



MA10478-FRA-R01

**Proposed Residential Development
Station Road, Surfleet**

Mr. and Mrs. Needham

Flood Risk Assessment

December 2016

millward

-  Civil & Structural Engineering
-  Environmental & Geotechnical
-  Flood Risk & Drainage
-  Highways & Infrastructure
-  Structural Inspections
-  Transportation

REVISION

Reference	Revision	Author	Date
MA10478-FRA-R01	Initial Issue for planning	JMcK	January 2017

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Proposed Impermeable Areas: MA10478/200

Proposed Drainage Strategy: MA10478/201

Proposed Site Layout: 1659-02

Appendix B – Consultations

Anglian Water Sewer Map

Anglian Water Pre Development Enquiry Report

Appendix C – WinDES Calculation Results

ICP SUDS Greenfield Run Off Calculation

Proposed Peak Foul Flows

Source Control Surface water drainage – Preliminary storage volumes



1. INTRODUCTION

- 1.1 Millward have been appointed to undertake a Flood Risk Assessment (FRA) for a proposed residential development for 23 units on land adjacent to Station Road, Surfleet, PE11 4DB.
- 1.2 The land is immediately to the rear of the proposed residential development of 5 units which front onto Station Road (Planning Approval reference: H17-0798-15).
- 1.3 This FRA is undertaken in accordance with the National Planning Policy Framework and associated Technical Guidance Document March 2012 (NPPF).
- 1.4 This FRA discusses and provides both a qualitative assessment and quantitative assessment for the residential development in terms of flood risk, future flood risk over the anticipated lifetime of the development and reference to the sequential and exception test using a precautionary and risk based approach.



2 THE SITE

- 2.1 This proposed residential development is located to the north side of Station Road on Brownfield Land in Surfleet, totalling 0.954 Hectares in area. The site is located within the urban extents of Surfleet approximately 5 miles north of the centre of Spalding. The site location is shown on drawing MA10478/SK01 contained within Appendix A.
- 2.2 Vehicular access to the development will be via Station Road as per the architects drawing contained within Appendix A which connects through to Station Road via the planning approved layout (Ref: H17-0798-15).
- 2.3 The site is currently developed as a nursery with the site area for development which includes Glasshouses and arable land for growing of plants. Whilst currently developed land, the Glasshouses do not look to have formal drainage taking the rainwater run-off to any drainage system. Indeed from a site visit there was no evidence of formal drainage taking the roof drainage of these Glasshouses. Therefore for the purpose of analysis for surface water run-off, the site is classed as Greenfield.
- 2.4 There is no evidence that the site is or has been formally drained into the existing adopted sewer system and with the topography of the land falling circa 1m to the northern boundary away from Station Road and the River Glen surface water connectivity to the River or the road is unlikely.
- 2.5 There is an existing drainage ditch located to the northern boundary of the site approximately 400mm-600mm deep which drains to the west along the northern boundary. This ditch location is shown on the proposed site layout drawing (1659-02 Cooper Architectural Design drawing).
- 2.6 This ditch then runs north essentially parallel to Hun Gate into the wider ditch network. From the site visit undertaken, the ditch becomes deeper once parallel to Hun Gate.



- 2.7 Existing site levels fall south to north towards this existing ditch and whilst the nursery development may not have had any formal drainage outfalls into the ditch, the land generally falls such that the natural drainage flow routes (either across the surface or within the soil) would be towards this ditch. Therefore the receptor for surface water run-off is this ditch to the north.
- 2.8 It is concluded that the land will currently drain via natural percolation into the topsoil and sub-soils (if permeable) and ultimately into the drainage ditch to the northern boundary.
- 2.9 Site levels within the development area vary from circa 5m AOD to the frontage of the site (Southern boundary which is Station Road) to circa 3.42m AOD to the north east corner of the site. The average gradient across the site south to north is circa 1:70 towards the northern boundary ditch.
- 2.10 The site currently has glasshouses and other structures on it but no evidence of formal surface water drainage. Therefore the site surface water run-off for the existing scenario has been calculated by the ICP SUDS method, which confirms a Greenfield run-off rate (QBAR) of 1.4 l/s. The WinDES results are contained within Appendix C.
- 2.11 In accordance with HR Wallingford Greenfield Run Off, a 5 l/s minimum rate applies for surface water discharge. This rate applies for proposed development up to and including the 1 in 100 year event including 40% allowance for climate change.



3 CONSULTATIONS

3.1 Environment Agency (EA)

- 3.1.1 The EA national flood risk maps available on their web site have been interrogated firstly to define in terms of planning what flood zone the site is contained within.
- 3.1.2 The development site is contained partially within Flood Zone 1 2 and 3 which in accordance with Table 1 of the NPPF Technical Guidance document, is defined as Low Probability, Medium and High Probability of flooding.
- 3.1.3 There are existing flood defences identified to the southern side of Station Road which could potentially protect the site from flooding although the EA mapping does not identify the site as benefiting from flood defences.
- 3.1.4 The EA have confirmed that they only hold basic flood mapping in this area (Product 1) and therefore they have confirmed the hazard mapping in the South Holland SFRA should be assessed and the site specific FRA should be based on the hazard mapping provided within the SFRA.
- 3.1.5 The Environment Agency standing advice note for sites within Flood Zone 1 greater than 1 hectare in size requires a flood risk assessment to be undertaken which should concentrate on dealing with the proposed surface water run-off from the site and how the run-off is dealt with and controlled. The southern part of the site is contained within Flood Zone 1 with the northern portion of the site within Flood Zone 3. This generally correlates as the topographical survey shows a slight gradient and reduction in levels to the northern boundary adjacent to the existing drainage ditch.

3.2 Anglian Water (AW)

- 3.2.1 As part of this assessment AW sewer plans have been obtained to determine the location of sewers in the vicinity of the site which is shown in Appendix B.



