

WATER SERVICES REPORT

Development at Riverbank Arts Centre,
Main Street Newbridge, Co. Kildare

Issue P01

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P1	AG	JP	JP	11/06/2026

Introduction

General

CORA Consulting Engineers have been appointed by Studio Red Architects to prepare an Engineering services report for the proposed development at Riverbank Arts Centre, new Bridge Co. Kildare.

Site Characteristics

The site is located on the corner of Main Street and Liffey Terrace. The site is within the jurisdiction of Kildare County Council. The site is approximately 0.18 ha in area. It is currently occupied by the Riverbanks Arts Centre with near complete hardstanding and roof coverage.

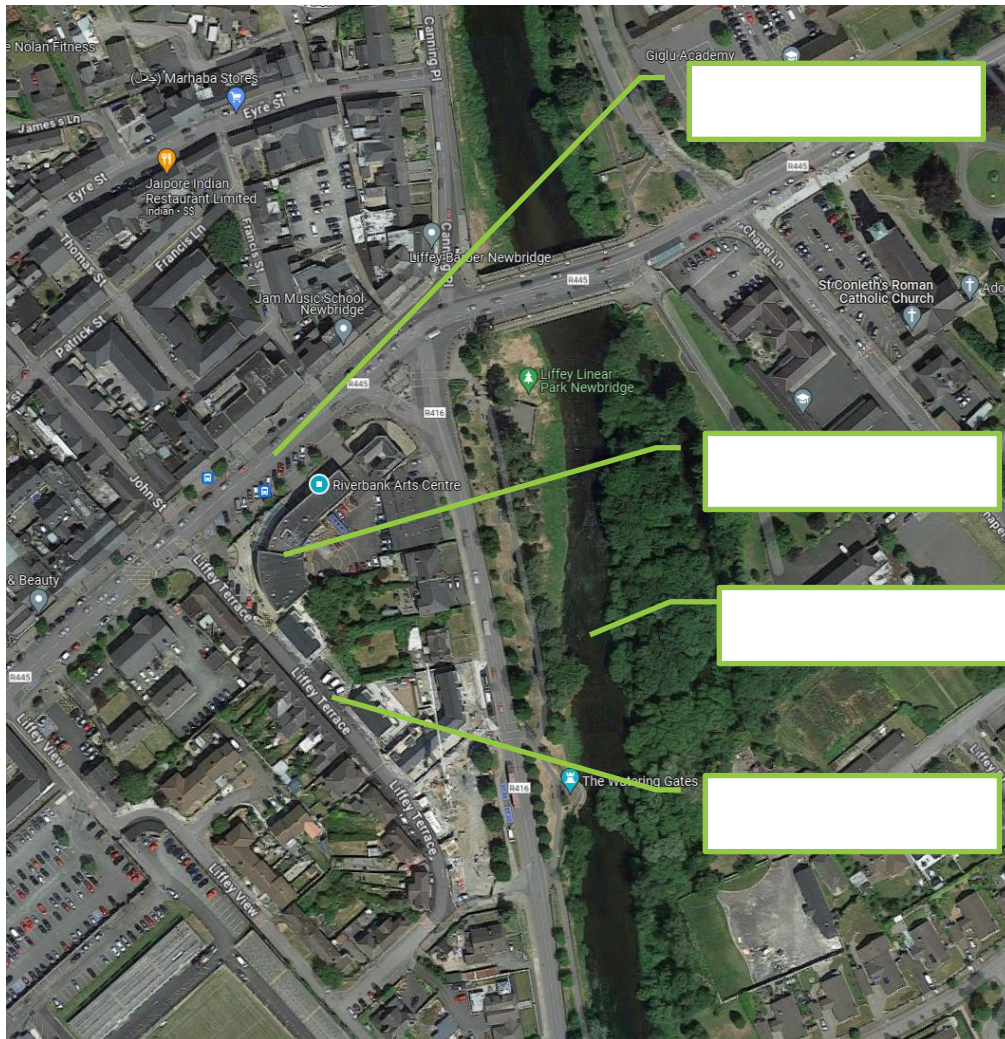


Figure 1 Site Location (Google Maps)

The site is zoned as Zone A - Town Centre in the Newbridge Local Area Plan 2013-2019 map 7. The 2025-2031 Local Area plan is currently in draft stage.

A review of the Office of Public Works records in relation to flooding reveals that there has been no history of flooding to the site or in the general locality. A separate site-specific flood risk assessment has been carried out for the site, please refer to CORA-2218-RP02-SSFRA.

Existing Drainage

There are a number of civil services in the vicinity of the site. An extract from the Uisce Eireann records is shown below outlining the local networks.

The existing Riverbank Arts Centre is understood to discharge by gravity to the 225mm diameter foul sewer running from south to north under the building. The surface water discharges to a 225mm surface water falling by gravity to the North and discharging to the River Liffey. Water provision to the site is through a 101.6 cast-iron water main on Liffey Terrace and 6" cat-iron main on Main Street.

