Comhairle Cathrach
& Contae Luimnigh

Limerick City
& County Council

# RESIDENTIAL DEVELOPMENT
# at
# Barnakyle, Patrickswell, Co. Limerick

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# Civil Engineering Report

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| Barnakyle, Patrickswell, Co. Limerick | | | | | |
|---|---|---|---|---|---|
| **Revision** | **Report Description** | **Author** | **Approved** | **Report Date** | |
| **A** | **First Issue** | **AD** | | **August 2022** | |
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## 1. Introduction

The proposed development will involve the construction of 24 Houses at Barnakyle, Patrickswell. The subject site is located north east of the village centre of Patrickswell, approximately 12km south west of Limerick City center (see Figure 1.0). Located on the eastern side of the Claina Road, the site extends with a narrow strip of land approximately 12m in width. This strip of land is intended to provide access to the site. The site itself is elongated in nature, and extends to the rear of established housing and a commercial warehouse site fronting onto the Claina Road. With a total site area of 2.06 hectares, approximately 1 hectare of land only is suitable for residential development. The remainder, as detailed in Figure 2.0 is zoned as 'open space and recreation'. Significant hedgerows and trees define the boundaries of the site. The subject lands are in the ownership of Limerick City & County Council and therefore can be efficiently utilised to meet some of the demand for social housing arising.

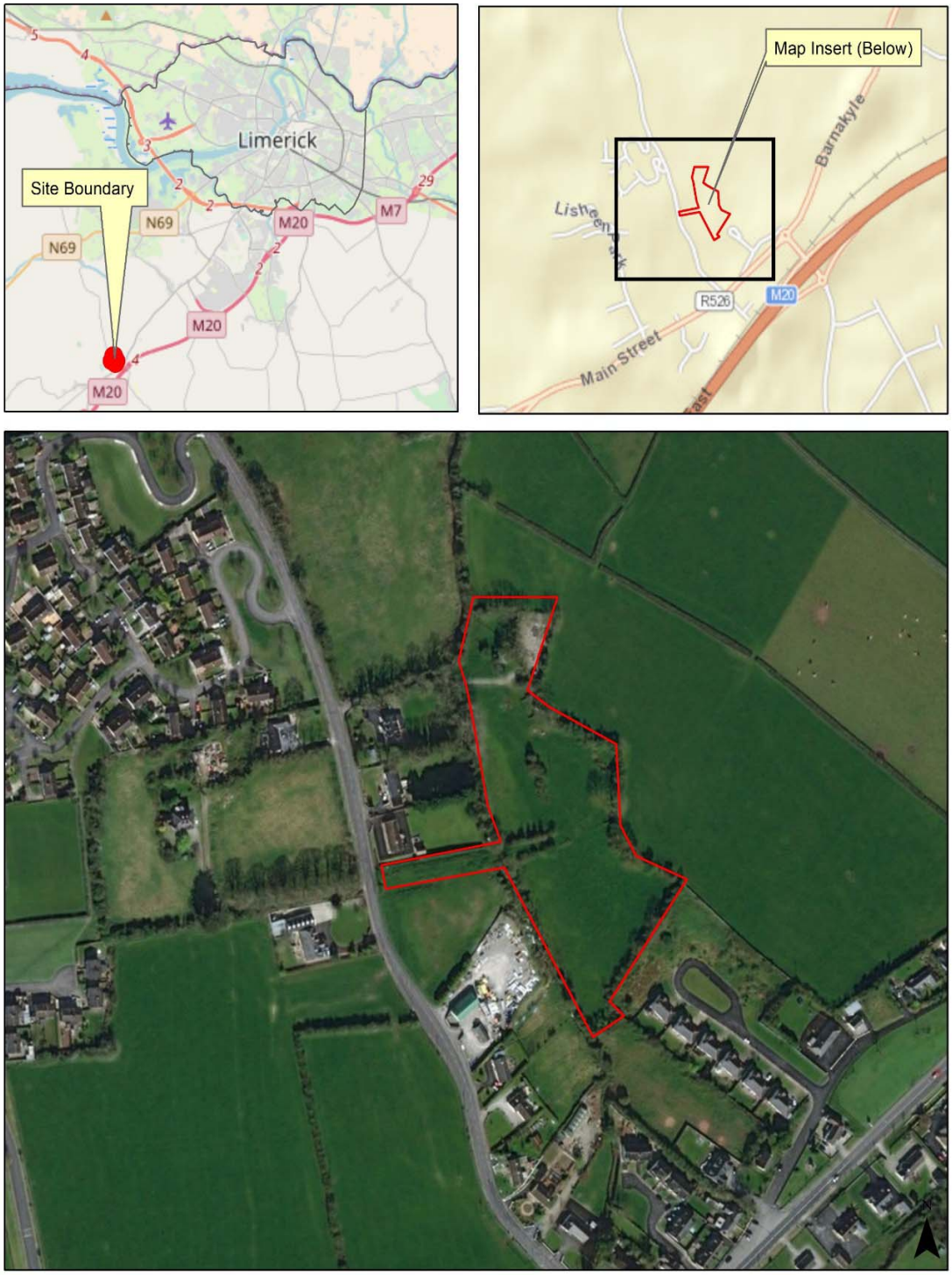



Figure 1.0 – Site Location

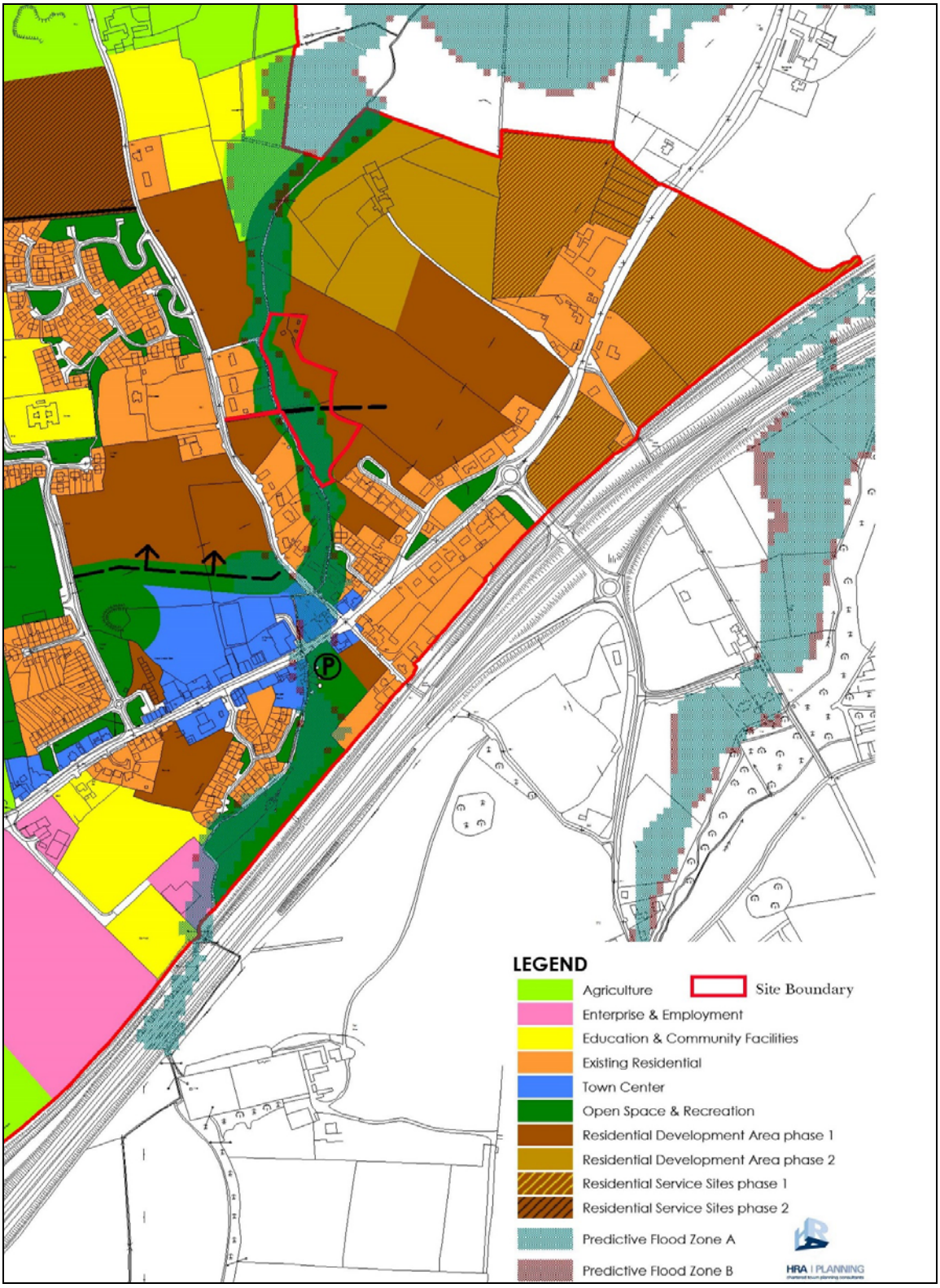


Figure 2.0 - Patrickswell Zoning Map

## 2. Site Investigation:

Site investigations were undertaken by Irish Drilling. A combination of trial pits and bore holes were carried out to ascertain existing ground conditions.

Four cable percussion (Shell & Auger) boreholes were completed using a Dando 2000 Cable Percussive Boring Rig. The boreholes were bored to 'refusal'. The borehole depths ranged from 2.20m to 5.40m below ground level. In–Situ testing consisting of Standard Penetration Tests were carried out at regular intervals(predominantly 1.0m intervals). Disturbed bulk and jar soil samples were taken at each change in strata and at a maximum of 1.50m intervals. The samples were returned to the laboratory and logged for testing. Four trial pits were excavated on site.

Ground conditions encountered during the completion of the fieldwork predominantly consisted of Glacial Tills overlying Bedrock. The Glacial Tills in general predominantly consist of slightly sandy gravelly silt/clay and/or silty sandy gravel with occasional, some or many cobbles and boulders.

### 2.1 Ground Water:

| Location | Water Strike Depth (below ground level) |
|---|---|
| BH 02 | 3.40m |
| TH 01 | 3.10m |
| TH 02 | 3.70m |
| TH 04 | 3.00m |

### 2.2 Soil infiltration:

Soil infiltration tests were undertaken in three areas around the site. Test were completed in accordance with BRE 365. Table 1 gives details of infiltrations rates found.

| Pit No. | Description of pit strata | | Test 1 (m/s) | | Test 1 (m/s) | | Test 1 (m/s) |
|---|---|---|---|---|---|---|---|
| Pit 1 | 200mm of Topsoil. 200mm of Brownish yellow Clay. 500mm Soft reddish brown sandy Clay. 800mm of Loose grey and brown silty very sandy fine Gravel on cobbles. | | 0.000019 | | 0.000021 | | 0.000016 |
| | | | | | | | |
| Pit 2 | 200mm of Tospsoil. 200mm Stiff blackish brown gravelly Clay.1.30m of Firm brown slightly sandy gravelly Silt/Clay with cobbles. Bottom of pit was Stiff dark gark grey sandy gravelly Silt/Clay with cobbles. | | 0.000025 | | 0.000032 | | 0.000041 |
| | | | | | | | |
| Pit 3 | 200mm of Topsoil. 300mm of Firm brownish yellow slightly sandy Clay. 500mm of Moist brown and grey gravelly very sandy Silt. 800mm of Medium dense grey brown very silty very sandy Gravel with cobbles. | | 0.000038 | | 0.000044 | | 0.000054 |

Table 1: Infiltration Test Results

### 2.3 Existing Site Drainage:

An existing 225mm diameter foul drainage line is located on site (Dwg 18011 – 0015). The line originates in two locations, to the west of the site at the proposed entrance and from the south of the site. Both lines converge and run in a northern direction to the east of the existing drain/stream. The line exits at the most northern part of the site. It is proposed to retain the main line to the east of the stream, while decommissioning the line from the west and south of the site. These lines will be replaced by a 225mm diameter twin wall sewer.

### 3.0 Foul Drainage

A wastewater connection application was lodged with Irish Water in October 2021. The Irish Water Reference Number is CDS2100705401. The Patrickswell Sewerage Scheme was completed in 2013 with the construction of a new pumping station at Barnakyle and a new rising main to deliver waste water into the Limerick Main Drainage Network at Raheen for treatment at the Wastewater Treatment Works at Bunlicky. Based on the recently issued Irish Water`s "Settlements with Waste Water Discharge Authorisations - Wastewater Treatment Capacity", the existing system has sufficient spare capacity.

The foul sewer network has been designed in accordance with Irish Water`s Code of Practice for Wastewater Infrastructure (July 2020) and hydraulic modelling using the Colebrook White equation.

Table 2 shows the input constants that have been assumed:

| | |
|---|---|
| Roughness (k) | 1.5 |
| | |
| Minimum Designed Velocity | 0.75m/sec |
| | |
| Maximum Designed Velocity | 2.0m/sec |
| | |
| Minimum Cover to pipes in non-trafficked areas | 900mm |
| | |
| Minimum Cover to pipes in trafficked areas | 1200mm |
| | |
| Minimum pipe diameter | 150mm |
| | |
| Minimum gradient | 1 in 108 |
| | |
| | |

Table 2: Input Constants

Note: Any pipe run not achieving the minimum cover, shall be surrounded with a minimum of 150mm of concrete.

**Table: Sewer Size/Gradient for Multiple Properties**

| Number of Dwellings | Pipe Diameter | Minimum Gradient |
|---|---|---|
| 2 to 9 | 150mm (or 225mm) | 1:60 |
| 10 to 20 | | 1:150 |
| 21 to 210 | 225mm | 1:200 |
| 211 to 250 | | 1:150 |
| 251 to 330 | | 1:100 |
| 331 – 450 | 300mm | 1:300 |
| 451 to 565 | | 1:200 |
| 566 to 655 | | 1:150 |
| 656 to 830 | | 1:100 |

Table 3. Sewer Size and Gradient

The sewers have been designed to carry a Wastewater volume of 6 times the dry weather flow as outlined in Section 2.2.5 of Appendix B. Dry weather flows (DWF) has been taken as 450 litres per dwelling. PE values have been taken as 2.7 persons per house.

Minimum flow velocities do not exceed 0.75m/s, with maximum designed velocities not exceeding 2.0m/s. It should be noted, that the existing line into which it is proposed to connect, have a maximum velocity of 2.8m/s.

