



GEDA CONSTRUCTION LTD

STATION ROAD

LONG SUTTON

PE12 9GH

DRAINAGE STRATEGY

MAY 2019

FW1733/DS/001-v1

SYNOPSIS

Farrow Walsh have been commissioned by the applicant, to prepare the SUDS Strategy in support of the proposed new development at Station Road, Long Sutton.

REVISION HISTORY

Revision	Reason for Issue	Author	Checker	Approved	Date
v1	First issue	CC	DM	JD	24.05.2019

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1.0 INTRODUCTION

1.1. BRIEF

1.1.1. Farrow Walsh have been commissioned by the applicant, to undertake the Drainage Strategy in support of the planning application for the proposed residential development at Station Road, Long Sutton. The purpose of this document is to report on the Conceptual Drainage Strategy for the proposed development and provide recommendations as to the use of SuDS within the development.

1.1.2. This report has been prepared using the following guidance documentation:

- National Planning Policy Guidance (NPPG)
- Ciria C753 – The SUDs Manual
- Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities (EA - February 2016)

2.0 SITE DETAILS

2.1. SITE LOCATION

2.1.1. The development is situated off Station Road, Long Sutton. The grid reference for the site is TF428229 (Eastings: 542845, Northings: 322912).

2.1.2. The site location is bound to the south by Station Road, to the East by The Suttons Medical Practice and to the north and west by residential properties.

2.1.3. Please refer to Appendix A – Site Location, which shows a visual representation as to the site's location and boundary.

2.2. SITE DESCRIPTION

2.2.1. The land is currently occupied by Nene Transport Ltd and is a haulage yard.

2.2.2. The development currently comprises of brownfield land and has an area of 10,380m² (1.038ha) which is 95% impermeable.

2.3. TOPOGRAPHY

2.3.1. The ground levels on the site fall from a central high point.

2.3.2. Please refer to Appendix I – Topographical survey, which shows a visual representation as to the site's levels.

2.4. GEOLOGICAL SUMMARY

A Ground Investigation has not been undertaken. However, investigation of online resources indicates that the site is underlain by the Ampthill Clay Formation overlain by superficial deposits of tidal deposits of clay and silt. These deposits are have low permeability and contain little to no groundwater.

2.5. EXISTING DRAINAGE

2.5.1. Anglian Water sewer records have been requested and can be found within Appendix D – water authority documents. The sewer records indicate that Station Road to the south / east of the site contains a 525mm diameter surface water sewer. A 300mm diameter foul sewer runs through the site, it is proposed that this is to be diverted (subject to a Section 185 approval from Anglian Water) through the site to reconnect to a 400mm diameter foul sewer within Station Road.

2.5.2. The proposed development area is anticipated to contain surface water drains. Further investigation, via a CCTV survey, is required to confirm the location and condition of any drains present on the site. Where possible the existing outfall connections into the adjacent sewers are to be re-used to minimise any works within the highway.

2.5.3. The existing impermeable area which is positively drained to the existing sewer network is 10,380m² (1.038ha). The existing surface water is anticipated to drain into the existing storm sewer within Station Road at an un-restricted rate.

2.5.4. Further investigation is required by means of a CCTV to establish the size, invert levels and condition for all drainage within the site and connecting into the adjacent public sewers.

2.5.5. The existing surface water discharge rates have been calculated using MicroDrainage and can be found within Appendix G – Existing Surface Water discharge calculation. The rates are summarised below:

- $Q_{1,ex} = 114.9 \text{ l/s}$
- $Q_{30,ex} = 255.4 \text{ l/s}$
- $Q_{100,ex} = 346.4 \text{ l/s}$

2.5.6. The greenfield runoff rates for the site area have been calculated using the HR Wallingford Method and can be found within Appendix F – greenfield runoff calculations.

- $Q_{BAR,GR} = 1.53 \text{ l/s}$
- $Q_{1,GR} = 1.32 \text{ l/s}$
- $Q_{30,GR} = 3.73 \text{ l/s}$
- $Q_{100,GR} = 5.42 \text{ l/s}$

2.5.7. The existing surface water drainage system can be summarised as follows:

- 95% impermeable (brownfield)
- No attenuation storage
- Surface water draining unrestricted into adjacent sewers

2.6. PROPOSED DEVELOPMENT

2.6.1. The proposals include 40 new residential dwellings.

2.6.2. The current architect drawings can be found within Appendix B – Architects site plan.

3.0 PROPOSED SURFACE WATER DRAINAGE DESIGN STRATEGY

3.1. SURFACE WATER DRAINAGE DESIGN

3.1.1. Surface Water runoff from the proposed development should mimic, as far as possible, the surface flows from an undeveloped greenfield site.

3.1.2. Greenfield runoff rates for an undeveloped site have been calculated in accordance with current guidance and calculations can be found within Appendix F – greenfield runoff calculations and are discussed in section 2.5.6.

3.1.3. The nearest watercourse to the site is the Lutton Drain a tributary of the River Nene. This is 0.45km to the North of the site. A connection to this watercourse is deemed impracticable due to the distance and existing landscape features.

3.1.4. Based on the above points surface water disposal by means of treatment and detention prior to controlled release into the sewer network is deemed the most appropriate solution.

3.1.5. The development area is 1.038ha and it is proposed that 45% of the development will be impermeable and require collecting and attenuating prior to discharge. For the purposes of this report the impermeable area of the proposed site has been taken as 0.468ha based on the current site layout available.

3.1.6. It is currently proposed that the main drains within the site will be offered to Anglian Water for adoption (subject to approved Section 104 and Section 185 applications).

3.1.7. Infiltration will not possible due to the nature of the formation; consisting of impermeable clays and silts.

3.1.8. Surface water drainage will be provided via new below ground gravity sewers constructed within the roads with surplus flows being attenuated using both voided stone below shared access areas and an attenuation basin. The proposed surface water runoff rate for the development area of 0.468 hectares is:

- $Q_{100+40\%cc} = 5.0 \text{ l/s}$ to public surface water sewer

This rate represents a reduction of >99% when compared to the existing arrangement as discussed further in section 4.02.23. This rate is subject to confirmation by Anglian Water (via a S104 application) and the LLFA.

3.1.9. By controlling the discharge rate from the site for a 1in100 year + 40% storm event to 5.0 l/s the site is offering a betterment to the downstream network by utilizing site flood storage at an earlier stage in the overall river catchment potentially reducing flooding downstream.

3.1.10. The table below demonstrates the surface water discharge reduction when compared to the existing site discharge rates as discussed in section 0.

Storm Event	Existing (l/s)	Proposed Peak (l/s)	Reduction
Q ₁	114.9	5.0	95%
Q ₃₀	255.4	5.0	98%
Q ₁₀₀	346.4	5.0	99%
Q _{100+40%cc}	-	5.0	>99%

Table 1 Peak Discharge Comparison

3.1.11. The discharge proposals offer a >99% reduction in surface water runoff for a 1in 100 + 40% climate change year storm event.

