Flood Risk Assessment

Caenby Corner Depot, Market Raisen, Lincolnshire.

January 2020

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Client Name: Henry Boot Construction
Document Reference: WIE16389-100-R-2-2-3-FRA
Project Number: WIE16389

Quality Assurance – Approval Status

This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS EN ISO 45001:2018)

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Comments

Comments

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1. Introduction

Waterman Infrastructure & Environment Limited ("Waterman") were instructed by Henry Boot Construction to undertake a Flood Risk Assessment for the proposed development of a Site situated at Caenby Corner in the West Lindsay District of Lincolnshire County (hereafter termed "the Site").

1.1 Site Description

1.1.1 Location and Access

The Site is located at Caenby Corner in the Lincolnshire area to the east of England. The Site adopts a roughly rectangular shape and encompasses a total area of approximately 1.95ha. The approximate O.S. Grid Reference is 497027, 389546.

Existing land uses at the development Site are currently defined/occupied by greenfield land. The development boundaries are defined by mature existing hedge lines to the south, east and north. The western Site boundary is separated from adjacent land by fence lines. The Site lies adjacent to the Caenby Corner raceway (west), which is an 'off road' vehicle racetrack. The Site lies in a predominantly rural area with agricultural land located beyond the Site boundaries in all directions. The Site access and nearest road/highway (the A631) are located to the south.

Within the Site boundaries, according to Google maps, there are two sheds/storage areas/abandoned farm vehicles located within the boundaries of the development Site, these areas are positioned at each field boundaries respective boundary/fence line. Numerous gated access points (within the Site and across adjacent land) allow for vehicular/pedestrian passage between neighbouring land parcels.

Figure 1: Current Site Layout

Source: Google Mapping, Accessed: 24/09/2019

1.1.2 Site Topography and Features

A topographical survey, undertaken by Henry Boot Construction Limited, is included in **Appendix A**.

According to the topographical information provided, the Site displays a predominantly north-westerly (high point) to south-easterly (low point) slope. The 'maximum' recorded topographical survey level information provided, located to the north-west corner of the development, is 46.00mAOD. From this high point, levels are shown to decrease to approximately 39.30mAOD at the south-eastern boundary of the development. Therefore, approximately 6.70mAOD of topographical variation is recorded at the Site, recorded between the highest point onsite and the lowest.

A drainage ditch is located along the southernmost boundary of the Site, located to the north of the A631. The proposed Site access, located to the south-west of the development, lies at an approximate elevation of 40.80mAOD. Further information regarding the watercourses present locally to the Site is provided in Section 2 of this report.

1.2 Development Proposals

The proposed development comprises a New Waste Depot, which includes for staff offices and a facility building, the New Waste Depot lies centrally within the Site. A 'refuse storage area' and 'work shop' are proposed to the north and west of the Site respectively. The majority of the developable area is occupied by carparking areas including a 77-space car park (including 7 spaces for visitors and 4 spaces for disabled Site users) located to the south of the central 'Main Building'. A 26-refuse vehicle parking area can be located to the north of the 'Main Building'.

The masterplan for the development has been produced by Whittam/Cox Architects and is included in **Appendix B**.

1.3 Scope of Report

This report comprises a Flood Risk Assessment in general accordance with requirements of the:

- National Planning Policy Framework (NPPF); [1]
- Planning Practice Guidance to the National Planning Policy Framework;[2]

This report assesses the potential effects upon the development of tidal, fluvial, groundwater, pluvial and artificial sources of flooding. The management of surface water is also assessed, and a strategy set out to effectively manage runoff.

The drainage strategy element of the report includes:

- the drainage requirements for the Site, highlighting potential constraints;
- an estimate the pre- and post-development surface water flows;
- outline surface water treatment and attenuation requirements;
- outline recommendations for SuDS facilities;
- identification and feasibility of both foul and surface water disposal from the Site.

[1] National Planning Policy Framework – Department for Communities and Local Government – February 2019

[2] National Planning Practice Guidance to the National Planning Policy Framework – Flood Risk and Coastal Change – 5th April 2015

1.4 National Planning Policy Framework

Overview

The NPPF sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that is relevant, proportionate and necessary to do so.

Where new development is deemed to be necessary in high risk areas, the policy aims to make it safe without increasing flood risk elsewhere, and where possible reduce flood risk overall. The NPPF advocates the use of the risk-based 'Sequential Test', in which new development is steered towards the areas at lowest probability of flooding (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

EA Flood Zones

Areas of varying flood risk, due to rivers and the sea, are classified using Flood Zones. Full descriptions of these are included within **Appendix C**, but are briefly summarised as follows in terms of the annual probability of flooding:

- Flood Zone 1 – low probability; less than 1 in 1,000 annual probability from rivers/sea.
- Flood Zone 2 - medium probability; between a 1 in 100 and 1 in 1,000 annual probability of river flooding and between a 1 in 200 and 1 in 1000 annual probability of sea flooding.
- Flood Zone 3a – high probability; greater than 1 in 100 annual probability of river flooding or 1 in 200 annual probability of sea flooding.
- Flood Zone 3b – the functional floodplain (where water is stored in times of flood, including water conveyance routes); typically greater than 1 in 20 annual probability of river flooding.

NPPF Aim

The National Planning Policy Framework (NPPF, paragraphs 148 to 165) states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

The NPPF states that when determining planning applications, Local Planning Authorities (LPA) should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific Flood Risk Assessment. Development should only be allowed in areas at risk of flooding where it can be demonstrated that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
- The development is appropriately flood resistant and resilient;
- It incorporates Sustainable Drainage Systems (SuDS), unless there is clear evidence that this would be inappropriate;
- Any residual risk can be safely managed; and
- Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Major developments should incorporate SuDS unless there is clear evidence that this would be inappropriate. The systems used should:

- Take account of advice from the LLFA;
- Have appropriate proposed minimum operational standards;
- Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
- Where possible, provide multifunctional benefits.

Site-Specific Flood Risk Assessment

A site-specific flood risk assessment is required:

- for proposals of 1 ha or greater in Flood Zone 1;
- for all proposals for new development (including minor development and change of use) in Flood Zones 2 & 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the EA);
- for all proposals on land allocated by the Environment Agency as having critical drainage problems;
- where proposed development, or a change of use to a more vulnerable class, may be subject to other sources of flooding.

Sequential Test

The NPPF requires the "Sequential Test" and where applicable the "Exception Test" to be undertaken. The Sequential Test is where the risk of flooding to the development is evaluated against the probability of flooding, based on Flood Zones, and the vulnerability of the type of development. The Technical Guidance to the NPPF provides a matrix which allows development to be permitted, not permitted or requiring the Exception Test. The Exception Test allows consideration of the wider sustainability benefits of a development to be considered to justify development in a high-risk flood zone, as long as the development is not considered vulnerable to flooding.

NPPF gives guidance on the aim of the Sequential Test, which states:

"Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. The Strategic Flood Risk Assessment will provide the basis for applying this test. A sequential approach should be used in areas known to be at risk from any form of flooding"

The Environment Agency's Flood Zone Map as shown in Figure 2 indicates that the Site lies within Flood Zone 1. In accordance with the Sequential Test of the NPPF all land uses are appropriate in Flood Zone 1. As the Development proposals lie within Flood Zone 1 the requirements of the Sequential Test are satisfied and hence the Exception Test is not required.

2. Potential Source of Flooding

2.1 Fluvial

EA Flood Maps

Based on the Environment Agency Flood Zone maps, included in Figure 2, the Site is located within Flood Zone 1. Flood Zone 1 is classified as the area having an annual probability of river or sea flooding of less than 1 in 1000 and is defined as having a low probability of flooding (see extract from the NPPF in **Appendix C**).

Figure 2: Environment Agency Fluvial Flood Risk Map

Source: Environment Agency, Fluvial Flooding Map, Accessed Online: 24/09/2019

Watercourses

The Environment Agency maps and local mapping records for the Site indicate that the nearest Main River to the development is situated approximately 6.30km to the east. This Main River, named the 'New River Ancholme', is located at a sufficient distance from the development, therefore flooding from this source will not affect the development. The River Ancholme rises to the south and flows under Main River status to the east of Saxby village, before flowing north. Another Main River, named the Paunch Brook, flows into the River Ancholme just upstream of the A631 crossing. The Ancholme meets the River Rase (another designated Main River) at the A631 crossing.

Another Main River, the River Rase, flows in a westerly direction through the village of Market Raisen before meeting the River Ancholme at the A631. Beyond the A631, both channels flow in tandem before converging. Numerous ordinary watercourse channels (including the Old River Ancholme) and Main River channels flow into/adjacent to the New River Ancholme along its passage north towards the Humber. Ultimately, all local Main River channels pass into the Humber at Ferriby Sluice.

Ordinary watercourses and field boundary ditches are present locally to the development with the most

proximal drainage ditch located along the southern boundary of the development. In accordance with the local topography, the predominant flow direction is to the east, with all local ordinary watercourses/drainage ditches flowing towards the New River Ancholme (and adjoining tributaries).

Correspondingly, the risk of flooding to the Site from Main Rivers and Ordinary Watercourses is low. Although a field/highway boundary ditch is shown along the southern boundary of the development, flooding from this source is likely to be low as the onsite levels are shown to climb to the north, away from this bounding ditch system, which flows past the development in its upstream reaches. This adjacent watercourse to the development is shown to flow east, to the north of the A631, before flowing/expanding into the Seggimore Brook (ordinary watercourse) which forms a Main River in its downstream reaches before forming a confluence with the New River Ancolme.

As above, the risk of fluvial flooding to the Site is low. The southern watercourse (which flows into the Seggimore Brook and New River Ancholme) should offer an appropriate drainage outfall for 'SuDS attenuated' surface water flows from the new development.

2.2 Pluvial

Pluvial flooding occurs when natural and engineered systems have insufficient capacity to deal with the volume of rainfall. Pluvial flooding can sometimes occur in urban areas during an extreme, high intensity, low duration summer rainfall event which overwhelms the local surface water drainage system. Alternatively, it can occur in rural areas during medium intensity, long duration events where saturated ground conditions prevent infiltration into the subsoil. This flood water would then be conveyed via overland flow routes as dictated by the local topography.

The Environment Agency (EA) surface water flooding maps show the likelihood of surface water flooding, classified into 'high risk', 'medium risk', 'low risk' and 'very low' risk. Definitions of the four categories are outlined below:

- HIGH risk means that there is more than a 1 in 30-year (3.3% AEP) chance of flooding in any given year;
- MEDIUM risk means that there is between 1 in 30-year (3.3% AEP) and 1 in 100-year (1% AEP) chance of flooding in any given year.
- LOW risk means that there is between 1 in 100-year (1% AEP) and 1 in 1000-year (0.1% AEP) chance of flooding in any given year;
- VERY LOW risk means there is less than 1 in 1000-year (0.1% AEP) chance of flooding in any given year.

