A L DAINES
& PARTNERS
CONSULTING CIVIL &
STRUCTURAL ENGINEERS

28 CASTLE STREET,
CARLISLE, CUMBRIA CA3 8TP

TEL 01228 527428/522196
EMAIL mail@aldaines.co.uk
WEB www.aldaines.co.uk

Drainage Strategy Report and Flood Risk Assessment

THOMAS GRAHAM, EGREMONT

16080

MAY 23

A L Daines & Partners LLP, Registered in England & Wales, Registration No. OC373173,
Registered Office 6 Brunswick Street, Carlisle CA1 1PN.
Partners: E Shimmin C.Eng M.I.C.E. & M Briggs C.Eng M.I.C.E

Contents

Appendices

INTRODUCTION

A L Daines & Partners (ALD) have been instructed to undertake a Surface and Foul Water Drainage Strategy and Flood Risk Assessment, in accordance with the National Planning Policy Framework (NPPF) [1], for the proposed 2.67ha commercial development accessed via Vale View, Egremont.

The purpose of this report is to provide a strategy to manage surface and foul water flows from the site, in support of the planning application, while fulfilling the requirements of the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA).

PLANNING POLICY

NPPF footnote 55 states that "*a site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use*."

Paragraph 169 reads *"Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:*

> *a) take account of advice from the lead local flood authority.*
> *b) have appropriate proposed minimum operational standards.*
> *c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*
> *d) where possible, provide multifunctional benefits."*

A major development, as per The Town and Country Planning Order 2015, is partly, but not wholly, categorised as development involving the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more and a development carried out on a site having an area of 1 hectare or more.

The Cumbria Minerals and Local Waste Plan – Strategic Flood Risk Assessment (June 2018) references the same criteria for local planning policy.

The site is therefore classified as a major development under the above criteria due to the proposals having a site area greater than 1ha and a floor area over 1000m^2.

PLANNING POLICY IN SITE CONTEXT

The site covers 2.67ha of greenfield site, and according to the most recent Environment Agency (EA) flood risk maps, lies entirely within Flood Zone 1.

The NPPF site categorisation Table 2 places a commercial development of this nature within the 'less vulnerable' category. Developments in the 'less vulnerable' category are acceptable within Flood Zone 1 and therefore the site-specific Flood Risk Assessment (FRA) need only be brief, see page 6.

SITE PLAN

The proposed development is located on an existing area of greenfield land to the east of Urban Fitness and to the west of the A595 at Egremont, Cumbria as shown on red line bordered plan in *Figure 1*.

Figure 1: Aerial photo of site - Google Maps

DEVELOPMENT DESCRIPTION

The proposed development will see one new access created off the Vale View, Egremont, leading to an industrial park to be built on the existing 2.67ha greenfield site. The existing ground is generally open grassed landscape which is currently grazed by livestock.

The proposed development hardstanding areas are split as follows:

- Total hardstanding area = 1.367ha
- Permeable Paving / greenspace = 1.303ha

The land generally runs in a westerly direction, with the high point located at the East of the site at 62.53m AOD and the low point at 46m AOD at the southwestern aspect of the site. The land is currently used for agricultural grazing purposes as open pasture with an existing field access onto the highway of Vale View.

PERMEABILITY AND SOIL PROFILE

British Geological Survey (BGS) and Land Information Systems (LandIS) mapping services have been used determine the following land make-up:

- Bedrock: St Bees Sandstone
- Superficial drift: Till, Devensian - Diamicton
- Soil: Soilscape 6 - Freely draining slightly acid loamy soils (as demonstrated within Appendix A, this result is inaccurate following a series of percolation testing undertaken on site)

CURRENT FOUL AND SURFACE WATER DRAINAGE PROVISION

Existing watercourses

The ordinary watercourse Beggar Gill flows along the northern boundary of the site prior to entering the river Ehen approximately 250m downstream. The current land use drains surface water into Beggar Gill. The development is proposing to discharge surface water into Beggar Gill as the preferred method of surface water disposal. The discharge rate for the surface water is to be at a maximum equal to the greenfield runoff rate for the development site.

Combined surface and foul water

There is an existing combined foul and surface water sewer adjacent to the northern boundary of the site within the carriageway of Vale View. The foul water from the development site is proposed to be pumped into the existing foul sewer. Find attached within *Appendix C* the United Utilities maps illustrating the locations of the sewer network in the vicinity of the development site.

FLOOD RISK ASSESSMENT (FRA)

As described earlier in the report, the current Environment Agency Flood Map for Planning shows the site to be located wholly within Flood Zone 1 as is illustrated within *Figure 2* below and is classified as less vulnerable.

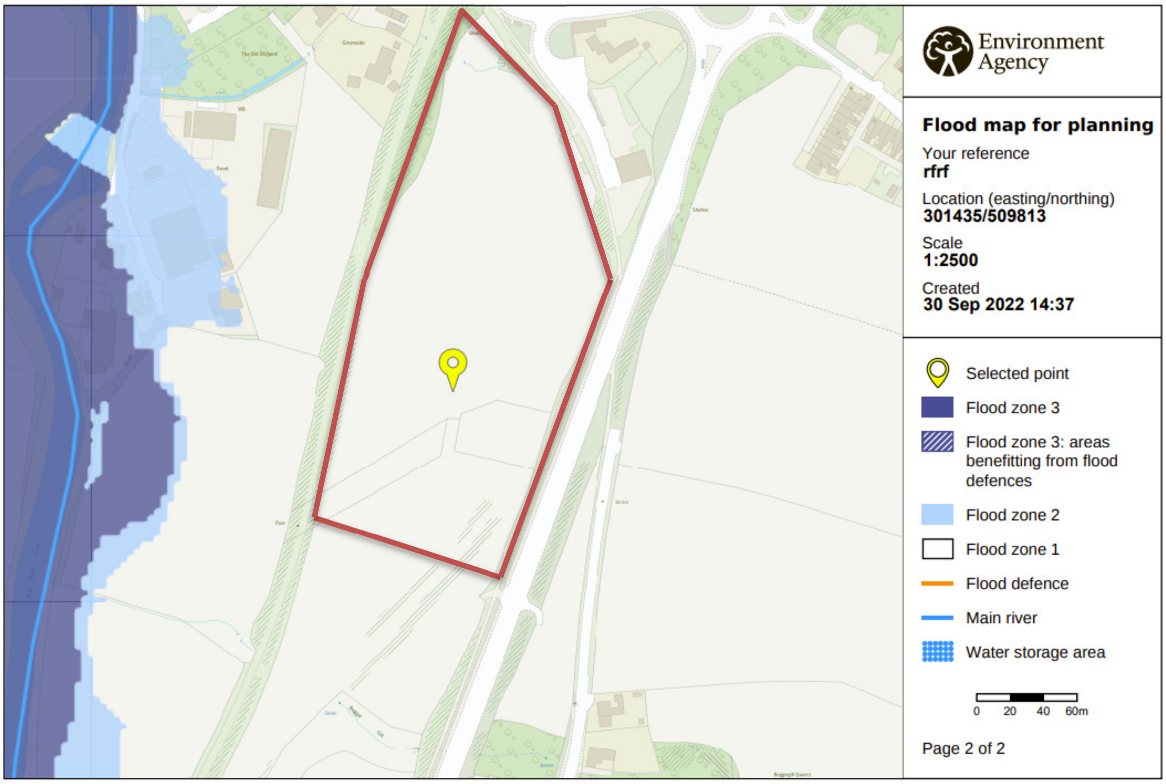


Figure 2: Flood map for planning

A full FRA is therefore not required, although the Environment Agency long term flood risk maps are included below to further inform this report.