- 3.2.2 To the north of the site there is a 150mm diameter foul sewer and rising main which from the records MH7501, 7502, and 6501 are 1.69m to 2.18m depth.
- 3.2.3 There are no surface water sewers in the vicinity of the site whatsoever.
- 3.2.4 The foul connection to the existing adopted sewer is subject to a S106 application which would be undertaken as part of the detailed design of the drainage for the development.
- 3.2.5 A pre development enquiry has been submitted to Anglian Water for up to 30 residential units and the Pre-Planning Report received back from AW is contained within Appendix B. The 30 unit application covers the planning approved 5no dwellings to the frontage as well as the proposed 23no dwellings.
- 3.2.6 The response from AW confirms that the site is in the catchment of the Surfleet Water Recycling Centre which does not currently have capacity to treat the flows from this development. Anglian Water are however obligated to accept the foul flows from the development with the benefit of planning consent and would therefore take the necessary steps to ensure that there is sufficient treatment capacity should planning permission be granted.
- 3.2.7 AW confirm that gravity foul flows from the planned development (30 units) can be accommodated in the existing adopted sewer network as the sewerage system at present has available capacity for the proposed site. An approved connection point has also been provided which is manhole 6502 which is located within the sites boundary. The Cover level of the manhole is 3.971m AOD with an invert level of 1.796m AOD according to AW records.
- 3.2.8 The topographical survey which was undertaken for the planned development has recorded both the cover and invert level of the manhole at this location. The Cover Level is 4.20m and the invert level is 1.72m (this is to GPS datum).



4 SEQUENTIAL AND EXCEPTION TESTS

4.1 Sequential Test

- 4.1.1 The site has been assessed in line with the NPPF technical guidance. The site is confirmed to be within Flood Zone 1 (Low probability) Flood Zone 2 (Medium Probability) and Flood Zone 3 (High Probability) as defined in Table 1 (Flood zones) of the technical guidance document for the NPPF. These flood zones allocations do not take into account the extensive flood defences in the area which protects the whole region.
- 4.1.2 In accordance with the NPPF, the SFRA data refines the information on the probability of flooding, taking other sources of flooding and the impacts of climate change into account. SFRA's provide the basis for applying the Sequential Test.
- 4.1.3 There are very minor pockets of Flood Zone 1 areas which this some of this site is part of.
- 4.1.4 Upon review of the SFRA data and map 5, the site is outside the high risk areas taking the flood defences into account with the high risk area in Surfleet to the south of the development site (south of the watercourse adjacent to Station Road).
- 4.1.5 The SFRA states that (the district overall) allowing for the presence of flood defences and other flood risk management measures, most of the district can be classified as having Medium to Low probability of flooding.
- 4.1.6 Table 2, (Flood risk vulnerability classification) of the same document confirms that residential development (buildings used for dwelling houses) is classified as 'More Vulnerable' development.
- 4.1.7 Table 3, (Flood risk vulnerability and flood zone 'compatibility') confirms that development classified as 'More vulnerable' development in Flood Zone 1 (Low Probability) or Flood Zone 2 (Medium Probability) is considered appropriate without applying the Exception Test.



- 4.1.8 In terms of Sequential Test, there are no areas within a lower flood risk zone in the Surfleet area or the wider region upon review of the SFRA information on actual flood risk taking into account the presence of flood defences and other flood mitigation measures.
- 4.1.9 As the development principle of residential is deemed appropriate in terms of Sequential Test, the Exception Test does not apply.



5 PROPOSED DEVELOPMENT

- 5.1 The proposed development proposals consist of 23no dwellings in total with associated driveways and garages (off road) and garden areas to the front and rear of the proposed dwellings. The site is accessed by a central cul-de-sac access road which then accesses the western and eastern portions of the site via an internal junction. There are two turning heads within the site to enable a refuse or emergency vehicle to turn around meaning that such vehicles can enter and exit the site in a forward gear. The proposed plan layout of the development is shown on the proposed site layout contained within in Appendix A.
- 5.2 The impermeable areas of the proposed site are 38% (0.365Ha) as shown on drawing MA10478/200 contained in Appendix A which is an increase in impermeable area on the site, which therefore will require mitigation measures in terms of surface water drainage to reduce the surface water run off to equivalent Greenfield rates.
- 5.3 The proposals will also look into provision of permeable paving solutions to the driveways and potentially soakaways for roof drainage subject to on site percolation testing of the soil strata. Therefore on site testing would be required before detailed design of any drainage system to determine if soakaways are potentially viable at this site. However this is unlikely due to ground conditions and therefore the drainage strategy for this site assumes infiltration is not feasible to prove that the site can be adequately drained.
- 5.4 The surface water run-off from the site will outfall into the existing drainage ditch to the northern boundary of the site. The run off rate will be restricted to 5l/s maximum and the rate controlled by a vortex flow control before outfall into the ditch as shown on drawing MA10478/201 contained within Appendix A.



- 5.5 Utilising WinDES source control software, based upon the proposed impermeable areas (and adding 10% for urban creep of these surfaces) the estimated volume of attenuation if infiltration has been calculated for the 1 in 100 year event including climate change allowance with the outflow restricted to 5 l/s maximum.
- 5.6 The volume range of attenuation is between 189m³ and 261m³ for the 1 in 100 year event including climate change allowance of 40%. The WinDES results are presented in Appendix C.
- 5.7 Attenuation volume on the site will be provided by oversized pipes (1.2m diameter) which will give circa 150m³ of storage. Further storage volume of circa 115m³ will be provided within the private driveway areas which will be permeable paving structures but with positive outfalls into the piped drainage system (non-infiltration for the purpose of this assessment). The depth of stone will be 500mm in the driveway areas over a 770m² cumulative area. With a 30% void ratio, this equates to 115m³.
- 5.8 The surface water drainage strategy is preliminary and is subject to detailed design should the site obtain planning, but the preliminary strategy provides evidence that there is a surface drainage solution for this site.
- 5.9 Foul drainage would connect into the existing Anglian Water sewer network to the western boundary of the site with anticipated peak foul flows of circa 1.1 l/s into the existing sewer as shown on drawing MA10478/201 contained within Appendix A. These connections would of course be subject to a S106 connection approval from Anglian water as part of the planning and detailed design process.
- 5.10 The proposed connection point is downstream of the approved connection point to make the proposed system more cost efficient. This is essentially outfalling into the same system but just into the next downstream pipe in the system.



