} = **0.41** m^3
Soakaway storage volume	S_{act} = l × d × w × V_{free} = **0.95** m^3

PASS - Soakaway storage volume

Time for emptying soakaway to half volume	t_{s50} = S_{req} × 0.5 / (a_{s50} × f) = 10min 53s

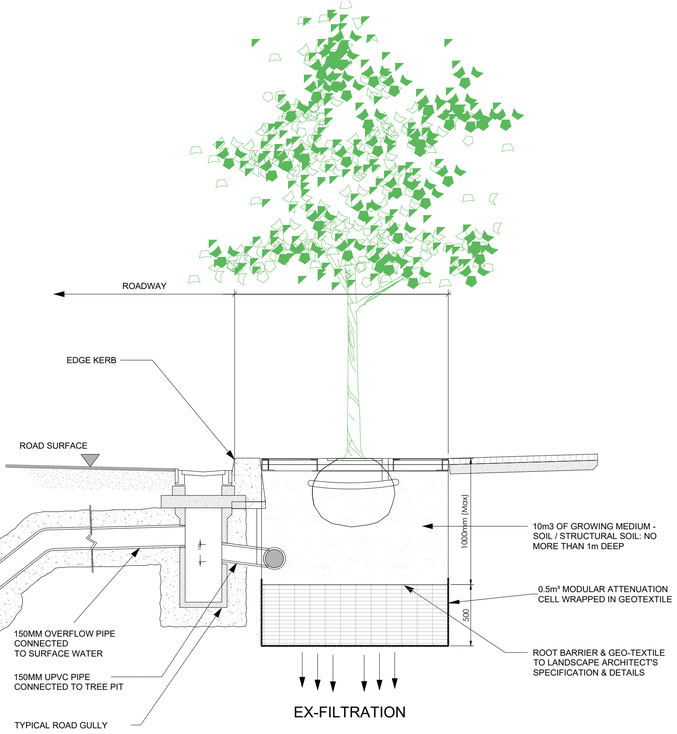
PASS - Soakaway discharge time less than or equal to 24 hours

Appendix C –Miscellaneous SuDS Drawings



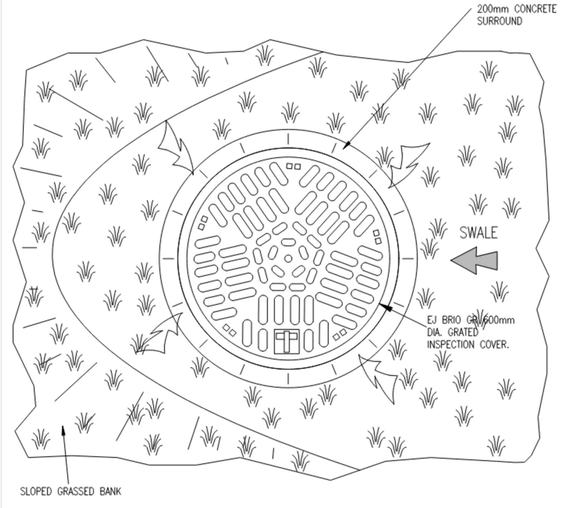
TYPICAL SECTION THROUGH RAIN GARDEN/BIORETATION TREE PIT

SCALE 1:25 @ A1



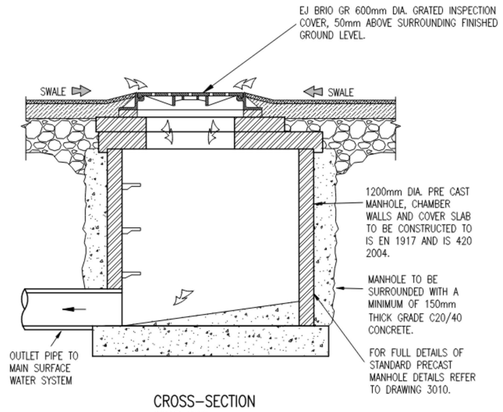
EX-FILTRATION

TYPICAL ROAD GULLY TO TREE PIT DETAIL (TYPE 1)