As noted above, it is proposed to relocate as section of existing 225mm diameter sewer. To ensure future capacity within the proposed foul drainage network, a total of 400 additional units have been assumed to enter the system from outside future developments which has been broken down as follows: 100 units into Existing Manhole 5.3 located at the proposed entrance to the site, 100 units into Manhole 4.3 located to the south of the site, 100 units into Manhole 4.1 located to the east of the site, and 100 units into Manhole 9.1 located to the east of the site. See drawing 18011 – 1005 for details of Manhole locations.

Details of the Foul Drainage design can located in Appendix A.

## 4.0 Watermains

The watermain network has been designed in accordance with the Irish Water Code of Practice for Water Infrastructure (July 2020).

Following consultation with Irish Water, a 150mm trunk main exists on the westerns side of the Barnakyle Road. It is proposed to provide a 150mm HDPE watermain in the form of a looped network throughout the development. A total demand of 60.8m3/day will be required for the development, see attached calculations. Individual connection to the units will be 25mm diameter, taken from the main line via Boundary Boxes.

The waterwmains will be laid under footpaths or grass margins. The distance between all lines and proposed building structures exceed 3.0m. A minimum distance of 1.0m exists between all lines and adjacent boundaries. All units lie within 46m from a hydrant, with a minimum distance of 6.0m from a building. Connections to all hydrants exceed 100mm in diameter. See drawing No. 18011 – 0006 for details. Details of the Water Demand design can located in Appendix B.

## 5.0 Storm Water:

The storm water layout is shown on Drawing 18011–0004, Drainage Layout. The layout has been designed for the collection and discharge of storm water from roof, driveways, roadways, paths, and parking areas within the development to the ground and to the existing drain via attenuation tanks.

With guidance from The SuDs Manual, the site has been reviewed in terms of employing achievable techniques to ensure the safe and proper management of Storm Water within the site. Options available include:

- Rainwater harvesting
- Infiltrations Systems
- Filter Drains
- Trees
- Pervious Pavements
- Attenuation Storage Tanks

Using the SuDs Management Train approach, the following principles have been considered:

### 5.1 Source Control:

**The control of runoff at or near its source, so that it does not enter the drainage system or is delayed and attenuated before it enters the drainage system.**

A number of techniques are being proposed to ensure control of storm water runoff before entering the drainage system.

#### 5.1.1 Permeable Paving:

It is proposed to install permeable paving to all car spaces outside the boundary of the dwelling unit, See Drawing 18011 – 0004, Proposed Roads Layout. This paving is regarded as suitable in lightly trafficked areas and will allow the transfer of storm water to the ground via open joints in the paving blocks. The designed layer under the blocks with attenuate water on a temporary basis before infiltration to the sub-strata's. the treatment processes that occur within the surface structure, the subsurface matrix (including the soil layers) and the geotextile layers include,

- Filtration
- Adsorption
- Biodegradation
- Sedimentation

It is proposed to use the Roadstone Aqua Verona Block. The block is 240 x 160mm with colors to be agreed.

The minimize the risk of flooding to the area, it is proposed to install an overflow from the parking bay to the main drainage, thereby ensuring no overspill onto the roadways.

#### 5.1.2 Tree Pits:

Tree pits are being proposed to collect and attenuate runoff from the road network via road gullies, thereby controlling discharge to the main drainage. See Drawing 18011 – 0004, 0011, Proposed Roads Details. The pits will measure 1.5m x 1.5m x 1.5m in depth.

### 5.1.3 Porous Asphalt:

It is proposed to use Porous Asphalt on the proposed pathway running adjacent to the drain/stream. As with the permeable paving, the designed layer under the asphalt will attenuate water on a temporary basis before infiltration to the sub-strata.

## 5.2 Site Control

**The reduction in the volume and rate of surface water runoff by means of treatment or attenuation.**

### 5.2.1 Attenuation Tanks:

It is proposed to attenuate surface water runoff using three attenuation tanks as shown on Drawing No. 18011-1005, Proposed Storm Water Layout. An overflow to the adjacent stream has been provide with outflow restricted to 2l/sec/ha. The tanks have been designed to allow 24-hour storage for a 1 in 100 year storm event, with a 30% additional allowance for Climate change and 10% for Urban Creep.
It is proposed to use the Polystorm geocellular attenuation system.

### 5.2.2 Class 1 Bypass Interceptor:

Prior to discharge to the attenuation tanks, all runoff will pass through a class 1 bypass interceptor, enduring both hydrocarbons and silt do not enter the tanks. It is proposed to install a Kingspan NSBE010 interceptors, complete with silt traps and oil alarm system as required by BS EN 858-1. The Class 1 unit is designed to achieve a concentration of 5mg/litre of oil under standard test conditions.

## 5.3 Pollution Hazard Index Calculations:

| Land Use | Pollution Hazard Level | TSS | Metals | Hydrocarbons |
|---|---|---|---|---|
| Individual property driveways, | Low | 0.5 | 0.5 | 0.4 |
| Residential car parks, | Low | 0.5 | 0.5 | 0.4 |
| Low traffic roads. (General Access Roads) | Low | 0.5 | 0.5 | 0.4 |

Table 4: Pollution Hazard Indices for different land use classifications:

| SuDs Component | TSS | Metals | Hydrocarbons |
|---|---|---|---|
| Permeable Paving | 0.7 | 0.6 | 0.7 |
| Tree Pits | 0.4 | 0.4 | 0.5 |

Table 5: Indicative SuDs mitigation indices for discharge to surface water

Table 6 below, sets out calculations for the total pollution prevention for each type of land use on site. As per the CIRIA report, C753, the following is used to calculate the total mitigation –

Total SuDs mitigation index = mitigation index $_1$ + 0.5 (mitigation index $_2$)

| Land Use | Mitigation 1 | | | Mitigation 2 | | | Total SuDs Mitigation | | |
|---|---|---|---|---|---|---|---|---|---|
| | TSS | Metals | Hydro | TSS | Metals | Hydro | TSS | Metals | Hydro |
| | Permeable Paving | | | Tree Pits | | | | | |
| Individual driveways, | -0.2 | -0.1 | -0.3 | 0.1 | 0.1 | -0.1 | -0.15 | -0.05 | -0.35 |
| | | | | | | | | | |
| | | | | | | | | | |
| Residential car parks | -0.2 | -0.1 | -0.3 | 0.1 | 0.1 | -0.1 | -0.15 | -0.05 | -0.35 |
| | | | | | | | | | |
| | | | | | | | | | |
| Low traffic roads. | -0.2 | -0.1 | -0.3 | 0.1 | 0.1 | -0.1 | -0.15 | -0.05 | -0.35 |

Table 6: Total pollution prevention

### 5.4 Pipe & Network Design

Design calculations are based on local rainfall rates as issued by Met Eireann including 30% for climate change and 10% urban creep. Pipes are designed for a 1 in 5 year return event, with the network designed for a 1 in 30 year event with checks undertaken for the 1 in 100 year event. The freeboard to Finish Floor level has been taken as 500mm minimum. Hydraulic modelling using the Colebrook White equation.

Table 7 shows the input constants that have been assumed:

| | |
|---|---|
| Roughness (k) | 0.6 |
| | |
| Run-off Coefficient (Cv) | 0.75 |
| | |
| Minimum Velocity | 1.0m/sec |
| | |
| Minimum Cover to pipes in non-trafficked areas | 900mm |
| | |
| Minimum Cover to pipes in trafficked areas | 1200mm |
| | |
| Minimum pipe diameter | 225mm |
| | |
| Minimum gradient | 1 in 222 |
| | |
| Climate Change | 30% |
| | |
| Urban Creep | 10% |
| | |
| SAAR | 1012mm |
| | |
| Rainfall Intensity | 50mm/hr |
| | |
| Return Period Pipe Designs | 1 in 5 year plus 30% Climate plus 10% Urban Creep |
| | |
| Return Period Network Design | 1 in 30 year plus 30% Climate plus 10% Urban Creep |
| | |
| Return Period Flooding Check | 1 in 100 plus 30% Climate plus 10% Urban Creep |
| | |
| Time of Entry (te) | 4 minutes |
| | |
| Outflow From attenuation tank | 2l/sec/ha |

Table 7: Input Constants

Note: Any pipe run not achieving the minimum cover, shall be surrounded with a minimum of 150mm of concrete.

Details of the Stormwater Drainage design can located in Appendix C.

## 6.0 Flood Risk

Following a review of the OPW CFRAM`s mapping, the site is located outside a flood Risk Zone and therefore a specific flood risk assessment is not required. Details of the CFRAM mapping can located in Appendix D.

## 7.0 Road Design

Details of the proposed road design are shown on drawing no. 18011 – 0007, 0008, 0011.

All internal roads within the proposed site are 5.50m in width. All footpaths are 2.0m wide.

Pedestrian Crossing points are designed as uncontrolled crossings due to the lightly trafficked and low speed network. Crossing are a minimum of 1.2m in width with dropped kerbs. It is proposed to construct a new pedestrian crossing on the Claina road, which will provide a link between new and existing footpaths. While designed as an uncontrolled crossing, it is proposed to install Belisha Beacons to increase pedestrian safety.

A 2.5m wide cycle land is proposed which has been designed in accordance with the National Cycle Manual.

Signage and road markings have been designed in accordance with the Traffic and Signs Manual.

A 50m Sightline has been provided on the Claina road for vehicles approaching the main entrance. 50m sightlines have also been provided on vehicles approaching internal junctions.

A total of 40 car parking spaces have been provided within the proposed development, with an allowance of 1 car space for 2 bed units and 2 car spaces from 3+ bed units. 10% of the car spaces are disabled access spaces in accordance with Irish Wheelchair Association Guidelines.

Aidan Doyle MEng MICE

# Appendix A

| Input Pipe Ref. No. | MH Upstream | MH Downstream | G.L. A | G.L. B | Length of Pipe | Pipe Size | P.E. | Pipe Size | Cover A | Cover B | I. L. Upstream | I.L. Downstream | Gradient | Velocity | Capacity | Rate of Flow | Rate of Flow (6 x DWF) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | (m) | (m) | (m) | (m) | | (mm) | (m) | (m) | (m) | (m) | (1 in X ) | m/s | $m^3/s$ | (l/s) | $m^3/s$ |
| F - 1 | 1.0 | 2.0 | 18.20 | 18.22 | 14 | 150 | 8.10 | 150 | 1.150 | 1.345 | 16.900 | 16.725 | 80 | 1.0 | 17.302 | 0.016 | 0.0956 |
| F - 2 | 2.0 | 3.0 | 18.22 | 18.21 | 33 | 150 | 13.5 | 150 | 1.340 | 1.66 | 16.730 | 16.400 | 100 | 0.9 | 15.464 | 0.043 | 0.2550 |
| F - 3 | 3.0 | 4.0 | 18.21 | 18.08 | 24 | 150 | 2.70 | 150 | 1.660 | 1.765 | 16.400 | 16.165 | 100 | 0.9 | 15.464 | 0.048 | 0.2869 |
| F - 4 | 4.1 | 4.0 | 17.97 | 18.08 | 24 | 225 | 270 | 225 | 2.965 | 3.325 | 14.780 | 14.530 | 96 | 1.2 | 46.554 | 0.531 | 3.1875 |
| F - 5 | 4.3 | 4.2 | 17.20 | 17.25 | 13 | 225 | 270 | 225 | 1.525 | 1.705 | 15.450 | 15.320 | 100 | 1.1 | 45.609 | 0.531 | 3.1875 |
| F - 6 | 4.2 | 4.0 | 17.25 | 18.08 | 85 | 225 | 0 | 225 | 1.705 | 3.325 | 15.320 | 14.530 | 108 | 1.1 | 43.961 | 0.531 | 3.1875 |
| F - 7 | 4.0 | 5.0 | 18.08 | 18.00 | 49 | 225 | 0 | 225 | 3.325 | 3.735 | 14.530 | 14.040 | 100 | 1.1 | 45.609 | 1.110 | 6.6619 |
| F - 8 | 5.3 | 5.2 | 19.82 | 19.57 | 14 | 225 | 270 | 225 | 1.995 | 1.85 | 17.600 | 17.495 | 133 | 1.0 | 39.467 | 0.531 | 3.1875 |
| F - 9 | 5.2 | 5.1 | 19.57 | 19.43 | 7 | 225 | 0 | 225 | 1.850 | 1.85 | 17.495 | 17.355 | 46 | 1.7 | 67.048 | 0.531 | 3.1875 |
| F - 10 | 5.1 | 5.0 | 19.43 | 18.00 | 66 | 225 | 0 | 225 | 1.850 | 1.245 | 17.355 | 16.530 | 80 | 1.3 | 51.021 | 0.531 | 3.1875 |
| F - 11 | 5.0 | 6.0 | 18.00 | 17.90 | 8 | 225 | 0 | 225 | 3.735 | 3.715 | 14.040 | 13.960 | 100 | 1.1 | 45.609 | 1.642 | 9.8494 |
| F - 12 | 6.0 | Existing MH. A | 17.90 | 15.30 | 40 | 225 | 0 | 225 | 3.715 | 1.98 | 13.960 | 13.095 | 46 | 1.7 | 67.183 | 1.642 | 9.8494 |
| F - 13 | Existing MH. A | 10 | 15.30 | 15.00 | 19 | 225 | 0 | 225 | 1.980 | 1.975 | 13.095 | 12.800 | 64 | 1.4 | 56.890 | 1.642 | 9.8494 |
| F - 14 | 7.0 | 8.0 | 17.88 | 17.79 | 8 | 150 | 5.4 | 150 | 1.730 | 1.74 | 16.000 | 15.900 | 80 | 1.0 | 17.302 | 0.011 | 0.0638 |
| F - 15 | 8.0 | 9.0 | 17.79 | 17.11 | 41 | 150 | 13.5 | 150 | 1.740 | 1.47 | 15.900 | 15.490 | 100 | 0.9 | 15.464 | 0.037 | 0.2231 |
| F - 16 | 9.1 | 9.0 | 17.01 | 17.11 | 19 | 225 | 270 | 225 | 1.105 | 1.395 | 15.680 | 15.490 | 100 | 1.1 | 45.609 | 0.531 | 3.1875 |
| F - 17 | 9.0 | 10 | 17.11 | 15.00 | 27 | 225 | 0 | 225 | 3.050 | 1.205 | 13.835 | 13.570 | 102 | 1.1 | 45.182 | 0.568 | 3.4106 |
| F - 18 | 10 | Existing MH. B | 15.00 | 14.75 | 46 | 225 | 0 | 225 | 1.975 | 4.43 | 12.800 | 10.095 | 17 | 2.8 | 110.944 | 2.210 | 13.260 |
| F - 19 | Existing MH. B.1 | Existing MH. B | 14.62 | 14.75 | 5 | 150 | 10.8 | 150 | 2.330 | 2.505 | 12.140 | 12.095 | 111 | 0.8 | 14.665 | 0.021 | 0.1275 |
| F - 20 | Existing MH. B | Existing MH. C | 14.75 | 14.02 | 31 | 225 | 0 | 225 | 2.430 | 2.7 | 12.095 | 11.095 | 31 | 2.1 | 82.108 | 2.231 | 13.388 |
| F - 21 | 11 | 12 | 16.40 | 15.85 | 40 | 150 | 21.6 | 150 | 1.250 | 1.1 | 15.000 | 14.600 | 100 | 0.9 | 15.464 | 0.043 | 0.2550 |
| F - 22 | 12 | Existing MH. C | 15.85 | 14.20 | 11 | 150 | 0 | 150 | 2.590 | 1.05 | 13.110 | 13.000 | 100 | 0.9 | 15.464 | 0.043 | 0.2550 |

