



LAND NORTH OF ARBOFIELD ROAD, SHINFIELD
FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

BELLWAY HOMES LTD (THAMES VALLEY

06 February 2026





Abley Letchford
3 Tealgate
Charnham Park
Hungerford
RG17 0YT

t: 01488 684390
e: contact@ableyletchford.co.uk
w: www.ableyletchford.co.uk

Quality Management:

Prepared by:	A Simmons
Authorised by:	E Philpott
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1.0 Introduction

1.1 Context

- 1.1.1 This Flood Risk Assessment (FRA) has been prepared by Abley Letchford Partnership Ltd (ALP) on behalf of Bellway Homes Ltd (Thames Valley), to support a full planning application for 191 residential properties at Land North of Arborfield Road, Shinfield in Reading.

1.2 Development Proposals

- 1.2.1 The proposals are for the provision of 191 residential units as depicted on the Illustrative Masterplan within Appendix 1.

1.3 Requirement for a Flood Risk Assessment

- 1.3.1 The requirement for an FRA is set out in Section 14 of the revised National Planning Policy Framework (NPPF) as revised in December 2023.
- 1.3.2 The footnote accompanying Paragraph 172 states:
- 1.3.3 '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.'
- 1.3.4 The site is a greenfield site that comprises of open fields with built development beyond the site to the west and north of the site. The A327 Eastern Relief Road is located to the east of the site. The B3349 Arborfield Road is located to the south of the site.
- 1.3.5 The area of the site is approximately 7 hectares. As the site area extends to 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.

1.4 Report Aim and Formation

- 1.4.1 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.
- 1.4.2 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, where required, to address this.
- 1.4.3 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.

1.5 Report Structure

- 1.5.1 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: Proposed Development and Sequential Test – a description of the proposed development and a classification of the vulnerability in the context of the Sequential Test.
- Section 6: Flood Risk Mitigation – the mitigation measures implemented, where required, 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

2.1 Introduction

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

2.2 National Planning Policy

- 2.2.1 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.
- 2.2.2 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 168-169 relates to the Exception Test.
- 2.2.3 Paragraph 173 discusses the determination of planning applications stating:
- 2.2.4 *'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.'*
- 2.2.5 The proposed development comprising of 191 residential units 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.'*



2.3 Environment Agency

- 2.3.1 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.
- 2.3.2 The EA Standing Advice has been consulted and reviewed within this FRA.
- 2.3.3 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.

2.4 Local Authorities

- 2.4.1 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).
- 2.4.2 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) (published May 2024 but dated May 2023)
 - WBC Level 2 Strategic Flood Risk Assessment (SFRA) (published May 2024 but dated August 2023) and
 - WBC SuDS Strategy (dated January 2017).
- 2.4.3 WBC became the LLFA under the Flood and Water Management Act 2010. WBC provide guidance to assess, manage and inform flood risk.
- 2.4.4 As LLFA, WBC's Flood and Water Management Team provide Planning Application Drainage Checklists within the Wokingham SuDS Strategy guidance document 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 completed checklist for a Major Development Outline Application is included within Appendix 2.
- 2.4.5 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.

2.5 Local Water Authority

- 2.5.1 Thames Water (TW) is responsible for the supply of clean water and disposal of wastewater for the Shinfield area.
- 2.5.2 Information with regards to sewer and water main flooding contained within the 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.



2.6 Other Sources of Information

- 2.6.1 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.
- 2.6.2 A site walkover was conducted during May 2024 which included observations of the general topography across the site and surrounding area as well as inspection of watercourses, ditches and drainage features both within the site and beyond the site boundary.
- 2.6.3 Guidance with respect to 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'.
- 2.6.4 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

