

SURFACE & FOUL WATER DRAINAGE STRATEGY
FOR
PROPOSED RESIDENTIAL DEVELOPMENT,
AT LAND OFF HIGHSTOCK LANE,
GEDNEY HILL, SPALDING
PROJECT No: 12121
DOCUMENT REF: 12121-REP-01

For D Brown Builders



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1. INTRODUCTION

The following drainage strategy has been prepared on behalf of D Brown Builders to support a full planning application for a proposed 10 plot residential development, at Land off Highstock Lane, Gedney Hill.

This strategy is based upon G. R. Merchant Ltd. Site Layout drawing 3146-17-300 revision E, contained in Appendix A.

The object of this report is to clarify the design philosophy followed when preparing the proposed surface & foul water drainage arrangement and to outline the proposed solution in sufficient detail for all relevant parties to be able to comment. This assessment also demonstrates that the proposals are within the guidance contained within the National Planning Policy Framework (NPPF).

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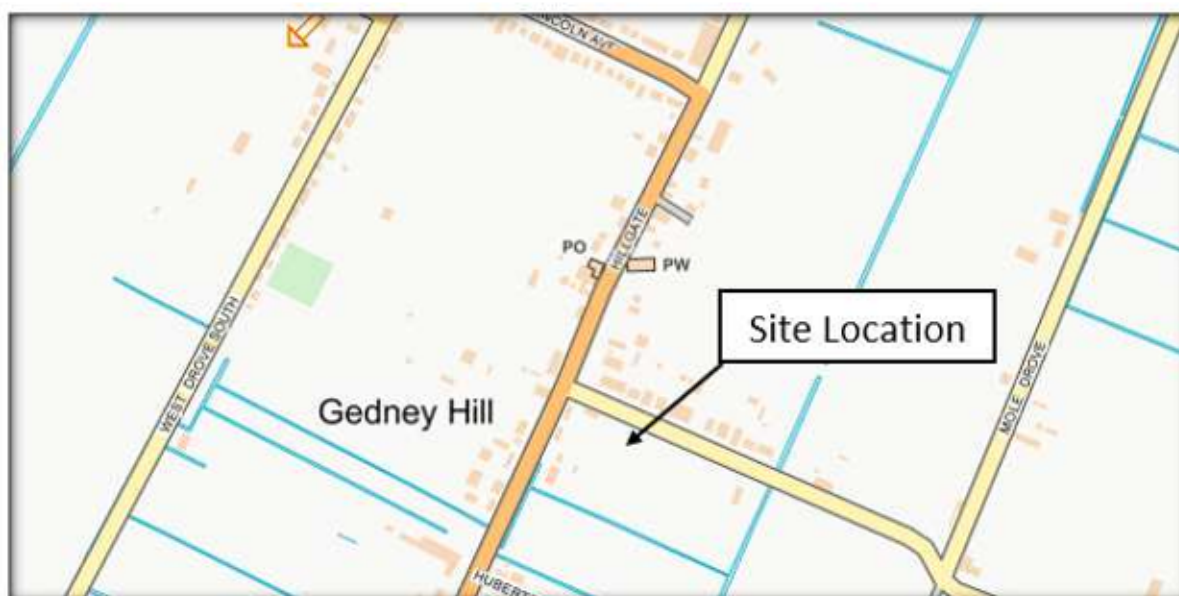
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2. LOCATION & SITE DESCRIPTION

See Appendix A for a Site Location Plan and proposed Block plan.

2.1 Site Location

The site is approximately 0.46 hectare in size and is located off Highstock Lane, Gedney Hill, National Grid reference TF 338110.



2.2 Site Description

The site is bounded by Highstock Lane to the North, existing watercourse to the South and residential dwellings to the East and West. The site is currently a greenfield site used for agriculture.

The topographical survey indicates that the site has nominal falls with ground levels varying from 1.6m to 1.2m AOD. Highstock Lane lies slightly higher at approximately 2.3m AOD.

2.3 Site Geology

The site ground investigation was undertaken in May 2019 and found that the site is predominantly underlain by clay. From our experience this is typical of the area. Infiltration testing was undertaken in February 2020 and deemed the site to be unsuitable for infiltration, the findings are included within Appendix B.

2.4 Site Proposals

The proposed development consists of 10 new dwellings, there is a combination of semi-detached and detached properties.

The proposed site layout drawing G. R. Merchant Ltd. drawing 3146-17-300 revision E, illustrates the proposal and is contained within Appendix A.

3. FLOOD RISK

A site-specific flood risk assessment has been prepared by Geoff Beel Consultancy, dated November 2019.

The flood risk strategy has identified that a floor levels are raised a minimum of 300mm above existing ground levels.

4. SURFACE WATER

4.1 Existing Surface Water

There is no Anglian Water drainage infrastructure in the area. However, the area is served by numerous watercourses, either riparian or IDB maintained. There is an existing watercourse to the South which is maintained by South Holland IDB.

4.2 SuDS Considerations

The SuDS hierarchy has been given consideration during the proposed drainage design, with the preferential hierarchy considered as follows:

- Infiltration
- Watercourse
- Surface Water Sewer
- Combined Sewer

As highlighted previously within this report, it has been established that the sites geotechnical characteristics do not lend themselves to the use of an infiltration strategy, due to the underlying clay strata.

However, the close proximity of a suitably sized/maintained watercourse to the South lends itself for the surface water discharge from the proposed development. This is subject to the relevant South Holland IDB consents which would be obtained during the detailed design stage.

4.3 Surface Water Proposals

The site area is only 0.46 hectare and the total impermeable area is only 2,120m². Therefore, the QBar rate would be significantly lower than any practicable discharge. As such we have utilised a reasonably practicable minimum of 5 l/s. This is generally accepted as a reasonable minimum for a development of this size, and flow restriction devices designed to this flowrate will not have orifices so small that they risk anything other than a low risk of blockage.

The attenuation volume required due to the flow restriction will be provided in the form of an on-line attenuation crates beneath the private road.

The design proposals are illustrated on our drawing 12121/01, included within Appendix C.

The private road, Area A, is to be tarmac surfaced and drainage via a series of gullies and pipes.

The individual plot drainage Area's B & C will be collected via traditional drainage prior to discharging into the surface water system located beneath the private road.

The final chamber prior to discharge to the watercourse will be fitted with a flow control device to restrict flows to 5 litres per second. The pipes upstream of this are to be perforated to allow additional flows above the restriction to surcharge into the attenuation structure.

This will be formed of attenuation crates alongside the perforated pipe which will be surrounded in voided stone. Both elements will be wrapped in an impermeable membrane to prevent ground water entering the system.

The system has been modelled utilising Microdrainage and the calculation inputs and outputs are included within our calculation package 12121-MD-01, contained with Appendix D. These calculations demonstrate that the sub-base provides adequate storage of surface water run-off without flooding in all events including the 1 in 100 year event plus climate change allowance.

5. FOUL WATER

5.1 Existing System

There is no Anglian Water drainage infrastructure in the area.

5.2 Foul Water Proposals

The proposed dwellings will have a buried pipe foul water network around their footprint before discharging into the shared foul water drainage beneath the road.

A domestic foul sewage treatment plant will be utilised to clean the discharge to all the required standards. Information relating to the treatment plant is contained within Appendix D.

It will be necessary to introduce a package pumping station prior to discharge to the watercourse to ensure that the discharge is at a suitable level to ensure the upstream network operates as intended. The outfall to the watercourse will be via a gravity drained pipe.

The design proposals are illustrated on our drawing 12121/01, included within Appendix C.

6. MAINTENANCE STRATEGY

The proposed system contains the following assets which are all required to be in reasonable working order for the systems to function as a whole and operate as anticipated in design models.

The following assets will be owned and maintained by the individual plot owners;

Gutters, downpipes and other building rainwater goods

SVP and AAV pipes.

Buried pipe networks and chambers on individual plots

Driveway gullies / drainage channel

Catchpit chamber

The following assets will become the property and maintenance liability of a Management Company.

