



Monaco Developments (Tramore) Ltd

Proposed Residential Development (LRD),
Ballynaneeshagh, Ballybeg Drive and Cork Road,
Waterford

LRD Stage 3

Surface Water Management Statement

Date: June 2024
Job No: W19044


Contents Amendment Records

Document: LRD Stage 3 Surface Water Management Plan

Project: Proposed Residential Development (LRD), Ballynaneeshagh,
Ballybeg Drive and Cork Road, Waterford

Client: Monaco Developments (Tramore) Ltd

Job Number: W19044

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Revision Record

Revision	Date	Description	Prepared By	Checked By	Approved By
00	June 2024	LRD Stage 3	R Moore	J Kinsella	J Kinsella

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1.0 Introduction

Malone O'Regan Consulting Engineers have been commissioned by the applicant, Monaco Developments (Tramore) Ltd to prepare this Surface Water Management Statement in relation to the Proposed Residential Development (LRD) at Ballynaneeshagh, Ballybeg Drive and Cork Road, Waterford.

Engineering drawings submitted with the application are listed in Appendix 1 of this Report.

2.0 Site Description and Proposed Development

2.1 Existing Site

The site is located 3.5km south west of Waterford City Centre in Ballinaneeshagh. The site is bound by the Ballybeg Drive Road and existing residential properties along the western boundary of the site, the St. Saviours FC grounds to the eastern boundary, the Meadowbank and Clonard Park residential areas to the southern boundary and existing residential properties and Cork Road to the north of the site.

2.2 Proposed Development

The proposed residential development site area is approx. 7.7 Hectares and slopes from a central high point to the west and to the east. The existing ground level at the west of the site is approx. 24.5m and 28m along the eastern portion of the site.

3.0 Surface Water Management Statement

3.1 Surface Water Management for the Site

The surface water from the development will be collected in a surface water pipe network consisting of pipe sizes ranging from 225mm to 600mm diameter pipes. The proposed storm water network includes 3no. retention basins, hydrobrakes and by-pass fuel / oil separators. It is planned to discharge storm water from the development to 2 no. discharge points.

The first discharge point will be to the existing network located to the west of the site (Ballybeg Drive). It was agreed the surface water discharge to this outfall would be limited to 4.0L/sec as agreed with the Waterford City and County Council Water Services Department. To attenuate the surface water flow in this direction, a retention basin is proposed and will work in combination with permeable paving zones to manage surface water flow in this area of the site. The basin will provide storage for the 1:100-year storm event including a 30% increase in rainfall to allow for climate change. Hydrobrakes will be included in the network to control the rate of flow from the site. A bypass fuel oil separator will be provided to retain any hydrocarbons to ensure these elements are not discharged from the site.

The second discharge point will be to the east of the site. It is proposed to discharge surface water from the development to the Ballybeg Drive, to the south west of St. Saviour's Church. The proposed surface water network will discharge to the

existing storm sewer at a controlled rate of max 21.5 L/sec. To attenuate the surface water flow in this direction, 2 no. retention basin are proposed and will work in combination with permeable paving zones to manage surface water flow in this area of the site. This surface water drainage strategy will provide adequate storage for the 1:100-year storm event including a 30% increase in rainfall to allow for climate change. Hydrobrakes will be included in the network to control the rate of flow from the site. A by-pass fuel/oil separator will be provided to retain any hydrocarbons to ensure these elements are not discharged from the site.

The surface water drainage details including proposed discharge points are indicated on Drawing W19044/P760_P, P761_P & P762_P.

3.2 Design Basis for Proposed Surface Water Management

Based on the requirements of Waterford City and County Council - Utility, Energy and Communication Policy Objective UTL 09: Storm and Surface Water Management, it is proposed to incorporate Nature Based Solutions, Sustainable Drainage Solutions as per guidance from the Greater Dublin Regional Code of Practice for Drainage Works, the Greater Dublin Strategic Drainage Study and The SuDS Manual, to demonstrate how the development successfully uses Sustainable urban Drainage Systems (SuDS) and Nature Based Solutions (NBS) to manage surface water within the site.