PLAN

SCALE 1:10

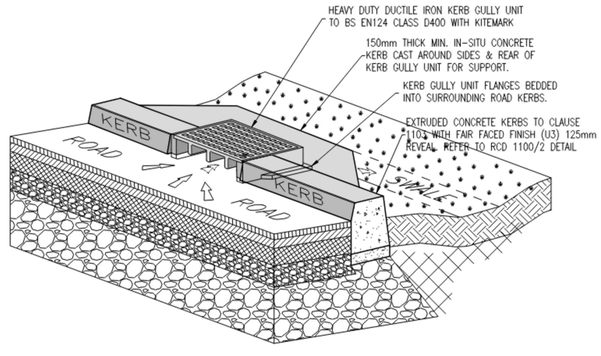


CROSS–SECTION

SCALE: N.T.S.

GRATED MANHOLE INLET CHAMBER

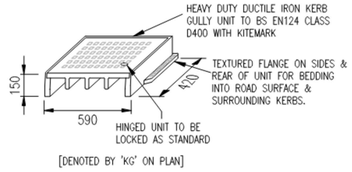
[FOR ROAD DRAINAGE]



LATERAL INLET KERB GULLY SCHEMATIC

[FOR ROAD DRAINAGE]

SCALE: NTS

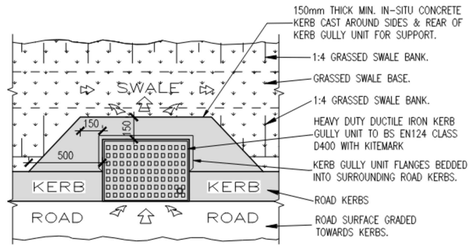


[DENOTED BY 'KG' ON PLAN]

LATERAL INLET KERB GULLY DETAIL

[LOCATED ALONG KERBLINES TO ALLOW ROAD SURFACE WATER RUN–OFF INTO SWALES]

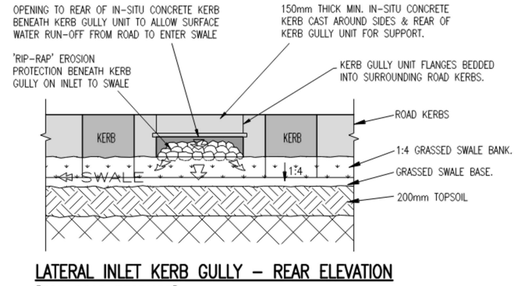
SCALE: NTS



LATERAL INLET KERB GULLY PLAN

[FOR ROAD DRAINAGE]

SCALE: NTS



LATERAL INLET KERB GULLY – REAR ELEVATION

[FOR ROAD DRAINAGE]

SCALE: NTS

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DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS

Joyce House
Barrack Square
Ballincollig
Co Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

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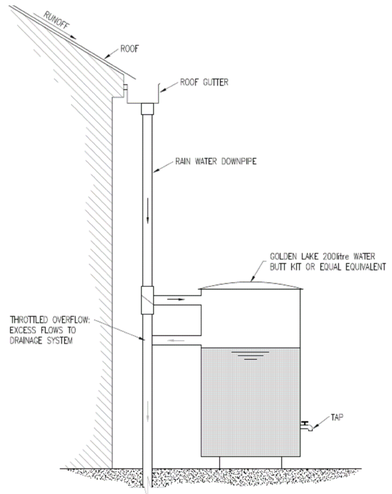
A	D.O'S.	S.O'G	L.O'T	16.08.24	Issued for Planning

CLIENT: Reside (Castlepark) Ltd.

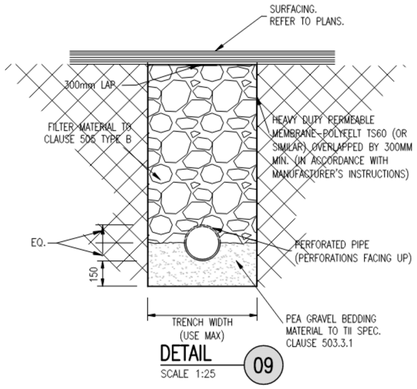
PROJECT: Castlepark, Mallow, Co. Cork

DRAWING TITLE: Proposed SUDS Details (1 of 2)