Buried pipe networks and chambers beneath the road,

Road gullies,

Surface water attenuation crates

Surface water Flow control chamber

Surface water headwall

Foul water treatment plant

Treated foul water package pump station

Treated foul water rising main

Treated foul water headwall

The scope/nature of inspection and maintenance is such that various facilities and structures are inspected and maintained at yearly intervals, as well as after or during use and/or heavy storms, in order that they continue to perform effectively.

The maintenance schedule for the foul water system, should as a minimum consist of annual inspections and 5 yearly rodding/jetting should no issue be encountered.

The maintenance schedule for the surface water system will comprise the following activities in accordance with the CIRIA publication C753 (The SuDS Manual)

Activity	Frequency	Typical Tasks
Routine/regular maintenance (including inspections and monitoring)	Monthly	- Litter/debris removal - Grass cutting (in season) - Inspection and clearance of gullies and drainage channels - Inspection of pumping station
Occasional maintenance	Annually	- Silt removal from catchpits/gullies - Pipe drainage every 3-5 years: suction sweeping (to Water Jetting Association standards) and CCTV where necessary
Remedial maintenance	As required (tasks to repair problems due to damage or vandalism)	- Silt removal - Inlet/outlet repair - Erosion repairs - System rehabilitation following a pollution event - Pump failure

On completion of the above, ensure the drainage system is running freely and cleanly. If not, repeat maintenance activities. Written records should be kept of all maintenance work carried out.

Overland flow of water caused by blockages should be coned off and any blockages cleared.

7. CONCLUSIONS

As illustrated by our design proposals on drawings 12121/01 and the information outlined within this report, it is demonstrable that a viable and robust surface & foul water scheme that comply with the requirements of National Planning Guidance can be provided for the proposed residential development.

For and on behalf of **SIDEBOTTOM RICHARDSON CHENG LTD**

M PETT

8th February 2021

Approved By: J.A. RICHARDSON | Eng. AMIStructE

APPENDIX A – Site Layout Plan

APPENDIX B – Infiltration Testing

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Sheet No.

40519/SA01

Rev

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Status

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Date

Feb. '20

Drawn

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Scale

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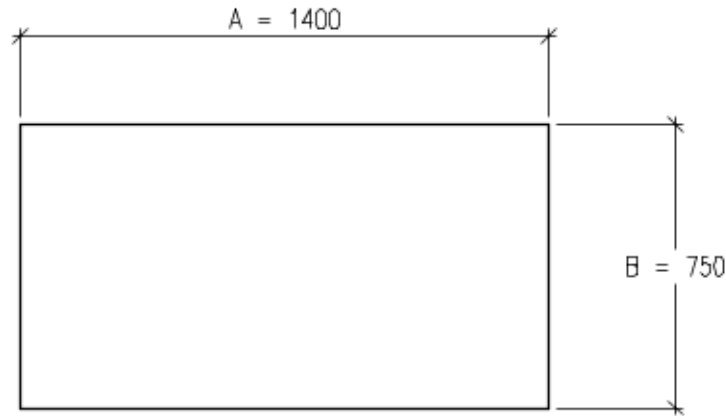
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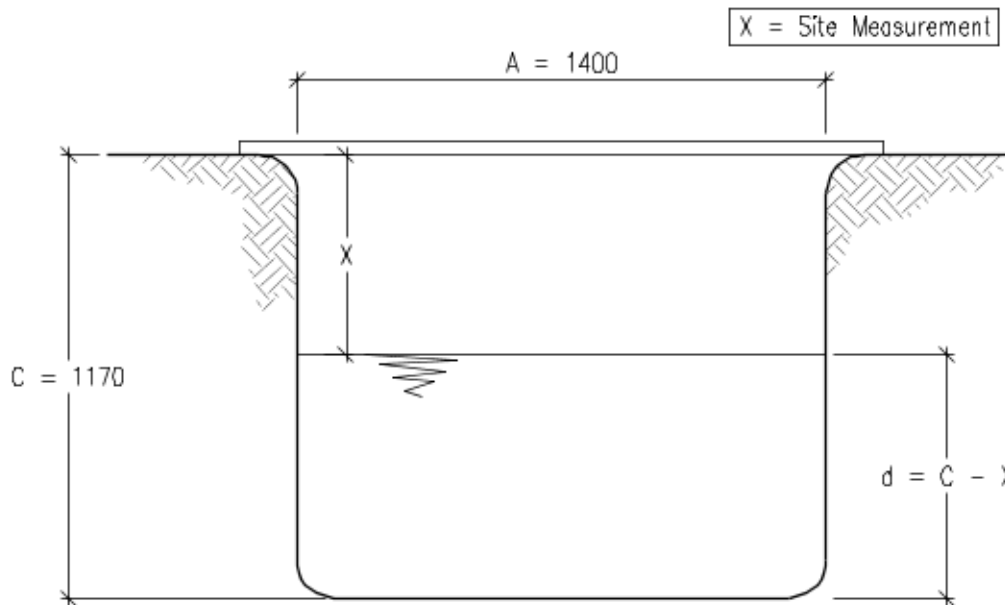
Project **Residential Development To Land Off
Highstock Lane, Gedney Hill,
Spalding, Lincs.**

Title

Infiltration Test Hole Sketch



Plan On SA01



Section Through SA01

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Soak-Away Test SA01

Job Reference Residential Development To Land Off,
Highstock Lane, Gedney Hill, Spalding

SA01	
TIME (Mins)	DEPTH mm (d)
0	655
15	650
30	655
45	660
60	670
90	675
120	685
180	700
240	710
300	717
360	725

