



Flood Risk Statement

Cheesebottom WwTW

Kemada

6 January 2022

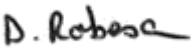
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Executive summary

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.2 and the assumptions and qualifications contained throughout the Report.

The Flood Risk Statement has been produced on behalf of Kemada in support of a proposed development for a chemical delivery area with two dosing kiosks for use in the water treatment process, within Cheesebottom WwTW (approximate grid reference SE 27935 01212).

The EA's Flood Map for Planning (FMfP) shows the proposed kiosk locations on the site to be located in Flood Zone 2. This is defined as an area which has an annual risk of fluvial flooding between 1% - 0.1% Annual Exceedance Probability (AEP).

The proposed development location is at a low risk of flooding from pluvial, groundwater and sewer sources.

In the event of failure, there is a high risk of reservoir flooding to the site. However, due to strict monitoring and regulations, the risk of reservoir failure is low.

As the site is located within Flood Zone 2, it is recommended that consideration is given to the location of the development within the site to make it the most sequentially preferable (from a location, levels and flood risk perspective), whilst still ensuring it is still operationally effective.

It is understood that the kiosks will be placed on a concrete slab constructed at 172.1m AOD and there will be no floor level openings to the building. Available plans indicate that this type of structure is sealed to at least 200+mm above slab level, this will help to manage the residual risk of shallow on-site flooding. Environment Agency (EA) data shows the proposed top of slab is elevated in excess of c.1.5m above the simulated flood levels of the 1% (1 in 100 year) fluvial flood event and in excess of c.0.87m above flood levels of the 0.1% (1 in 1000 year) fluvial flood event. The top of the slab level (172.1m AOD) therefore satisfies the EA guidance which suggests a freeboard allowance for development levels of 600mm above the estimated flood level.

During flood events there is safe access/egress to the kiosks via the access road to the north of the development. Nevertheless, site users and operators should sign up for the EA's Flood Warnings Direct Service as part of the site's safe management plan, where the quick dial code for the 'River Don at Oxspring and Cheesebottom' Flood Warning Area is 138457. This will help to ensure any flood risk is made clear to the site operations team and suitable action can be taken.

Contents

1.	Introduction	1
1.1	Purpose of this report	1
1.2	Scope and limitations	1
2.	Legislative Context	2
3.	Development Site	3
3.1	Existing Site Arrangements	3
3.2	Existing Site Levels	4
3.3	Existing Watercourses	4
3.4	Proposed Development Description	4
3.5	Historic Site Information	5
4.	Sources of Flood Risk Information	6
4.1	Environment Agency (EA)	6
4.2	Strategic Flood Risk Assessment (SFRA)	10
4.3	Sewerage Company	10
4.4	Local Authority	10
4.5	Lead Local Flood Authority (LLFA)	10
5.	Sources of Potential Flood Risk	11
5.1	Fluvial (Rivers)	11
5.1.1	Present Day Risk	11
5.1.2	Future Risk (Climate Change)	11
5.2	Infrastructure Failure	12
5.2.1	Defence Infrastructure	12
5.2.2	Conveyance Infrastructure	12
5.3	Pluvial (Surface Water)	12
5.4	Coastal / Tidal	13
5.5	Sewer Flooding	13
5.6	Ground Water	13
5.7	Artificial Water Bodies (Reservoir)	14
6.	Mitigation	15
6.1	Finished Floor Levels (FFL)	15
6.2	Flood Resistance Measures	15
6.3	Flood Resilience Measures	15
6.4	Safe access/egress	15
6.5	Floodplain Compensation	16
7.	Development Potential	17
8.	Conclusion	18

Table index

Table 1	Key Site Details	3
Table 2	Flood Levels (m AOD) for a range of Return Period Events	11

Figure index

Figure 1	Site Location Overview	3
Figure 2	Site ground level facing northwest across the site.	4
Figure 3	Extract from EA Flood Map for Planning	6
Figure 4	Extract from EA Risk of Flooding from Surface Water Mapping	7
Figure 5	Extract from EA Historic Flood Extent Map	8
Figure 6	Extract from EA Reservoir Flood Extent Map	9

Appendices

Appendix A	Topographical Survey	19
Appendix B	Site Layout	20
Appendix C	River Don EA Product 4	21

1. Introduction

1.1 Purpose of this report

The purpose of this report is to undertake a desktop assessment of flood risk, to review the current state of the site with respect to the identified risk and to investigate how a small development within the wider site boundary could impact the offsite flood risk to the area. It is not a formal Flood Risk Assessment as would be required to validate a planning application.

1.2 Scope and limitations

This report: has been prepared by GHD for Kemada and may only be used and relied on by Kemada for the purpose agreed between GHD and Kemada.

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The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Legislative Context

National Planning Policy Framework

The National Planning Policy Framework sets strict tests and criteria to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed.

Based on the proposed development being located in Flood Zone 2, a sequential test is required for this development.

Where required an Exception Test must be passed in order for particular developments to be justified within some Flood Zones. For the Exception Test to be passed the development would need to provide wider sustainability benefits and be safe for its lifetime, taking into account of the vulnerability of its users

For the purposes of this report, it is assumed that the WwTW is not required to remain operational during times of flood and therefore is classed as 'less vulnerable'. If the WwTW is required to remain operational in times of flood, then the site would be classed as 'essential infrastructure'.

Although the site is located in Flood Zone 2, for the purpose of this report the site is classified as 'less vulnerable' and as such the Exception Test is not required.

Local Planning Policy

Barnsley Metropolitan Borough Council's (BMBC) Local Plan was adopted in January 2019 and sets out the council's policies and proposals for development and land use in the local area.

BMBC Local Plan has one key policy relating to flood risk for new developments: '**Policy CC3 Flood Risk**'.

This states that new developments will not be permitted in locations where there is an unacceptable risk of flooding from any sources of flooding or where the development would give rise to flooding elsewhere.

3. Development Site

3.1 Existing Site Arrangements

The site comprises the existing Cheesebottom Wastewater Treatment Works (WwTW), southwest of Barnsley in South Yorkshire. The approximate boundary of the existing WwTW is bound by the River Don which flows around the east and south of the boundary and is predominantly surrounded by undeveloped greenfield land. Access to the site is to the north via a dedicated access road off Thurgoland Bank (B6462). The approximate boundary of the existing WwTW and site location are shown in Figure 1 below, with key site details provided in Table 1.

