MMOS

MURPHY · MATSON · O'SULLIVAN

CONSULTING CIVIL & STRUCTURAL ENGINEERS

Engineering Services Report

Student Accommodation, Rialto Cinema Site, Rialto

Rev. 6

Prepared by: DO'S

Murphy Matson O'Sullivan

Consulting Civil & Structural Engineers

Table of Contents

Project Reference 18_079

Revision control table

Revision	Date	Issue	Author	Checked By
0	30.04.18	Issue for Information	DOS	MM
1	19.10.18	Issue for planning review	DOS	MM
2	21.11.18	Re-issue for planning review	DOS	MM
3	21.01.19	Re-issue for planning review	DOS	MM
4	14.02.19	Planning review comments added	DOS	MM
5	19.04.19	IW & DCC comments rec'd and report amended	DOS	MM
6	04.07.19	Issued for Planning	DOS	MM

1.0 Introduction

This Civil Engineering report is to be read in conjunction with the Civil Engineering planning drawings and relevant architects' drawings.

2.0 Site Location and Description of Proposal

The site for the proposed scheme is Old Rialto Cinema site in Rialto, Dublin 8. The site fronts on to the South Circular Road on its northern side. It has the end of a housing terrace and associated rear garden and a single storey small industrial unit on its eastern side. There are open public footpath and hardstanding areas to the south and west sides of the site. The site is currently bordered by a circa 3m height block wall with security fencing over. The overall site area is 0.299Ha. See figures 1 & 2 for site location and plan view. The cinema was constructed in circa 1930's and operated as a cinema until the early 1970's. It was then converted to a Car Showroom. The site has been unoccupied for several years.

