O'Carroll Haulage & Crane Hire Ltd.

Retention Planning

Engineering Planning Report
231279-PUNCH-XX-XX-RP-C-0001

Document Control

Document Number: 231279-PUNCH-XX-XX-RP-C-001

Status	Rev	Description	Date	Prepared	Checked	Approved
S3	P01	Draft planning issue	08/05/2024	A. O'Gorman	D. Gallery	D. Gallery
A0	C01	Planning Issue	30/05/2024	A. O'Gorman	D. Gallery	D. Gallery

Table of Contents

Document Control i
Table of Contents ii
1 Introduction .... A-I
1.1 Proposed Development .... A-I
2 Surface Water Drainage Design .... A-I
2.1 Existing Surface Water Drainage .... A-I
2.2 Surface Water Drainage Constructed Associated with the Retention Planning .... A-II
2.3 Proposed Surface Water Drainage Network .... A-II
2.4 SUDs Proposals .... A-III
2.4.2 Filter Drain .... A-III
2.4.3 Petrol Interceptor .... A-III
2.4.4 Forecourt Separator .... A-III
2.4.5 Attenuation Tank .... A-IV
2.5 Pollution Hazard Indices Based on the Simple Index Approach .... A-IV
2.6 Consultation with the OPW .... A-V
3 Flooding .... A-VI
3.1 Site Specific Flood Risk Assessment .... A-VI
Appendix A Met Eireann Rainfall Data .... A-VII
Appendix B Causeway Stormwater Drainage Design Calculations .... B-I
Appendix C Greenfield Runoff Calculations .... C-I
Appendix D Maintenance Plan and Schedule .... D-I
Appendix E Separators .... E-II

1 Introduction

Punch Consulting Engineers are providing civil and structural engineering consultancy services for retention permission at O'Carroll Haulage and Crane hire Ltd, Court, Kildimo, Co. limerick. This report deals specifically with the proposals for the provision of surface water drainage associated with the retention permission.

The site prior to construction was a brownfield site consisting of a building, concrete slab and hardcore areas. The site is bound by Derek Walsh Camper Centre to the South, Local Road L8038 Derrybeg Road to the west, and green fields to the north and east.

1.1 Proposed Development

O'Carroll Haulage and Crane Hire Ltd. intend to apply for retention of works consisting of:

1. the filling of land.
2. the provision of extended concrete apron on part of that filled area.
3. the use of part of the filled and concrete areas for hardstanding storage of materials and plant associated with the established and permitted use of the property including provision of security fence and lighting.

Provision of remedial and mitigation measures including:

1. The cessation of use of part of the fill area and facilitating the natural regeneration of that area.
2. The provision of surface water management measures to improve the quality of the existing permitted and proposed discharge of surface water from the site to existing boundary drains.

The works are outlined in a series of drawings prepared by PUNCH Consulting Engineers and supplementary information by HRA Planning.

2 Surface Water Drainage Design

2.1 Existing Surface Water Drainage

Based on record drawings, client knowledge, a topographical survey and site visits it was established that the following surface water drainage infrastructure is located within the vicinity of the site:

a) OPW Arterial Drain "A" flows southwest to northeast and ultimately discharges into the River Maigue.

b) Open Drain "B" flows west to east and discharges to existing OPW arterial drain "A".

c) Open Drain "C" flows east to west and discharges to filter drain "D".

d) Filter Drain "D" flows southwest to northeast and discharges into open drain "E".

e) Open Drain "E" flows southwest to northeast. The open Drain then flows west to east and discharges to existing OPW arterial drain "A".

Please refer to drawing 231279-PUNCH-XX-XX-DR-C-0401 for details of the existing drainage network in the vicinity of the site.

As noted in section 1, the site prior to construction was a brownfield site consisting of a building, concrete slab and hardcore areas. The site discharged approximately 50l/s to the existing surface water network.

2.2 Surface Water Drainage Constructed Associated with the Retention Planning

The following surface water sewers were constructed:

a) Filter Drain "F" flows east to west discharges into open drain "E".

Please refer to drawing 231279-PUNCH-XX-XX-DR-C-0401 for details of the existing drainage network in the vicinity of the site.

2.3 Proposed Surface Water Drainage Network

It is proposed that surface water will be collected and discharged via a mixture of traditional and Sustainable urban Drainage System (SuDS) to the existing open drain "E". Surface water will be pumped at a rate of 3.1l/s from the attenuation tank. A class 2 bypass separator will treat runoff prior to entering the existing drain.

Please refer to drawing 231279-PUNCH-XX-XX-DR-C-0402 which accompanies this planning application for details of the proposed surface water drainage layout.

Table 2-1 describes the stormwater drainage design parameters used.

Table 2-1: Stormwater Drainage Design Parameters

Description	Value
Total Site area	1.23 ha
Return period target	Pipe Design 1 in 5 year. Network Design 1 in 30 year + CC. Check 1 in 100 year + CC for flooding.
Climate Change	30%
M5-60	17.7
Ratio R	0.319
SOIL type	4
Soil value	0.45
SAAR	1048mm
Controlled Outflow	3.1 l/s
Flow restriction method	Pump
Attenuation Storage Volume	550m^3

Please refer to Appendix A for Met Eireann rainfall data, Appendix B for detailed calculations, Appendix C for greenfield runoff calculations Appendix D for maintenance plan & schedule and Appendix E for separator details.