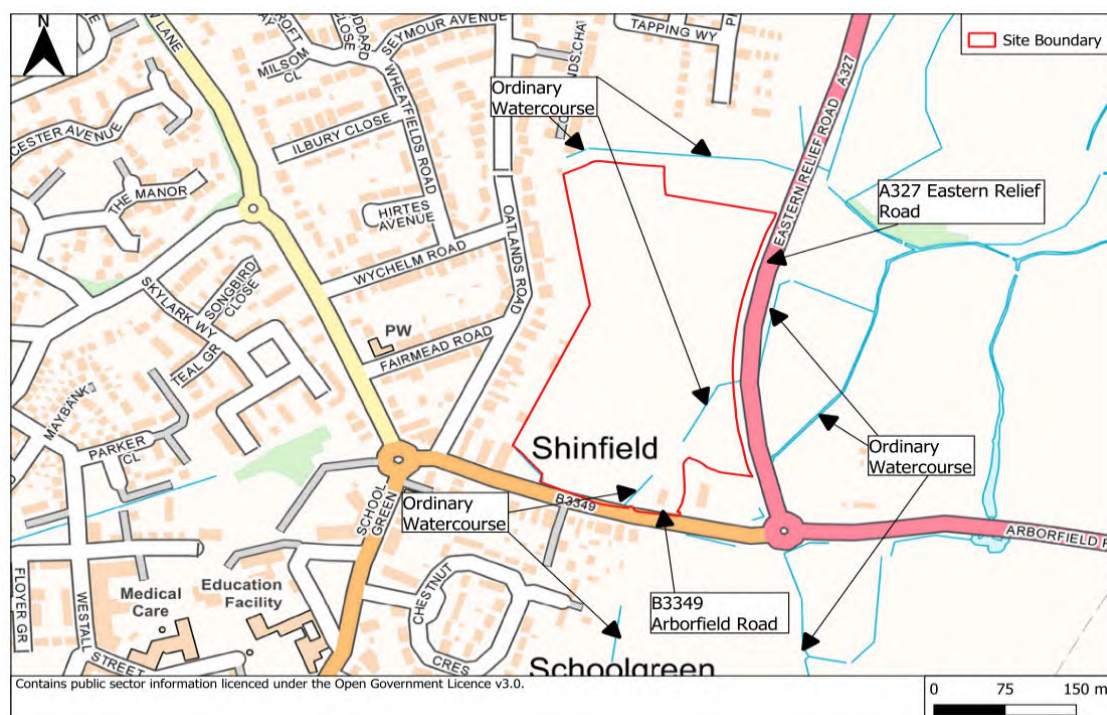
3.1 Introduction

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

3.2 Site Location

- 3.2.1 The site is located north of the B3349 Arborfield Road, located approximately 0.5km to the northeast of the centre of Shinfield, Reading. The nearest postcode for the site is RD2 9DY. The site centre grid reference is 473697E 168059N. The site location is shown in **Figure 1**.

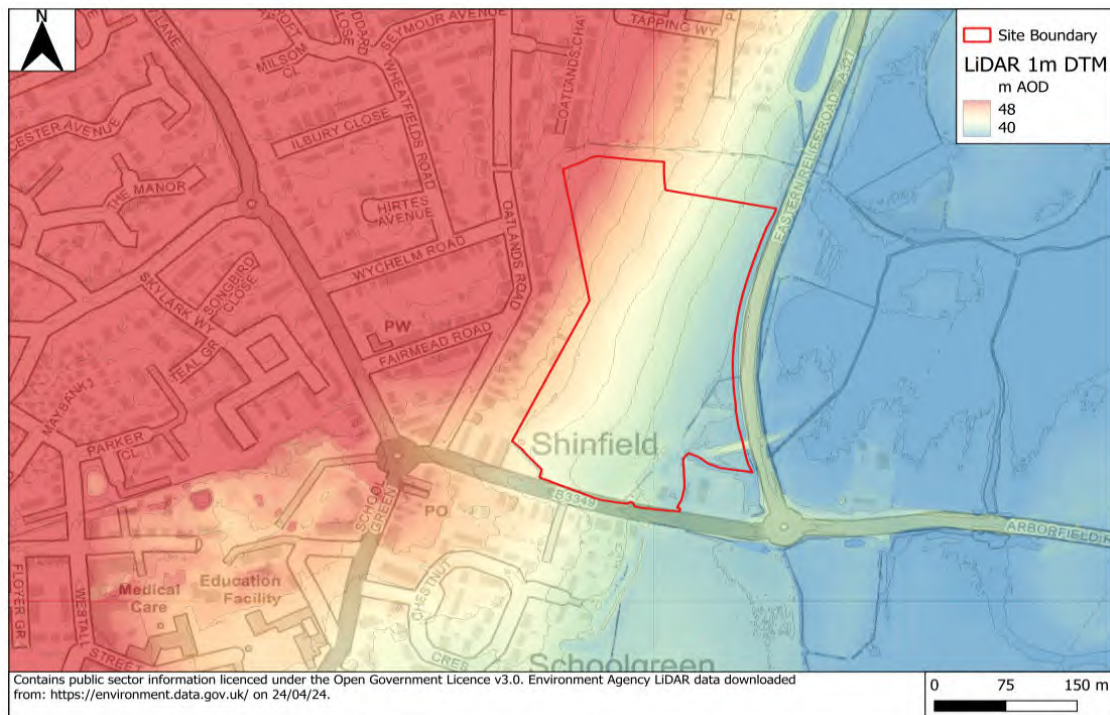
Figure 1 – Site Location



- 3.2.2 The site is bounded to the east by the A327 Eastern Relief Road and to the south by the B3349 Arborfield Road. There is a residential area to the south of Arborfield Road. To the west of the site is a residential area. To the north of the site is the Cutbush Lane development pursuant to application 181499. This development is nearing completion and comprises a residential development.
- 3.2.3 The site covers an area of approximately 7 hectares and is currently agricultural land with some trees and hedgerows along the site boundaries.
- ### 3.3 Topography
- 3.3.1 Ground levels across the site are shown by LiDAR data in **Figure 2**.

