GeoSmart Information

SuDSmart Plus

Sustainable Drainage Assessment

Site Address

Ardleigh Oaks
Old Ipswich Road
Ardleigh
Essex
CO7 7QR

Grid Reference

602462, 229532

Report Prepared for

Lewis Halliday, Phase 2 Planning
On behalf of HT Industrial Ltd

Date

2024-01-12

Report Status

FINAL

Site Area

0.96 ha

Report Reference

80610.01R2

Drain as Existing

Development proposals comprise the demolition of an existing industrial building and construction of a new B8 commercial property, with associated yard space, parking and ancillary refuse and cycle storage.

In accordance with the drainage hierarchy, infiltration testing undertaken on-Site has confirmed the underlying geology to be unsuitable for infiltration SuDS features, and due to the lack of suitable surface watercourse or public sewer network within the vicinity of the Site, the Site is proposed to drain as existing, with minor alterations to Site drainage conditions as would be required to accommodate the proposed development.

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1 Executive summary

This report assesses the feasibility of a range of Sustainable Drainage Scheme (SuDS) options in support of the Site development process. A SuDS strategy is proposed to ensure surface water runoff can be managed effectively over the lifetime of the development.

SuDS suitability

Risk	Issue	Result
Discharge Location	What is the infiltration potential at the Site?	Low*
	What is the potential to discharge to surface water features?	Low
	What is the potential to discharge to sewers?	Low
	What is the potential to discharge to highway drains?	Medium
Flooding	What is the river (fluvial) flood risk at the Site?	Very Low
	What is the surface water (pluvial) flood risk at the Site?	Very Low to Low
	What is the groundwater flood risk at the Site?	Negligible
Pollution	Is the groundwater a protected resource?	Yes
	Is the surface water feature a protected resource?	N/A

*Infiltration testing carried out at the Site by EPS Consulting on behalf of the Client (Appendix D) has confirmed that the underlying geology is of a low permeability nature and as such would not be suitable for infiltration SuDS features.

Summary of existing and proposed development

The Site is currently used within an industrial capacity. Currently, the Site comprises four warehouses, varying in size and predominantly of industrial use, used as a highway maintenance and storage depot (Use class Sui Generis) operated by Amey Highways Limited, acting as a contractor for the Highways Authority.

Development proposals comprise the demolition of existing industrial buildings and the construction of new B8 commercial property (c. 22,000ft^2) with associated resurfaced yard space, parking and ancillary refuse and cycle storage. Site plans and drawings are provided in Appendix A.

Summary of discharge routes

GeoSmart's SuDS Infiltration Potential (SD50) map indicates the Site has a Low potential for infiltration, primarily due to the low permeability of the underlying geology (Clay, Silt, and Sand). Infiltration testing undertaken at the Site by EPS Consulting in December 2023 has confirmed the underlying geology to be low permeability clay with occasional pockets of sand. Infiltration to ground is therefore not feasible for the Site.

Ordnance Survey (OS) mapping indicates that no known surface water features are within the vicinity of the Site. Due to the significant distance across third-party developed land that pipework would have to travel, discharge of surface water to surface watercourse would not be feasible for the Site.

The asset location plan search included in Appendix C confirms the Site is not located within the vicinity of a public sewer network. As such, discharge of surface water to sewer would not be feasible for the Site.

According to Google Streetview, highway gullies are located within Old Ipswich Road, indicating the presence of the highway drainage network. The destination and capacity of the network are unknown, and the topographic gradient on-Site slopes away from the road.

Proposed SuDS strategy

Due to the lack of feasible discharge routes, and as development proposals involve no significant alterations to the total impermeable surface area at the Site, the Site is proposed to drain as existing, with any minor adjustments as would required as part of the construction process to accommodate the proposed development.

Recommendations / Next steps

The existing Site drainage should be inspected and maintained in perpetuity of the existing and proposed development over its projected lifespan.

2 Site analysis

Site location

Figure 1. Aerial Imagery (Bluesky, 2024)

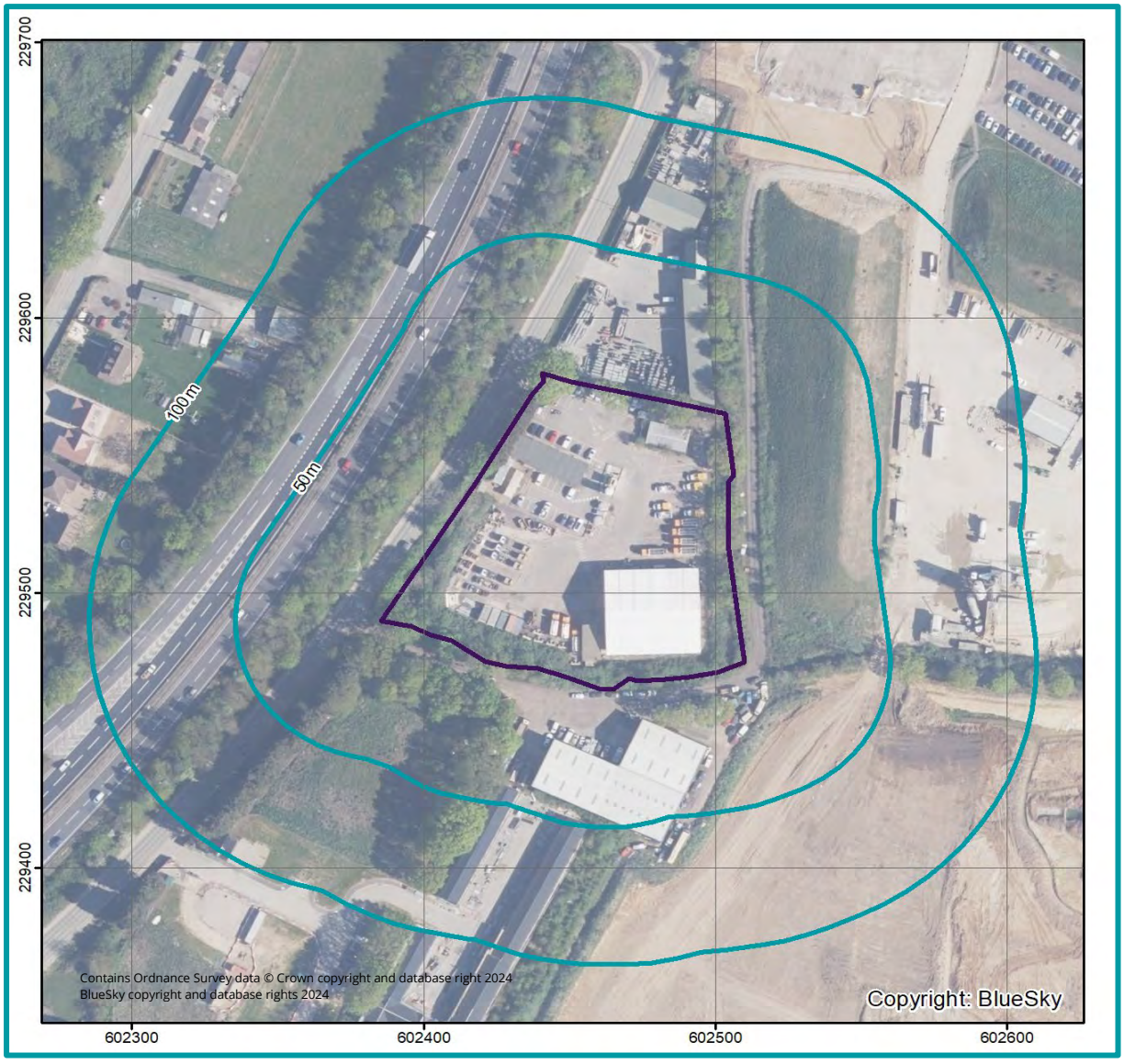
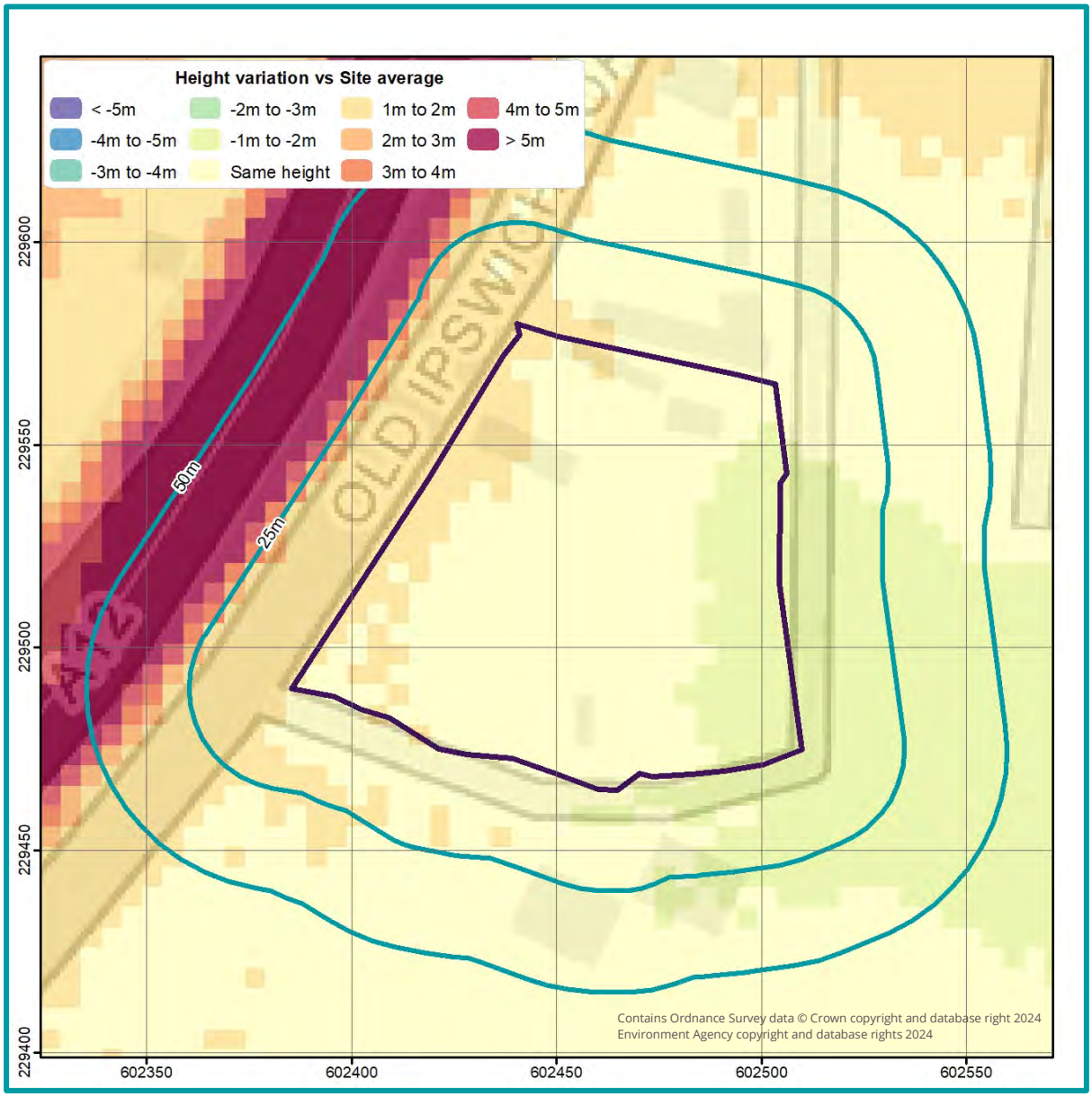


Figure 2. SuDS infiltration suitability (SD50) map (GeoSmart, 2024)

The GeoSmart SuDS Infiltration Suitability Map (SD50) screens the potential for infiltration drainage at the Site and indicates where further assessment is recommended. The map combines information on the thickness and permeability of the underlying material and the depth to the high groundwater table. It supports conceptual Site drainage design and the planning of further Site investigation.

There is a Low potential for infiltration SuDS across the Site, which has been confirmed through on-Site infiltration testing undertaken by EPS Consulting in December 2023 (Appendix D).