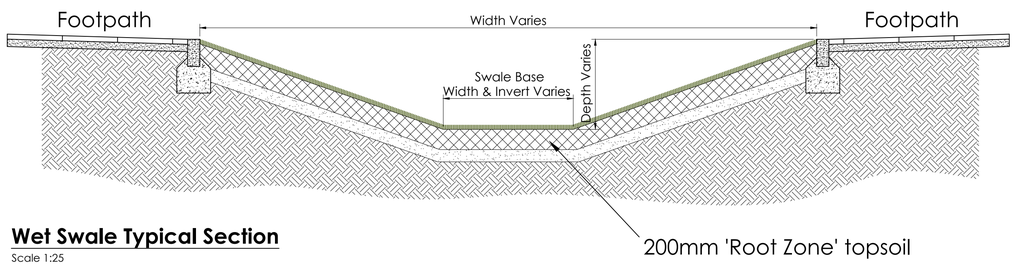
SHEET	SCALE	PROJECT NO.	DRAWING NO.	STATUS/ISSUE
A1	1:500	6621	0024	A



TYPICAL WATER BUTT DETAIL
SCALE: NTS



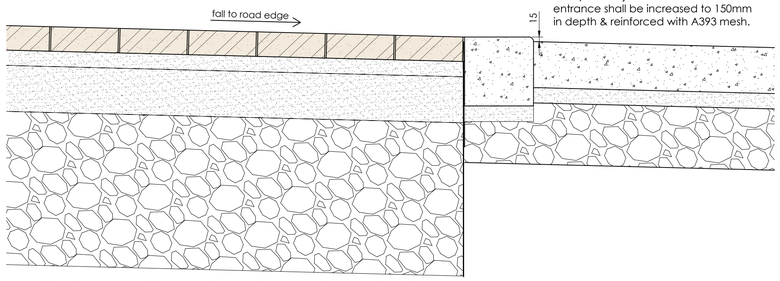
TYPICAL FILTER DRAIN DETAIL



Wet Swale Typical Section
Scale 1:25

Surface Construction: Parking Bay
80mm Permeable paving block to B.S.1338 & Architects specification & approval & laying pattern on
50mm laying material jointing to manufacturers specification (typically type 2/6.3 GC 80/20 to I.S. EN 13342) on
150mm road base course cement stabilised coarse graded aggregate as GBGM B to NRA CL 822 on
500mm Sub base layer 4mm to 20mm coarse grade clear crushed rock to I.S. EN 13242:2002 (se note on particle size distribution) on geotextile layer to clause 609 (NRA).

Concrete Pedestrian Pavement:
100mm C40/50 concrete on 50mm blinding on 100mm min compacted clause 803/804 sub base. Expansion joints at maximum 3m centres. Brush (non slip) finish, no bull nose trowel finish at expansion joint location. Vehicular entrance shall be increased to 150mm in depth & reinforced with A393 mesh.



Typical Permeable Paving Driveway Cross- Section
Scale 1:10

Joyce House
Barrack Square
Ballincollig
Co Cork
P31 KP84

021 4871781
info@dosa.ie
www.dosa.ie

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REV.	DRAWN	CHKD	APPRVD	DATE	DETAILS
A	D.O'S.	S.O'G	L.O'T	16.08.24	Issued for Planning

CLIENT: Reside (Castlepark) Ltd.
PROJECT: Castlepark, Mallow, Co. Cork
DRAWING TITLE: Proposed SUDS Details (2 of 2)
SHEET: A1
SCALE: 1:500
PROJECT NO.: 6621
DRAWING NO.: 0027
STATUS/ISSUE: A

Appendix D –Site Investigation Results

Priority Geotechnical Ltd.
Tel: 021 4631600
Fax: 021 4638690
www.prioritygeotechnical.ie

Trial Pit No
SA01
Sheet 1 of 1

Project Name: Castlelands Mallow	**Project No.** P24011	**Co-ords:**	**Date** 06/02/2024
Location: Co. Cork		**Dimensions (m):** 2.70 × 0.80	**Scale** 1:25
Client:		**Depth:** 2.30m BGL	**Logged** DOC

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
							Yellowish Brown Sandy slightly Gravelly CLAY. Sand fine to course, Gravel fine to course angular rounded.
				0.50			Brown slightly Clayey slightly Gravelly SAND. Sand fine to course, Gravel fine to course angular sub-rounded.
	2.00	B					
				2.30			End of Pit at 2.300m

1 2 3 4 5

Stability: Good
Plant: 14t Excavator.
Backfill: Arisings.