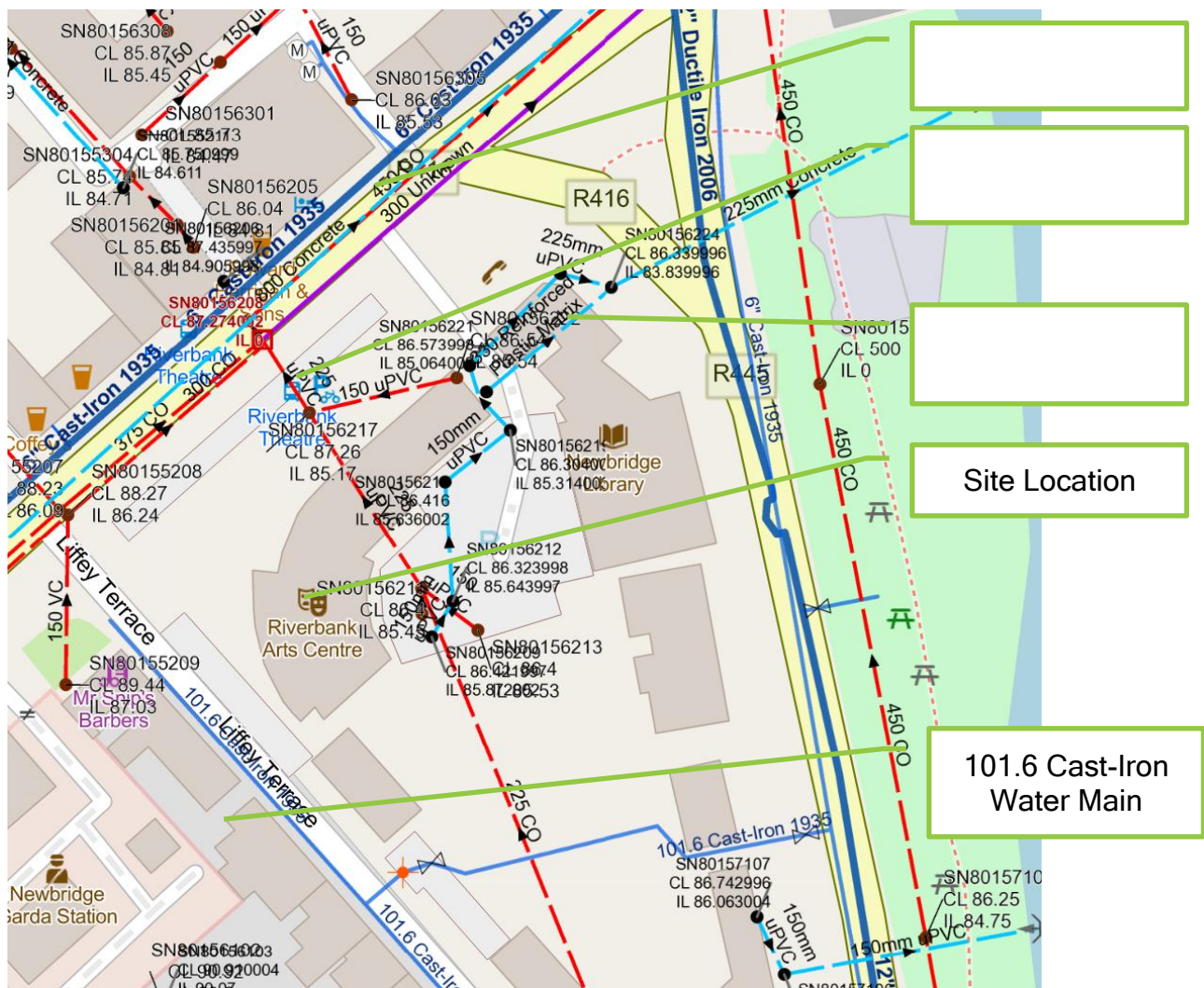


Figure 2 Extract from Uisce Eireann Drainage Records

The proposed layout and connection points are shown on CORA drawing 2218-CORA-C.001. The full Uisce Éireann local drainage records are shown in Appendix A.

Proposed Development

The proposal comprises the provision of new enhanced cultural facilities at the subject site in the form of a new Art Centre and all associated ancillary elements. The proposal is a component of the proposed new cultural quarter which includes the redevelopment of the adjoining county library.

The proposed development is the subject of a Part 8 proposal by Kildare County Council in partnership with Riverbank Arts Centre. The proposal includes the demolition of the original building and the construction of a new two-storey arts centre structure, along with associated services, landscaping, and public realm elements.

Due to its location, the proposed new arts centre building will form an important landmark building and re-invigorated cultural focus for Kildare, which will contribute to the creation of the overall Cultural Quarter proposals within Newbridge. It will also complement the regeneration of the neighbouring library.

Reference Publications used in the production of this Report

- Code of Practice - Wastewater Treatment and Disposal Systems Serving Single Houses (p.e. ≤ 10)
- Greater Dublin Strategic Drainage Study - Volumes 1 to 6
- Greater Dublin Regional Code of Practice for Drainage Works - Version 6.0
- Technical Guidance Documents - Part H
- Recommendations for Site Development Works for Housing Areas
- Irish Water Codes of practice for Water and Wastewater Services.
- The SuDS Manual (CIRIA 753)-2015
- Kildare County Council Development Plan (2023-2029)
- Newbridge Local Area Plan (2013 - 2019)

Foul Waste Discharge

It is intended that the proposed development is an arts centre with auditorium, gallery space, a café and associated offices. The foul discharge shall be fully separate from the surface network and be connected by gravity to the existing 225mm diameter public foul sewer running from south to north across the site.

The details of the proposed foul drainage are shown on CORA Drawing 2218-CORA-C.001.

Foul calculations are as follows in accordance with Irish Water Codes of Practice.

Theatre

Occupants	340No.
Wastewater Loading:	40 litres/day/person
Over 3 hour period for usage	

Back of House

Number of Staff:	78No.
Wastewater Loading:	60 litres/day/person
Over 12hour period of usage	

Café

Number of Occupants:	45No.
Number of sittings per day:	3
Wastewater Loading:	10 litres/day/person

Staff	10
Wastewater Loading:	60 litres/day/person
Over 12 hour period of usage	

Total Wastewater Loading

Theatre Loading= (340) x 40	= 13,600litres per day
Staff Loading= (78x 60)	= 4,680litres per day
Cafe= ((135 x 10) + (10 X 60)	= 1,950litres per day

Total Wastewater Loading=	= 20,230litres per day
Average Discharge (DWF) = Loading/ (usage x 60 x 60)	= 1.143litres per second
Peak Discharge (6DWF)	= 8.50l/s

A 225mm diameter pipe network is proposed to serve the site. The capacity of a 225mm diameter pipe with a gradient of 1:60 would be 62.8 litres per second which exceeds the potential outflow.

Surface Water Discharge

proposed development comprises of the part demolition of an existing theatre and the construction of a new multi-use arts centre and theatre. The existing centre has near full site coverage which will be replicated in the new development. The below surface water design seeks to reduce the amount of surface water discharging from the site, improve the quality of the discharge and improve the overall amenity and biodiversity for the town centre site.

Existing Site

Discharge

The existing centre has nearly full site coverage with an raised terrace providing access to the theatre. The roof is a flat roof finished in traditional felt and roofing materials. There are a number of plant units at roof level.

The existing roof areas discharge through rain water downpipes to a subsurface networks via gravity to the surface water sewers as noted above. In the current arrangement the discharge from the site for a 1 in 100-year event for a 1 hour duration is calculated at 10.6l/s.

Topography

The existing arts centre occupies the majority of the site footprint. A raised terrace and stairs facilitates access from the street level at the corner of Main Street and Liffey Terrace.

The cover levels for the manholes on Main Street identifies that the street falls from west to north east towards the River Liffey. The levels at junction of Liffey Street are recorded at 88.23m AOD falling to 84.58m at the junction of the R416 and Canning Place. The existing floor level is 86.465m approximately level with the midpoint of Main street between the boundary on Liffey Terrace and the R416 and River Liffey.

Surface water falling on the surrounding streets is directed away from the buildings to the curb at the edge of the roads.

