



TRUE Consulting Engineers
Specialist advisors in innovative solutions

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APPENDIX D

Percolation Testing Report

Petrol Coedpoeth, Coedpoeth

SUBADRA

Environmental - Geotechnical - Laboratory - Foundations

13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Tel: 01296 739400 Email: consultants@subadra.com

Matthew Easterbrook
Williams Southern Ltd
Southern House
Eagle Close
Plymouth
PL7 5HZ

Ref: CP17129 CL 002

Date: 16th April 2018

Dear Matthew

Soakaway Test Report - Petrol Coedpoeth, Coedpoeth

You recently instructed us to undertake soakaway testing at Petrol Coedpoeth in Coedpoeth. This letter documents the works we undertook and the results from our testing.

Soakaway Details and Test Methodology

We attended site on 5th April 2018 to complete soakaway testing. You were responsible for identifying below ground services and locating suitable locations for excavating test pits based on the proposed test pit location plan issued by yourself prior to our attending site.

The two test pits you requested were excavated as close to your proposed locations as possible, however we were unable to gain machinery access to the rear of the property. Subsequently both test pits were located at the front of the property. A test pit location plan is provided as Attachment Two.

Your operatives excavated two test pits (denoted TP1 to TP2) to 2.5m deep using an 8 tonne excavator. No groundwater was encountered in either of the test pits.

We filled the test pits with water and began monitoring the water levels. We recorded water levels within the pit until they reached a depth equivalent to less than 25% of the original effective storage volume, or the end of the working day (whichever came soonest). Tests are required to be completed three times to be compliant with Building Research Establishment 365 however based on the low infiltration rates we observed on the first day, you instructed us to abandon testing before the first fills had been completed.

Test Pit Geological Summary:

The geology we encountered in each test pit was logged in accordance with British Standard 5930. Full test pit logs are included in Attachment Two and are summarised in the following table

Geology Encountered	Layer	Unit	Description
	Layer I	Made Ground	Tarmac hardstanding overlying soft to firm light brown sandy (reworked) clay.
	Layer II	Glacial Till	Firm to stiff light brown becoming dark brown sandy clay.

Continued on the following page

Client: Williams Southern Ltd

Subadra Consulting Ltd. Registered in
England No. 4586038
Registered Office 13 Triangle Business
Park, Stoke Mandeville, HP22 5BL

Our Ref

CP17129 CL 002

Date

16th April 2018

Page

1

Petrol Coedpoeth, Coedpoeth

SUBADRA

Environmental - Geotechnical - Laboratory - Foundations

13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Tel: 01296 739400 Email: consultants@subadra.com

Continued from the previous page

Geology Encountered	Depth to Base of Layer		
		TP1	TP2
	Layer I	0.8	0.8
	Layer II	>2.5	>2.5
Groundwater Strike?		None encountered	None encountered

All dimensions in meters below ground level

Table One: Soil Lithology

The results of our soakaway testing is summarised in Table Two below.

Location	Test Pit Dimension L x W x D (m)	Soil Infiltration Rate (m/sec)		
		First Fill	Second Fill	Third Fill
TP1	2.0 x 0.6 x 2.5	<10 ⁻⁷	-	-
TP2	2.0 x 0.6 x 2.5	<10 ⁻⁷	-	-

Table Two: Soakaway Test Results

We recorded very little fall in the water level across all the test pits over a three hour period. Although we have insufficient data to extrapolate reliably, our data indicates the permeability is likely to be less than 10⁻⁷m/sec.

Discussion:

We have carried out two soakaway tests. The test pits were constructed in the Glacial Till and no groundwater was encountered. We observed only limited discharge from the test pits over a three hour period, with water levels dropping by a maximum of 7mm. In agreement with yourselves, we abandoned further testing.

We obtained insufficient data to allow us to reliably extrapolate a permeability value for soakaway design purposes. However we consider it likely that the permeability rate will be less than 10⁻⁷m/sec for all test locations. The use of standard soakaways is unlikely to be a viable drainage solution for this site at the depths tested.

If you have any questions or require any further information, please contact me directly.