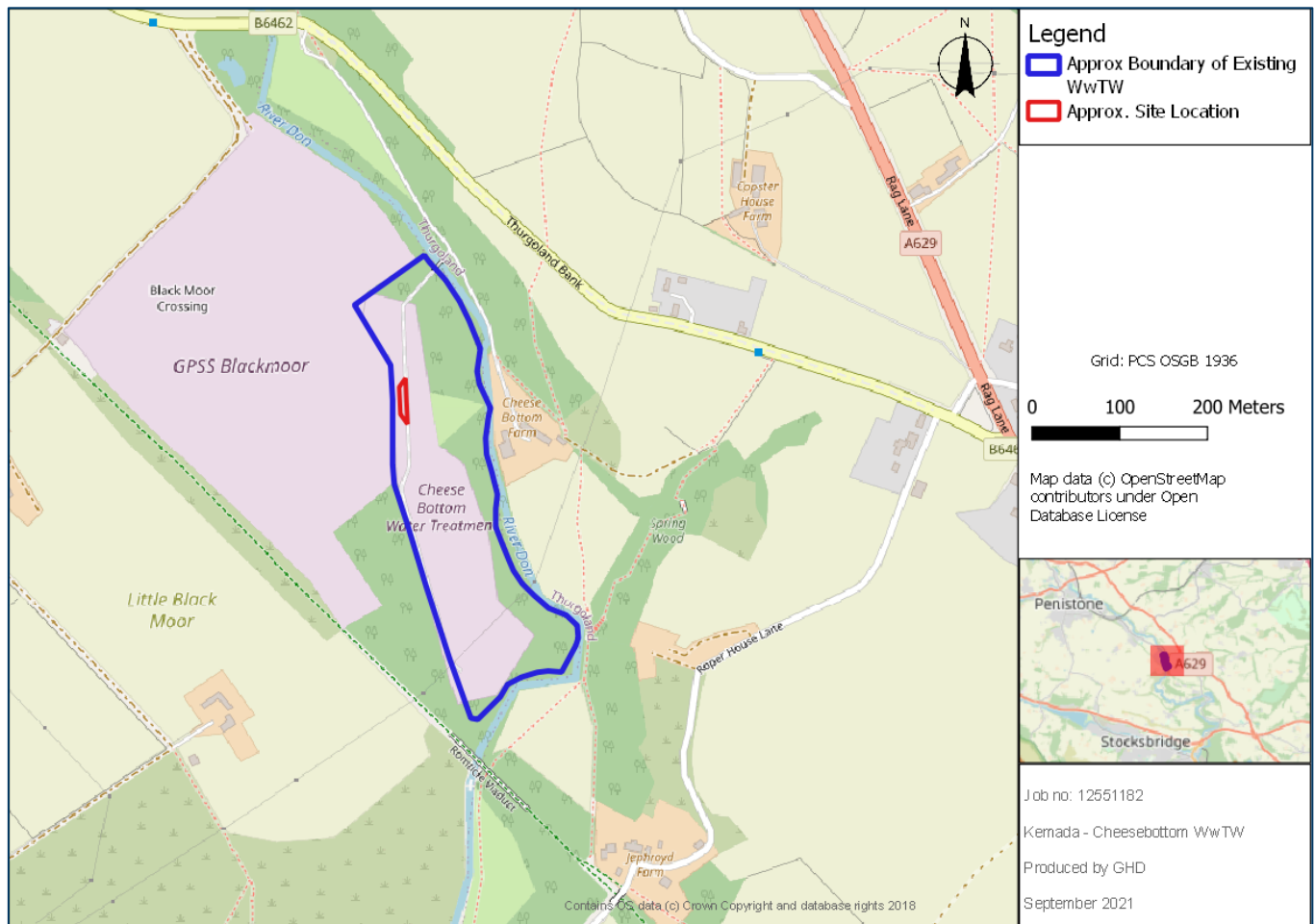


Figure 1 Site Location Overview

Table 1 Key Site Details

Site Location	Cheesebottom WwTW
Site area (m ²)	330 (Approximate boundary of existing WwTW c..5.5 hectares)
National grid reference	SE 27935 01212
Postcode	S35 7AH
Existing land use	Commercial
Local Planning Authority	Barnsley Metropolitan Borough Council
Lead Local Flood Authority	Barnsley Metropolitan Borough Council

3.2 Existing Site Levels

A topographical survey was undertaken for the site in September 2021. This focussed on the land immediately surrounding the proposed development position, not the approximated area of the existing WwTW. It indicates the proposed drop off area is situated west of the access road at c.171.9m AOD, on land elevated no more than 100mm from the existing access road.

Beyond the drop off area further west is where the two proposed dosing kiosks will be situated. Across the proposed development area, levels fall to the west, with a further dip to the north. The maximum difference in elevation across the development area is c.400m from east to west.

Freely available mapping indicates that overall levels for the approximate existing WwTW area fall from c.185m AOD at the western extent of the site to c.167.5m AOD at the eastern boundary.

Figure 2 shows an image of the proposed development area. Full topographical survey results for the site are in Appendix A.



Figure 2 Site ground level facing northwest across the site.

3.3 Existing Watercourses

In order to understand the risk of flooding occurring from nearby watercourses a review of the available mapping was undertaken. This identifies that the River Don at its closest approach flows adjacent to the approximate boundary of the existing WwTW, c.85m east of the proposed development location (see Figure 1). River Don flows from northwest to southeast as it passes the approximated existing WwTW boundary before flowing to its confluence with the River Ouse c.50km downstream of the site.

3.4 Proposed Development Description

The proposed development is for the construction of a concrete hard standing area to accommodate two prefabricated buildings, including an access/delivery area, which will also be used for the storage of chemicals used in the water treatment process.

The proposed site layout is provided in Appendix B.

3.5 Historic Site Information

Historic maps for the site and surrounding area have been examined from 1851 to present day in order to identify changes in the area which may be relevant to flood risk.

The earliest mapping (1851) shows the site to be largely open land with an old sandstone quarry mapped in the location of the present site. The River Don and Thurgoland Bank are mapped.

The Manchester, Sheffield and Lincolnshire Railway is noted to pass northbound from southeast to northwest, past the current southern approximate existing WwTW boundary. In 1905 the railway has changed to become the Great Central Railway, and again in 1931 to the London and North-eastern Railway. In 1979 the railway is shown as dismantled.

With the exception of the railway and expansion of nearby settlements there is limited change to the site since 1851.

In 1979 there are Sewage Works occupying the site of the current Cheesebottom WwTW, which were not mapped in 1965. An Oil Terminal occupies the site directly northeast of the WwTW, which is still mapped in the most recent mapping in 1989. From recent aerial images it can be seen that the Oil Terminal has been demolished and replaced with open land.

In summary, there have been no historic changes in land use in the immediate vicinity of the site which are considered to have a significant impact upon flood risk.

4. Sources of Flood Risk Information

4.1 Environment Agency (EA)

The Environment Agency (EA) Flood Map for Planning shows the proposed development site to be located within Flood Zone 2 (Figure 3). This is considered to have a 'Medium Probability' of fluvial flooding and means that the site location is potentially at risk from a 0.1% to 1% Annual Exceedance Probability event (or 1 in 100 to 1 in 1000-year event). The east and southern areas of the approximate existing WwTW area are located in Flood Zone 3, considered to have a 'High Probability' of fluvial flooding, meaning this area is potentially at risk from a 1% (1 in 100 year) Annual Exceedance Probability (AEP) event.

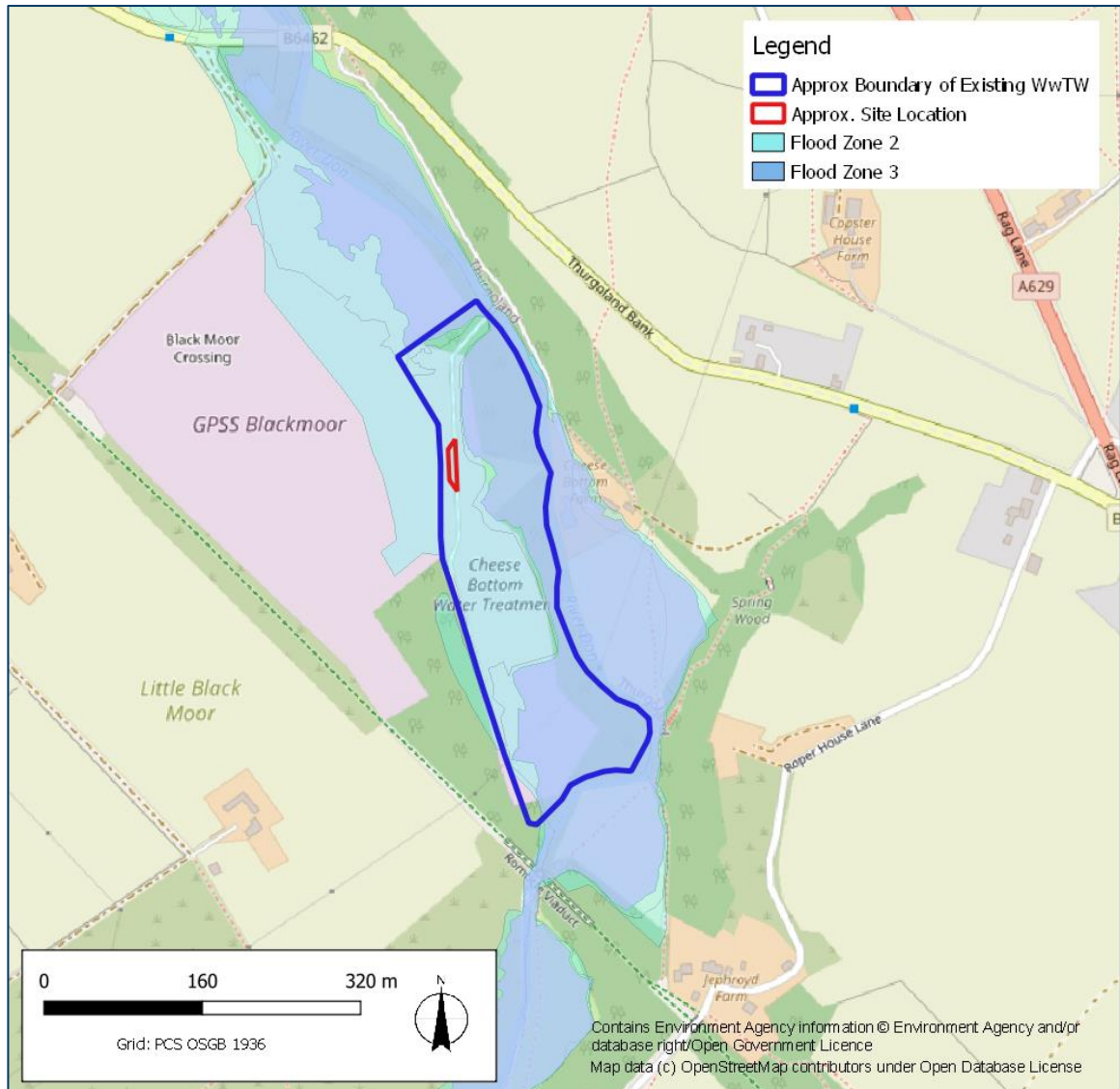


Figure 3 Extract from EA Flood Map for Planning

Pluvial flooding can occur during heavy and/or prolonged rainfall events when soil infiltration or drainage infrastructure capacities are overwhelmed causing an accumulation of surface water, generating overland flow pathways.

The EA's Risk of Flooding from Surface Water map (Figure 4 Extract from EA Risk of Flooding from Surface Water Mapping Figure 4) shows the potential flooding which could occur when rainwater does not drain away through the normal drainage system or infiltrate into the ground.