Groundwater: None encountered.

Remarks: Trial pit terminated at 2.30m bgl, scheduled depth reached.

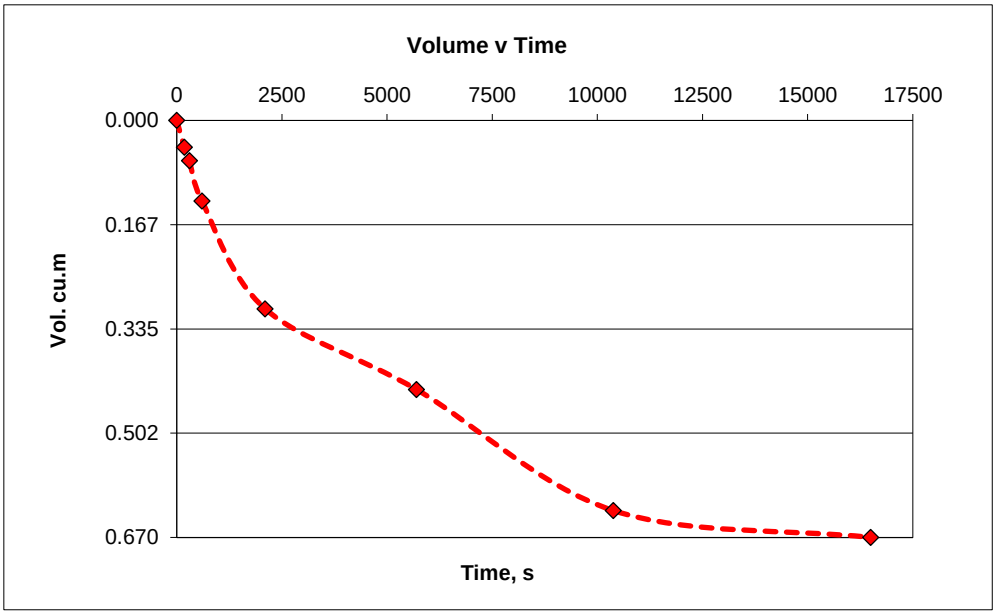
Project Nr. P24011
Project Name Castlelands Mallow
Location SA01
Cycle 1
Date: 06/02/2024

l, m	**2.70**	b, m	**0.80**	d, m	**2.30**
l_base, m	**2.70**			d_eff, m	**1.30**
l_eff, m	**2.70**				

	Time, min	Measure, m bgl	Time, sec	Depth water, m	Fall, m	Volume
12:35	0	1.00	0	1.30	0.00	0.000
	3	1.02	180	1.28	0.02	0.043
	5	1.03	300	1.27	0.03	0.065
	10	1.06	600	1.24	0.06	0.130
	35	1.14	2100	1.16	0.14	0.302
	95	1.20	5700	1.10	0.20	0.432
	173	1.29	10380	1.01	0.29	0.626
	275	1.31	16500	0.99	0.31	0.670

Area	2.160 m^2	$V_{p75\text{-}25\ theory}$	volume	1.4040	m^3
50% Area_eff, a_{p50}	6.710 m^2	$V_{p\ 75\ -\ 25\ actual}$	volume	0.3348	m^3
50% Area_act, a_{p50}	5.625 m^2	$t_{p\ 75\text{-}\ 25\ actual}$	time	6471	s

Infiltration Coefficient	*f*	9.20E-06	ms^-1



NOTES:
See SA01 log for detailed soil description; clayey gravelly SAND.
No groundwater encountered. Pit assumed unsaturated.
Infiltration calculated over actual fall

Photographic Record

Number:	**SA01**	**Project**	Castlelands, Mallow, Co. Cork.	
		Project No	P24011	
		Engineer	DOSA	