Job No. 40519

Date 21/02/2020

Trial Dimensions

A = 1.4 m
B = 0.75 m
C = 1.17 m

C.S.Area of
SA01 = 1.05 m²

Total Volume = -0.074 m³
75% Volume = -0.055 m³
25% Volume = -0.018 m³

Time Taken From 75% Volume to 25% Volume

0 Mins

Effective Depth From 75% Volume to 25% Volume

-0.035 m

50% Effective Internal Surface Area Including Base area

0.8995 m²

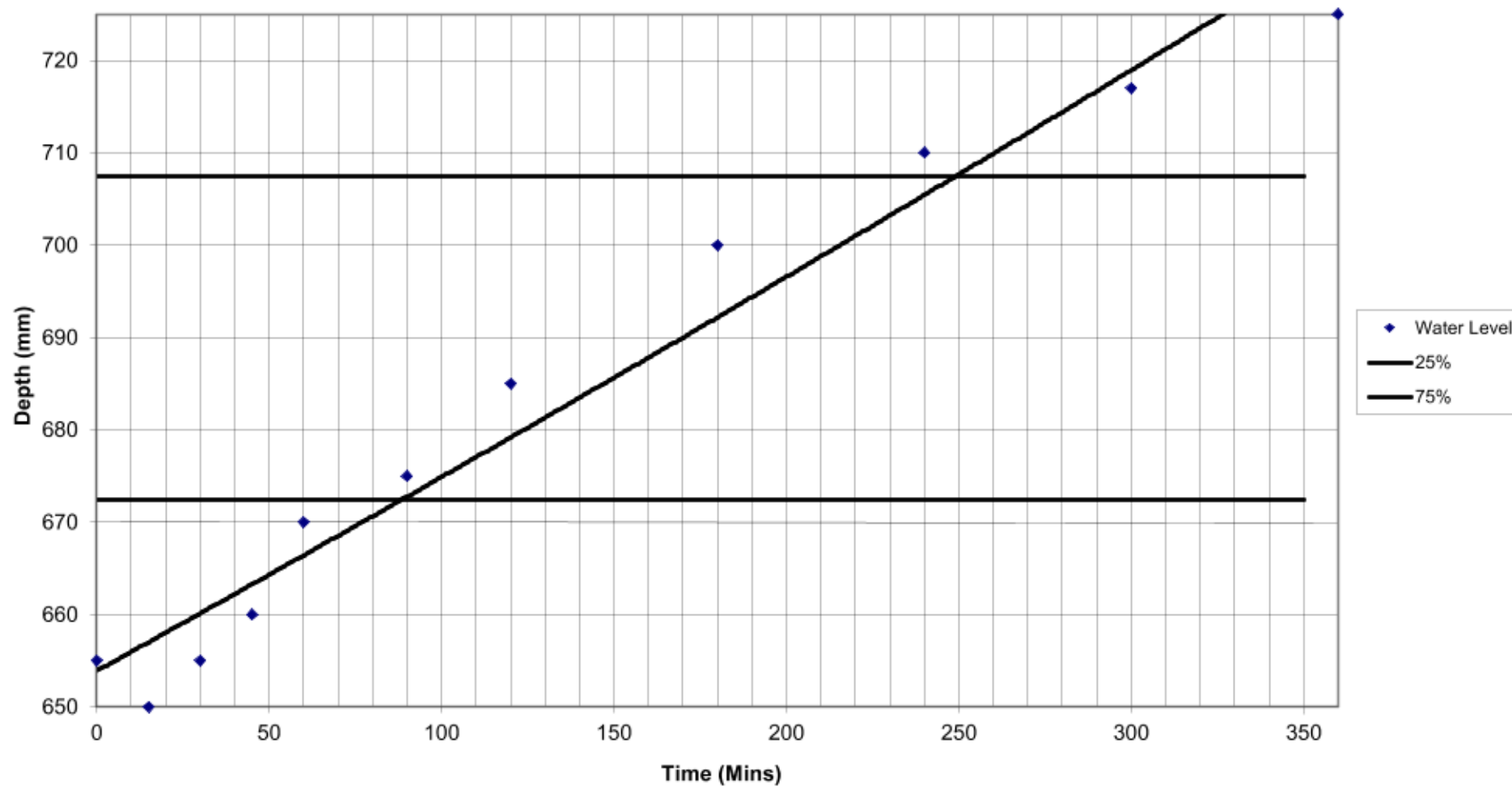
Soil Infiltration rate, f

No Infiltration - Water Level Rose

Proposed Residential Development To Land Off Highstock Lane, Gedney Hill

Job No. 40519 21/02/2020

Plot showing water level against time for SA01



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Sheet No.

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-

Status

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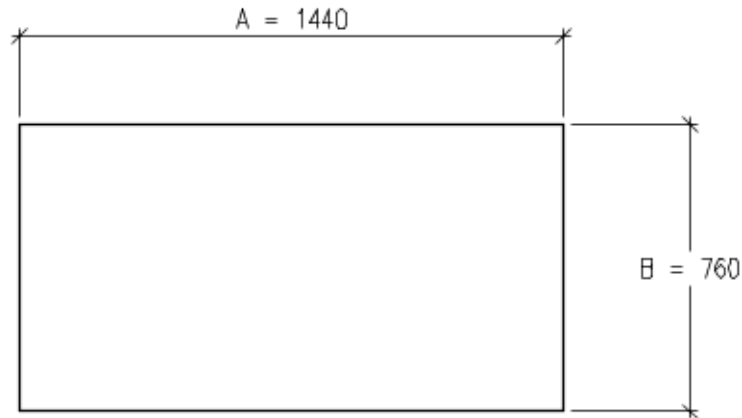
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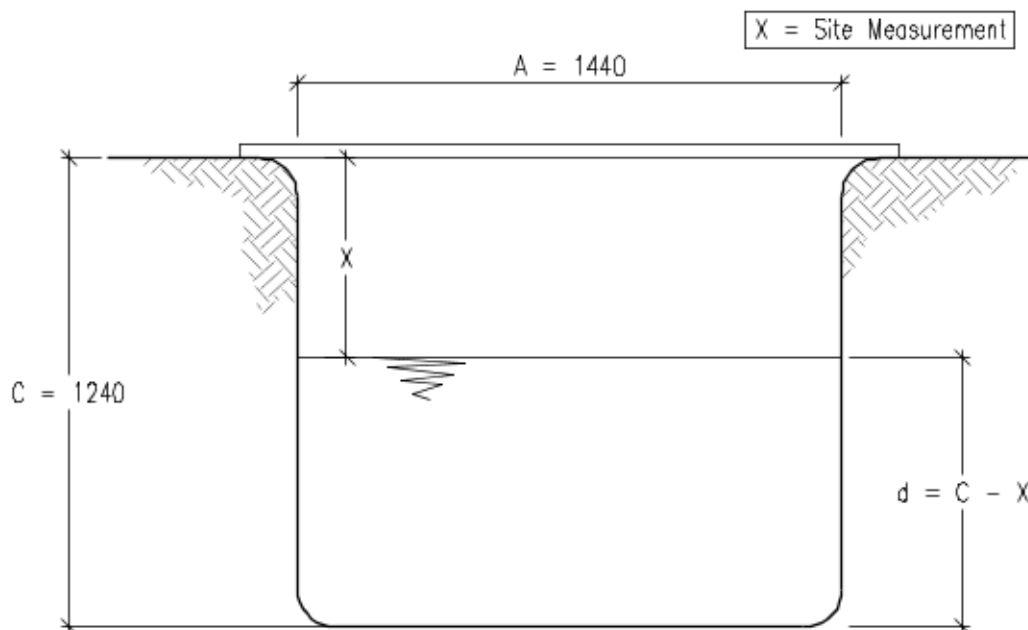
Project **Residential Development To Land Off
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Title

Infiltration Test Hole Sketch



Plan On SA02



Section Through SA02

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Soak-Away Test SA02

Job Reference Residential Development To Land Off,
Highstock Lane, Gedney Hill, Spalding

SA02	
TIME (Mins)	DEPTH mm (d)
0	705
10	715
25	730
40	750
70	765
100	795
160	830
220	875
280	895
340	915