- 3.3.2 The LiDAR indicates that there is an area of high ground in the northwest of the site and ground levels generally slope down from west to east, with ground levels lowest in the southeast and eastern parts of the site.
- 3.3.3 Ground levels vary from 49.0m AOD in the northwest to 41.2m AOD to the southeast.

Figure 2 – Site Topography



- 3.3.4 A topographical survey of the site has been carried out by Encompass Surveys November 2023. A copy of the topographical survey is included in **Appendix 1**.
- 3.3.5 The topographical survey provides a more detailed representation of the ground levels across the site as well as details of other key features. In general it agrees well with the LiDAR. From the topographical survey, the highest ground level within the site is in the northwest corner with an elevation of 49.2 m AOD and the lowest is in the southeast corner of the site with an elevation of 40.9 m AOD.
- 3.3.6 The Eastern Relief Road is elevated above the surrounding area. Alongside the site's southern boundary, Arborfield Road generally slopes down to the east towards the roundabout, typically with a grass/vegetated verge at a slightly higher level at the site boundary.

3.4 Watercourses and Ditches

- 3.4.1 The nearest Main River is the River Loddon approximately 600m to the east of the site.
- 3.4.2 A network of open channel ditches and watercourses form tributaries to the Loddon and some of these extend to the Eastern Relief Road.



- 3.4.3 Just beyond the site's northern boundary, and at the edge of the Cutbush Lane development is an open channel watercourse. This runs from west to east and is then culverted under the Eastern Relief Road. The culvert has a flap on the eastern side.
- 3.4.4 Running along both the western and eastern sides of the Eastern Relief Road are open channel features which were, in the main part, brought in when the road was constructed. These run almost the whole length of the road and for a section the western channel runs alongside the site's eastern boundary. There are a number of culverts running under the Eastern Relief Road connecting the two highways ditches and linking these to the network of tributaries of the Loddon to the east. From site observations it was evident that the 'downstream' eastern end of the culverts are flapped, meaning that there is only flow in an easterly direction through the culverts.
- 3.4.5 On site there are three key features which would be defined as Ordinary Watercourses.
- 3.4.6 An open watercourse runs from the site's southern boundary along the footpath for a length of approximately 50m, in part culverted and obscured by dense vegetation. From some mapping it is inferred that this watercourse extends upstream along the site's southern boundary, but no evidence of this was found on site. The watercourse commences at the site's boundary where flow emerges from a culvert from the direction of Arborfield Road.
- 3.4.7 There is a pond in the southeastern part of the site surrounded by dense vegetation. This appears to be a natural feature fed by the watercourse from the site's southern boundary. Survey and site observations were restricted due to the dense vegetation, but the pond appears to spill out towards the site's eastern boundary and the low lying area south of the farm access track. From here any flow joins the highways ditch on the western side of the Eastern Relief Road. There was no evidence of a connection from the southern ditch or the pond to the north under the farm access track.
- 3.4.8 The third feature is a recently constructed engineered cut off ditch which was part of the work associated with the Eastern Relief Road. It appears to convey any land drainage or surface water flow to the east around the trees. However, site observations showed this to be boggy and heavily vegetated rather than a flowing feature. This connects to the highways ditch alongside the Eastern Relief Road close to a culvert under the road.
- 3.4.9 In summary there is a natural watercourse and pond in the south eastern part of the site and an engineered cut off ditch north of the farm access track. All these features flow towards the east and join the highways ditch alongside the Eastern Relief Road, eventually flowing east towards the Loddon. As noted, there is a flow route east under the road through various culverts, but these are flapped and would not allow flow back towards the site from the direction of the Loddon.
- 3.5 Surface and Foul Water Sewers**
- 3.5.1 It is currently unclear how the farmhouse and small outlet buildings to the southeast of the site dispose of their surface water. Ditch outfall points and general longitudinal falls were less obvious due to heavy vegetation and restricted access. An open field ditch to west of the Eastern Relief Road was observed during the site walk over.
- 3.5.2 Sewer Asset Records obtained from TW indicates that there is a foul water sewer running within the site boundary to the west, which connected along Arborfield Road to the south which then runs in an easterly direction. This southern pipe is located outside of the boundary of the site.



