

TC/FRA&DS/P9298/23/05

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

AT

**Land South of A5
Watling Street
Hinckley
Leicestershire
LE10 3ED**

FOR

CNG Fuels



FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED

REPORT VERIFICATION

Site Address	Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED
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1 INTRODUCTION

1.1 Project Scope / Client Brief

Thomas Consulting has been commissioned by CNG Fuels to carry out a site-specific flood risk assessment and drainage strategy report in accordance with the National Planning Policy Framework (NPPF) to support a planning application that fulfils the requirements of the statutory local authorities.

1.2 Site Location & Topography

The site is located Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED and the report is to support the development of a Bio-CNG vehicle fuelling station. A copy of the development proposals can be found in Appendix A of this report. The approximate Ordnance Survey (OS) grid reference for the site is 440742 292568 and the location of the fuelling station is shown on Figure 1.



Figure 1: CNG Station location plan (Source: OS Maps, 2023: License No. 100020411)

The proposed site is approximately 0.92Ha and the plot of land comprises entirely of undeveloped greenfield grass land. The plot of land is situated west of the current BP petrol station and sits south of the A5 where an additional adopted slip-road has also been proposed for site access extending the current highway. Opposite the A5 sits an existing traveller site consisting of temporary homes. A topographical survey to ordnance datum has been made available by CNG Fuels and shows the levels of the site averaging between 89.2mAOD and 88.5mAOD. A full copy of the survey can be found in Appendix B.

1.3 National Planning Policy Framework and Planning Practice Guidelines

The NPPF and its Planning Practice Guidance (PPG) states any development other than the following outlined below is classed as a major development.

- Minor non-residential extensions: industrial/commercial/leisure etc extensions with a footprint less than 250 square meters.

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- Alterations: development that does not increase the size of buildings e.g. alterations to external appearance.
- Householder development: For example, sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any proposed development that would create a separate dwelling within the curtilage of the existing dwelling e.g. subdivision of houses into flats.

The guidance also states that a site-specific flood risk assessment is required for the following site proposals.

- A site proposed in Flood Zone 2 or 3 including minor development and change of use in development type to a more vulnerable class.
- More than 1 hectare (ha) in Flood Zone 1
- Less than 1 ha in Flood Zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs)
- In an area within Flood Zone 1 which has critical drainage problems as notified by the Environment Agency

1.4 Environment Agency Flood Map for Planning

National Planning Policy Framework (NPPF) Flood Zones comprise Flood Zone 1, Flood Zone 2, and Flood Zone 3. The Environment Agency's Indicative Flood Map for Planning (Figure 2) shows that most the site is located within the NPPF defined Flood zone 1 however the south east of the site intrudes Flood zone 2.

Flood Zones are based on an areas Annual Exceedance Probability (AEP) of River or Sea Flooding. For example, Flood Zone 1 has a 'Low Probability' of flooding as it has an AEP of <0.1% (Less than 1 in 1000 year) of occurring in any one year. Flood Zone 2 has a 'Medium Probability' having an AEP of 0.1-1.0% (1 in 1000 – 1 in 100 year) chance of river flooding, or 0.1-0.5% (1 in 1000 – 1 in 200 year) chance of tidal/sea flooding.

Flood Zones 3 is split between 'a' and 'b' classifications. Flood Zone 3a has a 'High Probability' of flooding as it has an AEP of >1.0% (More than 1 in 100 year) chance of river flooding, or >0.5% (More than 1 in 200 year) chance of sea/tidal flooding. Flood Zone 3b (The Functional Floodplain) comprises land where water has to flow or be stored in times of flooding. Local planning authorities should identify in the Strategic Flood Risk Assessments areas of a functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map for Planning).

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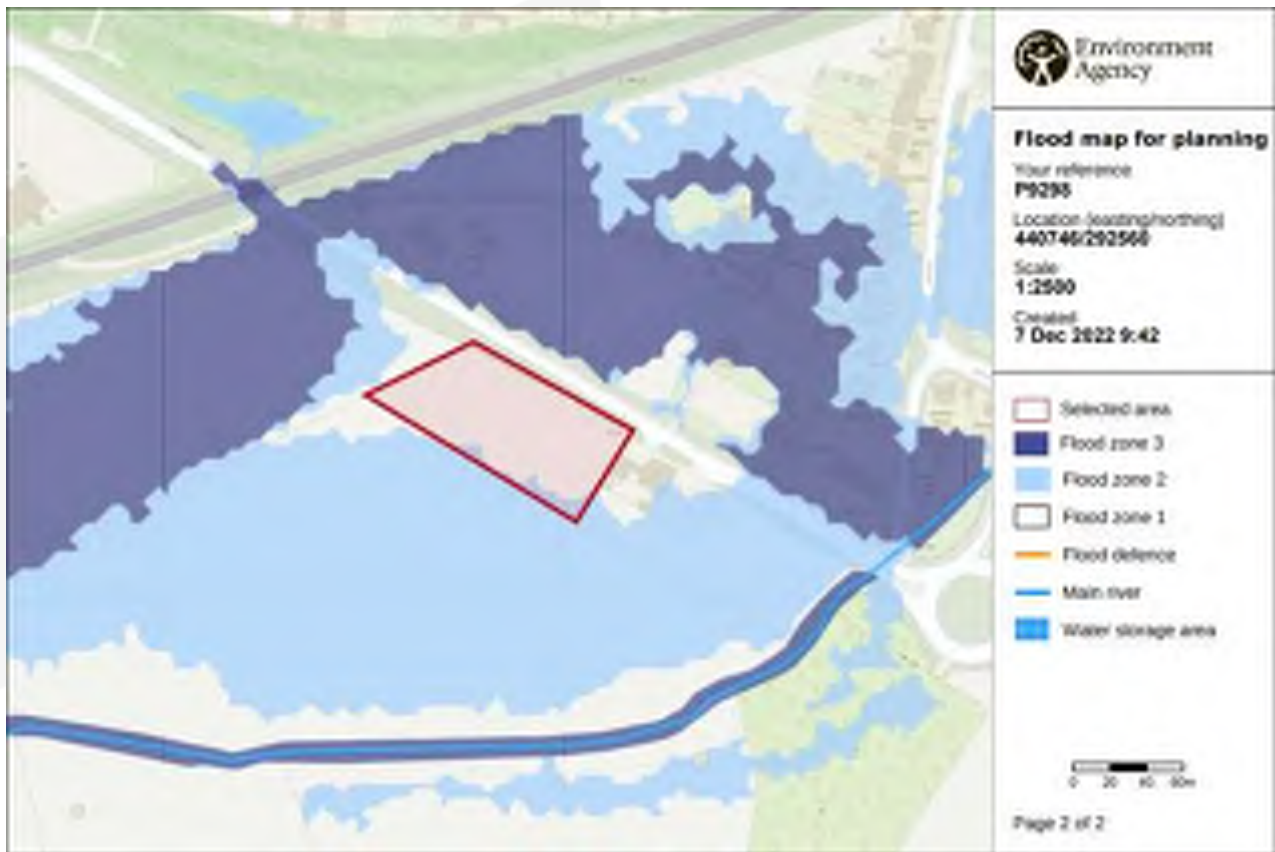


Figure 2: Environment Agency Flood Zone Map (Source: Environment Agency, 2022, GOV.UK)

1.5 Development Classification

The PPG separates each development into a vulnerability class. These classifications can be found in Figure 3, whilst in Figure 4 permissible development in relation to its classification is shown.

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Vulnerability Classification	Development
Essential Infrastructure	- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk - Essential utility infrastructure, which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood - Wind turbines
Highly Vulnerable	- Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operation during flooding. - Emergency dispersal points - Basement dwellings - Caravans, mobile homes and park homes intended for permanent residential use - Installations requiring hazardous substances consent
More Vulnerable	- Hospitals - Residential institutions such as residential care homes, children's homes, prisons and hostels. - Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. - Non-residential uses for health services, nurseries and education establishments. - Landfill and sites used for waste management facilities for hazardous waste. - Sites used for holiday or short let caravans and camping, subject to a specific warning and evacuation plan
Less Vulnerable	- Police, ambulance and fire stations which are NOT required to be operational during flooding. - Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distributions; non-residential institutions not included in the 'more vulnerable' class; and assemble and leisure. - Land and buildings used for agriculture and forestry - Waste treatment (except landfill & hazardous waste facilities) - Minerals working & processing (except for sand & gravel working) - Water treatment works which do not need to remain operational during times of flood - Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water-Compatible Development	- Flood control infrastructure - Water transmission infrastructure & pumping stations - Sewage transmission infrastructure & pumping stations - Sand & gravel working - Docks, marinas and wharves - Navigation facilities - Ministry of Defence installations - Ship building, repairing & dismantling, dockside fish processing & refrigeration & compatible activities requiring a waterside location - Water based recreation (excluding sleeping accommodation) - Lifeguard and coastguard stations - Amenity open space, nature conservation & biodiversity, outdoor sports and recreation and essential facilities such as changing rooms - Essential ancillary sleeping or residential accommodation for staff required by uses in this category subject to a specific warning & evacuation plan.

Figure 3: NPPF Flood Risk Vulnerability Classification (Source: National Planning Practice Guidance, 2014)

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Figure 4: NPPF Flood Risk Vulnerability Classification (Source: National Planning Practice Guidance, 2014)

1.6 The Proposed Development in Relation to Planning Requirement

As the proposed development footprint is approximately 0.92 Hectares and is partially situated in Flood Zone 2, a flood risk assessment and strategic drainage strategy is required. The site is classed as a major development and according to the PPG would fall under the “Less Vulnerable” class. “Less Vulnerable” developments are acceptable in Flood Zone 2 as shown in Figure 4.

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2 SITE CHARACTERISTICS

2.1 Geological Assessment

A desk-based study has been carried out to analyse the basic site geology. British Geological Survey (BGS) and Land Information Systems (LandIS) provide mapping which indicates the characteristics of the soil, superficial and bedrock layers across the site Table 1.

Principal Aquifers - These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Secondary A Aquifers - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

Secondary B Aquifers - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons, and weathering. These are generally the water-bearing parts of the former non-aquifers.

Secondary (Undifferentiated) Aquifers - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

Geological Assessment			
Geological Layer	Classification	Description	Aquifer Class
Soil	Soilscape 18	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils	N/A
Superficial (Drift)	Alluvium	Clay, silt, sand and gravel	Secondary A
Bedrock (Solid)	Mercia Mudstone	Mudstone	Secondary B

Table 1: Geological Assessment

Magic maps which are available online provide data on vulnerability zones such as source protection zones and/or groundwater vulnerability zones. The maps indicate that the site is a medium risk to groundwater vulnerability and the site is not in a source protection zone.

2.2 Existing Surrounding Natural or Manmade Drainage Features

According to the EA Main River Maps the closest known watercourse is approximately 150m southeast from the site. This watercourse is called Sketchley Brook and flows west before connecting to the River Anker.

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Severn Trent are the water authority for this region. Their detailed sewer records show that there is a 'Pressure Combined' sewer running parallel to the A5 on the proposed development side of the A5 crossing the proposed site entrance and a '4" URPVC Water Main' running under the path on the opposite side of the A5. There is no gravity fed public sewers on their records which are included in Appendix C.

2.3 Geotechnical Assessment

A Preliminary Risk Assessment (PRA – Formally known as a Phase 1) was published on 21/12/22 by Thomas Consulting ref: TC/PRA/P9299/22/01 and suggests based on the superficial strata and bedrock, permeability is likely to be very low on the site.

On 16/01/23, BEK published a Site Investigation & Ground Assessment ref: BEK-23005-1. This report presented results from 7 window sample borehole logs on site. The borehole results were consistent throughout the site and concluded approximately, the top 0.4m-0.5m consisted of grass and topsoils, followed by firm brown sandy gravelly clay for the next 0.8m-2m and then stiff brown and gold clay until reaching to termination depths of between 4.45m-5.45m. The results also show that 5 of the 7 boreholes found didn't encounter any water however one borehole located furthest southeast encountered a slight water strike at 2m (next to trees) and furthest north west was wet at ground level (next to trees). Furthermore, soakaway testing to BRE 365 was carried out at 2 locations and found that the percolation rate of the shallow strata does not support the use of soakaways on this site.

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3 ASSESSMENT OF FLOOD RISK

3.1 Explanation of Flood Risk

Flood events are often referred to as their probability of occurrence. This occurrence is usually related to how often a storm may return in any single year. Table 2 shows the storm return periods and how they are expressed as a fraction and percentage in common terminology.

Storm Return Period (Years)	Annual Exceedance Probability (AEP)	
	Fraction	Percentage
2	0.5	50%
10	0.1	10%
25	0.04	4%
50	0.02	2%
100	0.01	1%
200	0.005	0.5%
500	0.002	0.2%
1000	0.001	0.1%

Table 2: Storm Return Period Probabilities

3.2 Flooding Resulting from the Rivers and/or Sea.

Figure 5 shows the EA fluvial flood map derived from the DEFRA online portal. This map indicates areas which may be at risk of flooding from rivers and the sea. High risk is classed as a >3.3% Annual Exceedance Probability (AEP) event and is shown in dark blue. Medium risk is an AEP event of between 3.3-1% and is shown in blue. Low risk is an AEP event of between 1-0.1% and is shown in light blue. Very Low risk is an AEP event of <0.1% and is shown in white.