3.1.12. National Planning Policy Guidance requires that climate change incorporated within the surface water drainage design in accordance with The Environment Agency's 'Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities' February 2016 when assessing flood risk for a development.

3.1.13. The design life of the development is beyond 2070, therefore in accordance with the Environment Agency guidance the development should make allowances for an increase in extreme rainfall intensity of an additional 40% when compared to the 1961-1990 baseline.

3.1.14. The drawings & schedules of the as-built site drainage system are to be made available to the building occupier to enable drainage maintenance and future works to be undertaken.

3.1.15. Building Regulations 2010 Part H guidance for disposal of surface water is as follows:

- A soakaway or infiltration system, or where not reasonably practical;
- A surface water ditch or watercourse, or where not reasonably practical;
- A below ground sewer

3.1.16. All sewers and drainage are to be constructed in accordance with all relevant industry standards, including but not limited to:

- Building Regulations Approved Document Part H 2010
- Sewers For Adoption 6th Edition

3.1.17. The drawings & schedules of the as-built site drainage system are to be made available to the building occupier to enable drainage maintenance and future works to be undertaken.

3.1.18. Please refer to Appendix C – drainage strategy drawing.

3.2. ATTENUATION PROPOSALS

3.2.1. To achieve the reduction in discharge rate the development will provide above ground storage attenuating a minimum of 218m³ of runoff with the discharge via a control chamber into the existing Anglian Water sewers within Station Road to the South-east of the site. Discharge is subject to agreement with the LLFA / Anglian Water.

3.2.2. In accordance with current Environmental Agency Guidance, the attenuation volume for a site should be calculated based on a 1 in 100 year + climate change allowance.

3.2.3. Calculations have been undertaken to confirm the storage requirements for the proposed site. Microdrainage calculations can be found within Appendix H.

3.2.4. The surface water system has been designed up to the 24-hour 1 in 100 year +30% climate change storm event. Exceedance flows up to the 1 in 100 year +40% climate change storm event will be managed above ground within the highway.

3.2.5. In accordance with current Environmental Agency Guidance, the attenuation volume for a site should be calculated based on a 1 in 100 year + climate change allowance.

3.2.6. Please refer to Appendix H – Proposed surface water attenuation calculations

4.0 FOUL WATER DRAINAGE STRATEGY

4.1. FOUL WATER DRAINAGE DESIGN

- 4.1.1. It is proposed that foul drainage will be conveyed from the properties by below ground private gravity drains prior to connection into the existing Anglian Water sewer. The existing Anglian Water sewer is proposed to be diverted (subject to an approved Section 185 agreement with Anglian Water) through the site before reconnecting to the existing run into Station Road. The final discharge location is subject to confirmation of the existing outfall locations by means of a CCTV survey. All foul drainage will be vented in accordance Building Regulations Part H.

5.0 DRAINAGE MAINTENANCE

5.1. DRAINAGE MAINTENANCE SCHEDULE

- 5.1.1. Please refer to Appendix E – Suds Maintenance Schedule

6.0 CONCLUSIONS & RECOMMENDATIONS

6.1. CONCLUSIONS

6.1.1. The proposed surface water drainage system can be summarised as follows.

6.1.2. Surface water runoff from the development to discharge at a maximum rate of 5.0l/s into the public storm sewer for a 1 in 100 year + 30%CC, 24 hour storm event in accordance with Non-statutory technical standards for sustainable drainage systems.

6.1.3. The development provides a minimum 95% betterment in comparison to the existing runoff arrangement.

6.1.4. Exceedance flows will flow away from the proposed properties and be directed into the existing highway.

7.0 APPENDICIES

7.1. APPENDIX A – SITE LOCATION

SITE LOCATION PLAN

FW1733 – Station Road, Long Sutton

X:542839 Y:322894

Site Location - Image 1

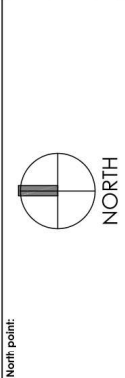


Site Location – Image 2



7.2. APPENDIX B – ARCHITECTS SITE PLAN

Printed or electronic copies of this drawing can be scaled for planning purposes only. Any discrepancies with this drawing to be reported and clarified prior to commencing work on site, if in doubt - Ask.
Corporate Architecture Ltd accept no responsibility for works not undertaken fully in accordance with this drawing and relevant specifications.
Copyright © Corporate Architecture Limited



Notes:

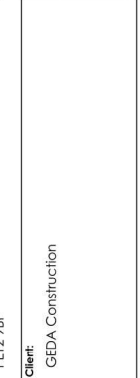
Schedule of Accommodation
40 no. Units - 6 no. x 1 bed 2 person flat - 3 x 45.4m ² & 3 x 49.8m ² 22 no. x 2 bed 4 person house - 69m ² 12 no. x 3 bed 5 person house - 84.4m ² & 87.5m ²
Total Site Area = 10,415m ² (2.574 acres).
Note FFL's to be no lower than 3.7AOD

Revision Log:

Rev:	Description:	By:	Date:
K	Extent of plots indicated	cd	Apr 19

Project:
Proposed Development at
Land Off Station Road
Long Sutton
Spalding
PE12 9RP

Client:
GEDA Construction



Drawn by: JAE	Checked: M/Tr 19	Date: M/Tr 19	Paper Size: A2
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Drawing Title:
Proposed Site Plan