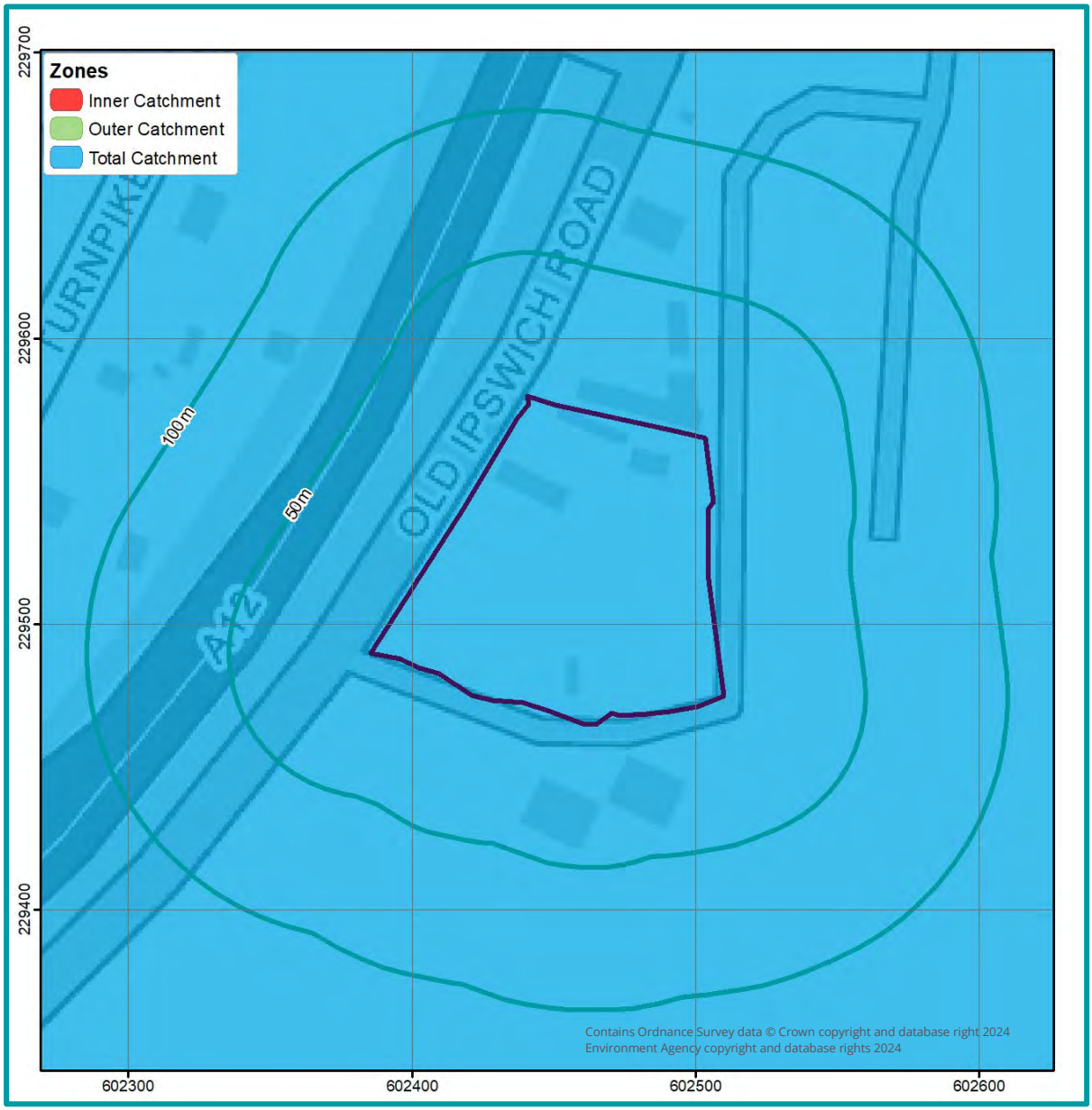
Figure 3. Site topography (GeoSmart, 2024)



An assessment of the topography at the Site has been undertaken using LiDAR DTM5 elevation data to identify the general slope and any localised depressions. The mapping shows a comparison between average ground levels on the Site with ground levels in the surrounding area. The mapping confirms the overall ground levels on Site fall to the east, with the majority of the Site generally level.

Further analysis could be undertaken by visiting the Site or by collecting additional topographic survey to provide further confirmation of ground levels.

Figure 4. Source protection zone map (EA, 2024)



An assessment of the EA's groundwater Source Protection Zones (SPZs) has been undertaken within the vicinity of the Site and confirms the Site lies within a total groundwater Source Protection Zone (SPZ III).

If further analysis is required, this would involve a review of Site-specific contaminated land data. If hazards are identified, it is recommended that the Local Authority and the Environment Agency are contacted to confirm the susceptibility of any SPZs within the wider area.

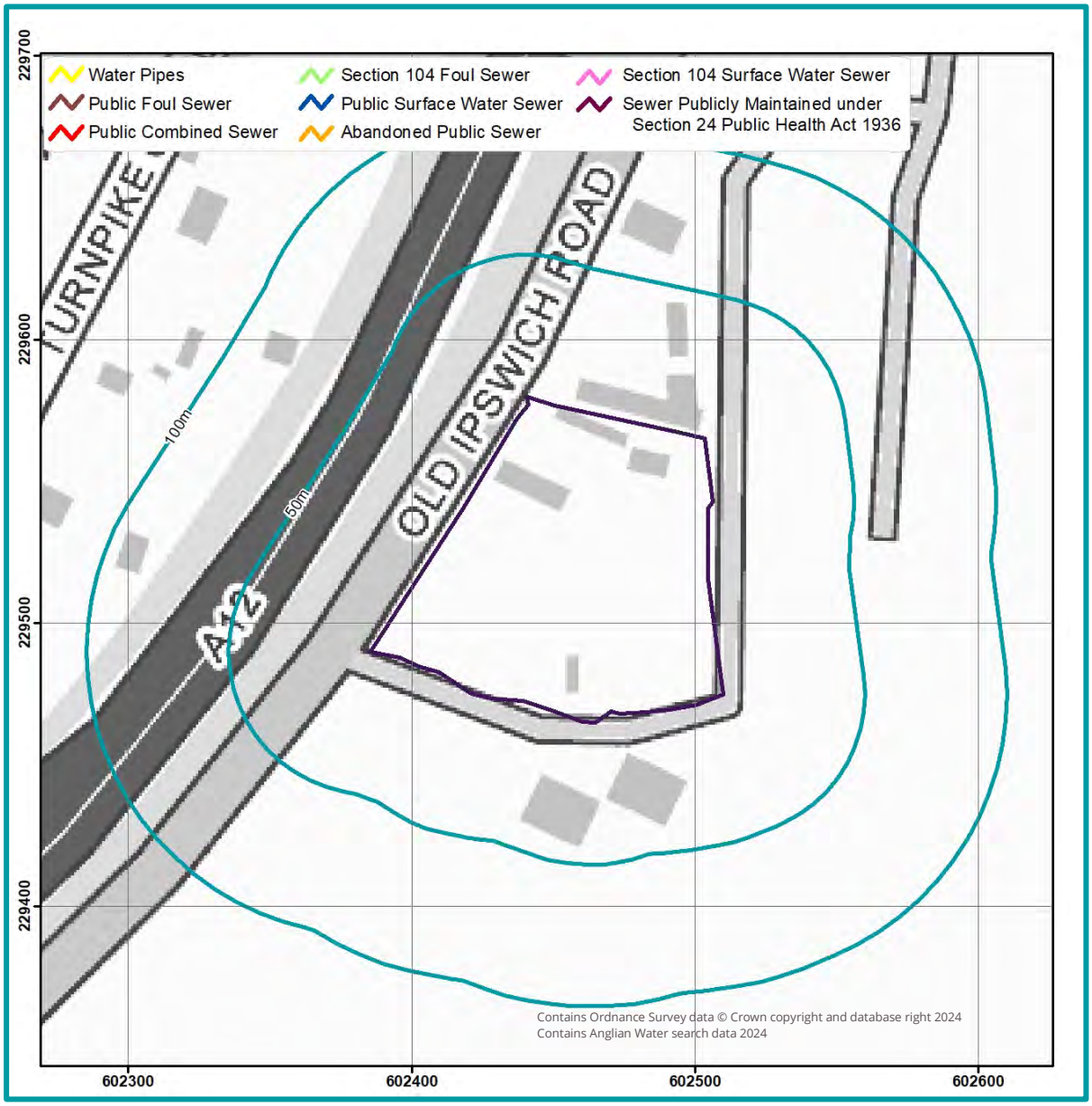
Figure 5. Surface water features map (EA, 2024)

OS mapping indicates that no surface water features are located within 100 m of the Site. According to DEFRA's Magic Map, the Site is not within 250m of a SSSI or SPA.

Due to the significant distance that pipework would have to travel to the nearest surface water feature, discharging runoff to surface watercourse is not considered to be feasible for the Site.

Further analysis could be undertaken by visiting the Site or by contacting the Local Council and the Environment Agency (EA) to confirm the presence, location, and condition of any unmapped surface water features.

Figure 6. Sewer features map (OS & Anglian Water, 2024)



GeoSmart has undertaken an assessment of the location of sewer features within the vicinity of the Site. According to the asset location plan undertaken at the Site (Appendix C), there are no public surface water sewer or combined sewers located within the vicinity of the Site.

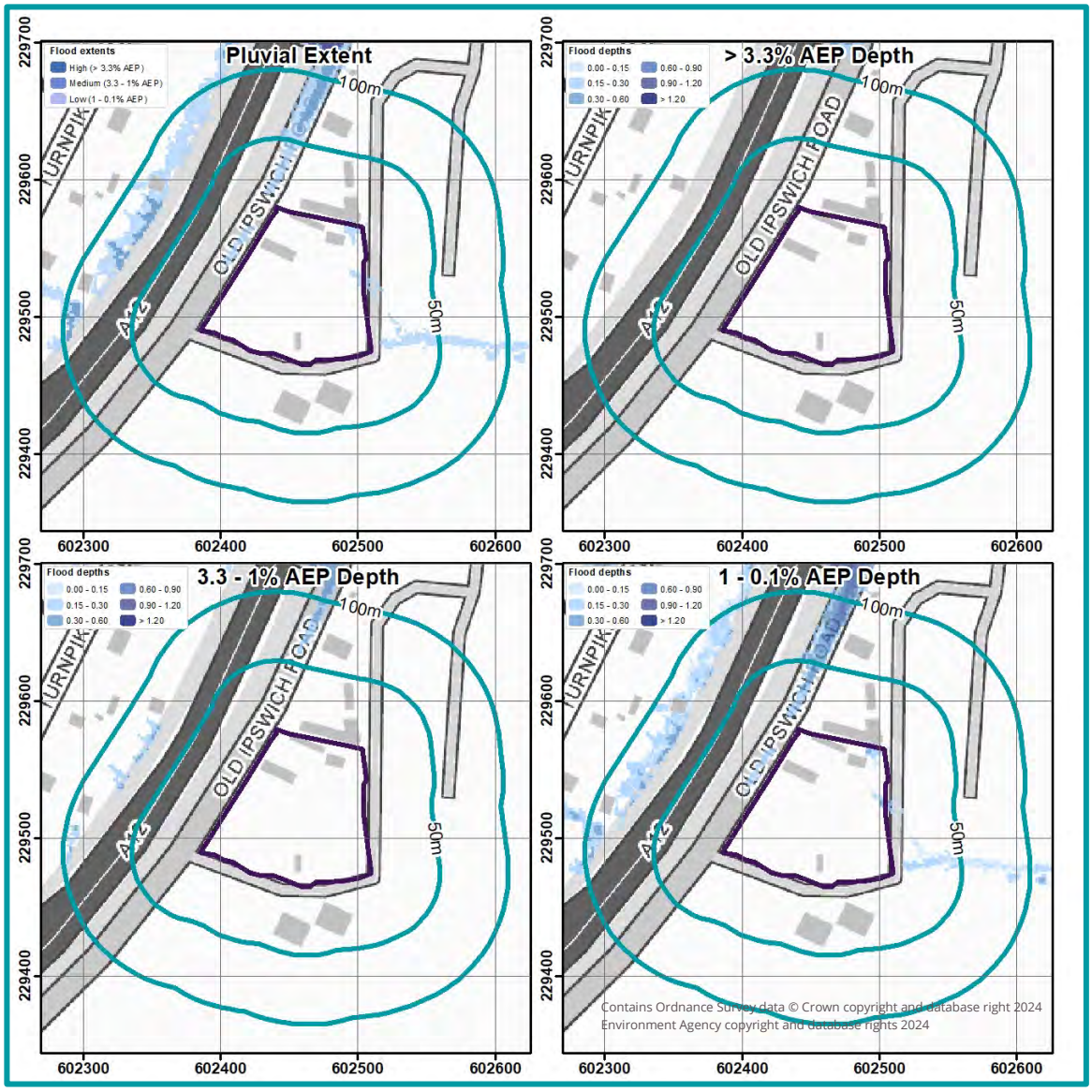
As such, discharging to sewers is not considered to be feasible for the Site.

Figure 7. Risk of flooding from rivers & sea map (EA, 2024)

According to the EA's Risk of Flooding from Rivers and the Sea (RoFRS) map, the Site has a Very Low risk of flooding from fluvial or coastal flooding, with less than 0.1% annual probability of flooding, therefore the SuDs design is unlikely to be affected.

A separate Flood Risk Assessment has been undertaken (ref: 80610), where the potential risks to the development are discussed further.