Section 6.3 (Storm and Surface Water Management) in the Waterford City and County Development Plan 2022-2028 recommends a Sustainable Urban Drainage Systems (SuDS) approach which consists of softer engineered or 'nature-based approach' to be used to manage rainfall runoff on the site i.e., to manage and treat surface water above-ground rather than sending rainfall below-ground into drains, pipes, attenuation tanks and other 'hard engineering' solutions where possible. The aim is to maximise the retention and/or infiltration of storm water runoff onsite, enhance biodiversity, minimise discharges to the public drainage system, to limit the discharge rates from the site to greenfield runoff rate or less and to provide appropriate pollution control measures (hydrocarbon interceptors, silt traps). It is noted that underground attenuation tanks or enlarged pipes may be considered, as a last resort, in combination with other measures / SuDS devices to achieve the necessary requirements for water quality and storage capacity.

3.3 Sustainable Urban Drainage Systems (SuDS) and NBS Selection Hierarchy Assessment

Within the surface water drainage design a number of SuDS measures have been implemented in accordance with SuDS Manual CIRIA C753 and illustrated in Appendix 4. This document encourages the use of a variety of alternative measures in the design of sustainable drainage systems, which take account of quality, quantity and amenity. These measures protect or enhance water quality, are sympathetic to the environment, provide a habitat for wildlife and encourage natural ground water recharge.

The SuDS Selection Hierarchy for Large Scale Developments in Section 3.4 of this Report includes a list of all current SuDS measures which would have been considered for this development. This table also outlines the rationale behind the selection of SuDS measures and why other measures would not be appropriate.

3.4 SuDS Selection Hierarchy for Large Scale Developments

SuDS & NBS Selection Hierarchy Sheet				
SuDS & NBS Measure	Measures to be used on site – YES/NO	Rationale for Selecting / Not Selecting Measure	Area of Feature (m ²)	Attenuation Volume of Feature (m ³)
Source Control				
Providing Storage at Source				
Swales	NO <i>Shallow swales / depressions that serve to reduce runoff rates / volumes as well as providing interception storage, treatment of runoff and encouraging biodiversity are proposed as part of the overall surface water management strategy.</i>	Swales were considered to act as a means of attenuating the surface water runoff from the eastern portion of the site. Due to the layout of the proposed drainage network and existing site topography, flow through swales are not considered the most appropriate option for surface water attenuation as part of the overall surface water management strategy for the proposed development.	N/A	N/A
Integrated constructed tree pits	NO <i>Attenuate surface water runoff by utilising voids within the root zone, tree pits will be incorporated into the design and will be located strategically to maximise the benefit of including these as a SuDS measure.</i>	Tree pits are not proposed due to adequate storage provision from other SuDS methods.	N/A	N/A
Rainwater Butts	NO <i>Rainwater butts are designed for roof water collection from downpipes in dwellings</i>	The use of rainwater butts for roof water collection is not required. The surface water runoff from dwelling roofs will be discharged to (i) permeable paving zones in the near vicinity of the dwelling or (ii) the surface water drainage pipe network to be managed downstream.	N/A	N/A

SUDS & NBS Selection Hierarchy Sheet				
SUDS & NBS Measure	Measures to be used on site – YES/NO	Rationale for Selecting / Not Selecting Measure	Area of Feature (m ²)	Attenuation Volume of Feature (m ³)
Downpipe Planters	<u>NO</u>	The use of downpipe planters for roof water collection is not required. The surface water runoff from dwelling roofs will be discharged to (i) permeable paving zones in the near vicinity of the dwelling or (ii) the surface water drainage pipe network to be managed downstream.	N/A	N/A
Rainwater Harvesting	<u>NO</u> <i>Rainwater harvesting is a means of collecting and storing roof water for later use where appropriate.</i>	The use of rainwater harvesting for roof water storage is not required. The surface water runoff from dwelling roofs will be discharged to (i) permeable paving zones in the near vicinity of the dwelling or (ii) the surface water drainage pipe network to be managed downstream.	N/A	N/A
Soakaways	<u>NO</u> <i>Allows runoff to percolate into the subsoil, reducing overall runoff volume</i>	Soakways are not intended to be used in the proposed surface water drainage layout. Permeable paving is proposed to manage surface water runoff at source. Ground infiltration is a component in the function of permeable paving which acts in a similar way to soakways. All infiltration systems will be designed in accordance with BRE Soakaway Design DG 365 - 2016.	N/A	N/A
Infiltration Trenches	<u>NO</u> <i>Allows runoff to percolate into the subsoil, reducing overall runoff volume</i>	Infiltration trenches are suitable for the discharge of clean surface water runoff to ground infiltration. In this case permeable paving will be used to manage the roof water at source.	N/A	N/A
Permeable Pavement	<u>YES</u>	Extensive permeable pavement is included in the	8,323 m ²	374m ³

