

MM PROPERTIES LTD

BROADFIELDS, EAST HORNDON

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

REPORT REF. 2008543-01

PROJECT NO. 2008543

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DOCUMENT CONTROL SHEET

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1. INTRODUCTION

Background

- 1.1. Ardent Consulting Engineers has been commissioned by MM Properties (London) Ltd to undertake a Flood Risk Assessment (FRA) and preliminary foul and surface water drainage strategy, to support an outline planning application (with all matters reserved except for access), for the proposed development of the site known as Broadfields, located off Tilbury Road, East Horndon, CM13 3LS (hereafter referred to as the "Site").
- 1.2. This FRA has been prepared with specific reference to the requirements of National Planning Policy Framework (NPPF), updated in July 2021 and the Planning Practice Guidance (PPG), which superseded the Technical Guidance to the NPPF, updated in August 2022. The report aims to demonstrate to the Local Planning Authority and Statutory Consultees that the site can be suitably redeveloped whilst complying with the requirements of the NPPF in terms of flood risk.
- 1.3. This report will also consider the requirements within the Non-statutory Technical Standards for Sustainable Drainage Systems (March 2015) and CIRIA C753 The SuDS Manual (November 2015).

Scope

- 1.4. In accordance with the NPPF assessment criteria, this report and associated surface water drainage strategy will ultimately seek to:
 - Ensure that flood mitigation is provided within the project Site to avoid detrimental impacts to third parties;
 - Ensure that the impact of climate change is assessed;
 - Ensure impermeable areas within the proposed development are minimised where practicable; and
 - Ensure the use of sustainable drainage systems (SuDS) is optimised in line with current best practice.

2. SITE DESCRIPTION

Site Location and existing use

- 2.1. The Site is located off Tilbury Road, East Horndon, CM13 3LS, centred on National Grid Reference (NGR) 563381E, 189112N (TQ 63381 89212).
- 2.2. The Site comprises 12.1 hectares (ha) of undeveloped greenfield land, with the exception of areas adjoining the eastern boundary, which are currently occupied by residential properties and some small-scale commercial buildings and a yard.
- 2.3. The Site is bound to the north by the A127 Southend Arterial Road; to the east by Tilbury Road; by undeveloped greenfield land to the south and an ordinary watercourse to the west, with Woodside Farm and associated agricultural land beyond. Outside the north-eastern corner of the site lie a number of residential properties. A site location plan is shown in **Figure 2-1** below.



Figure 2-1: Site Location Plan

Proposed Development

- 2.4. The proposals seek outline permission for the comprehensive redevelopment of the site to deliver a Net Zero Carbon development of up to 32,000 sqm of employment floorspace within Use Classes E(g)(iii), B2 and B8 and including an Ultra Rapid Electric Vehicle Charging Facility, a start up and enterprise hub of lower cost small medium and micro accommodation as well as a children's play area and associated works. Refer to **Figure 2-2** below for an extract of the Proposed Development Layout. A full set of development plans are included in **Appendix A**.



Figure 2-2: Illustrative Masterplan

- 2.5. Industrial developments are classified as 'less vulnerable' under the NPPF.

Topography

- 2.6. A drone topographical survey was undertaken at the Site in October 2020. Refer to **Appendix B** for a copy of the topographical survey.
- 2.7. The survey indicates that the Site generally falls north-east to south-west, from a high point of 22.00m AOD at the north-eastern corner to 16.50m AOD at the Site's south-western corner.

Hydrology

- 2.8. An ordinary watercourse runs parallel to the west of the site flowing in a southerly direction, adjacent to the Phase 2 development. This watercourse originates in Thorndon Park to the north of the site, before being culverted under the A127. The watercourse then continues southbound to its confluence with the Mar Dyke approximate 2km to the south of the site. The location of this watercourse in relation to the Site is illustrated in **Figure 2-3** below.



Figure 2-2 Existing Ordinary Watercourses

- 2.9. Online mapping indicates the presence of a ditch crossing the southern portion of the site from east to west, starting from the western side of Tilbury Road, and joining the aforementioned watercourse. Refer to **Figure 2-4** below.

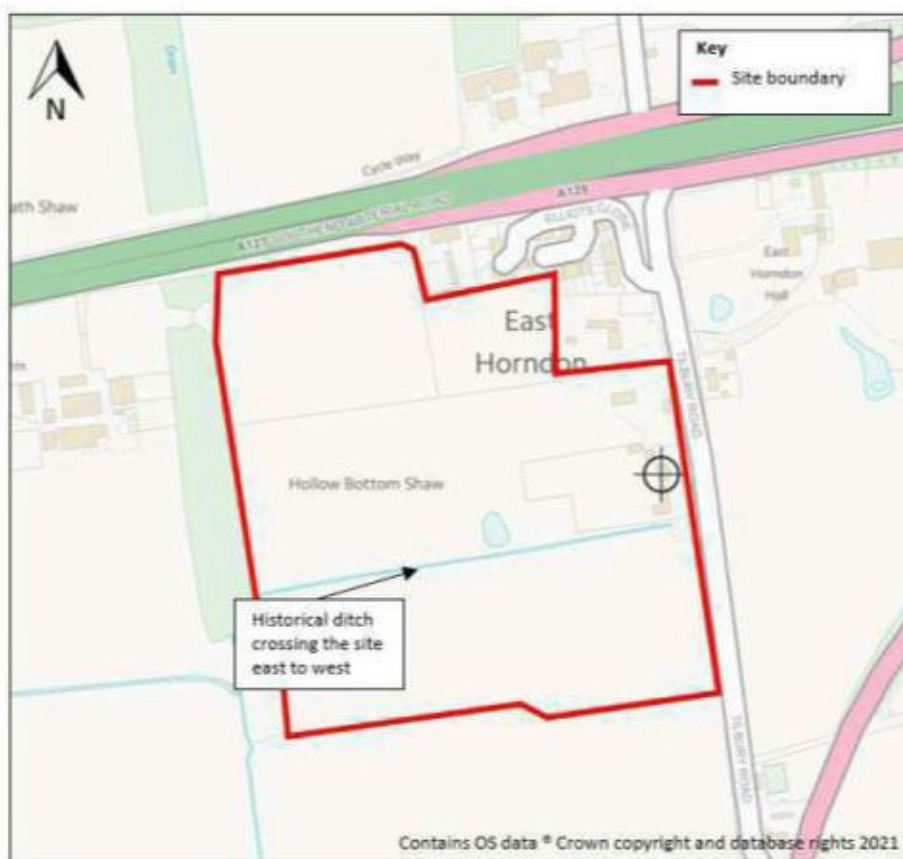


Figure 2-3: Historical watercourses

Geology and Ground conditions

- 2.10. According to the British Geological Survey (BGS) online datasets, the site is underlain by London Clay bedrock, with superficial deposits of Head – Clay, Silt, Sand and Gravel and Alluvium – Clay Silt Sand and Gravel to the southeast of the site (refer to extract in **Figure 2-5** and **2-6** below)

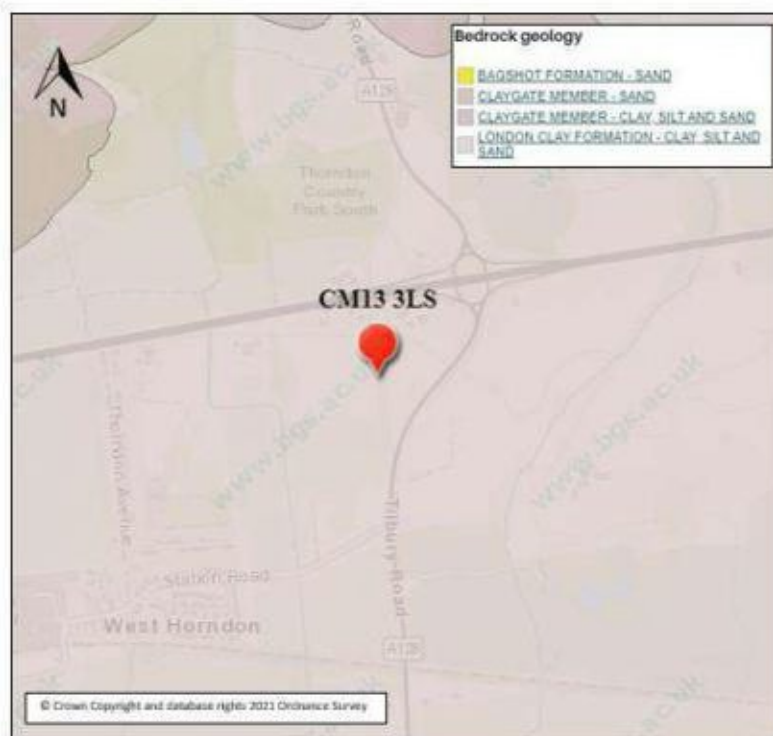


Figure 2-4: BGS Online Mapping- Bedrock



Figure 2-6: BGS Online Mapping- Superficial Deposits

- 2.11. Based on historic borehole records available on the BGS website, Groundwater was encountered in 2 No. boreholes in Tilbury Road (East) at depths of 10m below ground level, during an investigation in 1989.
- 2.12. An intrusive site investigation could be commissioned at the detailed design stage to investigate groundwater levels across the Site and identify any potential contamination issues.

Existing Sewer Infrastructure

- 2.13. Anglian Water Asset Location Plans are provided in **Appendix C**.
- 2.14. The plans show an Anglian Water Foul Water sewer entering the site from the west parallel to the Site's northern boundary, before running south for circa 130m, and turning east again crossing the eastern portion of the Site. The sewer continues south-east beyond the Site boundary. An excerpt of the sewer plan is shown in **Figure 2-6** below.
- 2.15. There are no public surface water drains/pipelines in the vicinity of the Site.

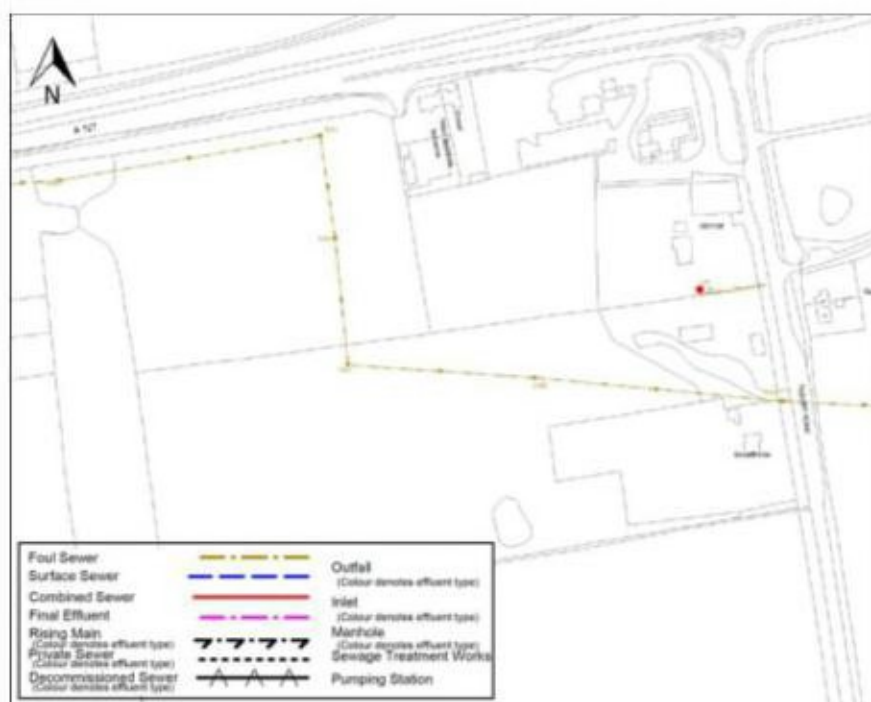


Figure 2-5: Thames Water Sewer Asset

3. POLICY CONTEXT

National Planning Policy Framework

- 3.1. The National Planning Policy Framework (NPPF) was revised in July 2021; where paragraphs 159 to 169 inclusive establish the Planning Policy relating to flood risk management. The Technical Guide to the NPPF has been superseded by the Planning Practice Guidance (PPG) in March 2014. The Flood risk and coastal change guidance was updated in August 2022.
- 3.2. The PPG states that when planning or decision making in terms of flood risk, the process followed should be to avoid, control, mitigate and manage residual risk.
- 3.3. 'Avoiding' risk relates to the application of the sequential and exception tests, as discussed in detail for the site in Section 6 and summarised below:
 - In plan-making, a sequential approach should be employed. This involves applying the 'Sequential Test' and, if needed, the 'Exception Test'
 - In decision-making, where necessary, planning authorities also apply the Sequential Test and, if needed, the Exception Test, to ensure that flood risk is minimised and appropriately addressed.
 - Where the sequential and the exception tests have been applied as necessary and not met, development should not be allowed.
 - Substitute lower vulnerability uses for higher vulnerability uses.
 - Within sites, using site layout to locate the most vulnerable aspects of development in areas of lowest flood risk, unless there are overriding reasons to prefer a different location. In addition, measures to avoid flood risk vertically can then be taken, by locating the most vulnerable uses on upper storeys, and by raising finished floor and/or ground levels, where

appropriate and that such techniques are suitably designed. Such measures should also account for residual flood risks from flood risk management infrastructure.

- 3.4. The PPG provides the methodology required to undertake the Sequential and Exception Tests and this should be applied to all sources of flooding.
- 3.5. 'Controlling' the risk relates to measures that will control the risk of flooding affecting the site. Early discussions with relevant flood risk management authorities, reference to Strategic Flood Risk Assessments and any programme of flood and coastal erosion risk management schemes will help to identify such opportunities.
- 3.6. 'Mitigating' the risk relates to the use of flood resistance and resilience measures to address any residual risks after the use of avoidance and control measures.
- 3.7. 'Managing' the risk relates to considering further management measures to deal with any residual risk remaining after avoidance, control and mitigation have been utilized such as providing safe access and escape routes and considering whether adequate flood warning would be available to people using the development. Residual risks will need to be safely managed to ensure people are not exposed to hazardous flooding.

Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems March 2015

- 3.8. The Non-statutory technical standards for sustainable drainage systems were published in March 2015. They should be used in conjunction with the Planning Practice Guidance. In addition, the Best Practice Guidance, prepared by LASOO, for the Non statutory technical standards was published in July 2015.
- 3.9. The Local Planning Authority (LPA) may set local requirements for planning permission that have the effect of more stringent requirements than these non-statutory technical standards.

- 3.10. In addition, SuDS should be designed in accordance with CIRIA 753 "The SuDS Manual", which represents current best practice.

***Essex County Council Local Flood Risk Management Strategy
(October 2018)***

- 3.11. The Essex County Council Local Flood Risk Management Strategy is a statutory document required by the Flood and Water Management Act (2010) to address the specific requirements to manage local flood risk. Local Flood Risk is defined by the Flood and Water Management Act (2010) as surface water flooding, ordinary watercourse flooding and groundwater flooding.
- 3.12. The nature of flood risk within Essex is extremely varied and widespread across the county. Essex has an extensive coastline and network of rivers and canals, combined with a large number of towns and urbanised areas, which means it is at risk of flooding from a range of different sources.
- 3.13. The document defines a set of objectives for the management of Local Flood Risk and sets out the LLFA's proposed measures for achieving the objectives. The measures are:
1. Investigating floods;
 2. Mapping local routes for water;
 3. Looking after watercourses;
 4. Planning for future floods;
 5. Influencing new development and drainage;
 6. Building flood defences; and
 7. Involving stakeholders.

***Brentwood Level 1 Strategic Flood Risk Assessment
(November 2018)***

- 3.14. The aim of the Level 1 SFRA is to characterise flood risk in the Borough of Brentwood, and provide an evidence base to support

spatial planning decisions at a Borough wide scale. The 2018 SFRA supersedes the 2011 Level 1 SFRA for Brentwood.

- 3.15. The document states that previous flood incidents in Brentwood are largely a result of rapid surface water runoff and ponding in areas such as low-lying roads.
- 3.16. Fluvial flood risk was found to be of limited spatial extent within the Borough and that the majority of the area covered by flood zones 2 and 3 is largely rural, with the exception of a few urban areas at risk including Heybridge, Ingatestone and areas to the east and west of Brentwood town.