2.4 SUDs Proposals

The proposed development has been assessed in relation to Sustainable Urban Drainage Systems (SuDS). A variety of SuDS measures may be adopted to comply with Council recommendations. All SuDS measures are to be implemented with reference to the UK Suds Manual and Limerick City & County Council drainage requirements.

Relatively small volumes of rainwater collected on the respective SuDS devices will enter the surface water sewer network during typical low intensity storms.

The SuDS processes decrease the impact of the development on the receiving environment by providing amenity and biodiversity in many cases. Regular maintenance of the SuDS proposals is required to ensure they are operating to their optimal level throughout their design life.

A site visit revealed that that there is a high groundwater table in the area and therefore discharge of surface water to ground is not suitable.

The specific measures adopted for the development comprise of the following:

2.4.1 Bio Retention Areas

The bio-retention areas will incorporate drainage stone/subsoil and will provide a level of additional attenuation within the bio-retention areas. Bioretention systems allow the stormwater to filter downwards through a filter medium removing finer contaminants along the way. The base and sides of the system will be lined and a high-level overflow to the drainage network within the build-up will accommodate removal of water.

CIRIA C753 (The SuDS Manual) Table 24.6 notes that regarding interception design of bio retention areas/modified planters, pavements drained by bio retention areas can be considered to provide Interception, i.e. it can be assumed that there will be zero runoff from the first 5 mm rainfall for 80% of events during the summer and 50% in winter.

2.4.2 Filter Drain

The filter drain provides a level of attenuation storage within the voids in the stone within the trench.

CIRIA C753 (The SuDS Manual) Table 24.6 notes that regarding interception design of infiltration trenches, impermeable areas drained by infiltration trenches can be considered to provide Interception, i.e. it can be assumed that there will be zero runoff from the first 5 mm rainfall for 80% of events during the summer and 50% in winter.

2.4.3 Petrol Interceptor

It is proposed that all surface water run-off from the development will outfall via a bypass separator. This device will remove hydrocarbons and fine sediment particles from the site runoff and lower the risk of downstream contamination following an oil spillage on site.

Bypass separators fully treat all flows generated by rainfall rates of up to 6.5mm/hr. This covers over 99% of all rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

2.4.4 Forecourt Separator

It is proposed that a forecourt separator is provided for the fuelling area. Forecourt separators are full retention separators specified to retain on site the maximum spillage likely to occur at the fuelling area. The separator can retain the possible loss of the contents of one compartment of a road tanker, which may be up to 7,600 litres.

2.4.5 Attenuation Tank

An attenuation tank is proposed to reduce the peak runoff from the site. The attenuation tanks are designed to accommodate surface water runoff for the 1 in 100 year rainfall event. The design and simulations also allow for 30% additional rainfall for climate change. As indicated in table 2-1 above, the controlled runoff rate of surface water will be 3.1 l/s.

2.5 Pollution Hazard Indices Based on the Simple Index Approach

In accordance with the SuDS Manual CIRIA C753 the pollution prevention guidelines have been followed to ensure appropriate levels of treatment are provided before attenuated run-off from the site is discharged into the existing surface water sewers. The Pollution Hazard Indices, shown in Table 2-1 below, for the different proposed land uses have been derived from Table 26.2 of CIRIA C753.

Table 2-1: Pollution Hazard Indices for Different Land Uses

Land Use	TSS	Metals	Hydrocarbons
Other Roofs (Typically commercial/industrial roofs)	0.3	0.2	0.05
Haulage Yards	0.8	0.8	0.9

To ensure the proposed SuDS strategy will appropriately mitigate against the potential pollution derived from these areas the Pollution Mitigation Indices (PMI) in Table 26.3 and 26.15 of CIRIA C753 have been reviewed and laid out in Table 2-2 below.

Table 2-2: Indicative SuDS mitigation indices for the site

SuDS Measures	TSS (PMI)	Metals (PMI)	Hydrocarbons
Filter Drain	0.4	0.4	0.4
Bioretention System	0.8	0.8	0.8

Table 2-3 below shows the calculations for the total pollution prevention for each type of hard standing on site. The following formula has been used to calculate the total mitigation in line with CIRIA C753. Total SuDS Mitigation Index = Mitigation Index 1 + 0.5 (Mitigation Index 2).

In Table 2-3, the Mitigation Indices for the relevant SuDS feature has been subtracted from the Pollution Hazard Indices for the land use to determine if sufficient treatment has been provided. A negative number indicates that enough treatment has been provided and a positive number indicates that additional forms of treatment are required.

Table 2-3: Pollution Hazard Indices for different Land Uses

<table>
<tr><th rowspan="2">Land Use</th><th colspan="3">Mitigation Method 1</th><th colspan="3">Mitigation Method 2</th><th colspan="3">Total SuDS Mitigation</th></tr>
<tr><th>TSS</th><th>Metals</th><th>H-C</th><th>TSS</th><th>Metals</th><th>H-C</th><th>TSS</th><th>Metals</th><th>H-C</th></tr>
<tr><td>Other Roofs</td><td colspan="3">Bioretention System</td><td colspan="3">Filter Drain</td><td colspan="3"></td></tr>
<tr><td>(Pollution Hazard Table 2.1 - Mitigation Index Table 2.2)</td><td>0.3-0.8 = -0.5</td><td>0.2-0.8 = -0.6</td><td>0.05-0.4 = -0.45</td><td>0.3-0.4 = -0.1</td><td>0.2-0.4 = -0.2</td><td>0.05-0.4= -0.35</td><td>-0.55</td><td>-0.20</td><td>-0.63</td></tr>
<tr><td>Haulage Yards</td><td colspan="3">Bioretention System</td><td colspan="3">Filter Drain</td><td colspan="3"></td></tr>
<tr><td rowspan="2">(Pollution Hazard Table 2.1 - Mitigation Index Table 2.2)</td><td rowspan="2">0.8-0.8 = 0.0</td><td rowspan="2">0.8-0.8 = 0.0</td><td rowspan="2">0.9-0.8 = 0.1</td><td rowspan="2">0.8-0.4 = 0.4</td><td rowspan="2">0.8-0.4 = 0.4</td><td rowspan="2">0.9-0.4 = 0.5</td><td>0.2</td><td>0.2</td><td>0.35</td></tr>
<tr><td colspan="3">Appropriate treatment is provided using a class 2 bypass separator and forecourt separator.</td></tr>
</table>