Existing Site & Surrounding topography

Proposed Development

Discharge

It is proposed to limit the discharge from the site in line with Kildare County Council requirements. The outflow from the new roof areas is to be limited to the following;

- Q_{bar} 1 in 30 year 2.0l/s
- Q_{bar} 1 in 100 year 2.38l/s

The outflow from the roof levels will be limited through the use of orifice control implemented at the outlets from the roof surfaces. Storage for the surface water falling on these roof surfaces will be provided through Blue roof finishes and green/blue roof finishes. The remaining section of roof will be rerouted where possible to rainwater planters at ground level to reduce the outflow from these surfaces. Permeable paving will be employed at ground level where possible.

Topography

The new development will have near full site coverage. The proposed floor level will tie in with the existing floor level at 86.465m. There are no proposed changes to external street levels as part of the development. As such the flow paths will be maintained in line with the existing surrounding topography.

Surface water on the surrounding footpaths and roads will be directed to the road gullies via gravity falls and curbing.

Proposed Site & Surrounding topography

SuDS Requirement 1 - Treatment Train/Run-off Destination

The proposed surface water drainage scheme has been designed in accordance with the Greater Dublin Strategic Drainage Study (2005). Sustainable urban Drainage Systems have been incorporated into the design and have been outlined in the following sections. In accordance with SuDS design the proposed development will reduce the run-off rate from the previous development. The following areas have been considered in the surface water design for the proposed development.

Source	Subsurface Area	Area	SuDS Measure	Receptor/Destination
Auditorium Roof	Sedum roof	335m ²	Sedum/Blue Roof	Surface Water Sewer
Blue Roof (Plant Area) 01	Blue roof	335m ²	Blue Roof	Surface Water Sewer
Blue Roof Area 02	Blue Roof	97m ²	Blue Roof	Surface Water Sewer
Green/Blue Roof Area 01	Green/Blue Roof	148m ²	Green/Blue Roof	Surface Water Sewer
Existing Roof Area	Impermeable	245m ²	Rainwater Planter	Surface Water Sewer
Ground Level Hardstanding	Permeable	181m ²	Ground level infiltration	Ground

Table 01 - SuDS Treatment Train

The proposed surface water drainage system is shown on CORA drawing 2218-CORA-C001 with the extent of SuDS measures shown on CORA drawing 2218-CORA-C.002.

SuDS Requirement 2 – Hydraulic Control

Site Parameters

Site specific information has been gathered to ensure that an accurate design has been provided. Data collected from Met Eireann in relation to the site location was used in the design. This information is included in Appendix B. The relevant information can be summarised as:

Site Criteria

- Irish Grid Coordinates
 - Easting 280622
 - Northing 215236
- 60 min to 2 day rainfall ratio (5 year) 0.2852
- M5-60min - 15.4mm
- Climate change allowance - 30%
- Standard average annual rainfall 754.3mm (Met Eireann)

Design Criteria

- Q_{bar} 1 in 30 year 2.0l/s
- Q_{bar} 1 in 100 year 2.38l/s
- Attenuation Storm event 100 year
- Climate change allowance 30%

Surface Water Impact Assessment

In line with the Greater Dublin Strategic Drainage Study, the following design criteria have been applied for the site;

Catchment	Plan Area	Discharge Rate		Storage				Additional Comments
		1 in 30	1 in 100	1 in 30		1 in 100		
		l/s	l/s	Required m³	Provided m³	Required m³	Provided m³	
Auditorium Roof	335	0	0					Auditorium Roof discharging to Blue Roof 01. No storage provided.
Blue Roof 01	335	0.5	0.5	23.0	33.5	32.6	33.5	
Blue Roof 02	97	0.5	0.5	1.3	9.7	2.0	9.7	
Green/Blue 01	148	0.5	0.5	2.4	7.4	3.7	7.4	
Existing	245	0	0					Existing Roof to retain original connections.

Greater Dublin Strategic Drainage Study					
Criterion	Sub	Return Period		Design Objective	Confirmation of Criteria Met
Criterion 01	1.1	<1		Green/Blue Roof Areas and Permeable Paving will provide interception for the first 5.0mm rainfall.	Green Roofs and Filtration blanket will intercept first 5.0mm of rainfall falling on the roof surfaces
Criterion 02	2.1	1		For the 1 year return period the discharge rate for the site is limited to 2.0l/s	Discharge limited to 2l/s for 1 in 30 year event and lower.
	2.2	100		For the 100 year return period the discharge rate for the site is limited to site peak run-off rate	Discharge limited to 2.38l/s as calculated site peak run-off rate.
Criterion 03	3.1	30		For the 30 year return period there is no flooding to the site. Summer design of 15 or 30 minute storm duration	As shown above, there is sufficient storage provided to cater for the 1 in 30 year event with discharge limited to 2l/s
	3.2	100		For the 100 year return period there is no internal property flooding.	Sufficient storage provided for 1 in 100 year storm event limiting discharge to 2.38l/s for critical duration event.
	3.3	100		No Internal Property Flooding. Floor levels at least 500mm above maximum river level	Refer to CORA flood risk assessment confirming floor levels and site outside river flooding extents
	3.4	100		For the 100 year return period there is no additional flooding of adjacent properties as a result of the drainage network.	The proposed works will not change the existing site condition. There will be an overall reduction in the discharge from the site.
Criterion 04	4.1	100		Long term flood water accommodated on site.	As shown in calculations sufficient storage provided for the 1 in 100 year event 6 hour duration.
	4.2	100		Infiltration storage provided equal to the long term storage.	As shown in calculations sufficient storage provided for the 1 in 100 year event 6 hour duration.
	4.3	100		For the 100 year return period, the maximum discharge rate of 2.0l/s or calculated peak site run-off rate to be applied.	Max discharge rate of 2.38l/s calculated for the site.

Table 02 - Attenuation & GDSDS Summary

The attenuation storage is to be provided at roof levels with the total discharge from the new roof surfaces limited to 2.38l/s for the 1 in 100-year event. The 6 hour duration has been determined as the worst case scenario and has determined the required storage volume for each roof catchment.

SuDS Requirement 03 – Water Quality

Green/Blue Roofs

The introduction of sections of green/blue roofs will serve to intercept, and reduce the outflow of rainfall generated from the roof area.

The outflow from the roof areas will be limited through reduced outlet orifice sizes. Storage will be provided in the intensive green roof substrate with additional capacity above the green roof substrate for larger intensity rainfall events.

Permeable Paving

Permeable paving is proposed for paved areas and parking where possible. In line with the SuDS manual CIRIA C753 Table 24.6, Permeable Pavements are assumed to be compliant for zero run-off from the first 5.0mm rainfall. The remaining ground level areas are to be landscaped with tree pits incorporated.

Where possible the hardstanding areas are to be constructed with permeable paving surfaces. All trafficked areas will be finished in permeable finishes which allow direct infiltration of rainfall to the ground within the site.