Surface Water Management Plan for Brentwood (January 2015)

- 3.17. The Surface Water Management Plan (SWMP) for Brentwood enables local communities and organisations to gain a better understanding of flood risk and outlines the preferred surface water management strategy at a given location.
- 3.18. The SWMP for Brentwood aims to establish a long term action plan to manage surface water and will influence future capital investment, maintenance, land-use planning, emergency planning and future developments.
- 3.19. An intermediate assessment was undertaken across the whole of Brentwood Borough to determine the overall flood risk and to identify flooding hotspots. Flooding hotspots were identified around three main areas; West Horndon, Ingatestone, and Brentwood Town Centre. A number of borough-wide and site-specific options/measures were determined which could be implemented to reduce flood risk in the flooding hotspots within the Brentwood Borough.
- 3.20. West Horndon, which represents a predominantly rural area, was identified as a Study area within the SWMP. Site visits highlighted that the culvert at Station Road can become significantly blocked. The SWMP considers improving the conveyance of flow through the

culvert at Station Road, with water allowed to pond in the fields to the south. This would aim to reduce flooding across the road allowing access to West Horndon. Whilst West Horndon is in a different surface water catchment to the site, a robust surface water drainage scheme is considered important for the proposed development to benefit the wider water environment.

Brentwood Pre-Submission Local Plan (2016-2033)

- 3.21. The Pre-Submission Local Plan for Brentwood presents the local council's vision for the borough's development over the next 17 years. It sets out Spatial Strategy and supporting policies for achieving this vision.
- 3.22. The document defines its strategic objectives as:
- SO1: Manage Growth Sustainably.
 - SO2: Deliver a Healthy and Resilient Built Environment.
 - SO3: Deliver Sustainable Communities with Diverse Economic & Social-Cultural Opportunities for all.
 - SO4: Deliver Beautiful, Biodiverse, Clean and a functional Natural Environment.
- 3.23. **Policy BE01:** Future Proofing, refers to anticipating the future and developing methods of minimising the effects of shocks and stresses of future events. These methods consist of reactive measures which would be used for short-term 'shocks' (e.g., floods) and proactive strategies adapting to long-term changes caused by climate change and technology changes through effective means such as sustainable design.
- 3.24. **Policy BE08:** Sustainable Drainage, states all developments should incorporate Sustainable Drainage Systems for the disposal of surface water, in order to avoid any increase in flood risk or adverse impact on water quality.

3.25. In line with **Policy BE08**, SuDS features will be required to discharge to previous greenfield rates or achieve a 50% reduction of brownfield run-off rates. This is displayed in Section 5.

Climate Change

1.1 The Planning Practice Guidance states that to allow for the predicted impacts of climate change on surface water runoff within the Combined Essex Management Catchment, the following increases detailed in **Table 3-1** below to rainfall intensity should be allowed for. For development with a lifetime beyond 2100, the upper end allowances should be used.

Table 3-1: Combined Essex Management Catchment Peak Rainfall Allowances

	Central	Upper
3.3% annual exceedance rainfall event		
2050s	20%	35%
2070s	20%	35%
1% annual exceedance rainfall event		
2050s	20%	45%
2070s	25%	40%

1.2 Therefore, under the NPPF an allowance of 45% for the effects of climate change for the 1% annual **exceedance** rainfall event would achieve the policy requirements in designing the drainage elements for the proposed residential redevelopment.

Sequential Test

- 1.3 The objective of the Sequential Test is to steer new developments toward areas with the lowest probability of flooding from all other sources. Where there are no reasonably available sites in these areas, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in areas at medium risk of flooding from all other sources before areas at high risk of flooding from all other sources are considered.
- 1.4 Annex 3 of the NPPF of the Planning Practice Guidance (PPG) classes the proposed residential use as 'more vulnerable'. As discussed in **Section 4** the Site is shown to be in Flood Zone 1 in the Environment Agency's map for planning, therefore it is not necessary for the site to undergo the Sequential Test.

Exception Test

- 1.5 Table 2 of the PPG replicated below in **Table 3-2**, confirms that the Exception Test is not required for "More Vulnerable" uses in Flood Zone 1.

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

Key:
 ✓ Exception test is not required
 X Development should not be permitted

Table 3-2: Extract from the PPG: Flood Risk Vulnerability

4. SOURCES OF FLOODING

4.1. The NPPF requires flood risk from the following sources to be assessed, each of which are assessed separately below:

- Fluvial sources (river flooding);
- Tidal sources (flooding from the sea);
- Groundwater sources;
- Pluvial sources (flooding resulting from overland flows);
- Drainage flooding;
- Artificial sources, canals, reservoirs etc.; and,
- It also requires the risk from increases in surface water discharge to be assessed (surface water management).

Fluvial/Tidal Flooding

4.2. According to the Environment Agency's (EA) flood map for planning, as illustrated in **Figure 4-1** below, the Site is located entirely within Flood Zone 1, defined as having a low risk of flooding (less than 1 in 1000-year annual probability of flooding) and being suitable for any type of development. Correspondence with the EA included in **Appendix D** confirms that the Site is located in Flood Zone 1.



Figure 4-1: EA Flood Zone Map (Flood Risk from Rivers and the Sea)

4.3. Considering the above, it is concluded that the proposed development is at very low risk of fluvial flooding.

Pluvial Flooding

4.4. The Environment Agency's surface water flood map shows parts of the Site are at "Low" and "Medium" risk of surface water flooding (**Figure 4-2**). This risk of surface water flooding relates to overland flow paths arising from Thorndon Country Park to the north of the A127 and spilling onto the Site during very extreme storm events (above a 1 in 100-year AEP).

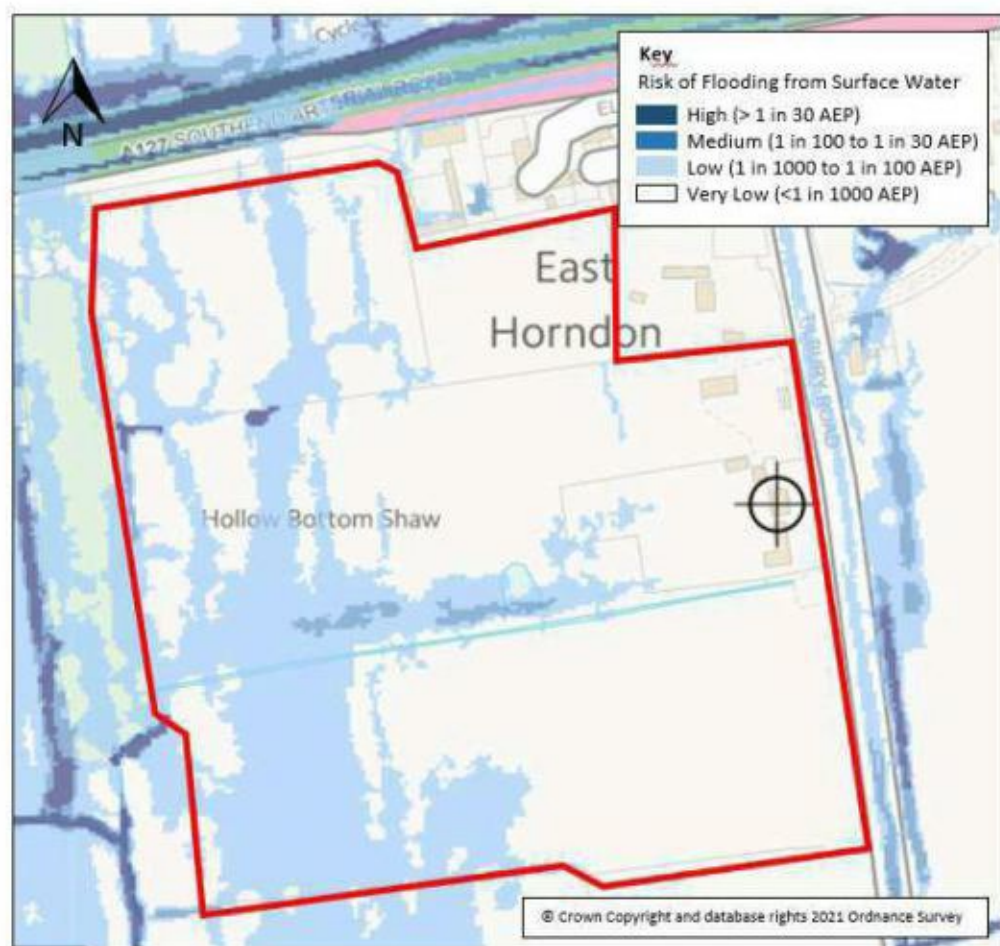


Figure 4-2: EA Risk of Surface Water Flooding Map - Extents

- 4.5. Whilst the risk is considered to be 'low', during exceedance events (i.e., storm events exceeding an AEP of 1 in 100 years) any surface water run-off flowing onto the site from Thorndon Park and the A127 would be conveyed across the site via the proposed SuDS network towards the south, as per the existing scenario. Ground levels along the northern portion of the Site should be designed to allow the flow of exceedance overland flows across the site without increasing risk of flooding offsite.
- 4.6. The EA maps indicate the site is not at risk of flooding from events up to the 1 in 100 AEP ('Medium Risk'), with the exception of a very small, localised area. Predicted flood depths in these areas of the site for the Medium Risk Scenario are below 300mm and are associated

with small depression in the terrain (refer to **Figure 4-3** below). This localised risk will be managed through the implementation of the proposed drainage network.



Figure 4-3: EA Risk of Surface Water Flooding Map - Depths

4.7. Based on the above, risk of surface water flooding is assessed as low.

Sewer Flooding

4.8. There is an Anglian Water Foul Water sewer running in a south easterly direction through the Site. There are no surface water sewers in close vicinity of the Site based on the Anglian Water sewer records. Proposed connections to the public sewer will be fitted with non-return valves to protect the Site from sewer surcharge. The buildings

proposed have been sited to avoid the existing foul sewer. Therefore, the flood risk from sewer surcharge is assessed as low.

Groundwater Flooding

- 4.9. The British Geological Survey (BGS) Map, refer to **Figure 2-5** above, shows that the site is underlain by London Clay. Groundwater was encountered in 2 No. historic borehole records at depths of 10m.
- 4.10. The Level 1 SFRA states that there have been no records of groundwater flooding in the Borough of Brentwood.
- 4.11. The risk of groundwater flooding on the Site is considered to be low.

Artificial Sources

- 4.12. The Environment Agency's flood maps from reservoirs indicate that the site is not within an area as risk of flooding reservoirs, canals, or other artificial water bodies.
- 4.13. The risk to the site from reservoir flooding and artificial sources is therefore considered very low.

Existing Hydrological Catchments

- 4.14. The local topography separates the study area into two hydrological catchments which is displayed in **Figure 4-4** below. Our assessment of the land indicates that surface water flowing in each of the catchment areas ends up in separate watercourses. The watercourses belonging to the separate catchments are separated a minimum of 400m as they pass by West Horndon, and only converge upon their confluence with the Mar Dyke, 1.80 km to the south of West Horndon.

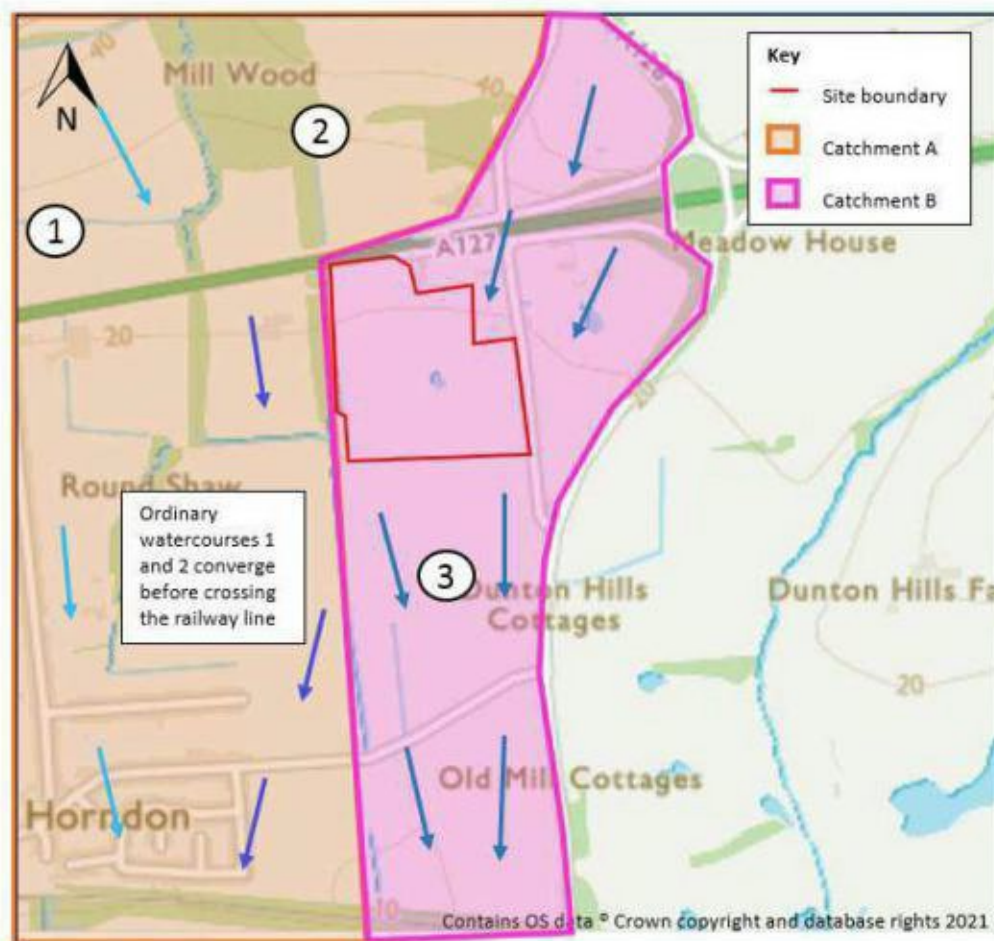


Figure 4-4: Hydrological Catchments

- 4.15. **Catchment A** contains the entire village of West Horndon and includes two unnamed watercourses (labelled 1 and 2 in **Figure 4-4** above) that run in a north-south direction. **Catchment B** contains the development site, a watercourse (labelled no.3) flows east to west and rainfall falling onto the site or its surroundings is conveyed towards the south and collected by watercourse 3.
- 4.16. The presence of these two separate catchments is additionally illustrated in the Environment Agency’s (EA) publicly available Flood risk from surface water maps. An extract of this mapping is provided in **Figure 4-5** below and shows predicted flow directions for a ‘Medium Risk’ flooding event, as per the Environment Agency’s hydraulic model.