Figure 3: EA long term flooding from surface water

The long-term flood risk from surface water is very low (0.1%) with no areas of the site showing any form of heightened flood risk.

Figure 4: EA long term flood risk from river or sea

The long-term flood risk from rivers or sea is very low (0.1%) with no areas of the site showing any form of heightened flood risk. Therefore, the risk to the new development is seen to be negligible.

SURFACE WATER DRAINAGE STRATEGY

The aim of the strategy is to provide a design which will avoid, reduce, and delay the discharge of surface water flows into public sewers and watercourses. This will aid in the protection of watercourses but will also ensure that no knock-on effects are seen beyond the site and that the risk of localised flooding and pollution within the site are reduced as far as possible.

To satisfy these criteria, surface water flows shall be subject to assessment via the hierarchy of drainage in accordance with the LASOO Non-Statutory Technical Standards for Sustainable Drainage: Practice Guidance. The hierarchy is as follows:

Hierarchy options:

1. Drain into the ground (infiltration).
2. To a surface water body.
3. To a surface water sewer, highway drain or another drainage system.
4. To a combined sewer.

The drainage strategy for the site is to be developed using the second level on the above hierarchy for the following reasons:

Drain into the ground (infiltration)

Four trial holes in accordance with the BRE 365 method were undertaken on site to test for infiltration. The results, as detailed within Appendix A of this report, have shown that the site is not suitable for infiltration as the method of surface water disposal. As such it is not proposed to discharge surface water via a soakaway.

Surface Water Body – highest viable drainage option route.

The ordinary water course Beggar Gill flows to the north of the development site. Due to the impermeability of the soil, as stated above, discharge into this system is proposed at a maximum of the greenfield run off rate (11.9/s) with attenuation provided on site to accommodate a 1 in 100 year plus 50% to account for climate change storm event. This is in line with the requirements of the Cumbria Development Design Guide.

Surface water sewer, highway drain or another drainage system

N/A

To a combined sewer

Foul water only is to be pumped into the existing combined sewer on Vale View, Egremont.

SURFACE WATER PROPOSED DESIGN

The greenfield run off calculations, via the ICP SuDS Mean Annual Flood method, for the site have been split into 4 distinct areas to provide their own flow controls and treatment systems. The areas are shown on drawing 21-C-16080-011 in *Appendix B*. The runoff rates are summarised below:

Area	QBar (l/s)
Area 1	5.1
Area 2	1.5
Area 3	3.6
Area 4	1.7
Total	11.9

In accordance with the earlier mentioned hierarchy of drainage options, the system has been designed to utilise permeable paving where possible and attenuation tanks to store surface water prior to discharge into Beggar Gill. Please find attached in *Appendix B* the greenfield runoff rate calculations. As per the LASOO guidance, the peak runoff rate from the development for the 1 in 1yr rainfall event and the 1 in 100yr rainfall event should not exceed the peak greenfield runoff for the same event. The design is also required to prevent flooding to any part of the site for storms up to and including the 1:30yr rainfall event, while any exceedance for the 6 hour 1:100yr event should be controlled within the site and should not flood any properties or service areas.

<u>Consideration of SuDS components</u>

A range of SuDS components are available and have been considered for use. Their applicability to the site has been addressed below:

- Rainwater harvesting – suitable for use on the site, however due to the use of the site there is no guarantee the systems have sufficient capacity for use during extreme events, therefore they have been discounted for site flow calculations.
- Soakaways – discounted due to poor infiltration demonstrated on site.
- Permeable paving – suitable for use on site parking areas. Poor infiltration rates will limit volumes able to be distributed so these shall not be used to take flows from additional hardstanding areas.
- Swales – Due to the extent of the hardstanding areas within the site there is not sufficient land available to allow safe construction and maintenance of swales. In addition, due to the steep topography of the site this feature has been discounted.
- Detention basins – Considered unsuitable due to large land uptake required and the steep nature of the site slopes and gradients – discounted.
- Ponds/wetlands – Considered unsuitable due to large land uptake required and the steep nature of the site slopes and gradients – discounted.
- Underground closed storage crate/tank systems – Considered viable for use however should not be used in preference to open SuDS systems where these are available. Viable

Climate change

Environment Agency guidance issued in 2022 estimates that peak rainfall intensity will increase due to climate change over the next 100 years. There is therefore an allowance of 50% attributed to the 30yr and 100yr storm event calculations in line with the Upper End estimate of rainfall increases for small and urban catchments.

Percentage impermeability (PIMP)

All impermeable area is modelled as 100% PIMP. This will allow for sufficient capacity for all hardstanding areas to be positively drained.

Volumetric Runoff Coefficient (Cv)

Industry standard Cv values vary for summer and winter and account for water volumes which do not enter the drainage system i.e., that is lost through infiltration, depression storage, evaporation, initial wetting etc. Standard values are 0.75 for summer and 0.84 for winter.

In this instance, only hardstanding areas are modelled and therefore the standard values have been uplifted to 0.85 and 0.95 respectively for both summer and winter storms. This results in conservative design with no infiltration allowance.

Surface water quality

The SuDS Manual provides best industry practice for assessing the pollutant potential of developments and providing mitigation methods to increase run off water quality using SuDS components.

The simple index approach has been utilised to assess the pollutant hazard indices and proposed treatment components. Note, this has been carried out in conjunction with the above SuDS component suitability assessment for the site and as such many features have already been discounted.

Table 26.2 from The SuDS Manual below outlines the pollution hazard indices for different land uses.

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	**Pollution hazard level**	**Total suspended solids (TSS)**	**Metals**	**Hydro-carbons**
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 5 SuDS Manual Table 26.2 Pollution hazard indices

This development is to be classed as a ‘Medium’ risk land use due to the presence of commercial yards with delivery areas and non-residential car parking. Due to the site layout and differing levels of pollution hazard, it is proposed to treat each area separately and therefore keep each SuDS ‘train’ separate. This ensures that flows are treated relative to their pollution indices and that flows are treated prior to the proposed attenuation areas; therefore, preventing any pollution build up.

This level of risk demands the following level of pollution control:

Land use	Suspended solids	Metal	Hydrocarbons
Other roofs	0.3	0.2	0.05
Parking/access road	0.7	0.6	0.7
Commercial Yard Areas	0.7	0.6	0.7

As per section 26.7.1 each SuDS component should be included in the total mitigation with a reduction of 50% for every additional component after the first. The highest risk element comes from the commercial yard areas and access roads, which are to be constructed using concrete / tarmac surfacing. As the loadings present will not allow for permeable surfacing, it is proposed to treat the runoff via a proprietary separator prior to entry into the below ground storage. As can be seen below, this mitigation provides sufficient treatment for these elements.