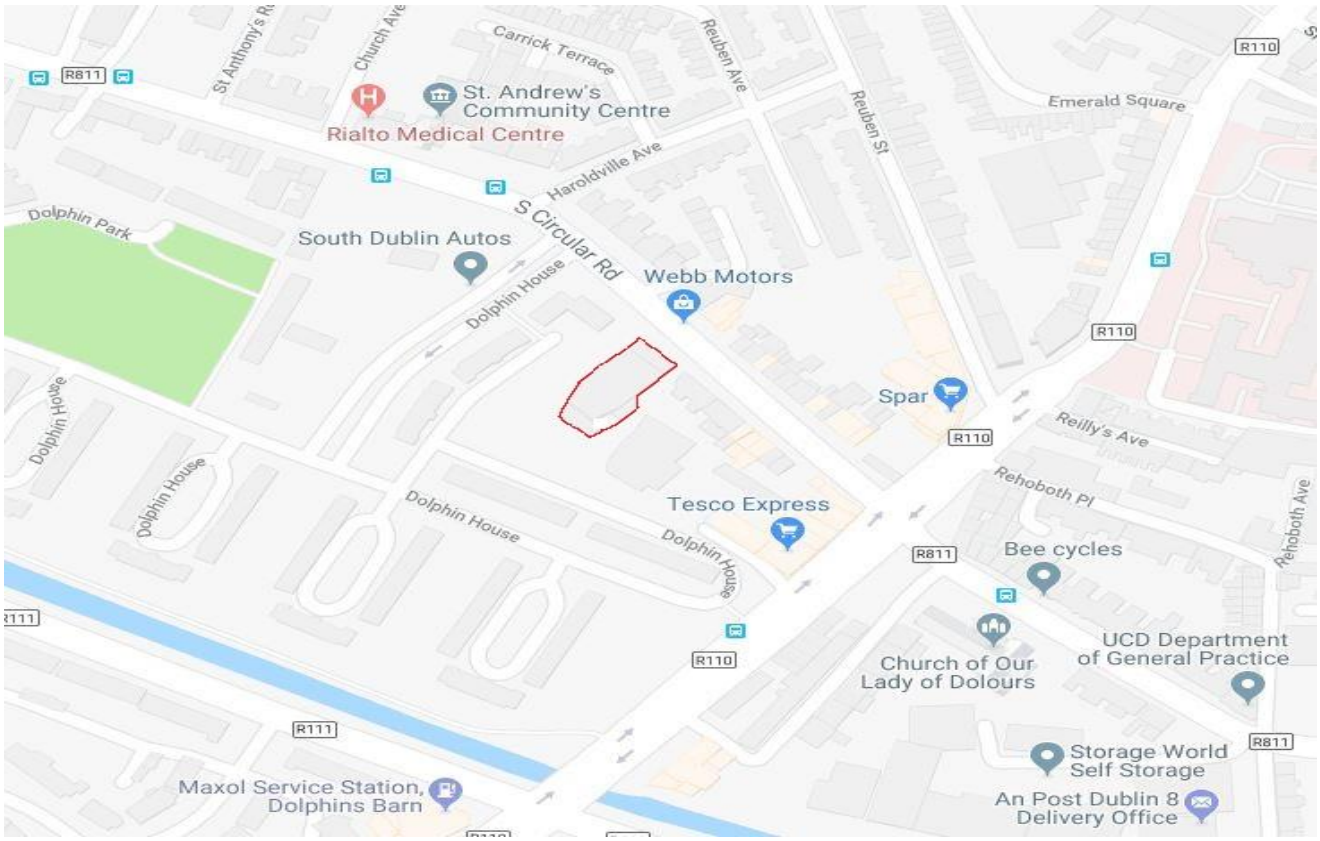


Figure 1 – Site Location Plan

Figure 2 – Site Plan view

The proposed development consists of a 5-7 storey above ground new Student Accommodation facility, with amenity and servicing areas at lower ground floor level. Accommodation is for circa 317 no. students (313 bedrooms) with associated facilities. The proposed development is to incorporate part of the existing 3 storey old Cinema structure to the front of the site. The remainder rear of the existing building on site will be demolished. Refer to figs 3 & 4 for Lower & Ground Floor levels -1 & 0 & architect's drawings attached to this application for full details.