3.5.3 A copy of TW Asset Record is included within **Appendix 1**.

3.6 Geology and Hydrogeology

3.6.1 British Geological Survey (BGS) 'Geology of Britain' online viewer indicates that the bedrock geology underlying the south of the site is London Clay Formation – clay silt and sand. There are superficial Terrace deposits 3 – sand and gravel in the southern part of the site. There are no records of superficial deposits in the central or northern parts of the site.

3.6.2 The Cranfield University 'Soilscales' online viewer indicates the site overlays 'Soilscale 22' - loamy soils with naturally high groundwater.

3.6.3 The DEFRA Magic Map online viewer indicates that the site lies outside of any groundwater Source Protection Zone (SPZ). The southern part of the site is located within a Secondary A superficial drift aquifer

3.6.4 Minor secondary aquifers are associated with the underlying bedrock and superficial drift layers. These rocks can provide modest amounts of water, but the nature of the rock or the aquifer's structure limits their use. They support water supplies at local rather than strategic scale.

4.0 Overview of Flood Risk

4.1 EA Flood Map for Planning

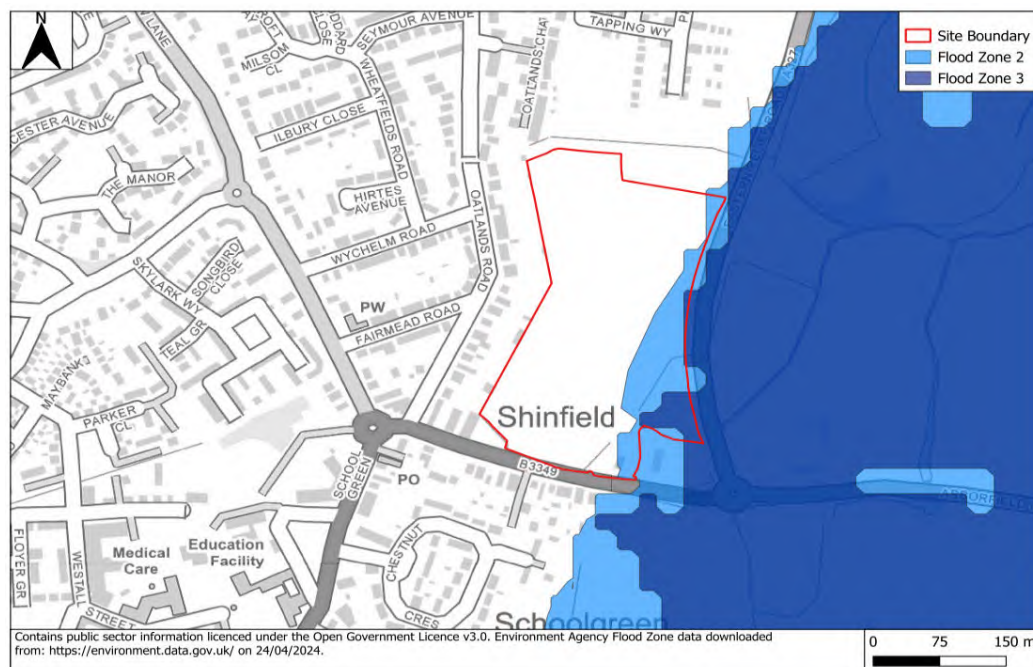
4.1.1 The EA Flood Map for Planning provides an initial indication of the extent of flood zones. In the NPPF, Flood Zones are defined as follows:

- Flood Zone 1 'Low Probability' – Land less than 1 in 1000 (0.1%) annual probability of river or sea flooding.
- Flood Zone 2 'Medium Probability' – Land between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding, or between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of sea flooding.
- Flood Zone 3 'High Probability' – Land at 1 in 100 (1%) or greater annual probability of river flooding, or 1 in 200 (0.5%) or greater annual probability of sea flooding.

4.1.2 **Figure 3** shows the EA flood zone mapping. It confirms that the majority of the site is located within Flood Zone 1 'Low Probability'.

4.1.3 The eastern part of the site is located within Flood Zone 2 'Medium Probability'. The eastern boundary of the site is located within Flood Zone 3 'High Probability'. This is purely fluvial flooding and associated with the River Loddon to the east. This is discussed in more detail in the following section.