Land use	Suspended solids	Metal	Hydrocarbons
Commercial Yard Area / parking and access roads	0.7	0.6	0.7
Kingspan AquaTreat Separator	0.85	0.64	0.99

The shop and storage roof areas are categorised with a lower level of risk and therefore shall be routed through an ACO V Septor to ensure efficient removal of pollutants.

Land use	Suspended solids	Metal	Hydrocarbons
Other Roofs	0.3	0.2	0.05
ACO V-Septor	0.5	0.5	0.4

The above table shows that an ACO V-Septor would provide sufficient pollutant removal for the other roof area categories on the development site. The introduction of further treatment would be deemed inappropriate for a development of this scale.

The manufacturers specification sheets for the proprietary treatment systems stated above are located within *Appendix E.*

<u>Surface water drainage proposals</u>

Based on the above assessments, it is proposed that drainage system will convey flows from the commercial development via gravity, to Beggar Gill. The system will accept all storm events up to 1:100yr + 50% allowance for climate change.

Max site outflow: 11.9l/s (QBar)

Storage provision: Underground geocellular crate system

Treatment systems: Various proprietary systems as described above.

MAINTENANCE

All components shall be maintained in accordance with the relative requirements shown in the SuDS Manual. These intervals should be deemed as a minimum frequency and reference should also be made to the manufacturers guidance to ensure all components are maintained correctly.

Table 21.3 from the SuDS Manual for attenuation tanks has been included below for reference.

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Figure 7 SuDS Manual table 21.3 Attenuation storage maintenance

FOUL WATER DRAINAGE STRATEGY

All foul water from the development site will be pumped via a new rising main towards the combined sewer network within Vale View, to the north of the development site.

MANAGEMENT

All separate surface and foul water drainage systems within the site are proposed to remain private and be maintained by the site owner.

APPENDIX A – INFILTRATION TESTING

The infiltration tests were undertaken on Wednesday 5 October 2022. The weather conditions consisted of persistent showers in the morning with dry, brighter weather conditions in the afternoon.

Infiltration Test 1

Trial Hole 1000mm x 1700mm x 1000mm

Time	Time Elapsed (min)	Water Depth (mm)
Abandoned due to ingress of water before test could take place		

Infiltration Test 2

Trial Hole 1000mm x 1700mm x 1000mm

Time	Time Elapsed (min)	Water Depth (mm)
11:16	0	1000
11:21	5	950
11:42	26	950
12:02	46	950
12:32	76	950
13:02	106	950
13:32	136	950

Test abandoned at 14:00 due to a lack of infiltration.

Infiltration Test 3

Trial Hole 1000mm x 1700mm x 1000mm

Time	Time Elapsed (min)	Water Depth (mm)
Abandoned due to ingress of water before test could take place		

Infiltration Test 4

Trial Hole 1000mm x 1700mm x 1000mm

Time	Time Elapsed (min)	Water Depth (mm)
11:19	0	1000
11:25	6	1000
11:40	21	940
12:05	46	940
12:35	76	940
13:05	106	940
13:30	136	940

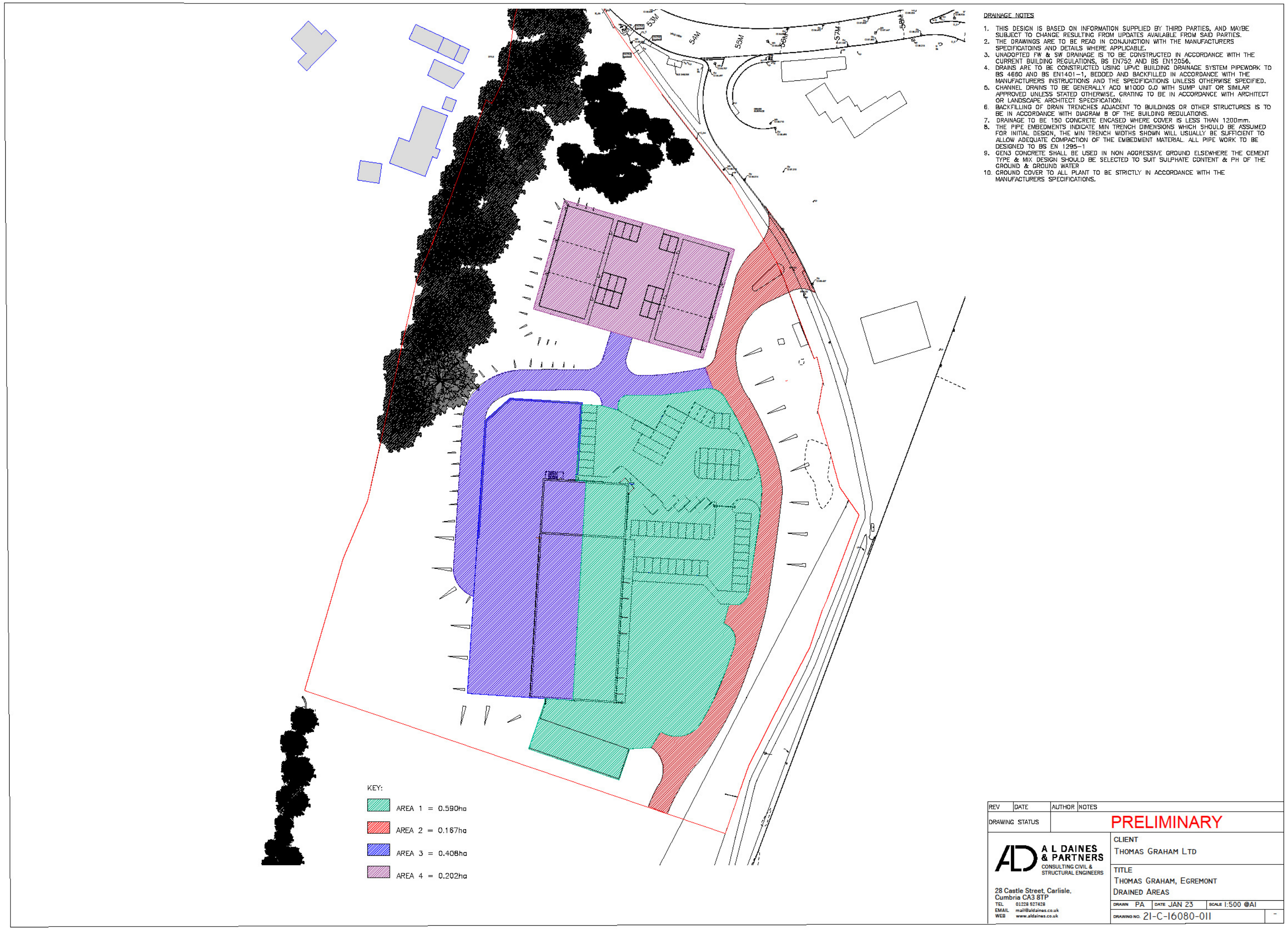
Test abandoned at 14:00 due to a lack of infiltration.