# Appendix B

| | | | |
|---|---|---|---|
| **LIMERICK CITY & COUNTY COUNCIL** | | **JOB REF** | **DATE** |
| | | *18011* | *24/08/2022* |
| **PROJECT** | | **SHEET NO** | **REV** |
| | *Barnakyle* | | |
| **ELEMENT** | | **CALCS BY** | **CHK BY** |
| | *WATER DEMANDS* | *CL* | |

NOTES

POTABLE WATER REQUIREMENTS FOR PROPOSED NEW UNITS

| | | |
|---|---|---|
| # UNTS | 24 | |

REFERENCE MATERIAL; TGD H 2010, IW CODE OF PRACTICE FOR WATER SUPPLY DECEMBER 2016

PIPE SIZE

| | | | |
|---|---|---|---|
| ϕ1 | 150 | mm | *Nominal internal diameter, water main, IW section 3.7* |
| ϕ2 | 25 | mm | *Service connection diameter, IW section 3.8* |

DEMAND PER UNIT

| | | |
|---|---|---|
| 150 | l/p/d | *Consumption per person per day, IW section 3.7.2* |
| 2.7 | | *Occupancy ratio per dwelling* |
| 405 | l/d | *Average daily domestic demand* |
| *x1.25* | | |
| 506.25 | l/d | *Average day/peak week demand* |
| x5 | | |
| 2531.25 | l/d | *Peak demand* |
| 2.5 | m3/d | *Peak demand* |

DEMAND ON NEW MAIN

| | | |
|---|---|---|
| 60.8 | m3/d | *Peak demand* |

FIRE REQUIREMENTS

| | |
|---|---|
| 8 | l/s |

# Appendix C

**Project No.** 18011 **Project:** Barnakyle Housing Development

## Storm Water Design - 1/5 Year Return Period

| Pipe Ref. No. | MH Ref Upstream | MH Ref Downstream | CL Upstream (m) | CL Downstream (m) | Ground Level (m) | Ground Level (m) | Length of Pipe (m) | Impermeable Area for Pipe Section ($m^2$) | Pipe Size (mm) | Rainfall Intensity (mm/hr) | Time of Concentration tc (min) | $t_{fp}$ (min) | I. L. Upstream (m) | I.L. Downstream (m) | Qflow for Pipe (m3/s) | Culmative Qflow (m3/s) | Gradient (1 in X) | Velocity (m/s) | Q design (m3/s) | Capacity ($m^3$/s) | Rate of Flow ($m^3$/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | A | B | A | B | | | | | | | | | | | | | | | |
| S - 1 | 1.0 | 2.0 | 19.6 | 17.7 | 19.57 | 17.65 | 72 | 1100 | 225 | 72.14 | 4.00 | 0.704 | 17.370 | 16.400 | 0.029 | 0.029 | 74 | 1.70 | 0.0678 | 0.068 | 0.029 |
| S - 2 | 2.0 | 3.0 | 17.7 | 18.1 | 17.65 | 18.08 | 48 | 606 | 225 | 69.20 | 4.70 | 0.563 | 16.400 | 15.950 | 0.015 | 0.044 | 107 | 1.42 | 0.0565 | 0.057 | 0.044 |
| S - 3 | 3.1 | 3.0 | 18.0 | 18.1 | 17.97 | 18.08 | 25 | 352 | 225 | 72.14 | 4.00 | 0.348 | 16.116 | 15.950 | 0.009 | 0.009 | 151 | 1.20 | 0.0476 | 0.048 | 0.009 |
| S - 4 | 3.0 | 4.0 | 18.1 | 17.9 | 18.08 | 17.88 | 15 | 272 | 300 | 70.65 | 4.35 | 0.172 | 15.950 | 15.850 | 0.007 | 0.060 | 150 | 1.45 | 0.1026 | 0.103 | 0.060 |
| S - 5 | 4.0 | 5.0 | 17.9 | 17.7 | 17.88 | 17.70 | 17 | 460 | 300 | 69.94 | 4.52 | 0.195 | 15.850 | 15.737 | 0.012 | 0.072 | 150 | 1.45 | 0.1025 | 0.102 | 0.072 |
| S - 6 | 5.0 | 6.0 | 17.7 | 17.5 | 17.70 | 17.46 | 16 | 742 | 300 | 69.15 | 4.72 | 0.183 | 15.737 | 15.630 | 0.019 | 0.091 | 150 | 1.45 | 0.1028 | 0.103 | 0.091 |
| S - 7 | 6.0 | 7.0 | 17.5 | 16.9 | 17.46 | 16.85 | 12 | 50 | 300 | 68.43 | 4.90 | 0.092 | 15.630 | 15.450 | 0.001 | 0.092 | 67 | 2.18 | 0.1540 | 0.154 | 0.092 |
| S - 8 | 8.0 | 9.0 | 16.9 | 15.5 | 16.85 | 15.50 | 20 | 50 | 225 | 72.14 | 4.00 | 0.338 | 14.850 | 14.760 | 0.001 | 0.001 | 222 | 2.18 | 0.0392 | 0.154 | 0.092 |
| | | | | | | | | | | | | | | | | | | | | | |
| S - 9 | 11.1 | 11.0 | 17.0 | 17.1 | 17.01 | 17.11 | 18 | 212 | 225 | 72.14 | 4.00 | 0.250 | 15.250 | 15.130 | 0.006 | 0.006 | 150 | 1.20 | 0.0477 | 0.048 | 0.006 |
| S - 10 | 11.0 | 12.0 | 17.1 | 16.5 | 17.11 | 16.45 | 29 | 462 | 225 | 71.07 | 4.25 | 0.404 | 15.130 | 14.937 | 0.012 | 0.018 | 150 | 1.20 | 0.0476 | 0.048 | 0.018 |
| S - 11 | 12.0 | 13.0 | 16.5 | 16.1 | 16.45 | 16.08 | 25 | 850 | 225 | 69.40 | 4.65 | 0.347 | 14.937 | 14.770 | 0.021 | 0.039 | 150 | 1.20 | 0.0477 | 0.048 | 0.039 |
| S - 12 | 13.0 | 14.0 | 16.1 | 15.9 | 16.08 | 15.90 | 13 | 586 | 300 | 68.03 | 5.00 | 0.149 | 14.770 | 14.683 | 0.015 | 0.054 | 149 | 1.45 | 0.1028 | 0.103 | 0.054 |
| S - 13 | 14.0 | 15.0 | 15.9 | 15.8 | 15.90 | 15.75 | 6 | 50 | 300 | 67.46 | 5.15 | 0.080 | 14.680 | 14.650 | 0.001 | 0.055 | 200 | 1.26 | 0.0889 | 0.089 | 0.055 |
| S - 14 | 16.0 | 17.0 | 16.3 | 14.5 | 16.30 | 14.50 | 9 | 50 | 225 | 72.14 | 4.00 | 0.144 | 13.645 | 13.600 | 0.001 | 0.001 | 200 | 1.04 | 0.0413 | 0.041 | 0.001 |
| | | | | | | | | | | | | | | | | | | | | | |
| S - 15 | 18.0 | 19.0 | 18.1 | 18.2 | 18.13 | 18.20 | 35 | 859 | 225 | 72.14 | 4.00 | 0.487 | 16.850 | 16.617 | 0.023 | 0.023 | 150 | 1.20 | 0.0477 | 0.048 | 0.023 |
| S - 16 | 19.0 | 20.0 | 18.2 | 18.2 | 18.20 | 18.15 | 15 | 553 | 225 | 70.08 | 4.49 | 0.209 | 16.617 | 16.517 | 0.014 | 0.037 | 150 | 1.20 | 0.0477 | 0.048 | 0.037 |
| S - 17 | 20.0 | 21.0 | 18.2 | 18.3 | 18.15 | 18.26 | 8 | 515 | 300 | 69.24 | 4.70 | 0.092 | 16.517 | 16.463 | 0.013 | 0.050 | 150 | 1.45 | 0.1026 | 0.103 | 0.050 |
| S - 18 | 22.0 | 23.0 | 16.4 | 16.1 | 16.42 | 16.09 | 23 | 50 | 225 | 72.14 | 4.00 | 0.369 | 15.460 | 15.345 | 0.001 | 0.001 | 200 | 1.04 | 0.0413 | 0.041 | 0.001 |

**Project No.** 18011 **Project:** Barnakyle Housing Development

## Storm Water Design - 1/30 Year Return Period

| Pipe Ref. No. | MH Ref Upstream | MH Ref Downstream | CL Upstream (m) | CL Downstream (m) | Ground Level (m) | Ground Level (m) | Length of Pipe (m) | Impermeable Area for Pipe Section ($m^2$) | Pipe Size (mm) | Rainfall Intensity (mm/hr) | Time of Concentration tc (min) | $t_{fp}$ (min) | I. L. Upstream (m) | I.L. Downstream (m) | Qflow for Pipe (m3/s) | Culmative Qflow (m3/s) | Gradient (1 in X) | Velocity (m/s) | Q design (m3/s) | Capacity ($m^3$/s) | Rate of Flow ($m^3$/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | A | B | A | B | | | | | | | | | | | | | | | |
| S - 1 | 1.0 | 2.0 | 19.6 | 17.7 | 19.57 | 17.65 | 72 | 1100 | 225 | 129.16 | 4.00 | 0.704 | 17.370 | 16.400 | 0.052 | 0.052 | 74 | 1.70 | 0.0678 | 0.068 | 0.052 |
| S - 2 | 2.0 | 3.0 | 17.7 | 18.1 | 17.65 | 18.08 | 48 | 606 | 300 | 122.07 | 4.70 | 0.465 | 16.400 | 15.950 | 0.027 | 0.079 | 107 | 1.72 | 0.1217 | 0.122 | 0.079 |
| S - 3 | 3.1 | 3.0 | 18.0 | 18.1 | 17.97 | 18.08 | 25 | 352 | 225 | 129.16 | 4.00 | 0.348 | 16.116 | 15.950 | 0.017 | 0.017 | 151 | 1.20 | 0.0476 | 0.048 | 0.017 |
| S - 4 | 3.0 | 4.0 | 18.1 | 17.9 | 18.08 | 17.88 | 15 | 272 | 375 | 125.55 | 4.35 | 0.148 | 15.950 | 15.850 | 0.012 | 0.108 | 150 | 1.69 | 0.1861 | 0.186 | 0.108 |
| S - 5 | 4.0 | 5.0 | 17.9 | 17.7 | 17.88 | 17.70 | 17 | 460 | 375 | 124.08 | 4.50 | 0.168 | 15.850 | 15.737 | 0.021 | 0.128 | 150 | 1.68 | 0.1858 | 0.186 | 0.128 |
| S - 6 | 5.0 | 6.0 | 17.7 | 17.5 | 17.70 | 17.46 | 16 | 742 | 375 | 122.45 | 4.67 | 0.158 | 15.737 | 15.630 | 0.033 | 0.161 | 150 | 1.69 | 0.1864 | 0.186 | 0.161 |
| S - 7 | 6.0 | 7.0 | 17.5 | 16.9 | 17.46 | 16.85 | 12 | 50 | 375 | 120.95 | 4.82 | 0.079 | 15.630 | 15.450 | 0.002 | 0.164 | 67 | 2.53 | 0.2792 | 0.279 | 0.164 |
| S - 8 | 8.0 | 9.0 | 16.9 | 15.5 | 16.85 | 15.50 | 20 | 50 | 225 | 129.16 | 4.00 | 0.338 | 14.850 | 14.760 | 0.002 | 0.002 | 222 | 2.53 | 0.0392 | 0.279 | 0.164 |
| | | | | | | | | | | | | | | | | | | | | | |
| S - 9 | 11.1 | 11.0 | 17.0 | 17.1 | 17.01 | 17.11 | 18 | 212 | 225 | 129.16 | 4.00 | 0.250 | 15.250 | 15.130 | 0.010 | 0.010 | 150 | 1.20 | 0.0477 | 0.048 | 0.010 |
| S - 10 | 11.0 | 12.0 | 17.1 | 16.5 | 17.11 | 16.45 | 29 | 462 | 225 | 126.55 | 4.25 | 0.404 | 15.130 | 14.937 | 0.021 | 0.031 | 150 | 1.20 | 0.0476 | 0.048 | 0.031 |
| S - 11 | 12.0 | 13.0 | 16.5 | 16.1 | 16.45 | 16.08 | 25 | 850 | 300 | 122.55 | 4.65 | 0.287 | 14.937 | 14.770 | 0.038 | 0.069 | 150 | 1.45 | 0.1027 | 0.103 | 0.069 |
| S - 12 | 13.0 | 14.0 | 16.1 | 15.9 | 16.08 | 15.90 | 13 | 586 | 300 | 119.87 | 4.94 | 0.149 | 14.770 | 14.683 | 0.026 | 0.095 | 149 | 1.45 | 0.1028 | 0.103 | 0.095 |
| S - 13 | 14.0 | 15.0 | 15.9 | 15.8 | 15.90 | 15.75 | 6 | 50 | 450 | 118.51 | 5.09 | 0.061 | 14.680 | 14.650 | 0.002 | 0.097 | 200 | 1.65 | 0.2621 | 0.262 | 0.097 |
| S - 14 | 16.0 | 17.0 | 16.3 | 14.5 | 16.30 | 14.50 | 9 | 50 | 225 | 129.16 | 4.00 | 0.144 | 13.645 | 13.600 | 0.002 | 0.002 | 200 | 1.04 | 0.0413 | 0.041 | 0.002 |
| | | | | | | | | | | | | | | | | | | | | | |
| S - 15 | 18.0 | 19.0 | 18.1 | 18.2 | 18.13 | 18.20 | 35 | 859 | 225 | 129.16 | 4.00 | 0.487 | 16.850 | 16.617 | 0.040 | 0.040 | 150 | 1.20 | 0.0477 | 0.048 | 0.040 |
| S - 16 | 19.0 | 20.0 | 18.2 | 18.2 | 18.20 | 18.15 | 15 | 553 | 300 | 124.18 | 4.49 | 0.172 | 16.617 | 16.517 | 0.025 | 0.065 | 150 | 1.45 | 0.1026 | 0.103 | 0.065 |
| S - 17 | 20.0 | 21.0 | 18.2 | 18.3 | 18.15 | 18.26 | 8 | 515 | 300 | 122.51 | 4.66 | 0.092 | 16.517 | 16.463 | 0.023 | 0.088 | 150 | 1.45 | 0.1026 | 0.103 | 0.088 |
| S - 18 | 22.0 | 23.0 | 16.4 | 16.1 | 16.42 | 16.09 | 23 | 50 | 225 | 129.16 | 4.00 | 0.369 | 15.460 | 15.345 | 0.002 | 0.002 | 200 | 1.04 | 0.0413 | 0.041 | 0.002 |

