MEC
Development Technical Consultants

FLOOD RISK & DRAINAGE



The Common, Fritchley, Derbyshire
Flood Risk Assessment
December 2023

Report Ref: 26939-FLD-0101

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Flood Risk Assessment
December 2023

REPORT REF: 26939-FLD-0101

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EXECUTIVE SUMMARY

Site Address	The Common, Fritchley, Derbyshire, DE56 2HZ, Grid Ref: E:435265, N:352918
Site Description and Setting	The site covers an approximate area of 0.88ha and comprises agricultural land. It is located 16.6km to the north of Derby. The site is bound to the north by The Common carriageway, to the east by existing residential dwellings, to the south by the Chadwick Nick Lane carriageway and to the west by agricultural land.
Proposed Development	The proposed development is for approximately 17 dwellings with associated infrastructure, parking and access to The Common.
Fluvial Flood Risk and Mitigation	The Flood Map for Planning shows the site is located within Flood Zone 1. Flood Zone 1 is defined as land assessed as having an annual probability of river flooding of less than 1%. As the site is located wholly within Flood Zone 1, mitigation measures are not required.
Surface Water Flood Risk and Mitigation	The Environment Agency Flood Risk from Surface Water Map indicates that the majority of the site is at very low risk from surface water flooding. The centre of the site is at low to medium risk of surface water flooding, due to the presence of a groundwater spring. Detailed surface water modelling results show that during the 3.3% AEP event, there is no flooding expected on-site. During the 1%AEP event and the 0.1% AEP event there is a small amount of flooding through the centre of the site with depths of up to 150mm and a velocity of up to 2m/s. The maximum hazard rating is very low. The dwellings have been designed sequentially to avoid the areas at low to high risk of surface water flooding. Permeable paving will be utilised to avoid any ponding of surface water above the ground. Given the above, surface water is likely to be collected by the proposed site-wide drainage infrastructure and conveyed to a proposed discharge point on site. Therefore, the risk of flooding will be managed at the site.
Surface Water Drainage Strategy	In accordance with the National SuDS Standards, the strategy involves conveying surface water flows to an attenuation basin on-site, before discharging into the combined sewer within The Common, subject to agreement with Severn Trent Water. Surface water flows for an impermeable area of 0.119ha including urban creep will be conveyed to the proposed geo-cellular tank, with a total storage volume of 63.55m^3 required to manage flows generated for events up to and including the 1%AEP40CC storm event, at a discharge rate of 2l/s. Surface water flows for an impermeable area of 0.322ha including urban creep and attenuation from the geo-cellular tank, will be conveyed to the proposed attenuation basin, with a total storage volume of 296.63m^3 required to manage flows generated for events up to and including the 1%AEP40CC storm event at a discharge rate of 2l/s. The attenuation storage features should be lined to prevent groundwater ingress. Permeable paving will be utilised to ensure surface water flows are controlled at source, act as a first stage of treatment for the run-off and ensure adequate treatment is provided.
Foul Water Drainage Strategy	Sewer records show there are no public sewers within the site. There is a 225mm combined sewer along The Common and a 150mm combined sewer along Chadwick Nick Lane. Foul water flows from the site will discharge into the existing combined sewer within The Common, subject to agreement with Severn Trent Water. The peak foul flow rate arising as a result of the development has been estimated at approximately 0.85l/s, assuming a foul load rate of 0.05l/s.
Conclusions	With the mitigation measures discussed in the report, the new development does not exacerbate flood risk in the wider area. Compliance with the NPPF is therefore ensured.
This summary should be read in conjunction with the full report and reflects an assessment of the site based on information received by MEC at the time of production.	

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1.0 INTRODUCTION

1.1 MEC, has been commissioned by Harrison J & R (hereafter referred to as 'the Client') to undertake a Flood Risk Assessment for a proposed residential development at The Common, Fritchley, Derbyshire (hereafter referred to as 'the Site'). A site location plan is provided in Appendix A and a sketch masterplan contained within Appendix B.

1.2 The site covers an approximate area of 0.88ha and comprises of agricultural land. The proposed development is for approximately 17 dwellings with associated infrastructure, parking and access to The Common.

1.3 The assessment has been undertaken to ascertain the constraints of the development to the site and assess the impact of the design, concerning flood risk.

1.4 The Flood Risk Assessment has been carried out in accordance with the requirements of the documents below. See Appendix C for additional policies and references.

- National Planning Policy Framework (NPPF)
- National Planning Practice Guidance on Flood Risk & Coastal Change (PPG)
- Environment Agency Flood Risk Standing Advice

1.5 The assessment has been prepared using our best engineering judgement however there are levels of uncertainty implicit in the historical data and methods of analysis. The report is based on the following information:

- British Geological Survey (BGS);
- The Flood Map for Planning and the Long-term Flood Risk Map from the Environment Agency and .gov.uk websites; and
- Topographical survey by Terra (February 2019)
- Amber Valley Strategic Flood Risk Assessment Level 1 Report (June 2009).
- R&D Outputs: Flood Risks to People, Phase 2. FD2321/TRI The Flood Risks to People Methodology (March 2006).

1.6 The Local Planning Authority is Amber Valley Borough Council (AVBC) and the Lead Local Flood Authority for Fritchley is Derbyshire County Council (DCC). The site falls within the Severn Trent Water catchment.

Disclaimer

1.7 MEC has completed this report for the benefit of the individuals referred to in paragraph 1.1 and any relevant statutory authority which may require reference in relation to approvals for the proposed development. Other third parties should not use or rely upon the contents of this report unless explicit written approval has been gained from MEC.

1.8 MEC accepts no responsibility or liability for:

- The consequence of this documentation being used for any purpose or project other than that for which it was commissioned;
- The issue of this document to any third party with whom approval for use has not been agreed.

2.0 SITE DESCRIPTION

Site Location and Features

2.1 The Ordnance Survey National Grid Reference (NGR) for the centre of the site is Grid Ref: E:435265, N:352918. The development site comprised 0.88ha of agricultural land and is located circa 16.6km to the north of Derby. The site is bound to the north by The Common carriageway, to the east by existing residential dwellings, to the south by the Chadwick Nick Lane carriageway and to the west by agricultural land.



Topographic Data

2.2 Full details of the topographical survey are included in Appendix D. The information indicates that the site slopes gently from southwest to northeast with levels ranging from around 178.00m AOD to 159.64m AOD.

Flood Zone Maps & Flood Defence Data

2.3 Information relating to the current flood risk to the application site has been obtained from the Environment Agency and.gov.uk websites. There is no recorded evidence of flood defences in the vicinity of the site.

Watercourses & Hydrology

2.4 The closest designated Main River is the River Amber, situated approximately 978m to the southeast of the site. Cromford Canal is located approximately 1.14km south of the site.

2.5 There is a groundwater spring, situated within the centre of the northern boundary. The spring is currently used as a watering hole for livestock, with an overflow pipe directly crossing through the centre of the site, from the north to the south.

Historic Flooding

2.6 The EA Historic Maps show there are no known flood incidences within the vicinity of the site. Local observations show the site has previously flooded due to the presence of the groundwater spring and overland flow pipe.

Geological Data

2.7 Information published by the BGS indicates that the site is directly underlain by bedrock strata of the Bowland Shale Formation consisting of Mudstone, Siltstone and Sandstone. There are no superficial deposits.

Sewers

2.8 Sewer records were obtained from Severn Trent Water see Appendix E. The sewer records show there are no public sewers within the site. There is a 225mm combined sewer along The Common and a 150mm combined sewer along Chadwick Nick Lane.

Sites of Special Scientific Interest

2.9 The site is located 250m north of the Crich Chase Site of Special Scientific Interest (SSSI). The site comprises a mosaic of habitats including long-established semi-natural woodland and neutral and acid grasslands.

2.10 Cromford Canal, Shining Cliff Woods and Ambergate and Ridgeway Quarries are all also SSSIs, located within 2km of the site. The development will not affect the SSSIs.

3.0 FLOOD RISK TO SITE

Flood Zone Allocation

3.1 The Flood Map for Planning is shown in Figure 3.1. The map shows the site is located within Flood Zone 1. FZ1 is defined as land assessed as having an annual probability of river flooding of less than 1%.

Figure 3.1: Extract from Environment Agency's Flood Map for Planning (Rivers and Sea).



