Hole Farm Community Woodland

Drainage Strategy Report
Hole Farm

April 2023

Revision	Production Date	Prepared by	Checked by	Approved for release by	Sections revised
1.0	12/22	A Singh	R Cooper	-	
2.0	02/23	A Singh	R Cooper		
3.0	04/23	A Singh	R Cooper		

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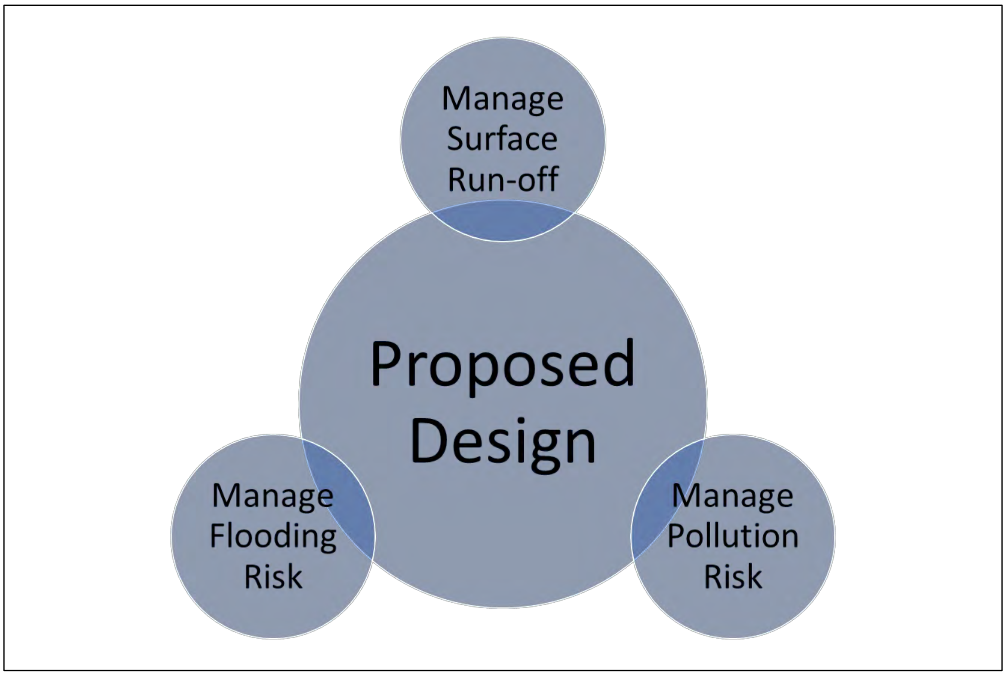
1 Introduction

1.1 Purpose

1.1.1 This report details the strategy adopted for drainage design at Hole Farm to meet the three primary elements associated with drainage design, as demonstrated in Figure 1-1 below, to ensure an 'Integrated Drainage Design' is ultimately developed in accordance with the necessary design standards such as Sustainable Drainage Systems Design Guide (Essex County Council, February 2020), The SuDS Manual (CIRIA C753) and relevant DMRB design standards.

Figure 1-1 – High Level Drainage Design Process



1.1.2 This report discusses the issues and constraints across the site extents and produces conceptual surface water drainage strategy for the proposed development.

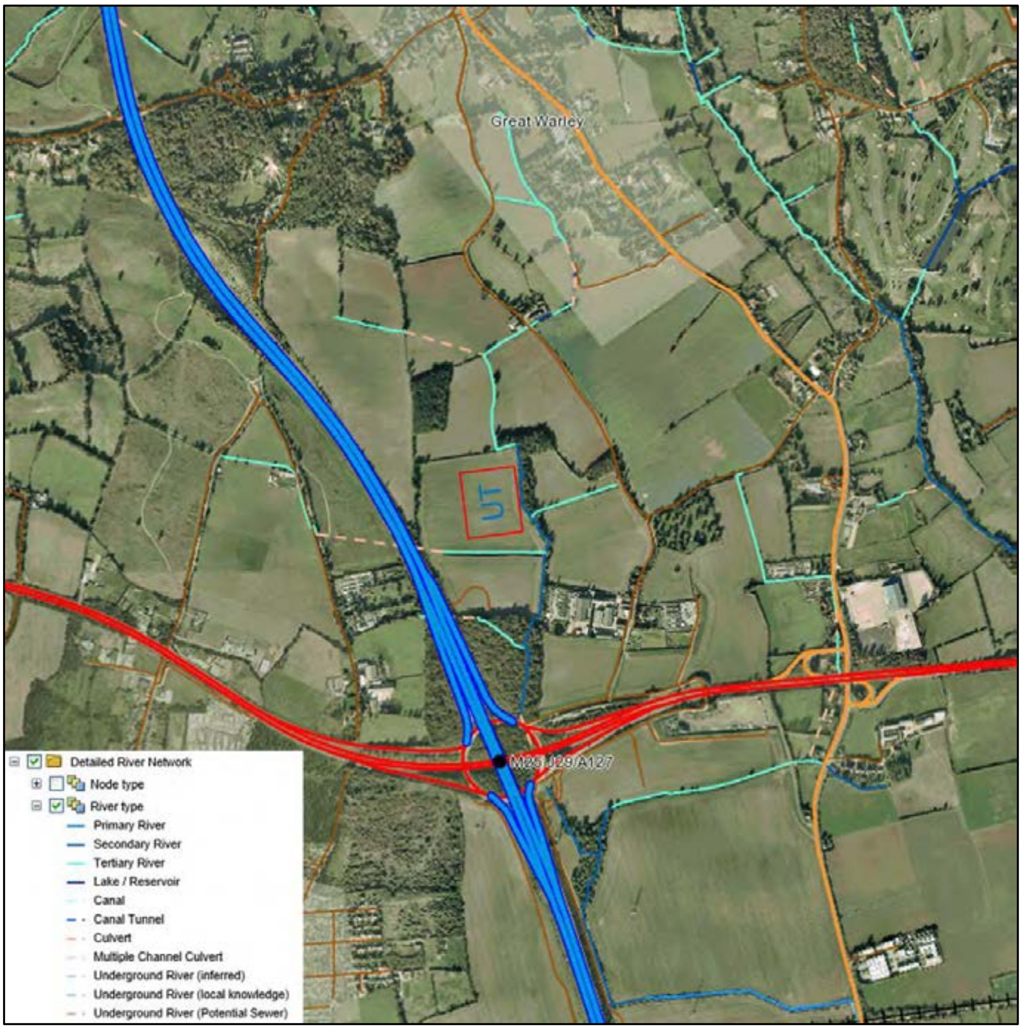
2 Design Basis

2.1 Existing Site Information

Existing watercourses

2.1.1 Upminster branch of Mar Dyke (UT) crosses the Hole Farm site and represent the primary outfall point for the Project.

Figure 2-1 – Existing Watercourses



Existing flood risk assessment data

2.1.2 The Environment Agency (EA), via their website, provide floodplain mapping data for the United Kingdom (UK). The floodplain is the area that would naturally be affected by flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas.

2.1.3 The floodplain mapping shows two distinct kinds of flooding for the river and the sea and are described as:

- Zone 3 (dark blue) – Shows the area that could be affected by flooding either from rivers or the sea, if there were no flood defences. This area could be flooded:

1 from the sea by a flood that has a 0.5 per cent (1 in 200 years) or greater chance of happening each year; or

2 from a river by a flood that has a 1 per cent (1 in 100 years) or greater chance of happening each year.

- Zone 2 (light blue) - shows the additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000 year) chance of occurring each year.

2.1.4 Where there is no blue shading, flooding from rivers and/or the sea is very unlikely. There is less than a 0.1 per cent (1 in 1000 years) chance of flooding occurring each year. These areas are described as Flood Zone 1.

2.1.5 The information taken from the EA website shows that the Project falls in Flood Zone 1 which is an area with a low probability of flooding.

Figure 2-2 - EA Flood Zone and Main River Mapping (not to scale)

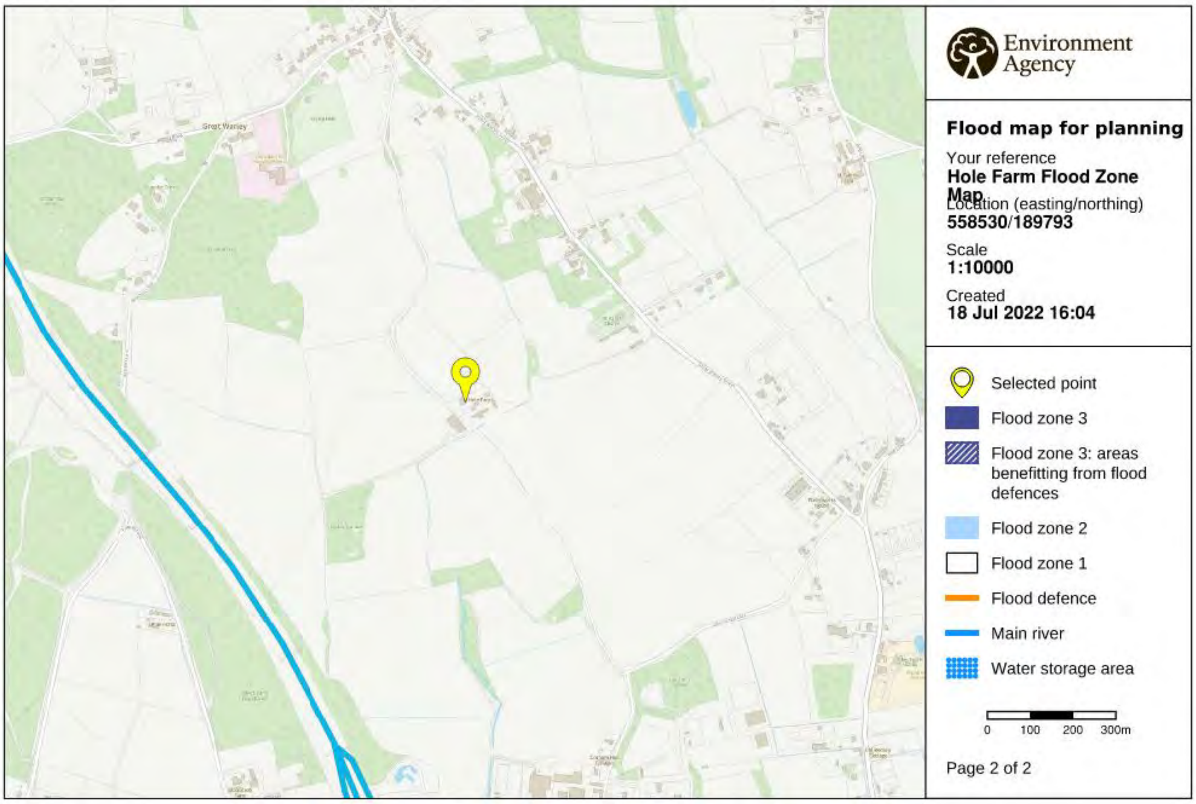
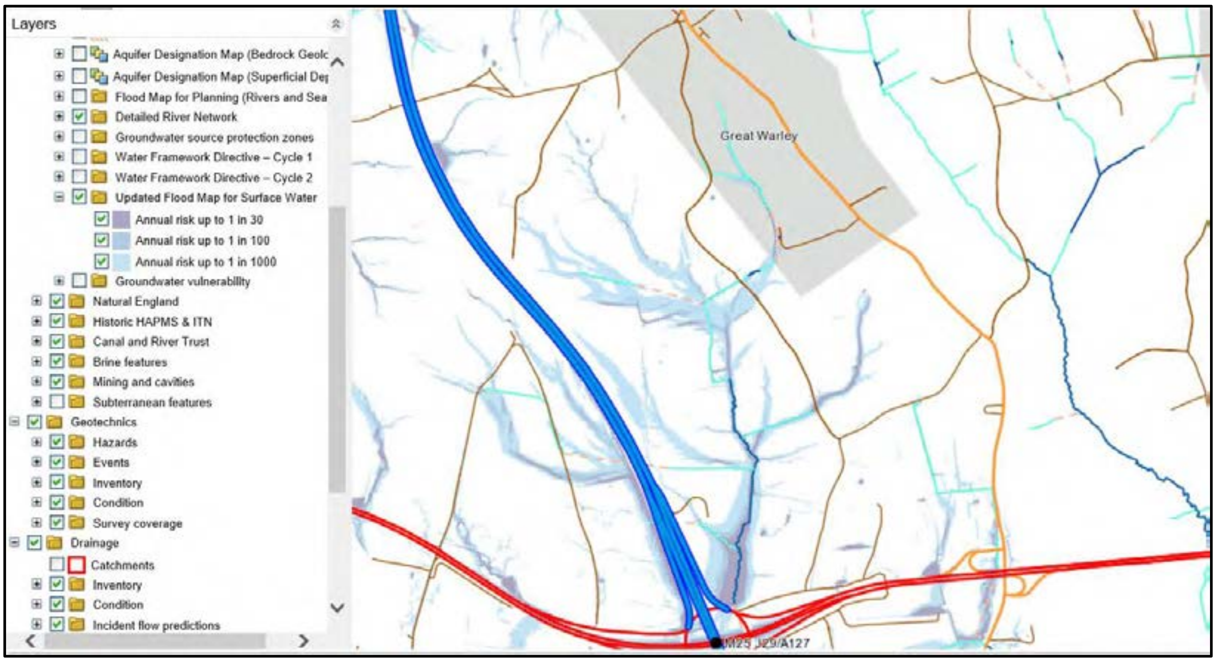


Figure 2-3 – Flood Zone Mapping from HADDMS



Aquifers and groundwater

2.1.6 Groundwater supplies a third of the drinking water in England and Wales. The EA provides groundwater mapping data for the UK. The EA has a duty to monitor and protect the quality of groundwater and to conserve its use for water resources as set out in their Policy and Practice for the Protection of Groundwater (1998). As a result, the EA have defined Source Protection Zones (SPZs) for 2000 groundwater sources (wells, boreholes and springs) used for the supply of public drinking water.

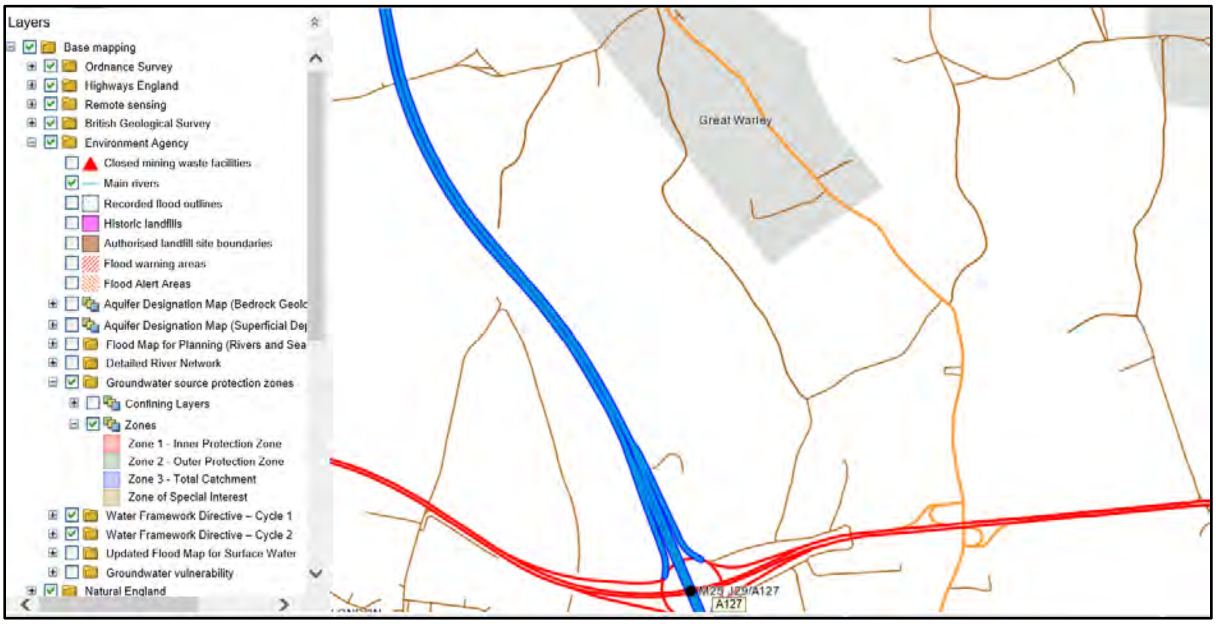
2.1.7 The shape and size of a zone depends on the condition of the ground, how the groundwater is removed, and other environmental factors.

2.1.8 The maps show three main zones:

- Inner zone (Zone 1) - Defined as the 50-day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres;
- Outer zone (Zone 2) - Defined by a 400-day travel time from a point below the water table. This zone has a minimum radius of 250 or 500 metres around the source, depending on the size of the abstraction; and
- Total Catchment (Zone 3) - Defined as the total recharge area around a source.

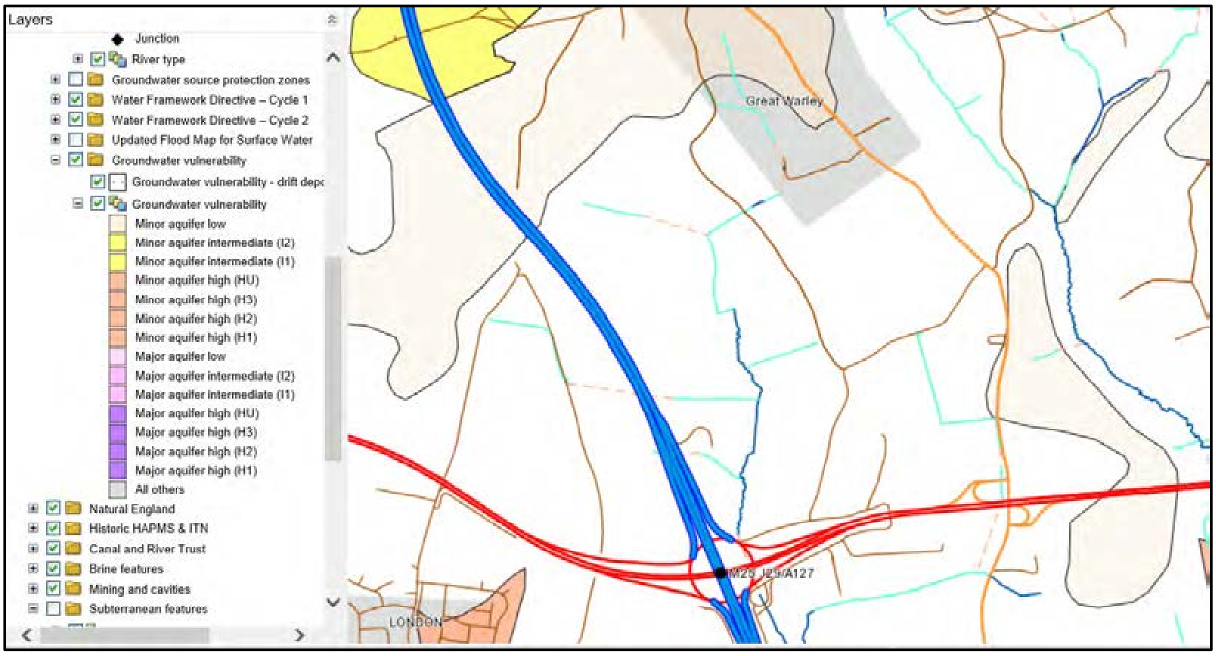
2.1.9 A review of the EA groundwater mapping data in Highways Agency Drainage Data Management System (HADDMS) has identified that there are no source protection zones within the Project, shown in Figure 2-4.

Figure 2-4 – EA Source protection zone mapping (not to scale)



2.1.10 A review of the Groundwater Vulnerability Mapping in HADDMS has also been undertaken to examine the EA’s assessment of the likelihood of a pollutant discharged at ground level reaching groundwater within superficial and bedrock aquifers. The status of the aquifer shown in Figure 2-5 is an indication of the importance of the groundwater for drinking water supply.

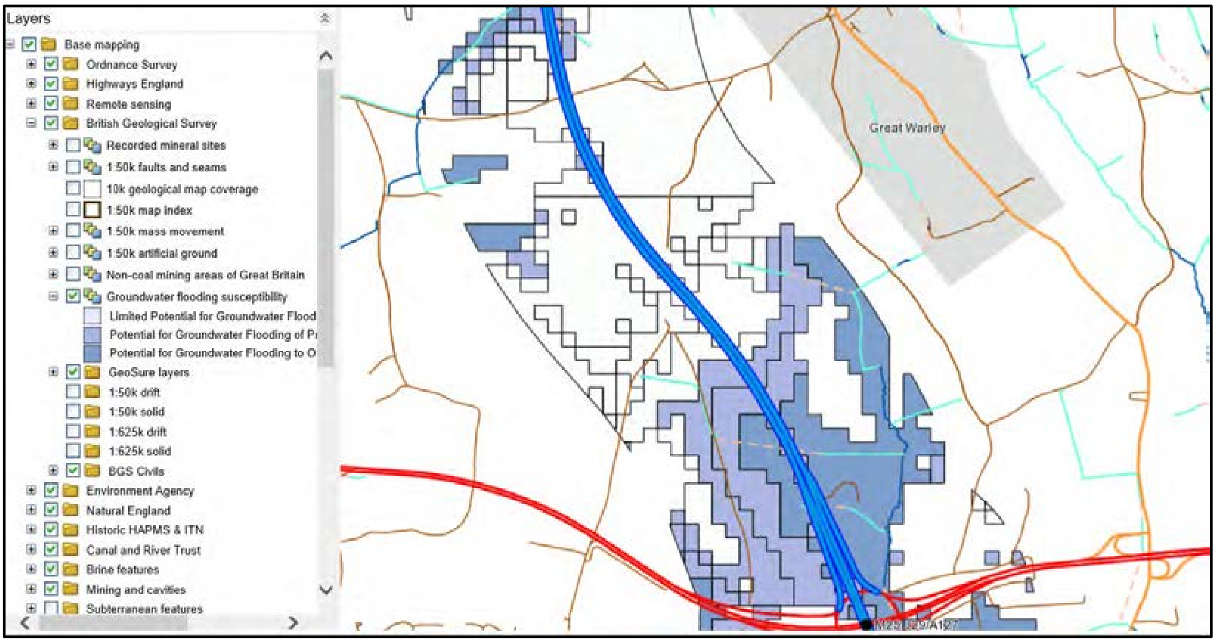
Figure 2-5 – EA Groundwater vulnerability mapping (not to scale)



2.1.11 The entire scheme is located outside of any aquifer.

2.1.12 Some part of the scheme extent lies within an area designated as being at risk from groundwater flooding at ground level and the remainder of the scheme in an area at risk of groundwater flooding below ground level, as shown in Figure 2-6. However, the entire drainage proposal is outside the region having potential of groundwater flooding.

Figure 2-6 – EA Groundwater flood risk mapping (not to scale)



2.1.13 As would be expected, groundwater could potentially cause flooding at the ground surface close to watercourse locations.

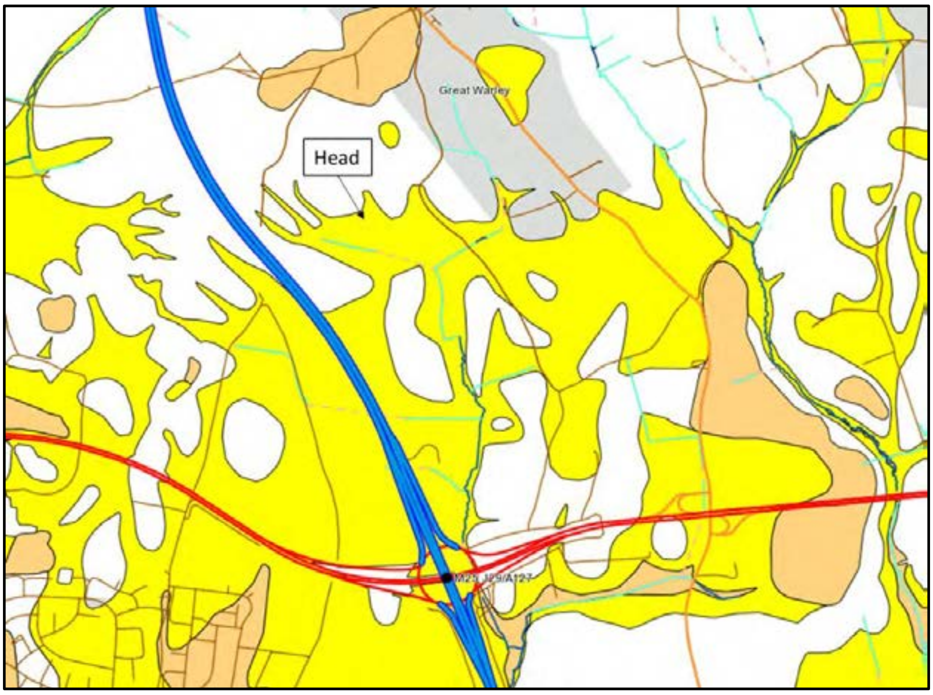
2.1.14 There is no information currently available regarding the groundwater levels across the Hole Farm site. However, based on the current groundwater flood risk assessment, the proposed swales and basins are proposed to be lined. This proposal would be reviewed upon receipt of more detailed groundwater information.

Geology

2.1.15 Drift cover is not recorded in the northern part of the region, but large areas of Head (Head is poorly sorted loose surface material (drift) formed from the accumulation of material on lower slopes derived from upslope, most typically via peri-glacial mass movements) deposits are recorded in the south.

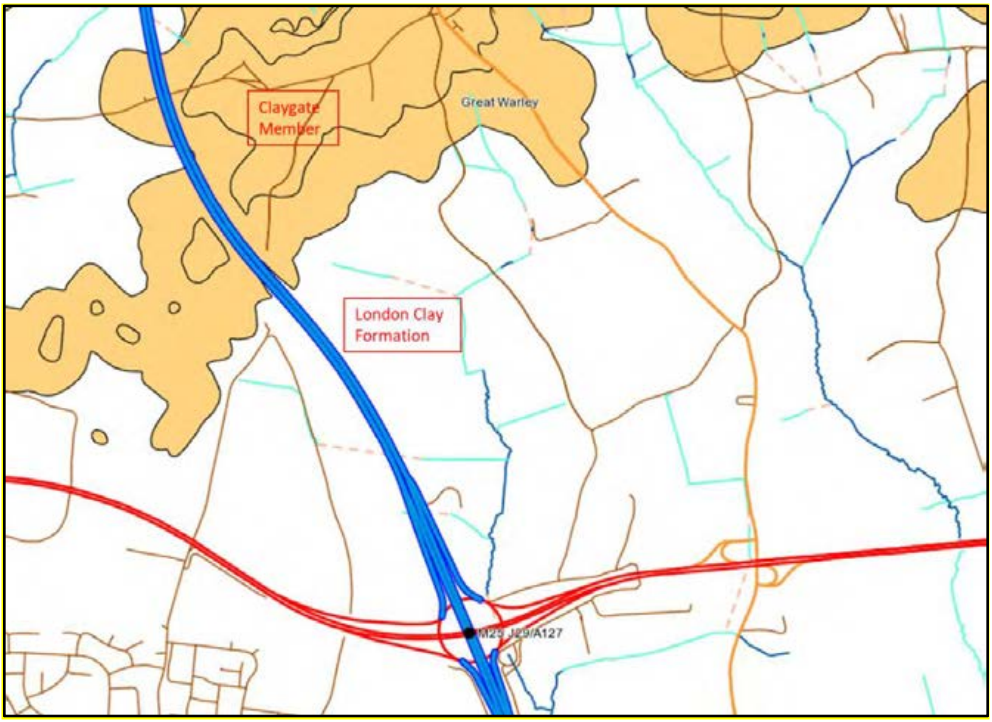
2.1.16 An overview of the superficial geology can be seen in Figure 2-7.

Figure 2-7 – Superficial Geology of the Site Extent



2.1.17 The 1:50,000 British Geological Survey (BGS) information shows the solid geology of most of the land as London clay formation. On the higher ground on north, Claygate member is recorded (clay, silts and fine sands). Figure 2-8 shows the bedrock geology of the site.

Figure 2-8 – Extract of solid strata from BGS (Extract from HADDMS)

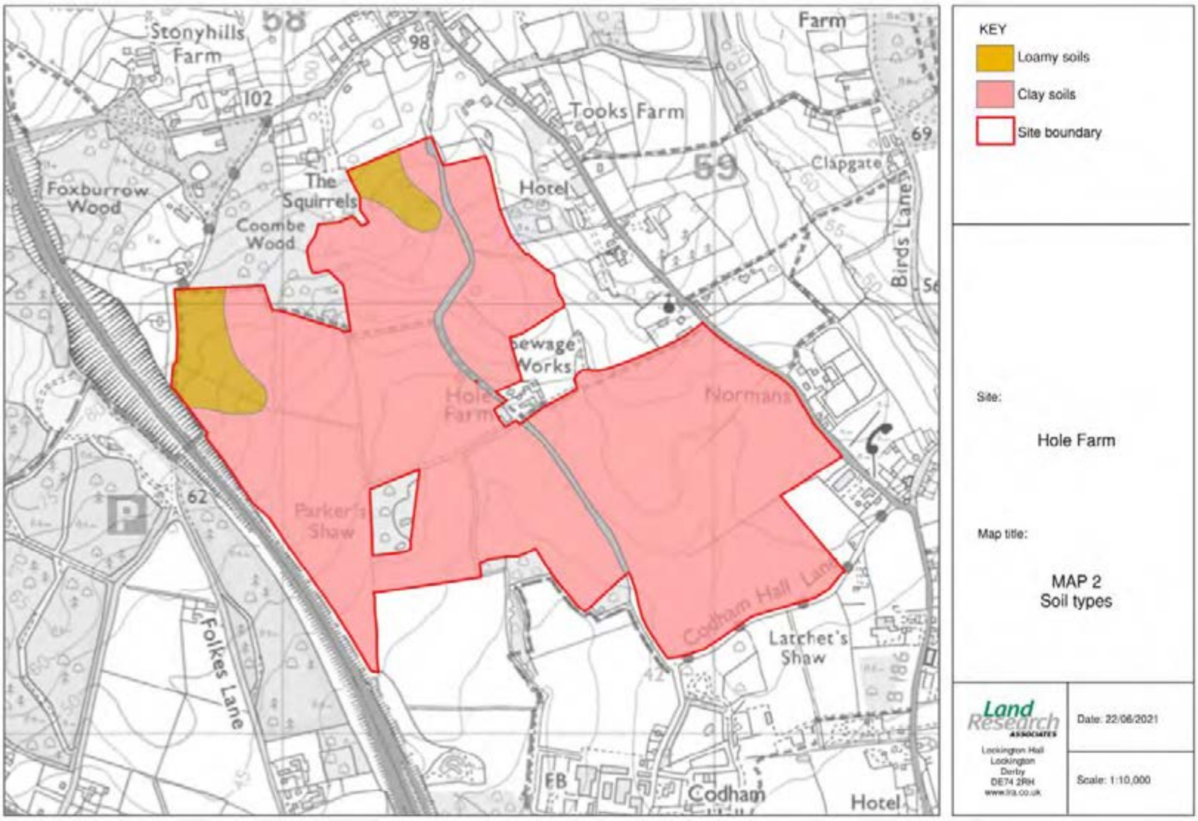


Soils

2.1.18 The site was visited between May 25th and 29th 2021. Spade/hand auger borings were conducted to a maximum depth of 1.8m along with sampling topsoil. Two soil types were identified across the site extents. Majority of the land was found to have deep clays with poorly structured subsoil (Soil A). The subsoils show evidence of seasonal waterlogging (greyish or pale colours with ochreous mottles) to shallow depth. The soils are generally stoneless, but slightly stony in places, particularly in the south. On higher ground in the north-west, the soil parent material changes from London clay to interbedded, sands, silts and clays (Soil B). The soils in this area are lighter, with a greater depth of permeable upper subsoil.

2.1.19 The distribution of these two solid types is shown in Figure 2-9. The detailed soil investigation report is in Appendix A.