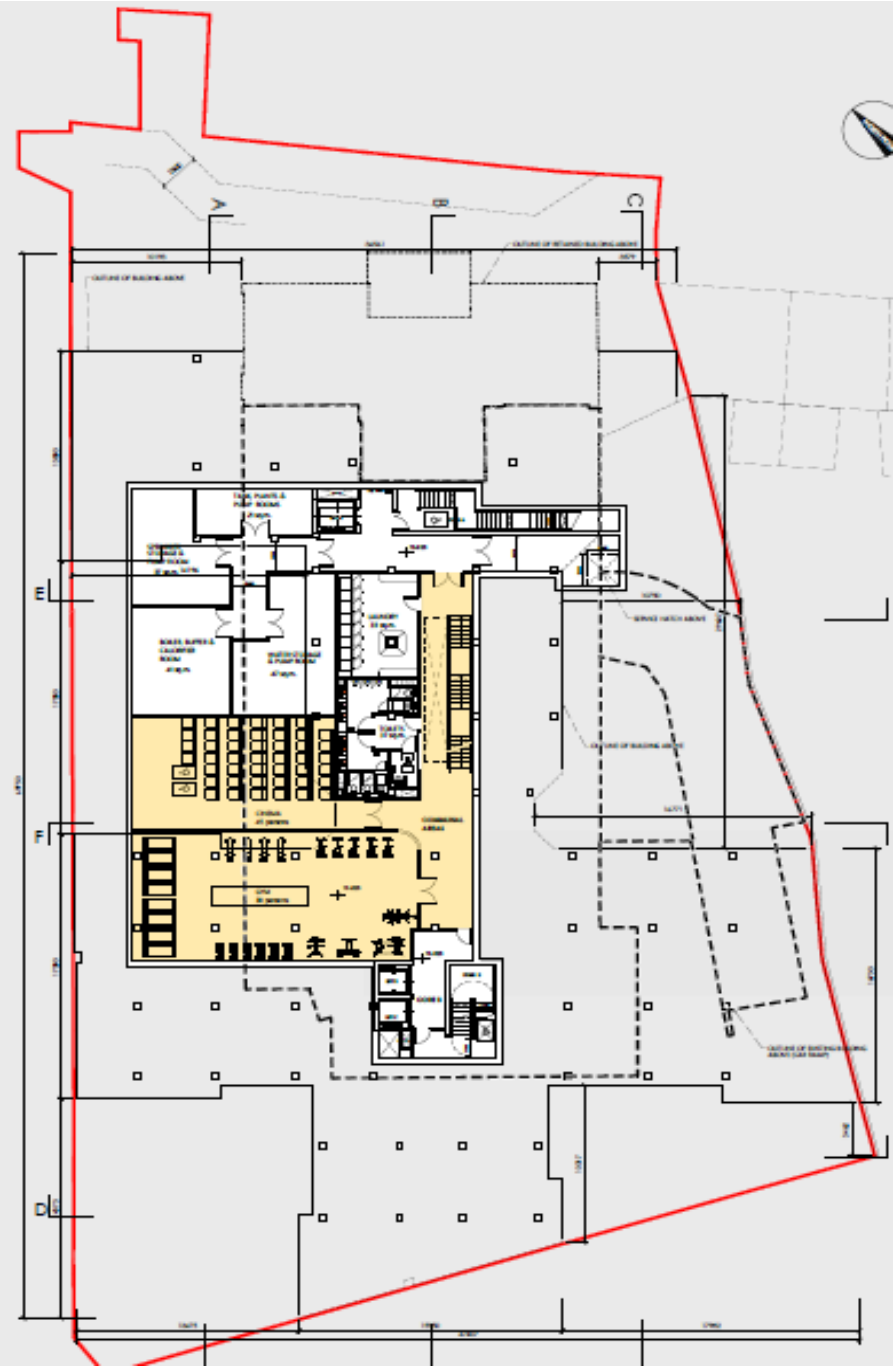


Fig. 3 - Lower Ground Floor Level -1

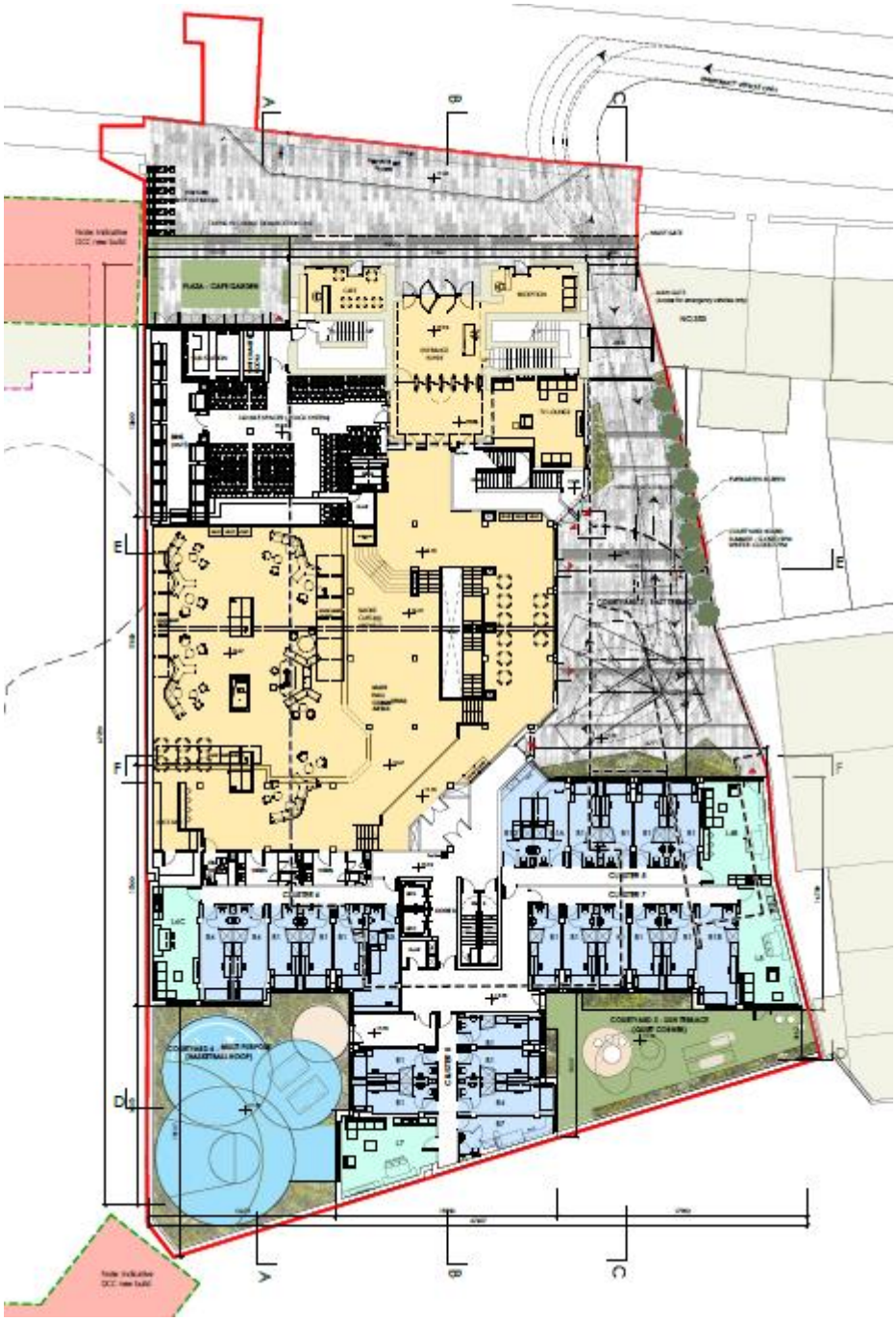


Fig. 4 - Ground Floor Level 0

The existing site levels vary from +19.50m AOD at the front of the site rising to +20.40m AOD at the rear. The proposed Upper Ground floor level is at +19.95m (Level 0 – see fig. 4) and the Lower Ground Floor level is at +15.825m (Level -1 – See fig. 03). The proposed scheme has the lowest level of building being constructed circa 4.6m below ground (Level -1 – Lower Ground Floor area containing Leisure facilities and general building plant rooms. The proposed development incorporates 3no. External Courtyard areas (courtyards 2, 3 & 4) at circa +19.90m AOD). There is no requirement for car parking within the site. Only courtyard 2 is accessible to vehicle, for emergency access by fire tenders in case of fire.

3.0 Surface Water Discharge

Existing Surface Water Drainage

At present the existing building and hardstanding surrounding area drains by gravity to either a combined public sewer in the South Circular Road or a surface water sewer with an outfall manhole on the pavement directly northwest of the site. From IW/DCC records the combined sewer is circa 600mm wide x 1030mm ht. brick culvert which runs by gravity from west to east. The surface water sewer is a 225mm diam. sewer running from south to north across the South Circular Road. See fig. 5 below.