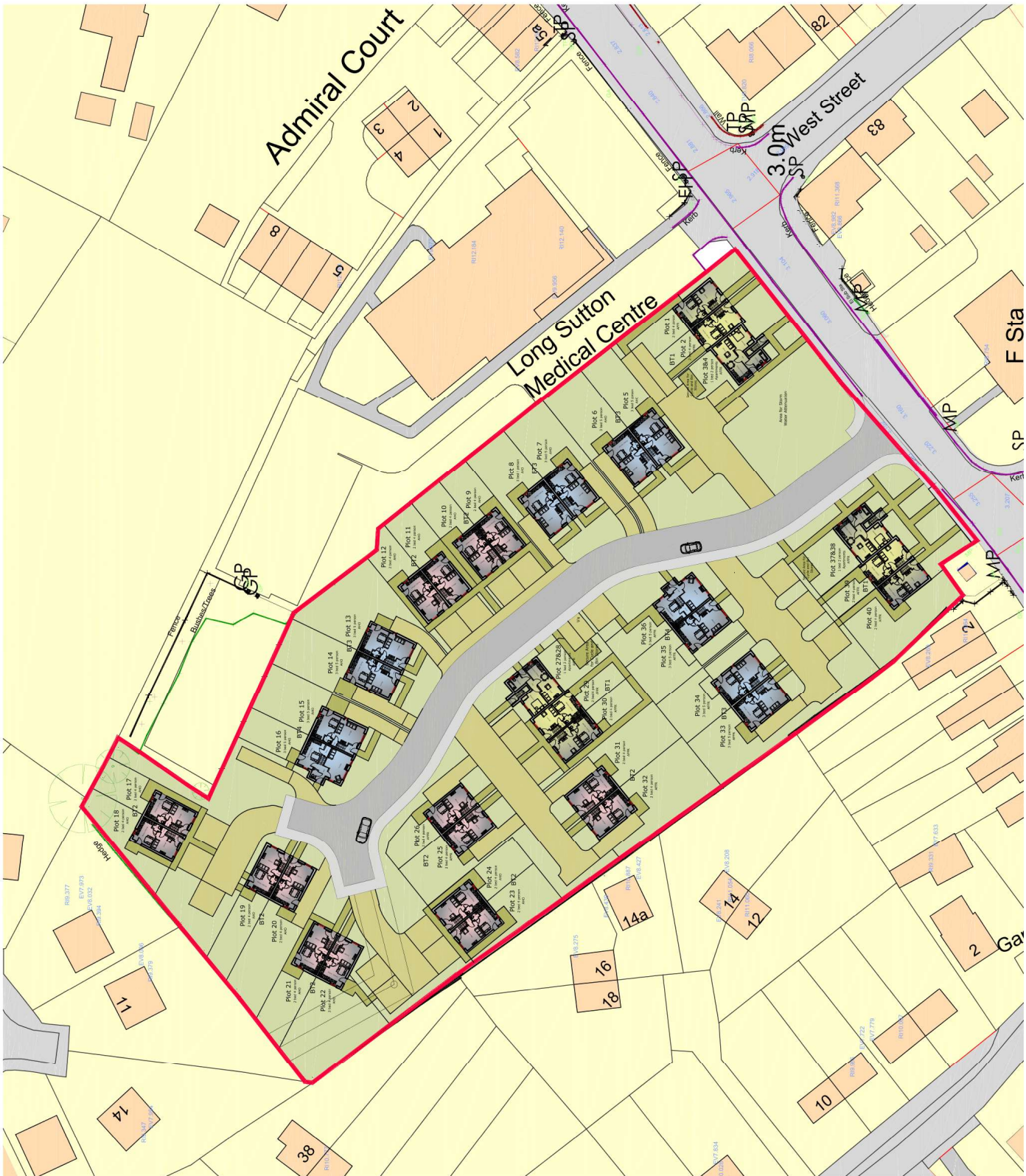
Drawing Status:
PLANNING ISSUE

Drawing Number: 4261/KP/17/003	Revision Number: K
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Proposed Site Plan
0 5m 10m 15m 20m 25m
1:500

7.3. APPENDIX C – DRAINAGE STRATEGY DRAWING

1. DO NOT SCALE.
2. This drawing is to be read in conjunction with all other relevant drawings and details.
3. Should there be any conflict between the details indicated on the drawing and those on other drawings the Engineer must be informed PRIOR to construction on site.
4. Until technical approval has been obtained from the relevant Authority, it should be assumed that all drawings issued by the Engineer and NOT to certain clients. Should the client be concerned that the work is not approved based on a drawing it is issued at their own risk.
5. Search proposals are for illustrative purposes only and as such are subject to detailed site investigation including ground conditions, contaminants, drainage, design and planning / density requirements.
6. All dimensions are in millimetres unless otherwise stated.
7. The Enviro-Watch Consulting Designers Risk Assessments for this project must be reviewed PRIOR to the commencement of any works on site.

NOTES

1. This drawing is for Approval purposes only and is not to be used for Construction.
2. This drawing is to be read in conjunction with all other relevant drawings.
3. All work is to be carried out in accordance with the current British Standards, codes of practice, building regulations and with Sewers for Private Adoption.
4. The exact position, level, size and use of existing sewers to be confirmed on site. Any discrepancies to be reported to the Engineer prior to commencement of works.
5. All work to be carried out in accordance with the relevant construction traffic as part of the Contractors temporary works requirements.
6. All proposed to road gullies and channels shall be 150mm nominal bore pipework.
7. All pipework to be U-PVC type in accordance with BS 438-01 unless otherwise stated.
8. All pipes connecting to adopted manholes up to and including 300mm dia. to be Wavin Ultrarae or similar approved.
9. All pipes connecting to adopted manholes greater than 300mm dia. to be Wavin Ultrarae or similar approved.
10. All pipework entering and exiting manholes to be connected with pipe of the same size and material.
11. All work to be to the satisfaction of the Engineer, Building Officer, Severn Trent Water, local authority Highway & Road Planning Officer.
12. All materials and drawings submitted for approval prior to the commencement shall be received by the Contractor prior to the commencement

LEGEND

- [illegible]

- | | |
|---|---|
| 1 | Existing Sewers |
| 2 | Size, invert and direction of existing drains to be confirmed on site prior to commencement of drainage works |
| 3 | Proposed Flow Chamber retaining the discharge to 5 m/s for a 1m100 year storm + 40% Connection to combined chamber fitted with 10" water trap downstream. See SHE-0101/5000-1205-5000 |
| 4 | Mesh screen to be placed over the outlet pipe of chamber F10 and F7 during site construction works and removed once the works are complete to the first occupancy of the dwellings |
| 5 | Collection Trench |
| 6 | Soles trenches to allow runoff from effluent to enter collection pipe. Minimum gradient within trench to be 1:100 |
| 7 | Existing Sewer to be diverted and diverted. Subject to Section 185 approval from Anglian Water. |

T1	Issued for Tender.	CB	CC	JD	18.04.19
Rev	Description of updates	F. J. J. J.		P. J. J. J.	Date