Figure A1: Photograph of infiltration testing undertaken on site (Trial Hole 4)

Figure A2: Photograph of a trial hole dug on site (Trial Hole 2)

Figure A3: Photograph of a trial hole dug on site (Trial Hole 1)

APPENDIX B – GREENFIELD RUNOFF CALCULATIONS



Overall Site

A L Daines & Partners		Page 1
28 Castle Street Carlisle CA3 8TP		
Date 06/04/2023 08:30 File	Designed by petera Checked by	
Micro Drainage	Source Control 2020.1.3	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	1.365	Urban	0.000
SAAR (mm)	1257	Region Number	Region 10

Results l/s

QBAR Rural	11.9
QBAR Urban	11.9
Q100 years	24.7
Q1 year	10.3
Q30 years	20.2
Q100 years	24.7

Area 1

A L Daines & Partners		Page 1
28 Castle Street Carlisle CA3 8TP		Micro Drainage
Date 06/04/2023 08:29 File	Designed by petera Checked by	
Micro Drainage	Source Control 2020.1.3	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.590	Urban	0.000
SAAR (mm)	1257	Region Number	Region 10

Results	**l/s**
QBAR Rural	5.1
QBAR Urban	5.1
Q100 years	10.7
Q1 year	4.5
Q30 years	8.7
Q100 years	10.7

Area 2

A L Daines & Partners		Page 1
28 Castle Street Carlisle CA3 8TP		
Date 06/04/2023 08:29 File	Designed by petera Checked by	
Micro Drainage	Source Control 2020.1.3	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.167	Urban	0.000
SAAR (mm)	1257	Region Number	Region 10

Results l/s

QBAR Rural 1.5
QBAR Urban 1.5

Q100 years 3.0

Q1 year 1.3
Q30 years 2.5
Q100 years 3.0

Area 3

A L Daines & Partners		Page 1
28 Castle Street Carlisle CA3 8TP		
Date 06/04/2023 08:29 File	Designed by petera Checked by	
Micro Drainage	Source Control 2020.1.3	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.408	Urban	0.000
SAAR (mm)	1257	Region Number	Region 10

Results	**l/s**
QBAR Rural	3.6
QBAR Urban	3.6
Q100 years	7.4
Q1 year	3.1
Q30 years	6.0
Q100 years	7.4

Area 4

A L Daines & Partners		Page 1
28 Castle Street Carlisle CA3 8TP		
Date 06/04/2023 08:30 File	Designed by petera Checked by	
Micro Drainage	Source Control 2020.1.3	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.200	Urban	0.000
SAAR (mm)	1257	Region Number	Region 10

Results l/s

QBAR Rural 1.7
QBAR Urban 1.7

Q100 years 3.6

Q1 year 1.5
Q30 years 3.0
Q100 years 3.6

APPENDIX C – UNITED UTILITIES SEWER RECORDS

United Utilities
Water for the North West

A L Daines & Partners LLP

28
Castle Street,
Carlisle,
CA3 8TP

FAO:

How to contact us:

United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

Your Ref: t graham, egremont
Our Ref: UUPS-ORD-261426
Date: 23/03/2021

Dear Sirs

Location: t graham egremont

I acknowledge with thanks your request dated 18/03/2021 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

I trust the above meets with your requirements and look forward to hearing from you should you anything further.

If you have any queries regarding this matter please contact us .

Yours Faithfully,

[illegible]
Property Searches Manager

UUWaterLtd/041/03-15

United Utilities Water Limited
Registered in England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park,
Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

United Utilities
Water for the North West

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

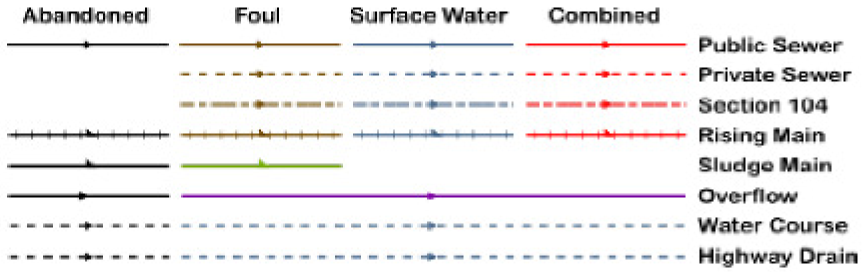
TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

UUWaterLtd/041/03-15

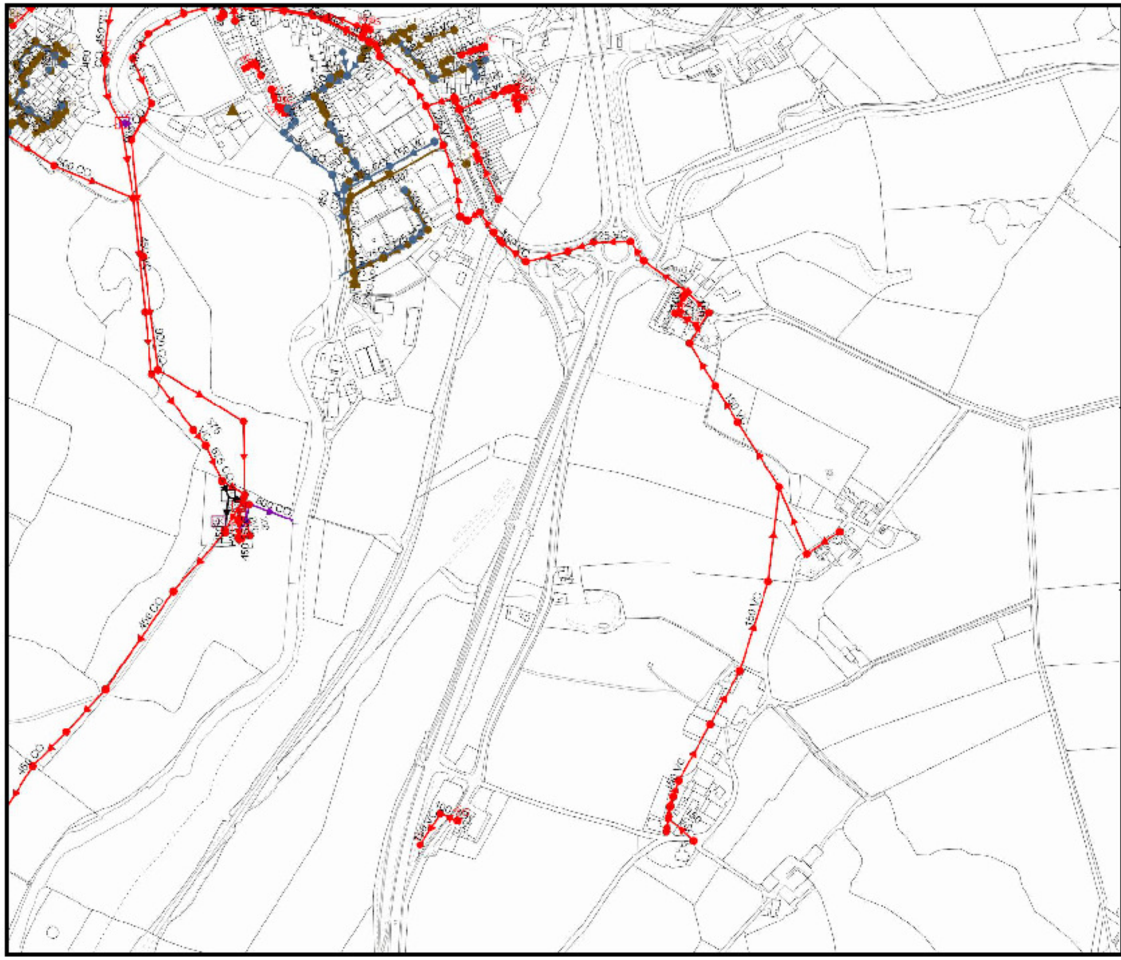
United Utilities Water Limited
Registered in England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