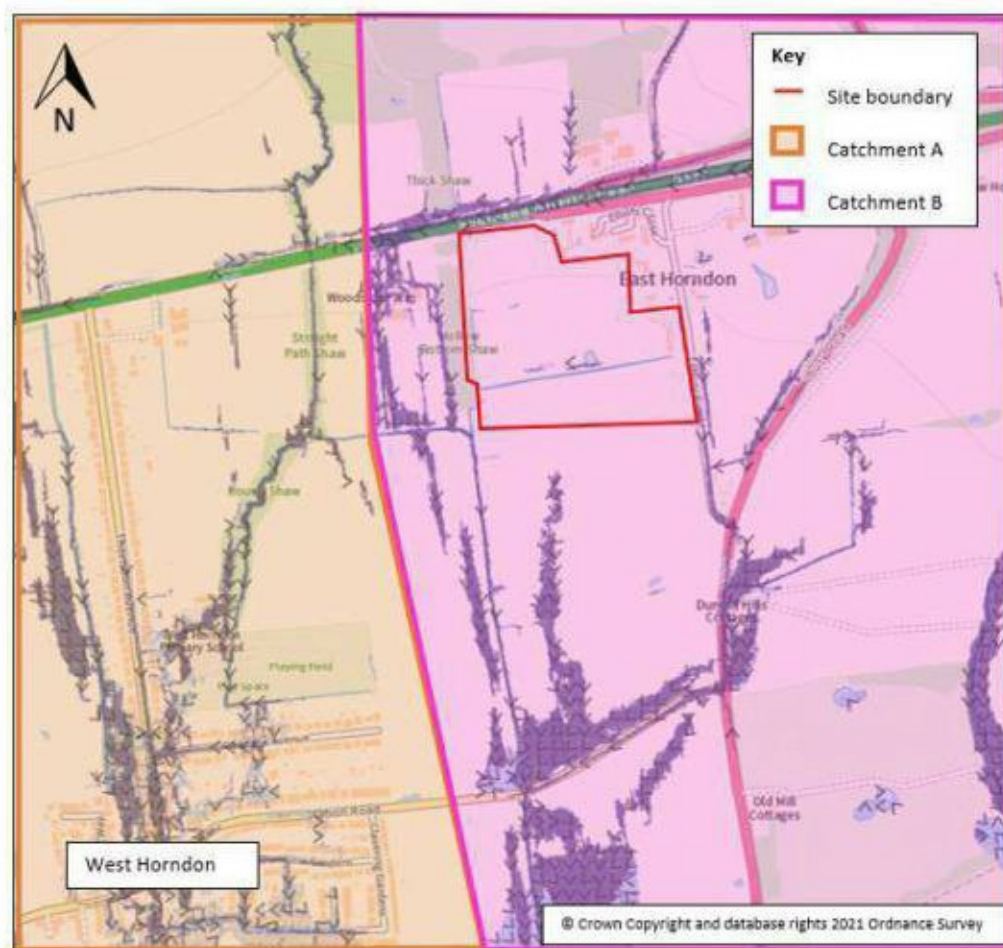


Figure 4-5: Extract from EA's flood Risk of Surface Water Maps: Medium Risk

4.17. Therefore, it was concluded that the development site will have no impact on the hydrology or level of flood risk of catchment A, including the residential extents of West Horndon. The development of the site could still have an impact on flood risk in Catchment B. However, this impact has been assessed and mitigated, and the proposed mitigation measures have been accepted, in principle, by the Environment Agency and Essex County Council.

5. SURFACE WATER DRAINAGE STRATEGY

Existing Surface Water Discharge

- 5.1. The planning redline boundary equates to 12.10 ha of predominantly greenfield land, of which 6.02 ha will be impermeable, following development. Based on the topography of the Site, greenfield runoff generated onsite will currently flow overland into the existing ditches running through the centre of the site, and south of the site before joining the watercourse to the west.
- 5.2. The existing greenfield runoff rates have been determined using the ICP SuDS Mean Annual Flow Method. The catchment size has been based upon the proposed developable area of 6.89ha. Peak Greenfield Runoff rates are presented in **Table 5-1** below. Full calculations can be found in **Appendix E**.

Table 5-1: Greenfield Discharge rates

Size (Ha)	Existing Greenfield Run-off rate (l/s)			
	Qbar	1 in 1 year	1 in 30 year	1 in 100 year
6.89	22.1	18.8	50.0	70.4

Proposed Sustainable Drainage Systems (SuDS)

- 5.3. In accordance with the NPPF Planning Practice Guidance, surface water runoff should be disposed of according to the following hierarchy:
1. Store rainwater for later use;
 2. Use infiltration techniques, such as porous surfaces in non-clay areas;
 3. Attenuate rainwater in ponds or open water features for gradual release;
 4. Attenuate rainwater by storing in tanks or sealed water features for gradual release;
 5. Discharge rainwater direct to a watercourse;
 6. Discharge rainwater to a surface water sewer/drain; and
 7. Discharge rainwater to the combined sewer.

- 5.4. As discussed in **Section 2**, the Site is underlain by London Clay which is incompatible with the use of infiltration systems. Therefore, infiltration has not been considered as a viable method of surface water disposal.
- 5.5. Based on the characteristics of the Site, it is proposed to discharge surface water runoff from the Site into the existing watercourse running through the centre of the site. Surface water will be attenuated within Sustainable Urban Drainage features prior to being discharged to existing ordinary watercourses at a controlled rate equivalent to the mean annual greenfield runoff rate for the developable area of the Site.
- 5.6. The constraints and opportunities for the use of SuDS techniques are appraised using the Management Train approach outlined in CIRIA C753 'The SuDS Manual' in **Table 5-1** below.

Table 5-2: C753 SuDS Management Train, Site Assessment

Type:	Infiltration Devices (Source Control)
Constraints:	Ground conditions onsite are not compatible with infiltration techniques.
Opportunities:	None.
Type:	Lined Permeable Paving (Source Control)
Constraints:	The use of permeable paving in an industrial site will be constrained by the proposed site activities and the volume of anticipated volume of HGVs.
Opportunities:	There are opportunities to use permeable paving in car parking areas.
Type:	Rainwater Harvesting (Source Control)
Constraints:	The benefits of rainwater harvesting on a specific design storm event cannot be quantified, due to the seasonal availability of storage within the structure.
Opportunities:	Opportunities in amenity areas to provide harvesting features such as raised planters and water butts exist. It would be difficult to quantify storage contribution, and therefore these features are not included within calculations as part of this surface water management strategy.
Type:	Swales, etc. (Permeable Conveyance)
Constraints:	In order to provide practicable attenuation benefits 1:3 side-slope swales tend to require a significant land requirement.
Opportunities:	Conveyance swales have not been incorporated into the proposed development site.
Type:	Attenuation Basin/Ponds (end of pipe treatment)
Constraints:	Significant land take.

Opportunities:	Efforts have been made to incorporate attenuation basins within the proposed layout
Type:	Attenuation Tanks (end of pipe treatment)
Constraints:	None.
Opportunities:	Oversized sewers and geo-cellular storage attenuation has been used in proposals
Type:	Proprietary SuDS – Downstream Defender (end of pipe system)
Constraints:	None.
Opportunities:	Downstream defenders could be used to improve the quality of surface water discharge offsite if required.

- 5.7. After consideration of the CIRIA C753 SuDS Management Train approach, the most viable SuDS option for this site are attenuation tanks, attenuation basins and oversized sewers. Permeable paving is also proposed in the parking areas in order to provide additional attenuation and a stage of treatment before discharging into the drainage system. Please refer to the proposed drainage strategy plan (**Drawing 2008543-001**) in **Appendix F**.

Proposed surface water runoff rates

- 5.8. Due to the risk of flooding within West Horndon, (although in a different catchment) flows will be restricted to a maximum discharge rate of 22.10 l/s (equivalent to Q_{bar}), for all rainfall events up to the 1 in 100 year plus a 45% allowance for climate change. This is a significant reduction on greenfield runoff rates during the extreme rainfall events.
- 5.9. MicroDrainage modelling results show there is no flooding on the Site during rainfall events up to the 1 in 100 year including 45% climate change rainfall event. MicroDrainage modelling results are included in **Appendix G**. Due to the levels on site, this small amount of flooding would be directed towards the watercourse and away from buildings.
- 5.10. Due to the shallow gradients of the site and levels within the existing watercourse, it is necessary to utilise a pumped surface water outfall. Options will be reviewed to achieve a gravity outfall as part of the wider development will be explored as the design progresses.

Long Term Storage and Urban Creep

- 5.11. It is proposed to restrict discharge rates from the development site to a discharge rate of 22.10 l/s, equivalent to Q_{bar} . As such, long term storage is not required.
- 5.12. It is proposed to develop the site for a commercial/industrial use. As such, urban creep has not been considered for this development.

Overland Flow Routes

- 5.13. The surface water drainage strategy has been designed to ensure no flooding occurs as a result of the 1 in 100-year rainfall event (including an allowance for climate change).
- 5.14. Site levels will be designed to ensure that exceedance flows are directed towards the proposed drainage network and away from buildings. Exceedance flows will be directed to attenuation tanks and conveyance swale.
- 5.15. Should the capacity of the surface water tanks be exceeded during an extreme rainfall event, surface water would flow towards the existing watercourse, currently flowing through the centre of the site.

Water Quality

- 5.16. Development proposals are for commercial/industrial use and ancillary office spaces. Based on Ciria753 Simple Index Treatment Method, the development would have an associated pollution hazard level of 'Medium' to 'High'. The recommended stages of treatment will be provided by the aforementioned attenuation basins and permeable paving. Refer to **Appendix H** for the simple Index Treatment Method calculations.

Maintenance and Management of System

- 5.17. The maintenance of all SuDS components will be in accord with the best practices and the CIRIA C753 The SuDS Manual. The recommended Operation and Maintenance requirements for the

proposed permeable paving, swale and attenuation basins are outlined in the Management Plan in **Appendix I**.

- 5.18. A management company will be appointed to maintain any parts of the network which are not to be offered for adoption to Anglian Water.

6. FOUL WATER DRAINAGE STRATEGY

- 6.1. It is proposed to develop the site to deliver a Net Zero Carbon development of up to 32,000 sqm of employment floorspace within Use Classes E(g)(iii), B2 and B8 and including an Ultra Rapid Electric Vehicle Charging Facility.
- 6.2. The peak foul flow rate for the proposed development has therefore been calculated to be 7.333 l/s. Refer to **Appendix J**.
- 6.3. It is proposed that foul flows from the development will discharge into the existing Anglian Water foul sewer that exists within the centre of the site. Refer to the preliminary drainage strategy drawing no. 2008543-001 provided in **Appendix F**.
- 6.4. Due to the topography of the site a private pumping station will be required.
- 6.5. A pre-planning application has been submitted to Anglian Water to confirm that the existing sewerage network has sufficient capacity to accommodate the proposed foul discharge from the proposed development. A response has not yet been received.

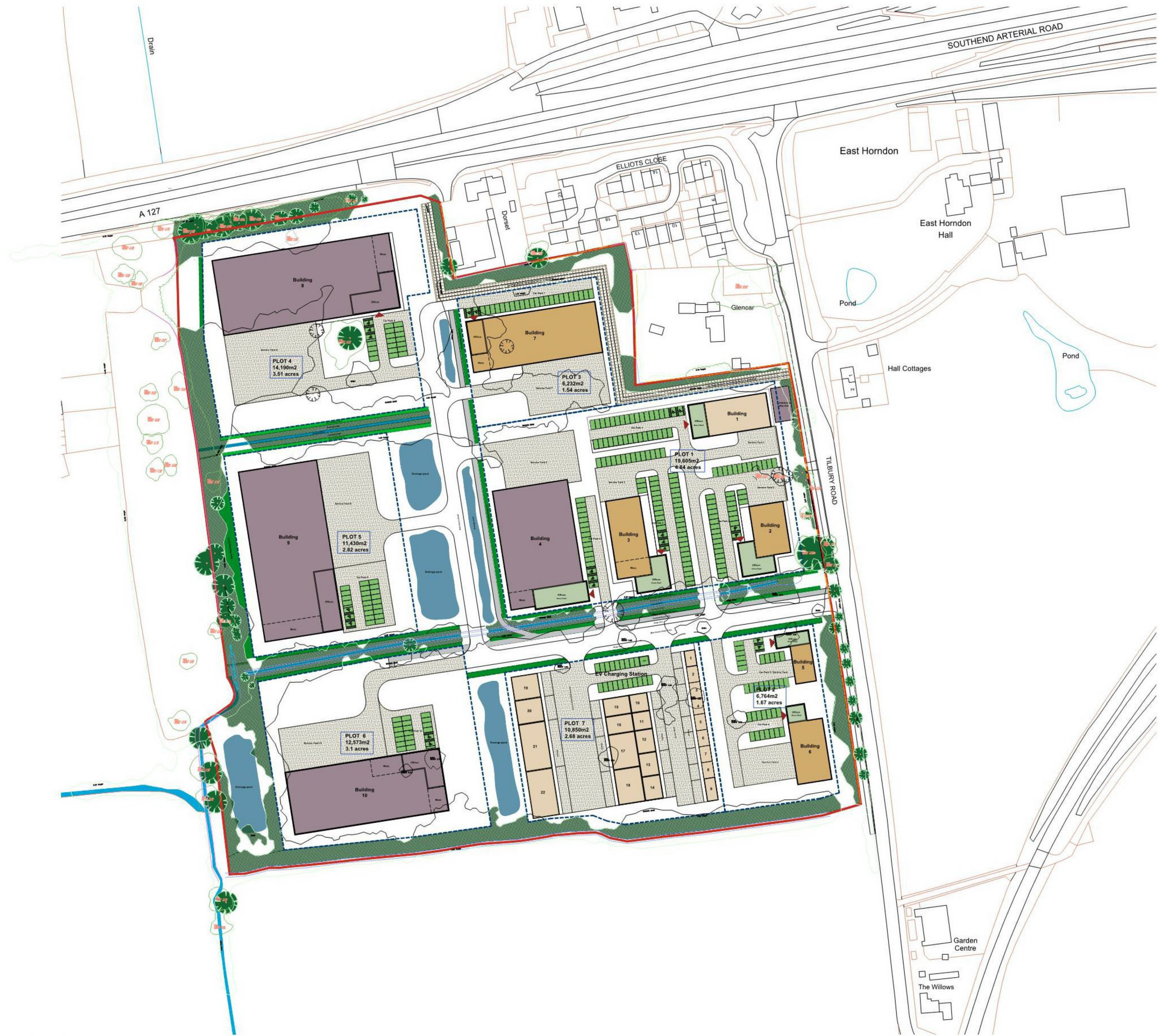
7. SUMMARY AND CONCLUSIONS

- 7.1. Ardent Consulting Engineers has been commissioned by MM Properties (London) Ltd to undertake a Flood Risk Assessment (FRA) and preliminary foul and surface water drainage strategy for the proposed development of the site known as Broadfields, located off Tilbury Road, East Horndon CM13 3LS (referred to as the "Site").
- 7.2. The Site is located entirely within Flood Zone 1, defined as having a low risk of flooding and being suitable for any type of development.
- 7.3. The Site is predominantly at 'Very Low' risk of surface water flooding, with the exception of the western portion of the Site which is considered to be at 'Low' risk, associated with overland flow paths generated in Thorndon Country Park, to the north of the A127.
- 7.4. The EA maps indicate the site is not at risk of surface water flooding from events up to the 1 in 100 AEP ('Medium Risk'), with the exception of a number of very small, localised areas. Predicted flood depths in these areas of the site for the Medium Risk Scenario are below 300mm and are associated with small depression in the terrain. This localised risk will be managed through the implementation proposed drainage network.
- 7.5. Based on the characteristics of the Site, it is proposed to discharge surface water runoff from the Site into the watercourse, currently running through the centre of the site. Surface water will be attenuated within Sustainable Urban Drainage features prior to being discharged to existing ordinary watercourse at a controlled rate equivalent to the mean annual greenfield runoff rate (Q_{bar}) for the developable area of the Site.
- 7.6. After consideration of the CIRIA C753 SuDS Management Train approach, the most viable SuDS option for this site are attenuation basins and attenuation tanks. Permeable paving is proposed in a number of areas in order to provide additional water attenuation and a stage of treatment before discharging into the drainage system.

- 7.7. The surface water drainage strategy has been designed to ensure no flooding occurs as a result of the 1 in 100-year rainfall event (including a 45% allowance for climate change).
- 7.8. In conclusion, this FRA demonstrates that the proposals are consistent with the aims of the NPPF and the Planning Practice Guidance to the NPPF along with the aims of the Strategic Flood Risk Assessment. The Site will not be at significant risk of flooding or increase the flood risk to others.

