ABLEY LETCHFORD PARTNERSHIP
Consulting Engineers

LAND NORTH OF SCHOOL ROAD ARBORFIELD CROSS

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

CROUDACE HOMES, VORTAL HOMES LIMITED AND FALCON DEVELOPMENTS (SE) LIMITED

19 SEPTEMBER 2024

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1.0 Introduction

Context

1.1. This Flood Risk Assessment (FRA) has been prepared by Abley Letchford Partnership Ltd (ALP), on behalf of Croudace Homes, Vortal Homes Limited and Falcon Developments (SE) Limited to support an outline planning application for a proposed residential development of up to 95 dwellings together with open space and associated works at School Road in Arborfield Cross.

Development Proposals

1.2. The proposals are for a residential development of up to 95 dwellings together with open space and associated works. Means of Access to be considered (with Appearance, Landscaping, Layout and Scale to be reserved). The proposed scheme is shown on the Concept Masterplan within Appendix 1.

Requirement for a Flood Risk Assessment

1.3. The requirement for an FRA is set out in Section 14 of the National Planning Policy Framework (NPPF) as revised in December 2023.

1.4. The footnote accompanying Paragraph 173 states:

'A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use..'

1.5. The site is a greenfield site that comprises of open space with established hedges and tree lined boundaries. The area of the site is 8.25 hectares. As the site area extends greater than 1 hectare, a site-specific flood risk assessment is required. To comply with the requirements of the NPPF, matters related to flood risk and drainage are addressed within this report.

Report Aim and Formation

1.6. The principal aims of this report are to demonstrate that the proposed development complies with national and local planning policy in respect to flood risk and to demonstrate that a suitable drainage strategy can be provided as part of development.

1.7. This report will also summarise the impacts the development could have on flood risk to the surrounding area and outlines the mitigation strategies that will be implemented to minimise this risk.

1.8. The drainage design embraces the guiding principles of Sustainable Drainage Systems (SuDS) which are central to the design of the surface water drainage strategy for the proposed development.

Report Structure

1.9. This report addresses the requirements of revised NPPF and considers the following aspects:

- Section 2: Policy and Sources of Information – a review of policy relevant to the assessment and sources of information used to inform the assessment.
- Section 3: Site Setting – a description of the site location, topography, geology and hydrology.
- Section 4: Overview of Flood Risk – a review of data for flooding from all sources to determine the baseline flood risk to the site and an assessment of the impacts of the development on flood risk.
- Section 5: Sequential Test & Exception Test – a description of the proposed development and a classification of the vulnerability in the context of the Sequential Test and Exception Test.
- Section 6: Flood Risk Mitigation – the mitigation measures implemented to manage the potential flood risk to the development.
- Sections 7 and 8: Drainage Strategy – a summary of appropriate strategies to manage the surface water and foul water from the site in the post development scenario.
- Section 9: Conclusion – a summary of the development proposals in the context of site vulnerability and the requirements of the NPPF.

2.0 Policy and Sources of Information

Introduction

2.1. This chapter provides a review of policy relevant to the assessment and the available information on all sources of flood risk.

National Planning Policy

2.2. National Planning Policy in relation to Flood Risk is set out in Section 14 of the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) ID: 7 for Flood Risk and Coastal Change. Flood Risk is discussed in Paragraphs 165-175 of the NPPF.

2.3. Paragraphs 165-168 discuss the sequential approach. Paragraph 166 refers to a Strategic Flood Risk Assessment (SFRA) that would form the basis of applying the Sequential Test for local authorities to allocate development, whilst Paragraphs 169-170 relate to the Exception Test.

2.4. Paragraph 173 discusses the determination of planning applications stating:

> *'When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood risk assessment. Development should only be allowed in areas at risk of flooding where, in light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*
>
> *a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
>
> *b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
>
> *c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
>
> *d) any residual risk can be safely managed; and*
>
> *e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.'*

2.5. The proposed development comprising of up to 95 dwellings would be classed as a Major development providing more than 10 homes and the site is greater than 0.5 hectares. Paragraph 175 states:

> *'Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:*
>
> *a) Take account of advice from the lead local flood authority;*
>
> *b) Have appropriate proposed minimum operational standards;*
>
> *c) Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*

d) Where possible, provide multifunctional benefits.'

Environment Agency

2.6. The Flood and Water Management Act (2010) provides the Environment Agency (EA) a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remediation of flood damage for main rivers and coastal areas. The EA is a statutory consultee in relation to flood risk and planning dependent upon criteria.

2.7. The EA Standing Advice has been consulted and reviewed within this FRA.

2.8. The EA Flood Map for Planning, EA Long Term Flood Risk Mapping and the Catchment Data Explorer websites have been interrogated in respect to flood risk extents and sources.

Local Authorities

2.9. The site lies within the administrative area of Wokingham Borough Council (WBC). WBC is the Local Planning Authority (LPA). WBC is also the Lead Local Flood Authority (LLFA).

2.10. Planning guidance published by WBC regarding the flood risk was referred to in order to assess the methodology best suited to suit the local area. The following key documents were reviewed:

- Wokingham Borough Council Adopted Core Strategy Development Plan (dated 2010).
- Wokingham Borough Council Local Flood Risk Management Strategy (dated April 2015).
- Wokingham Borough Council Preliminary Flood Risk Assessment (PFRA) (dated June 2011) and PFRA addendum (dated 2017).
- WBC Level 1 Strategic Flood Risk Assessment (SFRA) (dated May 2023).
- WBC Level 2 Strategic Flood Risk Assessment (SFRA) (dated August 2023) and
- WBC SuDS Strategy (dated January 2017).

2.11. WBC became the LLFA under the Flood and Water Management Act 2010. WBC provide guidance to assess, manage and inform flood risk.

2.12. As LLFA, WBC's Flood and Water Management Team provide a Sustainable Drainage Systems Strategy Guide to assist developers seeking planning permission for new sites by setting criteria to be met as part of the design of the drainage strategy and a list of documentation to be presented in the associated Flood Risk Assessment. A copy of this is included within Appendix 2.

2.13. WBC has permissive rights over any Ordinary Watercourses including land drainage ditches. If any work is required within the watercourse (improvements or crossings) then approval from the LLFA is required under the Flood and Water Management Act 1991.

Local Water Authority

2.14. Thames Water (TW) are responsible for the supply of clean water and disposal of wastewater for the Wokingham Borough.

2.15. Information with regards to sewer and water main flooding contained within the WBC Level 1 SFRA has been reviewed as part of this FRA. All Water Companies have a statutory obligation to maintain a register of properties and areas which are at risk of flooding from the public sewerage system and is shown on the DG5 Flood Register.

Other Sources of Information

2.16. A desktop study of the site was carried out using the following websites to ascertain local features, hydrology and soil characteristics:

- DEFRA's Magic Map portal,
- British Geological Survey (BGS) 'Geology of Britain' online viewer, and
- Cranfield University 'Soilscapes' portal.

2.17. A site walkover conducted during May 2024 allowed observation of existing topography, watercourses, and the general drainage regime at the site.

2.18. Guidance with respect to Sustainable Drainage Systems (SuDS) is contained within DEFRA document Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems March 2015, CIRIA C753 The SuDS Manual and within the NPPF Planning Practice Guidance (PPG) – 'Flood Risk and Coastal Change'.

2.19. Additional guidance on development and flood risk is contained within CIRIA C624 Development and Flood Risk – Guidance for the Construction Industry which identifies several key aims for a development to ensure it is sustainable in flood risk terms.

3.0 Site Setting

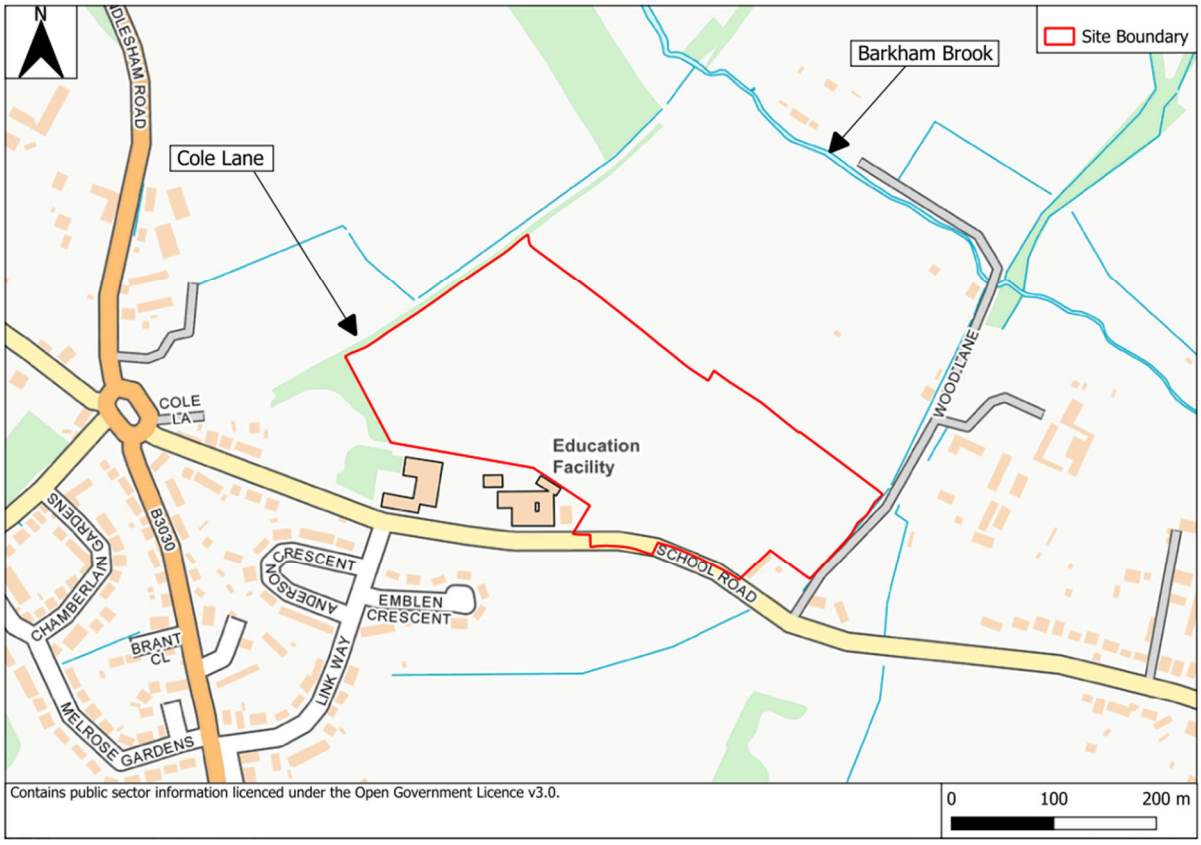
Introduction

3.1. This chapter provides a description of the site location, its topography, hydrological context, geology and hydrogeology.

Site Location

3.2. The site is located to the east of Arborfield Cross. The nearest postcode is RG2 9NX. The site centre grid reference is SU 76631 67078. The site location is shown in Figure 1.

Figure 1 – Site Location



3.3. The site is bounded to the south by School Road and a primary school with residential development beyond. Wood Lane is located to the eastern boundary of the site with some commercial and residential developments beyond. To the western boundary is Cole Lane and an Ordinary Watercourse. To the north of the site are arable and equestrian fields and the Barkham Brook.

3.4. The site consists predominantly of agricultural land which Is bounded by mature trees and hedgerow.

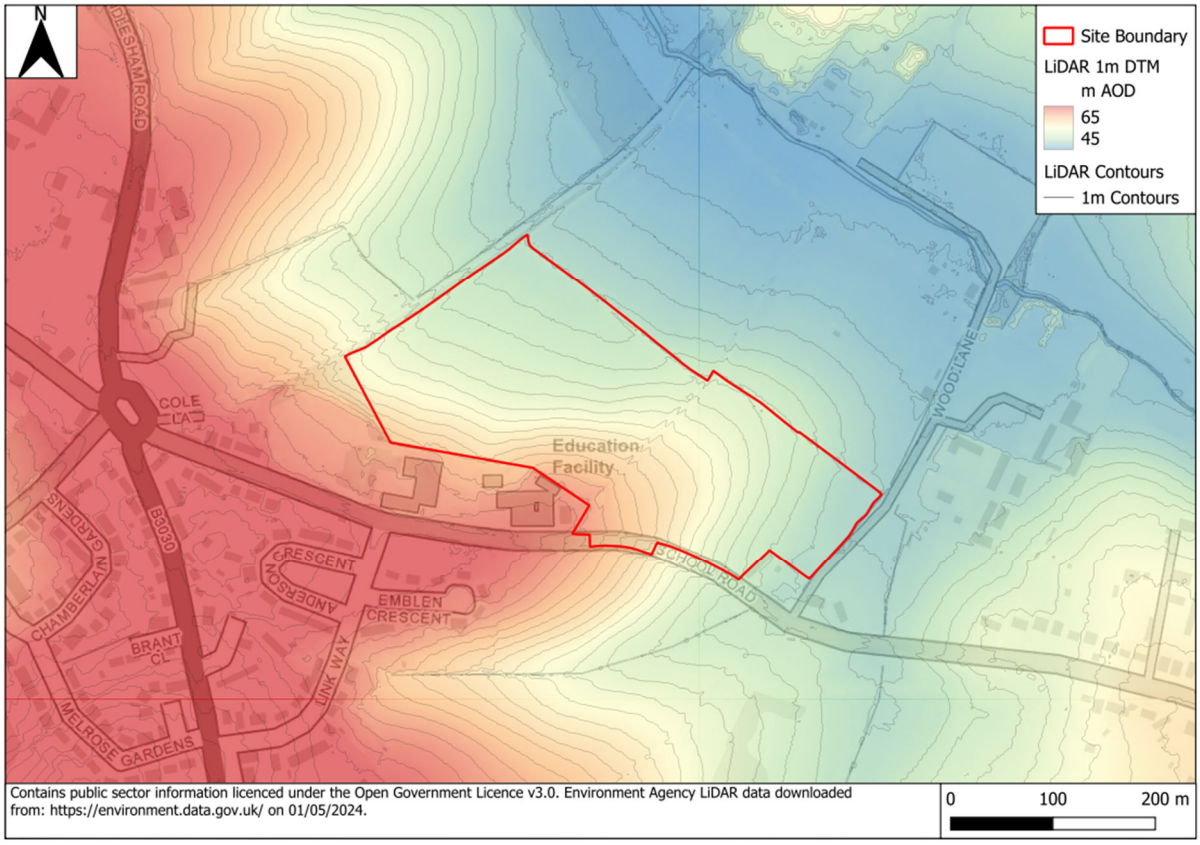
3.5. The site covers an area of 8.25 hectares.

Topography

3.6. The ground levels across the site are shown from LiDAR in Figure 2.

3.7. The LiDAR shows that the ground levels across the site slope downwards from the south to both the eastern and north-western corners. According to the LiDAR, the ground levels across the site are between 62.1m AOD on the site's southern boundary and 48.3m AOD in the eastern corner which is the lowest point of the site.

Figure 2 – Site Topography

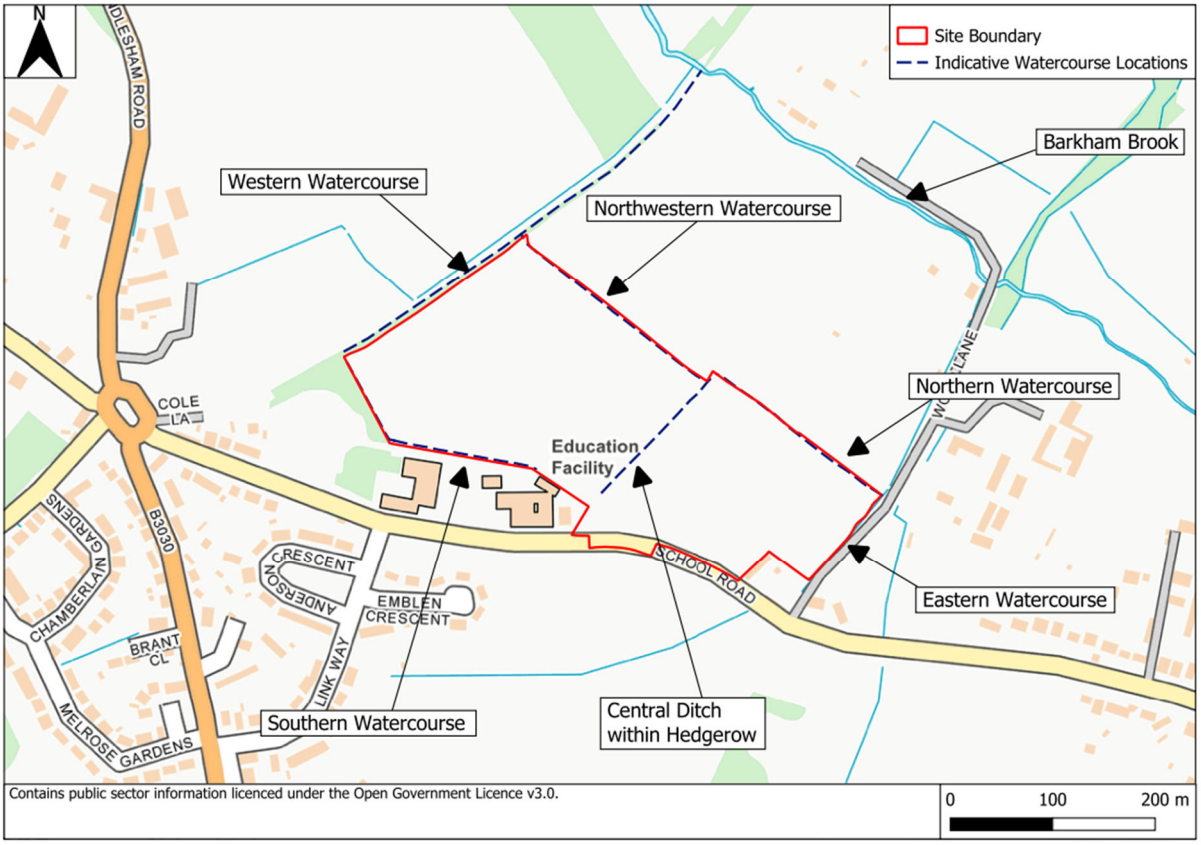


3.8. A topographical survey of the site has been completed by Encompass Surveys in May 2024. A copy of the topographical survey is included in Appendix 1. It confirms that ground levels across the site slope down from south to northeast and northwest. According to the detailed topographical survey, the highest point of the site is to the south by the school with a ground level of 61.7 m AOD. The lowest point of the site is in the northeast corner of the site with an elevation of 48.2 m AOD.

Watercourses and Ditches

3.9. A review of the Ordnance Survey (OS) mapping indicates formal ordinary watercourses along both the western and eastern boundaries of the site. This was confirmed by the site walkover when additional watercourses were also noted. These watercourses are indicated on Figure 3.

Figure 3 – Indicative Watercourse Locations



3.10. The watercourses are generally split into two systems: to the east and west of the site. There is also a shallow ditch within the hedgerow running through the centre of the site.

3.11. The southern watercourse runs along the boundary with the school and flows west into the western watercourse; this is shown in the photograph in Figure 4. The north-western watercourse also flows west, along the site boundary and into the western watercourse. The western watercourse flows northwards outside the site boundary and along the path to the Barkham Brook.

Figure 4: Southern watercourse adjacent to school boundary

3.12. The northern watercourse flows eastwards along the site boundary and into the eastern watercourse that flows along Wood Lane and northwards onto the Barkham Brook. The eastern watercourse is shown in a photograph in Figure 5.