Job No. 40519

Date 21/02/2020

Trial Dimensions

A = 1.44 m
B = 0.76 m
C = 1.24 m

C.S.Area of
SA01 = 1.0944 m²

Total Volume = -0.230 m³
75% Volume = -0.172 m³
25% Volume = -0.057 m³

Time Taken From 75% Volume to 25% Volume

0 Mins

Effective Depth From 75% Volume to 25% Volume

-0.105 m

50% Effective Internal Surface Area Including Base area

0.6324 m²

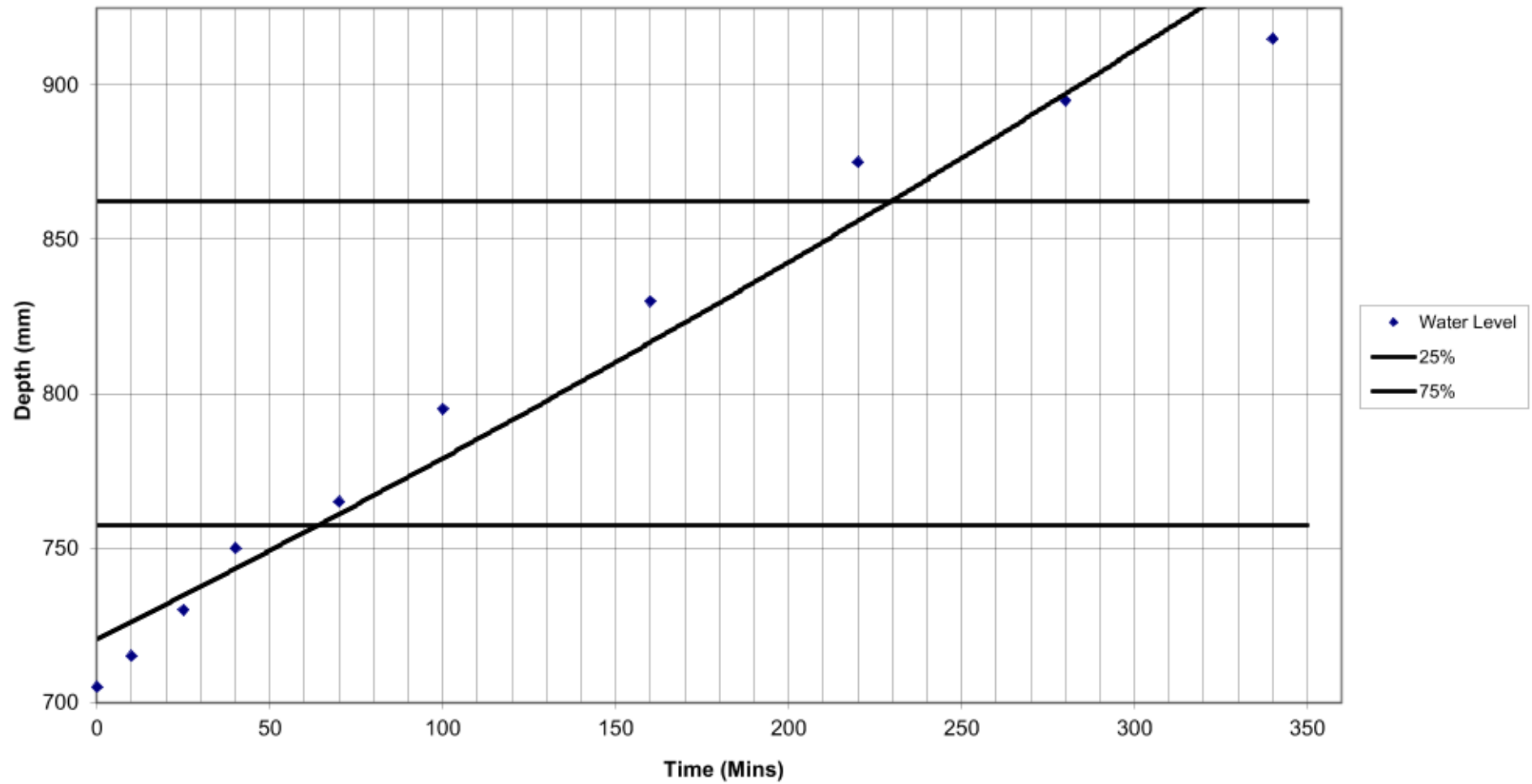
Soil Infiltration rate, f

No Infiltration - Water Level Rose

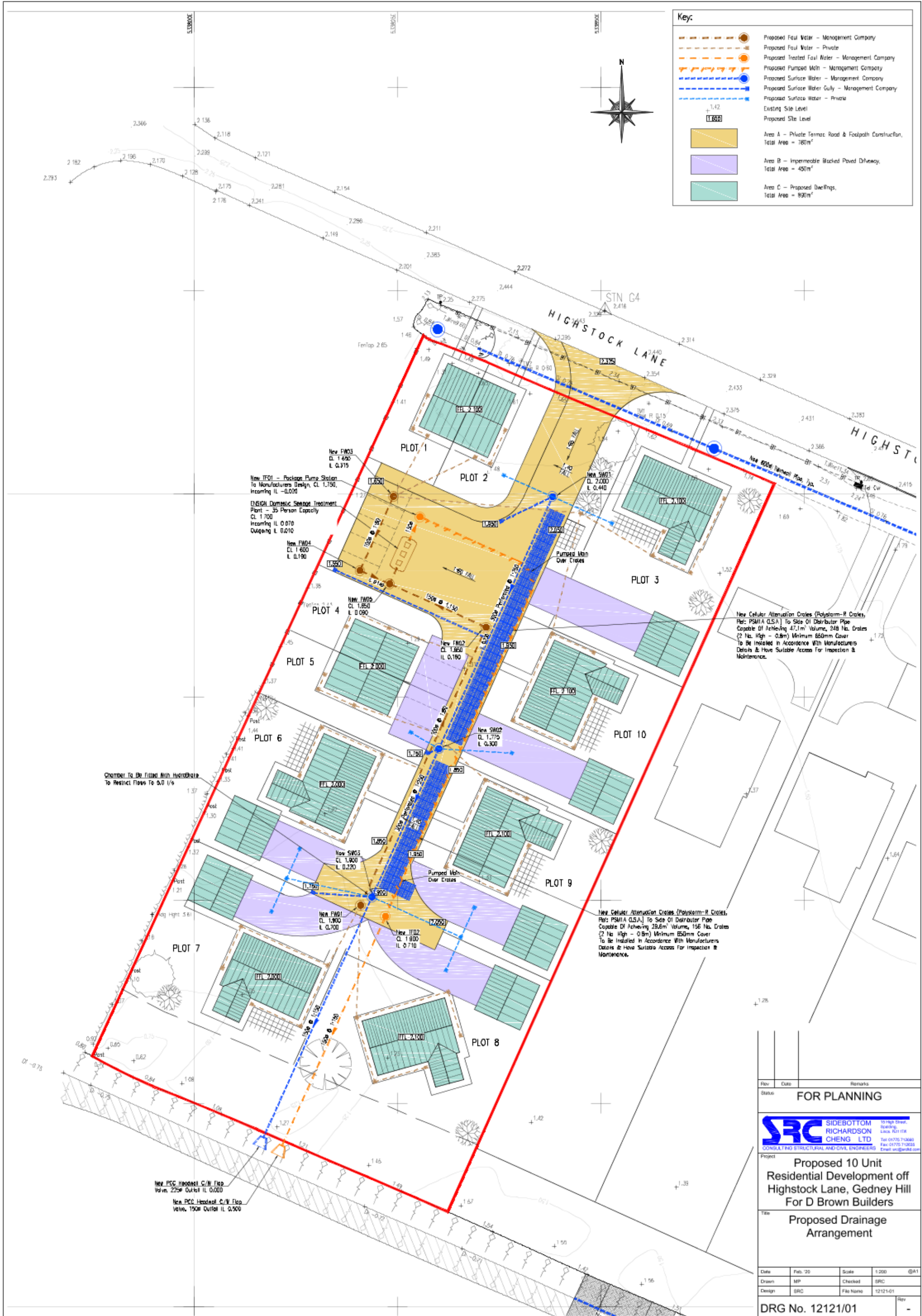
Proposed Residential Development To Land Off Highstock Lane, Gedney Hill

Job No. 40519 21/02/2020

Plot showing water level against time for SA02



[APPENDIX C – SRC Drainage Strategy Drawing](#)



APPENDIX D – Foul Water Treatment Plant Information

Gedney, Oliver

From: Polly Harris-Gorf
Sent: 18 January 2021 13:39
To: _planningadvice
Subject: FW: response to environment agency comment on application no h07-1059-20,
Attachments: We sent you safe versions of your files; TUV Ensign Range.pdf; MI-Ensign-Domestic-STP-full-range-.pdf

Please add as 6SUP (the proposed sewage treatment plant)

From: Des Ford
Sent: 14 January 2021 11:42
To: Polly Harris-Gorf
Cc: 'gr.merchant@btconnect.com'
Subject: FW: response to environment agency comment on application no h07-1059-20,

Mimecast Attachment Protection has deemed this file to be safe, but always exercise caution when opening files.

This message originated from outside your organization

Good morning ,

Please find below e mail from marsh industries with attached information regarding the proposed sewage treatment plant for the application of highstock lane. As you can see from jon bradleys e mail and attachments, the proposed unit meets all the required standards and is an acceptable way of achieving a drainage system for the site. The tank will be maintained by the management company and is located in a position that would enable it to be connected in the future to any Anglian water system that went into the village. we will of course apply to both the shldb and also the environment agency for the necessary permits required should the application be successful.