Figure 2-9 – Soil distribution across Scheme Extents



2.1.20 Based on the geology and soil properties of the region, it can be inferred that the soil in much of the scheme extent is clay (infiltration co-efficient less than $3x10^{-8}$ m/s as per Table 25.1 of The SuDS manual CIRIA C753) and is unsuitable for infiltration. Hence, provision of soakaway or other infiltration system along with any hybrid solution of infiltration and discharging to surface water body has been excluded from proposal. Detailed infiltration testing would be carried out at later design stages and this design decision can then be reviewed.

3 Planning Policy and Guidance

3.1 Brentwood Local Plan

The Brentwood local plan outlines the council's strategic priorities and sets out a spatial strategy and supporting policies for achieving this vision. The key policy related to surface water drainage is following:

Policy BE05: Sustainable Drainage

- All developments should incorporate appropriate Sustainable Drainage Systems (SuDS) for the disposal of surface water, in order to avoid any increase in surface water flood risk or adverse impact on water quality.
- Development within areas identified as a Critical Drainage Area (CDA) on the policies map, should optimise the use of Sustainable Drainage Systems by providing an individually designed mitigation scheme to address the site-specific issues and risk, as informed by a site specific Flood Risk Assessment. This could be provided as part of the Drainage Strategy and must address any issues highlighted in the Surface Water Management Plan, where relevant.
- Greenfield developments, major development and all development within a Critical Drainage Area must achieve a greenfield runoff rate. Where it is demonstrated that this is not possible on brownfield developments then a runoff reduction of 50% minimum should be achieved. The technical approach should be justified in the Drainage Strategy.
- Applicants are required to submit a surface water Drainage Strategy and a Flood Risk Assessment for all major development as well as for all development within a Critical Drainage Area. The Drainage Strategy must include a SuDS Management Plan setting out the long-term management and maintenance arrangements.
- SuDS will be required to meet the following design criteria:
    - the design must follow an index-based approach when managing water quality. Implementation in line with the updated CIRIA SuDS Manual is required. Source control techniques such as green roofs, permeable paving and swales should be used so that rainfall runoff in events up to 5mm does not leave the site;
    - SuDS should be sensitively designed and integrated into the Green and Blue infrastructure to create high quality public open space and landscaped public realm, in line with Strategic Policy NE02: Green and Blue Infrastructure;
    - maximise opportunities to enhance biodiversity net-gain;
    - improve the quality of water discharges and be used in conjunction with water use efficiency measures;
    - function effectively over the lifetime of the development;
    - the preferred hierarchy of managing surface water drainage from any development is through infiltration measures, secondly attenuation and

discharge to watercourses, and if these cannot be met, through discharge to surface water only sewers;

- o have regard to Essex County Council SuDS Design Guide 2020, or as amended.

- When discharging surface water to a public sewer, developers will be required to provide evidence that capacity exists in the public sewerage network to serve their development, in line with policy requirements in BE02 Water Efficiency and Management.
- Development proposals should be designed to include permeable surfaces wherever possible. Proposals for impermeable paving, including on small surfaces such as front gardens and driveways, will be strongly resisted unless it can be suitably demonstrated that this is not technically feasible or appropriate.

3.2 The Sustainable Drainage System Design Guide for Essex – Supporting Sustainable Development (2020)

This guide forms the local standards for Essex and, together with the National standards, strongly promotes the use of SuDS to help reduce surface water run-off and mitigate flood risk. It also strongly promotes the use of SuDS as they greatly benefit:

- Water quality - SuDS can help prevent and treat pollution in surface water runoff, protecting and enhancing the environment and contributing towards Water Framework Directive objectives.
- Amenity - SuDS can have visual and community benefits for the community.
- Biodiversity – SuDS can provide the opportunity to create and improve habitats for wildlife, enhancing biodiversity and enable multi-functional green infrastructure.

3.3 Climate Change

The Essex SuDS Design Guide (February 2020) suggests climate change factors shown in Table 1 **– Peak rainfall intensity allowance in small and urban catchments**

for flood risk assessments and drainage strategies to help minimise vulnerability and provide resilience for future events. These climate change factors are based on the 1961 to 1990 baseline.

Table 1 – Peak rainfall intensity allowance in small and urban catchments[1]

Applies across all of England	Total Potential change anticipated for the '2020s' (2015 to 2039)	Total Potential change anticipated for the '2050s' (2040 to 2069)	Total Potential change anticipated for the '2080s' (2070 to 2115)

[1] Ref: Flood risk assessments: climate change allowances Guidance by EA, February 2016

Upper End	10%	20%	40%
Central	5%	10%	20%

Environment Agency has updated the climate change factors based on the baseline on a 1981 – 2000 baseline. The updated climate change factors for the 100-year return period event for the site location is shown below.

Table 2 – Climate change allowance for peak rainfall[2]

Applicable to South Essex	Epoch 2050s (with lifetime up 2060)	Epoch 2070s (with lifetime between 2061 to 2125)
Upper End allowance	45%	40%
Central End allowance	20%	25%

The current design is based on upper end allowance of climate change of 45 percent.

[2] Source: https://hydrology-test.epimorphics.net/hydrology/climate-change-allowances/rainfall

4 Drainage Design

4.1 Drainage Strategy

4.1.1 The Project of 99.09 hectares site area would involve creation of a community woodland facility (See Appendix B) comprising:

a. Vehicular access into 94-space car and coach park, with EV charging points and overflow area
b. Staff and disabled car parking
c. Substation
d. An open sided visitor shelter
e. A modular café with covered outdoor seating area
f. Bin store
g. Cycle parking and WC facilities
h. Demolition of a grain store and development of a community building including staff welfare and office facilities and outdoor terrace
i. Demolition of an agricultural machinery store and construction of a Forestry England Barn
j. Service yard and vehicle turning circle
k. Surfaced and unsurfaced woodland paths
l. Creation of six new ponds
m. Countryside heritage and interpretation boards and informal natural play areas

4.1.2 The drainage proposal uses vegetated SuDS and ties aesthetically with landscaping proposal to provide biodiversity benefits along with satisfying hydraulic requirements. All the drainage assets have been designed in accordance with guidance laid out in Sustainable Drainage Systems Design Guide (Essex County Council, February 2020) and The SuDS Manual CIRIA C753. The proposal has also been shared with Essex County council for pre-application and the comments (See Appendix G) at that stage has also formed the basis of the current proposal.

4.2 Discharge Rate and Attenuation of the Proposed Adoptable Roads

4.2.1 The site has existing ditches and ponds which have been proposed to be retained. The drainage proposal would connect to these existing waterbodies to discharge the runoff.

Table 3 – Assessment of suitability of SuDS at the site

Rank	Discharge Type	Viability	Comments
1	Store rainwater for reuse	Recommended	Rainwater butts have been proposed near tree nursery for

Rank	Discharge Type	Viability	Comments
			rainwater storage and reuse (Refer to Hole Farm Community Building MEP Plant Layout for details)
2	Use infiltration techniques, such as porous surfaces in non-clay areas	Not suitable	Infiltration systems are highly unlikely due to soil type on site
3	Attenuate rainwater for gradual release	Recommended	Attenuation of rainwater has been proposed in detention basins.
4	Discharge rainwater to a watercourse	Recommended	Proposed to discharge attenuated run-off in secondary/ tertiary river
5	Discharge rainwater to a surface water sewer/drain	Not Recommended	No public surface water sewer available to discharge
6	Discharge rainwater to combined sewer	Not Recommended	Discharge in combined sewer is not recommended unless no other discharge option is available.

4.2.2 The catchment area of the Project is a combination of existing catchment drained by existing drainage arrangement and proposed impermeable area drained through proposed drainage system. The proposed drainage system has been sub-divided into three catchment areas based on ground topography and proximity to outlets. Appendix C and Figure 4-1 shows the catchment areas for the scheme. Drainage network for all these catchment areas discharge to Tertiary or Secondary River at greenfield discharge rate corresponding to 1 year return period.

4.2.3 In line with guidance laid out in Sustainable Drainage Systems Design Guide (Essex County Council, February 2020), greenfield run-off has been calculated for 1 year return period using ICP SuDS (See Appendix D) since the individual catchment areas are less than 50 hectares. The table below shows the site characteristics and greenfield run-off rate for catchment areas.

Table 4 – Greenfield Run-off Calculation Summary

Site Characteristics	
SAAR	600
SOIL	0.45
Region	Region 6

Greenfield Run-off Rates		
Catchment Area	Greenfield Run-off Rate (Return Period of 1 year)	Allowable flow rate
Catchment 1 (Part of Farm Access, Tree nursery and associated buildings and region west of Hole Farm Lane) – 231930sq.m.	3.119 l/sec/hec	72.3 lps
Catchment 2 (Parking lot and all abilities access trail) – 154740sq.m.	3.116 l/sec/hec	48.2 lps
Catchment 3 (Part of access road) – 1372sq.m.	2.915 l/sec/hec	1.0 lps

4.2.4 The greenfield run-off rate from catchment 3 for return period of 1 year return period using ICP SuDS was coming out to be 0.4 litres per second. However, based on guidance in Sustainable Drainage Systems Design Guide (Essex County Council, February 2020), the outflow from catchment 3 has been limited to 1 litre per second.

Figure 4-1- Catchment Plan

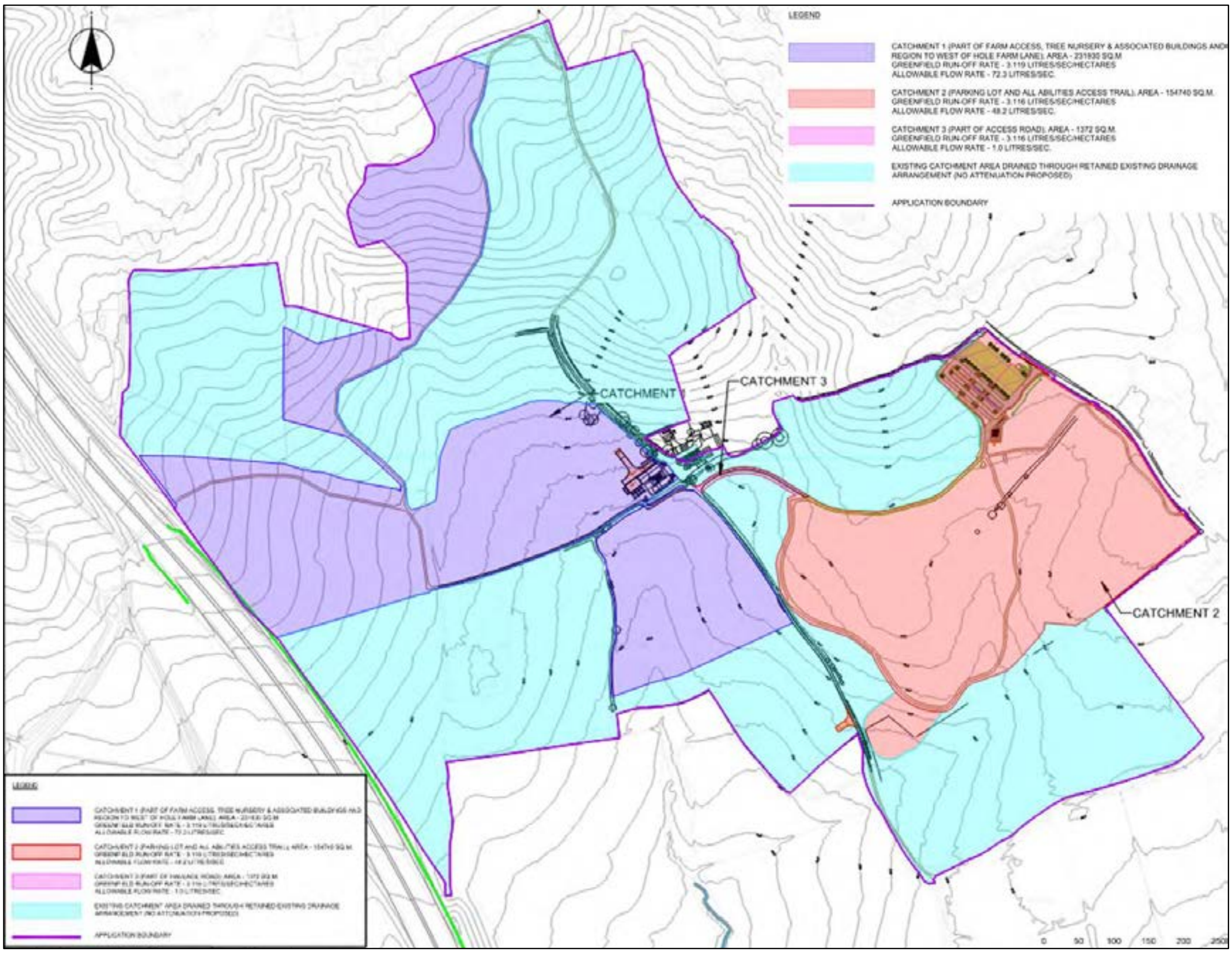
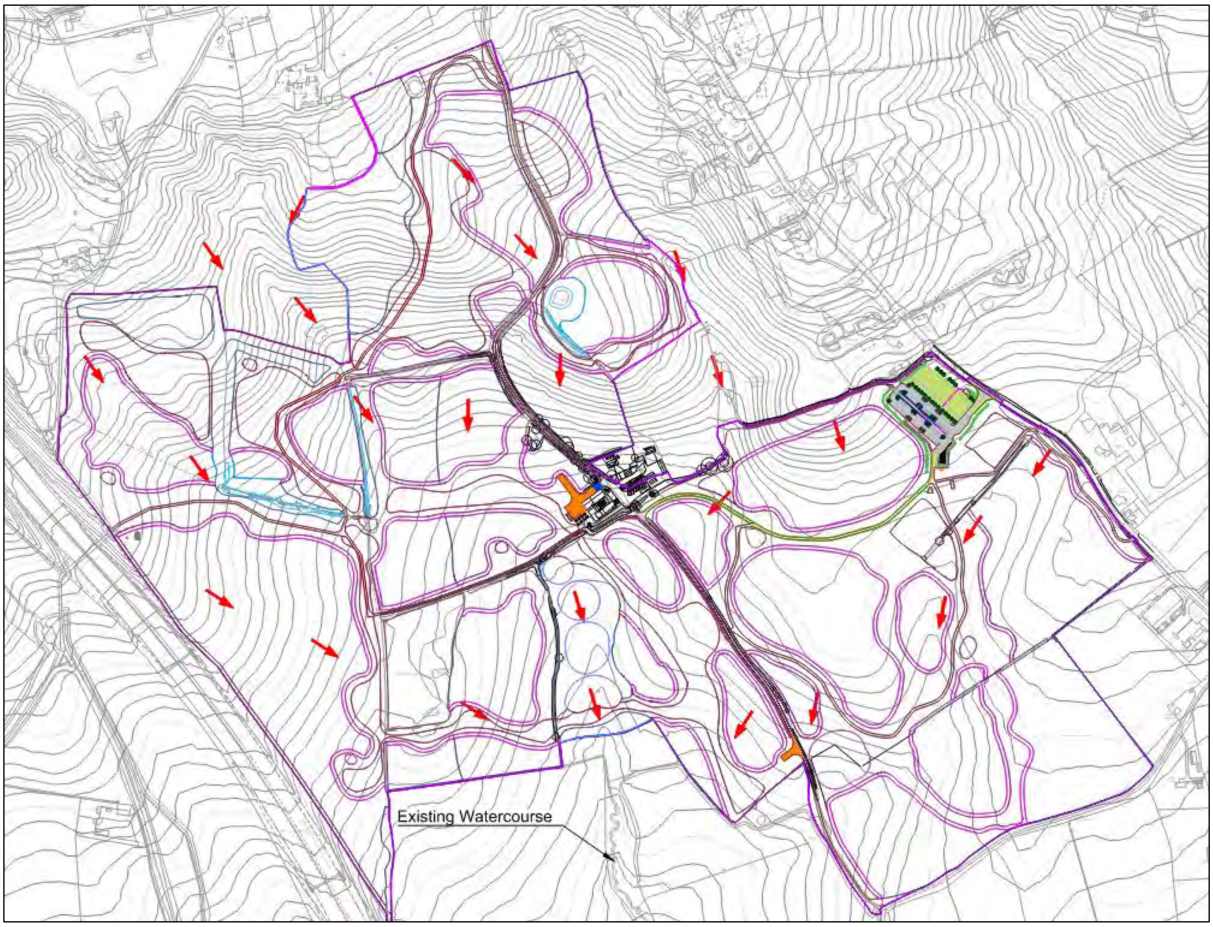


Figure 4-2- Exceedance Flow Path Sketch



4.3 Catchment 1

4.3.1 Appropriate rainwater collection system would be proposed as part of the roof of the buildings. Rainwater butts (Refer to Hole Farm Community Building MEP Plant Layout for details) have been proposed to store some rainwater for re-use in the tree nursery. The run-off from the building roof has then been conveyed to the proposed swale through carrier drains.

4.3.2 The run-off from the region west of Hole farm lane would be collected through lined swales (0.5m base width, minimum 0.5m depth and 1 in 3 side slope) and would eventually discharge into the existing watercourse after attenuation through a series of detention basins. Refer to Appendix E and Figure 4-3 for drainage proposal. Flow control, in the form of orifice has been provided at the outlet of the basin.

4.3.3 The combined outflow at the end of swale for a rainfall of 100-year return period with 45 percent climate change, before it connects to existing watercourse, has been controlled to allowable flow rate of 72.3 lps, which is the greenfield run-off rate from the catchment area for a rainfall of 1 year return period. Plantation in the proposed swale and detention basins would be proposed in liaison with the ecologists.

4.3.4 The detention basins have been designed to allow for 300mm freeboard for the rainfall of return period 100 year and 45 percent climate change. Additionally, the detention basins have been checked for rainfall of 1 in 30-year return period with climate change coupled with rainfall of return period of 10 years to demonstrate the 300mm freeboard is available. See Appendix F for detailed network summary results.

4.3.5 In the event of higher than design return period rainfall, the flooded water would follow the natural ground slope to flow towards the existing watercourse (see Figure 4-2) at the south west of the site.

4.3.6 The existing drainage arrangement of ditches and ponds, serving the existing property and surrounding area have been retained and they would discharge at existing rates. Condition and structural assessment of existing drainage assets for their reuse would be taken up in later design stages.

4.4 Catchment 2

4.4.1 Appropriate rainwater collection system would be proposed as part of roof of the modular cafe. Rainwater butts (Refer to Hole Farm Community Building MEP Plant Layout for details) have been proposed to store some rainwater for re-use.

4.4.2 Lined swale (0.5m base width, minimum 0.5m depth and 1 in 3 side slope) has been proposed at either side of the all-abilities access track and proposed car park. Attenuation to the drainage system has been provided through proposed detention basins, which would eventually discharge to the existing ditch. Refer to Appendix E and Figure 4-3 for drainage proposal. The outflow, for a rainfall of 100-year return period with 45 percent climate change, from the drainage network has been controlled through orifice to allowable flow rate of 48.2 lps, which is the greenfield run-off rate from the catchment area for a rainfall of 1 year return period.

4.4.3 The detention basins have been designed to allow for 300mm freeboard for the rainfall of return period 100 year and 45 percent climate change. Additionally, the detention basins have been checked for rainfall of 1 in 30-year return period with climate change coupled with rainfall of return period of 10 years to demonstrate the 300mm freeboard is available. See Appendix F for detailed network summary results.

4.4.4 Swales with bunds have been proposed at the western edge of Hole Farm Lane to regulate access.

4.4.5 In the event of higher than design return period rainfall, the flooded water would follow the natural ground slope to flow towards the existing watercourse (see Figure 4-2) at the south west of the site.

4.4.6 The existing drainage arrangement of ditches and ponds, serving the existing property and surrounding area have been retained and they would discharge at existing rates. Condition and structural assessment of existing drainage assets for their reuse would be taken up in later design stages.

4.5 Catchment 3

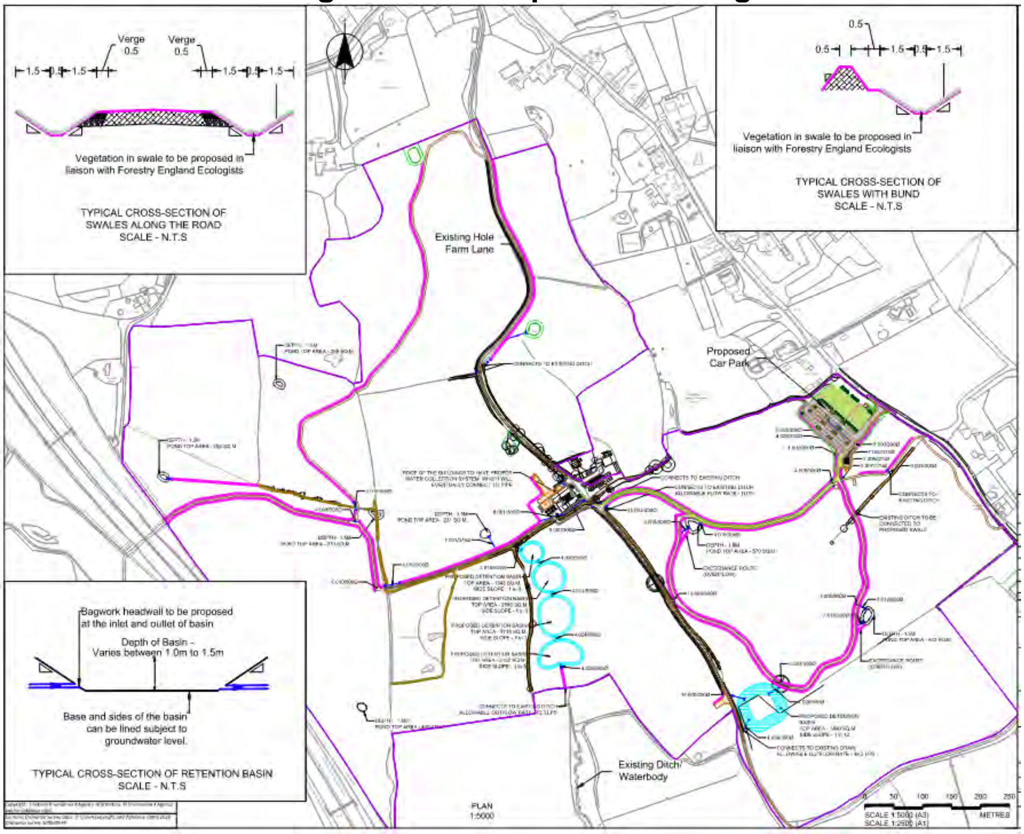
4.5.1 A lined swale (0.5m base width, minimum 0.5m depth and 1 in 3 side slope) has been proposed on the inside of access road. Attenuation to the drainage system has been provided through proposed swales, which would eventually discharge to the existing ditch. Refer to Appendix E and Figure 4-3 for drainage proposal. The outflow, for a rainfall of 100-year return period with 45 percent climate change, from the drainage network has been controlled through a combination of orifices and hydro brake to allowable flow rate of 1.0 lps.

4.5.2 Additionally, the drainage proposal has been checked for rainfall of 1 in 30-year return period with climate change coupled with rainfall of return period of 10 years to demonstrate that it does not flood. See Appendix F for detailed network summary results.

4.5.3 In the event of higher than design return period rainfall, the flooded water would follow the natural ground slope to flow towards the existing watercourse (see Figure 4-2) at the south west of the site.

4.5.4 The existing drainage arrangement of ditches and ponds, serving the existing property and surrounding area have been retained and they would discharge at existing rates. Condition and structural assessment of existing drainage assets for their reuse would be taken up in later design stages.

Figure 4-3 – Proposed Drainage Plan



4.6 Modelling Criteria

4.6.1 Design Criteria

The hydraulic model of the drainage networks has been designed using criteria shown in Table 5 below.

Table 5 – Design and Simulation Criteria (Micro Drainage model)

Design Parameter	Value
Rainfall Type	FSR Rainfall
Design Return Period	1 year
M5-60	20
Ratio R	0.4
Global time of entry	5 mins
Maximum Rainfall	300 mm/hr
Maximum time of concentration	30 mins
PIMP – Paved Surface	1.0
PIMP – Unpaved Surface	0.2
Volumetric Run-off co-efficient	1.0
MADD Factor	0

4.7 Water Quality Assessments

4.7.1 As per the requirements of Sustainable Drainage Systems Design Guide (Essex County Council, February 2020), Preliminary water quality assessments, using the Simple Index Approach suggested in The SuDS Manual CIRIA C753, have been undertaken on current drainage proposal for the Hole Farm to investigate likely impacts on the water quality of receiving watercourses.

4.7.2 As recommended in The SuDS Manual CIRIA C753, Pollution hazard impact indices created by the development has been proposed to be offset by SuDS mitigation measures.

4.7.3 The catchment area 2 falls within the Medium pollution hazard level with non-residential car parking with frequent change and approximately 500 traffic movements per day. Catchment area 1 & 3 would have Low pollution hazard level with infrequent access to Hole Farm Lane for delivery vehicles. Based on this classification, the pollution hazard indices of the proposed site as per Table 26.2 of The SuDS Manual CIRIA C753 are as shown in Table 6 below.

4.7.4 The current Hole Farm Community Woodland proposes Swales and detention basin for draining the run-off from catchment areas 1 and 2. Swales and detention basins have been proposed in series and eventually discharging to outfall (watercourse). The run-off from catchment area 3 is conveyed through swales before discharging to existing ditch. Hence, as per the procedure suggested in The SuDS Manual CIRIA C753, the resulting mitigation indices for discharges to surface water would be as shown in the table below.

Table 6 – Water Quality Assessment Summary (Simple Index Approach)

SuDS component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Swale	0.50	0.60	0.60
Detention Basin	0.50	0.50	0.60
SuDS mitigation index (Catchment 1)	0.75	0.85	0.9
SuDS mitigation index (Catchment 2)	0.75	0.85	0.9
SuDS mitigation index (Catchment 3)	0.50	0.60	0.60
	Pollution Hazard Indices		
SuDS Pollution Index for proposal (Catchment 2)	0.70	0.60	0.70
SuDS Pollution Index for proposal (Catchment 1 & 3)	0.50	0.40	0.40

4.7.5 The table shown above indicates that the SuDS proposal is sufficient to mitigate the pollution hazard posed by the development and hence the water quality of the receiving watercourse would not be worsened.

4.7.6 Additionally, non-return valves will be proposed at all the three outlets to ensure the pollution is contained within the site in the event of an accidental spillage.

4.8 Maintenance of SuDS

The on-site drainage will be managed by the applicant who will be responsible to maintain any on-site services including drainage. The maintenance provisions are in accordance with Table 7.1 of The SuDS Manual CIRIA C753 guidance and have been modified to suit the current proposal.

Table 7 – SuDS maintenance

Drainage Feature	Regular Maintenance	Occasional/ Remedial Maintenance	Monitoring
Detention Basin	Inspect inlets, outlets and overflows for blockages and clear if required Remove sediments from inlet, outlet and forebay	Prune and trim any trees and remove cuttings Repair/ rehabilitation of inlets, outlets and overflows	Inspect every six months or before a forecast storm and after a large storm
Swale	Inspect inlets and outlets for blockages and clear if required Cut grass Clearing the blockages along the length of the swale	Repair erosion or other damage by re-turfing or reseeding Relevel uneven surfaces and reinstate design levels	Inspect every six months

4.9 Water Recycling/ reuse plans

4.9.1 Rainwater harvesting is proposed with storage adjacent to both the community building and the modular café. This will be utilised for the flushing of the toilets in each building. The capturing of rainwater in these locations will have some additional localised retention easing pressure on the surface water drainage system. However, this additional localised capacity has been excluded from the surface water drainage calculations so that these two systems can act independently of one another.

5 Conclusion

The Hole Farm Community Woodland proposal aspires to become an inspiring place for the local community to enjoy and explore. The current proposal would increase the impermeable area of the system. The run-off from the proposed areas has been drained through combination of swales, pipes and detention basins, which would help attenuate the outflow to allowable rates and provide mitigation for the pollution from the site as well. The current drainage proposal would thereby not worsen flooding situation for downstream catchments and watercourses. Additionally, the drainage arrangement has been proposed to be sympathetic to landscaping and building proposal and ties into the surrounding to provide biodiversity benefits along with satisfying hydraulic requirements.

The current proposal is preliminary and is based on available existing site information and current building and access proposal. The design decisions and proposal will be developed through the detailed design stage in accordance with the agreed standards.

6 Appendices

Appendix A: Soil Suitability Report Hole Farm

SOIL SUITABILITY REPORT

HOLE FARM

Report 1784/1

6th July, 2021

Land Research ASSOCIATES
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SOIL SUITABILITY REPORT

HOLE FARM

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Report 1784/1
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Lockington Hall,
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DE74 2RH

[redacted]

6th July, 2021

1.0 Introduction

1.1 This report provides information on the soils of land at Hole Farm, Great Warley, Essex. The land is proposed for woodland creation.

1.2 Land Research Associates were commissioned to advise on soil conditions with regard to suitability for the proposed vegetation establishment. This report addresses the following items:

- Depth of soil cover
- Soil physical characteristics
- Soil chemical characteristics

1.3 The appropriateness of the soils at the site to support the proposed scheme is discussed in the context of these issues.

2.0 Site description

2.1 The site comprises a contiguous block, bordered to the west by the M25, to the east by Great Warley Street and adjoining gardens, to the north by woodland and grassland, and to the south by Codham Hall Lane and adjoining arable land.

2.2 The land in the north slopes moderately steeply, levelling to gently undulating topography in the south. Average elevation is approximately 50 m AOD.

PUBLISHED INFORMATION

2.3 1:50,000 BGS information shows the solid geology of most of the land as London Clay Formation. On the higher ground in the north, Claygate Member is recorded (clays, silts, and fine sands). Drift cover is not recorded in the north, but large areas of Head deposits[1] are recorded in the south.

2.4 The National Soil Map (published at 1:250,000 scale)[2] shows the land as Windsor Association: heavy slowly permeable soils formed in Eocence clays and associated drift. Burlesdon Association is recorded close to the northern boundary: loamy soils with variable drainage formed in inter-bedded Tertiary silts, sands, and clays.

[1] Head is poorly-sorted loose surface material (drift) formed from the accumulation of material on lower slopes derived from upslope, most typically via peri-glacial mass movements.

[2]Hodge, C.A.H. *et al*., (1984). *Soils and their use in Eastern England.* Soil Survey of England and Wales Bulletin No. 13, Harpenden.

3.0 Site investigation

3.1 The site was visited between May 25th and 29th 2021. During the visit spade/hand auger borings were conducted to a maximum depth of 1.8 m in order to determine topsoil/subsoil depth, drainage and general suitability to support the proposed planting scheme. Auger observations were conducted at approximately the intersections of a 100 m grid, giving a sampling density of one observation per hectare. Some sampling points were relocated to the nearest tramline to avoid damage to standing crops. Sample locations are shown by Map 1 in an appendix to this report.

3.2 At seven selected sample points, pits were hand-excavated in order to conduct more detailed observations of subsoil structural conditions, and to obtain samples for laboratory physical and chemical analysis. A total of twenty one topsoil and subsoil samples were collected from the seven pits.

3.3 Topsoil samples were taken across a broader representative area, roughly on a per field basis (see Map 1).

3.4 The distribution of generalised soil types is shown by Map 2 in an appendix to this report. Two soil types were identified.

DENSE SLOWLY PERMEABLE CLAYS (SOIL TYPE A)

3.5 The majority of the land was found to have deep clays with poorly structured subsoil. The subsoils show evidence of seasonal waterlogging (greyish or pale colours with ochreous mottles) to shallow depth. The soils are generally stoneless, but slightly stony in places, particularly in the south.

FINE LOAMS WITH LIGHT DRAINAGE RESTRICTIONS (SOIL TYPE B)

3.6 On higher ground in the north-west, the soil parent material changes from London clay to interbedded, sands, silts and clays. The soils in this area are lighter, with a greater depth of permeable upper subsoil.