Wastewater Symbology



All point assets follow the standard colour convention: red – combined, brown - foul, blue – surface water, purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic



United Utilities
Water for the North West

SEWER RECORDS

Address or Site Reference

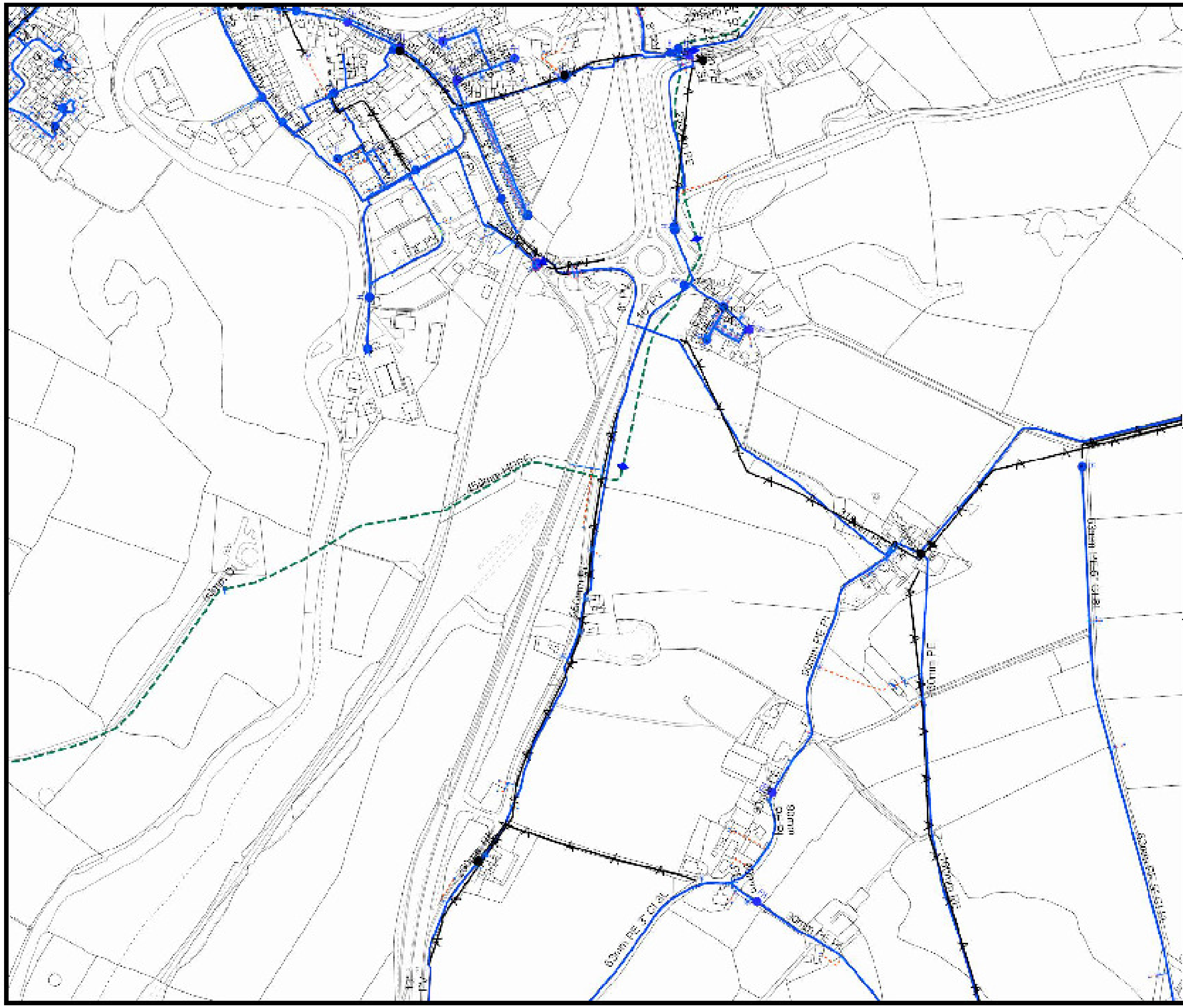
t graham egremont,

Scale: 1:5000
Date: 23/03/2021
Printed by: Property Searches

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

Clean Water Symbology

Symbology for proposed assets is the same as above, but shown in green
Symbology for abandoned assets is the same as above, but shown in black



United Utilities

Water for the North West

WATER MAIN RECORDS

Address or Site Reference

t graham egremont,

Scale:	1:5000
Date:	23/03/2021
Printed by:	Property Searches

The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

APPENDIX D – MICRO DRAINAGE CALCULATIONS

A L Daines & Partners		Page 1
28 Castle Street Carlisle CA3 8TP		
Date 02/05/2023 09:28 File MD CALCS SM.MDX	Designed by petera Checked by	
Micro Drainage	Network 2020.1.3	

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
3.005	OUTFALL	49.000	48.025	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	4
Number of Online Controls	4	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	22.000	Storm Duration (mins)	30
Ratio R	0.196		

A L Daines & Partners		Page 2
28 Castle Street Carlisle CA3 8TP		Micro Drainage
Date 02/05/2023 09:28 File MD CALCS SM.MDX	Designed by petera Checked by	
Micro Drainage	Network 2020.1.3	

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW09, DS/PN: 3.002, Volume (m³): 11.2

Unit Reference	MD-SHE-0107-5100-1000-5100
Design Head (m)	1.000
Design Flow (l/s)	5.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	107
Invert Level (m)	53.660
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.1
Flush-Flo™	0.297	5.1
Kick-Flo®	0.640	4.2
Mean Flow over Head Range	-	4.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.6	3.000	8.5	7.000	12.8
0.200	5.0	1.400	6.0	3.500	9.2	7.500	13.2
0.300	5.1	1.600	6.3	4.000	9.8	8.000	13.6
0.400	5.0	1.800	6.7	4.500	10.3	8.500	14.0
0.500	4.9	2.000	7.0	5.000	10.9	9.000	14.4
0.600	4.5	2.200	7.4	5.500	11.4	9.500	14.8
0.800	4.6	2.400	7.7	6.000	11.9		
1.000	5.1	2.600	8.0	6.500	12.3		