With the inclusion of attenuation, restricted surface water discharge, SuDS measures and proprietary treatment, there will be a decrease in peak surface water run-off and an increase in surface water quality discharging to the existing surface water network as a result of the proposed development.

2.6 Consultation with the OPW

The OPW (Sarah Ryan, South-West Drainage Maintenance & Construction Department) was consulted in regard to discharging surface water to the OPW arterial drain. The OPW noted that discharge to the arterial drain is agreeable in principle in accordance with the proposed design.

3 Flooding

3.1 Site Specific Flood Risk Assessment

A site-specific flood risk assessment has been undertaken and accompanies the planning submission.

Appendix A Met Eireann Rainfall Data

Met Eireann

Return Period Rainfall Depths for sliding Durations

Irish Grid: Easting: 146753, Northing: 152308,

	Interval		Years													
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.6,	3.9,	4.6,	5.7,	6.5,	7.1,	9.1,	11.6,	13.2,	15.6,	17.7,	19.5,	22.1,	24.2,	26.0,	N/A ,
10 mins	3.6,	5.4,	6.4,	7.9,	9.0,	9.9,	12.7,	16.1,	18.4,	21.7,	24.7,	27.1,	30.8,	33.8,	36.2,	N/A ,
15 mins	4.2,	6.3,	7.5,	9.3,	10.6,	11.6,	15.0,	19.0,	21.7,	25.6,	29.1,	31.9,	36.3,	39.7,	42.6,	N/A ,
30 mins	5.5,	8.0,	9.5,	11.6,	13.1,	14.3,	18.3,	22.9,	25.9,	30.4,	34.3,	37.5,	42.4,	46.2,	49.4,	N/A ,
1 hours	7.1,	10.2,	11.9,	14.5,	16.3,	17.7,	22.3,	27.5,	31.1,	36.1,	40.5,	44.0,	49.5,	53.7,	57.2,	N/A ,
2 hours	9.2,	13.0,	15.0,	18.1,	20.2,	21.8,	27.2,	33.2,	37.2,	42.8,	47.9,	51.8,	57.8,	62.4,	66.3,	N/A ,
3 hours	10.7,	15.0,	17.2,	20.6,	22.9,	24.7,	30.5,	37.0,	41.3,	47.4,	52.7,	56.9,	63.3,	68.2,	72.3,	N/A ,
4 hours	11.9,	16.5,	19.0,	22.6,	25.1,	27.0,	33.1,	40.0,	44.6,	50.9,	56.5,	60.8,	67.5,	72.6,	76.9,	N/A ,
6 hours	13.9,	19.0,	21.7,	25.7,	28.4,	30.5,	37.2,	44.7,	49.5,	56.3,	62.3,	66.9,	73.9,	79.3,	83.8,	N/A ,
9 hours	16.2,	21.9,	24.9,	29.3,	32.2,	34.5,	41.8,	49.8,	55.0,	62.3,	68.6,	73.5,	80.9,	86.6,	91.3,	N/A ,
12 hours	18.0,	24.2,	27.4,	32.1,	35.3,	37.7,	45.4,	53.8,	59.3,	66.9,	73.5,	78.6,	86.3,	92.2,	97.1,	N/A ,
18 hours	21.0,	27.9,	31.4,	36.6,	40.0,	42.6,	50.9,	60.1,	65.9,	74.0,	81.0,	86.4,	94.5,	100.8,	105.9,	N/A ,
24 hours	23.4,	30.8,	34.6,	40.1,	43.7,	46.5,	55.3,	64.9,	71.1,	79.5,	86.8,	92.4,	100.8,	107.3,	112.6,	130.6,
2 days	29.5,	38.0,	42.2,	48.4,	52.4,	55.4,	64.9,	75.1,	81.6,	90.4,	98.0,	103.7,	112.4,	118.9,	124.2,	142.3,
3 days	34.9,	44.2,	48.9,	55.6,	59.9,	63.2,	73.4,	84.3,	91.1,	100.4,	108.3,	114.3,	123.3,	130.0,	135.5,	154.1,
4 days	39.8,	49.9,	55.0,	62.2,	66.8,	70.3,	81.2,	92.6,	99.9,	109.6,	117.9,	124.1,	133.4,	140.4,	146.1,	165.3,
6 days	48.7,	60.4,	66.1,	74.2,	79.4,	83.3,	95.3,	107.9,	115.7,	126.3,	135.3,	142.0,	152.0,	159.5,	165.5,	185.8,
8 days	57.1,	70.0,	76.3,	85.2,	90.9,	95.1,	108.2,	121.8,	130.3,	141.6,	151.1,	158.3,	168.9,	176.8,	183.2,	204.6,
10 days	65.0,	79.1,	86.0,	95.6,	101.7,	106.3,	120.3,	134.8,	143.8,	155.8,	166.0,	173.5,	184.7,	193.0,	199.8,	222.2,
12 days	72.6,	87.9,	95.2,	105.5,	112.1,	116.9,	131.8,	147.2,	156.7,	169.4,	180.0,	188.0,	199.7,	208.4,	215.4,	238.8,
16 days	87.3,	104.6,	112.9,	124.5,	131.7,	137.2,	153.7,	170.7,	181.1,	194.9,	206.6,	215.2,	227.9,	237.3,	244.9,	270.0,
20 days	101.5,	120.7,	129.8,	142.5,	150.5,	156.4,	174.4,	192.9,	204.1,	219.1,	231.5,	240.8,	254.4,	264.5,	272.5,	299.2,
25 days	118.8,	140.1,	150.3,	164.3,	173.1,	179.6,	199.3,	219.4,	231.6,	247.8,	261.3,	271.2,	285.8,	296.7,	305.3,	333.8,