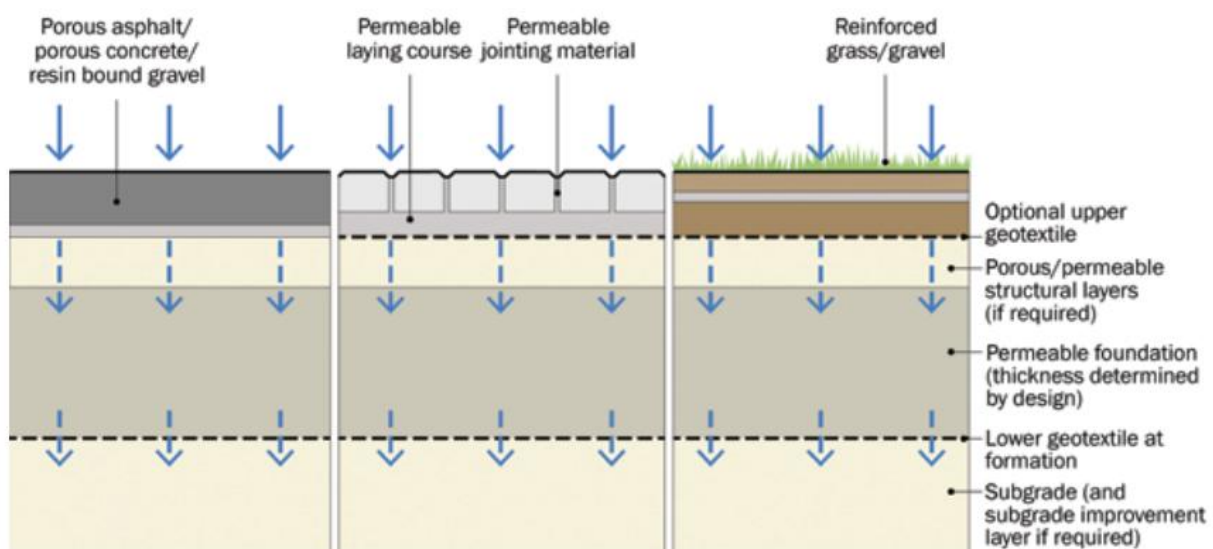


Figure 20.12 Pervious pavement system types: Type A – total infiltration

Figure 3 Permeable Paving

SuDS Requirement 04 – Amenity

The provision of the green blue roofs within the development will allow the storage of the rainfall in the soil build up below whilst also providing spaces of a visual quality and diversity.

The hardstanding areas will be constructed with permeable paving where possible which will allow the surface water to drain to the ground below and provides areas for car parking, vehicular and pedestrian access to the development. The use of permeable paving allows the water to be cleaned of micro carbons prior to the discharge to the ground below.

SuDS Requirement 05 – Biodiversity

The current site condition includes primarily hard surfaces and roof areas . The proposed development shall continue to provide a combination of both the built environment and the natural landscape.

The intensive Green/Blue Roof surfaces will be planted with native species to encourage the biodiversity of the local area.

Maintenance

To ensure the SuDS features continue to act as intended, a maintenance strategy will be incorporated into the building operations manual. The following measures are proposed;

1.0 General Requirements

Maintenance activities comprise · Regular Maintenance · Occasional Tasks · Remedial Work	Frequency
Generally Litter Collect all litter or other debris and remove from site at each site visit.	Monthly
Grass Mow amenity grass at regularly	As required
Planting Strim at permitted times of the year to suit wildlife	Annually or as required

- **Avoid** use of weedkillers and pesticides to prevent chemical pollution
- **Avoid** de-icing agents wherever possible to allow bio-remediation of pollutants in permeable surfaces.
- **Protect** all permeable, porous and infiltration surfaces from silt, sand, mulch and other fine particles.

2.0 Permeable Surfaces

· **Permeable surfaces** including permeable block paving, porous asphalt, gravel or free draining soils that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc. Permeable block paving and porous asphalt can be cleaned by suction brushing.

PERMEABLE AND POROUS SURFACES	
Regular Maintenance	Frequency
Cleaning Brush regularly and remove sweepings from all hard surfaces	Monthly
Occasional Tasks	Frequency
Permeable Pavements. Brush and vacuum surface once a year to prevent silt blockage and enhance design life.	Annually
Remedial Work	Frequency
Monitor effectiveness of permeable pavement and when water does not infiltrate immediately advise the client of the possible need for reinstatement of top layers or specialist cleaning. Recent experience suggests jet washing and suction cleaning will substantially reinstate pavement to 90% efficiency.	As required

3.0 Green/Blue Roofs

The Green Roof areas will be accessible through the lift and stair cores to allow for maintenance. A separate water feed will be provided to allow for irrigation of the green roofs during times of drought or low rainfall.

Green Blue Roof	
Regular Maintenance	Frequency
Sedum areas Irrigation to be provided to growing medium for times of drought. Inspection of roof materials to occur regularly to ensure continued growth	Monthly or as required

Outlets Inspect surface water outlets at roof level for excessive silt deposits to ensure no blockages.	Regularly or after periods of heavy rain.
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Water Supply

The site is served with a 150mm diameter ductile iron watermain on Main Street. It is proposed that the existing connection will be surveyed at the time of works and re-used where possible.

The water demand has been assessed as follows:

Theatre

Occupants	340No.
Water Demand:	40 litres/day/person
Over 3 hour period for usage	

Back of House

Number of Staff:	78No.
Water Demand:	60 litres/day/person
Over 12hour period of usage	

Café

Number of Occupants:	45No.
Number of sittings per day:	3
Water Demand:	10 litres/day/person

Staff	10
Water Demand:	60 litres/day/person
Over 12 hour period of usage	

Total Water Demand

Theatre Demand= (340) x 40	= 13,600litres per day
Staff Demand= (78x 60)	= 4,680litres per day
Café Demand= ((135 x 10) + (10 X 60)	= 1,950litres per day

Total Water Demand=	= 20,230litres per day
Average Demand = Loading/ (usage x 60 x 60)	= 1.143litres per second
Peak Discharge (3 x Average)	= 3.429l/s

Details of the proposed connection are shown on CORA drawing 2218-CORA-C.001.

Prepared by:



Alan Garvey BSc, ME, CEng, MIEI
for CORA Consulting Engineers

Reviewed by:



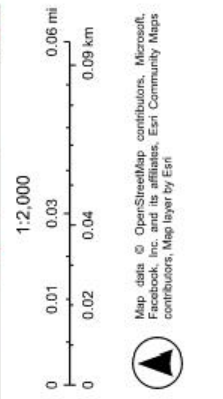
John Pigott BE, Cert. Eng Tech., CEng, MIEI
for CORA Consulting Engineers.