Des ford

From: Jon Bradley <
Sent: 14 January 2021 11:28
To: Des Ford <
Subject: d brown 10 unit site gedney hill

Dear Mr. Ford

I have looked at your plans for Highstock Lane and we are more than able to help you with your submission. We have supplied treatment plants all around the Gedney Hill area including several on station Road, which discharge to either drainage fields or drainage ditches. As you will see from the attached certificate, our treatment plants are tested and proven to provide much higher standard of effluent than is legally required. This means a colourless and odour free discharge, which should satisfy any authority that you are doing your upmost to preserve the environment. I also attach our brochure to show the compact and efficient design of our units. The only visual impact is the 600mm square lids of the unit. Also an added safety feature above other available units. The 10 number 2 bedroom properties shown would work out by Building Regulations to require a 32 person treatment plant. We offer a 35 person as detailed in our attached brochure. If you or the authorities require any further information to support your application please do not hesitate to contact me.

Jon Bradley
Regional Sales Director

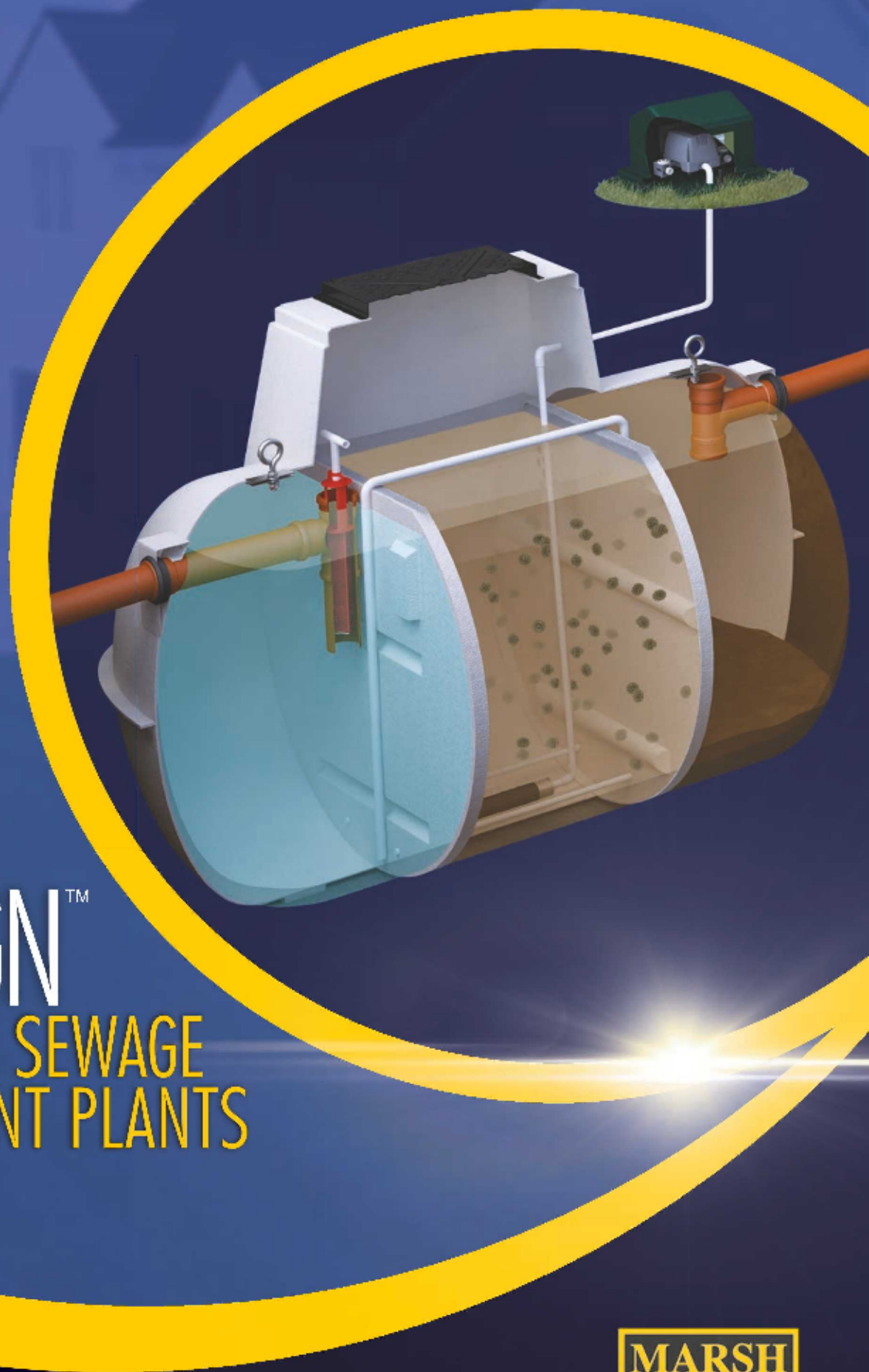
Marsh Industries Limited

www.marshindustries.co.uk



Providing world-class off-mains
drainage products to the domestic,
commercial and agricultural sectors

Marsh Industries is a limited company registered in England & Wales. Registered number: 5157928



ENSIGN™

DOMESTIC SEWAGE TREATMENT PLANTS

4-50PE



ECONOMIC, EFFICIENT, ENVIRONMENTALLY SAFE

Marsh Ensign – Advanced sewage treatment plant

The Marsh Ensign is widely regarded as one of the most efficient, reliable and economical sewage treatment plants on the market.

The standard Ensign has been adapted to improve reliability and the Ensign:Ultra now brings unique enhancements to further improve noise level, treatment efficiency and final effluent quality.

Class leading performance

Tested and approved to BSEN12566-3/A1:2009 all Ensign units provide treatment well within national consent requirements. Published test results of 11.5:19.2:8.4mg/ltr (BOD:suspended solids:ammonia), with influent concentrations on test higher than those chosen by most competitor plants, effectively equates to 97% pollutant removal.

Unrivalled choice

Ranging in size from 4 to 50+ PE in Ultra, Standard and Shallow versions of each, and with a wide range of ancillaries, almost all site, consent and budget requirements can be met by units from the range.

Why choose Marsh Ensign?

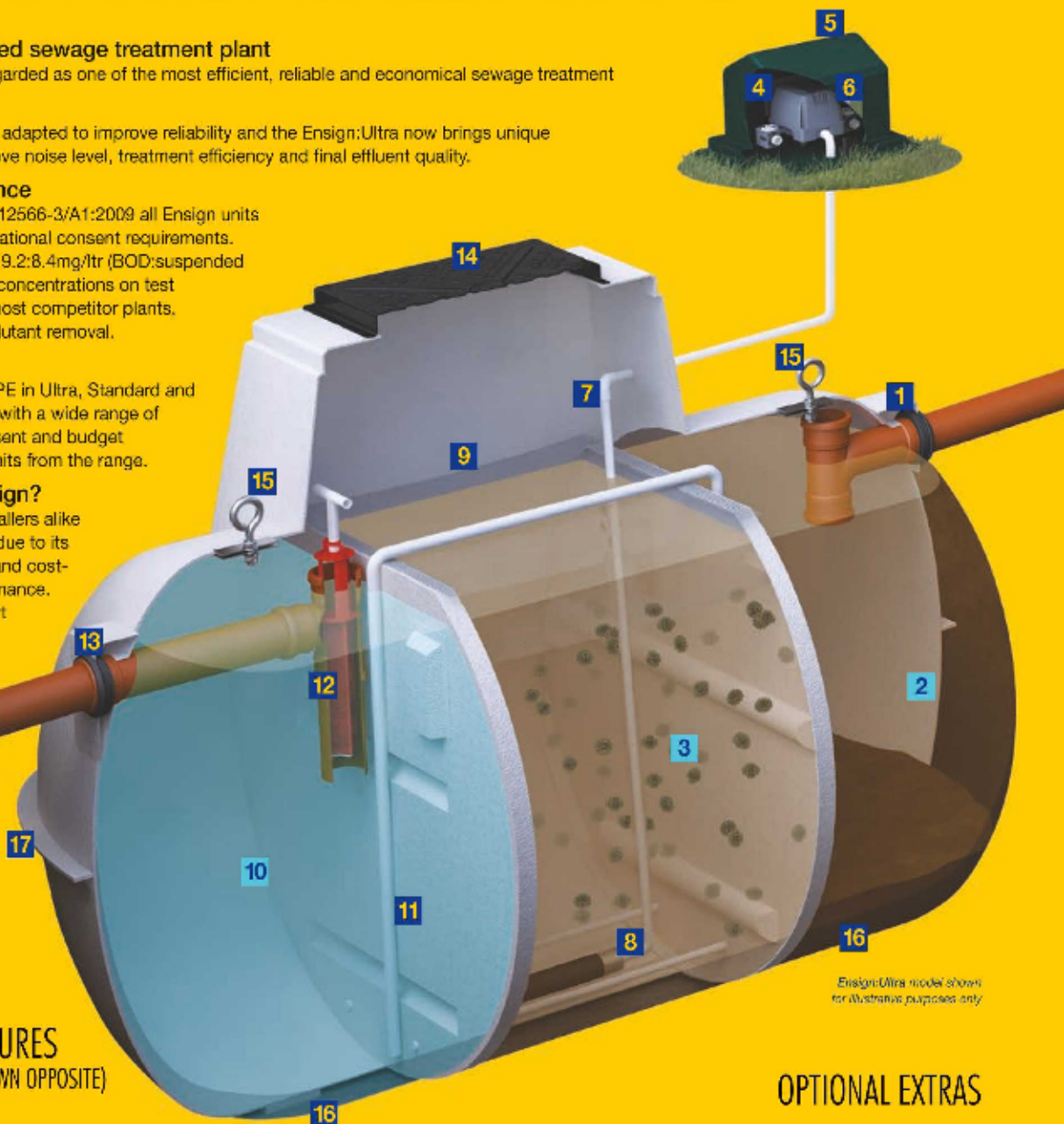
End users, merchants and installers alike recommend the Ensign range due to its ease of installation, reliability, and cost-effective operation and maintenance. All backed by technical support from local contacts.