Surface Water Flooding Risk Allocation

3.2 The Environment Agency Flood Risk from Surface Water Map, refer to Figure 3.2, indicates that the majority of the site is at very low risk from surface water flooding. The centre of the site is at low to medium risk of surface water flooding, due to the presence of a groundwater spring.

Figure 3.2: Environment Agency's Flood Risk from Surface Water Map



Other Flooding Risk and other Allocation

3.3 Ambergate Reservoir was constructed in 2018 which is located 275m south of the proposed development. The Environment Agency Mapping shows that the site is not at risk from artificial sources, as such, the risk of flooding from artificial sources is very low.

3.4 Groundwater Vulnerability Mapping indicates the Bowland Shale Formation is a 'Secondary A' Aquifer. This classification is usually assigned to permeable layers capable of supporting water supplies at a local, rather than strategic scale, and in some cases forming an important source of base flows to rivers.

3.5 The site is not located within a Groundwater Source Protection Zone and the majority of the site is indicated to be at negligible risk of groundwater flooding. There is some risk of groundwater flooding from the spring, situated within the centre of the northern boundary, however, no development will be located in areas at risk.

3.6 According to the SFRA there is no record of any sewer flooding within the site vicinity.

4.0 FLOOD RISK ASSESSMENT

Flood Risk Assessment Methodology & Objectives

4.1 It is recognised that developments that are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works. Current guidance on development and flood risk identifies several key aims for development to ensure that it is sustainable in flood risk terms.

4.2 These aims are as follows:

- The development should not be at significant risk of flooding and should not be susceptible to damage due to flooding;
- The development should not be exposed to flood risk such that the health, safety and welfare of the users of the development, or the population elsewhere, are threatened;
- Safe access/egress to and from the development should be possible during flood events;
- The development should not increase flood risk elsewhere;
- The development should not prevent safe maintenance of watercourses or maintenance and operation of flood defences;
- The development should not be associated with an onerous or difficult operation and maintenance regime to manage flood risk. The responsibility for any operation and maintenance required should be clearly defined;
- Future users of the development should be made aware of any flood risk issues relating to the development;
- The development should not lead to the degradation of the environment; and
- The development should meet all of the above criteria for its entire lifetime, including consideration of the potential effects of climate change.

4.3 This Flood Risk Assessment is undertaken with due consideration of these sustainability aims and has been prepared to inform the proposed scheme.

Project Scope

4.4 In order to achieve the aims outlined above, this Flood Risk Assessment has been undertaken in accordance with current best-practice guidance, including the National Planning Practice Guidance. A scoping study was initially undertaken to identify all potential sources of flooding at the site, which may warrant further consideration. Any potential flooding issues identified in the scoping study have subsequently been considered within this Flood Risk Assessment. The aim of the scoping study is to review all available information and provide a qualitative assessment of the flood risk to the site and the impact of the site on flood risk elsewhere. The report has been undertaken with due regard to the EA's National Standing Advice on Development and Flood Risk.

Scoping Study

4.5 All potential sources of flooding must be considered for any proposed development.

4.6 Using the EA Flood Zone mapping, topographical survey and Ordnance Survey maps, a summary of the potential sources of flooding and a review of the potential risk posed by each source on the development area of the application site is presented in Table 4.1.

Table 4.1: Potential Risks posed by Flooding Sources in accordance with the gov.uk Long-Term Flood Risk Map

Source	Risk			
	High	Medium	Low	Very low
Fluvial				✓
Tidal				✓
Surface Water			✓	
Groundwater			✓	
Sewer				✓
Artificial water bodies				✓

Surface Water Flood Risk Mitigation

4.7 The Environment Agency Flood Risk from Surface Water Map, indicates that the majority of the site is at very low risk from surface water flooding. The centre of the site is at low to medium risk of surface water flooding, due to the presence of an groundwater spring.

4.8 Detailed surface water modelling information was downloaded from DEFRA Risk of Flooding from Surface Water Data Services. The results show that during the 3.3% AEP event, there is no flooding on-site. During the 1% AEP event and the 0.1% AEP event there is a small amount of flooding through the centre of the site with depths of up to 150mm and a velocity of up to 2m/s. The maximum hazard rating is very low.

4.9 No development should be located in areas of low to high risk of surface water flooding. Permeable paving will be utilised to avoid any ponding of surface water above the ground. Given the above, surface water is likely to be collected by the proposed site-wide drainage infrastructure and conveyed to a proposed discharge point on site. Therefore, the risk of flooding will be managed at the site.

4.10 Access and egress should be considered in regards to surface water flooding. The maps show The Common is susceptible to surface water flooding from the 1%AEP event and the 0.1% AEP event, with depths below 150mm and a velocity of up to 2m/s. Due to the nature of the development it is recommended that residents stay indoors during intense storm events. According to the R&D Outputs: Flood Risk to People Phase 2 (March 2006) report by the Environment Agency and HR Wallingford, emergency vehicles can travel in flood waters up to 1m deep and fire engines remain controllable in depths of 0.5m at up to 5m/s water flows. Therefore, in an emergency, the local emergency services would be able to reach the proposed development.

Vulnerability Classification of Proposed Development

4.11 The National Planning Practice Guidance: Flood Zone and Flood Risk Tables provide information on the vulnerability classification of various developments. The proposed residential development end use of this site falls in the "more vulnerable" classification. A comparison of the 'more vulnerable' use with the development proposals within Flood Zone 1 areas shows development proposals are acceptable and in accordance with NPPF, as shown in Table 4.2.

Table 4.2: Flood risk vulnerability and flood zone 'compatibility' from Flood Risk and Coastal Change – Planning Practice Guidance

Flood Risk Vulnerability classification		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test required	✓	x	Exception Test Required	✓
	Zone 3b 'Functional Floodplain'	Exception Test Required	✓	x	x	x

Key:

✓ Development is appropriate X Development should not be permitted

Sequential Test

4.12 According to National Planning Practice Guidance: Flood Zone and Flood Risk, the Sequential Test gives preference for locating new developments in low-risk areas from all sources of flooding. However, if there is no allocated land within the low-risk areas that meets the policy aims of the published Local Authority Local Plan or Local Development Framework then other sites in higher flood risk categories can be considered for that development.

4.13 The site lies wholly within Flood Zone 1. The majority of the site is at very low risk of surface water flooding, with the centre of the site at low to medium risk due to the presence of a groundwater spring and associated overflow pipe. Given the mitigation measures set out in sections 4.7 – 4.10 and the sequential design of the development, the sequential test is not required.

Exception Test

4.14 The proposed development is in accordance with NPPF and the exception test is not required. This is in accordance with paragraphs 163 to 168 of the NPPF and PPG.

5.0 SURFACE WATER MANAGEMENT STRATEGY

5.1 It is essential that the proposed development does not increase flood risk to adjacent land or downstream of the site, as well as protecting the development from flooding itself. To ensure that the flood risk is minimised, the drainage design will incorporate the following flood mitigation measures:

- Site levels will be designed to direct all overland surface water flows away from the dwellings flowing the natural topography of the land.
- The proposed development will include a surface water drainage system that will intercept runoff generated within the development. This will minimise the risk of flooding to the new buildings and also reduce the incidence of overland flows.
- The surface water drainage system will convey flows to an attenuation basin on site. The surface water flows generated within the development up to and including a 1%AEP40CC will be stored on-site and discharged at a minimum discharge rate of 2.0l/s.

Surface Water Outfall

5.2 Surface water arising from developed sites should, as far as practical, be managed in a sustainable manner to mimic the surface water flows arising from the undeveloped site. When considering the surface water discharge the SuDS hierarchy needs to be adhered to. The SuDS hierarchy states that the options below must be adhered to in order of sustainability or evidenced otherwise before moving down to a less sustainable discharge method;

- Discharge at source (soakaway)
- Watercourse or waterbody
- Public Sewer

Discharge at Source

5.3 Information published by the BGS indicates that the site is directly underlain by bedrock strata of the Bowland Shale Formation consisting of Mudstone, Siltstone and Sandstone. There are no superficial deposits. Due to the geology, infiltration is unlikely to be viable for the proposed development

Discharge to Watercourse

5.4 The closest designated Main River is the River Amber, situated approximately 978m to the southeast of the site. Any route to the river would cross third-party land and therefore it would be unfeasible to discharge into the River Amber.

Discharge to Sewers

5.5 Sewer records were obtained from Severn Trent Water see Appendix E. The sewer records show there are no public sewers within the site. There is a 225mm combined sewer along The Common and a 150mm combined sewer along Chadwick Nick Lane.