Figure 4 shows the proposed development location and majority of the approximate existing WwTW area to be at a very low risk from surface water flooding, meaning this area has a less than 0.1% chance of flooding during a 0.1% AEP rainfall event. Isolated areas within the north and south of the existing WwTW area are shown in Figure 4 to be at low risk of flooding. Further small, isolated areas to the south of the site are shown to be at high risk of flooding, meaning these areas are at risk of surface water flooding during a 3.33% AEP rainfall event. It must be noted that the majority of areas at high risk from surface water flooding are within the River Don channel and none of the identified areas negatively impact on the proposals.

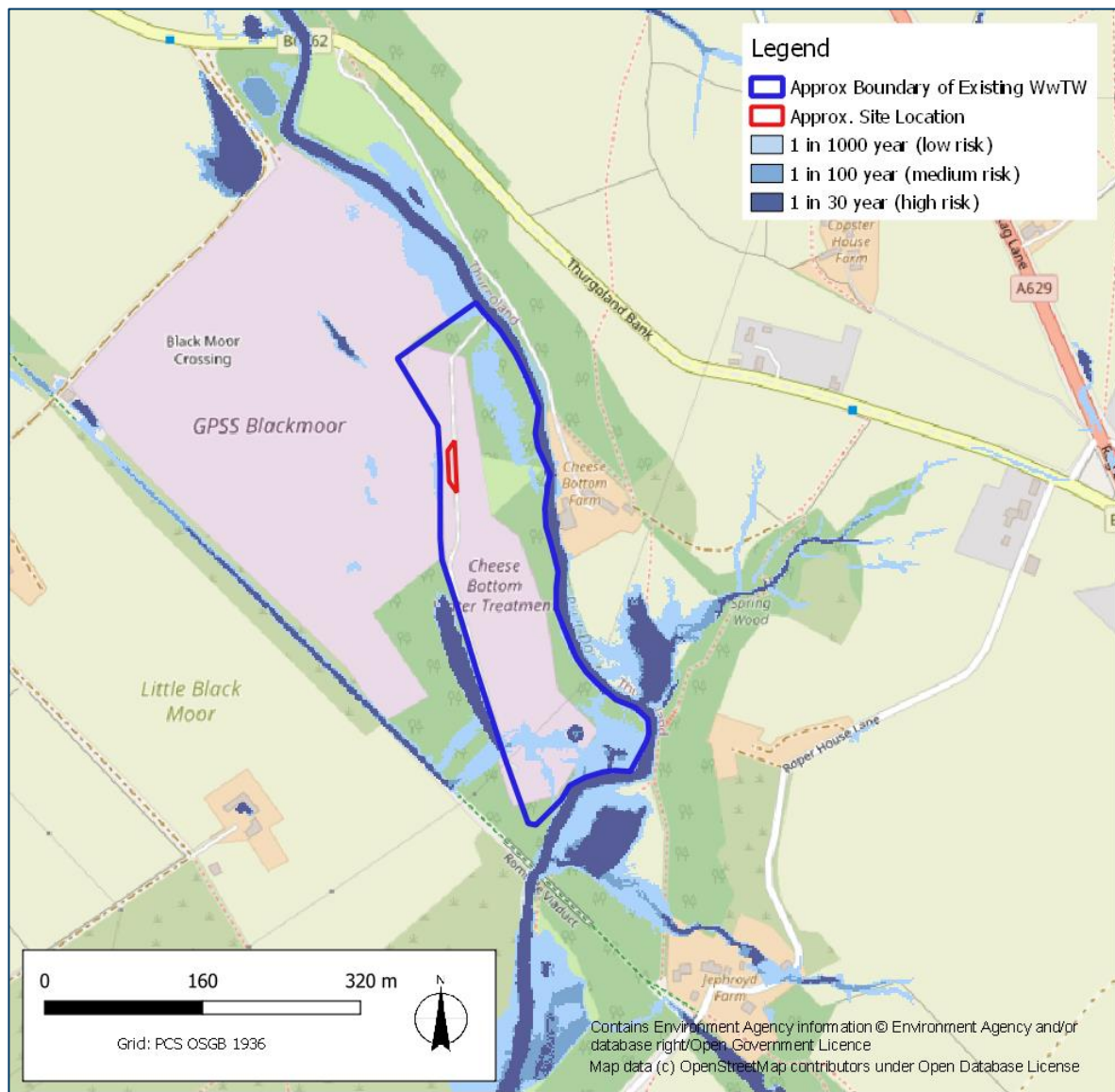


Figure 4 Extract from EA Risk of Flooding from Surface Water Mapping

The EA's historical flood event map is shown in Figure 5, showing the site to have flooded in the past. Flooding occurred most recently in June 2007 and was identified by the EA to be due to '*channel capacity exceeded (no raised defences)*'. The 2007 flood covered, circa 96% of the approximate existing WwTW area. Areas north, beyond the existing WwTW boundary, were subject to flooding in Autumn 2000 although the cause of this flood is unknown.

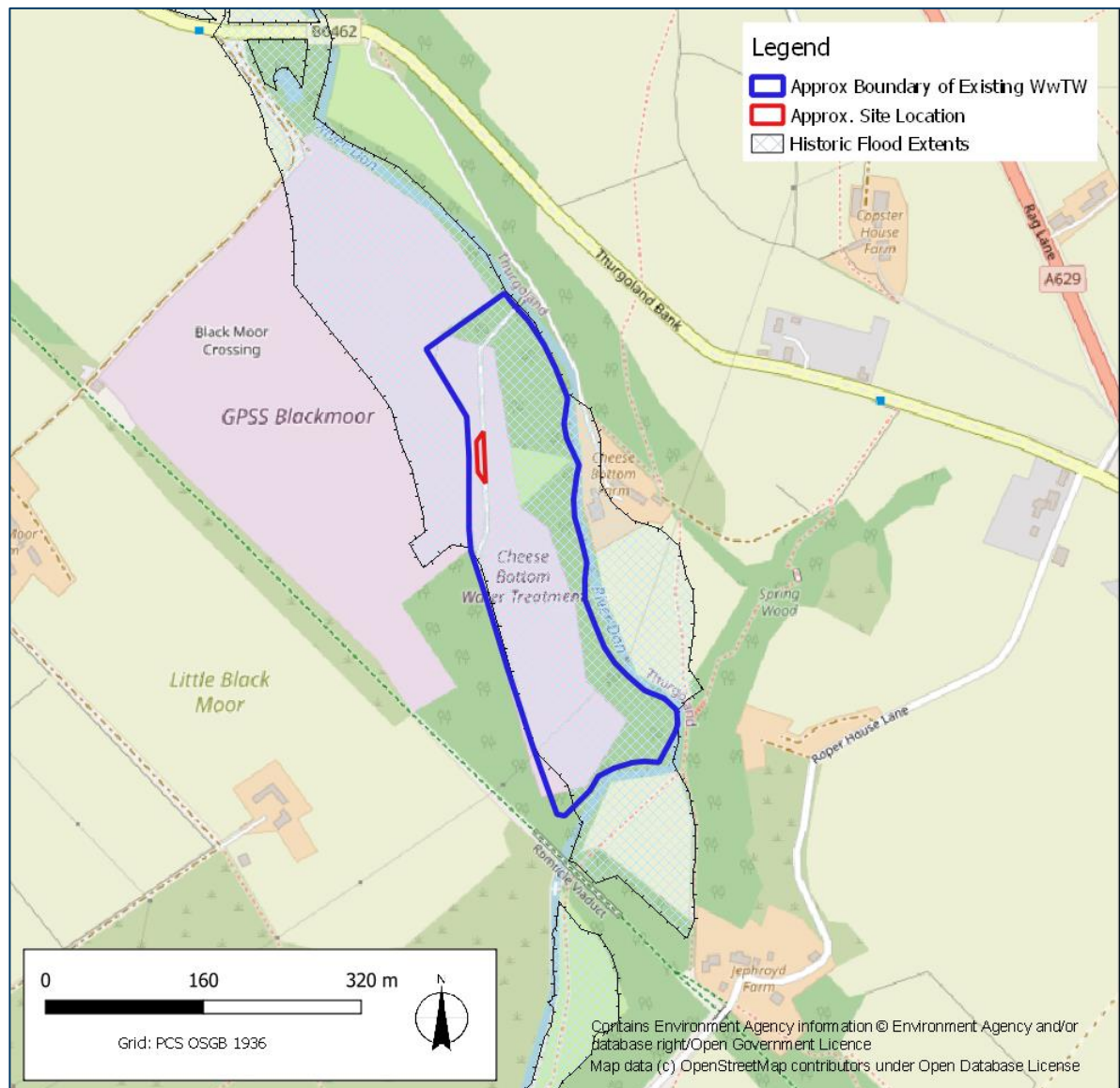


Figure 5 Extract from EA Historic Flood Extent Map

Flooding can be sourced from large waterbodies and reservoirs. Although unlikely, due to the tightly regulated nature and regular inspection frequency, reservoirs and other large waterbodies could overtop or breach their structures leading to rapid inundation of downstream locations. The closest reservoir to the site is Scout Dike Reservoir, located approximately 5.5km upstream of the site.

The EA's risk of flooding from reservoirs (Figure 6) shows the proposed development location is situated within the maximum reservoir failure flood extent.