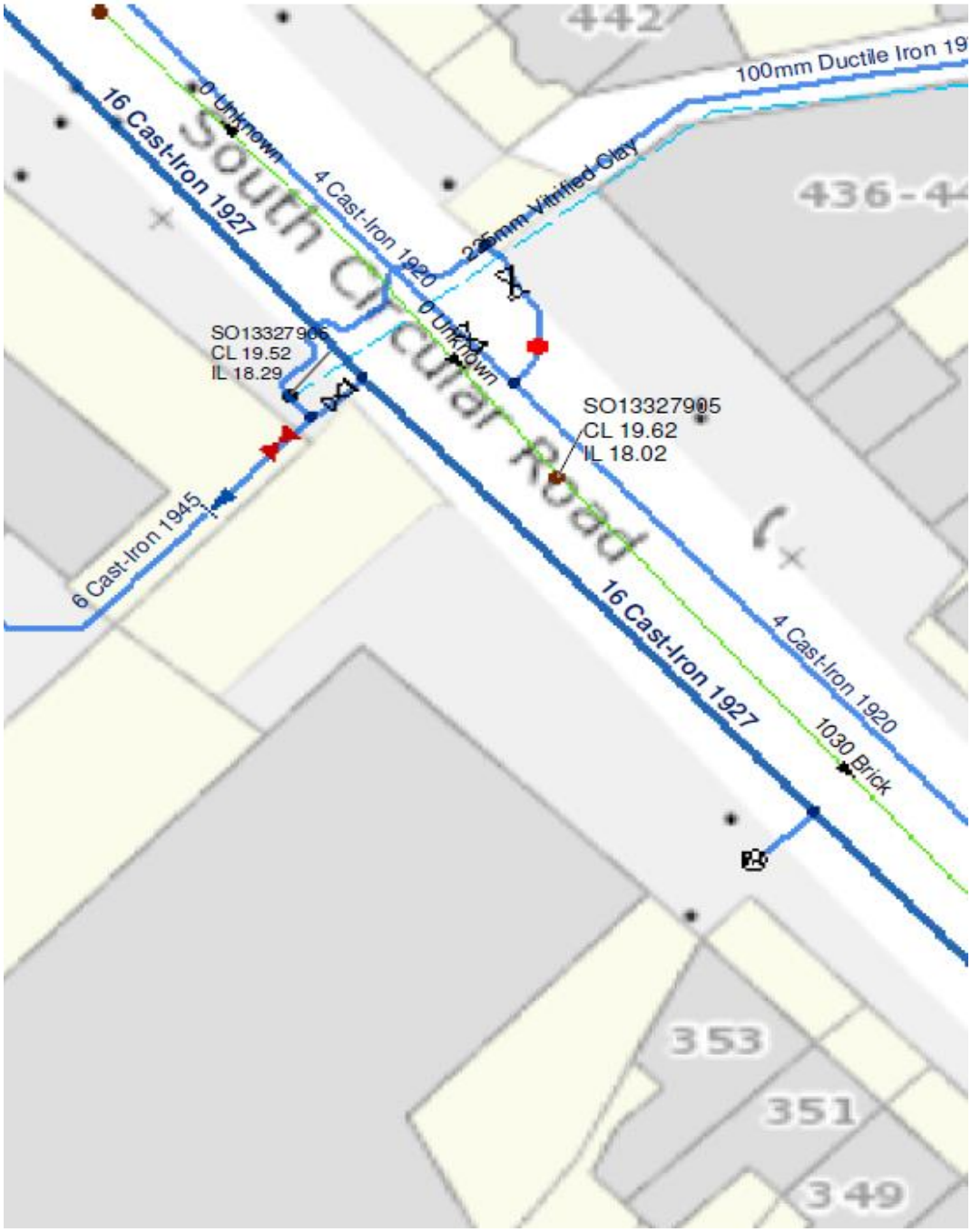


Fig 5 – Irish Water records extract

Proposed Surface Water Drainage

Storm water from the upper roof areas will drain, via RW outlets, gullies, downpipes and suspended SW drainage pipework, to a gravity network of below ground surface water sewers on the perimeter of the site at Upper Ground floor level. These sewers will drain by gravity to an onsite attenuation facility proposed on the eastern side of the site. Attenuation capacity is designed for a 1 in 100 year storm event + 20% allowance for climate change. Attenuation will be provided by a 75m3 below ground storage tank. Attenuated outfall from this system will fall by gravity to the existing surface water sewer via the existing manhole in the pavement directly north west of the site. Surface water outfall from the attenuation tank is to be restricted by a hydrobrake. The small site area (0.297 Ha.) gives a theoretical greenfield run-off rate less than 2 l/s and as such a 2 l/s value was used to calculate the required attenuation storage volume. The peak stormwater discharge is therefore to be restricted to 2 l/s (or as per lowest commercially available restriction hydrobrake requirement).