NOTES:

N/A Data not available

These values are derived from a Depth Duration Frequency (DDF) Model

For details refer to:

'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

M5-60 = 17.7
R-Ratio = 0.319

Appendix B Causeway Stormwater Drainage Design Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	17.700	Minimum Backdrop Height (m)	0.200
Ratio-R	0.319	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1-0	0.341	5.00	0.600	1200	546694.339	652337.217	1.600
S1-1	0.100	15.00	0.600	1200	546692.735	652349.773	1.700
SIC 3-0	0.060	15.00	0.310	1200	546774.271	652362.670	1.425
S1-3			0.300	1200	546759.499	652360.076	2.542
PI			0.300	1200	546758.585	652364.414	2.669
Attenuation Tank			0.300		546756.350	652374.135	2.920
S1-5			0.370	1200	546738.786	652373.055	3.287
S1-6		5.00	0.190	1200	546707.583	652476.141	1.425
Headwall			0.190	1200	546715.911	652499.418	1.475
1	0.500	5.00	0.300	1200	546762.449	652347.896	1.300

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
S1.000	S1-0	S1-1	10.000	0.600	-1.000	-1.100	0.100	100.0	225	5.13	50.0
S1.001	S1-1	S1-3	67.554	0.600	-1.100	-2.242	1.142	59.2	225	15.66	41.7
S2.000	SIC 3-0	S1-3	14.998	0.600	-1.115	-1.367	0.252	59.5	225	15.15	42.5
S1.002	S1-3	PI	4.433	0.600	-2.242	-2.269	0.027	164.2	225	15.73	41.6
S1.003	PI	Attenuation Tank	9.975	0.600	-2.369	-2.545	0.176	56.7	225	15.83	41.5
S1.004	Attenuation Tank	S1-5	17.597	0.600	-2.620	-2.917	0.297	59.2	300	15.97	41.3
S1.006	S1-6	Headwall	24.722	0.600	-1.235	-1.285	0.050	494.4	225	5.71	50.0
3.000	1	S1-3	10.000	0.600	-1.000	-1.100	0.100	100.0	300	5.11	50.0

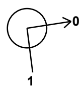
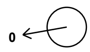
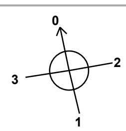
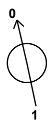
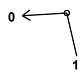
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
S1.000	1.307	52.0	46.2	1.375	1.475	0.341	0.0	166	1.471
S1.001	1.703	67.7	49.9	1.475	2.317	0.441	0.0	144	1.857
S2.000	1.698	67.5	6.9	1.200	1.442	0.060	0.0	49	1.107
S1.002	1.017	40.5	112.9	2.317	2.344	1.001	0.0	225	1.036
S1.003	1.741	69.2	112.5	2.444	2.620	1.001	0.0	225	1.773
S1.004	2.046	144.6	111.9	2.620	2.987	1.001	0.0	199	2.251
S1.006	0.581	23.1	0.0	1.200	1.250	0.000	0.0	0	0.000
3.000	1.572	111.1	67.8	1.000	1.100	0.500	0.0	170	1.647

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
S1.000	10.000	100.0	225	Circular	0.600	-1.000	1.375	0.600	-1.100	1.475
S1.001	67.554	59.2	225	Circular	0.600	-1.100	1.475	0.300	-2.242	2.317
S2.000	14.998	59.5	225	Circular	0.310	-1.115	1.200	0.300	-1.367	1.442
S1.002	4.433	164.2	225	Circular	0.300	-2.242	2.317	0.300	-2.269	2.344
S1.003	9.975	56.7	225	Circular	0.300	-2.369	2.444	0.300	-2.545	2.620
S1.004	17.597	59.2	300	Circular	0.300	-2.620	2.620	0.370	-2.917	2.987
S1.006	24.722	494.4	225	Circular	0.190	-1.235	1.200	0.190	-1.285	1.250
3.000	10.000	100.0	300	Circular	0.300	-1.000	1.000	0.300	-1.100	1.100