Figure 3 – EA Flood Map for Planning



4.2 Flood Risk from Fluvial Sources

4.2.1 The eastern part of the site is shown to be within Flood Zone 2 and 3 of the EA Flood Map for Planning. The western and central part of the site is shown to be within Flood Zone 1 of the EA Flood Map for Planning. This indicates that the eastern site is affected by fluvial flooding in the 1 in 100 and 1 in 1000 annual probability scenarios. These maps are based on strategic modelling and do



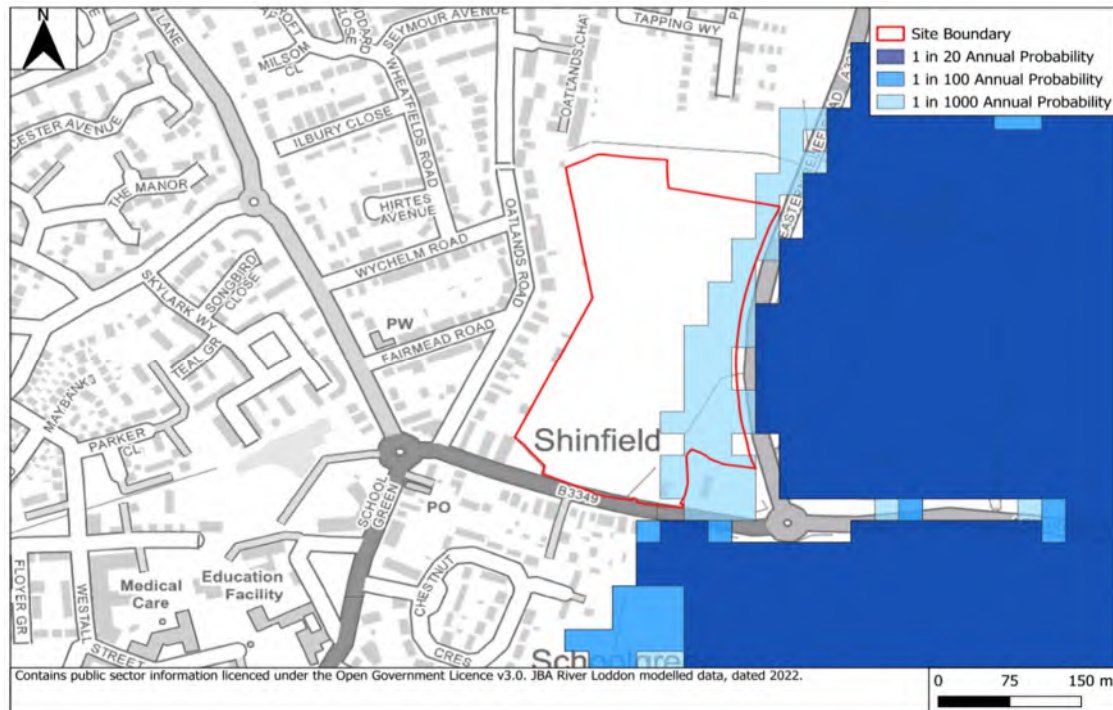
not take into consideration site specific information. Therefore it is appropriate for a site specific FRA to obtain or derive more detailed information to inform the analysis of actual flood risk at the site. The starting point for this is the EA and their detailed modelling, although in this location WBC has also commissioned extensive modelling of the Loddon.

- 4.2.2 Over the last few years there has been much analysis and modelling of the River Loddon, its floodplain and its contributing watercourses. The EA originally produced a model in 2009, which we understand still forms the basis of the published flood zone maps for planning. It is the 2009 model which was provided to us by the EA on request for modelling suitable to inform this FRA.
- 4.2.3 However, since 2009, modelling methods and practice have developed and more data has become available. There have also been some changes in the relevant infrastructure both in flood defence terms and the wider road and highway infrastructure. These have been absorbed into a more detailed and refined model produced by WBC, culminating in the model produced for WBC in 2021 (the 2021 SFRA Model) which added a contemporary assessment of climate change allowances.
- 4.2.4 Since this date WBC completed an update to their SFRA to support the latest version of the Local Plan and a new model has been produced by JBA which uses the original EA 2009 model as a base but updates the hydrology to contemporary methods with contemporary allowances for climate change (the 2022 Loddon Model). Critically this does not absorb the changes in data within the 2021 SFRA Model to reflect the physical changes or the more refined model grids.
- 4.2.5 WBC has confirmed that the 2022 Loddon model has been confirmed by the EA as ‘sufficiently robust to inform policy and strategy decisions i.e. robust to underpin the SFRA. For site specific FRAs they have advised that an alternative model could be used to inform future planning applications following validation by the Environment Agency.’
- 4.2.6 The 2022 Loddon and 2021 SFRA models have been reviewed and are discussed in turn, along with a commentary on the implications of each model for the site. The 2009 EA model is not discussed further as the later models are both deemed to be more representative as they include more recent information and also include current climate change allowances which directly informs the ‘design event’ to be considered for a FRA.