Figure 5: Eastern watercourse

3.13. The nearest main river is the Barkham Brook. This is located approximately 250m from the site's northern boundary.

Surface and Foul Water Sewers

3.14. Sewer asset records obtained from Thames Water confirm that there are no surface water sewers within the site's boundary or in the vicinity of the site. A 300mm dia foul sewer runs through the eastern part of the site, parallel to another foul sewer (either 150mm or 200mm dia) in Wood Lane, both of which flow northwards, across the Barkham Brook and then west to the wastewater treatment works. Another foul sewer (150mm or 175mm dia) runs east along School Road into the foul sewer at Wood Lane.

3.15. A copy of Thames Water Asset Record is included within Appendix 1.

Geology and Hydrogeology

3.16. British Geological Survey (BGS) 'Geology of Britain' online viewer indicates that the geology underlying the site is predominantly London Clay Formation, clay, silt and sand. There are no records of superficial deposits across the site.

3.17. The Cranfield University 'Soilscapes' online viewer indicates to the south of the site overlays slowly permeable seasonally wet slightly acid but base- rich loamy and clayey soils. To the north of the site, it is situated over slightly acid loamy and clayey soils with impeded drainage.

3.18. The DEFRA Magic Map online viewer indicates that the site lies outside of any Groundwater Source Protection Zone (SPZ), or Principal Aquifer designation.

4.0 Overview of Flood Risk

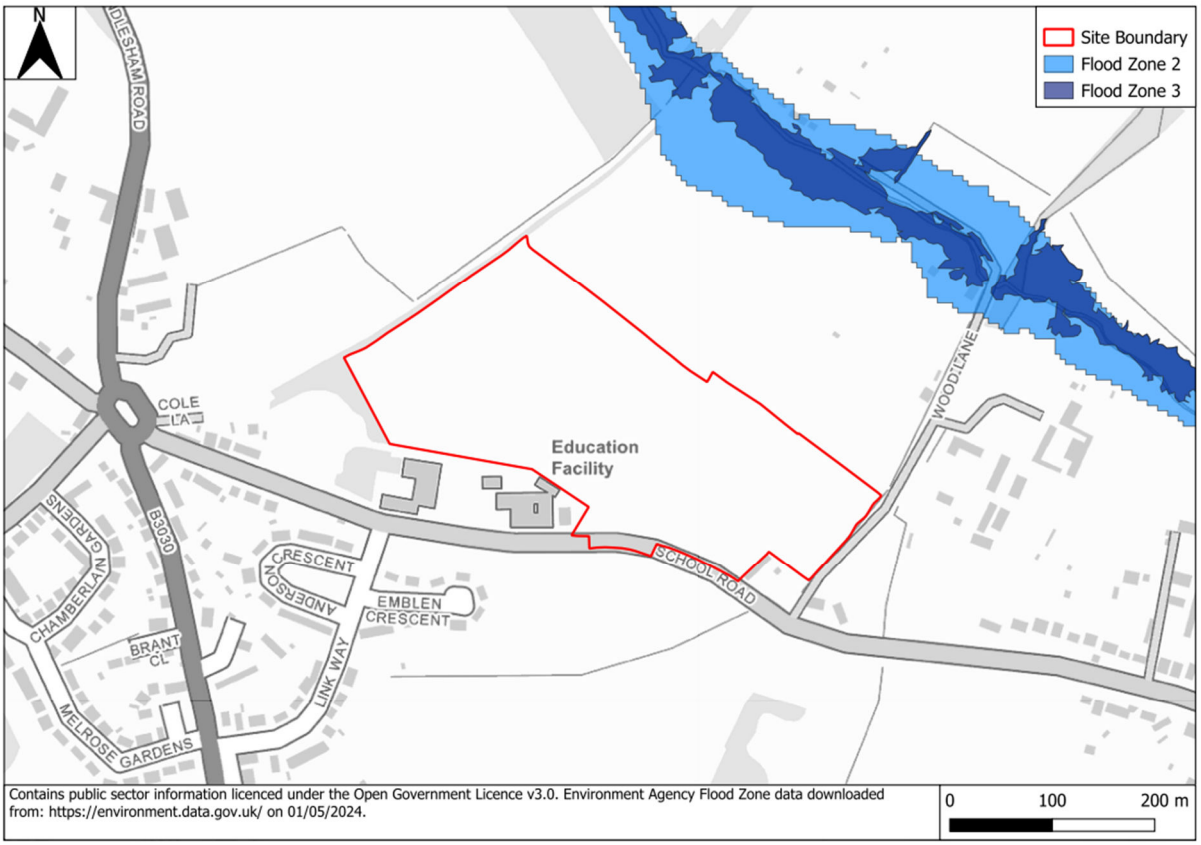
EA Flood Map for Planning

4.1. The EA Flood Map for Planning provides an initial indication of the extent of flood zones. This is refined by site-specific modelled flood levels and topographical survey. In the NPPF, Flood zones are defined as follows:

- Flood Zone 1 'Low Probability' – Land less than 1 in 1,000 (0.1%) annual probability of river or sea flooding.
- Flood Zone 2 'Medium Probability' – Land between 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding, or between 1 in 200 (0.5%) and 1 in 1,000 (0.1%) annual probability of sea flooding.
- Flood Zone 3 'High Probability' – Land at 1 in 100 (1%) or greater annual probability or river flooding, or 1 in 200 (0.5%) or greater annual probability of sea flooding.

4.2. Figure 6 shows the EA flood zone mapping. It confirms that the entire site is located within Flood Zone 1 'Low Probability' of fluvial (or tidal) flooding.

Figure 6 – EA Flood Map for Planning



Flood Risk from Surface Water

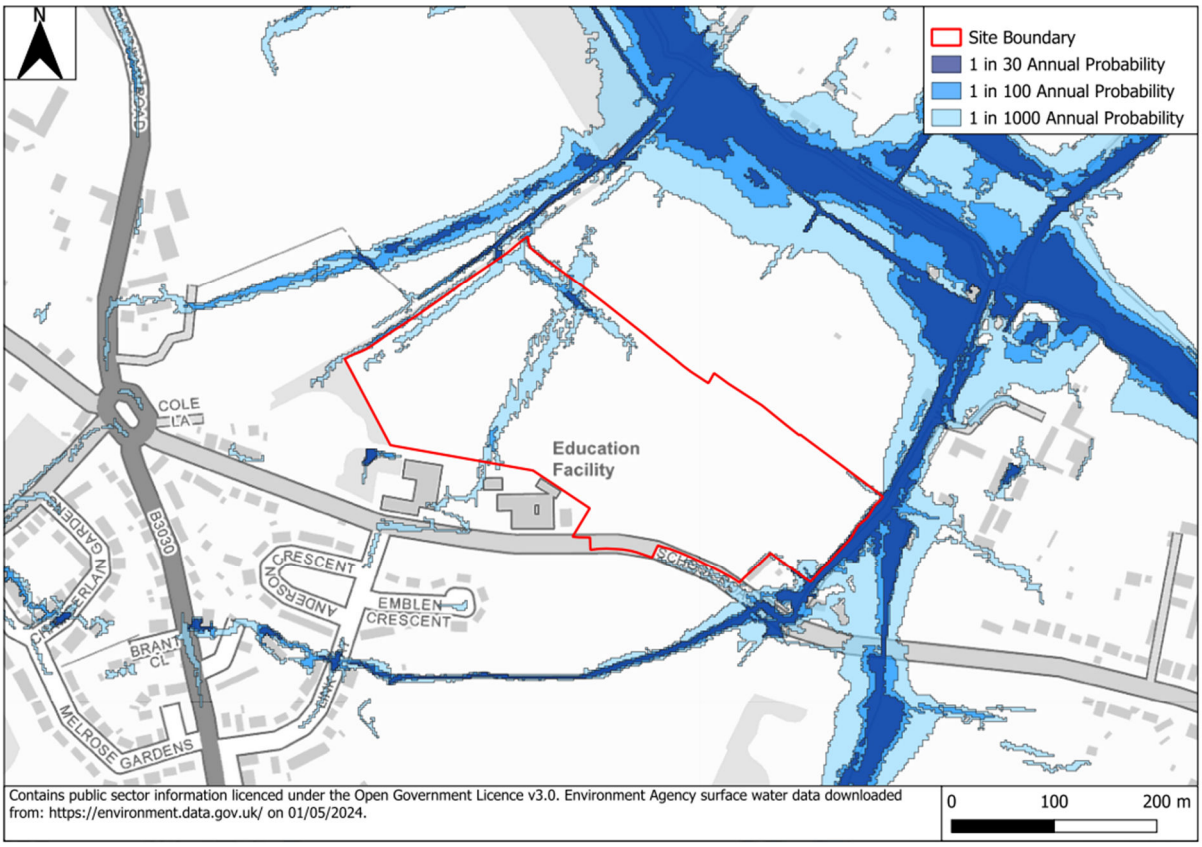
4.3. The EA's Risk of Flooding from Surface Water mapping indicates areas that could be susceptible to surface water flooding during extreme rainfall events. The EA surface water mapping defines rainfall events based on the following:

- 1 in 30 (3.3%) annual probability 'High Risk'
- 1 in 100 (1%) annual probability 'Medium Risk'
- 1 in 1,000 (0.1%) annual probability 'Low Risk'
- Lower than 1 in 1,000 (0.1%) annual probability 'Very Low Risk'.

4.4. The NPPF PPG – 'Flood Risk and Coastal Change' includes the 1 in 100 annual probability of surface water flood (including climate change) within the definition of the design flood event to be used to inform a FRA.

4.5. Figure 7 shows the flood risk from surface water. The EA Flood Risk from Surface Water mapping indicates that the majority of the site is at a very low risk of surface water flooding.

Figure 7 – EA Flood Risk from Surface Water



4.6. The mapping indicates a flow route through the site from the school. However this was not observed during the site walkover and instead there are physical features that would prevent this flow route.

4.7. As noted earlier there are watercourses along the site's western perimeter and these would intercept any overland flow and convey it to the western watercourse and onwards to the Barkham Brook.

4.8. This is to be expected as the EA surface water mapping is based on a national scale surface water ground surface model. The model does not consider any site-specific local information or below ground drainage infrastructure. The mapping therefore provides a guide to vulnerable areas based on the topography of the area and not a detailed assessment of surface water flooding for a specific site.

4.9. The WBC Level 1 SFRA indicates that there have been no incidents of surface water flooding within the site boundary.

4.10. The risk from surface water flooding is therefore assessed to be low.

Flood Risk from Groundwater

4.11. Groundwater flooding has the potential to occur after prolonged periods of unusually high rainfall. During such periods, more water than usual infiltrates through the ground, raising the water table above its normal depth below the surface. Where the water table is at a shallow depth in any case, the water table can reach the surface. This can cause groundwater to merge with rainfall and cause localised flooding.

4.12. The WBC Level 1 SFRA has assessed the area for susceptibility to groundwater flooding. This is based off 1km grid squares to show the percentage that is susceptible to ground water flooding. The site is located within a 1km grid square of which less than 25% risk of this grid square is at risk of groundwater flooding. The WBC Level 1 SFRA does not contain any records of groundwater flooding to the site. The risk of flooding from groundwater sources is considered low.

Flood Risk from Sewers

4.13. When exceeded, surcharged sewer networks can lead to flooding from backed up manholes and gully connections.

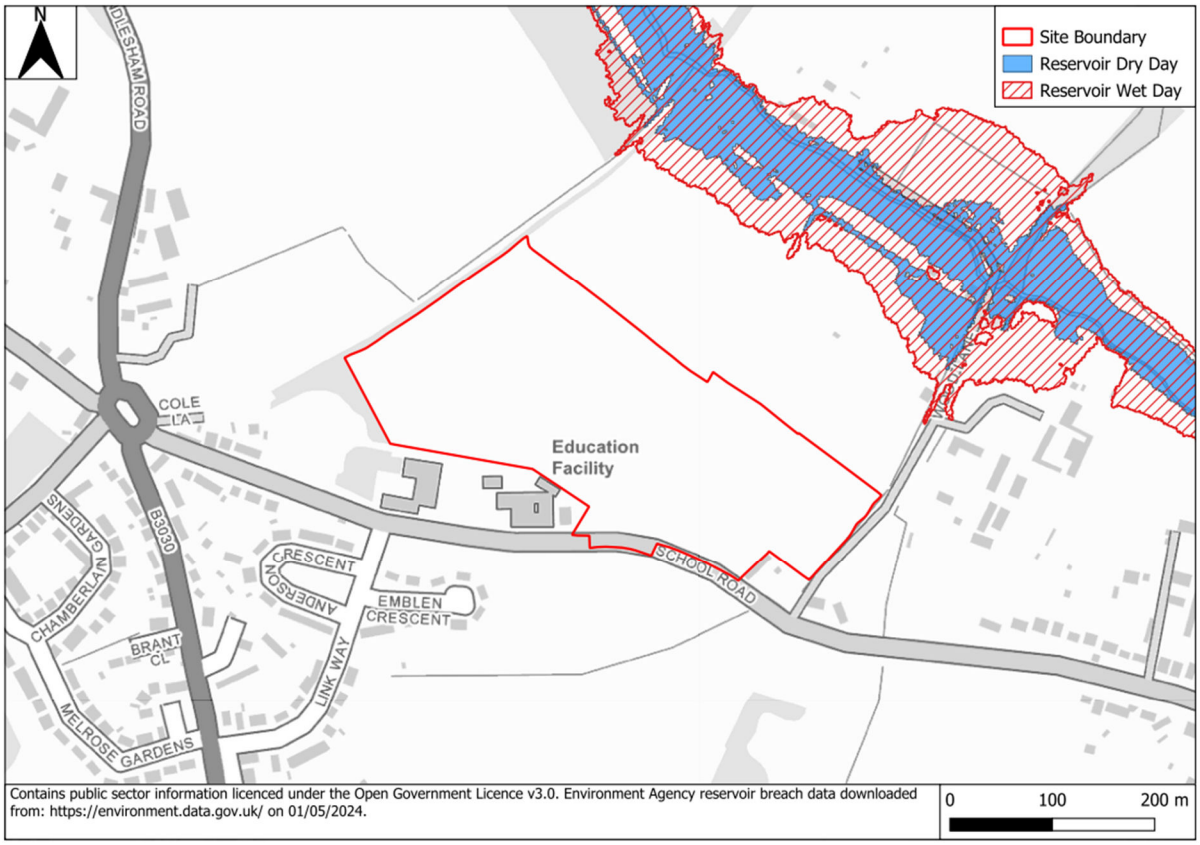
4.14. There is a Foul sewer to the east of the site, but this is located away from the developable area and the ground in this location slopes to the east, therefore the risk of flooding from sewers can be considered low.

Flood Risk from Reservoirs

4.15. The EA flood risk from reservoirs mapping indicates areas that would be at risk of flooding in the event of a reservoir breach.

4.16. Figure 8 shows the flood risk from reservoirs. The Environment Agency inundation mapping indicates that the site is not at risk of flooding in the event of a reservoir breach. The site is therefore at low risk of flooding from reservoirs.

Figure 8 – EA Flood Risk from Reservoirs



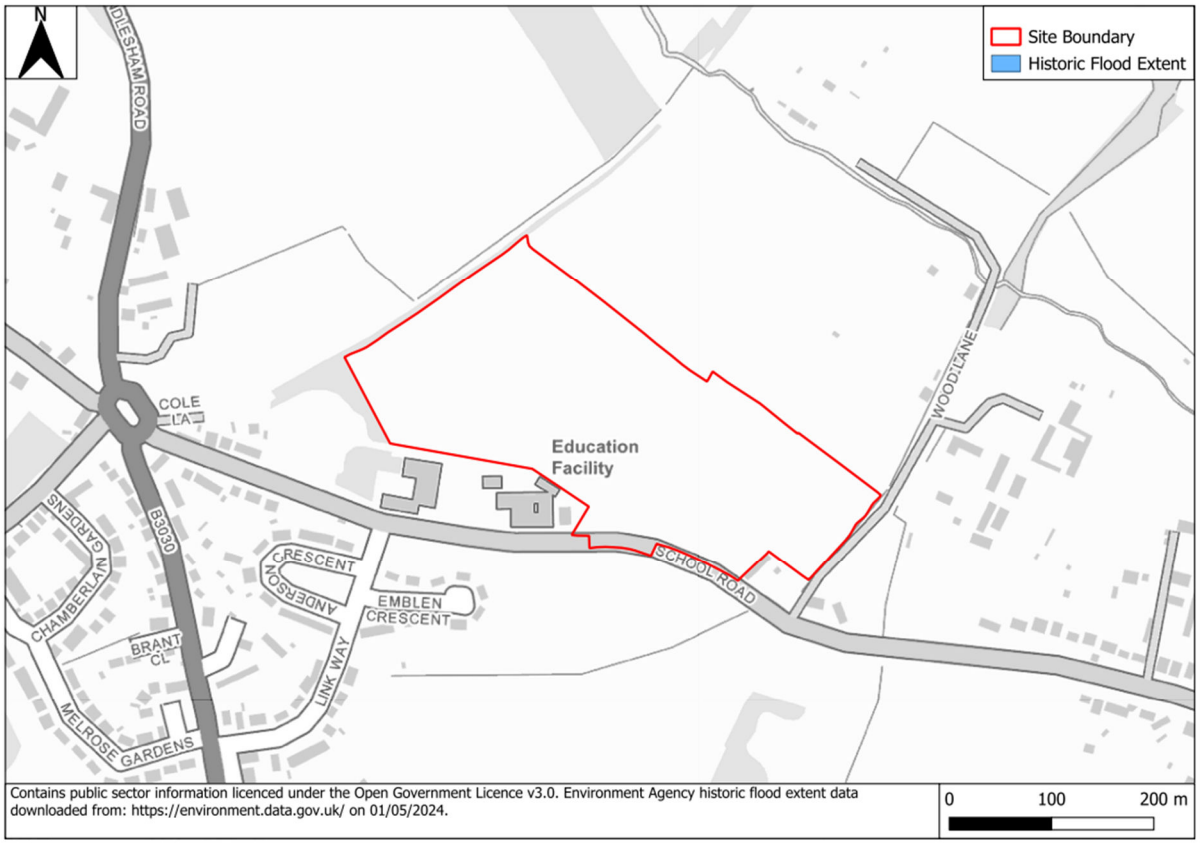
Flood Risk from Other Sources

4.17. The EA flood risk maps, WBC PFRA and WBC Level 1 SFRA indicate that the site is not at risk of flooding from canals or other artificial sources. The WBC Level 1 and Level 2 SFRA uses national inundation Reservoir Mapping (Long term flood risk map) from the EA.

Historic Flooding

4.18. The EA Historic Flood Map shows the maximum extent of recorded flood events. The site is not shown to have been impacted by a historic flood event. This is shown in Figure 9.

Figure 9 - Historic Flood Extent



Flood Risk Summary

4.19. A summary of flooding from all sources is provided in Table 2.

Table 2 – Summary of Flood Risk

Source of Flooding	High	Medium	Low	Comments
Tidal			✓	The site is inland and not influenced by tidal levels.
Fluvial			✓	The site is located within Flood Zone 1. The WBC Flood Zone confirms that the site is located within Flood Zone 1.
Pluvial			✓	The majority of the site is at a 'Very Low' or 'Low' risk of surface water flooding. The EA mapping indicates a possible flow route but observations and physical features on site demonstrate that this would not occur, with any overland flow being intercepted and conveyed to the western watercourse.
Groundwater			✓	The WBC Level 1 SFRA indicates that the site is located within a 1km grid square that is at a less than 25% susceptibility to groundwater flooding for the square.
Sewers			✓	Limited sewers across the site and the SFRA does not indicate the site to be at risk.
Reservoirs, canals and other artificial sources			✓	EA and SFRA Level 1 mapping do not indicate the site to be at risk.

4.20. The site is deemed to be at low risk of flooding.

5.0 Sequential Test and Exception Test

NPPF Sequential Test

5.1. NPPF states that Local Planning Authorities allocating land for development should apply the Sequential Test to demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.

5.2. The Site is located within Flood Zone 1. This FRA has assessed the potential for flooding from surface water flooding as low and the potential for flooding form other sources is also low.