As can be seen the site is shown to be at low to medium risk of fluvial flooding. The maps show the latest information provided by the EA and considers the protections provided by current flood defences. However, climate change is not assessed as part of the map's information.

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Figure 5: Environment Agency Fluvial Flood Map (Source: Environment Agency, 2023, GOV.UK)

3.3 Flooding Resulting from Surface Water

Also available on the DEFRA online portal are maps provided by the EA showing areas known to be affected by surface water flooding. These maps are based on historic flooding information received from statutory authorities and a generalised model based on digital terrain modelling.

The maps work in the same colour coding as described above for the fluvial maps where High risk AEP events are displayed in Dark Blue, Medium Risk in Blue, Low Risk in Light Blue and Very Low Risk in White. Figure 6 shows the site is predominantly not at risk of surface water flooding however it borders around areas with low and medium extent of flooding.



Figure 6: Environment Agency Surface Water Flood Map (Source: Environment Agency, 2023, GOV.UK)

3.4 Flooding Resulting from Other Sources

Hinckley & Bosworth Borough Council provide reference to Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA) completed by JBA Consulting in 2019 and 2020 respectively.

The Level 1 SFRA explains that Sketchley Brook poses a fluvial flood risk to Hinckley and that the region/borough is within the <25% susceptible ground flooding classification. Section 5.7 of their report (Page 54) explains that Borehole records hold valuable information on groundwater flooding. As previously mentioned in section 2.3, window borehole samples concluded that within the site 1 of 7 borehole samples encountered a slight water strike at a depth of 2m whilst 1 other encountered water at ground level.

The DEFRA portal also provides Reservoir Flood Maps produced by the EA, in which a copy for the area can be seen in Figure 7. This map indicates the maximum extend of flooding from reservoirs highlighted in light blue. As can be seen the site is not at risk of flooding from reservoirs and has no other canals or artificial sources nearby that pose any risk of flooding.

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Figure 7: Environment Agency Reservoir Flood Map (Source: Environment Agency, 2023, GOV.UK)

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4 FLOOD MITIGATION

4.1 Flood Defence

Although the site is partially situated in Flood Zone 2, Product 4 data was readily available from a previous CNG site and has been taken into consideration for a more accurate analysis as the information provided is still relevant. The Product 4 data was requested by TC to the Environment Agency (EA) on 23/02/2022 and was received on 15/03/2022. A reference plan and Product 4 document referenced 253382 was provided showing modelled water levels of Sketchley Brook. Reference to the plan can be made in Figure 8 below showing the node point locations analysed within the document. A full copy of the Product 4 data received from the EA can be found in Appendix D of this report.



Figure 8: Environment Agency Node Location Plan (Source: Environment Agency, 2022)

The most applicable node references to this assessment are as follows;

- 1.022, 1.023D, 1.023i1, 1.023i2

The modelled data is from analysis undertaken in 2013. Maximum water levels have been provided against the corresponding nodes in the un-defended scenario and have been highlighted in Figure 9 below;

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Annual Exceedance Probability - Maximum Water Levels (mAOD) UN-DEFENDED				
Node Label	EASTING	NORTHING	1% (1 in 100)	0.1% (1 in 1000)
1.025U	441042	292566	90.22	90.48
1.024U	440975	292506	90.22	90.35
1.023U	440969	292499	90.21	90.34
1.022	440863	292416	88.54	88.72
1.023D	440946	292480	88.92	88.99
1.025D	441013	292538	90.22	90.34
1.026D	441124	292604	90.34	90.55
1.026U	441077	292594	90.23	90.48
1.023U	440919	292453	88.70	88.83
1.023U	440892	292428	88.59	88.76

Figure 9: Environment Agency Max Water Level (Source: Environment Agency, 2022)

The maximum water levels associated with a number of annual exceedance probabilities has also been provided for the defended scenario which have been highlighted in Figure 10 below;

Annual Exceedance Probability - Maximum Water Levels (mAOD) DEFENDED											
Node Label	EASTING	NORTHING	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (Climate Change)*	0.5% (1 in 200)	0.1% (1 in 1000)
1.025U	441042	292566	89.594	89.6	89.965	90.17	90.195	90.223	90.29	90.296	90.476
1.024U	440975	292506	89.59	89.59	89.96	90.17	90.19	90.22	90.29	90.30	90.35
1.023U	440969	292499	89.58	89.58	89.95	90.15	90.18	90.21	90.28	90.28	90.34
1.022	440863	292416	88.16	88.18	88.37	88.50	88.52	88.54	88.61	88.61	88.72
1.023D	440946	292480	88.74	88.74	88.83	88.90	88.91	88.92	88.95	88.95	88.99
1.025D	441013	292538	89.59	89.60	89.96	90.17	90.19	90.22	90.29	90.29	90.34
1.026D	441124	292604	90.01	90.01	90.14	90.29	90.31	90.34	90.42	90.43	90.55
1.026U	441077	292594	89.65	89.65	89.97	90.17	90.20	90.23	90.29	90.30	90.48
1.023U	440919	292453	88.40	88.41	88.56	88.66	88.68	88.70	88.75	88.75	88.83
1.023U	440892	292428	88.21	88.23	88.43	88.55	88.57	88.59	88.65	88.65	88.76

Figure 10: Environment Agency Max Water Level for AEP's (Source: Environment Agency, 2022)

The EA explain within their document that they hold no record of historic flooding in the area and that there are no formal defences owned or operated by the EA protecting the proposed development site. As this is the case the un-defended 1% AEP maximum recorded water level (mAOD) will be analysed for the site.

4.2 Flood Defence/Mitigation Recommendations

As can be seen the 1% AEP / 1 in 100-year return period + climate change shown in Figure 10 will be analysed with a maximum water level recorded at **88.95mAOD**. The proposed finished forecourt level shows elevations ranging between **88.59-89.95mAOD** and are also protected by a minimum kerb height of 88.94m AOD surrounding the forecourt. A levels plan and catchment plan has been made available in Appendix E. Furthermore, the site is at a minimum distance of approximately 150m away from the closest relevant node shown within the product 4 data and therefore any overland flooding is assumed to dissipate over the adjacent land before reaching the site. As discussed in section 1.2, the site is to be used as bio-fuelling station which is not deemed to be harmful to the environment compared to a tradition petroleum fuelling station. Biomethane when it escapes is light enough to be carried through air molecules and therefore, would likely escape into the atmosphere rather than transported through water.

CNG Fuelling stations are also not personnel manned sites. Therefore, they technically can be allowed to flood during extreme rainfall events. As the proposed development is situated over 150m from the brook, our precautionary recommendations are as follows;

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- All plant and apparatus on site should be either bunded and/or adequately sealed if located below ground (i.e. storage tanks, sampling chambers, ducting). Anything located above ground such as pumps etc should be raised above the flood level, if required and/or possible, on plinths etc.
- Non-return valves and anti-flood mechanisms should be installed on devices such as oil interceptors, treatment devices, flow controls and headwalls. This prevents the potential for pollutant displacement during flood events.
- The site should be designed as to not displace flood water off the site and should be designed as to hold the water until the storm event and flooding subsides.
- The site should be designed so that safe access and egress is still available for emergency vehicles etc. This will need to be analysed following the provision of a topographical survey to ensure safe flood levels are maintained on site for emergency crews to access the site.

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5 SURFACE WATER DRAINAGE STRATEGY

5.1 Catchment Assessment

A catchment assessment has been completed in AutoCAD to determine the different types of proposed land cover with the results demonstrated in Table 3. The total site area is 0.92ha, however the new proposed slip road for site access hasn't been included in the catchment assessment as it is intended to drain into the existing highway drains. A full catchment plan along with a levels plan of the site has been made available in Appendix E as previously mentioned.

Catchment Assessment	
Type of Land	Associate Area m ² (Ha)
Paved Impermeable Area	5276 (0.53)
Garden & landscaped area	1171 (0.12)
Highway Junction and Site Access	2748 (0.27)

Table 3: Catchment Assessment on Proposed Development

5.2 Urban Creep

Urban Creep is not a statutory requirement, however, to account for future increases in impermeable area through the development of extensions and/or alterations to habitable dwellings an increase of 10% is usually applied to associated roof areas. However, as this development is for the construction of a bio-methane fuelling station, no expansion is proposed or expected, nor is there any space in the land ownership to extend the site further. Therefore, urban creep isn't to be applied.

5.3 Climate Change

Climate Change projections indicate that worsening rainfall events are to occur over the next few decades. These effects are becoming more prominent and speeding up in development. To account for the effects of climate change in accordance with guidance outlined by the Environment Agency an uplift allowance of 40% has been added to the 100-year return period to increase the worst-case scenario for the design of the drainage network.

5.4 Proposed Runoff Rates

Runoff calculations have been provided in Appendix F and have been completed using the IH124 method via the UK SuDS HR Wallingford online portal. The proposed greenfield runoff rates have been calculated from 0.74 Ha as this is the area within the redline boundary that is currently not being captured by highway gullies into their separate system. Below in Table 4 is a summary of the results.

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Peak Rate of Runoff (l/s) Assessment		
Return Period	Greenfield	Proposed Rate
Q1	2.69	3.24
QBAR	3.24	3.24
Q30	6.48	3.24
Q100	8.33	3.24

Table 4: Surface Water Rate of Runoff Results – Entire Development

As can be seen in Table 4, the proposed rate has been restricted to the Greenfield QBAR runoff rate, with proposed runoff rates being less than greenfield runoff rates for any return period greater than QBAR.

5.5 SuDS Hierarchy

All surface water drainage designs are to follow the SuDS Hierarchy outlined within the SuDS Manual. This hierarchy requires the designer to attempt infiltration methods, prior to proposing disposal to a watercourse. If the above two are not possible then consideration can be made to the disposal of surface water to the public sewer network. However, a connection to a dedicated sewer (i.e. surface water or foul) should always be sought in preference to the connection of a combined sewer.

As previously mentioned in section 2.3, soakaways have been found unviable on this site and therefore, following the SuDS hierarchy, a connection to Sketchley Brook previously mentioned in section 2.2 has been sought.

5.6 Design Parameters

The following design parameters have been utilised within the drainage model;

- Simulations have been set to analyse in 1 in 5 year return period, 1 in 30 and 1 in 100 + 40% climate change.
- Storm durations have been capped at 1440 minutes as the worst case storm scenario was 480 minutes.
- CV values are set at industry standard 0.75 for summer and 0.84 for winter.
- The calculations use the most recent FEH-13 rainfall data for the analysis.
- The restricted discharge rate for the site has been set at QBAR (3.2l/s)

5.7 Surface Water Drainage Proposals

Based on the above assessment the following SuDS techniques are proposed:

- Geocellular Storage Tanks & Restricted Run-Off Discharge (Flow Control Chamber)
- Full Retention Separator

The SuDS have been sized to contain a future 1% AEP event of critical duration with future climate change (40%) accounted for. Although much of the areas housing the plant don't need to be positively drained as the granular finish will act similar to that pre-development, it has still been included in the drainage catchment areas for conservative design. The hydraulic calculations and proposed drainage layout are included in Appendix G & H respectively.

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It is proposed that the entirety of the sites paved impermeable area runoff is to be drained via rainwater gullies and channel drainage which is then passed through a Full Retention Separator prior to being stored within a geocellular attenuation tank under a parking bay southeast of the fuelling stations forecourt. The geocellular attenuation tank is proposed to consist of a full depth of 1080mm providing a total storage volume of 274.5m³. The water then flows into a flow control chamber housing a pumping water east to a manhole located adjacent to Sketchley Brook before discharging into the Brook.

As the site is currently a greenfield site proposed for development it is a statutory requirement that off-site runoff is restricted so that discharge rates do not exceed pre-development greenfield runoff rates for any storm duration. Due to this, the pump is set to a fixed rate of 3.2 l/s set by the Greenfield QBAR rate as previously mentioned in section 5.4.

5.8 Exceedance Routing

The drainage model has been designed to store a 100-year return period, plus the effects of climate change utilising overland storage within the forecourt. In this case, S102 will allow exceedance flows from the gully lid before ponding against the southern kerb of the site until the storm subsides. The forecourt can contain 25.75m³ of additional overland storage which has the capacity to contain the 1 in 100 year + 40% climate change event. An overland storage drawing which models this has been made available in Appendix I. In the rare event a storm of greater severity occurs, water will breach the kerb and disperse over the neighbouring fields.

5.9 Treatment Processes

Treatment of the surface water run-off from the development has been completed in accordance with the Simple Index method outlined within the SuDS Manual. As per Section 5.7, the proposed drainage methods have been shown below against the proposed development usage to indicate adequate treatment has been provided.

SuDS Simple Index Method			
Pollution Hazard	TSS	Metals	Hydro-Carbons
Medium	0.7	0.6	0.7
SuDS	TSS	Metals	Hydro-Carbons
Typical Full Retention Separator	0.8	0.6	0.9
Total	0.8	0.6	0.9

Table 5: SuDS Simple Index Method

A copy of our Simple Index Method calculations has been provided in Appendix J. The Full Retention Separator will be specified to mitigate a 'Medium' Pollution hazard level as stated within Table 26.2 of The SuDS Manual (Ciria report C753).

Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED

6 CONCLUSIONS

- The site is approximately 0.92ha and is located south of the A5 in Hinckley. The site currently comprises of undeveloped greenfield grass land and is generally flat with average elevations of 89.2mAOD and 88.5mAOD.
- The proposed development is classed as a major development and according to the NPPF's PPG as a bio-fuelling station the site is classed as less vulnerable to flood risk. Less vulnerable developments are deemed acceptable in Flood Zone 2.
- The site is at a medium risk to groundwater vulnerability and the site is not in a source protection zone.
- The site is mainly located within Flood Zone 1 and is partially occupied by Flood Zone 2 towards the southeast site boundary. It borders a low to medium risk of flooding from surface water and a medium risk from fluvial flooding.
- Severn Trent sewer records show that there is a combined sewer and water main running parallel to the A5 on the closest and opposing sides respectively.
- Site investigation testing to BRE365 has concluded that infiltration methods aren't viable on this site and therefore following the SuDS hierarchy, discharge to the closest watercourse has been initially sought.
- It is proposed that the entirety of the sites paved impermeable area runoff is to be drained via rainwater gullies and channel drainage which is then passed through a Full Retention Separator prior to being stored within a geocellular attenuation tank under a parking bay southeast of the fuelling stations forecourt. The water then continues to a flow control chamber housing a pump before discharging into Sketchley Brook southwest of the site.
- The pump is restricted to a fixed QBAR Greenfield run-off rate of 3.2 l/s that is discharged into the Sketchley Brook.
- The site has been designed to store surface water on site for storm intensities of 1 in 5 year return period, 1 in 30 and 1 in 100 + 40% climate change. If a storm of greater severity does occur, water will exceed the site via breaching the kerb southwest of the site before dissipating into the neighbouring field.
- All surface water drained from the forecourt gets treated through a Full Retention Separator complying with the simple index method before entering Sketchley Brook further east of the site.

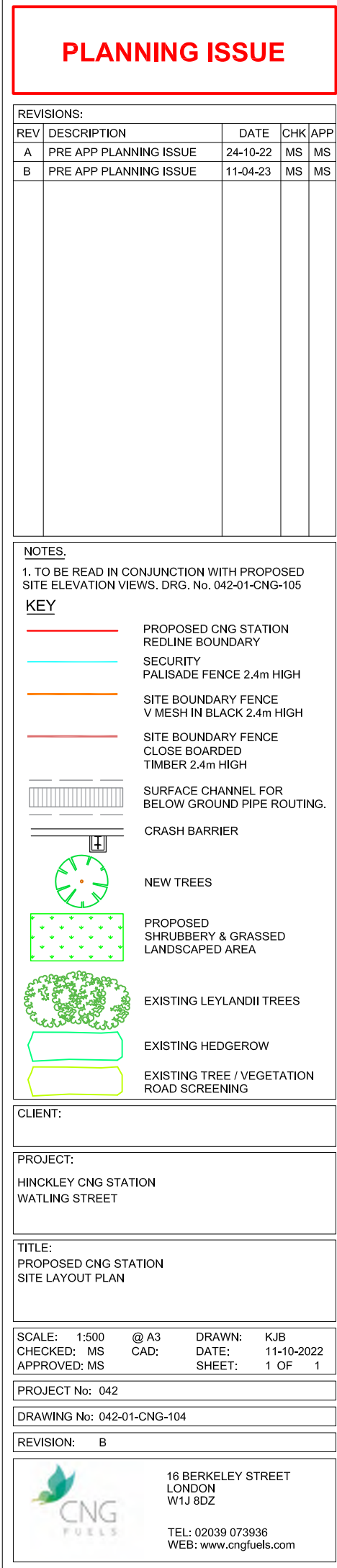
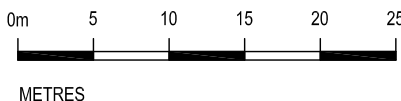
Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED

7 REFERENCES

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- [5] Land Information System (LANDIS), Soilscales Viewer
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- [8] Severn Trent Sewer Records.
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- [11] JBA Consulting, *2019s0332 Strategic Flood Risk Assessment for Hinckley and Bosworth Borough Council*, July 2019.
- [12] D.B Boorman, J.M. Hollis & A. Lilly, 1995. *Hydrology of soil types, Report No. 126. (IoH126) Institute of Hydrology*, November 1995.
- [13] UK SuDS Online Tool in accordance with Environment Agency report SC030419, *Rainfall Runoff Management for Developments*, October 2013
- [14] CIRIA, *Designing for Exceedance in Urban Drainage – Good Practice, Report C635*, 2006.
- [15] DEFRA, *Sustainable Drainage Systems – Non-statutory technical standards for sustainable drainage systems*, March 2015.
- [16] LASOO, *Non-statutory SUDS technical standards guidance*, 2016.

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APPENDIX A
DEVELOPMENT PROPOSALS



Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED

APPENDIX B
TOPOGRAPHICAL SURVEY



LINE
ACRES



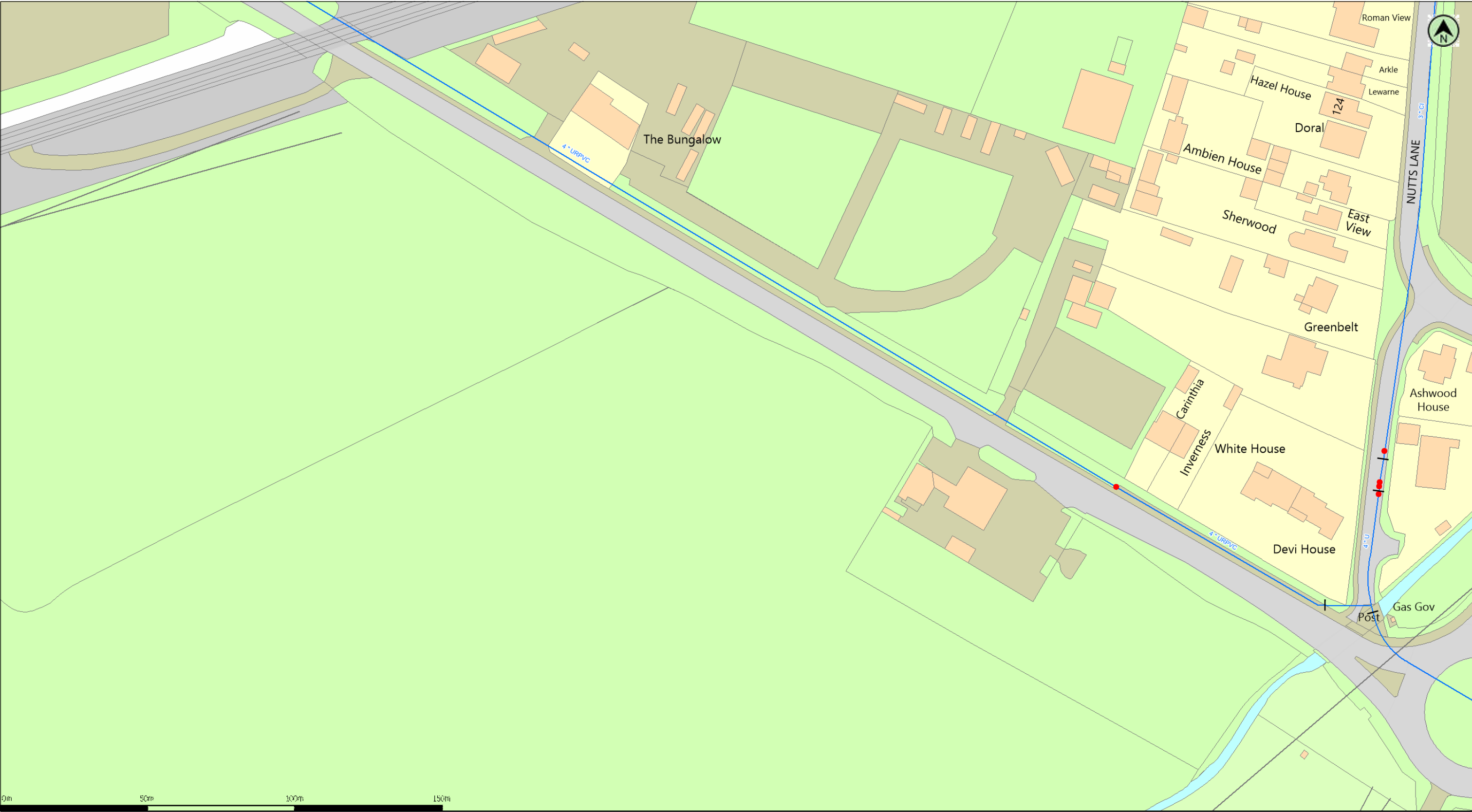
BP PETROL
STATION
LE10 3ED

LARGE
LECHLAND

TITLE	WATLING ST TOPO-OS Map
DRAWN BY	D NUTTALL
DRAWING NUMBER	N/A
DATE	28/09/2022

Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED

APPENDIX C
SERVERN TRENT SEWER PLANS



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Hydrant	●	Valve		Aqueduct	----
Washout	●	Water Main	—	Duct	----
Meter	■	Abandoned Pipe	----	Service Pipe/ Private Pipe	----

stacey.meades@cngfuels.com
Hinckley, Watling St



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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.
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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 or 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.



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

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Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED

APPENDIX D
ENVIRONMENT AGENCY PRODUCT 4 DATA

Product 4 (Detailed Flood Risk Data) for Land off Hydes Lane, Hinkley

Reference number: 253382

Date of issue: 14 March 2022

Model Information

The following information and attached maps contain a summary of the modelled information relevant to the area of interest. The information provided is based on the best available data as of the date of issue.

Model Name	Release Date
Stour and Hinckley Flood Mapping	2013

Flood Map for Planning (Rivers and Sea)

The Flood Map for Planning (Rivers and Sea) indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood event with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring in any year for fluvial (river) flooding (Flood Zone 3). It also shows the extent of the Extreme Flood Outlines (Flood Zone 2) which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater. The Flood Zones refer to the land at risk of flooding and **do not** refer to individual properties. It is possible for properties to be built at a level above the floodplain but still fall within the risk area.

This Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered that flooding may occur from other sources such as surface water, sewers, road drainage, etc.

To find out which flood zone a location is in please use: <https://flood-map-for-planning.service.gov.uk/>

Definition of flood zones

- **Zone 1** - The area is within the lowest probability of flooding from rivers and the sea, where the chance of flooding in any one year is less than 0.1% (i.e. a 1000 to 1 chance).
- **Zone 2** - The area which falls between the extent of a flood with an annual probability of 0.1% (i.e. a 1000 to 1 chance) fluvial and tidal, or greatest recorded historic flood, whichever is greater, and the extent of a flood with an annual probability of 1% (i.e. a

100 to 1 chance) fluvial / 0.5% (i.e. a 200 to 1 chance) tidal. (Land shown in light blue on the Flood Map).

- **Zone 3** - The chance of flooding in any one year is greater than or equal to 1% (i.e. a 100 to 1 chance) for river flooding and greater than or equal to 0.5% (i.e. a 200 to 1 chance) for coastal and tidal flooding.

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the [Strategic Flood Risk Assessment](#) when considering location and potential future flood risks to developments and land uses.

Node Data

The attached map will show a selection of 1D model node points near to your site. The fluvial levels for these node points are shown below.

Fluvial Flood Levels (m AOD)

The modelled levels are given in m AOD (N), m AOD indicates metres Above Ordnance Datum (Newlyn).

The information is taken from the model referenced above and does not include the updated climate change figures.

Annual Exceedance Probability - Maximum Water Levels (mAOD) UN-DEFENDED				
Node Label	EASTING	NORTHING	1% (1 in 100)	0.1% (1 in 1000)
1.025U	441042	292566	90.22	90.48
1.024U	440975	292506	90.22	90.35
1.023U	440969	292499	90.21	90.34
1.022	440863	292416	88.54	88.72
1.023D	440946	292480	88.92	88.99
1.025D	441013	292538	90.22	90.34
1.026D	441124	292604	90.34	90.55
1.026i1	441077	292594	90.23	90.48
1.023i1	440919	292453	88.70	88.83
1.023i2	440892	292428	88.59	88.76

Annual Exceedance Probability - Maximum Water Levels (mAOD) DEFENDED											
Node Label	EASTING	NORTHING	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (Climate Change)*	0.5% (1 in 200)	0.1% (1 in 1000)
1.025U	441042	292566	89.594	89.6	89.965	90.17	90.195	90.223	90.29	90.296	90.476
1.024U	440975	292506	89.59	89.59	89.96	90.17	90.19	90.22	90.29	90.30	90.35
1.023U	440969	292499	89.58	89.58	89.95	90.15	90.18	90.21	90.28	90.28	90.34
1.022	440863	292416	88.16	88.18	88.37	88.50	88.52	88.54	88.61	88.61	88.72
1.023D	440946	292480	88.74	88.74	88.83	88.90	88.91	88.92	88.95	88.95	88.99
1.025D	441013	292538	89.59	89.60	89.96	90.17	90.19	90.22	90.29	90.29	90.34
1.026D	441124	292604	90.01	90.01	90.14	90.29	90.31	90.34	90.42	90.43	90.55
1.026i1	441077	292594	89.65	89.65	89.97	90.17	90.20	90.23	90.29	90.30	90.48
1.023i1	440919	292453	88.40	88.41	88.56	88.66	88.68	88.70	88.75	88.75	88.83
1.023i2	440892	292428	88.21	88.23	88.43	88.55	88.57	88.59	88.65	88.65	88.76

*Climate change percentage increase not specified

Climate Change

In February 2016 the '[Flood Risk Assessments: Climate Change Allowances](#)' were published on GOV.UK. This is in replacement of previous climate change allowances for planning applications. The data provided in this product does not include the new allowances. You will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding. The fluvial climate change factors are now more complex and a single uplift percentage across England cannot be justified.