The Environment Agency surface water flood maps provide information required to identify areas potentially at risk of surface water flooding. It is also suitable for identifying areas likely to flood first, deepest or most frequently. However, it is unlikely to be reliable for more localised areas and extremely unlikely to be reliable for identifying individual properties at risk.

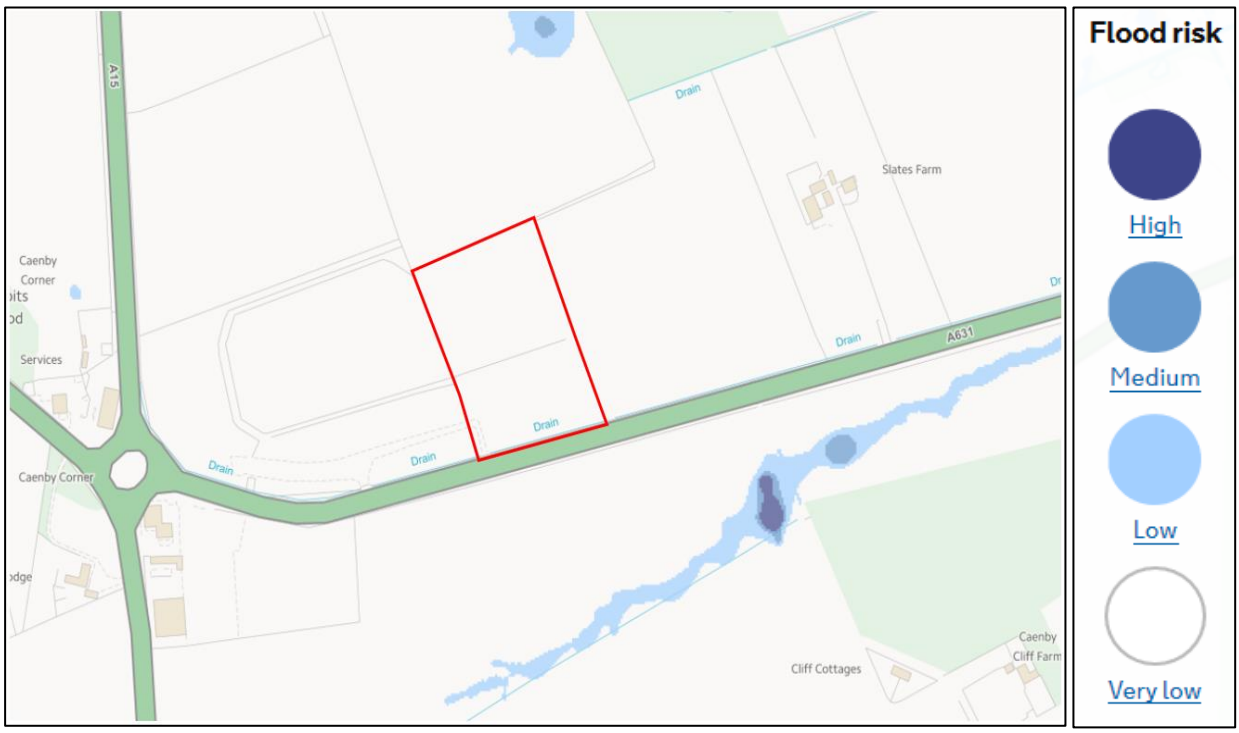
Site Pluvial Flooding

The Site is shown to remain free from surface water flooding. A surface water flow pathway is located to the south of the development and south of the A631, flowing east towards to the local Main River network in accordance with the local topography.

According to the Environment Agency surface water flood mapping records, as shown in Figure 3, no surface water flooding is shown to affect the development and it is considered to have a very low risk of flooding from overland flows.

An extract from the Environment Agency's surface water flooding map is shown in Figure 3 below.

Figure 3: Surface Water Flooding



Source: Environment Agency, Pluvial (Surface Water) Flooding Map, Accessed Online: 24/09/2019

Pluvial Flooding - Conclusions

Although no surface water flooding currently occurs at the development, the provision of additional hardstanding areas will increase the amount of surface water runoff occurring locally.

To mitigate against future surface water flood risk, the proposed Development will include a positive surface water drainage system which will intercept the run-off generated within the Site itself and reduce the incidence of overland flow causing flooding across adjacent land.

The risk of surface water flooding affecting the Site and to others downstream of the Site is therefore considered to be low subject to the provision of a positive surface water drainage system (as described above and in Section 4).

2.3 Coastal

Given the Site's location, it is considered that there is no coastal or tidal flood risk to this Site. The Site is not situated within proximity to the coast with the nearest coastline situated approximately 50km to the east.

2.4 Sewers

Anglian Water (AW) operate as the local sewerage undertaker relevant to the Site area. To establish what local public sewers, occur within proximity to the development, Anglian Water asset location plans are required. Copies of these plans can be found in **Appendix D**.

Foul Drainage

AW foul drainage plans show:

- No foul water sewers are situated within proximity to the development.

Surface Water Drainage

AW surface water drainage plans show:

- No surface water sewers are situated within proximity to the development.

Combined Water Drainage

- No combined water sewers are situated within proximity to the development.

Sewer Flooding

Surface water (including the risk of sewers and culverted watercourses surcharging) poses the highest risk of more frequent flooding. Surface water drainage from new developments is critical in reducing the risk of more localised flooding.

Flooding from drainage system occurs when flow entering a system exceeds its discharge capacity, the system becomes blocked or, in the case of surface water sewers, it cannot discharge due to high water level in the receiving watercourse. Sewer flooding is often caused by surface water discharging into the combined sewerage system, sewer capacity is exceeded in large rainfall events causing backup of flood waters within properties or discharging through manholes.

There are no public surface/foul water sewers locally and therefore there is no risk of sewerage flooding.

The proposed development will include a positive surface water drainage system that will trap surface water generated onsite, before releasing it at a controlled rate. Correspondingly, all new developments aim to improve the Sites drainage characteristics over and above the pre-development's drainage state.

2.5 Groundwater

Overview

The character of the underlying geology is an important consideration and can indicate the behaviour of hydrological processes. Large grained sedimentary rocks, or those with significant faults and fractures such as karst landscapes, can indicate good catchment porosity. Other rock types such as metamorphic or small grained sedimentary rocks, like mudstone, are less permeable. Equally, the types of superficial deposits can also indicate differing hydrological behaviours. The presence of deposits such as sands and gravels often indicate good drainage whereas clays and other fine grained glacial till deposits might suggest poor permeability and therefore fast runoff and increased flood risk.

In the absence of any detailed ground investigation and/or infiltration testing the British Geological Survey online mapping records have been used to assess the geology of the ground beneath the Site.

Bedrock Geology

The geology beneath the Site has been attained using the British Geological Survey (BGS) Geological Map (accessed online 24/09/2019) with groundwater classifications obtained from DeFRA's Magic Map online dataset (accessed online 09/04/2019'). Local bedrock geology and is shown in Figure 4 below.

Bedrock deposits underlying the Site are described as belonging to the *'Rutland Formation, consisting of*

argillaceous rocks with subordinate sandstones and limestones'. The Rutland Formation is shown to underlie the entire development.

Surrounding bedrock geology, occurring to the north, west and south of the Site comprises the *'Lincolnshire Limestone Formation'*, which consists primarily of limestones.

Beyond the underlying bedrock geology to the east, a bedrock geology belonging to the 'Blisworth Limestone Formation' is documented.

Superficial Geology

According to the British Geological Survey, there are no superficial deposits underlying the Site.

Figure 4: Geology – Bedrock – Sourced from the British Geological Survey Online Mapping Dataset

Source: British Geology Survey Online Map Viewer, Accessed 24/09/2019

The geology has been established from BGS maps, a summary is provided in Table 1 Local borehole records (accessible via British Geological Survey Online) are not available for the Site in question. However nearby borehole records (Ref: SK98NE1/B and SK98NE1/A) are available. These borehole records were measured at the A15/A631 roundabout, approximately 0.35km west of the Site.

Table 1: Site Geology – As recorded within nearby boreholes.

Stratum	Area Covered	Estimated Thickness	Typical Description
Soil.	0.35km west of Site	0.18m	Topsoil.
Yellow Stone	0.35km west of Site	0.65m	NA
Blue Clay	0.35km west of Site	0.19m	NA
Hard Grey Shale	0.35km west of Site	3.25m	NA
Blue Stone	0.35km west of Site	1.86m	NA
Shale	0.35km west of Site	0.18m	NA

Stratum	Area Covered	Estimated Thickness	Typical Description
Black Clay	0.35km west of Site	0.14m	NA

According to the nearby borehole records, the recorded (nearby) local ground conditions comprise a combination of stones and clays. This configuration suggests that infiltration drainage is unlikely at the Site, as, typically, clays are impermeable strata. The above borehole record does not reference the presence of groundwater.

Local Groundwater Classifications

According to DeFRA's Magic Map online dataset (accessed online 26/09/2019'), the bedrock geological deposits underlying the Site are classified as per Table 2 below:

Table 2: Summary of Hydrogeological Properties of the Main Geological Strata

Stratum	EA Classification	Hydrogeological Significance
Bedrock Geology – 'Rutland Formation – Argillaceous rocks with subordinate sandstone and limestone'.	Secondary B Aquifer	Contains insignificant quantities of vertically or laterally extensive groundwater
Lincolnshire Limestone Formation	Principal Aquifer	Regionally important aquifer, likely to be used to support potable abstractions
Bilsworth Limestone Formation	Principal Aquifer	Regionally important aquifer, likely to be used to support potable abstractions

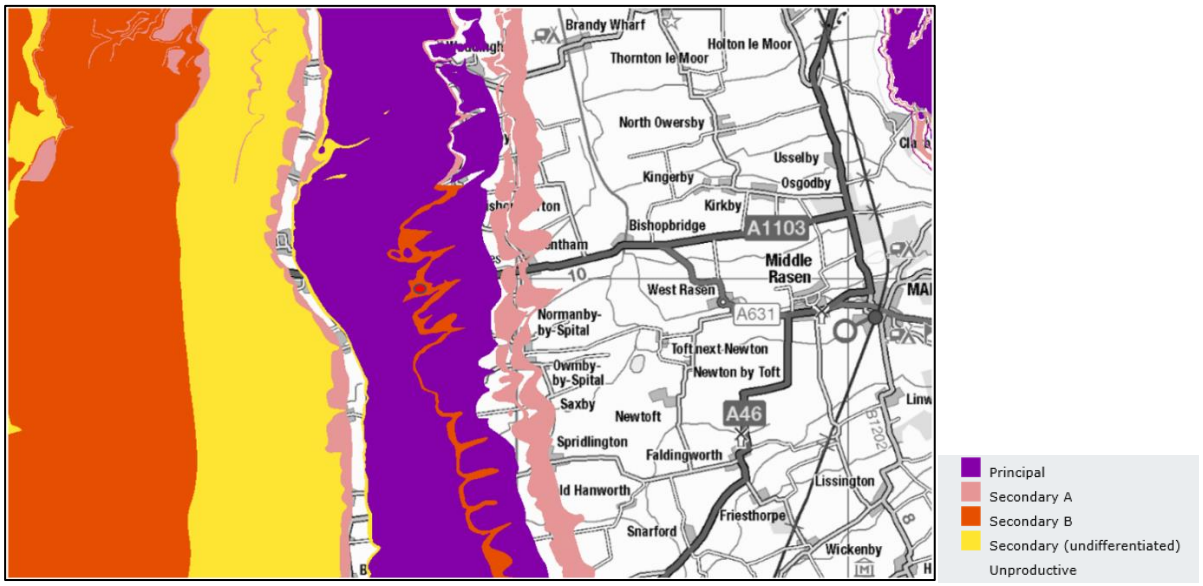
As shown in Table 2 above, the bedrock geology present beneath the Site (Rutland Formation) has been classified as Secondary B, defined as *'predominantly lower permeability strata which may in part have the ability to store and yield limited amounts of groundwater by virtue of localised features such as fissures, thin permeable horizons and weathering'*.