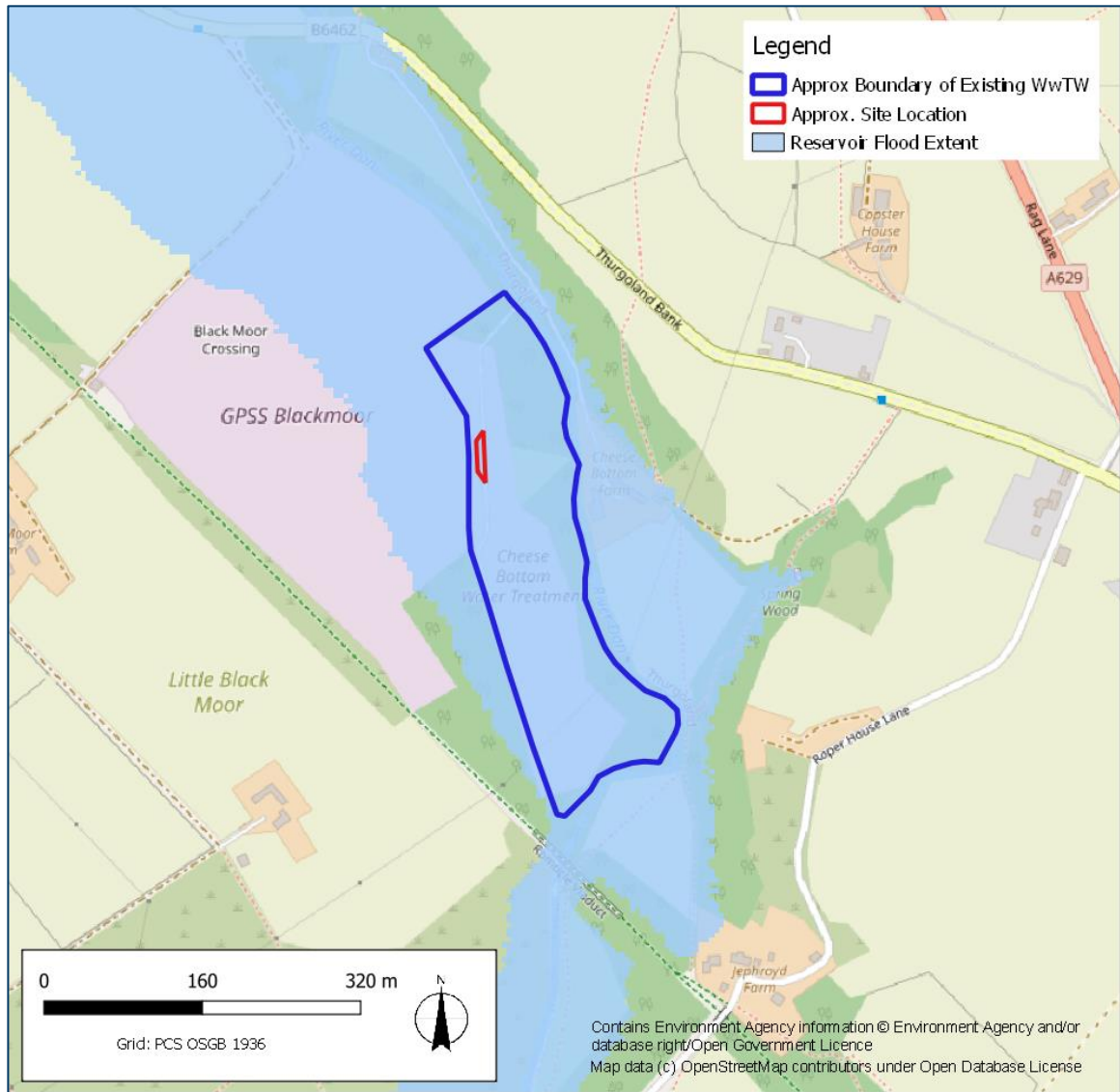


Figure 6 Extract from EA Reservoir Flood Extent Map

4.2 Strategic Flood Risk Assessment (SFRA)

Barnsley Metropolitan Borough Council's (RMBC) level 1 SFRA (2010) provides a summary of flood risk within the Barnsley area and was reviewed in the production of this Flood Risk Statement.

The SFRA expresses flood risk as the relationship between the probability of flooding multiplied by the consequences of flooding.

Relevant extracts from the SFRA are included below in relation to the wider Barnsley area:

"The Barnsley MBC area is located with the River Dearne and Upper Don catchments. Flood processes and flood risk issues across the borough are inextricably linked by the Rivers Dearne and Upper Don and their tributaries. [...]

Flooding can occur from many different sources and PPS25 requires all of these flood risks to be considered at all stages of the planning process".

There was no specific mention of Cheesebottom WWTW or the immediate surrounding areas. No further site-specific flood risk information was available for the site in the SFRA.

4.3 Sewerage Company

Sewer flooding can occur when the capacity of the pipe infrastructure is exceeded by high flows, if the downstream sewage system becomes surcharged, or as a result of a reduction in capacity due to blockage. These individually and collectively can lead to sewers flooding onto the surrounding surface through surcharge of manholes and gullies

Yorkshire Water, the sewerage operator in the region, is required by OFWAT to maintain a record of flooding incidents due to hydraulic capacity problems on the sewerage network. Properties are placed on the register following investigations to determine the cause and risk of flooding and are placed on the appropriate register depending on risk. It is recommended that Yorkshire Water be contacted to determine risk of sewer flooding at the site.

The SFRA noted 'Yorkshire Water have provided data on internal and external flooding from their databases. In the Yorkshire Water managed and maintained system the incidence of external sewer flooding is not widespread or particular frequent'.

The SFRA made no reference to the site or surrounding area in relation to risk from sewer flooding.

4.4 Local Authority

Barnsley Metropolitan Borough Council (BMBC) are the Local Authority for the development in the area.

A review of the freely available information from the BMBC website was carried out to determine if there were any records of historical flooding at the site or at nearby developments.

No additional records of historical flooding were found in relation to the site. It is recommended that BMBC be contacted to determine whether they hold records of flooding for the site.

4.5 Lead Local Flood Authority (LLFA)

BMBC are also the LLFA for the development area. See Section 4.4 for information.

5. Sources of Potential Flood Risk

5.1 Fluvial (Rivers)

5.1.1 Present Day Risk

Extreme fluvial flood events have the potential to cause rapid inundation of land and properties, whilst posing a threat to the welfare of residents, alongside potentially preventing emergency access to properties and essential infrastructure. The EA's Flood Map for Planning (FMfP) shows the site is located in Flood Zone 2, 'Medium Probability' of flooding. This is defined as an area which has an annual risk of fluvial flooding of between a 0.1% (1 in 1000 year) and 1% (1 in 100 year). The east and southern areas of the approximate existing WwTW area are situated in Flood Zone 3, 'High Probability' of flooding (Figure 3). This means that these areas have a greater than 1% (1 in 100 year) annual risk of fluvial flooding.

The EA provided modelled water levels and flows for a series of nodes along the River Don (Appendix C). Peak flood levels (m AOD) from these nodes, during a series of different return period events, are provided in Table 2. The nodes closest to the site are 'DON17_22884' and 'DON17_22741'.

According to the topographic survey, existing ground levels at the location of the proposed dosing kiosk are c.171.9m AOD. However, the top of slab level is proposed to be elevated above the ground level at 172.1m AOD. Comparing these to the modelled flood events, the proposed top of slab is elevated in excess of c.1.5m above the simulated flood levels of the 1% AEP (1 in 100 year) fluvial flood event and in excess of c.0.87m above flood levels of the 0.1% AEP (1 in 1000 year) fluvial flood event. The top of the slab level (172.1m AOD) therefore satisfies the EA guidance which suggests a freeboard allowance for development levels of 600mm above the estimated flood level. This data therefore suggests that the Flood Zone 2 in which the proposed dosing kiosk is located, is defined by a historic flood event and not from EA modelling.

Table 2 Flood Levels (m AOD) for a range of Return Period Events

	Modelled Peak Water Level at a range of Return Period Events (m AOD)		
Node Label	2% AEP (1 in 50-year event)	1% AEP (1 in 100-year event)	0.1% AEP (1 in 1000-year event)
DON17_22884	170.52	170.60	171.23
DON17_22741	170.05	170.14	170.82

5.1.2 Future Risk (Climate Change)

The EA guidance document 'Flood risk assessments: climate change allowances' was released in February 2016 and included statistical increases in peak fluvial flows by river basin district and allowance categories based on epochs and development vulnerability classification. This was later updated in July 2021 to use the UKCP18 projections to update the peak river flow allowances that are now based on management catchments, instead of river basin districts. In addition, there has been an update on the guidance on applying peak river flow allowances.

As the development is classed as 'less vulnerable', in accordance with the NPPF, the central allowance is to be used for the site, which requires a 28% increase in river flow for the site's management catchment. This is for the period up to 2115.

No modelled climate change data has been provided by the EA. However, as the slab level is elevated c.0.87m above the 0.1% AEP (1 in 1000 year), it is unlikely that the 1% AEP + 28% climate change flood levels would be higher than the 0.1% AEP values such that it significantly reduces the 0.6m freeboard that the EA requires.