1

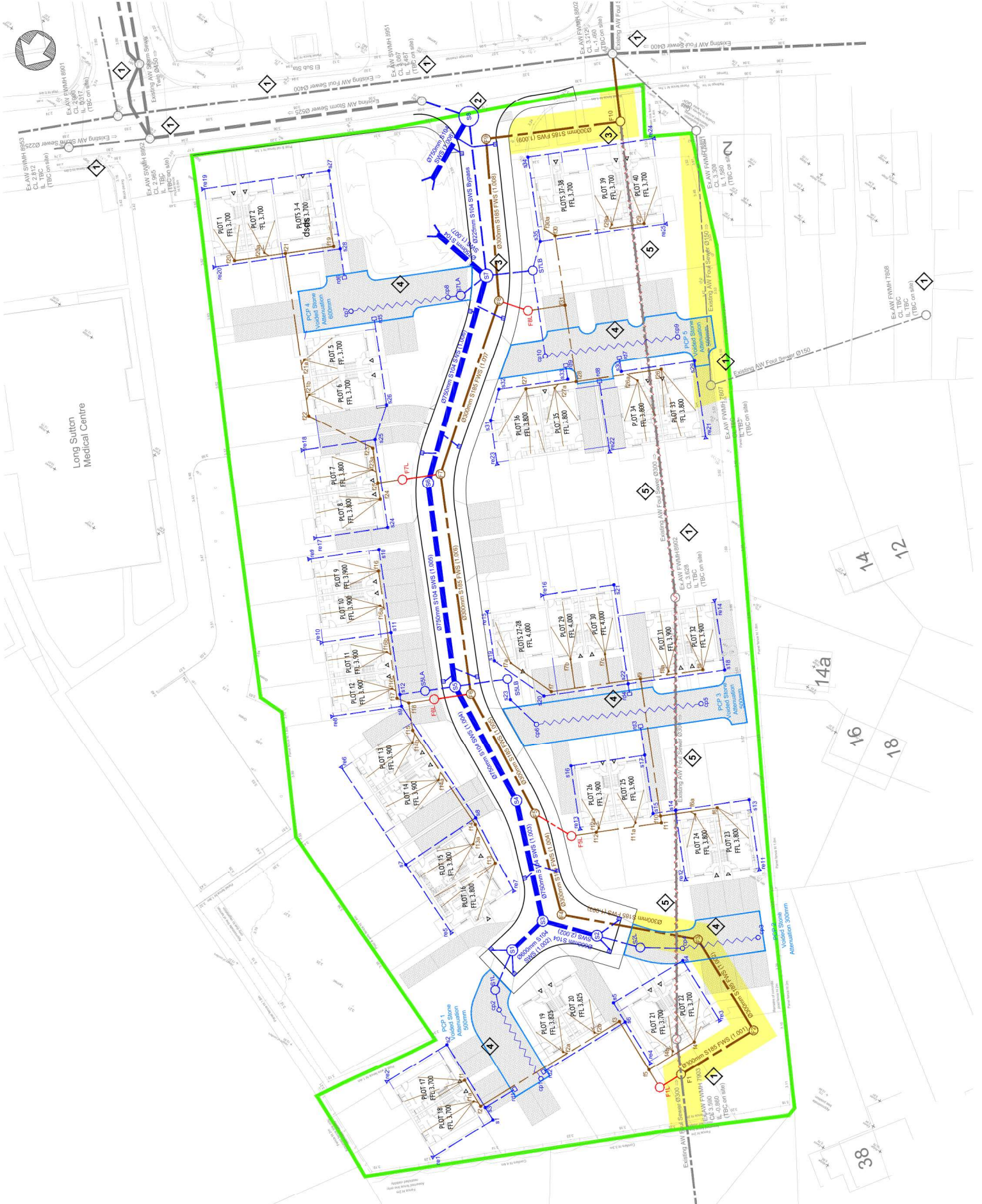
Client: Kaplan Property Group

Project: Station Road,
Long Sutton

Title: Domestic Drainage Layout

Drawn: CB	Checked: CC	Approved: JD	Date: April 2019	Scale: 1:250 @ A1
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Drawing No. **FW1733-D-401-01**



7.4. APPENDIX D – WATER AUTHORITY DOCUMENTS

Pre-Planning
Assessment Report
STATION ROAD, LONG SUTTON
145888/903892756/1/0055731

Section 1: Proposed development

Thank you for submitting a pre-planning enquiry. This has been produced for Farrow Walsh . Your reference number is **145888/903892756/1/0055731**. If you have any questions upon receipt of this report, please contact the Pre-Development team on 03456 066087 or email planningliaison@anglianwater.co.uk.

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments	
Type of development	No. Of units
Dwellings	40

The anticipated residential build rate is:

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12
Build rate	40	0	0	0	0	0	0	0	0	0	0	0

Site grid reference no.

TF4279822952

Development type

Brownfield

Planning application status

Approved

The comments contained within this report relate to the public water mains and sewers indicated on our records. Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2: Assets affected

Our records indicate that we have the following types of assets within or overlapping the boundary of your development site as listed in the table below.

Additionally, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence. We are unable to permit development either over or within the easement strip without our prior consent. The extent of the easement is provided in the table below. Please be aware that the existing water mains/public sewers should be located in highway or open space and not in private gardens. This is to ensure available access for any future maintenance and repair and this should be taken into consideration when planning your site layout.

Water and Used water easement information		
Asset type	Pipe size (mm)	Total easement required (m)
Sewer mains	300	3.00 m either side of the centre line
Sewer mains	150	3.00 m either side of the centre line
Sewer mains	300	3.00 m either side of the centre line
Sewer mains	300	3.00 m either side of the centre line
Sewer mains	150	3.00 m either side of the centre line

If it is not possible to avoid our assets then these may need to be diverted in accordance with Section 185 of the Water Industry Act (1991). You will need to make a formal application if you would like a diversion to be considered.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3: Water recycling services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and influent quality arising from your development.

Water recycling centre

The foul drainage from the proposed development is in the catchment of Sutton Bridge Water Recycling Centre, which currently has capacity to treat the flows from your development site. Anglian Water cannot reserve capacity and the available capacity at the water recycling centre can be reduced at any time due to growth, environmental and regulation driven changes.

Used water network

Our assessment has been based on development flows connecting to the nearest foul water sewer of the same size or greater pipe diameter to that required to drain the site. The infrastructure to convey foul water flows to the receiving sewerage network is assumed to be the responsibility of the developer. Conveyance to the connection point is considered as Onsite Work and includes all work carried out upstream from the point of connection, including making the connection to our existing network. This connection point has been determined in reference to the calculated discharge flow and on this basis, a 150mm internal diameter pipe is required to drain the development site. The nearest practicable connection is to the 400mm diameter sewer in Station Road (B1390) – (National Grid Reference TF4284122881) via a new manhole at a point suitable to development layout. Anglian water has assessed the impact of gravity flows from the planned development to the public foul sewerage network. We can confirm that this is acceptable as the foul sewerage system, at present, has available capacity for your site. Please note that Anglian Water will request a suitably worded condition at planning application stage to ensure this strategy is implemented to mitigate the risk of flooding.

It is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network. Consequently, this report does not include any costs for the conveyance of flows.

Surface water disposal

Anglian Waters surface water policy is as follows: Where a Brownfield site is redeveloped, no historic right of connection will exist, and any sewer connections will be treated as new. The site will be treated as if it was Greenfield and therefore discharge rate limited to the equivalent 1 in 1 year Greenfield rate. The Greenfield runoff for the site is calculated using the IH124 method. A free Greenfield runoff estimation tool can be accessed on the UKSuDS website www.uksuds.com Where the above is not practical, the Developer is asked to calculate the existing Brownfield rates based on the existing roof areas. The discharge rate from the development will be limited to the equivalent 1 in 1 year rate, or an appropriate rate as agreed by Anglian Water. In both circumstances, Anglian Water will assess the capacity of the public sewers and upon meeting the above policy principles, advise and make recommendations on the proposed development and or new connection. The information provided suggests that the existing buildings on-site are to be demolished; In accordance with our surface water policy we have assessed this site as greenfield based on a site area of 1.13Ha. We have examined your development site for available surface water discharge options. It is our understanding that the evidence to confirm your compliance with the surface water hierarchy is not currently available. However once the evidence has been confirmed, then a connection point may be made to manhole 8851 in Station Road (B1390) at NGR TF4284322887 at a rate of 5.00l/s It is your responsibility to provide the evidence to confirm that all alternative methods of surface water disposal have been explored and these will be required before your connection can be agreed. This is subject to satisfactory evidence which shows the surface water management hierarchy as outlined in Building Regulations Part H has been explored. This would encompass the results from the site specific infiltration testing and/or confirmation that the flows cannot be discharged to a watercourse. Anglian Water's surface water policy follows the Surface Water hierarchy, outlined in Part H of the Building Regulations. Should your assumptions or evidence change then an alternative solution, connection point or flow rate may be required. You are therefore advised to update Anglian Water with the key supporting evidence at your earliest convenience.