Photographic Record

Number:	**SA01**	**Project**	Castlelands, Mallow, Co. Cork.	
		Project No	P24011	
		Engineer	DOSA	

Photographic Record

Number:	**SA01**	**Project**	Castlelands, Mallow, Co. Cork.	
		Project No	P24011	
		Engineer	DOSA	

Priority Geotechnical Ltd.
Tel: 021 4631600
Fax: 021 4638690
www.prioritygeotechnical.ie

Trial Pit No
SA02
Sheet 1 of 1

Project Name: Castlelands Mallow	**Project No.** P24011	**Co-ords:**	**Date** 06/02/2024
Location: Co. Cork		**Dimensions (m):** 3.20 × 0.80	**Scale** 1:25
Client:		**Depth:** 2.00m BGL	**Logged** DOC

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.30			Hard Yellowish Brown Sandy slightly Gravelly CLAY with low Cobble content. Sand fine to course, Gravel fine to course angular sub-rounded, Cobbles sub-angular sub-rounded with Mudstone lithology. *Cobble content between 63-200mm.*
							Yellowish Brown Clayey Gravelly SAND. Sand fine to course, Gravel fine to course angular sub-rounded. *Cobble content between 63-200mm.*
	2.00	B		2.00			End of Pit at 2.000m

1 2 3 4 5

Stability: Good.
Plant: 14t Excavator.
Backfill: Arisings.

Groundwater: None encountered.

Remarks: Trial pit terminated at 2.00m bgl, scheduled depth reached.

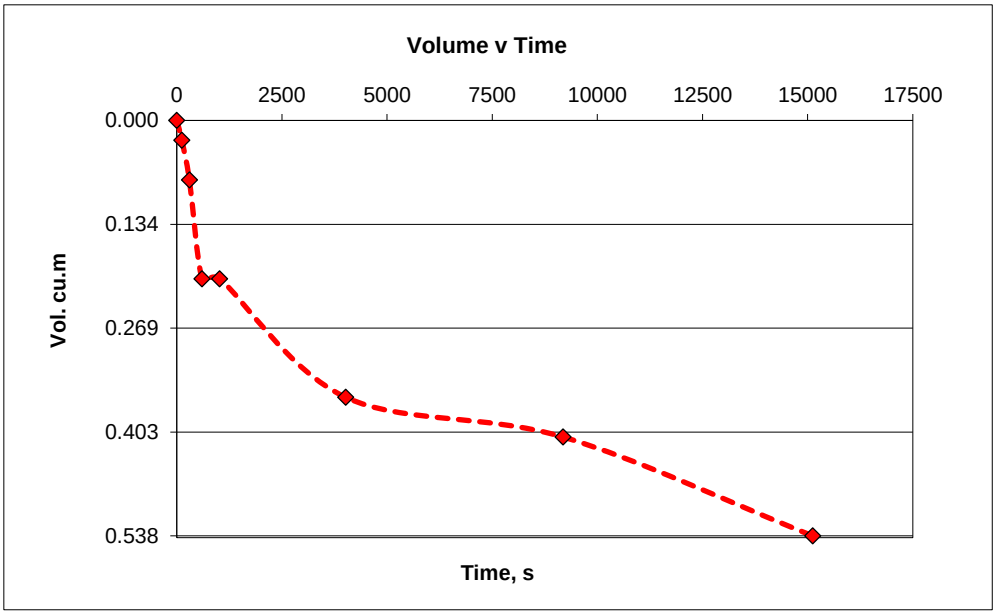
Project Nr. P24011
Project Name Castlelands Mallow
Location SA02
Cycle 1
Date: 06/02/2024

l, m	**3.20**	b, m	**0.80**	d, m	**2.00**
l_base, m	**3.20**			d_eff, m	**1.30**
l_eff, m	**3.20**				

	Time, min	Measure, m bgl	Time, sec	Depth water, m	Fall, m	Volume
12:58	0	0.70	0	1.30	0.00	0.000
	2	0.71	120	1.29	0.01	0.026
	5	0.73	300	1.27	0.03	0.077
	10	0.78	600	1.22	0.08	0.205
	17	0.78	1020	1.22	0.08	0.205
	67	0.84	4020	1.16	0.14	0.358
	153	0.86	9180	1.14	0.16	0.410
	252	0.91	15120	1.09	0.21	0.538