Figure 8. Risk of surface water flooding map (EA, 2024)

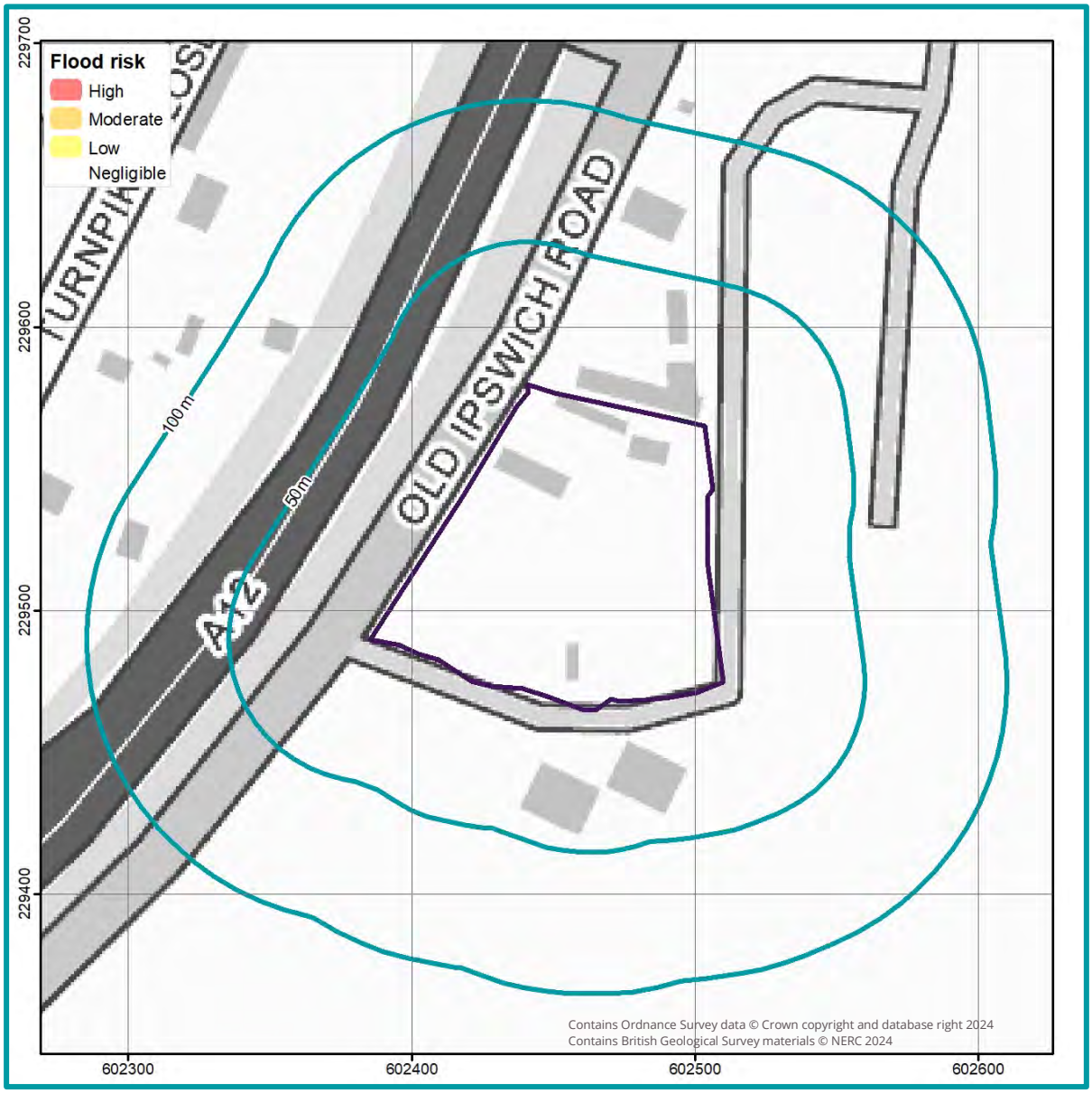


GeoSmart have undertaken an assessment of the risk of flooding from surface water (pluvial) sources within the vicinity of the Site using the EA's Risk of Flooding from Surface Water (RoFSW) mapping. The EA's mapping confirms the Site is considered to be at Very Low to Low risk of surface water flooding.

The above map shows the extent and depth of flooding during the >3.3% annual probability (AEP) (1 in 30 year – High risk), 3.3 – 1% AEP (1 in 100 year – Medium risk) and 1 – 0.1% AEP (1 in 1000 year – Low risk) events. This confirms there are areas where flooding could occur in a 1 in 1000 year event. Flooding in these areas may constrain certain types of SuDS features being used.

Further analysis could be undertaken by visiting the Site or by contacting the Local Council and the Environment Agency to confirm the pluvial flood risk, flood depths and velocities where applicable.

Figure 9. Groundwater flood risk (GW5) map (GeoSmart, 2024)



GeoSmart have undertaken an assessment of the risk of flooding from groundwater within the vicinity of the Site. GeoSmart's Groundwater Flood Risk Screening (GW5) map confirms the Site has a Negligible risk of groundwater flooding during a 1% annual probability (1 in 100 year) event.

3 Site context

Site information

The purpose of this report is to assess the potential for disposing of surface water through a Sustainable Drainage System (SuDS) for the site of Ardleigh Oaks, Old Ipswich Road CO7 7QR (the Site). The Site is located to the north east of Colchester in a setting of commercial, industrial and residential land use. The land falls to the east from 43.95 mAOD to 38.46 mAOD along the eastern boundary. This is based on EA elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of ±150 mm.

Development

The Site is currently used within an industrial capacity. Currently, the Site comprises four warehouses, varying in size and predominantly of industrial use, used as a highway maintenance and storage depot (Use class Sui Generis) operated by Amey Highways Limited, acting as a contractor for the Highways Authority.

Development proposals comprise the demolition of existing industrial buildings and the construction of new B8 commercial property (c. 22,000ft^2) with associated resurfaced yard space, parking and ancillary refuse and cycle storage. Site plans and drawings are provided in Appendix A.

Geology, permeability, and thickness

British Geological Survey (BGS) national superficial and bedrock geology mapping confirms the geological formations underlying the Site and each formation may have a range of permeability.

Table 1. Site Geology

Geology present on-Site		Potentially permeable?
Superficial geology (Figure 11)	Coversands (Clay, Silt, and Sand) (CSD)	X*
Bedrock geology (Figure 12)	Thames Group (Clay, Silt, and Sand) (THAM)	X

*Infiltration testing undertaken at the Site (Appendix D) has confirmed that the underlying geology (primarily clay) is of a very low permeability, and as such would not be suitable for the use of infiltration SuDS features.

The BGS website was used to extract ground information from the nearest borehole records to the Site (ref: TM02NW81 and TM02NW82). These boreholes are located approximately 124 m and 150 m to the north of the Site, respectively.

The borehole records confirm the underlying geology is comprised of:

- TM02NW81 (c. 41.00 mAOD): Topsoil to a depth of 0.3 m below ground level (bgl), overlying silty clay to a depth of 1.5 m bgl, overlying clay to a depth of 3.0 m bgl, overlying sand with gravel to a depth of 8.5 m bgl, overlying silty clay to a depth of 9.0 m bgl, overlying very silty clay to a depth of 20 m bgl, where the borehole terminates.
    - Groundwater was encountered at a depth of 6.0 m bgl (c. 35 mAOD) within the sand horizons, on 16/11/71.
- TM02NW82 (c. 41.05 mAOD): Topsoil to a depth of 0.3 m bgl, overlying sandy clay with gravel to a depth of 1.5 m bgl, overlying clayey silty to a depth of 3.0 m bgl, overlying slightly clayey silty sand with gravel to a depth of 8.5 m bgl, overlying silty clay to a depth of 9.0 m bgl, overlying very silty clay to a depth of 20 m bgl, where the borehole terminates.
    - Groundwater was encountered at a depth of 4.0 m bgl (c. 37.05 mAOD) within the sand horizons, on 13/11/71.

On-Site infiltration testing performed by EPS Consulting in December 2023 (Appendix D) confirmed the underlying ground conditions to consist of Made Ground to a depth of 0.65 m bgl, overlying slightly sandy, slightly gravelly clay with occasional lenses of clayey silt to 1.50 m bgl, overlying slightly sandy silty clay thinly interbedded with silty fine to medium sand to 2.20 m bgl, where the trial pit terminated.

No soakage was observed over a 3-hour monitoring period. As such, infiltration features are not proposed at the Site, given the low permeability of the underlying geology.

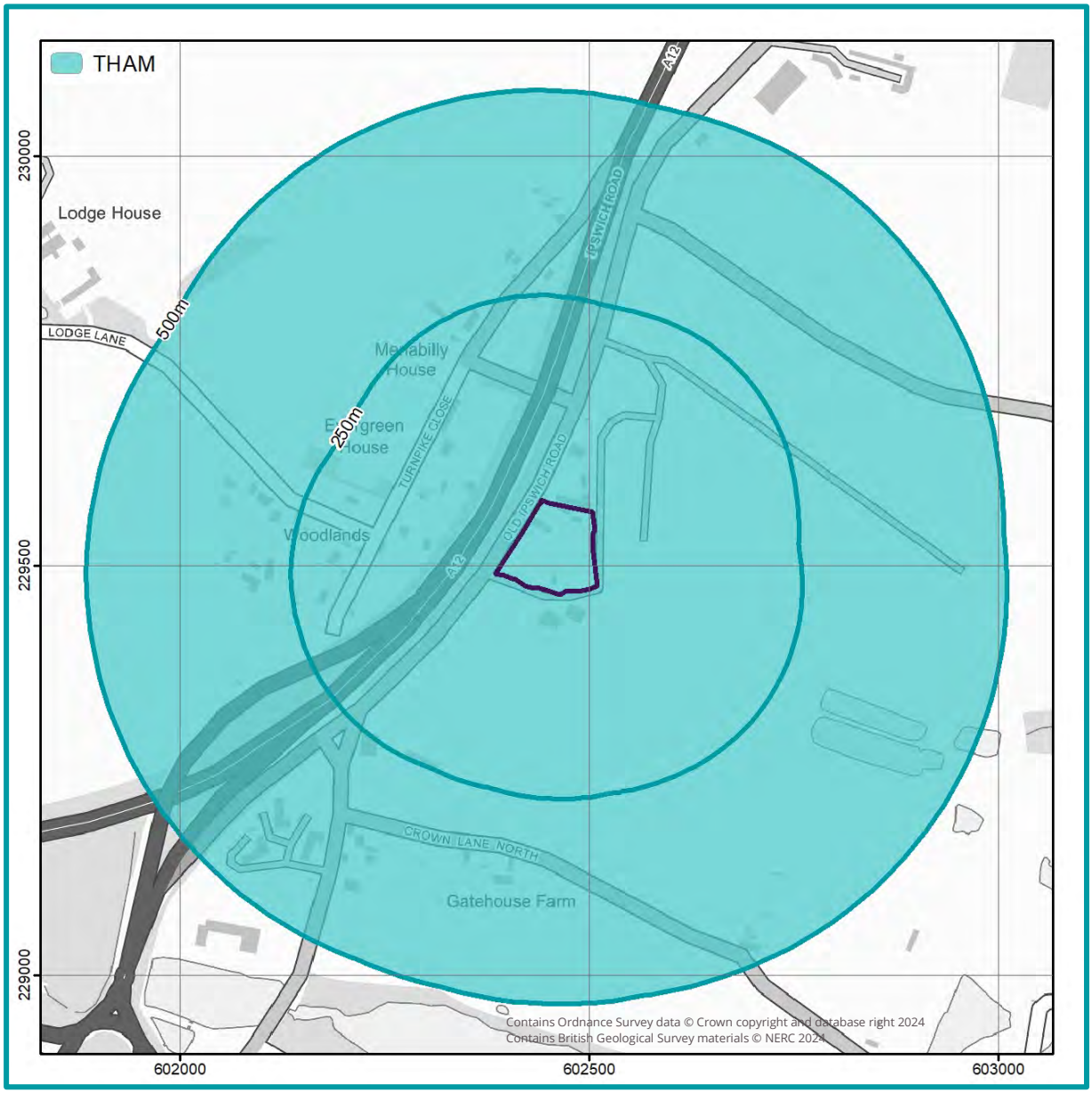
Depth to groundwater

Nearby borehole records indicate that groundwater levels could be between 35.00 and 37.05 mAOD, compared to minimum Site levels of 38.46 mAOD, which would infer a groundwater depth at the Site of between 3.46 and 1.41 m bgl, subject to variation with distance from the Site.

Site investigation has confirmed that no groundwater strike was observed during the trial pit excavation to a depth of 2.20 m bgl (Appendix D).

Figure 10. Superficial Geology (BGS, 2024)

Figure 11. Bedrock Geology (BGS, 2024)



Ground conditions

Infiltration SuDS features are not proposed at the Site, therefore a detailed investigation into the ground conditions is not required.

Water quality

The Site lies within an SPZ; however, infiltration is not proposed. For the purposes of the sustainable drainage assessment further consideration of the historical land uses (and any associated contamination risks) is not considered necessary.