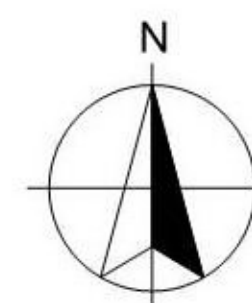
Appendix A

Development Proposals



Indicative Site Layout

scale 1:1250 @ A1



Revision	Notes	Date	Drawn By	Checked By
-	Issued for review	21.09.2022	AS/DL	NW
A	Issued for review	22.09.2022	AS/DL	NW
B	Issued for planning	23.09.2022	AS/DL	NW

Project: Broadfields Innovation and Business Park	Client: MM Properties (London) Ltd.
Date: 23.09.2022	Title: Indicative Site Layout
Drawn: AS	Status: Planning
Checked: NW	Drawing: 0503-A20-007
Scale: 1:1250 @ A1	Rev: B

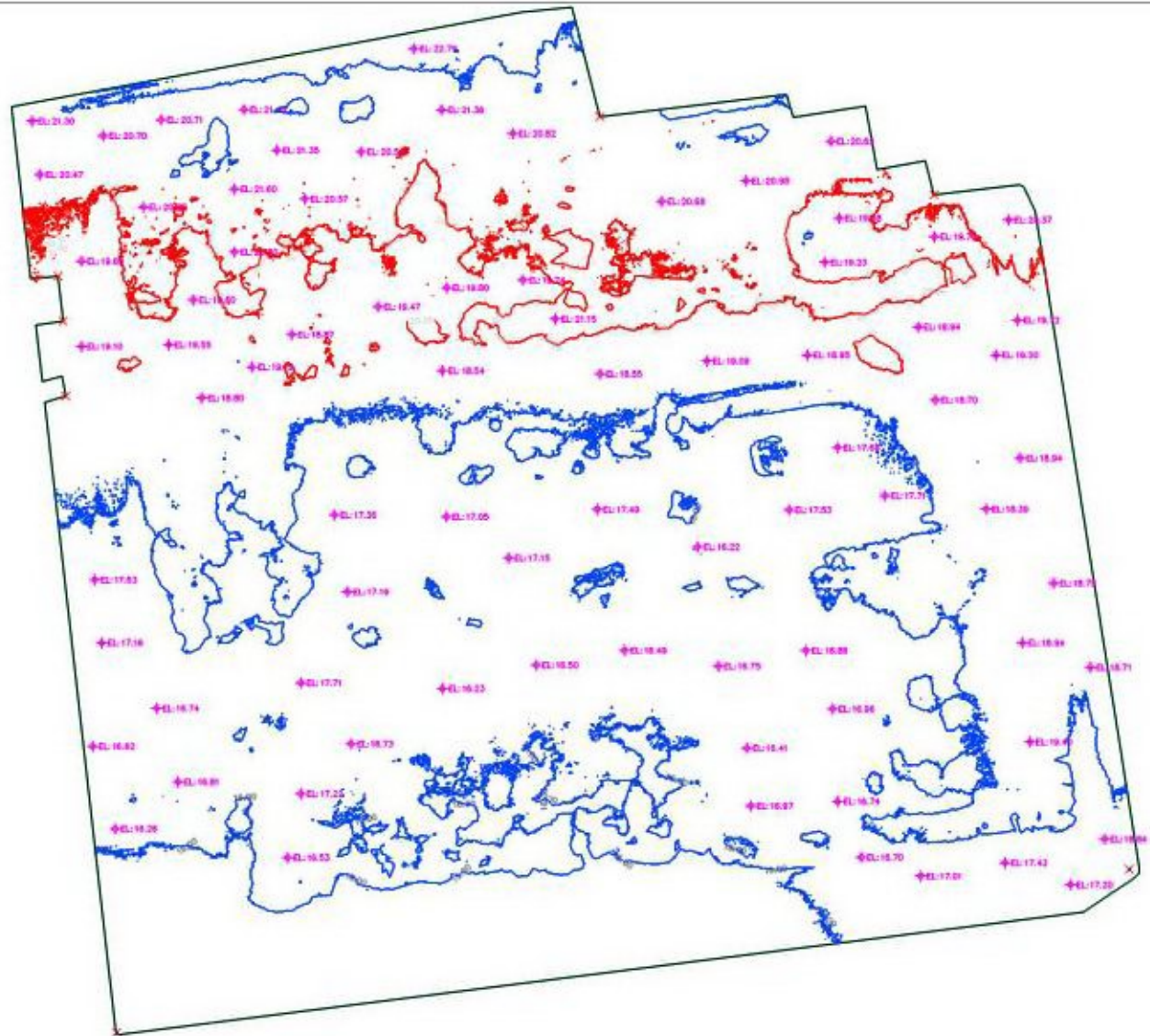


Nicholas Webb Architects plc
 The Old Dairy
 Harpendenbury Farm
 Redbourn
 Hertfordshire AL3 7QA
 Tel: 01582 792500
 Email: admin@nwarchitects.co.uk
www.nwarchitects.co.uk

Notes:
 All setting out of work to be checked before work commences.
 Any errors to be reported to Nicholas Webb Architects before any further work is carried out.
 Work only to measured dimension, do not scale.

Appendix B

Topographical Survey



Appendix C




Anglian Water Asset Plans

Utilities Report

Utility Type

	Electricity	AFFECTED
	Gas	AFFECTED
	Water and Sewerage	AFFECTED
	Telecoms	AFFECTED
	Other	AFFECTED

Report Information

	Works Description: Legal Conveyancing
	This is Batch A - Responses Enclosed
	Awaiting Further Responses

This report is issued for the site described as:

Land off Tilbury Road, West
Horndon, BRENTWOOD

Report Reference:
103696471_1

National Grid Reference:
563550,189170

Customer Reference:
LM / 50340

Report Date:
14/11/2016

CONTACT DETAILS

If you require any assistance please
contact our customer services team on:

0844 844 9966

or by email at:

helpdesk@landmark.co.uk

Utilities Report



Understanding This Report

We have asked a comprehensive list of Utility companies whether they have any apparatus or underground services in the vicinity of the site.

Location Map

This shows the plan that was dispatched to the Utility companies. The companies have been asked to return information on the area outlined, which will encompass your chosen site.

Request Status Report

This will confirm the current status of the information requests. We list which responses we have received and whether the company is affected. The Status Report will be divided into the following sections.

Affected Utilities - We have received plans/information

No response received - We are still awaiting a full response

Not affected utilities - We have received a not affected/no plant present response

Responses

Affected responses are listed by company.

Any responses from companies confirming they are not affected are provided at the back of the report for your records.



'Awaiting Further Responses' or 'Pack Complete' ?

We do not include Local Authority requests when indicating if the pack is 'Complete' or 'Awaiting Further Responses' as Local Authorities are not obliged to reply to these enquiries.

The local authority for the area is contacted to see if they have any council owned property that may be affected by works. In general, these plant enquiries go to the highways department for responses regarding street lighting and drainage. However, the responses we receive can vary each time depending on resources available at the council and we often don't receive replies from local authorities at all.

Response Times

We endeavour to obtain as much of the information as possible within the timescale of this report. Unfortunately, there are occasions when the response times of the utility companies mean we do not receive all information within the chosen timescale.

In these scenarios we will send all the information that is available as a first report. When we receive any remaining responses, the report will be re-issued in full incorporating the new information. This will continue until the report is complete. The front page of the report will confirm the batch (e.g. A, B or C) and whether responses are outstanding.

Terms and Conditions

Full Terms and Conditions can be found on the following link: <http://www.landmarkinfo.co.uk/Terms/Show/515>

Please note that Utility reports have a validity of 3 months from the date of purchase.

If you experience difficulties accessing our Terms and Conditions, please copy and paste the link directly into your browser, you will then be able to access our Terms and Conditions from there. Should you still experience difficulties, please telephone our Customer Service Team on 0844 844 9966.

Next Steps:

For any queries regarding the report content, or help with the report, contact your Landmark Customer Services team.

Utilities Report



Landmark Utilities Report Service PAS 128 Statement

Prepared for: **Landmark Information Group Ltd**

Practitioner: Atkins

Order Number: 50340

Site Name: Land off Tilbury Road, West Horndon, BRENTWOOD

Date of Order: 07/11/2016

Date of Issue: 14/11/2016

Thank you for using our Utility Report Service.

This report has been completed in accordance with the standards defined under Survey Category D of PAS128, a Publicly Available Specification for underground utility detection, verification and location published by the British Standards Institution.

Positional accuracy of plant is not guaranteed from information presented in a desktop search alone and the location of underground utilities should be verified through other means prior to breaking ground.

Information relating to the presence of Radio Frequency Identification Devices (RFIDs) has been requested from relevant utility companies or taken from mapping systems where available.

Utility companies who have not responded to enquiries are referenced on the enclosed Status Report accordingly. Their response will be chased and forwarded on for a period of up to four working weeks. Whilst we cannot guarantee that a utility company will respond to our enquiries, we endeavour to obtain responses from those that have not responded.

Any responses contained within this report have been obtained between the start date of the order and the date of issue.

If you want to discuss your report further with us please contact Landmark Customer Services.

Checked by **PS**



Please ensure that the search data covers the **COMPLETE AREA** within the boundary lines on this map. (marked by: **—**)

Landmark will not be held responsible for any incident or accident arising from the use of the information associated with this particular Statutory Search. The details provided are given in good faith, but no liability whatsoever can be accepted in respect thereof.

REFERENCE: 50340

SITE: Land off Tilbury Road, West Horndon, BRENTWOOD

POST CODES:

CM13 3LJ

SITE SIZE: 21.79 ha

MAP SCALE: 1:5000

COORDINATES:

1) 563546 189151; 2) 563823 189274; 3) 563625 189432; 4) 563326 189328; 5) 563486 188740;

Land off Tilbury Road, West Horndon, BRENTWOOD

OSGR: 563550,189170

Date Requested: 07-Nov-2016

CM13 3LP

Client Reference:

103696471_1

Affected Utilities We have received plans/information from the following companies. Please see the enclosed response.

Utility	Category	Date Issued	Late Response Issue Date	Notes
Anglian Water	Water, Sewerage,	14 Nov 16		Sewer only.
Essex & Suffolk Water	Water,	14 Nov 16		
Essex County Council	Council,	14 Nov 16		See response.
LinesearchbeforeUdig	Pipeline,	14 Nov 16		Essex & Suffolk Water - Identified as affected. See separate response.
National Grid Gas	Gas,	14 Nov 16		
Openreach - [British Telecommunications]	Telecom,	14 Nov 16		
Plancast - [Interoute]	Telecom,	14 Nov 16		
SKY Telecommunications Services	Telecom,	14 Nov 16		See response.
UK Power Networks	Electric,	14 Nov 16		
Vodafone	Telecom,	14 Nov 16		Only affected sent.

No response received We are still awaiting a full response from the following companies.

Utility	Category	Date Issued	Late Response Issue Date	Notes
C.A. Telecom UK - [Colt Technology Services]	Telecom,			
Environment Agency	Environmental Agency,			
Instalcom - [Level 3, Global Crossing (UK) & PEC and Fibernet UK]	Telecom,			
McNicholas - [KPN International]	Telecom,			
McNicholas - [TATA Communications]	Telecom,			
Virgin Media	Telecom,			

Not affected utilities

We have received a not affected/no plant present response from the following companies.

Utility	Category	Date Issued	Late Response Issue Date	Notes
CityFibre	Telecom,	14 Nov 16		Website used.
Energetics	Gas, Electric, Water,	14 Nov 16		
GTC	Telecom, Gas, Electric, Water, Pipeline,	14 Nov 16		
Interoute Vtesse	Telecom,	14 Nov 16		
KCOM Group	Telecom,	14 Nov 16		
Network Rail	Rail,	14 Nov 16		
SSE	Telecom, Gas, Electric,	14 Nov 16		Website used.
Telent - [TeliaSonera]	Telecom,	14 Nov 16		
Trafficmaster	Other,	14 Nov 16		Website used.
Verizon	Telecom,	14 Nov 16		

Checked and Validated By Alison Friend

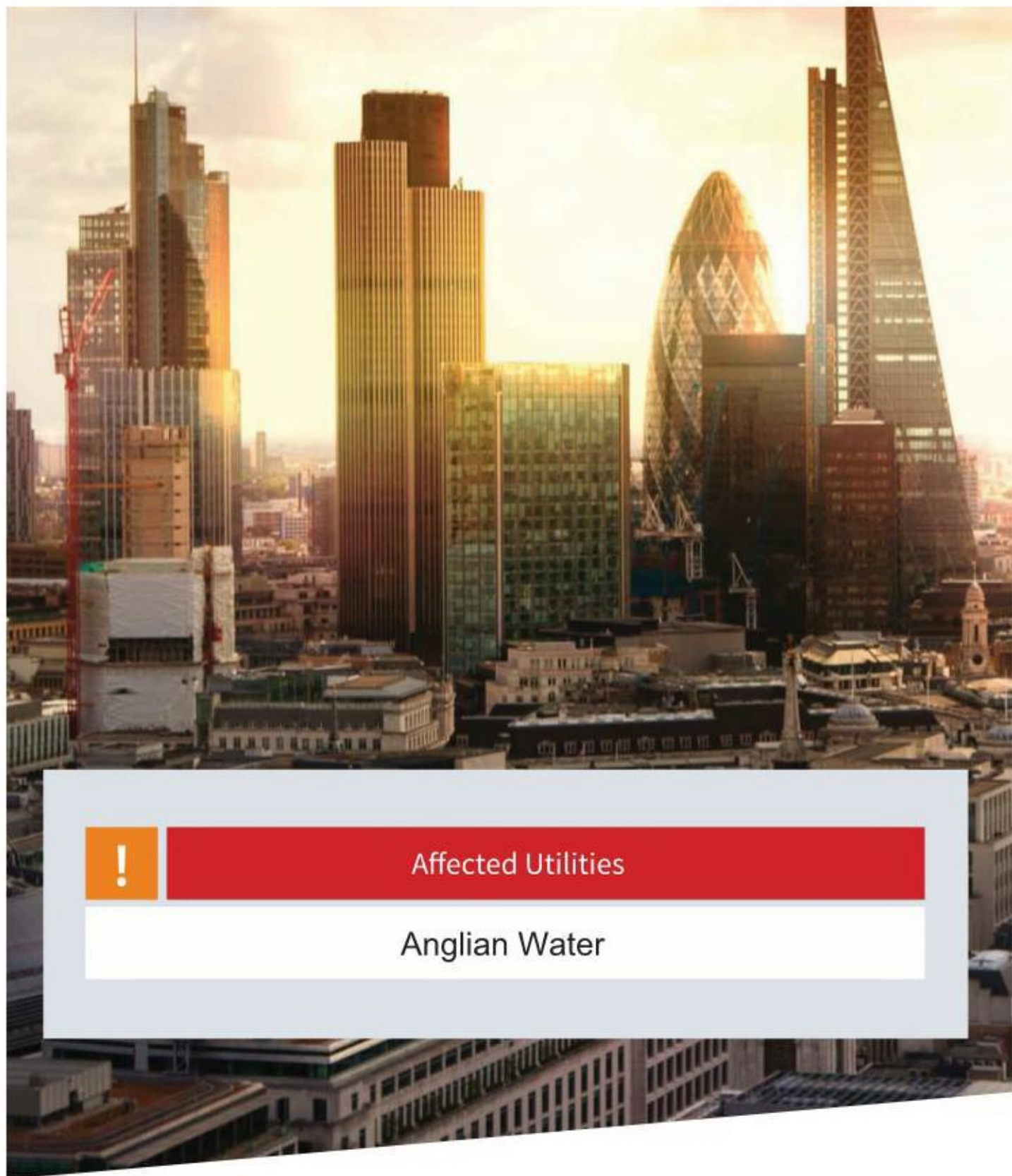
Date 14 November 2016



Definition of Terms

- Affected** Utility supplier is expected to be affected by any work carried out in the area searched as their records indicate their plant is in or close to the area searched. It is recommended to anybody carrying out works in the area that they should consult with the utility company as soon as possible and in any event prior to carrying out any works.
- No response received** At the date of sending the report no response has been received from the utility supplier.
- Not affected** Utility supplier is not expected to be affected by any work carried out in the area searched as their records indicate their plant is not in or close to the area searched.

Utilities Report



Affected Utilities

Anglian Water



CHECKED

Utilities Report



Affected Utilities

Essex & Suffolk Water

50340

LAND OFF TILBURY ROAD WEST HORNDON BRENTWOOD

CHECKED

Site Enquiry

Plan

We enclose Plan(s) showing the approximate position of the Company apparatus in the vicinity of the area of your enquiry.