Surrounding bedrock strata is limestone dominant, with the allocated 'principal' groundwater classification, defined as *'geology that exhibits high permeability and/or provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale'*. The surrounding limestones are therefore more likely to harbour groundwater and/or allow for infiltration.

There is no groundwater vulnerability classification assigned to the strata underlying the development Site.

The local bedrock groundwater classifications are displayed in Figure 5. As the underlying bedrock has received a 'Secondary B' groundwater classification and is likely dominated by a clay-based stratum (as per the nearby local borehole records). Infiltration rates are unlikely to be sufficient at the development Site to allow for infiltration-based SuDS. Groundwater is also unlikely to be present. Nevertheless, a detailed ground investigation/infiltration test is advised to further inform the development.

Figure 5: Geology – Bedrock – Groundwater Classification – Mapping Extract Sourced from DeFRA's Magic Map Online Dataset



Infiltration Testing/Ground Investigation

Based on the recorded geology, nearby borehole records and groundwater classifications, the Site is unlikely to be suitable for infiltration-based SuDS. Groundwater flooding is also considered unlikely as the underlying strata is reportedly not able to harbour a significant amount of lateral groundwater.

Groundwater flooding is caused by the emergence of water from beneath the ground, which usually occurs at a slow rate. Groundwater flooding can however cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability.

Several mechanisms increase the risk of groundwater flooding including prolonged rainfall, high in bank levels, artificial structures groundwater rebound, and mine water rebound. Properties with basements or cellars that are situated within areas susceptible to groundwater flooding are at risk.

Although there is a low potential for groundwater flooding, as part of the Site-specific ground investigative works, the locations of bedrock groundwater sources would be assessed and if any are found, their proximity to ground surface levels and potential impacts of the development would be further assessed. Groundwater monitoring wells, installed at strategic locations across the Site, would allow for a seasonal/annual groundwater evaluation to be undertaken (as groundwater levels can fluctuate seasonally). Ground investigations should also be coupled with an infiltration/percolation test to confirm for or against the possibility of infiltration-based SuDS techniques.

2.6 Reservoir, Canal and Artificial Sources

Flooding of reservoirs is modelled, by the Environment Agency, with reservoir mapping outlines confirming that the Site lies outside of areas deemed to be at risk from reservoir flooding.

Figure 6: Flood Risk from Reservoirs

The Site is located away from any area of perceived reservoir flood risk with the closest area of reservoir flooding affecting land situated within proximity to the nearest Main River channel (i.e. areas around the Old/New River Ancholme) to the east of the development.

Due to there being a lack of canals situated within proximity to the Site, risk of flooding from this source is not considered to be an issue to the development.

There are no significant expanses of standing water located within the boundaries of the Site. The nearest interconnected lake/pond/watercourse system is shown to flow east from Spital in the Street, approximately 0.7km to the north of the development. Spital in the Street lies at a lower elevation than the Site, therefore flooding from this source will not affect the Site.

In summary, the risk posed to the Site by artificial sources, including canals, ponds and reservoirs, is low.

3. Flood Risk Assessment

3.1 Overview

The National Planning Policy Framework (NPPF) sets out the approach LPA's should take when determining planning applications. LPA's should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific flood risk assessment following the Sequential Test, and if required the Exception Test, it can be demonstrated that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and
- Development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.

The Site is located entirely within Flood Zone 1. Therefore, in accordance with the Sequential test the land use is considered appropriate for development in Flood Zone 1.

Table 2 from the Framework (see **Appendix C**) - Flood Risk Vulnerability Classification (in NPPF) classifies the hotel development as “more vulnerable” and other uses as “less vulnerable”.

Table 3 from the Framework (see **Appendix C**) - Flood Risk Vulnerability and Flood Zone Compatibility (in NPPF) indicates that “more vulnerable” development is appropriate in Flood Zone 1.

3.2 Climate Change

Overview

Recently published Environment Agency Climate Change Guidelines[3] recommends that for developments with a lifespan in the order of 50 - 100 years, increasing peak rainfall intensity by 20% (the ‘central’ statistical allowance), or 40% (the ‘upper end’ statistical allowance), would provide an appropriate precautionary response to the uncertainty of climate change impacts.

According to LLFA and EA guidance, the developer should:

- Design the surface water attenuation onsite to accommodate the 1 in 100-year event plus a 20% allowance for Climate Change.
- Consider the comparative impact of the 1 in 100 year + 40% Climate Change storm event.

If the comparative implications are significant, then a view may be taken to provide more attenuation, or additional mitigation. Mitigation might include specifying a higher freeboard, to ensure no risk to third parties/onsite users for the 40% climate change scenario. This will tie into existing principles for designing for exceedance.

In assessing the impacts of climate change on flooding from land, rivers and the sea, the sensitivity ranges in Table 5 from the Framework Technical Guidance and newly published Environment Agency Guidance provide an appropriate precautionary response to the uncertainty about climate change impacts on rainfall intensities, river flows, wave height and wind speed.

The impact of Climate Change on rainfall intensities will need to be considered when designing Site surface water drainage. Typical Guidance from the Lead Local Flood Authorities (LLFA’s) recommends that ‘*for all new development with a design life to 2060-2115 (i.e. residential development), Lead Local Flood Authorities (LLFA’s) expect that all developers should design the surface water attenuation onsite to*

[3] Flood Risk Assessments - Climate Change Allowances – The Environment Agency – 19th February 2016

accommodate the +20% Climate Change allowance, and undertake a sensitivity analysis to understand the flooding implication of the +40% Climate Change allowance'.

The EA published updated climate change allowance in December 2019[4], which sets out recommended contingency allowances for net sea level rise, peak rainfall intensities, and peak river flow. Sea level rise is predicted to be between 1.01 and 1.62m between now until the year 2125. Peak Rainfall intensities should be increased between 5% and 40% and river flow allowances should be increased by between 10% and 105% from now until the year 2115. This is in keeping with the statement above regarding a maximum appropriate increased rainfall allowance of 40%.

[4] Environment Agency, December 2019. Flood Risk Assessments: Climate Change Allowances

4. Drainage Assessment

This section provides outline details for both a surface and foul water drainage strategy for the Site.

Surface water arising from a developed site should, as far as practical, be managed in a sustainable manner to mimic the surface water flows arising from an undeveloped Site. Part H of the Building Regulations 2010 (2015 Edition)[5] recommends that surface water run-off shall discharge to one of the following, listed in order of priority:

i) an adequate soakaway or some other adequate infiltration system, or where that is not reasonably practicable

ii) a watercourse, or, where that is not reasonably practicable

iii) a sewer

Although infiltration testing has yet to be carried out at this stage, a desktop analysis of the Site confirms that the Site is directly underlain by a bedrock geology belonging to the Rutland Formation, which is classified as a 'Secondary B' aquifer. A nearby borehole record confirms that the underlying strata is clay dominant and is therefore unlikely to be suitable for infiltration-based SuDS.

A ditch lies along the southern boundary of the Site that would offer a suitable outfall. The ditch that passes the Site becomes the Seggimore Brook, flowing east into the Norton Beck before ultimately discharging into the River Ancholme (Main River).

Based on there being a suitable local watercourse, it is not envisaged that public sewerage connection will be required for disposal of surface water. The LLFA/Shire Group of IDB's have been consulted to confirm that discharge to this watercourse is acceptable.

Anglian Water operate as the local sewerage undertaker and have been contacted to obtain a pre-developer enquiry (which includes a local sewerage asset location plan and details regarding local capacities and suitable connection points). The pre-developer enquiry establishes if any local sewers are present and would offer a suitable connection location for foul water (and surface water if required) flows generated within the Site. Anglian Water have confirmed that there are no sewerage assets (surface water/foul water or combined water) located within the adjacent road (A631).

4.1 Existing Drainage

It is likely that surface runoff follows the Site's natural contours, and hence would tend to run across the Site, from the topographical 'high point', situated to the north-west, towards the low point onsite, which is situated towards the south-east. No records of significant surface water accumulation are noted within the boundaries of the Site.

Existing Runoff Rates

The total Site area is 1.95ha and predominantly consists of undeveloped greenfield land. Preliminary runoff calculations have been undertaken (included in **Appendix E**), using MicroDrainage software, show that the value of the mean annual flood (Qbar), from the existing undeveloped Site, is approximately 7.50/s (using a WRAP of 0.45).

Wallingford SOIL classification mapping shows the Site lies in an area with soils of a Winter Rain Acceptance Potential (WRAP) of 0.45, defined as:

(i) Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

[5] The Building Regulations (2010) – Drainage and Waste Disposal – 2015 Edition – HM Government (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/442889/BR_PDF_AD_H_2015.pdf)

The chances of significant infiltration drainage being available is low. The ground investigation and infiltration testing report may however still be required to confirm that infiltration is not viable at the Site.

4.2 Proposed Surface Water Drainage Strategy

The detailed design of the drainage system should be based on sustainable drainage principles and an assessment of the hydrological and hydro-geological context of the Site. It should satisfy the requirements of statutory consultees, Building Regulations, and the NPPF. Therefore, the design should ensure that:

- surface water piped systems are designed to cause no surface flooding during a 1 in 30-year event;
- surface water runoff, up to the critical 1 in 100-year event (plus calculations for 40% allowances for upper end climate change limits, in accordance with LLFA/The Shire Group of Internal Drainage Boards (IDB) maximum possible typical requirements), would be accommodated within the Site;
- in the event of exceedance, floodwater escaping from the piped drainage system would be routed away from buildings and retained onsite, so as not to displace water onto third-party land, to protect buildings from flooding, and to not increase flood risk offsite;
- holding SuDS would be utilised to achieve the attenuation of flows;
- discharge from the Site should be reduced from current conditions to as close to pre-development Greenfield 'Qbar' rates as considered practicable (in accordance with typical LLFA/Internal Drainage Board (IDB) requirements); and,
- future maintenance responsibilities are considered.