4 National & local policy context

National Guidance

CIRIA SuDS Manual (C753) (2015)

A development should utilise sustainable drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1. Use infiltration techniques, such as porous surfaces in non-clay areas,
2. attenuate rainwater in ponds or open water features for gradual release,
3. attenuate rainwater by storing in tanks or sealed water features for gradual release,
4. discharge rainwater direct to a watercourse,
5. discharge rainwater to a surface water sewer / drain,
6. discharge rainwater to the combined sewer.

Defra - Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems (2015)

Peak Flow control

For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

Volume control

Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event. The runoff volume must be discharged at a rate that does not adversely affect flood risk.

The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the Site for a 1 in 30 year rainfall event.

Ministry of Housing, Communities & Local Government – National Planning Practice Guidance: Flood risk assessments: climate change allowances (2022)

The Peak rainfall intensity allowances section provides advice on the increased rainfall effects on river levels and land and urban drainage systems. As of May 2022, the applicable climate change allowance is defined by specific Management Catchment for the 1 in 30 (≥ 3.3% AEP) and 1 in 100 (< 3.3 to 1% AEP) year event.

As the Site is located within the Combined Essex Management Catchment the following climate change allowances are applicable:

Table 2. Combined Essex Management Catchment peak rainfall allowances

Combined Essex Management Catchment	3.3% Annual exceedance rainfall event		1% Annual exceedance rainfall event	
	2050s	2070s	2050s	2070s
Central	20%	20%	20%	25%
Upper end	35%	35%	45%	40%

The drainage system should be designed to make sure there is no increase in the rate of runoff discharged from the Site for the upper end allowance.

Where on-Site flooding for the upper end allowance presents a significant flood hazard (for example, depths and velocities of surface water runoff cause a significant danger to people), you will need to take further mitigation measures to protect people and property (for example, raising finished floor levels). As a minimum, there should be no significant flood hazard to people from on-Site flooding for the central allowance.

Local Policy

Essex SuDS Design Guide (Essex County Council, 2023)

Brownfield Sites - What the LLFA expect to see

At all stages of the planning process, when developing a brownfield site and once it has been proven that discharging to the 1 in 1-year greenfield rate (or matched rates) or as close as feasibly possible is not possible. The current brownfield rates accompanied by their calculations should be provided to ensure that a minimum 50% betterment is provided.

Calculating Runoff Rates - What the LLFA expect to see

For greenfield runoff rates we would expect to see the calculations used, including the inputs and outputs. For brownfield runoff rates, within outline applications the modified rational method or the urbanisation method found in the ReFH2 software are acceptable. The calculations themselves along with their inputs should be provided. However, at a more

detailed design stage more site-specific calculations should be provided and modelled to show what influence factors such as the current pipe sizes have.

Infiltration - What the LLFA expect to see

For outline applications, preliminary ground investigations, or a desk top study highlighting the potential capacity for infiltration should be provided. For full applications or where necessary for discharge of conditions applications, full detailed infiltration testing needs to be provided in line with BRE365 and the infiltration testing methods found in chapter 25.3 of the CIRIA SuDS Manual C753. This should include the locations and results. The lowest found rate should be used as a conservative approach.

The minimum acceptable rate of infiltration is 1x10-6 m/s. Rates found to be slower than this may potentially have to deliver a hybrid drainage solution. If rates are found to be too slow for formal infiltration this does not rule out the possibility of some soakage taking place. Features (for example permeable /porous paving) should be unlined or use permeable lining wherever possible regardless of infiltration rates in order to maximise infiltration capacity. This should be approached with care, as should all infiltrating sites, when dealing with areas that are subject to previous contamination or other issues such as structural stability. Whilst Essex Highways will not adopt permeable paving within roads, if this option is to be used, the features should be lined. This lining can be permeable to encourage infiltration, but there has to be a material separating the storage medium from the formation.

5 Storage, volume and peak flow rate

Surface water runoff

An increase in impermeable area on-Site will result in greater rainfall runoff. Reduction in runoff will help mitigate flood risk both on and off-Site. Further information on the surface water runoff calculations is provided in Section 10 'Background Information'.

Guidance

The Non-Statutory Technical Guidance for SuDS (Defra, March 2015) states:

"Where reasonably practicable, for Greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the Greenfield runoff volume for the same event. Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the Greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event."

Table 3. Change in impermeable area associated with the development

Total Site area	9750 m^2
Impermeable area (and as a percentage of the total Site area)	
Pre-development	Post-development
7444 m^2 (76%)	7444 m^2 (76%)*
Impermeable land use: warehouse footprint, parking areas, yard space and paved areas Permeable land use: landscaped areas	impermeable land use: new warehouse footprint, parking areas, cycle storage, yard space and paved areas permeable land use: landscaped areas

*As the development proposals involve no increase in impermeable area there would be no anticipated increase in runoff volume or rate.

Guidance

"The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event' and 'flooding does not occur during a 1 in 100 year rainfall event in any part

of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development"

(Defra, March 2015, non-statutory guidance).

Peak discharge rates

The table below presents peak discharge rates for a range of storm events used to assess the impact of the proposed development and select the maximum permitted discharge rate. Further information on the calculation and control of peak discharge rates is provided in Section 10 'Background Information'.

Table 4. Peak discharge rates associated with the development

Rainfall event	Greenfield runoff rates (l/s)	Existing runoff rates[1] (l/s)	Potential runoff rates without attenuation (l/s)	Potential minus existing (l/s)
QBAR	0.13	N/A	N/A	N/A
6 hour 1 in 1 year	0.11	8.25	8.25	0.00
6 hour 1 in 10 year	0.21	13.05	13.05	0.00
6 hour 1 in 30 year	0.29	20.12	20.12	0.00
6 hour 1 in 100 year	0.41	20.43	20.43	0.00
6 hour 1 in 100 year + 20% CC	N/A	N/A	24.51	4.09
6 hour 1 in 100 year + 45% CC	N/A	N/A	29.62	9.19

[1] Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the IoH124 method.

Relevant national, regional and local planning policy has been consulted in Section 4 to determine restrictions on runoff from previously developed and greenfield sites. In some cases, greenfield rates may be requested, but in practice it is difficult to restrict discharge rates at any one control point to less than 2 l/s, without increasing the risk of any potential blockages occurring in the drainage network.

Total discharge volumes

The table below presents discharge volumes for a range of storm events used to assess the impact of the proposed development and calculate the required storage volumes. Further

information on the calculation of total discharge volumes is provided in Section 9 'Methodology and Limitations'.

Table 5. Total discharge volumes associated with the development

Rainfall event	Greenfield runoff volume (m^3)	Existing runoff volume[2] (m^3)	Potential runoff volume without attenuation (m^3)	Potential minus existing (m^3)
QBAR	24.07	N/A	N/A	N/A
6 hour 1 in 1 year	22.64	178.20	178.20	0.00
6 hour 1 in 10 year	36.85	281.98	281.98	0.00
6 hour 1 in 30 year	55.22	434.69	434.69	0.00
6 hour 1 in 100 year	56.05	441.21	441.21	0.00
6 hour 1 in 100 year + 20% CC	N/A	N/A	529.46	88.24
6 hour 1 in 100 year + 45% CC	N/A	N/A	639.76	198.55

[2] Assumes 100% runoff from impermeable surfaces. Assumes Greenfield runoff from permeable surfaces calculated using the IoH124 method.

6 Runoff destination

Options for the destination for the runoff generated on-Site have been assessed in line with the prioritisation set out in the Building Regulations Part H document (HM Government, published in 2010 and updated in 2015) and Defra's Non-statutory Technical Standards for SuDS (2015).

Flow attenuation using infiltration SuDS (discharge to ground) is generally the preferred option. If discharge to ground is not available, runoff discharge to surface water is the other preferred method. Only if these two options are impractical should discharge to the sewer network be considered.

Discharge to ground

Infiltration testing undertaken at the Site by EPS Consulting in December 2023 (Appendix D) has confirmed that the underlying geology at the Site is of a low permeability nature, and as such would not be suitable for the use of infiltration SuDS features.

There are no known issues identified relating to Site contamination, but the Site is located within a SPZ.

Discharge to surface watercourse

There are no known surface watercourses within the vicinity of the Site that would be feasible for the discharge of runoff. Due to the significant distance across third-party land that any pipework would be required to travel, discharge to surface watercourse is not considered to be feasible for the Site.

Discharge to sewer

GeoSmart has undertaken an assessment of the location of sewer features within the vicinity of the Site. According to the asset location plan undertaken at the Site (Appendix C), there are no public surface water sewer or combined sewers located within the vicinity of the Site.

7 Water quality

A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution. This can be effectively managed by an appropriate "train" or sequence of SuDS components that are connected in series. The frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals and various organic and inorganic contaminants). Therefore, the first 5-10 mm of rainfall (first flush) should be adequately treated with SuDS.

The minimum number of treatment stages will depend on the sensitivity of the receiving water body and the potential hazard associated with the proposed development SuDS Manual (CIRIA, 2015). The proposed development is a combination of Very Low (roof water) to Medium (Commercial, industrial use). The Site does lie within an SPZ and therefore additional treatment stages may be required.

Table 6. Level of hazard

Hazard	Source of hazard
Very Low	Residential roof drainage
Low	Residential, amenity uses including low usage car parking spaces and roads, other roof drainage.
Medium	Commercial, industrial uses including car parking spaces and roads (excluding low usage roads, trunk roads and motorways).
High	Areas used for handling and storage of chemicals and fuels, handling of storage and waste (incl. scrap-yards).

The recommended minimum number of treatment stages suggested for the different runoff waters identified for the proposed development is highlighted in the table below.

Table 7. Minimum number of treatment stages for runoff

		Sensitivity of the receiving water body		
		Low	Medium	High
Hazard	Low	1	1	1
	Med	2	2	2
	High	3	3	3

8 Proposed SuDS strategy

SuDS Strategy:

In accordance with the drainage hierarchy established within the Building Regulations Part H document (HM Government, 2010) and Defra's National Standards for SuDS (2015), each potential discharge destination has been investigated:

- Due to the low permeability of the underlying clay deposits, infiltration of runoff to ground would not be feasible for the Site;
- No known surface watercourses are located within the vicinity of the Site that could be feasibly discharged to;
- No public surface water, combined, nor foul sewer network is located within the vicinity of the Site;
- Whilst highway drains are present within Old Ipswich Road, the capacity and destination of this drainage is unknown, and the gradient of the Site slopes away from the highway. Highway drainage is generally rated to drain the highway itself without flooding up to the 1 in 30-year flood event and as such would be unlikely to feasibly support the discharge from the Site up to the 1 in 100 year plus 45% climate change event without increasing the risk of flooding.

As such, and due to the development proposals involving no significant increase in impermeable surface area at the Site, the proposed SuDS strategy is for the Site to drain as existing, with minor alterations to the drainage conditions as required to accommodate the construction process.

9 Methodology and limitations of study

This report assesses the feasibility of infiltration SuDS and alternative drainage strategies in support of the Site development process. From April 6th 2015 SuDS are regulated by Local Planning Authorities and will be required under law for major developments in all cases unless demonstrated to be inappropriate. What is considered appropriate in terms of costs and benefits by the Planning Authority will vary depending on local planning policy, and Site setting. The Lead Local Flood Authority will require information as a statutory consultee on major planning applications with surface water drainage implications. The National Planning Policy Framework requires that new developments in areas at risk of flooding should give priority to the use of SuDS and demonstrate that the proposed development does not increase flood risk downstream to third parties.

How was the suitability of SuDS estimated for the Site?

There are a range of SuDS options available to provide effective surface water management that intercept and store excess runoff. When considering these options, the destination of the runoff should be assessed using the order of preference outlined in the Building Regulations Part H document (HM Government, 2010) and Defra's National Standards for SuDS (2015):

1. Discharge to the ground;
2. Discharge to a surface water body;
3. Discharge to a surface water sewer;
4. Discharge to a local highway drain; and
5. Discharge to a combined sewer.

Data sets relating to each of the potential discharge options have been analysed to assess the feasibility of each option according to the hierarchy set out above. Hydrogeological characteristics for the Site are assessed in conjunction with the occurrence of SPZ's to assess infiltration suitability. The Site has been screened to determine whether flood risk from groundwater, surface water, fluvial or coastal sources may constrain SuDS. The distance to surface water bodies and sewers has been reviewed gauge whether these provide alternative options.

GeoSmart SuDS Infiltration Suitability Map (SD50)

The GeoSmart SuDS Infiltration Suitability Map (SD50) screens the suitability for infiltration drainage in different parts of the Site and indicates where further assessment is recommended. In producing the SuDS Infiltration Suitability Map (SD50), GeoSmart used data from the British Geological Survey on groundwater levels, geology and permeability to screen

for areas where infiltration SuDS may be suitable. The map classifies areas into 3 categories of High, Medium and Low suitability for infiltration SuDS. This can then be used in conjunction with additional data on Site constraints to give recommendations for SuDS design and further investigation.

The primary constraint on infiltration potential is the minimum permeability of the underlying material and in some cases the range in permeability may be considerable, ranging down to low. The map classifies these areas as moderate infiltration suitability requiring further investigation. In cases where the thickness of the receiving permeable horizon is less than 1.5 meters then additional Site investigation is recommended. If the Site is at risk of groundwater flooding for up to the 1% annual occurrence the map classifies these areas as moderate infiltration suitability requiring further investigation.