3.7 Full pit descriptions and photographs are included in an appendix to this report.

Table 3.1: Soil type properties

		Soil Survey of England and Wales		Forestry Commission		
Soil type	**Generalised soil type (Map 2)**	**Soil classification[3]**	**Soil Wetness Class[4]**	**Soil classification[5]**	**Soil Moisture Class[3]**	**Soil Nutrient Regime[3]**
A	Slowly permeable clays	Pelo-stagnogleys	III (IV)*	Surface water gley	Very moist	Rich
B	Deep loams	Typical stagnogleys Stagnogleyic brown earths	III (III-IV)	Surface water gley Brown gley	Very moist to moist	Rich

*Figures in brackets in the absence of effective agricultural drainage measures

[3] Avery, B.W., 1980. *Soil Classification of England and Wales: Higher Categories*. Soil Survey Technical Monograph No. 14, Harpenden.

[4] Robson J.D. and Thomasson, A.J., 1977. *Soil Water Regimes*. Soil Survey Technical Monograph No. 12, Harpenden.

[5] Kennedy, F., 2002. *The identification of soils for forest management*. Forestry Commission, Stockport.

4.0 Laboratory analysis

NUTRIENTS AND ORGANIC MATTER

(See Tables 4.1, 4.2 and 4.3 for summary)

4.1 The topsoils are mainly silty clays, of neutral pH with low stone content. In the north-west the topsoils are fine to medium loams. Organic matter and nitrogen concentrations are moderately low (typical of soils in continuous long term arable use). Available P, K and Mg concentrations are high (see Table 4.1).

4.2 The subsoil layers of most of the land are typically slightly alkali clays with high base saturation. Those in the north-west are fine loams with neutral pH.

BULK DENSITY

4.3 Bulk density levels for both topsoils and subsoils are marginal to levels presenting rooting restrictions. The topsoil density levels are likely to be at least partially related to the choice of pit locations (avoiding cropped areas)[6]. It may be of note that at Pit location 98 the roots of nearby *Leylandii* were found to over 1 m depth.

4.4 Full laboratory certificates are appended to this report.

Table 4.1: Topsoil nutrient status

Field ID*	pH	P	K	Mg
		mg/kg		
1	6.8	20	151	167
2	6.7	37	143	168
3	6.8	41	181	228
4	7.1	28	225	331
5	7.0	53	199	116
6	7.0	30	249	353
7	7.3	36	173	208
8	6.9	27	137	176
9	6.6	29	201	320
10	6.8	36	302	365
11	7.0	42	185	214
12	7.4	41	171	191
13	7.4	29	189	194

*See Map 1

[6] Foot, K. and Sinnett, D., 2014. Imported soil or soil-forming material placement. Forest Research Best Practice Guidance for Land Regeneration Note 5. Farnham, Surrey.

Table 4.2: Selected soil analyses

Pit No.[1]	Layer[2]	Texture	pH	Organic matter[3] %	P mg/kg	K mg/kg	Mg mg/kg	Total N %	Total stones % volume	$CaCO_3$	Bulk density[4] g/cm^3
33	TS	Silty clay	6.6	3.7	28	152	323	0.22	5	1.2	1.4
	SSA	Clay	8.1	1	<2.5	187	1801	0.05	<1	1.7	1.5
	SSB	Clay	8.2	0.9	<2.5	177	1657	0.05	4	2.6	1.5
51	TS	Silty clay	7.6	5.3	42	242	319	0.3	<1	1.3	1.4
	SSA	Silty clay	7.9	1.9	7	105	684	0.05	<1	0.7	1.7
	SSB	Clay	7.7	1.8	10	128	1131	0.10	3	0.9	1.5
75	TS	Silty clay	7.5	4.0	35	164	200	0.21	2	1.2	1.2
	SSA	Clay	8.4	0.8	<2.5	162	1011	0.04	7	1.2	1.5
	SSB	Clay	8.2	0.8	<2.5	163	889	0.04	9	1.1	1.6
79	TS	Silty clay	7.2	3.7	34	193	150	0.22	2	1.2	1.8
	SSA	Clay	8.4	0.9	<2.5	209	209	0.05	8	1.4	1.8
	SSB	Clay	8.4	0.7	<2.5	279	279	0.04	11	2	1.6
98	TS	Silty clay	6.9	4.8	37	244	366	0.25	1	0.9	1.5
	SSA	Clay	7.6	0.7	<2.5	137	427	0.08	2	0.5	1.7
	SSB	Clay	7.9	1.1	<2.5	187	624	0.06	3	0.6	1.6
1	TS	Sandy clay loam	6.0	2.9	29	151	99	0.15	1	0.4	1.6
	SSA	Sandy clay loam	7.1	1.1	<2.5	85	343	0.04	<1	0.2	1.6
	SSB	Sandy clay loam	7.5	0.6	<2.5	168	467	<0.02	<1	0.2	1.7
80	TS	Sandy loam	4.4*	3.9	48	262	41	0.24	4	0.2	1.5
	SSA	Sandy clay loam	7.1	0.8	3	94	114	0.04	7	<0.1	1.7
	SSB	Sandy clay	6.9	1.4	<2.5	164	127	0.03	1	0.5	1.6

Table 4.3: Average by soil type

Soil type	Layer[2]	Texture	pH	Organic matter[3] %	P mg/kg	K mg/kg	Mg mg/kg	Total N %	Total stones % volume	$CaCO_3$	Bulk density g/cm^3
A	TS	Silty clay	7.2	4.3	35.2	199	272	0.24	2	1.2	1.5
	USS	Clay	8.1	1.1	<2.5	160	826	0.05	2	1.1	1.6
	LSS	Clay	8.1	1.1	<2.5	187	916	0.06	2	1.4	1.6
B	TS	Sandy clay loam	5.2*	3.4	39	207	70	0.20	2.5	0.3	1.6
	USS	Sandy clay loam	7.1	1.0	<2.5	90	229	0.04	-	0.2	1.7
	LSS	Sandy clay loam	7.2	1.0	<2.5	166	297	0.03	1	0.4	1.7

[1] See Map 1; [2]: TS topsoil, SS1 45-50cm, SS2 85-100 cm; [3] Dumas method; [4]Average of three cores per layer
***Suspected analytical error**

5.0 Suitability to support commercial woodland plantation

5.1. The land has soils with significant drainage restrictions: these can be more effectively managed under agriculture than under forestry, and it is expected that the majority of the land will stand waterlogged to shallow depth for long periods during winter as agricultural drainage systems deteriorate under woodland. However, the warm dry local climate means that prolonged waterlogging during the growing season is unlikely. This means the land is suitable for most commercial hardwood species with the exception of beech.

5.2. The land has field drains at present, and this is likely to be partially effective in reducing surface waterlogging during establishment. The soils are well suited to mole drainage, which would further reduce shallow waterlogging during establishment. It would be expedient to consider this step during the site development phase, and pre-planting.

5.3. The topsoils have high nutrient levels and adequate weed control during establishment will be necessary.

5.4. Rooting may be restricted by the density of the subsoil, although this is unlikely to present a major issue to commercial forestry. Subsoiling prior to planting may be advantageous, although care would need to be taken to ensure the subsoils are sufficiently dry to prevent plastic deformation in these clay soils.

Table 5.1: Soil suitability for commercial yields of selected tree species (assessed using Forest Research ESC[1])

Tree species	Soil type	Suitability	Reason
Pendunculate oak	A Clays	Very suitable	-
	B Loams	Very suitable	-
Hornbeam	A Clays	Suitable	Wetness
	B Loams	Suitable	Wetness
Beech	A Clays	Unsuitable	Wetness
	B Loams	Suitable	Wetness
Downy birch	A Clays	Suitable	Nutrient regime
	B Loams	Suitable	Nutrient regime
Silver birch	A Clays	Very suitable	-
	B Loams	Very suitable	-

[1]Pyatt *et al.,* 2001. *An Ecological Site Classification for Forestry in Great Britain*. Bulletin 124, HMSO.

6.0 Potential for habitat creation

6.1 The main soils are relatively uniform neutral clays. These soils are probably most suited to lowland mixed broadleaf habitat in this part of the country (W10 in Rodwell's classification). A transition to wet woodland dominated by alder and willow species is likely in lower-lying parts of the site, particularly if existing agricultural drainage is allowed to deteriorate. An area of willow woodland is present in the south-east of the site.

6.2 Target habitat (other than woodland) should be neutral moist grassland. However, phosphate concentrations are high (typically MAFF index 3), which means that establishment of species-rich grassland habitat is likely to be difficult: creation of this habitat would need medium-term management in the form of extractive cropping, with herbicides required to control likely dominance of productive grasses and agricultural weed species.

6.3 The land has slowly permeable geology, which is well suited to the creation of ponds: this could be achieved by excavating 'clay pits' and puddling/compacting underlying clay to create impermeable conditions. The flatter lower-lying land in the south is best suited to pond creation, although a pond/clay pit is present on level higher ground in the north-east of the site.

6.4 There is an opportunity to expand an existing area of wet woodland in the south-west of the site, with the possibility of creating true wetland conditions if the drainage ditch adjoining this area were blocked.

7.0 Summary and Conclusions

7.1 The site has heavy slowly permeable soils. This land has good potential to support commercial yields of a range of native tree species, with mixed native broadleaf the target habitat, and with areas of wet woodland for increased habitat diversity. Wetness caused by slowly permeable subsoil is likely to affect planting conditions: mole drainage is recommended to reduce winter waterlogging during tree establishment.

7.2 Neutral grassland habitat creation has limited potential without significant management due to elevated phosphate concentrations.

7.3 Creation of new ponds would be relatively easy, particularly in the south of the site.

APPENDIX

DETAILS OF OBSERVATIONS

MAPS

LABORATORY ANALYSIS

HOLE FARM: SOIL RESOURCES SURVEY– DETAILS OF AUGER OBSERVATIONS AT EACH SAMPLING POINT

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class
1	0-21	SCL	<5	21-50	SCL	xxx	50-90+	SCL	xxx	5	III
2	0-26	HCL	<5	26-34	HZCL	xxx	34-100+	C	xxx	3	III
3	0-30	MZCL	<5	30-60	MZCL	xxx	60-90+	HZCL	xxx	3	II
4	0-26	HCL	<5	26-41	ZC	xxx	41-70+	ZC	xxx	4	III
5	0-25	ZC	<5	25-90+	C	xxx				6	III
6	0-28	C	<5	28-44	C	xxx	44+	Stopped on stones		5	?
7	0-32	HZCL	<5	32-47	HZCL	xxx	47-80+	C	xxx	2	III
8	0-27	HZCL	<5	27-47	HZCL	xxx	47-100+	C	xxx	4	III
9	0-41	C	<5	41-90+	C	xxx				3	III
10	0-21	C	<5	20-90+	C	xx(x)				3	III
11	0-38	HZCL	<5	38-43	ZC	xxx	43-80+	C	xxx	3	III
12	0-29	HZCL	<5	29-48	HZCL	xxx	48-90+	C	xxx	2	III
13	0-33	ZC	<5	33-80+	C	xxx				4	III
14	0-31	ZC	5	31-90+	C	xxx				3	III
15	0-30	ZC	<5	30-90+	C	xxx				2	III
16	0-26	C	<5	26-90+	C	xxx				3	III
17	0-27	HZCL	<5	27-39	HZCL	xxx	39-62 62+	C Stopped on stones	xxx	3	III
18	0-28	HZCL	<5	28-45	HZCL	xxx	45-90+	C	xxx	3	III
19	0-35	ZC	<5	35-50	ZC	xxx	50-90+	C	xxx	2	III
20	0-28	HZCL	5-10	28-42	ZC	xxx	42-90+	C	xxx	2	III
21	0-32	ZC	<5	32-48	ZC	xxx	48-90+	C	xxx	1	III
22	0-32	HCL	5-10	32-82	C	xxx	82+	Stopped on stones		1	III
23	0-34	ZC	0	34-90+	C	xxx				1	III
24	0-32	ZC	0	32-80+	C	xxx				4	III
25	0-16	C	<5	16-90+	C	xxx				4	III
26	0-30	HZCL	<5	30-46	ZC	xxx	46-90+	C	xxx	1	III
27	0-27	HZCL	<5	27-51	HZCL	xxx	51-90+	ZC	xxx	3	III
28	0-29	ZC	<5	29-34	ZC	xxx	34-80+	C	xxx	3	III
29	0-28	HZCL	<5	28-48	HZCL	xxx	48-80+	C	xxx	1	III
30	0-23	HZCL	<5	23-33	HZCL	xxx	33-80+	C	xxx	2	III
31	0-33	ZC	<5	33-100+	C	xxx				1	III
32	0-9	HZCL	<5	9-27	HZCL(dist)	xxx	27-100+	C	xxx	0	III
33	0-28	C	<5	28-56	C	xxx	56-90+	C	xx	3	III
34	0-28	C	<5	28-90+	C	xxx				2	III
35	0-25	C	<5	25-90+	C	xxx				1	III
36	0-26	C	<5	26-80+	C	xxx				2	III
37	0-34	C	<5	34-90+	C	xxx				3	III
38	0-31	C		31-90+	C	xxx				2	III
39	0-18	C	<5	18-90+	C	xx(x)				2	II?

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class
40	0-26	C	<5	26-90+	C	xxx				2	III
41	0-27	C	0	27-90+	C	xxx				2	III
42	0-26	C	<5	26-90+	C	xxx				3	III
43	0-30	C	<5	30-100+	C	xxx				2	III
44	0-24	C	<5	24-42	C	xxx	42-90+	C	xxx	0	III
45	0-21	C	<5	21-90+	C	xxx				4	III
46	0-31	C	<5	31-90+	C	xxx				4	III
47	0-27	C	<5	27-47	C	xxx	47-78 78+	C	xxx	2	III
48	0-34	C	<5	34-100+	C	xxx				1	III
49	0-23	C	<5	23-80+	C	xxx				1	III
50	0-24	ZC	5-10	24-46	ZC	xxx	46-90+	ZC	xxx	2	III
51	0-23	C	0	23-80+	C	xxx				1	III
52	0-2i3	C	<5	23-100+	C	xxx				3	III
53	0-21	ZC	<5	21-90+	C	xxx				4	III
54	0-27	ZC	<5	27-90+	C	xxx				1	III
55	0-24	C	<5	24-90+	C	xxx				0	III
56	0-27	C	<5	27-80+	C	xxx				2	III
57	0-23	C	<5	23-90+	C	xxx				2	III
58	0-28	C	<5	28-80+	C	xxx				2	III
59	0-24	C	<5	24-90+	C	xxx				2	III
60	0-26	C	<5	26-44	C	xxx	44-80+	C	xxx	2	III
61	0-21	C	<5	21-80+	C	xxx				1	III
62	0-25	Cslca	<5	25-90+	C	xxx				1	III
63	0-42	HZCL(dist)	10	42-80+	mstC	xxx				1	III
64	0-29	C	<5	29-80+	C	xxx				2	III
65	0-21	C	<5	21-90+	C	xxx				3	III
66	0-32	ZC	<5	32-44	ZC	xxx	44-90+	C	xxx	3	III
67	0-50	C(dist)	5-10	50+	Stopped					3	III
68	0-31	ZC	5-10	31-90+	C	xxx				2	III
69	0-26	C	<5	26-90+	C	xxx				1	III
70	0-23	C	<5	23-53	C	xxx	53-90+	C	xxx	3	III
71	0-26	C	<5	26-100+	C	xxx				3	III
72	0-22	C	<5	22-80+	C	xxx				4	III
73	0-30	C	<5	30-80+	ZC	xxx				3	III
74	0-27	C	<5	27-100+	C	xxx				2	III
75	0-30	C	<5	30-90+	C	xxx				0	III
76	0-27	C	<5	27-100+	C	xxx				1	III
77	0-19	C	<5	19-90+	C	xxx				3	III
78	0-29	slstC	<5	29-46	slstC	xxx	46-80+	C	xxx	1	III
79	0-25	slstC	<5	25-43	slstC	xxx	43-70+	C	xxx	2	III

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class
80	0-31	SCL	<5	31-55	SCL	xxx	55-90+	C/ZC	xxx	4	III
81	0-27	HZCL	<5	29-38	HZCL	xxx	38-90+	C	xxx	3	III
82	0-28	ZC	<5	31-90+	C	xxx				2	III
83	0-27	C	<5	27-90+	C	xxx				4	III
84	0-28	MZCL	<5	28-51	MZCL	xxx	51-90+	HZCL	xxx	1	III
85	0-60	HZCL(dist)	<5	60+	Stopped	xxx				1	-
86	0-28	C	<5	28-90+	C	xxx				4	III
87	0-29	C	<5	29-90+	C	xxx				8	III
88	0-26	C	<5	26-90+	C	xxx				4	III
89	0-26	C	<5	26-100+	C	xxx				2	III
90	0-33	HZCL	<5	33-47	ZC	xxx	47-90+	C	xxx	3	III
91	0-30	ZC	0	30-80+	C	xxx				4	III
92	0-25	C	<5	25-90+	C	xxx				5	III
93	0-32	C	0	32-90+	C	xxx				6	III
94	0-26	C	0	26-70+	C	xxx				2	III
95	0-21	C	0	21-90+	C	xxx				5	III
96	0-44	ZC	0	44-64	ZC	xx	64-90+	ZC	xx	2	II
97	0-31	C	<5	31-90+	C	xxx				5	III
98	0-37	C	<5	37-46	C	xxx	46-80+	C	xxx	3	III

Key to table

Mottle intensity:

o unmottled
x few to common rusty root mottles (topsoils) or a few ochreous mottles (subsoils)
xx common to many ochreous mottles and/or dull structure faces
xxx common to many greyish or pale mottles (gleyed horizon)
xxxx dominantly grey, often with some ochreous mottles (gleyed horizon)

a depth underlined (e.g. 50) indicates the top of a slowly permeable layer (a wavy underline indicates the top of a layer borderline to slowly permeable)

Texture:

C - clay
ZC - silty clay
SC - sandy clay
CL - clay loam (H-heavy, M-medium)
ZCL - silty clay loam (H-heavy, M-medium)
SCL - sandy clay loam
SZL - sandy silt loam (F-fine, M-medium, C-coarse)
SL - sandy loam (F-fine, M-medium, C-coarse)
LS - loamy sand (F-fine, M-medium, C-coarse)
S - sand (F-fine, M-medium, C-coarse)
P - peat (H-humified, SF-semi-fibrous, F-fibrous)
LP - loamy peat; PL - peaty loam
R - bedrock

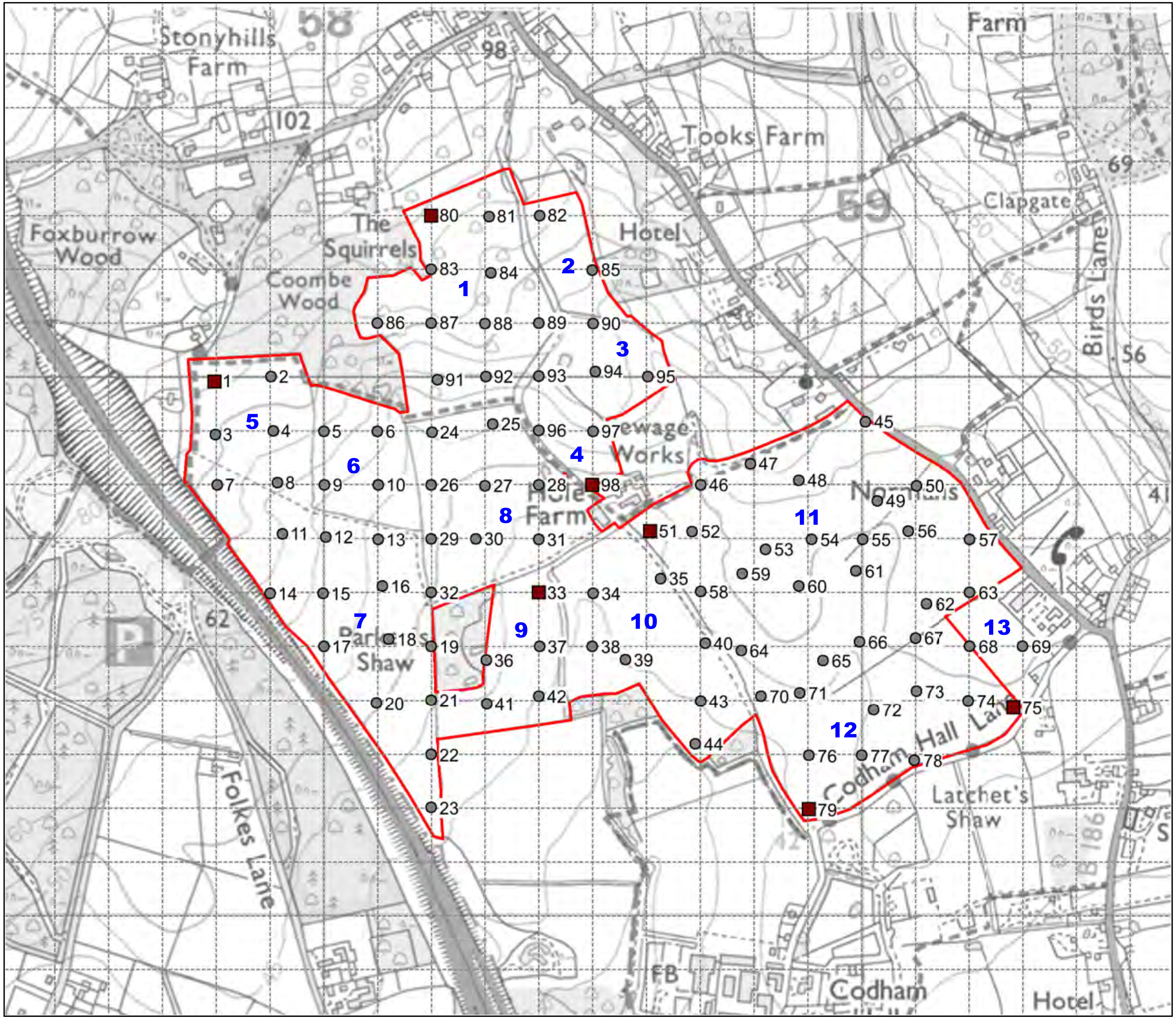
Limitations:

W - wetness/workability
D - droughtiness
De - depth
St – stoniness
Sl – slope
F - flooding
T – topography/microrelief

Texture suffixes & prefixes:

ca – calcareous: x-extremely, v-very, sl-slightly
(ca) marginally calcareous
mn - ferrimanganiferous concentrations
gn – greenish, yb – yellowish brown, rb – reddish brown r – reddish; (v)st – (very) stony; sdst – sandstone lst - limestone

dist - disturbed soil layer; mdst – mudstone



KEY

- Auger observations
- Pits
- 1 Field topsoil samples
- Site boundary

Site:

Hole Farm

Map title:

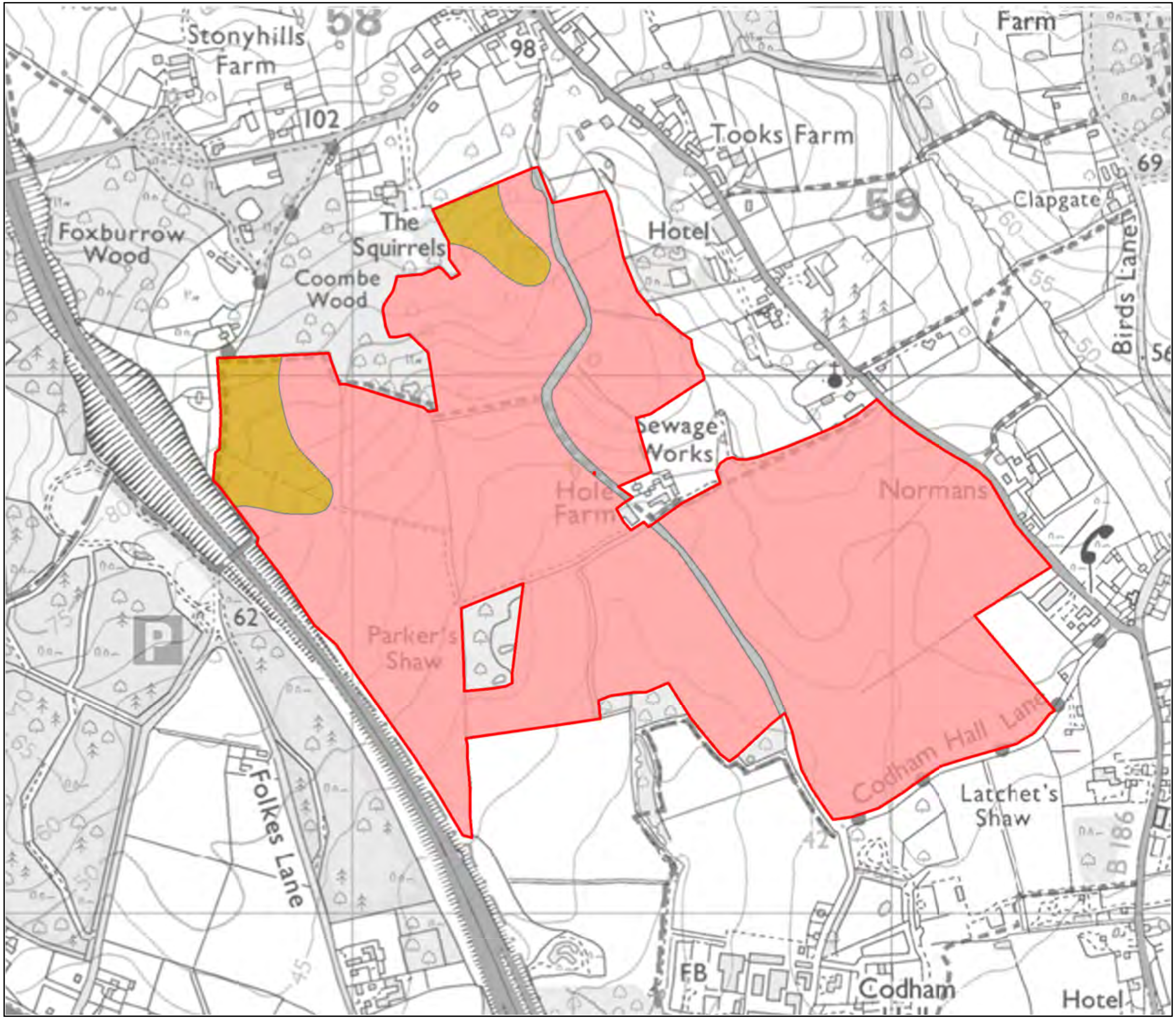
MAP 1
Observations

Land Research Associates

Lockington Hall
Lockington
Derby
DE74 2RH
www.lra.co.uk

Date: 22/06/2021

Scale: 1:10,000



KEY

Loamy soils

Clay soils

Site boundary

Site:

Hole Farm

Map title:

MAP 2
Soil types

Land Research Associates

Lockington Hall
Lockington
Derby
DE74 2RH
www.lra.co.uk

Date: 22/06/2021

Scale: 1:10,000

Pit descriptions

Pit 33: soil type A (see Map 1 & 2)

0-25 cm	Very dark greyish brown (10YR 3/2) clay; slightly stony (medium and large mixed pebbles); moderately developed very coarse sub-angular blocky structure; very firm; few fine fibrous roots; non-calcareous; smooth clear boundary to:
25-48 cm	Grey (7.5YR 5/1) clay with 40% medium and coarse distinct reddish yellow (7.5YR 6/8) mottles; very slightly stony to stoneless; weakly developed very coarse prismatic structure; very firm; no macro-pores; high packing density; no roots; non-calcareous; smooth gradual boundary to:
48-60 cm	Brown (7.5YR 5/3) clay with 15% fine faint strong brown (7.5YR 5/6) mottles; stoneless; structureless (massive); very firm; no macro-pores; high packing density; no roots; non-calcareous; smooth gradual boundary to:
60-80 cm	Brown (7.5YR 5/4) clay with 25% grey (7.5YR 6/1) and strong brown (7.5YR 5/6) mottles; moderately stony (soft sandstone? fragments); structureless (massive); very firm; no macro-pores; high packing density; no roots; slightly calcareous; smooth gradual boundary to:
80-180 cm	Brown (7.5YR 5/4) clay; stoneless; structureless (massive); very firm; no macro-pores; high packing density; no roots; calcareous.

Pit 51: soil type A (see Map 1 & 2)

0-35 cm	Dark greyish brown (10YR 4/2) clay; very slightly stony (small mixed pebbles); moderately developed very coarse sub-angular blocky structure; very firm; few fine fibrous roots; smooth clear boundary to:
35-51 cm	Grey (10YR 5/1) clay with 30% fine and medium distinct reddish yellow (7.5YR 6/8) mottles; very slightly stony; weakly developed medium angular blocky structure; very firm; no macro-pores; common fine fissures; medium packing density; common fine fibrous roots; smooth gradual boundary to:
51-145 cm	Grey (10YR 5/1) clay with 35-40% yellowish red (5YR 5/8) mottles and medium and coarse black ferri-manganiferous concentrations; slightly stony; weakly developed very coarse angular blocky structure; very firm; no macro-pores; high packing density; no roots; non-calcareous; smooth diffuse boundary to:
145-180 cm	Greyish brown (2.5YR 5/2) clay with 25% distinct fine strong brown (7.5YR 5/6) mottles; stoneless; structureless (massive); very firm; no macro-pores; high packing density; no roots.

Pit 75: soil type A (see Map 1 & 2)

0-25 cm	Dark greyish brown (2.5Y 4/2) silty clay; slightly stony (10-15% small and medium mixed pebbles); moderately developed very coarse sub-angular blocky structure; firm; no roots; non-calcareous; smooth clear boundary to:
25-37 cm	Light brownish grey (2.5Y 6/2) clay with 40% medium prominent reddish yellow (7.5YR 6/8) mottles; weakly developed coarse to very coarse angular blocky structure; very firm; no macro-pores; high packing density; no roots;
37-105 cm	Light brownish grey (2.5Y 6/2) clay with 15% fine distinct strong brown (7.5YR 5/8) mottles; weakly developed very coarse prismatic structure; very firm; no macro-pores; high packing density; no roots; smooth diffuse boundary to
105-180 cm	Brown (7.5YR 5/3) clay with 15-20% distinct medium grey (10YR 5/1) and 10% faint strong brown (7.5YR 5/6) mottles; stoneless; structureless (massive) very firm; no macro-pores; high packing density; calcareous.

Pit 1: soil type B (see Map 1 & 2)

0-25 cm	Dark greyish brown (2.5Y 4/2) (fine) sandy clay loam; very slightly stony (small mixed pebbles); moderately developed coarse and very coarse sub-angular blocky structure; friable; few fine fibrous roots; non-calcareous; smooth clear boundary to:
25-39 cm	Light grey (10YR 7/1) (fine) sandy clay loam; stoneless; weakly developed very coarse sub-angular blocky structure; firm; 1-2% medium macro-pores; medium packing density; few fine fibrous roots; non-calcareous; smooth gradual boundary to:
39-70 cm	Greyish green (5GY 5/2) sandy clay loam with 25% prominent medium reddish yellow (7.5YR 6/8) mottles; stoneless; weakly developed very coarse prismatic structure to structureless (massive); very firm and plastic; no macro-pores; high packing density; smooth diffuse boundary to:
70-180 cm	Dark greyish green (10YR 6/1) heavy clay loam with 20% distinct yellowish red (7.5YR 6/8) mottles; stoneless; structureless (massive); very firm; no macro-pores; high packing density.