PRINCIPLE TANK FEATURES

(DETAILED TANK FEATURES SHOWN OPPOSITE)

- 1 Inlet
- 2 Primary settlement chamber
- 3 Aeration chamber
- 4 Compressor with alarm
- 5 Compressor housing (External or internal options)
- 6 RCD / Electrical connection
- 7 PVC pressure pipe for diffuser(s)
- 8 Bio-media
- 9 Stainless steel mesh
- 10 Final settlement chamber
- 11 Sludge return
- 12 Unique Polylok tertiary filter (Ensign:Ultra units)
- 13 Outlet
- 14 Access lid
- 15 Integral lifting eyes
- 16 Stabilising feet
- 17 Unique 'keying-in' lip



Ensign:Ultra model shown for illustrative purposes only

OPTIONAL EXTRAS

Carbon vents/covers



Elevated compressor housings



Anti-flood valves



GRP kiosks





ENSIGN:ULTRA



SHALLOW ENSIGN:ULTRA

1

Inlet with 'Forsheda seal'

Forsheda seal provides flexibility in the joint for easier installation.
Optional risers to increase invert depth are available.

4

Advanced compressor with alarm

Near silent compressor ensures minimal running, maintenance and servicing costs. Integral alarm detects low pressure in air line.

5

Compressor housing (External or internal options)

The compressor can be housed internally or externally with no difference in cost. *External recommended to increase compressor life, and supplied as standard on 4PE, shallow and pumped outlet versions.*

6

RCD / Electrical connection

The RCD box provides easier installation and provides a higher degree of safety.

7

PVC pressure pipe / diffuser(s)

Provides a protective conduit for the air diffuser line. Can be easily removed for maintenance and cleaning.

8

Bio-media

High specification bio-media (310m³ per m²) and membrane diffusers ensure even circulation to eliminate 'dead spots'. The bio-media is contained by a stainless steel securing mesh to ensure no migration during handling or potential flooding.

9

Stainless steel mesh

Retains media in aeration chamber during transportation and handling, and in the event of flooding.

11

32mm sludge return

Larger diameter sludge return prevents the possibility of blockages and improves system circulation. Provides higher effluent quality whilst balancing flow over a 24 hour period or periods of intermittent use.

12

Unique Polylok tertiary filter (Ensign:Ultra unit only)

The Polylok tertiary filter reduces suspended solids and BOD by a further 40% helping to extend drainage field life.

13

Outlet with 'Forsheda seal'

Forsheda seal provides flexibility in the joint for easier installation.
Optional pumped outlets are available.

14

Impermeable lid

Heavy duty lid/frame improves strength and durability whilst blending into the surrounding environment.

Ensign:Ultra								Shallow Ensign:Ultra							
Model	Length	Width	Height	Inlet		Outlet		Model	Length	Width	Height	Inlet		Outlet	
(Pop)		(±100mm)		Invert	Ø	Invert	Ø	(Pop)		(±100mm)		Invert	Ø	Invert	Ø
4	1600	1332	1575	540	110	600	110	6	2860	1912	1600	500	110	575	110
6	2602	1650	1935	550	110	625	110	8	2860	1912	1600	500	110	575	110
8	2602	1650	1935	550	110	625	110	10	2860	1912	1600	500	110	575	110
10	2602	1650	1935	550	110	625	110	12	2860	1912	1600	500	110	575	110
12	2860	1912	2139	550	110	625	110	16	3400	1912	1600	500	110	575	110
16	2860	1912	2284	720	110	800	110	20	4200	1912	1600	500	160	575	160
20	3650	1912	2284	720	160	800	160	25	4200	1912	1600	500	160	575	160
25	3650	1912	2284	770	160	850	160	30	5200	1912	1600	500	160	575	160
30	4200	1912	2284	770	160	850	160	35	5200	1912	1600	500	160	575	160
35	4200	1912	2284	770	160	850	160								
40	5200	1912	2284	770	160	850	160								
45	5200	1912	2284	770	160	850	160								
50	5200	1912	2284	770	160	850	160								

Notes:

- > Larger population sewage treatment plants may be supplied as multiple tank configurations. For precise tank sizes and configurations, please contact Marsh Industries
- > All dimensions in mm

TANK FEATURES



ENSIGN:STANDARD

SHALLOW ENSIGN:STANDARD

1

Inlet with 'Forsheda seal'

Forsheda seal provides flexibility in the joint for easier installation.
Optional risers to increase invert depth are available.

4

Compressor with alarm

Low-energy compressor provides minimal running, maintenance and servicing costs. Integral alarm detects low pressure in air line.

5

Compressor housing (External or internal options)

The compressor can be housed internally or externally with no difference in cost. *External recommended to increase compressor life, and supplied as standard on 4PE, shallow and pumped outlet versions.*

6

Plug / socket connection

Standard electrical connection

7

PVC pressure pipe for diffuser(s)

Provides a protective conduit for the air diffuser line. Can be easily removed for maintenance and cleaning.

8

Bio-media

High specification bio-media (310m³ per m²) and membrane diffusers ensure even circulation to eliminate 'dead spots'. The bio-media is contained by a stainless steel securing mesh to ensure no migration during handling or potential flooding.

9

Stainless steel mesh

Retains media in aeration chamber during transportation and handling, and in the event of flooding.

11

32mm sludge return

Larger diameter sludge return prevents the possibility of blockages and improves system circulation. Provides higher effluent quality whilst balancing flow over a 24 hour period or periods of intermittent use.

12

Polylok tertiary filter NOT supplied on Ensign:Standard range

13

Outlet with 'Forsheda seal'

Forsheda seal provides flexibility in the joint for easier installation.
Optional pumped outlets are available.

14

Standard lid

Marsh lid protects inner components whilst blending into the surrounding environment.