2022 Loddon Model

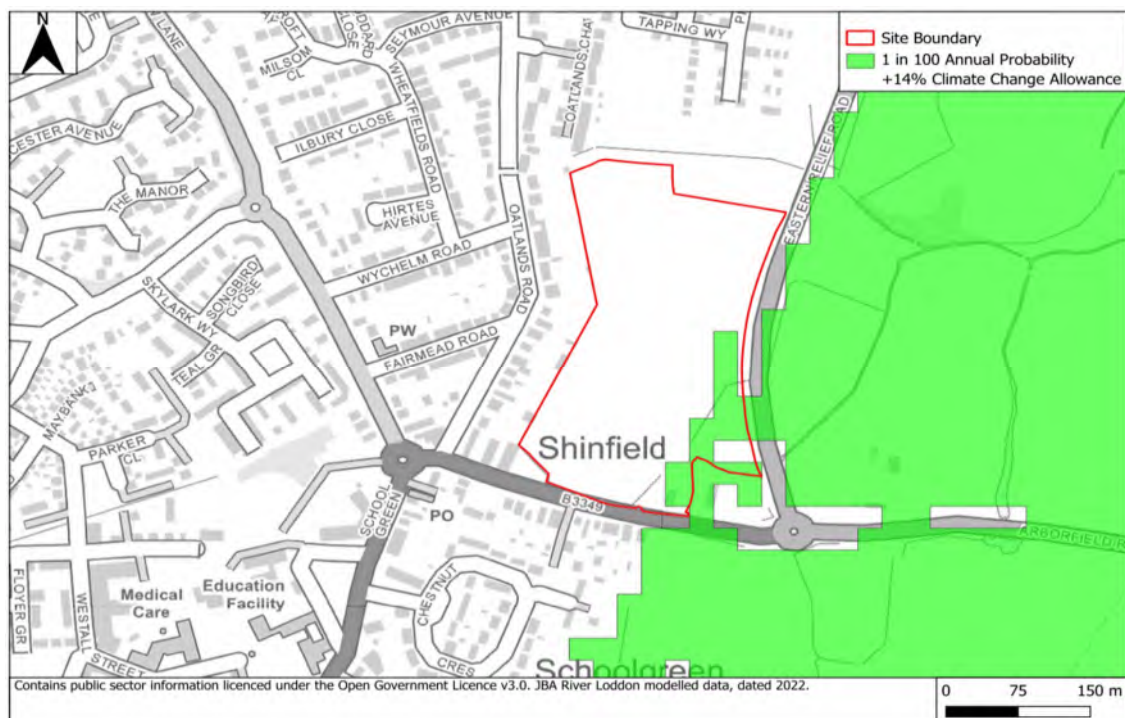
- 4.2.7 This model is the source of data for the current SFRA. As such it is deemed to be the key information to inform the strategic overview in planning terms of fluvial flood risk for the site.
- 4.2.8 As noted above this model uses the EA’s 2009 model as a base and applies updated hydrology.
- 4.2.9 The 2023 SFRA present day flood extents are shown in **Figure 4**. This indicates the extents of flood zone 2 and 3 (1 in 1000 and 1 in 100 annual probability respectively).

Figure 4 – 2022 Loddon Present Day Flood Extents



4.2.10 The 2023 SFRA 14% climate change flood extents are shown in **Figure 5**.

Figure 5 – 2022 Loddon 14% Climate Change Flood Extent





- 4.2.11 **Figure 4** and 5 indicate that there is flooding in the south eastern corner of the site and along the eastern boundary in the 1 in 1,000 and the 1 in 100 + climate change flood events.
- 4.2.12 The 2022 Loddon model uses a coarse, 25m grid size and does not include the Eastern Relief Road as it uses LiDAR data flow prior to the Eastern Relief Road's construction in 2017.
- 4.2.13 The model results suggest that there are two possible flow routes into the site; from the south and from the east. Each of these possible flow routes has been assessed to confirm whether the flow route into the site is indeed viable.
- 4.2.14 The flow route from the south would be across Arborfield Road from the south.
- 4.2.15 **Table 1** shows a summary of the modelled flood levels across Arborfield Road.