Pit 80: soil type B (see Map 1 & 2)

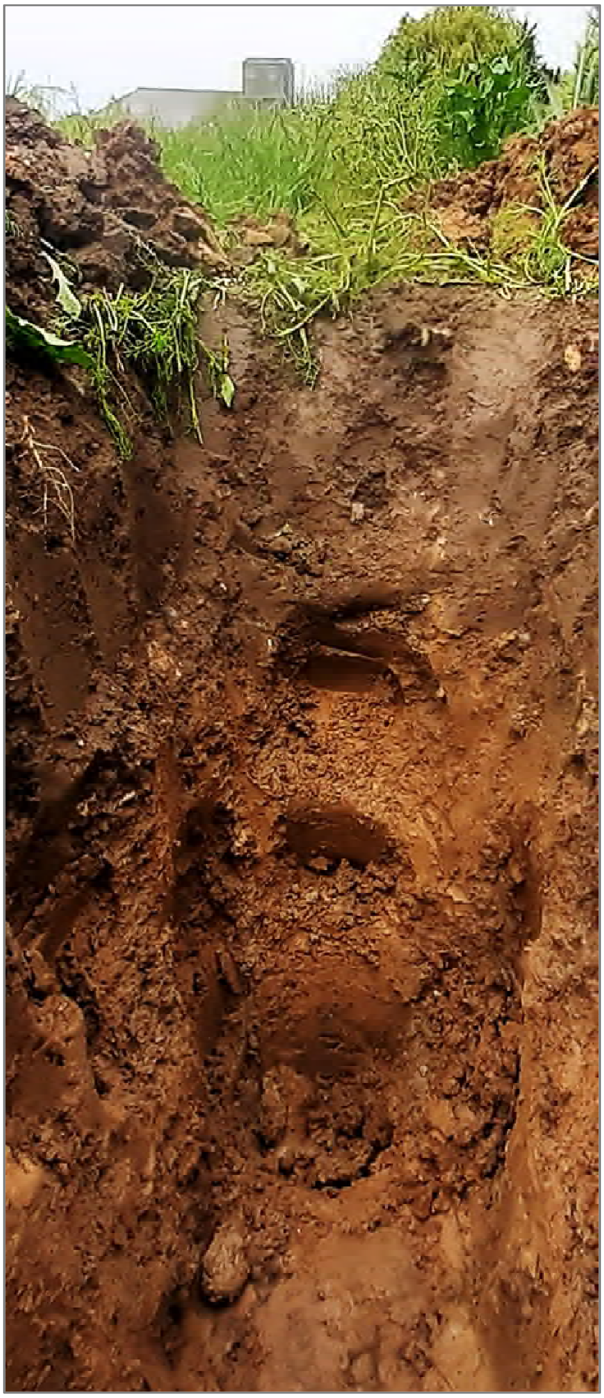
0-25 cm	Dark greyish brown (2.5Y 4/2) (fine) sandy clay loam; slightly stony (10% small and medium mixed pebbles); moderately developed coarse coarse sub-angular blocky structure; friable; very few roots;; smooth clear boundary to:
25-39 cm	Light grey (10YR 7/1) (fine) sandy clay loam; very slightly stony to stoneless; moderately developed very coarse sub-angular blocky structure; firm; 1% fine and medium macro-pores; medium packing density; very few fine fibrous roots; smooth diffuse boundary to:
70-180 cm	Grey (10YR 6/1) heavy clay loam with 40% distinct medium and coarse yellowish red (7.5YR 6/8) mottles; stoneless; weakly developed very coarse sub-angular blocky structure to structureless (massive); very firm; no macro-pores; high packing density.

Soil survey pit photographs (May 2021)

1

33

51



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H579

Please quote the above code for all enquiries

Client : HOLE FARM

Sample Matrix : Agricultural Soil

Laboratory Reference
Card Number 75814/21

Date Received	04-Jun-21
Date Reported	10-Jun-21

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
524546/21	1	**1** *No cropping details given*	**6.8**	**2**	**2-**	**3**	**20.2**	**151**	**167**
524547/21	2	**2** *No cropping details given*	**6.7**	**3**	**2-**	**3**	**37.0**	**143**	**168**
524548/21	3	**3** *No cropping details given*	**6.8**	**3**	**2+**	**4**	**41.4**	**181**	**228**
524549/21	4	**4** *No cropping details given*	**7.1**	**3**	**2+**	**5**	**28.4**	**225**	**331**
524550/21	5	**5** *No cropping details given*	**7.0**	**4**	**2+**	**3**	**53.2**	**199**	**116**
524551/21	6	**6** *No cropping details given*	**7.0**	**3**	**3**	**6**	**30.2**	**249**	**353**

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.
The analytical methods used are as described in DEFRA Reference Book 427
The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by *Nina Mansfield* On behalf of NRM Ltd Date *10/06/21*

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H579

Please quote the above code for all enquiries

Client : HOLE FARM

Sample Matrix : Agricultural Soil

Laboratory Reference
Card Number 75814/21

Date Received	04-Jun-21
Date Reported	10-Jun-21

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
524552/21	7	**7** *No cropping details given*	**7.3**	**3**	**2-**	**4**	**36.4**	**173**	**208**
524553/21	8	**8** *No cropping details given*	**6.9**	**3**	**2-**	**4**	**26.6**	**137**	**176**
524554/21	9	**9** *No cropping details given*	**6.8**	**3**	**2+**	**5**	**29.4**	**201**	**320**
524555/21	10	**10** *No cropping details given*	**6.6**	**3**	**3**	**6**	**35.8**	**302**	**365**

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.
The analytical methods used are as described in DEFRA Reference Book 427
The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by *Nina Mansfield* On behalf of NRM Ltd Date *10/06/21*

MICRO NUTRIENT REPORT

DATE **10th June 2021**

SAMPLES FROM **HOLE FARM**

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Reference: **75814/524546/21** Field Name: **1**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	4.9	1	*OM level data not available for this crop*				

Reference: **75814/524547/21** Field Name: **2**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	4.5	1	*OM level data not available for this crop*				

Reference: **75814/524548/21** Field Name: **3**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	5.4	1	*OM level data not available for this crop*				

Reference: **75814/524549/21** Field Name: **4**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	5.1	1	*OM level data not available for this crop*				

Reference: **75814/524550/21** Field Name: **5**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	4.8	1	*OM level data not available for this crop*				

Reference: **75814/524551/21** Field Name: **6**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	5.4	1	*OM level data not available for this crop*				

Reference: **75814/524552/21** Field Name: **7**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	5.2	1	*OM level data not available for this crop*				

Reference: **75814/524553/21** Field Name: **8**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	6.2	1	*OM level data not available for this crop*				

Reference: **75814/524554/21** Field Name: **9**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	5.1	1	*OM level data not available for this crop*				

Reference: **75814/524555/21** Field Name: **10**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	5.7	1	*OM level data not available for this crop*				

Notes (*)

(1) NRM considers Organic soils to contain between 10-20% organic material with Peaty soils containing over 20% . The optimum ranges for Organic Matter which have been set are dependent on the soil type and the cropping but these must be viewed as guidance values only.

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H579

Please quote the above code for all enquiries

Client : HOLE FARM

Sample Matrix : Agricultural Soil

Laboratory Reference
Card Number 75815/21

Date Received 04-Jun-21
Date Reported 10-Jun-21

SOIL ANALYSIS REPORT

Laboratory Sample Reference	Field Details		Soil pH	Index			mg/l (Available)		
	No.	Name or O.S. Reference with Cropping Details		P	K	Mg	P	K	Mg
524556/21	1	**11** *No cropping details given*	**7.4**	**3**	**2+**	**4**	**41.8**	**185**	**214**
524557/21	2	**12** *No cropping details given*	**7.4**	**4**	**2-**	**4**	**48.2**	**171**	**191**
524558/21	3	**13** *No cropping details given*	**6.8**	**3**	**2+**	**4**	**29.0**	**189**	**194**

If general fertiliser and lime recommendations have been requested, these are given on the following sheets.
The analytical methods used are as described in DEFRA Reference Book 427
The index values are determined from the AHDB Fertiliser Recommendations RB209 9th Edition.

Released by *Nina Mansfield* On behalf of NRM Ltd Date *10/06/21*

MICRO NUTRIENT REPORT

DATE **10th June 2021**

SAMPLES FROM **HOLE FARM**

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Reference: **75815/524556/21** Field Name: **11**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	5.9	1	*OM level data not available for this crop*				

Reference: **75815/524557/21** Field Name: **12**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	5.1	1	*OM level data not available for this crop*				

Reference: **75815/524558/21** Field Name: **13**	Result	(*)	Deficient	Marginal	Target	Marginal	Excessive
Organic matter (LOI) %	8.5	1	*OM level data not available for this crop*				

Notes (*)

(1) NRM considers Organic soils to contain between 10-20% organic material with Peaty soils containing over 20% . The optimum ranges for Organic Matter which have been set are dependent on the soil type and the cropping but these must be viewed as guidance values only.

ANALYTICAL REPORT

Report Number	**54993-21**	**H579**	**MR MIKE PALMER**	**Client HOLE FARM**
Date Received	**04-JUN-2021**		**LAND RESEARCH ASSOCIATES**	
Date Reported	**18-JUN-2021**		**LOCKINGTON HALL**	
Project	**TOPSOIL**		**LOCKINGTON**	
Reference	**HOLE FARM**		**DERBY**	
Order Number			**DE74 2RH**	

Laboratory Reference		**ENV 60828**	**ENV 60829**	**ENV 60830**	**ENV 60831**	**ENV 60832**	**ENV 60833**	**ENV 60834**			
Sample Reference		**PIT 1 TOPSOIL**	**PIT 33 TOP SOIL**	**PIT 51 TOP SOIL**	**PIT 75 TOP SOIL**	**PIT 79 TOP SOIL**	**PIT 80 TOP SOIL**	**PIT 98 TOP SOIL**			
Determinand	**Unit**	**TOPSOIL**	**TOPSOIL**	**TOPSOIL**	**TOPSOIL**	**TOPSOIL**	**TOPSOIL**	**TOPSOIL**			
pH (Value)		6.0	6.6	7.6	7.5	7.2	4.4	6.9			
Available Phosphorus	mg/l	29 (3)	28 (3)	42 (3)	35 (3)	34 (3)	48 (4)	37 (3)			
Available Potassium	mg/l	151 (2-)	152 (2-)	242 (3)	164 (2-)	193 (2+)	262 (3)	244 (3)			
Available Magnesium	mg/l	99 (2)	323 (5)	319 (5)	200 (4)	150 (3)	41 (1)	336 (5)			
Sand (2.00-0.063mm)	%	59	15	12	13	17	59	19			
Silt (0.063-0.002mm)	%	23	46	49	47	47	26	43			
Clay (<0.002mm)	%	18	39	39	40	36	15	38			
Total Nitrogen	% w/w	0.15	0.22	0.30	0.21	0.22	0.24	0.25			
Sulphur	mg/kg	320	366	481	333	403	408	439			
Stones 2-20mm	%	3.6	12.0	1.2	4.6	4.6	9.4	2.0			
Conductivity (Sat CaSO4)	uS/cm	2296	2103	2056	2049	2056	2445	2033			
Organic Matter by LOI	% w/w	3.3	5.1	6.3	5.1	4.8	5.1	5.9			
Organic Carbon	% w/w	1.9	3.0	3.7	3.0	2.8	3.0	3.4			
Neutralising Value as CaC03 equiv.	% w/w	0.4	1.2	1.3	1.2	1.2	0.2	0.9			
Neutralising Value as CaO equiv.	% w/w	0.2	0.7	0.7	0.7	0.7	<0.1	0.5			
Water Soluble Boron	mg/l	1.0	2.0	2.2	1.2	1.8	0.8	1.8			
Calcium	mg/kg	2894	4750	6048	6198	5648	1794	4658			
Total Sulphate	mg/kg	485	544	753	510	552	717	608			
Easily Liberated Sulphide	mg/kg	<10	<10	<10	<10	<10	<10	<10			
Elemental Sulphur	mg/kg	<5	<5	<5	<5	<5	<5	<5			
Dry Matter	% w/w	81.5	84.2	82.7	81.2	78.4	77.4	80.9			
Stones 20-60mm	% w/w	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Stones >60mm	% w/w	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
Organic Carbon by DUMAS	%	1.7	2.1	3.1	2.3	2.2	2.3	2.8			
Organic Matter [calculation]	%	2.9	3.7	5.3	4.0	3.7	3.9	4.8			

ANALYTICAL REPORT

Report Number	**54994-21**	**H579**	**MR MIKE PALMER**	**Client HOLE FARM**
Date Received	**04-JUN-2021**		**LAND RESEARCH ASSOCIATES**	
Date Reported	**18-JUN-2021**		**LOCKINGTON HALL**	
Project	**SUBSOIL**		**LOCKINGTON**	
Reference	**HOLE FARM**		**DERBY**	
Order Number			**DE74 2RH**	

Laboratory Reference		**ENV 60835**	**ENV 60836**	**ENV 60837**	**ENV 60838**	**ENV 60839**	**ENV 60840**	**ENV 60841**	**ENV 60842**	**ENV 60843**	**ENV 60844**
Sample Reference		**PIT 1 SUBS OIL 1**	**PIT 1 SUBS OIL 2**	**PIT 33 SUB SOIL 1**	**PIT 33 SUB SOIL 2**	**PIT 51 SUB SOIL 1**	**PIT 51 SUB SOIL 2**	**PIT 75 SUB SOIL 1**	**PIT 75 SUB SOIL 2**	**PIT 79 SUB SOIL 1**	**PIT 79 SUB SOIL 2**
Determinand	**Unit**	**SUBSOIL**	**SUBSOIL**	**SUBSOIL**	**SUBSOIL**	**SUBSOIL**	**SUBSOIL**	**SUBSOIL**	**SUBSOIL**	**SUBSOIL**	**SUBSOIL**
pH (Value)		7.1	7.5	8.1	8.2	7.9	7.7	8.4	8.2	8.4	8.4
Available Phosphorus	mg/l	<2.5 (0)	<2.5 (0)	<2.5 (0)	<2.5 (0)	7 (0)	10 (1)	<2.5 (0)	<2.5 (0)	<2.5 (0)	<2.5 (0)
Available Potassium	mg/l	85 (1)	168 (2-)	187 (2+)	177 (2-)	105 (1)	128 (2-)	162 (2-)	163 (2-)	209 (2+)	279 (3)
Available Magnesium	mg/l	343 (5)	467 (6)	1801 (9)	1657 (9)	684 (7)	1131 (8)	1011 (8)	889 (7)	852 (7)	1416 (8)
Sand (2.00-0.063mm)	%	56	67	5	3	15	23	7	6	8	3
Silt (0.063-0.002mm)	%	17	8	31	31	45	31	33	33	31	34
Clay (<0.002mm)	%	27	25	64	66	40	46	60	61	61	63
Total Nitrogen	% w/w	0.04	<0.02	0.05	0.05	0.10	0.09	0.04	0.04	0.05	0.04
Sulphur	mg/kg	126	88	427	684	220	255	107	101	105	177
Stones 2-20mm	%	0.4	0.1	0.6	11.6	2.2	7.6	19.2	23.1	19.7	29.7
Conductivity (Sat CaSO4)	uS/cm	2024	2057	2408	2286	2062	2161	2012	1976	1991	2062
Organic Matter by LOI	% w/w	1.6	1.1	2.8	3.0	3.0	3.2	2.6	2.7	2.8	2.5
Organic Carbon	% w/w	0.9	0.6	1.6	1.7	1.8	1.8	1.5	1.6	1.6	1.5
Neutralising Value as CaC03 equiv.	% w/w	0.2	0.2	1.7	2.6	0.7	0.9	1.2	1.1	1.4	2.0
Neutralising Value as CaO equiv.	% w/w	0.1	0.1	1.0	1.4	0.4	0.5	0.7	0.6	0.8	1.1
Water Soluble Boron	mg/l	0.2	0.2	0.8	0.9	0.9	0.8	0.9	1.1	0.6	0.4
Calcium	mg/kg	2164	2392	5454	16079	3924	2865	5198	4821	5593	5092
Total Sulphate	mg/kg	<200	<200	772	1434	388	469	<200	<200	<200	323
Easily Liberated Sulphide	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Elemental Sulphur	mg/kg	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Dry Matter	% w/w	81.0	78.4	76.0	75.3	81.6	78.7	76.7	75.3	75.1	75.9
Stones 20-60mm	% w/w	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Stones >60mm	% w/w	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Organic Carbon by DUMAS	%	0.7	0.4	0.6	0.5	1.1	1.1	0.5	0.5	0.5	0.4
Organic Matter [calculation]	%	1.1	0.6	1.0	0.9	1.9	1.8	0.8	0.8	0.9	0.7

ANALYTICAL REPORT

Report Number	**54995-21**	**H579**	**MR MIKE PALMER**	**Client HOLE FARM**
Date Received	**04-JUN-2021**		**LAND RESEARCH ASSOCIATES**	
Date Reported	**18-JUN-2021**		**LOCKINGTON HALL**	
Project	**SUBSOIL**		**LOCKINGTON**	
Reference	**HOLE FARM**		**DERBY**	
Order Number			**DE74 2RH**	

Laboratory Reference		**ENV 60845**	**ENV 60846**	**ENV 60847**	**ENV 60848**						
Sample Reference		**PIT 80 SUB SOIL 1**	**PIT 80 SUB SOIL 2**	**PIT 98 SUB SOIL 1**	**PIT 98 SUB SOIL 2**						
Determinand	**Unit**	**SUBSOIL**	**SUBSOIL**	**SUBSOIL**	**SUBSOIL**						
pH (Value)		7.1	6.9	7.6	7.9						
Available Phosphorus	mg/l	3 (0)	<2.5 (0)	<2.5 (0)	<2.5 (0)						
Available Potassium	mg/l	94 (1)	164 (2-)	137 (2-)	187 (2+)						
Available Magnesium	mg/l	114 (3)	287 (5)	427 (6)	624 (7)						
Sand (2.00-0.063mm)	%	52	51	17	8						
Silt (0.063-0.002mm)	%	30	18	42	39						
Clay (<0.002mm)	%	18	31	41	53						
Total Nitrogen	% w/w	0.04	0.03	0.08	0.06						
Sulphur	mg/kg	101	102	185	136						
Stones 2-20mm	%	18.5	1.8	3.9	7.6						
Conductivity (Sat CaSO4)	uS/cm	2038	2020	2023	1983						
Organic Matter by LOI	% w/w	1.2	1.6	2.6	2.5						
Organic Carbon	% w/w	0.7	0.9	1.5	1.5						
Neutralising Value as CaC03 equiv.	% w/w	<0.1	0.5	0.6	0.5						
Neutralising Value as CaO equiv.	% w/w	<0.1	0.3	0.3	0.3						
Water Soluble Boron	mg/l	0.3	0.4	1.0	1.2						
Calcium	mg/kg	1694	2579	3799	3920						
Total Sulphate	mg/kg	<200	<200	386	<200						
Easily Liberated Sulphide	mg/kg	<10	<10	<10	<10						
Elemental Sulphur	mg/kg	<5	<5	<5	<5						
Dry Matter	% w/w	87.3	80.8	82.0	76.2						
Stones 20-60mm	% w/w	<0.1	<0.1	<0.1	<0.1						
Stones >60mm	% w/w	<0.1	<0.1	<0.1	<0.1						
Organic Carbon by DUMAS	%	0.5	0.4	0.8	0.7						
Organic Matter [calculation]	%	0.8	0.7	1.4	1.1						

Appendix B: Hole Farm Proposed Building and Car Park Layout

GENERAL NOTES

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KEY

- Planning application boundary
- Surfaced path type A - 3.5m width prime aggregate with a wearing course of tar and chip, grey granite finish
- Surfaced path type B - 3m width tarmac with coloured surface dressing of natural angled stone chip
- Surfaced path type C - 3m width unsealed prime aggregate, with compacted 6mm to dust grey granite angled chip
- Surfaced path type D - 3m width prime aggregate with a wearing course of tar and chip, grey granite finish
- Surfaced path type E - 3m width tarmac with grey granite surface dressing
- Unsealed prime aggregate

Part of separate EIA for afforestation application by Forestry England

- Proposed rides and glades neutral grassland
- Proposed rides and glades species rich grassland
- Proposed shrub
- Proposed and existing woodland
- Proposed natural regeneration
- Proposed feature planting

- Pedestrian site access point
- Vehicular site access point
- Existing ponds
- Proposed ponds
- Existing bridleway
- Existing buildings to be demolished
- Existing footpath (PRoW)

0 50m 100m 150m 200m
Scale 1:5000@A3

Rev	Date	Description	Drawn	Chkd	App
P08	30/05/23	FOR PLANNING	VS	GH	JB
P07	09/05/23	FOR PLANNING	VS	GH	JB
P06	27/04/23	FOR APPROVAL	VS	GH	JB
P05	20/04/23	FOR APPROVAL	VS	GH	JB
P04	13/04/23	FOR APPROVAL	VS	GH	JB
P03	31/03/23	FOR APPROVAL	VS	GH	JB
P02	15/03/23	IDR FOR COMMENT	VS	GH	JB
P01	03/02/23	PLANNING DRAFT FOR COMMENT	EB	GH	JB

Client
FORESTRY ENGLAND

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w : www.fereday-pollard.co.uk e : admin@fereday-pollard.co.uk

Project Title
HOLE FARM

Drawing Title
PROPOSED OVERALL SITE PLAN

Scale	Date Created		Alternative Reference
1:2500@A1/1:5000@A3	01-02-23		

Drawn By	Checked By	Approved By
EB	GH	JB

Status	Suitability Code	DrawingNumber	Revision
FOR PLANNING		375-FP-00-ZZ-DRG-A-000050	P08

Sheet Size A1 841 x 594

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KEY

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- Proposed buildings
- Surfaced path type B - 3m width tarmac with coloured surface dressing of natural angled stone chip
- Surfaced path type C - 3m width unsealed prime aggregate, with compacted 6mm to dust grey granite angled chip
- Surfaced path type E - 3m width tarmac with grey granite surface dressing
- Unsealed prime aggregate
- Proposed threshold surfacing

Part of separate EIA for afforestation application by Forestry England

- Proposed rides and glades neutral grassland
- Proposed rides and glades species rich grassland
- Proposed and existing woodland
- Proposed shrub

- Hedgerows
- Existing trees
- Proposed trees
- Existing building footprint
- Existing concrete apron
- Existing footpath (PRoW)
- Top of bank or ditch

0 5m 10m 15m 20m 25m 30m

Scale 1:500@A3

Rev	Date	Description	Drawn	Chkd	App
P08	30/05/23	FOR PLANNING	VS	GH	JB
P07	09/05/23	FOR PLANNING	VS	GH	JB
P06	27/04/23	FOR APPROVAL	VS	GH	JB
P05	20/04/23	FOR APPROVAL	VS	GH	JB
P04	13/04/23	FOR APPROVAL	VS	GH	JB
P03	31/03/23	FOR APPROVAL	VS	GH	JB
P02	15/03/23	IDR FOR COMMENT	VS	GH	JB
P01	03/02/23	PLANNING DRAFT FOR COMMENT	EB	GH	JB

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Scale: 1:250@A1/1:500@A3
Date Created: 31-01-23
Drawn By: EB
Checked By: GH
Approved By: JB
Status: FOR PLANNING
Suitability Code:

Project Title
HOLE FARM

Drawing Title
PROPOSED BUILDINGS CLUSTER SITE PLAN

Alternative Reference

DrawingNumber: 375-FP-01-ZZ-DRG-A-000051
Revision: P08

Sheet Size A1 841 x 594

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KEY

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- Proposed covered areas
- Surfaced path type A - 3.5m width prime aggregate with a wearing course of tar and chip, grey granite finish
- Surfaced path type B - 3m width tarmac with coloured surface dressing of natural angled stone chip
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- Surfaced path type D - 3m width prime aggregate with a wearing course of tar and chip, grey granite finish
- Surfaced path type E - 3m width tarmac with grey granite surface dressing

Part of separate EIA for afforestation application by Forestry England

- Proposed rides and glades neutral grassland
- Proposed rides and glades species rich grassland
- Proposed shrub
- Proposed and existing woodland
- Proposed natural regeneration
- Proposed feature planting
- Hedgerows
- Existing footpath (PRoW)
- Existing trees
- Proposed trees

0 5m 10m 15m 20m 25m 30m

Scale 1:500@A3

Rev	Date	Description	Drawn	Chkd	App
P08	30/05/23	FOR PLANNING	VS	GH	JB
P07	09/05/23	FOR PLANNING	VS	GH	JB
P06	27/04/23	FOR APPROVAL	VS	GH	JB
P05	20/04/23	FOR APPROVAL	VS	GH	JB
P04	13/04/23	FOR APPROVAL	VS	GH	JB
P03	31/03/23	FOR APPROVAL	VS	GH	JB
P02	15/03/23	IDR FOR COMMENT	VS	GH	JB
P01	03/02/23	PLANNING DRAFT FOR COMMENT	EB	GH	JB

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w : www.fereday-pollard.co.uk e : admin@fereday-pollard.co.uk

Project Title
HOLE FARM

Drawing Title
LOCATION PLAN
PROPOSED MODULAR CAFE
AND OPEN-SIDED VISITOR SHELTER
[OUTLINE PLANNING]

Scale	Date Created
1: 250@A1/1:500@A3	03-02-23

Drawn By	Checked By	Approved By	Alternative Reference
EB	GH	JB	

Status	Suitability Code	DrawingNumber	Revision
FOR PLANNING		375-FP-02-ZZ-DRG-A-000110	P08

Sheet Size A1 841 x 594

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- Surfaced path type E - 3m width tarmac with grey granite surface dressing

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- Proposed rides and glades species rich grassland
- Proposed shrub
- Proposed and existing woodland
- Proposed natural regeneration
- Proposed feature planting

- Hedgerows
- Existing footpath (PRoW)
- Existing trees
- Proposed trees

0 10m 20m 30m 40m 50m

Scale 1:1000@A3

Rev	Date	Description	Drawn	Chkd	App
P08	30/05/23	FOR PLANNING	VS	GH	JB
P07	09/05/23	FOR PLANNING	VS	GH	JB
P06	27/04/23	FOR APPROVAL	VS	GH	JB
P05	20/04/23	FOR APPROVAL	VS	GH	JB
P04	13/04/23	FOR APPROVAL	VS	GH	JB
P03	31/03/23	FOR APPROVAL	VS	GH	JB
P02	15/03/23	IDR FOR COMMENT	VS	GH	JB
P01	03/02/23	PLANNING DRAFT FOR COMMENT	EB	GH	JB

Client
FORESTRY ENGLAND

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Project Title
HOLE FARM

Drawing Title
PROPOSED CAR PARK LOCATION PLAN

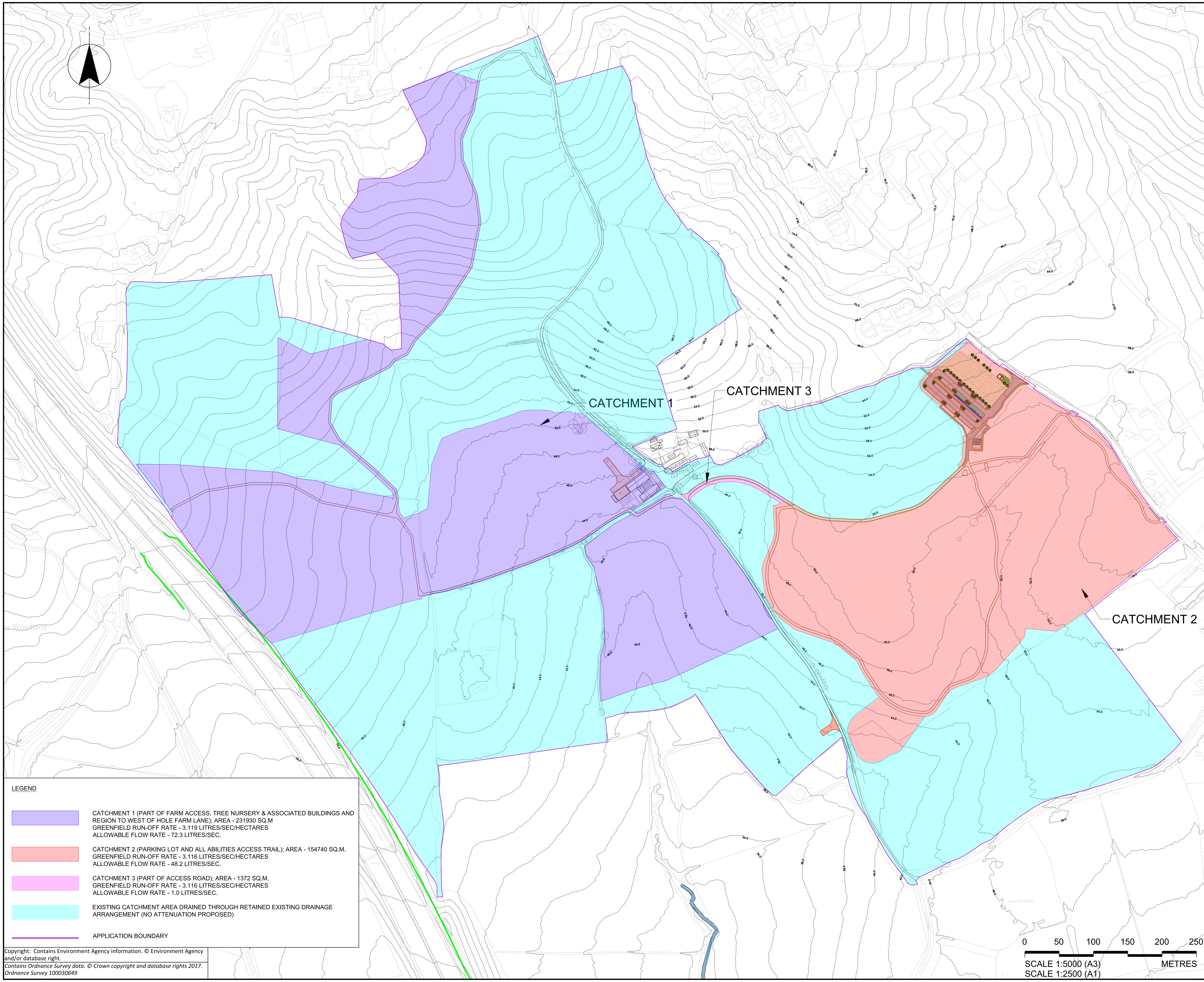
Scale	Date Created
1:500@A1/1:1000@A3	03-02-23

Drawn By	Checked By	Approved By	Alternative Reference
EB	GH	JB	

Status	Suitability Code	DrawingNumber	Revision
FOR PLANNING		375-FP-02-ZZ-DRG-L-000100	P08

Sheet Size A1 841 x 594

Appendix C: Hole Farm Catchment Plan Sketch



LEGEND

- CATCHMENT 1 (PART OF FARM ACCESS, TREE NURSERY & ASSOCIATED BUILDINGS AND REGION TO WEST OF HOLE FARM LANE); AREA - 231930 SQ.M
  GREENFIELD RUN-OFF RATE - 3.119 LITRES/SEC/HECTARES
  ALLOWABLE FLOW RATE - 72.3 LITRES/SEC.
- CATCHMENT 2 (PARKING LOT AND ALL ABILITIES ACCESS TRAIL); AREA - 154740 SQ.M.
  GREENFIELD RUN-OFF RATE - 3.116 LITRES/SEC/HECTARES
  ALLOWABLE FLOW RATE - 48.2 LITRES/SEC.
- CATCHMENT 3 (PART OF ACCESS ROAD); AREA - 1372 SQ.M.
  GREENFIELD RUN-OFF RATE - 3.116 LITRES/SEC/HECTARES
  ALLOWABLE FLOW RATE - 1.0 LITRES/SEC.
- EXISTING CATCHMENT AREA DRAINED THROUGH RETAINED EXISTING DRAINAGE ARRANGEMENT (NO ATTENUATION PROPOSED)
- APPLICATION BOUNDARY

0 50 100 150 200 250 METRES
SCALE 1:5000 (A3)
SCALE 1:2500 (A1)

NOTES

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   DO NOT TAKE DIGITAL DIMENSIONS OFF THIS DRAWING.
   WORK TO FIGURED DIMENSIONS ONLY - IF IN DOUBT ASK.
4. REFER TO LANDSCAPE PROPOSAL FOR DETAILS OF SURFACING TYPE OF PROPOSED PATHS.
5. REFER TO HIGHWAYS PROPOSAL FOR DETAILS OF ACCESS TO PARKING AND T BAYS.
6. REFER TO BUILDING PROPOSAL FOR DETAILS OF BUILDING LAYOUT AND CAR PARKING PROPOSAL.