The Environment Agency will incorporate the new allowances into future modelling studies. For now, it remains the applicant's responsibility to demonstrate through their proposal and flood risk assessments that new developments will be safe in flood risk terms for its lifetime.

Recorded Flood Outlines

Following examination of our records of historical flooding we have no record of flooding in the area. The absence of coverage for an area does not mean that the area has never flooded, only that we do not currently have records of flooding in this area. It is also possible that the pattern of flooding in this area has changed and that this area would now flood or not flood under different circumstances.

You may also wish to contact your Local Authority or Internal Drainage Board, to see if they have other relevant local flood information.

Flood Defences

There are no formal raised flood defences owned or operated by the Environment Agency protecting this site. You may wish to contact the Local Authority to obtain further information regarding localised flooding from drains, culverts and small watercourses, and regarding existing or planned flood defence measures.

Planning development/s

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency Information for Flood Risk Assessments. You can also request pre application advice:

<https://www.gov.uk/planning-applications-assessing-flood-risk>

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

Supporting Information

River modelling: technical standards and assessment guidance

The link below contains standards for the flood risk management industry on how to build and review hydraulic models and provide evidence for flood risk management decisions.

<https://www.gov.uk/government/publications/river-modelling-technical-standards-and-assessment>

Surface Water

Managing the risk of flooding from surface water is the responsibility of Lead Local Flood Authorities. The 'risk of flooding from surface water' map has been produced by the Environment Agency on behalf of government, using information and input from Lead Local Flood Authorities.

You may wish to contact your Local Authority who may be able to provide further detailed information on surface water.

It is not possible to say for certain what the flood risk is but we use the best information available to provide an indication so that people can make informed choices about living with or managing the risks. The information we supply does not provide an indicator of flood risk at an individual site level. Further information can be found on the Agency's website:

<https://flood-warning-information.service.gov.uk/long-term-flood-risk>

Flood Risk from Reservoirs

The Flood Risk from Reservoirs map can be found on the Long Term Flood Risk Information website:

<https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=Reservoirs>

Flood Alert & Flood Warning Area

We issue flood alert/warnings to specific areas when flooding is expected. If you receive a flood warning you should take immediate action.

You can check whether you are in a Flood Alert/Warning Area and register online using the links below:

<https://www.gov.uk/check-flood-risk>

<https://www.gov.uk/sign-up-for-flood-warnings>

If you would prefer to register by telephone, or if you need help during the registration process, please call Floodline on 0345 988 1188.

The associated dataset for flood warning areas is available here:

<https://data.gov.uk/dataset/flood-warning-areas3>

The associated dataset for flood alert areas is available here: <https://data.gov.uk/dataset/flood-alert-areas2>

Flood Risk Activity Permits

We now consider applications for works, which may be Flood Risk Activities, under Environmental Permitting Regulations. This replaces the process of applying for a Flood Defence Consent. You may need an environmental Permit for flood risk activities if you want to do work:

- in, under, over or near a main river (including where the river is in a culvert)
- on or near a flood defence on a main river
- in the flood plain of a main river
- on or near a sea defence

Please go to this website to find out more about how to apply:

<https://www.gov.uk/guidance/flood-risk-activities-environmental-permits>.

Please be aware that Bespoke and Standard Rules permits can take up to 2 months to determine and will incur a charge.

Further details about the Environment Agency information supplied can be found on the GOV.UK website:

<https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

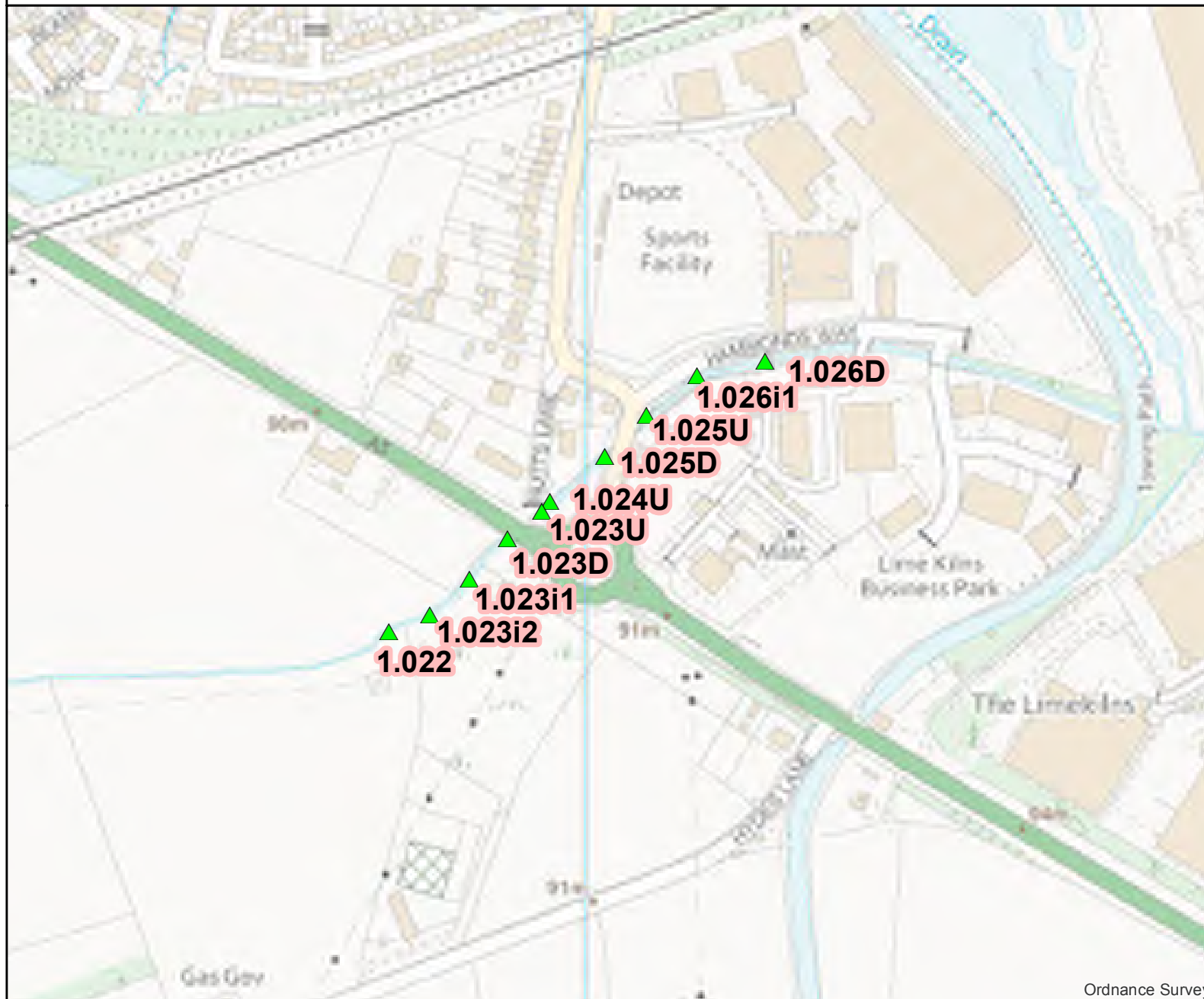
Node Point Location Plan for Land off Hydes Lane, Hinkley

Ref. 253382



Legend

▲ Modelled Levels

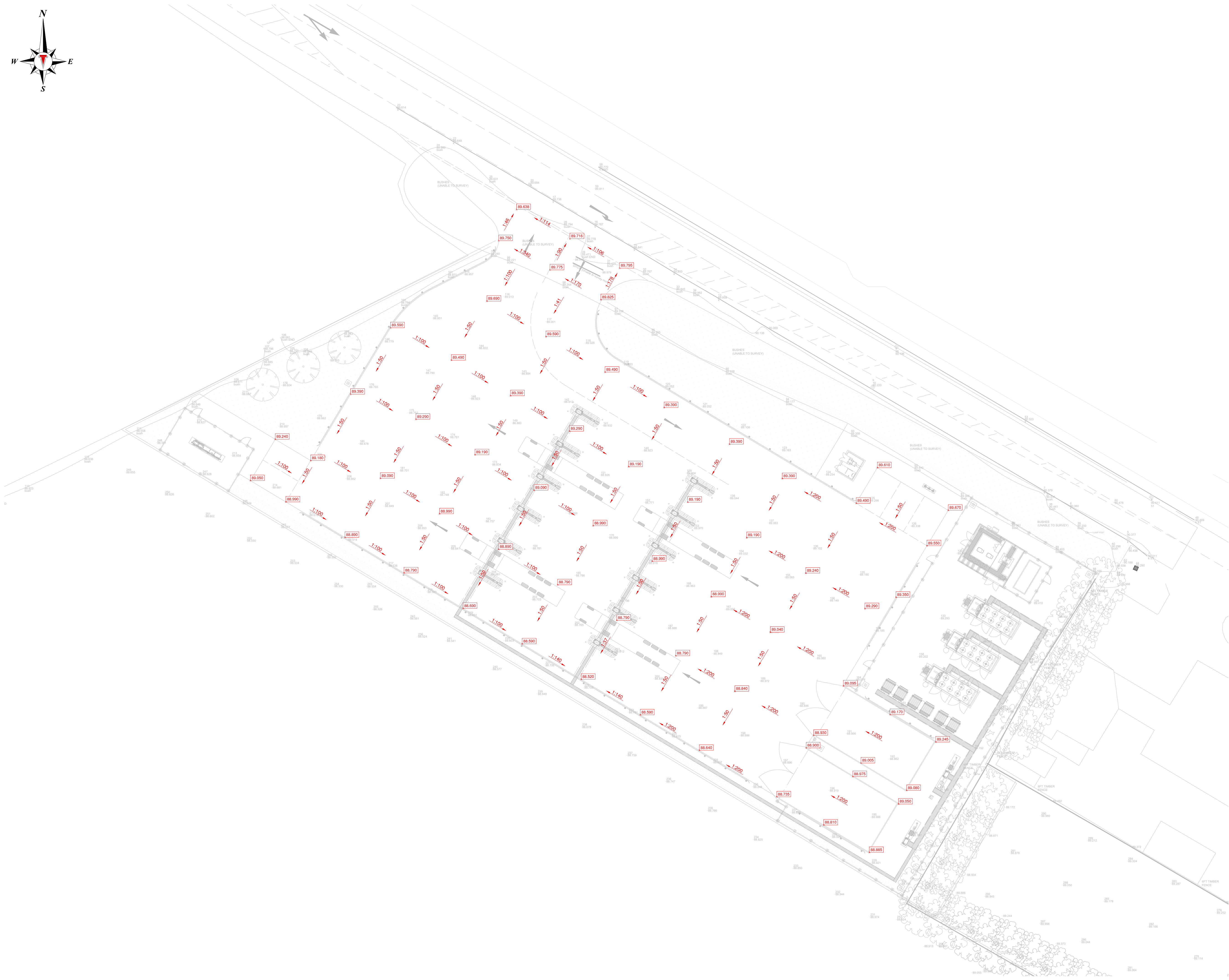
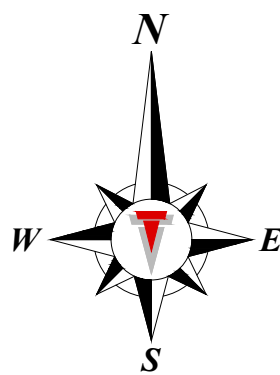


Scale: 1:4,000
Created: 14/03/2022
Eastings: 441,019
Northings: 292,504



Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED

APPENDIX E
LEVELS & CATCHMENT PLAN



DO NOT SCALE THIS DRAWING

A1

GENERAL NOTES:

- Before construction commences, the setting out Engineer shall ensure that all setting out information is mutually compatible with all the drawings and documents provided by the designers. Where information is apparently contradictory or ambiguous, the design Engineer and/or the Architect is to be informed immediately. Thomas Consulting will accept no liability for setting out errors where work is constructed to incorrect information.
- All drawings and documents are to be read in conjunction with one another, are mutually compatible and shall be read as such. All documents shall be checked to ensure that they are compatible by the contractor before construction commences. In the event of apparent ambiguity or contradiction the engineer and/or architect shall be notified immediately. Thomas Consulting accept no liability in the event of not being so notified and where construction work has commenced.
- In accordance with CDM regulations 2015 this drawing has been prepared with due attention to identifying any unusual design hazards that may exist. Unusual design hazards are hazards that a reasonably competent contractor, experienced in this type of work may not be expected to identify. In dealing with unusual design hazards we have adopted the "ERIC" principle and where possible eliminated (E) the hazard at design stage, if it has not been possible to eliminate the hazard we have endeavoured to reduce (R) it. Where it has not been possible to eliminate these hazards, the hazard is noted on the drawing with appropriate information (I) in order that the hazard can be controlled (C) during construction. It is the contractor's responsibility to fully acquaint themselves with all construction drawings before commencing construction and if in doubt about any matter to ask for clarification from the designer.
- All drawings issued electronically for this scheme are provided for the sole purpose of assisting the design, procurement or construction of the structures for which Thomas Consulting have been appointed as Design Engineers/Consultants. They may not be used for any other purpose, nor may they be amended, copied, redistributed or issued to third parties without the written agreement of Thomas Consulting. All drawings remain under copyright to, and the intellectual property of, Thomas Consulting. Upon completion of the project, all drawings are to be deleted from your computer systems and all other electronic copies destroyed. Where electronic copies of final drawings are to be issued, these will be provided in a digital only format by Thomas Consulting (no other copies may be retained). By opening and using this drawing, it is assumed that you agree to abide by these Terms and Conditions.
- Unless expressly agreed with a director of Thomas Consulting Ltd, for the purposes of the CDM regulations 2015 Thomas Consulting are not the Principal Designer. The client has been advised that they are required to appoint a Principal Designer. For further information see <http://www.hse.gov.uk/>.