1. The company is not responsible for private water supply pipes that connect the property to the public system and does not hold details of these.
2. Individual property services have not been shown although it should be assumed they exist.

General Notes

A copy of the standard conditions for working near Company apparatus is enclosed for your information. If you require any further assistance to identify Company apparatus, then do not hesitate to make contact with the Area Office at the contact number shown in the standard conditions.

Important:- Please ensure this detail is made available to anyone carrying out any works which may affect out apparatus.

From the 1st October 2011 there may be lateral drains and/or public sewers which are not recorded on the public sewer map.



On behalf of Northumbrian Water, Essex & Suffolk Water

Tel : 0191 301 6954

Fax : 0191 301 6517

Email : plans@nwl.co.uk

or : assetplans@eswater.co.uk

Date: 09/NOV/2016

Ref: 1136373

**STANDARD CONDITIONS FOR WORKING
NEAR ESSEX & SUFFOLK WATER APPARATUS**



NWG Property Solutions is part of Northumbrian Water Group (NWG)
Northumbrian Water and Essex & Suffolk Water are also part of NWG

**THE FOLLOWING CONDITIONS WILL APPLY TO ALL
WORKS IN THE VICINITY OF COMPANY APPARATUS**

1. Contact should be made with the appropriate Company Area Office prior to the commencement of any work. Arrangements can then be made for the local representative to visit the site and assist in the location and protection of any apparatus affected. The Company must be given two working days notice before any works, including trial holes, are carried out within their easements. Contact **08457 820 999**.
2. The information shown on any plan provided by the Company is for general guidance only. The position of apparatus shown should not be relied upon as being precise. No service pipes are shown on plans.
3. The actual position of apparatus must be established by taking trial holes in all cases. No machine excavation will be permitted within 1 metre side of a main. The actual position of any apparatus must be found by hand excavation.
4. Where Company apparatus is exposed by excavation, support and protection measures are to be agreed on site. Where excavations are taken out below the invert of a main, adequate support is to be provided to prevent collapse of the excavation and subsequent undermining of the main. Special attention is to be given to the compaction of selected backfill material under the main and the company may require the use of lean mix concrete to replace inadequately compacted or unsuitable support backfill material. The compaction of selected backfill material under, around and up to a level of 300mm above the top of any main shall be carried out by hand. Upon completion of operations, any excavation is to be left open until after inspection by Company's representative.
5. No installation of plant may take place within the Company's easements without the prior consent of the Company and with all special conditions and arrangements being finalised before commencement of work.
6. Indiscriminate crossing of the main by heavy construction plant will not be permitted. Where applicable, Crossing Points must be agreed by the Company and any protective measures necessary taken before work begins.
7. Surface boxes and covers should not be removed without obtaining prior consent of the Company. All surface covers to washouts, valves, air valves, hydrants, stopcocks etc. are to be kept clear of obstruction and with free access at all times. If surface boxes or covers have been temporarily removed, positions should be clearly marked.
8. Where the levels of carriageway and footpath surfaces are raised or lowered, then the Company's surface covers must be adjusted as appropriate.
9. No pipes or cables are to be laid or structures placed directly over the line of Company apparatus.
10. Where drains, pipes or cables cross over or under any mains, a minimum clearance of 300mm must be maintained. Where it is necessary for any plant to lay parallel to the pipelines, a minimum distance of 1 metre shall be maintained between the outside of the pipeline and any plant being installed, except in the case of small diameter plant where N.J.U.G 7 dimensions apply. The Company must agree exceptions to these conditions in writing.
11. All crossing of the company's pipelines and easements shall be at right angles where possible. Where skew crossings are necessary, no more than 3 metres of the Company's pipeline shall be exposed at any time.
12. The Company will require three copies of proposal drawings showing the details of any proposed crossing of pipelines above 300mm diameter. The drawings must show the Company's pipelines in relation to the proposed works, to a scale of no less than 1:500 and no work shall commence until the Company has given approval.
13. Where it is necessary to carry out piling works closer than 6m to the Company' apparatus, or to carry out works using plant that is likely to damage the integrity of the Company's apparatus, the Company will require a method statement of the works shall be consulted before work commences.
14. Where the Company's pipeline is protected by a cathodic protection system, the Company will require a suitable joint testing programme to be agreed before the application of any cathodic protection scheme proposed by another authority or utility undertaking. If any bond-wires or test leads associated with the Company's cathodic protection system are damaged, disconnected or found to be in poor condition, the Company should be notified so that repairs can be made.
15. In the case of Trunk mains which cross development sites, no development is to take place within an agreed distance either side of the pipeline. A guide showing the easement widths for the various diameters and depths of pipe is available from Asset Plans.
16. No tree planting or landscaping work is done in close proximity to Company apparatus unless otherwise agreed in writing by the Company. A planting guide is available from Asset Plans.
17. In the event of any damage to any of the Company's plant the Company must be informed immediately. Where any damage occurs to Company apparatus, the appropriate remedial work will be carried out by the Company and charged to the promoter of the works.
18. Every effort should be made to secure the site against vandalism of the Company's plant.
19. A copy of these conditions is to be made available to all Contractors or Sub-Contractors working in the vicinity of Company apparatus.



Valves/Regulators	Fittings/Symbols	Storage/Operations	Network Types	Specific Main Types	Area Types
P1			Distribution Treated Raw Fire Supply	Abandoned Asbestos Abandoned Out of Commission Private	Water Quality District Metering Easement



User : DAWSJ1

Date : 09/11/2016 09:16:18

Title : 0000

Map Sheet : TQ6389

Centre Point : 563543,189088

Paper / Scale : A3@1:2700

The material contained on this plot has been reproduced from an Ordnance Survey map with permission of the controller of H.M.S.O. Crown Copyright Reserved. Licence No. 100022480. The information shown on this plan should be regarded as approximate and is intended for guidance only. No Liability of any kind whatsoever is accepted by Essex & Suffolk Water, it's servants or agents for any omission. The actual position of any mains shown on the plan must be established by taking trial holes in all cases. Essex & Suffolk Water must be given two working days notice of their intention to excavate trial holes. Private connections are not shown but their presence should be anticipated. **WARNING**...Where indicated on the plan there could be abandoned asbestos cement materials or shards of pipe. If excavating in the vicinity of these abandoned asbestos cement materials, the appropriate Health & Safety precautions should be taken. Essex & Suffolk Water accepts no liability in respect of claims, costs, losses or other liabilities which arise as the result of the presence of the pipes or any failure to take adequate precautions. Emergency Telephone Number: 0345 782 0999



Utilities Report



Affected Utilities

Essex County Council

STREETLIGHTING

Please see attached PDF/Map showing the marked area where we believe Essex County Council owned private cable networks to be present. Please refer to the below Terms below for the use of this information.

IMPORTANT READ THE TERMS OF USE SET OUT IN PARAGRAPHS 1 to 12 INCLUSIVE BELOW.

TERMS OF USE

1. *Essex County Council does not warrant that the information provided to you is correct. You rely upon it at your risk.*
2. *The information provided to you is that held in our electronic records at the date of its provision to you.*
3. *The information about electrical plant and/or electric lines provided to you belongs to and remains the property of Essex County Council. You shall not alter it in any respect.*
4. *The information provided to you about the electrical plant and/or electric lines depicted on the plans is **NOT** a complete record of such apparatus belonging to Essex County Council. The information provided relates to electric lines and/or electrical plant belonging to Essex County Council that it believes to be present but the plans are **NOT** definitive: other electric lines and/or electrical plant may be present and that may or may not belong to Essex County Council.*
5. *Apparatus not belonging to Essex County Council is not shown on the plans. It is your responsibility to make your own enquiries elsewhere to discover whether apparatus belonging to others is present. It would be prudent to assume that other apparatus is present.*
6. *Essex County Council will not supply paper copies of the plans made available to you through this email. You are responsible for ensuring:*
 - 6.1 *That the information made available to you through this email is passed to those acting on your behalf; and*
 - 6.2 *That all such persons also accept these Terms of Use.*
7. *Because the information provided to you may **NOT** be accurate you are recommended to ascertain the presence of all electric lines and/or electrical plant by the digging of trial holes. **Trial holes should be dug by hand only.** Excavations must be carried out in line with the Health and Safety Executive guidance document HSG 47.*
8. *Any work near to any overhead electric lines will be carried out by you in accordance with the Health and Safety Executive guidance document GS6 recommendations. The GS6 Recommendations may be purchased from HSE Books or downloaded from the Energy Networks Association's website www.hse.gov.uk*
9. *You are responsible for the security of the information provided to you.*
10. *The information that Essex County Council has provided to you must not be given or sold or made available upon payment of a fee to a third party.*
11. *Essex County Council has no liability to you in contract, in tort (including negligence), for breach of statutory duty or otherwise howsoever arising for any losses, damages, costs, claims, demands, or expenses that you may suffer or incur as a result of using the information provided to you whether for physical damage to property or for any economic loss (including without limitation loss of profit, loss of opportunity, loss of savings loss of goodwill loss of business loss of use) or any special or consequential loss or damage whatsoever.*
12. *If you wish to contact Essex County Council about this information you should contact: street.lighting@essex.gov.uk*



Draw Line on
Personal drawing layer

Line	Colour	Width	Style
	Red	2	Solid

Importance: High

Good Afternoon,

Although we may have apparatus within the vicinity that you have specified, we do not hold any records. We would therefore ask that you please hand dig this area with care.

Thank you

**Debbie Goddard / Streetworks Technician
Highways**

Ringway Jacobs | Essex County Council
Unit 36, Childerditch Industrial Park, Childerditch Hall Drive, Brentwood, CM13 3HD

T: **Mobile: 07725 607262**

E: Debbie.Goddard@essexhighways.org

W: www.essex.gov.uk/highways

Urgent- It would be greatly appreciated if you could reply ASAP, where possible by 11/11/2016 Thanks in advance.

Our Reference: 50340

Site Name: Land off Tilbury Road, West Horndon, BRENTWOOD

Works Description: Development Appraisal

Site Grid References: 563534 189086,563773 189280,563376 189320,563619 189382,563486 188790

To whom it may concern,

Please find enclosed a plant enquiry for your attention.

We request plans showing the location of your company's affected plant in relation to the entire site area shown within the boundary on the attached map. Grid references and postcodes relative to the site boundary are provided on the attached map to help you locate the site.

Within your response please quote our reference number and the name of the site shown above. If you do not have any apparatus in this area, please could you send written confirmation to declare that no apparatus is affected. Please also include information relating to the use and location of Radio Frequency Identification Devices (RFIDs) where available.



ITS MAINTENANCE – TRAFFIC SIGNALS

Dear Sir/Madam

Further to your recent email regarding the proposed works at:

Land off Tilbury Road, West Horndon, BRENTWOOD

I can confirm that we have no Traffic Control equipment underground services in the immediate vicinity of the proposed works detailed below.

If you have any queries please contact the ITS Maintenance team on the details below:

Email - ITSMaintenance@essexhighways.org

Telephone - 01245 342796 (ITS Maintenance Fault Report Desk)



Urgent- It would be greatly appreciated if you could reply ASAP, where possible by 11/11/2016 Thanks in advance.

Our Reference: 50340

Site Name: Land off Tilbury Road, West Horndon, BRENTWOOD

Works Description: Development Appraisal

Site Grid References: 563534 189086,563773 189280,563376 189320,563619 189382,563486 188790

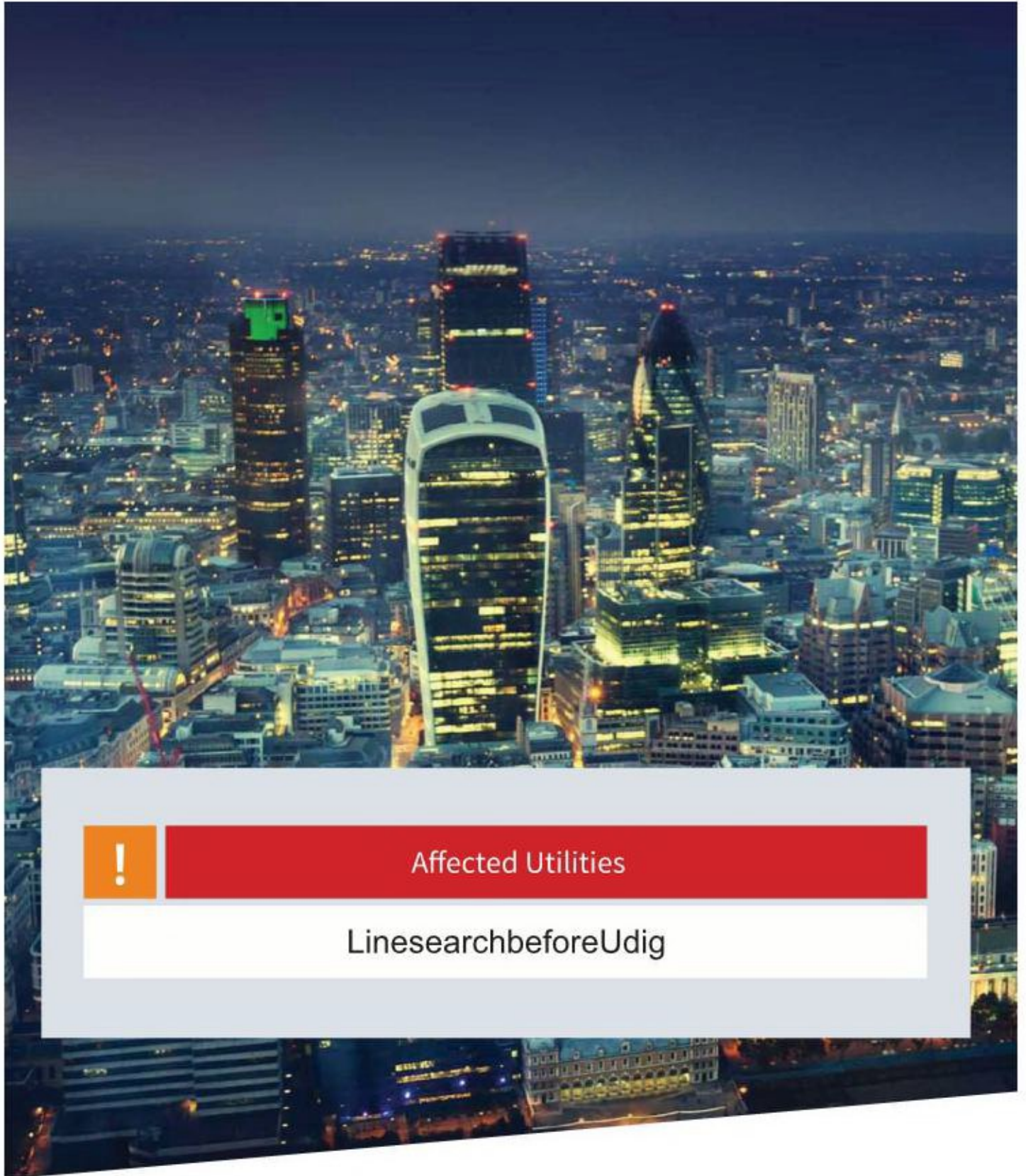
To whom it may concern,

Please find enclosed a plant enquiry for your attention.

We request plans showing the location of your company's affected plant in relation to the [entire site area shown within the boundary on the attached map](#). Grid references and postcodes relative to the site boundary are provided on the attached map to help you locate the site.

Within your response please quote our reference number and the name of the site shown above. If you do not have any apparatus in this area, please could you send written confirmation to declare that no apparatus is affected. Please also include information relating to the use and location of Radio Frequency Identification Devices (RFIDs) where available.