5.2 Infrastructure Failure

5.2.1 Defence Infrastructure

Flood defences are typically raised structures that alter natural flow patterns and prevent floodwater from entering property in times of flooding.

EA Mapping shows the nearest EA maintained flood defences to be located on the River Don, c.12.5km downstream in Sheffield and will therefore have no impact on the proposed site location.

5.2.2 Conveyance Infrastructure

The failure of conveyance infrastructure such as culverts or bridges could increase the risk of flooding at the site. Mapping shows the location of three bridges in proximity to the site crossing the River Don which could have a bearing on flood flow conveyance. These are:

- Bridge over which the B6462 (Thurgoland Bank/Sheffield Road) crosses c.430m north (upstream) of the site location
- Bridge over which the site access road crosses c.140m north of the site
- Romticle viaduct, over which the Upper Don Trail crosses c.400m south of the site location

There are no further mapped conveyance infrastructure in proximity to the site.

B6462 Bridge

To the north of the site is a bridge over which the B6462 crosses over the River Don. In the event of a blockage or failure of this structure there would be a reduction in available river conveyance. Due to levels rising to the north/east and falling towards the south, flows would likely travel towards the existing WwTW area. A review of freely available mapping indicates a low point north of the existing WwTW's northern boundary, likely enabling flows to be conveyed back towards the river channel. Due to the topography and location of this structure in relation to the site, there is a risk, albeit low, of flooding to the site.

Site Access

The access to the site involves a crossing over the River Don. In the event of a blockage or failure of this structure there would be a reduction in available river conveyance. Under a full blockage, and to some degree a partial also, flows would back up behind the structure until such a point as flood water is able to be conveyed out of channel and around the blockage. Due to levels rising to the north/east and falling to the south/west flows would preferentially travel towards the site location. A review of freely available mapping identifies a low point at the existing WwTW's western boundary. This would enable flows to be conveyed past the site back towards the river channel. In the event of flows reaching higher levels, there is a risk that flood water could spill over and towards the proposed site location and flow east back towards the river channel. Overall, there is a residual risk to the site from a blockage of the upstream bridge structure.

Viaduct

To the south of the site is Romticle Viaduct. In the event of a failure there would be a reduction in available river conveyance. Due to levels rising to the north/west and falling to the south/east, flows would preferentially travel away from the proposed development location. Due to the topography and location of the Viaduct in relation to the site, there is a low risk of flooding from this structure to the site.

It is recommended that all structures mentioned here are regularly inspected to ensure any defects are identified and repaired as required.

5.3 Pluvial (Surface Water)

The EA's Risk of Flooding from Surface Water mapping shows the majority of the approximate existing WwTW area and proposed development position to be at very low risk from flooding from pluvial sources.

Details provided by the EA mapping show:

High Risk (3.3% AEP)

- Extents are to the west and south within the approximate existing WwTW area and within the river channel;
- Depths for high-risk areas in the south of the approximate existing WwTW area are below 300mm, whereas to the west of the site location, depths are between 300-900mm and greater than 900mm in the centre of this topographical depression, and;
- Velocities within the river channel are greater than 0.25m/s, with flow moving downstream. Outside of the channel, velocities are mainly shown to be stationary, moving at a rate less than 0.25m/s, indicating pooling at topographical low points.

Medium Risk (1% AEP)

At the resolution of the mapping, areas at medium risk of surface water flooding show the same extent as areas of high risk. Depths and velocities will vary.

Low Risk (0.1% AEP)

- Extents are situated directly to the west of the proposed development location but predominantly occupy the south of the approximate existing WwTW area, greatest towards the river channel;
- Depths are greater than 900mm in an isolated area to the west of the approximate existing WwTW area. At the north and south boundaries of the wider site, close to the river channel, depths are between 300-900mm. Depths are below 300mm in areas surrounding the water treatment tanks and to the north of the site and;
- Velocities in the pooled area to the west of the wider site are less than 0.25m/s, moving in a circular direction indicating pooling at a topographical low point. In low-risk areas to the north, water is moving in a southerly direction at velocities less than 0.25m/s before re-entering the river channel. Pluvial water to the southwest of the site is moving at a rate greater than 0.25m/s, towards the south and west of the approximate existing WwTW area.

As none of these identified areas are shown to be located within the development site location (only the wider WwTW site), it is considered that there is a low risk to the proposed development location.

5.4 Coastal / Tidal

The River Don is not understood to be tidally influenced as it passes through the site. As such there is a low risk from this source.

5.5 Sewer Flooding

The topographical survey shows the presence of an onsite sewage system, with mainly surface water sewers identified across the proposed development area (see Appendix A). However, given the site is a WwTW, the risk of sewer exceedance has been considered in the site development and any exceedance flow will follow local topography.

Overall, given the site is isolated from nearby residential areas and is an actively managed and operated treatment works where any potential drainage issues are likely to be identified and rectified before they can contribute significantly to flooding, the risk of sewer flooding is considered to be low.

5.6 Ground Water

Soilscapes mapping describes the soils at the site to be '*slowly permeable seasonally wet acid loamy and clayey soils*' and with '*impeded drainage*'. The British Geological Survey (BSG) online mapping describes Cheesebottom WwTW to be underlain by superficial deposits comprising of Alluvium overlying First River Terrace Deposits (Sand and Gravel). According to the BGS and Coal Authority the solid bedrock geology comprises the Pennine Lower Coal Measures Formation strata. These strata comprise the Grenoside Sandstone.

BGS borehole database indicate there are no available borehole records for the site or the immediate surrounding area.

The SFRA (2010) noted groundwater to be a '*significant but localised issue*'. The SFRA made no specific reference to the site or surrounding area in relation to risk from groundwater flooding.

The proposed development involves the construction of two concrete slabs and a hard standing vehicle area. The proposed structures to be housed on the slabs will be sealed at the base for at least 200mm above external ground level, with levels falling away from the slab to the west. Therefore, any groundwater emergence will result in flow draining away from the development area, meaning the risk of flooding from this source is very low.

5.7 Artificial Water Bodies (Reservoir)

Reservoirs, canals and other artificial water bodies have the potential to hold a large volume of water, often above ground level. Should the containment of these waterbodies fail (e.g., due to breach or overtopping) there could be a sudden release of deep, fast-moving, water with little warning able to be provided. However, due to regular maintenance and careful monitoring which are mandatory for such structures, there is a low risk posed from such an event.

The closest reservoir to the site is Scout Dike Reservoir, located c.5.5 km upstream of the site.

The SFRA noted:

"According to the Environment Agency's Register of Reservoirs, there are 19 operational 'large, raised reservoirs' located within the boundaries of the Barnsley MBC boundary ranging in capacity between about 35,250m³ and 8,296,000m³. [...]"

"Whilst the probability of dam failure or breaching occurring is very small, the consequences of such an event can be devastating hence presenting a risk of flooding which has to be considered."

EA mapping shows the proposed development location to be positioned within the area at risk of flooding from reservoirs, with flood water depth greater than 2m and speed greater than 2m/s. Thus, the proposed development location is at high risk in the event of reservoir failure. However, reservoir flooding is extremely unlikely to occur and there has been no loss of life in the UK from reservoir flooding since 1925.

6. Mitigation

6.1 Finished Slab Level

The site is situated within Flood Zone 2. Although this is understood by GHD to be defined by a historic event, it is recommended that the slab be raised where possible above the predicted flood level, to help manage the risk of flooding. The top of the concrete slab on which the dosing kiosk will be situated will be at 172.1m AOD, c.0.87m above the 0.1% (1 in 1000) River Don fluvial flood event and is therefore in excess of the EA guidance of 600mm, allowing for effective operation of the site.

6.2 Flood Resistance Measures

Flood resistance refers to measures to construct a building in such a way as to prevent floodwater entering the building and damaging its fabric or structure.

It is understood there will be no ground level openings on the kiosk and that the building will be sealed to at least 200+mm above the level of the concrete slab. If required, further resistance could be provided by using waterproof doors and/or flood barriers. This will help to manage the risk of water intrusion to the building.

6.3 Flood Resilience Measures

Flood resilience measures can be used to limit the impact of flooding to a building, and reduce the time taken to clean up after a flood. Based on the sites proposed use, the use of flood resilience measures is not deemed to be appropriate due to the complex machinery that will be installed, and so an elevated concrete slab and resistance measures are more appropriate.

6.4 Safe Access/Egress

The top of the concrete slab will be elevated c.0.87m above the 0.1% AEP (1 in 1000 year) River Don fluvial flood event. Additionally, the access road to the north is elevated in excess of c.0.57m above the 0.1% AEP fluvial flood event, allowing safe access and egress via the site access road to the north during flood conditions.

Nevertheless, site operatives should be made aware of the risks of flooding. The EA provides a 24-hour Flood Warning service for the site, to which Kemada are recommended to subscribe. A Flood Warning provides a lead-in time between half an hour to one day in advance of flooding. The site is located within the '*River Don at Oxspring and Cheesebottom*' Flooding Warning area.

It is recommended that site owners Kemada sign up for the EA's Flood Warnings Direct Service by calling Floodline on 0345 988 1188 or entering relevant details on the EA website. Flood Warnings can be received by telephone, mobile, email, SMS text message or fax.