5.3. It is therefore deemed that the Sequential Test is not required.

Exception Test

5.4. Given that the Sequential Test is not needed, there is no requirement for the Exception Test.

6.0 Flood Mitigation Strategy

Sequential Approach

6.1. The NPPF encourages a 'sequential approach' in master planning for new development: locating the more vulnerable uses of the development in the areas of lowest flood risk from all sources.

6.2. This FRA has confirmed that the site is at very low potential of flooding from all sources with surface water flow tending to be intercepted by ditches around the site. The proposed development areas are set back from these ditches and the development strategy has therefore followed a sequential approach.

Building Ground Floor Levels

6.3. The requirements for setting ground floor levels for new developments are set out in BS8533:2017 'Assessing and Managing Flood Risk in New Developments – Code of Practice' based on the fluvial flood level and the WBC Level 1 SFRA also sets out requirements related to surface water flooding. However, neither of these is relevant as the areas for development have been shown to be outside areas of potential flooding.

6.4. Where the site is located outside of the fluvial flood extents, ground floor levels should be set a minimum of 150mm above the surrounding ground level to mitigate the residual flood risk from surface water runoff events. It is recommended that surrounding ground levels are appropriately contoured to direct surface water away from the development.

Floodplain Storage and Flow Routes

6.5. The site is located outside of the fluvial and surface water flood extents. There is therefore no impact on fluvial or surface water floodplain storage or flow routes.

Safe Access

6.6. The site is shown to be a low risk of flooding. Continuous safe access is therefore available.

Residual Risk

6.7. The NPPF PPG – 'Flood Risk and Coastal Change' defined residual risk as coming from 'flood risk management infrastructure' and the 'residual risk to a development once any site-specific flood mitigation measures are taken into account'.

6.8. Residual risk to the site includes a breach in the raised flood defences, the failure of a reservoir and a flood event greater than the designed standards.

6.9. The residual risk to the site is low. The EA AIMS dataset which contains information of flood defences indicates that the site does not benefit from raised flood defences. The EA mapping for reservoir breaches indicates that the site is not located within an area at risk of flooding in the event of a reservoir. The site is located outside of the 1 in 1,000 annual probability flood extent.

6.10. Therefore residual risk is low.

7.0 Surface Water Drainage

Introduction

7.1. This chapter provides details on the surface drainage strategy and includes measures to drain the proposed development site.

Overall Strategy

7.2. The proposed drainage strategy has been designed to exceed the requirements of the NPPF by providing a comprehensive drainage system which embraces the SuDS philosophy and key principles. The utilisation of Sustainable Drainage Systems (SuDS) not only provides the benefit of controlling waters at source and online treatment of collected surface water but also allows enhanced aesthetics through improved landscaping, biodiversity, and ecological opportunities.

7.3. These features offer a holistic treatment train and management system to the benefit of new residents, members of the wider community, downstream receptors and the environment.

7.4. The alteration of natural surface water flow patterns through developments can lead to problems elsewhere in the catchment, particularly flooding downstream. Changes of land uses can have significant downstream impacts where existing drainage systems may not have sufficient capacity for any additional surface water flow.

7.5. A surface water management strategy is therefore required to manage and reduce the flood risk posed by the surface water runoff from the site. The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates to the pre-development scenario, unless specific off-site arrangements are made and result in the same net effect.

7.6. Sustainable water management measures (SuDS) should be introduced to control the surface water runoff from the proposed development site therefore, managing the flood risk to the site and surrounding areas from the surface water runoff.

7.7. The Construction Industry Research and Information Association, CIRIA's C690 states the following:

- **Prevention** – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing surfaces)
- **Source Control** – control of runoff at or very near its source (such as the use of rainwater harvesting)
- **Site Control** – management of water from several sub-catchments (including routing water from roofs and car parks to one or several soakaways for the entire site)
- **Regional Control** – management of runoff from several sites, typically in a detention basin or wetland.

7.8. The SuDS Manual 2015 (C753) provides best practice guidance on the planning, design, construction, operation and maintenance of SuDS. This document provides guidance to ensure that SuDS are planned and designed to maximise the opportunities and benefits of surface water management.

7.9. The four main categories of benefits that can be achieved by SuDS, referred to as the four pillars of SuDS design, are:

- **Water quantity** – control the quantity of runoff to support the management of flood risk, and maintain and protect the natural water cycle;
- **Water quality** – manage the quality of the runoff to prevent pollution
- **Amenity** – create and sustain better places for people
- **Biodiversity** – create and sustain better places for nature.

7.10. Supplemental to CIRIA guidance, Document H of the Building Regulations 2015 sets out three possible options to discharge surface water runoff. Rainwater shall discharge to one of the following, listed in order of priority:

- An adequate soakaway or some other adequate infiltration system; or where that is not reasonably practicable,
- A watercourse; or where that is not reasonably practicable
- A sewer.

7.11. As geological data indicates that infiltration is not a viable method of disposal, the surface water drainage proposals will be designed to attenuate runoff with controlled discharge to the existing local watercourses i.e. the existing Ordinary Watercourse to the east and north-west of the site which would be feasible points of discharge.

7.12. Implementation of SuDS will ensure that flood risk downstream is not increased due to the proposed development. These features will also provide positive improvements to the quality of surface water runoff.

7.13. The following SuDS components are deemed applicable to the site:

- Pervious surfacing systems – structural surfaces that allow water to penetrate into a granular layer thus providing storage and treatment, e.g. pervious paving.
- Conveyance systems – components that convey flows to downstream storage systems, e.g. swales and filter drains.
- Storage systems – components that control flow, and possibly volumes, by storing water and releasing it slowly, e.g. geocellular units, attenuation basins and wetlands.
- Treatment systems – components that remove or facilitate the degradation of contaminants present in runoff, e.g. filter strips and proprietary treatment systems.

Pre and Post Development Areas/Rates

7.14. To quantify any potential increase in surface water runoff, the existing Greenfield/Pre-Development runoff rate from the site must be determined. The rates of runoff have been determined using the current 'industry best practice' guidelines as outlined in the Interim Code of Practice for SuDS. The recommended methodology for sites up to 50 hectares in area is the ICP SuDS method.

7.15. An assessment of existing surface water runoff has been undertaken, to determine the potential surface water options and attenuation requirements for the site utilising the following parameters.

- Average Annual Rainfall (SAAR): 651mm
- Soil: 0.3
- Region No.: 6

7.16. With an overall site area of 8.16 hectares (ha), the calculated Greenfield run off discharge rates and volumes are as presented in Table 3. The corresponding runoff outputs created within InfoDrainage can be found within Appendix 2.

Table 3 – Pre-Development Runoff Rates/Volumes

Annual Probability	Greenfield/Pre-Development Runoff Rate per hectare (l/s)	Greenfield/Pre-Development Runoff Rate for 8.16ha (l/s)	Greenfield/Pre-Development Volume 360 minute storm m3
1 in 1 year storm event	1.4	11.4	-
1 in 2 year storm event	-	-	518
QBar	1.7	13.9	-
1 in 30 year storm event	3.9	31.8	1,149
1 in 100 year storm event	6.3	51.4	1,538

7.17. Based on the Illustrative Masterplan, it has been conservatively estimated that the impermeable surfaces will be approximately 65% of the developable area. Depending upon how future Reserved Matters Site Layouts evolve, this percentage typically reduces slightly to around 55-60%.

7.18. The use of 65% therefore provides for a robust assessment which allows for fluctuations in residential density and future urban creep of up to 10% in accordance with The SuDS Manual (CIRIA 753).

7.19. The overall Post developed area amounts to 3.55 hectares (ha), of which 2.78ha has been calculated as being impermeable.

7.20. Therefore, the discharge rates of the proposed development will be restricted to 4.7l/s, which is the greenfield runoff rate, QBAR.

7.21. In order to comply with best practice as stipulated in EA Report SC030219 'Rainfall Runoff Management for Developments', proposed discharge rates should be restricted to one of two methods for all storms up to and including the 1 in a 100 year storm event plus a 40% allowance for climate change.

Proposed Areas & Attenuation Volumes

7.22. For the purposes of this report and to provide a robust analysis, all attenuation requirements have been calculated to restrict all discharge flows to 4.9l/s.

7.23. The proposed development is distinctly split into two catchments (Catchment A & B) with an impermeable area of 1.72ha (Catchment A) and 1.06ha (Catchment B).

7.24. With the above in mind and having assessed limiting the offsite discharge rate to QBAR, the anticipated attenuation volumes for a 100 year storm with a 40% allowance for climate change are presented in Table 4 below:

Table 4 – Required Attenuation Volumes

Annual Exceedance Probability	Attenuation Volume (m^3) Required Based on a 2.9l/s Discharge Rate (QBAR) for Catchment A	Attenuation Volume (m^3) Required Based on a 1.8l/s Discharge Rate (QBAR) for Catchment B
1 in 2 year Storm Event (50% AEP)	540	339
1 in 30 year Storm Event (3.3% AEP)	1,008	624
1 in 30 year Storm Event plus 35% CC (3.3% AEP)	1,408	873
1 in 100 year Storm Event (1% AEP) plus 40% Climate Change	1,896	1,175

Surface Water Proposals

7.25. It is proposed to provide a network of trapped gullies, pipes and Sustainable Drainage (SuDS) features to collect the surface water runoff from impermeable areas such as roads, roofs and driveways. The traditional system will work in combination with such features as permeable paving, roadside swales and basins to provide attenuation storage and high-quality water benefits.

7.26. A ditch that runs parallel along the northern boundary of the site will receive the surface water runoff from the proposed development, in order to mimic the existing drainage conditions.

7.27. The existing central hedgerow that crosses the site from north to south effectively bisects the site in half and therefore the drainage strategy is split into two separate catchments (Catchment A and B).

7.28. Each catchment benefits from its own principal attenuation basin and outfall point into the nearby ditch.

7.29. Drawing HD083-001 Drainage Strategy provides an overview to the proposals and catchments, a copy of which is included within Appendix 3.

7.30. This drawing shows an option for the location and size of the basins. It should be noted that the indicative location for the eastern basin is dictated in part by the presence of a foul sewer running within the eastern part of the site. The location and form for this basin may be varied at detailed design stage to integrate further with the landscape and biodiversity aspirations for the scheme and, for instance, if the foul sewer is diverted. The drainage strategy may be revised at a later stage if site investigation including soakage testing shows that infiltration is a viable means for the discharge of surface water.

7.31. The locations and general forms for the basins demonstrate that there is adequate space for a suitable feature at this stage. The final details will be confirmed at detailed design.

7.32. The banks of the SuDS basins will be designed in accordance with the SuDS Manual C753 in respect to having a maximum gradient of 1 in 5 and an appropriate freeboard above the maximum water level. This allows landscaping of both wetland and wildflower mixes to provide an appropriate landscape context in the vicinity of the features through the provision of an aquatic shelf.

7.33. Open SuDS features will be designed so as not to compromise the safety of residents, visitors and their property. Generally open boundaries are provided, and perimeter planting could be utilised to define the extents of the features.

7.34. Proposed discharge rates will be restricted to QBAR for all storm events up to and including the 1 in 100 year storm event plus 40% allowance for climate change. This would negate the requirement for Long Term Storage and flows would be attenuated on site and discharged utilising on-site flow control devices such as a Hydrobrakes.

7.35. All conveyance systems will be designed to cater for the 1:30 year storm event, in accordance with industry standard, with all attenuation features designed to allow for the 1 in 100 year storm event plus 40% climate change allowance.

7.36. The proposals draw reference to the DEFRA document Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems March 2015, as well as CIRIA C753 The SuDS Manual.

7.37. Current uncontrolled pluvial runoff exhibited onsite during high rainfall events will be mitigated as a result of the Development. This will occur by virtue of the change in surface from greenfield to positively drained impermeable areas, which will serve to capture, attenuate and delay surface water runoff. This will be a benefit to downstream receptors.

7.38. This proposal identifies the principal components of the surface water strategy and is subject to further detailed localised investigations as part of the subsequent Reserved Matters applications. These assumptions are subject to evolution as the design develops and the individual parcels are further realised.

7.39. There is scope to utilise source control techniques (such as swales, granular strips and permeable paving) which will assist with the reduction of larger attenuation storage features. This should be embraced and investigated as the project progresses.

7.40. Subject to the provision of additional geotechnical information, the attenuation basins may require partial lining to protect against the ingress of natural groundwater. Such lining provides the ability to create localised, small permanent bodies of water which adds landscaping and biodiversity opportunities to the scheme.

Exceedance Flood Routing

7.41. Flows in excess of the above design storms, which may flood from the network for storms in excess of the 1 in 100 year storm plus 40% climate change, will be kept within the internal road network, until such time as they can be directed into adjacent landscaping areas or existing vegetation/woodland. This ensures that no onsite or offsite residential units are afforded an increased level of protection from flood waters until such time as the rain events become significant.

7.42. The attenuation basins of the Development are designed to provide 300mm freeboard and therefore can accept additional flood water from manholes upstream within the development area and drainage strategy.

Water Quality Improvements

7.43. CIRIA report C753 The SuDS Manual outlines the methodology for assessing water quality risks associated with new development. This is a simple index approach which provides a high level scoping analysis of the land usage and gives guidelines for appropriate treatment stages.

7.44. This process identifies features necessary to provide adequate substance removal in line with Environment Agency requirements. This is a three step process of Allocation, Mitigation and Review.

7.45. Surfaces generating runoff are 'graded' on their potential to contribute to various harmful pollutants and gives each surface a risk of pollution from each element. An extract of Table 26.2 within the SuDS Manual is set out overleaf.

Figure 10 – Extract from Table 26.2 SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Other Roofs	Low	0.3	0.2-0.8	0.05
Low traffic residential roads and non-residential parking with infrequent change.	Low	0.5	0.4	0.4
Commercial yard, parking with frequent change, other roads,	Medium	0.7	0.6	0.7
Sites with heavy pollution	High	0.8	0.8	0.9

7.46. Historically, PPG3 documentation would recommend that pollutants were removed utilising oil separators, but since its superseding, more recent guidance has shifted to the use of SuDS features to remove pollutants; thereby providing significant improvements in treatment.

7.47. The use of non-mechanical features decreases the requirements for maintenance and increase natural biodiversity. That said, the SuDS Manual does not remove the possibility of utilising separators, so long as they are considered in partnership with a comprehensive overall SuDS regime.

7.48. Without adequate treatment, the pollutants would cause damage if they were to enter the watercourse or water table in large volumes. The use of SuDS features to slow down and degrade these pollutants is critical to the provision of an acceptable discharge.

7.49. The respective cleansing abilities of common SuDS features are given by corresponding mitigation indices within the SuDS Manual. An extract of Table 26.3 is set out below highlighting the key proposed SuDS feature within the drainage strategy.

Figure 11 – Extract from Table 26.3 SuDS Manual

Type of SuDS component	Total Suspended Solids	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable Paving	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

7.50. The individual pollution indices are totalled, with the first SuDS component utilising its full value and subsequent downstream SuDS features acting with 50% efficiency. This provides a realistic strategy which mimics the reduced cleansing effectiveness as the concentration of a pollutant decreases along the SuDS train.

7.51. The pollution indices for the proposed development do not exceed the “Low Pollution Hazard” (TSS:0.5, Metals:0.4, Hydrocarbons:0.4) level and the proposed detentions basins (TSS: 0.5, Metals: 0.5, Hydrocarbons: 0.6) provide adequate pollution mitigation for each catchment.

7.52. In line with Environment Agency guidance, before the design phase is concluded, the proposals are reviewed and analysed in order to identify potential shortcomings and to ensure that adequate volume of SuDS features are provided to mitigate the risk of pollution from each source.

SuDS Maintenance Strategy

7.53. For the water treatment effects of SuDS features to remain effective, a comprehensive maintenance strategy should be implemented.

7.54. During construction, maintenance of SuDS features should be undertaken by the Contractor. Upon completion, the assets should be passed over to the Management Company, statutory authority, or community group commissioned to maintain the features in perpetuity.

7.55. As part of the strategy, a regular maintenance regime will be created, which consists of several primary measures required to ensure the longevity of the system. These should be undertaken on a regular basis to ensure consistent performance. Typical maintenance activities consist of:

- Inspecting and reporting; relatively regular review of the condition identifying issues and providing resolutions. Periodic review from the maintenance contractor;
- Litter and debris removal;
- Grass trimming, overall cutting and localised strimming preventing blockages;
- Weed and evasive plant control;
- Shrub management;
- Aquatic and shoreline vegetation management;
- Sweeping pervious surfaces; and
- Oil removal from proprietary systems.

7.56. A remedial maintenance schedule would be recommended as part of the handover of the SuDS features, remedial maintenance is required to provide repairs to the system and monitor long term damage ensuring the system remains consistently productive. the schedule could consist of;

- Structure rehabilitation and repair;
- Infiltration surface rehabilitation;
- Scarifying to remove “Thatch”;
- Spiking or Tining the soil;
- Air pressure treatment.

7.57. The maintenance schedule contents and timing will depend upon multiple factors including usage, contents of water utilising the system, location and biology. To this end, it is suggested that the schedule be finalised as part of detailed design; ensuring the most comprehensive maintenance schedule is incorporated for the phase in hand.

7.58. Community outreach can be undertaken as part of the development, which will raise awareness on the importance of SuDS to both flood risk and water quality in the local area. Imparting the new residents with knowledge on the risks associated with pollution to the surface water drainage system is key, as is the direct effect their actions may have on water quality and biodiversity in the area.

Adoption and Ownership

7.59. The drainage system is designed to the appropriate standards including the new Sewerage Sector Guidance (SSG), the Building Regulations and the requirement of the National Planning Policy Framework

7.60. The intention of adoption and ownership of drainage and SuDS is as follows:

- Surface water sewers within development parcels to be offered for adoption to Thames Water under the Section 104 process of the Water Industry Act.
- Surface water highway drains, gullies and leads within adopted roads to be maintained by the Highway Authority.
- Above ground attenuation (i.e. swales and basins) to be maintained by a private maintenance company funded by residential properties or subject to agreement with the Local Authority.
- SuDS features serving single properties, for example, permeable paved driveways to single dwellings, will be owned and maintained by the owner of that property.

7.61. Suitable adoption and maintenance regimes for SuDS should be submitted in support of the Reserved Matters application.

8.0 Foul Water Drainage

Introduction

8.1. This chapter provides details on the proposed foul water drainage strategy and measures to convey effluent.

Overall Strategy

8.2. Due to the topography of the site and location of the existing foul sewer point of connection, wastewater from the site can flow entirely by gravity to the receiving public sewer.

8.3. An existing Thames Water foul sewer is running along School Road and an outfall can be found at the road access of the proposed development. An alternative point of connection could be made to the foul sewers to the east of the site.

8.4. The connection to the existing public sewer system will be made via a S106 Agreement with Thames Water.

8.5. The proposed foul water sewers will be designed in collaboration with Thames Water as approving body in accordance with the new Sewerage Sector Guidance (SSG) and will be offered to Thames Water for adoption under S104 Agreement of the Water Industry Act.

8.6. An indicative foul route can be seen in Drawing HD083-001 Drainage Strategy in Appendix 3.

Adoption and Ownership

8.7. The drainage system is designed to the appropriate standards including the new Sewerage Sector Guidance (SSG), the Building Regulations and British Standards.

8.8. Foul water sewers within development parcels and offsite to the point of connection are to be offered for adoption to Thames Water under the Section 104 process of the Water Industry Act.

9.0 Conclusion

Flood Risk

9.1. The EA Flood Risk mapping was reviewed alongside the Wokingham Borough Council (WBC) Preliminary Flood Risk Assessment (PFRA) and Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA).