6 FLOOD RISK

6.1 Flooding From Watercourses

- 6.1.1 The development area is shown within Low to Medium Probability areas from watercourses and other sources of flooding according to the SFRA maps.
- 6.1.2 The closest area of high risk flooding is to the south of Station Road on lower lying land.
- 6.1.3 The South Holland SFRA (2010 update) provides district wide assessment of the flood risk including flood defence breach scenarios which have been assessed.
- 6.1.4 The SFRA shows the site is not at risk of flooding in the present day scenario
- 6.1.5 The risk of flooding to the development area from fluvial sources is considered to be **LOW** probability as the site is situated in the lowest flood zone from this source when assessing the site against the SFRA information available.

6.2 Flooding From Land / Adjacent Development

- 6.2.1 The main risk of flooding to this site is from the impermeable surfaces within the adjacent residential area to the east and west of the site, along with the Station Road carriageway which due to failure of the existing adopted drainage systems or intense rainfall saturating the soil resulting in run off over land instead of infiltration or interception by drainage infrastructure.
- 6.2.2 Any overland flow from adjacent development site is likely to be shallow and there are no low points within the site which would create a localised depression in the ground which would be at risk of ponding / pooling water from this source.



6.2.3 Any flooding from this source would be sheet flooding, shallow in depth. Flood flow routes from the existing properties would not be towards the development site. Station Road flood flow routes would potentially be towards the site but volumes of water from this source would be low.

6.2.4 Overall the risk of flooding from this source is considered to be **LOW**.

6.3 Flooding From Infrastructure Failure

6.3.1 The site is not within an area deemed to be at risk of flooding from reservoirs (according to the data on the EA website).

6.3.2 As the site is outside the limits of any deemed flood extents from a reservoir failure, the risk of flooding to the site is considered **LOW**.

6.4 Flooding From Groundwater

6.4.1 There are no confirmed records of groundwater flooding in the vicinity of the site in the SFRA.

6.4.2 The site is potentially underlain by Oxford Clay and therefore the chances of groundwater being an issue is remote as these soils are predominantly impermeable which would stop any rise in groundwater reaching the surface.

6.4.3 Overall the risk of flooding from this source is considered to be **LOW**. As there should not be any dwellings in localised low points within the site it is not considered further assessment is required to assess flooding from this source.

6.5 Flooding From Sewers

6.5.1 There are existing adopted foul sewers to the north of the development site which are 150mm diameter and connect to an existing pumping station to the north west of the site.



- 6.5.2 If any of these sewers were to flood, the water flow routes would be away from the development flowing in a northerly direction. The pump station is also lower than the site and if this was to fail flood flow routes of any foul water would be away from the site also
- 6.5.3 Overall taking into account the proximity of the sewers and topography of the area, the risk of flooding from this source is considered to be **LOW**.

6.6 Flooding From Climate Change

- 6.6.1 The NPPF Technical Guidance Document confirms in Table 5 that peak rainfall intensity is estimated to increase up to 30% over the lifetime of this development (100 years) and peak river flows by 20%. Tidal aspects extreme wave heights could increase between 5% and 10%. Sea level rises in this area over the lifetime of the development would be anticipated to be circa 1.2m (to year 2115).
- 6.6.2 The South Holland SFRA assesses the risk of flooding from Tidal and Fluvial events at year 2115. The plans show that the actual flood depth could be between 0 and 0.5m in depth for this general area. The site is located towards the outer extents of the limits of flooding and therefore levels in the region of 250mm should be expected which is mid-range for the area identified.
- 6.6.3 The SFRA plans show that the existing Station Road is at the limits of anticipated flooding.
- 6.6.4 The proposed site drainage will however be designed not to flood with an allowance of 40% for climate change in line with the NPPF technical guidance document.
- 6.6.5 Overall the risk of flooding from the effects of climate change is considered to be **MEDIUM**.



7 MITIGATION MEASURES

7.1 Essential Mitigation Measures

- 7.1.1 The assessment of flood risk in Section 6 of this assessment confirms a **LOW** risk of flooding from all sources of flooding except for the potential implications of climate change which is considered a **MEDIUM** risk primarily from tidal sources.
- 7.1.2 The finished floor levels of the properties should be set no lower than the existing Station Road or a minimum of 300mm above existing levels whichever is the higher. This will ensure that the floor levels of the dwellings are above any anticipated flood levels expected to occur over the lifetime of the development.
- 7.1.3 Upon review of the topographical survey of the site which includes Station Road to the south, the minimum finished floor level on the site should be 5.0m AOD which matches the level of Station Road.
- 7.1.4 Surface water drainage for the site should be designed to accommodate the 1 in 100 year event storm scenarios including a 40% allowance for climate change.

7.2 Recommended Mitigation Measures

- 7.2.1 All dwellings should have concrete ground floors with damp proof membranes as they are regarded as the most flood resilient floor types with effective connections between the dpc and dpm. The dpm should be between the surface screed and the concrete slab as this enables the concrete floor to dry out quickly and would also protect against any rising groundwater (unlikely) should flood risk from this source increase over the lifetime of the development.
- 7.2.2 Permeable paving to private driveways and parking areas should be utilised even if infiltration SUDS are not viable as permeable paving can be designed into a sealed system before outfall into the drainage ditch to the north of the site. This would form part of a SUDS treatment train in line with CIRIA C753.



- 7.2.3 Further investigations will be required as part of the detailed design of the drainage outfall which may require off site mitigation works to this existing drainage ditch to ensure free flow of the ditch.
- 7.2.4 From preliminary assessment from the site visit, the ditch should be excavated out to make it deeper and the culvert under the pumping station access should have remedial works undertaken to the headwall area to ensure free flow of water.
- 7.2.5 Where external gradients are flat or towards the dwelling entrances, provision of linear drainage should be provided to all access points.