After receipt of a Flood Warning, it is suggested that Kemada contact the EA Floodline '*dial and listen*' service to hear further information. To do this dial **0345 988 1188** and select option 1. Here the user will be given the option to enter a quick dial code to get more information. The quick dial code for the '*River Don at Oxspring and Cheesebottom*' Flood Warning Area is **138457**.

This information should be part of the site's safe management plan and, where required, include a site-specific Flood Warning and Evacuation Plan. This will provide Kemada all pertinent information with respect to flood risk at the site, such that risk to life is reduced, damage is mitigated and to ensure a safe and organised evacuation of occupants during a flood event.

In the event of a flood, staff should monitor the situation and only attend if deemed safe to do so. If it is not possible to evacuate, site users should move to higher ground and seek emergency assistance.

6.5 Floodplain Compensation

Floodplain compensation is not required as the proposed dosing kiosk area is wholly within Flood Zone 2, is elevated above the 0.1% (1 in 1000) River Don fluvial flood event and is classified as 'less vulnerable' infrastructure.

7. Development Potential

The site is located in Flood Zone 2, suggesting that this location is at a 'Medium Probability' of flooding, from fluvial events with an annual exceedance probability of between 1% and 0.1%.

As the site is located within Flood Zone 2, it is recommended that consideration is given to the location of the development within the site to make it the most sequentially preferable (from a location, levels and flood risk perspective), whilst still ensuring it is operationally effective.

The top of the concrete slab on which the dosing kiosk will be situated will be at 172.1m AOD, c.0.87m above the EA modelled 0.1% AEP (1 in 1000 year) River Don fluvial flood event, to manage the risk of internal flooding. The top of the slab level (172.1m AOD) is therefore in excess of the EA guidance of 600mm freeboard above the estimated flood level, allowing for effective operation of the site.

As the site is classed as 'less vulnerable' the Exception Test is not required.

8. Conclusion

This Flood Risk Statement has been produced on behalf of Kemada, for a proposed development of a chemical delivery area consisting of two dosing kiosks on a concrete slab, within the Cheesebottom WwTW.

The EA's Flood Map for Planning (FMfP) shows the site to be located within Flood Zone 2. This is considered to have a 'Medium Probability' of fluvial flooding and means that the site location is potentially at risk from a 0.1% to 1% Annual Exceedance Probability (AEP) event (or 1 in 100 to 1 in 1000-year event). However, EA modelled flood events for the River Don show the proposed top of slab is elevated in excess of c.1.5m above the simulated flood levels of the 1% AEP (1 in 100 year) fluvial flood event and in excess of c.0.87m above flood levels of the 0.1% (1 in 1000 year) fluvial flood event. The top of the slab level (172.1m AOD) therefore satisfies the EA guidance which suggests a freeboard allowance for development levels of 600mm above the estimated flood level. This data suggests the site is unlikely to be flooded by the River Don and confirms that the Flood Zone 2 in which the proposed dosing kiosk is located, is defined by a historic flood event and not from EA modelling.

It can be concluded from all other available sources of information that the proposed development location is at a low risk of flooding from pluvial, groundwater and sewer sources.

There is a high risk of flooding to the site in the event of a failure of upstream reservoirs/dams. However, due to strict monitoring and regulations, the risk of reservoir failure is low.

It is understood there will be no floor level openings on the kiosk and that it will be sealed to at least 200+mm above the level of the concrete slab, to reduce the risk of water intrusion to the kiosk.

It is recommended that site users sign up for the EA's Flood Warnings Direct Service as part of the site's safe management plan, where the quick dial code for the 'River Don at Oxspring and Cheesebottom' Flood Warning Area is 138457.

Appendix A – Topographical Survey



LEGEND		
	ELE	SURVEY EXTENTS
	ELE	ELECTRICITY CABLE
	FWS	FOUL WATER
	FWS	SURFACE WATER
	FWS	WATER FEATURE
	WAT	WATER SERVICE
	UNK	UNKNOWN SERVICE
	GPR	GPR FEATURE
	DLC	DUCT
	EAS	EARTH STRAP
	PFPD	UNIDENTIFIED PIPE
	RADIB	RADIO FREQUENCY FEATURE
	(ANY SERVICE)	ASSUMED ROUTE
	(ANY SERVICE)	TAKEN FROM RECORDS

ABBREVIATIONS			
AV	AIR VALVE	IC	INSPECTION COVER
BH	BOREHOLE	IL	INVERT LEVEL
BOL	BOLLARD	LC	LIGHTING COLUMN
CAB	CABINET	LP	LAMP POST
CATV	CABLE TELEVISION COVER	MH	MANHOLE
CL	COVER LEVEL	P	POST
DP	DOWN PIPE	RE	RODDING EYE
DIU	DEPTH UNKNOWN	SP	SIGN POST
EJB	ELECTRICITY JUNCTION BOX	ST	STOP TAP
EDT	END OF TRACE	SV	SERVICE VALVE
ER	EARTH ROD	TL	TRAFFIC LIGHT
FH	FIRE HYDRANT	TP	TELEGRAPH POLE
FP	FLAG POLE	UTR	UNABLE TO RAISE
G	GULLY	UTT	UNABLE TO TRACE
GV	GAS VALVE	VP	VENT PIPE

NOTES

A RANGE OF METHODS ARE USED TO OBTAIN THE UNDERGROUND INFORMATION PRODUCED IN THIS DRAWING. VARIATIONS IN GROUND CONDITIONS CAN AFFECT THE QUALITY OF THE DATA AND THEREFORE AN ABSOLUTE AFFIRMATION CANNOT BE GUARANTEED.

POWER CARRYING FEATURES SHOWN ON THIS DRAWING ARE ILLUSTRATED BY AN INDIVIDUAL SERVICE LINE. THIS DOES NOT NECESSARILY REPRESENT THE NUMBER OF CABLES.

DEPTH OF UTILITY IS TAKEN AT THE POINT SHOWN ON THE DRAWING AND IS TO THE TOP OF THE SERVICE UNLESS STATED OTHERWISE. ALL DEPTHS ARE APPROXIMATE.

ALL DRAINAGE DEPTHS ARE TO PIPE INVERT UNLESS STATED OTHERWISE.

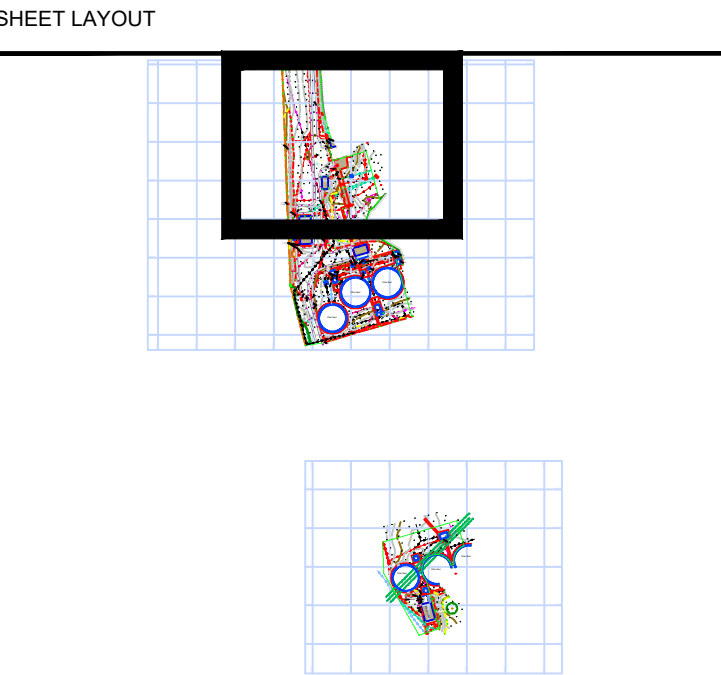
PIPE SIZES ARE SHOWN ONLY FROM VISUAL INSPECTION OR TAKEN FROM STATUTORY RECORDS.

A DEFINITION OF A SUB SURFACE ANOMALY IS AN AREA WHERE THE RADAR DATA SHOWS A SUBSTANTIAL CHANGE IN THE UNIFORM DATA FROM THE SURROUNDING AREA. THESE AREAS COULD BE VOIDS, HEAVILY SATURATED GROUND, BURIED TANKS OR OTHER SUB-SURFACE FEATURES.