Appendix A

Uisce Éireann Water Services Public Records



04/12/2023



Map data © OpenStreetMap contributors, Microsoft, Esri, and its licensors, Esri Community Maps contributors, Map layer by Esri

- Water Mains
 - 12" Ductile Iron
 - 150mm Cast Iron
 - 125mm Cast Iron
 - Water Main Valve
 - Water Main Manhole
 - Water Main Connection
 - Water Main Access
 - Water Main Repair
 - Water Main Replacement
 - Water Main Relocation
 - Water Main Abandonment
- Valves
 - Gate Valve
 - Check Valve
 - Isolation Valve
 - Pressure Reducing Valve
 - Water Control Valve
 - Water Control Valve (Isolation)
 - Water Control Valve (Pressure Reducing)
 - Water Control Valve (Isolation/Pressure Reducing)
- Manholes
 - Water Main Manhole
 - Water Main Access Manhole
 - Water Main Repair Manhole
 - Water Main Replacement Manhole
 - Water Main Relocation Manhole
 - Water Main Abandonment Manhole
- Other Infrastructure
 - Water Main Connection Box
 - Water Main Connection Box (Isolation)
 - Water Main Connection Box (Pressure Reducing)
 - Water Main Connection Box (Isolation/Pressure Reducing)
 - Water Main Connection Box (Isolation/Pressure Reducing/Isolation)

Appendix B

Rainfall Return Volumes - Met Éireann																
Minutes	0.5	1	2	3	4	5	10	20	30	50	75	100	150	200	250	500
5	2.6	3.6	4.1	4.9	5.4	5.8	7	8.5	9.4	10.7	11.8	12.7	14	15.1	15.9	N/A
10	3.6	5	5.7	6.8	7.5	8	9.8	11.8	13.1	14.9	16.5	17.7	19.6	21	22.2	N/A
15	4.3	5.9	6.7	8	8.8	9.4	11.5	13.9	15.4	17.5	19.4	20.8	23	24.7	26.1	N/A
30	5.7	7.7	8.7	10.3	11.3	12.1	14.6	17.4	19.3	21.8	24	25.7	28.3	30.3	32	N/A
60	7.5	10	11.3	13.2	14.5	15.4	18.5	21.9	24.1	27.1	29.8	31.8	34.9	37.2	39.1	N/A
120	9.9	13	14.7	17	18.6	19.7	23.5	27.6	30.2	33.8	36.9	39.3	42.9	45.7	47.9	N/A
180	11.6	15.2	17.1	19.7	21.5	22.8	27	31.5	34.4	38.4	41.9	44.5	48.5	51.5	54	N/A
240	13.1	17	19	21.9	23.8	25.2	29.8	34.7	37.8	42.1	45.8	48.6	52.8	56.1	58.7	N/A
360	15.4	19.9	22.1	25.4	27.5	29.1	34.2	39.7	43.1	47.9	51.9	55	59.7	63.2	66.1	N/A
540	18.1	23.2	25.8	29.4	31.8	33.6	39.3	45.4	49.2	54.4	58.9	62.3	67.4	71.2	74.4	N/A
720	20.3	25.9	28.7	32.7	35.3	37.2	43.4	49.9	54	59.6	64.4	68	73.5	77.6	80.9	N/A
1080	23.9	30.3	33.4	37.9	40.8	43	49.8	57.1	61.6	67.8	73.1	77	83	87.4	91.1	N/A
1440	26.9	33.8	37.2	42.1	45.2	47.6	55	62.8	67.6	74.2	79.9	84.1	90.4	95.2	99.1	112.1
2880	31.8	39.4	43	48.2	51.6	54	61.7	69.8	74.8	81.6	87.3	91.6	97.9	102.7	106.5	119.4
4320	36.2	44.3	48.3	53.8	57.3	60	68.1	76.5	81.8	88.8	94.7	99.1	105.7	110.6	114.5	127.7
5760	40.2	48.9	53	58.9	62.6	65.4	73.9	82.8	88.2	95.5	101.6	106.2	113	118	122.1	135.6
8640	47.5	57.1	61.7	68.2	72.3	75.3	84.6	94.2	100.1	107.9	114.5	119.3	126.5	131.9	136.2	150.5
11520	54.1	64.6	69.7	76.7	81.1	84.4	94.3	104.6	110.9	119.2	126.2	131.3	138.9	144.6	149.1	164.2
14400	60.3	71.7	77.1	84.6	89.3	92.8	103.4	114.3	120.9	129.7	137.1	142.5	150.5	156.5	161.2	176.9
17280	66.3	78.4	84.2	92.1	97.1	100.8	112.1	123.5	130.5	139.7	147.4	153.1	161.5	167.7	172.7	189
23040	77.6	91.1	97.5	106.3	111.9	115.9	128.3	140.8	148.5	158.5	166.9	173	182.1	188.8	194.1	211.7
28800	88.3	103.2	110.2	119.8	125.8	130.2	143.6	157.1	165.3	176.1	185.1	191.7	201.4	208.5	214.2	232.9
36000	101.2	117.6	125.2	135.8	142.3	147.2	161.7	176.4	185.3	196.9	206.6	213.7	224.1	231.8	237.9	258

Ratio m5-60/M5-2d	
M5_60	15.4
M5_2Day	54
Ratio	0.285185

Irish Grid Coordinates	
Easting	280622
Northing	215236

Appendix C

CORA CONSULTING ENGINEERS			Job No. 2218		Ref No.		Rev.																
Title:			By:		AG		Checked:																
			Riverbank Arts Theatre		18/01/2024		Date:																
Met Eireann Historic Records																							
Irish Grid Coordinates (Site)																							
Easting			280622																				
Northing			215236																				
Historic Record Data (Casement)																							
Easting			321000																				
Northing			229000																				
Average Monthly Rainfall (mm)																							
Jan	63.8	Feb	48.5	Mar	50.7	Apr	51.9	May	59.1	Jun	62.5	Jul	54.2	Aug	72.3	Sep	60.3	Oct	81.6	Nov	73.7	Dec	75.7
Average Annual Rainfall			754.3 mm						SAAR														
Winter Average			54.33333																				
Spring Average			57.83333																				
Summer Average			62.26667																				
Autumn Average			77																				
LTA	63.8	48.5	50.7	51.9	59.1	62.5	54.2	72.3	60.3	81.6	73.7	75.7	754.3										



Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Alan Garvey

Site name: Riverbank

Site location: Newbridge

Site Details

Latitude: 53.18176° N

Longitude: 6.79484° W

Reference: 2638666113

Date: Jan 18 2024 10:04

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

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.1728

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	2	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.47

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	869	754.3
Hydrological region:	12	12
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.13	2.13
Growth curve factor 100 years:	2.61	2.61
Growth curve factor 200 years:	2.86	2.86