Non-return valves shall be incorporated into the SW system at points of entry of the gravity sewers into the attenuation tank. Note also that a relieving gully outlet at ground level will be built within the attenuation tank design to allow outfall should exceedance occur.

Surface Water Drainage Design – Pipe Sizing

Site is split with SW drain runs on each side, each taking circa 50% of site area

Check outfall pipe for ¼ of site area

Contributing Area = 750m2 max.

Q = 0.075 x 75 x 2.78 = 15.6 l/s

Add 20% for climate change, Q = 18.77 l/s

For 225mm diam. @ 1/200, Ks = 0.6mm

Capacity = 36.5 l/s 225mm diam. pipe OK

Check outfall pipe for 1/2 of site area

Q = 37.54 l/s

For 300mm diam. @ 1/200, Ks = 0.6mm

Capacity = 78.2 l/s 300mm diam. pipe OK

4.0 SuDS

Sustainable Drainage System

The Greater Dublin Strategic Drainage Study (GDSDS) Vol. 2 Section E2.1 requires provision of interception and/or treatment volume for River Water Quality Protection. It is intended to provide interception for first 5-10mm of rainfall within the site by incorporation of Green Roof to approx. 70% of total new roof area and inherent permeable paving within the courtyard areas. Refer to Shipsey Barry Architects roof plan drawing no. SB-2017-015-206 and Fig. 6 below for details of extent of Green Roof. Refer to attached MMOS drawings 18079 – 1000 & 1007 for details. The following 'soft' SuDS measures are proposed within the site;

- **Green Roofs system to upper roofs**

  It is intended to provide an overall area of Green Roof of just under 70% of new roof areas (1,264m2). The system proposed for majority of green roof area will incorporate a Sedum type Blanket over a Bauder DSE40 water retention/drainage and protection layer green roof system (or similar approved). This is an Extensive type of green roof which provides a water storage capacity of 13.5 Litres/m2 and will provide interception storage for the first 5-10mm of rainfall. As well as improving water quality by providing surface water interception and infiltration, green roofs improve biodiversity by providing habitat for wildlife. Refer to attached Sedum Mats and Bauder DSE40 Data sheets for details.

- **Permeable paving to courtyards 2, 3 & 4**

  It is intended to provide permeable paving (pervious paving and porous asphalt) within the courtyard areas (circa 650m2) to provide Interception in the courtyard paving and landscaping area by means of provide inherent storage capacity within the voided sub-base of the Courtyard area at Level 0. This will act to trap suspended solid and filter pollutants from stormwater

The above measure will provide for interception treatment by infiltration for a total area of 1914m2 or 64% of total development site area (Total site area = 2,973m2).

Additional SuDs measures proposed within the site are detailed below;

- **Water Butts and Rainwater Harvesting** – a small local water butt at Ground level and larger Rainwater Harvesting storage tank at basement level are to be provided within the site to provide non-potable water storage for serving landscaping and general irrigation and maintenance needs. Rainwater harvesting will reduce the

quantity of rainwater entering the surface water system and reduce the water demand on mains water supply.

- **Attenuation** – Attenuation is to be provided by means of a below ground Storage Tank to restrict outflow from the development to 2 l/sec/Hectare, in accordance with the requirements of the Greater Dublin Strategic Drainage Study (GDSDS). Attenuation is to be designed for a 1 in 100 year storm event + 20% for climate change. The attenuation volume required is 75m3.