5.6 In accordance with the drainage hierarchy, surface water will discharge into the combined sewer along The Common, subject to agreement with Severn Trent Water.

Land Use

5.7 In order to calculate the drainage requirements an understanding of the land use on-site needs to be known. Table 5.1, below summarises the proposed land uses within the site. The site currently consists of agricultural land. The current land use has been calculated using the existing site plan and the post-development land use has been measured from the proposed layout.

Table 5.1: Land Use Summary

Land Use Type	Existing Site Areas		Proposed Site Areas	
	ha	%	ha	%
Impermeable Areas	0	0	0.401	46
Green Landscape / Permeable areas	0.890	100	0.489	54
Total	0.890	100	0.890	100

Urban Creep Allowances

5.8 Urban creep is the conversion of permeable surfaces to impermeable ones over time, e.g., extensions to existing buildings. It has been shown that, over the lifetime of development, urban creep can increase impermeable areas by as much as 10%. An allowance of 10% for increases in the impermeable area will be included in the drainage calculations and the calculated impermeable area will be 0.441ha, based on a 10% increase to the proposed values.

Climate Change Allowances

5.9 The influence of climate change on rivers and watercourses is likely to increase the frequency of flood events and the overall volume of water that passes the site. When considering surface water runoff from the site, the increase in peak rainfall intensity varies over the lifetime of the development. Where residential developments with a lifetime beyond the 2070s are proposed the Flood Risk Assessments: Climate Change Allowances Guidance requires the use of the Upper-End Allowance for the 2070s epoch (2061 to 2125), the upper end gives an expected increase of 40%, refer to Table 5.2.

Table 5.2: Peak Rainfall intensity allowance in small and urban catchments from the Flood Risk Assessments: Climate Change Allowances Guidance

	Total potential change anticipated for the '2050s' (2022 to 2060)		Total potential change anticipated for the '2070s' (2061 to 2125)	
Annual Exceedance Probability	Central	Upper End	Central	Upper End
3.3 % AEP	20%	35%	25%	35%
1 % AEP	20%	40%	30%	40%

Discharge Rate

5.10 Existing greenfield runoff conditions have been calculated using the FEH module within Flow Causeway. For an impermeable area of 0.401ha, the QBAR Greenfield Rate has been calculated as 1.5l/s. As this is a low discharge rate, that may create blockages in the system, a minimum discharge rate of 2.0l/s has been applied. Calculations for the greenfield rates can be found in Appendix F.

Drainage Strategy

5.11 The overall drainage strategy has been based on the land use table, discharge rates and storage requirements table and the current site layout presented in Appendix B. In accordance with the National SuDS Standards, the strategy involves conveying surface water flows to a geo-cellular tank and attenuation basin on-site, before discharging into the combined sewer within The Common, subject to agreement with STW.

5.12 Surface water flows for an impermeable area of 0.119ha, including an allowance for urban creep, will be conveyed to the proposed geo-cellular tank on site. A storage volume of 63.55m^3 is required within the proposed attenuation basin, to allow sufficient time for all surface water to discharge at a maximum discharge rate of 2.0l/s for all events up to the 1%AEP40CC.

5.13 Surface water flows for an impermeable area of 0.322ha, including an allowance for urban creep and flows from the geo-cellular tank will discharge into the proposed attenuation basin. A storage volume of 296.63m^3 is required within the proposed attenuation basin, to allow sufficient time for all surface water to discharge at a maximum discharge rate of 2.0l/s for all events up to the 1%AEP40CC. The storage features will be lined to prevent groundwater ingress from the existing spring. Groundwater monitoring should be undertaken in due course.

5.14 Due to the space available on site the attenuation basin has been designed using GeoGrow's Rootlok Vegetated Wall System. Rootlok Vegetated Wall System is a fully tested, soft engineered system providing flexible solutions that offer the same benefits of a hard engineered system. However, unlike hard revetment alternatives, the system offers many benefits some of which are outline below:

- A green solution with high performance levels
- Water moves and filters through the system rather than being redirected
- The system vegetates – roots grow within the structure to provide further structural support
- A long term and permanent solution – the vegetation protects the structure from UV degradation and the effects of harsh weather
- Enhances the natural environment – creates natural habitats providing real biodiversity gains
- Helps to reduce carbon footprint
- Has a 120-year design life

5.15 Using the GeoGrow's Rootlok will provide a better alternative to a gabion system and will allow enough space for long term maintenance and access to the proposed basin.

5.16 In addition to the proposed geo-cellular tank and attenuation basin, permeable paving will be proposed on-site within private roads and car parking spaces. These features will provide extra storage on-site, act as a first treatment stage for any run-off and will ensure adequate surface water treatment is provided. These features have been excluded from the calculations at this stage.

5.17 A drainage strategy based on the principles above is shown on drawing 26939_01_230_01a in Appendix G. It should be noted that these proposals are high-level at this stage and further refinement will be required as the development proposals evolve.

Applicable SuDS Techniques

5.18 The National Standards for Sustainable drainage systems (Ref. 16) that deals with SuDS cover a whole range of sustainable approaches to surface water drainage management including:

- source control measures including rainwater recycling and drainage;
- filter strips and swales, which are vegetated features that hold and drain water downhill mimicking natural drainage patterns;
- filter drains and porous pavements to allow rainwater and run-off to infiltrate into permeable material below ground and provide storage if needed; and
- basins and ponds to hold excess water after rain and allow controlled discharge that avoids flooding.

5.19 Each of the five SuDS considerations listed above is discussed below in Table 5.4, with reference to their suitability for the proposed development.

Table 5.4: Suitability of SuDS techniques

	COMPONENT	SUITABILITY	REASON
Source Control	Rainwater Harvesting	Yes	Water butts could be used to store run-off from roofs before discharge into the drainage system. Any storage is not to be included in calculations.
	Green Roofs	No	This would not be appropriate given the scope and scale of the development.
	Bio-retention Systems/ Rain Gardens	Yes	Rain Gardens could be used as standalone SuDS across the site but offer limited attenuation capacity. Therefore, they have not been included within the drainage strategy at this stage.
Proprietary Systems	Proprietary bio-retention systems	No	More appropriate SuDS features can be accommodated within the development and are preferred.
Infiltration Devices	Permeable Paving	Yes	Permeable paving is suitable for the proposed development within parking spaces and private roads.
	Infiltration trenches/ Soakaways	No	Infiltration is unlikely to be feasible at the proposed development.
Filtration	Open Swales, Filter Strips/ Drains	No	Swales would not be appropriate given the scope and scale of the development.
Retention/ Detention	Detention Basin, Attenuation Pond/ Tanks	Yes	The attenuation basin and geo-cellular tank will provide surface water storage and treatment prior to discharge from the site.

Surface Water Quality

5.20 The SuDS Manual CIRIA document C753 (Ref. 10), indicates the minimum treatment indices appropriate for contributing pollution hazards for different land use classifications. To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant) that equals or exceeds the pollution hazard index (see Table 5.5).

5.21 Surface water runoff from residential roofs will have a very low pollution hazard level, while the residential parking areas will have a low pollution hazard level. The exact pollution hazard levels are shown in Table 5.5.

Table 5.5: Pollution Hazard Indices (Extract from CIRIA 753 Table 26.2)

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, and low-traffic roads.	Low	0.5	0.4	0.4

5.22 To provide the correct level of treatment, an assessment needs to be made of the mitigation provided by each SuDS feature. This is shown in Table 5.6 below;

Table 5.6: SuDS Mitigation Indices (Extract from CIRIA 753 Table 26.3)

	Mitigation indices		
Type of SuDS component	**Total Suspended Solids**	**Metals**	**Hydrocarbons**
Permeable Paving	0.7	0.6	0.7
Attenuation Basin	0.7	0.7	0.5

5.23 For the very low and low pollution hazard levels generated at the site, the proposed permeable paving and attenuation basin would provide sufficient treatment in accordance with the Simple Index Method.

Exceedance and Flow Routing

5.24 The risk of overland flooding from adjacent land to dwellings is very low. The design of levels and features on the site will follow best practice by ensuring any overland flow on the site is routed safely away from dwellings and to areas of lowest risk on site. Any surcharging and subsequent flooding of sewers on or in the vicinity of the site will also be mitigated by the flood routing described above. As such the risk of flooding on site from exceedance events and flood flow routes is very low.