As you may be aware, Anglian Water will consider the adoption of SuDs provided that they meet the criteria outline in our SuDs adoption manual. This can be found on our website at <http://www.anglianwater.co.uk/developers/suds.aspx>. We will adopt features located in public open space that are designed and constructed, in conjunction with the Local Authority and Lead Local Flood Authority (LLFA), to the criteria within our SuDs adoption manual. Specifically, developers must be able to demonstrate:

1. Effective upstream source control,
2. Effective exceedance design, and
3. Effective maintenance schedule demonstrating that the assets can be maintained both now and in the future with adequate access.

If you wish to look at the adoption of any SuDs then an expression of interest form can be found on our website at: <http://www.anglianwater.co.uk/developers/suds.aspx>

The proposed method of surface water disposal is not relevant to Anglian Water; we suggest that you contact the relevant Local Authority, Lead Local Flood Authority, the Environment Agency or the Internal Drainage Board, as appropriate.

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

As a result of the recent charging rules published by Ofwat, our charging regime has changed. Your development site will be required to pay a Zonal charge for each new property connecting to the public sewer that benefits from Full planning permission.

Payment of the Zonal charge must be made before premises are connected to the public sewer. More information on the Zonal charge can be found at

<http://www.anglianwater.co.uk/developers/charges>

The Zonal charge consists of two elements. The first is called the 'Fixed Element' which is the same in nature to the Infrastructure charge applied prior to April 2018. The second is called the 'Variable Element' which may vary each financial year.

The elements are combined together to create the 2018/19 Zonal charge for Sewerage:

Fixed Element	£ 370
Variable Element	£ 101

In most circumstances zonal charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage). However, if the new connection is to non-household premises, the fixed element is calculated according to the number and type of water fittings in the premises. This is called the "relevant multiplier" method of calculating the charge. Details of the relevant multiplier for each fitting can be found at our web-page:

<http://www.anglianwater.co.uk/developers/charges/>

The total Zonal charge payable for your site for Sewerage is:

Zonal charge per new connection - Sewerage	No. Of Units	Total amount payable
£ 471	40	£ 18,840.00

It has been assumed that the onsite used water network will be provided under a section 104 Water Industry Act application.

It is recommended that you also budget for connection costs. Please note that we offer alternative types of connections depending on your needs and these costs are available at our website.

Section 4: Map of Proposed Connection Points



Figure 1: Showing your used water point of connection



Figure 2: Showing your surface water point of connection

Section 5: Useful Information

Used water

Water Industry Act – Key Used Water Sections:

Section 98:

This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

Section 102:

This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.

Section 104:

This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.

Section 106:

This provides you with the right to have your constructed sewer connected to the public sewer.

Section 185:

This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our website at <http://www.anglianwater.co.uk/developers> or via our Development Services team on 03456 066087.

Sustainable drainage systems:

Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term. Therefore our preferred method of surface water disposal is through the use of Sustainable Drainage Systems (SuDS). SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our website at <http://www.anglianwater.co.uk/developers/suds.aspx>. We also recommend that you contact the Local Authority and Lead Local Flood Authority (LLFA) for the area to discuss your application.

Private sewer transfers:

Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

- Surface water sewers and lateral drains that did not discharge to the public sewer, e.g. those that discharged to a watercourse.
- Foul sewers and lateral drains that discharged to a privately owned sewage treatment/collection facility.
- Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created. It is anticipated that all new sewer applications will need to have an approved section 104 application ahead of a section 106 connection.

Encroachment:

Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our website at <http://anglianwater.co.uk/developers/encroachment.aspx>

Locating our assets:

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from . All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge. We have more information on our website at: <http://www.anglianwater.co.uk/developers/our-assets/>

Summary of charges:

A summary of this year's water and used water connection and infrastructure charges can be found at <http://www.anglianwater.co.uk/developers/charges>

Disclaimer:

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the planned approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

No liability whatsoever, including liability for negligence is accepted by Anglian Water, or its partners, employees or agents, for any error or omission, or for the results obtained from the use of this report and/or its content. Furthermore in no event will any of those parties be liable to the applicant or any third party for any decision made or action taken as a result of reliance on this report.

This report is valid for the date printed and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s).

Appendix E – SUDS MAINTENANCE SCHEDULE

Drainage Maintenance Schedule

FW1733 - Station Road, Long Sutton

Schedule	Feature	Required Action	Frequency
Regular Maintenance	Swales	Remove Litter and Debris	Monthly, or as required
		Cut Grass – to Retain Grass Height Within Specified Design Range.	Monthly (during growing season), or as required
		Manage Other Vegetation and Remove Nuisance Plants.	Monthly at start, then as required
		Inspect Inlets, Outlets and Overflows for Blockages, and Clear if Required.	Monthly
		Inspect Infiltration Surfaces for Ponding, Compaction, Silt Accumulation, Record Areas Where Water is Ponding for > 48 Hours.	Monthly, or when required
		Inspect Vegetation Coverage.	Monthly for 6 months, quarterly for 2 years, then half yearly
		Inspect Inlets and Facility Surface for Silt Accumulation, Establish Appropriate Silt Removal Frequencies.	Half yearly
	Trees	Remove Litter and Debris.	Monthly (or as required)
		Manage Other Vegetation and Remove Nuisance Plants.	Monthly (at start, then as required)
		Inspect Inlets and Outlets.	Inspect monthly
	Permeable Pavements	Brushing and Vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers recommendations – pay attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment

Drainage Maintenance Schedule

FW1733 - Station Road, Long Sutton

	Attenuation Storage Tanks	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
	Detention Basins	Remove Litter and Debris.	Monthly
		Cut Grass – for Spillways and Access Routes.	Monthly (during growing season), or as required
		Cut Grass – Meadow Grass in and Around Basin.	Half yearly (spring – before nesting season, and autumn)
		Manage Other Vegetation and Remove Nuisance Plants.	Monthly (at start, then as required)
		Inspect Outlets, Inlets and Overflows for Blockages and Clear if Required.	Monthly
		Inspect Banksides, Structures, Pipework etc for Evidence of Physical Damage.	Monthly
		Inspect Inlets and Facility Surface for Silt Accumulation. Establish Appropriate Silt Removal Frequencies.	Monthly (for first year), then annually or as required
		Check any Penstocks and Other Mechanical Devices.	Annually
		Tidy All Dead Growth Before Start of Growing Season.	Annually
		Remove Sediment from Inlets, Outlets and Forebay.	Annually (or as required)
		Manage Wetland Plants in Outlet Pool – Where Provided.	Annually

Drainage Maintenance Schedule

FW1733 - Station Road, Long Sutton

Schedule	Feature	Required Action	Frequency
Occasional Maintenance	Trees	Check Tree Health and Manage Tree Appropriately.	Annually
		Remove Silt Build-Up from Inlets and Surface and Replace Mulch as Necessary.	Annually, or as required
		Water	As required
	Permeable Pavements	Stabilise and Mow Contributing and Adjacent Areas.	As required
		Removal of Weeds or Management Using Glyphosate Applied Directly into the Weeds by an Application Rather Than Spraying.	As required – once per year on less frequently used pavements
	Detention Basins	Reseed Areas if Poor Vegetation Growth.	As required
		Prune and Trim any Trees and Remove Cuttings.	Every 2 years, or as required
		Remove Sediment from Inlets, Outlets, Forebay and Main Bain when Required.	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided).