Surface Water Runoff Generated by the New Development.

In addition to adhering to the guidance provided, FRA's should consider the following issues with regards to managing surface water:

- Consideration of how surface water is managed onsite, how it is currently functioning and how it is to be undertaken in the new development.
- All sewers that will subsequently be adopted by the sewerage undertaker must be designed and built in accordance with the requirements of Sewers for Adoption.
- Sewers should be designed so that no flooding occurs above ground level for events with a return period of 30 years.
- For events with a return period in excess of 30 years (3.3%AEP), surface flooding of open space such as landscaped areas or carparks is considered acceptable for short periods.
- No flooding of local property/proposed commercial units should occur as a result of a 1 in 100-year (1%AEP) storm event with a 40% climate change allowance. The proposed SuDS, installed onsite, will be designed to accommodate all flows generated during this 'critical' storm scenario.
- Developed rate of runoff into a watercourse, or another receiving body, should be no greater than the existing rate of runoff for the same event.
- Developers are strongly advised to reduce runoff rates for previously developed Sites as much as is reasonably practicable.
- Volumes of runoff should also be reduced wherever possible using infiltration and attenuation techniques.

Offsite Discharge

The Site is anticipated to be underlain by a bedrock geology belonging to the 'Rutland Formation' consisting primarily of stoney clays. This bedrock geology has been assigned a 'Secondary B' groundwater classification and has received a WRAP figure of 4, indicating low porosity.

Correspondingly, it has been assumed that infiltration is unlikely to offer a suitable means of surface water disposal from the development Site.

In accordance with the requirements of the LLFA, flow from the Site should aim to achieve greenfield rates; however, if unfeasible a higher rate may be accepted given the necessary evidence. In any circumstance, flows from the Site should be restricted via a flow control device at the discharge point.

Attenuation Storage

Given the requirement for a restricted runoff rate, surface water will need to be attenuated on/within the Site. An onsite attenuation basin is proposed to the south of the Site, adjacent to the outfall ditch where topographical levels are at their lowest to enable a gravity discharge from all areas of the Site.

In addition, as spatial constraints presented by the Site masterplan limit the size of the basin, to supplement the attenuation storage a geo-cellular tank is also proposed. The geo-cellular tank will be positioned beneath vehicular carparking areas, just to the north of the proposed basin.

The calculated attenuation volume (based on all surface water discharging to a single attenuation basin that is not supplemented by an upstream geo-cellular tank) can be summarised as follows:

- The attenuation basin and tank will store approximately 1185m^3 during all storm events up to and including the 1 in 100 year + 40% Climate Change storm event. The calculated Site 'QBar', using 100% of the Site boundary area (1.95ha) provides a QBar runoff figure of 7.5l/s (QBar).
- The proposed impermeable areas onsite approximate 1.53ha (redline boundary area 1.95ha). Correspondingly, the runoff rate will be reduced from 7.5l/s (redline boundary area) to 5.88l/s (proposed impermeable areas) to account for runoff generated by the proposed impermeable areas onsite.

These storage volumes are illustrated in the calculations, provided in **Appendix E**.

The layout of the SuDS feature within the context of the development are displayed on the drainage strategy drawing, included in **Appendix F**.

SuDS Options

Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a) take account of advice from the lead local flood authority;

b) have appropriate proposed minimum operational standards;

c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and

d) where possible, provide multifunctional benefits.

Table 3 below, outlines various SuDS techniques that should be considered, and provides a suitability assessment, based on the specifics of the Site.

Table 3: Sustainable Drainage Techniques

Device	Description	Constrains / Comments	✓/✗
Pervious Surfaces (source control)	Provide soft landscaping at roof/surface level which reduces surface water runoff and/or provides storage.	Permeable carparking (with a voided sub-base) would be dependent on-site levels and constraints. Provision of attenuation storage below carparking areas may assist by reducing the storage present within the attenuation basin, where spatial constraints may limit the size of the basin. Currently, porous carparking has not been included in the Site drainage design and its potential inclusion in the design will therefore be disregarded for the purpose of this assessment.	✗
Infiltration Devices (source control)	Store runoff and allow water to percolate into the ground via natural infiltration.	Infiltration based SuDS are subject to on-site infiltration testing of the underlying bedrock geology (of the Rutland Formation – consisting of Interbedded Limestones and Sandstones). Assessment shows that infiltration is unlikely to be possible across the Site.	✗
Pervious Surfaces (source control)	Storm water is allowed to infiltrate through the surface into a storage layer, from which it can either infiltrate and/or slowly release to sewers.	See Infiltration devices above.	✗
Rainwater harvesting (source control)	Reduces the annual average rate of runoff from the Site by reusing water for non-potable uses e.g. toilet flushing.	Rainwater harvesting is not considered to reduce the run-off from a particular storm event. However, it may be implemented as and additional 'at source' control measure. This has not been agreed with the developer so it is assumed that rainwater harvesting will not be used onsite.	✓
Swales (permeable conveyance)	Broad shallow channels that convey/store runoff and allow infiltration (ground conditions permitting).	See Infiltration devices above. Based on the current layout swales are unfeasible due to spatial constrains present on the Site.	✗
Bioretention Areas (permeable conveyance)	Shallow landscaped depressions which are under drained and rely on engineered soils and enhanced vegetation and filtration to remove pollution and reduce runoff downstream.	Unfeasible due to spatial constraints on the Site.	✗
Filter Drains & Perforated Pipes	Trenches filled with granular materials (which are designed to	See Infiltration Devices above.	✗

(permeable conveyance)	take flows from adjacent impermeable areas) that convey runoff while allowing infiltration.		
Filter Strips (permeable conveyance)	Wide gently sloping areas of grass or dense vegetation that remove pollutants from run-off from adjacent areas.	See Infiltration Devices above.	×
Infiltration Basins (end of pipe treatment)	Depressions in the surface designed to store runoff and allow infiltration.	See infiltration devices above.	×
Detention Basins / Wet ponds (end of pipe treatment)	Provide water quality treatment & temporary storage above any permanent water level.	The primary attenuation measure will be provision of an attenuation basin, situated to the south of the development. An attenuation basin will provide approximately 1185m^3 storage to cater for the 1 in 1000 year + 40% Climate Change storm event.	✓
Attenuation Tanks (end of pipe treatment)	Oversized pipes or geo-cellular tanks designed to store water below ground level.	Used only when the SuDS listed above cannot be installed with sufficient volumes to restrict flows to the required rate. Below ground tanks can be used to supplement the storage upstream of the attenuation basin.	✓

Based on Table 4 above, the final combination of SuDS onsite will likely comprise a detention basin, with potential for supplementation upstream via geocellular tanks/porous carparking with voided sub-base.

4.3 Foul Drainage

Anglian Water asset location plans document no public foul or combined water sewers located locally.

As no foul water disposal options exist, it is proposed to use a package treatment plant to treat foul flows before discharging to the onsite ditch/watercourse.

Potential Package Effluent Treatment Plants are outlined below:

- A TT Pumps Junior Pureflow (can cater for a population of between 7 and 28 people).
- A TT Pumps Senior Pureflow (can cater for a population of between 40 and 250 people).
- A Kingspan Wastewater Management Modular Biodisk (can cater for a population of 250-2000 people).

The following assessment is based upon the most up to date masterplan at the Site, as shown in **Appendix B**.

4.4 Sewer Design

The proposed sewerage network should be designed as a separate system in accordance with Sewers for Adoption 7th Edition and modelled using a suitable hydraulic modelling software package.

The surface water pipes should be designed with a minimum velocity of 1m/s at pipe full flow and with a roughness of 0.6mm. The pipe should provide enough capacity to convey all the surface run off flows to attenuation and treatment facilities.

The foul pipes should be designed to provide a self-cleansing regime with a minimum flow velocity of 0.75m/s at one-third design flow. Gradients should be restricted to no steeper than 1:10 to comply with safety standards.

Both surface water and foul sewers should preferably be laid with a minimum cover of 1.5m to avoid interference with other underground utility pipes and cables and have a minimum diameter of 150mm.

4.5 Maintenance

The proposed onsite foul and surface water drainage systems would be designed in accordance with Sewers for Adoption 7th Edition standards.

The developer will be required to adopt and maintain any proposed SuDS features.

Prior to planning permission being granted it is likely necessary to confirm with Lincolnshire County Council the acceptability of the SuDS measures proposed. Prior to planning permission being granted, the company responsible for SuDS adoption and maintenance should be identified, with a clear maintenance regime outlined and demonstrated to the LLFA for approval.

A private inspection and maintenance agreement will be required for the on-site SuDS that would not be adopted.

Regular SuDS scheme inspections will:

- Help to determine future maintenance activities;
- Confirm hydraulic, water quality, amenity and ecological performance; and
- Allow identification of potential system failures, such as: blockage, poor infiltration, poor water quality.

During the first year of operation, inspections should ideally be carried out after every significant storm event to ensure proper functioning.

Typical routine inspection questions that will indicate when occasional or remedial maintenance activities are required, and/or when water quality requires investigation include:

- Are inlets and outlets blocked?
- Does any part of the system appear to be leaking?
- Is there evidence of sedimentation build-up?
- Is there evidence of ponding above an infiltration surface?
- Is there evidence of structural damage which requires repair?

All those responsible for maintenance should take appropriate health and safety precautions and risk assessments should always be carried out. Table 4 indicates the maintenance requirements for the proposed 'key' SuDS component whilst Table 5 provides a maintenance summary of all potential key SuDS components.

In any eventuality, it is considered the drainage system and SuDS features will be maintained in perpetuity.

Table 4: Operation and Maintenance Requirements for Attenuation Basins.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris.	Monthly
	Cut grass – for spillway and access routes.	Monthly (during growing season), or as required

	Cut grass – meadow grass in and around basin.	Half yearly (spring-before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage.	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually as required
	Check any penstocks and other mechanical devices.	Annually
	Tidy all dead growth before start of growing season.	Annually
	Remove sediment from inlets, outlet and forebay.	Annually (or as required)
	Manage wetland plants in outlet pool – where provided.	Annually (or as required)
Occasional maintenance	Reseed areas of poor vegetation growth.	As required
	Prune and trim any trees or remove cuttings.	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebays or main basins when required.	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing.	As required
	Re-alignment of rip-rap.	As required
	Repair/rehabilitation of inlets/outlets and overflows.	As required
	Relevel uneven surfaces and reinstate design levels.	As required

Table 5: Typical SUDS operation and maintenance activities. (Adapted from the CIRIA SUDS Manual).