SPECIFICATIONS

Ensign:Standard

Shallow Ensign:Standard

Model (Pop)	Length	Width (±100mm)	Height	Inlet		Outlet		Model (Pop)	Length	Width (±100mm)	Height	Inlet		Outlet	
				Invert	Ø	Invert	Ø					Invert	Ø	Invert	Ø
4	1600	1332	1575	540	110	600	110	6	2860	1912	1600	500	110	575	110
6	2602	1650	1935	550	110	625	110	8	2860	1912	1600	500	110	575	110
8	2602	1650	1935	550	110	625	110	10	2860	1912	1600	500	110	575	110
10	2602	1650	1935	550	110	625	110	12	2860	1912	1600	500	110	575	110
12	2860	1912	2139	550	110	625	110	16	3400	1912	1600	500	110	575	110
16	2860	1912	2284	720	110	800	110	20	4200	1912	1600	500	160	575	160
20	3650	1912	2284	720	160	800	160	25	4200	1912	1600	500	160	575	160
25	3650	1912	2284	770	160	850	160	30	5200	1912	1600	500	160	575	160
30	4200	1912	2284	770	160	850	160	35	5200	1912	1600	500	160	575	160
35	4200	1912	2284	770	160	850	160								
40	5200	1912	2284	770	160	850	160								
45	5200	1912	2284	770	160	850	160								
50	5200	1912	2284	770	160	850	160								



PACKAGE SEWAGE TREATMENT PLANTS

Package Sewage Treatment Plant's (or PSTP's) are often a suitable option where groundwater in the surrounding environment is vulnerable, drainage field percolation values are restrictive, or direct discharge to a drainage field/watercourse or surface water sewer is the preferred discharge method.

HOW DO THEY WORK?

In addition to anaerobic digestion taking place in the primary settlement chamber **1**, the Ensign:Ultra unit allows the clarified water to pass into a second 'aeration' chamber **2**, where it is treated to remove the dissolved constituents. Here aerobic bacteria, supported by diffused air and mobile media, ensures full treatment is achieved before the treated effluent and 'sloughed off' bacteria flows to a final settlement chamber **3**. The final effluent is then discharged to the drainage field or watercourse via a Polylok filter.

Notes:

- > PSTP's should be sized using the latest version of British Water Flows & Loads which provides detailed information on sewage production figures and sizing calculations
- > Regulatory authorities for the control of pollution in the UK normally require treatment plants conforming to BSEN12566:3 to be demonstrated as capable of producing a minimum effluent discharge quality of 20:30:20 (Biochemical Oxygen Demand; Suspended Solids; Ammoniacal Nitrogen in mg/ltr), although in certain areas more stringent site-specific qualities may be required
- > No surface water should enter the system as this can reduce the system's capacity and cause solids to be flushed out which may prematurely block drainage field or cause pollution
- > As with septic tanks sludge should be removed annually or in line with manufacturers instructions

MARSH INDUSTRIES

Based in Northamptonshire with extended facilities in Somerset, Marsh Industries is a leading manufacturer of off-mains drainage products, oil separators and rainwater harvesting systems for both UK and overseas markets.

Marsh supplies sewage treatment plant and off-mains drainage products for domestic, commercial and industrial applications as well as offering engineering design and technical support.

With one of the largest merchant distributor networks available in Europe, clients ask for Marsh products and services because they know the company delivers from a solid foundation of knowledge, customer support, product quality and proven performance.

Architects, specifiers and installers within the construction sectors seek alliances and partnership with Marsh because its core products and services bring further added value to their own brands.

MATERIALS AND MANUFACTURING

A significant differentiator at Marsh Industries, as a privately owned company, is the ability to invest in continuous research and development programmes. This not only translates into an unrivalled range of innovative products and materials but also the depth of experience available from the company's design engineering team.

The company has also invested heavily in plant and machinery at its Northampton and Bridgwater facilities to ensure its ability to adapt to new market initiatives and trends.

With this in mind Marsh uses only the highest quality parts and materials to provide complete assurance in every aspect of product build quality. All products are fully type-tested and certified to ensure compliance with relevant environmental permitting programmes and Building Regulations.

Tanks and chambers are typically made from the following materials:

Virgin unfilled resin (no 'fillers' such as chalk)

Provides consistent wall thickness to ensure superior structural strength and durability. This also enables the tank to be significantly lighter for on-site handling/positioning and better suited to withstand greater hydrostatic pressures when in use.

ISO gel-coat / flo-coat

Protecting the fibres in the laminates reduces UV degradation whilst improving water and chemical resistance. This inherent integrity allows Marsh to offer an unrivalled 50 year design life, backed by a 25 year structural guarantee.

OTHER PRODUCTS IN THE MARSH RANGE

- > Commercial/industrial sewage treatment plants
- > Pump chambers
- > Septic tanks
- > Cesspools
- > Grease traps
- > Oil separators
- > Domestic and commercial rainwater harvesting systems



01933 654582 | sales@marshindustries.co.uk | www.marshindustries.co.uk
MARSH INDUSTRIES UK LEADERS IN OFF-MAINS DRAINAGE AND RAINWATER HARVESTING



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PROTOCOL

ON PRODUCT TYPE TESTING



Czech

Registration No. 1017 – CPD – 05.686.914

Issued in compliance with Article 5 Section 1 Clause b) of Government Order No. 190/2002 Coll. and in compliance with Council Directive No. 89/106/EEC of 21st December, 1988, on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products, amended by Council Directive 93/68/EEC, by the Notified Body No. 1017.

Domestic Wastewater Treatment Plant

Type range: **Marsh Uni Ensign**

Types: 6PE, 10PE, 12PE, 16PE, 20PE, 25PE, 30PE, 35PE, 40PE, 45PE, 50PE

EN 12566-3:2005+A1:2009

MARSH INDUSTRIES LIMITED

Units 3-13, Little Addington Business Park, Irthlingborough Road, Little Addington,
Kettering NN14 4AS UNITED KINGDOM
VAT Ident. No.: GB866868943

Place of the production: See above

TÜV SÜD Czech s.r.o. performed the initial testing of the respective product characteristics described in Annex ZA of the standard

EN 12566-3:2005+A1:2009

The testing results are presented in the Evaluation Report Reg.No. 05.686.242 from 20-04-2012, which consists of 3 pages and forms an inseparable part of this Product Type Testing Protocol.

Treatment efficiency on organic daily loading BOD ₅ = 0,49 kg/day	BOD ₅ COD _{CR} TSS N-NH ₄ ⁺ P _{total}	97,4 % 91,0 % 94,1 % 81,0 % 42,0 %	11,5 mg O ₂ /l 71,5 mg O ₂ /l 19,2 mg/l 8,4 mg/l 5,7 mg/l
Watertightness	Passed		
Structural behaviour	Passed		
Durability	Passed		

In Prague, 03.05.2012



On behalf of the Notified Body 1017

APPENDIX E – Surface Water Design Calculations

Project: Proposed Residential Development at Highstock Lane, Gedney Hill, Spalding

Title: Surface Water Design Calculations

Project: Proposed Residential Development

Location: Highstock Lane, Gedney Hill, Spalding

Client: D Brown Builders

Project Ref: 12121

Prepared By: M.Pett

Date: February 2021

Doc Ref: 12121-MD-01

Project: Proposed Residential Development at Highstock Lane, Gedney Hill, Spalding

Calculation Summary:

The following calculations have been prepared to demonstrate the design of the surface water drainage system serving the proposed 10 plots at the above development, to support the planning application.

The calculations include the surface water catchment from the new roofs, shared access road & the driveways / car parking spaces. The drainage strategy details how each of the surface water elements are collected and the design proposals are shown on SRC drawing 12121/01.

The system has been designed for storms up to and including the 1:100yr +40% climate change event.

The attenuation tanks have been modelled to the adjacent chambers.

The surface water from the plot roofs and the drives is to be collected by a drainage network local to each plot. However, this network has not been modelled, and the catchment area applied to the drainage network within the road.

A proposed flow control has been incorporated SW03 to limit discharge to a maximum of 5 litres / second.

The system outfalls to an existing watercourse maintained by South Holland Internal Drainage Board.

The purpose of these calculations is to support the planning application and therefore they should not be used solely, for the detailed design/construction.