Utilities Report



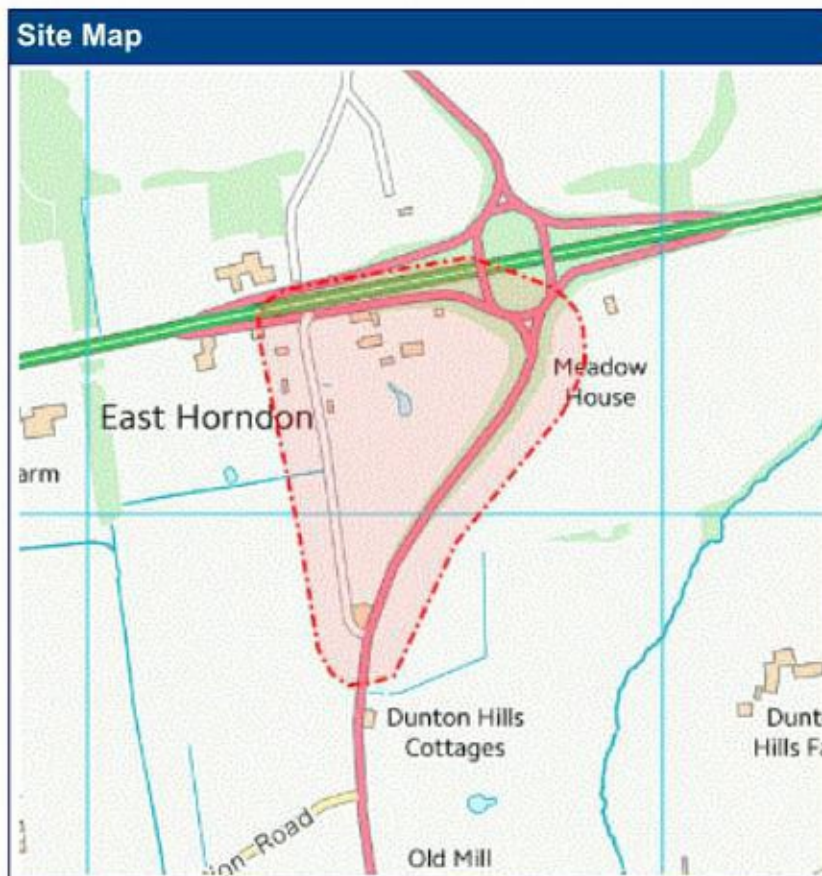
Affected Utilities

LinesearchbeforeUdig

Enquirer			
Name	Ms Christina Elliott	Phone	01454 662397
Company	Atkins	Mobile	Not Supplied
		Fax	Not Supplied
Address	500 Park Avenue Aztec West Almondsbury Bristol BS32 4RZ		
Email	stat.enquiries@atkinglobal.com		
Notes	Please ensure your contact details are correct and up to date on the system in case the LSBUD Members need to contact you.		

Enquiry Details			
Scheme/Reference	LM 50340/SuG		
Enquiry type	Initial Enquiry	Work category	Utility Works
Start date	11/11/2016	Work type	Single excavation site
End date	11/02/2017	Site size	262863 metres square
Searched location	XY= 563546, 189151 Easting/Northing	Work type buffer*	25 metres
Confirmed location	563546 189069		

* The WORK TYPE BUFFER is a distance added to your search area based on the Work type you have chosen.



LSBUD Members who have assets registered on the LSBUD service within the vicinity of your search area.

List of affected LSBUD members

Asset Owner	Phone/Email	Emergency Only	Status
Essex & Suffolk Water	01913016954	08702417408	Await response

LSBUD members who do not have assets registered on the LSBUD service within the vicinity of your search area. Please be aware that LSBUD members make regular changes to their assets.

List of not affected LSBUD members

AWE Pipeline	ESSAR	Petroineos
BOC Limited (A Member of the Linde Group)	Esso Petroleum Company Limited	Phillips 66
BP Midstream Pipelines	FibreSpeed Limited	Premier Transmission Ltd (SNIP)
BPA	Fulcrum Pipelines Limited	Redundant Pipelines - LPDA
Carrington Gas Pipeline	Gamma	RWEnpower (Little Barford and South Haven)
CATS Pipeline c/o Wood Group PSN	Humbly Grove Energy	SABIC UK Petrochemicals
Cemex	IGas Energy	Scottish Power Generation
Centrica Energy	Ineos Enterprises Limited	Seabank Power Ltd
Centrica Storage Ltd	INEOS Manufacturing (Scotland and TSEP)	Shell (St Fergus to Mossmorran)
CLH Pipeline System Ltd	Lark Energy	Shell Pipelines
Concept Solutions People Ltd	Lightsource SPV Limited	Total (Finaline, Colnbrook & Colwick Pipelines)
ConocoPhillips (UK) Ltd	Mainline Pipelines Limited	Transmission Capital
Coryton Energy Co Ltd (Gas Pipeline)	Manchester Jetline Limited	Uniper UK Ltd
Dong Energy (UK) Ltd	Manx Cable Company	Vattenfall
E.ON UK CHP Limited	Marchwood Power Ltd (Gas Pipeline)	Western Power Distribution
EirGrid	National Grid Gas (Above 7 bar), National Grid Gas Distribution Limited (Above 2 bar) and National Grid Electricity Transmission	Wingas Storage UK Ltd
Electricity North West Limited	NPower CHP Pipelines	Zayo Group UK Ltd c/o JSM Group Ltd
ENI & Himor c/o Penspen Ltd	Oikos Storage Limited	
ESP Utilities Group	Perenco UK Limited (Purbeck Southampton Pipeline)	

Utilities Report



Affected Utilities

National Grid Gas

WARNING! This area contains Gas Mains
 Operating at High Pressure in Excess of 7 bar.
 Before excavating in the area call 0800
 688588.



SCALE: Not to scale
 USER ID: SHET4973
 DATE: 08/11/2016
 EXTRACT DATE: 10/06/2016
 MAP REF: TQ6389
 CENTRE: 563555, 189102

LP MAINS	
MP MAINS	
IP MAINS	
LHP MAINS	
NHP MAINS	

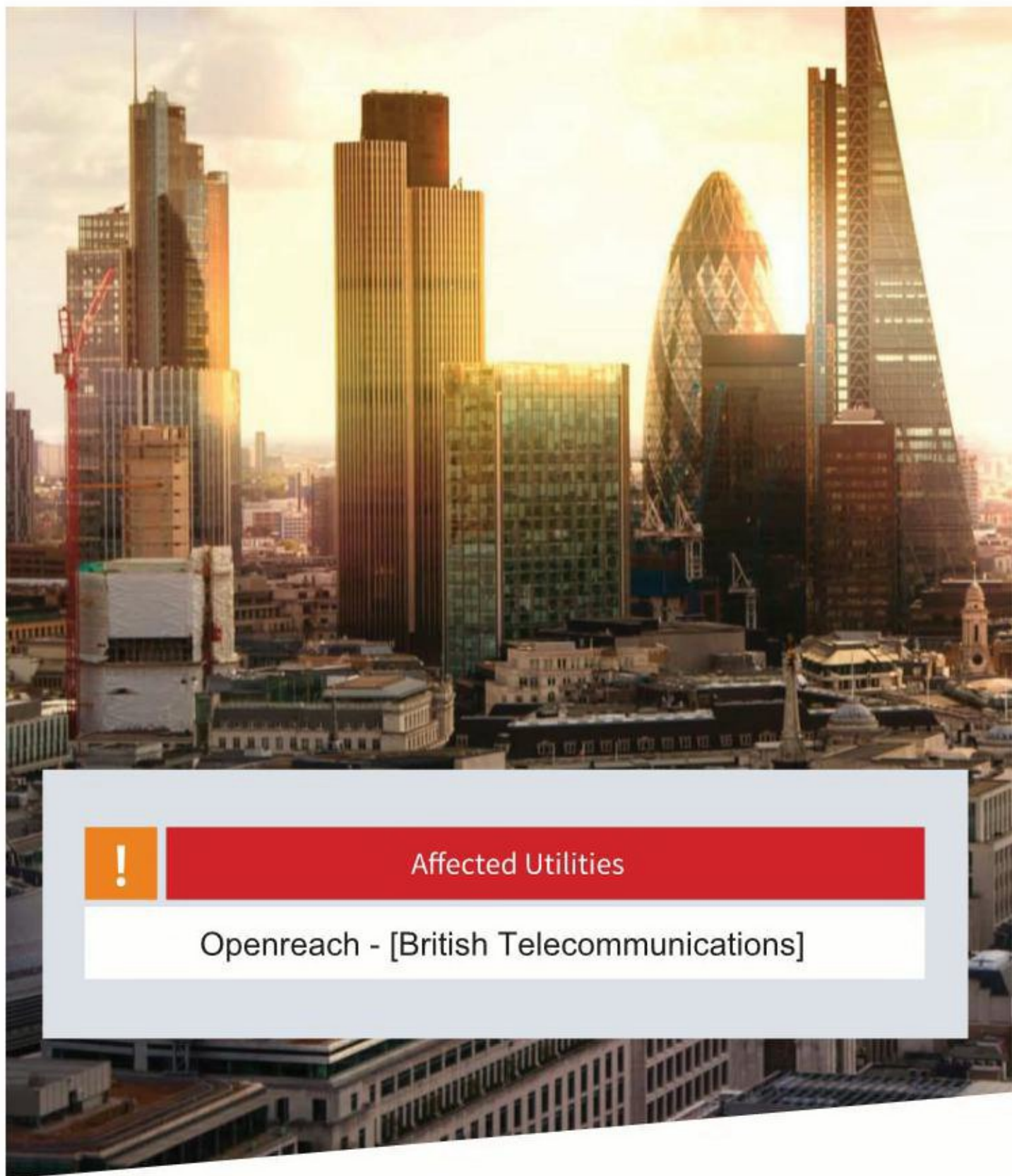
This plan shows those pipes owned by National Grid Gas plc in their role as a Licensed Gas Transporter (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections, etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by National Grid Gas plc or their agents, servants or contractors for any error or omission. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue. Further information on all DR4s can be determined by calling the DR4 hotline on 01455 892426 (9am-5pm) A DR4 is where a potential error has been identified within the asset record and a process is currently underway to investigate and resolve the error as appropriate.



CHECKED

MAPS Viewer Version 5.6.7.0
 Local Machine
 This plan is reproduced from or based on the OS map by National Grid Gas plc, with the sanction of the controller of HM Stationery Office. Crown Copyright Reserved.

Utilities Report



Affected Utilities

Openreach - [British Telecommunications]



Our Ref: Ref shown on map

email: DBYD@openreach.co.uk
Phone: 0800 023 2023. Option 5

Date of issue shown on map

Dear Customer,

NR & SW ACT 1991 – PROPOSED WORKS AT:

Prior to commencement of work: for free onsite guidance and accurate up to date location of BT plant please contact our Plant Protection Service by the following methods

***Email Dial before you dig** DBYD@openreach.co.uk*

***Visit the website** www.dialbeforeyoudig.com*

Thank you for your request of describing the above proposals.

Enclosed are copies of our drawing marked up to show the approximate locations of BT apparatus which is present in the immediate vicinity of your works. It is intended for general guidance only. No guarantee is given of its accuracy.

It should not be relied upon in the event of excavations or other works made near to British Telecommunications plc apparatus which may exist at various depths and may deviate from the marked route.

To avoid damage it is recommended that mechanical excavators or borers are not used within 600mm of British Telecommunications plc plant. If scaffolding is erected, please ensure that our equipment is not enclosed, blocked, covered or otherwise obstructed by the scaffolding.

In the event of BT apparatus being in the area of works we recommend that your plant/vehicle crossing is either resited, or apply for a budget estimate by submitting detailed plans to the above address, these will be forwarded to the appropriate department for their comments.

Please ensure you quote our reference on any future correspondence.

Yours faithfully,

Maps by email Plant Information Reply



IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.



openreach
BT

CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08.00 to 17.00)
www.openreach.co.uk/cbyd

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KEY TO BT SYMBOLS

DP	
Planned DP	
PCP	
Planned PCP	
Built	
Planned	
Inferred	
Building	
Kiosk	
Hatchings	

Pole	
Planned Pole	
Joint Box	
Change Of State	
Split Coupling	
Duct Tee	
Planned Box	
Manhole	
Planned Manhole	
Cabinet	
Planned Cabinet	

Other proposed plant is shown using dashed lines.
BT Symbols not listed above maybe disregarded.
Existing BT Plant may not be recorded.
Information valid at time of creation

openreach
a BT Group business

BT Ref : LWU06505D

Map Reference : (centre) TQ635 758932

Easting/Northing : (centre) 563575,1893

Issued : 08/11/2016 06:50:38

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk

Maps by email Plant Information Reply



IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy. It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.



openreach
BT

CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08.00 to 17.00)
www.openreach.co.uk/cbyd

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(C) Crown Copyright British Telecommunications plc 100028040

KEY TO BT SYMBOLS

DP	
Planned DP	
PCP	
Planned PCP	
Built	
Planned	
Inferred	
Building	
Kiosk	
Hatchings	

Pole	
Planned Pole	
Joint Box	
Change Of State	
Split Coupling	
Duct Tee	
Planned Box	
Manhole	
Planned Manhole	
Cabinet	
Planned Cabinet	

Other proposed plant is shown using dashed lines.
BT Symbols not listed above maybe disregarded.
Existing BT Plant may not be recorded.
Information valid at time of operation

openreach
a BT Group business

BT Ref : CWX06509Q

Map Reference : (centre) TQ6359288875

Easting/Northing : (centre) 563592,188875

Issued : 08/11/2016 06:50:59



WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk

Utilities Report



Affected Utilities

Plancast - [Interoute]



This response does not include Vtesse or Easynet plant, please continue to use Vtesse or Easynet details for their enquiries

To whom it may concern,

Thank you for your enquiry regarding the above proposals at the above location

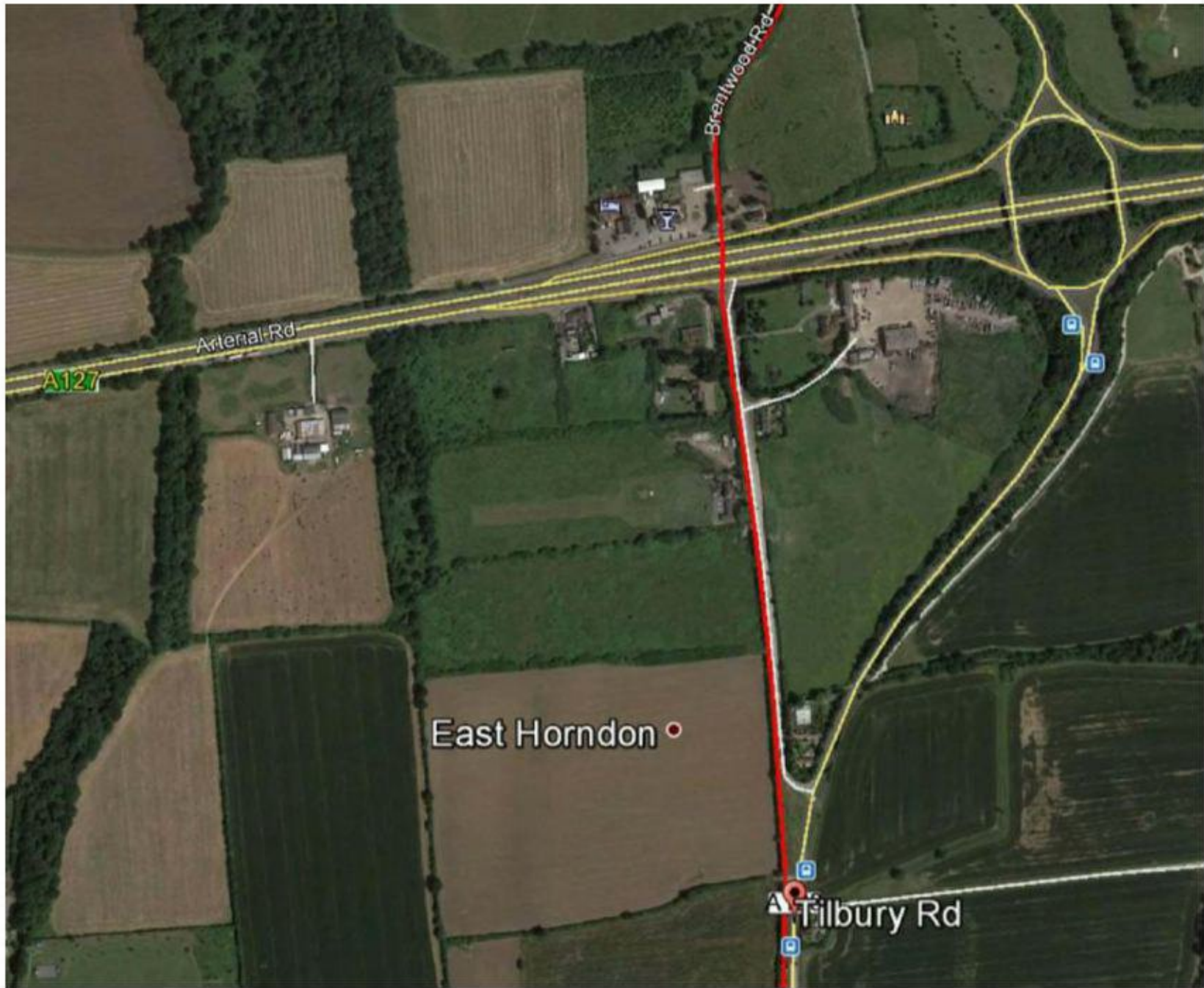
We would advise that there is Interoute duct and fibre optic cable existing in the approximate location of your work as indicated by way of a RED line on the enclosed marked up drawings and only hand digging methods, that will ensure the safety of Interoute plant should be employed, until the precise location of the plant has been established and marked.