**Project No.** 18011 **Project:** Barnakyle Housing Development

## Storm Water Design - 1/100 Year Return Period

| Pipe Ref. No. | MH Ref Upstream | MH Ref Downstream | CL Upstream (m) | CL Downstream (m) | Ground Level (m) | Ground Level (m) | Length of Pipe (m) | Impermeable Area for Pipe Section ($m^2$) | Pipe Size (mm) | Rainfall Intensity (mm/hr) | Time of Concentration tc (min) | $t_{fp}$ (min) | I. L. Upstream (m) | I.L. Downstream (m) | Qflow for Pipe (m3/s) | Culmative Qflow (m3/s) | Gradient (1 in X) | Velocity (m/s) | Q design (m3/s) | Capacity ($m^3$/s) | Rate of Flow ($m^3$/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | A | B | A | B | | | | | | | | | | | | | | | |
| S - 1 | 1.0 | 2.0 | 19.6 | 17.7 | 19.57 | 17.65 | 72 | 1100 | 225 | 163.44 | 4.00 | 0.704 | 17.370 | 16.400 | 0.065 | 0.065 | 74 | 1.70 | 0.0678 | 0.068 | 0.065 |
| S - 2 | 2.0 | 3.0 | 17.7 | 18.1 | 17.65 | 18.08 | 48 | 606 | 300 | 155.50 | 4.70 | 0.465 | 16.400 | 15.950 | 0.034 | 0.100 | 107 | 1.72 | 0.1217 | 0.122 | 0.100 |
| S - 3 | 3.1 | 3.0 | 18.0 | 18.1 | 17.97 | 18.08 | 25 | 352 | 225 | 163.44 | 4.00 | 0.348 | 16.116 | 15.950 | 0.021 | 0.021 | 151 | 1.20 | 0.0476 | 0.048 | 0.021 |
| S - 4 | 3.0 | 4.0 | 18.1 | 17.9 | 18.08 | 17.88 | 15 | 272 | 375 | 159.42 | 4.35 | 0.148 | 15.950 | 15.850 | 0.016 | 0.136 | 150 | 1.69 | 0.1861 | 0.186 | 0.136 |
| S - 5 | 4.0 | 5.0 | 17.9 | 17.7 | 17.88 | 17.70 | 17 | 460 | 375 | 157.76 | 4.50 | 0.168 | 15.850 | 15.737 | 0.026 | 0.163 | 150 | 1.68 | 0.1858 | 0.186 | 0.163 |
| S - 6 | 5.0 | 6.0 | 17.7 | 17.5 | 17.70 | 17.46 | 16 | 742 | 450 | 155.93 | 4.67 | 0.140 | 15.737 | 15.630 | 0.042 | 0.205 | 150 | 1.91 | 0.3031 | 0.303 | 0.205 |
| S - 7 | 6.0 | 7.0 | 17.5 | 16.9 | 17.46 | 16.85 | 12 | 50 | 450 | 154.43 | 4.80 | 0.070 | 15.630 | 15.450 | 0.003 | 0.208 | 67 | 2.85 | 0.4539 | 0.454 | 0.208 |
| S - 8 | 8.0 | 9.0 | 16.9 | 15.5 | 16.85 | 15.50 | 20 | 50 | 225 | 163.44 | 4.00 | 0.338 | 14.850 | 14.760 | 0.003 | 0.003 | 222 | 2.85 | 0.0392 | 0.454 | 0.208 |
| | | | | | | | | | | | | | | | | | | | | | |
| S - 9 | 11.1 | 11.0 | 17.0 | 17.1 | 17.01 | 17.11 | 18 | 212 | 225 | 163.44 | 4.00 | 0.250 | 15.250 | 15.130 | 0.013 | 0.013 | 150 | 1.20 | 0.0477 | 0.048 | 0.013 |
| S - 10 | 11.0 | 12.0 | 17.1 | 16.5 | 17.11 | 16.45 | 29 | 462 | 225 | 160.53 | 4.25 | 0.404 | 15.130 | 14.937 | 0.027 | 0.040 | 150 | 1.20 | 0.0476 | 0.048 | 0.040 |
| S - 11 | 12.0 | 13.0 | 16.5 | 16.1 | 16.45 | 16.08 | 25 | 850 | 300 | 156.05 | 4.65 | 0.287 | 14.937 | 14.770 | 0.048 | 0.088 | 150 | 1.45 | 0.1027 | 0.103 | 0.088 |
| S - 12 | 13.0 | 14.0 | 16.1 | 15.9 | 16.08 | 15.90 | 13 | 586 | 375 | 153.01 | 4.94 | 0.128 | 14.770 | 14.683 | 0.033 | 0.121 | 149 | 1.69 | 0.1865 | 0.186 | 0.121 |
| S - 13 | 14.0 | 15.0 | 15.9 | 15.8 | 15.90 | 15.75 | 6 | 50 | 375 | 151.69 | 5.07 | 0.069 | 14.680 | 14.650 | 0.003 | 0.123 | 200 | 1.46 | 0.1612 | 0.161 | 0.123 |
| S - 14 | 16.0 | 17.0 | 16.3 | 14.5 | 16.30 | 14.50 | 9 | 50 | 225 | 163.44 | 4.00 | 0.144 | 13.645 | 13.600 | 0.003 | 0.003 | 200 | 1.04 | 0.0413 | 0.041 | 0.003 |
| | | | | | | | | | | | | | | | | | | | | | |
| S - 15 | 18.0 | 19.0 | 18.1 | 18.2 | 18.13 | 18.20 | 35 | 859 | 300 | 163.44 | 4.00 | 0.402 | 16.850 | 16.617 | 0.051 | 0.051 | 150 | 1.45 | 0.1027 | 0.103 | 0.051 |
| S - 16 | 19.0 | 20.0 | 18.2 | 18.2 | 18.20 | 18.15 | 15 | 553 | 300 | 158.82 | 4.40 | 0.172 | 16.617 | 16.517 | 0.032 | 0.083 | 150 | 1.45 | 0.1026 | 0.103 | 0.083 |
| S - 17 | 20.0 | 21.0 | 18.2 | 18.3 | 18.15 | 18.26 | 8 | 515 | 375 | 156.92 | 4.57 | 0.079 | 16.517 | 16.463 | 0.029 | 0.112 | 150 | 1.68 | 0.1860 | 0.186 | 0.112 |
| S - 18 | 22.0 | 23.0 | 16.4 | 16.1 | 16.42 | 16.09 | 23 | 50 | 225 | 163.44 | 4.00 | 0.369 | 15.460 | 15.345 | 0.003 | 0.003 | 200 | 1.04 | 0.0413 | 0.041 | 0.003 |

| Project No. | 18011 | Client : LCCC | Project: Barnakyle, Patrickswell |
|---|---|---|---|

## Attenuation Design - No. 1

**Impermeable Areas**

| Type of Surface | Runoff Coefficient | Area | Factored |
|---|---|---|---|
| Roofs | 1 | 420 | 420 |
| Roads + Paths | 0.9 | 1790 | 1611 |
| Hard Landscaping | 0.6 | 0 | 0 |
| | | | |
| | | | 0 |
| | | | 0 |
| Total | | 2210 | 2031 |

**BRE 365 Results**

**Soil Infiltration Rate** f = $V_{p75-25}/a_{p50} \times t\ p_{75-25}$

**Pit Area** **500mm x 1000mm x 1500mm**

**Soil Infiltration Rate** 0.000019 m/s

**Filtration over soakaway volume** 2.432 l/s

Site Area 2.06 ha

Allowable discharge - 2l/sec/ha or 4.12l/sec

Q=Rate of run off (l/s) $Q=A_p \times I \times Cr \times Cv \times 2.78$

| | | | |
|---|---|---|---|
| Ap = | **0.2031** hectares | (Impermeable Area ) | **2031** $m^2$ |
| Cr= | **1** | (Routing Coefficient) | |
| Cv= | **1.3** | (Impermeability Factor) | |

**Q= 0.734 x Intensity (l/sec.)**

| | | | Length (m) | Width (m) | Depth (m) |
|---|---|---|---|---|---|
| Plan Area of Attenuation | **128** $m^2$ | Propsed Size of Attenuation = | **16** | **8** | **1.6** |
| Rate of Outflow | 4.120 l./sec. | | | | |

**For a 100 Year return period from table below**

| Rainfall (hours) | mm | Intensity (mm / hr) | Q (l/sec.) | Volume flow in (litres) | Volume out (litres) | Volume of Storage required (litres) |
|---|---|---|---|---|---|---|
| 0.25 | 49.4 | 197.680 | 145.098 | 130588 | 3708 | 126880 |
| 0.50 | 57.7 | 115.360 | 84.675 | 152414 | 7416 | 144998 |
| 1.00 | 67.3 | 67.340 | 49.428 | 177940 | 14832 | 163108 |
| 2.00 | 78.7 | 39.340 | 28.876 | 207905 | 29664 | 178241 |
| 4.00 | 92.0 | 22.995 | 16.878 | 243049 | 59328 | 183721 |
| 6.00 | 100.8 | 16.800 | 12.331 | 266355 | 88992 | 177363 |
| 12.00 | 117.7 | 9.812 | 7.202 | 311118 | 177984 | 133134 |
| 24.00 | 137.5 | 5.728 | 4.205 | 363279 | 355968 | 7311 |
| 48.00 | 152.6 | 3.179 | 2.334 | 403232 | 711936 | -308704 |

Rainfall Data obtained from Met Eireann
Including 30 % for climate change
Including 10 % for Urban Creep

**Therefore taking the worst case from the above =>**

**Volume of Storage required =** **184** $m^3$

**Assuming** **90** **% Voids**

**Attenuation Size Required =>** 204 $m^3$

**Therefore:**

| | Length (m) | width (m) | Depth (m) | |
|---|---|---|---|---|
| | | **Soakaway Size** | | |
| **Attenuation proposed =** | 16 | 8 | **1.60** | |
| **or** | | **205** | $m^3$ =>Therefore | OK |

| Project No. | 18011 | Client : LCCC | Project: Barnakyle, Patrickswell |
|---|---|---|---|

## Attenuation Design - No. 2

**Impermeable Areas**

| Type of Surface | Runoff Coefficient | Area | Factored |
|---|---|---|---|
| Roofs | 1 | 320 | 320 |
| Roads + Paths | 0.9 | 3312 | 2980.8 |
| Hard Landscaping | 0.6 | 0 | 0 |
| | | | |
| | | | 0 |
| | | | 0 |
| Total | | 3632 | 3300.8 |

**BRE 365 Results**

**Soil Infiltration Rate** f = $V_{p75-25}/a_{p50} \times t\ p_{75-25}$

**Pit Area** **500mm x 1000mm x 1500mm**

**Soil Infiltration Rate** 0.000019 m/s

**Filtration over soakaway volume** 6.156 l/s

Site Area 2.06 ha

Allowable discharge - 2l/sec/ha or 4.12l/sec

Q=Rate of run off (l/s) $Q=A_p \times I \times Cr \times Cv \times 2.78$

| | | | |
|---|---|---|---|
| Ap = | **0.33008** hectares | (Impermeable Area ) | **3300.8** $m^2$ |
| Cr= | **1** | (Routing Coefficient) | |
| Cv= | **1.3** | (Impermeability Factor) | |

**Q= 1.193 x Intensity (l/sec.)**

| | | | Length (m) | Width (m) | Depth (m) |
|---|---|---|---|---|---|
| Plan Area of Attenuation | **324** $m^2$ | Propsed Size of Attenuation = | **18** | **18** | **1.2** |
| Rate of Outflow | 4.120 l./sec. | | | | |

**For a 100 Year return period from table below**

| Rainfall (hours) | mm | Intensity (mm / hr) | Q (l/sec.) | Volume flow in (litres) | Volume out (litres) | Volume of Storage required (litres) |
|---|---|---|---|---|---|---|
| 0.25 | 49.4 | 197.680 | 235.814 | 212233 | 3708 | 208525 |
| 0.50 | 57.7 | 115.360 | 137.614 | 247705 | 7416 | 240289 |
| 1.00 | 67.3 | 67.340 | 80.331 | 289190 | 14832 | 274358 |
| 2.00 | 78.7 | 39.340 | 46.929 | 337889 | 29664 | 308225 |
| 4.00 | 92.0 | 22.995 | 27.431 | 395006 | 59328 | 335678 |
| 6.00 | 100.8 | 16.800 | 20.041 | 432883 | 88992 | 343891 |
| 12.00 | 117.7 | 9.812 | 11.704 | 505631 | 177984 | 327647 |
| 24.00 | 137.5 | 5.728 | 6.833 | 590404 | 355968 | 234436 |
| 48.00 | 152.6 | 3.179 | 3.792 | 655337 | 711936 | -56599 |

Rainfall Data obtained from Met Eireann
Including 30 % for climate change
Including 10 % for Urban Creep

**Therefore taking the worst case from the above =>**

**Volume of Storage required =** **344** $m^3$

**Assuming** **90** **% Voids**

**Attenuation Size Required =>** 382 $m^3$

**Therefore:**

| | Length (m) | width (m) | Depth (m) | |
|---|---|---|---|---|
| **Soakaway Size** | | | | |
| **Attenuation proposed =** | 18 | 18 | **1.20** | |
| **or** | | **389** | $m^3$ =>Therefore | OK |

| Project No. | 18011 | Client : LCCC | Project: Barnakyle, Patrickswell |
|---|---|---|---|