The GeoSmart SuDS Infiltration Suitability Map (SD50) is a national screening tool for infiltration SuDS techniques but a Site specific assessment should be used before final detailed design is undertaken. Further information on the GeoSmart SuDS Infiltration Suitability Map (SD50) is available at geosmartinfo.co.uk

How is the suitability to discharge to sewers and watercourses calculated?

The suitability to discharge to discharge to sewers and watercourses has been calculated using the distance from the Site to both. For example, where the Site is within 50 m of a surface water body. Discharge to surface water is potentially appropriate subject to land access arrangements and a feasibility assessment. Where the Site is within 50 m of a sewer, discharge to sewer is potentially appropriate subject to land access arrangements and a feasibility assessment. The utility company should be contacted to agree connection feasibility and sewer capacity.

Further information relating to sewers available in the area can be found in Appendix C.

What is a Source Protection Zone?

The Environment Agency have defined Source Protection Zones (SPZs) for 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. The maps show three main zones (inner, outer and total catchment) and a fourth zone of special interest, which is occasionally applied. The zones are used to set up pollution prevention measures in areas which are at a higher risk. The shape and size of a zone depends on the condition of the ground, how the groundwater is removed, and other environmental factors. Inner zone (Zone 1) is defined as the 50 day travel time from any point below the water table to the source (minimum radius of 50 metres). Outer zone (Zone 2) is defined by a 400 day travel time. Total catchment (Zone 3) is defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source.

How was surface water runoff estimated from the Site?

In accordance with The SuDS Manual (C753) (CIRIA, 2015), the Greenfield runoff from the Site has been calculated using the IoH124 method and is assumed representative of the runoff generated on the undeveloped surfaces that are affected by the proposed development. The method used for calculating the runoff complies with the NPPF (MHCLG, 2023). For the impermeable surfaces, it has been assumed that 100% runoff will occur (calculations provided in Appendix B). Rainfall data is derived from the Flood Estimation Handbook (FEH), developed by NERC (2009). Only areas affected by the proposed development are considered in the flow and volume calculations. Permeable areas that remain unchanged are not included in the calculations as it is assumed these will not be actively drained and attenuated.

What is the peak discharge rate?

An estimation of peak runoff flow rate and volume is required to calculate infiltration, storage and discharge requirements. The peak discharge rate is the maximum flow rate at which surface water runoff leaves the Site during a particular storm event, without considering the impact of any mitigation such as storage, infiltration or flow control. Proposed discharge rates (with mitigation) should be no greater than existing rates for all corresponding storm events. If all drainage is to infiltration there will be no discharge off-Site. Discharging all flow from Site at the existing 1 in 100 event would increase flood risk during smaller events. Flow restriction is generally required to limit the final discharge from Site during all events as a basic minimum to the green field QBAR rate. A more complex flow restriction which varies the final discharge rate from the Site depending on the storm event will reduce the volume of storage required on-Site. Drainage to infiltration SuDS is subtracted from the total discharge off-Site to achieve a beneficial net affect.

What is the total discharge volume?

The total discharge volume is calculated on the basis of the surface water runoff that has the potential to leave the Site as a result of the assumed 6 hour duration design storm event. The runoff is related to the underlying soil conditions, impermeable cover, rainfall intensity and duration of the storm event. The total volume generated by the current Site is compared to the potential total volume from the developed Site (not taking into consideration any mitigation). The difference provides the minimum total volume that will need to be stored and infiltrated on-Site or released at a controlled rate. Guidance indicates that the total discharge volume should never exceed the runoff volume from the development Site prior to redevelopment for that event and should be as close as is reasonably practicable to the Greenfield runoff volume.

10 Background SuDS information

SuDS control surface water runoff close to where it falls. SuDS are designed to replicate, as closely as possible, the natural drainage from the Site before development to ensure that the flood risk downstream does not increase as a result of the Site being developed, and that the Site will have satisfactory drainage under current and likely future climatic conditions. SuDS provide opportunities to reduce the causes and impacts of flooding; remove pollutants from urban runoff at source; and combine water management with green space with benefits for amenity, recreation and wildlife. Government planning policy and planning decisions now include a presumption in favour of SuDS being used for all development Sites, unless they can be shown to be inappropriate.

For general information on SuDS see our website: http://geosmartinfo.co.uk/

Infiltration SuDS

Government policy for England is to introduce sustainable drainage systems (SuDS) via conditions in planning approvals. Guidance indicates that capturing rainfall runoff on-Site and infiltrating it into the ground (infiltration SuDS) is the preferred method for managing surface water without increasing flood risk downstream.

The greatest benefit to general flood risk is if all runoff is infiltrated on-Site, however, this may not be feasible due to physical and economic constraints in which case infiltration may be considered as a part of an integrated drainage solution. The final design capacity for an infiltration SuDS system depends on the Site constraints and the requirements of the individual Planning Authority and the Lead Local Flood Authority.

The capacity of the ground to receive infiltration depends on the nature, thickness and permeability of the underlying material and the depth to the high groundwater table. The final proportion of the Site drained by infiltration will depend on topography, outfall levels and a suitable drainage gradient. It is important to note that, even if the whole Site cannot be drained by infiltration, the use of partial infiltration is encouraged, with the remainder of runoff discharged via other SuDS systems.

Types of infiltration SuDS

Infiltration components include infiltration trenches, soakaways, swales and infiltration basins without outlets, rain gardens and permeable pavements. These are used to capture surface water runoff and allow it to infiltrate (soak) and filter through to the subsoil layer, before returning it to the water table below.

An infiltration trench is usually filled with permeable granular material and is designed to promote infiltration of surface water to the ground. An infiltration basin is a dry basin or depression designed to promote infiltration of surface water runoff into the ground. Soakaways are the most common type of infiltration device in the UK where drainage is often connected to over-sized square or rectangular, rubble-filled voids sited beneath lawns.

According to the guidance in Building Research Establishment (BRE) Digest 365 (2016) a soakaway must be able to discharge 50% of the runoff generated during a 1 in 10 year storm event within 24 hours in readiness for subsequent storm flow. This is the basic threshold criteria for a soakaway design and the internal surface area of the proposed soakaway design options should be calculated on this basis by taking into account the soil infiltration rate for the Site.

Developers need to ensure their design takes account of the construction, operation and maintenance requirements of both surface and subsurface components, allowing for any machinery access required.

SuDS maintenance and adoption

Regular maintenance is essential to ensure effective operation of the soakaway(s) over the intended lifespan of the proposed development. A maintenance schedule for SuDs is required. Sewerage undertakers or Local Authorities may adopt SuDS and will require maintenance issues to be dealt with in accordance with their Management Plan. If the SuDS will not be adopted other provision is required with associated financial implications. Maintenance is a long-term obligation requiring the upkeep of all elements of the SuDS, including mechanical components (e.g. pumps), as well as inspections, regular maintenance and repair.

Additional background SuDS information can be found on our website: http://geosmartinfo.co.uk/

11 Further information

The following table includes a list of additional products by GeoSmart:

Additional GeoSmart Products			
	Additional assessment: EnviroSmart Report		Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective. Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements. Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions. Please contact info@geosmartinfo.co.uk for further information.

12 References and glossary

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GeoSmart Information

Glossary

General terms

Attenuation	Reduction of peak flow and increased duration of a flow event.
Combined sewer	A sewer designed to carry foul sewage and surface water in the same pipe.
Detention basin	A vegetated depression, normally is dry except after storm events, constructed to store water temporarily to attenuate flows. May allow infiltration of water to the ground.
Evapotranspiration	The process by which the Earth's surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.
FEH	Flood Estimation Handbook, produced by Centre for Ecology and Hydrology, Wallingford (formerly the Institute of Hydrology).
Filter drain or trench	A linear drain consisting of a trench filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water, but may also be designed to permit infiltration.
First flush	The initial runoff from a site or catchment following the start of a rainfall event. As runoff travels over a catchment it will collect or dissolve pollutants, and the "first flush" portion of the flow may be the most contaminated as a result. This is especially the case for intense storms and in small or more uniform catchments. In larger or more complex catchments pollution.
Flood plain	Land adjacent to a watercourse that would be subject to repeated flooding under natural conditions (see Environment Agency's Policy and practice for the protection of flood plains for a fuller definition).
Greenfield runoff	This is the surface water runoff regime from a site before development, or the existing site conditions for brownfield redevelopment sites.
Impermeable surface	An artificial non-porous surface that generates a surface water runoff after rainfall.
Permeability	A measure of the ease with which a fluid can flow through a porous medium. It depends on the physical properties of the medium, for example grain size, porosity and pore shape.

Runoff	Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.
Sewerage undertaker	This is a collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage disposal including surface water from roofs and yards of premises.
Soakaway	A subsurface structure into which surface water is conveyed to allow infiltration into the ground.
Treatment	Improving the quality of water by physical, chemical and/or biological means.

The terms included in this glossary have been taken from CIRIA (2015) guidance.

GeoSmart Information

Data Sources

Aerial Photography	Contains Ordnance Survey data © Crown copyright and database right 2024 BlueSky copyright and database rights 2024
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2024 Ordnance Survey data © Crown copyright and database right 2024
Flood Risk (RoFRS/Pluvial/Surface Water Features/SPZ)	Environment Agency copyright and database rights 2024 Ordnance Survey data © Crown copyright and database right 2024
Flood Risk (Groundwater) and SuDS infiltration suitability (SD50)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2024) Contains British Geological Survey materials © NERC 2024 Ordnance Survey data © Crown copyright and database right 2024
Sewer Location	Contains Ordnance Survey data © Crown copyright and database right 2024 Contains Anglian Water Search data 2024
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2024 Environment Agency copyright and database rights 2024

13 Appendices

GeoSmart Information

Appendix A

Site plans

1:1000

0 5 10 20 30 40m

NORTH

CR

CB

B

CP & ED Bdy

Evergreen House

ngalow

nd Cottage

40.9m

41.4m

OLD IPSWICH ROAD

WB

PROJECT.	CLIENT.				
LAND S.EAST SIDE OF A12 OLD IPSWICH ROAD ARDLEIGH, COLCHESTER, CO7 7QW	HT INDUSTRIAL LTD	REV.	DATE.	AMENDMENT.	DRAWN.
	DRAWING TITLE.	xx	xx	xx	xx
	LOCATION PLAN	PROJECT NO. 23.536	REVISION. -	DRAWING NO. 001	
		DATE. 14.02.2023			

FRONT. 171 HIGH STREET, RAYLEIGH, ESSEX, SS6 7QA.
TEL. +44 (0)1702 831 415 | EMAIL. HELLO@FRONT-ARCHITECTURE.CO.UK

1:1000

0 5 10 20 30 40m

NORTH

CR_IF

CB

B

CP & ED Bdy

Evergreen House

ngalow

nd Cottage

OLD IPSWICH ROAD

40.9m

41.4m

WB

PROJECT.	CLIENT.			
LAND S.EAST SIDE OF A12 OLD IPSWICH ROAD ARDLEIGH, COLCHESTER, CO7 7QW	HT INDUSTRIAL LTD DRAWING TITLE: EXISTING SITE PLAN			
		REV. xx	DATE. xx	AMENDMENT. xx / DRAWN. xx
		PROJECT NO. 23.536	REVISION. -	DRAWING NO. 002
		DATE. 14.02.2023		

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TEL. +44 (0)1702 831 415 | EMAIL. HELLO@FRONT-ARCHITECTURE.CO.UK

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NORTH

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CP & ED Bdy

Evergreen House

ngalow

nd Cottage

40.9m

OLD IPSWICH ROAD

11 CAR PARKING SPACES

WB

REV.	DATE.	AMENDMENT.	DRAWN.
P2	JULY 23	AMENDED POSITION BASED ON CLIENT COMMENTS	CH
P1	JULY 23	AMENDED TO MEET DESIGN	McL