9.2. This Flood Risk Assessment (FRA) concludes that:

- The entire site is located within Flood Zone 1 'Low Probability' (land at less than 1 in 1,000 (0.1%) annual probability of river or sea flooding').
- EA flood maps suggest that there may be a potential flow route for surface water flooding through the site; however site observations and a more detailed assessment confirm that any overland flow would be intercepted by the perimeter ditches and would be conveyed within the existing ditches around the site. Surface water flood risk is therefore low.
- The WBC Level 1 SFRA confirm that there are no records of groundwater flooding at the site. The mapping indicates that the site is within a 1km grid square with less than 25% risk of groundwater flooding. The site is therefore considered to be at a low risk of flooding from groundwater.
- There is a Foul sewer running within the site's boundary however this is located away from the built development. This will be assessed further at detailed design.
- The site is not at risk of flooding in the event of a reservoir breach.

9.3. The site is therefore at a low risk of all sources. This FRA confirms that there will be no increased risk because of this development.

Vulnerability and the Sequential Test

9.4. The proposed development is classed as 'More Vulnerable' and development. These uses are considered appropriate within Flood Zone 1 and areas with a 'Low' or 'Very Low' risk of surface water flooding without the need for the Sequential Test to be undertaken. The Exception Test is not needed for this site.

Mitigation Strategy

9.5. Where the site is located outside of the fluvial flood extent, ground floor levels should be set a minimum of 150mm above the surrounding ground level to mitigate the residual flood risk from surface water runoff events. It is recommended that surrounding ground levels are appropriately contoured to direct surface water away from houses.

9.6. The proposed surface water drainage strategy will manage the surface water runoff from the site. Any increase in surface water run-off will be managed using SuDS source control techniques as well as attenuation features to provide storage in extreme storm events. This provides the minimum of two treatment storage stages which is in accordance with the recommendations of CIRIA C753. All surface water drainage systems will be designed to restrict drainage discharge rates to QBAR runoff rates and store the balance of water for all events up to and including the 1 in 100 year event including allowance for a 40% increase in rainfall intensities as a result of climate change and urban creep.

9.7. The basins shown in the FRA demonstrate that a suitable strategy can be delivered at the site although the location and form for the basins is indicative at this stage. The final form will be confirmed at detailed design.

Summary

9.8. This FRA demonstrates that the proposed development complies with national and local planning policy with respect to flood risk and drainage. The risk of flooding is adequately managed, and, with the implementation of a suitable surface water drainage strategy, the offsite flood risk is not increased.

Appendices

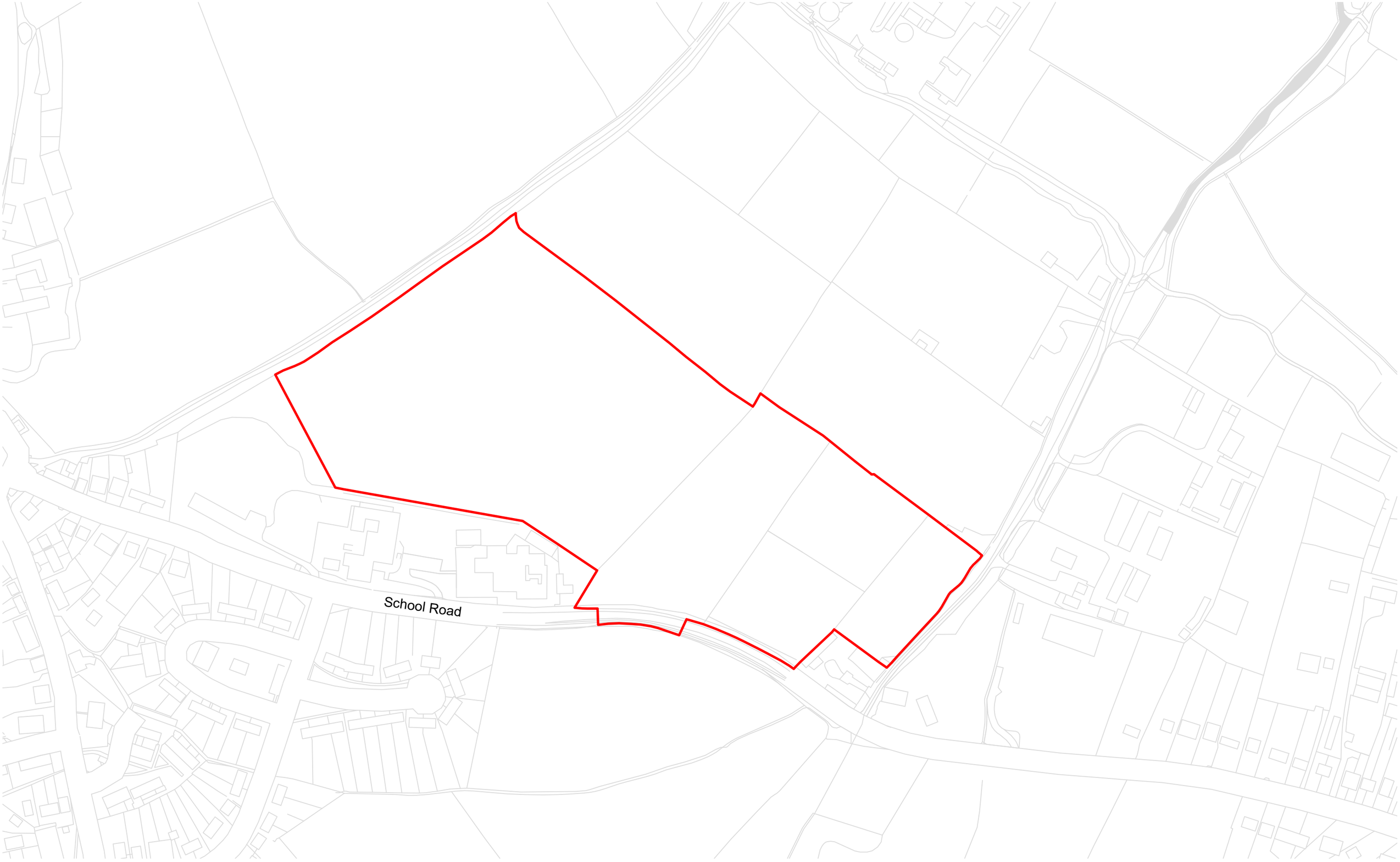
Appendices

Appendix 1 - Plans

Illustrative Masterplan

Topographic Survey

Thames Water Sewer Asset Plan



Site Boundary - 8.25Ha

Status **Final**

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Client:	Croudace Homes
Project title:	Land North of School Road, Arborfield Cross
Drawing title:	Site Boundary Plan

Scale:	1:2500@A3
Date:	12.08.2024
Drawn by:	DR
Checked by:	MV
Drawing no.:	2522477.4
Revision:	A

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Client:	Croudace Homes
Project title:	Land North of School Road, Arborfield Cross
Drawing title:	Ilustrative Masterplan

Scale:	1:1500@A2
Date:	09.08.2024
Drawn by:	DR
Checked by:	MV
Drawing no.:	2522477.4
Revision:	C

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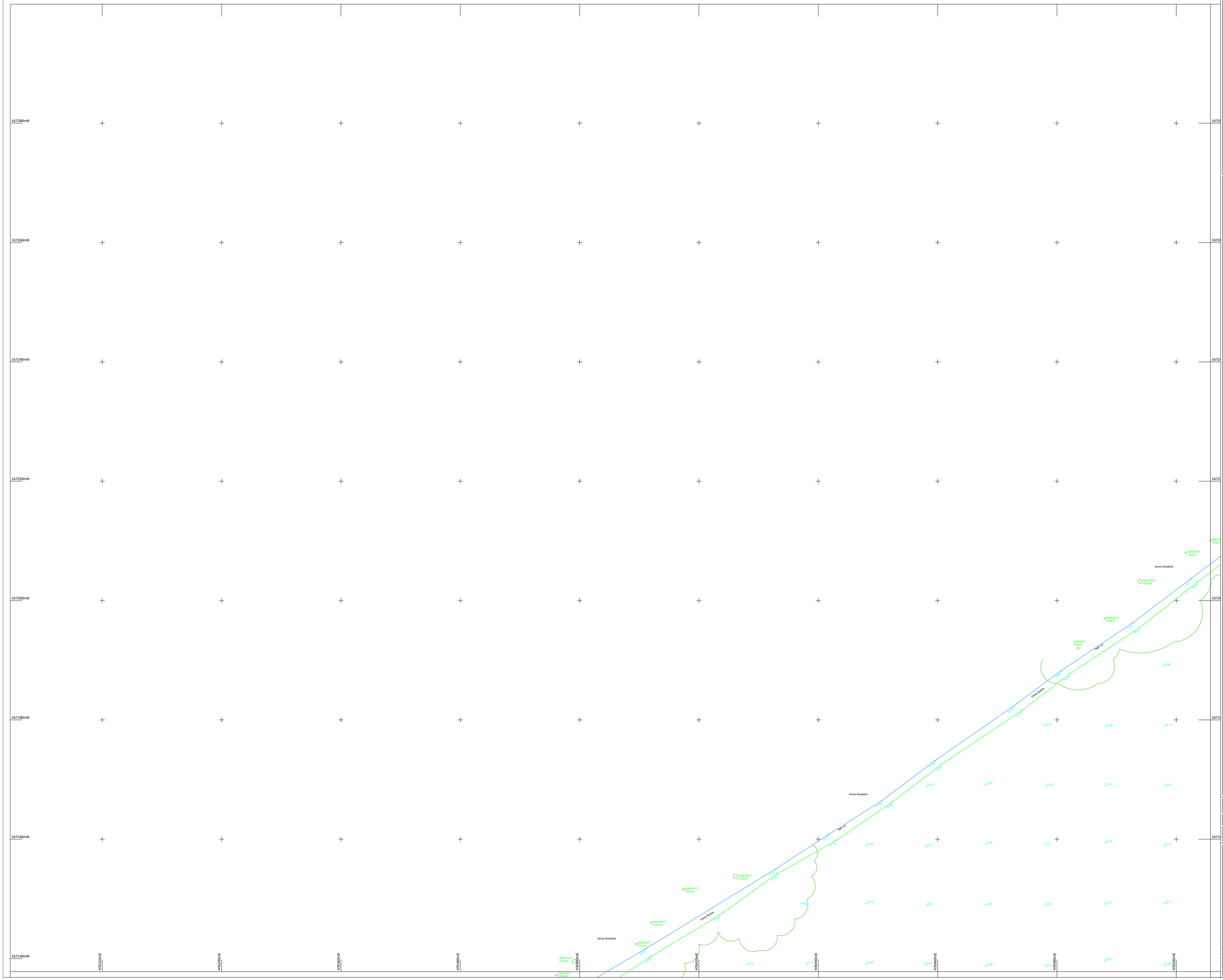
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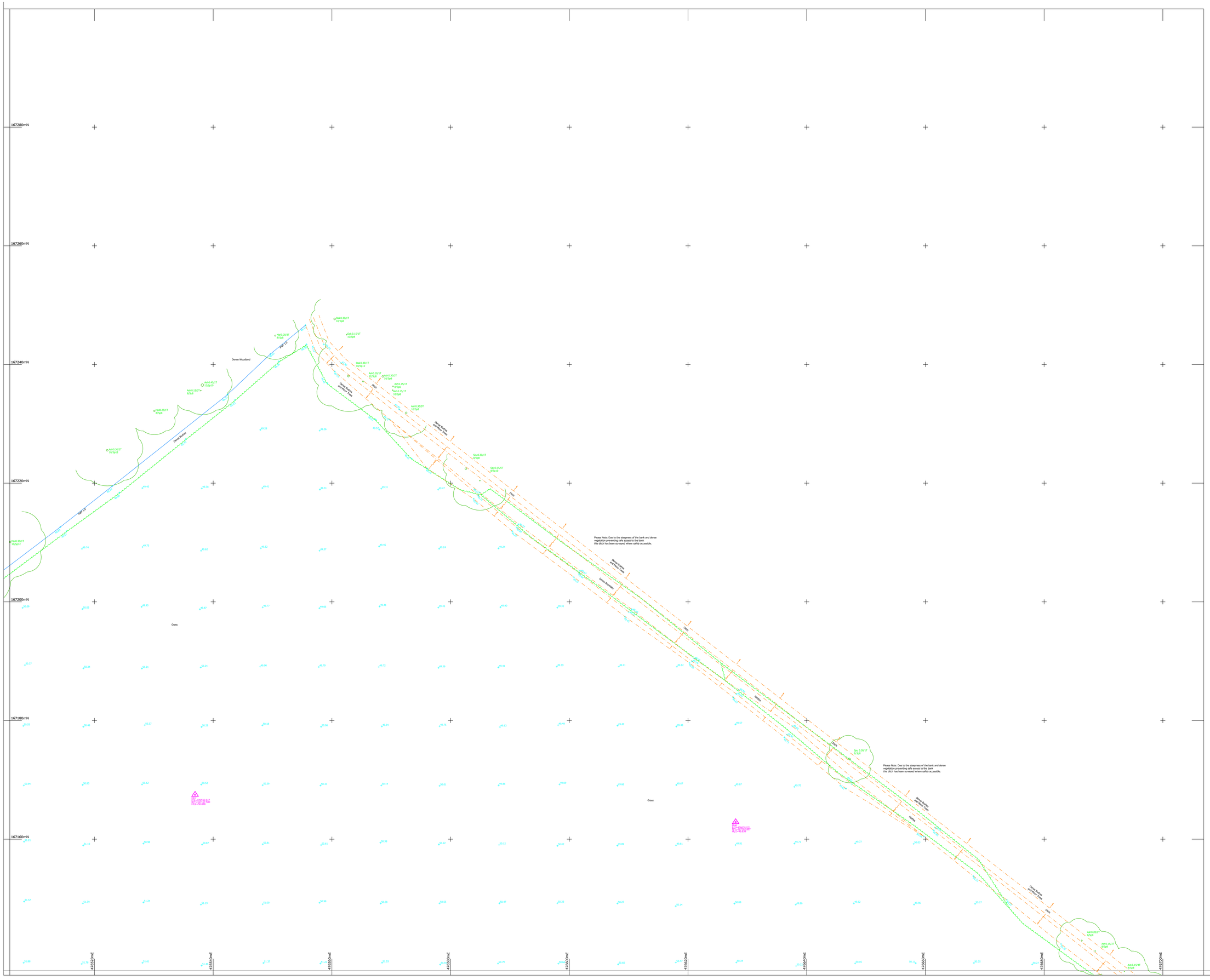
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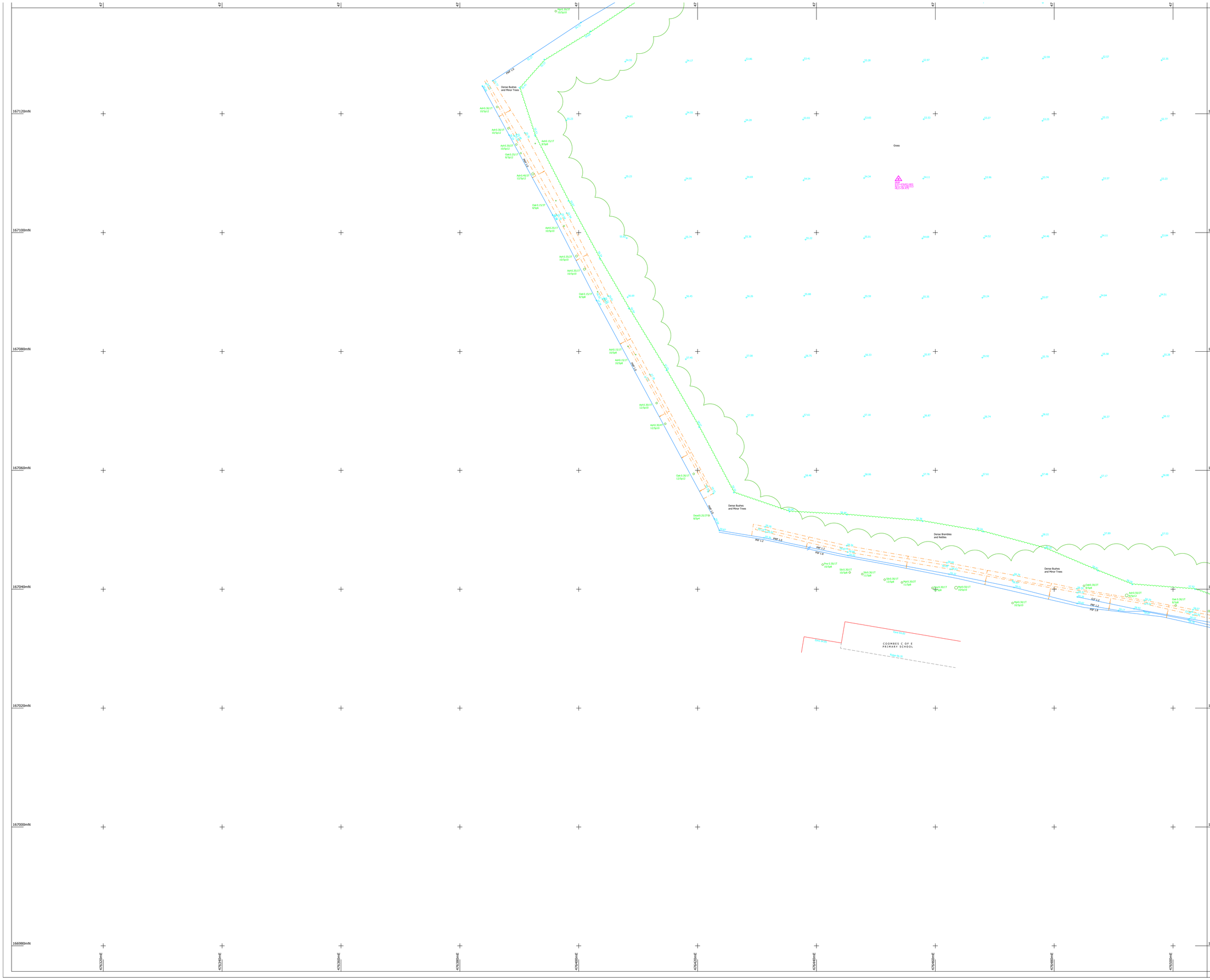

NOTES:

Drainage:
Inspection Covers are lifted where possible and all drainage invert information has been obtained through visual inspection only, with no entry into manholes. Therefore the complete accuracy cannot be guaranteed. Where drainage is of critical importance we suggest the services of a specialist drainage expert be used.

Trees:
Every effort has been made to identify and detail all trees on site but where trees are of critical importance we suggest the use of a specialist such as an arborist. Tree spread and heights are indicative.

GPS:
GPS detail is relative to the time and date of survey. GPS levels and grid are obtained using industry standard guidelines and can vary according to the quality of the GPS network at the time of survey. Unless stated otherwise, surveys are Scale Factor 1 and Horizontal and Vertical Datums are established from a central site fix and baseline orientation station utilising GNSS correction data.

Survey notes:
Survey specification is linked to the original purpose of the survey commissioned at source and is to be used for this purpose only. Survey is accurate within limitations of site conditions at the time of survey. In areas difficult to survey due to restricted access, lines of sight or dense vegetation, critical dimensions and positions should be verified following suitable clearance.
Survey detail obtained and shown is relative to the plotting scale.