Area	2.560 m^2	$V_{p75\text{-}25\ theory}$	volume	1.6640	m^3
50% Area_eff, a_{p50}	7.760 m^2	$V_{p\ 75\ -\ 25\ actual}$	volume	0.2688	m^3
50% Area_act, a_{p50}	6.920 m^2	$t_{p\ 75\text{-}\ 25\ actual}$	time	8048	s

Infiltration Coefficient	*f*	4.83E-06	ms^-1



NOTES:
See SA02 log for detailed soil description; clayey gravelly SAND.
No groundwater encountered. Pit assumed unsaturated.
Infiltration calculated over actual fall

Photographic Record

Number:	**SA02**	**Project**	Castlelands, Mallow, Co. Cork.	
		Project No	P24011	
		Engineer	DOSA	

Photographic Record

Number:	**SA02**	**Project**	Castlelands, Mallow, Co. Cork.	
		Project No	P24011	
		Engineer	DOSA	

Photographic Record

Number:	**SA02**	**Project**	Castlelands, Mallow, Co. Cork.	
		Project No	P24011	
		Engineer	DOSA	

Priority Geotechnical Ltd.
Tel: 021 4631600
Fax: 021 4638690
www.prioritygeotechnical.ie

Trial Pit No
SA03
Sheet 1 of 1

Project Name: Castlelands Mallow	**Project No.** P24011	**Co-ords:**	**Date** 06/02/2024
Location: Co. Cork	**Dimensions (m):** 3.00 × 0.80		**Scale** 1:25
Client:	**Depth:** 2.30m BGL		**Logged** DOC

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.20			Yellowish Brown Sandy slightly Gravelly CLAY. Sand fine to course, Gravel fine to medium angular sub-rounded.
							Yellowish Brown Gravelly Sandy CLAY with low Cobble content. Sand fine to course, Gravel fine to course angular sub-rounded, Cobbles angular sub-angular with mudstone lithology.
							Cobble content between 63-280mm.
							Red oxidised layer at 0.5-0.8m bgl.
							Colour change to brown at 0.8-1.7m bgl.
	2.00	B		1.70			Brown very Sandy Clayey GRAVEL with low Cobble content. Sand fine to course, Gravel fine to course angular sub-rounded, Cobbles sub-angular sub-rounded with Mudstone lithology.
							Cobble content between 68-160mm.
				2.30			End of Pit at 2.300m

1 2 3 4 5

Stability: Very Poor to Good.
Plant: 14t Excavator.
Backfill: Arisings.

Groundwater: None encountered.

Remarks: Trial pit terminated at 2.30m bgl, scheduled depth reached.

Photographic Record

Number:	**SA03**	**Project**	Castlelands, Mallow, Co. Cork.	
		Project No	P24011	
		Engineer	DOSA	

Photographic Record

Number:	**SA03**	**Project**	Castlelands, Mallow, Co. Cork.	
		Project No	P24011	
		Engineer	DOSA	

Photographic Record

Number:	**SA03**	**Project**	Castlelands, Mallow, Co. Cork.	
		Project No	P24011	
		Engineer	DOSA	