SUDS & NBS Selection Hierarchy Sheet				
SUDS & NBS Measure	Measures to be used on site – YES/NO	Rationale for Selecting / Not Selecting Measure	Area of Feature (m ²)	Attenuation Volume of Feature (m ³)
(Grasscrete, Block Paving, Porous Asphalt etc)	<i>Allows runoff to percolate into the subsoil, reducing overall runoff volume</i>	proposed surface water design to act as the primary means of managing surface water. This will provide at source water storage which helps to minimise the downstream volume requirement for swales and attenuation tanks. Permeable paving zones will allow for infiltration, where suitable, to the underlying substrate and will also allow for overflow/discharge to the piped surface water network throughout the development. The discharge from the individual zones will contain slit/grit traps and a hydrobrake to maximise the storage volume within the zones to ensure as much surface water as possible is managed locally.		
Green Roof	<u>NO</u> <i>Vegetated roofs used to reduce the rate and volume of runoff as well as encouraging biodiversity</i>	It is not proposed to provide green roofs to the proposed buildings. This is not considered suitable for traditional dwellings and the proposed structural general arrangement for the apartment building is not considered suitable for the inclusion of green roofs.	N/A	N/A
Green Wall	<u>NO</u> <i>Planted walls which improve air quality and encourage biodiversity</i>	Green walls are not considered appropriate given the proposed building types.	N/A	N/A
Filter Strips	<u>NO</u> <i>Localised depressions in the ground that collect</i>	It not proposed to install filter drains at the site. Consideration was given to the inclusion of this measure; however, the	N/A	N/A

SUDS & NBS Selection Hierarchy Sheet				
SUDS & NBS Measure	Measures to be used on site – YES/NO	Rationale for Selecting / Not Selecting Measure	Area of Feature (m ²)	Attenuation Volume of Feature (m ³)
	<i>runoff from roofs and allow infiltration, reducing runoff rates and volumes</i>	proposed gradient of suitable areas is too steep to accommodate filter strips without posing a localised flood risk.		
Bio-Retention Systems / Raingardens	<u>NO</u> <i>Shallow landscaped depressions that serve to reduce runoff rates / volumes as well as providing interception storage, treatment of runoff and encouraging biodiversity are not suitable</i>	Bioretention areas are not proposed however retention basins will be present as part of the proposed scheme.	N/A	N/A
Blue Roof	<u>NO</u> <i>Provide attenuation storage, reducing requirement for storage elsewhere on site</i>	Green roofs are only suitable in areas where the building structure is appropriate to support such roofs. Refer to 'Green Roofs' above. These measures are not proposed for this development.	N/A	N/A
Filter Drain	<u>YES</u> Provide a filter drain at path edges with infiltration to ground for surface water runoff	Filter drains are suitable for the discharge of clean surface water runoff to ground infiltration These will be included to the design to allow at source management of surface water from walkways and paths.	Linear feature 610 m total length	36m ³
Site Control				
Detention Basin	<u>NO</u> <i>Provides attenuation storage, reducing requirement for storage elsewhere on site</i>	Detention basins are only suitable in areas where there is sufficient open green space with appropriate existing site contours which are compatible with the surface water drainage network. It is	N/A	N/A