8 CONCLUSIONS

- 8.1 This Flood Risk Assessment serves to review, assess and quantify (where applicable) the sources, or any potential flooding, the pathways of this flooding and potential receptors within the vicinity of the site.
- 8.2 The assessment of flood risk undertaken for this development confirms that the risk of flooding is **LOW** from all sources of flooding except for tidal sources with climate change applied which is **MEDIUM**.
- 8.3 The site is not at risk of flooding from any source present day and is situated within a low to medium area of flooding according the South Holland SFRA. Therefore safe access and egress to the properties is available if required.
- 8.4 The mitigation measures will provide further protection to the development and reduce any residual risk (however low) as far as practicable. It is recommended that compliance with the recommendations of this FRA are conditioned as part of any planning permission.
- 8.5 This assessment concludes that the site is suitable for development for residential use without unacceptable risk of flooding from all sources to the site itself and elsewhere for the lifetime of the development.



Appendix A – Drawings

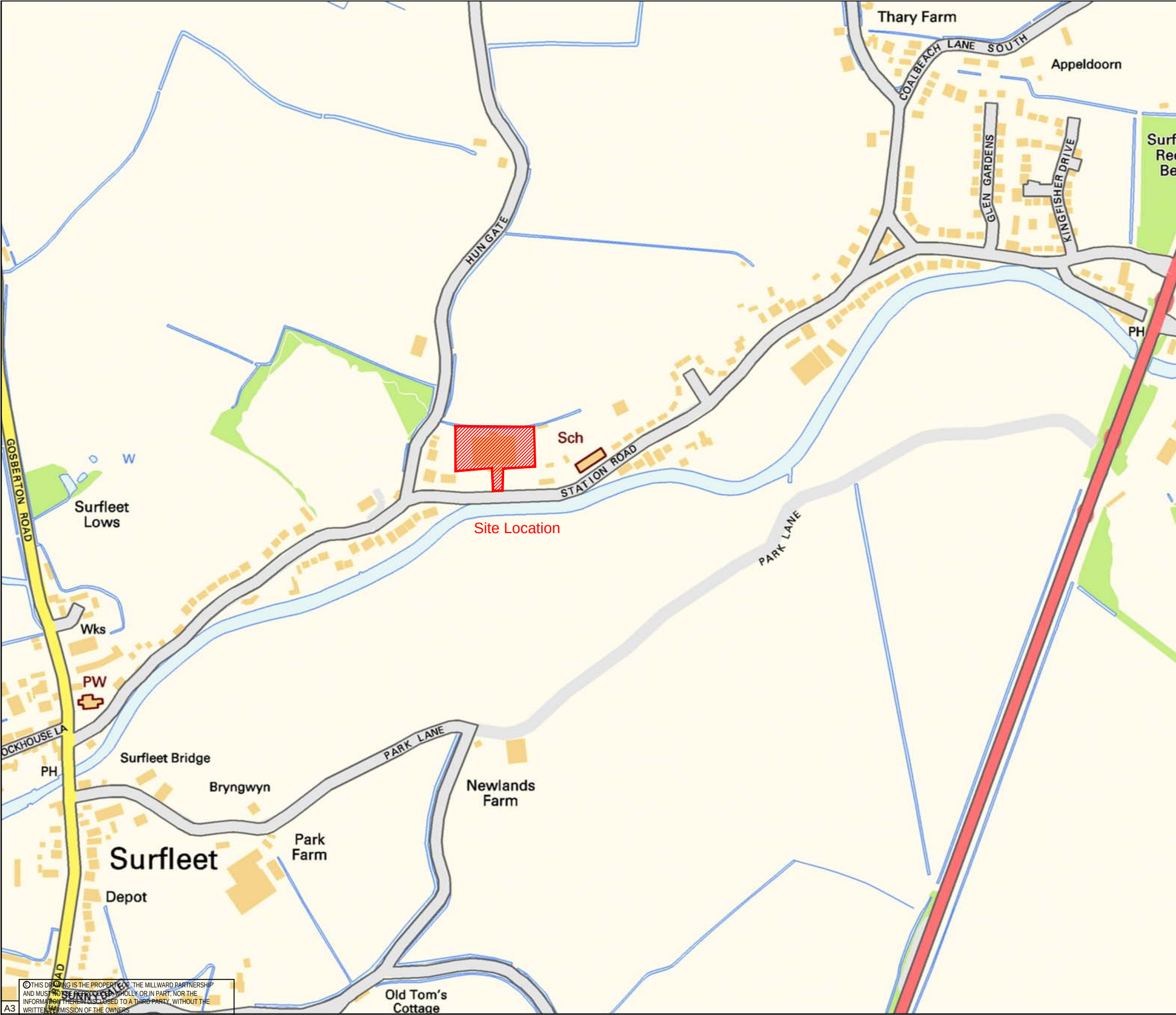
Site Location Plan: MA10478/SK01

Proposed Impermeable Areas: MA10478/200

Proposed Drainage Strategy: MA10478/201

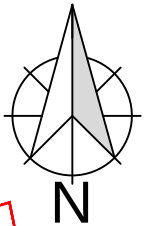
Proposed Site Layout: 1659-02





ASSOCIATED DRAWINGS				
No.	TITLE			
NOTES				
				
REV	DATE	BY	DETAILS	CHK'D
AMENDMENTS				
CLIENT				
Mr and Mrs Needham				
PROJECT				
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TITLE				
LOCATION PLAN				
DRAWING No:			DRAWING STATUS	
MA10478 / SK01			PRELIMINARY	
SCALE		DRAWN	ENGINEER	
1:500 @A3		J Harrison	J McKellar	
DATE		CHECKED	APPROVED BY	
January 2017		J McKellar	J McKellar	
 t: 0115 941 4560 no.1 malin hill, nottingham ng1 1jq e: info@millward.co.uk w: www.millward.co.uk				

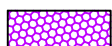
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ASSOCIATED DRAWINGS

No.	TITLE

NOTES

- Impermeable Areas**
- Roof Areas  1306m²
- Highways Areas  1568m²
- Driveway Areas  774m²
- Anglian Water
Foul Sewer Easement (6m) 

REV	DATE	BY	DETAILS	CHK'D
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AMENDMENTS