Hydro-Brake® Optimum Manhole: SW05, DS/PN: 4.004, Volume (m³): 67.1

Unit Reference	MD-SHE-0062-1500-0700-1500
Design Head (m)	0.700
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	62
Invert Level (m)	55.065
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Hydro-Brake® Optimum Manhole: SW05, DS/PN: 4.004, Volume (m³): 67.1

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	1.5
Flush-Flo™	0.211	1.5
Kick-Flo®	0.446	1.2
Mean Flow over Head Range	-	1.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	1.9	3.000	2.9	7.000	4.3
0.200	1.5	1.400	2.1	3.500	3.1	7.500	4.5
0.300	1.5	1.600	2.2	4.000	3.3	8.000	4.6
0.400	1.4	1.800	2.3	4.500	3.5	8.500	4.8
0.500	1.3	2.000	2.4	5.000	3.7	9.000	4.9
0.600	1.4	2.200	2.5	5.500	3.9	9.500	5.0
0.800	1.6	2.400	2.6	6.000	4.0		
1.000	1.8	2.600	2.7	6.500	4.2		

Hydro-Brake® Optimum Manhole: SW16, DS/PN: 6.004, Volume (m³): 8.1

Unit Reference	MD-SHE-0095-3600-0700-3600
Design Head (m)	0.700
Design Flow (l/s)	3.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	95
Invert Level (m)	49.200
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	3.6
Flush-Flo™	0.210	3.6
Kick-Flo®	0.471	3.0
Mean Flow over Head Range	-	3.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	0.300	3.5	0.500	3.1	0.800	3.8
0.200	3.6	0.400	3.4	0.600	3.4	1.000	4.2

Hydro-Brake® Optimum Manhole: SW16, DS/PN: 6.004, Volume (m³): 8.1

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.200	4.6	2.400	6.4	5.000	9.0	8.000	11.3
1.400	5.0	2.600	6.6	5.500	9.4	8.500	11.6
1.600	5.3	3.000	7.1	6.000	9.8	9.000	12.0
1.800	5.6	3.500	7.6	6.500	10.2	9.500	12.3
2.000	5.9	4.000	8.1	7.000	10.6		
2.200	6.1	4.500	8.6	7.500	10.9		

Hydro-Brake® Optimum Manhole: SW19, DS/PN: 7.001, Volume (m³): 7.5

Unit Reference	MD-SHE-0062-1200-0200-1200
Design Head (m)	0.200
Design Flow (l/s)	1.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	62
Invert Level (m)	52.500
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.200	1.2
Flush-Flo™	0.086	1.2
Kick-Flo®	0.159	1.1
Mean Flow over Head Range	-	0.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.2	1.200	2.7	3.000	4.2	7.000	6.4
0.200	1.2	1.400	2.9	3.500	4.5	7.500	6.6
0.300	1.4	1.600	3.1	4.000	4.8	8.000	6.8
0.400	1.6	1.800	3.3	4.500	5.1	8.500	7.0
0.500	1.8	2.000	3.4	5.000	5.4	9.000	7.2
0.600	2.0	2.200	3.6	5.500	5.7	9.500	7.4
0.800	2.2	2.400	3.7	6.000	5.9		
1.000	2.5	2.600	3.9	6.500	6.2		

Storage Structures for Storm

Porous Car Park Manhole: SW10, DS/PN: 3.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	38.0
Membrane Percolation (mm/hr)	1000	Length (m)	85.0
Max Percolation (l/s)	897.2	Slope (1:X)	46.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	53.820	Membrane Depth (mm)	400

Cellular Storage Manhole: SW09, DS/PN: 3.002

Invert Level (m)	53.660	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	650.0	0.0	0.961	0.0	0.0
0.960	650.0	0.0			

Cellular Storage Manhole: SW16, DS/PN: 6.004

Invert Level (m)	49.475	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	650.0	0.0	0.961	0.0	0.0
0.960	650.0	0.0			

Cellular Storage Manhole: SW19, DS/PN: 7.001

Invert Level (m)	52.500	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	350.0	0.0	0.961	0.0	0.0
0.960	350.0	0.0			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff 0.750 Foul Sewage per hectare (l/s) 0.000
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 4
Number of Online Controls 4 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 50, 50

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
3.000	SW11	15 Winter	1	+0%					54.122
3.001	SW10	60 Summer	1	+0%	100/30 Summer				53.972
3.002	SW09	720 Winter	1	+0%	30/60 Winter				53.813
4.000	SW01	15 Winter	1	+0%					55.845
4.001	SW02	240 Winter	1	+0%					55.412
4.002	SW03	240 Winter	1	+0%					55.412
4.003	SW04	240 Winter	1	+0%					55.412
5.000	SW07	240 Winter	1	+0%	30/30 Summer				55.412
5.001	SW06	240 Winter	1	+0%	30/15 Summer				55.412
4.004	SW05	240 Winter	1	+0%	1/15 Summer				55.412
3.003	SW08	720 Winter	1	+0%					53.527
6.000	SW12	15 Winter	1	+0%					52.994
6.001	SW13	15 Winter	1	+0%					52.078
6.002	SW14	15 Winter	1	+0%					49.627
6.003	SW15	360 Winter	1	+0%	100/180 Winter				49.538
6.004	SW16	360 Winter	1	+0%	1/15 Summer				49.537
3.004	SW17	720 Winter	1	+0%					48.644
7.000	SW20	15 Winter	1	+0%					53.075
7.001	SW19	720 Winter	1	+0%	100/240 Winter				52.617
3.005	SW18	720 Winter	1	+0%					48.212

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	SW11	-0.328	0.000	0.15			23.6	OK	
3.001	SW10	-0.298	0.000	0.25		12	39.5	OK	
3.002	SW09	-0.147	0.000	0.06		324	4.7	OK	
4.000	SW01	-0.245	0.000	0.08			3.3	OK	
4.001	SW02	-1.133	0.000	0.00			1.9	OK	
4.002	SW03	-1.003	0.000	0.00			2.1	OK	
4.003	SW04	-0.953	0.000	0.00			2.4	OK	
5.000	SW07	-0.113	0.000	0.03			0.9	OK	
5.001	SW06	-0.083	0.000	0.06			1.6	OK	
4.004	SW05	0.197	0.000	0.03			1.5	SURCHARGED	
3.003	SW08	-0.273	0.000	0.02			6.2	OK	
6.000	SW12	-0.231	0.000	0.12			16.4	OK	
6.001	SW13	-0.222	0.000	0.15			30.6	OK	
6.002	SW14	-0.473	0.000	0.10			44.6	OK	
6.003	SW15	-0.362	0.000	0.03			11.5	OK	
6.004	SW16	0.112	0.000	0.14		168	3.6	SURCHARGED	
3.004	SW17	-0.106	0.000	0.55			9.6	OK	
7.000	SW20	-0.375	0.000	0.06			24.5	OK	
7.001	SW19	-0.333	0.000	0.00		408	1.2	OK	
3.005	SW18	-0.138	0.000	0.32			10.8	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff 0.750 Foul Sewage per hectare (l/s) 0.000
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 4
Number of Online Controls 4 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 50, 50