Maintenance and Management

5.25 An integrated approach to the maintenance and management of SuDS systems is a requirement of the NPPF and by the Flood & Water Management Act 2010. A maintenance and management plan aims to ensure that there is a clear understanding of drainage responsibilities and that a maintenance regime is implemented for all new drainage systems for the lifetime of the development, so they can continue to function as required.

5.26 All private drainage systems, including the SuDS features, will be maintained by landowners or by an appointed management company.

5.27 A proposed maintenance schedule which breaks down the maintenance requirements of the various proposed assets is shown in Appendix H.

6.0 FOUL WATER STRATEGY

6.1 According to The Building Regulations (2010), foul water drainage from new developments should be discharged into the following in order of priority:

- A public sewer, or;
- A private sewer communicating with a public sewer, or;
- A septic tank which has an appropriate form of secondary treatment, or;
- A cesspool.

6.2 Sewer records were obtained from Severn Trent Water see Appendix E. The sewer records show there are no public sewers within the site. There is a 225mm combined sewer along The Common and a 150mm combined sewer along Chadwick Nick Lane.

6.3 Foul water flows from the site will discharge into the existing combined sewer within The Common, subject to agreement with Severn Trent Water. The peak foul flow rate arising as a result of the development has been estimated at approximately 0.85l/s, assuming a foul load rate of 0.05l/s. The combined discharge rate is 2.85l/s. The proposed connection is shown on drawing 26939_01_230_01 in Appendix G.

7.0 CONCLUSION AND SUMMARY

7.1 MEC has been commissioned by Harrison J & R to undertake a Flood Risk Assessment for a proposed care home development at The Common, Fritchley, Derbyshire. This assessment has been undertaken to ascertain the constraints of the development to the site and to assess the impact of the design, with respect to flood risk.

- The development is located wholly within Flood Zone 1 and therefore compatible with a "more vulnerable" development in line with policy guidance.
- The majority of the site is at very low risk of surface water flooding. The centre of the site is at low to medium risk of surface water flooding, due to the presence of a groundwater spring.
- No development should be built over areas at high risk of surface water flooding.
- The risk of flooding from all other sources is low.
- In accordance with the National SuDS Standards, the strategy involves conveying surface water flows to a geo-cellular tank and an attenuation basin on site, before discharging via gravity into the existing combined water sewer, at a rate no greater than 2.0l/s.
- Surface water flows for an impermeable area of 0.119ha including urban creep will be conveyed to the proposed geo-cellular tank, with a total storage volume of 63.55m^3 required to manage flows generated for events up to and including the 1%AEP40CC storm event.
- Surface water flows for an impermeable area of 0.322ha including urban creep and attenuation from the geo-cellular tank, will be conveyed to the proposed attenuation basin, with a total storage volume of 296.63m^3 required to manage flows generated for events up to and including the 1%AEP40CC storm event.
- The attenuation storage features should be lined to prevent groundwater ingress. Due to the space available on site, the attenuation basin has been designed using GeoGrow's Rootlok Vegetated Wall System.
- Permeable paving will be utilised to ensure surface water flows are controlled at source, act as a first stage of treatment for the run-off and ensure adequate treatment is provided.
- Seven Trent Water sewer records show there is a 225mm combined sewer along The Common and a 150mm combined sewer along Chadwick Nick Lane. Foul water flows from the site will discharge into the existing combined sewer within The Common, via gravity, subject to agreement with Severn Trent Water. The combined discharge rate is 2.85l/s.

7.2 With the above measures in place, the development of the site will not create any flood risk issues to the wider area.

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APPENDICES



APPENDIX A

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The Old Chapel
Station Road
Hugglescote
Leicestershire
LE67 2GB

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SITE LOCATION PLAN

Project: The Common, Fritchley, Derbyshire

File Ref: 26939

O.S. Grid Ref: E:435265, N:352918.

Postcode: DE56 2HZ



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APPENDICES



APPENDIX B

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Sunny Side

The Briars

Robin Hill

Norway

THE COMMON

CRICH ROAD

FRITCHLEY LANE

El

Sub Sta

2

Holmfield

Broom Royd

Maris

Ridgemont

Rocklynn

Hill Rise

Ballantrae

House

Woodgate

Dane

Holme

The Haven

Bramble

Bage

DALE CLOSE

CHADWICK

NICK LANE

The Nook

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

1

7

12

14

17

21

A

B

C

D

E

F

G

N

1/500

Scale

metres

0 5 10 25

UNIT 1 & 2 WINDLEHILL FARM
TYTHE BARN LANE
SUTTON ON THE HILL
ASHBOURNE
DERBYSHIRE
DE6 5JH

E: enquiries@filerwilliamson.co.uk

T: 01283 734043

Filer Williamson LIMITED

CLIENT:
HARRISON J & R

ADDRESS:
THE COMMON, FRITCHLEY COMMON, DERBYSHIRE

DRAWING TITLE:
SITE PLAN

DATE:
NOV 2023

SCALE:
1/500 @ A2

DRAWING NUMBER:
FW 869 D01

REV A

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APPENDICES



APPENDIX C

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Policies and References

National Planning Policy Framework

The National Planning Policy Framework (Ref. 4) sets out the Government's objectives for the planning system and how there should be a 'Presumption in Favour of Sustainable Development and the planning system should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change.

The document seeks to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Reference should also be made to the Planning Practice Guidance (Ref. 17) which provides additional guidance on flood risk.

For the purposes of applying the National Planning Policy Framework, areas at risk from all sources of flooding are included. For fluvial (river) and sea flooding, this is principally land within Flood Zones 2 and 3. It can also include an area within Flood Zone 1 in which the Environment Agency has notified the local planning authority of having critical drainage problems.

Key elements from the document include

"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk…"

"Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding."

"When determining any planning applications, local planning authorities should ensure flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific risk assessment. Development should only be allowed in areas at risk of flooding where in light of this assessment (and the sequential and exception tests) it can be demonstrated that:

a) *Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*

b) *The development is appropriately flood resistant and resilient*

c) *It incorporates sustainable drainage systems unless there is clear evidence that this would be inappropriate;*

d) *Any residual risk can be safely managed; and*

e) *Safe access and escape plan routes are included where appropriate, as part of an agreed emergency plan."*

Flood and Water Management Act 2010

The Flood and Water Management Act 2010 (Ref. 19) gained Royal Assent on the 8th April 2010. The Flood and Water Management Act is the government's newest legislation to help improve flood risk management and ensure the security of water supplies in England and Wales. The Act updates legislation to ensure better protection from flooding, manage water more sustainably, improve public services and secure water resources during periods of drought. The Flood and Water Management Act helps to reduce flood risk by:

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- Clarifying who is responsible for managing all sources of flood risk.
- Encourage more sustainable forms of drainage in new developments.
- Makes it easier to resolve misconnections to sewers.

The Flood and Water Management Act imparts significant new roles and responsibilities on local authorities. County or unitary authorities are now classed as lead local flood authorities (LLFAs) who have responsibilities for managing local flood risk. The responsibilities of a LLFA include:

- Prepare and maintain a strategy for local flood risk management in their areas, coordinating views and activity with other local bodies and communities through public consultation and scrutiny, and delivery planning.
- Maintain a register of assets – these are physical features that have a significant effect on flooding in their area.
- Investigate significant local flooding incidents and publish the results of such investigations.
- Issue consents for altering, removing or replacing certain structures or features on ordinary watercourses.
- Play a lead role in emergency planning and recovery after a flood event.

Planning Practice Guidance on Flood Risk & Coastal Change – March 2014, updated August 2021
The Government's new planning policy on sustainable drainage systems came into effect on 6 April 2015. It expects local planning policies and decisions on planning applications relating to major development (those of 10 dwellings or more; or equivalent non-residential or mixed development) to ensure that sustainable drainage systems for the management of run-off are put in place unless demonstrated to be inappropriate. Lead Local Flood Authorities (LLFAs) have also been made statutory consultees and new non-statutory guidance has been published under the changes.

The changes follow a joint Defra/DCLG consultation on delivering SuDS published in September 2014 in which the Government dropped all the key provisions of Schedule 3 of the Flood & Water Management Act 2010 and SuDS Approval Bodies (SABs) in favour of passing the oversight of SuDS from county councils (who are also LLFAs) to local planning authorities. According to the new planning policy, local planning authorities are expected, when considering planning applications:

- To consult the relevant lead local flood authority on the management of surface water,
- To satisfy themselves that the proposed minimum standards of operation are appropriate, and
- To ensure through the use of planning conditions or planning obligations that there are clear arrangements in place for ongoing maintenance over the lifetime of the development.