## Attenuation Design - No. 3

**Impermeable Areas**

| Type of Surface | Runoff Coefficient | Area | Factored |
|---|---|---|---|
| Roofs | 1 | 540 | 540 |
| Roads + Paths | 0.9 | 1437 | 1293.3 |
| Hard Landscaping | 0.6 | 0 | 0 |
| | | | |
| | | | 0 |
| | | | 0 |
| Total | | 1977 | 1833.3 |

**BRE 365 Results**

**Soil Infiltration Rate** f = $V_{p75-25}/a_{p50} \times t\ p_{75-25}$

**Pit Area** **500mm x 1000mm x 1500mm**

**Soil Infiltration Rate** 0.000019 m/s

**Filtration over soakaway volume** 3.42 l/s

Site Area 2.06 ha

Allowable discharge - 2l/sec/ha or 4.12l/sec

Q=Rate of run off (l/s) $Q=A_p \times I \times Cr \times Cv \times 2.78$

Ap = **0.18333** hectares (Impermeable Area ) **1833.3** $m^2$

Cr= **1** (Routing Coefficient)

Cv= **1.3** (Impermeability Factor)

**Q= 0.663 x Intensity (l/sec.)**

| | | | Length (m) | Width (m) | Depth (m) |
|---|---|---|---|---|---|
| Plan Area of Attenuation | **180** | $m^2$ | Propsed Size of Attenuation = | **15** | **12** | **1** |
| Rate of Outflow | 4.120 | l./sec. | | | | |

**For a 100 Year return period from table below**

| Rainfall (hours) | mm | Intensity (mm / hr) | Q (l/sec.) | Volume flow in (litres) | Volume out (litres) | Volume of Storage required (litres) |
|---|---|---|---|---|---|---|
| 0.25 | 49.4 | 197.680 | 130.974 | 117876 | 3708 | 114168 |
| 0.50 | 57.7 | 115.360 | 76.432 | 137578 | 7416 | 130162 |
| 1.00 | 67.3 | 67.340 | 44.616 | 160619 | 14832 | 145787 |
| 2.00 | 78.7 | 39.340 | 26.065 | 187667 | 29664 | 158003 |
| 4.00 | 92.0 | 22.995 | 15.235 | 219390 | 59328 | 160062 |
| 6.00 | 100.8 | 16.800 | 11.131 | 240428 | 88992 | 151436 |
| 12.00 | 117.7 | 9.812 | 6.501 | 280833 | 177984 | 102849 |
| 24.00 | 137.5 | 5.728 | 3.795 | 327917 | 355968 | -28051 |
| 48.00 | 152.6 | 3.179 | 2.106 | 363981 | 711936 | -347955 |

Rainfall Data obtained from Met Eireann
Including 30 % for climate change
Including 10 % for Urban Creep

**Therefore taking the worst case from the above =>**

**Volume of Storage required =** **160** $m^3$

**Assuming** **90** **% Voids**

**Attenuation Size Required =>** 178 $m^3$

**Therefore:**

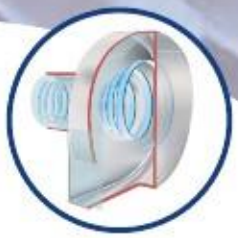
| | Length (m) | width (m) | Depth (m) | |
|---|---|---|---|---|
| | | **Soakaway Size** | | |
| **Attenuation proposed =** | 15 | 12 | **1.00** | |
| **or** | | **180** | $m^3$ =>Therefore | OK |

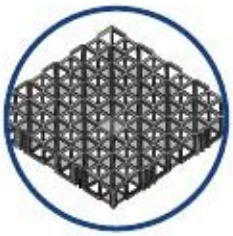
# Modular Geo-Void Systems

Total Water Management

# ESS EcoCell

## Ecological Tank Systems





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Our wide range of environmental protection products, surface water drainage modules and modular water storage tank systems provides maximum design flexibility for engineers and architects working on even the most demanding of storm water storage and recycling projects.

## Stormwater Management And Design

Stormwater is the phrase used to describe the excess rainwater that flows from rooftops, roads, car parks and other buildings. This water can contain many pollutants picked up from roofs and highways. In extreme weather conditions sudden heavy downpours of rain can cause major environmental disasters. Using our Rainmanager products; stormwater can not only safely be removed, but it can be stored and recycled for commercial and domestic use.

### How it works - ESS Attenuation Tank

Stormwater enters the attenuation tank via the inlet manhole, which incorporates a silt collection sump and a galvanised leaf collection basket. Water passes through the tank and exits through the outlet manhole, which contains an AquaBrake flow control device.
This flow control device regulates the release rate of water from the tank, and in so doing, enables the tank to fill. As a result of water entering the tank at a greater rate than it can exit, the void space then fills with water. While the tank fills, air is vented from the tank.
The Inlet/Outlet pipe will act as a flushing channel. This perforated pipe is wrapped completely in High Flow Filtering Geotextile, which prevents silt entering the block area. As the tank continues to empty at a pre-determined rate, air re-enters the tank via the same air vent system. The roof of the completed tank must be lower than the lowest gully trap on site.

### Benefits

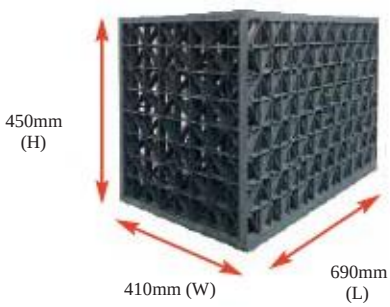
- 100% sealed tank
- Full installation service provided
- 12 years experience as market leader
- Quick installation – reduce site access delays
- Increased land usage – tanks are sub surface
- Economical – generally more cost efficient than any other equivalent sealed tank
- Cost effective – reduced costs for excavation and disposal of material
- Modular – easy to create any shape
- Strong – designed to support shear loading
- Lightweight – no cranes required
- Determinate volume – one cubic metre of matrix tank modules contain 950 litres of water, whereas stone fill will only provide 300 litres of storage per cubic metre.

### Soakaway

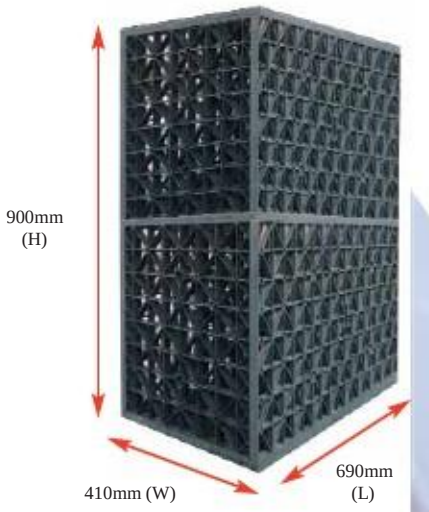
The soakaway is normally best built as a long narrow structure.
The inlet pipe comes in at roof level and faces downwards so that the water can percolate into the tank.
The blocks are wrapped in Geotextile, to protect them and also to keep clay from filling up the void.
An air vent pipe is installed on the highest point with a cowl on top or vented back to an inlet manhole.
There is no outlet from a soakaway, therefore no flow control unit is required.

## Stormwater Storage Tank

SUITABLE FOR USE UNDER:
- Roadways
- Car parks
- Green areas




**Single**
**8 Modules/m3**
**Flowrate - 2300 l/min**




**Double**
**4 Modules/m3**
**Flowrate - 4600 l/min**


**Triple**
**2.6 Modules/m3**
**Flowrate - 6900 l/min**

Notes:
Blocks must be positioned in the correct orientation.
See opposite above

## SPECIFICATION (SINGLE)

| | |
|---|---|
| Weight (maximum) | 9.17kg |
| Crush Strength (up to) | 400kN/m2 |
| Lateral Strength | 80kN/m2 |
| Minimum Cover (green areas) | 500mm |
| (trafficked areas) | 650mm |
| Maximum Cover | 3m |
| Material | Polypropylene |
| Void Ratio (Internal) | >95% |

### Design Requirements:

Tank storage capacity (m3)
Depth restrictions
Location (Road, Car Park, Green Area)
Design constraints on site

A set of loading calculations specific to the site requirement will be done by ESS and submitted on all tanks

### DESIGN CRITERIA

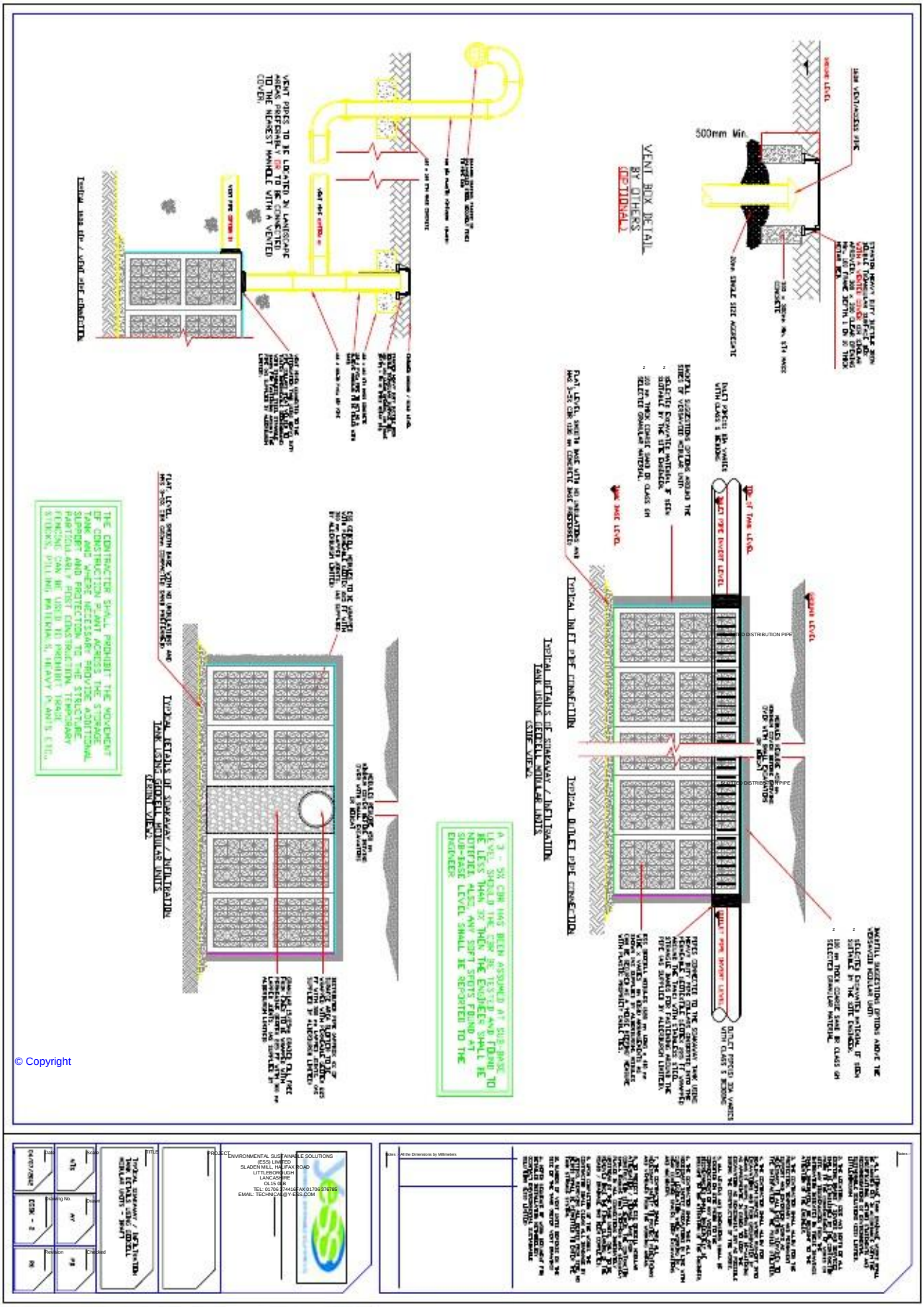
The attenuation tank is constructed using matrix module blocks. These blocks can take passing loads of up to 40 tonnes/m2. The void ratio of each block is 95%. The blocks are made from polypropylene.

The tank is sealed with a layer of Tuflex membrane, which is fully welded together to form a 100% seal. All pipe penetrations are fully sealed to the membrane. The Tuflex membrane is protected by a layer of heavy duty protection geotextile, to prevent damage from construction or backfilling. A number of air extraction vents/flushing points are placed in the roof of the tank.

Note:
It is vital that the underground tanks are fully sealed, otherwise ground water and silt particles may enter the void space and use up capacity. Preferably, the base of the tank should be 500mm above the ground water level. Otherwise ground water relief measures should be implemented.