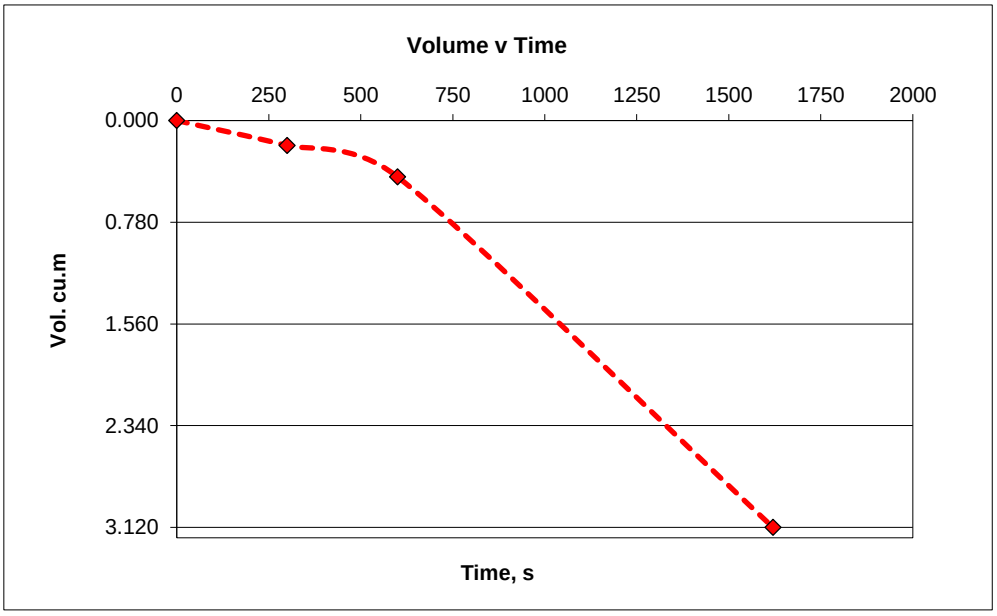
Project Nr.	P24011
Project Name	Castlelands Mallow
Location	SA03
Cycle	1
Date:	06/02/2024

l, m	**3.00**	b, m	**0.80**	d, m	**2.30**
l_base, m	**3.00**			d_eff, m	**1.30**
l_eff, m	**3.00**				

	Time, min	Measure, m bgl	Time, sec	Depth water, m	Fall, m	Volume
13:28	0	1.00	0	1.30	0.00	0.000
	5	1.08	300	1.22	0.08	0.192
	10	1.18	600	1.12	0.18	0.432
13:55	27	2.30	1620	0.00	1.30	3.120

Area	2.400	m^2	$V_{p75\text{-}25\ theory}$	volume	1.56 m^3
50% Area_eff, a_{p50}	7.340	m^2	$V_{p\ 75\ -\ 25\ actual}$	volume	1.56 m^3
50% Area_act, a_{p50}	7.340	m^2	$t_{p\ 75\text{-}\ 25\ actual}$	time	465 s

Infiltration Coefficient	*f*	4.57E-04 ms^-1



NOTES:
See SA03 log for detailed soil description; clayey GRAVEL
No groundwater encountered. Pit assumed unsaturated.
Infiltration calculated over effective depths.

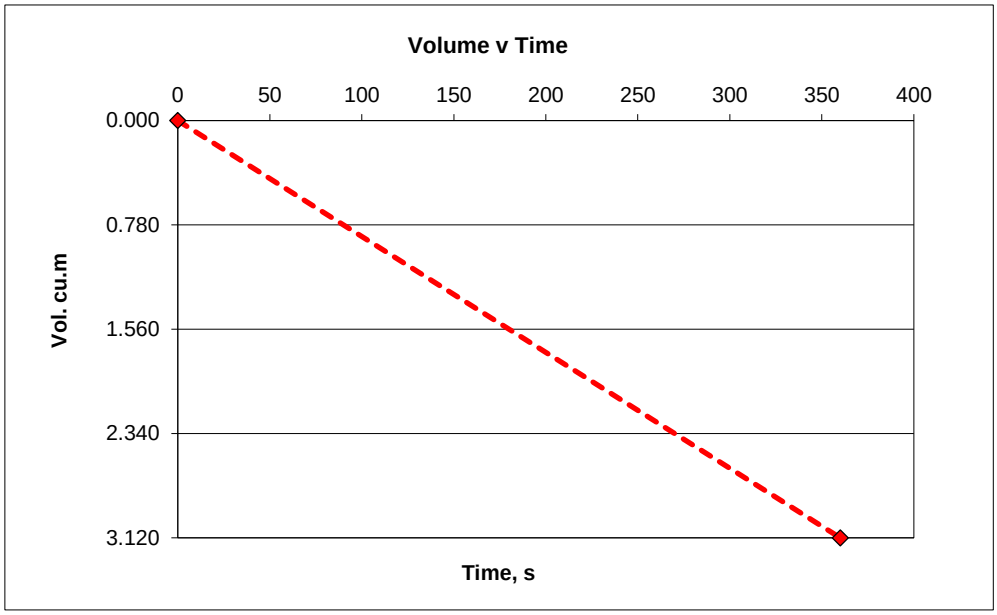
Project Nr.	P24011
Project Name	Castlelands Mallow
Location	SA03
Cycle	2
Date:	06/02/2024

l, m	**3.00**	b, m	**0.80**	d, m	**2.30**
l_base, m	**3.00**			d_eff, m	**1.30**
l_eff, m	**3.00**				