SUDS & NBS Selection Hierarchy Sheet				
SUDS & NBS Measure	Measures to be used on site – YES/NO	Rationale for Selecting / Not Selecting Measure	Area of Feature (m ²)	Attenuation Volume of Feature (m ³)
		not suitable for this development.		
Retention Basin	<p><u>Yes</u></p> <p><i>Provides attenuation storage, reducing requirement for storage elsewhere on site. These will be located (i) at the main entrance to the site and (ii) to the south of the apartment building (iii) to the east of the site</i></p>	<p>Retention basins are suitable in areas where there is sufficient open green space with appropriate existing site contours which are compatible with the surface water drainage network. It is proposed to provide the required storage with retention basins which accommodate the balance of surface water which is not stored or infiltrated within or through the proposed permeable paving zones.</p> <p>The design of the edge to the perimeter of these basins, where appropriate, shall consist of a tiered edge as per guidance from the Dublin City Council publication “Sustainable Drainage Design & Evaluation Guide (2021)”. This shall be implemented in combination with the proposed landscaping features including vegetation and boundary features.</p>	<p>(i) 684m²</p> <p>(ii) 390m²</p> <p>(iii) 1,257 m²</p>	<p>(i) 410m³</p> <p>(ii) 264m³</p> <p>(iii) 1,169 m³</p>
Regional Control				
Wetlands	<p><u>NO</u></p> <p><i>Provides attenuation storage, reducing requirement for storage elsewhere on site</i></p>	Wetlands are only suitable in areas where there is sufficient open green space with appropriate existing site contours which are compatible with the surface water drainage network. It is not suitable for this development.	N/A	N/A

SUDS & NBS Selection Hierarchy Sheet				
SUDS & NBS Measure	Measures to be used on site – YES/NO	Rationale for Selecting / Not Selecting Measure	Area of Feature (m ²)	Attenuation Volume of Feature (m ³)
Other				
Petrol / Oil Interceptor / Grit Trap	<u>YES</u> Petrol / Oil Klargestor Interceptors (NSBE20 / NSBE30) are included in the surface water drainage design. Grit traps are proposed at the inlet to basins, attenuation tanks and at the outlet from permeable paving zones.	The proposed interceptors and silt/grit traps are designed to provide capacity for the surface water treatment and separation for the proposed development.	N/A	N/A
Attenuation Tank	<u>NO</u> Provides attenuation storage, reducing requirement for storage elsewhere on site	As requested by Waterford City and County Council, attenuation tanks are not permitted for this development	N/A	N/A
Oversized Pipes only as a last resort where other measures are not feasible	<u>NO</u> Provides attenuation storage, reducing requirement for storage elsewhere on site	Oversized pipes are not proposed as part of the drainage network. The surface water drainage design with regard to pipe sizes allows for the conveyance of water under gravity. No pipes are oversized with a view to increasing storage capacity above the storage natural capacity of the pipes proposed as part of the gravity network design.	N/A	N/A
Other			N/A	N/A

4.0 Proposed Surface Water Drainage Design

4.1 Surface Water Drainage Design Parameters

The following table indicates the values included in the design of the surface water drainage network.

Parameter Description	Assigned Value
Attenuation Design Return Period	100 years
Allowance for climate change	30% (Ref. OPW Flood Risk Management Climate Change Sectoral Adaptation Plan, High-End Future Scenario)
M5-60	18.9mm (Met Eireann data)
M5-2D	69.3mm (Met Eireann data)
Ratio, r	0.272
Time of Entry	4 min
Pipe roughness, Ks	0.6mm (Ref. GDSDS Volume 2, Table 6.4)
Minimum velocity	1.0 m/s (Ref. GDSDS Volume 2, Table 6.4)

For discharge to the West of the site, the twenty-four hour 1:100-year rainfall event is the worst case i.e., requires the greatest volume of attenuation for the retention basins prior to discharge. A “hydrobrake” with a suitable orifice size will be installed to restrict the discharge flow to 4.0 L/sec.

From the attached calculations for the surface water drainage system in Appendix 3 it can be seen that the critical storm duration for the 100-year return period is the sixteen-hour storm, the volume of storage required is **408m³**, this volume will be attenuated in a retention basin located at the western entrance to the site. This basin will attenuate the surface water runoff upstream. A hydrobrake will also be provided to restrict flow from this portion of the site. Refer to drawings W19044/P760_P & P795_P for details of the surface water layout.