CURRENT VERSION INFORMATION

B. LIST CHANGES FOR CURRENT VERSION.

Rev	Revision Description	Drawn	Des'd	Chk'd	App'd.	Date
R1	FOR TCPA SUBMISSION	AS	AS	RC		26/04/23

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Client: FORESTRY ENGLAND

Project: HOLE FARM COMMUNITY WOODLAND

Title: HOLE FARM CATCHMENT PLAN

Drawn by: AS	Designed by: AS	Checked: RC
Date: 26/04/23	Orig. Sheet Size: A1	Approved:
Scales: 1:2500	Status: S2 - FIT FOR INFORMATION	
Drawing No: HE540039-CJV-HDG-SZP_DC000000_Z-DR-CD-00012		Revision A

Appendix D: Greenfield Run-off Rate Calculation

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.450
Area (ha)	15.474	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results	**l/s**
QBAR Rural	56.8
QBAR Urban	56.8
Q1 year	48.2
Q1 year	48.2
Q30 years	128.6
Q100 years	181.1

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.450
Area (ha)	0.137	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results	**l/s**
QBAR Rural	0.5
QBAR Urban	0.5
Q1 year	0.4
Q1 year	0.4
Q30 years	1.1
Q100 years	1.6

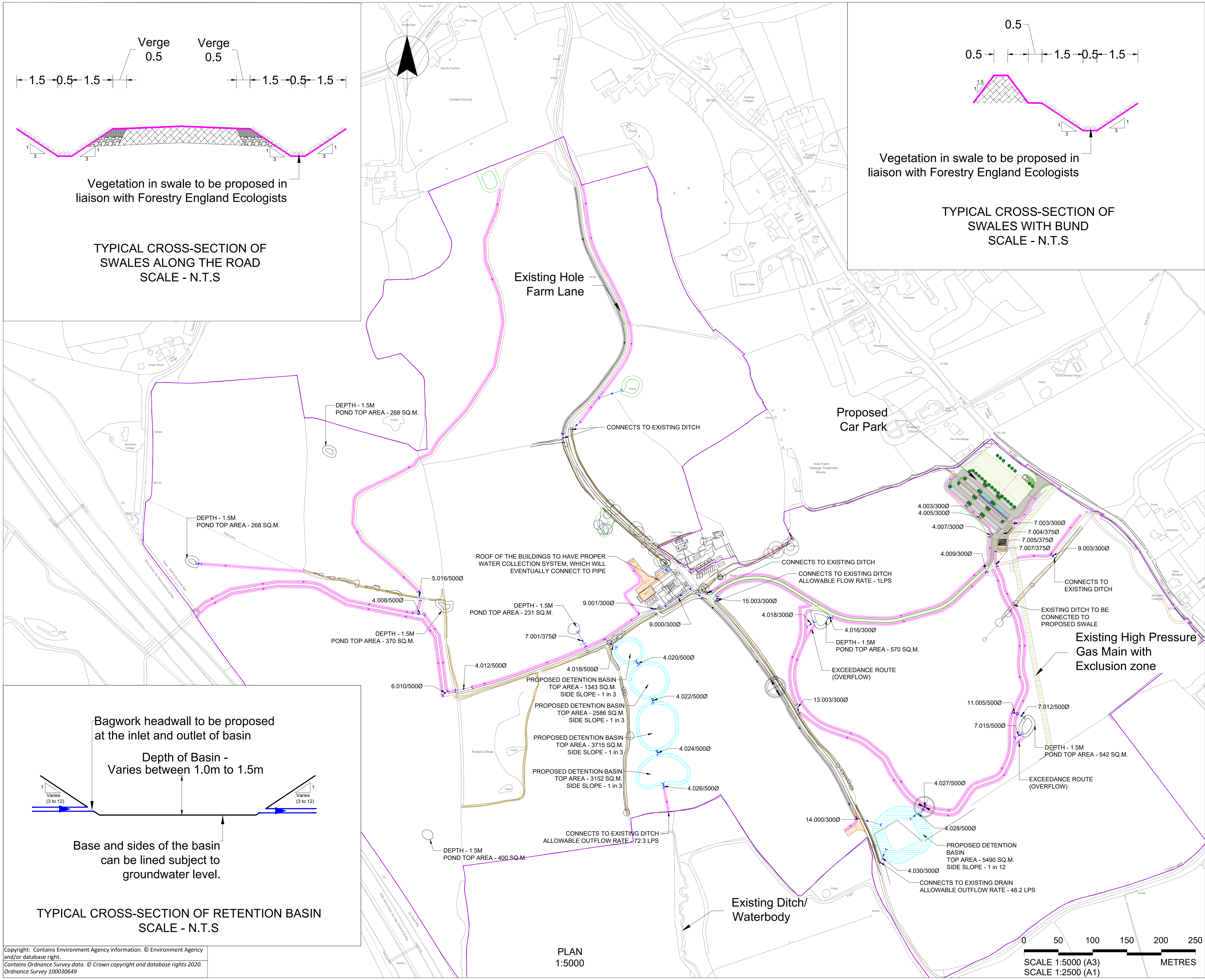
ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.450
Area (ha)	23.193	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results	**l/s**
QBAR Rural	85.1
QBAR Urban	85.1
Q1 year	72.3
Q1 year	72.3
Q30 years	192.8
Q100 years	271.4

Appendix E: Hole Farm Drainage Plan



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6. REFER TO BUILDING PROPOSAL FOR DETAILS OF BUILDING LAYOUT AND CAR PARKING PROPOSAL.

LEGEND

- HIGH POINT
- LOW POINT
- PROPOSED SWALE
- PROPOSED SWALE WITH BUNDS
- EXISTING DITCH RETAINED
- PROPOSED CHAMBER
- PROPOSED HEADWALL
- PROPOSED CARRIER DRAIN
- PROPOSED DETENTION BASIN
- PROPOSED DETENTION BASIN (FORESTRY ENGLAND)
- EXISTING BASIN
- APPLICATION BOUNDARY

CURRENT VERSION INFORMATION
B. LIST CHANGES FOR CURRENT VERSION.

Rev	Revision Description	Drawn	Des'd	Chk'd	App'd.	Date
R1	FOR APPROVAL	AS	AS	RC		14/04/23

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Tel: +44 207 940 7600 E-Mail: info_@cowi.com

Client: FORESTRY ENGLAND

Project: HOLE FARM COMMUNITY WOODLAND

Title: HOLE FARM PROPOSED DRAINAGE PLAN

Drawn by: AS	Designed by: AS	Checked: RC
Date: 14/04/23	Orig. Sheet Size: A3	Approved:
Scales: 1:5000	Status: S2 - FIT FOR INFORMATION	

Drawing No: HE540039-CJV-HDG-ZZZ_DN000000_Z-DR-CD-00001
Revision: A

Appendix F: Drainage Network Result Summary

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes LTC pipes Manhole Sizes LTC manholes

FSR Rainfall Model - England and Wales

Return Period (years)	1	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	20.000	Volumetric Runoff Coeff.	1.000	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.400	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	300	Add Flow / Climate Change (%)	20	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	12.094	0.024	503.9	0.002	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.001	10.731	0.406	26.4	0.003	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.002	62.507	3.420	18.3	0.153	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.003	27.674	1.360	20.3	0.085	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.004	11.433	0.230	49.7	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S4.005	38.817	1.520	25.5	0.020	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.006	11.226	0.430	26.1	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S4.007	30.597	0.569	53.8	0.016	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.008	58.391	0.586	99.6	0.021	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.009	28.757	0.058	500.0	0.012	0.00	0.0		0.050	3 \=/	500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	52.27	5.54	59.010	0.002	0.0	0.0	0.1	0.37	375.0	0.5
S4.001	51.81	5.65	58.986	0.005	0.0	0.0	0.2	1.64	1637.3	1.1
S4.002	49.68	6.18	58.580	0.158	0.0	0.0	5.7	1.97	1969.0	34.1
S4.003	48.75	6.42	55.160	0.243	0.0	0.0	8.6	1.87	1866.1	51.4
S4.004	48.44	6.51	53.800	0.243	0.0	0.0	8.6	2.24	158.0	51.4
S4.005	47.08	6.90	53.570	0.263	0.0	0.0	8.9	1.67	1665.7	53.7
S4.006	46.88	6.96	52.050	0.263	0.0	0.0	8.9	3.09	218.4	53.7
S4.007	45.44	7.40	51.620	0.279	0.0	0.0	9.1	1.15	1147.9	54.9
S4.008	42.13	8.56	51.051	0.300	0.0	0.0	9.1	0.84	843.3	54.9
S4.009	39.19	9.83	50.465	0.312	0.0	0.0	9.1	0.38	376.4	54.9

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.010	36.716	0.073	500.0	0.016	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.011	39.046	0.078	500.0	0.015	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.012	56.611	0.113	501.0	0.024	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.013	6.980	1.100	6.3	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S4.014	21.591	0.814	26.5	0.011	0.00	0.0	0.600		o	300	Pipe/Conduit	
S4.015	13.977	0.047	300.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S5.000	28.387	0.668	42.5	0.000	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.016	21.218	0.042	500.0	0.040	0.00	0.0		0.050	3 \=/	500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.010	36.11	11.45	50.407	0.327	0.0	0.0	9.1	0.38	376.5	54.9
S4.011	33.38	13.18	50.334	0.342	0.0	0.0	9.1	0.38	376.5	54.9
S4.012	30.18	15.69	50.256	0.366	0.0	0.0	9.1	0.38	376.1	54.9
S4.013	30.16	15.71	50.143	0.366	0.0	0.0	9.1	6.28	443.9	54.9
S4.014	30.03	15.83	49.043	0.378	0.0	0.0	9.1	3.06	216.6	54.9
S4.015	29.74	16.09	48.229	0.378	0.0	0.0	9.1	0.90	63.8	54.9
S5.000	53.02	5.37	48.850	0.000	0.0	0.0	0.0	1.29	1291.3	0.0
S4.016	28.75	17.03	48.182	0.417	0.0	0.0	9.1	0.38	376.4	54.9

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.017	46.228	1.176	39.3	0.110	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.018	74.919	1.050	71.4	0.128	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.019	69.701	0.139	500.0	0.094	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.020	50.806	0.102	500.0	0.067	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.021	36.232	0.072	500.0	0.046	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.022	33.312	0.466	71.5	0.042	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.023	21.877	0.591	37.0	0.013	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.000	45.897	1.619	28.3	0.095	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.001	44.057	1.290	34.2	0.110	0.00	0.0		0.050	3 \=/	500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.017	28.18	17.60	48.140	0.527	0.0	0.0	10.7	1.34	1342.6	64.4
S4.018	27.03	18.85	46.964	0.655	0.0	0.0	12.8	1.00	996.5	76.7
S4.019	24.61	21.94	45.914	0.749	0.0	0.0	13.3	0.38	376.5	79.9
S4.020	23.14	24.19	45.774	0.816	0.0	0.0	13.6	0.38	376.5	81.8
S4.021	22.24	25.79	45.673	0.862	0.0	0.0	13.8	0.38	376.4	83.1
S4.022	21.94	26.35	45.600	0.905	0.0	0.0	14.3	1.00	995.6	86.0
S4.023	21.81	26.61	45.134	0.918	0.0	0.0	14.4	1.38	1383.5	86.7
S6.000	52.51	5.48	47.703	0.095	0.0	0.0	3.6	1.58	1581.0	21.6
S6.001	50.39	5.99	46.084	0.205	0.0	0.0	7.5	1.44	1440.4	44.8

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.002	38.071	0.076	500.0	0.104	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.003	48.368	0.097	500.0	0.149	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.004	38.927	0.078	500.0	0.022	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.024	8.435	0.374	22.6	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	
S7.000	18.988	0.380	50.0	0.238	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S7.001	23.741	0.610	38.9	0.242	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S7.002	14.257	0.170	83.9	0.201	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S7.003	6.011	0.880	6.8	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S6.002	44.59	7.68	44.794	0.309	0.0	0.0	10.0	0.38	376.5	59.7
S6.003	39.21	9.82	44.718	0.458	0.0	0.0	13.0	0.38	376.5	77.8
S6.004	35.95	11.54	44.621	0.480	0.0	0.0	13.0	0.38	376.5	77.8
S4.024	21.79	26.64	44.543	1.397	0.0	0.0	22.0	4.59	901.0	131.9
S7.000	53.47	5.27	54.690	0.238	0.0	0.0	9.2	1.19	1190.8	55.2
S7.001	52.18	5.56	54.310	0.480	0.0	0.0	18.1	1.35	1349.3	108.6
S7.002	51.10	5.82	53.700	0.681	0.0	0.0	25.1	0.92	919.2	150.8
S7.003	51.03	5.83	53.530	0.681	0.0	0.0	25.1	6.05	427.8	150.8

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.004	33.406	0.454	73.6	0.033	0.00	0.0	0.600		o	375	Pipe/Conduit	
S7.005	15.986	0.586	27.3	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S7.006	17.535	0.877	20.0	0.057	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S7.007	4.035	0.040	100.0	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S7.008	57.935	1.138	50.9	0.000	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S8.000	66.926	1.360	49.2	0.016	5.00	0.0		0.045	3 \=/	500	1:3 Swale	
S8.001	5.845	0.060	97.4	0.000	0.00	0.0		0.050	o	500	Pipe/Conduit	
S9.000	33.262	0.978	34.0	0.086	5.00	0.0		0.050	3 \=/	500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.004	49.98	6.10	52.575	0.714	0.0	0.0	25.8	2.11	233.5	154.7
S7.005	49.69	6.17	52.121	0.714	0.0	0.0	25.8	3.48	384.5	154.7
S7.006	49.10	6.33	51.535	0.772	0.0	0.0	27.4	1.88	1882.3	164.2
S7.007	48.96	6.37	50.658	0.772	0.0	0.0	27.4	1.81	200.1	164.2
S7.008	46.13	7.18	50.618	0.772	0.0	0.0	27.4	1.18	1179.8	164.2
S8.000	51.02	5.84	52.110	0.016	0.0	0.0	0.6	1.33	1333.3	3.5
S8.001	50.25	6.03	50.750	0.016	0.0	0.0	0.6	0.51	99.5	3.5
S9.000	52.94	5.38	53.080	0.086	0.0	0.0	3.3	1.44	1443.6	19.7

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.001	32.990	0.970	34.0	0.049	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S9.002	12.231	0.383	31.9	0.029	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S10.000	43.637	0.582	75.0	0.072	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S9.003	14.946	0.048	311.4	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S8.002	30.992	0.500	62.0	0.017	0.00	0.0		0.045	3 \=/	600	1:3 Swale	
S8.003	47.825	0.710	67.4	0.021	0.00	0.0		0.045	3 \=/	600	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S9.001	51.32	5.76	52.102	0.134	0.0	0.0	5.0	1.44	1443.6	29.8
S9.002	50.76	5.90	51.131	0.163	0.0	0.0	6.0	1.49	1489.6	35.9
S10.000	51.38	5.75	51.330	0.072	0.0	0.0	2.7	0.97	972.1	16.1
S9.003	49.65	6.18	50.748	0.236	0.0	0.0	8.5	0.89	62.6	50.7
S8.002	46.66	7.02	50.690	0.269	0.0	0.0	9.1	0.61	96.9	54.3
S8.003	42.62	8.37	50.190	0.289	0.0	0.0	9.1	0.59	92.9	54.3

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.009	59.764	0.803	74.4	0.286	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S7.010	68.938	0.527	130.8	0.308	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S7.011	39.773	0.366	108.7	0.169	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S11.000	58.130	2.010	28.9	0.063	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S11.001	56.438	0.982	57.5	0.110	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S11.002	65.480	0.520	126.0	0.136	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S11.003	15.676	0.193	81.1	0.037	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S11.004	24.117	0.080	301.5	0.064	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S11.005	8.084	0.081	100.0	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.009	40.13	9.39	49.480	1.347	0.0	0.0	39.0	0.98	975.7	234.2
S7.010	36.99	10.96	48.677	1.655	0.0	0.0	44.2	0.74	736.0	265.3
S7.011	35.56	11.78	48.150	1.824	0.0	0.0	46.8	0.81	807.5	281.1
S11.000	51.93	5.62	51.650	0.063	0.0	0.0	2.4	1.57	1565.3	14.1
S11.001	48.60	6.47	49.640	0.173	0.0	0.0	6.1	1.11	1110.4	36.4
S11.002	43.88	7.92	48.658	0.308	0.0	0.0	9.8	0.75	749.9	58.6
S11.003	43.09	8.20	48.138	0.345	0.0	0.0	10.7	0.93	934.8	64.5
S11.004	40.95	9.03	47.945	0.410	0.0	0.0	12.1	0.48	484.8	72.7
S11.005	40.81	9.09	47.865	0.410	0.0	0.0	12.1	2.17	426.6	72.7

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.012	11.441	0.286	40.0	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	
S7.013	12.272	0.332	37.0	0.152	0.00	0.0	0.600		o	500	Pipe/Conduit	
S7.014	14.440	0.334	43.2	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	
S7.015	12.208	0.024	500.0	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	
S12.000	31.056	1.296	24.0	0.013	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S7.016	61.681	2.089	29.5	0.263	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S7.017	44.142	0.088	500.0	0.016	0.00	0.0		0.050	3 \=/	600	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.012	35.47	11.83	47.784	2.234	0.0	0.0	57.2	3.44	675.9	343.3
S7.013	35.37	11.89	47.498	2.387	0.0	0.0	61.0	3.58	702.9	365.8
S7.014	35.25	11.96	47.166	2.387	0.0	0.0	61.0	3.31	650.1	365.8
S7.015	34.91	12.17	46.833	2.387	0.0	0.0	61.0	0.96	189.4«	365.8
S12.000	53.31	5.30	48.104	0.013	0.0	0.0	0.5	1.72	1719.6	2.9
S7.016	33.89	12.84	46.808	2.662	0.0	0.0	65.1	1.55	1549.1	390.9
S7.017	31.28	14.76	44.719	2.677	0.0	0.0	65.1	0.38	401.1	390.9

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.018	26.769	0.054	500.0	0.010	0.00	0.0		0.050	3 \=/	600	1:3 Swale	
S7.019	23.405	0.174	134.5	0.007	0.00	0.0		0.050	3 \=/	600	1:3 Swale	
S7.020	44.681	0.234	190.9	0.015	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S13.000	41.339	0.083	500.0	0.015	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S13.001	54.160	1.159	46.7	0.019	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S13.002	49.895	0.668	74.7	0.016	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S13.003	12.604	0.216	58.4	0.006	0.00	0.0		0.050	o	300	Pipe/Conduit	
S13.004	93.969	0.188	500.0	0.035	0.00	0.0		0.050	3 \=/	600	1:3 Swale	
S13.005	45.731	0.091	500.0	0.017	0.00	0.0		0.050	3 \=/	600	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.018	29.91	15.93	44.631	2.687	0.0	0.0	65.1	0.38	401.1	390.9
S7.019	29.34	16.46	44.577	2.694	0.0	0.0	65.1	0.74	773.3	390.9
S7.020	28.10	17.68	44.403	2.708	0.0	0.0	65.1	0.61	609.2	390.9
S13.000	47.31	6.83	47.884	0.015	0.0	0.0	0.5	0.38	376.4	3.2
S13.001	44.94	7.56	47.801	0.034	0.0	0.0	1.1	1.23	1231.4	6.6
S13.002	42.50	8.42	46.642	0.051	0.0	0.0	1.6	0.97	974.0	9.3
S13.003	41.33	8.87	45.974	0.057	0.0	0.0	1.7	0.47	32.9	10.1
S13.004	33.69	12.97	45.558	0.091	0.0	0.0	2.2	0.38	401.1	13.3
S13.005	31.03	14.96	45.370	0.108	0.0	0.0	2.4	0.38	401.1	14.5

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S13.006	41.815	0.084	500.0	0.015	0.00	0.0		0.050	3 \=/	600	1:3 Swale	
S13.007	29.047	0.668	43.5	0.010	0.00	0.0		0.050	3 \=/	600	1:3 Swale	
S13.008	23.534	0.558	42.2	0.008	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.025	28.941	1.599	18.1	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.026	50.741	2.611	19.4	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	
S14.000	25.024	0.050	500.0	0.000	5.00	0.0		0.050	3 \=/	600	1:3 Swale	
S14.001	64.022	1.211	52.9	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S13.006	28.99	16.79	45.279	0.123	0.0	0.0	2.6	0.38	401.1	15.4
S13.007	28.61	17.16	45.195	0.132	0.0	0.0	2.7	1.30	1360.0	16.4
S13.008	28.32	17.46	44.727	0.140	0.0	0.0	2.9	1.30	1296.2	17.2
S4.025	21.74	26.74	44.169	4.246	0.0	0.0	66.7	5.12	1006.1	400.0
S4.026	21.65	26.91	42.570	4.246	0.0	0.0	66.7	4.94	970.9	400.0
S14.000	46.27	7.14	41.170	0.000	0.0	0.0	0.0	0.19	30.7	0.0
S14.001	44.73	7.63	41.170	0.000	0.0	0.0	0.0	2.17	153.2	0.0

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.027	20.882	0.042	500.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S15.000	41.826	2.570	16.3	0.015	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S15.001	44.245	0.720	61.5	0.017	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S15.002	62.378	1.645	37.9	0.037	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S15.003	6.183	0.021	300.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.027	21.41	27.41	39.959	4.246	0.0	0.0	66.7	0.70	49.2«	400.0
S15.000	53.17	5.33	48.570	0.015	0.0	0.0	0.6	2.09	2086.6	3.5
S15.001	50.28	6.02	46.000	0.032	0.0	0.0	1.2	1.07	1073.8	7.0
S15.002	47.48	6.78	45.280	0.069	0.0	0.0	2.4	1.37	1367.0	14.3
S15.003	47.09	6.90	43.635	0.069	0.0	0.0	2.4	0.90	63.8	14.3

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	59.510	0.500	Junction		S4.000	59.010	500				
S2	59.550	0.564	Junction		S4.001	58.986	500	S4.000	58.986	500	
S3	59.080	0.500	Junction		S4.002	58.580	500	S4.001	58.580	500	
S4	55.660	0.500	Junction		S4.003	55.160	500	S4.002	55.160	500	
S5	54.300	0.500	Junction		S4.004	53.800	300	S4.003	53.800	500	
S6	54.070	0.500	Junction		S4.005	53.570	500	S4.004	53.570	300	
S7	52.550	0.500	Junction		S4.006	52.050	300	S4.005	52.050	500	
S8	52.120	0.500	Junction		S4.007	51.620	500	S4.006	51.620	300	
S9	51.551	0.500	Junction		S4.008	51.051	500	S4.007	51.051	500	
S10	50.965	0.500	Junction		S4.009	50.465	500	S4.008	50.465	500	
S11	51.225	0.818	Junction		S4.010	50.407	500	S4.009	50.407	500	
S12	51.443	1.109	Junction		S4.011	50.334	500	S4.010	50.334	500	
S13	51.916	1.660	Junction		S4.012	50.256	500	S4.011	50.256	500	
S14	50.744	0.601	Junction		S4.013	50.143	300	S4.012	50.143	500	
S15	50.272	1.229	Junction		S4.014	49.043	300	S4.013	49.043	300	
S16	49.729	1.500	Junction		S4.015	48.229	300	S4.014	48.229	300	
S17	49.350	0.500	Junction		S5.000	48.850	500				
S18	49.096	0.914	Junction		S4.016	48.182	500	S4.015	48.182	300	
								S5.000	48.182	500	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S19	48.818	0.678	Junction		S4.017	48.140	500	S4.016	48.140	500	
S20	47.464	0.500	Junction		S4.018	46.964	500	S4.017	46.964	500	
S21	46.414	0.500	Junction		S4.019	45.914	500	S4.018	45.914	500	
S22	48.116	2.342	Junction		S4.020	45.774	500	S4.019	45.774	500	
S23	48.184	2.511	Junction		S4.021	45.673	500	S4.020	45.673	500	
S24	46.737	1.137	Junction		S4.022	45.600	500	S4.021	45.600	500	
S25	45.634	0.500	Junction		S4.023	45.134	500	S4.022	45.134	500	
S26	48.203	0.500	Junction		S6.000	47.703	500				
S27	46.584	0.500	Junction		S6.001	46.084	500	S6.000	46.084	500	
S28	45.294	0.500	Junction		S6.002	44.794	500	S6.001	44.794	500	
S29	46.056	1.338	Junction		S6.003	44.718	500	S6.002	44.718	500	
S30	45.328	0.707	Junction		S6.004	44.621	500	S6.003	44.621	500	
S31	45.283	0.740	Junction		S4.024	44.543	500	S4.023	44.543	500	
								S6.004	44.543	500	
S32	55.190	0.500	Junction		S7.000	54.690	500				
S33	54.810	0.500	Junction		S7.001	54.310	500	S7.000	54.310	500	
S34	54.200	0.500	Junction		S7.002	53.700	500	S7.001	53.700	500	
S35	54.035	0.505	Junction		S7.003	53.530	300	S7.002	53.530	500	
S36	54.150	1.575	Junction		S7.004	52.575	375	S7.003	52.650	300	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S37	53.710	1.589	Junction		S7.005	52.121	375	S7.004	52.121	375	
S38	53.110	1.575	Junction		S7.006	51.535	500	S7.005	51.535	375	
S39	52.440	1.782	Junction		S7.007	50.658	375	S7.006	50.658	500	
S40	52.260	1.642	Junction		S7.008	50.618	500	S7.007	50.618	375	
S41	53.000	0.890	Junction		S8.000	52.110	500				
S42	51.450	0.700	Junction		S8.001	50.750	500	S8.000	50.750	500	
S43	53.580	0.500	Junction		S9.000	53.080	500				
S44	52.740	0.638	Junction		S9.001	52.102	500	S9.000	52.102	500	
S45	52.170	1.039	Junction		S9.002	51.131	500	S9.001	51.131	500	
S46	52.330	1.000	Junction		S10.000	51.330	500				
S47	52.000	1.252	Junction		S9.003	50.748	300	S9.002	50.748	500	
								S10.000	50.748	500	
S48	51.510	0.820	Junction		S8.002	50.690	600	S8.001	50.690	500	
								S9.003	50.700	300	160
S49	51.050	0.860	Junction		S8.003	50.190	600	S8.002	50.190	600	
S50	50.221	0.741	Junction		S7.009	49.480	500	S7.008	49.480	500	
								S8.003	49.480	600	
S51	49.391	0.714	Junction		S7.010	48.677	500	S7.009	48.677	500	
S52	49.964	1.814	Junction		S7.011	48.150	500	S7.010	48.150	500	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S53	52.150	0.500	Junction		S11.000	51.650	500				
S54	50.140	0.500	Junction		S11.001	49.640	500	S11.000	49.640	500	
S55	49.158	0.500	Junction		S11.002	48.658	500	S11.001	48.658	500	
S56	49.505	1.367	Junction		S11.003	48.138	500	S11.002	48.138	500	
S57	49.159	1.214	Junction		S11.004	47.945	500	S11.003	47.945	500	
S58	48.520	0.655	Junction		S11.005	47.865	500	S11.004	47.865	500	
S59	48.755	0.971	Junction		S7.012	47.784	500	S7.011	47.784	500	
								S11.005	47.784	500	
S60	49.238	1.740	Junction		S7.013	47.498	500	S7.012	47.498	500	
S61	49.160	1.994	Junction		S7.014	47.166	500	S7.013	47.166	500	
S62	48.333	1.501	Junction		S7.015	46.833	500	S7.014	46.832	500	
S63	48.604	0.500	Junction		S12.000	48.104	500				
S64	47.491	0.683	Junction		S7.016	46.808	500	S7.015	46.808	500	
								S12.000	46.808	500	
S65	45.219	0.500	Junction		S7.017	44.719	600	S7.016	44.719	500	
S66	45.680	1.049	Junction		S7.018	44.631	600	S7.017	44.631	600	
S67	45.311	0.734	Junction		S7.019	44.577	600	S7.018	44.577	600	
S68	44.903	0.500	Junction		S7.020	44.403	500	S7.019	44.403	600	
S69	48.384	0.500	Junction		S13.000	47.884	500				

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S70	48.578	0.777	Junction		S13.001	47.801	500	S13.000	47.801	500	
S71	47.142	0.500	Junction		S13.002	46.642	500	S13.001	46.642	500	
S72	46.474	0.500	Junction		S13.003	45.974	300	S13.002	45.974	500	
S73	46.258	0.700	Junction		S13.004	45.558	600	S13.003	45.758	300	
S74	47.655	2.285	Junction		S13.005	45.370	600	S13.004	45.370	600	
S75	47.730	2.451	Junction		S13.006	45.279	600	S13.005	45.279	600	
S76	46.145	0.950	Junction		S13.007	45.195	600	S13.006	45.195	600	
S77	45.227	0.700	Junction		S13.008	44.727	500	S13.007	44.527	600	
S78	44.819	0.650	Junction		S4.025	44.169	500	S4.024	44.169	500	
								S7.020	44.169	500	
								S13.008	44.169	500	
S79	43.220	0.650	Junction		S4.026	42.570	500	S4.025	42.570	500	
S80	41.670	0.500	Junction		S14.000	41.170	600				
S81	42.410	1.290	Junction		S14.001	41.170	300	S14.000	41.120	600	
S82	41.459	1.500	Junction		S4.027	39.959	300	S4.026	39.959	500	
								S14.001	39.959	300	
S78	40.271	0.354	Open Manhole	0		OUTFALL		S4.027	39.917	300	
S83	49.070	0.500	Junction		S15.000	48.570	500				

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S84	47.000	1.000	Junction		S15.001	46.000	500	S15.000	46.000	500	
S85	46.280	1.000	Junction		S15.002	45.280	500	S15.001	45.280	500	
S86	44.760	1.125	Junction		S15.003	43.635	300	S15.002	43.635	500	
S73	44.450	0.836	Open Manhole	1500		OUTFALL		S15.003	43.614	300	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	558920.623	189895.850			No Entry	
S2	558912.670	189886.739			No Entry	
S3	558913.871	189876.076			No Entry	
S4	558960.878	189834.875			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S5	558980.866	189815.778			No Entry	
S6	558973.745	189806.834			No Entry	
S7	558969.116	189768.293			No Entry	
S8	558971.531	189757.330			No Entry	
S9	558948.739	189736.917			No Entry	
S10	558903.135	189700.693			No Entry	
S11	558875.602	189692.390			No Entry	
S12	558840.177	189682.741			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S13	558801.304	189681.580			No Entry	
S14	558745.796	189690.359			No Entry	
S15	558738.842	189689.749			No Entry	
S16	558718.073	189683.851			No Entry	
S17	558714.202	189699.995			No Entry	
S18	558707.124	189675.163			No Entry	
S19	558703.654	189654.268			No Entry	
S20	558690.287	189610.015			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S21	558720.158	189543.733			No Entry	
S22	558784.251	189516.687			No Entry	
S23	558824.696	189486.070			No Entry	
S24	558842.848	189454.712			No Entry	
S25	558863.242	189428.505			No Entry	
S26	559005.554	189547.473			No Entry	
S27	559002.383	189501.776			No Entry	
S28	558985.553	189461.852			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S29	558950.307	189447.505			No Entry	
S30	558919.673	189410.075			No Entry	
S31	558881.690	189416.746			No Entry	
S32	559047.676	189871.432			No Entry	
S33	559034.957	189857.333			No Entry	
S34	559021.992	189837.445			No Entry	
S35	559011.797	189827.479			No Entry	
S36	559005.786	189827.479			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S37	558983.731	189802.388			No Entry	
S38	558982.930	189786.422			No Entry	
S39	558983.541	189768.898			No Entry	
S40	558984.916	189765.104			No Entry	
S41	559108.716	189823.102			No Entry	
S42	559066.830	189770.904			No Entry	
S43	559106.945	189840.090			No Entry	
S44	559086.461	189813.884			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S45	559066.603	189787.539			No Entry	
S46	559014.181	189777.303			No Entry	
S47	559057.612	189779.894			No Entry	
S48	559063.449	189766.136			No Entry	
S49	559040.721	189745.065			No Entry	
S50	559006.723	189711.430			No Entry	
S51	559025.321	189654.634			No Entry	
S52	559029.592	189585.828			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S53	558978.382	189760.350			No Entry	
S54	559000.383	189706.544			No Entry	
S55	559017.451	189652.749			No Entry	
S56	559021.606	189587.401			No Entry	
S57	559016.337	189572.636			No Entry	
S58	559006.510	189550.612			No Entry	
S59	559014.442	189549.053			No Entry	
S60	559024.778	189544.147			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S61	559028.981	189532.617			No Entry	
S62	559021.328	189520.371			No Entry	
S63	559013.259	189545.328			No Entry	
S64	559010.638	189514.476			No Entry	
S65	558992.405	189457.224			No Entry	
S66	558952.362	189438.673			No Entry	
S67	558936.872	189416.841			No Entry	
S68	558919.713	189401.892			No Entry	