IN ADDITION TO THE HAZARDS/RISKS ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS:

ITEM	HAZARD IDENTIFICATION
1	CHECK IF THERE ARE RESIDUAL RISKS

REVISIONS				
REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
A	26.04.23	Site Layout updated	CS	JP
B	22.05.23	Site Layout updated	CS	JP
C	16.11.23	Updated for Detailed Design	CS	NJ

DRAWING STATUS:

FOR PLANNING



THOMAS CONSULTING

STRUCTURAL & CIVIL DESIGN ENGINEERS

Offices in **Charley, Lancaster & Shrewsbury**

Tel: 01524 846022

e-mail: info@thomasconsulting.co.uk

CLIENT:

CNG FUELS

PROJECT:

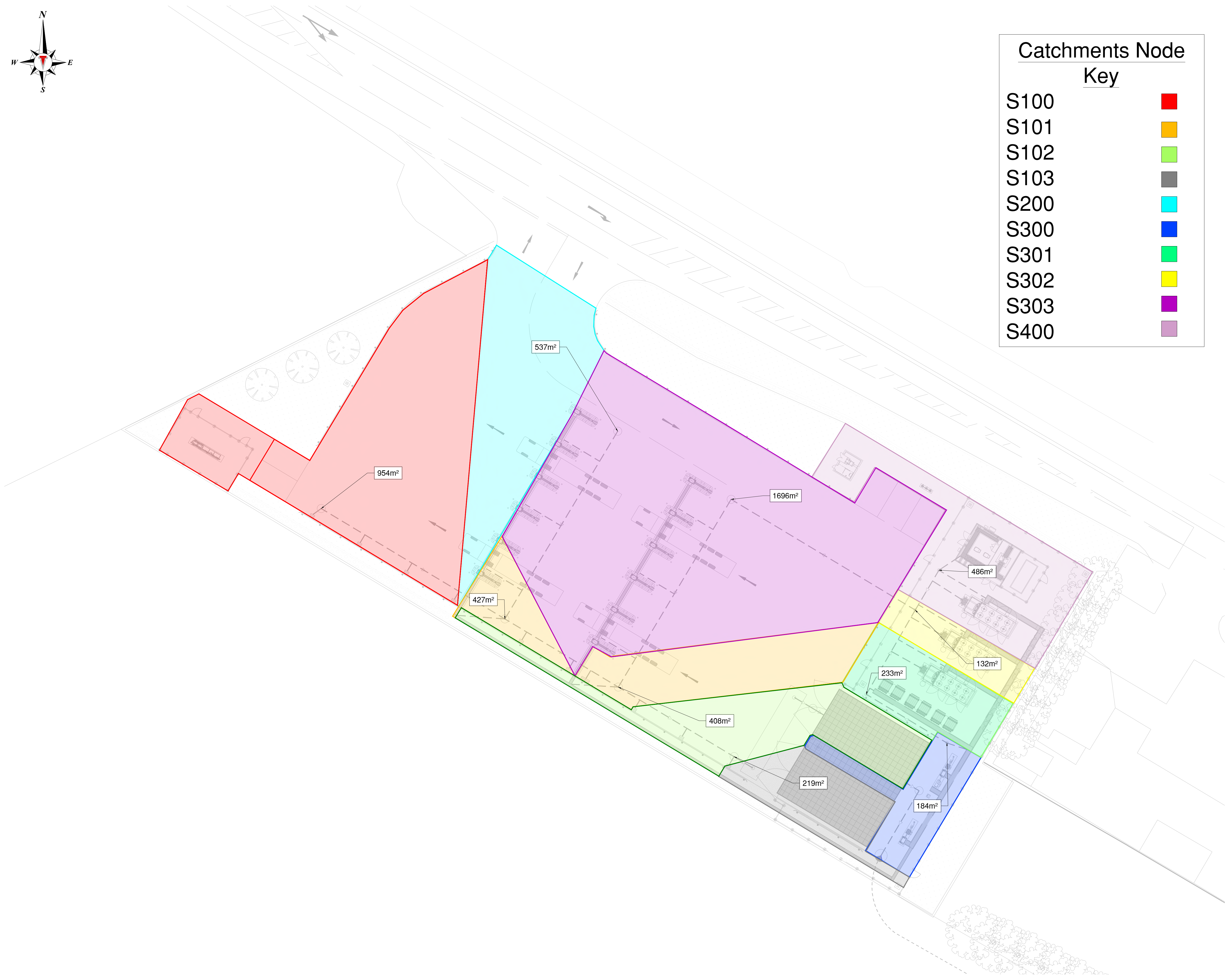
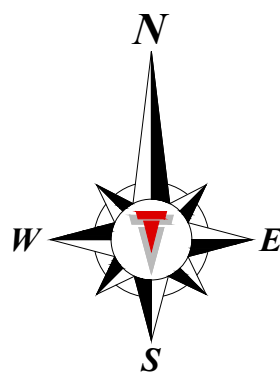
HINCKLEY 2

DRAWING TITLE:

LEVELS PLAN

DATE CREATED:	DRAWING SCALE:	DRAWN BY:	CHECKED BY:	QA CATEGORY:
06.12.22	1:250	CS	JP	1

DRAWING REF:	REV:
TC / P9298 / 23 / 100	C



Catchments Node Key

S100	
S101	
S102	
S103	
S200	
S300	
S301	
S302	
S303	
S400	

DO NOT SCALE THIS DRAWING

A1

GENERAL NOTES:

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- All drawings issued electronically for this scheme are provided for the sole purpose of assisting the design, procurement or construction of the structures for which Thomas Consulting have been appointed as Design Engineers/Consultants. They may not be used for any other purpose, nor may they be amended, copied, redistributed or issued to third parties without the written agreement of Thomas Consulting. All drawings remain under copyright to, and the intellectual property of, Thomas Consulting. Upon completion of the project, all drawings are to be deleted from your computer systems and all other electronic copies destroyed. Where electronic copies of final drawings are to be issued, these will be provided in a digital only format by Thomas Consulting (no other copies may be retained). By opening and using this drawing, it is assumed that you agree to abide by these Terms and Conditions.
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ITEM	HAZARD IDENTIFICATION			
¹	CHECK IF THERE ARE RESIDUAL RISKS			
REVISIONS				
REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
A	03.03.23	Updated Drainage Layout	CS	JP
B	26.04.23	Site Layout updated	CS	JP
C	22.05.23	Site Layout updated	CS	JP
D	16.11.23	Updated for Detailed Design	CS	NJ

DRAWING STATUS: FOR PLANNING

THOMAS CONSULTING
STRUCTURAL & CIVIL DESIGN ENGINEERS
Offices in **Charley, Lancaster & Shrewsbury**
Tel: 01524 846022
e-mail: info@thomasconsulting.co.uk

CLIENT: CNG FUELS

PROJECT: HINCKLEY 2

DRAWING TITLE: CATCHMENT PLAN

DATE CREATED: 06.12.22 DRAWING SCALE: 1:250 DRAWN BY: CS CHECKED BY: JP QA CATEGORY: 1

DRAWING REF: REV:

TC / P9298 / 23 / 101 D

APPENDIX F
GREENFIELD RUNOFF CALCULATIONS

[Print](#)[Close Report](#)

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by: Cameron Shearman

Site name: CNG Hinckley 2

Site location: Hinckley

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude: 52.52938° N

Longitude: 1.40038° W

Reference: 1752281132

Date: Dec 07 2022 16:09

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 0.74

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
--	---------	--------

SOIL type:	4	4
------------	---	---

HOST class:	N/A	N/A
-------------	-----	-----

SPR/SPRHOST:	0.47	0.47
--------------	------	------

Hydrological characteristics

	Default	Edited
--	---------	--------

SAAR (mm):	644	644
------------	-----	-----

Hydrological region:	4	4
----------------------	---	---

Growth curve factor 1 year:	0.83	0.83
-----------------------------	------	------

Growth curve factor 30 years:	2	2
-------------------------------	---	---

Growth curve factor 100 years:	2.57	2.57
--------------------------------	------	------

Growth curve factor 200 years:	3.04	3.04
--------------------------------	------	------

Notes

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

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

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

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

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

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
--	---------	--------

Q_{BAR} (l/s):	3.24	3.24
------------------	------	------

1 in 1 year (l/s):	2.69	2.69
--------------------	------	------

1 in 30 years (l/s):	6.48	6.48
----------------------	------	------

1 in 100 year (l/s):	8.33	8.33
----------------------	------	------

1 in 200 years (l/s):	9.85	9.85
-----------------------	------	------

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

APPENDIX G
SURFACE WATER CALCULATIONS

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	5	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	1.000
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	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S100	0.095	5.00	88.990	1200	440702.455	292568.538	1.425
S101	0.043	5.00	88.665	1200	440729.193	292552.472	1.500
S102	0.041	5.00	88.609	1500	440745.700	292542.554	1.643
S103	0.022	5.00	88.700	1200	440760.813	292533.473	1.789
Int In			88.737		440765.297	292530.771	1.843
Int Out			88.921		440771.285	292541.028	2.127
S104			88.937	1200	440774.014	292539.443	2.153
Storage In			88.952		440775.600	292538.487	2.174
Attenuation			88.950		440781.957	292531.985	2.173
Storage Out			88.950		440787.661	292528.560	2.174
S105			88.950	1200	440789.476	292527.468	2.181
S106			88.935	1800	440783.936	292518.034	2.200
S107		5.00	89.600	460	440902.242	292440.699	1.100
Outfall			89.600		440902.619	292437.565	1.130
S200	0.054	5.00	89.302	1200	440745.610	292579.794	1.425
S300	0.018	5.00	89.000	460	440793.535	292534.414	1.425
S301	0.023	5.00	88.853	460	440781.684	292541.296	1.425
S302	0.013	5.00	88.853	460	440788.920	292553.766	1.585
S303	0.170	5.00	89.262	1200	440762.120	292569.874	2.197
S400	0.049	5.00	88.920	460	440792.374	292559.575	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
S1.000	S100	S101	31.194	0.600	87.565	87.240	0.325	96.0	225
S1.001	S101	S102	19.257	0.600	87.165	87.041	0.124	155.3	300
S1.002	S102	S103	17.631	0.600	86.966	86.911	0.055	320.6	375
S1.003	S103	Int In	5.235	0.600	86.911	86.894	0.017	308.0	375
S1.003A	Int In	Int Out	11.877	0.600	86.894	86.794	0.100	118.8	375
S1.004	Int Out	S104	3.156	0.600	86.794	86.784	0.010	315.6	375
S1.005	S104	Storage In	1.852	0.600	86.784	86.778	0.006	308.6	375

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
S1.000	1.335	53.1	12.9	1.200	1.200	0.095	0.0	75	1.104
S1.001	1.259	89.0	26.0	1.200	1.268	0.192	0.0	111	1.098
S1.002	1.006	111.1	68.6	1.268	1.414	0.506	0.0	214	1.057
S1.003	1.027	113.4	71.6	1.414	1.468	0.528	0.0	216	1.084
S1.003A	1.661	183.5	71.6	1.468	1.752	0.528	0.0	162	1.561
S1.004	1.014	112.0	71.6	1.752	1.778	0.528	0.0	218	1.073
S1.005	1.026	113.3	71.6	1.778	1.799	0.528	0.0	216	1.082