Yours sincerely



Steven Partridge

Subadra Consulting Ltd

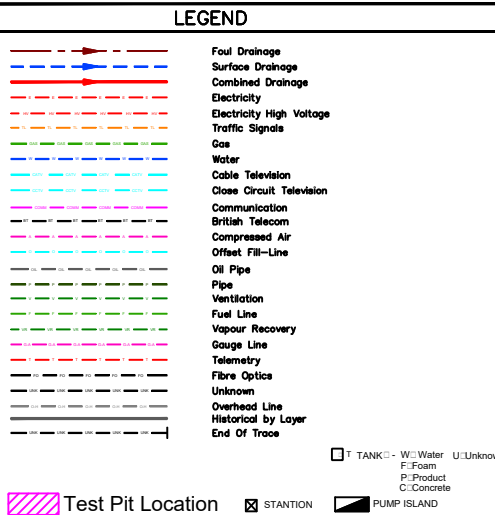
Attachments:

Attachment One: Notice to Interested Parties

Attachment Two: Test Pit Logs and Location Plan

Client: Williams Southern Ltd	Soakaway Test Report	Report	CP17129 CL 002
		Date	16 th April 2018
		Page	2

Unit 13, Triangle Business Park
Stoke Mandeville, Bucks HP22 5BL
Tel. 01296 739400 Fax. 01296 739400

[illegible]

LOCATION: CO-OP PFS COEDPOETH
HIGH STREET
WREXHAM
LL11 3UF

TEST PIT LOCATION PLAN

DESIGNED BY:	DRAWN BY:	APPROVED BY:
SVS LTD	MS/AW	PC

WING NO:	SURVEY DATE:
17129 DR 002	24-04-2018
SHEET NO:	REV:

1 OF 2

Borehole Log TP001

SUBADRA

Environmental - Geotechnical - Laboratory - Foundations

13 Triangle Business Park, Wendover Road
Stoke Mandeville, Bucks HP22 5BL

Tel. 01296 739400 Email: consultants@subadra.com

Project Name	CP17129 Petrol Coedpoeth	Coordinates	
Date	5th April 2018	Ground Level	
Site Engineer	Byron McGuone	Drilling Method	Excavator

Depth (m)	Well	Water Level	Log	Sample	Laboratory Analysis	Headspace (ppm)	SPT 'N' or Su (kPa)	Description
1								0.00m - 0.20m Made Ground Tarmac.
								0.20m - 0.80m Made Ground SOFT to FIRM light brown sandy CLAY (reworked).
2								0.80m - 2.50m Till FIRM TO STIFF light brown becoming dark brown sandy CLAY.
3								Borehole terminated at 2.50m
4								
5								
6								
7								
8								
9								
10								

 Prism.NET www.prismerp.co.uk	Well Diameter		Depth of Borehole	2.50m
	Well Casing Length		Depth to Groundwater	Dry
	Well Screen Length		Page	One of One

Borehole Log TP002

SUBADRA

Environmental - Geotechnical - Laboratory - Foundations

13 Triangle Business Park, Wendover Road
Stoke Mandeville, Bucks HP22 5BL

Tel. 01296 739400 Email: consultants@subadra.com

Project Name	CP17129 Petrol Coedpoeth	Coordinates	
Date	5th April 2018	Ground Level	
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Depth (m)	Well	Water Level	Log	Sample	Laboratory Analysis	Headspace (ppm)	SPT 'N' or Su (kPa)	Description
1								0.00m - 0.20m Made Ground Tarmac.
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2								0.80m - 2.50m Till FIRM TO STIFF light brown becoming dark brown sandy CLAY.
3								Borehole terminated at 2.50m
4								
5								
6								
7								
8								
9								
10								

 Prism.NET www.prismerp.co.uk	Well Diameter		Depth of Borehole	2.50m
	Well Casing Length		Depth to Groundwater	Dry
	Well Screen Length		Page	One of One



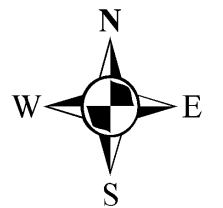
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APPENDIX E

Welsh Water Sewer Records and Correspondence

The Co-Operative, High Street, Coedpoeth



LEGEND(Representative of most common features)

	Waste network:		Foul chamber		Outfall
			Surface water chamber		Lampole
			Combined chamber		Storm Overflow
			Combined sewer overflow		Rising main
			Special purpose chamber		Gravity sewer
			Treatment works		Private sewer
			Pumping station		Private sewer subject to Sect. 104 adoption agreement
					Private Sewer Transfer
					Lateral Drain
					Inspection Chamber

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation.