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
3.000	SW11	15 Winter	30	+50%					54.261
3.001	SW10	720 Winter	30	+50%	100/30 Summer				54.224
3.002	SW09	720 Winter	30	+50%	30/60 Winter				54.221
4.000	SW01	15 Winter	30	+50%					55.899
4.001	SW02	480 Winter	30	+50%					55.871
4.002	SW03	480 Winter	30	+50%					55.871
4.003	SW04	480 Winter	30	+50%					55.871
5.000	SW07	480 Winter	30	+50%	30/30 Summer				55.872
5.001	SW06	480 Winter	30	+50%	30/15 Summer				55.872
4.004	SW05	480 Winter	30	+50%	1/15 Summer				55.871
3.003	SW08	120 Winter	30	+50%					53.528
6.000	SW12	15 Winter	30	+50%					53.065
6.001	SW13	15 Winter	30	+50%					52.174
6.002	SW14	600 Winter	30	+50%					49.867
6.003	SW15	600 Winter	30	+50%	100/180 Winter				49.866
6.004	SW16	600 Winter	30	+50%	1/15 Summer				49.866
3.004	SW17	120 Winter	30	+50%					48.645
7.000	SW20	15 Winter	30	+50%					53.149
7.001	SW19	720 Winter	30	+50%	100/240 Winter				52.929
3.005	SW18	720 Winter	30	+50%					48.214

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	SW11	-0.189	0.000	0.56			85.8	OK	
3.001	SW10	-0.046	0.000	0.19		408	30.1	OK	
3.002	SW09	0.261	0.000	0.07			5.1	SURCHARGED	
4.000	SW01	-0.191	0.000	0.28			12.2	OK	
4.001	SW02	-0.674	0.000	0.00			3.8	OK	
4.002	SW03	-0.544	0.000	0.00			1.9	OK	
4.003	SW04	-0.494	0.000	0.00			2.1	OK	
5.000	SW07	0.347	0.000	0.06			1.9	SURCHARGED	
5.001	SW06	0.377	0.000	0.14			3.8	SURCHARGED	
4.004	SW05	0.656	0.000	0.04			1.6	SURCHARGED	
3.003	SW08	-0.272	0.000	0.02			6.5	OK	
6.000	SW12	-0.160	0.000	0.43			60.0	OK	
6.001	SW13	-0.126	0.000	0.62			123.0	OK	
6.002	SW14	-0.233	0.000	0.06			25.8	OK	
6.003	SW15	-0.034	0.000	0.08			25.5	OK	
6.004	SW16	0.441	0.000	0.14		680	3.6	SURCHARGED	
3.004	SW17	-0.105	0.000	0.56			9.7	OK	
7.000	SW20	-0.301	0.000	0.24			90.1	OK	
7.001	SW19	-0.021	0.000	0.00			1.7	OK	
3.005	SW18	-0.136	0.000	0.33			11.3	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff 0.750 Foul Sewage per hectare (l/s) 0.000
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 4
Number of Online Controls 4 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 50, 50

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
3.000	SW11	720 Winter	100	+50%					54.379
3.001	SW10	720 Winter	100	+50%	100/30 Summer				54.379
3.002	SW09	720 Winter	100	+50%	30/60 Winter				54.377
4.000	SW01	600 Winter	100	+50%					56.049
4.001	SW02	600 Winter	100	+50%					56.049
4.002	SW03	600 Winter	100	+50%					56.049
4.003	SW04	600 Winter	100	+50%					56.049
5.000	SW07	600 Winter	100	+50%	30/30 Summer				56.050
5.001	SW06	600 Winter	100	+50%	30/15 Summer				56.050
4.004	SW05	600 Winter	100	+50%	1/15 Summer				56.049
3.003	SW08	60 Winter	100	+50%					53.528
6.000	SW12	15 Winter	100	+50%					53.089
6.001	SW13	15 Winter	100	+50%					52.207
6.002	SW14	720 Winter	100	+50%					50.014
6.003	SW15	720 Winter	100	+50%	100/180 Winter				50.013
6.004	SW16	720 Winter	100	+50%	1/15 Summer				50.012
3.004	SW17	720 Winter	100	+50%					48.647
7.000	SW20	15 Winter	100	+50%					53.171
7.001	SW19	720 Winter	100	+50%	100/240 Winter				53.053
3.005	SW18	720 Winter	100	+50%					48.217

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	SW11	-0.071	0.000	0.09			14.3	OK	
3.001	SW10	0.109	0.000	0.22		624	34.8	SURCHARGED	
3.002	SW09	0.417	0.000	0.07			5.1	SURCHARGED	
4.000	SW01	-0.041	0.000	0.05			2.2	OK	
4.001	SW02	-0.496	0.000	0.00			4.1	OK	
4.002	SW03	-0.366	0.000	0.00			1.7	OK	
4.003	SW04	-0.316	0.000	0.00			1.9	OK	
5.000	SW07	0.525	0.000	0.07			2.1	SURCHARGED	
5.001	SW06	0.555	0.000	0.15			4.1	SURCHARGED	
4.004	SW05	0.834	0.000	0.04			1.7	SURCHARGED	
3.003	SW08	-0.272	0.000	0.02			6.5	OK	
6.000	SW12	-0.136	0.000	0.56			77.4	OK	
6.001	SW13	-0.093	0.000	0.80			158.8	OK	
6.002	SW14	-0.086	0.000	0.06			28.5	OK	
6.003	SW15	0.113	0.000	0.09			28.2	SURCHARGED	
6.004	SW16	0.587	0.000	0.15			3.9	SURCHARGED	
3.004	SW17	-0.103	0.000	0.57			10.0	OK	
7.000	SW20	-0.279	0.000	0.31			116.3	OK	
7.001	SW19	0.103	0.000	0.00			1.9	SURCHARGED	
3.005	SW18	-0.133	0.000	0.35			11.9	OK	

APPENDIX E – TREATMENT SYSTEMS

Mitigation Indices

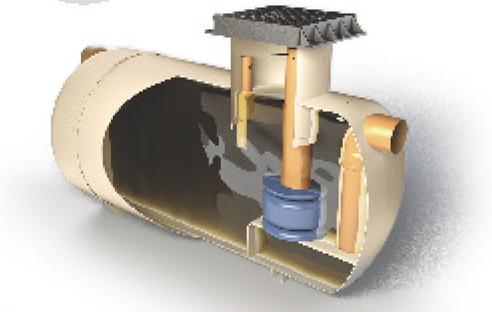
TSS	Metals	Hydrocarbons
0.85	0.64**	0.99

1,000 – 30,840m²
Available to cover flow rates up to 285 litres per second

3 YR WARRANTY PERIOD*

Why choose an AquaTreat separator?

- Larger silt storage capacities (compared to vortex separators)
- Meets excellent SuDS indices ratings (compared to vortex separators)
- Our indices cater for high polluted lands (single piece solution)
- Reduced risk of silt build up
- Lesser risk of downstream pollution in SuDS solution due to high capacity silt storage
- Our range is tested against full flow**
- Easier servicing, with maintenance from ground level
- SmartServ Pro remote monitoring solution (available as optional extra)



**** Our range has been tested against full flow - why is this important?**
Our units have been tested at their maximum flow rate (10l/s), unlike some products which have been tested based on bypass and therefore only 10% of the flow. This ensures total accuracy of our silt retention results, by replicating the full effect of the silt wash through.