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LEGEND

OVERALL TREE SPECIES INFORMATION

ALDER	ALD	LONDON PLANE	LPN
ASH	ASH	MAGNOLIA	MAG
ASPEN	ASP	MAPLE	MPL
BEECH	BCH	OAK	OAK
CHERRY	CHY	PINE	PNE
ELM	ELM	POPLAR	POP
FIR	FIR	RHODODENDRONS	RDN
FRUIT	FRT	SYCAMORE	RWN
HAWTHORN	HAW	SILVER BIRCH	SBI
HAZEL	HAZ	SWEET CHESTNUT	SCH
HOLLY	HLY	WALNUT	WNT
HORSE CHESTNUT	HCH	WILLOW	WLW
LIME	LIM	YEW	YEW
LOCUST	LOC	SPECIES UNKNOWN	SPU
		COPPICED	COP

TREE ANNOTATIONS: Tree Species / Tree Bole Size / No of Boles
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF
CHAIN LINK FENCE	CLF
CHESTNUT PALING FENCE	CPF
CLOSE BOARD FENCE	CBF
CONCRETE SLAT FENCE	CCF
CORRUGATED IRON FENCE	CIF
CRASH BARRIER	CBR
HANDRAIL	HDL
IRON RAILINGS	IRF
MESH FENCE	MSF
MISCELLANEOUS FENCE	MSF
PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
SECURITY FENCE	SCF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF
WIRE MESH FENCE	WMF

LEVEL INFORMATION

BED LEVEL	BL
COVER LEVEL	CL
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
POOL WATER	PW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Cc
BRICK PAVING	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
SCALPINGS	Scalp
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NAME PLATE	NP
TELECOMS IC	BTIC	NOTICE BOARD	NB
BUS STOP	BS	POST	P
CABLE TELEVISION IC	CATV	RAIN WATER PIPE	RWP
EARTHING ROD	ER	ROAD SIGN	RS
ELECTRICITY CABLE PIT	ELCP	RODDING EYE	RE
ELECTRICITY POLE	EP	SERVICE MARKER POST	SMP
FIRE HYDRANT	FH	SOIL VENT PIPE	SVP
FLAG POLE	FP	STOP VALVE	SV
GUIDE POST	GP	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TRAFFIC SIGNAL	TS
LAMP POST	LP	TRAFFIC SIGNALS IC	TSIC
LETTER BOX	LB	WASH OUT	WO
KERB OUTLET	KO	WATER METER	WM

REVISIONS

PLOT MAP

1	2	
3	4	5
	6	7

Level Datum:
Levels are related to OSGB15 derived from the GPS network

Grid:
Grid is related to OSGB15 derived from the GPS network

Northpoint:

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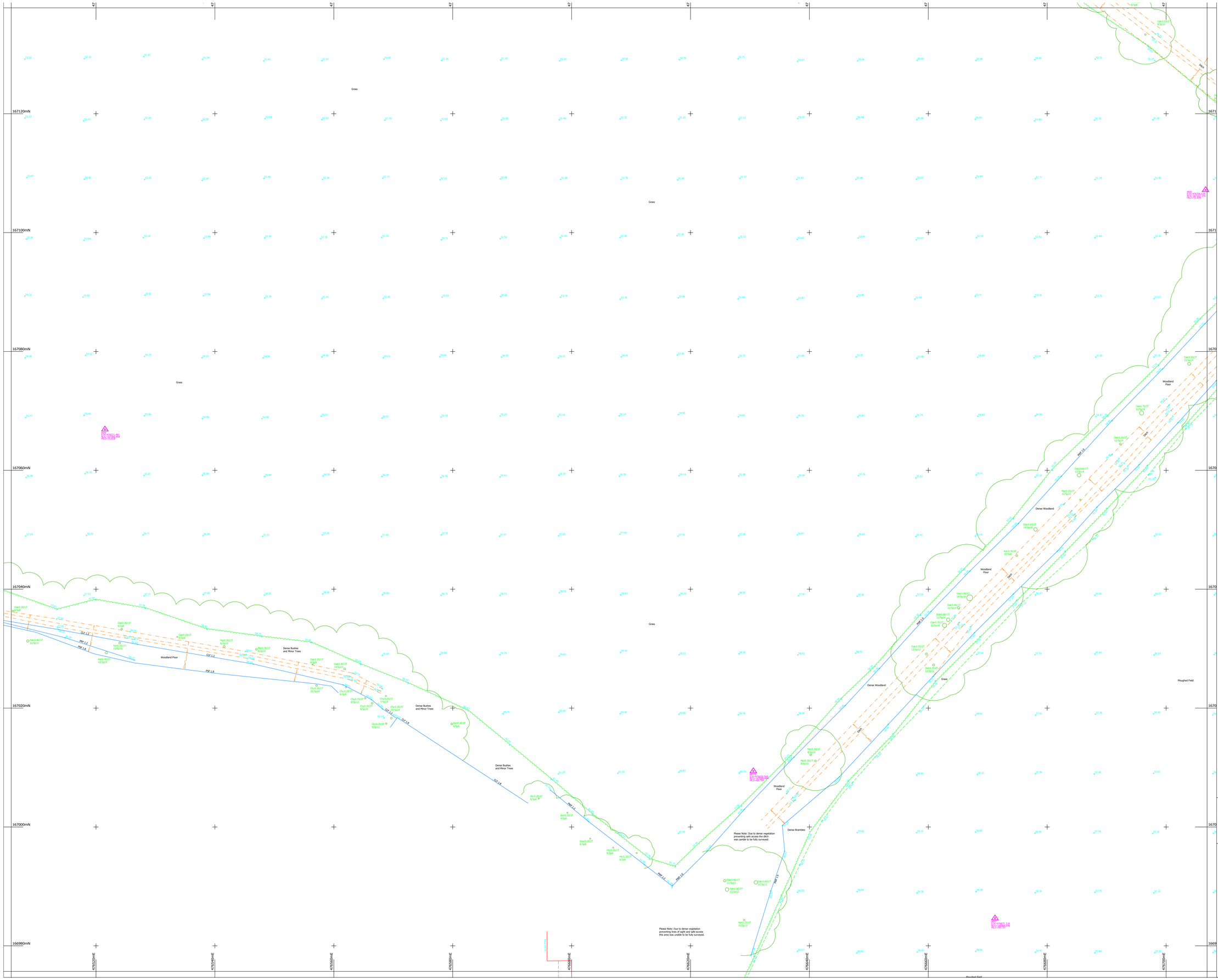
Tel: (+44)2380 692002 Email: info@encompass-surveys.co.uk
Website: encompass-surveys.co.uk

Client:	Croudace Homes		
Survey Location:	Land North of School Road Arborfield Cross Wokingham RG41 4TN		
Survey type:	Topographical	Scale:	1:200@A0
Drawing ref:	ENC/020524/3336-S1	Date:	May 2024
Drawn/QA:	MH/DH	Plot No.	3 of 7



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BEECH	BCH	OAK	OAK
CHERRY	CHY	PINE	PNE
ELM	ELM	POPLAR	POP
FIR	FIR	RHODODENDRONS	RDN
HAZEL	HAZ	ROWAN	RWN
HAWTHORN	HAW	SILVER BIRCH	SBI
HOLLY	HLY	SWEET CHESTNUT	SCH
HORSE CHESTNUT	HCH	WALNUT	WNT
LIME	LIM	WILLOW	WLW
LOCUST	LOC	YEW	YEW
		SPECIES UNKNOWN COPPICED	SPU COP

TREE ANNOTATIONS: Tree Species / Tree Bole Size / No of Boles
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF
CHAIN LINK FENCE	CLF
CHESTNUT PALING FENCE	CPF
CLOSE BOARD FENCE	CBF
CONCRETE SLAT FENCE	CCF
CORRUGATED IRON FENCE	CIF
CRASH BARRIER	CBR
HANDRAIL	HDL
IRON RAILINGS	IRF
MESH FENCE	MSF
MISCELLANEOUS FENCE	MSF
PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
SECURITY FENCE	SCF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF
WIRE MESH FENCE	WMF

LEVEL INFORMATION

BED LEVEL	BL
COVER LEVEL	CL
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
POOL WATER	PW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Cc
BRICK PAVING	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
SCALPINGS	Scalp
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NAME PLATE	NP
TELECOMS JC	BTJC	NOTICE BOARD	NB
BUS STOP	BS	POST	P
CABLE TELEVISION JC	CATV	RAIN WATER PIPE	RWP
EARTHING ROD	ER	ROAD SIGN	RS
ELECTRICITY CABLE PIT	ELCP	RODDING EYE	RE
ELECTRICITY POLE	EP	SERVICE MARKER POST	SMP
FIRE HYDRANT	FH	SOIL VENT PIPE	SVP
FLAG POLE	FP	STOP VALVE	SV
GUIDE POST	GP	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TRAFFIC SIGNAL	TS
LAMP POST	LP	TRAFFIC SIGNALS JC	TSJC
LETTER BOX	LB	WASH OUT	WO
KERB OUTLET	KO	WATER METER	WM

REVISIONS

PLOT MAP

1	2	
3	4	5
	6	7

Level Datum:
Levels are related to OSGB15 derived from the GPS network

Grid:
Grid is related to OSGB15 derived from the GPS network

Northpoint:

ENCOMPASS SURVEYS

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Whiteley, Fareham
Hampshire, PO15 7AX

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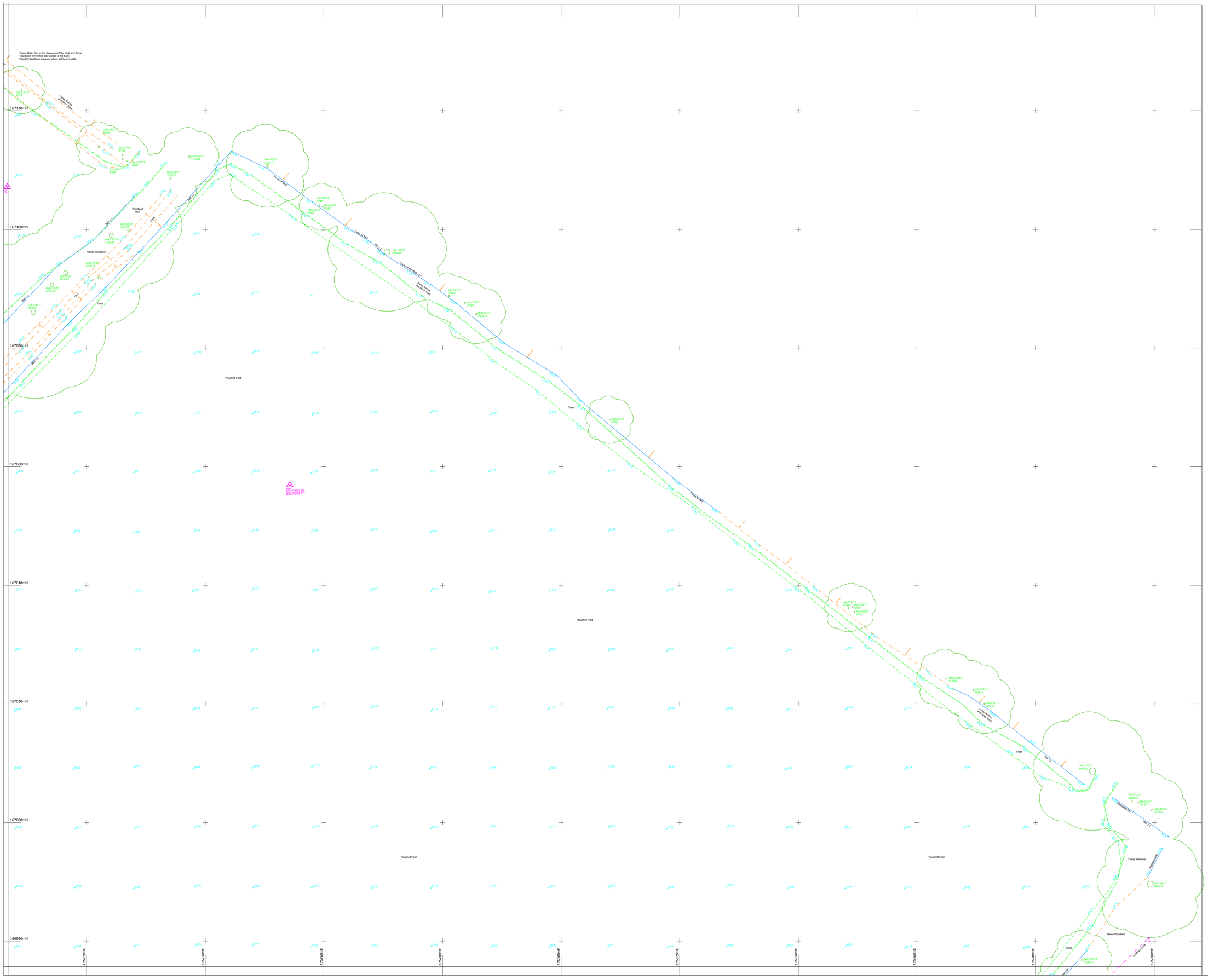
Website: encompass-surveys.co.uk

Client:	Croudace Homes		
Survey Location:	Land North of School Road Arborfield Cross Wokingham RG41 4TN		
Survey type:	Topographical	Scale:	1:200@A0
Drawing ref:	ENC/0220524/3336-S1	Date:	May 2024
Drawn/QA:	MH/DH	Plot No.	4 of 7



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LEGEND

OVERALL TREE SPECIES INFORMATION

ALDER	ALD	LONDON PLANE	LPN
ASH	ASH	MAGNOLIA	MAG
ASPEN	ASP	MAPLE	MPL
BEECH	BCH	OAK	OAK
CHERRY	CHY	PINE	PNE
ELM	ELM	POPLAR	POP
FIR	FIR	RHODODENDRONS	RDN
FILBERT	FLT	ROWAN	RWN
HAWTHORN	HAW	SILVER BIRCH	SBI
HAZEL	HAZ	SWEET CHESTNUT	SCH
HOLLY	HLY	WALNUT	WNT
HORSE CHESTNUT	HCH	WILLOW	WLW
LIME	LIM	YEW	YEW
LOCUST	LOC	SPECIES UNKNOWN COPPICED	SPU COP

TREE ANNOTATIONS: Tree Species / Tree Bole Size / No of Boles
Tree Height / Tree Canopy Spread

FENCE INFORMATION

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PICKET FENCE	PKF
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POST AND RAIL FENCE	PRF
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FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Cc
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REVISIONS

PLOT MAP

1	2	
3	4	5
	6	7

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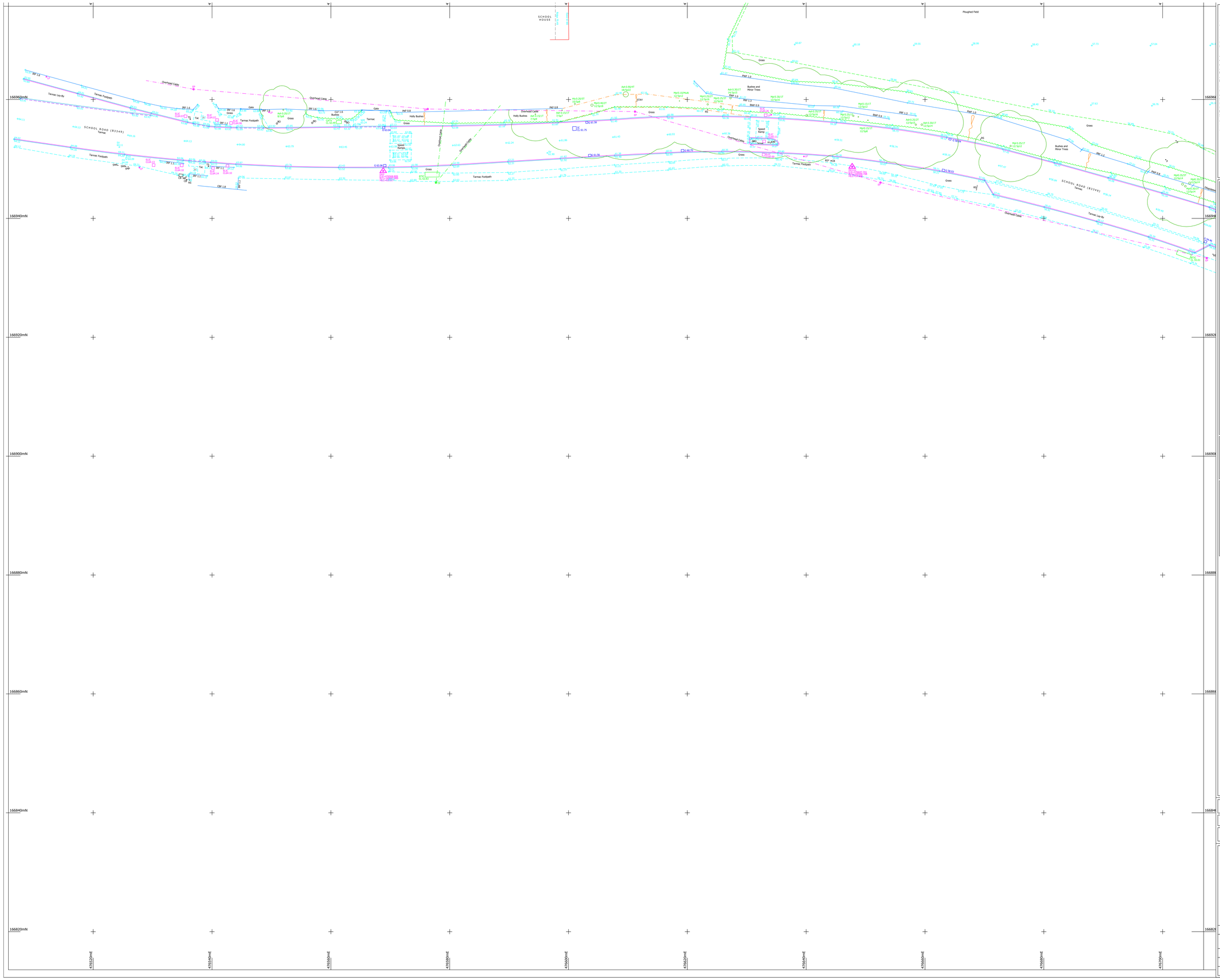
Survey Location:	Land North of School Road Arborfield Cross Wokingham RG41 4TN		
Survey type:	Topographical	Scale:	1:200@A0
Drawing ref:	ENC/020524/3336-S1	Date:	May 2024
Drawn/QA:	MH/DH	Plot No.	5 of 7



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INSPECTION COVER	IC
LAMP POST	LP
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TRAFFIC SIGNALS IC	TSIC
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REVISIONS