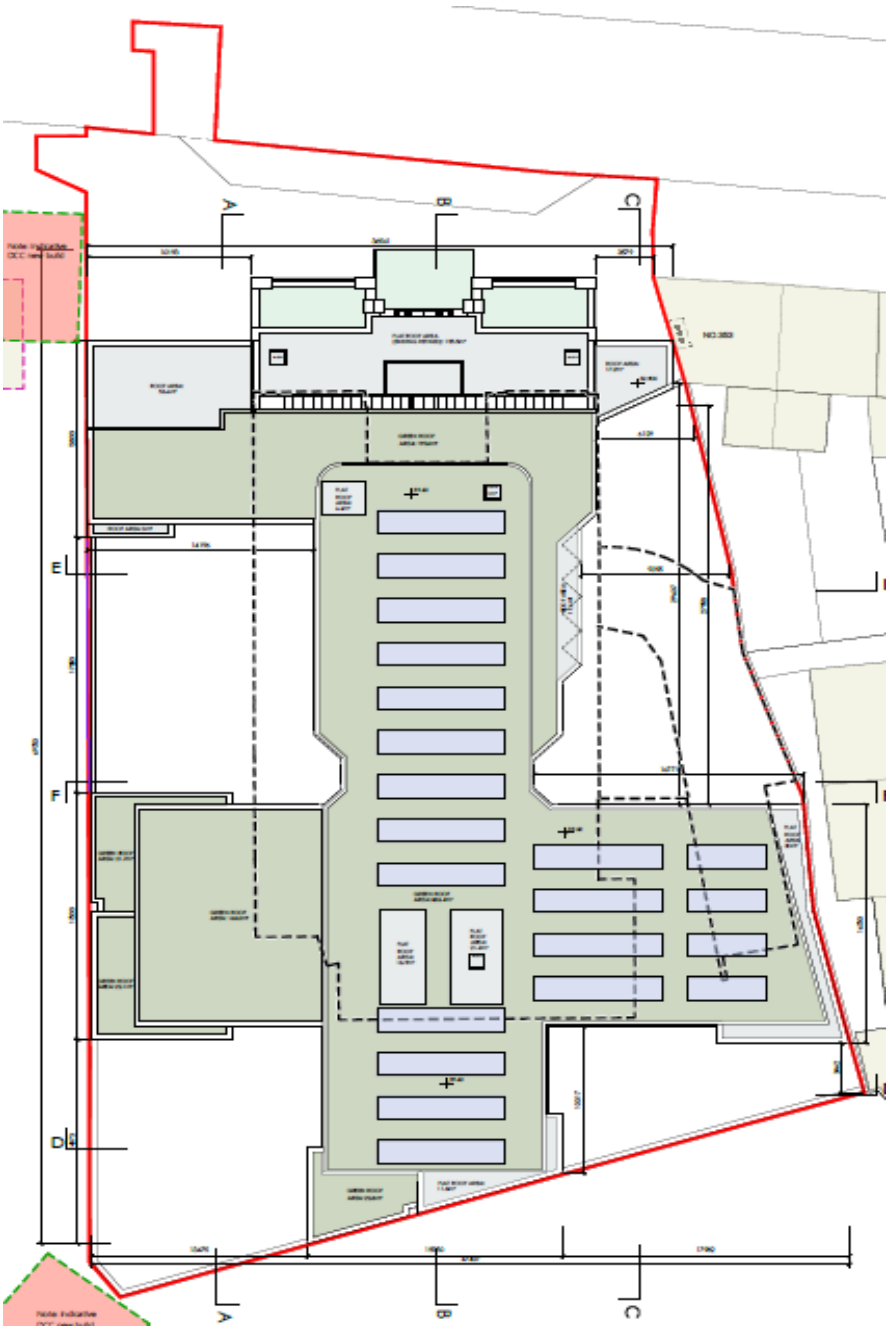


Fig. 6 – Roof plan with Green roof areas highlighted green

5.0 Foul Water Discharge

There is an existing foul sewer network on site serving the cinema and latterly the Motor company. This will be mostly removed as part of the demolition works and replaced by a new Foul Drainage system which will largely discharge from the accommodation units at each level, via vertical shafts, to a foul water collection system at Upper Ground Floor level (Level 0). Refer to drawings 18079-1000 & 1006 for details. As the Lower Ground Floor level (Level -1) is below the invert of the combined sewer in the South Circular Road, a Foul Water pumping station is required at this level, for any outfall foul drainage from the leisure facilities at this level, with duty and stand-by pumps and with volume of chamber sized for 24 hour storage of foul water discharging at level -1. This Foul outfall will be pumped to a transition manhole on site at Upper Ground floor level and then fall by gravity within the main site foul sewer system to the combined sewer in South Circular Road.

The foul water outfall is as follows;

Per Capita Consumption = 150 l/head/day

Occupancy Rate = 1 (1 person per student unit)

Average Day Peak multiplier = 1.25

Unaccounted for Water = 110 l/conn./day

(note; 1 no. connection proposed for development)

The Per Property (Student Unit) Domestic Demand = 150 x 1 x 1.25

= 187.5 l/head/day

For 317 no. Student Accommodation Units

= 187.5 x 317 + (110) = 59,547.5 litres per day

Therefore DWF = 59,547.5/24x60x60 = 0.690 litres/ sec.

6 x DWF = 4.135 litres / sec.

Foul Sewer Pipe Sizing

Peak flow = 4.135 l/s

By inspection use min. 150mm diam. pipe at 1/150 min. fall

Capacity = 11.5 l/s => Pipe okay by inspection

6.0 Water Supply

There are 2no. public watermains within the South Circular Road. It is intended to take a 150mm branch connection from the existing 100mm diam. watermain on the north side of the South Circular Road and directly in front of the proposed development (as per Irish Water requirements). Refer to drawings 18079 – 1000 & 1008 for details. The connection will be metered and fire fighting requirements for the site will be subject to detailed design and agreement with the local authority.

Refer to section 5.0 above for total water demand. The proposed development will require 59.55m3/day. An onsite water storage tank will be provided to satisfy the 24hr water storage requirement.