Schedule	Feature	Required Action	Frequency
Remedial Actions	Swales	Repair Erosion or Other Damage by Re-Turfing or Reseeding.	As required
		Relevel Uneven Surfaces and Reinstate Design Levels.	As required
		Scarify and Spike Topsoil Layer to Improve Infiltration Performance, Break Up Silt Deposits and Prevent Compaction of the Soil Surface.	As required
		Remove Build-Up of Sediment on Upstream Gravel Trench, Flow Spreader or at Top of Filter Strip.	As required
		Remove and Dispose of Oils or Petrol Residues Using Safe Standard Practices.	As required
	Permeable Pavements	Remediate Any Landscaping which, Through Vegetation Maintenance or Soil Slip, has been Raised to within 50mm of the Level of the Paving.	As required
		Remedial Work to any Depressions, Rutting and Cracked or Broken Blocks Considered Detrimental to the Structural Performance or a Hazard to Users, and Replace Lost Jointing Material.	As required

Drainage Maintenance Schedule

FW1733 - Station Road, Long Sutton

		Rehabilitation of Surface and Upper Substructure by Remedial Sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
	Attenuation Storage Tanks	Repair/ Rehabilitate Inlets, Outlets, Overflows and Vents.	As required
	Detention Basins	Repair Erosion or Other Damage by Reseeding or Re-Turfing.	As required
		Realignment of Rip-Rap.	As required
		Repair/ Rehabilitation of Inlets, Outlets and Overflows.	As required
		Relevel Uneven Surfaces and Reinstate Design Levels.	As required

Schedule	Feature	Required Action	Frequency
Monitoring	Attenuation Storage Tanks	Survey Inside of Tank for Sediment Build-Up and Remove if Necessary.	Every 5 years or as required
		Inspect/ Check all Inlets, Outlets, Vents and Overflows to Ensure that they are in Good Condition and Operating as Designed.	Annually
	Permeable Pavements	Initial Inspection.	Monthly for three months after installation
		Inspect for Evidence of Poor Operation and/or Weed Growth – if required, take Remedial Action.	Three-monthly, 48 hours after large storms in first six months
		Inspect Silt Accumulation Rates and Establish Appropriate Brushing Frequencies.	Annually
		Monitor Inspection Chambers.	Annually

7.5. APPENDIX F – GREENFIELD RUNOFF CALCULATIONS

Calculated by:

Site name:

Site location:

Site coordinates

Latitude:

Longitude:

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Reference:

Date:

Methodology	IH124
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Site characteristics

Total site area (ha)	1.038
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Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	2	2
HOST class	---	---
SPR/SPRHOST	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm)	581	581
Hydrological region	5	5
Growth curve factor: 1 year	0.87	0.87
Growth curve factor: 30 year	2.45	2.45
Growth curve factor: 100 year	3.56	3.56

Notes:

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

Normally limiting discharge rates which are less than 2.0 l/s/ha are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consents are usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	1.52	1.52
1 in 1 year (l/s)	1.32	1.32
1 in 30 years (l/s)	3.73	3.73
1 in 100 years (l/s)	5.42	5.42

7.6. APPENDIX G – EXISTING SURFACE WATER DISCHARGE CALCULATION

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes Private Manhole Sizes Private

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.800	4-8	0.014

Total Area Contributing (ha) = 0.814

Total Pipe Volume (m³) = 2.165

Network Design Table for Storm

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	Auto Design
1.000	5.000	0.063	79.4	0.814	4.00	0.0	0.600	o	525	Pipe/Conduit	
1.001	5.000	0.063	80.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.03	9.000	0.814	0.0	0.0	0.0	2.52	544.7	110.2
1.001	50.00	4.07	8.937	0.814	0.0	0.0	0.0	2.51	542.5	110.2

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN Invert Level (m)	Diameter (mm)	Pipes In PN Invert Level (m)	Diameter (mm)	Backdrop (mm)
ex1	10.000	1.000	Open Manhole	1500	1.000	9.000	525		
ex2	10.000	1.063	Open Manhole	1500	1.001	8.937	525	1.000	8.937
	10.000	1.126	Open Manhole	0		OUTFALL		1.001	8.875

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PIPELINE SCHEDULES for Storm

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)
1.000	o	525	ex1	10.000	9.000	0.475	Open Manhole	1500
1.001	o	525	ex2	10.000	8.937	0.538	Open Manhole	1500

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)
1.000	5.000	79.4	ex2	10.000	8.937	0.538	Open Manhole	1500
1.001	5.000	80.0		10.000	8.875	0.601	Open Manhole	0

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)
1.001		10.000	8.875	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 * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.400		

Manhole Headloss for Storm

PN	US/MH Name	US/MH Headloss
1.000	ex1	0.500
1.001	ex2	0.500

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Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	ex1	1.767	0.758	0.000	2.525
1.001	ex2	1.878	0.920	0.000	2.798
Total		3.646	1.678	0.000	5.323

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Summary Wizard of 15 minute 1 year Winter I+0% for Storm

Simulation Criteria

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.406 Cv (Winter) 0.840

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

Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water Surcharged Flooded			Pipe		
PN	US/MH Name	Storm Rank	Level (m)	Depth (m)	Volume (m ³)	Flow / Overflow Cap.	Flow (l/s)	Status
1.000	ex1	4	9.251	-0.274	0.000	0.46	114.9	OK
1.001	ex2	4	9.188	-0.274	0.000	0.46	114.0	OK

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Summary Wizard of 15 minute 2 year Winter I+0% for Storm

Simulation Criteria

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.406 Cv (Winter) 0.840

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

Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water Surcharged Flooded					Pipe	
	US/MH	Storm	Level	Depth	Volume	Flow /	Overflow	Flow	
PN	Name	Rank	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)	Status
1.000	ex1	3	9.294	-0.231	0.000	0.60		148.8	OK
1.001	ex2	3	9.231	-0.231	0.000	0.59		147.8	OK

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Summary Wizard of 15 minute 30 year Winter I+0% for Storm

Simulation Criteria

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.406 Cv (Winter) 0.840

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

Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water	Surcharged	Flooded		Pipe		
PN	US/MH Name	Storm Rank	Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	ex1	2	9.578	0.053	0.000	1.03		255.4	SURCHARGED
1.001	ex2	2	9.486	0.024	0.000	1.02		252.4	SURCHARGED