PLOT MAP

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3	4	5
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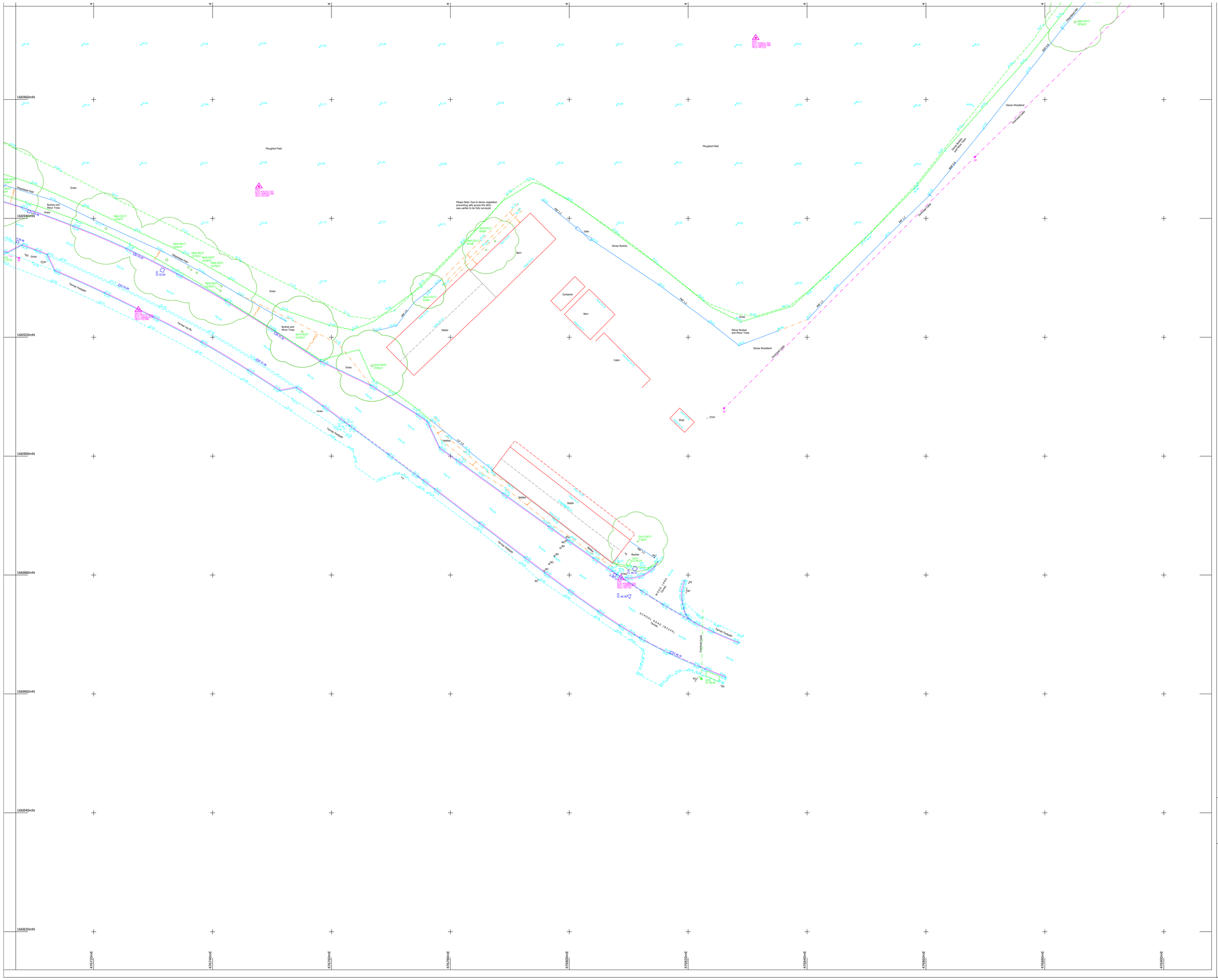
Survey type:	Topographical	Scale:	1:200@A0
Drawing ref:	ENC/020524/3336-S1	Date:	May 2024
Drawn/QA:	MH/DH	Plot No.	6 of 7



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HAZEL	HAZ	SWEET CHESTNUT	SCH
HOLLY	HLY	WALNUT	WNT
HORSE CHESTNUT	HCH	WILLOW	WLW
LIME	LIM	YEW	YEW
LOCUST	LOC	SPECIES UNKNOWN	SPU
		CORPICED	COP

TREE ANNOTATIONS: Tree Species / Tree Bole Size / No of Boles
Tree Height / Tree Canopy Spread

FENCE INFORMATION

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CRASH BARRIER	CBR
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STOCK WIRE FENCE	SWF
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LEVEL INFORMATION

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COVER LEVEL	CL
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Cc
BRICK PAVING	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
SCALPINGS	Scalp
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REVISIONS

PLOT MAP

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3	4	5
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Drawing ref:	ENC/020524/3336-S1	Date:	May 2024
Drawn/QA:	MH/DH	Plot No.	7 of 7

Asset Location Search Sewer Map - ALS/ALS Standard/2024_4986248

SU7666NW

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 476250,166750

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
3601	67.83	66.28
3703	67.77	65.84
3702	66.04	65.06
3701	66.34	64.8
3704	67.22	65.99
3810	65.84	64.58
381B	n/a	n/a
381C	n/a	n/a
381A	n/a	n/a
381D	n/a	n/a
381E	n/a	n/a
3806	65.31	64.06
3802	63.37	62.35
3805	n/a	n/a
3803	n/a	n/a
3804	65.12	63.56
3801	63.3	62
4803	n/a	n/a
4804	n/a	n/a
4801	61.86	60.93
4802	62.48	61.19
3808	65.25	64.13
4901	62.73	60.45
4902	62.71	60.55
4903	63.05	60.94
3901	62.62	61.38
1902	65.25	64.15
1953	65.26	64.08
1903	66.53	64.58
1951	66.67	65.46
1904	66.6	65.04
1952	67.23	66.09
1950	67.54	65.78
1901	67.38	66.19
191A	n/a	n/a
191B	n/a	n/a
1905	68.22	66.8
2902	67.91	66.02
2903	68	66.12
281B	n/a	n/a
291C	n/a	n/a
2901	67.62	65.7
291A	n/a	n/a
291E	n/a	n/a
3550	66.15	64.48
2650	67.38	65.69
2651	67.81	65.8
261A	n/a	n/a
2606	n/a	n/a
2605	67.73	67.29
2604	67.86	67.24
2603	67.82	66.92
2602	67.89	66.73
3602	67.5	66.63
2601	68.1	66.69
1701	73.66	72.29
2703	71.75	70.35
171C	n/a	n/a
171A	n/a	n/a
1703	70.62	69.41
3705	67.72	66.24
2701	68.38	67.15
2702	70.59	69.12
171E	n/a	n/a
171D	n/a	n/a
1702	70.15	69.03
0802	67.52	66.56
2805	67.91	67.21
1802	69.48	68.1
0801	67.24	66.39
2804	67.21	66.5
2803	66.78	66.12
2809	68.14	67.39
1807	67.5	66.09
1801	n/a	n/a
3809	66.73	65.82
2808	67.57	67
2807	66.61	66.14
2814	67.57	66.23
1806	67.28	65.88
2806	66.71	65.76
1805	67.21	65.85
2802	66.52	65.45
1804	67.17	65.71
2813	67.49	65.47
2812	n/a	n/a
2811	67.59	65.24
0806	65.32	62.9
1803	67.65	65.59
3807	65.75	64.54
281A	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
2801	65.49	64.43
2810	66.7	64.86
2815	67.36	65.51
1850	64.58	62.41
1809	64.56	63.6
0854	63.93	62.07
1808	63.67	62.81
1851	64.78	63.16
2816	n/a	n/a
071C	n/a	n/a
071B	n/a	n/a
071A	n/a	n/a
081A	n/a	n/a
0853	65.39	63.02
0804	63.91	62.21
0852	64.22	61.66
0805	63.8	62.48
0851	63.46	61.55
0803	62.6	61.47
0850	62.77	61.05
0905	61.66	60.22
0955	61.6	60.09
0903	62.11	60.96
0904	60.78	59.4
0954	60.88	59.24
0906	61.25	60.17
0902	61.18	60.62
091B	n/a	n/a
091C	n/a	n/a
091A	n/a	n/a
0901	61.99	61.01
0957	n/a	n/a
0956	63.69	62.85

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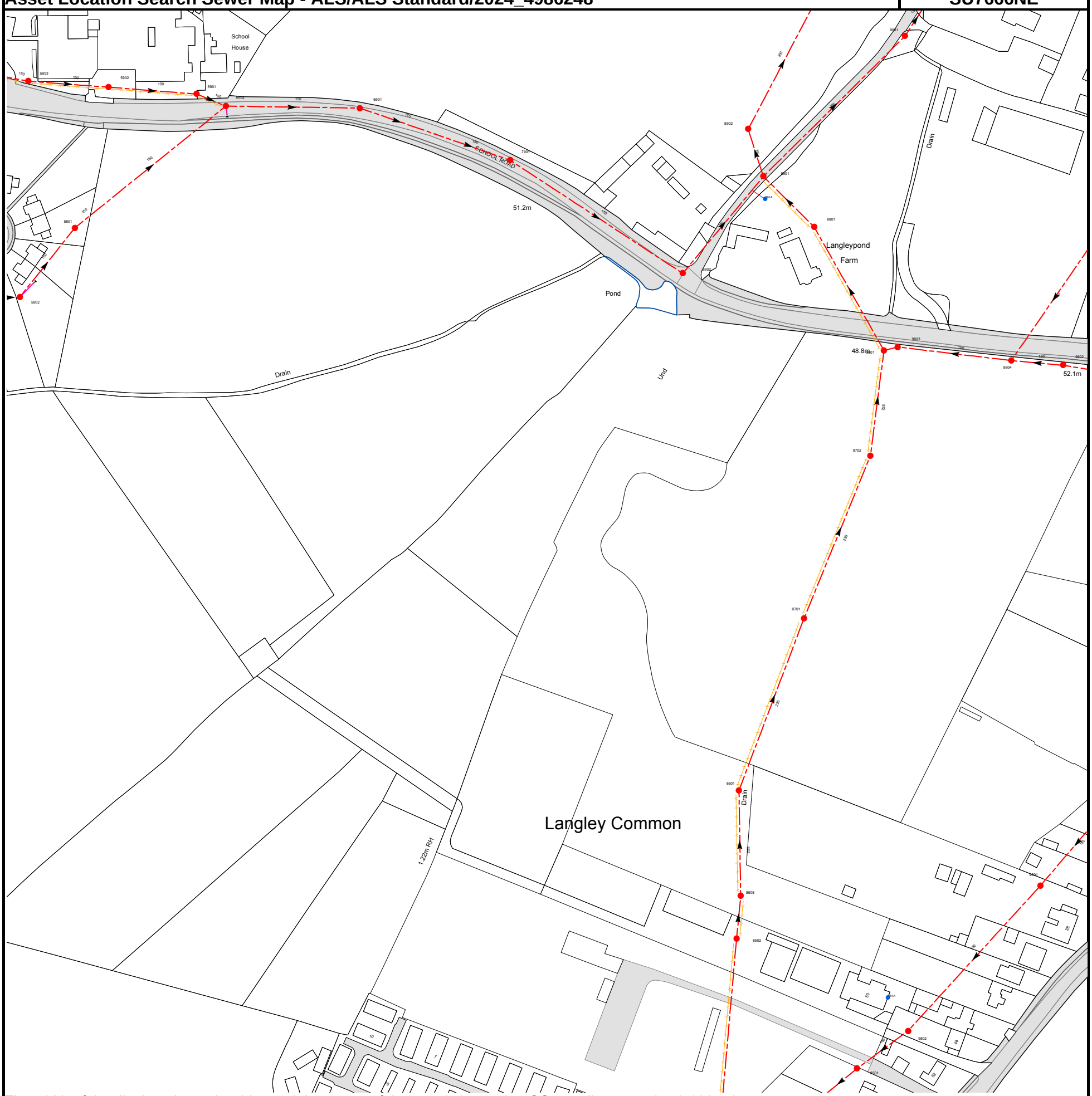
SU7666NE



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8501	53.48	52.26
9502	n/a	n/a
951A	n/a	n/a
8502	51.11	49.75
8508	50.83	49.58
9501	53.98	52.78
8601	50.47	49.02
8701	49.69	48.53
8702	49.13	47.96
9802	51.66	50.51
9804	n/a	n/a
9801	48.64	47.48
9803	48.66	47.65
8802	49.76	47.34
8801	48.64	46.93
891A	n/a	n/a
8901	48.272	46.592
7901	52.62	50.7
8902	48.86	46.4
9901	47.55	46.09
5802	61.97	60.53
5801	63.31	60.2
6901	58.14	56.3
6902	61.5	59.21
5901	62.62	59.67
5902	63.53	60
5903	63.49	60.25

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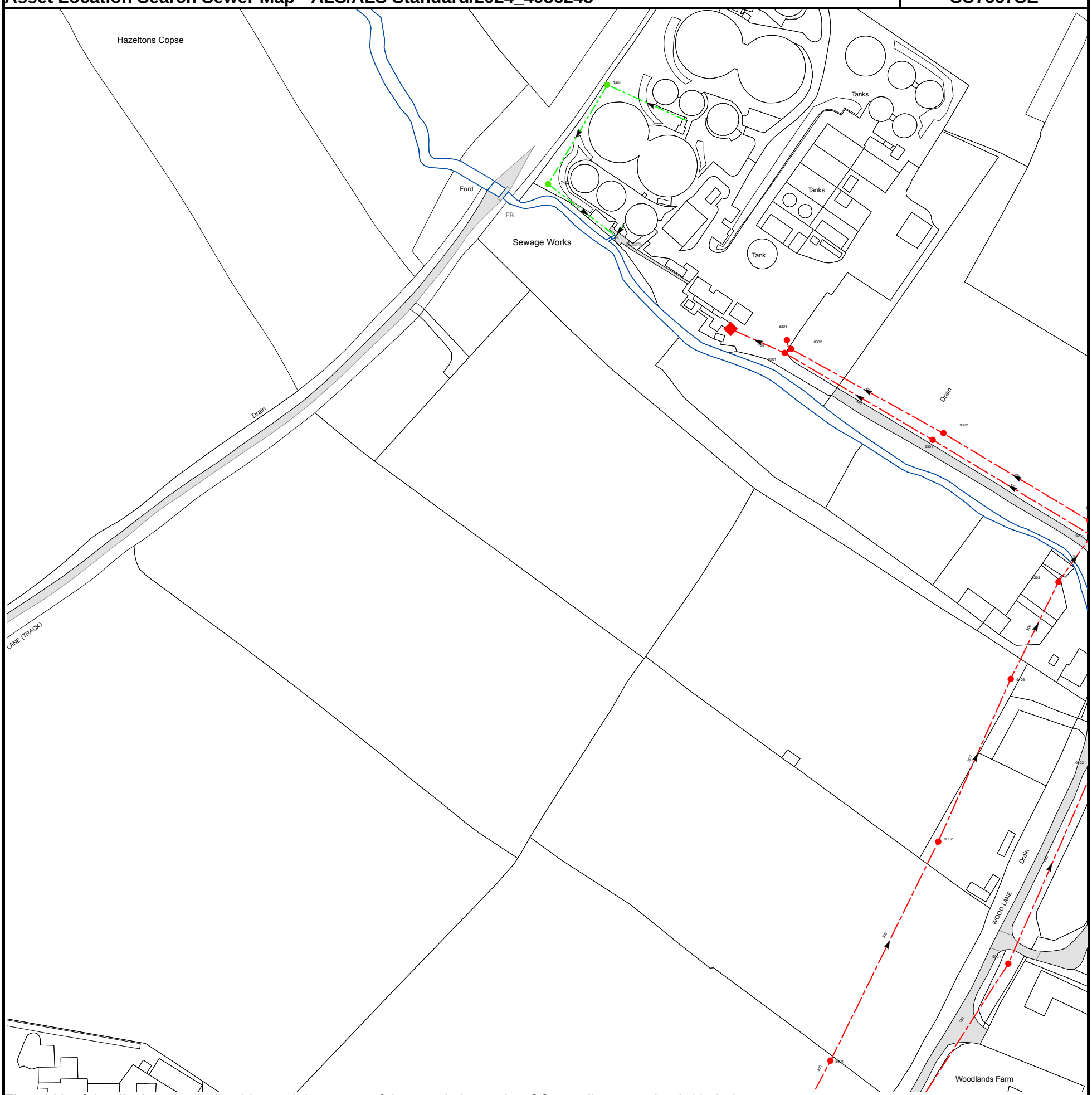
Asset Location Search Sewer Map - ALS/ALS Standard/2024_4986248

SU7667SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 476750,167250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
8001	48.34	45.78
9001	46.85	45.41
9002	47.54	44.97
0102	n/a	n/a
9103	45.7	43.93
9203	45.64	43.35
9201	46.007	43.287
9202	46.142	43.232
9301	45.85	43.17
9302	46.019	43.119
8301	45.55	43.1
8302	45.66	43.04
8304	n/a	n/a
7402	n/a	n/a
7401	n/a	n/a

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Asset Location Search Sewer Map - ALS/ALS Standard/2024_4986248

SU7667SW

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 476250,167250

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
3001	63.56	62.25
0001	64.13	62.55
1050	65.87	63.72
1001	67.08	65.55
1051	66.8	64.98
2004	65.7	63.85
201A	n/a	n/a
201B	n/a	n/a
2002	65.75	63.75
201C	n/a	n/a
2001	64.57	63.01

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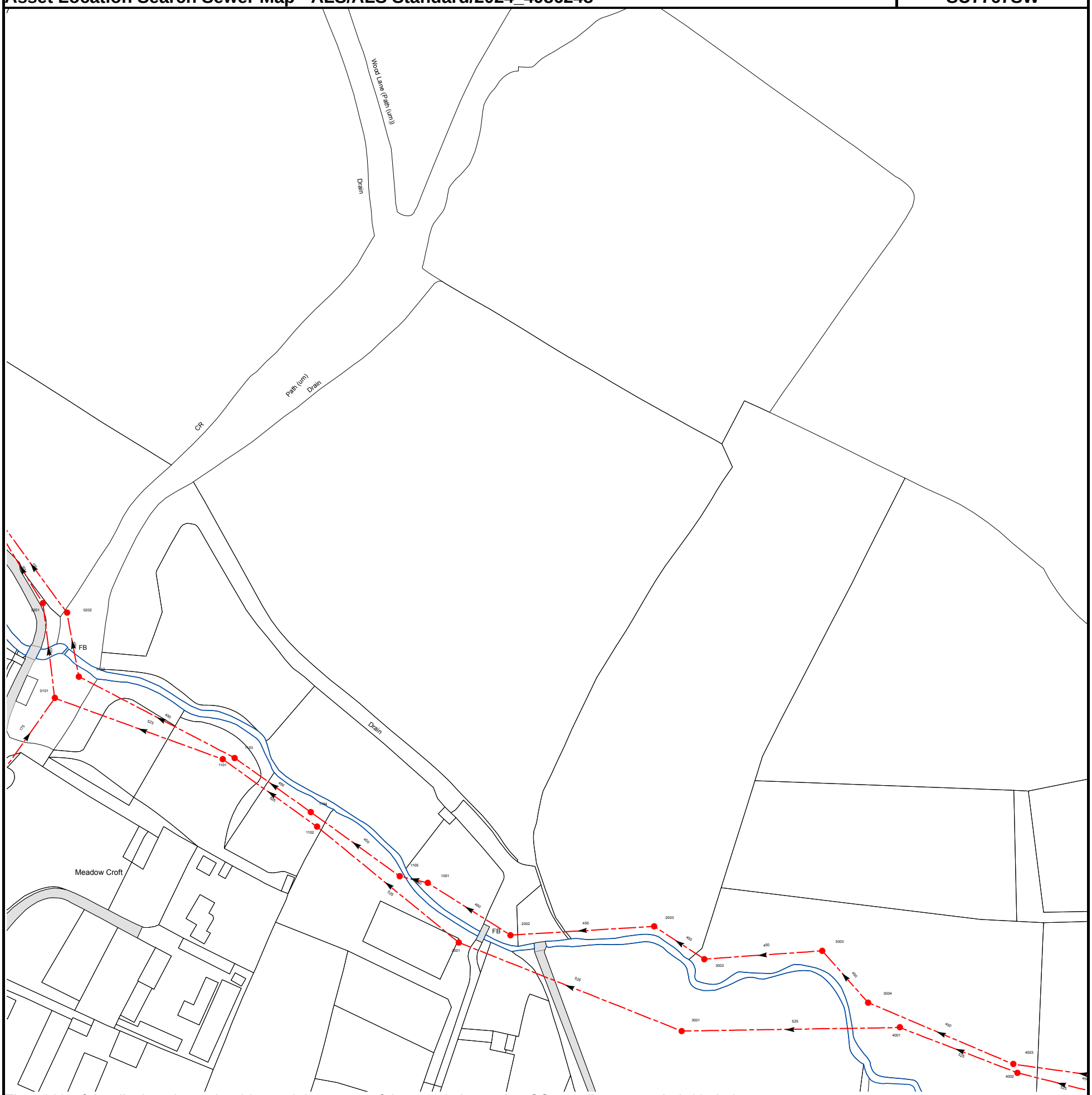
Asset Location Search Sewer Map - ALS/ALS Standard/2024_4986248 | **SU7767SW**



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 477250,167250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
2003	47.45	43.92
3001	47.14	43.8
3002	46.61	43.97
3003	46.94	44.05
3004	46.74	44.09
4001	46.86	n/a
4003	47.41	44.31
4002	47.19	n/a
2001	47.03	n/a
2002	46.45	43.82
1001	46.27	43.75
1105	46.47	43.72
1102	n/a	n/a
1104	46.2	43.64
1101	46.49	n/a
1103	46.2	43.56
0101	45.99	43.4
0103	46	43.43
0202	46.101	43.311
0201	46.11	43.33

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Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

- Inlet
- Outfall
- Undefined End

Other Symbols

Symbols used on maps which do not fall under other general categories.