Manhole Schedules for Storm

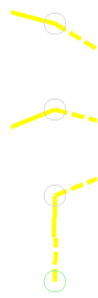
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S69	558697.120	189704.206			No Entry	
S70	558697.387	189662.868			No Entry	
S71	558682.399	189610.823			No Entry	
S72	558693.023	189562.701			No Entry	
S73	558696.894	189550.713			No Entry	
S74	558780.269	189509.668			No Entry	
S75	558817.061	189482.508			No Entry	
S76	558838.654	189446.699			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S77	558856.471	189423.910			No Entry	
S78	558875.893	189410.618			No Entry	
S79	558852.750	189393.240			No Entry	
S80	558762.134	189379.539			No Entry	
S81	558779.059	189397.971			No Entry	
S82	558823.435	189351.824			No Entry	
S78	558814.406	189332.995			No Entry	
S83	558710.075	189710.507			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S84	558674.375	189732.299			No Entry	
S85	558632.094	189743.401			No Entry	
S86	558575.725	189720.780			No Entry	
S73	558575.610	189714.598			No Entry	



Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
4.000	Classification	Unpaved	20	0.012	0.002	0.002
4.001	Classification	Unpaved	20	0.013	0.003	0.003
4.002	Classification	Paved	100	0.153	0.153	0.153
4.003	Classification	Paved	100	0.085	0.085	0.085
4.004	-	-	100	0.000	0.000	0.000
4.005	Classification	Paved	100	0.020	0.020	0.020
4.006	-	-	100	0.000	0.000	0.000
4.007	Classification	Paved	100	0.013	0.013	0.013
	Classification	Unpaved	20	0.014	0.003	0.016
4.008	Classification	Paved	100	0.016	0.016	0.016
	Classification	Unpaved	20	0.023	0.005	0.021
4.009	Classification	Paved	100	0.010	0.010	0.010
	Classification	Unpaved	20	0.012	0.002	0.012
4.010	Classification	Paved	100	0.013	0.013	0.013
	Classification	Unpaved	20	0.015	0.003	0.016
4.011	Classification	Paved	100	0.012	0.012	0.012
	Classification	Unpaved	20	0.015	0.003	0.015
4.012	Classification	Paved	100	0.019	0.019	0.019
	Classification	Unpaved	20	0.023	0.005	0.024
4.013	-	-	100	0.000	0.000	0.000
4.014	Classification	Unpaved	20	0.057	0.011	0.011
4.015	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.000	0.000	0.000
4.016	Classification	Unpaved	20	0.198	0.040	0.040
4.017	Classification	Unpaved	20	0.549	0.110	0.110
4.018	Classification	Unpaved	20	0.639	0.128	0.128
4.019	Classification	Unpaved	20	0.472	0.094	0.094

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
4.020	Classification	Unpaved	20	0.335	0.067	0.067
4.021	Classification	Unpaved	20	0.231	0.046	0.046
4.022	Classification	Unpaved	20	0.211	0.042	0.042
4.023	Classification	Unpaved	20	0.065	0.013	0.013
6.000	Classification	Unpaved	20	0.475	0.095	0.095
6.001	Classification	Unpaved	20	0.551	0.110	0.110
6.002	Classification	Unpaved	20	0.519	0.104	0.104
6.003	Classification	Unpaved	20	0.053	0.011	0.011
	Classification	Unpaved	20	0.691	0.138	0.149
6.004	Classification	Unpaved	20	0.109	0.022	0.022
4.024	-	-	100	0.000	0.000	0.000
7.000	Classification	Paved	100	0.234	0.234	0.234
	Classification	Unpaved	20	0.021	0.004	0.238
7.001	Classification	Paved	100	0.239	0.239	0.239
	Classification	Unpaved	20	0.014	0.003	0.242
7.002	Classification	Paved	100	0.198	0.198	0.198
	Classification	Unpaved	20	0.015	0.003	0.201
7.003	-	-	100	0.000	0.000	0.000
7.004	Classification	Paved	100	0.033	0.033	0.033
7.005	-	-	100	0.000	0.000	0.000
7.006	Classification	Unpaved	20	0.163	0.033	0.033
	Classification	Paved	100	0.025	0.025	0.057
7.007	-	-	100	0.000	0.000	0.000
7.008	-	-	100	0.000	0.000	0.000
8.000	Classification	Unpaved	20	0.079	0.016	0.016
8.001	-	-	100	0.000	0.000	0.000
9.000	Classification	Unpaved	20	0.344	0.069	0.069

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	Classification	Paved	100	0.017	0.017	0.086
9.001	Classification	Paved	100	0.010	0.010	0.010
	Classification	Unpaved	20	0.193	0.039	0.049
9.002	Classification	Unpaved	20	0.077	0.015	0.015
	Classification	Paved	100	0.004	0.004	0.020
	Classification	Paved	100	0.009	0.009	0.029
10.000	Classification	Paved	100	0.013	0.013	0.013
	Classification	Unpaved	20	0.105	0.021	0.034
	Classification	Paved	100	0.038	0.038	0.072
9.003	-	-	100	0.000	0.000	0.000
8.002	Classification	Unpaved	20	0.086	0.017	0.017
8.003	Classification	Unpaved	20	0.103	0.021	0.021
7.009	Classification	Unpaved	20	1.329	0.266	0.266
	Classification	Paved	100	0.020	0.020	0.286
7.010	Classification	Unpaved	20	1.422	0.284	0.284
	Classification	Paved	100	0.024	0.024	0.308
7.011	Classification	Unpaved	20	0.778	0.156	0.156
	Classification	Paved	100	0.014	0.014	0.169
11.000	Classification	Unpaved	20	0.314	0.063	0.063
11.001	Classification	Unpaved	20	0.550	0.110	0.110
11.002	Classification	Unpaved	20	0.678	0.136	0.136
11.003	Classification	Unpaved	20	0.185	0.037	0.037
11.004	Classification	Unpaved	20	0.322	0.064	0.064
11.005	-	-	100	0.000	0.000	0.000
7.012	-	-	100	0.000	0.000	0.000
7.013	Classification	Unpaved	20	0.762	0.152	0.152
7.014	-	-	100	0.000	0.000	0.000

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
7.015	-	-	100	0.000	0.000	0.000
12.000	Classification	Paved	100	0.013	0.013	0.013
7.016	Classification	Unpaved	20	1.214	0.243	0.243
	Classification	Paved	100	0.020	0.020	0.263
7.017	Classification	Paved	100	0.016	0.016	0.016
7.018	Classification	Paved	100	0.010	0.010	0.010
7.019	Classification	Paved	100	0.007	0.007	0.007
7.020	Classification	Paved	100	0.015	0.015	0.015
13.000	Classification	Paved	100	0.015	0.015	0.015
13.001	Classification	Paved	100	0.019	0.019	0.019
13.002	Classification	Paved	100	0.016	0.016	0.016
13.003	Classification	Paved	100	0.006	0.006	0.006
13.004	Classification	Paved	100	0.035	0.035	0.035
13.005	Classification	Paved	100	0.017	0.017	0.017
13.006	Classification	Paved	100	0.015	0.015	0.015
13.007	Classification	Paved	100	0.010	0.010	0.010
13.008	Classification	Paved	100	0.008	0.008	0.008
4.025	-	-	100	0.000	0.000	0.000
4.026	-	-	100	0.000	0.000	0.000
14.000	-	-	100	0.000	0.000	0.000
14.001	-	-	100	0.000	0.000	0.000
4.027	-	-	100	0.000	0.000	0.000
15.000	Classification	Paved	100	0.015	0.015	0.015
	Classification	Unpaved	20	0.002	0.000	0.015
15.001	Classification	Unpaved	20	0.002	0.000	0.000
	Classification	Paved	100	0.016	0.016	0.017
15.002	Classification	Paved	100	0.036	0.036	0.036

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	Classification	Unpaved	20	0.004	0.001	0.037
15.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				15.550	4.315	4.315

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)
S4.027	S78	40.271	39.917	0.000	0	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)
S15.003	S73	44.450	43.614	0.000	1500	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	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	7	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	1.000
Return Period (years)	1	Ratio R	0.400	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Storm

Orifice Manhole: S16, DS/PN: S4.015, Volume (m³): 1.5

Diameter (m) 0.250 Discharge Coefficient 0.600 Invert Level (m) 48.229

Orifice Manhole: S47, DS/PN: S9.003, Volume (m³): 198.7

Diameter (m) 0.075 Discharge Coefficient 0.600 Invert Level (m) 50.748

Orifice Manhole: S62, DS/PN: S7.015, Volume (m³): 2.8

Diameter (m) 0.410 Discharge Coefficient 0.600 Invert Level (m) 46.833

Orifice Manhole: S82, DS/PN: S4.027, Volume (m³): 14.5

Diameter (m) 0.160 Discharge Coefficient 0.600 Invert Level (m) 39.959

Orifice Manhole: S84, DS/PN: S15.001, Volume (m³): 41.8

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 46.000

Orifice Manhole: S85, DS/PN: S15.002, Volume (m³): 154.9

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 45.280

Hydro-Brake® Optimum Manhole: S86, DS/PN: S15.003, Volume (m³): 218.3

Unit Reference	MD-SHE-0047-1000-1000-1000	Sump Available	Yes
Design Head (m)	1.000	Diameter (mm)	47
Design Flow (l/s)	1.0	Invert Level (m)	43.635
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.0	Kick-Flo®	0.415	0.7
Flush-Flo™	0.205	0.8	Mean Flow over Head Range	-	0.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.8	0.600	0.8	1.600	1.2	2.600	1.5	5.000	2.1	7.500	2.5
0.200	0.8	0.800	0.9	1.800	1.3	3.000	1.6	5.500	2.2	8.000	2.6
0.300	0.8	1.000	1.0	2.000	1.4	3.500	1.8	6.000	2.3	8.500	2.7
0.400	0.7	1.200	1.1	2.200	1.4	4.000	1.9	6.500	2.3	9.000	2.7
0.500	0.7	1.400	1.2	2.400	1.5	4.500	2.0	7.000	2.4	9.500	2.8

Storage Structures for Storm

Tank or Pond Manhole: S16, DS/PN: S4.015

Invert Level (m) 48.229

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	236.1	1.500	569.1

Tank or Pond Manhole: S62, DS/PN: S7.015

Invert Level (m) 46.833

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	221.0	1.500	542.1

Tank or Pond Manhole: S82, DS/PN: S4.027

Invert Level (m) 39.959

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1721.3	1.500	5490.2

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 7 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 1.000
Region England and Wales Ratio R 0.400 Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S4.000	S1	15 minute 100 year Summer I+45%	59.510	59.047	-0.463	0.000	0.01	0.032	0.1	1.9	OK
S4.001	S2	15 minute 100 year Summer I+45%	59.550	59.011	-0.539	0.000	0.00	0.094	0.3	4.3	OK
S4.002	S3	15 minute 100 year Summer I+45%	59.080	58.731	-0.349	0.000	0.07	0.381	1.0	143.3	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S4.003	S4	15 minute 100 year Summer I+45%	55.660	55.351	-0.309	0.000	0.12	0.472	1.1	220.5	OK
S4.004	S5	15 minute 100 year Summer I+45%	54.300	54.306	0.206	6.179	1.40	10.193	2.4	168.2	FLOOD
S4.005	S6	15 minute 100 year Summer I+45%	54.070	53.754	-0.316	0.000	0.11	0.361	1.0	183.6	OK
S4.006	S7	15 minute 100 year Summer I+45%	52.550	52.415	0.065	0.000	1.09	2.462	2.6	178.8	FLOOD RISK*
S4.007	S8	15 minute 100 year Summer I+45%	52.120	51.842	-0.278	0.000	0.16	0.360	0.7	186.3	FLOOD RISK*
S4.008	S9	15 minute 100 year Summer I+45%	51.551	51.315	-0.236	0.000	0.23	2.234	0.6	191.6	FLOOD RISK*
S4.009	S10	30 minute 100 year Summer I+45%	50.965	50.861	-0.104	0.000	0.50	10.287	0.3	187.4	FLOOD RISK*
S4.010	S11	30 minute 100 year Summer I+45%	51.225	50.796	-0.429	0.000	0.15	12.907	0.3	181.9	OK
S4.011	S12	30 minute 100 year Summer I+45%	51.443	50.711	-0.732	0.000	0.07	13.314	0.3	175.6	OK
S4.012	S13	30 minute 100 year Summer I+45%	51.916	50.611	-1.305	0.000	0.02	9.321	0.3	173.9	OK
S4.013	S14	30 minute 100 year Summer I+45%	50.744	50.321	-0.122	0.000	0.66	6.080	4.0	173.1	OK*
S4.014	S15	30 minute 100 year Summer I+45%	50.272	49.248	-0.095	0.000	0.80	0.227	3.4	174.1	OK*
S4.015	S16	60 minute 100 year Summer I+45%	49.729	48.721	0.192	0.000	1.01	139.601	0.9	61.7	SURCHARGED*
S5.000	S17	15 minute 1 year Summer I+0%	49.350	48.850	-0.500	0.000	0.00	0.000	0.0	0.0	OK
S4.016	S18	60 minute 100 year Summer I+45%	49.096	48.405	-0.691	0.000	0.04	1.869	0.2	64.4	OK
S4.017	S19	15 minute 100 year Summer I+45%	48.818	48.315	-0.503	0.000	0.05	2.173	0.8	129.9	OK
S4.018	S20	15 minute 100 year Summer I+45%	47.464	47.235	-0.229	0.000	0.22	1.790	0.7	222.8	FLOOD RISK*
S4.019	S21	15 minute 100 year Summer I+45%	46.414	46.361	-0.053	0.000	0.68	10.371	0.4	254.3	FLOOD RISK*
S4.020	S22	15 minute 100 year Summer I+45%	48.116	46.212	-1.904	0.000	0.01	19.973	0.3	253.0	OK
S4.021	S23	15 minute 100 year Summer I+45%	48.184	46.079	-2.104	0.000	0.01	11.074	0.4	256.8	OK
S4.022	S24	30 minute 100 year Summer I+45%	46.737	45.874	-0.863	0.000	0.04	6.402	0.7	264.6	OK
S4.023	S25	30 minute 100 year Summer I+45%	45.634	45.374	-0.260	0.000	0.19	2.301	0.9	266.9	FLOOD RISK*
S6.000	S26	15 minute 100 year Summer I+45%	48.203	47.826	-0.377	0.000	0.05	0.118	0.7	76.3	OK
S6.001	S27	15 minute 100 year Summer I+45%	46.584	46.279	-0.305	0.000	0.12	0.651	0.8	171.7	OK
S6.002	S28	15 minute 100 year Summer I+45%	45.294	45.258	-0.036	0.000	0.65	5.685	0.3	244.6	FLOOD RISK*

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S6.003	S29	15 minute 100 year Summer I+45%	46.056	45.196	-0.860	0.000	0.08	21.021	0.4	316.0	OK
S6.004	S30	30 minute 100 year Summer I+45%	45.328	45.084	-0.244	0.000	0.30	32.221	0.3	255.0	FLOOD RISK*
S4.024	S31	30 minute 100 year Summer I+45%	45.283	45.049	0.006	0.000	1.04	37.336	2.5	441.3	FLOOD RISK*
S7.000	S32	15 minute 100 year Summer I+45%	55.190	54.912	-0.278	0.000	0.16	0.217	0.8	195.0	FLOOD RISK*
S7.001	S33	15 minute 100 year Summer I+45%	54.810	54.609	-0.201	0.000	0.31	2.675	1.0	413.4	FLOOD RISK*
S7.002	S34	15 minute 100 year Summer I+45%	54.200	54.142	-0.058	0.000	0.63	5.684	0.8	577.9	FLOOD RISK*
S7.003	S35	15 minute 100 year Summer I+45%	54.035	54.104	0.274	68.718	1.09	79.626	3.7	256.6	FLOOD
S7.004	S36	30 minute 100 year Winter I+45%	54.150	52.950	0.000	0.000	1.15	0.627	2.4	267.7	SURCHARGED*
S7.005	S37	15 minute 100 year Summer I+45%	53.710	52.403	-0.093	0.000	0.91	1.092	3.1	274.0	OK*
S7.006	S38	15 minute 100 year Summer I+45%	53.110	51.752	-1.358	0.000	0.01	0.378	1.3	326.4	OK
S7.007	S39	30 minute 100 year Summer I+45%	52.440	51.540	0.507	0.000	2.74	18.312	2.7	294.1	SURCHARGED*
S7.008	S40	30 minute 100 year Summer I+45%	52.260	50.877	-1.383	0.000	0.01	0.519	0.9	294.2	OK
S8.000	S41	15 minute 100 year Summer I+45%	53.000	52.162	-0.838	0.000	0.00	0.047	0.4	12.7	OK
S8.001	S42	15 minute 100 year Summer I+45%	51.450	50.868	-0.382	0.000	0.13	0.246	0.4	12.5	OK*
S9.000	S43	15 minute 100 year Summer I+45%	53.580	53.202	-0.378	0.000	0.05	0.117	0.7	69.4	OK
S9.001	S44	15 minute 100 year Summer I+45%	52.740	52.257	-0.483	0.000	0.04	0.469	0.8	111.8	OK
S9.002	S45	120 minute 100 year Summer I+45%	52.170	51.691	-0.480	0.000	0.01	9.113	0.4	49.1	OK
S10.000	S46	120 minute 100 year Summer I+45%	52.330	51.691	-0.639	0.000	0.00	0.356	0.3	24.6	OK
S9.003	S47	120 minute 100 year Summer I+45%	52.000	51.691	0.643	0.000	0.18	99.306	0.2	11.2	SURCHARGED*
S8.002	S48	15 minute 100 year Summer I+45%	51.510	50.777	-0.733	0.000	0.01	0.264	0.5	33.8	OK
S8.003	S49	15 minute 100 year Summer I+45%	51.050	50.299	-0.751	0.000	0.01	0.389	0.5	51.2	OK
S7.009	S50	15 minute 100 year Summer I+45%	50.221	49.877	-0.344	0.000	0.22	12.668	0.9	545.5	OK
S7.010	S51	15 minute 100 year Summer I+45%	49.391	49.191	-0.200	0.000	0.42	15.268	0.7	723.8	FLOOD RISK*
S7.011	S52	30 minute 100 year Summer I+45%	49.964	48.730	-1.234	0.000	0.04	36.559	0.8	716.4	OK
S11.000	S53	15 minute 100 year Summer I+45%	52.150	51.751	-0.399	0.000	0.03	0.096	0.6	50.3	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S11.001	S54	15 minute 100 year Summer I+45%	50.140	49.844	-0.296	0.000	0.13	0.716	0.7	141.8	FLOOD RISK*
S11.002	S55	15 minute 100 year Summer I+45%	49.158	48.975	-0.183	0.000	0.31	3.526	0.6	228.9	FLOOD RISK*
S11.003	S56	60 minute 100 year Summer I+45%	49.505	48.702	-0.804	0.000	0.01	31.381	0.5	145.8	OK
S11.004	S57	60 minute 100 year Summer I+45%	49.159	48.701	-0.458	0.000	0.04	24.710	0.3	153.6	OK
S11.005	S58	60 minute 100 year Summer I+45%	48.520	48.701	0.336	180.575	1.17	227.946	1.3	257.0	FLOOD
S7.012	S59	60 minute 100 year Summer I+45%	48.755	48.701	0.417	0.000	0.96	82.993	2.1	356.4	FLOOD RISK*
S7.013	S60	30 minute 100 year Winter I+45%	49.238	47.998	0.000	0.000	1.09	3.165	2.3	438.3	SURCHARGED*
S7.014	S61	30 minute 100 year Winter I+45%	49.160	47.666	0.000	0.000	1.09	3.404	2.3	436.4	SURCHARGED*
S7.015	S62	60 minute 100 year Summer I+45%	48.333	48.020	0.687	0.000	2.01	401.467	1.5	294.3	SURCHARGED*
S12.000	S63	15 minute 100 year Summer I+45%	48.604	48.144	-0.460	0.000	0.01	0.035	0.4	10.2	OK
S7.016	S64	30 minute 100 year Summer I+45%	47.491	47.071	-0.420	0.000	0.11	2.075	1.1	347.8	OK
S7.017	S65	60 minute 100 year Summer I+45%	45.219	45.203	-0.016	0.000	0.88	5.786	0.4	353.9	FLOOD RISK*
S7.018	S66	60 minute 100 year Summer I+45%	45.680	45.100	-0.579	0.000	0.15	27.928	0.4	353.4	OK
S7.019	S67	60 minute 100 year Summer I+45%	45.311	44.931	-0.380	0.000	0.19	11.219	0.6	355.0	OK
S7.020	S68	60 minute 100 year Summer I+45%	44.903	44.801	-0.102	0.000	0.58	11.471	0.5	354.8	FLOOD RISK*
S13.000	S69	15 minute 100 year Summer I+45%	48.384	47.987	-0.397	0.000	0.03	0.098	0.2	12.2	OK
S13.001	S70	15 minute 100 year Summer I+45%	48.578	47.884	-0.694	0.000	0.01	0.806	0.5	27.6	OK
S13.002	S71	15 minute 100 year Summer I+45%	47.142	46.757	-0.385	0.000	0.04	0.342	0.4	39.8	OK
S13.003	S72	15 minute 100 year Summer I+45%	46.474	46.258	-0.016	0.000	1.00	3.486	0.5	32.9	FLOOD RISK*
S13.004	S73	15 minute 100 year Summer I+45%	46.258	45.771	-0.487	0.000	0.06	0.212	0.2	50.4	OK
S13.005	S74	30 minute 100 year Summer I+45%	47.655	45.588	-2.067	0.000	0.00	5.211	0.2	54.2	OK
S13.006	S75	30 minute 100 year Summer I+45%	47.730	45.484	-2.245	0.000	0.00	2.082	0.2	58.7	OK
S13.007	S76	30 minute 100 year Summer I+45%	46.145	45.306	-0.839	0.000	0.01	1.186	0.6	61.1	OK
S13.008	S77	30 minute 100 year Summer I+45%	45.227	44.849	-0.378	0.000	0.05	3.075	0.6	63.2	OK
S4.025	S78	60 minute 100 year Summer I+45%	44.819	44.556	-0.113	0.000	0.95	21.072	5.2	839.2	FLOOD RISK*

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S4.026	S79	60 minute 100 year Summer I+45%	43.220	42.929	-0.141	0.000	0.86	0.787	5.6	839.5	FLOOD RISK*
S14.000	S80	15 minute 1 year Summer I+0%	41.670	41.170	-0.500	0.000	0.00	0.000	0.0	0.0	OK
S14.001	S81	15 minute 1 year Summer I+0%	42.410	41.120	-0.350	0.000	0.00	0.000	0.0	0.0	OK*
S4.027	S82	600 minute 100 year Winter I+45%	41.459	41.028	0.769	0.000	1.06	3071.382	0.8	47.9	SURCHARGED*
S15.000	S83	15 minute 100 year Summer I+45%	49.070	48.610	-0.460	0.000	0.01	0.035	0.5	12.2	OK
S15.001	S84	30 minute 100 year Summer I+45%	47.000	46.831	-0.169	0.000	0.00	9.159	0.2	4.7	FLOOD RISK*
S15.002	S85	120 minute 100 year Winter I+45%	46.280	45.937	-0.343	0.000	0.00	24.505	0.2	4.1	OK
S15.003	S86	480 minute 100 year Winter I+45%	44.760	44.600	0.665	0.000	0.02	43.522	0.3	1.0	FLOOD RISK*

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 7 Number of Storage Structures 3 Number of Real Time Controls 0

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

Rainfall file(s) analysed

30 year 1440 plus 10 year 1440 Winter

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S4.000	S1	30 year 1440 plus 10 year 1440 Winter	59.510	59.013	-0.497	0.000	0.00	0.000	0.1	OK
S4.001	S2	30 year 1440 plus 10 year 1440 Winter	59.550	58.987	-0.563	0.000	0.00	0.000	0.1	OK
S4.002	S3	30 year 1440 plus 10 year 1440 Winter	59.080	58.600	-0.480	0.000	0.00	0.019	3.7	OK
S4.003	S4	30 year 1440 plus 10 year 1440 Winter	55.660	55.187	-0.473	0.000	0.00	0.028	5.8	OK
S4.004	S5	30 year 1440 plus 10 year 1440 Winter	54.300	53.842	-0.258	0.000	0.05	0.046	5.8	OK*
S4.005	S6	30 year 1440 plus 10 year 1440 Winter	54.070	53.600	-0.470	0.000	0.00	0.036	6.2	OK
S4.006	S7	30 year 1440 plus 10 year 1440 Winter	52.550	52.087	-0.263	0.000	0.04	0.041	6.2	OK*

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S4.007	S8	30 year 1440 plus 10 year 1440 Winter	52.120	51.659	-0.461	0.000	0.01	0.041	6.6	OK
S4.008	S9	30 year 1440 plus 10 year 1440 Winter	51.551	51.099	-0.452	0.000	0.01	0.124	7.1	OK
S4.009	S10	30 year 1440 plus 10 year 1440 Winter	50.965	50.552	-0.413	0.000	0.02	0.367	7.4	OK
S4.010	S11	30 year 1440 plus 10 year 1440 Winter	51.225	50.496	-0.729	0.000	0.01	0.599	7.7	OK
S4.011	S12	30 year 1440 plus 10 year 1440 Winter	51.443	50.424	-1.019	0.000	0.00	0.580	8.1	OK
S4.012	S13	30 year 1440 plus 10 year 1440 Winter	51.916	50.342	-1.574	0.000	0.00	0.102	8.7	OK
S4.013	S14	30 year 1440 plus 10 year 1440 Winter	50.744	50.178	-0.265	0.000	0.03	0.530	8.7	OK*
S4.014	S15	30 year 1440 plus 10 year 1440 Winter	50.272	49.082	-0.261	0.000	0.04	0.036	8.9	OK*
S4.015	S16	30 year 1440 plus 10 year 1440 Winter	49.729	48.458	-0.071	0.000	0.10	59.042	5.9	OK*
S5.000	S17	30 year 1440 plus 10 year 1440 Winter	49.350	48.850	-0.500	0.000	0.00	0.000	0.0	OK
S4.016	S18	30 year 1440 plus 10 year 1440 Winter	49.096	48.253	-0.843	0.000	0.00	0.198	6.4	OK
S4.017	S19	30 year 1440 plus 10 year 1440 Winter	48.818	48.180	-0.638	0.000	0.00	0.228	8.1	OK
S4.018	S20	30 year 1440 plus 10 year 1440 Winter	47.464	47.017	-0.447	0.000	0.01	0.115	10.3	OK
S4.019	S21	30 year 1440 plus 10 year 1440 Winter	46.414	46.015	-0.399	0.000	0.03	0.337	12.5	OK
S4.020	S22	30 year 1440 plus 10 year 1440 Winter	48.116	45.894	-2.223	0.000	0.00	0.521	14.0	OK
S4.021	S23	30 year 1440 plus 10 year 1440 Winter	48.184	45.783	-2.400	0.000	0.00	0.231	15.0	OK
S4.022	S24	30 year 1440 plus 10 year 1440 Winter	46.737	45.668	-1.069	0.000	0.00	0.415	16.0	OK
S4.023	S25	30 year 1440 plus 10 year 1440 Winter	45.634	45.191	-0.443	0.000	0.01	0.181	16.3	OK
S6.000	S26	30 year 1440 plus 10 year 1440 Winter	48.203	47.720	-0.483	0.000	0.00	0.012	2.2	OK
S6.001	S27	30 year 1440 plus 10 year 1440 Winter	46.584	46.112	-0.472	0.000	0.00	0.029	4.8	OK
S6.002	S28	30 year 1440 plus 10 year 1440 Winter	45.294	44.882	-0.412	0.000	0.02	0.104	7.3	OK
S6.003	S29	30 year 1440 plus 10 year 1440 Winter	46.056	44.823	-1.233	0.000	0.00	0.603	10.8	OK
S6.004	S30	30 year 1440 plus 10 year 1440 Winter	45.328	44.721	-0.607	0.000	0.01	1.233	11.3	OK
S4.024	S31	30 year 1440 plus 10 year 1440 Winter	45.283	44.625	-0.418	0.000	0.06	0.805	27.6	OK*
S7.000	S32	30 year 1440 plus 10 year 1440 Winter	55.190	54.725	-0.465	0.000	0.00	0.030	5.6	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S7.001	S33	30 year 1440 plus 10 year 1440 Winter	54.810	54.358	-0.452	0.000	0.01	0.118	11.3	OK
S7.002	S34	30 year 1440 plus 10 year 1440 Winter	54.200	53.770	-0.430	0.000	0.02	0.153	16.1	OK
S7.003	S35	30 year 1440 plus 10 year 1440 Winter	54.035	53.581	-0.249	0.000	0.07	0.181	16.1	OK*
S7.004	S36	30 year 1440 plus 10 year 1440 Winter	54.150	52.641	-0.309	0.000	0.07	0.061	16.9	OK*
S7.005	S37	30 year 1440 plus 10 year 1440 Winter	53.710	52.178	-0.318	0.000	0.06	0.089	16.9	OK*
S7.006	S38	30 year 1440 plus 10 year 1440 Winter	53.110	51.586	-1.524	0.000	0.00	0.058	18.2	OK
S7.007	S39	30 year 1440 plus 10 year 1440 Winter	52.440	50.761	-0.272	0.000	0.17	0.123	18.2	OK*
S7.008	S40	30 year 1440 plus 10 year 1440 Winter	52.260	50.684	-1.576	0.000	0.00	0.092	18.2	OK
S8.000	S41	30 year 1440 plus 10 year 1440 Winter	53.000	52.113	-0.887	0.000	0.00	0.000	0.4	OK
S8.001	S42	30 year 1440 plus 10 year 1440 Winter	51.450	50.759	-0.491	0.000	0.00	0.005	0.4	OK*
S9.000	S43	30 year 1440 plus 10 year 1440 Winter	53.580	53.097	-0.483	0.000	0.00	0.012	2.0	OK
S9.001	S44	30 year 1440 plus 10 year 1440 Winter	52.740	52.124	-0.616	0.000	0.00	0.021	3.2	OK
S9.002	S45	30 year 1440 plus 10 year 1440 Winter	52.170	51.155	-1.015	0.000	0.00	0.023	3.9	OK
S10.000	S46	30 year 1440 plus 10 year 1440 Winter	52.330	51.346	-0.984	0.000	0.00	0.012	1.7	OK
S9.003	S47	30 year 1440 plus 10 year 1440 Winter	52.000	50.978	-0.070	0.000	0.08	2.989	5.2	OK*
S8.002	S48	30 year 1440 plus 10 year 1440 Winter	51.510	50.722	-0.788	0.000	0.00	0.087	5.9	OK
S8.003	S49	30 year 1440 plus 10 year 1440 Winter	51.050	50.224	-0.826	0.000	0.00	0.102	6.4	OK
S7.009	S50	30 year 1440 plus 10 year 1440 Winter	50.221	49.576	-0.645	0.000	0.01	0.358	31.3	OK
S7.010	S51	30 year 1440 plus 10 year 1440 Winter	49.391	48.802	-0.589	0.000	0.02	0.601	38.6	OK
S7.011	S52	30 year 1440 plus 10 year 1440 Winter	49.964	48.277	-1.687	0.000	0.00	1.000	42.6	OK
S11.000	S53	30 year 1440 plus 10 year 1440 Winter	52.150	51.664	-0.486	0.000	0.00	0.009	1.5	OK
S11.001	S54	30 year 1440 plus 10 year 1440 Winter	50.140	49.670	-0.470	0.000	0.00	0.031	4.1	OK
S11.002	S55	30 year 1440 plus 10 year 1440 Winter	49.158	48.710	-0.448	0.000	0.01	0.141	7.3	OK
S11.003	S56	30 year 1440 plus 10 year 1440 Winter	49.505	48.186	-1.319	0.000	0.00	0.232	8.2	OK
S11.004	S57	30 year 1440 plus 10 year 1440 Winter	49.159	48.021	-1.138	0.000	0.00	0.089	9.7	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S11.005	S58	30 year 1440 plus 10 year 1440 Winter	48.520	47.933	-0.432	0.000	0.04	0.470	9.7	OK*
S7.012	S59	30 year 1440 plus 10 year 1440 Winter	48.755	47.908	-0.376	0.000	0.14	0.948	52.2	OK*
S7.013	S60	30 year 1440 plus 10 year 1440 Winter	49.238	47.621	-0.377	0.000	0.14	0.201	55.8	OK*
S7.014	S61	30 year 1440 plus 10 year 1440 Winter	49.160	47.333	-0.333	0.000	0.14	0.319	55.8	OK*
S7.015	S62	30 year 1440 plus 10 year 1440 Winter	48.333	47.320	-0.013	0.000	0.35	130.960	51.7	OK*
S12.000	S63	30 year 1440 plus 10 year 1440 Winter	48.604	48.107	-0.497	0.000	0.00	0.000	0.3	OK
S7.016	S64	30 year 1440 plus 10 year 1440 Winter	47.491	46.912	-0.579	0.000	0.02	0.259	57.5	OK
S7.017	S65	30 year 1440 plus 10 year 1440 Winter	45.219	44.931	-0.288	0.000	0.14	0.802	57.8	FLOOD RISK*
S7.018	S66	30 year 1440 plus 10 year 1440 Winter	45.680	44.835	-0.844	0.000	0.02	4.399	58.0	OK
S7.019	S67	30 year 1440 plus 10 year 1440 Winter	45.311	44.726	-0.586	0.000	0.03	2.059	58.1	OK
S7.020	S68	30 year 1440 plus 10 year 1440 Winter	44.903	44.574	-0.329	0.000	0.10	2.102	58.4	OK
S13.000	S69	30 year 1440 plus 10 year 1440 Winter	48.384	47.899	-0.485	0.000	0.00	0.010	0.4	OK
S13.001	S70	30 year 1440 plus 10 year 1440 Winter	48.578	47.809	-0.770	0.000	0.00	0.024	0.8	OK
S13.002	S71	30 year 1440 plus 10 year 1440 Winter	47.142	46.658	-0.484	0.000	0.00	0.028	1.2	OK
S13.003	S72	30 year 1440 plus 10 year 1440 Winter	46.474	46.013	-0.261	0.000	0.04	0.122	1.3	OK*
S13.004	S73	30 year 1440 plus 10 year 1440 Winter	46.258	45.594	-0.665	0.000	0.00	0.030	2.2	OK
S13.005	S74	30 year 1440 plus 10 year 1440 Winter	47.655	45.407	-2.248	0.000	0.00	0.296	2.5	OK
S13.006	S75	30 year 1440 plus 10 year 1440 Winter	47.730	45.316	-2.414	0.000	0.00	0.040	2.9	OK
S13.007	S76	30 year 1440 plus 10 year 1440 Winter	46.145	45.215	-0.930	0.000	0.00	0.147	3.1	OK
S13.008	S77	30 year 1440 plus 10 year 1440 Winter	45.227	44.751	-0.476	0.000	0.00	1.370	3.3	OK
S4.025	S78	30 year 1440 plus 10 year 1440 Winter	44.819	44.274	-0.395	0.000	0.10	0.827	87.7	OK*
S4.026	S79	30 year 1440 plus 10 year 1440 Winter	43.220	42.671	-0.399	0.000	0.09	0.116	87.8	OK*
S14.000	S80	30 year 1440 plus 10 year 1440 Winter	41.670	41.170	-0.500	0.000	0.00	0.000	0.0	OK
S14.001	S81	30 year 1440 plus 10 year 1440 Winter	42.410	41.120	-0.350	0.000	0.00	0.000	0.0	OK*
S4.027	S82	30 year 1440 plus 10 year 1440 Winter	41.459	40.509	0.250	0.000	0.81	1249.598	36.6	SURCHARGED*