EXCAVATIONS IN THE VICINITY OF SERVICES SHOWN ARE TO BE CARRIED OUT WITH DUE DILIGENCE. (REF: H5547)

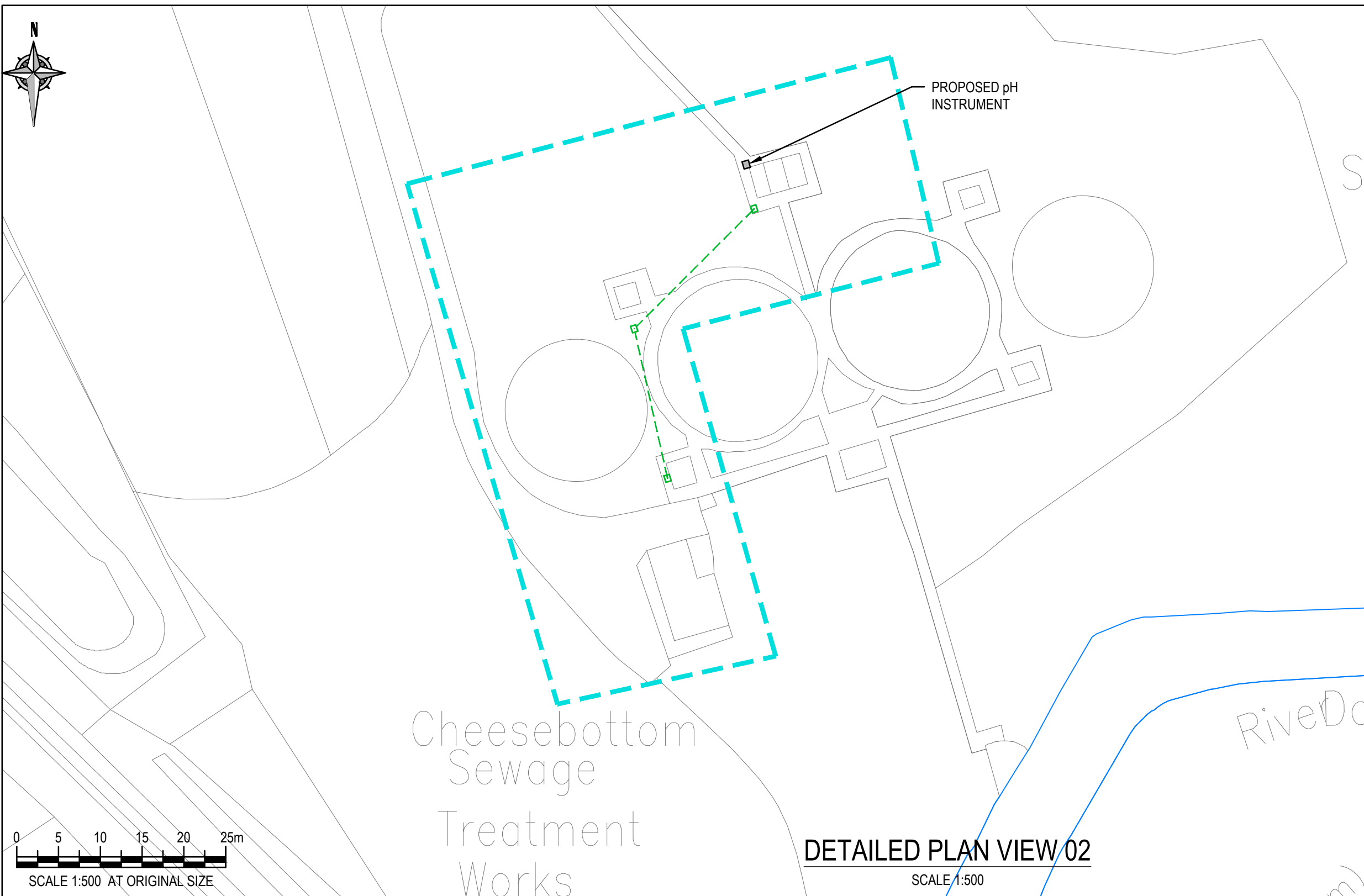
THE FOLLOWING TEXT IS AN EXTRACT FROM SURVEYS OF LAND, BUILDINGS AND UTILITY SURVEYS AT SCALES OF 1:500 AND LARGER ISSUED BY THE ROYAL INSTITUTE OF CHARTERED SURVEYORS (FEBRUARY 1996): "ELECTRONIC TRACING IS A RELIABLE METHOD OF LOCATING BURIED SERVICES ON HEAVILY BUILT UP SITES 85% COMPLETENESS IS PROBABLY ALL THAT CAN BE EXPECTED." "AN ACCURACIES OF THE ORDER + OR - 150MM MAY BE ACHIEVED BUT THIS FIGURE WILL DEPEND ON THE DEPTH OF THE SERVICE BELOW GROUND LEVEL WHERE SIMILAR SERVICES RUN IN CLOSE PROXIMITY. SEPARATION MAY BE IMPOSSIBLE. SUCCESSFUL TRACING OF NON-METALLIC PIPES MAY BE LIMITED." "EXISTING RECORD INFORMATION SHOWING UNDERGROUND SERVICES IS OFTEN INCOMPLETE AND OF DOUBTFUL ACCURACY. IT SHOULD BE REGARDED ONLY AS AN INDICATION AND CANNOT BE GUARANTEED."

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH PRODAR SURVEYS LIMITED REPORT IR92137-001.



REVISION	DESCRIPTION	DATE
		PRODAR SURVEYS LTD. Unit 20 Carlisle House Carlisle Street Goole DN14 5DS T: +44 (0) 1482 778 588 F: +44 (0) 8443 913 111 E: info@prodarsurveys.co.uk W: www.prodarsurveys.co.uk
JOB TITLE: Kemada Limited Cheese Bottom WWTW Thurgoland Sheffield		
DRAWING TITLE: Topographic and Underground Utility Mapping Survey		
DRAWING NO: 92137-001	DATE: 03/09/2021	
SHEET NO: No.1 of 3	REVISION:	
DRAWN BY: AB	SCALE: 1:200 @ A1	
CHECKED BY: MG	APPROVED BY: AG	
SCALE BAR: 0.0m 2.0m 4.0m 6.0m 8.0m 10.0m		

Appendix B – Site Layout



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks:

Refer to designers residual risk register for full details

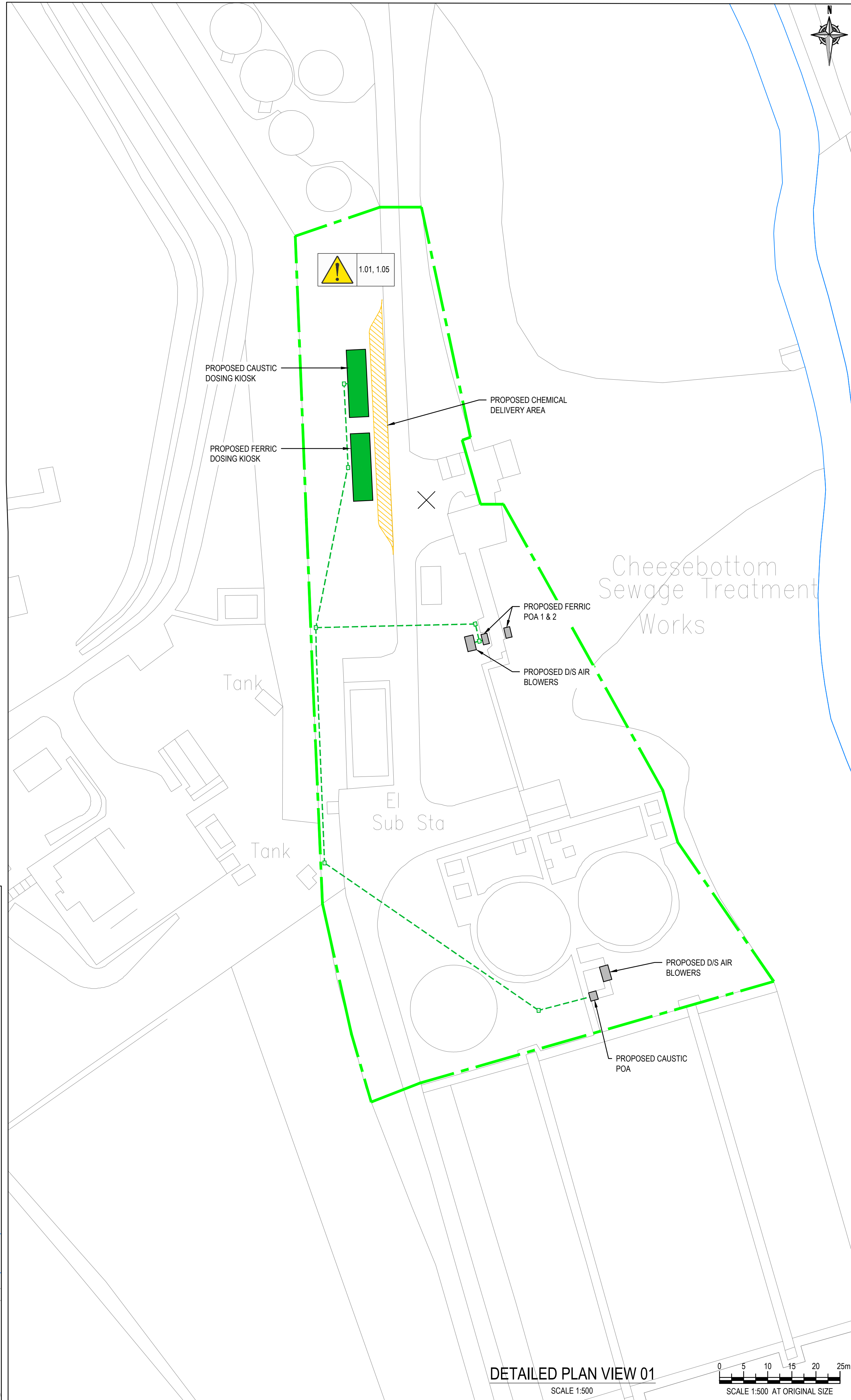
HAZARDOUS	
1/01 GROUND INVESTIGATION / TOPOGRAPHICAL & GPR, ECOLOGY SURVEY - WORKING IN CLOSE PROXIMITY TO WATERCOURSE / DRAINAGE DITCHES	
1/02 GROUND INVESTIGATION / TOPOGRAPHICAL & GPR, ECOLOGY AND MH AND CCTV SURVEY - OPERATIONAL SEWAGE TREATMENT WORKS	
1/03 GROUND INVESTIGATION / TOPOGRAPHICAL & GPR, ECOLOGY AND MH AND CCTV SURVEY - STEEP EMBANKMENTS/STEEPLY SLOPING GROUND - INSTABILITY OF PLANT, SLIPS, TRIPS & FALLS	
1/04 GROUND INVESTIGATION / TOPOGRAPHICAL & GPR, ECOLOGY AND MH AND CCTV SURVEY - SERVICE STRIKE - UNDERGROUND/OVERHEAD/UNCHARTED SERVICES - HV ELECTRICITY CABLES - ELECTROCUTION/DEATH	
1/05 GROUND INVESTIGATION / TOPOGRAPHICAL & GPR, ECOLOGY AND MH AND CCTV SURVEY - WORKS WITHIN ACCESS ROADS - VEHICLE STRIKE	
1/06 GROUND INVESTIGATION - UNKNOWN GROUND CONDITIONS - GROUNDWATER SEEPAGE, TRIP COLLAPSE	
1/07 GROUND INVESTIGATION / TOPOGRAPHICAL & GPR - ECOLOGY - DAMAGE TO HABITATS, NESTING BIRDS	