PROJECT.
LAND S.EAST SIDE OF A12
OLD IPSWICH ROAD
ARDLEIGH, COLCHESTER, CO7 7QW

CLIENT.
HT INDUSTRIAL LTD

DRAWING TITLE.
PROPOSED SITE PLAN

PROJECT NO.
23.536

REVISION.
P2

DATE.
14.02.2023

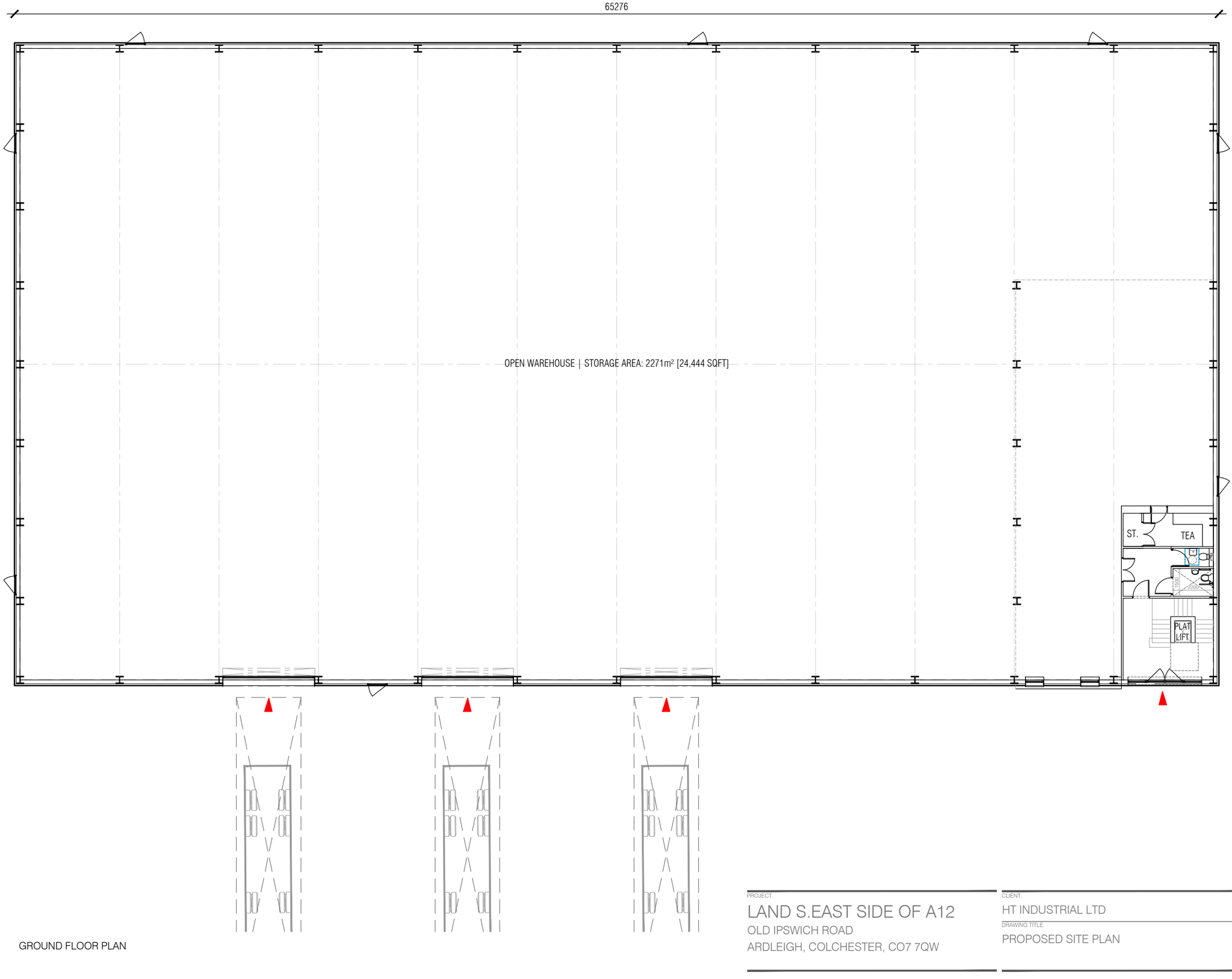
DRAWING NO.
100.1

FRONT. 171 HIGH STREET, RAYLEIGH, ESSEX, SS6 7QA.
TEL. +44 (0)1702 831 415 | EMAIL HELLO@FRONT-ARCHITECTURE.CO.UK

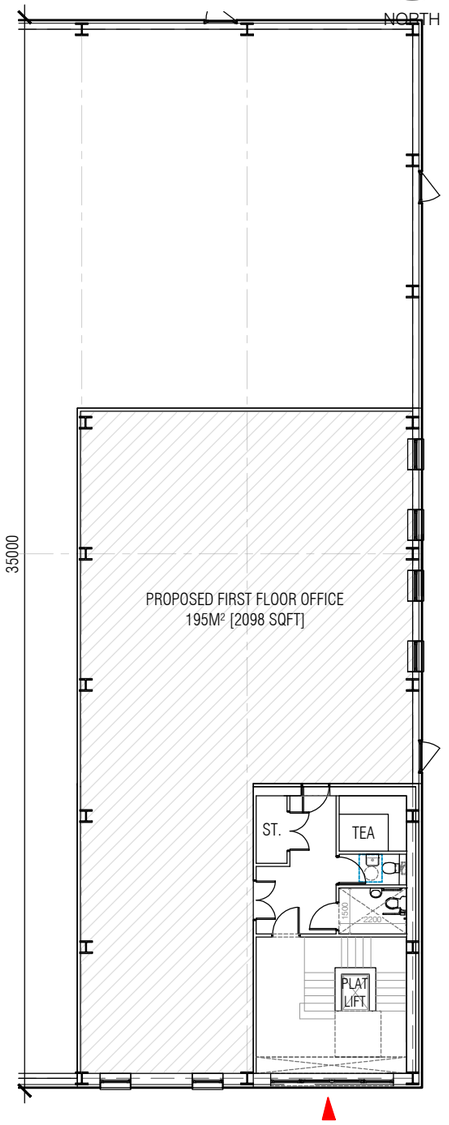
1:1000

0 5 10 20 30 40m

NORTH



GROUND FLOOR PLAN



FIRST FLOOR EXTRACT

REV.	DATE.	AMENDMENT.	DRAWN.
P3	JULY 2023	AMENDED LAYOUT	McL
P2	JULY 2023	AMENDED LAYOUT	McL
P1	JULY 2023	AMENDED LAYOUT	McL

PROJECT.
LAND S.EAST SIDE OF A12
OLD IPSWICH ROAD
ARDLEIGH, COLCHESTER, CO7 7QW

CLIENT.
HT INDUSTRIAL LTD

DRAWING TITLE.
PROPOSED SITE PLAN

PROJECT NO. 23.536

REVISION. P3

DRAWING NO. 100.2

DATE. 14.02.2023

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TEL. +44 (0)1702 831 415 | EMAIL. HELLO@FRONT-ARCHITECTURE.CO.UK

0 1 2 5 8m 1:200

NORTH

PROJECT:
LAND S.EAST SIDE OF A12
OLD IPSWICH ROAD
ARDLEIGH, COLCHESTER, CO7 7QW

CLIENT:
HT INDUSTRIAL LTD

DRAWING TITLE:
PROPOSED FRONT AND SIDE ELEVATIONS

REV.	DATE	AMENDMENT	DRAWN
P2	11.07.2023	CLIENT COMMENTS	CH

PROJECT NO.: 23.536
REVISION: P2
DRAWING NO.: 100.3
DATE: 14.02.2023

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GeoSmart Information

Appendix B

Rainfall runoff calculations

Greenfield Site Run-Off Calculations usng the IoH124 method

Greenfield peak run-off rate (QBAR):

Parameters	Input	Units	Comments
Area	50	ha	mimimum 50ha
SAAR	567	mm	FEH CD ROM (NERC, 2009)
SPR	0.10	N/A	Soil run-off coefficient
Region	6	N/A	Region on Hydrological area map

QBAR

$$Q_{BAR(rural)} = 1.08AREA^{0.89}SAAR^{1.17}SPR^{2.17}$$

Where:

$Q_{BAR(rural)}$	is the mean annual flood (a return period of 2.3 years) in l/s
AREA	is the area of the catchment in km² (minimum of 0.5km²)
SAAR	is the standard average rainfall for the period 1941 to 1970 in mm
SPR	is the soil run-off coefficient

$Q_{BAR(rural)}$ can be factored by the UK Flood Studies Report regional growth curves to produce peak flood flows for any return period.

$Q_{BAR(rural)}$	=	6.56	l/s for 50ha site
Divided by 50 to scale down	=	0.13	l/s/ha
Actual Area of the entire Site	=	0.98	ha

Return Periods (Growth curves obtained from DEFRA report)

Return Period		Growth Factor	l/s/ha	Peak site run-off rate (l/s)
1	**$Q_{BAR(rural)}$ x**	**0.85**	**0.11**	**0.109**
2	$Q_{BAR(rural)}$ x	0.88	0.12	0.11
5	$Q_{BAR(rural)}$ x	1.28	0.17	0.16
10	$Q_{BAR(rural)}$ x	1.62	0.21	0.21
25	$Q_{BAR(rural)}$ x	2.14	0.28	0.27
30	**$Q_{BAR(rural)}$ x**	**2.24**	**0.29**	**0.287**
50	$Q_{BAR(rural)}$ x	2.62	0.34	0.34
100	**$Q_{BAR(rural)}$ x**	**3.19**	**0.42**	**0.41**
200	$Q_{BAR(rural)}$ x	3.86	0.51	0.49

Greenfield total run-off volume:

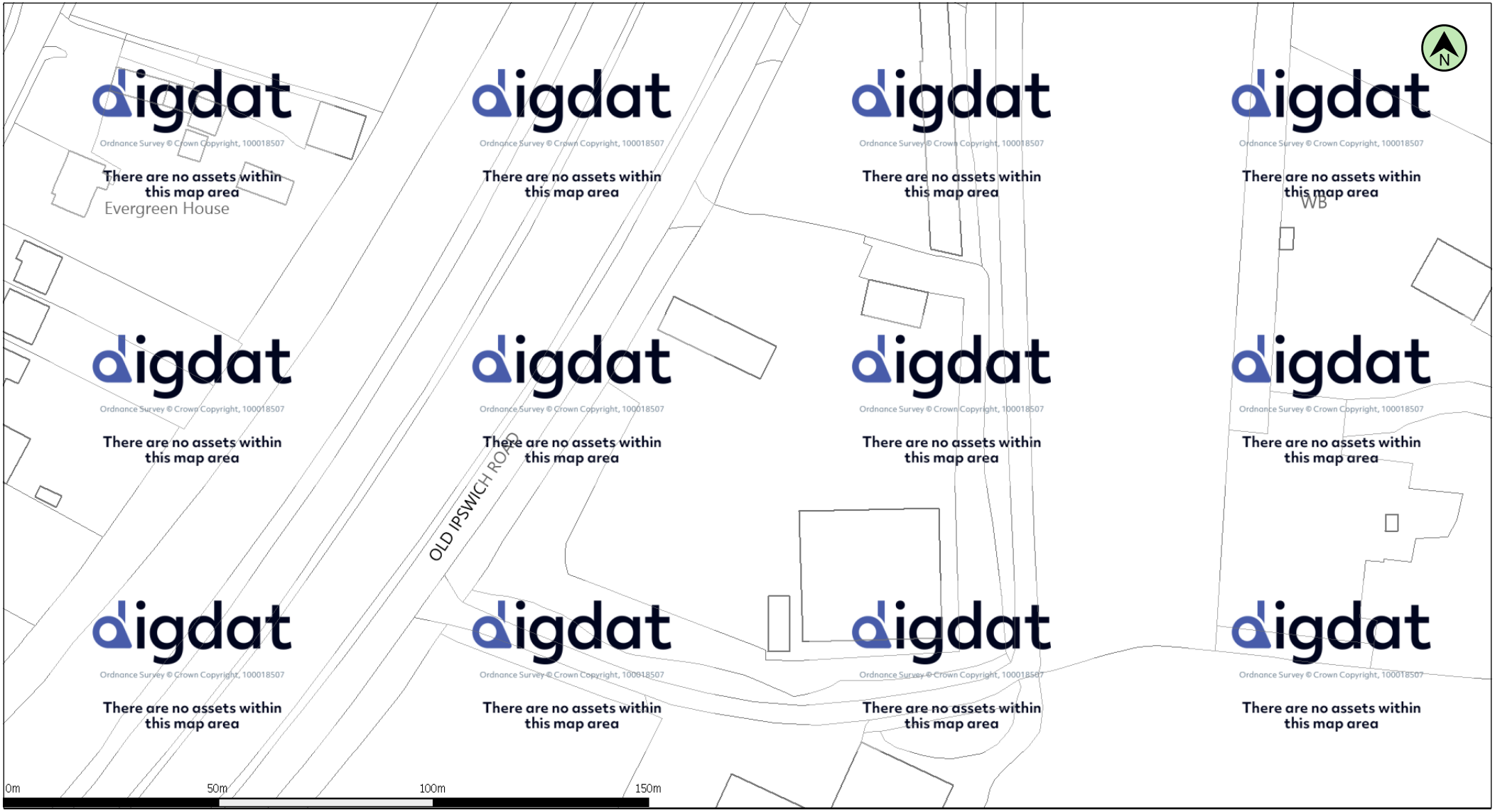
= actual area of the entire site x SPR x 6 hour rainfall depth

Return Period	6 hour rainfall (mm) from FEH CD-ROM	Area (ha)	SPR	Total run-off (m^3)
2.3 (QBAR)	24.69	0.98	0.10	24.1
1	23.22	0.98	0.10	22.6
10	37.79	0.98	0.10	36.8
30	56.64	0.98	0.10	55.2
100	57.49	0.98	0.10	56.1