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Q_{BAR} (l/s):	0.41	0.91
1 in 1 year (l/s):	0.34	0.77
1 in 30 years (l/s):	0.86	1.94
1 in 100 year (l/s):	1.06	2.38
1 in 200 years (l/s):	1.16	2.6

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix D

Site Summary

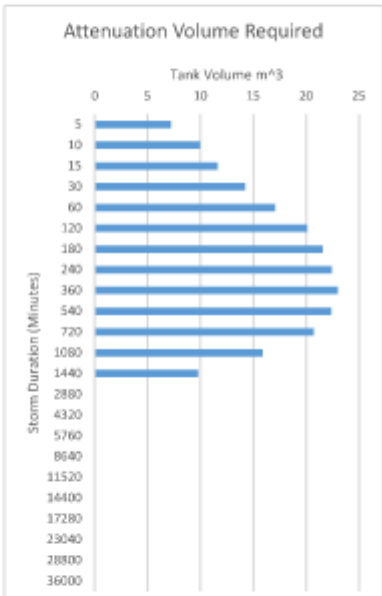
 Behan Hoare 33 Lower Mount Street Dublin D02 HT73 Tel: +353 1 6611100 E: info@cora.ie	Job No.	2218	Ref No.		Rev	PL1																																																						
		Riverbank Arts Theatre			Page No.	0																																																						
	By:	AG	Checked:																																																									
Title:			SW Drainage: Site Areas		Date:	18-Jan-2024																																																						
Breakdown of Roof Areas Roof - <table> <tr> <td>Overall Area</td> <td>1728.0 m²</td> </tr> <tr> <td>Auditorium Roof (Sedum)</td> <td>335.0 m²</td> </tr> <tr> <td>Blue Roof 01</td> <td>335.0 m²</td> </tr> <tr> <td>Blue Roof 02</td> <td>97.0 m²</td> </tr> <tr> <td>Green/Blue 01</td> <td>148.0 m²</td> </tr> <tr> <td>Existing</td> <td>245.0 m²</td> </tr> </table> Ground - <table> <tr> <td>Permeable Pavement</td> <td>90.0 m²</td> </tr> <tr> <td>Permeable Parking</td> <td>91.0 m²</td> </tr> <tr> <td>Rainwater Planter</td> <td>49.0 m²</td> </tr> </table> Irish Grid Coordinates <table> <tr> <td>Northing</td> <td>280622</td> </tr> <tr> <td>Easting</td> <td>215236</td> </tr> </table> Q₁₀₀ <table> <tr> <td>1 in 30 years</td> <td>2 l/s</td> <td rowspan="2">Refer to HR Wallingford Calculation</td> </tr> <tr> <td>1 in 100 years</td> <td>2.38 l/s</td> </tr> </table> Q₁₀₀ <table> <tr> <td></td> <td>1 in 30</td> <td>1 in 100</td> </tr> <tr> <td>Site</td> <td>2</td> <td>2.38</td> </tr> <tr> <td>Catchment</td> <td></td> <td></td> </tr> <tr> <td>Auditorium Roof (Sedum)</td> <td></td> <td></td> </tr> <tr> <td>Blue Roof 01</td> <td>0.5</td> <td>0.5</td> </tr> <tr> <td>Blue Roof 02</td> <td>0.5</td> <td>0.5</td> </tr> <tr> <td>Green/Blue 01</td> <td>0.5</td> <td>0.5</td> </tr> <tr> <td>Existing</td> <td>0</td> <td>0</td> </tr> <tr> <td>Check Sum of Discharge</td> <td>OK</td> <td>OK</td> </tr> </table>							Overall Area	1728.0 m ²	Auditorium Roof (Sedum)	335.0 m ²	Blue Roof 01	335.0 m ²	Blue Roof 02	97.0 m ²	Green/Blue 01	148.0 m ²	Existing	245.0 m ²	Permeable Pavement	90.0 m ²	Permeable Parking	91.0 m ²	Rainwater Planter	49.0 m ²	Northing	280622	Easting	215236	1 in 30 years	2 l/s	Refer to HR Wallingford Calculation	1 in 100 years	2.38 l/s		1 in 30	1 in 100	Site	2	2.38	Catchment			Auditorium Roof (Sedum)			Blue Roof 01	0.5	0.5	Blue Roof 02	0.5	0.5	Green/Blue 01	0.5	0.5	Existing	0	0	Check Sum of Discharge	OK	OK
Overall Area	1728.0 m ²																																																											
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Blue Roof 01 - 1 in 30-year Attenuation

	Job No.	2218	Ref No.	Rev.
	By:	AG	Checked:	
Title: Riverbank Arts Theatre			Date: 18/01/2024	

Roof Area	335 Auditorium Roof	335	Total Area	670
Impermeability Factor	0.9 Impermeability Factor	0.9 Impermeability Factor	1 Equivalent Drainage Area	603
Return Period	30 years	Climate Change Increase Factor	30% Flow Control Device	Orifice Control

Allowable Site Discharge Rate	0.5 l/sec
-------------------------------	-----------

Storm Duration (min)	Rainfall (mm)	Rainfall Volume (litres)	Discharge (litres)	Attenuation Reduced (m³)	
5	12.22	7366.66	150	7.21866	
10	17.03	10269.09	300	9.96909	
15	20.02	12072.06	450	11.62206	
30	25.09	15129.27	900	14.22927	
60	31.33	18891.99	1800	17.09199	
120	39.26	23673.78	3600	20.07378	
180	44.72	26966.16	5400	21.56616	
240	49.14	29631.42	7200	22.43142	
360	56.03	33786.09	10800	22.98609	
540	63.96	38567.88	16200	22.36788	
720	70.2	42330.6	21600	20.7306	
1080	80.08	48288.24	32400	15.88824	
1440	87.88	52991.64	43200	9.79164	
2880	97.24	58635.72	86400	0	
4320	106.34	64123.02	129600	0	
5760	114.66	69139.98	172800	0	
8640	130.13	78468.39	259200	0	
11520	144.17	86934.51	345600	0	
14400	157.17	94773.51	432000	0	
17280	169.65	102298.95	518400	0	
23040	193.05	116409.15	691200	0	
28800	214.89	129578.67	864000	0	
36000	240.89	145256.67	1080000	0	