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
S1.005A	Storage In	Attenuation	9.093	0.600	86.778	86.777	0.001	9093.3	375
S1.005B	Attenuation	Storage Out	6.653	0.600	86.777	86.776	0.001	6653.3	375
S1.006	Storage Out	S105	2.118	0.600	86.776	86.769	0.007	302.6	375
S1.007	S105	S106	10.940	0.600	86.769	86.735	0.034	321.8	375
S1.009	S107	Outfall	3.000	0.600	88.500	88.470	0.030	100.0	225
S2.000	S200	S101	31.875	0.600	87.877	87.240	0.637	50.0	225
S3.000	S300	S301	13.704	0.600	87.575	87.428	0.147	93.2	225
S3.001	S301	S302	14.417	0.600	87.428	87.343	0.085	169.6	225
S3.002	S302	S303	31.268	0.600	87.268	87.140	0.128	244.3	300
S3.003	S303	S102	31.875	0.600	87.065	86.966	0.099	322.0	375
S4.000	S400	S302	6.758	0.600	87.570	87.418	0.152	44.5	150

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
S1.005A	0.181	19.9	71.6	1.799	1.798	0.528	0.0	375	0.183
S1.005B	0.213	23.5	71.6	1.798	1.799	0.528	0.0	375	0.215
S1.006	1.036	114.4	71.6	1.799	1.806	0.528	0.0	215	1.091
S1.007	1.004	110.9	71.6	1.806	1.825	0.528	0.0	219	1.065
S1.009	1.307	52.0	0.0	0.875	0.905	0.000	0.0	0	0.000
S2.000	1.853	73.7	7.3	1.200	1.200	0.054	0.0	48	1.196
S3.000	1.354	53.8	2.4	1.200	1.200	0.018	0.0	32	0.685
S3.001	1.001	39.8	5.6	1.200	1.285	0.041	0.0	57	0.709
S3.002	1.001	70.8	14.0	1.285	1.822	0.103	0.0	90	0.783
S3.003	1.004	110.9	37.0	1.822	1.268	0.273	0.0	149	0.907
S4.000	1.513	26.7	6.6	1.200	1.285	0.049	0.0	51	1.256

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)
S1.000	31.194	96.0	225	Circular	88.990	87.565	1.200	88.665	87.240	1.200
S1.001	19.257	155.3	300	Circular	88.665	87.165	1.200	88.609	87.041	1.268
S1.002	17.631	320.6	375	Circular	88.609	86.966	1.268	88.700	86.911	1.414
S1.003	5.235	308.0	375	Circular	88.700	86.911	1.414	88.737	86.894	1.468
S1.003A	11.877	118.8	375	Circular	88.737	86.894	1.468	88.921	86.794	1.752
S1.004	3.156	315.6	375	Circular	88.921	86.794	1.752	88.937	86.784	1.778
S1.005	1.852	308.6	375	Circular	88.937	86.784	1.778	88.952	86.778	1.799
S1.005A	9.093	9093.3	375	Circular	88.952	86.778	1.799	88.950	86.777	1.798
S1.005B	6.653	6653.3	375	Circular	88.950	86.777	1.798	88.950	86.776	1.799
S1.006	2.118	302.6	375	Circular	88.950	86.776	1.799	88.950	86.769	1.806

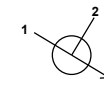
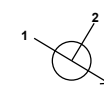
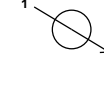
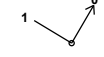
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
S1.000	S100	1200	Manhole	Adoptable	S101	1200	Manhole	Adoptable
S1.001	S101	1200	Manhole	Adoptable	S102	1500	Manhole	Adoptable
S1.002	S102	1500	Manhole	Adoptable	S103	1200	Manhole	Adoptable
S1.003	S103	1200	Manhole	Adoptable	Int In		Junction	
S1.003A	Int In		Junction		Int Out		Junction	
S1.004	Int Out		Junction		S104	1200	Manhole	Adoptable
S1.005	S104	1200	Manhole	Adoptable	Storage In		Junction	
S1.005A	Storage In		Junction		Attenuation		Junction	
S1.005B	Attenuation		Junction		Storage Out		Junction	
S1.006	Storage Out		Junction		S105	1200	Manhole	Adoptable

Pipeline Schedule

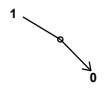
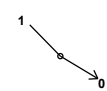
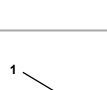
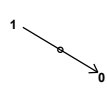
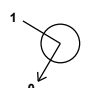
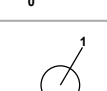
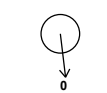
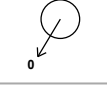
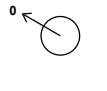
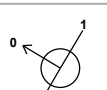
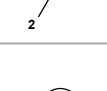
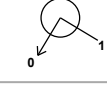
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
S1.007	10.940	321.8	375	Circular	88.950	86.769	1.806	88.935	86.735	1.825
S1.009	3.000	100.0	225	Circular	89.600	88.500	0.875	89.600	88.470	0.905
S2.000	31.875	50.0	225	Circular	89.302	87.877	1.200	88.665	87.240	1.200
S3.000	13.704	93.2	225	Circular	89.000	87.575	1.200	88.853	87.428	1.200
S3.001	14.417	169.6	225	Circular	88.853	87.428	1.200	88.853	87.343	1.285
S3.002	31.268	244.3	300	Circular	88.853	87.268	1.285	89.262	87.140	1.822
S3.003	31.875	322.0	375	Circular	89.262	87.065	1.822	88.609	86.966	1.268
S4.000	6.758	44.5	150	Circular	88.920	87.570	1.200	88.853	87.418	1.285

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
S1.007	S105	1200	Manhole	Adoptable	S106	1800	Manhole	Adoptable
S1.009	S107	460	Manhole	Adoptable	Outfall		Junction	
S2.000	S200	1200	Manhole	Adoptable	S101	1200	Manhole	Adoptable
S3.000	S300	460	Manhole	Adoptable	S301	460	Manhole	Adoptable
S3.001	S301	460	Manhole	Adoptable	S302	460	Manhole	Adoptable
S3.002	S302	460	Manhole	Adoptable	S303	1200	Manhole	Adoptable
S3.003	S303	1200	Manhole	Adoptable	S102	1500	Manhole	Adoptable
S4.000	S400	460	Manhole	Adoptable	S302	460	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S100	440702.455	292568.538	88.990	1.425	1200		0	S1.000	87.565	225
S101	440729.193	292552.472	88.665	1.500	1200		1	S1.000	87.240	225
							2	S2.000	87.240	225
S102	440745.700	292542.554	88.609	1.643	1500		0	S1.001	87.165	300
							1	S1.001	87.041	300
S103	440760.813	292533.473	88.700	1.789	1200		2	S3.003	86.966	375
							0	S1.002	86.966	375
S103	440760.813	292533.473	88.700	1.789	1200		1	S1.002	86.911	375
							0	S1.003	86.911	375
Int In	440765.297	292530.771	88.737	1.843			1	S1.003	86.894	375
Int Out	440771.285	292541.028	88.921	2.127			0	S1.003A	86.894	375
							1	S1.003A	86.794	375
S104	440774.014	292539.443	88.937	2.153	1200		0	S1.004	86.794	375
							1	S1.004	86.784	375
S104	440774.014	292539.443	88.937	2.153	1200		0	S1.005	86.784	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Storage In	440775.600	292538.487	88.952	2.174			1 S1.005	86.778	375
Attenuation	440781.957	292531.985	88.950	2.173			1 S1.005A	86.777	375
							0 S1.005B	86.777	375
Storage Out	440787.661	292528.560	88.950	2.174			1 S1.005B	86.776	375
S105	440789.476	292527.468	88.950	2.181	1200		1 S1.006	86.769	375
							0 S1.007	86.769	375
S106	440783.936	292518.034	88.935	2.200	1800		1 S1.007	86.735	375
S107	440902.242	292440.699	89.600	1.100	460		0 S1.009	88.500	225
Outfall	440902.619	292437.565	89.600	1.130			1 S1.009	88.470	225
S200	440745.610	292579.794	89.302	1.425	1200		0 S2.000	87.877	225
S300	440793.535	292534.414	89.000	1.425	460		0 S3.000	87.575	225
S301	440781.684	292541.296	88.853	1.425	460		1 S3.000	87.428	225
S302	440788.920	292553.766	88.853	1.585	460		1 S4.000	87.418	150
							2 S3.001	87.343	225
S303	440762.120	292569.874	89.262	2.197	1200		1 S3.002	87.140	300
S400	440792.374	292559.575	88.920	1.350	460		0 S3.003	87.065	375
							0 S4.000	87.570	150

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	✓	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
10	0	0	0
30	0	0	0
100	40	0	0

Node S106 Offline Pump Control

Flap Valve	x	Invert Level (m)	86.735	Switch off depth (m)	0.000
Loop to Node	S107	Switch on depth (m)	0.001		

Depth (m)	Flow (l/s)
0.001	3.200

Node Attenuation Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	86.777
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	267.5	0.0	1.100	267.5	0.0	1.101	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S100	10	87.640	0.075	12.5	0.1844	0.0000	OK
15 minute winter	S101	10	87.279	0.114	24.7	0.1943	0.0000	OK
15 minute winter	S102	11	87.183	0.217	64.2	0.4927	0.0000	OK
15 minute winter	S103	11	87.106	0.195	66.4	0.2680	0.0000	OK
15 minute winter	Int In	11	87.066	0.172	66.7	0.0000	0.0000	OK
15 minute winter	Int Out	11	87.048	0.254	67.1	0.0000	0.0000	OK
15 minute summer	S104	11	87.041	0.257	64.5	0.2905	0.0000	OK
360 minute winter	Storage In	272	87.030	0.252	12.4	0.0000	0.0000	OK
360 minute winter	Attenuation	272	87.030	0.253	12.6	64.2095	0.0000	OK
360 minute winter	Storage Out	272	87.030	0.254	8.7	0.0000	0.0000	OK
360 minute winter	S105	272	87.030	0.261	7.4	0.2949	0.0000	OK
360 minute winter	S106	272	87.030	0.295	7.6	0.7500	0.0000	OK
240 minute winter	S107	128	88.539	0.039	3.2	0.0065	0.0000	OK
240 minute winter	Outfall	128	88.508	0.038	3.2	0.0000	0.0000	OK
15 minute winter	S200	10	87.924	0.047	7.1	0.0891	0.0000	OK
15 minute winter	S300	10	87.607	0.032	2.4	0.0134	0.0000	OK
15 minute winter	S301	11	87.485	0.057	5.4	0.0278	0.0000	OK
15 minute winter	S302	11	87.358	0.090	13.3	0.0295	0.0000	OK
15 minute winter	S303	11	87.215	0.150	35.0	0.4027	0.0000	OK
15 minute winter	S400	10	87.624	0.054	6.5	0.0481	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S100	S1.000	S101	12.1	1.075	0.228	0.3522	
15 minute winter	S101	S1.001	S102	24.6	0.920	0.276	0.5497	
15 minute winter	S102	S1.002	S103	63.7	1.032	0.573	1.0928	
15 minute winter	S103	S1.003	Int In	66.7	1.249	0.588	0.2804	
15 minute winter	Int In	S1.003A	Int Out	67.1	1.040	0.366	0.7641	
15 minute winter	Int Out	S1.004	S104	71.0	0.946	0.633	0.2430	
15 minute winter	S104	S1.005	Storage In	80.4	1.074	0.710	0.1387	
15 minute summer	Storage In	S1.005A	Attenuation	76.7	2.353	3.845	0.4133	
60 minute winter	Attenuation	S1.005B	Storage Out	28.3	0.744	1.204	0.3116	
60 minute winter	Storage Out	S1.006	S105	24.0	0.799	0.209	0.1035	
60 minute winter	S105	S1.007	S106	20.5	0.677	0.185	0.6176	
60 minute winter	S106	Pump	S107	3.2				41.2
240 minute winter	S107	S1.009	Outfall	3.2	0.709	0.062	0.0135	72.7
15 minute winter	S200	S2.000	S101	6.9	1.160	0.094	0.1896	
15 minute winter	S300	S3.000	S301	2.4	0.427	0.044	0.0771	
15 minute winter	S301	S3.001	S302	5.3	0.686	0.132	0.1103	
15 minute winter	S302	S3.002	S303	13.2	0.767	0.187	0.5390	
15 minute winter	S303	S3.003	S102	34.5	0.651	0.311	1.7130	
15 minute winter	S400	S4.000	S302	6.4	1.187	0.241	0.0367	