O&M activity	SUDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter trench	Modular storage	Pervious pavement	Swale/bioretention/green roofs	Filter strip	Sand filter	Pre-treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter/debris removal	■	■	■	■	□	■	■	□	■	■	■	■	■
Grass cutting	■	■	■	■	□	■	■	□	□	■	■	□	□
Weed/invasive plant control	□	□	□	□		□	□		□	□	□	□	□
Shrub management	□	□	□	□					□	□	□		□
Shoreline vegetation management	■	■	□										□
Aquatic vegetation management	■	■	□										□
Occasional maintenance													
Sediment management (*)	■	■	■	■	■	■	■	■	■	■	■	■	■
Vegetation/plant replacement	□	□	□	□						□	□		□
Vacuum sweeping and brushing										■			
Remedial maintenance													
Structure rehabilitation/repair	□	□	□	□	□	□	□	□	□	□	□	□	□
Infiltration surface reconditioning				□	□	□	□		□	□	□	□	

5. Conclusions and Recommendations

The proposed development comprises a New Waste Depot, which includes for staff offices and a facility building, the New Waste Depot lies centrally within the Site. A 'refuse storage area' and 'work shop' are proposed to the north and west of the Site respectively. The majority of the developable area is occupied by carparking areas including a 77-space car park (including 7 spaces for visitors and 4 spaces for disabled Site users) located to the south of the central 'Main Building'. A 26-refuse vehicle parking area can be located to the north of the 'Main Building'.

Flood Risk Assessment

The nearest watercourse to the Site flows east along the southern boundary and is hence allocated as a potential surface water discharge location. This watercourse flows in an easterly direction, expanding into the Seggimoor Beck, then the Norton Beck and ultimately discharging into the New/Old River Ancholme (local Main River).

The Old/New River Ancholme, situated approximately 6.30km to the east of the Site, is the nearest Main fluvial system. All watercourses located east of the Site locally flow east towards this Main River system. There is no perceived flood risk to the Site from any fluvial source present locally.

No surface water flood risk is documented locally, or within the boundaries of the development. There is no risk of flooding by surface water.

The Site includes a positive surface water drainage system that will reduce flood risk occurring at the Site and locally.

Flood risk from groundwater, sewerage or artificial sources has also been assessed and is low.

Drainage

Infiltration testing has not been undertaken. Local bedrock geology belonging to the Rutland Formation is a 'Secondary B' aquifer and is unlikely to be suitable for infiltration.

A combined attenuation system will be required to service the development as spatial constraints prevent all storage being provided within a single detention basin. A geo-cellular tank beneath carparking areas will supplement the storage of the attenuation tank.

Approximately 1185m^3 of storage is required within the Site to cater for the critical 1 in 1000 year + 40% Climate Change storm event. Flows from the Site will be restricted to 5.88l/s (the equivalent QBar rate is 7.5l/s).

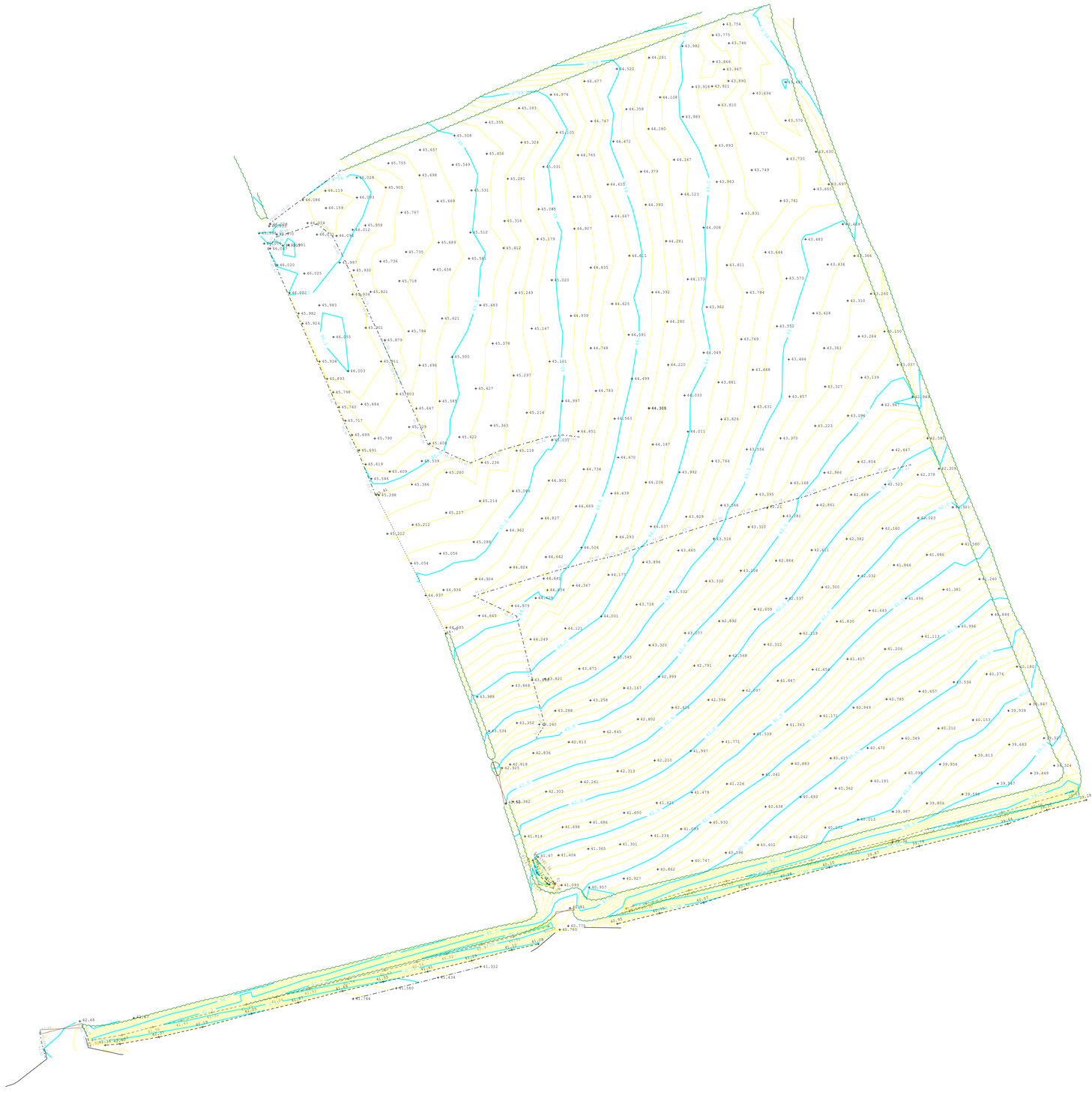
Interceptors are proposed to prevent contamination of the Site runoff prior to discharge into the southern ditch/watercourse.

Anglian Water have confirmed that no sewers are present locally, this includes surface water, foul water and combined water sewers. As there are no sewers present locally then a package treatment plant is potentially required to treat the water to the standard that is acceptable for discharging into a surface water system.

In summary, it is concluded that the proposed development is at low risk of flooding and suitable positive outfalls are available to the Site for surface water drainage. Foul drainage is still to be confirmed with Anglian Water, although it is considered that a foul disposal option will be available for the development.

APPENDICES

A. Site Topographical Survey



NOTES

EAST LINDSEY COUNCIL

CAENBY CORNER DEPOT

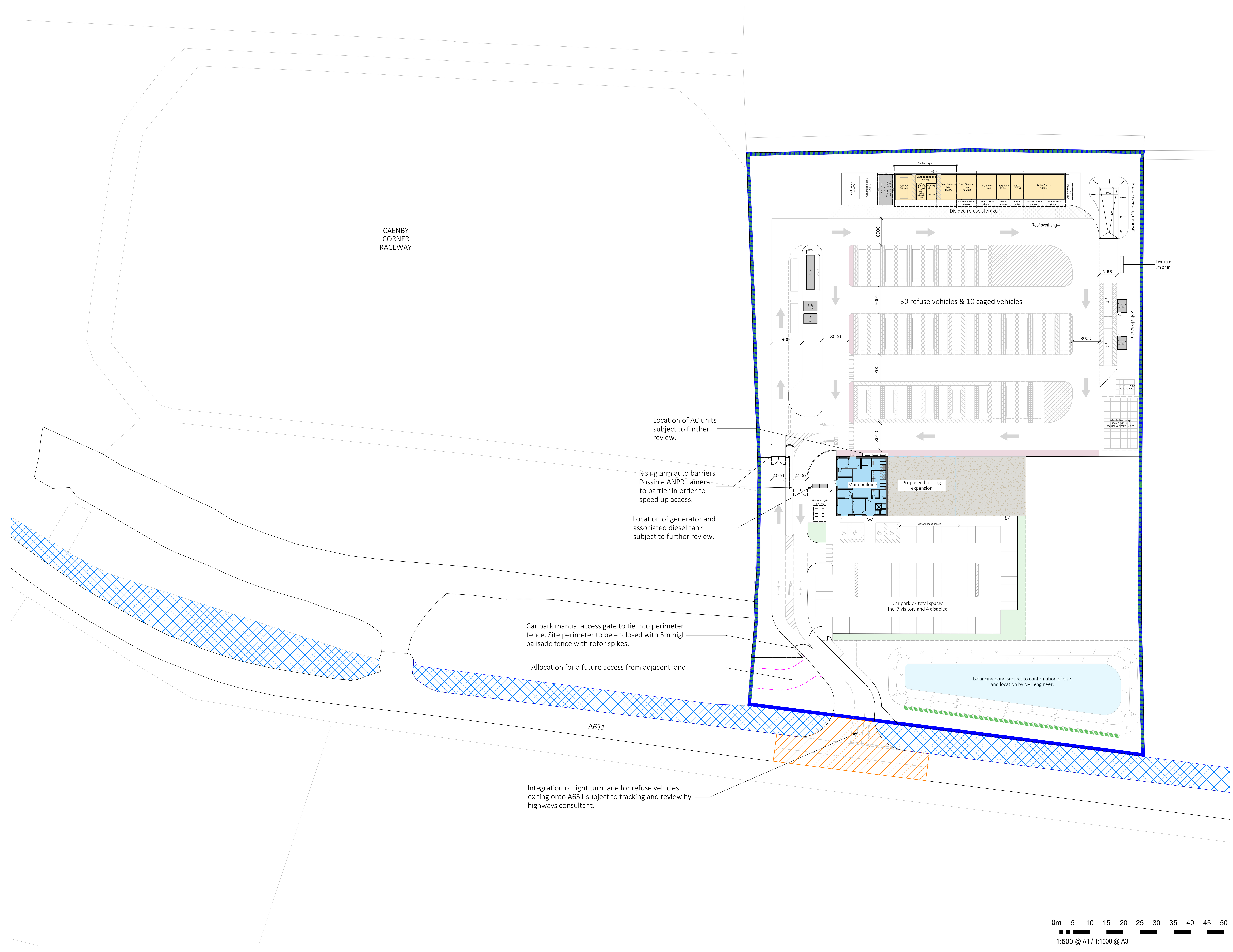
Original Ground Levels

SCALE	1:500	SIZE	A1
DRAWN	AO		09 SEP 19
SURVEYED	AO		04/09/19

CES, EASTERN DIVISION
HENRY BOOT CONSTRUCTION LTD
Callywhite Lane
Dronfield
S18 2XN
Tel. 01246 410111

ITT30/19	Eng	01	-

B. Site Development Masterplan



N

NOTES:

Please note that further information is required of the existing topography of the site, which will inform the location of services, fence lines etc.