Table 1 : Summary of 2022 Loddon Model Maximum Flood Levels Across Arborfield Road

Flood Event	Modelled Flood Level, m AOD
1 in 20 Annual Probability (5%)	No flooding
1 in 100 Annual Probability (1%)	No flooding
1 in 100 Annual Probability +14% Climate Change Allowance	41.59
1 in 1000 (0.1%) Annual Probability	41.74

- 4.2.16 The 1 in 100 annual probability +14% climate change modelled flood level along Arborfield Road is 41.59m AOD. This flood level was reviewed against the topographical survey and LiDAR data.
- 4.2.17 From this review it is concluded that the levels along the carriageway are such that floodwater at a level of 41.59mAOD would not exceed the ground levels along the road and there is no flow route into the site in this event.
- 4.2.18 In the 1 in 1000 annual probability event there could be a flow route into the site. However floodwater would not flow far into the site before entering the southern ditch and the pond area in the south east of the site; then flowing into the highway ditch alongside the Eastern Relief Road. Depths and volumes would be relatively small.
- 4.2.19 The second possible flow route into the site is from the east is across the Eastern Relief Road.

Table 2 shows a summary of modelled flood levels at the Eastern Relief Road.

Flood Event	Modelled Flood Level, m AOD
1 in 20 Annual Probability (5%)	40.93
1 in 100 Annual Probability (1%)	41.11
1 in 100 Annual Probability +14% Climate Change Allowance	41.24
1 in 1000 (0.1%) Annual Probability	41.38

- 4.2.20 Ground levels along the Eastern Relief Road are between 41.99m AOD and 42.67m AOD adjacent to the site. The modelled flood levels are substantially below the Eastern Relief Road ground levels therefore the flooding would not flow freely across the road. There are three culverts under the

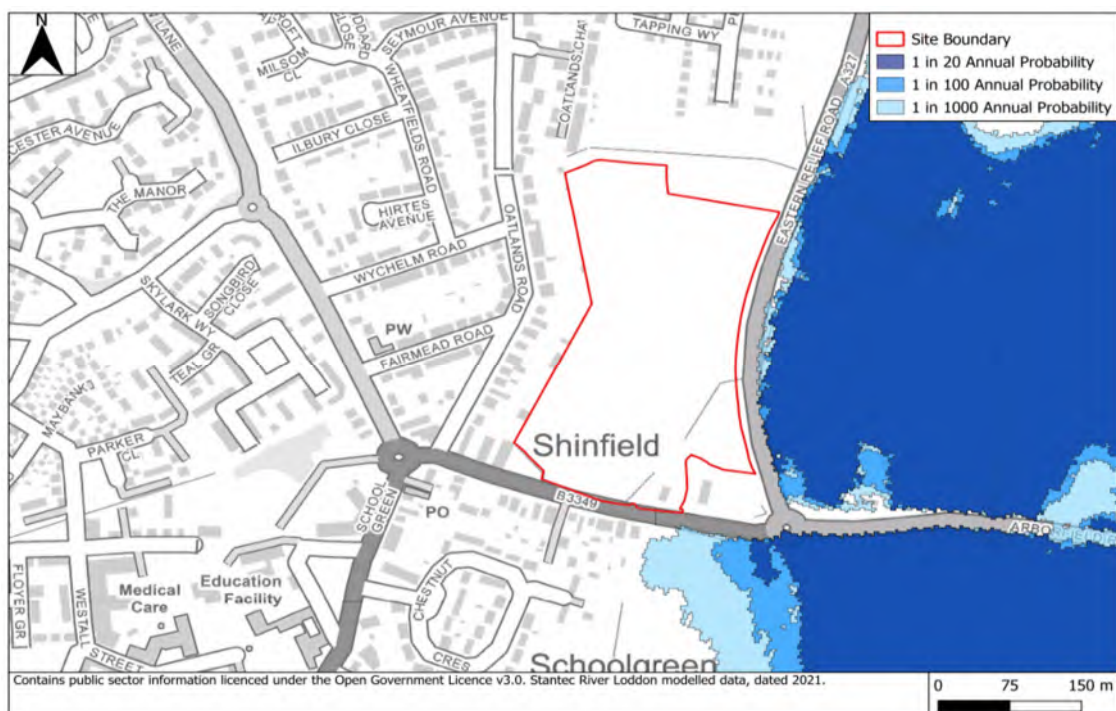
Eastern Relief Road. However, as noted from the site observations the culverts are flapped on the eastern side. There is, therefore, no flow route under the Eastern Relief Road and into the site.

- 4.2.21 Therefore the 2022 Loddon modelling results show that the site is not affected by fluvial flooding in the design event (the 1 in 100 annual probability with 14% climate change) and only a small part of the south eastern area of the site could be affected in the 1 in 1000 annual probability. There is a small area of Flood Zone 2 in the site's south eastern corner but the remainder of the site is in Flood Zone 1.