Results for 10 year Critical Storm Duration. Lowest mass balance: 98.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S100	10	87.672	0.107	23.6	0.2645	0.0000	OK
15 minute winter	S101	11	87.341	0.176	46.9	0.3002	0.0000	OK
15 minute winter	S102	11	87.314	0.348	117.4	0.7885	0.0000	OK
15 minute winter	S103	11	87.214	0.303	120.7	0.4176	0.0000	OK
360 minute winter	Int In	336	87.208	0.314	19.6	0.0000	0.0000	OK
360 minute winter	Int Out	336	87.208	0.414	18.9	0.0000	0.0000	SURCHARGED
360 minute winter	S104	336	87.208	0.424	19.6	0.4800	0.0000	SURCHARGED
360 minute winter	Storage In	336	87.208	0.430	20.1	0.0000	0.0000	SURCHARGED
360 minute winter	Attenuation	336	87.208	0.431	19.4	109.6245	0.0000	SURCHARGED
360 minute winter	Storage Out	336	87.208	0.432	4.7	0.0000	0.0000	SURCHARGED
360 minute winter	S105	336	87.208	0.439	4.6	0.4969	0.0000	SURCHARGED
360 minute winter	S106	336	87.208	0.473	4.5	1.2045	0.0000	OK
30 minute summer	S107	21	88.539	0.039	3.2	0.0066	0.0000	OK
30 minute summer	Outfall	21	88.508	0.038	3.2	0.0000	0.0000	OK
15 minute winter	S200	10	87.941	0.064	13.4	0.1213	0.0000	OK
15 minute winter	S300	10	87.618	0.043	4.5	0.0182	0.0000	OK
15 minute winter	S301	10	87.508	0.080	10.1	0.0391	0.0000	OK
15 minute winter	S302	10	87.389	0.121	25.2	0.0400	0.0000	OK
15 minute winter	S303	11	87.342	0.277	67.2	0.7417	0.0000	OK
15 minute winter	S400	10	87.649	0.079	12.2	0.0701	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S100	S1.000	S101	22.9	1.269	0.433	0.5661	
15 minute winter	S101	S1.001	S102	45.7	0.934	0.514	1.0621	
15 minute winter	S102	S1.002	S103	115.5	1.144	1.039	1.7826	
15 minute winter	S103	S1.003	Int In	120.4	1.350	1.062	0.4720	
15 minute winter	Int In	S1.003A	Int Out	123.0	1.257	0.670	1.1426	
15 minute winter	Int Out	S1.004	S104	129.5	1.243	1.156	0.3309	
15 minute winter	S104	S1.005	Storage In	125.2	1.314	1.105	0.1900	
15 minute summer	Storage In	S1.005A	Attenuation	151.7	2.456	7.606	0.6046	
30 minute winter	Attenuation	S1.005B	Storage Out	40.2	0.850	1.714	0.5553	
30 minute winter	Storage Out	S1.006	S105	36.1	0.843	0.315	0.1803	
15 minute summer	S105	S1.007	S106	31.6	1.442	0.285	0.7253	
15 minute summer	S106	Pump	S107	3.2				42.3
30 minute summer	S107	S1.009	Outfall	3.2	0.709	0.062	0.0135	48.3
15 minute winter	S200	S2.000	S101	13.2	1.227	0.179	0.4207	
15 minute winter	S300	S3.000	S301	4.4	0.504	0.083	0.1233	
15 minute winter	S301	S3.001	S302	9.9	0.815	0.248	0.1756	
15 minute winter	S302	S3.002	S303	24.9	0.776	0.351	1.2033	
15 minute winter	S303	S3.003	S102	62.5	0.686	0.564	3.0911	
15 minute winter	S400	S4.000	S302	12.1	1.383	0.453	0.0592	

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S100	10	87.692	0.127	31.4	0.3125	0.0000	OK
15 minute winter	S101	11	87.510	0.345	63.5	0.5884	0.0000	SURCHARGED
15 minute winter	S102	11	87.445	0.479	144.7	1.0862	0.0000	SURCHARGED
360 minute winter	S103	352	87.355	0.444	24.8	0.6115	0.0000	SURCHARGED
360 minute winter	Int In	352	87.355	0.461	24.3	0.0000	0.0000	SURCHARGED
360 minute winter	Int Out	352	87.355	0.561	24.0	0.0000	0.0000	SURCHARGED
360 minute winter	S104	352	87.355	0.571	23.8	0.6458	0.0000	SURCHARGED
360 minute winter	Storage In	352	87.355	0.577	23.7	0.0000	0.0000	SURCHARGED
360 minute winter	Attenuation	352	87.355	0.578	23.5	146.8803	0.0000	SURCHARGED
360 minute winter	Storage Out	352	87.355	0.579	7.3	0.0000	0.0000	SURCHARGED
360 minute winter	S105	352	87.355	0.586	6.2	0.6627	0.0000	SURCHARGED
360 minute winter	S106	352	87.355	0.620	7.1	1.5777	0.0000	OK
15 minute summer	S107	13	88.539	0.039	3.2	0.0066	0.0000	OK
240 minute summer	Outfall	108	88.508	0.038	3.2	0.0000	0.0000	OK
15 minute winter	S200	10	87.951	0.074	17.8	0.1407	0.0000	OK
15 minute winter	S300	10	87.625	0.050	5.9	0.0209	0.0000	OK
15 minute winter	S301	12	87.546	0.118	13.4	0.0575	0.0000	OK
15 minute winter	S302	12	87.528	0.260	33.5	0.0857	0.0000	OK
15 minute winter	S303	11	87.511	0.446	82.3	1.1953	0.0000	SURCHARGED
15 minute winter	S400	10	87.665	0.095	16.2	0.0847	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S100	S1.000	S101	31.7	1.298	0.597	0.9555	
15 minute winter	S101	S1.001	S102	56.2	0.944	0.631	1.3561	
15 minute winter	S102	S1.002	S103	144.5	1.310	1.300	1.9446	
15 minute winter	S103	S1.003	Int In	149.8	1.378	1.321	0.5760	
15 minute summer	Int In	S1.003A	Int Out	148.4	1.360	0.809	1.2633	
15 minute winter	Int Out	S1.004	S104	155.1	1.406	1.384	0.3481	
15 minute winter	S104	S1.005	Storage In	157.1	1.485	1.387	0.2037	
15 minute summer	Storage In	S1.005A	Attenuation	170.7	2.925	8.558	0.7038	
30 minute summer	Attenuation	S1.005B	Storage Out	42.2	0.778	1.797	0.6572	
60 minute summer	Storage Out	S1.006	S105	36.4	0.826	0.318	0.2336	
15 minute winter	S105	S1.007	S106	25.4	0.680	0.229	1.0578	
15 minute summer	S106	Pump	S107	3.2				46.8
240 minute summer	S107	S1.009	Outfall	3.2	0.709	0.062	0.0135	76.2
15 minute winter	S200	S2.000	S101	17.6	1.225	0.239	0.8118	
15 minute winter	S300	S3.000	S301	5.8	0.549	0.109	0.1824	
15 minute winter	S301	S3.001	S302	13.2	0.874	0.331	0.4028	
15 minute winter	S302	S3.002	S303	33.4	0.779	0.472	2.1140	
15 minute winter	S303	S3.003	S102	75.8	0.691	0.684	3.5157	
15 minute winter	S400	S4.000	S302	16.1	1.469	0.601	0.0796	

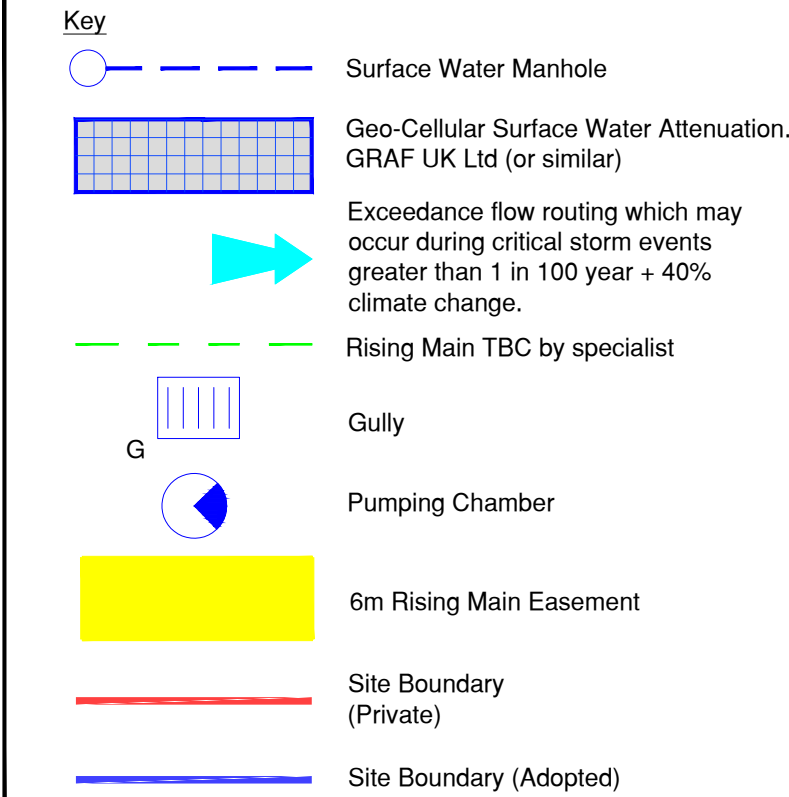
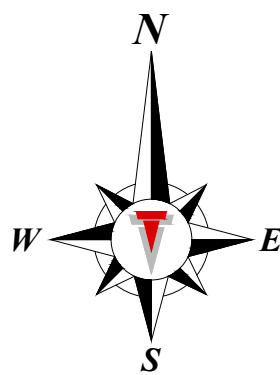
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S100	12	88.735	1.170	57.6	2.8822	0.0000	FLOOD RISK
360 minute winter	S101	312	88.611	1.446	17.1	2.4632	0.0000	FLOOD RISK
720 minute winter	S102	540	88.609	1.643	24.2	3.7230	20.5918	FLOOD
360 minute winter	S103	312	88.610	1.699	43.2	2.3401	0.0000	FLOOD RISK
360 minute winter	Int In	312	88.611	1.717	42.9	0.0000	0.0000	FLOOD RISK
360 minute winter	Int Out	312	88.612	1.818	42.8	0.0000	0.0000	SURCHARGED
360 minute winter	S104	312	88.612	1.828	42.6	2.0672	0.0000	SURCHARGED
360 minute winter	Storage In	312	88.612	1.834	42.5	0.0000	0.0000	SURCHARGED
360 minute winter	Attenuation	312	88.613	1.836	42.3	279.6646	0.0000	SURCHARGED
360 minute winter	Storage Out	312	88.613	1.837	4.9	0.0000	0.0000	SURCHARGED
360 minute winter	S105	312	88.613	1.844	4.7	2.0858	0.0000	SURCHARGED
360 minute winter	S106	312	88.614	1.879	4.3	4.7817	0.0000	OK
15 minute summer	S107	11	88.539	0.039	3.2	0.0066	0.0000	OK
15 minute summer	Outfall	11	88.508	0.038	3.2	0.0000	0.0000	OK
360 minute winter	S200	312	88.613	0.736	4.8	1.3902	0.0000	SURCHARGED
360 minute winter	S300	312	88.614	1.039	1.6	0.4354	0.0000	SURCHARGED
360 minute winter	S301	312	88.614	1.186	3.7	0.5798	0.0000	FLOOD RISK
360 minute winter	S302	312	88.613	1.345	9.3	0.4437	0.0000	FLOOD RISK
360 minute winter	S303	312	88.610	1.545	23.4	4.1395	0.0000	SURCHARGED
15 minute winter	S400	12	88.696	1.126	29.7	1.0045	0.0000	FLOOD RISK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S100	S1.000	S101	47.5	1.306	0.895	1.2406	
15 minute winter	S101	S1.001	S102	95.8	1.361	1.077	1.3561	
15 minute winter	S102	S1.002	S103	252.8	2.292	2.275	1.9446	
15 minute winter	S103	S1.003	Int In	263.4	2.388	2.322	0.5774	
15 minute winter	Int In	S1.003A	Int Out	263.6	2.390	1.437	1.3100	
15 minute winter	Int Out	S1.004	S104	263.8	2.392	2.355	0.3481	
15 minute winter	S104	S1.005	Storage In	264.1	2.395	2.331	0.2043	
15 minute summer	Storage In	S1.005A	Attenuation	264.7	3.147	13.270	1.0029	
15 minute winter	Attenuation	S1.005B	Storage Out	54.2	0.910	2.308	0.7338	
15 minute winter	Storage Out	S1.006	S105	46.5	0.823	0.407	0.2336	
15 minute summer	S105	S1.007	S106	34.5	1.255	0.311	1.2067	
15 minute summer	S106	Pump	S107	3.2				47.2
15 minute summer	S107	S1.009	Outfall	3.2	0.710	0.062	0.0135	47.1
15 minute winter	S200	S2.000	S101	28.9	1.184	0.392	1.2677	
15 minute summer	S300	S3.000	S301	-14.8	0.593	-0.274	0.5450	
15 minute summer	S301	S3.001	S302	23.2	0.893	0.582	0.5734	
15 minute winter	S302	S3.002	S303	53.2	0.789	0.752	2.2019	
15 minute winter	S303	S3.003	S102	139.9	1.269	1.262	3.5157	
15 minute winter	S400	S4.000	S302	25.5	1.512	0.952	0.1190	

Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED

APPENDIX H
DRAINAGE LAYOUT PLAN



- Notes**
- All drains to be HDPE twinwall pipes.
 - Inspection chambers to have min. class D400 cover and frame in trafficked areas.
 - All pipework and fittings to be installed in accordance with manufacturers instructions.
 - All drainage to comply with relevant British Standards, current Building Regulations Part H and NHBC Standards.
 - All connections to be made at soffit to soffit level, unless noted otherwise.
 - Attenuation tank must be installed in strict accordance with manufacturers details, specifications & installation details.
 - Fuel interceptor must be installed in strict accordance with manufacturers details, specifications & installation details.
 - Fuel interceptor must be double sealed in accordance with manufacturers installation details to prevent water escaping between stub shaft and extension shaft.