	Time, min	Measure, m bgl	Time, sec	Depth water, m	Fall, m	Volume
15:35	0	1.00	0	1.30	0.00	0.000
15:41	6	2.30	360	0.00	1.30	3.120

Area	2.400 m^2	$V_{p75\text{-}25\ theory}$	volume	1.5600	m^3
50% Area_eff, a_{p50}	7.340 m^2	$V_{p\ 75\ -\ 25\ actual}$	volume	1.5600	m^3
50% Area_act, a_{p50}	7.340 m^2	$t_{p\ 75\text{-}\ 25\ actual}$	time	175	s

Infiltration Coefficient	*f*	1.75E+02	ms^-1



NOTES:

See SA03 log for detailed soil description; clayey GRAVEL

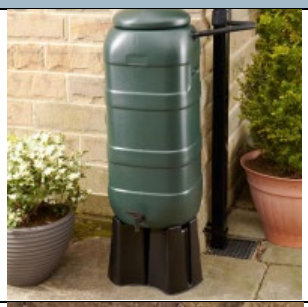
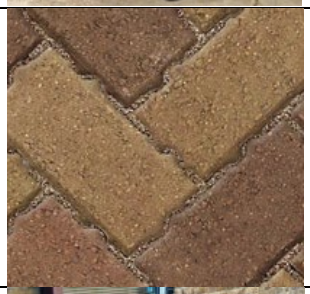
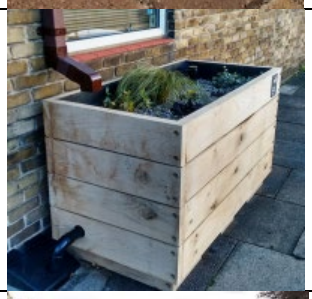
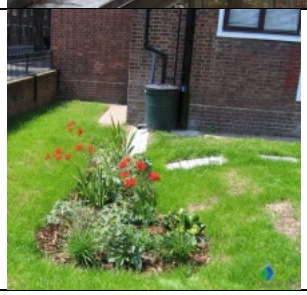
No groundwater encountered. Pit assumed unsaturated.

Infiltration calculated over actual fall

Further tests termianted due to pit collapse

Appendix E –SuDS Selection Table

TABLE 3
CORK COUNTY COUNCIL SUDS SELECTION HIERARCHY SHEET FOR SMALL-SCALE DEVELOPMENT

SuDS Measures		Measures to be used on site	Rational for selecting / not selecting measure including discharge rate applied with supporting calculations
Water butt – 150L capacity or more (based water use demand) with means of overflow		Measure to be used in rear gardens on site	This could be located to the rear of each unit. This water butt will only have the ability to catch the rear sloping side of the dwelling and the reuse would be for watering plants
Permeable paving – consider for all hard paved areas without heavy traffic		Permeable paving will be installed in the proposed parking areas adjacent the Creche to promote infiltration.	Permeable pavement reduces the overall impermeable area of the hard-standing area, which will reduce the impact of the discharge and improve the quality of the effluent from the proposed development
Bio-retention planter – disconnect downpipe connection into drains and allow roof runoff into planter with means of overflow		Not to be used on site	More suitable in apartment buildings of which there are none on site
Green / Blue Roof – requires a minimum substrate depth (growth medium) of at least 80 mm excluding the vegetative map		Not to be used on site	More suitable in apartment buildings of which there are none on site
Rain garden - disconnect downpipe/RWP into the planted flower bed		Not to be used on site	More suitable in apartment buildings of which there are none on site
Other			