This sketch layout is indicative and as such is subject to further review. The following information has been prepared based on OS survey data.

Proposals subject to full HGV and Vehicle Tracking. Specifications of surfacing should also account for the additional loading associated with the service vehicle. Proposed highways access points into the site are subject to highways design, Local Authority approval and confirmation from any third party land ownerships.

LEGEND:

- Indicative site ownership boundary (acres); 4.962
- Blue hatch denotes extents of staff offices and facilities building.
- Light orange hatch denotes extents of ancillary buildings.
- Grey hatch denotes small use buildings (pressure washer, diesel filling pumps).
- Orange diagonal hatch denotes 278 highways works and right turn lane. Subject to further review by highways consultant.
- Blue solid hatch denotes indicative location of balancing pool subject to review by civil engineering consultant.
- Blue crosshatch denotes extents of roadside ditch.
- Magenta diagonal hatch denotes extents of spur into adjacent plot subject to agreement with adjoining land owner.

No.	Date	Description	Drawn/Chkd By

CLIENT
West Lindsey District Council

PROJECT
New Operational Services Depot
Gainsborough

TITLE
Proposed Site Layout
Future proofed 12.11.19 Option

DRAWING STATUS
FOR INFORMATION

DRAWN	WF	CHECKED	DC
SCALE	1:500 @ A1 / 1:1000 @ A3		
DATE	November 2019		

Whittam Cox ARCHITECTS
Chesterfield / 01246 260261
London / 020 3388 0019
Leeds / 0113 468 2450
whittamcox.com

JOB NO.	DRAWING NO.	REV
180229	SK_11	-

C. Extracts from the National Planning Practice Guidance – Flood Risk and Coastal Change

Table 1: Flood Zones

In accordance with the sequential test in the National Planning Policy Framework, sites are to be classed as follows:

Flood Risk Vulnerability	Definition	Appropriate Uses	FRA Requirements	Policy Aims
Zone 1 – Low Probability	This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).	All uses of land are appropriate in this zone.	For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or other local considerations require particular attention.	In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems.
Flood Zone 2 – Medium Probability	This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.	Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses as set out in table 2 are appropriate in this zone. The highly vulnerable uses are only appropriate in this zone if the Exception Test is passed.	All development proposals in this zone should be accompanied by a FRA.	In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems.
Zone 3a - High Probability	This zone comprises land assessed as having a 1 in 100 or greater annual probability of river (>1%) or a 1 in 200-year greater annual probability of flooding from the sea (>0.5%) in any year.	The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses in the table below should not be permitted in this zone. The more vulnerable uses and essential infrastructure should	All development in this zone should be accompanied by a FRA.	In this zone, developers and local authorities should seek opportunities to: i. reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems;

Flood Risk Vulnerability	Definition	Appropriate Uses	FRA Requirements	Policy Aims
		only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.		ii. relocate existing development to land in zones with a lower probability of flooding; and iii. create a space for flooding to occur by restoring functional and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.
Zone 3b - The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local Planning Authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.	Only the water-compatible uses and essential infrastructure listed in table 2 that has to be there should be permitted in this zone. It should be designed and constructed to: • remain operational and safe for users in times of flood; • result in no net loss of floodplain storage; • not impede water flows; and • not increase flood risk elsewhere. Essential infrastructure in this zone should pass the Exception Test.	All development in this zone should be accompanied by a FRA.	In this zone, developers and local authorities should seek opportunities to: i. reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques; and ii. relocate existing development to land with a lower probability of flooding.

Table 2 - Flood Risk Vulnerability Classification

Vulnerability	Land Use Types
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 stations; water treatment works that need to remain operational in times of flood; • Wind turbines.
Highly Vulnerable	• Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational 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, social services 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 educational 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 stations, Ambulance stations and Fire stations which are not required to be operational during flooding; • Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in 'more vulnerable'; and assembly and leisure; • Land and buildings used for agriculture and forestry; • Waste treatment (except landfill and hazardous waste facilities); • Minerals working and processing (except for sand and gravel working); • Water treatment plants which are not required to be operational during flooding; • Sewage treatment plants (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-compatible Development	• Flood control infrastructure; • Water transmission infrastructure and pumping stations; • Sewage transmission infrastructure and pumping stations; • Sand and gravel workings; • Docks, marinas and wharves; • Navigation facilities; • MOD defence installations; • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location • Water-based recreation (excluding sleeping accommodation); • Lifeguard and coastguard stations; • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms;

Vulnerability	Land Use Types
	• Essential ancillary sleeping or residential accommodation for staff required by uses in this category, **subject to a specific warning and evacuation plan.**

Notes:
1. This classification is based partly on Department for Environment, Food and Rural Affairs and Environment Agency research on "Flood Risks to People (FD2321/TR2) and also on the need of some uses to keep functioning during flooding.
2. Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.
3. The impact of a flood on the particular uses identified within the flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

Table 3 - Flood Risk Vulnerability and Flood Zone Compatibility

Flood Risk Vulnerability	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	√	√	√	√	√
Zone 2	√	√	Exception Test Required	√	√
Zone 3a	Exception Test Required	√	X	Exception Test Required	√
Zone 3b	Exception Test Required	√	X	X	X

√ - Development is appropriate.

X – Development should not be permitted.

Notes: This table does not show:
1. The application of the Sequential Test which gives development to Flood Zone 1 first, then Zone 2, and then Zone 3;
2. Flood risk assessment requirements; or
3. The policy aims for each flood zone.

D. Anglian Water Sewer Record Plan

Date: 13/08/19

Scale: 1:1250

Map Centre: 496928,389522

Data updated: 31/07/19

Our Ref: 329342 - 1

Clean Water Plan A1

Potable Water

Raw Water

Decommissioned Water

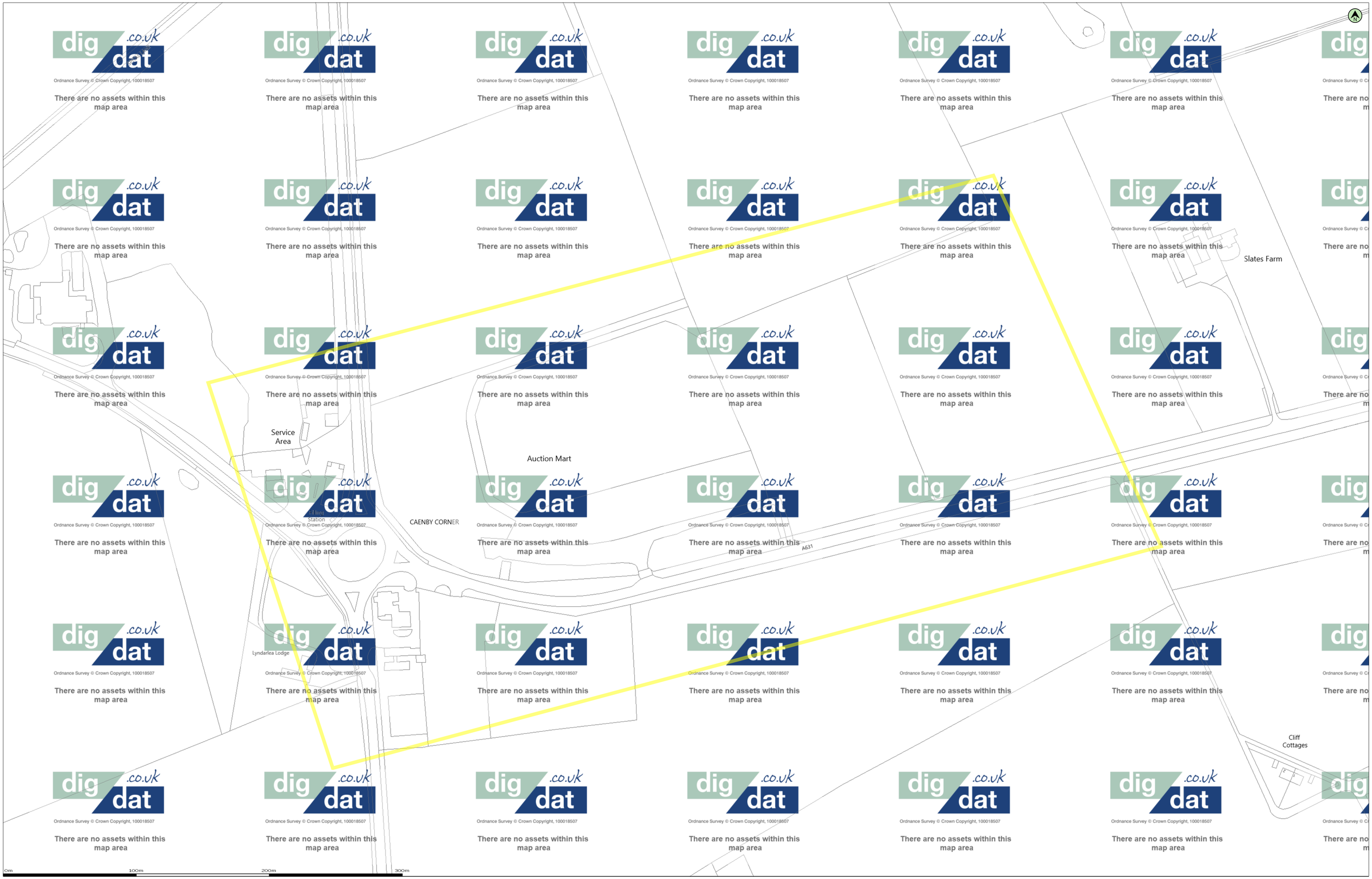
Fitting

Hydrant

holli.welsh@premierenergy.co.uk

605883 Gainsborough

love every drop anglianwater



(c) Crown copyright and database rights 2019 Ordnance Survey 100022432 | Date: 13/08/19 | Scale: 1:1250 | Map Centre: 496928,389522 | Data updated: 31/07/19 | Our Ref: 329342 - 2 | Wastewater Plan A1

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2019 Ordnance Survey 100022432.This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

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

holli.welsh@premierenergy.co.uk

605883 Gainsborough

love every drop anglianwater

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

E. Runoff/Attenuation Storage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 628 Urban 0.000
Area (ha) 1.950 Soil 0.150 Region Number Region 4