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Pipe Flow (l/s)	Status
S15.000	S83	30 year 1440 plus 10 year 1440 Winter	49.070	48.573	-0.497	0.000	0.00	0.000	0.4	OK
S15.001	S84	30 year 1440 plus 10 year 1440 Winter	47.000	46.054	-0.946	0.000	0.00	0.062	0.8	OK
S15.002	S85	30 year 1440 plus 10 year 1440 Winter	46.280	45.398	-0.882	0.000	0.00	0.278	1.6	OK
S15.003	S86	30 year 1440 plus 10 year 1440 Winter	44.760	44.137	0.202	0.000	0.01	7.510	0.8	SURCHARGED*

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes LTC pipes Manhole Sizes LTC manholes

FSR Rainfall Model - England and Wales

Return Period (years)	1	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	20.000	Volumetric Runoff Coeff.	1.000	Min Design Depth for Optimisation (m)	0.000
Ratio R	0.400	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	300	Add Flow / Climate Change (%)	20	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	72.412	3.655	19.8	0.091	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.001	85.957	5.789	14.8	0.051	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.002	30.535	1.565	19.5	0.014	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.003	22.547	1.180	19.1	0.007	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.004	29.400	1.440	20.4	0.013	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.005	69.159	3.297	21.0	0.034	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.006	31.369	2.022	15.5	0.033	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.007	6.907	0.548	12.6	0.000	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.000	30.697	1.291	23.8	0.091	5.00	0.0		0.050	3 \=/	500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	51.84	5.64	71.185	0.091	0.0	0.0	3.4	1.89	1891.2	20.4
S4.001	49.23	6.29	67.530	0.142	0.0	0.0	5.0	2.18	2184.5	30.2
S4.002	48.25	6.56	61.741	0.156	0.0	0.0	5.4	1.91	1905.7	32.6
S4.003	47.57	6.76	60.176	0.163	0.0	0.0	5.6	1.93	1925.7	33.5
S4.004	46.67	7.02	58.996	0.175	0.0	0.0	5.9	1.86	1862.9	35.5
S4.005	44.69	7.65	57.556	0.210	0.0	0.0	6.8	1.84	1837.9	40.6
S4.006	43.97	7.89	54.259	0.243	0.0	0.0	7.7	2.14	2137.1	46.3
S4.007	43.83	7.94	52.237	0.243	0.0	0.0	7.7	2.37	2371.0	46.3
S5.000	53.34	5.30	84.759	0.091	0.0	0.0	3.5	1.73	1726.3	21.1

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S5.001	45.556	0.460	99.0	0.085	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.002	82.350	1.539	53.5	0.171	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.003	42.447	1.691	25.1	0.173	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.004	65.230	7.932	8.2	0.241	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.005	74.699	7.670	9.7	0.126	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.006	54.998	3.667	15.0	0.044	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.007	49.697	2.109	23.6	0.020	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.008	32.785	0.066	500.0	0.025	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.009	21.824	0.044	500.0	0.026	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.010	32.052	0.064	500.0	0.049	0.00	0.0		0.050	3 \=/	500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S5.001	49.61	6.19	83.468	0.176	0.0	0.0	6.3	0.85	845.9	37.9
S5.002	45.49	7.39	83.008	0.347	0.0	0.0	11.4	1.15	1150.7	68.4
S5.003	44.21	7.81	81.469	0.520	0.0	0.0	16.6	1.68	1680.1	99.5
S5.004	43.15	8.18	79.778	0.761	0.0	0.0	23.7	2.94	2935.4	142.3
S5.005	41.91	8.64	71.846	0.887	0.0	0.0	26.8	2.70	2697.3	161.1
S5.006	40.88	9.06	64.176	0.931	0.0	0.0	27.5	2.17	2173.4	164.9
S5.007	39.81	9.54	60.509	0.951	0.0	0.0	27.5	1.73	1734.1	164.9
S5.008	36.93	10.99	58.400	0.976	0.0	0.0	27.5	0.38	376.5	164.9
S5.009	35.26	11.96	58.334	1.002	0.0	0.0	27.5	0.38	376.5	164.9
S5.010	33.11	13.38	58.290	1.051	0.0	0.0	27.5	0.38	376.5	164.9

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S5.011	44.899	0.090	500.0	0.131	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.012	6.118	0.012	500.0	0.010	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.013	46.756	0.094	500.0	0.073	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.014	53.464	2.569	20.8	0.017	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.015	46.050	3.011	15.3	0.017	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S5.016	12.641	0.726	17.4	0.006	0.00	0.0		0.050	o	500	Pipe/Conduit	
S5.017	17.274	0.035	500.0	0.011	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.008	13.823	0.161	85.9	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.009	36.719	1.819	20.2	0.000	0.00	0.0		0.050	3 \=/	500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S5.011	30.56	15.36	58.226	1.182	0.0	0.0	27.5	0.38	376.5	164.9
S5.012	30.25	15.63	58.136	1.193	0.0	0.0	27.5	0.38	376.5	164.9
S5.013	28.08	17.70	58.124	1.265	0.0	0.0	27.5	0.38	376.5	164.9
S5.014	27.63	18.19	58.030	1.283	0.0	0.0	27.5	1.85	1845.2	164.9
S5.015	27.31	18.54	55.461	1.300	0.0	0.0	27.5	2.15	2152.5	164.9
S5.016	27.15	18.72	52.450	1.306	0.0	0.0	27.5	1.20	235.3	164.9
S5.017	26.49	19.48	51.724	1.316	0.0	0.0	27.5	0.38	376.5	164.9
S4.008	26.41	19.58	51.689	1.559	0.0	0.0	29.7	2.35	460.6	178.5
S4.009	26.14	19.91	51.528	1.559	0.0	0.0	29.7	1.87	1873.5	178.5

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.010	80.974	0.162	500.0	0.006	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.000	65.983	2.552	25.9	0.036	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.001	66.007	4.815	13.7	0.071	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.002	50.131	2.672	18.8	0.112	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.003	20.099	1.099	18.3	0.060	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.004	36.710	1.841	19.9	0.139	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.005	64.673	3.118	20.7	0.201	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.006	48.307	2.176	22.2	0.308	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.007	31.335	0.831	37.7	0.086	0.00	0.0		0.050	3 \=/	500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.010	23.57	23.49	49.709	1.566	0.0	0.0	29.7	0.38	376.5	178.5
S6.000	51.73	5.66	70.227	0.036	0.0	0.0	1.4	1.66	1655.5	8.1
S6.001	49.79	6.15	67.675	0.108	0.0	0.0	3.9	2.27	2273.5	23.2
S6.002	48.19	6.58	62.860	0.219	0.0	0.0	7.6	1.94	1943.4	45.8
S6.003	47.59	6.75	60.188	0.279	0.0	0.0	9.6	1.97	1968.4	57.5
S6.004	46.50	7.07	59.089	0.418	0.0	0.0	14.0	1.89	1885.1	84.2
S6.005	44.66	7.66	57.248	0.619	0.0	0.0	20.0	1.85	1848.3	119.7
S6.006	43.35	8.11	54.130	0.927	0.0	0.0	29.0	1.79	1786.6	174.1
S6.007	42.31	8.49	51.954	1.013	0.0	0.0	30.9	1.37	1370.8	185.7

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.008	82.152	0.750	109.5	0.219	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.009	2.647	0.024	110.3	0.000	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S6.010	10.746	0.802	13.4	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.011	10.845	0.022	492.9	0.004	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.012	24.110	0.909	26.5	0.104	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.013	38.746	1.120	34.6	0.170	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.014	28.399	1.057	26.9	0.130	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.015	62.836	1.883	33.4	0.258	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.016	38.532	1.619	23.8	0.126	0.00	0.0		0.050	3 \=/	500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S6.008	38.46	10.19	51.123	1.232	0.0	0.0	34.2	0.80	804.3	205.2
S6.009	38.35	10.25	50.373	1.232	0.0	0.0	34.2	0.80	801.6	205.2
S6.010	38.29	10.28	50.349	1.232	0.0	0.0	34.2	5.96	1169.8	205.2
S4.011	23.27	23.97	49.547	2.802	0.0	0.0	47.1	0.38	379.1	282.5
S4.012	23.22	24.07	49.525	2.905	0.0	0.0	48.7	4.23	830.7	292.3
S4.013	22.95	24.52	48.616	3.076	0.0	0.0	51.0	1.43	1431.2	305.9
S4.014	22.78	24.81	47.496	3.206	0.0	0.0	52.7	1.62	1624.0	316.5
S4.015	22.38	25.53	46.439	3.464	0.0	0.0	56.0	1.46	1457.2	335.9
S4.016	22.18	25.90	44.556	3.590	0.0	0.0	57.5	1.73	1725.5	345.1

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.000	14.074	0.207	68.0	0.042	5.00	0.0	0.600		o	500	Pipe/Conduit	
S7.001	26.076	0.052	500.0	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
S4.017	37.620	2.272	16.6	0.154	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S8.000	28.988	1.162	24.9	0.083	5.00	0.0		0.050	3 \=/	500	1:3 Swale	
S8.001	29.331	0.808	36.3	0.018	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S8.002	35.653	2.097	17.0	0.096	0.00	0.0		0.050	3 \=/	500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.000	54.29	5.09	43.196	0.042	0.0	0.0	1.6	2.64	517.8	9.9
S7.001	51.88	5.63	42.989	0.042	0.0	0.0	1.6	0.80	88.7	9.9
S4.017	22.02	26.20	42.937	3.786	0.0	0.0	60.2	2.07	2068.7	361.2
S8.000	53.38	5.29	46.470	0.083	0.0	0.0	3.2	1.69	1685.3	19.1
S8.001	51.85	5.64	45.308	0.101	0.0	0.0	3.8	1.40	1397.1	22.7
S8.002	50.65	5.93	44.500	0.197	0.0	0.0	7.2	2.04	2041.5	43.2

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.000	43.741	0.710	61.6	0.193	5.00	0.0	1.500		o	300	Pipe/Conduit	
S9.001	35.954	0.072	500.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S8.003	2.416	0.005	500.0	0.013	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S8.004	19.514	0.039	500.0	0.020	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S8.005	44.941	1.694	26.5	0.167	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.018	22.356	0.582	38.4	0.118	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.019	34.670	0.263	131.8	0.023	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.020	5.790	0.290	20.0	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S9.000	52.82	5.41	43.185	0.193	0.0	0.0	7.4	1.77	125.0	44.2
S9.001	49.31	6.27	42.475	0.193	0.0	0.0	7.4	0.70	49.2	44.2
S8.003	48.91	6.38	42.403	0.403	0.0	0.0	14.2	0.38	376.5	85.4
S8.004	45.94	7.24	42.398	0.423	0.0	0.0	14.2	0.38	376.5	85.4
S8.005	44.52	7.70	42.359	0.590	0.0	0.0	19.0	1.63	1634.3	113.9
S4.018	21.96	26.31	40.665	4.494	0.0	0.0	71.3	3.51	689.8	427.7
S4.019	21.80	26.61	40.083	4.516	0.0	0.0	71.3	1.89	371.2«	427.7
S4.020	21.79	26.63	39.820	4.516	0.0	0.0	71.3	4.87	957.0	427.7

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)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.021	50.110	1.120	44.7	0.192	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.022	6.947	0.058	119.2	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.023	67.285	0.880	76.5	0.308	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.024	4.229	0.042	100.0	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.025	39.442	0.951	41.5	0.276	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.026	9.992	0.012	857.2	0.000	0.00	0.0	0.600		o	500	Pipe/Conduit	
S4.027	68.265	0.967	70.6	0.000	0.00	0.0		0.050	3 \=/	500	1:3 Swale	
S4.028	5.000	0.010	500.0	0.000	0.00	0.0		0.050	3 \=/	500	1:3 Swale	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.021	21.66	26.89	39.530	4.708	0.0	0.0	73.7	3.25	639.0	442.0
S4.022	21.63	26.95	38.410	4.708	0.0	0.0	73.7	1.99	390.5«	442.0
S4.023	21.41	27.40	38.352	5.016	0.0	0.0	77.6	2.49	488.2	465.3
S4.024	21.39	27.43	37.472	5.016	0.0	0.0	77.6	2.17	426.6«	465.3
S4.025	21.30	27.63	37.430	5.292	0.0	0.0	81.4	3.38	663.8	488.4
S4.026	21.19	27.85	36.479	5.292	0.0	0.0	81.4	0.73	144.1«	488.4
S4.027	20.66	28.99	36.467	5.292	0.0	0.0	81.4	1.00	1001.9	488.4
S4.028	20.56	29.21	35.500	5.292	0.0	0.0	81.4	0.38	376.5«	488.4

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	71.685	0.500	Junction		S4.000	71.185	500				
S2	68.030	0.500	Junction		S4.001	67.530	500	S4.000	67.530	500	
S3	62.241	0.500	Junction		S4.002	61.741	500	S4.001	61.741	500	
S4	60.676	0.500	Junction		S4.003	60.176	500	S4.002	60.176	500	
S5	59.496	0.500	Junction		S4.004	58.996	500	S4.003	58.996	500	
S6	58.056	0.500	Junction		S4.005	57.556	500	S4.004	57.556	500	
S7	54.759	0.500	Junction		S4.006	54.259	500	S4.005	54.259	500	
S8	53.337	1.100	Junction		S4.007	52.237	500	S4.006	52.237	500	
S9	85.259	0.500	Junction		S5.000	84.759	500				
S10	83.968	0.500	Junction		S5.001	83.468	500	S5.000	83.468	500	
S11	83.508	0.500	Junction		S5.002	83.008	500	S5.001	83.008	500	
S12	81.969	0.500	Junction		S5.003	81.469	500	S5.002	81.469	500	
S13	80.278	0.500	Junction		S5.004	79.778	500	S5.003	79.778	500	
S14	72.346	0.500	Junction		S5.005	71.846	500	S5.004	71.846	500	
S15	64.676	0.500	Junction		S5.006	64.176	500	S5.005	64.176	500	
S16	61.433	0.923	Junction		S5.007	60.509	500	S5.006	60.509	500	
S17	58.910	0.510	Junction		S5.008	58.400	500	S5.007	58.400	500	
S18	60.624	2.290	Junction		S5.009	58.334	500	S5.008	58.334	500	
S19	62.052	3.762	Junction		S5.010	58.290	500	S5.009	58.290	500	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S20	63.542	5.316	Junction		S5.011	58.226	500	S5.010	58.226	500	
S21	63.064	4.928	Junction		S5.012	58.136	500	S5.011	58.136	500	
S22	62.863	4.739	Junction		S5.013	58.124	500	S5.012	58.124	500	
S23	59.987	1.957	Junction		S5.014	58.030	500	S5.013	58.030	500	
S24	56.635	1.174	Junction		S5.015	55.461	500	S5.014	55.461	500	
S25	54.124	1.674	Junction		S5.016	52.450	500	S5.015	52.450	500	
S26	53.398	1.674	Junction		S5.017	51.724	500	S5.016	51.724	500	
S27	53.100	1.411	Junction		S4.008	51.689	500	S4.007	51.689	500	
								S5.017	51.689	500	
S28	52.450	0.922	Junction		S4.009	51.528	500	S4.008	51.528	500	
S29	51.463	1.754	Junction		S4.010	49.709	500	S4.009	49.709	500	
S30	70.727	0.500	Junction		S6.000	70.227	500				
S31	68.175	0.500	Junction		S6.001	67.675	500	S6.000	67.675	500	
S32	63.360	0.500	Junction		S6.002	62.860	500	S6.001	62.860	500	
S33	60.688	0.500	Junction		S6.003	60.188	500	S6.002	60.188	500	
S34	59.589	0.500	Junction		S6.004	59.089	500	S6.003	59.089	500	
S35	57.748	0.500	Junction		S6.005	57.248	500	S6.004	57.248	500	
S36	54.630	0.500	Junction		S6.006	54.130	500	S6.005	54.130	500	
S37	52.454	0.500	Junction		S6.007	51.954	500	S6.006	51.954	500	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S38	51.623	0.500	Junction		S6.008	51.123	500	S6.007	51.123	500	
S39	51.023	0.650	Junction		S6.009	50.373	500	S6.008	50.373	500	
S40	50.999	0.650	Junction		S6.010	50.349	500	S6.009	50.349	500	
S41	50.677	1.130	Junction		S4.011	49.547	500	S4.010	49.547	500	
								S6.010	49.547	500	
S42	50.340	0.815	Junction		S4.012	49.525	500	S4.011	49.525	500	
S43	49.116	0.500	Junction		S4.013	48.616	500	S4.012	48.616	500	
S44	47.996	0.500	Junction		S4.014	47.496	500	S4.013	47.496	500	
S45	46.939	0.500	Junction		S4.015	46.439	500	S4.014	46.439	500	
S46	45.056	0.500	Junction		S4.016	44.556	500	S4.015	44.556	500	
S47	44.896	1.700	Junction		S7.000	43.196	500				
S48	44.489	1.500	Junction		S7.001	42.989	375	S7.000	42.989	500	
S49	44.235	1.298	Junction		S4.017	42.937	500	S4.016	42.937	500	
								S7.001	42.937	375	
S50	46.970	0.500	Junction		S8.000	46.470	500				
S51	45.808	0.500	Junction		S8.001	45.308	500	S8.000	45.308	500	
S52	45.000	0.500	Junction		S8.002	44.500	500	S8.001	44.500	500	
S53	44.685	1.500	Open Manhole	1500	S9.000	43.185	300				
S54	43.975	1.500	Open Manhole	1500	S9.001	42.475	300	S9.000	42.475	300	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S55	43.770	1.367	Junction		S8.003	42.403	500	S8.002	42.403	500	
								S9.001	42.403	300	
S56	43.726	1.328	Junction		S8.004	42.398	500	S8.003	42.398	500	
S57	43.537	1.178	Junction		S8.005	42.359	500	S8.004	42.359	500	
S58	43.137	2.472	Junction		S4.018	40.665	500	S4.017	40.665	500	
								S8.005	40.665	500	
S59	42.470	2.387	Junction		S4.019	40.083	500	S4.018	40.083	500	
S60	41.320	1.500	Junction		S4.020	39.820	500	S4.019	39.820	500	
S61	41.130	1.600	Junction		S4.021	39.530	500	S4.020	39.530	500	
S62	39.910	1.500	Junction		S4.022	38.410	500	S4.021	38.410	500	
S63	39.800	1.448	Junction		S4.023	38.352	500	S4.022	38.352	500	
S64	38.972	1.500	Junction		S4.024	37.472	500	S4.023	37.472	500	
S65	38.858	1.428	Junction		S4.025	37.430	500	S4.024	37.430	500	
S66	37.979	1.500	Junction		S4.026	36.479	500	S4.025	36.479	500	
S67	37.847	1.380	Junction		S4.027	36.467	500	S4.026	36.467	500	
S68	36.000	0.500	Junction		S4.028	35.500	500	S4.027	35.500	500	
S	36.000	0.510	Open Manhole	0		OUTFALL		S4.028	35.490	500	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	557809.747	189694.644			No Entry	
S2	557871.287	189732.807			No Entry	
S3	557956.701	189742.446			No Entry	
S4	557987.208	189741.113			No Entry	
S5	558008.158	189732.782			No Entry	
S6	558033.774	189718.353			No Entry	
S7	558101.230	189703.096			No Entry	
S8	558131.987	189696.934			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S9	558260.260	190314.000			No Entry	
S10	558254.953	190283.765			No Entry	
S11	558237.320	190241.760			No Entry	
S12	558257.828	190162.004			No Entry	
S13	558264.383	190120.067			No Entry	
S14	558251.853	190056.051			No Entry	
S15	558211.212	189993.375			No Entry	
S16	558160.543	189971.986			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S17	558140.450	189926.533			No Entry	
S18	558117.208	189903.410			No Entry	
S19	558097.649	189893.729			No Entry	
S20	558068.698	189879.975			No Entry	
S21	558045.833	189841.334			No Entry	
S22	558045.413	189835.231			No Entry	
S23	558067.676	189794.116			No Entry	
S24	558108.363	189759.432			No Entry	

Kelvin House
RTC Business Park, London Rd
Derby DE24 8UP

Date 11/04/2023 17:14
File Hole Farm West of farm Lane Rev 5.MDX
Designed by AHSI
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Innovyze
Network 2020.1.3

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S25	558141.647	189727.607			No Entry	
S26	558144.266	189715.241			No Entry	
S27	558138.602	189698.921			No Entry	
S28	558151.315	189693.492			No Entry	
S29	558172.322	189663.376			No Entry	
S30	557814.775	189689.129			No Entry	
S31	557870.331	189724.727			No Entry	
S32	557935.515	189735.122			No Entry	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S33	557985.627	189733.742			No Entry	
S34	558004.300	189726.304			No Entry	
S35	558036.314	189708.340			No Entry	
S36	558099.740	189695.699			No Entry	
S37	558147.124	189686.301			No Entry	
S38	558165.159	189660.676			No Entry	
S39	558175.956	189579.237			No Entry	
S40	558176.351	189576.620			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S41	558184.722	189583.357			No Entry	
S42	558195.564	189583.583			No Entry	
S43	558219.211	189588.286			No Entry	
S44	558256.471	189598.915			No Entry	
S45	558283.499	189607.630			No Entry	
S46	558342.511	189629.218			No Entry	
S47	558362.534	189677.128			No Entry	
S48	558374.392	189669.547			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S49	558378.198	189643.750			No Entry	
S50	558445.427	189771.555			No Entry	
S51	558462.907	189748.429			No Entry	
S52	558446.409	189726.148			No Entry	
S53	558537.885	189731.714	558537.885	189731.714	Required	
S54	558501.746	189707.071	558501.746	189707.071	Required	
S55	558467.182	189697.172			No Entry	
S56	558466.024	189695.051			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S57	558449.338	189684.934			No Entry	
S58	558412.507	189659.182			No Entry	
S59	558430.864	189646.423			No Entry	
S60	558458.701	189625.756			No Entry	
S61	558462.636	189621.508			No Entry	
S62	558488.952	189578.864			No Entry	
S63	558488.979	189571.917			No Entry	
S64	558491.579	189504.682			No Entry	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S65	558492.632	189500.586			No Entry	
S66	558495.736	189461.267			No Entry	
S67	558498.196	189451.583			No Entry	
S68	558511.272	189384.582			No Entry	
S	558511.812	189379.611			No Entry	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
4.000	Classification	Unpaved	20	0.454	0.091	0.091
4.001	Classification	Unpaved	20	0.255	0.051	0.051
4.002	Classification	Unpaved	20	0.071	0.014	0.014
4.003	Classification	Unpaved	20	0.034	0.007	0.007
4.004	Classification	Unpaved	20	0.063	0.013	0.013
4.005	Classification	Unpaved	20	0.172	0.034	0.034
4.006	Classification	Unpaved	20	0.088	0.018	0.018
	Classification	Paved	100	0.016	0.016	0.033
4.007	-	-	100	0.000	0.000	0.000
5.000	Classification	Unpaved	20	0.392	0.078	0.078
	Classification	Paved	100	0.013	0.013	0.091
5.001	Classification	Unpaved	20	0.357	0.071	0.071
	Classification	Paved	100	0.014	0.014	0.085
5.002	Classification	Unpaved	20	0.729	0.146	0.146
	Classification	Paved	100	0.025	0.025	0.171
5.003	Classification	Unpaved	20	0.800	0.160	0.160
	Classification	Paved	100	0.013	0.013	0.173
5.004	Classification	Unpaved	20	1.107	0.221	0.221
	Classification	Paved	100	0.020	0.020	0.241
5.005	Classification	Unpaved	20	0.515	0.103	0.103
	Classification	Paved	100	0.023	0.023	0.126
5.006	Classification	Unpaved	20	0.134	0.027	0.027
	Classification	Paved	100	0.017	0.017	0.044
5.007	Classification	Unpaved	20	0.029	0.006	0.006
	Classification	Paved	100	0.015	0.015	0.020
5.008	Classification	Unpaved	20	0.065	0.013	0.013
	Classification	Paved	100	0.012	0.012	0.025

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
5.009	Classification	Unpaved	20	0.101	0.020	0.020
	Classification	Paved	100	0.006	0.006	0.026
5.010	Classification	Unpaved	20	0.197	0.039	0.039
	Classification	Paved	100	0.010	0.010	0.049
5.011	Classification	Unpaved	20	0.584	0.117	0.117
	Classification	Paved	100	0.014	0.014	0.131
5.012	Classification	Unpaved	20	0.051	0.010	0.010
5.013	Classification	Unpaved	20	0.289	0.058	0.058
	Classification	Paved	100	0.015	0.015	0.073
5.014	Classification	Paved	100	0.017	0.017	0.017
5.015	Classification	Paved	100	0.013	0.013	0.013
	Classification	Unpaved	20	0.019	0.004	0.017
5.016	Classification	Unpaved	20	0.006	0.001	0.001
	Classification	Paved	100	0.005	0.005	0.006
5.017	Classification	Paved	100	0.011	0.011	0.011
4.008	-	-	100	0.000	0.000	0.000
4.009	-	-	100	0.000	0.000	0.000
4.010	Classification	Unpaved	20	0.031	0.006	0.006
6.000	Classification	Unpaved	20	0.067	0.013	0.013
	Classification	Paved	100	0.023	0.023	0.036
6.001	Classification	Unpaved	20	0.257	0.051	0.051
	Classification	Paved	100	0.020	0.020	0.071
6.002	Classification	Unpaved	20	0.482	0.096	0.096
	Classification	Paved	100	0.015	0.015	0.112
6.003	Classification	Unpaved	20	0.268	0.054	0.054
	Classification	Paved	100	0.006	0.006	0.060
6.004	Classification	Unpaved	20	0.639	0.128	0.128

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	Classification	Paved	100	0.011	0.011	0.139
6.005	Classification	Unpaved	20	0.905	0.181	0.181
	Classification	Paved	100	0.020	0.020	0.201
6.006	Classification	Unpaved	20	1.540	0.308	0.308
6.007	Classification	Unpaved	20	0.383	0.077	0.077
	Classification	Paved	100	0.010	0.010	0.086
6.008	Classification	Unpaved	20	0.953	0.191	0.191
	Classification	Paved	100	0.028	0.028	0.219
6.009	-	-	100	0.000	0.000	0.000
6.010	-	-	100	0.000	0.000	0.000
4.011	Classification	Paved	100	0.004	0.004	0.004
4.012	Classification	Unpaved	20	0.483	0.097	0.097
	Classification	Paved	100	0.007	0.007	0.104
4.013	Classification	Unpaved	20	0.793	0.159	0.159
	Classification	Paved	100	0.012	0.012	0.170
4.014	Classification	Unpaved	20	0.607	0.121	0.121
	Classification	Paved	100	0.008	0.008	0.130
4.015	Classification	Unpaved	20	1.197	0.239	0.239
	Classification	Paved	100	0.019	0.019	0.258
4.016	Classification	Unpaved	20	0.573	0.115	0.115
	Classification	Paved	100	0.012	0.012	0.126
7.000	Classification	Unpaved	20	0.210	0.042	0.042
7.001	-	-	100	0.000	0.000	0.000
4.017	Classification	Unpaved	20	0.710	0.142	0.142
	Classification	Paved	100	0.012	0.012	0.154
8.000	Classification	Paved	100	0.024	0.024	0.024
	Classification	Unpaved	20	0.293	0.059	0.083

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
8.001	Classification	Paved	100	0.014	0.014	0.014
	Classification	Unpaved	20	0.021	0.004	0.018
8.002	Classification	Paved	100	0.096	0.096	0.096
9.000	Classification	Paved	100	0.193	0.193	0.193
9.001	-	-	100	0.000	0.000	0.000
8.003	Classification	Paved	100	0.006	0.006	0.006
	Classification	Unpaved	20	0.033	0.007	0.013
8.004	Classification	Unpaved	20	0.073	0.015	0.015
	Classification	Paved	100	0.006	0.006	0.020
8.005	Classification	Unpaved	20	0.768	0.154	0.154
	Classification	Paved	100	0.013	0.013	0.167
4.018	Classification	Unpaved	20	0.588	0.118	0.118
4.019	Classification	Unpaved	20	0.113	0.023	0.023
4.020	-	-	100	0.000	0.000	0.000
4.021	Classification	Unpaved	20	0.958	0.192	0.192
4.022	-	-	100	0.000	0.000	0.000
4.023	Classification	Unpaved	20	1.538	0.308	0.308
4.024	-	-	100	0.000	0.000	0.000
4.025	Classification	Unpaved	20	1.382	0.276	0.276
4.026	-	-	100	0.000	0.000	0.000
4.027	-	-	100	0.000	0.000	0.000
4.028	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				23.193	5.292	5.292