Maximum Attenuation Volume	22.98609 m³
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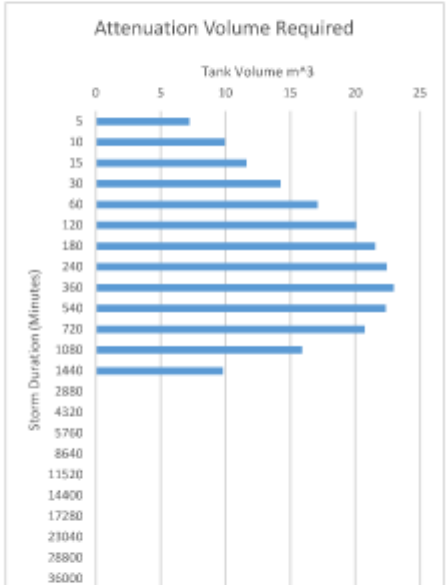
Plan Area	
Blue (Storage)	335 m²
Depth Required	68.61519403 mm
Area under paving	100 mm
Volume Provided	33.5 m³

Blue Roof 01 - 1 in 100-year Attenuation

	Job No.	2218	Ref No.	Rev.
	By:	AG	Checked:	
Title:	Riverbank Arts Theatre		Date:	18/01/2024

Roof Area	335 Auditorium Roof	335	Total Area	670
Impermeability Factor	0.9 Impermeability Factor	Impermeability 0.9 Factor	1 Equivalent Drainage Area	603
Return Period	100 years	Climate Change Increase Factor	30% Flow Control Device	Orifice Control

Allowable Site Discharge Rate	0.5 L/sec
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Storm Duration (min)	Rainfall (mm)	Rainfall Volume (litres)	Discharge (litres)	Attenuation Required (m³)	
5	16.51	9955.53	150	9.80553	
10	23.01	13875.03	300	13.57503	
15	27.04	16305.12	450	15.85512	
30	33.41	20146.23	900	19.24623	
60	41.34	24928.02	1800	23.12802	
120	51.09	30807.27	3600	27.20727	
180	57.85	34883.55	5400	29.48355	
240	63.18	38097.54	7200	30.89754	
360	71.5	43114.5	10800	32.3145	
540	80.99	48836.97	16200	32.63697	
720	88.4	53305.2	21600	31.7052	
1080	100.1	60380.3	32400	27.9603	
1440	109.33	65925.99	43200	22.72599	
2880	119.08	71805.24	86400	0	
4320	128.83	77684.49	129600	0	
5760	138.06	83250.18	172800	0	
8640	155.09	93519.27	259200	0	
11520	170.69	102926.07	345600	0	
14400	185.25	111705.75	432000	0	
17280	199.03	120015.09	518400	0	
23040	224.9	135614.7	691200	0	
28800	249.21	150273.63	864000	0	
36000	277.81	167519.43	1080000	0	

Maximum Attenuation Volume	32.63697 m³
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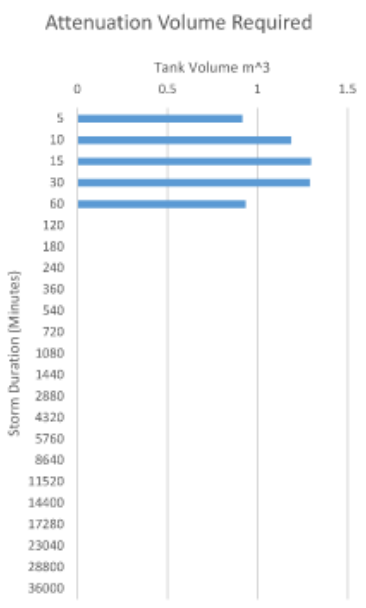
Plan Area		
Blue (Storage)	335	m²
Depth Required	97.42379104	mm
Area under paving	100	mm
Volume Provided	33.5	m³

Blue Roof 02 - 1 in 30-year Attenuation

	Job No.	2218	Ref No.		Rev.	
	By:	AG	Checked:			
Title: Riverbank Arts Theatre			Date: 18/01/2024			

Roof Area	97	Total Area	97
Impermeability Factor	0.9 Impermeability Factor	0.9 Impermeability Factor	1 Equivalent Drainage Area
Return Period	30 years	Climate Change Increase Factor	30% Flow Control Device
			Orifice Control

Allowable Site Discharge Rate	0.5 L/sec
-------------------------------	-----------

Storm Duration (min)	Rainfall (mm)	Rainfall Volume (litres)	Discharge (litres)	Attenuation Reduced (m ³)	Attenuation Volume Required 
5	12.22	1066.806	150	0.916806	
10	17.03	1486.719	300	1.186719	
15	20.02	1747.746	450	1.297746	
30	25.09	2190.357	900	1.290357	
60	31.33	2735.109	1800	0.935109	
120	39.26	3427.398	3600	0	
180	44.72	3904.056	5400	0	
240	49.14	4289.922	7200	0	
360	56.03	4891.419	10800	0	
540	63.96	5583.708	16200	0	
720	70.2	6128.46	21600	0	
1080	80.08	6990.984	32400	0	
1440	87.88	7671.924	43200	0	
2880	97.24	8489.052	86400	0	
4320	106.34	9283.482	129600	0	
5760	114.66	10009.818	172800	0	
8640	130.13	11360.349	259200	0	
11520	144.17	12586.041	345600	0	
14400	157.17	13720.941	432000	0	
17280	169.65	14810.445	518400	0	
23040	193.05	16853.265	691200	0	
28800	214.89	18759.897	864000	0	
36000	240.89	21029.697	1080000	0	

Maximum Attenuation Volume	1.297746 m ³
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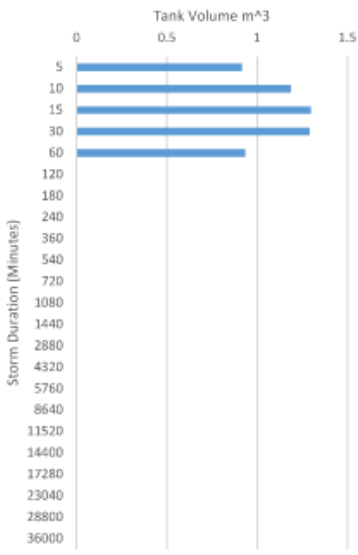
Plan Area		
Blue (Storage)	97	m ²
Depth Required	13.37882474	mm
Area under paving	100	mm
Volume Provided	9.7	m ³

Blue Roof 02 - 1 in 100-year Attenuation

	Job No.	2218	Ref No.		Rev.	
	By:	AG	Checked:			
Title: Riverbank Arts Theatre			Date: 18/01/2024			

Roof Area	97	Total Area	97
Impermeability Factor	0.9 Impermeability Factor	0.9 Impermeability Factor	1 Equivalent Drainage Area
Return Period	30 years	Climate Change Increase Factor	30% Flow Control Device
			Orifice Control