Results l/s

QBAR Rural 0.7
QBAR Urban 0.7

Q100 years 1.8

Q1 year 0.6
Q30 years 1.4
Q100 years 1.8

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 628 Urban 0.000
Area (ha) 1.950 Soil 0.450 Region Number Region 4

Results l/s

QBAR Rural 7.5
QBAR Urban 7.5

Q100 years 19.4

Q1 year 6.3
Q30 years 14.8
Q100 years 19.4

Greenfield Runoff Volume

FEH Data

Return Period (years)	100
Storm Duration (mins)	360
FEH Rainfall Version	2013
Site Location	GB 496871 389473
Data Type	Point
Areal Reduction Factor	1.00
Area (ha)	1.950
SAAR (mm)	628
CWI	92.040
SPR Host	35.160
URBEXT (1990)	0.0000

Results

Percentage Runoff (%)	31.74
Greenfield Runoff Volume (m^3)	430.572

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	40.178	0.478	5.9	517.8	O K
30 min Summer	40.311	0.611	5.9	676.0	O K
60 min Summer	40.445	0.745	5.9	842.2	O K
120 min Summer	40.508	0.808	5.9	923.3	O K
180 min Summer	40.540	0.840	5.9	964.6	O K
240 min Summer	40.560	0.860	5.9	990.3	O K
360 min Summer	40.583	0.883	5.9	1020.8	O K
480 min Summer	40.594	0.894	5.9	1035.2	O K
600 min Summer	40.598	0.898	5.9	1041.1	O K
720 min Summer	40.599	0.899	5.9	1041.5	O K
960 min Summer	40.592	0.892	5.9	1032.5	O K
1440 min Summer	40.564	0.864	5.9	995.3	O K
2160 min Summer	40.523	0.823	5.9	941.8	O K
2880 min Summer	40.487	0.787	5.9	895.7	O K
4320 min Summer	40.423	0.723	5.9	814.8	O K
5760 min Summer	40.363	0.663	5.9	739.2	O K
7200 min Summer	40.296	0.596	5.9	658.1	O K
8640 min Summer	40.237	0.537	5.9	586.9	O K
10080 min Summer	40.183	0.483	5.9	523.8	O K
15 min Winter	40.232	0.532	5.9	580.7	O K
30 min Winter	40.378	0.678	5.9	758.4	O K
60 min Winter	40.525	0.825	5.9	944.8	O K
120 min Winter	40.596	0.896	5.9	1037.1	O K
180 min Winter	40.631	0.931	5.9	1084.8	O K
240 min Winter	40.654	0.954	5.9	1115.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	182.717	0.0	456.6	27
30 min Summer	119.493	0.0	486.9	42
60 min Summer	74.861	0.0	820.4	72
120 min Summer	41.642	0.0	892.8	130
180 min Summer	29.422	0.0	919.9	190
240 min Summer	22.979	0.0	925.9	250
360 min Summer	16.234	0.0	919.2	368
480 min Summer	12.688	0.0	909.7	486
600 min Summer	10.485	0.0	899.9	606
720 min Summer	8.976	0.0	890.2	724
960 min Summer	7.035	0.0	871.1	962
1440 min Summer	5.010	0.0	834.2	1374
2160 min Summer	3.582	0.0	1457.6	1712
2880 min Summer	2.831	0.0	1526.0	2084
4320 min Summer	2.041	0.0	1537.7	2908
5760 min Summer	1.624	0.0	1783.9	3752
7200 min Summer	1.364	0.0	1871.3	4536
8640 min Summer	1.184	0.0	1947.6	5272
10080 min Summer	1.051	0.0	2013.1	6048
15 min Winter	182.717	0.0	485.7	27
30 min Winter	119.493	0.0	471.7	41
60 min Winter	74.861	0.0	898.5	70
120 min Winter	41.642	0.0	935.5	128
180 min Winter	29.422	0.0	933.2	186
240 min Winter	22.979	0.0	928.9	246

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
360 min Winter	40.682	0.982	5.9	1152.5	O K
480 min Winter	40.696	0.996	5.9	1171.7	O K
600 min Winter	40.703	1.003	5.9	1181.4	Flood Risk
720 min Winter	40.705	1.005	5.9	1184.9	Flood Risk
960 min Winter	40.703	1.003	5.9	1181.1	Flood Risk
1440 min Winter	40.681	0.981	5.9	1151.4	O K
2160 min Winter	40.630	0.930	5.9	1083.3	O K
2880 min Winter	40.588	0.888	5.9	1026.9	O K
4320 min Winter	40.503	0.803	5.9	916.1	O K
5760 min Winter	40.417	0.717	5.9	807.3	O K
7200 min Winter	40.320	0.620	5.9	686.8	O K
8640 min Winter	40.223	0.523	5.9	570.2	O K
10080 min Winter	40.140	0.440	5.9	473.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
360 min Winter	16.234	0.0	920.1	362
480 min Winter	12.688	0.0	912.0	478
600 min Winter	10.485	0.0	904.5	594
720 min Winter	8.976	0.0	897.3	710
960 min Winter	7.035	0.0	883.7	938
1440 min Winter	5.010	0.0	860.7	1378
2160 min Winter	3.582	0.0	1623.9	1820
2880 min Winter	2.831	0.0	1683.5	2224
4320 min Winter	2.041	0.0	1590.7	3160
5760 min Winter	1.624	0.0	1998.0	4088
7200 min Winter	1.364	0.0	2095.9	4912
8640 min Winter	1.184	0.0	2182.3	5624
10080 min Winter	1.051	0.0	2257.1	6360

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 496871 389473	Shortest Storm (mins)	15
Data Type	Point	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.530

Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)	Time From: (mins)	To:	Area (ha)
0	4	0.510	4	8	0.510	8	12	0.510

Model Details

Storage is Online Cover Level (m) 41.000

Tank or Pond Structure

Invert Level (m) 39.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1000.0	0.300	1103.4	0.600	1212.0	0.900	1325.6	1.200	1444.3
0.100	1033.9	0.400	1139.0	0.700	1249.3	1.000	1364.6	1.300	1485.0
0.200	1068.4	0.500	1175.2	0.800	1287.1	1.100	1404.1		

Hydro-Brake® Optimum Outflow Control

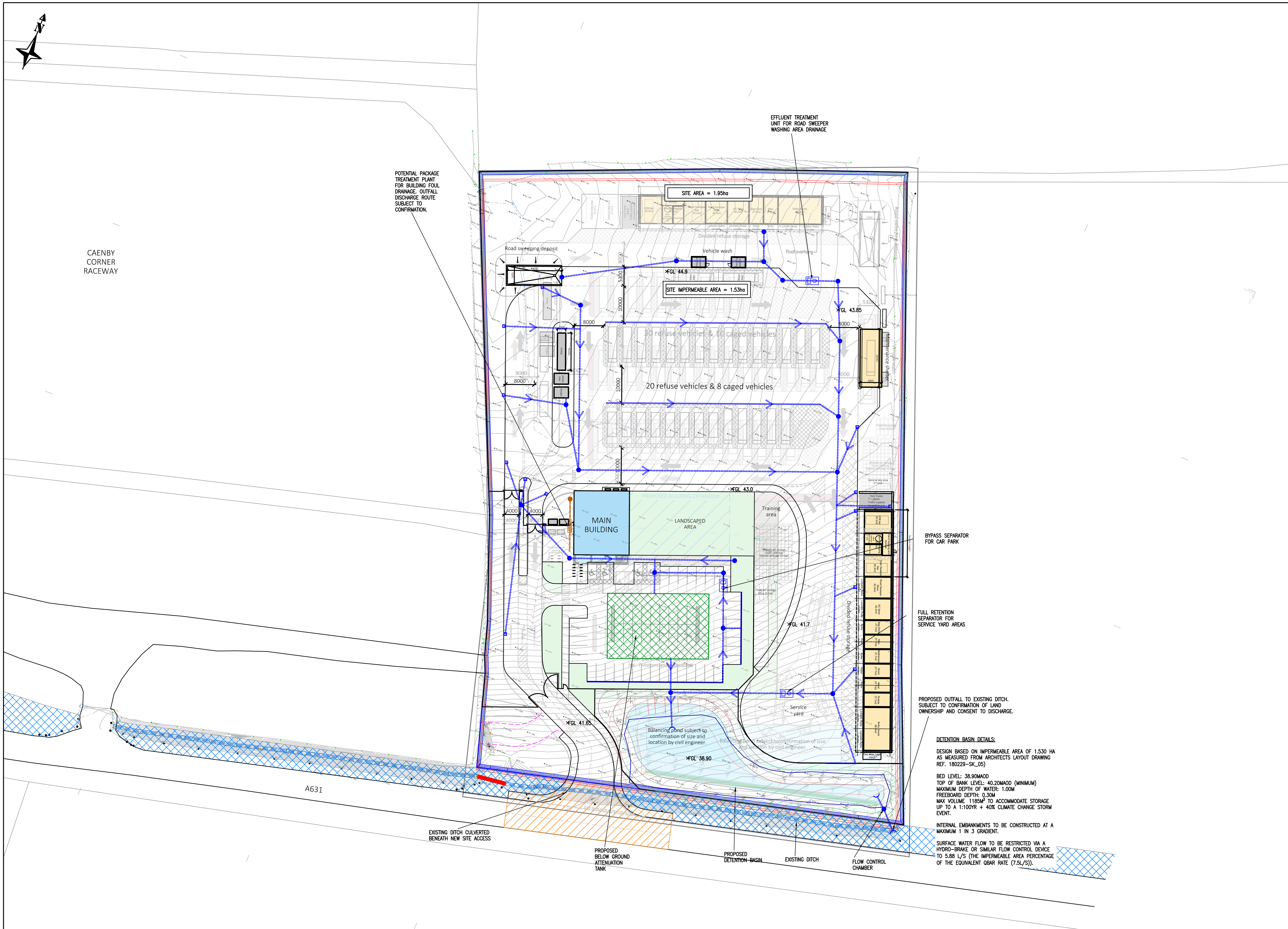
Unit Reference	MD-SHE-0114-5900-1000-5900
Design Head (m)	1.000
Design Flow (l/s)	5.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	114
Invert Level (m)	39.700
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.9	Kick-Flo®	0.645	4.8
Flush-Flo™	0.295	5.9	Mean Flow over Head Range	-	5.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.0	0.800	5.3	2.000	8.2	4.000	11.3	7.000	14.8
0.200	5.7	1.000	5.9	2.200	8.5	4.500	12.0	7.500	15.3
0.300	5.9	1.200	6.4	2.400	8.9	5.000	12.6	8.000	15.8
0.400	5.8	1.400	6.9	2.600	9.2	5.500	13.2	8.500	16.2
0.500	5.6	1.600	7.3	3.000	9.9	6.000	13.7	9.000	16.7
0.600	5.2	1.800	7.8	3.500	10.6	6.500	14.3	9.500	17.1