The policy also states that the sustainable drainage system should be designed to ensure that the maintenance and operation requirements are economically proportionate.

Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems – 2015
The non-statutory technical standards for the design, maintenance and operation of sustainable drainage systems to drain surface water have been published by Defra. The standards apply to systems that drain surface water from housing, non-residential or mixed use developments for the lifetime of the developments. The non-statutory technical standards are to be used in conjunction with the National Planning Policy Framework, and Planning Practice Guidance on Flood Risk & Coastal Change.

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The following documents have been referred to in this report:

1 The Building Regulations 2015, Approved Document H.
2 Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code") - October 2019, updated June 2022.
3 Planning Practice Guidance – November 2016, updated August 2022.
4 National Planning Policy Framework - March 2012, updated July 2021
5 Civil Engineering Specification for the Water Industry, 7th Edition.
6 Flood Risk and Coastal Change Guidance – March 2014, updated August 2022.
7 Environment Agency Flood Risk Standing Advice.
8 Environment Agency 'Flood Risk Assessments – Climate Change Allowances' - February 2016., updated May 2022.
9 The SuDS Manual – CIRIA C753.
10 Interim Code of Practice for Sustainable Drainage Systems – National SuDS Working Group, July 2004.
11 Cranfield University Soilscapes Map - http://www.landis.org.uk/soilscapes/.
12 British Geological Survey – Geology of Britain viewer, http://mapapps.bgs.ac.uk /geologyofbritain/home.html.
13 FEH WebService – Centre for Ecology and Hydrology, https://fehweb.ceh.ac.uk/GB/map.
14 Design and analysis of urban storm drainage. The Wallingford Procedure Vol.1.
15 Institute of Hydrology Report No. 124 – Flood Estimation for small catchments.
16 Sustainable Drainage Systems – Non-statutory technical standards for sustainable drainage systems – March 2015.
17 Water Industry Act 1991.
18 Flood and Water Management Act 2010.

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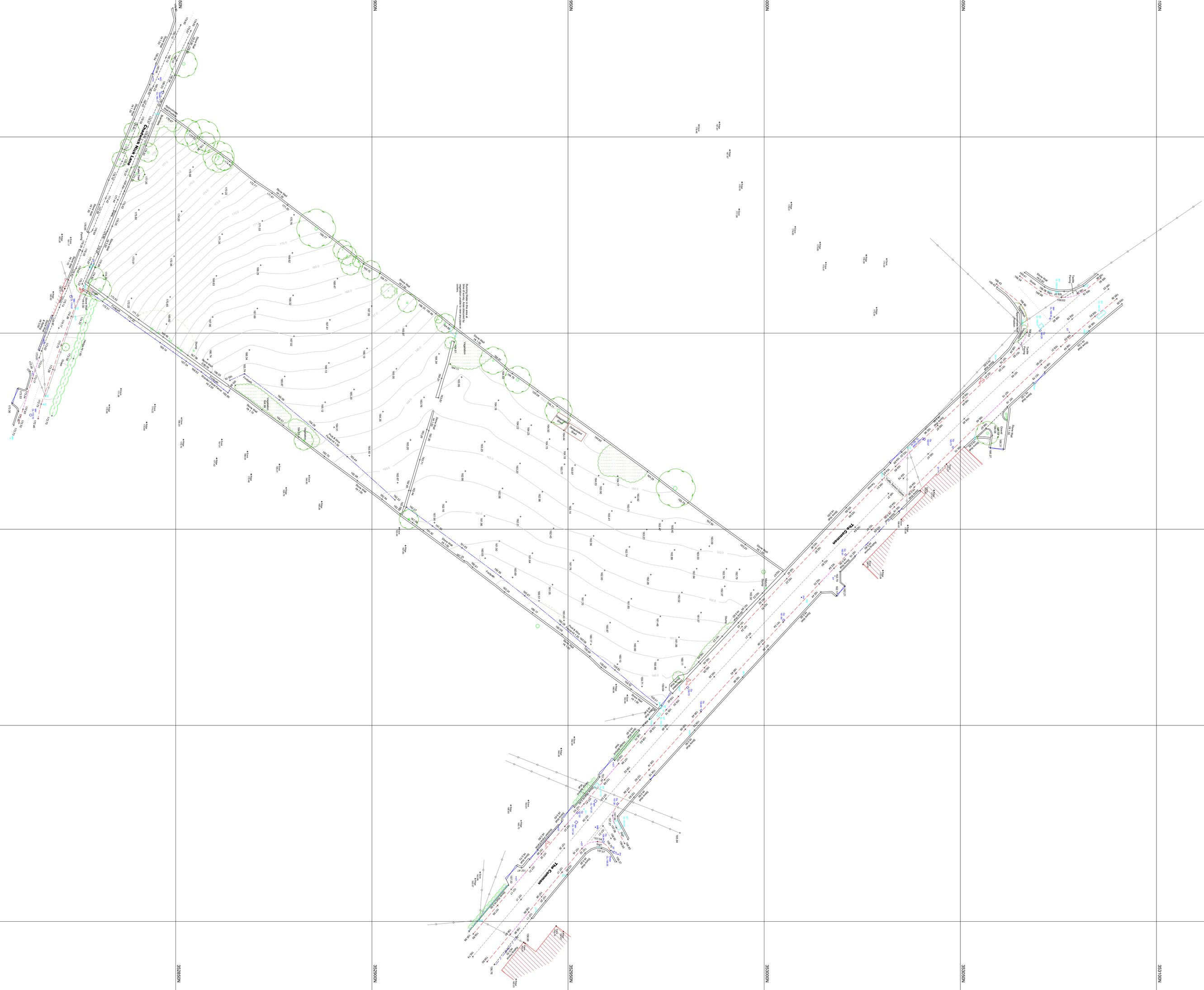
APPENDICES



APPENDIX D


358600N
358500N
358400N
358300N
358200N
358100N
358000N
357900N
435200E
435250E
435300E
435350E
435400E
The Common
Cowdale Main 1.1mm
Pipeline
Pipeline
Pipeline

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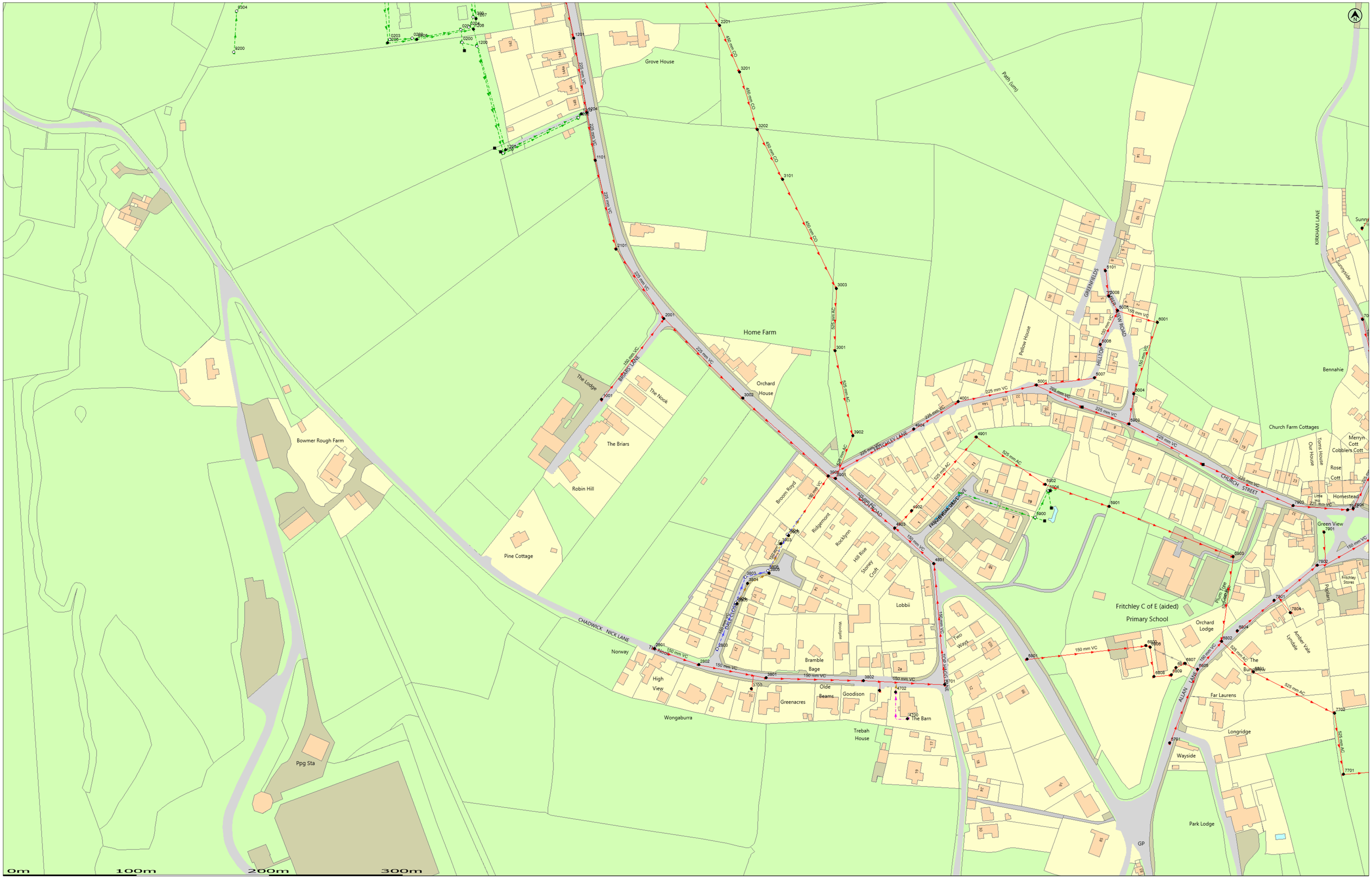
APPENDICES