As part of our Planet Passionate programme, Kingspan are dedicated to delivering innovative surface water management technologies, developed on the back of 65 years' experience.

*Terms and conditions apply. View online at https://www.kingspan.com/gb/en-gb/products/wastewater-management/warranty-terms

Kingspan. PLANET PASSIONATE

Klargester AquaTreat
Surface Water Treatment Separator Range

Technical Specifications

Model	Treatment device capacity [l]	Treatment flow rate [l/s]	Connectable surface [m²]	Particulate storage capacity [l]	Hydrocarbons storage capacity [l]
SWT010	2450	10	1000	1000	100
SWT015	3600	15	1470	1500	150
SWT020	7300	20	2000	2000	200
SWT030	9150	30	3735	3000	300
SWT040	11000	40	4500	4000	400
SWT050	13400	50	5470	5000	500
SWT065	17250	65	7040	6500	650
SWT080	24800	80	10125	8000	800
SWT100	27100	100	11065	10000	1000
SWT125	32950	125	13450	12500	1250
SWT150	40650	150	16600	15000	1500
SWT175	47380	175	19340	17500	1750
SWT200	52650	200	21500	20000	2000
SWT210	56200	210	14105	21000	2100
SWT225	60100	225	15013	22500	2250
SWT240	63950	240	15909	24000	2400
SWT255	67850	255	16817	25500	2550
SWT270	71700	270	17724	27000	2700
SWT285	75550	285	18620	28500	2850

DIBt at 10l/s	
Hydrocarbon retention	99.7%
Particulate retention efficiency	85.5%
Zinc retention efficiency**	64%
Copper retention efficiency**	64%

** Reduction of heavy metals by collecting and retaining suspended solids is assumed as 75%.

British Water CoP testing results available on request.

For more information on any of our products: T: +44 (0)1296 633 209
E: elliott.evans@kingspan.co.uk or visit **kingspan.co.uk/klargester**

4359-gb-02/2022-v1

ACO. creating
the future of drainage

ACO V-Septor – Hydrodynamic Separator

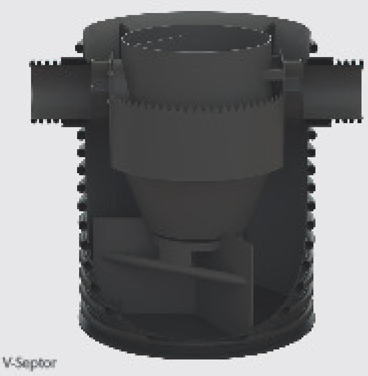
The ACO V-Septor is an advanced hydrodynamic separator that removes sediment bound contaminants. Its design enables removal of pollutants by means of settlement and the capture of floatables.

The ACO V-Septor is available in a range of sizes to accommodate small to large sites and can be custom made for demanding installations.

The ACO V-Septor retains solid pollution and oil. It also forms part of the SuDS management train as it removes over 50% of fine Total Suspended Solids as well as sediment bound metals and hydrocarbons.

Benefits

- Removes solid pollution – from plastic rubbish to fine silt
- Forms part of the SuDS management train
- Delivered fitted in a HDPE chamber with lifting eyes, and straps supplied for ease of installation
- Easily accessible for maintenance



ACO V-Septor

Hydrocarbons	Total suspended solids	Metals
0.5	0.5	0.4

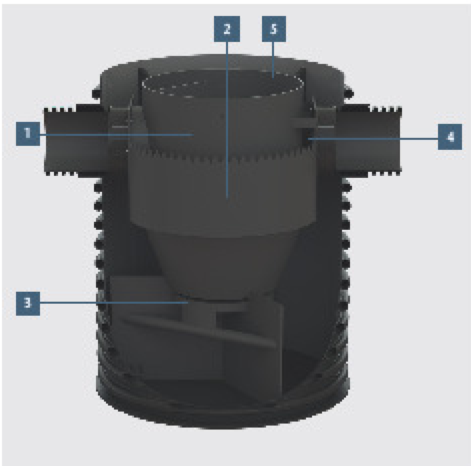
Liquid hydrocarbons	Sediment bound hydrocarbons
0.8	0.5

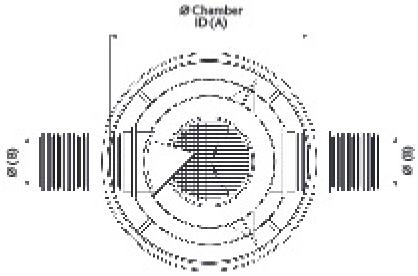
Details available on request

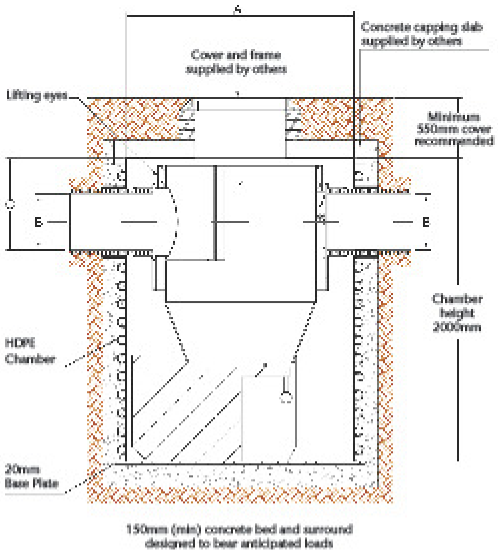
Product name	Product code	Chamber diameter (A)	Pipe connections (B)	Top to invert (C)	Sediment storage capacity	Oil / debris storage capacity	Typical treatment flow rate (fine)	Typical treatment flow rate (coarse)	Typical non remobilisation flow rate (coarse)
		mm	mm	mm	m³	l	l/s	l/s	l/s
ACO V-Septor - Hydrodynamic Separator Range									
V-Septor 750	40995	750	150	375	0.4	49	11	14	37
V-Septor 1000	41000	1050	225	483	0.6	335	20	25	67
V-Septor 1200	41003	1200	300	550	0.86	397	29	37	98
V-Septor 1500	41005	1500	375	608	1.2	785	45	57	151
V-Septor 2000	41009	2100	500	700	2.2	1130	80	102	269
V-Septor 2500	41013	2400	600	850	3.5	2010	125	159	421

How it works

1. The deflection plate directs the incoming stormwater to create a vertical vortex.
2. Suspended solids settle down in the sludge chamber. Light liquids and debris are captured at the surface.
3. Radial flow baffles create isolated zones to retain sediments in the sludge chamber and prevent remobilisation of sediments during peak flow events.
4. Cleaned water flows up the outer chamber and over the balancing weir and then passes through the outlet to discharge to the water environment.
5. Captured solids and debris can easily be removed by suction hose during maintenance.







ACO Water Management Contacts:
Sales: uk-swc@aco.co.uk
Technical: technical@aco.co.uk
Tel: 01462 816666
www.aco.co.uk

ACO. creating
the future of drainage

ACO