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
S1.000	S1-0	1200	Manhole	Adoptable	S1-1	1200	Manhole	Adoptable
S1.001	S1-1	1200	Manhole	Adoptable	S1-3	1200	Manhole	Adoptable
S2.000	SIC 3-0	1200	Manhole	Adoptable	S1-3	1200	Manhole	Adoptable
S1.002	S1-3	1200	Manhole	Adoptable	PI	1200	Manhole	Adoptable
S1.003	PI	1200	Manhole	Adoptable	Attenuation Tank		Junction	
S1.004	Attenuation Tank		Junction		S1-5	1200	Manhole	Adoptable
S1.006	S1-6	1200	Manhole	Adoptable	Headwall	1200	Manhole	Adoptable
3.000	1	1200	Manhole	Adoptable	S1-3	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S1-0	546694.339	652337.217	0.600	1.600	1200		0	S1.000	-1.000	225
S1-1	546692.735	652349.773	0.600	1.700	1200		1	S1.000	-1.100	225
							0	S1.001	-1.100	225
SIC 3-0	546774.271	652362.670	0.310	1.425	1200		0	S2.000	-1.115	225
S1-3	546759.499	652360.076	0.300	2.542	1200		1	3.000	-1.100	300
							2	S2.000	-1.367	225
							3	S1.001	-2.242	225
							0	S1.002	-2.242	225
PI	546758.585	652364.414	0.300	2.669	1200		1	S1.002	-2.269	225
							0	S1.003	-2.369	225
Attenuation Tank	546756.350	652374.135	0.300	2.920			1	S1.003	-2.545	225
							0	S1.004	-2.620	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S1-5	546738.786	652373.055	0.370	3.287	1200	1	S1.004	-2.917	300
S1-6	546707.583	652476.141	0.190	1.425	1200	0	S1.006	-1.235	225
Headwall	546715.911	652499.418	0.190	1.475	1200	1	S1.006	-1.285	225
1	546762.449	652347.896	0.300	1.300	1200	0	3.000	-1.000	300

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	Scotland and Ireland	Skip Steady State	x
M5-60 (mm)	17.700	Drain Down Time (mins)	240
Ratio-R	0.319	Additional Storage (m^3/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	20	0	10
30	20	0	10
100	20	0	10

Node S1-5 Online Pump Control

Flap Valve	x	Design Depth (m)	3.400	Switch off depth (m)	0.100
Replaces Downstream Link	x	Design Flow (l/s)	3.1		
Invert Level (m)	-2.917	Switch on depth (m)	0.500		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.500	1.550	0.501	1.771	2.000	2.214	3.400	3.100

Node Attenuation Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	-2.620
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	275.0	0.0	2.000	275.0	0.0	2.001	0.0	0.0

Node S1-0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00400	Safety Factor	2.0	Invert Level (m)	-1.000
Side Inf Coefficient (m/hr)	0.00400	Porosity	0.65	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	165.0	165.0	1.000	165.0	165.0	1.010	165.0	165.0

Node 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00400	Safety Factor	2.0	Invert Level (m)	-1.000
Side Inf Coefficient (m/hr)	0.00400	Porosity	0.60	Time to half empty (mins)	90

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	375.0	250.0	1.000	375.0	250.0	1.010	0.0	250.0

Results for 10 year +20% CC +10% Q Critical Storm Duration. Lowest mass balance: 99.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	S1-0	25	-0.718	0.282	79.5	31.7822	0.0000	SURCHARGED
30 minute winter	S1-1	24	-0.754	0.346	58.3	0.7990	0.0000	SURCHARGED
1440 minute winter	SIC 3-0	1380	-0.980	0.135	1.1	0.2671	0.0000	OK
1440 minute winter	S1-3	1380	-0.980	1.262	17.5	1.4278	0.0000	SURCHARGED
1440 minute winter	PI	1380	-0.980	1.389	17.3	1.5712	0.0000	SURCHARGED
1440 minute winter	Attenuation Tank	1380	-0.980	1.640	17.2	450.9821	0.0000	SURCHARGED
1440 minute winter	S1-5	1380	-0.980	1.937	2.2	2.1906	0.0000	OK
15 minute summer	S1-6	1	-1.235	0.000	0.0	0.0000	0.0000	OK
15 minute summer	Headwall	1	-1.285	0.000	0.0	0.0000	0.0000	OK
30 minute winter	1	22	-0.804	0.196	116.6	45.8452	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	S1-0	S1.000	S1-1	44.2	1.378	0.851	0.3977	
30 minute winter	S1-0	Infiltration		0.1				
30 minute winter	S1-1	S1.001	S1-3	52.2	1.359	0.771	2.6867	
1440 minute winter	SIC 3-0	S2.000	S1-3	1.1	0.633	0.016	0.4853	
1440 minute winter	S1-3	S1.002	PI	17.3	0.819	0.427	0.1763	
1440 minute winter	PI	S1.003	Attenuation Tank	17.2	0.875	0.249	0.3967	
1440 minute winter	Attenuation Tank	S1.004	S1-5	2.2	0.066	0.015	1.2392	
1440 minute winter	S1-5	Pump		2.2				158.5
15 minute summer	S1-6	S1.006	Headwall	0.0	0.000	0.000	0.0000	0.0
30 minute winter	1	3.000	S1-3	69.4	1.544	0.625	0.4492	
30 minute winter	1	Infiltration		0.1				