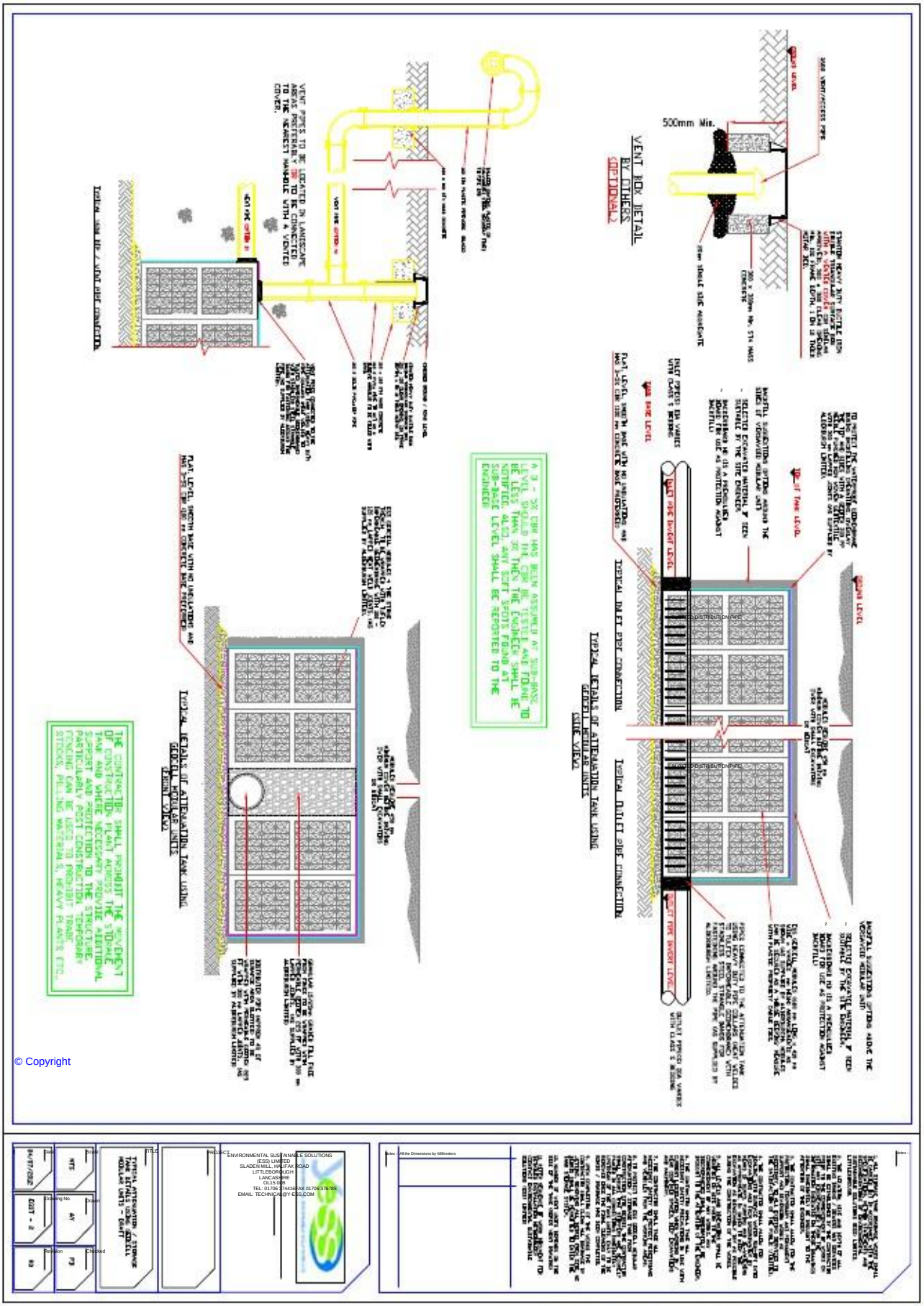
# Infiltration System

## Typical arrangement using ESS Ecological Tank System for water quality



# Retention System

## Typical on site collection and recycling arrangement using ESS Ecological Tank System



# Infiltration Swales & Underground Channels

Please refer to separate data sheets for the following products

## Modular VersaVoid System

### Benefits

G **Quick**
Reduce site access delays

G **Lightweight**
No cranes required

G **Strong**
Designed for maximum anticipated loads

G **Maintenance Free Tank**
All debris and sediment is pre-filtered

G **Determinate Volume**
One cubic metre of Tank modules contain 950 litres of water

G **Cost Effective**
Reduces excavation and disposal by up to 5 x compared with conventional soak wells

G **High Infiltration**
98% void surface area

G **Totally Modular**
For greatest flexibility designed to cope. Units start at 300mm deep for shallow inverts to 3050mm+ deep in 250mm increments.

G **Designed by Engineers for Engineers** – to specify with confidence.

G **Designing out Problems**
with such systems (access, maintenance, loading etc.)

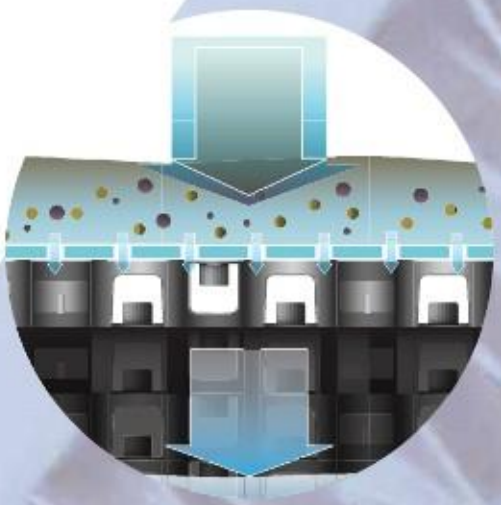
G **Designing in Answers**
to design requirements.

G **Total 3D Access**
For total maintenance with total confidence.

G **Structurally Designed**
with built in safety factor to carry all loads with complete confidence.
16 clear vertical access chambers per m2.

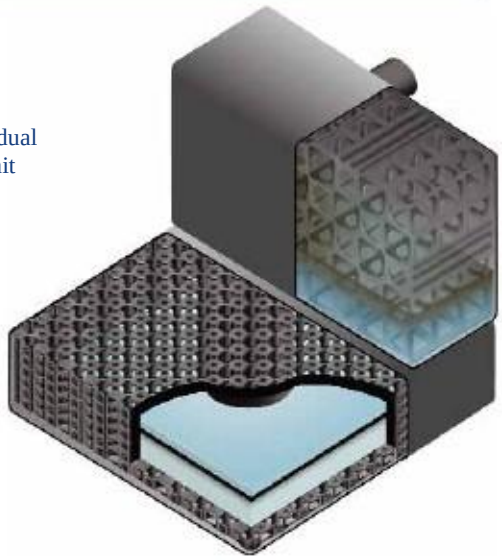
G **Total Void Creation**
With the greatest strength from any modular systems.

## Oil Filtration



### Benefits

G Source control designed to handle catastrophic spillages
G Capture, filter and break down residual hydrocarbons - all in one compact unit
G Self-maintaining ecosystems decompose hydrocarbon compounds and clean filters
G Load bearing, modular components provide up to 200t/m² loading capacity



## Aquabrake

### Benefits

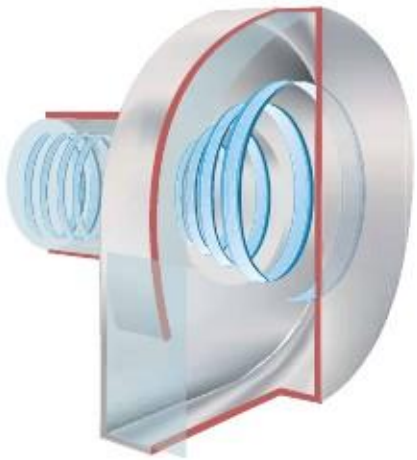
G Cost Savings
Can reduce upstream storage requirements by up to 30%.

G Durability
Corrosion resistant stainless steel.

G No energy requirements
Self-activating solution with no moving parts.

G Clog Resistant
AquaBrake design prevents blockages likely to occur in traditional orifices.

G Flexible Design
Several options for attachment available.



# The ESS CombiSwale

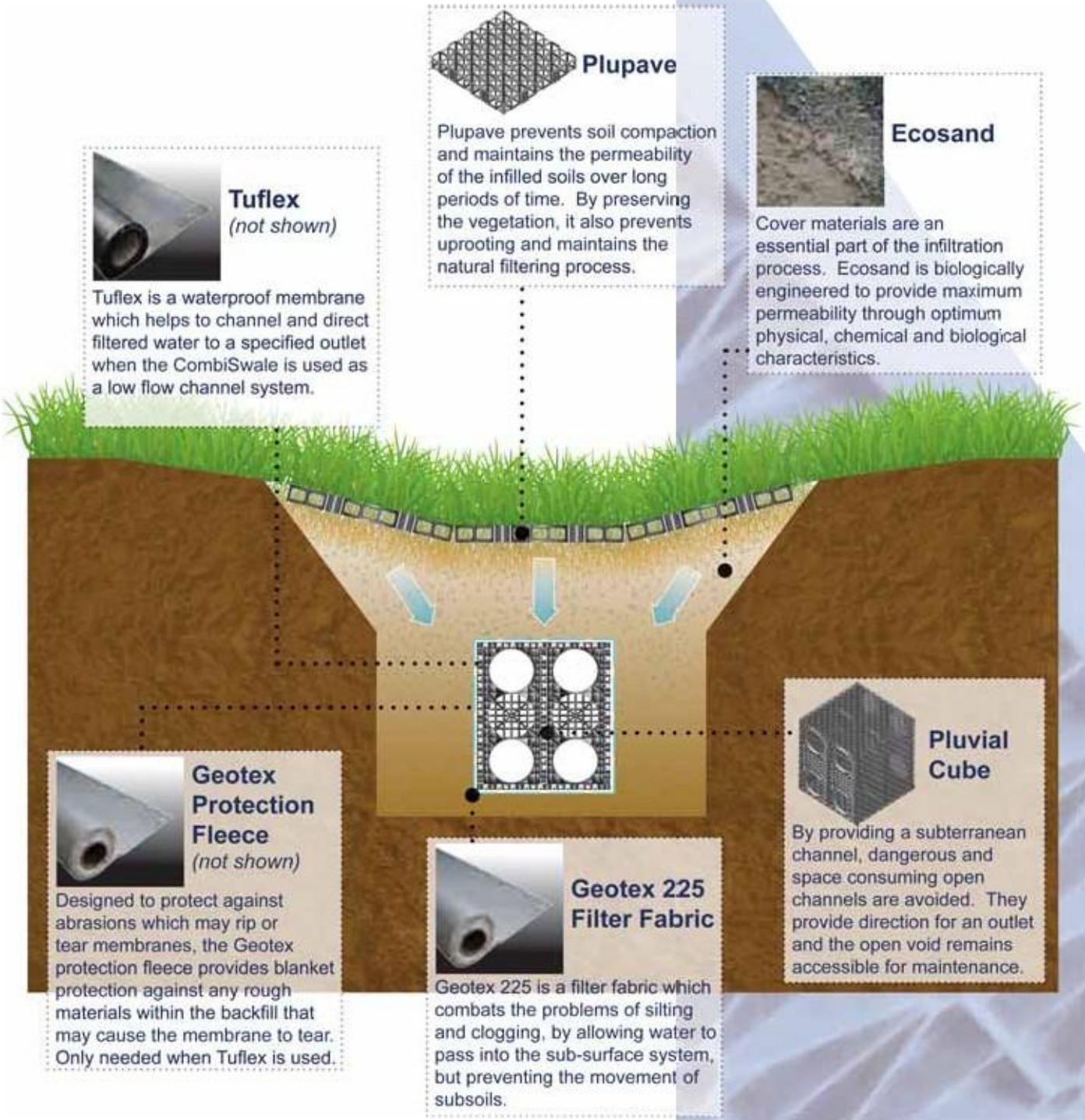
Please refer to separate data sheets for the following products

## Water Sensitive Urban Channels

### Surface and Sub-Surface Water Treatment

By combining surface and sub-surface channeling and treatment solutions, ESS has created the ideal in bioswale water management.

The CombiSwale system includes the addition of permeable sub-surface waterways that further restore water quality and recharge the natural environment. The sub-surface ESS channel system provides a unique way of working with nature to solve the enormous problems currently associated with open concrete channels and swales.



All products are manufactured to the highest quality, being subject to rigid quality control. However, the company cannot control conditions of application and use of its products, thus any warranty, written or implied, is given in good faith for materials only. ESS Ltd will not accept any responsibility for damage or injury arising from storage handling, misapplication or misuse of its products All transactions are subject to our standard condition of sale, copies of which are available on request.

Water Management Solutions

# Separators
# Product Brochure

Fully compliant range of Separators for a variety of commercial and industrial applications

kingspan.me/water

Kingspan®

# Fuel/Oil Separators for Commercial and Industrial Applications

Contact our expert local separators team for technical advice on your project requirements.

Email **Water-ME@kingspan.com** and a member of our team will be in touch.

Surface water drains typically 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.

UK environment regulators, the Environment Agency; the Scottish Environment Protection Agency (SEPA); and the Department of Environment (DOE); have all published guidance on surface water disposal, which includes 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 or from across the plant, or from more major events like 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**
The UK has adopted a two-part European Standard (BS EN 858-1:2002 and BS EN 858-2:2003; Reference 5) for the design, use, selection, installation, operation and maintenance of prefabricated oil separators.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, a Class I separator should be used when the separator is required to remove very small oil droplets. Class 1 separators always discharge to a watercourse.

**Class II**
Designed to achieve a concentration of less than 100mg/l oil under standard test conditions, Class II separators are suitable for dealing with discharges where a lower quality requirement applies. Class II separators discharge effluent to a foul sewer.

**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.

**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.

**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 your local Water/Environmental Agency.

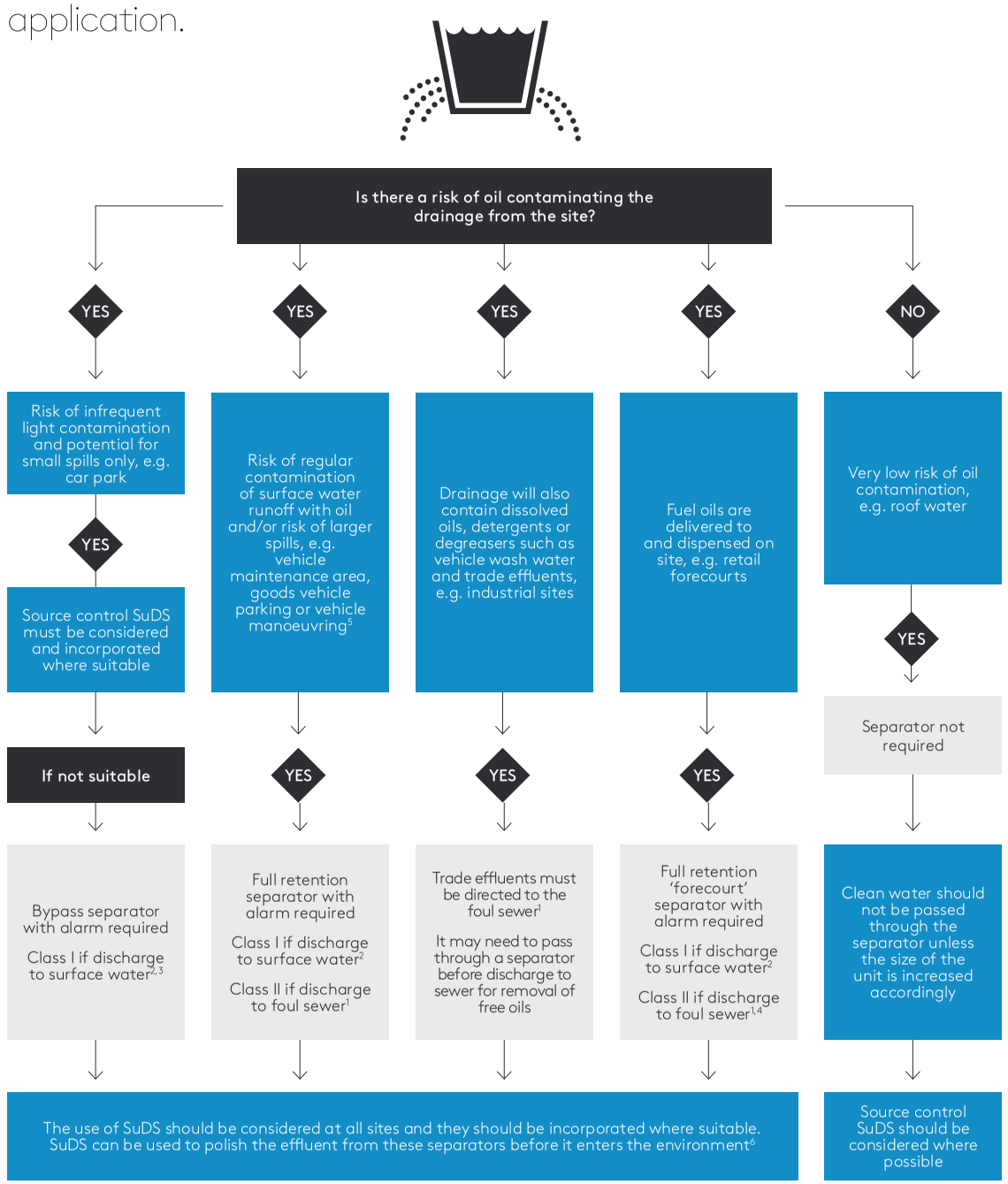
Kingspan has a specialist team who provide technical assistance in selecting the appropriate separator for your application.