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement

Ducts may contain high voltage cables. Please check with Thames Water.

- Conduit Bridge
- Subway
- Tunnel

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Asset Location Search Water Map - ALS/ALS Standard/2024_4986248

SU7666NW

The width of the displayed area is 500m and the centre of the map is located at OS coordinates 476250,166750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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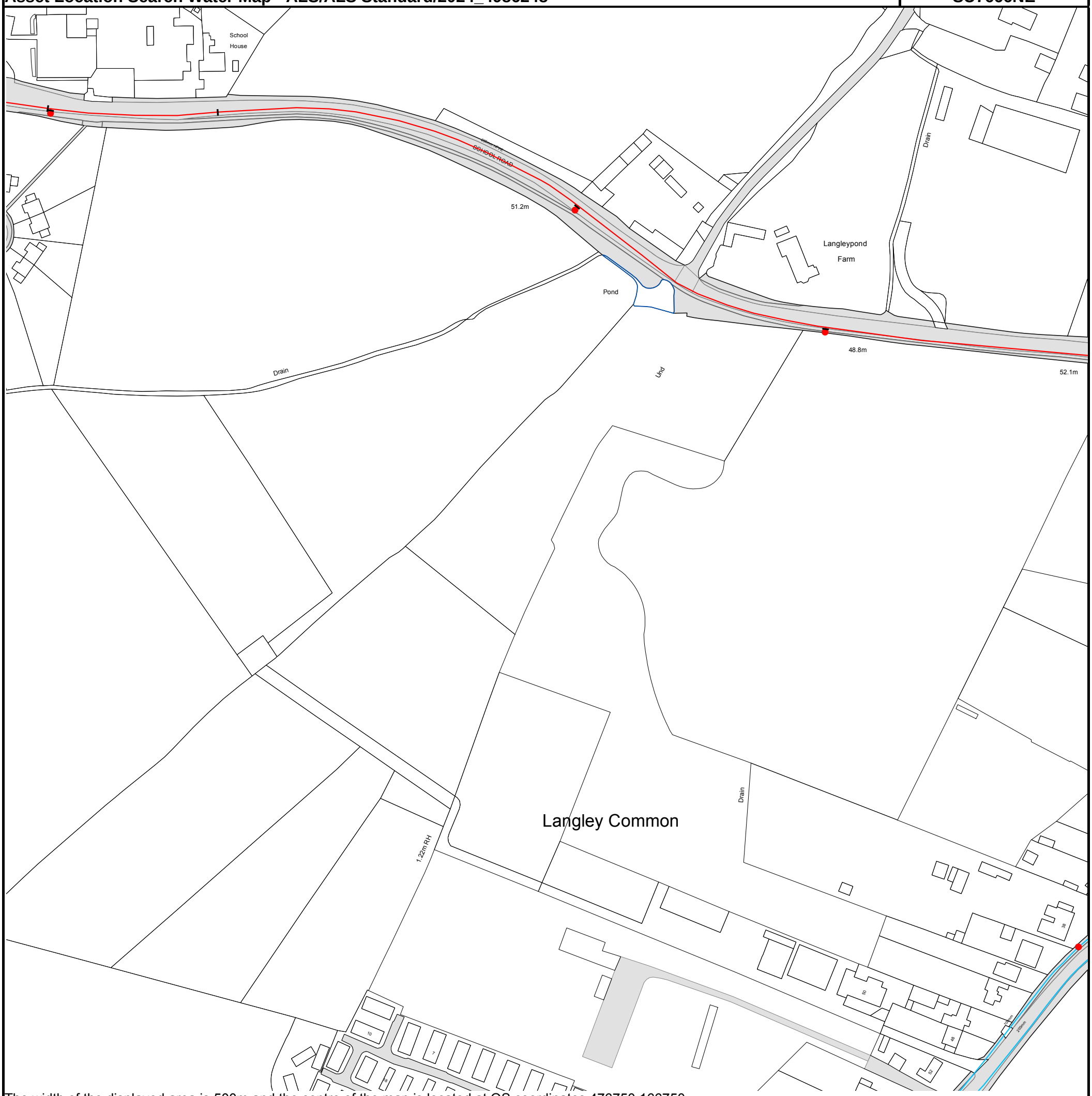
Asset Location Search Water Map - ALS/ALS Standard/2024_4986248

SU7666NE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 476750,166750

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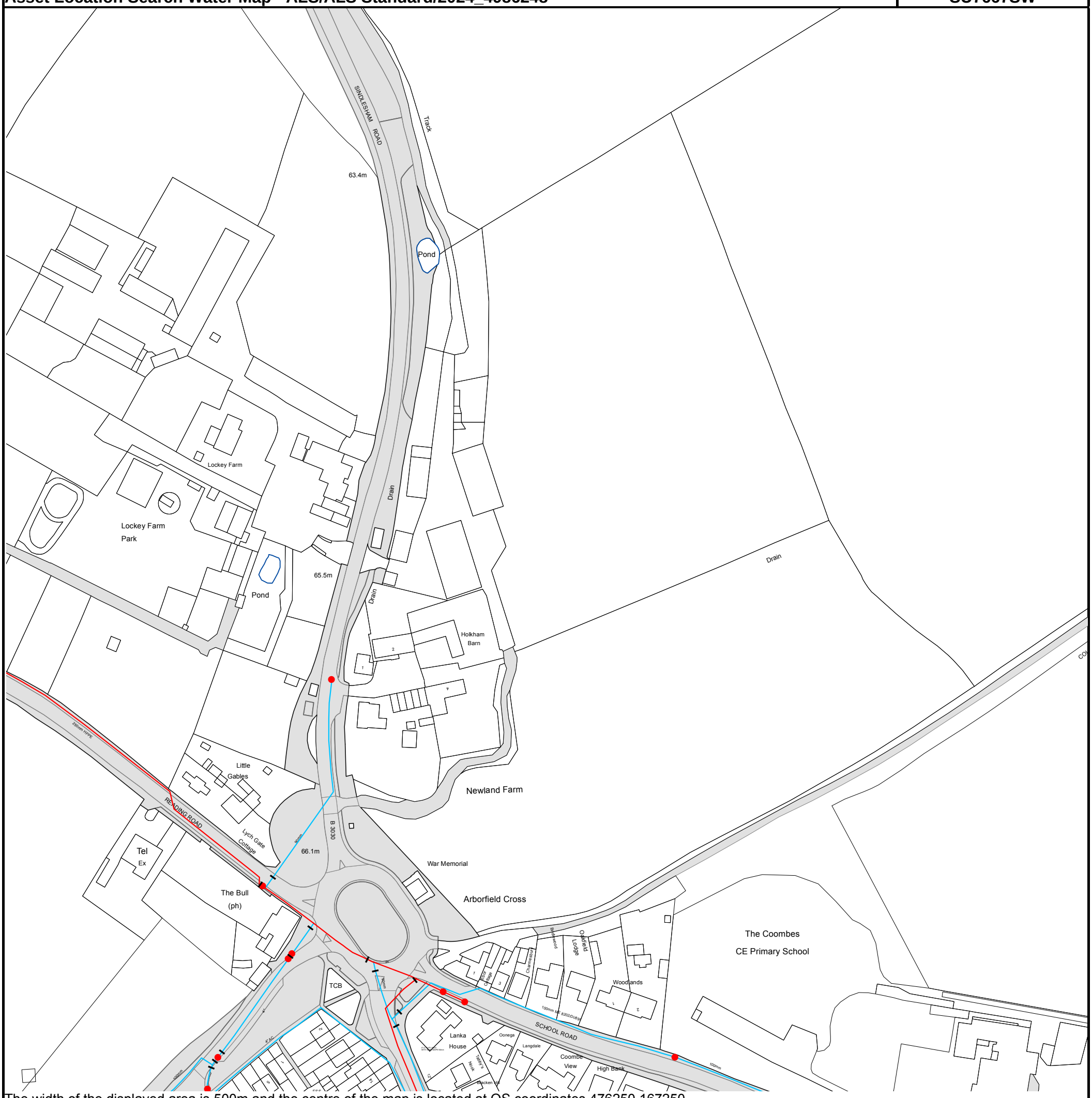
Asset Location Search Water Map - ALS/ALS Standard/2024_4986248

SU7667SW



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 476250,167250

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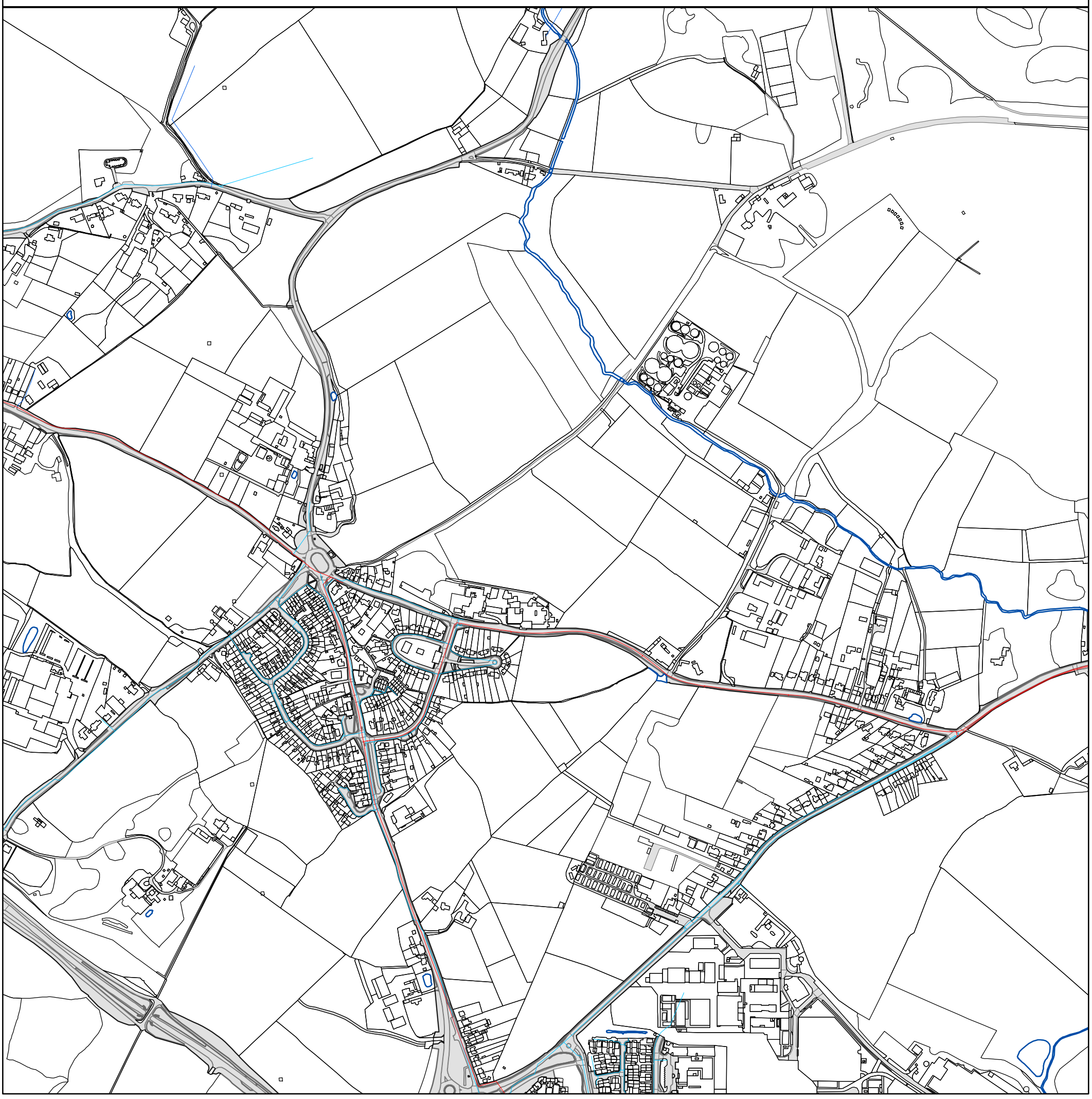
ALS/ALS Standard/2024_4986248



0 45 90 180 270 360 Meters

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Scale:	1:7161
Width:	2000m
Printed By:	ASuji
Print Date:	13/05/2024
Map Centre:	476585,167101
Grid Reference:	SU7667SE

Comments:

Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

Casement: Ducts may contain high voltage cables. Please check with Thames Water.

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Payment Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment within 14 days of the date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service or will be held to be invalid.
4. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
5. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
6. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800.

If you are unhappy with our service, you can speak to your original goods or customer service provider. If you are still not satisfied with the outcome provided, we will refer the matter to a Senior Manager for resolution who will provide you with a response.

If you are still dissatisfied with our final response, and in certain circumstances such as you are buying a residential property or commercial property within certain parameters, The Property Ombudsman will investigate your case and give an independent view. The Ombudsman can award compensation of up to £25,000 to you if he finds that you have suffered actual financial loss and/or aggravation, distress, or inconvenience because of your search not keeping to the Code. Further information can be obtained by visiting www.tpos.co.uk or by sending an email to admin@tpos.co.uk.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0300 034 2222 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**
Please Call **0800 009 4540** quoting your invoice number starting CBA or ADS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Appendix 2 - LLFA Developer Checklist

Planning Application Drainage Checklists

Major Development Outline Applications

Outline planning applications for Major Developments must include the following information and details on the proposed drainage strategy and system(s).

Ref.	Documentation required	Requirement met/included
	The applicant shall submit a description of the proposed drainage system(s) with an explanation of key operating principles and design decisions including but not necessarily limited to:	
	■ Identification of the destination of discharge (in accordance with Building Regulation Part H hierarchy) with appropriate justification for the selection;	Met
	■ Identification of proposed points of connection(s) to water bodies, sewers, public surface water sewers or highway drains etc.;	Included
	■ Evidence of agreement in principal from key third parties whose systems the proposed drainage system will need to connect / impact (Environment Agency, Lead Local Flood Authority, Thames Water or adjacent landowner);	To be Confirmed
	■ Identification of the SuDS techniques that will be applied at the site with appropriate justification for the selection;	Met
	■ A description of how water will be collected and dealt with across the site by the proposed SuDS techniques including what volumes are to be stored where;	Included
	■ A description of the water quality treatment measures applied to surface water as it drains the site;	Included
	■ Where necessary a description of how the proposed system(s) will deal with surface water overland flow flooding originating from off-site areas;	Included
	■ Where necessary, an explanation of why it is not reasonably practicable to achieve any of the non-statutory technical standards for sustainable drainage systems (March 2015);	Included
	■ Where proposing discharge to ground; evidence to support proposed infiltration rates used in initial calculations. This should include nearby borehole logs, geological mapping and if available any geotechnical investigations, infiltration tests and records of groundwater monitoring. Consideration shall also be given to the implications of any local Source Protection Zones;	Included
	■ Where necessary, identification of any mechanical or electrical features necessary for the effective operation of the drainage strategy; and;	Met
	■ Proposals for the adoption and maintenance of the entire drainage system(s), including a schedule, with written agreement in principal from the adopting/maintaining body.	Included
	Plans & Drawings Required	

	The applicant shall submit plans defining the proposed drainage system including but not necessarily limited to: ■ Topographic survey of the site including local surface water drainage features; ■ Position of the site relative to surrounding flood sources, including where necessary identification of surface water/groundwater flows entering the development from adjacent land; ■ Where necessary definition of sub-catchments within the site; ■ A conceptual plan of the proposed drainage system(s) identifying the proposed point(s) of outfall, position of SuDS techniques / drainage features, the attenuation features, conveyance routes (including exceedence routes) comprising the drainage system(s); and ■ A thematic plan of the existing and proposed developments identifying land uses / coverings significant in informing discharge rates.	Included Included Included Included Included
	Calculations Required	
	Overview **design calculations** and **design parameters** to demonstrate conformity with the design criteria for the site. These should include: ■ Demonstration through calculation of the existing and proposed (unmitigated) development discharge rates for the 1, , 30 and 100 year (including allowance for the effects of climate change) design storm events; ■ Demonstration through calculation(s) of the volumes of surface water storage required to attenuate site discharges to pre-development / agreed discharge rates; ■ Demonstration through calculation(s) that the proposed drainage system(s) will not result in flooding off site under the 100 year return period design storm including allowance for climate change; and ■ Demonstration through calculation(s) that provision is made to meet long term storage volumes required for the site, unless discharge rates have been restricted to QBar for all storm events up to and including the 1 in 100 year including allowance for climate change	Included Included Included Included

Additional requirements for a large site or multi-plot development (including Strategic Development Locations).