Results for 30 year +20% CC +10% Q Critical Storm Duration. Lowest mass balance: 99.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
30 minute winter	S1-0	27	-0.551	0.449	101.4	50.6237	0.0000	SURCHARGED
30 minute winter	S1-1	26	-0.572	0.528	59.2	1.2180	0.0000	SURCHARGED
1440 minute winter	SIC 3-0	1410	-0.797	0.318	1.3	0.6279	0.0000	SURCHARGED
1440 minute winter	S1-3	1410	-0.797	1.445	21.3	1.6344	0.0000	SURCHARGED
1440 minute winter	PI	1410	-0.797	1.572	21.0	1.7784	0.0000	SURCHARGED
1440 minute winter	Attenuation Tank	1410	-0.797	1.823	20.9	501.2933	0.0000	SURCHARGED
1440 minute winter	S1-5	1410	-0.797	2.120	2.3	2.3975	0.0000	OK
15 minute summer	S1-6	1	-1.235	0.000	0.0	0.0000	0.0000	OK
15 minute summer	Headwall	1	-1.285	0.000	0.0	0.0000	0.0000	OK
30 minute winter	1	22	-0.761	0.239	148.7	55.8679	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
30 minute winter	S1-0	S1.000	S1-1	48.5	1.453	0.934	0.3977	
30 minute winter	S1-0	Infiltration		0.1				
30 minute winter	S1-1	S1.001	S1-3	53.6	1.379	0.792	2.6867	
1440 minute winter	SIC 3-0	S2.000	S1-3	1.3	0.664	0.019	0.5965	
1440 minute winter	S1-3	S1.002	PI	21.0	0.832	0.520	0.1763	
1440 minute winter	PI	S1.003	Attenuation Tank	20.9	0.921	0.303	0.3967	
1440 minute winter	Attenuation Tank	S1.004	S1-5	2.3	0.069	0.016	1.2392	
1440 minute winter	S1-5	Pump		2.3				167.3
15 minute summer	S1-6	S1.006	Headwall	0.0	0.000	0.000	0.0000	0.0
30 minute winter	1	3.000	S1-3	90.6	1.630	0.815	0.5542	
30 minute winter	1	Infiltration		0.1				

Results for 100 year +20% CC +10% Q Critical Storm Duration. Lowest mass balance: 99.28%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	S1-0	30	-0.321	0.679	132.4	76.4364	0.0000	SURCHARGED
30 minute winter	S1-1	28	-0.344	0.756	62.7	1.7440	0.0000	SURCHARGED
1440 minute winter	SIC 3-0	1410	-0.471	0.644	1.6	1.2709	0.0000	SURCHARGED
1440 minute winter	S1-3	1410	-0.472	1.770	26.5	2.0021	0.0000	SURCHARGED
1440 minute winter	PI	1410	-0.471	1.898	25.9	2.1472	0.0000	SURCHARGED
1440 minute winter	Attenuation Tank	1410	-0.472	2.148	25.8	550.1375	0.0000	SURCHARGED
1440 minute winter	S1-5	1410	-0.471	2.446	2.6	2.7663	0.0000	OK
15 minute summer	S1-6	1	-1.235	0.000	0.0	0.0000	0.0000	OK
15 minute summer	Headwall	1	-1.285	0.000	0.0	0.0000	0.0000	OK
1440 minute winter	1	1410	-0.471	0.529	13.3	123.6627	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	S1-0	S1.000	S1-1	48.4	1.385	0.930	0.3977	
30 minute winter	S1-0	Infiltration		0.1				
30 minute winter	S1-1	S1.001	S1-3	53.3	1.361	0.788	2.6867	
1440 minute winter	SIC 3-0	S2.000	S1-3	1.6	0.692	0.024	0.5965	
1440 minute winter	S1-3	S1.002	PI	25.9	0.812	0.641	0.1763	
1440 minute winter	PI	S1.003	Attenuation Tank	25.8	0.984	0.373	0.3967	
1440 minute winter	Attenuation Tank	S1.004	S1-5	2.6	0.057	0.018	1.2392	
1440 minute winter	S1-5	Pump		2.5				183.8
15 minute summer	S1-6	S1.006	Headwall	0.0	0.000	0.000	0.0000	0.0
1440 minute winter	1	3.000	S1-3	13.1	1.022	0.118	0.7042	
1440 minute winter	1	Infiltration		0.1				

Appendix C Greenfield Runoff Calculations

Mean Annual Flood Flow Rate Equation for Greenfield Catchments IH124

(Based on Institute of Hydrology report No. 124)

Project title: **O'Carroll Haulage and Crane Hire**

Project no.: **231279**

Designed: **D Gallery** Date: **08/05/2024**

(Complete figures in **blue** only)

Q Bar = 0.00108 x Area $^{0.89}$ x SAAR$^{1.17}$ x Soil$^{2.17}$

Where			**Units**
Q Bar	=	Mean Annual Peak Flow	m^3/s
Area	=	Catchment area	km^2
SARR	=	Standard Annual Average Rainfall	mm
Soil	=	Soil Index	-

Area description: Brownfield

Soil characteristics: Soil type (See Table 1) **4** (Clayey, poorly drained)
=> Soil index = 0.45 **See UKSuDS calc**

Area = 0.5 km^2 (**4494** m^2)

SAAR = 1048 mm 995 1019 1007.00

Q Bar = 0.3522 m^3/s

= 352.21 l/s

or

= 7.04 l/s/ha

Linear Interpolation of Q Bar based on ratio of development to 50 ha

Peak greenfield discharge rate, Q_{Bar} = 3.17 l/s

Appendix D Maintenance Plan and Schedule

Maintenance Plan and Maintenance Schedule:

ITEM	INSPECTION FREQUENCY	INSPECTION TYPE	CLEANING MECHANISM	CLEANING FREQUENCY
Storm Water Manholes	Quarterly or after major storm event	Visual	Open manhole cover. Remove any debris.	Minimum every 2 years
Surface Water Pump	Pump is to be checked for obstructions quarterly or after major storm events.	Visual	Open inlet/outlet manhole cover. Remove any debris.	Yearly
Filter Drain	Every 6 months	Visual	Remove sediment, debris and weeds	Yearly
Bypass separators/Forecourt Separators	Every 6 months or in the event of a spill	Visual	Bypass separators/Forecourt Separator to be emptied/cleaned	Yearly
Bio Retention Areas	Every 3 months	Visual	Remove sediment, debris and weeds	Monthly during growing season
Attenuation tanks	To be checked for debris or silt quarterly or after major storm event	Visual	Open inlet and outlet manhole cover. Remove any debris.	Yearly

Appendix E Separators

Separators

A RANGE OF FUEL/OIL SEPARATORS FOR PEACE OF MIND

Surface water drains normally discharge to a watercourse or indirectly into underground waters (groundwater) via a soakaway. Contamination of surface water by oil, chemicals or suspended solids can cause these discharges to have a serious impact on the receiving water.