# Choosing the Right Separator

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

The chart below 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.




1 You must seek prior permission from your local sewer provider before you decide which separator to install and before you make any discharge.

2 You must seek prior permission from the relevant environmental body before you decide which separator to install.

3 In this case, if it is considered that there is a low risk of pollution a source control SuDS scheme may be appropriate.

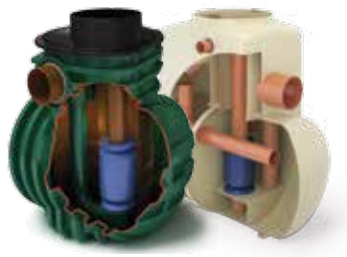
4 In certain circumstances, the sewer provider may require a Class 1 separator for discharges to sewer to prevent explosive atmospheres from being generated.

5 Drainage from higher risk areas such as vehicle maintenance yards and goods vehicle parking areas should be connected to foul sewer in preference to surface water.

6 In certain circumstances, a separator may be one of the devices used in the SuDS scheme. Ask us for advice.

# Bypass Separators

NSB RANGE



Kingspan NSB range achieved on average <1mg/l under EN 858-1 testing conditions

**Performance**
Kingspan was one of the first UK manufacturers to have separators tested to BS EN 858-1. In 2006, we introduced the NSB range of bypass separators. The NSB number denotes the maximum flow at which the separator treats liquids. The British Standards Institute (BSI) tested the required range of Kingspan bypass separators, and certified their performance in relation to their flow and process performance, assessing the effluent qualities to the requirements of BS EN 858-1. Kingspan 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 (Class 1 units only).

The unit is designed to treat the first 10% of peak flow ('first flush principle'). The calculated drainage areas served by each separator are indicated according to the formula NSB = 0.0018A($m^2$). Flows generated by higher rainfall rates will pass through part of the separator, bypassing the 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 BS EN 858-1)
- 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:

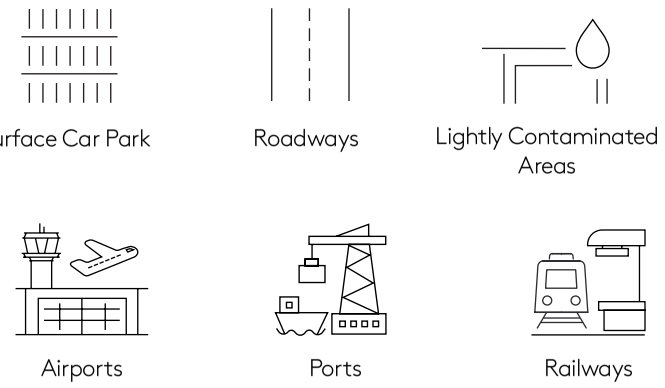
- The calculated flow rate for the drainage area served. Our designs are based on the assumptions that any interconnecting pipework fitted elsewhere on site does not impede flow into or out of the separator and that the flow is not pumped
- The drain invert inlet depth
- Pipework type, size and orientation.

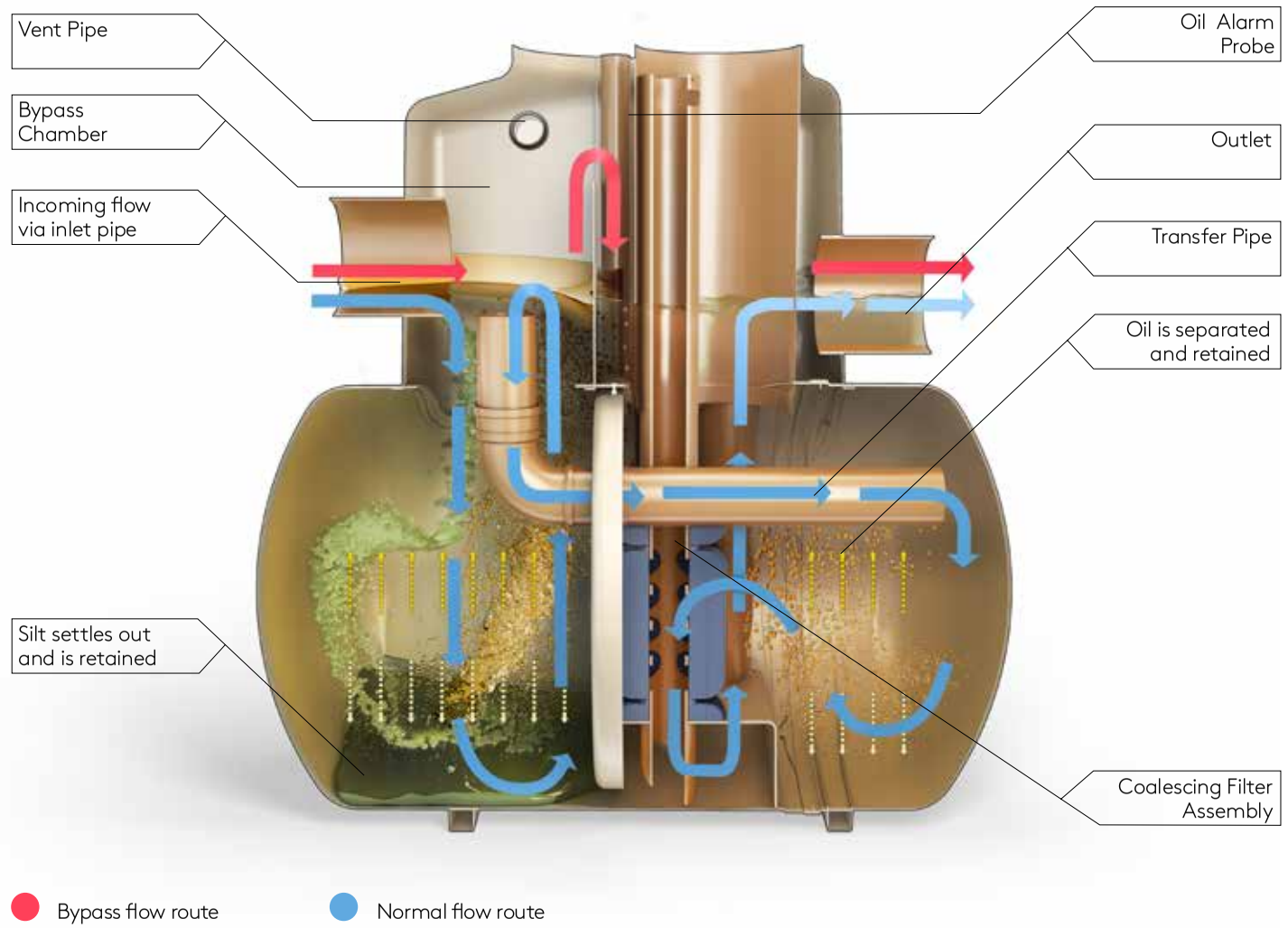
## Technical Specifications

| Model Reference | Flow (l/s) | Peak Flow Rate (l/s) | Drainage Area($M^2$) Based on UK rainwater flow | Storage Capacity (Ltrs) | | Length (mm) | Diameter (mm) | Access Shaft Diameter (mm) | Base Inlet Invert (mm) | Base to Outlet Invert (mm) | Standard Fall Across (mm) | Min Inlet Invert (mm) | Standard Pipework Diameter (mm)** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Silt | Oil | | | | | | | | |
| **Polyethylene Chamber Construction** | | | | | | | | | | | | | |
| **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 |
| **GRP Chamber Construction** | | | | | | | | | | | | | |
| **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 |

** Systems to cater for larger flow rates are available on request. Email water-ME@kingspan.com for further information.*
** Some units have more than one access shaft – diameter of largest shown | ** Larger pipework available on request.*

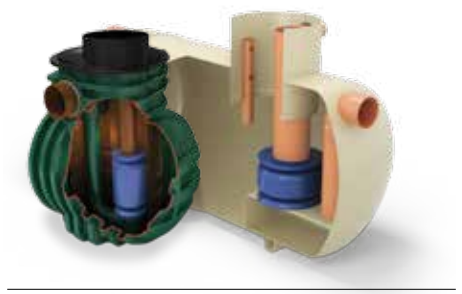
**Applications**
Kingspan's range of bypass separators are typically used for the following applications:



# Full Retention Separators

NSF RANGE



Kingspan NSF range achieved on average <1mg/l under EN 858-1 testing conditions

**Performance**
Kingspan were the first UK manufacturer to have the required range (3-30 l sec) certified to BS EN 858-1 in the UK. The NSF number denotes the flow at which the separator operates. The British Standards Institute (BSI) have witnessed the performance tests of the required range of separators and have certified their performance, in relation to their flow and process performance to ensure that they meet the effluent quality requirements of BS EN 858-1. Larger separator designs have been determined using the formulas extrapolated from the test range.

Each full retention separator design includes the necessary volume requirements for:

- Oil separation capacity
- Oil storage volume
- Silt storage capacity
- Coalescer (Class I units only)
- Automatic closure device.

Kingspan full retention separators treat the whole of the specified flow.

**Features**
- Light and easy to install
- 3-30 l/sec range independently tested and performance sampled, certified by the BSI
- Inclusive of silt storage volume
- Fitted inlet/outlet connectors
- Oil alarm system available
- Vent points within necks
- Extension access shafts for deep inverts
- Maintenance from ground level
- GRP or rotomoulded construction (subject to model)

To specify a nominal size full retention separator, the following information is needed:

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

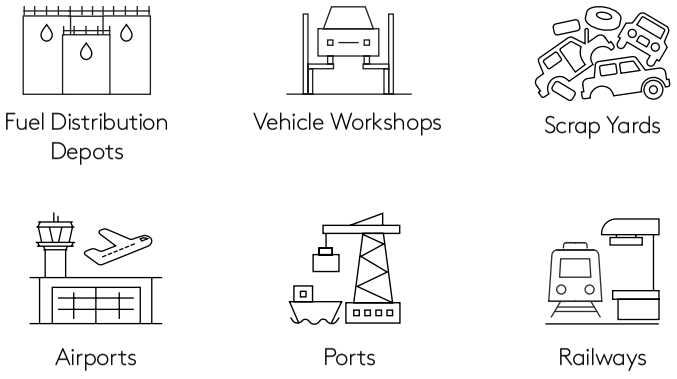
## Technical Specifications

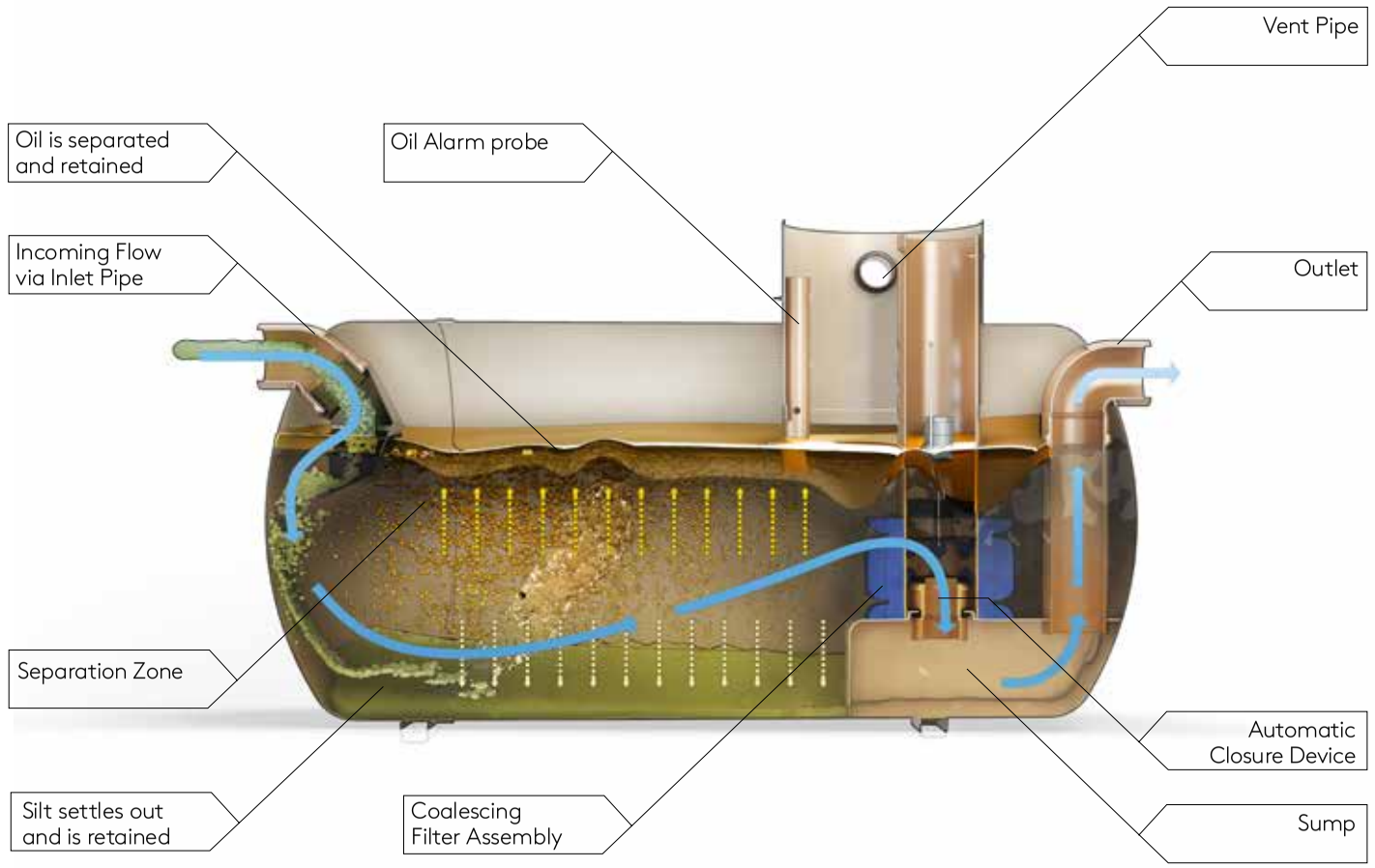
| Model Reference | Flow (l/s) | Drainage Area (m2) PPG-3 (0.018) | Storage Capacity (Ltrs) | | Length (mm) | Diameter (mm) | Manhole Cover Dimensions (mm) | Base Inlet Invert (mm) | Base to Outlet Invert (mm) | Min Inlet Invert (mm) | Standard Pipework Diameter (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Silt | Oil | | | | | | | |
| **Polyethylene Chamber Construction** | | | | | | | | | | | |
| **NSFP003** | 3 | 170 | 300 | 30 | 1700 | 1350 | 600 | 1410 | 1335 | 550 | 160 |
| **NSFP006** | 6 | 335 | 600 | 60 | 1700 | 1350 | 600 | 1410 | 1335 | 550 | 160 |
| **GRP Chamber Construction** | | | | | | | | | | | |
| **NSFA010** | 10 | 555 | 1000 | 100 | 2610 | 1225 | 600 | 1050 | 1000 | 500 | 200 |
| **NSFA015** | 15 | 835 | 1500 | 150 | 3910 | 1225 | 600 | 1050 | 1000 | 1000 | 200 |
| **NSFA020** | 20 | 1115 | 2000 | 200 | 3200 | 2010 | 600 | 1810 | 1760 | 1000 | 315 |
| **NSFA030** | 30 | 1670 | 3000 | 300 | 3915 | 2010 | 600 | 1810 | 1760 | 1000 | 315 |
| **NSFA040** | 40 | 2225 | 4000 | 400 | 4640 | 2010 | 600 | 1810 | 1760 | 1000 | 315 |
| **NSFA050** | 50 | 2780 | 5000 | 500 | 5425 | 2010 | 600 | 1810 | 1760 | 1000 | 315 |
| **NSFA065** | 65 | 3160 | 6500 | 650 | 6850 | 2010 | 600 | 1810 | 1760 | 1000 | 315 |
| **NSFA080** | 80 | 4445 | 8000 | 800 | 5744 | 2820 | 600 | 2500 | 2450 | 1000 | 315 |
| **NSFA100** | 100 | 5560 | 10000 | 1000 | 6200 | 2820 | 600 | 2500 | 2450 | 1000 | 400 |
| **NSFA125** | 125 | 6945 | 12500 | 1250 | 7365 | 2820 | 600 | 2500 | 2450 | 1000 | 450 |
| **NSFA150** | 150 | 8335 | 15000 | 1500 | 8675 | 2820 | 600 | 2500 | 2450 | 1000 | 525 |
| **NSFA175** | 175 | 9725 | 17500 | 1750 | 9975 | 2820 | 600 | 2500 | 2450 | 1000 | 525 |
| **NSFA200** | 200 | 11110 | 20000 | 2000 | 11,280 | 2820 | 600 | 2500 | 2450 | 1000 | 600 |

** Systems to cater for larger flow rates are available on request. Email water-ME@kingspan.com for further information*
** Some units have more than one access shaft – diameter of largest shown.*



**Applications**
Full retention separators are used in high risk spillage areas such as:



# Forecourt Separators


**Compliance**
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, therefore 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.

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.

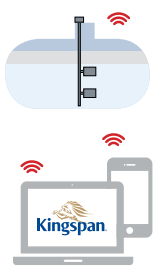
The separator should be installed and vented in accordance with local Health and Safety guidelines.

### Technical Specifications

| Separator Class | Backfill Type | Total Capacity (Ltrs) | Drainage Area ($m^2$) | Peak Flow Rate (L/s) | Length (mm) | Diameter (mm) | Access Shaft Diameter (mm) | Base Inlet Invert (mm) | Base to Outlet Invert (mm) | Standard Fall Across (mm) | Min Inlet Invert (mm) | Standard Pipework Diameter (mm) | Empty Weight (kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I/II | Concrete | 10000 | 835 | 15 | 3915 | 2020 | 600 | 2180 | 2130 | 50 | 600 | 160 | 620 |
| I/II | Concrete | 10000 | 1115 | 20 | 3915 | 2020 | 600 | 2180 | 2130 | 50 | 600 | 200 | 620 |

# Local and remote separator monitoring solutions

Kingspan offer both local oil level alarm systems and remote monitoring solutions, specifically designed to help you manage your separator system(s).


**SmartServ Remote Monitoring Solution**
Kingspan's intelligent fuel/oil separator monitoring system ('SmartServ') is a cost effective solution designed to offer greater control over your separator system. SmartServ is also fully compliant with British European Standard EN 858-1.

**Benefits**
- Helps avoid costly overflows
- Saves money
- Greater control over assets

**Oil Level Alarm System**
British European Standard EN 858-1 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.

**Benefits**
- Easily fitted to existing tanks
- Excellent operational range
- Visual and audible alarm



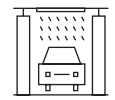


# Washdown and Silt Units

**Performance**
Vehicle wash down facilities must not be allowed to discharge directly into surface water. Instead, their discharge must be directed to a foul connection leading to a municipal treatment works as it is likely to contain emulsifiers, soaps and detergents, which can dissolve and disperse the oils.

**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

**Applications**


Car Wash


Tool Hire Depots

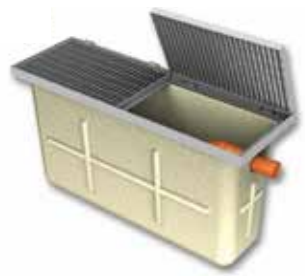

Truck Cleansing


Construction compounds cleansing points

### Technical Specifications

| Model Ref | Total Capacity (Ltrs) | Max.rec. Silt (Ltrs) | Max. Flow Rate (L/s) | Length (mm) | Diameter (mm) | Access Shaft Diameter (mm) | Base Inlet Invert (mm) | Base To Outlet Invert (mm) | Standard Fall Across (mm) | Min Inlet Invert (mm) | Standard Pipework Diameter (mm) | Approx. Empty (Kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W1/010 | 1000 | 500 | 3 | 1123 | 1225 | 460 | 1150 | 1100 | 50 | 500 | 160 | 60 |
| W1/020 | 2000 | 1000 | 5 | 2074 | 1225 | 460 | 1150 | 1100 | 50 | 500 | 160 | 120 |
| W1/030 | 3000 | 1500 | 8 | 2952 | 1225 | 460 | 1150 | 1100 | 50 | 500 | 160 | 150 |
| W1/040 | 4000 | 2000 | 11 | 3898 | 1225 | 460 | 1150 | 1100 | 50 | 500 | 160 | 180 |
| W1/060 | 6000 | 3000 | 16 | 4530 | 1440 | 600 | 1360 | 1310 | 50 | 500 | 160 | 320 |
| W1/080 | 8000 | 4000 | 22 | 3200 | 2020 | 600 | 2005 | 1955 | 50 | 500 | 160 | 585 |
| W1/100 | 10000 | 5000 | 27 | 3915 | 2020 | 600 | 2005 | 1955 | 50 | 500 | 160 | 680 |
| W1/120 | 12000 | 6000 | 33 | 4640 | 2020 | 600 | 2005 | 1955 | 50 | 500 | 160 | 770 |
| W1/150 | 15000 | 7500 | 41 | 5435 | 2075 | 600 | 1940 | 1890 | 50 | 500 | 160 | 965 |
| W1/190 | 19000 | 9500 | 52 | 6865 | 2075 | 600 | 1940 | 1890 | 50 | 500 | 160 | 1200 |

# Car Wash Silt Trap



**Features**
- FACTA Class B covers
- Light and easy to install
- Maintenance from ground level

### Technical Specifications

| Model Ref | Total Capacity (Ltrs) | Max.rec. Silt (Ltrs) | Max. Flow Rate (L/s) | Length (mm) | Diameter (mm) | Access Shaft Diameter (mm) | Base Inlet Invert (mm) | Base To Outlet Invert (mm) | Standard Fall Across (mm) | Min Inlet Invert (mm) | Standard Pipework Diameter (mm) | Approx. Empty (Kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| W1/190 | 19000 | 9500 | 52 | 6865 | 2075 | 600 | 1940 | 1890 | 50 | 500 | 160 | 1200 |

# Middle Eastern Installations

Kingspan operate in over 85 countries worldwide, with currently over 5 million water management system installations. Take a look at a selection of our case studies below.

Experience

OVER 60 YEARS

QA

**Hamad International Airport**
Qatar
Fuel/Oil Separators

EAU

**Jumeirah Lake Towers**
Dubai
Fuel/Oil Separators

EAU

**Four Seasons Hotel**
Abu Dhabi
Fuel/Oil Separators and Grease Separators

OM

**Sohar Labour Camp**
Oman
Forecourt Separators and Sewage Treatment Plants

KW

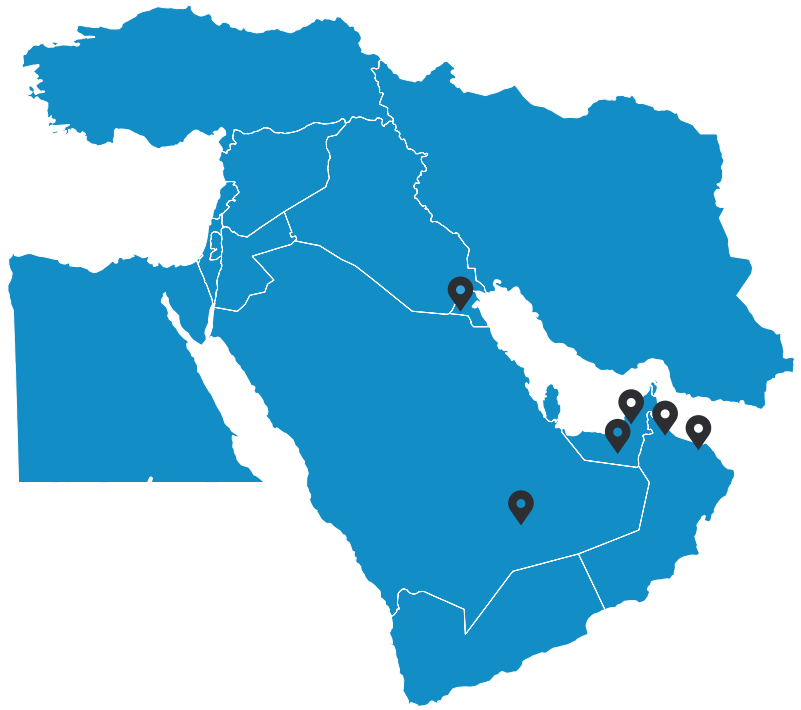
**AZ-Zour Desalination Plant**
Kuwait City
Fuel/Oil Separators and Package Pumping Stations

OM

**Muscat Airport**
Oman
Fuel/Oil Separators

SA

**Haramain 'Western Railway' High Speed Rail Project**
Saudi Arabia
Fuel/Oil Separators





# Other Water Management Solutions from Kingspan

Expert Advice Available

Kingspan offer a full range of commercial, domestic and industrial wastewater treatment solutions. To find out more information on any of our products featured, email water-ME@kingspan.com or visit our website at kingspan.me/water

**Domestic Sewage Treatment Plants**

**Commercial Sewage Treatment Plants**

**Domestic and Commercial Pumping Stations**

**Rainwater Harvesting Systems**

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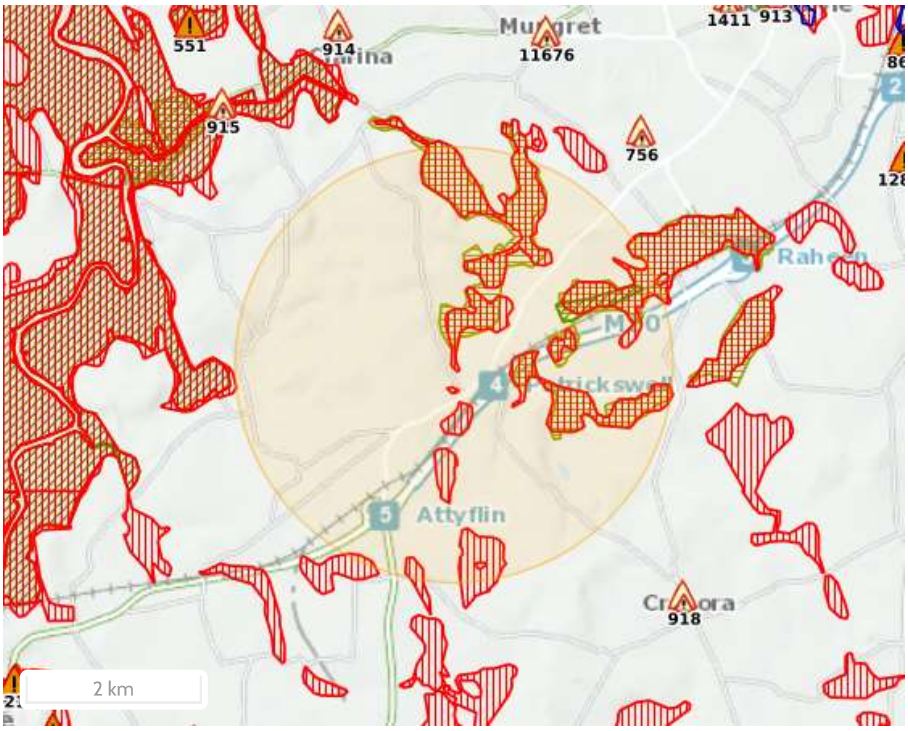
# Appendix D

# Past Flood Event Local Area Summary Report

Report Produced: **24/8/2022 10:39**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "**Website**"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.




## Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

## 0 Results

| Name (Flood_ID) | Start Date | Event Location |
|---|---|---|