Dŵr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

**EXACT LOCATIONS OF ALL APPARATUS
TO BE DETERMINED ON SITE.**

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Map Ref: 328098,351461
Map scale: 1:1250
Printed by: Parker Amanda
Printed on: 14 Mar 2018

Mike Quigley

From: Mike Quigley <mike.quigley@trueconsultant.co.uk>
Sent: Wednesday, May 2, 2018 11:54 AM
To: 'Jones Alaw'
Cc: ben.miller@williamsbuild.com; steve.morrell@trueconsultant.co.uk; James Large (james.large@williamsbuild.com)
Subject: Surface Water Drainage Discharge - Co-op petrol station-High Street- Coedpoeth

Alaw

Thank you for your response and agreement to allow us to make a storm water drainage discharge to the combined sewer network.

We have not yet looked at detailed design for the development, but are confident we will be able to reduce discharge to the combined sewer to a rate not exceeding 5L/s

Thank you for sorting this matter out for us.

Regards,
Mike

From: Jones Alaw [mailto:Alaw.Jones@dwrcymru.com]
Sent: Wednesday, May 2, 2018 8:36 AM
To: Mike Quigley
Subject: RE: Redevelopment of the Existing Co-op petrol station-High Street- Coedpoeth

Dear Mike,

Thank you for your e-mail.

In order for us to agree in principle to allow a surface water connection from the above development into the combined public sewer, we would seek for the surface water to be attenuated and discharged into the combined public sewer at a rate not exceeding 5l/s. If this is not possible, we would be grateful to receive evidence to demonstrate why this cannot be incorporated into the proposed development and clarification as to what would be the lowest viable discharge rate possible.

Should you have any queries, please do not hesitate to contact me.

Kind regards,
Alaw



Alaw Jones

**Development Control Officer | Developer Services | Wholesale Business Services | Services Dwr
Cymru Welsh Water**

Kinmel Park | Bodelwyddan | LL18 5TQ | T: 0800 917 2652 | www.dwrcymru.com

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*We will respond to your email as soon as possible but you should allow up to **10 working days** to receive a response. For most of the services we offer we set out the timescales that we work to on our Developer Services section of our*

website. Just follow this link <http://www.dwrcymru.com/en/Developer-Services.aspx> and select the service you require where you will find more information and guidance notes which should assist you. If you cannot find the information you are looking for then please call us on 0800 917 2652 as we can normally deal with any questions you have during the call.

If we've gone the extra mile to provide you with excellent service, let us know. You can nominate an individual or team for a Diolch award through our [website](#).

From: Mike Quigley [mailto:mike.quigley@trueconsultant.co.uk]
Sent: 02 May 2018 08:34
To: Jones Alaw <Alaw.Jones@dwrcymru.com>
Cc: steve.morrell@trueconsultant.co.uk; ben.miller@williamsbuild.com
Subject: RE: Redevelopment of the Existing Co-op petrol station-High Street- Coedpoeth
Importance: High

***** External Mail *****

Alaw

When we spoke last week you advised that you were having a meeting with your manager on Monday 30th April to discuss the storm water drainage discharge from our proposed development and would respond to us after the meeting.

We do not appear to have received a response to date.

Could you please confirm that a storm water drainage discharge to the combined sewer is acceptable as we need to make the Planning Application submission.

We look forward to hearing from you by return.

Regards,
Mike

From: Mike Quigley [<mailto:mike.quigley@trueconsultant.co.uk>]
Sent: Thursday, April 19, 2018 12:48 PM
To: 'Jones Alaw'
Cc: steve.morrell@trueconsultant.co.uk; ben.miller@williamsbuild.com
Subject: RE: Redevelopment of the Existing Co-op petrol station-High Street- Coedpoeth

Alaw

With reference to our above mentioned proposed development and your response below, we have been trying to establish if there is a highway drain that we could discharge storm water drainage into.

To date, we have been unsuccessful in identifying anyone within the Wrexham Highways Dept who can confirm the locations of their assets and whether or not a storm water drainage discharge would be feasible.

However, our discussions have led back to the Wrexham LLFA and we received the attached information from them. You will note that the properties opposite the site have recently flooded to what we believe to be a significant depth in their basement.

Welsh Water have confirmed to us in writing that they have no records of flooding from their apparatus in the area. The flood records provided by the LLFA indicate that the flooding is as a result of highway run off from Stoneleigh.

Given the local highway flooding issues, it would not be appropriate to make a discharge to any local highway drainage network.

As advised previously, there is no infiltration feasible on site due to the very low permeability of the sub soils, there is no local water course and there are no storm water sewers in the area.