DO NOT SCALE THIS DRAWING

A1

- GENERAL NOTES:**
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ITEM	HAZARD IDENTIFICATION
1	CHECK IF THERE ARE RESIDUAL RISKS

REVISIONS				
REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
A	28.02.23	Replaced swale with piped outfall	CS	JP
B	26.04.23	Updated Tree Constraint Plan and site layout	CS	JP
C	22.05.23	Updated Site Layout	CS	JP
D	15.11.23	Updated Site Layout	CS	NJ

DRAWING STATUS: FOR PLANNING

THOMAS CONSULTING
STRUCTURAL & CIVIL DESIGN ENGINEERS
Offices in **Chorley, Lancaster & Shrewsbury**
Tel: 01524 846022
e-mail: info@thomasconsulting.co.uk

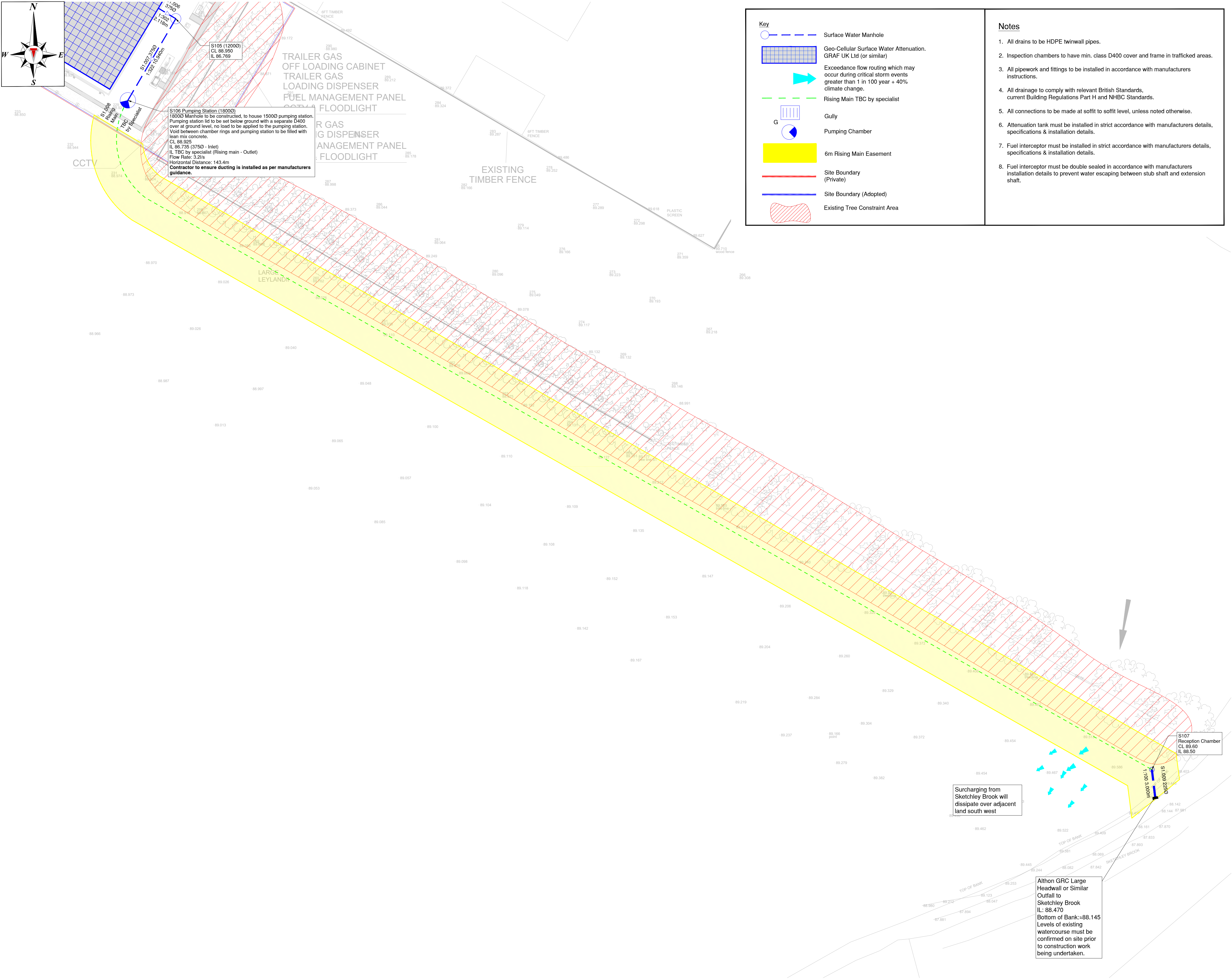
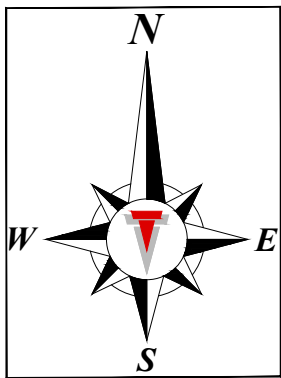
CLIENT: CNG FUELS

PROJECT: HINCKLEY 2

DRAWING TITLE: DRAINAGE LAYOUT PLAN 1 of 2

DATE CREATED: 08.12.22 DRAWING SCALE: 1:200 DRAWN BY: CS CHECKED BY: JP QA CATEGORY: 1

DRAWING REF: TC / P9298 / 23 / 102 REV: D



- Key**
- Surface Water Manhole
 - Geo-Cellular Surface Water Attenuation. GRAF UK Ltd (or similar)
 - Exceedance flow routing which may occur during critical storm events greater than 1 in 100 year + 40% climate change.
 - Rising Main TBC by specialist
 - Gully
 - Pumping Chamber
 - 6m Rising Main Easement
 - Site Boundary (Private)
 - Site Boundary (Adopted)
 - Existing Tree Constraint Area

- Notes**
- All drains to be HDPE twinwall pipes.
 - Inspection chambers to have min. class D400 cover and frame in trafficked areas.
 - All pipework and fittings to be installed in accordance with manufacturers instructions.
 - All drainage to comply with relevant British Standards, current Building Regulations Part H and NHBC Standards.
 - All connections to be made at soffit to soffit level, unless noted otherwise.
 - Attenuation tank must be installed in strict accordance with manufacturers details, specifications & installation details.
 - Fuel interceptor must be installed in strict accordance with manufacturers details, specifications & installation details.
 - Fuel interceptor must be double sealed in accordance with manufacturers installation details to prevent water escaping between stub shaft and extension shaft.

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ITEM	HAZARD IDENTIFICATION			
 1	CHECK IF THERE ARE RESIDUAL RISKS			
REVISIONS				
REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
A	26/04/23	Updated Tree Constraint Plan and site layout	CS	JP
B	20/11/23	Updated for Detailed Design	CS	NJ

DRAWING STATUS:

FOR PLANNING

THOMAS CONSULTING
STRUCTURAL & CIVIL DESIGN ENGINEERS

Offices in **Charley, Lancaster & Shrewsbury**
Tel: 01524 846022
e-mail: info@thomasconsulting.co.uk

CLIENT:

CNG FUELS

PROJECT:

HINCKLEY 2

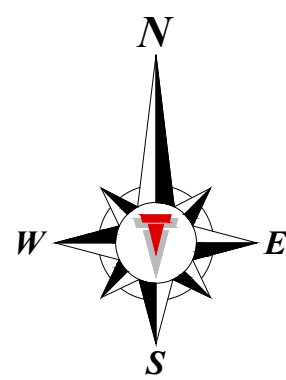
DRAWING TITLE:

DRAINAGE LAYOUT PLAN 2 of 2

DATE CREATED: 02.03.23	DRAWING SCALE: 1:200	DRAWN BY: CS	CHECKED BY: JP	QA CATEGORY: 1
DRAWING REF:	TC / P9298 / 23 / 103			REV: B

Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED

APPENDIX I
OVERLAND STORAGE



Exceedance route of storms of greater severity than 100 year +40%CC will oversail onto graveled area before diverted south west over the adjacent field before entering Sketchley Brook

Key

- HB2 kerb (100mm Upstand)
- GST1A kerb (230mm Upstand)
- Transition Kerb (125mm → 230mm Upstand)
- Exceedance Route

Prismoidal Volume Calculation Summary
Minimum Top of
Kerb level: 88.940mAO
Storage Volume: 25.75m³
100 year + 40% CC Flood Volume:
20.59m³
25.75m³ > 20.59m³
Surface Water can be stored on site
without effecting flood risk elsewhere

Water Depth Bands (m)	Flood Storage Volume (m ³)
Band 1 - 0m - 0.05m	13.53m ³
Band 2 - 0.05m - 0.1m	7.73m ³
Band 3 - 0.1m - 0.15m	3.47m ³
Band 4 - 0.15m - 0.2m	0.97m ³
Band 5 - 0.2m - 0.25m	0.05m ³
Total Flood Volume Storage: 25.75m ³	

DO NOT SCALE THIS DRAWING

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ITEM	HAZARD IDENTIFICATION			
	CHECK IF THERE ARE RESIDUAL RISKS			
REVISIONS				
REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
A	03.03.23	Updated Flow route and flood volume	CS	JP
B	26.04.23	Site Layout updated	CS	JP
C	22.05.23	Updated to site layout match calcs	CS	JP
D	17.11.23	Updated For Detailed Design	CS	NJ

DRAWING STATUS: FOR PLANNING

THOMAS CONSULTING
STRUCTURAL & CIVIL DESIGN ENGINEERS
Offices in **Chorley, Lancaster & Shrewsbury**
Tel: 01524 846022
e-mail: info@thomasconsulting.co.uk

CLIENT: CNG FUELS

PROJECT: HINCKLEY 2

DRAWING TITLE: OVERLAND STORAGE

DATE CREATED: 08.12.22	DRAWING SCALE: 1:250	DRAWN BY: CS	CHECKED BY: JP	QA CATEGORY: 1
DRAWING REF:	TC / P9298 / 23 / 110			REV: D

Land South of A5, Watling Street, Hinckley, Leicestershire, LE10 3ED

APPENDIX J
SIMPLE INDEX METHOD

Simple Index method

Job Name: CNG Hinckley 2

Contract Number: P9298

Date: 20/11/2023

Engineer: CS

Checker: NJ

Calculation Brief

This spreadsheet has been developed to assist in calculating the proposed treatment method for SuDS. The calculation utilises the Simple Index Method outlined in CIRIA Report C753 - The SuDS Manual, V6 - 2015. The calculation considers the Pollution Methods, Total Suspended Solids (TSS), Metals, Hydro-Carbons and balances them again Mitigation Indices for proposed SuDS devices.

Information Source

This spreadhseet has been created using information obtained from CIRIA Report C753 - The SuDS Manual, V6 - 2015. Chapter 26 provides guidance on Water Quality Management and Section 26.7.1 provides guidance on the Simple Index Method. We have also gathered propriatory treatment information information from SPEL's SuDS Handbook.

Pollution Hazard

Select the correlating number to the land use you are looking at. If there is more than one for example roofs and car parking then you can select more than one below. If you only have one hazard/land use then input 0 for the other selections. The total polution hazard is displayed.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.3 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg out de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) or < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured, industrial sites, trunk roads and motorways ²	High	0.8 ¹	0.8 ¹	0.9 ¹

Notes

- Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2006).
- These should only be used if considered appropriate as part of a detailed risk assessment - required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.

Pollution Hazard Reference	Pollution Hazard	TSS	Metal	Hydro-Carbons
4	Medium	0.70	0.60	0.70
0	N/A	0.00	0.00	0.00
0	N/A	0.00	0.00	0.00
Total Pollution Hazard		0.70	0.60	0.70

	Simple Index Method			
	Job Name: CNG Hinckley 2			
	Contract Number: P9298	Date: 20/11/2023		
	Engineer: CS	Checker: NJ		

Mitigation				
Where the mitigation index of an individual component is insufficient, two components (or more) in series will be required where;				
Total SuDS mitigation index = mitigation index, + 0.5*mitigation index				
A factor of 0.5 is used to account for the reduced performance of secondary or tertiary components associated with already reduced inflow concentrations.				
Component	Type of SuDS component	TSS	Metal	Hydro-Carbons
Primary	Full Retention Separator	0.8	0.6	0.9
Secondary	None	0	0	0
Tertiary	None	0	0	0
Total Mitigation Index		0.8	0.6	0.9

Summary				
		TSS	Metal	Hydro-Carbons
Total Pollution Hazard		0.70	0.60	0.70
Total Mitigation Hazard		0.8	0.6	0.90
Check		PASS	PASS	PASS

Refences				
- CIRIA Report 753, The SuDS Manual, Version 6, 2015				
- SPEL SuDS Handbook, 2022				

Notes				
Total SuDS Mitigation of Full Retention Separator to be confirmed by manufacturer.				