GeoSmart Information

Appendix C

Anglian Water Asset Location Plan



(c) Crown copyright and database rights 2023 Ordnance Survey 100022432 | Date: 24/10/23 | Scale: 1:1250 | Map Centre: 602449,229532 | Data updated: 30/09/23 | Our Ref: 1304779 - 1 | Wastewater Plan A4

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 2023 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
- Surface Sewer
- Combined Sewer
- Final Effluent
- Rising Main*
- Private Sewer*
- Decommissioned Sewer*
- Outfall*
- Inlet*
- Manhole*
- Sewage Treatment Works
- Public Pumping Station
- Decomissioned Pumping Station

*(Colour denotes effluent type)

davidsouth@geosmartinfo.co.uk

80610.01

love every drop anglianwater

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

GeoSmart Information

Appendix D

Soil Infiltration Testing Report (EPS Consulting, 2023)

SOIL INFILTRATION TESTING REPORT

ARDLEIGH OAKS, OLD IPSWICH ROAD, ARDLEIGH,CO7 7QR

REFERENCE: P1171/R1/V2

REPORT PREPARED FOR: HT INDUSTRIAL LTD

REPORT PREPARED BY: EPS CONSULTING

JANUARY 2024

PLANNING | DUE DILIGENCE | CONSTRUCTION

QUALITY ASSURANCE

Issue/revision	Issue 1	Revision 1	Revision 2
Author	Hayley Elson	Tim Conibear	
Job Title	Senior Engineer	Director	
Authorised by	Stuart Phillips	Tim Conibear	
Job title	Director	Director	
Project number	P1171/R1/V1	P1171/R1/V2	

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39 East Drive
Carshalton Beeches
SM5 4PA

London Office:
Build Studios
203 Westminster Bridge Road
London
SE1 7FR

www.epsconsulting.co.uk

EXECUTIVE SUMMARY	
Site Address	Ardleigh Oaks, Old Ipswich Road, Ardleigh, CO7 7QR
National Grid Reference	TM0245729529
Current Site Use	The site currently comprises an active highways maintenance depot.
Proposed Development	The development proposal is for the demolition of existing buildings and the construction of a new warehouse with associated yard space, parking, and ancillary refuse and cycle storage.
Scope of Site Investigation Works	Soil infiltration testing within a single location (ref. TP1) to inform the sustainable drainage system (SuDS) design for the scheme.
Summary of Ground Conditions Encountered	▶ A thin layer of Asphalt overlying Made Ground to a depth of 0.65mbgl; ▶ Firm light grey and yellowish brown mottled orangish brown slightly sandy slightly gravelly CLAY with occasional lenses of orangish brown clayey silt to 1.50mbgl; ▶ Stiff light grey and orangish brown slightly sandy silty CLAY thinly interbedded with light orangish brown and grey silty fine to medium sand to >2.20mbgl; and ▶ A very slow groundwater seepage was observed within a clay fissure at 1.80mbgl, but was not deemed to represent a groundwater strike. The test was therefore continued and deemed representative.
Findings and recommendations	In-situ soil Infiltration testing revealed no soakage with water remaining static after a 3-hour test period which is generally typical of firm to stiff CLAY. After this time, due to zero soakage, the test was terminated. Based on the above, alternative methods of surface water disposal will be required.

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

1.1 Background

eps consulting (EPS) has been commissioned by HT Industrial Ltd ("the Client") to undertake soil infiltration testing at Ardleigh Oaks, Old Ipswich Road, Ardleigh, CO7 7QR.

A Site Location Plan is presented as Figure 1 within Appendix I.

1.2 Proposed Development

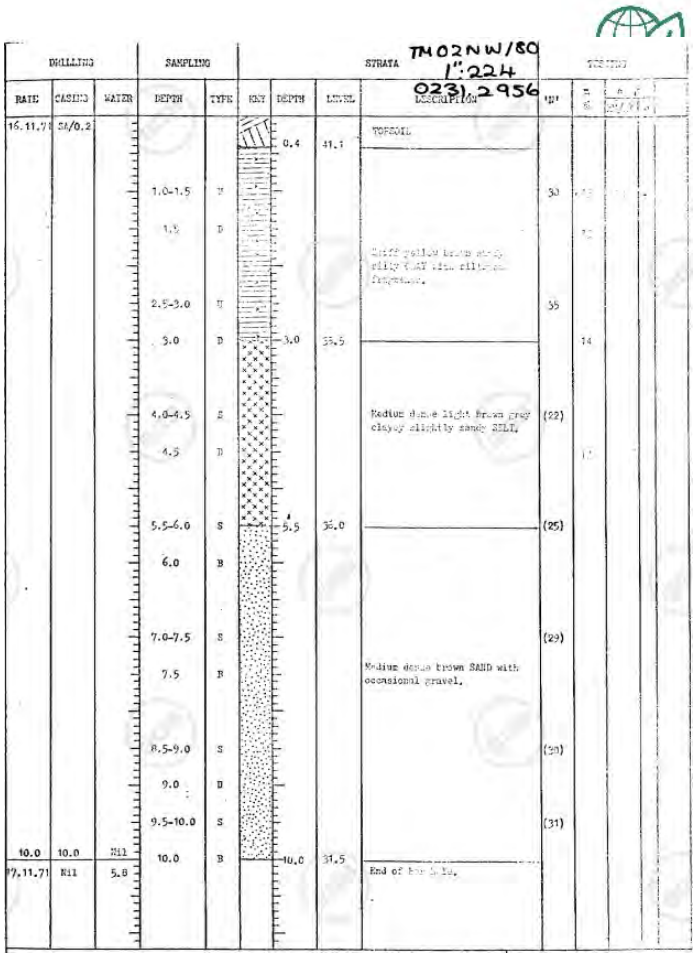
The development proposal is for the demolition of existing buildings and the construction of a new warehouse with associated yard space, parking, and ancillary refuse and cycle storage. A proposed development plan is presented as Figure 2 within Appendix I.

1.3 Objectives

The objective of this report is to provide information on ground conditions to determine the feasibility of adopting shallow soakaways to inform the sustainable drainage system (SuDS) design. All works were undertaken in accordance with eps consulting's fee proposal letter dated 28th November 2023 (ref. P1171/231127/P1).

Geological maps were reviewed during the fee proposal stage and indicated that the site is underlain by superficial Cover Sand (clay, silt and sand), overlying bedrock of Thames Group (clay, silt and sand). A nearby BGS borehole record dating back to 1949 and situated c. 115m to the west (see extract, overleaf), confirmed this with ground conditions comprising stiff yellow brown slightly sandy silty clay with siltstone fragments. This was underlain by medium dense light brown, grey clayey slightly sandy silt overlying a medium dense brown sand with occasional gravel.

The geology encountered indicates that near surface soils are likely to be of low permeability and as such if similar ground conditions are present on site, it is unlikely that it will be possible to adopt a drainage solution based on the use of shallow soakaways. However, it was also noted that a quarry is present to the east of the site, which would indicate the presence of predominantly coarse-grained soils within the area.



Extract 1 - BGS record (115m to the west of site)

1.4 Sources of Information

The following sources of information have been utilised in the preparation of this report:

- Front Architecture: Location Plan (23.536/001);
- Front Architecture: Existing Site Plan (23.536/002);
- Front Architecture: Proposed Site Plan (23.536/P2/100.1);
- Front Architecture: 23.536 Pre-Application Statement; and
- Tendring District Council: Pre-Application Enquiry Letter (23/30086/PREAPP).

1.5 Confidentiality

EPS has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from EPS. A charge may be levied against such approval.

1.6 Limitations

The full limitations of this report are presented in Appendix II.

2.0 SITE INVESTIGATION

2.1 Summary of Fieldwork

Intrusive site investigation works were carried out on 6th December 2023 and comprised the following scope:

- A single machine excavated trial pit (ref. TP1) to a depth of 2.20mbgl;
- Pit was filled to a depth of 0.90mbgl with potable water;
- No soakage was observed within a 3 hour monitoring period with the water level remaining static at 0.90mbgl; and
- Upon completion, excess water was removed and the pit was backfilled with arisings in reverse order and compacted in layers.

The location of the trial pit is shown on Figure 2 within Appendix I.

2.2 Site Investigation Standards

All exploratory works, associated sampling, in-situ testing, and logging were carried out broadly in accordance with techniques outlined in:

- BS5930:2015+A1:2020 Code of Practice for Ground Investigations;
- BS EN ISO 14688-1 Identification of Soil;
- BS EN ISO 14688-2 Classification of Soil;
- BS EN ISO 22475 Sampling methods and groundwater measurements; and
- BRE Digest 365 Soakaway Design (revised 2016).

3.0 GROUND AND GROUNDWATER CONDITIONS

3.1 Summary of Ground Conditions

Ground conditions encountered were generally consistent with published geology comprising a thin veneer of Asphalt overlying Made Ground to a depth of 0.65mbgl. The Made Ground comprised fine-grained soils of slightly sandy slightly gravelly clay. Gravels of flint, quartz and rare brick were noted.

Firm light grey and yellowish brown mottled orangish brown slightly sandy slightly gravelly CLAY with occasional lenses of orangish brown clayey silt was encountered to a depth of 1.50mbgl. This was underlain by stiff light grey and orangish brown slightly sandy silty CLAY thinly interbedded with light orangish brown and grey silty fine to medium sand to a depth greater than >2.20mbgl.

An exploratory hole log is presented within Appendix IV with photographs presented in Appendix V.

3.2 Groundwater

A very slow groundwater seepage was observed within a clay fissure at 1.80mbgl but was not deemed to represent a groundwater strike. The test was therefore continued and deemed representative.

4.0 SOIL INFILTRATION TESTING

As presented within Appendix IV, in-situ soil Infiltration testing revealed no soakage with test water remaining static during the 3 hour test period. After this time, due to zero soakage the test was terminated.

Based on the above, it is likely that alternatively methods of surface water disposal will be required.

END OF REPORT

APPENDIX I

DRAWINGS

KEY:

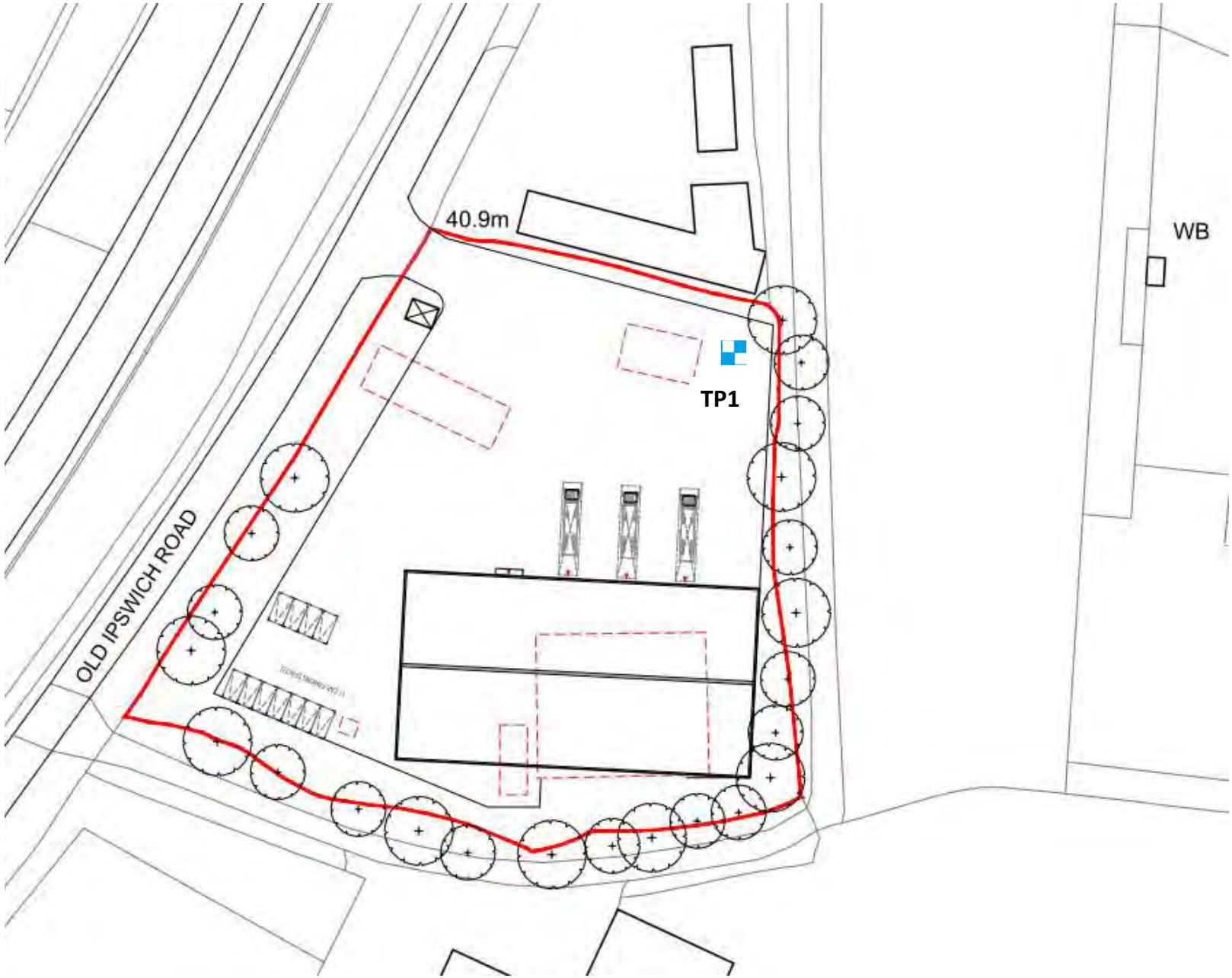
eps consulting

Job No. & Title:	P1171 Ardleigh Oaks
Client:	HT Industrial Ltd
Drawn by:	TC
Approved by:	SP
Date:	January 2024
Notes:	NOT DRAWN TO SCALE
Drawing Title:	Figure 1 Site Location Plan

KEY:

N

Trial Pit



eps consulting

Job No. & Title:	P1171 Ardleigh Oaks
Client:	HT Industrial Ltd
Drawn by:	TC
Approved by:	SP
Date:	January 2024
Notes:	NOT DRAWN TO SCALE
Drawing Title:	Figure 2 Site Investigation and Proposed Development Layout Plan

APPENDIX II – LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between EPS and the Client.