Based on all the information now available, could you please confirm that Welsh Water will now allow the storm water drainage discharge to be maintained from the site into their combined sewer network.

Your earliest attention would be greatly appreciated.

Should you have any further questions please do not hesitate to contact me.

Regards,
Mike

From: Jones Alaw [<mailto:Alaw.Jones@dwrcymru.com>]

Sent: Thursday, April 12, 2018 8:54 AM

To: Mike Quigley

Subject: RE: Redevelopment of the Existing Co-op petrol station-High Street- Coedpoeth

Dear Mike,

Thank you for your e-mail in relation to the above redevelopment at the Co-op Petrol Station, High Street, Coedpoeth.

Having reviewed the information contained within your e-mail we would offer the following comments:

Foul

We note that there will be a reduction in foul flows as a result of the proposed redevelopment therefore it is considered that foul flows from the proposed development can be accommodated within the public sewerage system.

Surface Water

With reference to the surface water flows from the proposed development, due to the sensitivity of allowing surface water to enter the public sewerage system, you are required to fully exhaust all technical options outlined under Sections 3.2 and 3.4 of Part H of the publication 'Building Regulations 2000'. We note that you have explored utilising soakaways and a connection to surface water public sewers. Have you considered discharging surface water into a highway drain? Evidence will be required to demonstrate that all the priority levels have been fully exhausted. Discharge of surface water to the public sewer is only to be made as a last resort.

Advisory

It would appear that the site is crossed by private combined sewers as is shown on the public sewer extract plan attached to your e-mail.

You may need to apply to Dwr Cymru / Welsh Water for any connection to the public sewer under S106 of the Water Industry Act 1991. If the connection to the public sewer network is either via a lateral drain (i.e. a drain which extends beyond the connecting property boundary) or via a new sewer (i.e. serves more than one property), it is now a mandatory requirement to first enter into a Section 104 Adoption Agreement (Water Industry Act 1991). The design of the sewers and lateral drains must also conform to the Welsh Ministers Standards for Gravity Foul Sewers and Lateral Drains, and conform with the publication "Sewers for Adoption"- 7th Edition. Further information can be obtained via the Developer Services pages of www.dwrcymru.com

You are also advised that some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The presence of such assets may affect the proposal. In order to assist us in dealing with the proposal you may contact Dwr Cymru Welsh Water. Under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

If the development will give rise to a new discharge (or alter an existing discharge) of trade effluent, directly or indirectly to the public sewerage system, then a Discharge Consent under Section 118 of the Water Industry Act 1991 is required from Dwr Cymru / Welsh Water. Please note that the issuing of a Discharge Consent is independent of the planning process and a consent may be refused although planning permission is granted.

I hope the above is of assistance, but should you require any further information please do not hesitate to contact me.

Kind regards,
Alaw



Alaw Jones

Development Control Officer | Developer Services | Wholesale Business Services | Services Dwr Cymru Welsh Water

Kinnel Park | Bodelwyddan | LL18 5TQ | T: 0800 917 2652 | www.dwrcymru.com

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If we've gone the extra mile to provide you with excellent service, let us know. You can nominate an individual or team for a Diolch award through our [website](#).

From: Mike Quigley [<mailto:mike.quigley@trueconsultant.co.uk>]

Sent: 27 March 2018 10:39

To: Jones Alaw <Alaw.Jones@dwrcymru.com>

Cc: steve.morrell@trueconsultant.co.uk

Subject: Redevelopment of the Existing Co-op petrol station-High Street- Coedpoeth

***** External Mail *****

Dear Alaw,

Thank you for replying last week, sorry I was not available to talk to you.

Attached is the proposed redevelopment of the existing convenience store at the CO-OP, 84 High Street, Coedpoeth, LL11 3UF (SJ280514).

The client has purchased the adjacent property (Afallon) and intends to build a new convenience store to serve the local demand. Currently the impermeable area for both the CO-OP and the adjacent property is =1465m². The existing drainage survey demonstrates that both sites have an uncontrolled surface water discharge to the foul sewer (combined).

In accordance with current guidance we have investigated the use of soakaways as a means to drain the site's surface water via an infiltration system. Unfortunately the results provided by Subadra Geotechnical

have concluded that the near surface material consist of clay with very low permeability, and ground water levels are within 1.8m of existing ground. It will therefore not be feasible to use soakaways to drain the surface water.

We have obtained your record drawings and note there are no dedicated surface water sewers with the vicinity as they combine with the foul in Smelt Road.