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Summary Wizard of 15 minute 100 year Winter I+0% for Storm

Simulation Criteria

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.406 Cv (Winter) 0.840

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

Profile(s) Winter
 Duration(s) (mins) 15
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 0

			Water	Surcharged	Flooded		Pipe		
PN	US/MH Name	Storm Rank	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	ex1	1	9.805	0.280	0.000	1.38		343.0	FLOOD RISK
1.001	ex2	1	9.588	0.126	0.000	1.39		346.6	SURCHARGED

7.7. APPENDIX H – PROPOSED SURFACE WATER ATTENUATION CALCULATIONS

SUDS Storage Calculations

Global Variables

Location = England and Wales

SAAR = 600 mm/yr

WRAP = 2

M5-60 = 19.00 mm

r Ratio = 0.40

Soil index = 0.3

Input Data

Contributing area = 1.038 ha

Allowable discharge = 5 lps

Maximum possible storm duration = 1440 min

Storm duration time step = 10 min

Storm return period = 100 years

Calculated Data

Time to max. storage = 190 mins

Rainfall at max. storage = 16.5 mm/hr

Storage volume = 186.397 m³

Adjustments to Result for Climate Change

Volume + 10% for normal discharge (W5-074) : Storage volume = 205.037 m³

Volume + 20% for discharge into river flows (DEFRA): Storage volume = 223.677 m³

Volume + 40% for EA residential requirements : Storage volume = 260.956 m³

Volume + 50% for other residential requirements : Storage volume = 279.596 m³

Output Data

Time	Rainfall	Inflow	Outflow	Balance
	Intensity			
mins	mm/hr	m ³	m ³	m ³
10.0	115.70	90.069	3.000	87.069
20.0	78.92	122.879	6.000	116.879
30.0	61.30	143.175	9.000	134.175
40.0	50.73	157.987	12.000	145.987
50.0	43.60	169.706	15.000	154.706
60.0	38.41	179.428	18.000	161.428
70.0	34.45	187.750	21.000	166.750
80.0	31.32	195.030	24.000	171.030
90.0	28.76	201.505	27.000	174.505
100.0	26.63	207.336	30.000	177.336
110.0	24.83	212.639	33.000	179.639
120.0	23.28	217.503	36.000	181.503
130.0	21.93	221.992	39.000	182.992

140.0	20.75	226.160	42.000	184.160
150.0	19.70	230.048	45.000	185.048
160.0	18.76	233.690	48.000	185.690
170.0	17.92	237.114	51.000	186.114
180.0	17.15	240.343	54.000	186.343
190.0	16.46	243.397	57.000	186.397 Maximum
200.0	15.82	246.293	60.000	186.293
210.0	15.23	249.046	63.000	186.046
220.0	14.69	251.667	66.000	185.667
230.0	14.19	254.167	69.000	185.167
240.0	13.73	256.557	72.000	184.557
250.0	13.30	258.844	75.000	183.844
260.0	12.90	261.037	78.000	183.037
270.0	12.52	263.141	81.000	182.141
280.0	12.16	265.163	84.000	181.163
290.0	11.83	267.108	87.000	180.108
300.0	11.52	268.981	90.000	178.981
310.0	11.22	270.787	93.000	177.787
320.0	10.94	272.529	96.000	176.529
330.0	10.67	274.211	99.000	175.211
340.0	10.42	275.837	102.000	173.837
350.0	10.19	277.657	105.000	172.657
360.0	9.97	279.339	108.000	171.339
370.0	9.75	280.983	111.000	169.983
380.0	9.55	282.589	114.000	168.589
390.0	9.36	284.159	117.000	167.159
400.0	9.17	285.696	120.000	165.696
410.0	9.00	287.200	123.000	164.200
420.0	8.83	288.673	126.000	162.673
430.0	8.67	290.116	129.000	161.116
440.0	8.51	291.532	132.000	159.532

450.0	8.36	292.920	135.000	157.920
460.0	8.22	294.282	138.000	156.282
470.0	8.08	295.619	141.000	154.619
480.0	7.95	296.933	144.000	152.933
490.0	7.82	298.223	147.000	151.223
500.0	7.69	299.491	150.000	149.491
510.0	7.57	300.738	153.000	147.738
520.0	7.46	301.964	156.000	145.964
530.0	7.35	303.170	159.000	144.170
540.0	7.24	304.357	162.000	142.357
550.0	7.14	305.525	165.000	140.525
560.0	7.03	306.676	168.000	138.676
570.0	6.94	307.809	171.000	136.809
580.0	6.84	308.926	174.000	134.926
590.0	6.75	310.026	177.000	133.026
600.0	6.66	311.110	180.000	131.110
610.0	6.57	312.180	183.000	129.180
620.0	6.49	313.234	186.000	127.234
630.0	6.41	314.274	189.000	125.274
640.0	6.33	315.300	192.000	123.300
650.0	6.25	316.313	195.000	121.313
660.0	6.18	317.313	198.000	119.313
670.0	6.10	318.299	201.000	117.299
680.0	6.03	319.274	204.000	115.274
690.0	5.96	320.236	207.000	113.236
700.0	5.89	321.186	210.000	111.186
710.0	5.83	322.125	213.000	109.125
720.0	5.76	323.053	216.000	107.053
730.0	5.70	323.970	219.000	104.970
740.0	5.64	324.876	222.000	102.876
750.0	5.58	325.772	225.000	100.772