CLIENT
Mr and Mrs Needham

PROJECT
Residential Development
72 Station Road
Surfleet, Lincolnshire

TITLE
PROPOSED IMPERMEABLE AREAS

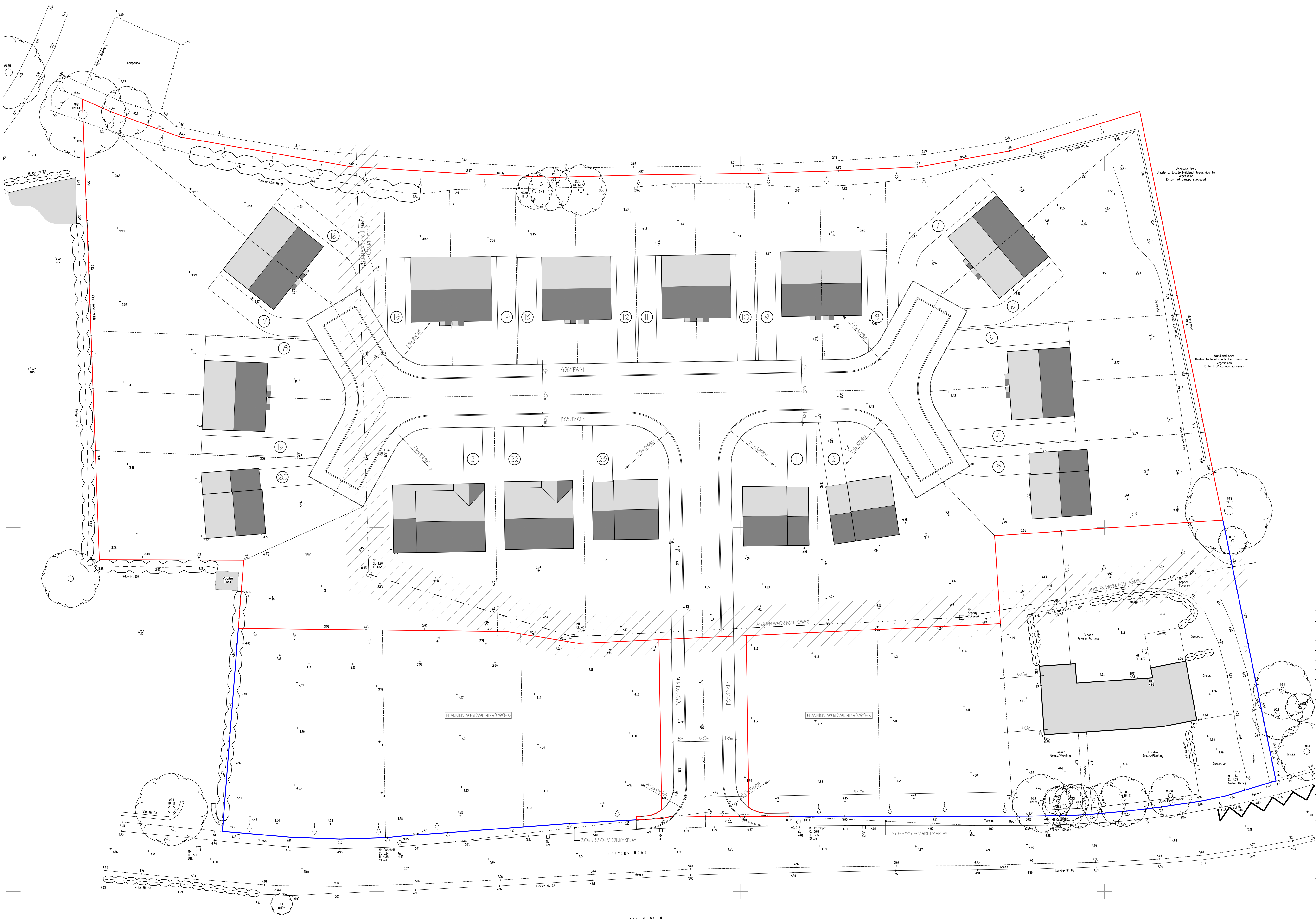
DRAWING No: MA10478 / 200	DRAWING STATUS PRELIMINARY
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SCALE 1:500 @A3	DRAWN J Harrison	ENGINEER J McKellar
DATE January 2017	CHECKED J McKellar	APPROVED BY J McKellar



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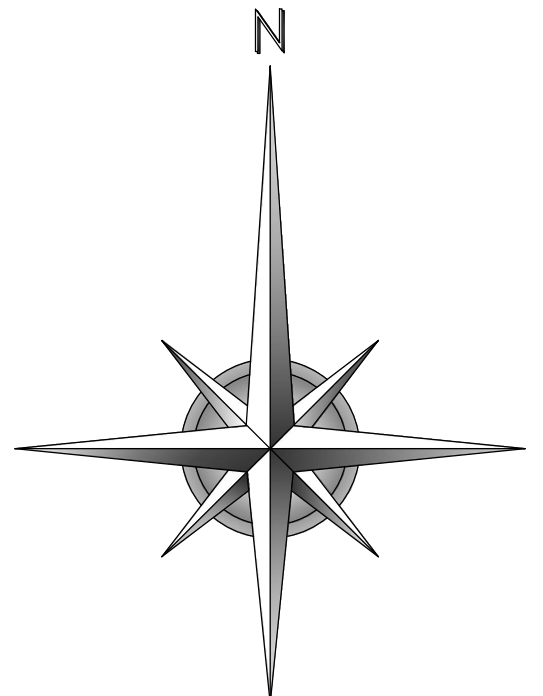


LIMITATIONS:
This drawing is limited in the amount of information contained and does not purport to contain a full specification of the works. It is solely for the purpose of obtaining Planning/Building Regulation approval.
The drawing must not be used as a contract document alone. All dimensions shall be taken from site from actual work. Under no circumstances shall measurements be scaled from this drawing for construction or ordering purposes.
All given dimensions shall be checked by the Builder/Contractor and will be his responsibility from commencement of site works.
The works will not be supervised or inspected on site by C.A.D. or any representative thereof. It is the client or their appointed agents responsibility to control workmanship, substitution of materials, adherence to specification, variations to contract etc.