We have reviewed the current infrastructure within the ground associated with the forecourt, and the factors noted above, and would like to propose the following strategy for your approval.

FOUL:

The proposed site will have reduced foul flows due the removal of the property. The convenience store will maintain its foul connection for the use of public and private WCs. The forecourt water will maintain its current status and go through an interceptor prior to connecting with the foul sewer.

Can you confirm there is adequate capacity to take the flows from the proposed development?

SURFACE WATER:

We have investigated the use of soakaways, which unfortunately are not viable.

We have considered whether the surface water from the proposed development could be attenuated before connecting with combined sewer. The infrastructure that serves the forecourt precludes the use of below ground storage as there is insufficient space available. The connection points within the curtilage of the adjacent property (Afallon) are likely to be head manholes and will be shallow, thereby requiring pumping of any proposed surface water storage.

We therefore propose an uncontrolled discharge for the surfaces water, with a reduction of impermeable area as betterment; the proposed impermeable area =1412m².

Can you confirm there is adequate capacity to take the flows from the proposed development?

Should you need to discuss any aspect please do not hesitate in contacting me.

Kind regards,

Mike Quigley
Drainage Highway Engineer



TRUE Consulting Engineers

Specialist advisors in innovative solutions

Ringslade House
Broadway Road

Mike Quigley

From: Humphreys Rachel <Rachel.Humphreys@dwrcymru.com>
Sent: Thursday, March 29, 2018 5:47 PM
To: mike.quigley@trueconsultant.co.uk
Cc: Sewerage Services
Subject: History of sewer flooding

Dear Mike

I write further to my telephone conversation with your colleague Steve Morrell earlier today.

I confirm that there is no history of flooding due to sewer overloading in the following area and there are no properties at risk of sewer flooding:

The Co-operative
High Street
Coedpoeth
LL11 3UF

I am making enquiries as to whether there is any other history of flooding and will update you accordingly.

Yours sincerely

Rachel Humphreys
Chartered Legal Executive

Tel: 01443 452383

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APPENDIX F

Micro Drainage Calculations for Attenuation Volume Requirements

True Consulting Engineers

Ringslade House
Broadway Road
Newton Abbot Devon TQ12 3EH

Date 02-May-18 12:57 PM
File QSE 1412m2 at 5ls.SRCX

XP Solutions

CO-OP Coedpoeth
Attenuation Estimate
1412m² at 5L/s

Designed by Mike Quigley
Checked by

Source Control 2017.1.2

Page 1



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

Half Drain Time : 70 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	48.206	0.406	0.0	5.0	5.0	21.6	O K
30 min Summer	48.329	0.529	0.0	5.0	5.0	28.1	O K
60 min Summer	48.426	0.626	0.0	5.0	5.0	33.3	O K
120 min Summer	48.474	0.674	0.0	5.0	5.0	35.9	O K
180 min Summer	48.465	0.665	0.0	5.0	5.0	35.4	O K
240 min Summer	48.434	0.634	0.0	5.0	5.0	33.7	O K
360 min Summer	48.363	0.563	0.0	5.0	5.0	29.9	O K
480 min Summer	48.292	0.492	0.0	5.0	5.0	26.2	O K
600 min Summer	48.226	0.426	0.0	5.0	5.0	22.7	O K
720 min Summer	48.168	0.368	0.0	5.0	5.0	19.6	O K
960 min Summer	48.076	0.276	0.0	4.9	4.9	14.7	O K
1440 min Summer	47.969	0.169	0.0	4.6	4.6	9.0	O K
2160 min Summer	47.913	0.113	0.0	3.9	3.9	6.0	O K
2880 min Summer	47.893	0.093	0.0	3.2	3.2	5.0	O K
4320 min Summer	47.875	0.075	0.0	2.4	2.4	4.0	O K
5760 min Summer	47.865	0.065	0.0	1.9	1.9	3.4	O K
7200 min Summer	47.859	0.059	0.0	1.6	1.6	3.1	O K
8640 min Summer	47.854	0.054	0.0	1.4	1.4	2.9	O K
10080 min Summer	47.851	0.051	0.0	1.3	1.3	2.7	O K
15 min Winter	48.260	0.460	0.0	5.0	5.0	24.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	94.367	0.0	24.9	17
30 min Summer	65.497	0.0	34.6	31
60 min Summer	43.553	0.0	46.0	58
120 min Summer	27.971	0.0	59.1	92
180 min Summer	21.230	0.0	67.3	126
240 min Summer	17.302	0.0	73.2	160
360 min Summer	12.936	0.0	82.0	226
480 min Summer	10.513	0.0	88.9	290
600 min Summer	8.942	0.0	94.5	352
720 min Summer	7.829	0.0	99.3	412
960 min Summer	6.339	0.0	107.2	530
1440 min Summer	4.697	0.0	119.1	752
2160 min Summer	3.469	0.0	132.0	1104
2880 min Summer	2.793	0.0	141.8	1468
4320 min Summer	2.053	0.0	156.3	2200
5760 min Summer	1.653	0.0	167.8	2936
7200 min Summer	1.397	0.0	177.3	3616
8640 min Summer	1.218	0.0	185.5	4352
10080 min Summer	1.085	0.0	192.8	5136
15 min Winter	94.367	0.0	27.9	17