The Environment Regulators, Environment Agency, England and Wales, SEPA, Scottish Environmental Protection Agency in Scotland and Department of Environment & Heritage in Northern Ireland, have published guidance on surface water disposal, which offers a range of means of dealing with pollution both at source and at the point of discharge from site (so called 'end of pipe' treatment). These techniques are known as 'Sustainable Drainage Systems' (SuDS).

Where run-off is draining from relatively low risk areas such as car-parks and non-operational areas, a source control approach, such as permeable surfaces or infiltration trenches, may offer a suitable means of treatment, removing the need for a separator.

Oil separators are installed on surface water drainage systems to protect receiving waters from pollution by oil, which may be present due to minor leaks from vehicles and plant, from accidental spillage.

Effluent from industrial processes and vehicle washing should normally be discharged to the foul sewer (subject to the approval of the sewerage undertaker) for further treatment at a municipal treatment works.

SEPARATOR STANDARDS AND TYPES

A British (and European) standard (EN 858-1 and 858-2) for the design and use of prefabricated oil separators has been adopted. New prefabricated separators should comply with the standard.

SEPARATOR CLASSES

The standard refers to two 'classes' of separator, based on performance under standard test conditions.

CLASS I

Designed to achieve a concentration of less than 5mg/l of oil under standard test conditions, should be used when the separator is required to remove very small oil droplets.

CLASS II

Designed to achieve a concentration of less than 100mg/l oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies (for example where the effluent passes to foul sewer).

Both classes can be produced as full retention separators. The oil concentration limits of 5 mg/l and 100 mg/l are only applicable under standard test conditions. It should not be expected that separators will comply with these limits when operating under field conditions.

FULL RETENTION SEPARATORS

Full retention separators treat the full flow that can be delivered by the drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr.

On large sites, some short term flooding may be an acceptable means of limiting the flow rate and hence the size of full retention systems.

BYPASS SEPARATORS

Bypass separators fully treat all flows generated by rainfall rates of up to 6.5mm/hr. This covers over 99% of all rainfall events. Flows above this rate are allowed to bypass the separator. These separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where the risk of a large spillage and heavy rainfall occurring at the same time is small.

FORECOURT SEPARATORS

Forecourt separators are full retention separators specified to retain on site the maximum spillage likely to occur on a petrol filling station. They are required for both safety and environmental reasons and will treat spillages occurring during vehicle refuelling and road tanker delivery. The size of the separator is increased in order to retain the possible loss of the contents of one compartment of a road tanker, which may be up to 7,600 litres.

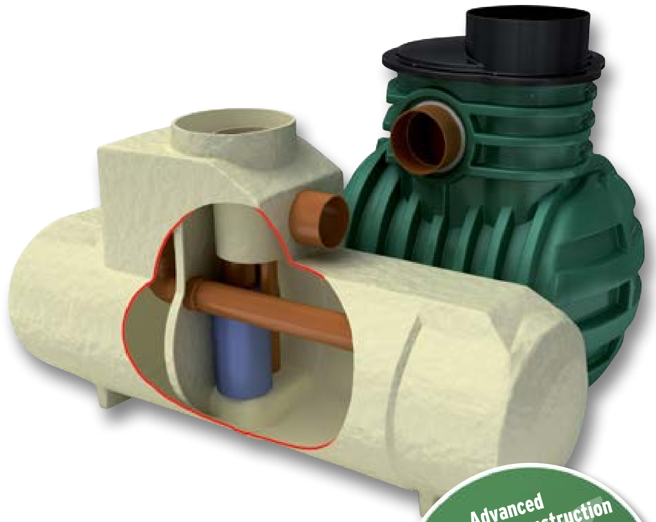
SELECTING THE RIGHT SEPARATOR

The chart on the following page gives guidance to aid selection of the appropriate type of fuel/oil separator for use in surface water drainage systems which discharge into rivers and soakaways.

For further detailed information, please consult the Environment Agency Pollution Prevention Guideline 03 (PPG 3) 'Use and design of oil separators in surface water drainage systems' available from their website.

Kingspan Klargester has a specialist team who provide technical assistance in selecting the appropriate separator for your application.

Bypass NSB RANGE



APPLICATION

Bypass separators are used when it is considered an acceptable risk not to provide full treatment, for very high flows, and are used, for example, where the risk of a large spillage and heavy rainfall occurring at the same time is small, e.g.

- Surface car parks.
- Roadways.
- Lightly contaminated commercial areas.

PERFORMANCE

Klargester were one of the first UK manufacturers to have separators tested to EN 858-1. Klargester have now added the NSB bypass range to their portfolio of certified and tested models. The NSB number denotes the maximum flow at which the separator treats liquids.
The British Standards Institute (BSI) tested the required range of Kingspan Klargester Bypass separators and certified their performance in relation to their flow and process performance assessing the effluent qualities to the requirements of EN 858-1. Klargester bypass separator designs follow the parameters determined during the testing of the required range of bypass separators.