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Materials shall conform to appropriate British Standard Specification or BBA Certificate or European Code equivalent.

HEALTH & SAFETY:
The Employer/Client shall ensure that the selected contractor is conversant with and adopts all measures necessary to achieve compliance with Health & Safety legislation for Building Sites and Work Places.
The Employer/Client is advised that should the works need to comply with the Construction Design and Management Regulations an Independent Planning Supervisor will be required.

SCOPE OF THE WORKS:
The works shall comprise of all that is shown on the drawing and details. Work that may not be specifically shown but may be reasonably inferred as necessary to carry out the works shall be deemed to be included.



SITE AREA 0.954 Ha.
FINISHED FLOOR LEVELS
4.50 O.D.

ROOM DIMENSIONS ARE INTERNAL
OF WALL FINISHES

revision	date	init.	revision details.



COOPER ARCHITECTURAL DESIGN
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Client. MR & MRS J NEDHAM
Project. RESIDENTIAL DEVELOPMENT (OUTLINE)
72 STATION ROAD
SURPLEET
Lincs
PE11 4DB
Drawing.

PROPOSED BLOCK PLAN
WITH INDICATIVE LAYOUT

Scale 1:250 @A1	Drawing No. 1659-02
Date DEC. '16	Drawn. J.C.

Appendix B – Consultations

Anglian Water Sewer Map

Anglian Water Pre Development Enquiry Report



Pre-Planning Assessment Report

72 Station Road, Surfleet

Section 1: Proposed Development

Thank you for submitting a pre-planning enquiry. This has been produced for Millward. Your reference number is **00018407**. If you have any questions upon receipt of this report, please contact Mark Rhodes on 01733 414690 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
C3 Dwellings	30

The anticipated residential build rate is:

Year	2016
Build Rate	30

- The grid reference for the site is TF2566828562.
- The site currently does not have planning permission and is located on a brownfield site.

Section 2: Assets Affected

In addition to any private assets that may be located on your site, there are public assets, owned and maintained by Anglian Water, located next to your site. The statutory easement of these assets overlap into your development site. The following table confirms the easement that will need to be taken into consideration when designing your layout.

Water and Used Water Easement Information		
Asset Type	Pipe Size (mm)	Total Easement Required (m)
Public Foul Sewer	150	3.0 m either side of the centre line
Public Foul Sewer	Unknown	Minimum of 3.0 m either side of the centre line

If it is not possible to avoid our assets then the water main/sewer may need to be diverted in accordance with Section 185 of the Water Industry Act (1991). We have a duty to divert our sewerage infrastructure if requested to do so although this would be at your expense. You will need to make a formal application if you would like a diversion to be considered. A copy of the section 185 diversion application form can be found at www.anglianwater.co.uk/developers

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 this development is in the catchment of Surfleet Water Recycling Centre, which currently does not have capacity to treat the flows from your development site. Anglian Water are obligated to accept the foul flows from your development with the benefit of planning consent and would therefore take the necessary steps to ensure that there is sufficient treatment capacity should the planning authority grant planning permission.

Used Water Network

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. The connection point will be to manhole 6502 located at land adjacent to Station Road at National Grid Reference (NGR) TF2564328546.

Surface Water Disposal

There are no public surface water sewers within the vicinity of the proposed development. Therefore Anglian Water will be unable to provide the site with a feasible solution of surface water disposal within the current assets. Alternative methods of surface water disposal will need to be investigated such as infiltration techniques or a discharge to a watercourse in accordance with the surface water management hierarchy as outlined in Building Regulations Part H.

The alternative is that a new surface water sewer is constructed which is used to convey your surface water to a watercourse or as part of a SuDs scheme, where appropriate. Subject to the sewer being designed in accordance with the current version of Sewers For Adoption, the sewer can be put forward for adoption by Anglian Water under Section 104 of the Water Industry Act 1991. If the outfall is to a watercourse, the applicant will be required to obtain consent to discharge via the appropriate body.

If your site has no means of drainage due to third party land then you may be able to requisition Anglian Water, under Section 98, to provide a connection to the public sewer for domestic drainage purposes. As part of this option, you may wish to enter into a works agreement in accordance with Section 30 of the Anglian Water Authority Act 1977. This will allow you to design and construct the public sewer using Anglian Waters' statutory powers in accordance with Section 159/168 of the Water Industry Act 1991.

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>

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

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 both infrastructure charges and connection costs. The 2016/17 charges are:

Infrastructure Charge	£354.00 per connection
-----------------------	------------------------

Please note that we offer alternative types of connections depending on your needs and these costs are available in our annual charges booklet, which can be downloaded from www.anglianwater.co.uk/developers/charges.