2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.

4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not be made known or accessible.

5. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

6. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

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8. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

APPENDIX III

EXPLORATORY HOLE LOG

endeavour drilling

Contract Name:			Client:		Trial Pit ID:
Ringway Ardleigh Depot, Colchester			EPS Consulting		TP1
Contract Number:	Date Started:	Logged By:	Checked By:	Status:	Sheet 1 of 1
J5627	13/12/2023	OW	MJS	PRELIM	
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used:	Date Printed: / Scale:
				5T Excavator	15/12/2023 / 1:40

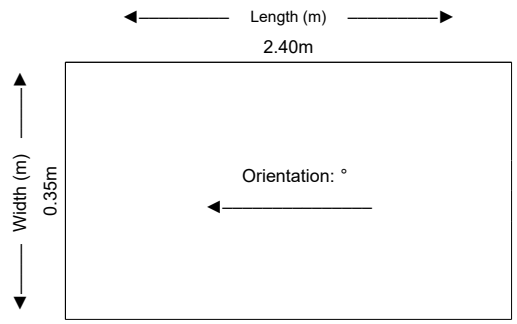
Weather: Overcast with some showers | Termination: Reached target depth | Stability: Stable

Samples & In Situ Testing			Strata Details				Water	Backfill
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description		
				0.25		ASPHALT		
				(0.40)		MADE GROUND - Stiff light greenish grey mottled dark grey slightly sandy slightly gravelly clay with rare fine to coarse subangular brick fragments. Gravel is fine to coarse, subangular to subrounded of flint and quartz.		
				0.65		Firm light grey and yellowish brown mottled orangish brown slightly gravelly slightly sandy CLAY with occasional lens of orangish brown clayey silt. Gravel is fine to medium, subangular to subrounded of flint and quartz.		
		HV 1.00m, 72kPa		(0.85)				
				1.50		Stiff light grey and orangish brown slightly sandy silty CLAY thinnly interbedded with light orangish brown and grey silty fine to medium sand.		
		HV 1.80m, 101kPa		(0.70)				
				2.20		End of Trial Pit at 2.20m		

1 2 3 4 5 6

Dimensions:

Final Depth: 2.20m



Inclination: °

General Remarks:

1. Trial pit machine excavated to 2.20mbgl. 2. Groundwater seepage at 1.80mbgl in southern sidewall. 3. Soakaway test completed at 2.20mbgl. 4. Trial pit backfilled and compacted with arisings on completion.

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
1.80			20	1.80	Seepage

APPENDIX IV

SOIL INFILTRATION TEST CERTIFICATE

endeavour drilling

SOAKAWAY TEST IN TRIAL PIT

PROJECT	Ringway Ardleigh Depot		DATE	13.12.23	
CLIENT	EPS Consulting		TRIAL PIT NO.	TP1	
PIT DETAILS					
Sidewall Stability	Stable	Pit infilled - N			
Depth	2.20mbgl	Width	0.35m	Length	2.40mbgl
WATER LEVEL BEFORE TEST		No water present	START TIME	10:31am	

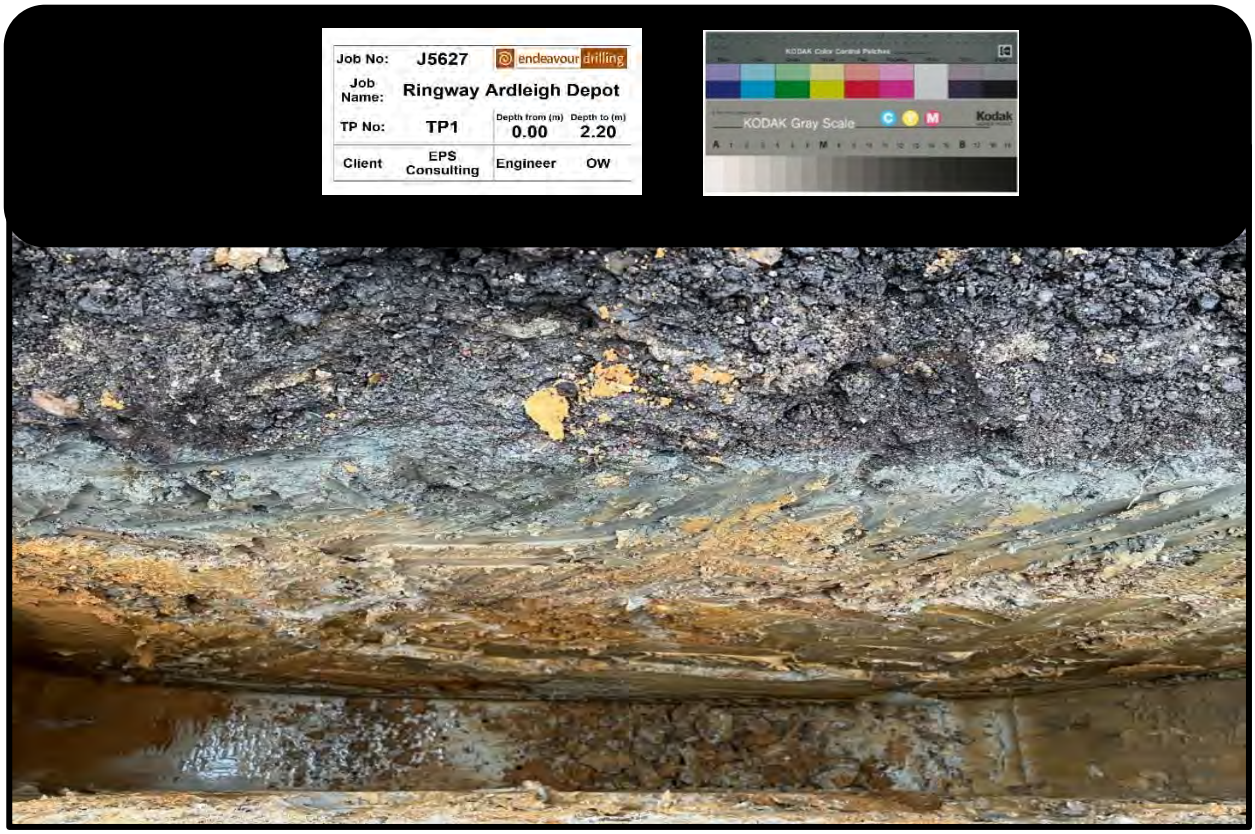
ELAPSED TIME (min:sec)	WATER LEVEL BELOW GROUND LEVEL (mbgl)	Time	ELAPSED TIME (min:sec)	WATER LEVEL BELOW GROUND LEVEL (mbgl)	Time
00:00	0.90		15 mins	0.90	
30 secs	0.90		20 mins	0.90	
1 min	0.90		30 mins	0.90	
1 min 30 secs	0.90		40 mins	0.90	
2 mins	0.90		50 mins	0.90	
3 mins	0.90		60 mins	0.90	
4 mins	0.90		1 hr 30 mins	0.90	
5 mins	0.90		2 hrs	0.90	
6 mins	0.90		3 hrs	0.90	
7 mins	0.90				
8 mins	0.90				
9 mins	0.90				
10 mins	0.90				

TEST CARRIED OUT BY	OW	Test	No 1

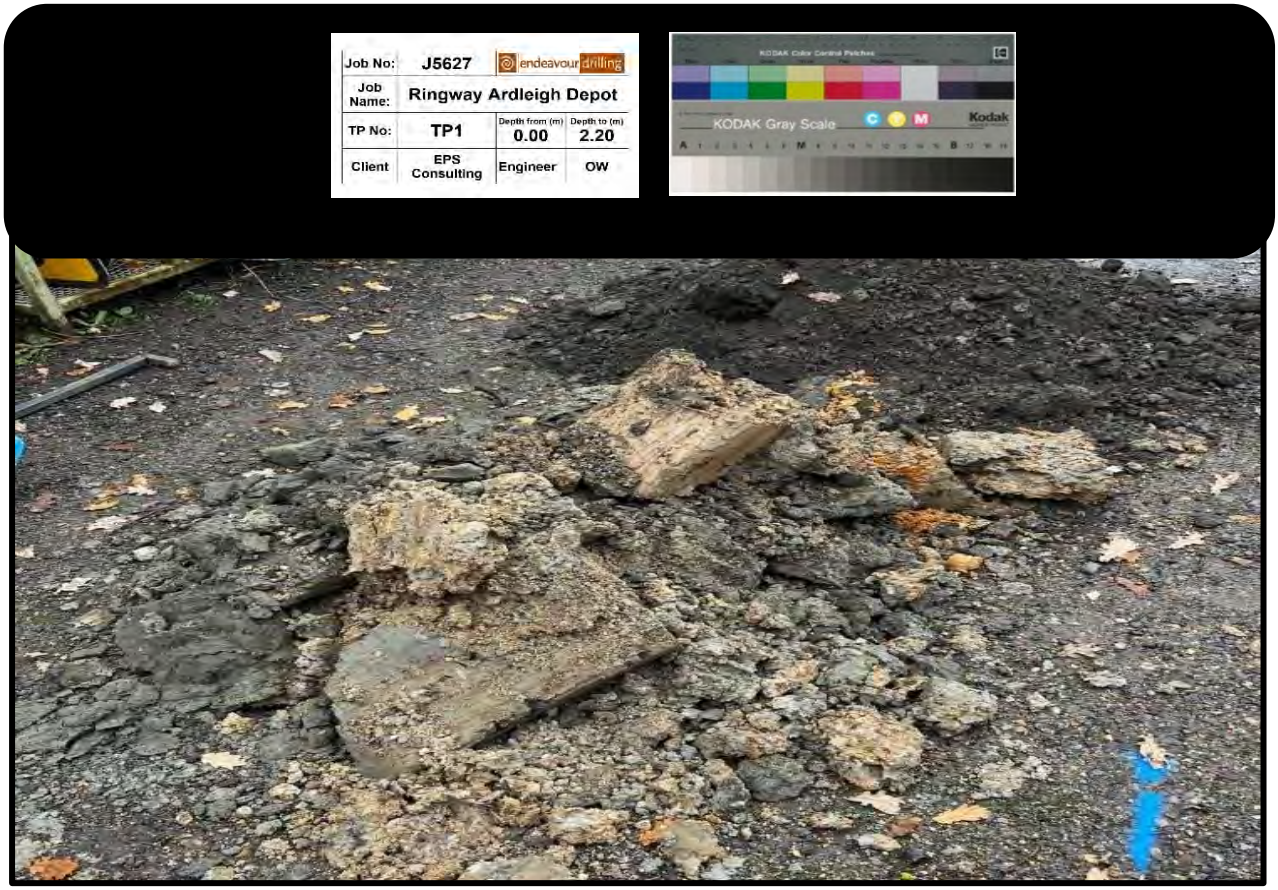
APPENDIX V

PHOTOGRAPHS

TP1 – 0.0mbgl – 2.20mbgl



TP1 – 0.0mbgl – 2.20mbgl



TP1 – 0.0mbgl – 2.20mbgl

TP1 – 0.0mbgl – 2.20mbgl

TP1 – 0.0mbgl – 2.20mbgl

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Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

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GeoSmart Information

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The Property Ombudsman scheme

Milford House

43-55 Milford Street

Salisbury

Wiltshire SP1 2BP

Tel: 01722 333306

Fax: 01722 332296

Email: admin@tpos.co.uk

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We will co-operate fully with the Ombudsman during an investigation and comply with his final decision. Complaints should be sent to:

Martin Lucass

Commercial Director

GeoSmart Information Limited

Suite 9-11, 1st Floor,

Old Bank Buildings,

Bellstone, Shrewsbury, SY1 1HU

Tel: 01743 298 100

martinlucass@geosmartinfo.co.uk

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