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)
S4.028	S	36.000	35.490	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	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	3	Number of Storage Structures	5	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	1.000
Return Period (years)	1	Ratio R	0.400	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Storm

Orifice Manhole: S48, DS/PN: S7.001, Volume (m^3): 2.8

Diameter (m) 0.050 Discharge Coefficient 0.600 Invert Level (m) 42.989

Orifice Manhole: S64, DS/PN: S4.024, Volume (m^3): 13.2

Diameter (m) 0.300 Discharge Coefficient 0.600 Invert Level (m) 37.472

Orifice Manhole: S66, DS/PN: S4.026, Volume (m^3): 7.7

Diameter (m) 0.220 Discharge Coefficient 0.600 Invert Level (m) 36.479

Storage Structures for Storm

Tank or Pond Manhole: S48, DS/PN: S7.001

Invert Level (m) 42.989

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	49.1	1.500	230.8

Tank or Pond Manhole: S60, DS/PN: S4.020

Invert Level (m) 39.820

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	820.6	1.500	1342.8

Tank or Pond Manhole: S62, DS/PN: S4.022

Invert Level (m) 38.410

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1837.0	1.500	2585.6

Tank or Pond Manhole: S64, DS/PN: S4.024

Invert Level (m) 37.472

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2798.4	1.500	3715.2

Tank or Pond Manhole: S66, DS/PN: S4.026

Invert Level (m) 36.479

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2249.3	1.500	3151.5

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 5 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 1.000
Region England and Wales Ratio R 0.400 Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S4.000	S1	15 minute 100 year Summer I+45%	71.685	71.295	-0.390	0.000	0.04	0.105	0.8	72.7	OK
S4.001	S2	15 minute 100 year Summer I+45%	68.030	67.659	-0.371	0.000	0.05	0.230	1.0	114.4	OK
S4.002	S3	15 minute 100 year Summer I+45%	62.241	61.886	-0.355	0.000	0.07	0.262	0.9	126.0	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S4.003	S4	15 minute 100 year Summer I+45%	60.676	60.323	-0.353	0.000	0.07	0.304	1.0	131.8	OK
S4.004	S5	15 minute 100 year Summer I+45%	59.496	59.151	-0.345	0.000	0.08	0.333	1.0	141.7	OK
S4.005	S6	15 minute 100 year Summer I+45%	58.056	57.725	-0.331	0.000	0.09	0.409	1.0	164.3	OK
S4.006	S7	15 minute 100 year Summer I+45%	54.759	54.425	-0.334	0.000	0.09	0.400	1.2	188.8	OK
S4.007	S8	30 minute 100 year Summer I+45%	53.337	52.422	-0.915	0.000	0.02	0.410	1.3	171.5	OK
S5.000	S9	15 minute 100 year Summer I+45%	85.259	84.874	-0.385	0.000	0.04	0.110	0.8	74.4	OK
S5.001	S10	15 minute 100 year Summer I+45%	83.968	83.700	-0.268	0.000	0.17	0.861	0.5	143.7	FLOOD RISK*
S5.002	S11	15 minute 100 year Summer I+45%	83.508	83.283	-0.225	0.000	0.23	4.226	0.8	267.7	FLOOD RISK*
S5.003	S12	15 minute 100 year Summer I+45%	81.969	81.737	-0.232	0.000	0.24	2.294	1.2	399.1	FLOOD RISK*
S5.004	S13	15 minute 100 year Summer I+45%	80.278	80.028	-0.250	0.000	0.20	1.053	2.0	588.9	FLOOD RISK*
S5.005	S14	15 minute 100 year Summer I+45%	72.346	72.123	-0.223	0.000	0.25	0.605	1.9	685.1	FLOOD RISK*
S5.006	S15	15 minute 100 year Summer I+45%	64.676	64.483	-0.193	0.000	0.33	0.796	1.6	706.6	FLOOD RISK*
S5.007	S16	15 minute 100 year Summer I+45%	61.433	60.850	-0.582	0.000	0.09	1.369	1.4	713.8	OK
S5.008	S17	15 minute 100 year Summer I+45%	58.910	58.983	0.073	72.971	1.12	78.237	0.4	440.1	FLOOD
S5.009	S18	30 minute 100 year Summer I+45%	60.624	58.902	-1.722	0.000	0.03	18.250	0.4	438.0	OK
S5.010	S19	30 minute 100 year Summer I+45%	62.052	58.853	-3.199	0.000	0.01	7.994	0.4	446.7	OK
S5.011	S20	15 minute 100 year Summer I+45%	63.542	58.795	-4.746	0.000	0.00	8.524	0.4	469.7	OK
S5.012	S21	30 minute 100 year Summer I+45%	63.064	58.681	-4.384	0.000	0.00	11.211	0.4	477.5	OK
S5.013	S22	30 minute 100 year Summer I+45%	62.863	58.670	-4.193	0.000	0.00	2.063	0.4	517.4	OK
S5.014	S23	30 minute 100 year Summer I+45%	59.987	58.304	-1.683	0.000	0.01	4.986	1.5	528.0	OK
S5.015	S24	30 minute 100 year Summer I+45%	56.635	55.728	-0.907	0.000	0.03	1.042	1.6	536.0	OK
S5.016	S25	30 minute 100 year Summer I+45%	54.124	54.177	1.227	53.047	1.59	120.412	1.9	373.4	FLOOD
S5.017	S26	30 minute 100 year Summer I+45%	53.398	52.430	-0.968	0.000	0.06	2.243	0.3	373.8	OK
S4.008	S27	30 minute 100 year Summer I+45%	53.100	52.420	0.231	0.000	1.61	30.271	2.3	449.3	SURCHARGED*
S4.009	S28	30 minute 100 year Summer I+45%	52.450	51.792	-0.658	0.000	0.05	1.150	1.3	449.1	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S4.010	S29	30 minute 100 year Summer I+45%	51.463	50.430	-1.033	0.000	0.05	10.792	0.3	435.3	OK
S6.000	S30	15 minute 100 year Summer I+45%	70.727	70.298	-0.429	0.000	0.02	0.066	0.6	29.1	OK
S6.001	S31	15 minute 100 year Summer I+45%	68.175	67.787	-0.388	0.000	0.04	0.165	1.0	91.5	OK
S6.002	S32	15 minute 100 year Summer I+45%	63.360	63.035	-0.325	0.000	0.10	0.351	1.1	189.6	OK
S6.003	S33	15 minute 100 year Summer I+45%	60.688	60.385	-0.303	0.000	0.12	0.504	1.2	242.0	OK
S6.004	S34	15 minute 100 year Summer I+45%	59.589	59.332	-0.257	0.000	0.19	0.789	1.2	362.8	FLOOD RISK*
S6.005	S35	15 minute 100 year Summer I+45%	57.748	57.542	-0.206	0.000	0.28	1.210	1.4	526.3	FLOOD RISK*
S6.006	S36	15 minute 100 year Summer I+45%	54.630	54.486	-0.144	0.000	0.44	1.955	1.5	781.3	FLOOD RISK*
S6.007	S37	15 minute 100 year Summer I+45%	52.454	52.365	-0.089	0.000	0.62	2.817	1.2	850.7	FLOOD RISK*
S6.008	S38	15 minute 100 year Summer I+45%	51.623	51.651	0.028	28.242	0.95	35.632	0.8	761.9	FLOOD
S6.009	S39	30 minute 100 year Summer I+45%	51.023	51.024	0.001	1.273	0.49	38.294	0.7	732.2	FLOOD
S6.010	S40	30 minute 100 year Summer I+45%	50.999	51.019	0.170	19.797	0.97	23.856	3.5	602.8	FLOOD
S4.011	S41	30 minute 100 year Summer I+45%	50.677	50.388	-0.289	0.000	0.44	160.391	0.5	935.5	FLOOD RISK*
S4.012	S42	30 minute 100 year Summer I+45%	50.340	50.380	0.355	40.628	1.19	63.495	4.0	790.1	FLOOD
S4.013	S43	30 minute 100 year Summer I+45%	49.116	49.009	-0.107	0.000	0.56	1.154	1.2	806.9	FLOOD RISK*
S4.014	S44	30 minute 100 year Summer I+45%	47.996	47.879	-0.117	0.000	0.53	3.560	1.4	866.0	FLOOD RISK*
S4.015	S45	30 minute 100 year Summer I+45%	46.939	46.872	-0.067	0.000	0.69	3.848	1.3	1002.2	FLOOD RISK*
S4.016	S46	30 minute 100 year Summer I+45%	45.056	44.965	-0.091	0.000	0.62	3.991	1.5	1069.6	FLOOD RISK*
S7.000	S47	240 minute 100 year Summer I+45%	44.896	43.353	-0.343	0.000	0.03	0.152	0.8	9.1	OK*
S7.001	S48	240 minute 100 year Summer I+45%	44.489	43.352	-0.012	0.000	0.03	25.139	0.0	2.6	OK*
S4.017	S49	30 minute 100 year Summer I+45%	44.235	43.328	-0.907	0.000	0.05	5.403	1.8	1145.1	OK
S8.000	S50	15 minute 100 year Summer I+45%	46.970	46.581	-0.389	0.000	0.04	0.106	0.7	67.3	OK
S8.001	S51	15 minute 100 year Summer I+45%	45.808	45.444	-0.364	0.000	0.06	0.290	0.7	82.4	OK
S8.002	S52	15 minute 100 year Summer I+45%	45.000	44.661	-0.339	0.000	0.08	0.578	1.1	168.0	OK
S9.000	S53	15 minute 100 year Summer I+45%	44.685	44.686	1.201	0.212	1.23	2.855	2.1	146.3	FLOOD

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S9.001	S54	15 minute 100 year Summer I+45%	43.975	43.607	0.832	0.000	3.11	4.978	2.1	141.4	SURCHARGED
S8.003	S55	60 minute 100 year Winter I+45%	43.770	43.259	-0.511	0.000	0.02	12.474	0.3	158.0	OK
S8.004	S56	60 minute 100 year Winter I+45%	43.726	43.259	-0.467	0.000	0.05	5.580	0.3	165.7	OK
S8.005	S57	60 minute 100 year Winter I+45%	43.537	43.259	-0.278	0.000	0.02	44.082	1.0	223.9	FLOOD RISK*
S4.018	S58	60 minute 100 year Winter I+45%	43.137	43.256	2.091	119.361	1.53	472.781	4.1	810.6	FLOOD
S4.019	S59	30 minute 100 year Winter I+45%	42.470	40.583	0.000	0.000	2.32	6.200	4.2	829.2	SURCHARGED*
S4.020	S60	60 minute 100 year Summer I+45%	41.320	40.791	0.471	0.000	1.64	957.489	3.1	613.0	SURCHARGED*
S4.021	S61	120 minute 100 year Summer I+45%	41.130	40.030	0.000	0.000	0.95	1.402	3.7	608.2	SURCHARGED*
S4.022	S62	120 minute 100 year Summer I+45%	39.910	39.174	0.264	0.000	1.86	1546.284	2.1	410.3	SURCHARGED*
S4.023	S63	180 minute 100 year Summer I+45%	39.800	38.709	-0.143	0.000	0.86	1.210	2.8	418.2	OK*
S4.024	S64	480 minute 100 year Summer I+45%	38.972	38.378	0.406	0.000	0.60	2787.708	1.9	132.6	SURCHARGED*
S4.025	S65	15 minute 100 year Summer I+45%	38.858	37.650	-0.280	0.000	0.40	0.458	3.2	267.7	OK*
S4.026	S66	960 minute 100 year Summer I+45%	37.979	37.410	0.431	0.000	0.48	2349.335	0.4	70.8	SURCHARGED*
S4.027	S67	960 minute 100 year Summer I+45%	37.847	36.613	-1.234	0.000	0.01	0.410	0.5	70.8	OK
S4.028	S68	960 minute 100 year Summer I+45%	36.000	35.729	-0.271	0.000	0.13	2.028	0.3	70.8	FLOOD RISK*

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 5 Number of Real Time Controls 0

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

Rainfall file(s) analysed

30 year 1440 plus 10 year 1440 Winter

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S4.000	S1	30 year 1440 plus 10 year 1440 Winter	71.685	71.200	-0.485	0.000	0.00	0.010	0.3	2.1	OK
S4.001	S2	30 year 1440 plus 10 year 1440 Winter	68.030	67.548	-0.482	0.000	0.00	0.016	0.3	3.3	OK
S4.002	S3	30 year 1440 plus 10 year 1440 Winter	62.241	61.762	-0.479	0.000	0.00	0.019	0.3	3.7	OK
S4.003	S4	30 year 1440 plus 10 year 1440 Winter	60.676	60.197	-0.479	0.000	0.00	0.020	0.3	3.8	OK
S4.004	S5	30 year 1440 plus 10 year 1440 Winter	59.496	59.018	-0.478	0.000	0.00	0.022	0.3	4.1	OK
S4.005	S6	30 year 1440 plus 10 year 1440 Winter	58.056	57.581	-0.475	0.000	0.00	0.025	0.3	5.0	OK
S4.006	S7	30 year 1440 plus 10 year 1440 Winter	54.759	54.284	-0.475	0.000	0.00	0.025	0.4	5.7	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S4.007	S8	30 year 1440 plus 10 year 1440 Winter	53.337	52.258	-1.079	0.000	0.00	0.020	0.2	5.7	OK
S5.000	S9	30 year 1440 plus 10 year 1440 Winter	85.259	84.775	-0.484	0.000	0.00	0.011	0.2	2.2	OK
S5.001	S10	30 year 1440 plus 10 year 1440 Winter	83.968	83.503	-0.465	0.000	0.00	0.038	0.2	4.2	OK
S5.002	S11	30 year 1440 plus 10 year 1440 Winter	83.508	83.052	-0.456	0.000	0.01	0.173	0.3	8.2	OK
S5.003	S12	30 year 1440 plus 10 year 1440 Winter	81.969	81.513	-0.456	0.000	0.01	0.113	0.4	12.3	OK
S5.004	S13	30 year 1440 plus 10 year 1440 Winter	80.278	79.818	-0.460	0.000	0.01	0.044	0.7	18.0	OK
S5.005	S14	30 year 1440 plus 10 year 1440 Winter	72.346	71.892	-0.454	0.000	0.01	0.051	0.7	21.0	OK
S5.006	S15	30 year 1440 plus 10 year 1440 Winter	64.676	64.229	-0.447	0.000	0.01	0.060	0.6	22.0	OK
S5.007	S16	30 year 1440 plus 10 year 1440 Winter	61.433	60.570	-0.862	0.000	0.00	0.070	0.5	22.5	OK
S5.008	S17	30 year 1440 plus 10 year 1440 Winter	58.910	58.557	-0.353	0.000	0.06	0.381	0.2	23.1	OK
S5.009	S18	30 year 1440 plus 10 year 1440 Winter	60.624	58.492	-2.132	0.000	0.00	0.848	0.2	23.7	OK
S5.010	S19	30 year 1440 plus 10 year 1440 Winter	62.052	58.449	-3.603	0.000	0.00	0.193	0.1	24.8	OK
S5.011	S20	30 year 1440 plus 10 year 1440 Winter	63.542	58.388	-5.154	0.000	0.00	0.196	0.0	27.9	OK
S5.012	S21	30 year 1440 plus 10 year 1440 Winter	63.064	58.290	-4.774	0.000	0.00	0.187	0.1	28.2	OK
S5.013	S22	30 year 1440 plus 10 year 1440 Winter	62.863	58.274	-4.589	0.000	0.00	0.182	0.1	29.9	OK
S5.014	S23	30 year 1440 plus 10 year 1440 Winter	59.987	58.097	-1.890	0.000	0.00	0.078	0.4	30.3	OK
S5.015	S24	30 year 1440 plus 10 year 1440 Winter	56.635	55.525	-1.110	0.000	0.00	0.074	0.7	30.7	OK
S5.016	S25	30 year 1440 plus 10 year 1440 Winter	54.124	52.570	-0.380	0.000	0.13	0.143	0.9	30.8	OK*
S5.017	S26	30 year 1440 plus 10 year 1440 Winter	53.398	51.884	-1.514	0.000	0.01	0.222	0.2	31.1	OK
S4.008	S27	30 year 1440 plus 10 year 1440 Winter	53.100	51.809	-0.380	0.000	0.13	0.330	1.0	36.8	OK*
S4.009	S28	30 year 1440 plus 10 year 1440 Winter	52.450	51.604	-0.846	0.000	0.00	0.141	0.7	36.8	OK
S4.010	S29	30 year 1440 plus 10 year 1440 Winter	51.463	49.900	-1.563	0.000	0.00	0.232	0.2	37.0	OK
S6.000	S30	30 year 1440 plus 10 year 1440 Winter	70.727	70.235	-0.492	0.000	0.00	0.003	0.2	0.9	OK
S6.001	S31	30 year 1440 plus 10 year 1440 Winter	68.175	67.690	-0.485	0.000	0.00	0.012	0.3	2.5	OK
S6.002	S32	30 year 1440 plus 10 year 1440 Winter	63.360	62.885	-0.475	0.000	0.00	0.025	0.4	5.2	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S6.003	S33	30 year 1440 plus 10 year 1440 Winter	60.688	60.216	-0.472	0.000	0.00	0.029	0.4	6.6	OK
S6.004	S34	30 year 1440 plus 10 year 1440 Winter	59.589	59.126	-0.463	0.000	0.01	0.040	0.4	9.9	OK
S6.005	S35	30 year 1440 plus 10 year 1440 Winter	57.748	57.294	-0.454	0.000	0.01	0.052	0.5	14.6	OK
S6.006	S36	30 year 1440 plus 10 year 1440 Winter	54.630	54.188	-0.442	0.000	0.01	0.066	0.6	21.9	OK
S6.007	S37	30 year 1440 plus 10 year 1440 Winter	52.454	52.024	-0.430	0.000	0.02	0.081	0.5	23.9	OK
S6.008	S38	30 year 1440 plus 10 year 1440 Winter	51.623	51.228	-0.395	0.000	0.04	0.232	0.3	29.1	OK
S6.009	S39	30 year 1440 plus 10 year 1440 Winter	51.023	50.476	-0.547	0.000	0.02	0.472	0.4	29.1	OK
S6.010	S40	30 year 1440 plus 10 year 1440 Winter	50.999	50.418	-0.431	0.000	0.05	0.080	1.8	29.1	OK*
S4.011	S41	30 year 1440 plus 10 year 1440 Winter	50.677	49.776	-0.901	0.000	0.03	9.323	0.2	66.2	OK
S4.012	S42	30 year 1440 plus 10 year 1440 Winter	50.340	49.632	-0.393	0.000	0.10	0.352	2.2	68.6	OK*
S4.013	S43	30 year 1440 plus 10 year 1440 Winter	49.116	48.740	-0.376	0.000	0.05	0.174	0.7	72.5	OK
S4.014	S44	30 year 1440 plus 10 year 1440 Winter	47.996	47.615	-0.381	0.000	0.05	0.220	0.7	75.5	OK
S4.015	S45	30 year 1440 plus 10 year 1440 Winter	46.939	46.570	-0.369	0.000	0.06	0.268	0.7	81.6	OK
S4.016	S46	30 year 1440 plus 10 year 1440 Winter	45.056	44.678	-0.378	0.000	0.05	0.239	0.8	84.5	OK
S7.000	S47	30 year 1440 plus 10 year 1440 Winter	44.896	43.203	-0.493	0.000	0.00	0.002	0.2	1.0	OK*
S7.001	S48	30 year 1440 plus 10 year 1440 Winter	44.489	43.100	-0.264	0.000	0.01	6.123	0.0	0.9	OK*
S4.017	S49	30 year 1440 plus 10 year 1440 Winter	44.235	43.052	-1.183	0.000	0.00	0.586	0.9	88.6	OK
S8.000	S50	30 year 1440 plus 10 year 1440 Winter	46.970	46.485	-0.485	0.000	0.00	0.010	0.2	2.0	OK
S8.001	S51	30 year 1440 plus 10 year 1440 Winter	45.808	45.327	-0.481	0.000	0.00	0.018	0.2	2.4	OK
S8.002	S52	30 year 1440 plus 10 year 1440 Winter	45.000	44.523	-0.477	0.000	0.00	0.040	0.4	4.7	OK
S9.000	S53	30 year 1440 plus 10 year 1440 Winter	44.685	43.223	-0.262	0.000	0.04	0.058	0.9	4.6	OK
S9.001	S54	30 year 1440 plus 10 year 1440 Winter	43.975	42.543	-0.232	0.000	0.10	0.144	0.4	4.6	OK
S8.003	S55	30 year 1440 plus 10 year 1440 Winter	43.770	42.495	-1.275	0.000	0.00	0.456	0.1	9.7	OK
S8.004	S56	30 year 1440 plus 10 year 1440 Winter	43.726	42.488	-1.239	0.000	0.00	0.106	0.1	10.2	OK
S8.005	S57	30 year 1440 plus 10 year 1440 Winter	43.537	42.407	-1.130	0.000	0.00	0.054	0.5	14.0	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S4.018	S58	30 year 1440 plus 10 year 1440 Winter	43.137	40.816	-0.349	0.000	0.20	0.218	2.1	105.2	OK*
S4.019	S59	30 year 1440 plus 10 year 1440 Winter	42.470	40.268	-0.315	0.000	0.30	0.378	1.6	105.8	OK*
S4.020	S60	30 year 1440 plus 10 year 1440 Winter	41.320	39.997	-0.323	0.000	0.27	151.154	1.6	102.6	OK*
S4.021	S61	30 year 1440 plus 10 year 1440 Winter	41.130	39.666	-0.364	0.000	0.17	0.185	2.5	106.8	OK*
S4.022	S62	30 year 1440 plus 10 year 1440 Winter	39.910	38.636	-0.274	0.000	0.42	427.768	1.1	93.0	OK*
S4.023	S63	30 year 1440 plus 10 year 1440 Winter	39.800	38.503	-0.349	0.000	0.20	0.351	2.0	98.1	OK*
S4.024	S64	30 year 1440 plus 10 year 1440 Winter	38.972	37.897	-0.075	0.000	0.28	1243.282	1.6	62.7	OK*
S4.025	S65	30 year 1440 plus 10 year 1440 Winter	38.858	37.534	-0.396	0.000	0.10	0.148	2.2	65.1	OK*
S4.026	S66	30 year 1440 plus 10 year 1440 Winter	37.979	36.972	-0.007	0.000	0.32	1179.015	0.2	46.6	OK*
S4.027	S67	30 year 1440 plus 10 year 1440 Winter	37.847	36.586	-1.261	0.000	0.00	0.283	0.5	46.6	OK
S4.028	S68	30 year 1440 plus 10 year 1440 Winter	36.000	35.695	-0.305	0.000	0.09	1.353	0.2	46.6	OK

Appendix G: Pre-application Advice

Essex County Council
Development and Flood Risk
Waste & Environment
E3 County Hall
Chelmsford
Essex CM1 1QH

Essex County Council

Date: 12th January 2023
Our Ref SUDS-006477

Dear Ms Moulson,

Pre-application Response – SUDSPA473054722 - Hole Farm Community Woodland

Thank you for contacting us for pre-application advice which provides Essex County Council (ECC) with the opportunity to assess and advise on the proposed surface water drainage strategy for the aforementioned planning application.

As the Lead Local Flood Authority (LLFA) ECC provides advice on SuDS schemes for major developments. ECC have been statutory consultee on surface water since the 15th April 2015.

In providing advice this Council looks to ensure sustainable drainage proposals comply with the required standards as set out in the following documents:

- Non-statutory technical standards for sustainable drainage systems
- Essex County Council's (ECC's) adopted Sustainable Drainage Systems Design Guide
- The CIRIA SuDS Manual (C753)
- BS8582 Code of practice for surface water management for development sites.

Lead Local Flood Authority position

After reviewing the submitted documents please see a summary of our comments below:

ECC is statutory consultee to ensure the adoption of sustainable ways of surface water management where above ground storage is our preferred option when considering drainage strategies for new developments. Above ground storage options maximize the amenity and biodiversity benefits of SUDS. It is preferable that these are implemented throughout the development and integrated into the proposed landscaping as extensively as practicable.

Overall Drainage Strategy

Overall the drainage strategy is acceptable but there were a few king things that we discussed that need to be altered or considered moving forward. The first point was that the climate change allowance needs to be changed from 25% to 45%. In line with the drainage hierarchy we discussed the importance of utilising rainwater reuse wherever possible. Although infiltration is unlikely based on the soil types this will need to be confirmed with infiltration testing. Discharge rates and water treatment were all acceptable. Adoption by Forestry England was discussed but this will be confirmed at a later stage. Detailed modelling and calculations will be required but the principles of the drainage scheme proposed are acceptable.

Flood Risk Assessment

A flood risk assessment should consider all forms of flood risk.

These include:

- Flooding from the sea or tidal flooding;
- Flooding from land;
- Flooding from groundwater;
- Flooding from sewers; and
- Flooding from reservoirs, canals, and other artificial sources.

It should be considered how any existing flood risk will interact with the proposed development and associated drainage scheme.

Run off Destinations

Surface water run- off should be disposed of in line with the discharge hierarchy and should be investigated in the below order:

- Rainwater reuse
- Discharge via infiltration
- A hybrid Approach
- Discharge to a watercourse/surface water body
- Discharge to a surface water sewer
- Discharge to a combined sewer

Rainwater re-use

In line with the updated 2020 Essex County Council SuDS Design Guide, rainwater re-use should be considered as part of any development. If this is not proposed as part of an application a clear explanation should be provided to demonstrate why this is not a viable option of source control on site. Essex is likely to experience increasing water scarcity in the near future so rainwater re-use needs to be strongly considered as part of any application for larger sites, however it should also be

considered for smaller sites. If rainwater re-use is excluded without explanation, then the ECC SuDS team will ask for further information. For more detailed advice please read the following section in our new design guide:
[redacted]

Infiltration

If infiltration is proposed, groundwater testing and infiltration testing in line with BRE 365 will need to be submitted to show that infiltration is feasible. Any infiltration storage devices should have 1m between the base of the storage device and seasonal high groundwater level.

If infiltration is unlikely to be possible at the site due to ground conditions, then we will still require high level ground investigations in order to prove that this is not a viable option.

Where the sites have some infiltration capacity, but rates are too low to achieve full infiltration results. We recommend to design hybrid infiltration solution, which uses low level infiltration for smaller events and pipe outfall for larger events. The minimum acceptable rate of infiltration to design soakaway is 1 $x10-^{6}$.

Watercourse or Sewer

If discharge to a watercourse or sewer is proposed, it must be ensured that the site discharges at a suitable rate and any appropriate permissions are in place. Details in regards to the level of the outfall in relation surface water in the outfall feature should also be submitted.

Where the discharge is to a watercourse, the outfall should be above the 1 in 100 plus climate change level or alternatively the effect of surcharging of the outfall should be modelled and appropriate measures should be put in place.

Peak Flow

If following the discharge hierarchy infiltration is not found to be feasible on site, discharge from the site should be limited to the Greenfield 1 in 1 year rate for all storm events up to and including the 1 in 100 (plus climate change) storm event.

Alternatively, surface water can be discharged at equivalent Greenfield rates with the inclusion of long-term storage. Information would need to be provided about the values used to calculate this rate and these would be reviewed on submission.

Please also note that we do not accept a flat rate of 5l/s discharging from the site if the Greenfield 1 in1 year rate is below 5l/s. Historically 5l/s was applied to an outlet where Qbar was lower than 5l/s, as most devices would require an outlet orifice size smaller than 50mm, which would increase the susceptibility of blockage and failure.

There are now vortex flow control devices which can be designed to discharge at 1l/s, with 600mm shallow design head and still provide more than a 50mm diameter orifice. Furthermore, it is expected that appropriate measures should be put in place to remove materials that are likely to cause blockage before they reach the flow control device.

Storage requirements

It should be demonstrated how surface water up to the 1 in 100 year plus climate change event is managed within the development.

The Environment Agency updated their climate change allowance in May 2020 and we require the design to be to the upper end allowance (i.e. 40%, 45% which is applicable), unless this can be shown to make the development unviable, in which case the central allowance should be used with a sensitivity analysis carried out for the effects of the upper allowance. Please see the following link for more information on revised climate change allowances: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Furthermore a 10% allowance in storage calculations should be provided for urban creep on roof areas. Details regarding the half-drain time of any storage device should also be submitted for review which, in this instance could be demonstrated by the 1 in 30yr +CC RP, followed by the 1 in 10yr RP storm event as necessary. Half drain time should be calculated as per 30 year rainfall intensity allowance updated by Environment agency.

As part of the planning application, detailed calculations considering a range of summer and winter storms should be submitted for storage requirements.

Please note if storage is placed in a path of a surface water flow that comes from off site, it should be demonstrated that any storage features will be sized appropriately for surface water created by the site and off site flows that may enter the storage features.

Water Quality

There should be treatment in line with Chapter 26 of the CIRIA SuDS Manual C753 for all areas of the site.

Whether the site is considered a medium or low pollutant risk depends on the traffic movements expected on the development. If the development is expected to have over 300 traffic movements then the medium pollution indices should be applied whereas the low pollution indices should be applied if less than 300 daily traffic movements are expected.

Considering impact of water pollution, in line with Paragraph 174 of the NPPF, priority should be given to SuDS and all SuDS options should be explored. If proprietary features are used however, it should be shown how these features will provide enough treatment in terms of total suspended solids, hydrocarbons and metals in line with Chapter 26.

It should be noted that trapped gullies and catch pits are generally not considered appropriate forms of pollution mitigation because of the high risk of remobilisation of pollutants using this method of treatment.

Residual Flood Risk

As part of any planning application it should be ensured that surface water is managed so that there is no flooding in a 1 in 30 year storm event and no internal flooding in a 1 in 100 year, inclusive of climate change storm event. Detail should also be given in regards to exceedance routes above the critical 1 in 100 year, inclusive of climate change storm event, which should be directed away from properties.

Maintenance and Adoption

The on-going maintenance of any features will be necessary to ensure that flooding does not occur due to failure of components. A maintenance plan should be provided as part of the planning application process detailing the maintenance activities and frequencies as well as who will be maintaining the system.

We understand that Anglian Water do adopt SuDS schemes within this region upon a scheme meeting their Adoption Criteria. If you intend to have them adopt your scheme, you will also need to provide proof that you have sent an Expression of Interest to them, or an Approval in Principle of your design.

Additional comments:

For a summary of what we require and when, please see the following link: [redacted]

Our ECC suds design guide 2020 can be found at the following link: [redacted]

Our ECC new suds proforma can be found at the following link: [redacted]

At some point during the planning stage, you would need to show how surface water will be managed during the construction phase.

You would also need to demonstrate how surface water impacts on the drainage system before and after development, and how the new development improves existing land drainage or surface water management.

Under Section 23 of the Land Drainage act (1991) any proposed structure that impacts on the cross-sectional area of a watercourse will require Ordinary Watercourse consent to be sought from Essex County Council. Such applications are separate from and are required in addition to the planning process.

Please note:

The advice provided by the Council's Officers is informal opinion only and is made without prejudice to any formal decision that may be given in the event of an application being submitted.

In particular, any advice given will not constitute a formal response or recommendation of the County Council. Any views of opinions expressed are in good faith and to the best of ability, without prejudice to the formal consideration of any application, which will ultimately be decided by the Local Planning Authority. The County Council cannot guarantee that new issues will not be raised following submission of a planning application and consultation upon it.

Officers cannot give guarantees about the final formal decision that will be made on planning or related applications. However, the advice contained within the written response will be considered by officers when considering any future planning application. This is subject to the proviso that circumstances and information may change or come to light that could alter the position. It should be noted that the weight given to pre-application advice will change if new material considerations arise.

Whilst we have no further comments at this stage, we strongly recommend you engage in pre-application consultation with any other organisations that maybe relevant to the proposed drainage strategy to avoid potential delays at the application stage. If you have any queries about any advice we have given please do not hesitate to contact us.

Yours sincerely,

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