APPENDIX E



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Date: 11/09/23

Scale: 1:1250

Map Centre: 435262,352983

Data updated: 14/08/23

Our Ref: 1268940 - 1

Wastewater Plan A1

Do not scale off this map. The plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems. Reproduction by permission of Ordnance Survey on behalf of HMSO. ©Crown Copyright and database rights 2023 All rights reserved. Ordnance Survey licence number 100031673. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and is subject to copyright, therefore, no further copies should be made from it.

Public Foul Gravity/Lateral Drain
Public Combined Gravity/Lateral Drain
Public Surface Water Gravity/Lateral Drain
Pressure Foul
Pressure Combined
Pressure Surface Water
Highway Drain
Overflow Pipe
Disposal Pipe
Culverted Water Course
Pumping Station
Fitting
Manhole Foul
Manhole Surface
Abandoned Pipe
Chamber
Section 104 sewers are shown in green
Private sewers are shown in magenta

emma.harris@m-ec.co.uk

26939

SEVERN TRENT

GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:
0800 783 4444 (24 hours)

a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991(a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as "STW Apparatus" in these general conditions and precautions.

b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.

c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.

d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.

e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).

f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.

2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).

3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.

4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.

5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.

6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.

7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.

8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.

9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.

10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.

11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.

12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.

13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,

14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

TREE PLANTING RESTRICTIONS

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.

16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.

17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May 2014

18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.

19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main of other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
	C		0	0
1001	C	172.94	171.4	1.54
1101	C	173.19	171.47	1.72
1201	C	175.09	173.41	1.68
1203	C		0	0
1204	C		173.41	0
2001	C	168.55	166.54	2.01
2101	C	171.08	169.35	1.73
2201	C	168.1	164.3	3.8
2801	C	174.85	173.38	1.47
2802	C	172.7	171.15	1.55
3001	C	157.53	152.88	4.65
3002	C		0	0
3003	C	160.09	158.11	1.98
3101	C	161.65	159.63	2.02
3201	C	165.77	162.64	3.13
3202	C	164.1	160.65	3.45
3700	C		0	0
3801	C	169.75	168.06	1.69
3802	C	161.95	160.21	1.74
3901	C	157.34	151.77	5.57
3902	C	156.24	152.12	4.12
3906	C	157.48	153.72	3.76
4001	C	149.7	147.93	1.77
4701	C	159.22	157.34	1.88
4801	C	155.57	154.11	1.46
4901	C	151.49	148.83	2.66
4902	C	154.53	150.39	4.14
4903	C	156.38	151.2	5.18
4904	C	152.45	150.82	1.63
5001	C	146.53	144.87	1.66
5004	C	139.44	138.29	1.15
5005	C	145.79	144.29	1.5
5006	C	147.57	146.54	1.03
5007	C		0	0
5008	C	146.86	145.91	0.95
5101	C	147.83	146.78	1.05
5801	C	148.41	147.36	1.05
5901	C		0	0
5902	C		0	0
5903	C	136.93	135.18	1.75
6001	C	139.81	138.96	0.85
6701	C		0	0
6800	C		147.36	0
6801	C	124.89	121.6	3.29
6802	C	127.99	124.85	3.14
6803	C	136.58	133.03	3.55
6804	C		0	0
6805	C	129.6	127.75	1.85
6806	C	136.39	135.04	1.35
6807	C	131.95	147.36	0
6808	C	135.31	133.42	1.89
6809	C	133.78	131.44	2.34
6810	C	132.1	130.96	1.15
7003	C	116.36	114.6	1.76
7100	C		0	0
7701	C	117.18	114.75	2.43
7702	C	117.92	116.21	1.71
7801	C	123.65	0	0
7802	C	121.1	119.46	1.64
7804	C		0	0
7901	C	120.99	120.14	0.85
7902	C		0	0
7903	C	122.68	120.49	2.19
7904	C	119	117.33	1.67
0205	F		0	0
0206	F		0	0
1205	F		0	0
1206	F		0	0
1207	F		0	0
2805	F	163.85	161.55	2.3
3804	F	162.5	160.95	1.55
3805	F	162.85	160.66	2.19
3903	F	161.15	159.13	2.02
3905	F	160.36	158.42	1.94
4700	F		0	0
4702	F		0	0
0200	S		0	0
0201	S		0	0
0202	S		0	0
0203	S		0	0
0204	S		0	0
1100	S		0	0
1200	S		0	0
1202	S		0	0
1300	S		0	0
2803	S	169.45	166.48	2.97
2804	S	163.98	161.99	1.99
3803	S	162.53	161.28	1.25
3806	S	162.8	160.98	1.82
3904	S	160.36	158.81	1.55
5900	S	149.89	148.95	0.94
5904	S	149.66	148	1.66
9200	S		0	0
9304	S		0	0

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APPENDICES



APPENDIX F

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Doc. Ref.	26939-CALC-0101
Sheet	1 of 7
Engineer	Z. Jordan
Date	08 Dec 23
Revision	-

DESIGN CALCULATIONS FRONT SHEET

SCHEME	The Common, Fritchley, Derbyshire
CLIENT	Harrison J & R
ASPECTS OF SCHEME TO BE DESIGNED	Greenfield Calculations Surface water attenuation design and simulation results for the 1%AEP40CC event for the development site.
CODES OF PRACTICE, DESIGN SPECIFICATIONS & BRITISH STANDARDS	• Design and analysis of urban storm drainage. Wallingford Procedure Vol.1 • Sustainable Drainage Systems- Non-Statutory technical standards for Sustainable drainage systems- 2015 • The SuDS Manual – CIRIA C753
NOTES	Existing runoff conditions have been calculated using the FEH Statistical method within Flow Causeway to calculate the Greenfield discharge rate for the impermeable area of 0.401ha, the QBAR Greenfield rate has been calculated as 1.5l/s. As this is a low discharge rate, that may create blockages in the system, a minimum discharge rate of 2.0l/s has been applied. Design calculations were carried out within Flow Causeway.