Allowable Site Discharge Rate	0.5 L/sec
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Storm Duration (min)	Rainfall (mm)	Rainfall Volume (litres)	Discharge (litres)	Attenuation Required (m³)	Attenuation Volume Required 
5	12.22	1066.806	150	0.916806	
10	17.03	1486.719	300	1.186719	
15	20.02	1747.746	450	1.297746	
30	25.09	2190.357	900	1.290357	
60	31.33	2735.109	1800	0.935109	
120	39.26	3427.398	3600	0	
180	44.72	3904.056	5400	0	
240	49.14	4289.922	7200	0	
360	56.03	4891.419	10800	0	
540	63.96	5583.708	16200	0	
720	70.2	6128.46	21600	0	
1080	80.08	6990.984	32400	0	
1440	87.88	7671.924	43200	0	
2880	97.24	8489.052	86400	0	
4320	106.34	9283.482	129600	0	
5760	114.66	10009.818	172800	0	
8640	130.13	11360.349	259200	0	
11520	144.17	12586.041	345600	0	
14400	157.17	13720.941	432000	0	
17280	169.65	14810.445	518400	0	
23040	193.05	16853.265	691200	0	
28800	214.89	18759.897	864000	0	
36000	240.89	21029.697	1080000	0	

Maximum Attenuation Volume	1.297746 m³
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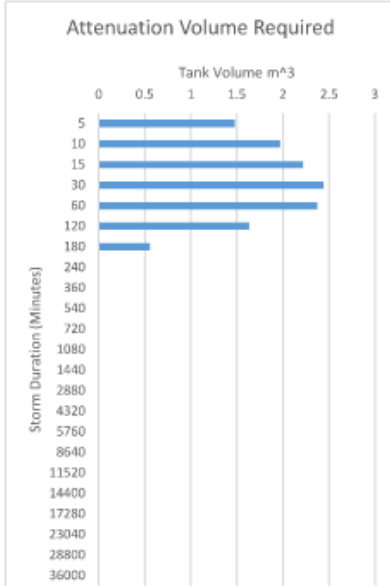
Plan Area		
Blue (Storage)	97	m²
Depth Required	13.37882474	mm
Area under paving	100	mm
Volume Provided	9.7	m³

Green/Blue Roof 01 - 1 in 30-year Attenuation

	Job No.	2218	Ref No.	Rev.
	By:	AG	Checked:	
Title: Riverbank Arts Theatre			Date: 18/01/2024	

Roof Area	148	Total Area	148
Impermeability Factor	0.9	Impermeability Factor	0.9
		1 Equivalent Drainage Area	133.2
Return Period	30 years	Climate Change Increase Factor	30% Flow Control Device
			Orifice Control

Allowable Site Discharge Rate	0.5 L/sec
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Storm Duration (min)	Rainfall (mm)	Rainfall Volume (litres)	Discharge (litres)	Attenuation Required (m³)	
5	12.22	1627.704	150	1.477704	
10	17.03	2268.396	300	1.968396	
15	20.02	2666.664	450	2.216664	
30	25.09	3341.988	900	2.441988	
60	31.33	4173.156	1800	2.373156	
120	39.26	5229.432	3600	1.629432	
180	44.72	5956.704	5400	0.556704	
240	49.14	6545.448	7200	0	
360	56.03	7463.196	10800	0	
540	63.96	8519.472	16200	0	
720	70.2	9350.64	21600	0	
1080	80.08	10666.656	32400	0	
1440	87.88	11705.616	43200	0	
2880	97.24	12952.368	86400	0	
4320	106.34	14164.488	129600	0	
5760	114.66	15272.712	172800	0	
8640	130.13	17333.316	259200	0	
11520	144.17	19203.444	345600	0	
14400	157.17	20935.044	432000	0	
17280	169.65	22597.38	518400	0	
23040	193.05	25714.26	691200	0	
28800	214.89	28623.348	864000	0	
36000	240.89	32086.548	1080000	0	

Maximum Attenuation Volume	2.441988 m³
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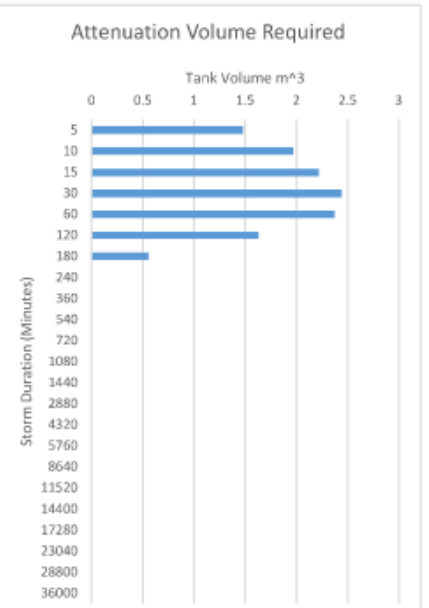
Plan Area		
Blue (Storage)	148	m²
Void Ratio	30.00%	
Depth Required	54.99972973	mm
Area under paving	100	mm
Volume Provided	4.44	m³

Green/Blue Roof 01 - 1 in 100-year Attenuation

	Job No.	2218	Ref No.	Rev.
	By:	AG	Checked:	
Title: Riverbank Arts Theatre			Date: 18/01/2024	

Roof Area	148	Impermeability	Total Area	148
Impermeability Factor	0.9	Impermeability Factor	0.9 Factor	1 Equivalent Drainage Area
Return Period	100 years	Climate Change Increase Factor	30% Flow Control Device	Orrifice Control

Allowable Site Discharge Rate	0.5 L/sec
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Storm Duration (min)	Rainfall (mm)	Rainfall Volume (litres)	Discharge (litres)	Attenuation Required (m³)	
5	16.51	2199.132	150	2.049132	
10	23.01	3064.932	300	2.764932	
15	27.04	3601.728	450	3.151728	
30	33.41	4450.212	900	3.550212	
60	41.34	5506.488	1800	3.706488	
120	51.09	6805.188	3600	3.205188	
180	57.85	7705.62	5400	2.30562	
240	63.18	8415.576	7200	1.215576	
360	71.5	9523.8	10800	0	
540	80.99	10787.868	16200	0	
720	88.4	11774.88	21600	0	
1080	100.1	13333.32	32400	0	
1440	109.33	14562.756	43200	0	
2880	119.08	15861.456	86400	0	
4320	128.83	17160.156	129600	0	
5760	138.06	18389.592	172800	0	
8640	155.09	20657.988	259200	0	
11520	170.69	22735.908	345600	0	
14400	185.25	24675.3	432000	0	
17280	199.03	26510.796	518400	0	
23040	224.9	29956.68	691200	0	
28800	249.21	33194.772	864000	0	
36000	277.81	37004.292	1080000	0	

Maximum Attenuation Volume	3.706488 m³
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Plan Area		
Blue (Storage)	148	m²
Void Ratio	30.00%	
Depth Required	83.47945946	mm
Area under paving	100	mm
Volume Provided	4.44	m³