Please note the following:

1. The information provided is for general guidance only and no guarantee is given of the accuracy. The location of Interoute plant shown on the route plan is specific to that point at the date of this enquiry and to the best of our knowledge.
2. The information provided is given without warranty and therefore, the accuracy cannot be guaranteed. Some building connections may not be shown but their presence should be anticipated.
3. The information provided is not to be relied upon in the event of excavations or other works made near to Interoute plant, as this plant may exist at various depths or deviate from the indicated route
4. Any information provided by Interoute at any time, shall not in any way reduce and or limit / mitigate your liability or duty to safeguard Interoute plant and or equipment.
5. No liability of any kind whatsoever is accepted by Interoute or their Agents, servants or contractors for any error or omission in the information provided.
6. The information provided should not be referred to beyond a period of 28 days from the date of this enquiry.
7. Safe digging practices, in accordance with HS(G)47, must be used to establish the actual position of the plant on site before any mechanical plant is used. Mechanical equipment must not be used within 500mm of any part of Interoute plant without Interoute or their Agents written authority. If scaffolding is erected, you are to ensure that the Interoute plant or equipment is not enclosed, blocked, covered or otherwise obstructed by the scaffolding.
8. Trial excavations must be carried out to confirm the identification, exact location and depths, of Interoute plant.
9. Interoute must be advised on 01296 662647 or by e-mail to Interoute.Enquiries@plancast.co.uk if any Interoute plant or equipment is exposed or when damage to Interoute plant is sustained.
10. Your representatives and/or agents shall comply with any reasonable request to safeguard and or facilitate the repair of Interoute plant and you will be liable to any damage caused by your operations and for all remedial works and all related expenses.
11. We may require a meeting to be convened with our Agent's representative on site, to determine the impact of the proposed works on the Interoute plant. This may result in the re-design of the proposed works or an application can be made to PLANCAST to provide a C3 estimate to re-locate the Interoute plant.
12. You should be made aware that it is a criminal offence under the Telecommunications Act 1984 to alter or disturb any telecommunications apparatus without the owner's written consent or a Court Order.

Kind regards

PLANCAST Plant Enquiry Department



East Horndon

Tilbury Rd

Arterial Rd

A127

Brentwood Rd

The Old Haybarn
Rosebery Mews, Mentmore
Bedfordshire LU7 0UE

T: 01296 662647
www.plancast.co.uk

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Registered office: 1st Floor, The Old Haybarn, Rosebery Mews, Mentmore LU7 0UE.

Registered in England and Wales with number 4455025 VAT No. 8567 195 80

-----Original Message-----

From: atkinsstatutory.enquiries@atkinsglobal.com [mailto:atkinsstatutory.enquiries@atkinsglobal.com]

Sent: 08 November 2016 04:17

To: plantenquiries@catelecomuk.com; plantenquiries@energetics-uk.com; enquiries@environment-agency.gov.uk; plantenquiries@instalcom.co.uk; plantenquiries@mcnicholas.co.uk; plantenquiries@mcnicholas.co.uk; opburiedservicesenquiries@networkrail.co.uk; Interoute Enquiries <interoute.enquiries@plancast.co.uk>; nrswa@sky.uk; osp-team@uk.verizon.com; osp-team@uk.verizonbusiness.com; osm.enquiries@atkinsglobal.com

Cc: atkinsstatutory.enquiries@atkinsglobal.com

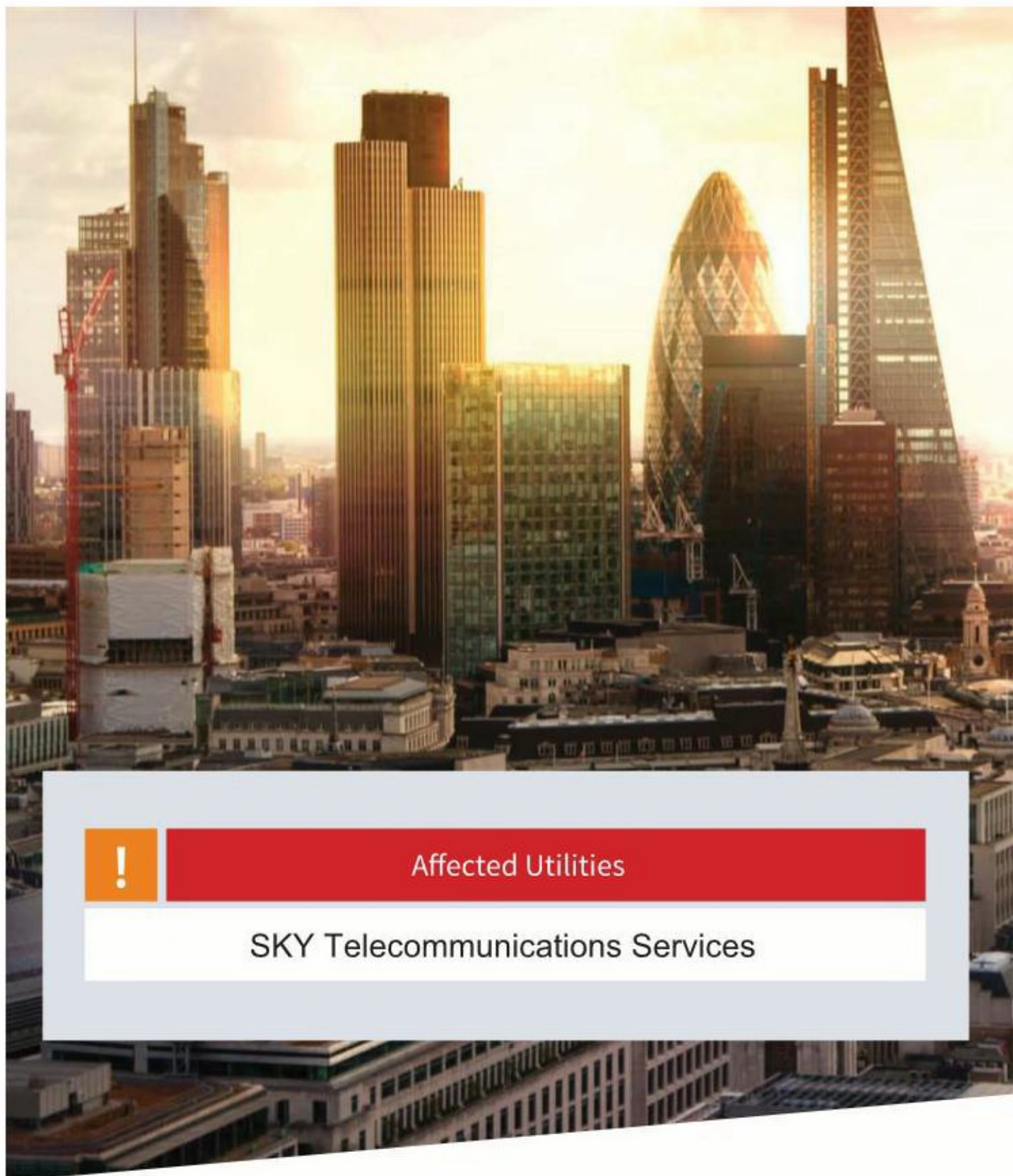
Subject: Plant Enquiry - 50340 - Land off Tilbury Road, West Horndon, BRENTWOOD - Please respond by 11/11/2016

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Consider the environment. Please don't print this e-mail unless you really need to.

Utilities Report



Affected Utilities

SKY Telecommunications Services

Ready to Dig
ATKINS
atkinsstatutory.enquiries@atkinsglobal.com

SKY
Telecommunications
Services Ltd
70
Buckingham
Avenue
SLOUGH
SL1 4PN
Tel: 0207 0323
234/250
Fax: 020
70323252
email:
nrswa@sky.uk

Date	Our Reference	Your Reference
08 November 2016	PEA-16-11-0054	50340

**RE: Land off Tilbury Road, West Horndon, BRENTWOOD
E563534 189086,N563486 188790**

Further to your recent enquiry at the location above, the following SKY route(s) are affected:
DLIS, Telehouse North to Ipswich

Although the above SKY route(s) are affected, InterRoute are responsible for the maintenance or diversion of the affected route as SKY only lease Fibre or Duct from them. For further information or detailed plans for this area, please contact their Enquiry Team.

You may be able to contact InterRoute, by email: Interoute.enquiries@plancast.co.uk. Please be aware that this information may no longer be valid and we do not have any further contact details for this company. Please visit their company website for more information.

Yours sincerely

NRSWA Department
Network Infrastructure
Sky Network Services

Utilities Report



Affected Utilities

UK Power Networks



Mr. Andy Aitken
Atkins Communications
The Hub
500 Park Avenue
Aztec West
Almondsbury
BS32 4RZ

CHECKED

Our Ref: 2016/2237717
Your Ref: 50340
10/11/2016

Dear Sir/Madam

LAND OFF TILBURY ROAD, WEST HORNDON, BRENTWOOD CM13 3LJ

Thank you for your letter of 09/11/2016 in which you asked if there are any electric lines and/or electrical plant belonging to UK Power Networks (EPN) plc ("UK Power Networks") within the land identified by your enquiry.

I enclose a copy of UK Power Networks record of its electric lines and/or electrical plant at the site identified by your enquiry. If the records provided do not relate to the land to which you had intended to refer please resubmit your enquiry.

This information is made available to you on the terms set out below.

- 1. UK Power Networks does not warrant that the information provided to you is correct. You rely upon it at your own risk.**
- UK Power Networks does not exclude or limit its liability if it causes the death of any person or causes personal injury to a person where such death or personal injury is caused by its negligence.
- Subject to paragraph 2 UK Power Networks has no liability to you in contract, in tort (including negligence), for breach of statutory duty or otherwise how for any loss, damage, costs, claims, demands, or expenses that you or any third party may suffer or incur as a result of using the information provided whether for physical damage to property or for any economic loss (including without limitation loss of profit, loss of opportunity, loss of savings, loss of goodwill, loss of business, loss of use) or any special or consequential loss or damage whatsoever.**
- The information about UK Power Networks electrical plant and/or electric lines provided to you belongs to and remains the property of UK Power Networks. You must not alter it in any respect.
- The information provided to you about the electrical plant and/or electric lines depicted on the plans may NOT be a complete record of such apparatus belonging to UK Power Networks. The information provided relates to electric lines and/or electrical plant belonging to UK Power Networks that it believes to be present but the plans are NOT definitive: other electric lines and/or electrical plant may be present and that may or may not belong to UK Power Networks.**
- Other apparatus not belonging to UK Power Networks is not shown on the plan. It is your responsibility to make your own enquiries elsewhere to discover whether apparatus**

belonging to others is present. It would be prudent to assume that other apparatus is present.

7. You are responsible for ensuring that the information made available to you is passed to those acting on your behalf and that all such persons are made aware of the contents of this letter.
8. Because the information provided to you may **NOT** be accurate, you are recommended to ascertain the presence of UK Power Networks electric lines and/or electrical plant by the digging of trial holes. **Trial holes should be dug by hand only**. Excavations must be carried out in line with the Health and Safety Executive guidance document HSG 47. We will not undertake this work. A copy of HSG 47 can be obtained from the Health and Safety Executives website.

All electric lines discovered must be considered LIVE and DANGEROUS at all times and must not be cut, resited, suspended, bent or interfered with unless specially authorised by UK Power Networks.

The electric line and electrical plant belonging to UK Power Networks remains so even when made dead and abandoned and any such electric line and/or electrical plant exposed shall be reported to UK Power Networks.

Where your works are likely to affect our electric lines and/or electrical plant an estimate of the price of any protective /diversionary works can be prepared by UK Power Networks Branch at Metropolitan House, Darkes Lane, Potters Bar, Herts. , EN6 1AG, telephone no. 0845 2340040

- 9 **Any work near to any overhead electric lines must be carried out by you in accordance with the Health and Safety Executive guidance document GS6 and the Electricity at Work Regulations.**

The GS6 Recommendations may be purchased from HSE Books or downloaded from the Energy Networks Association's website.

If given a reasonable period of prior notice UK Power Networks will attend on site without charge to advise how and where "goal posts" should be erected. If you wish to avail yourself of this service, in the first instance please telephone: 0845 6014516 between 08:30 and 17:00 Monday to Friday, Public and bank holidays excepted.

10. You are responsible for the security of the information provided to you. It must not be given, sold or made available upon payment of a fee to a third party.
11. If in carrying out work on land in, on, under or over which is installed an electric line and/or electrical plant that belongs to UK Power Networks you and/or anyone working on your behalf damages (however slightly) that apparatus you must inform immediately UK Power Networks by telephone at the number below providing:
 - your name, address and telephone number; and
 - the date, time and place at which such damage was caused; and
 - a description of the electric line and/or electrical plant to which damage was caused; and
 - the name of the person whom it appears to you is responsible for that damage; and
 - the nature of the damage

In the East of England or London 0800 780078 (24 Hours).

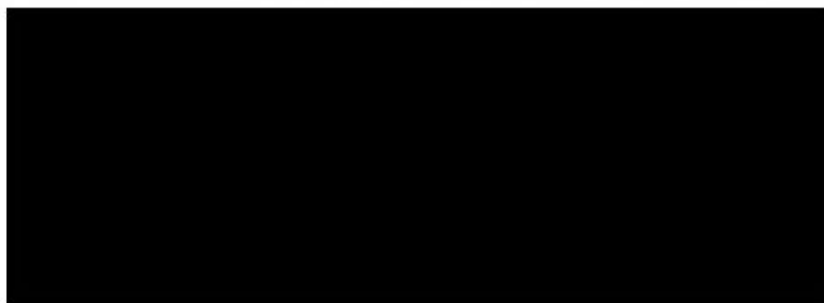
12. The expression "UK Power Networks" includes UK Power Networks (EPN) plc, UK Power Networks (LPN) plc, UK Power Networks (SEPN) plc, UK Power Networks and any of their successors and predecessors in title.

IF YOU DO **NOT** ACCEPT AND/OR **DO NOT** UNDERSTAND THE TERMS OF USE SET OUT IN PARAGRAPHS 1 TO 12 INCLUSIVE ABOVE YOU MUST NOT USE THE PLANS AND RETURN THEM TO ME.

I would remind you that work adjacent to electric lines and/or electrical plant represents a serious risk to health and safety and as such should feature amongst the items you have assessed in your workplace risk assessment and method statement.