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 377 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Σ Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	12.818	0.443	0.0	1.5	1.5	29.2	O K
30 min Summer	12.971	0.596	0.0	1.5	1.5	39.3	O K
60 min Summer	13.112	0.737	0.0	1.6	1.6	48.6	O K
120 min Summer	13.239	0.864	0.0	1.7	1.7	57.0	O K
180 min Summer	13.294	0.919	0.0	1.8	1.8	60.7	O K
240 min Summer	13.320	0.945	0.0	1.8	1.8	62.3	O K
360 min Summer	13.335	0.960	0.0	1.8	1.8	63.4	O K
480 min Summer	13.338	0.963	0.0	1.8	1.8	63.5	O K
600 min Summer	13.333	0.958	0.0	1.8	1.8	63.2	O K
720 min Summer	13.324	0.949	0.0	1.8	1.8	62.7	O K
960 min Summer	13.301	0.926	0.0	1.8	1.8	61.1	O K
1440 min Summer	13.246	0.871	0.0	1.7	1.7	57.5	O K
2160 min Summer	13.161	0.786	0.0	1.6	1.6	51.9	O K
2880 min Summer	13.081	0.706	0.0	1.5	1.5	46.6	O K
4320 min Summer	12.938	0.563	0.0	1.5	1.5	37.2	O K
5760 min Summer	12.820	0.445	0.0	1.5	1.5	29.4	O K
7200 min Summer	12.719	0.344	0.0	1.5	1.5	22.7	O K
8640 min Summer	12.519	0.144	0.0	1.5	1.5	9.5	O K
10080 min Summer	12.497	0.122	0.0	1.4	1.4	8.0	O K
15 min Winter	12.872	0.497	0.0	1.5	1.5	32.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	91.990	0.0	30.3	26
30 min Summer	62.658	0.0	41.4	40
60 min Summer	39.995	0.0	53.0	68
120 min Summer	24.904	0.0	66.0	126
180 min Summer	18.717	0.0	74.4	182
240 min Summer	15.262	0.0	80.9	240
360 min Summer	11.412	0.0	90.8	304
480 min Summer	9.274	0.0	98.4	368
600 min Summer	7.890	0.0	104.6	434
720 min Summer	6.913	0.0	110.0	502
960 min Summer	5.608	0.0	119.0	644
1440 min Summer	4.175	0.0	132.8	918
2160 min Summer	3.107	0.0	148.5	1324
2880 min Summer	2.518	0.0	160.4	1732
4320 min Summer	1.870	0.0	178.6	2512
5760 min Summer	1.512	0.0	192.7	3288
7200 min Summer	1.283	0.0	204.3	4048
8640 min Summer	1.121	0.0	214.2	4424
10080 min Summer	1.000	0.0	222.9	5144
15 min Winter	91.990	0.0	34.0	26

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	13.045	0.670	0.0	1.5	1.5	44.2	O K
60 min Winter	13.207	0.832	0.0	1.7	1.7	54.9	O K
120 min Winter	13.357	0.982	0.0	1.8	1.8	64.8	O K
180 min Winter	13.426	1.051	0.0	1.9	1.9	69.4	O K
240 min Winter	13.462	1.087	0.0	1.9	1.9	71.7	O K
360 min Winter	13.483	1.108	0.0	1.9	1.9	73.2	O K
480 min Winter	13.483	1.108	0.0	1.9	1.9	73.2	O K
600 min Winter	13.477	1.102	0.0	1.9	1.9	72.7	O K
720 min Winter	13.463	1.088	0.0	1.9	1.9	71.8	O K
960 min Winter	13.424	1.049	0.0	1.9	1.9	69.2	O K
1440 min Winter	13.333	0.958	0.0	1.8	1.8	63.2	O K
2160 min Winter	13.200	0.825	0.0	1.7	1.7	54.4	O K
2880 min Winter	13.079	0.704	0.0	1.5	1.5	46.5	O K
4320 min Winter	12.875	0.500	0.0	1.5	1.5	33.0	O K
5760 min Winter	12.523	0.148	0.0	1.5	1.5	9.8	O K
7200 min Winter	12.487	0.112	0.0	1.3	1.3	7.4	O K
8640 min Winter	12.469	0.094	0.0	1.2	1.2	6.2	O K
10080 min Winter	12.456	0.081	0.0	1.0	1.0	5.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	62.658	0.0	46.4	39
60 min Winter	39.995	0.0	59.4	68
120 min Winter	24.904	0.0	74.0	124
180 min Winter	18.717	0.0	83.4	180
240 min Winter	15.262	0.0	90.7	236
360 min Winter	11.412	0.0	101.7	340
480 min Winter	9.274	0.0	110.2	384
600 min Winter	7.890	0.0	117.2	462
720 min Winter	6.913	0.0	123.2	540
960 min Winter	5.608	0.0	133.3	694
1440 min Winter	4.175	0.0	148.8	990
2160 min Winter	3.107	0.0	166.3	1416
2880 min Winter	2.518	0.0	179.6	1828
4320 min Winter	1.870	0.0	200.0	2648
5760 min Winter	1.512	0.0	215.8	3064
7200 min Winter	1.283	0.0	228.8	3744
8640 min Winter	1.121	0.0	239.9	4416
10080 min Winter	1.000	0.0	249.7	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	17.000	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.177

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.059	4	8	0.059	8	12	0.059

Date: 10-04-2010

TECHNICAL DATA SHEET

Bauder DSE40 Drainage and Protection Layer

DESCRIPTION:

Water storage and multi-directional drainage layer that provides a pressure resistant stable base for high loads or support for roof mounted equipment without compression to the drainage capacity.