Section 4: Map of Proposed Connection Points

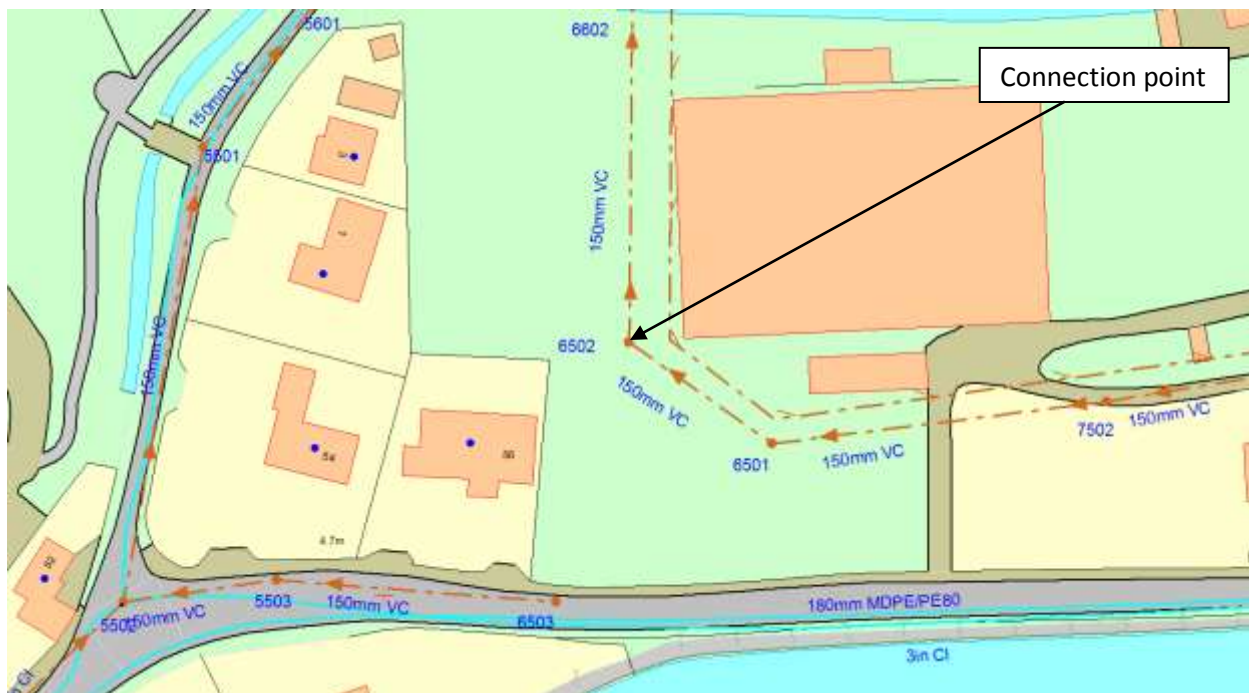


Figure 1: Showing your used water point of connection at manhole 6502 with a Cover Level of 3.971m and an Invert Level of 1.796m

Section 5: Useful Information

Water

Water Industry Act – Key Water Sections:

- **Section 41:** This provides you with the right to requisition a new water main for domestic purposes to connect your site to the public water network.
- **Section 45:** This provides you with the right to have a connection for domestic purposes from a building or part of a building to the public water main.
- **Section 51A:** This provides you with the right to provide the water main or service connection yourself and for us to vest them into our company.
- **Section 55:** This applies where you request a supply of water for non domestic premises.
- **Section 185:** This provides you with the right to make a reasonable request to have a public water main, sewer or public lateral drain removed or altered, at your expense. Details on how to make an application and the s185 form is available on our website at <http://www.anglianwater.co.uk20/developers> or via our Developer Services team on 08457 60 66 087.

Details on how you can make a formal application for a new water main, new connection or diversion are available on from our Developer Services team on 08457 60 66 087 or via our website at www.anglianwater.co.uk/developers

If you have any other queries on the rights to requisition or connect your housing to the public water and sewerage infrastructure then please contact our developer services team at: Developer Services, Anglian Water, PO Box 495, Huntingdon, PE29 6YY or Telephone: 0845 60 66 087 or Email: developerservices@anglianwater.co.uk

Water pressure and flow rate: The water pressure and consistency that we must meet for your site is laid out in the Water Industry Act (1991). This states that we must supply a flow rate of 9 litres per minute at a pressure of 10 metres of head to the external stop tap. If your water pressure requirements exceed this then you will need to provide and maintain any booster requirements to the development site.

Self Lay of Water Mains: A list of accredited Self Lay Organisations can be found at www.lloydsregister.co.uk/schemes/WIRS/providers-list.aspx.

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 www.anglianwater.co.uk/developers or via our Developer Services team on 08457 60 66 087.

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 www.digdat.co.uk. 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: 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/>

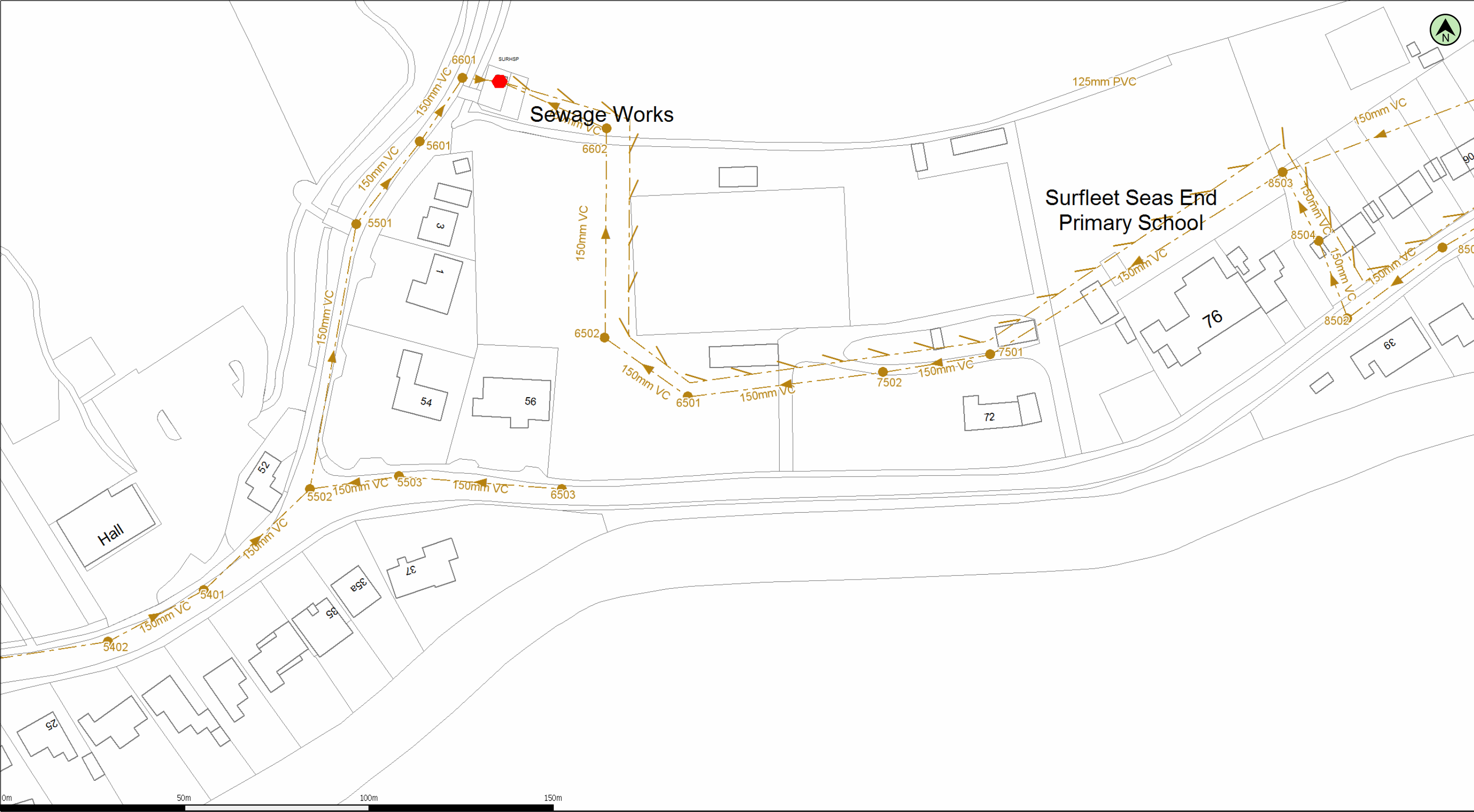
Disclaimer: The information provided within this report is based on the best data currently recorded, recorded within the last 12 months or provided by a third party. The position must be regarded as approximate. If there is further development in the area or for other reasons the position may change.