INDEX

Pages	Calculations	Checked by	Date
2 - 6	Greenfield Calculations and attenuation Basin and geo-cellular tank source control design details for the 50%AEP, 3.3% AEP and 1%AEP40CC event.	RC	08.12.2023

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	200.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Tank	0.119	5.00	167.950	1200	1.900
HydroBrake 1			167.500	1200	1.550
Pipe 1			165.870	1200	1.425
Pipe 2			162.440	1200	1.425
Pond	0.322	5.00	160.400	1200	1.500
HydroBrake 2			160.400	1200	1.600
Outfall			161.240	1200	3.410

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Tank	HydroBrake 1	9.398	0.600	166.050	165.950	0.100	94.0	300	5.10	164.7
1.001	HydroBrake 1	Pipe 1	18.284	0.600	165.950	164.445	1.505	12.1	225	5.18	163.9
1.002	Pipe 1	Pipe 2	35.550	0.600	164.445	161.015	3.430	10.4	225	5.32	162.5
1.003	Pipe 2	Pond	40.000	0.600	161.015	158.900	2.115	18.9	225	5.54	160.4
1.004	Pond	HydroBrake 2	8.000	0.600	158.900	158.800	0.100	80.0	300	5.62	143.1
1.005	HydroBrake 2	Outfall	10.000	0.600	158.800	157.830	0.970	10.3	150	5.67	142.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.622	114.6	53.1	1.600	1.250	0.119	0.0
1.001	3.774	150.1	52.9	1.325	1.200	0.119	0.0
1.002	4.087	162.5	52.4	1.200	1.200	0.119	0.0
1.003	3.022	120.2	51.7	1.200	1.275	0.119	0.0
1.004	1.759	124.3	171.1	1.200	1.300	0.441	0.0
1.005	3.156	55.8	169.9	1.450	3.260	0.441	0.0

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	9.398	94.0	300	Storm	167.950	166.050	1.600	167.500	165.950	1.250
1.001	18.284	12.1	225	Storm	167.500	165.950	1.325	165.870	164.445	1.200
1.002	35.550	10.4	225	Storm	165.870	164.445	1.200	162.440	161.015	1.200
1.003	40.000	18.9	225	Storm	162.440	161.015	1.200	160.400	158.900	1.275
1.004	8.000	80.0	300	Storm	160.400	158.900	1.200	160.400	158.800	1.300
1.005	10.000	10.3	150	Storm	160.400	158.800	1.450	161.240	157.830	3.260

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Tank	1200	Manhole	Adoptable	HydroBrake 1	1200	Manhole	Adoptable
1.001	HydroBrake 1	1200	Manhole	Adoptable	Pipe 1	1200	Manhole	Adoptable
1.002	Pipe 1	1200	Manhole	Adoptable	Pipe 2	1200	Manhole	Adoptable
1.003	Pipe 2	1200	Manhole	Adoptable	Pond	1200	Manhole	Adoptable
1.004	Pond	1200	Manhole	Adoptable	HydroBrake 2	1200	Manhole	Adoptable
1.005	HydroBrake 2	1200	Manhole	Adoptable	Outfall	1200	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Tank	167.950	1.900	1200	0	1.000	166.050	300
HydroBrake 1	167.500	1.550	1200	1	1.000	165.950	300
				0	1.001	165.950	225
Pipe 1	165.870	1.425	1200	1	1.001	164.445	225
				0	1.002	164.445	225
Pipe 2	162.440	1.425	1200	1	1.002	161.015	225
				0	1.003	161.015	225
Pond	160.400	1.500	1200	1	1.003	158.900	225
				0	1.004	158.900	300
HydroBrake 2	160.400	1.600	1200	1	1.004	158.800	300
				0	1.005	158.800	150
Outfall	161.240	3.410	1200	1	1.005	157.830	150

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	2 year (l/s)	1.4
Summer CV	0.750	Drain Down Time (mins)	240	30 year (l/s)	3.0
Winter CV	0.840	Additional Storage (m³/ha)	0.0	100 year (l/s)	3.8
Analysis Speed	Normal	Check Discharge Rate(s)	✓	Check Discharge Volume	x

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Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	35	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	FEH	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.401	Betterment (%)	0
SAAR (mm)	833	QMed	1.4
Host	1	QBar	1.5
BFIHost	0.579	Q 2 year (l/s)	1.4
Region	1	Q 30 year (l/s)	3.0
QBar/QMed conversion factor	1.111	Q 100 year (l/s)	3.8
Growth Factor 2 year	0.90		

Node HydroBrake 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	165.950	Product Number	CTL-SHE-0063-2000-1300-2000
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node HydroBrake 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	158.800	Product Number	CTL-SHE-0063-2000-1300-2000
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	166.050
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	60.0	0.0	1.200	60.0	0.0	1.201	0.0	0.0

Node Pond Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	158.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	0.0	1.200	347.0	0.0	1.500	409.0	0.0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute winter	Tank	92	166.203	0.153	7.0	8.8841	0.0000	OK
120 minute winter	HydroBrake 1	82	166.206	0.256	7.3	0.2899	0.0000	SURCHARGED
120 minute winter	Pipe 1	94	164.461	0.016	1.7	0.0184	0.0000	OK
120 minute winter	Pipe 2	92	161.034	0.019	1.7	0.0212	0.0000	OK
480 minute winter	Pond	440	159.260	0.360	9.2	65.0731	0.0000	SURCHARGED
480 minute winter	HydroBrake 2	440	159.260	0.460	7.1	0.5204	0.0000	SURCHARGED
60 minute winter	Outfall	62	157.848	0.018	1.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	Tank	1.000	HydroBrake 1	7.3	0.306	0.064	0.4674	
120 minute winter	HydroBrake 1	Hydro-Brake®	Pipe 1	1.7				
120 minute winter	Pipe 1	1.002	Pipe 2	1.7	1.196	0.010	0.0504	
120 minute winter	Pipe 2	1.003	Pond	1.7	0.484	0.014	0.8267	
480 minute winter	Pond	1.004	HydroBrake 2	7.1	0.289	0.057	0.5634	
480 minute winter	HydroBrake 2	1.005	Outfall	1.7	1.403	0.030	0.0121	64.0

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Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	Tank	176	166.817	0.767	14.3	44.5693	0.0000	SURCHARGED
180 minute winter	HydroBrake 1	176	166.817	0.867	6.7	0.9802	0.0000	SURCHARGED
15 minute summer	Pipe 1	127	164.461	0.016	1.7	0.0185	0.0000	OK
15 minute summer	Pipe 2	131	161.034	0.019	1.7	0.0212	0.0000	OK
960 minute winter	Pond	975	159.857	0.957	12.2	219.8887	0.0000	SURCHARGED
960 minute winter	HydroBrake 2	975	159.857	1.057	6.4	1.1957	0.0000	SURCHARGED
960 minute winter	Outfall	975	157.849	0.019	1.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	Tank	1.000	HydroBrake 1	6.7	0.299	0.058	0.6618	
180 minute winter	HydroBrake 1	Hydro-Brake®	Pipe 1	1.7				
15 minute summer	Pipe 1	1.002	Pipe 2	1.7	1.480	0.010	0.0504	
15 minute summer	Pipe 2	1.003	Pond	1.7	0.250	0.014	0.8267	
960 minute winter	Pond	1.004	HydroBrake 2	6.4	0.285	0.052	0.5634	
960 minute winter	HydroBrake 2	1.005	Outfall	1.8	1.430	0.032	0.0127	115.1

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Tank	232	167.143	1.093	15.4	63.5507	0.0000	SURCHARGED
240 minute winter	HydroBrake 1	232	167.143	1.193	6.9	1.3495	0.0000	SURCHARGED
240 minute winter	Pipe 1	232	164.462	0.017	1.9	0.0196	0.0000	OK
240 minute winter	Pipe 2	236	161.035	0.020	1.9	0.0225	0.0000	OK
1440 minute winter	Pond	1440	160.092	1.192	11.5	296.6311	0.0000	SURCHARGED
1440 minute winter	HydroBrake 2	1440	160.092	1.292	4.9	1.4607	0.0000	SURCHARGED
1440 minute winter	Outfall	1440	157.849	0.019	2.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	Tank	1.000	HydroBrake 1	6.9	0.288	0.060	0.6618	
240 minute winter	HydroBrake 1	Hydro-Brake®	Pipe 1	1.9				
240 minute winter	Pipe 1	1.002	Pipe 2	1.9	1.246	0.012	0.0550	
240 minute winter	Pipe 2	1.003	Pond	1.9	0.526	0.016	0.8296	
1440 minute winter	Pond	1.004	HydroBrake 2	4.9	0.151	0.040	0.5634	
1440 minute winter	HydroBrake 2	1.005	Outfall	2.0	1.471	0.036	0.0135	170.1

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APPENDICES



APPENDIX G

MANHOLE 2001
CL – 168.55m AOD
IL –166.54m AOD

SURFACE AND FOUL WATER TO COMBINE AND DISCHARGE VIA GRAVITY INTO THE EXISTING COMBINED WATER SEWER WITHIN THE COMMON, SUBJECT TO AGREEMENT WITH STW.
COMBINED DISCHARGE RATE = 2.85l/s

MANHOLE 3002
CL – TBC
IL –TBC

PROPOSED CONNECTION
CL –161.24m AOD
IL* –157.83m AOD
*IL IS ASSUMED BASED ON INTERPOLATION OF MH 3906 AND MH 2001

PEAK FOUL FLOW RATE OF 0.85l/s, ASSUMING A FOUL LOAD RATE OF 0.05l/s/dwelling

HYDROBRAKE
INVERT LEVEL = 158.80m AOD
DESIGN HEAD = 1.3m
DESIGN FLOW = 2l/s

AREA TO REMAIN UNDEVELOPED DUE TO SURFACE WATER RISK

EXTERNAL BANKING TO BE BUILT USING ROOTLOK VEGETATED WALL SYSTEM FROM GEOGROW.