Each bypass separator design includes the necessary volume requirements for:

- Oil separation capacity.
- Oil storage volume.
- Silt storage capacity.
- Coalescer.

The unit is designed to treat 10% of peak flow. The calculated drainage areas served by each separator are indicated according to the formula given by PPG3 NSB = 0.0018A(m2). Flows generated by higher rainfall rates will pass through part of the separator and bypass the main separation chamber.

Class I separators are designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Oil alarm system available (required by EN 858-1 and PPG3).
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- GRP or rotomoulded construction (subject to model).

To specify a nominal size bypass separator, the following information is needed:-

- The calculated flow rate for the drainage area served. Our designs are based on the assumption that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped.
- The drain invert inlet depth.
- Pipework type, size and orientation.

SIZES AND SPECIFICATIONS

UNIT NOMINAL SIZE	FLOW (l/s)	PEAK FLOW RATE (l/s)	DRAINAGE AREA (m²)	STORAGE CAPACITY (litres)		UNIT LENGTH (mm)	UNIT DIA. (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT	STANDARD FALL ACROSS (mm)	MIN. INLET INVERT (mm)	STANDARD PIPEWORK DIA.
				SILT	OIL								
NSBP003	3	30	1670	300	45	1700	1350	600	1420	1320	100	500	160
NSBP004	4.5	45	2500	450	60	1700	1350	600	1420	1320	100	500	160
NSBP006	6	60	3335	600	90	1700	1350	600	1420	1320	100	500	160
NSBE010	10	100	5560	1000	150	2069	1220	750	1450	1350	100	700	315
NSBE015	15	150	8335	1500	225	2947	1220	750	1450	1350	100	700	315
NSBE020	20	200	11111	2000	300	3893	1220	750	1450	1350	100	700	375
NSBE025	25	250	13890	2500	375	3575	1420	750	1680	1580	100	700	375
NSBE030	30	300	16670	3000	450	4265	1420	750	1680	1580	100	700	450
NSBE040	40	400	22222	4000	600	3230	1920	600	2185	2035	150	1000	500
NSBE050	50	500	27778	5000	750	3960	1920	600	2185	2035	150	1000	600
NSBE075	75	750	41667	7500	1125	5841	1920	600	2235	2035	200	950	675
NSBE100	100	1000	55556	10000	1500	7661	1920	600	2235	2035	200	950	750
NSBE125	125	1250	69444	12500	1875	9548	1920	600	2235	2035	200	950	750

Rotomoulded chamber construction   GRP chamber construction   * Some units have more than one access shaft – diameter of largest shown.

Forecourt

APPLICATION

The forecourt separator is designed for installation in petrol filling station forecourts and similar applications. The function of the separator is to intercept hydrocarbon pollutants such as petroleum and oil and prevent their entry to the drainage system, thus protecting the environment against hydrocarbon contaminated surface water run-off and gross spillage.

PERFORMANCE

Operation ensures that the flow cannot exit the unit without first passing through the coalescer assembly.

In normal operation, the forecourt separator has sufficient capacity to provide storage for separated pollutants within the main chamber, but is also able to contain up to 7,600 litres of pollutant arising from the spillage of a fuel delivery tanker compartment on the petrol forecourt. The separator has been designed to ensure that oil cannot exit the separator in the event of a major spillage, subsequently the separator should be emptied immediately.

FEATURES

- Light and easy to install.
- Inclusive of silt storage volume.
- Fitted inlet/outlet connectors.
- Vent points within necks.
- Extension access shafts for deep inverts.
- Maintenance from ground level.
- Class I and Class II design.
- Oil storage volume.
- Coalescer (Class I unit only).
- Automatic closure device.
- Oil alarm system available.

INSTALLATION

The unit should be installed on a suitable concrete base slab and surrounded with concrete or pea gravel backfill. See sales drawing for installation.

If the separator is to be installed within a trafficked area, then a suitable cover slab must be designed to ensure that loads are not transmitted to the unit.

The separator should be installed and vented in accordance with Health and Safety Guidance Note HS(G)41 for filling stations, subject to Local Authority requirements.

SIZES AND SPECIFICATIONS

ENVIROCEPTOR CLASS	TOTAL CAP. (litres)	DRAINAGE AREA (m^2)	MAX. FLOW RATE (l/s)	LENGTH (mm)	DIAMETER (mm)	ACCESS SHAFT DIA. (mm)	BASE TO INLET INVERT (mm)	BASE TO OUTLET INVERT (mm)	STD. FALL ACROSS UNIT (mm)	MIN. INLET INVERT (mm)	STD. PIPEWORK (mm)	EMPTY WEIGHT (kg)
I	10000	555	10	3963	1920	600	2110	2060	50	400	160	500
II	10000	555	10	3963	1920	600	2110	2060	50	400	160	500
I	10000	1110	20	3963	1920	600	2110	2060	50	400	200	500
II	10000	1110	20	3963	1920	600	2110	2060	50	400	200	500

Alarm Systems

British European Standard EN 858-1 and Environment Agency Pollution Prevention Guideline PPG3 requires that all separators are to be fitted with an oil level alarm system and that it should be installed and calibrated by a suitably qualified technician so that it will respond to an alarm condition when the separator requires emptying.

- Easily fitted to existing tanks.
- Excellent operational range.
- Visual and audible alarm.
- Additional telemetry option.