F. Drainage Strategy Drawing (Ref: WIE16389-C-SA-92-100-A01)



CAENBY CORNER RACEWAY
POTENTIAL PACKAGE TREATMENT PLANT FOR BUILDING FOUL DRAINAGE. OUTFALL DISCHARGE ROUTE SUBJECT TO CONFIRMATION.
EFFLUENT TREATMENT UNIT FOR ROAD SWEEPER WASHING AREA DRAINAGE
SITE AREA = 1.95ha
SITE IMPERMEABLE AREA = 1.53ha
Road sweeping deposit
Vehicle wash
FGL 44.9
FGL 43.85
20 refuse vehicles & 10 caged vehicles
20 refuse vehicles & 8 caged vehicles
FGL 43.0
MAIN BUILDING
LANDSCAPED AREA
Training area
BYPASS SEPARATOR FOR CAR PARK
FULL RETENTION SEPARATOR FOR SERVICE YARD AREAS
FGL 41.7
FGL 41.65
Service yard
Balancing pond subject to confirmation of size and location by civil engineer.
FGL 38.90
PROPOSED OUTFALL TO EXISTING DITCH. SUBJECT TO CONFIRMATION OF LAND OWNERSHIP AND CONSENT TO DISCHARGE.
A631
EXISTING DITCH CULVERTED BENEATH NEW SITE ACCESS
PROPOSED BELOW GROUND ATTENUATION TANK
PROPOSED DETENTION BASIN
EXISTING DITCH
FLOW CONTROL CHAMBER
1:500 0 10m 20m 30m 40m 50m
1:1 0 10 20 30 40 50 60 70 80 90 100

DETENTION BASIN DETAILS:

DESIGN BASED ON IMPERMEABLE AREA OF 1.530 HA AS MEASURED FROM ARCHITECTS LAYOUT DRAWING REF. 180229-SK_05)

BED LEVEL: 38.90MAOD
TOP OF BANK LEVEL: 40.20MAOD (MINIMUM)
MAXIMUM DEPTH OF WATER: 1.00M
FREEBOARD DEPTH: 0.30M
MAX VOLUME 1185M^3 TO ACCOMMODATE STORAGE UP TO A 1:100YR + 40% CLIMATE CHANGE STORM EVENT.

INTERNAL EMBANKMENTS TO BE CONSTRUCTED AT A MAXIMUM 1 IN 3 GRADIENT.

SURFACE WATER FLOW TO BE RESTRICTED VIA A HYDRO-BRAKE OR SIMILAR FLOW CONTROL DEVICE TO 5.88 L/S (THE IMPERMEABLE AREA PERCENTAGE OF THE EQUIVALENT QBAR RATE (7.5L/S)).

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEER'S, ARCHITECT'S OR OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
3. THE CONTRACTOR MUST ENSURE AND WILL BE HELD RESPONSIBLE FOR THE OVERALL STABILITY OF THE BUILDING/STRUCTURE/EXCAVATION AT ALL STAGES OF THE WORK.
4. ALL WORK BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
5. ALL WORK IS TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES AND REGULATIONS.

KEY

- SITE REDLINE BOUNDARY
- EXISTING SURFACE WATER SEWER
- EXISTING FOUL WATER SEWER
- EXISTING WATERCOURSE/DITCH SYSTEM
- EXISTING CULVERT
- PROPOSED SURFACE WATER SEWER
- PROPOSED FOUL WATER SEWER
- PROPOSED LINEAR CHANNEL DRAIN TO SERVE CARPARKING AREAS
- PROPOSED ATTENUATION BASIN
- PROPOSED UNDERGROUND GEO-CELLULAR TANK
- PROPOSED SURFACE WATER TREATMENT
- POTENTIAL PACKAGE TREATMENT PLAN FOR FOUL WATER
- × FGL 94.15 PROPOSED FINISHED GROUND LEVEL

15 January 2020 15:51
-- DRAFT --
Nick Page

Rev	Date	Description	By
A04	15.01.20	RUNOFF RATE AMENDMENTS	NP
A03	09.01.19	SITE LAYOUT PLAN UPDATED	NP
A02	02.12.19	SITE LAYOUT PLAN UPDATED	NP
A01	25.01.18	ISSUED	NP

Amendments

Project
CAENBY CORNER DEPOT

Title
PRELIMINARY DRAINAGE STRATEGY

Client
HENRY BOOT CONSTRUCTION

Waterman

Halifax House, Halifax Place, Nottingham, NG1 1QN.
t 0115 948 2612
mail@watermangroup.com www.watermangroup.com

Drawing Status
PRELIMINARY

Designed by	NP	Checked by	RW	Project No WIE16389
Drawn by	NP	Date	SEP 2019	Work Order No -
Scales @ A1 work to figured dimensions only	1:500			

Publisher	Zone	Category	Number	Revision
WIE	SA	92	100	A04

040919DWG - Topo Survey (Modified), 180229 SK_05F - Proposed Site Plan Opt 4 (Latest 30.09.2019) (Modified), A1-Wat-T

G. LLFA Enquiry (Lincolnshire County Council)

Dear Sir/Madam,

Following on from the below enquiry I am writing to chase a response.

Initial drainage proposals (as shown on the attached masterplan) are for surface water to discharge into a southern attenuation feature. It is likely that a pre-development 'QBAR' runoff rate will be proposed for flows from the development. A connection to the southern ditch system will offer the Site a drainage outfall. This ditch flows east into the Seggimore Brook which then flows into the New River Ancholme.

I would appreciate your comments/guidance on the scheme to further inform these 'initial' proposals.
Kind regards,

Nicholas Page
Engineer
Waterman Infrastructure & Environment
Halifax House | Halifax Place | The Lace Market | Nottingham NG1 1QN
t +44 115 9482612 | **m** +[redacted]
[redacted]
www.watermangroup.com | LinkedIn | Twitter

From: Nick Page
Sent: 13 September 2019 10:34
To: [redacted]
Subject: Pre-Developer Enquiry - Caenby Corner Depot, Lincolnshire. LN8 2AU.

Dear Sir/Madam,

Please find attached a Site location plan for a prospective development Site. The Site itself is currently occupied by undeveloped 'greenfield' land, situated off the A631 in Caenby Corner (just east of Hemswell Cliff and west of Glentham) in the West Lindsay District of Lincolnshire.

Please see the attached Site location plan for reference.

Site Details – Please see the attached Site Location Plan

The Site postcode is **LN8 2AU**.

The Site is centred on **OS grid reference: 497027, 389546**.

Enquiry

As a statutory consultee in the planning process, could you please advise your requirements in respect of the development, surface water disposal and flood risk assessment requirements including:

- Any local planning policy that I should be aware of that would need to be acknowledged within the report?
- Acceptable runoff rate from the Site's (currently we are proposing to discharge runoff from the Site to 1.0l/s (equivalent QBar rate))? Although it appears that infiltration may be feasible (underlying bedrock limestones and sandstones)?
- Any know flooding problems (occurring from any source) within the vicinity of the Site.
- Climate Change allowances. Based on current EA guidelines is a 20 - 40% climate change allowance now enforced?
- If SuDS are implemented, who would be responsible for maintenance and upkeep of the proposed features? Would this responsibility be taken on by the local council, the district council, or would the responsibility fall with the developer to appoint a private management company.

I would appreciate any information that you may have regarding the prospective Site that you deem useful for supporting the Flood Risk Assessment/Drainage Strategy for the Site.

To assist with your enquiry please find attached a Site Location Plan, in addition to a Proposed Site plan and the Site Topographical Survey. The Site is located entirely within Flood Zone 1.

If you would like to discuss or require any further information please get in touch using the contact details outlined below.

Kind regards,

Nicholas Page
Engineer
Waterman Infrastructure & Environment
Halifax House | Halifax Place | The Lace Market | Nottingham NG1 1QN
t [redacted]
[redacted]nkedIn | Twitter

Apologies the correct ‘soil type’ greenfield runoff calc is now attached. (0.450 soils)

From: Nick Page
Sent: 10 January 2020 16:25
To: '[redacted]' <[redacted]; Donal O'Donovan [redacted]
Subject: RE: Pre-Developer Enquiry - Caenby Corner Depot, Lincolnshire. LN8 2AU.

Hi Stephen,

Thank you for your assistance on the telephone. I have tried to contact Lincolnshire County Council as per the email train below. I am looking for some pre-development requirements/advice to assist further and progress the scheme.

Please find the draft drainage plan attached. Please could you consider:

- The runoff rate from the Site. Currently I am proposing to discharge surface water to QBar rates (7.5l/s).
- Anglian Water plans are attached, there are no surface or foul sewers present locally. Foul water will be treated and discharged into the ditch (as per surface water).
- The Site access will need to cross the southern ditch system, therefore, consent for culverting of this watercourse will be required (I presume) to allow for the Site access?
- The proposed SuDS will comprise a geo-cellular storage tank and attenuation basin.

Please get in touch if you want to discuss or require any further information. Also see the email train below and the attached masterplan for the development proposal.
Kind regards,
Nicholas Page
Engineer
Waterman Infrastructure & Environment
Halifax House | Halifax Place | The Lace Market | Nottingham NG1 1QN
[redacted]
[redacted] | Twitter

From: Nick Page
Sent: 24 September 2019 15:02
To: [redacted]
Subject: FW: Pre-Developer Enquiry - Caenby Corner Depot, Lincolnshire. LN8 2AU.

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[redacted]LinkedIn | Twitter

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Nicholas Page
Engineer
Waterman Infrastructure & Environment
[redacted]
[redacted]kedIn | Twitter

Dear Sir/Madam,

Please see the below emails and attachments. I would like some pre-development advice ideally.

Kind regards,
Nicholas Page
Engineer
Waterman Infrastructure & Environment
Halifax House | Halifax Place | The Lace Market | Nottingham NG1 1QN
[redacted]
www.watermangroup.com | LinkedIn | Twitter
From: Nick Page [redacted]
Sent: 10 January 2020 16:28
To: [redacted]
Cc: [redacted] Donal O'Donovan <[redacted]
Subject: FW: Pre-Developer Enquiry - Caenby Corner Depot, Lincolnshire. LN8 2AU.

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- Climate Change allowances. Based on current EA guidelines is a 20 - 40% climate change allowance now enforced?
- If SuDS are implemented, who would be responsible for maintenance and upkeep of the proposed features? Would this responsibility be taken on by the local council, the district council, or would the responsibility fall with the developer to appoint a private management company.

I would appreciate any information that you may have regarding the prospective Site that you deem useful for supporting the Flood Risk Assessment/Drainage Strategy for the Site.

To assist with your enquiry please find attached a Site Location Plan, in addition to a Proposed Site plan and the Site Topographical Survey. The Site is located entirely within Flood Zone 1.

If you would like to discuss or require any further information please get in touch using the contact details outlined below.
Kind regards,

Nicholas Page
Engineer
Waterman Infrastructure & Environment

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UK and Ireland Office Locations