TECHNICAL DATA:

Composition

Material	Recycled High Density Polyethylene

Weights and sizes

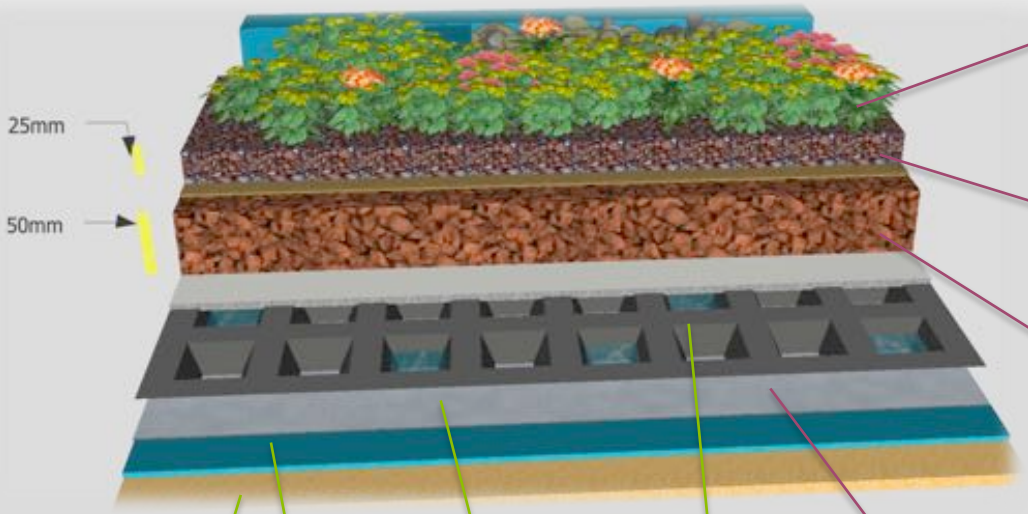
Size: 1.04m x 2.03m
Thickness: 40mm
Coverage: 2.1m²
Weight: 1.8kg/m²
Saturated Weight: 15.3kg water only/27kg infilled with mineral drain
Water Storage Capacity: 13.5l/m² empty/8.4l/m² infilled with mineral drain
Fill Volume (Mineral Drain): 21l/m²
Compressive Strength: 80kN/m² when empty/≥ 1000kN/m² when infilled

UNITED KINGDOM
Bauder Ltd
70 Landseer Road
Ipswich Suffolk England IP3 0DH
T: +44 (0)1473 257671 **E:** info@bauder.co.uk
bauder.co.uk

IRELAND
Bauder Ltd
O'Duffy Centre Cross Lane Carrickmacross
Co. Monaghan Ireland
T: +353 (0)42 9692 333 **E:** info@bauder.ie
bauder.ie

SEDUM GREEN ROOF

Sedum Mats



Vegetation

Up to 12 different sedum species ensures optimal

25mm substrate with Sedum mat

50mm Coarse Substrate

A specialised blend of recycled lightweight organic materials acts as a

Structural plywood roof

Waterproof membrane

Protects your roof

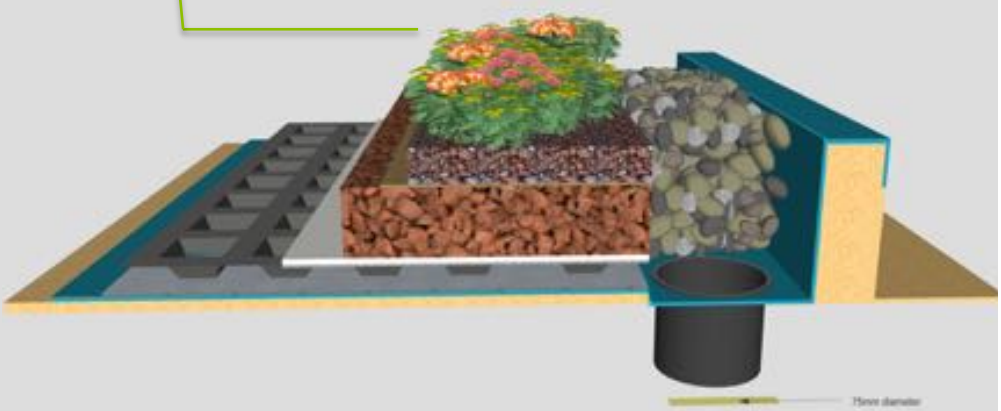
Root barrier

Filter Fleece

Ensures efficient water and nutrient distribution and retention, enhancing growth and

Water retention and

- Saturated weight – 98Kg/m2
- 10-20mm thickness range
- Flexible polyethylene



www.sedumgreenroof.co.uk

Email us: info@sedumgreenroof.co.uk

Call us on

01747 591 268

Monday- Friday 9am -4pm