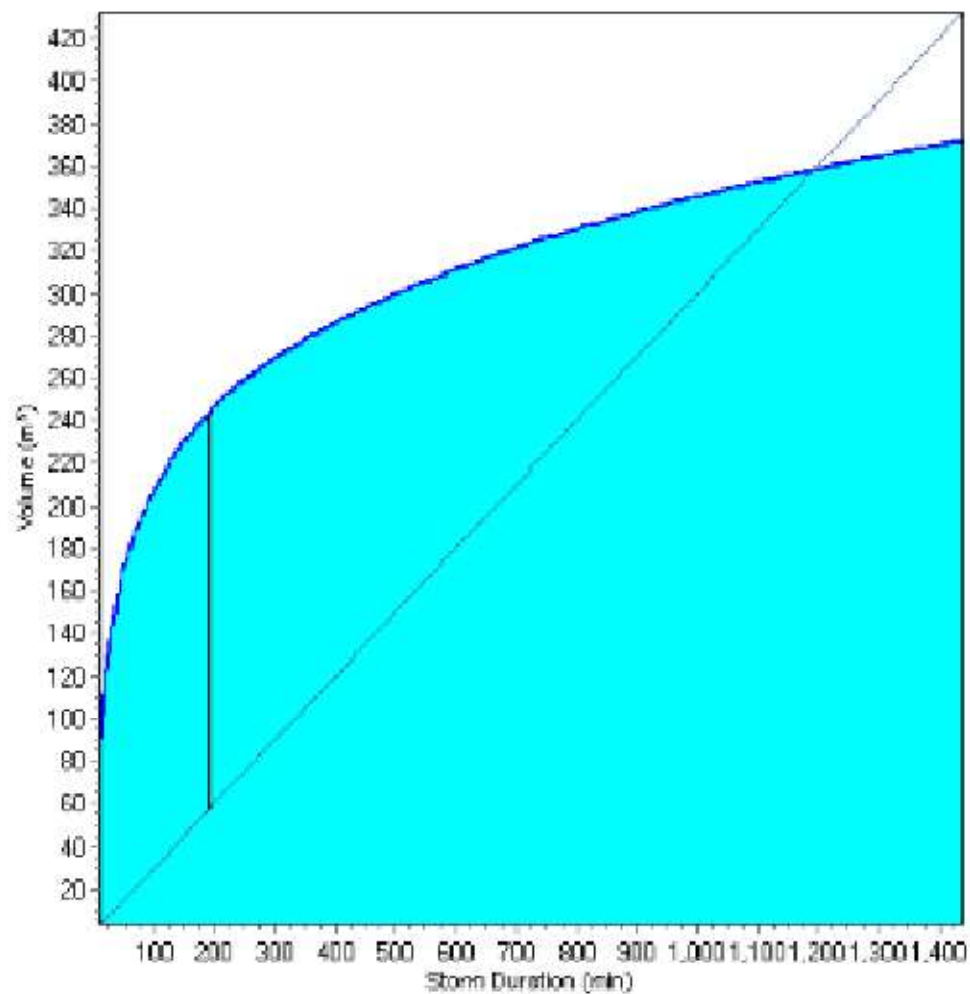
760.0	5.52	326.658	228.000	98.658
770.0	5.46	327.534	231.000	96.534
780.0	5.41	328.401	234.000	94.401
790.0	5.35	329.258	237.000	92.258
800.0	5.30	330.106	240.000	90.106
810.0	5.25	330.945	243.000	87.945
820.0	5.20	331.775	246.000	85.775
830.0	5.15	332.597	249.000	83.597
840.0	5.10	333.410	252.000	81.410
850.0	5.05	334.215	255.000	79.215
860.0	5.00	335.012	258.000	77.012
870.0	4.96	335.801	261.000	74.801
880.0	4.91	336.583	264.000	72.583
890.0	4.87	337.357	267.000	70.357
900.0	4.83	338.124	270.000	68.124
910.0	4.78	338.883	273.000	65.883
920.0	4.74	339.636	276.000	63.636
930.0	4.70	340.381	279.000	61.381
940.0	4.66	341.120	282.000	59.120
950.0	4.62	341.852	285.000	56.852
960.0	4.58	342.578	288.000	54.578
970.0	4.55	343.297	291.000	52.297
980.0	4.51	344.010	294.000	50.010
990.0	4.47	344.716	297.000	47.716
1000.0	4.44	345.417	300.000	45.417
1010.0	4.40	346.112	303.000	43.112
1020.0	4.37	346.801	306.000	40.801
1030.0	4.33	347.484	309.000	38.484
1040.0	4.30	348.162	312.000	36.162
1050.0	4.27	348.834	315.000	33.834
1060.0	4.24	349.500	318.000	31.500

1070.0	4.20	350.162	321.000	29.162
1080.0	4.17	350.818	324.000	26.818
1090.0	4.14	351.469	327.000	24.469
1100.0	4.11	352.115	330.000	22.115
1110.0	4.08	352.756	333.000	19.756
1120.0	4.05	353.392	336.000	17.392
1130.0	4.02	354.023	339.000	15.023
1140.0	4.00	354.649	342.000	12.649
1150.0	3.97	355.271	345.000	10.271
1160.0	3.94	355.888	348.000	7.888
1170.0	3.91	356.501	351.000	5.501
1180.0	3.89	357.109	354.000	3.109
1190.0	3.86	357.713	357.000	0.713
1200.0	3.84	358.313	360.000	0.000
1210.0	3.81	358.908	363.000	0.000
1220.0	3.79	359.499	366.000	0.000
1230.0	3.76	360.086	369.000	0.000
1240.0	3.74	360.670	372.000	0.000
1250.0	3.71	361.249	375.000	0.000
1260.0	3.69	361.824	378.000	0.000
1270.0	3.67	362.395	381.000	0.000
1280.0	3.64	362.962	384.000	0.000
1290.0	3.62	363.526	387.000	0.000
1300.0	3.60	364.086	390.000	0.000
1310.0	3.58	364.642	393.000	0.000
1320.0	3.55	365.195	396.000	0.000
1330.0	3.53	365.744	399.000	0.000
1340.0	3.51	366.290	402.000	0.000
1350.0	3.49	366.832	405.000	0.000
1360.0	3.47	367.370	408.000	0.000
1370.0	3.45	367.906	411.000	0.000

1380.0	3.43	368.438	414.000	0.000
1390.0	3.41	368.967	417.000	0.000
1400.0	3.39	369.492	420.000	0.000
1410.0	3.37	370.015	423.000	0.000
1420.0	3.35	370.534	426.000	0.000
1430.0	3.33	371.050	429.000	0.000
1440.0	3.31	371.563	432.000	0.000

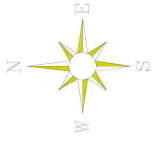
SUDS Storage Volume

— Inflow Volume — Outflow Volume — Maximum Storage



Rainfall intensity at max. storage = 16.5 mm/hr
Time to max. storage = 190.0 mins
Storage volume required = 186.397 m³

7.8. APPENDIX I – TOPOGRAPHICAL SURVEY



Station			Eastings (m)	Northings (m)	Level (m)
M1	542760.391	322911.261	3.770		
M2	542760.391	322911.261	3.770		
M3	542836.897	322977.543	3.251		
M4	542880.878	322920.007	2.919		

Station			Eastings (m)	Northings (m)	Level (m)
M1	542760.391	322911.261	3.770		
M2	542760.391	322911.261	3.770		
M3	542836.897	322977.543	3.251		
M4	542880.878	322920.007	2.919		

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MEASURED SURVEYS

CLIENT
Kaplan
Property Group

PROJECT
Station Road
Long Sutton, Spalding
PE12 9BP

TITLE
Topographical
Survey

Scale 1:2000
Date 18.03.2019
Drawn ST
Checked RP
Level datum ONS
Grid orientation ONS
Job number 3066
Revision 0
Drawing no. 0001
Sheet 1 of 1

Notes:
This drawing is a topographical survey of the land shown on the plan. It is not a plan of the land and should not be used for any purpose other than the one for which it was prepared. It is the responsibility of the client to ensure that the land is correctly identified and that the survey is carried out in accordance with the relevant legislation. The survey is carried out in accordance with the relevant legislation and the client is responsible for ensuring that the land is correctly identified and that the survey is carried out in accordance with the relevant legislation. The survey is carried out in accordance with the relevant legislation and the client is responsible for ensuring that the land is correctly identified and that the survey is carried out in accordance with the relevant legislation.

ICES