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True Consulting Engineers		Page 3
Ringslade House Broadway Road Newton Abbot Devon TQ12 3EH	CO-OP Coedpoeth Attenuation Estimate 1412m ² at 5L/s	
Date 02-May-18 12:57 PM File QSE 1412m2 at 5ls.SRCX	Designed by Mike Quigley Checked by	
XP Solutions	Source Control 2017.1.2	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.291	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.141

Time (mins)	Area
From:	To: (ha)

0	4 0.141
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True Consulting Engineers		Page 4
Ringslade House Broadway Road Newton Abbot Devon TQ12 3EH	CO-OP Coedpoeth Attenuation Estimate 1412m ² at 5L/s	
Date 02-May-18 12:57 PM File QSE 1412m2 at 5ls.SRCX	Designed by Mike Quigley Checked by	
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Model Details

Storage is Online Cover Level (m) 50.200

Cellular Storage Structure

Invert Level (m) 47.800 Safety Factor 5.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	56.0	0.0	1.300	0.0	0.0
0.100	56.0	0.0	1.400	0.0	0.0
0.200	56.0	0.0	1.500	0.0	0.0
0.300	56.0	0.0	1.600	0.0	0.0
0.400	56.0	0.0	1.700	0.0	0.0
0.500	56.0	0.0	1.800	0.0	0.0
0.600	56.0	0.0	1.900	0.0	0.0
0.700	56.0	0.0	2.000	0.0	0.0
0.800	56.0	0.0	2.100	0.0	0.0
0.801	0.0	0.0	2.200	0.0	0.0
1.000	0.0	0.0	2.300	0.0	0.0
1.100	0.0	0.0	2.400	0.0	0.0
1.200	0.0	0.0	2.500	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0103-5000-1200-5000
Design Head (m) 1.200
Design Flow (l/s) 5.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 103
Invert Level (m) 47.800
Minimum Outlet Pipe Diameter (mm) 150
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.0
Flush-Flo™	0.354	5.0
Kick-Flo®	0.745	4.0
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

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Ringslade House Broadway Road Newton Abbot Devon TQ12 3EH	CO-OP Coedpoeth Attenuation Estimate 1412m² at 5L/s	
Date 02-May-18 12:57 PM File QSE 1412m2 at 5ls.SRCX	Designed by Mike Quigley Checked by	
XP Solutions	Source Control 2017.1.2	

Hydro-Brake® Optimum Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.4	1.200	5.0	3.000	7.7	7.000	11.5
0.200	4.7	1.400	5.4	3.500	8.3	7.500	11.8
0.300	5.0	1.600	5.7	4.000	8.8	8.000	12.2
0.400	5.0	1.800	6.0	4.500	9.3	8.500	12.6
0.500	4.9	2.000	6.3	5.000	9.8	9.000	12.9
0.600	4.7	2.200	6.6	5.500	10.2	9.500	13.3
0.800	4.1	2.400	6.9	6.000	10.7		
1.000	4.6	2.600	7.2	6.500	11.1		



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APPENDIX G

Maintenance Schedule for SuDS System

21.13 OPERATION AND MAINTENANCE REQUIREMENTS

Regular inspection and maintenance is required to ensure the effective long-term operation of below-ground storage systems. Maintenance responsibility for systems should be placed with a responsible organisation. **Table 21.3** provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required.

Maintenance Plans and schedules should be developed during the design phase, and will be specific to the type of tank that is adopted. Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements. Further detail on the preparation of maintenance specifications and schedules of work is given in **Chapter 32**.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

- Generic health and safety guidance is provided in **Chapter 36**.

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