GROUNDWATER SPRING WITH A WATERING HOLE FOR LIVESTOCK THAT IS FED BY THE SPRING, WITH AN OVERFLOW THAT GOES INTO A DRAIN

MANHOLE 3906
CL – 157.48m AOD
IL –153.72m AOD

INTERNAL BANKING 1:3

ATTENUATION BASIN
DESIGN BASED ON AN IMPERMEABLE AREA OF 0.322ha INCLUDING A 10% ALLOWANCE FOR URBAN CREEP, AND ATTENUATION FROM THE GEO–CELLULAR TANK.

COVER LEVEL = 160.40m
INVERT LEVEL = 158.90m
DEPTH OF POND = 1.2m
MINIMUM FREEBOARD= 0.3m
PLAN AREA = 409.00m²

MAXIMUM STORAGE VOLUME OF 296.63m³ TO ACCOMMODATE STORAGE FOR ALL STORM EVENTS UP TO AND INCLUDING THE 1%AEP40CC.

GEO–CELLULAR TANK
DESIGN BASED ON AN IMPERMEABLE AREA OF 0.119ha, INCLUDING A 10% ALLOWANCE FOR URBAN CREEP.

COVER LEVEL = 167.95m
INVERT LEVEL = 166.05m
DEPTH OF COVER = 0.7m
DEPTH OF TANK = 1.2m
PLAN AREA = 60m²

MAXIMUM STORAGE VOLUME OF 63.55m³ TO ACCOMMODATE STORAGE FOR ALL STORM EVENTS UP TO AND INCLUDING THE 1%AEP40CC.

HYDROBRAKE
INVERT LEVEL = 165.95m AOD
DESIGN HEAD = 1.3m
DESIGN FLOW = 2l/s

1:500
15m 0 15m 30m 45m 60m 75m

NOTES:

1. DO NOT SCALE THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SPECIALIST DESIGN DRAWINGS AND DETAILS.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
4. THIS DRAWING IS FOR STRATEGY PURPOSES ONLY AND IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.
5. DESIGN BASED ON EXISTING LEVELS AND SUBJECT TO CHANGE WITH EXTERNAL WORKS DESIGN / CONFIRMATION OF FFLS.
6. DRAINAGE STRATEGY IS SUBJECT TO AGREEMENT WITH RELEVANT THIRD PARTIES, INCLUDING ENVIRONMENT AGENCY, LOCAL PLANNING AUTHORITY, LEAD LOCAL FLOOD AUTHORITY AND WATER AUTHORITY.
6. CONCRETE PROTECTION TO BE PROVIDED TO ANY PIPES WITH LOW COVER.
7. THE DRAINAGE STRATEGY WILL NEED UPDATING IF THE LAYOUT IS REVISED.
8. SURFACE WATER FLOWS AND FOUL WATER FLOWS WILL COMBINED AND DISCHARGE VIA GRAVITY INTO THE EXISTING COMBINED WATER SEWER WITHIN THE COMMON, SUBJECT TO AGREEMENT WITH SEVERN TRENT WATER.
9. THE ATTENUATION BASIN AND GEO–CELLULAR TANK SHOULD BE LINED TO PREVENT GROUNDWATER INGRESS. GROUNDWATER MONITORING SHOULD BE UNDERTAKEN IN DUE COURSE.

KEY

- SITE BOUNDARY
- PROPOSED SURFACE WATER SEWER
- PROPOSED FOUL WATER SEWER
- PROPOSED COMBINED WATER SEWER
- EXISTING PUBLIC COMBINED WATER SEWER
- PROPOSED ATTENUATION BASIN
- PROPOSED GEO–CELLULAR TANK
- PROPOSED PERMEABLE PAVING
- PROPOSED OVERLAND FLOW ROUTES
- PUBLIC RIGHT OF WAY
- 3.3% SURFACE WATER FLOOD RISK
- 1% SURFACE WATER FLOOD RISK
- 0.1% SURFACE WATER FLOOD RISK

REV:	AMENDMENTS:	DRN:	CHK:	APP:	DATE:
A	UPDATED LAYOUT	ZJ	RC	TR	08.12.23
-	FIRST ISSUE	ZJ	RC	TR	12.09.23

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THE COMMON,
FRITCHLEY,
DERBYSHIRE

DRAWING TITLE:
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CLIENT:
HARRISON J & R

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APPENDICES



APPENDIX H

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MAINTENANCE AND MANAGEMENT

A proposed maintenance plan is shown in the table below and breaks down the maintenance requirements of the various proposed assets in accordance with the CIRIA C753 SuDS Manual guidance.

Table 1.1: Proposed Maintenance Regime

Drainage Asset	Responsible Organisation	Maintenance Work	Frequency
Pipework / Manholes	Private Ownership / Management Company	Inspect pipework and clear blockages	Annually or after severe storms.
		Inspect manholes and clear blockages	
		Repair any defects in the network	
		Inspect flow control, ensure operating freely and pivoting bypass door and penstock valve operating correctly	
Headwalls	Private Ownership / Management Company	Inspect the structure and remove any debris/litter on the structure.	Annually or after severe storms
		Replace malfunctioning parts or structures	As required
Catchpits	Private Ownership / Management Company	Inspect structure and remove any debris/litter on structure	Annually or after severe storms
		Replace malfunctioning parts or structures	As required
Gullies	Private Ownership / Management Company	Inspect structure and remove any debris/litter on structure	Annually or after severe storms
		Replace malfunctioning parts or structures	As required
Flow Control Chamber	Private Ownership / Management Company	Inspect structure and remove excessive silt build-up	Monthly during construction and then annually or after severe storms
		Inspect pipework and manholes also clear blockages	Annually or after severe storms
		Inspect manholes and clear blockages	
		Inspect flow control, ensure operating freely and pivoting bypass door and penstock valve operating correctly	
		Replace malfunctioning parts or structures	
		Inspect for evidence of poor operation	6 monthly
		Inspect sediment accumulation rates and establish appropriate removal frequencies	
		Test control structure to ensure operating as per original design	5 yearly
Permeable Pavements	Private Ownership / Management Company	Brushing and vacuuming (standard cosmetic sweep over the whole surface)	Once a year after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging of manufacturer's recommendations.
		Stabilise and mow contributing and adjacent areas	As required

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		Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than sweeping	
		Remediate any landscaping which, through vegetation maintenance of soil slip, has been raised to within 50 mm of the level of the paving	
		Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users and replace lost jointing material	
		Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
		Initial inspection	Monthly for 3 months after installation
		Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	3 monthly, 48 hours after large storms in first 6 months
		Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
		Monitor inspection chambers	
Attenuation Storage Tanks	Private Ownership / Management Company	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months then annually
		Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
		For systems where rainfall infiltrates into the tank from above, check the surface of the filter for blockages by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually
		Remove the sediment from pre-treatment structures and/or internal forebays	
		Repair/rehabilitate inlets, outlets, overflows and vents	As required
		Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
		Survey inside of the tank for sediment build-up and remove if necessary	Every 5 years or as required
Attenuation/Detention Basins	Private Ownership / Management Company	Remove litter and debris	Monthly
		Cut grass – for spillways and access routes	
		Cut grass – meadow grass in and around the basin	
		Manage other vegetation and remove nuisance plants	
		Inspect inlets, outlets and overflows for blockages, and clean if required	

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		Inspect banksides, structures for silt accumulation. Establish appropriate silt removal frequencies	
		Check any penstocks and other mechanical devices	Annually
		Tidy all dead growth before the start of the growing season	
		Remove the sediment from inlets, outlets and forebay	
		Manage wetland plants in outlet pool – where provided	

- CIVIL ENGINEERING
- TRANSPORT
- FLOOD RISK & DRAINAGE
- STRUCTURES
- GEO-ENVIRONMENTAL
- ACOUSTIC AIR
- UTILITIES
- GEOMATICS
- LIGHTING
- EXPERT WITNESS

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