Hazard/Control	
2.1	

It is assumed that all works will be carried out by a competent contractor working, where applicable to an approved method statement

KEY TO HEALTH AND SAFETY SYMBOLS

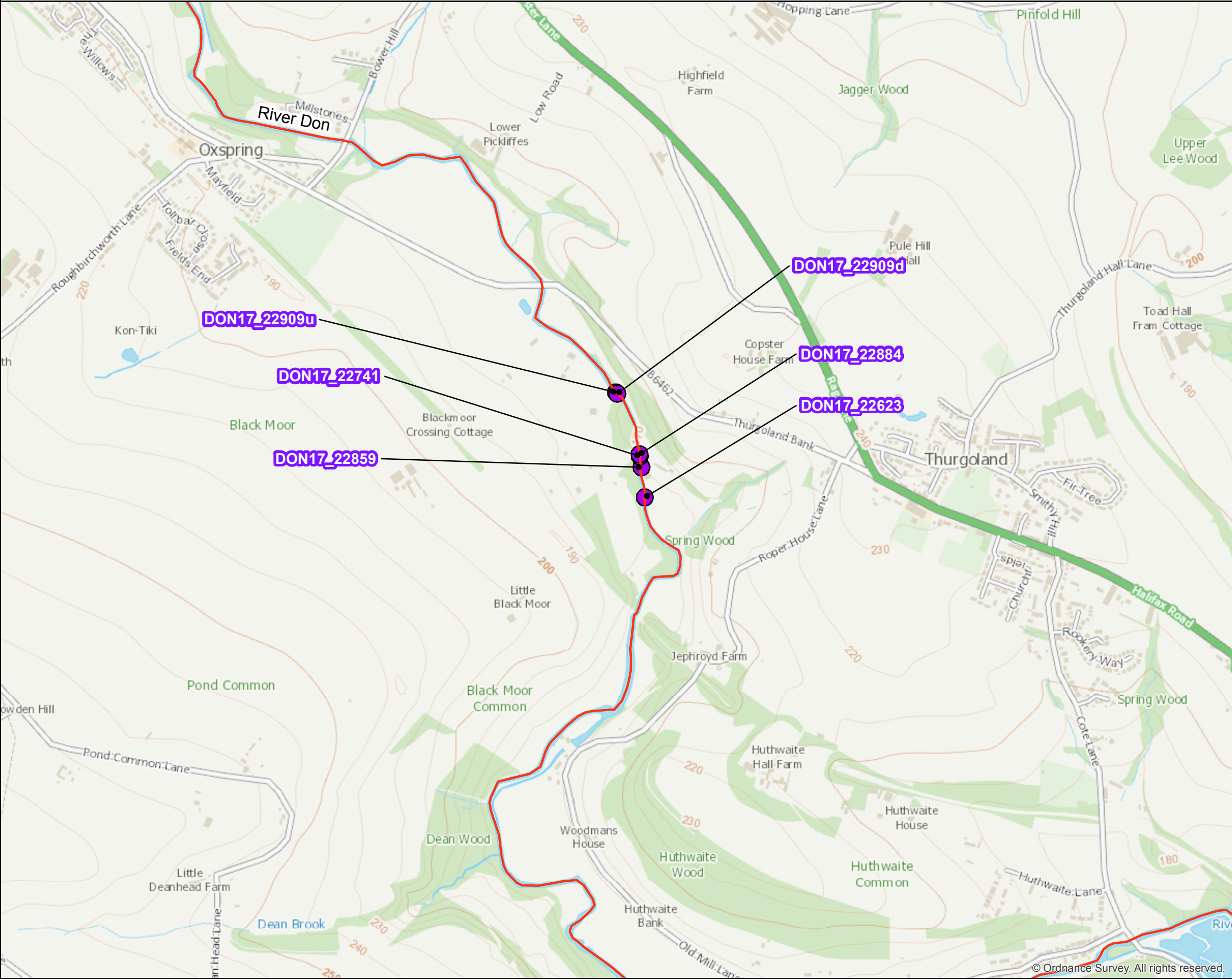
INDICATES A RESIDUAL RISK REQUIRING A COMPULSORY ACTION.	
	INDICATES A RESIDUAL RISK FOR INFORMATION.
	INDICATES A RESIDUAL RISK REQUIRING A PROHIBITIVE ACTION.
	INDICATES A RESIDUAL RISK AS A WARNING.

[illegible]

Appendix C – River Don EA Product 4

RFI/2021/235296 Node Point Map Centred on Cheesebottom WwTW

Date created: 15/12/2021

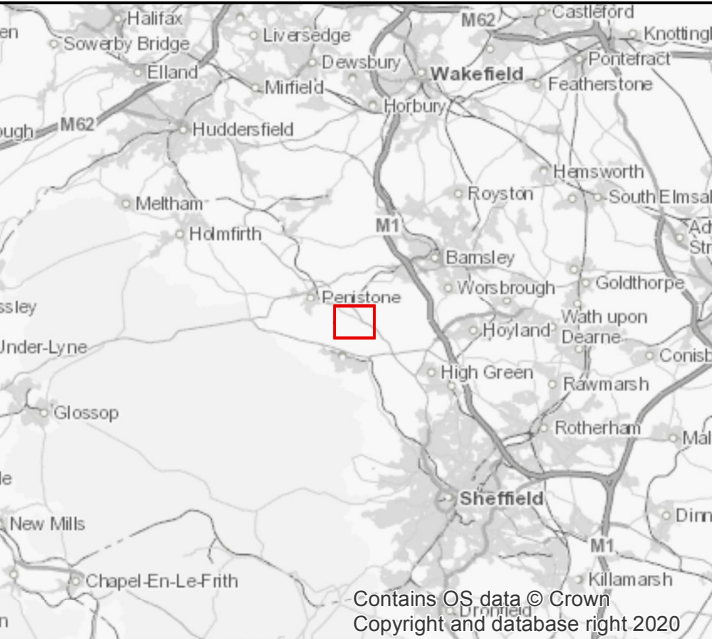


www.environment-agency.gov.uk

Scale: 1:10,000



when reproduced @ A3



LEGEND

- Main River
- Node Points

Node Point	2012 Sheffield Comprehensive Flood Review Defended Model Results - RFI/2021/235296 - (Stage = mAOD) (Flow = m³/s)											
	4% AEP (1 in 25)		2% AEP (1 in 50)		1.33% AEP (1 in 75)		1% AEP (1 in 100)		0.5% AEP (1 in 200)		0.1% AEP (1 in 1000)	
	Max Stage	Max Flows	Max Stage	Max Flows	Max Stage	Max Flows	Max Stage	Max Flows	Max Stage	Max Flows	Max Stage	Max Flows
DON17_22859	170.29	45.86	170.44	55.65	170.48	58.61	170.51	60.58	170.68	72.85	171.14	112.63
DON17_22909u	170.45	45.86	170.61	55.66	170.65	58.61	170.68	60.57	170.85	72.85	171.27	112.63
DON17_22741	169.91	45.85	170.05	55.59	170.1	58.52	170.14	60.58	170.33	72.85	170.82	112.63
DON17_22909d	170.45	45.86	170.61	55.66	170.65	58.61	170.68	60.57	170.85	72.85	171.27	112.63
DON17_22884	170.37	45.86	170.52	55.66	170.57	58.61	170.6	60.57	170.77	72.85	171.23	112.63
DON17_22623	169.55	45.85	169.75	55.29	169.84	58.22	169.9	60.56	170.14	72.84	170.69	112.62



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