The accuracy of this report is therefore not guaranteed and does not obviate the need to make additional appropriate searches, inspections and enquiries. You are advised therefore to renew your enquiry should there be a delay in submitting your application for water supply/sewer connection to re-confirm the situation.

Any cost calculations provided within the report are estimated only and may be subject to change.

The responses made in this report are based on the presumption that your proposed development obtains planning permission. Whilst this report has been prepared to help assess the viability of your proposal, it must not be considered in isolation. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework (NPPF). As a spatial planning statutory consultee, we assist planning authorities in the preparation of a sustainable local plan on the basis of capacity within our water and water recycling (formerly referred to as wastewater) infrastructure. Consequently, any infrastructure needs identified in this report must only be considered in the context of up to date, adopted or emerging local plans. Where local plans are absent, silent or out of date these needs should be considered against the definition of sustainability set out in the NPPF as a whole.

No liability whatsoever including liability for negligence is accepted by Anglian Water Services Limited for any error or inaccuracy or omission including the failure to accurately record or record at all, the location of any water main, discharge pipe, sewer, or drain or disposal main or any item of apparatus.



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Date: 30/07/15

Scale: 1:1000

Map Centre: 525680,328528

Data updated: 15/06/15

Our Ref: 151177 - 1

Wastewater Plan A3

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2015 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Foul Sewer		Outfall	
Surface Sewer		(Colour denotes effluent type)	
Combined Sewer		Inlet	
Final Effluent		(Colour denotes effluent type)	
Rising Main		Manhole	
(Colour denotes effluent type)		(Colour denotes effluent type)	
Private Sewer		Sewage Treatment Works	
(Colour denotes effluent type)		Pumping Station	
Decommissioned Sewer			
(Colour denotes effluent type)			

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MA10160



Appendix C – WinDES Calculation Results

ICP SUDS Greenfield Run Off Calculation

Proposed Peak Foul Flows

Source Control Surface water drainage – Preliminary storage volumes



The Millward Partnership Ltd		Page 1																								
2nd Floor 3-7 Middle Pavement Nottingham NG1 7DX	Station Road Surfleet Existing Greenfield Run-off Estimate																									
Date Dec 2016 File	Designed By JMcK Checked By																									
Micro Drainage		Source Control W.12.4																								
<u>ICP SUDS Mean Annual Flood</u> Input <table> <tr> <td>Return Period (years)</td> <td>1</td> <td>Soil</td> <td>0.300</td> </tr> <tr> <td>Area (ha)</td> <td>0.954</td> <td>Urban</td> <td>0.000</td> </tr> <tr> <td>SAAR (mm)</td> <td>582</td> <td>Region Number</td> <td>Region 5</td> </tr> </table> Results l/s <table> <tr> <td>QBAR Rural</td> <td>1.4</td> </tr> <tr> <td>QBAR Urban</td> <td>1.4</td> </tr> <tr> <td>Q1 year</td> <td>1.2</td> </tr> <tr> <td>Q1 year</td> <td>1.2</td> </tr> <tr> <td>Q30 years</td> <td>3.4</td> </tr> <tr> <td>Q100 years</td> <td>5.0</td> </tr> </table>			Return Period (years)	1	Soil	0.300	Area (ha)	0.954	Urban	0.000	SAAR (mm)	582	Region Number	Region 5	QBAR Rural	1.4	QBAR Urban	1.4	Q1 year	1.2	Q1 year	1.2	Q30 years	3.4	Q100 years	5.0
Return Period (years)	1	Soil	0.300																							
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©1982-2010 Micro Drainage Ltd																										

The Millward Partnership Ltd		Page 1
2nd Floor 3-7 Middle Pavement Nottingham NG1 7DX	Station Road Surfleet Proposed Foul Flows	
Date Jan2017 File	Designed By JMCK Checked By	
Micro Drainage	Network W.12.4	

FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes	STANDARD	Manhole Sizes	STANDARD
Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.200
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	1.500
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	10.000	0.067	150.0	0.000	23	0.0	1.500	o	150

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ DWF (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	3.500	0.000	0.0	23	0.0	30	0.43	0.71	12.6	1.1

Variables

Results

Design

Overview 2D

Overview 3D

Vt

Quick Storage Estimate

FSR Rainfall

Return Period (years)

Region

Map

M5-60 (mm)

Ratio R

Cv (Summer)

Cv (Winter)

Impermeable Area (ha)

Maximum Allowable Discharge (l/s)

Infiltration Coefficient (m/hr)

Safety Factor

Climate Change (%)

0.750

0.840

0.400

5.0

0.00000

2.0

40

Analyse

OK

Cancel

Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

Variables

Results

Design

Overview 2D

Overview 3D

Vt

Quick Storage Estimate

Results

Global Variables require approximate storage of between 189 m³ and 261 m³.

These values are estimates only and should not be used for design purposes.

Analyse

OK

Cancel

Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0