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Existing Network Details for Existing

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type
SW1.000	34.036	0.140	243.1	0.084	5.00	0.0	0.600	o	300	Pipe/Conduit
SW1.001	20.000	0.080	250.0	0.045	0.00	0.0	0.600	o	300	Pipe/Conduit
SW1.002	32.500	0.220	147.7	0.082	0.00	0.0	0.600	o	150	Pipe/Conduit

Network Results Table

PN	US/IL E (m)	I.Area (ha)	E Base Flow (l/s)	Vel (m/s)	Cap (l/s)
SW1.000	0.440	0.084	0.0	1.00	71.0
SW1.001	0.300	0.129	0.0	0.99	70.0
SW1.002	0.220	0.211	0.0	0.82	14.6

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Manhole Schedules for Existing

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SW01	2.000	1.560	Open Manhole	1200	SW1.000	0.440	300				
SW02	1.775	1.475	Open Manhole	1200	SW1.001	0.300	300	SW1.000	0.300	300	
SW03	1.900	1.680	Open Manhole	1200	SW1.002	0.220	150	SW1.001	0.220	300	
SW	1.600	1.600	Open Manhole	0		OUTFALL		SW1.002	0.000	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW01	533844.072	311099.653	533844.072	311099.653	Required	
SW02	533830.098	311068.617	533830.098	311068.617	Required	
SW03	533821.876	311050.386	533821.876	311050.386	Required	
SW	533808.515	311020.759			No Entry	



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PIPELINE SCHEDULES for Existing

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
SW1.000	o	300	SW01	2.000	0.440	1.260	Open Manhole	1200
SW1.001	o	300	SW02	1.775	0.300	1.175	Open Manhole	1200
SW1.002	o	150	SW03	1.900	0.220	1.530	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
SW1.000	34.036	243.1	SW02	1.775	0.300	1.175	Open Manhole	1200
SW1.001	20.000	250.0	SW03	1.900	0.220	1.380	Open Manhole	1200
SW1.002	32.500	147.7	SW	1.600	0.000	1.450	Open Manhole	0

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Area Summary for Existing

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.008	0.008	0.008
	User	-	100	0.009	0.009	0.016
	User	-	100	0.004	0.004	0.020
	User	-	100	0.022	0.022	0.042
	User	-	100	0.035	0.035	0.077
	User	-	100	0.007	0.007	0.084
1.001	User	-	100	0.008	0.008	0.008
	User	-	100	0.009	0.009	0.016
	User	-	100	0.004	0.004	0.020
	User	-	100	0.011	0.011	0.031
	User	-	100	0.007	0.007	0.038
	User	-	100	0.007	0.007	0.045
1.002	User	-	100	0.009	0.009	0.009
	User	-	100	0.004	0.004	0.012
	User	-	100	0.004	0.004	0.016
	User	-	100	0.008	0.008	0.024
	User	-	100	0.009	0.009	0.033
	User	-	100	0.004	0.004	0.037
	User	-	100	0.009	0.009	0.045
	User	-	100	0.004	0.004	0.049
	User	-	100	0.010	0.010	0.059
	User	-	100	0.006	0.006	0.065
	User	-	100	0.006	0.006	0.072
	User	-	100	0.006	0.006	0.078
	User	-	100	0.004	0.004	0.082
				Total	Total	Total
				0.211	0.211	0.211

Free Flowing Outfall Details for Existing

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SW1.002	SW	1.600	0.000	0.000	0	0

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Online Controls for Existing

Hydro-Brake® Optimum Manhole: SW03, DS/PN: SW1.002, Volume (m³): 3.2

Unit Reference	MD-SHE-0095-5000-1750-5000
Design Head (m)	1.750
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	95
Invert Level (m)	0.220
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.750	5.0
Flush-Flo™	0.415	4.5
Kick-Flo®	0.847	3.6
Mean Flow over Head Range	-	4.1

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	1.200	4.2	3.000	6.4	7.000	9.6
0.200	4.1	1.400	4.5	3.500	6.9	7.500	9.9
0.300	4.4	1.600	4.8	4.000	7.4	8.000	10.2
0.400	4.5	1.800	5.1	4.500	7.8	8.500	10.5
0.500	4.4	2.000	5.3	5.000	8.2	9.000	10.8
0.600	4.3	2.200	5.6	5.500	8.6	9.500	11.1
0.800	3.8	2.400	5.8	6.000	8.9		
1.000	3.9	2.600	6.0	6.500	9.3		

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Storage Structures for Existing

Tank or Pond Manhole: SW02, DS/PN: SW1.001

Invert Level (m) 0.325

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	62.0	0.800	62.0	0.801	0.0

Tank or Pond Manhole: SW03, DS/PN: SW1.002

Invert Level (m) 0.245

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	38.0	0.800	38.0	0.801	0.0

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.420
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 2, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
SW1.000	SW01	15 Winter	1	+0%	100/15 Winter				0.524
SW1.001	SW02	60 Winter	1	+0%	30/30 Winter				0.411
SW1.002	SW03	60 Winter	1	+0%	1/15 Summer				0.408

		Surcharged		Flooded		Pipe			
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	Level Exceeded	
SW1.000	SW01	-0.216	0.000	0.17		11.0	OK		
SW1.001	SW02	-0.189	0.000	0.07		4.3	OK		
SW1.002	SW03	0.038	0.000	0.29		4.0	SURCHARGED		

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XP Solutions	Network 2019.1	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 2
 Number of Online Controls 1 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.420
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 10, 30, 100
 Climate Change (%) 0, 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
SW1.000	SW01	15 Winter	2	+0%	100/15 Winter				0.536
SW1.001	SW02	60 Winter	2	+0%	30/30 Winter				0.451
SW1.002	SW03	60 Winter	2	+0%	1/15 Summer				0.448

		<u>Surcharged</u>		<u>Flooded</u>			<u>Pipe</u>		
PN	US/MH Name	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded	
SW1.000	SW01	-0.204	0.000	0.22		14.3	OK		
SW1.001	SW02	-0.149	0.000	0.07		4.5	OK		
SW1.002	SW03	0.078	0.000	0.30		4.2	SURCHARGED		

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.420
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 2, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
SW1.000	SW01	15 Winter	10	+0%	100/15 Winter				0.560
SW1.001	SW02	60 Winter	10	+0%	30/30 Winter				0.549
SW1.002	SW03	60 Winter	10	+0%	1/15 Summer				0.546

		Surcharged		Flooded	Pipe			
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	Level Exceeded
SW1.000	SW01	-0.180	0.000	0.33		21.4	OK	
SW1.001	SW02	-0.051	0.000	0.07		4.2	OK	
SW1.002	SW03	0.176	0.000	0.32		4.4	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.420
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 2, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
SW1.000	SW01	60 Winter	30	+0%	100/15 Winter				0.648
SW1.001	SW02	60 Winter	30	+0%	30/30 Winter				0.645
SW1.002	SW03	60 Winter	30	+0%	1/15 Summer				0.643

		Surcharged		Flooded	Pipe			
PN	US/MH Name	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	Level Exceeded
SW1.000	SW01	-0.092	0.000	0.21		13.7	OK	
SW1.001	SW02	0.045	0.000	0.07		4.2	SURCHARGED	
SW1.002	SW03	0.273	0.000	0.32		4.5	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 2
 Number of Online Controls 1 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.420
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 2, 10, 30, 100
 Climate Change (%) 0, 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
SW1.000	SW01	120 Winter	100	+40%	100/15 Winter				1.364
SW1.001	SW02	120 Winter	100	+40%	30/30 Winter				1.361
SW1.002	SW03	120 Winter	100	+40%	1/15 Summer				1.359

		Surcharged		Flooded	Pipe			
PN	US/MH Name	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
SW1.000	SW01	0.624	0.000	0.23		15.2	SURCHARGED	
SW1.001	SW02	0.761	0.000	0.07		4.5	FLOOD RISK	
SW1.002	SW03	0.989	0.000	0.32		4.4	SURCHARGED	