For discharge to the East of the site, the twelve-hour 1:100-year rainfall event is the worst case i.e., requires the greatest volume of attenuation for the retention basin prior to discharge. A “hydrobrake” with a suitable orifice size will be installed to restrict the discharge flow to 21.5 L/sec.

From the attached calculations for the surface water drainage system in Appendix 3 it can be seen that the critical storm duration for the 100-year return period is the twelve-hour storm, the volume of storage required is **1,170m³**. It is proposed to provide a retention basin to store the rainwater balance this volume is required in combination with the use of permeable paving for storage and infiltration of the surface water runoff and a second retention basin located to the south of the proposed apartment block this basin will have a storage volume of **264m³** for the 1:100-year event including allowance for climate change. This basin will attenuate flow upstream to manage surface water runoff close to source. The attenuation features are indicated on Drawing W19044/P760_P, P761_P & P762_P.

Extensive areas of permeable paving are located strategically throughout the development to manage the surface water runoff from the proposed development. These areas work in conjunction with the primary water storage features to reduce the required storage volume required in the retention basins. The areas of permeable paving will generally be located within homezones and will consist of a combination of partial infiltration and no infiltration systems. The main access roads will not consist of permeable paving. Soakaway tests have been carried out at the site to establish the suitability of the site for infiltration of surface water runoff. The testing identified areas of the site which are not suitable for infiltration. Where these areas coincide with proposed areas of permeable paving, the permeable paving will not infiltrate to the underlying soils. The soakaway test report is detailed in Appendix 6.

Calculations for the proposed surface water drainage network are attached in Appendix 3. This should be read in conjunction with the drainage drawings for the development. The rainfall intensities are based on Met Eireann figures for the site location, these Met Eireann rainfall data figures are included in Appendix 2. An allowance of 30% increase in rainfall has been included in the design to account for climate change as per the recommendations of the Greater Dublin Strategic Drainage Study (GSDSDS).

A preliminary maintenance plan has been prepared; this details the maintenance requirements for each of the elements of the surface water drainage network as part of the proposed development. Refer to Appendix 5 for details of the preliminary maintenance plan.

5.2 Allowable Discharge from the Site

The rate of discharge is restricted to 4.0 L/sec to the Green Road Catchment as agreed with Jim Lenane from the Waterford City and County Council Water Services Department. This measure is required to alleviate concerns raised by Waterford City and County Council with regard to flooding issues.

The standard permissible runoff calculation recommended for use by the Greater Dublin Strategic Drainage Study (GSDSDS) is based the calculation of $Q_{BAR_{RURAL}}$, which is sourced from the Institute of Hydrology Report IHR124. This value is the mean annual flood flow from a rural catchment in m^3/sec and is given by the equation;

$$Q_{BAR_{RURAL}} = 0.00108[Area^{0.89}] \times [SAAR^{1.17}] \times [Soil^{2.17}]$$

Where:

$Q_{BAR_{RURAL}}$	Mean annual flood flow from a rural catchment in m^3/s
Area	Area of the catchment in km^2
SAAR	Standard Average Annual Rainfall in mm.
Soil	Soil index

Standard Average Annual Rainfall for the site was taken from Met Eireann data, SAAR was taken as 1042mm.

The Soil Type was taken from the Flood Studies Report as Soil Type 2 which has a corresponding Standard Percentage Runoff (SPR) coefficient of 0.3.

$$QBAR_{rural} = 0.00108 [0.0713]^{0.89} \times [1042]^{1.17} \times [0.3]^{2.17}$$

$$QBAR_{rural} = 0.02564 \text{ m}^3/\text{s}$$

$$QBAR_{rural} = \mathbf{25.5 \text{ l/s} \quad (3.57 \text{ l/s/ha})}$$

The value for $QBAR_{RURAL}$ calculated above in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) provides the maximum allowable discharge from the site.

Given the discharge restriction imposed to the Green Road Catchment, the hydrobrake controlling the discharge to the east of the site has been calculated to be 21.5 L/sec based on the difference between the allowable total discharge from the site and the allowable discharge to the Green Road Catchment only (4.0 L/sec).