Ref.	Detail required	Requirement met/included
	■ Plans demonstrating the phasing of drainage infrastructure (in keeping with wider development phasing proposals, demonstrating how flood risks and drainage will be managed throughout and on completion of the development.	Not Applicable

Appendix 3 - Drainage Strategy

Greenfield Runoff Rate Estimation

Greenfield Volumes

Western Basin

Eastern Basin

HD083 -001 P5 Drainage Strategy

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	GEORGIOS ROINAS
Site name:	HD083 School Road, Arborfield Cross
Site location:	School Road, Arborfield Cross

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

Site Details

Latitude:	51.39722° N
Longitude:	0.89968° W
Reference:	1141134777
Date:	Jul 29 2024 11:46

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	651	651
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

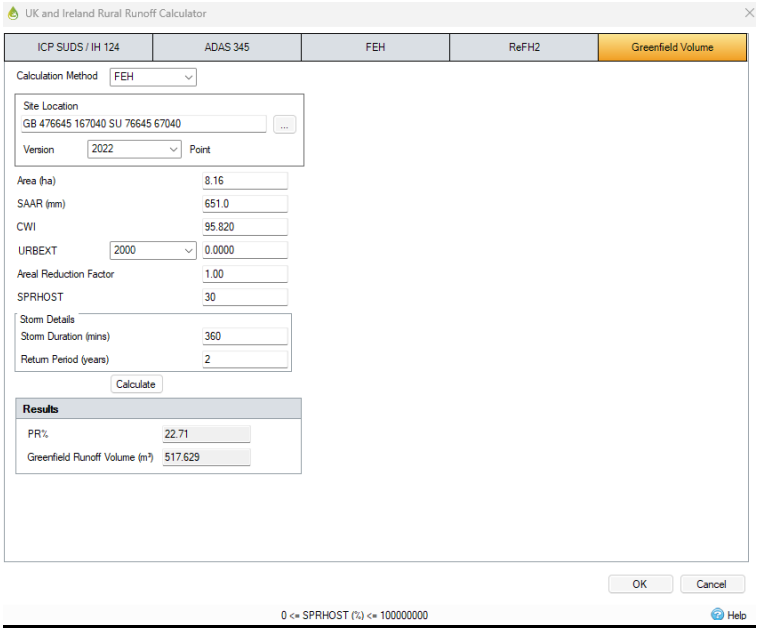
	Default	Edited

Q_{BAR} (l/s):	1.67	1.67
1 in 1 year (l/s):	1.42	1.42
1 in 30 years (l/s):	3.85	3.85
1 in 100 year (l/s):	5.34	5.34
1 in 200 years (l/s):	6.26	6.26

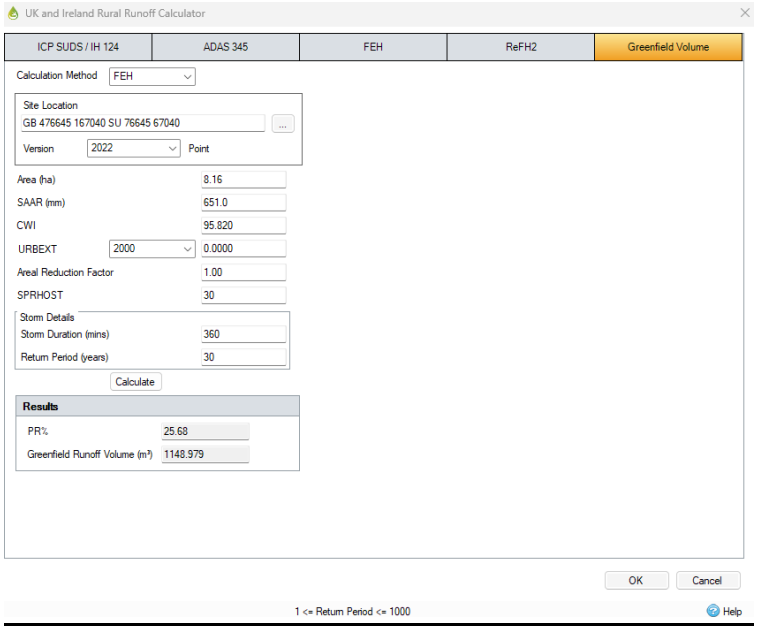
This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this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

GREENFIELD VOLUME

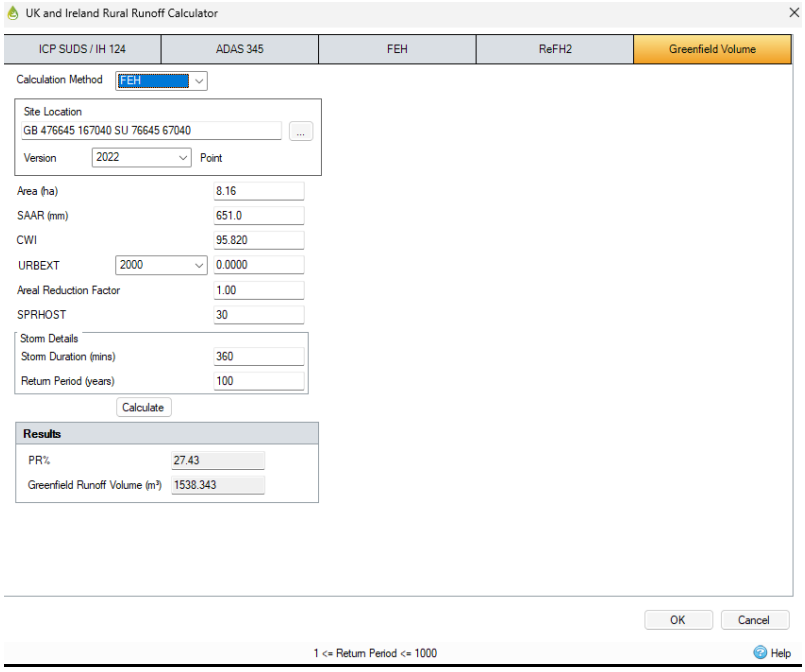
50% AEP



3.3% AEP



1% AEP


UK and Ireland Rural Runoff Calculator
ICP SUDS / IH 124
ADAS 345
FEH
ReFH2
Greenfield Volume
Calculation Method
FEH
Site Location
GB 476645 167040 SU 76645 67040
Version
2022
Point
Area (ha)
8.16
SAAR (mm)
651.0
CWI
95.820
URBEXT
2000
0.0000
Areal Reduction Factor
1.00
SPRHOST
30
Storm Details
Storm Duration (mins)
360
Return Period (years)
100
Calculate
Results
PR%
27.43
Greenfield Runoff Volume (m³)
1538.343
OK
Cancel
1 <= Return Period <= 1000
Help

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

Catchment Area

Type : Catchment Area

Area (ha)	1.72

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

Pond

Type : Pond

Dimensions

Exceedance Level (m)	100.000
Depth (m)	1.500
Base Level (m)	98.500
Freeboard (mm)	300
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	7.418
Total Volume (m³)	1943.573

Depth (m)	Area (m²)	Volume (m³)
0.000	1030.249	0.000
1.500	2685.248	2689.385

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area
Bypass Destination	(None)
Capacity Type	No Restriction

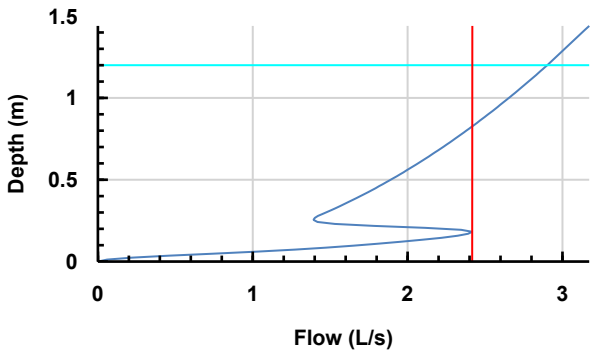
Outlets

Outlet

Outgoing Connection	(None)
Outlet Type	Hydro-Brake®

Invert Level (m)	98.500
Design Depth (m)	1.200
Design Flow (L/s)	2.9
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☐

Unit Reference	CHE-0074-2900-1200-2900



Advanced

Perimeter	Circular
Length (m)	119.584
Friction Scheme	Manning's n
n	0.035

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	Pond		Time of Concentration	1.72	100	0	100	1.72
TOTAL		**0.0**		**1.72**				**1.72**

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by:	Checked by:	Approved By:
	GR		
Report Details:	Company Address:		
Type: Network Design Criteria Storm Phase: Phase	Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

Pipe Options

Lock Slope Options	None
Design Options	Minimise Excavation
Design Level	Level Soffits
Min. Cover Depth (m)	1.200
Min. Slope (1:X)	500.00
Max. Slope (1:X)	40.00
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Pipe Size Library

Default

Add. Increment (mm)	75
Max. Diameter (mm)	0

Diameter (mm)	Min. Slope (1:X)	Max. Slope (1:X)
100	0.00	0.00
150	0.00	0.00

Manhole Options

Apply Offset	☐

Manhole Size Library

Default

Diameter / Width

Connection (mm)	Diameter / Length (m)	Width (m)
0	1.200	0.000
375	1.350	0.000
500	1.500	0.000
750	1.800	0.000

Additional Sizing

Connection (mm)	900
Diameter / Length (m)	0.900
Width (m)	0.000

Depth

Depth (m)	Diameter / Length (m)	Width (m)
0.000	1.050	0.000
1.500	1.200	0.000

Access

Depth (m)	Ladder Protrusion (mm)
0.000	130
3.000	230

Benching Requirements

Landing Width (mm)	500
Benching Width (mm)	225

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Outfall Details Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

Outfalls

Outfall	Outfall Type	Fixed Surcharged Level (m)	Level Curve
Pond	Free Discharge		

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Shortest
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 476645 167040 SU 76645 67040
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	0.000
30.0	35.000
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FEH: 2 years: +0 %: 15 mins: Summer	1.72	348.7	151.422

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

FEH: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FEH: 30 years: +0 %: 15 mins: Summer	1.72	862.5	374.560

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

FEH: 30 years: Increase Rainfall (%): +35: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FEH: 30 years: +35 %: 15 mins: Summer	1.72	1164.4	505.654

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FEH: 100 years: +45 %: 15 mins: Summer	1.72	1604.9	696.952

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 2 years: +0 %: 10080 mins: Summer	98.940	98.940	0.440	0.440	7.6	540.110	0.000	0.000	2.4	1172.302	72.210	OK

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

FEH: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 30 years: +0 %: 1440 mins: Winter	99.235	99.235	0.735	0.735	33.8	1008.740	0.000	0.000	2.4	336.443	48.099	OK

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

FEH: 30 years: Increase Rainfall (%): +35: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 30 years: +35 %: 2160 mins: Winter	99.450	99.450	0.950	0.950	32.3	1408.793	0.000	0.000	2.6	569.690	27.515	OK

Project:	Date:		
HD083 School Road, Arborfield Cross Western Basin (Catchment A) 50%, 3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charman Park Hungerford, RG17 0YT		

FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 100 years: +45 %: 2160 mins: Winter	99.679	99.679	1.179	1.179	42.3	1896.673	0.000	0.000	2.9	634.717	2.413	OK

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Inflows Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

Catchment Area

Type : Catchment Area

Area (ha)	1.06

Dynamic Sizing

Runoff Method	Time of Concentration
Summer Volumetric Runoff	1.000
Winter Volumetric Runoff	1.000
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	Pond		Time of Concentration	1.06	100	0	100	1.06
TOTAL		**0.0**		**1.06**				**1.06**

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by:	Checked by:	Approved By:
	GR		
Report Details: Type: Network Design Criteria Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

Flow Options

Peak Flow Calculation	(UK) Modified Rational Method
Min. Time of Entry (mins)	5
Max. Travel Time (mins)	30

Pipe Options

Lock Slope Options	None
Design Options	Minimise Excavation
Design Level	Level Soffits
Min. Cover Depth (m)	1.200
Min. Slope (1:X)	500.00
Max. Slope (1:X)	40.00
Min. Velocity (m/s)	1.0
Max. Velocity (m/s)	3.0
Use Flow Restriction	☐
Reduce Channel Depths	☐

Pipe Size Library

Default

Add. Increment (mm)	75
Max. Diameter (mm)	0

Diameter (mm)	Min. Slope (1:X)	Max. Slope (1:X)
100	0.00	0.00
150	0.00	0.00

Manhole Options

Apply Offset	☐

Manhole Size Library

Default

Diameter / Width

Connection (mm)	Diameter / Length (m)	Width (m)
0	1.200	0.000
375	1.350	0.000
500	1.500	0.000
750	1.800	0.000

Additional Sizing

Connection (mm)	900
Diameter / Length (m)	0.900
Width (m)	0.000

Depth

Depth (m)	Diameter / Length (m)	Width (m)
0.000	1.050	0.000
1.500	1.200	0.000

Access

Depth (m)	Ladder Protrusion (mm)
0.000	130
3.000	230

Benching Requirements

Landing Width (mm)	500
Benching Width (mm)	225

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Outfall Details Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

Outfalls

Outfall	Outfall Type	Fixed Surcharged Level (m)	Level Curve
Pond	Free Discharge		

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by:	Checked by:	Approved By:
	GR		
Report Title:	Company Address:		
Rainfall Analysis Criteria	Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Shortest
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FEH

Type: FEH

Site Location	GB 476645 167040 SU 76645 67040
Rainfall Version	2022
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	0.000
30.0	35.000
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FEH: 2 years: +0 %: 15 mins: Summer	1.06	214.9	93.318

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

FEH: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FEH: 30 years: +0 %: 15 mins: Summer	1.06	531.5	230.832

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

FEH: 30 years: Increase Rainfall (%): +35: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FEH: 30 years: +35 %: 15 mins: Summer	1.06	717.6	311.628

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Inflows Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
Catchment Area	FEH: 100 years: +45 %: 15 mins: Summer	1.06	989.0	429.520

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 2 years: +0 %: 10080 mins: Summer	98.929	98.929	0.429	0.429	4.7	339.613	0.000	0.000	1.3	723.261	73.711	OK

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

FEH: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 30 years: +0 %: 2160 mins: Winter	99.204	99.204	0.704	0.704	14.7	624.400	0.000	0.000	1.4	302.485	51.666	OK

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

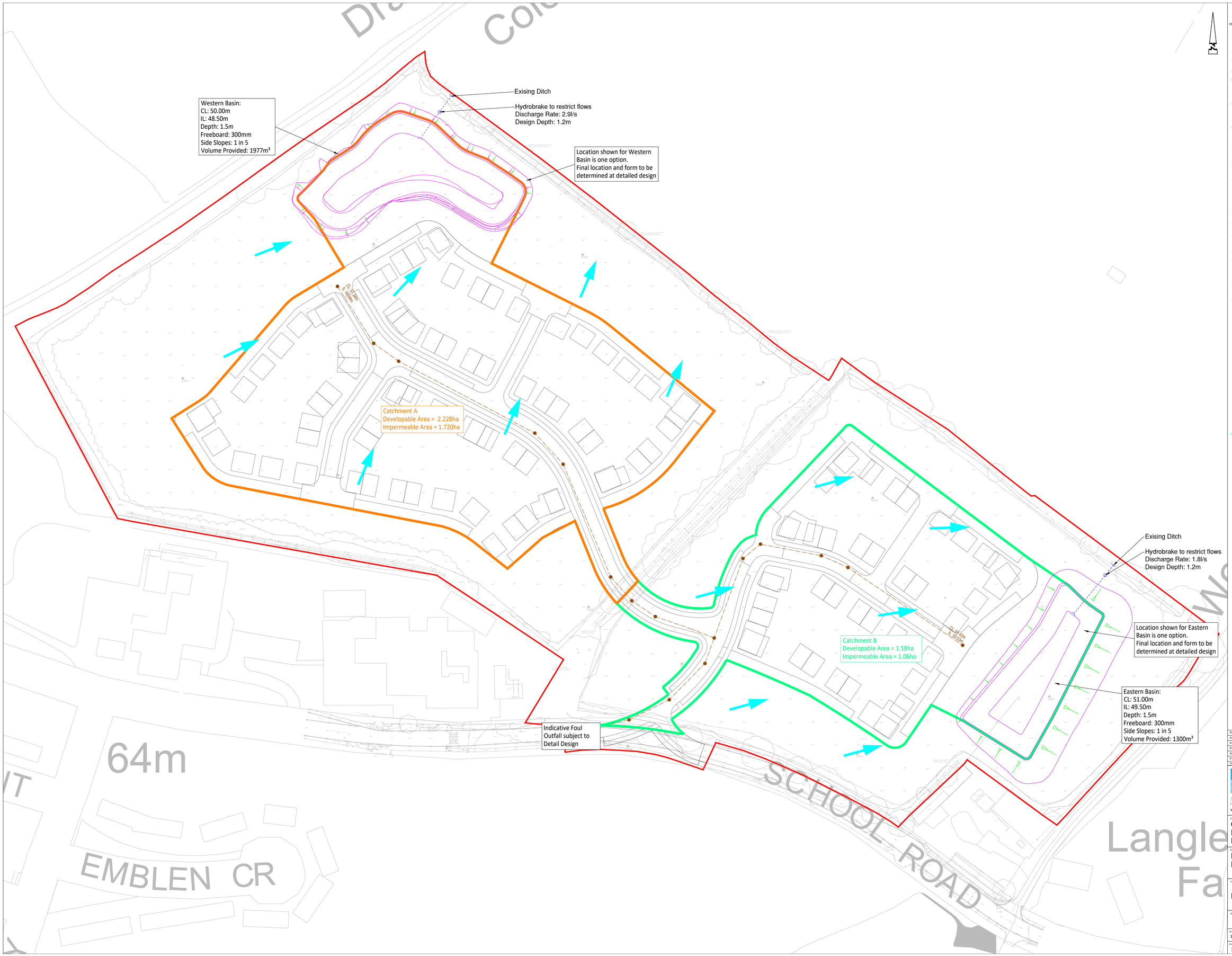
FEH: 30 years: Increase Rainfall (%): +35: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 30 years: +35 %: 2880 mins: Winter	99.408	99.408	0.908	0.908	15.7	873.732	0.000	0.000	1.6	455.662	32.365	OK

Project:	Date:		
HD083 School Road, Arborfied Cross Eastern Basin (Catchment B) 50%,3.3%, 3.3% plus 35% CC & 1% AEP plus 40% CC	19/07/2024		
	Designed by: GR	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	Company Address: Abley Letchford Partnership 3 Tealgate, Charnham Park Hungeford, RG17 0YT		

FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 100 years: +45 %: 2880 mins: Winter	99.624	99.624	1.124	1.124	20.4	1175.063	0.000	0.000	1.7	507.494	9.040	OK



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DRAINAGE NOTES:

1. Do not scale.
2. This drawing is to be read in conjunction with and checked against all other drawings, Engineering details, Specification and any structural, Geotechnical or other specialist document provided.
3. Site layout shown for context only, refer to other project drawings for details.
4. All adoptable drainage works to be constructed as detailed in design and construction guidance or as stipulated in the water authorities addendum.
5. All public sewers are to be the subject of a section 104 agreement of the water industry act 1991.
6. Invert levels of existing manholes and sewers are to be checked on site before construction commences and results reported to engineers.
7. The contractor is responsible for maintaining continuity of flow for all existing sewers within the site boundary and limit of works for the duration of the project.
8. All drainage ironworks to comply with bs en124, and be stamped with bsi kitemark. covers to suit loading as below;
   - carriageways and roads - d400
   - driveways and verges - c250
   - footways and pedestrian areas - b125
   - gardens/landscaping - a15
9. All sewer pipes, up to, and including 225mm are to be vitrified clay to BS EN295. All sewer pipes 300mm diameter and above to be concrete pipes to BS EN2916. Where agreed with adopting authority pipes up to and including 600mm diameter can be PVC-U to BS EN1404.
10. All drainage shall be installed and tested strictly in accordance with the manufacturers' printed instructions, bs en 752, bs en 1601, local water authority requirements and the building regulations.
11. All bedding shall be class s unless noted otherwise.
12. All trenches under existing and proposed public highways are to be backfilled with thoroughly compacted type 1 granular sub-base material.
13. Drainage laid beneath roads and areas of vehicular access (car parking etc) with less than 1200mm of cover shall be encased in concrete bed and surround with associated movement joints. drainage laid beneath paths, footways and pedestrian areas with less than 900mm of cover shall be similarly treated.
14. Chambers with outgoing pipes greater than 600mm diameter shall be fitted with guard bars, safety chains or other approved safety devices.
15. The use of precast concrete products made with sulphate resisting cement is mandatory, unless a laboratory report proves such precautions are not necessary.
16. All sewers to be abandoned must be surveyed to identify any lateral connections that are still live with any found to be reported to the engineer.
17. All foul and storm water drains which are not to be adopted as public sewers shall be in accordance with document h of the building regulations, together with nhbc standards chapter 5.3 and bs8301.
18. Where pipes pass through footings, retaining or screen walls, lintels to be provided over drains.
19. Where inverts are less than 0.6m deep inspection chambers (min dia. 190mm) or access fittings (225 x 100mm) to be used, elsewhere proprietary plastic, brick or pcc is to be used and sized in accordance with table 11 of document h of the building regulations [<0.6m to invert min dn300, >0.6m to invert min dn475].
20. Where required 1m deep root barrier of an approved type to be installed vertically along the back edging kerb of all areas of footway/ demarcation to protect from both proposed and future plantation.
21. Construction details subject to refinement through detailed design/technical approval process.

ALL PIPE BEDDING TO BE CLASS 'S' GRANULAR SURROUND UNLESS NOTED OTHERWISE ON THE DRAWING

Manhole cover levels are derived from a 3D digital terrain model, final cover levels to suit finished surfaces onsite.

Manhole covers to be located wholly within one surface i.e grass or hard standing/road. Manhole covers are to be fully accessible to users.

KEY

- Application Boundary
- Proposed adoptable surface water sewer & MH
- Indicative foul water sewer & MH
- Headwall
- Direction of excess flow
- Indicative size and location of basin; final arrangement will be confirmed at detailed design
- Catchment A
- Catchment B

0 5 10 15 20 25m
Scale 1:500

No.	Date	Description	Drawn	Checked
P5	09.24	Client Name Revised	GR	EP
P5	08.24	Client Name Revised	GR	EP
P4	08.24	Red line boundary & project name updated	LC	EP
P3	08.24	Notes added and key updated	LC	EP
P2	08.24	Eastern Basin Amended	GR	EP
P1	07.24	First Issue	AS	GR

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Project
LAND NORTH OF SCHOOL ROAD, ARBORFIELD CROSS.

Title
DRAINAGE STRATEGY

Status

Scale	Date	Drawn	Checked
1:150 @ A0	JULY 2024	AS	GR

Drawing No: HD083-001
Revision: P6