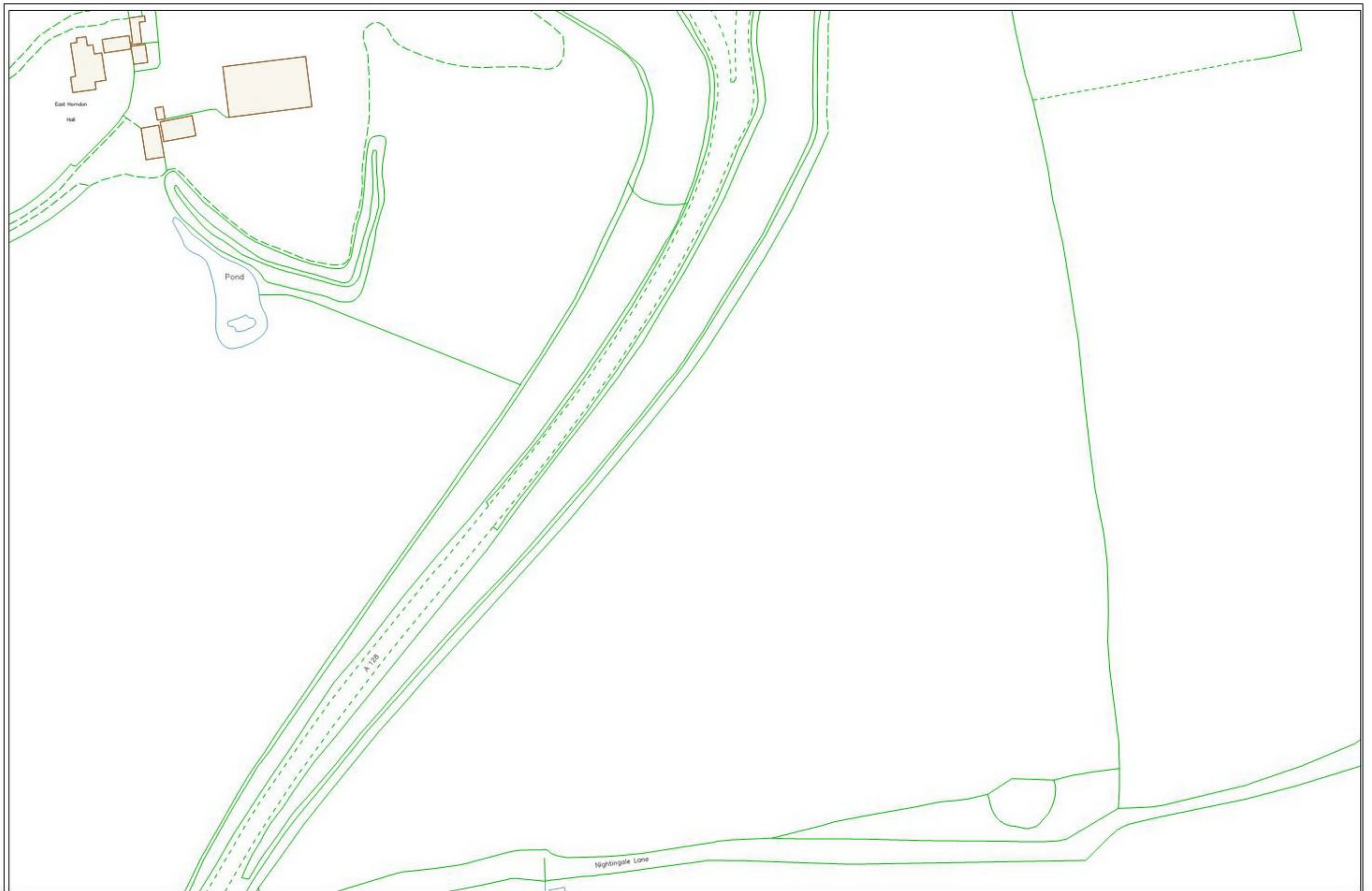
The enclosed plans normally only show the mains electricity cables. Service cables are not usually shown in the East of England. A service cable is the cable that takes the electricity from the mains cable to your property and ends at the main fuse close to the meter.

I shall be pleased to supply you with further assistance if you require it.



UK Power Networks, Plan Provision, Fore Hamlet, Ipswich, IP3 8AA. Tel: 0800 0565866. Fax: 0870 1963782.

UK Power Networks Registered in England and Wales Registered No 7290590.
Registered office: Newington House, 237 Southwark Bridge Road London, SE1 6NP.



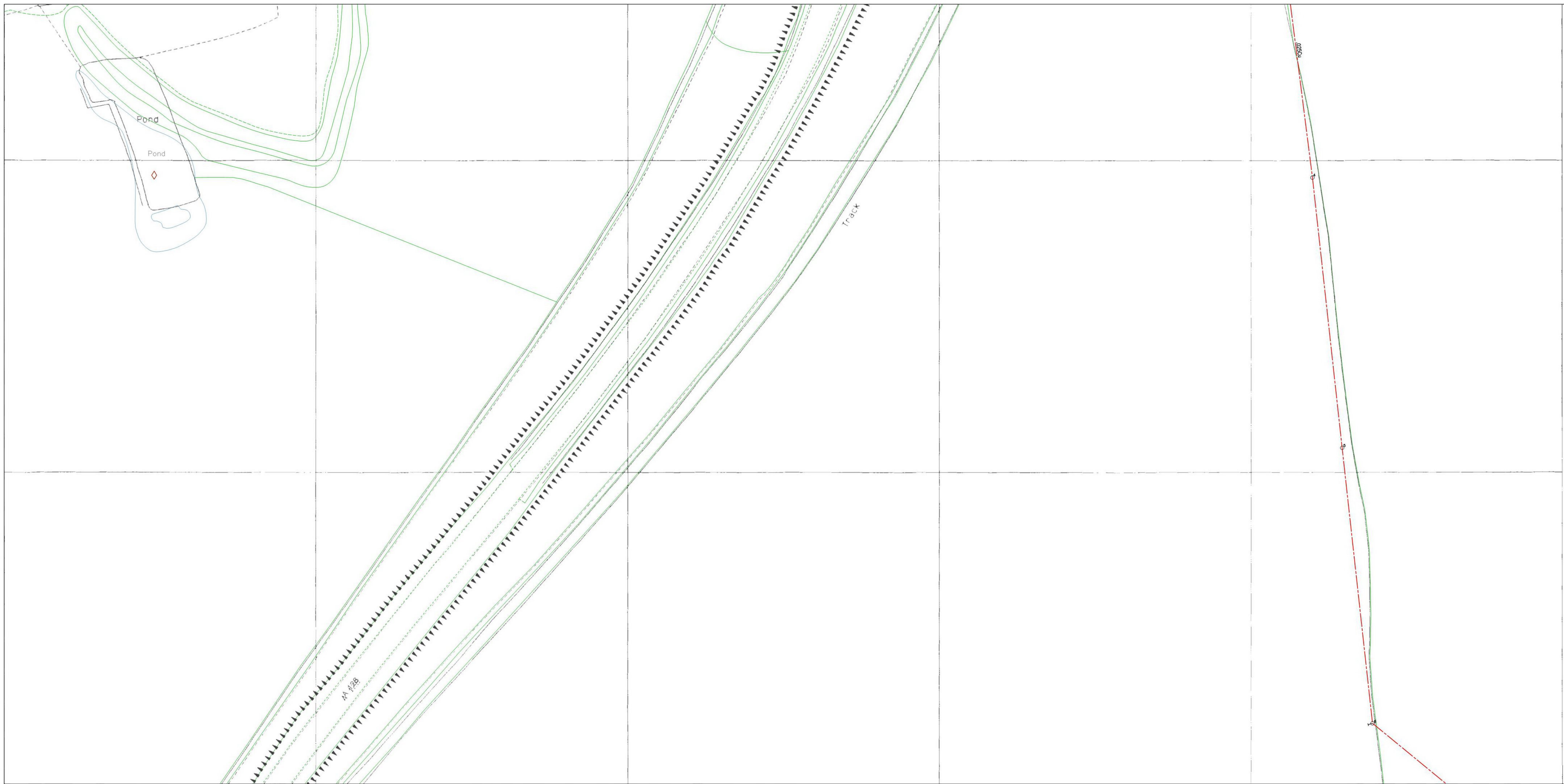
Plotted By: Martin Johnson

2016/2237717

Plotted On 10/11/2016

TQ6389SEB





Plotted On : 10/11/2016

Plotted By : Martin Johnson

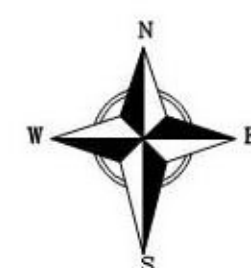
Plot Description: LAND OFF TILBURY ROAD, WEST HORNDON, BRENTWOOD CM13 3LJ

2016/2237717/ug_mains

Map Centre : TQ6389SE



UK Power Networks
Plan Provision
Fore Hamlet
IPSWICH
Suffolk
IP3 8AA
Tel 0800 0565 866
Fax 08701 963782



For details of the symbology please refer to <http://www.ukpowernetworks.co.uk/safety-emergencies/in-the-workplace/understanding-safety-symbols.shtml>

PRIMARY CABLES
EXTRA HIGH VOLTAGE CABLES (EHV) 22,000 TO 132,000 Volts

Depth normally 750mm cover in carriageway & 600mm cover in footway.
Before digging within one metre of these cable routes Telephone 0800 056 5866 in order that the Company's apparatus may be located on site and any necessary protection works agreed.

N.B. THRUST BORERS OR MOLES MUST NOT BE USED WITHIN THE VICINITY OF ANY CABLES BELONGING TO UK POWER NETWORKS WITHOUT FIRST CONTACTING THIS COMPANY.

1. The position of the apparatus shown on this drawing is believed to be correct but the original landmarks may have been altered since the apparatus was installed.
2. The exact position of the apparatus should be verified – use approved cable avoidance tools prior to excavation using suitable hand tools.
3. It is essential that trial holes are carefully made avoiding the use of mechanical tools or picks until the exact location of all cables have been determined.
4. It must be assumed that there is a service cable into each property, lamp column and street sign, etc.
5. All cables must be treated as being live unless proved otherwise by UK Power Networks.
6. The information provided must be given to all people working near UK Power Networks' plant & equipment. Do not use plans more than 3 months after the issue date for excavation purposes.
7. Please be aware that electric cables/lines belonging to other owners of licensed electricity distribution systems may be present and it is your responsibility to identify their location.

1. UK Power Networks Ltd does not warrant that the information provided to you is correct. You rely upon it at your own risk.
2. UK Power Networks Ltd does not exclude or limit its liability if it causes the death of a person or causes personal injury to a person where such death or personal injury is caused by its negligence.
3. Subject to paragraph 2, UK Power Networks Ltd has no liability to you in contract, in tort (including negligence), for breach of statutory duty or otherwise howsoever for any loss, damage, costs, claims, demands or expenses that you or any third party may suffer or incur as a result of using the information provided whether for physical damage to property or for any economic loss (including without limitation loss of profit, loss of opportunity, loss of savings, loss of goodwill, loss of business, loss of use) or any special or consequential loss or damage whatsoever.

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ADVICE TO CONTRACTORS ON AVOIDING DANGER FROM BURIED ELECTRICITY CABLES.

- 1) Do have cable drawings with you on site and check them before you start the excavation.
- 2) Do have a cable locator tool on site and use it to help you.
- 3) Mark out the location of electricity cables.
- 4) Do not use a mechanical excavator within 0.5m of electricity cables.
- 5) Use spades and shovels in preference to other tools.
- 6) Never disturb electricity cables and joints or their protective covers.

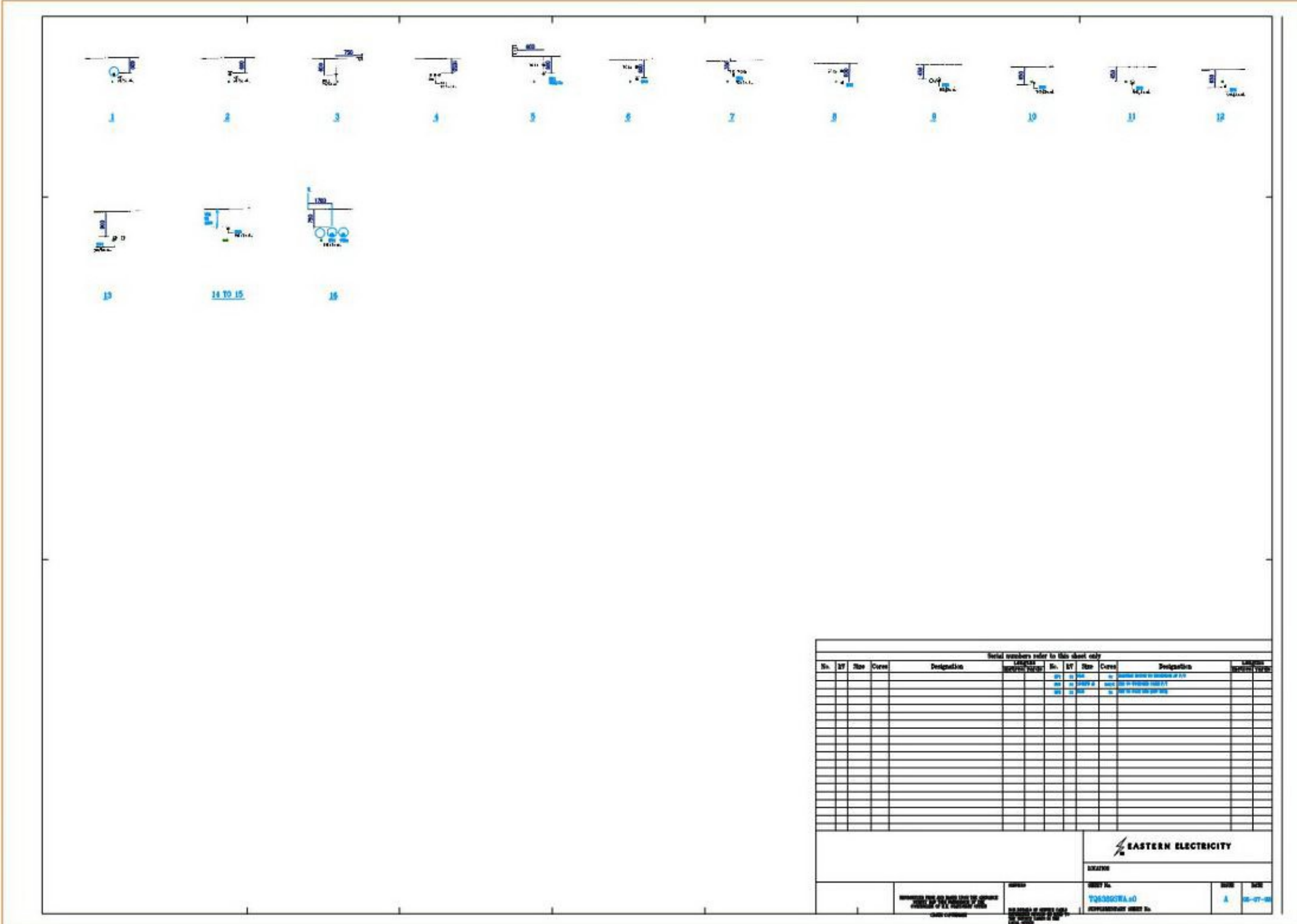
**IF IN DOUBT – ASK! PHONE 0800 056 5866
EMERGENCY – If you damage a cable or line
Phone 0800 780 0780 (24hrs) URGENTLY**

These basic safety precautions are explained in detail in the HSE booklet, HS(G)47 – Avoiding Danger from Underground Services, a copy of which may be obtained from your supervisor or HMSO.

Please be aware that electric lines belonging to other owners of licensed electricity distribution systems may be present and it is your responsibility to identify their location.

TQ6389SWA 1:500 LV

SO



Serial numbers refer to this sheet only

No.	LT	Size	Curve	Designation	Location	Serial Number	No.	LT	Size	Curve	Designation	Location	Serial Number
							01	25	250	25	250V 250A	SW 1	
							02	25	250	25	250V 250A	SW 2	
							03	25	250	25	250V 250A	SW 3	

LOCATION:
 SHEET No:
 TQ6389SWA.dwg
 DATE: 10-07-16



Cross Section (11)

See Supplementa
TQ6389SW
for Cross-Section

Cross Section (5)

See Supplementa
TQ6389SW
for Cross-Section

Cross Section (6)

See Supplementa
TQ6389SW
for Cross-Section

Cross Section (12)

See Supplementa
TQ6389SW
for Cross-Section