4.3 2021 SFRA Model

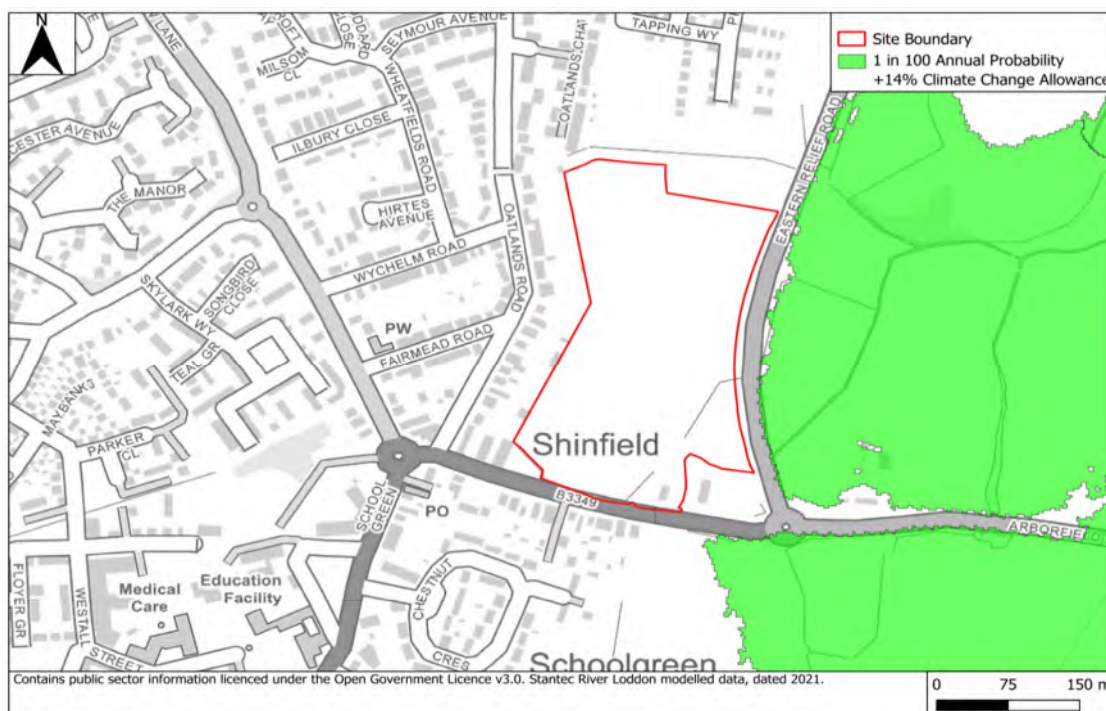
- 4.3.1 The 2021 SFRA model includes physical changes within the floodplain and catchment which have occurred since 2009, such as the construction of the eastern relief Road.
- 4.3.2 The 2021 SFRA present day model extents are shown in **Figure 6**.

Figure 6 – 2021 SFRA Present Day Flood Extents



- 4.3.3 The 2021 SFRA model considered the +70% climate change allowance. However, this allowance no longer adheres to the current guidance. The relevant climate change allowance for the site is +14%. ALP has rerun the 2021 SFRA model for the +14% change allowance.
- 4.3.4 The 2021 SFRA 14% climate change flood extents are shown in **Figure 7**.

Figure 7 – 2021 SFRA 14% Climate Change Flood Extents



4.3.5 **Figure 6 and 7** shows that the flood extent is located to the east of the Eastern Relief Road for all modelled scenarios using the 2021 SFRA.

4.3.6 **Table 2** summarises the modelled flood levels to the east of the Eastern Relief Road. The flood levels are relatively uniform in this area. The flood level was taken adjacent to the central culvert.

Table 2 – Summary of 2021 SFRA Model Maximum Flood Levels to the east of the Eastern Relief Road

Flood Event	Modelled Flood Level, m AOD
1 in 20 Annual Probability (5%)	40.36
1 in 100 Annual Probability (1%)	40.47
1 in 100 Annual Probability +14% Climate Change Allowance	40.52
1 in 1000 (0.1%) Annual Probability	40.74

4.3.7 The 1 in 100 annual probability +14% climate change scenario is the design event.

4.3.8 The 1 in 100 annual probability +14% climate change allowance flood level is 40.5m AOD. As noted above the Eastern Relief Road would not be overtopped and the flapped culverts under the Eastern Relief Road would prevent any flow towards the site from the eastern side of the road.

4.3.9 The 2021 SFRA model results confirm that the site is located entirely within Flood Zone 1 and is unaffected by flooding from the River Loddon.

Summary of Fluvial Flood Risk

4.3.10 The 2021 SFRA model which includes the most up to date physical representation of the floodplain and catchment of the River Loddon shows the site to be in Flood Zone 1 and unaffected in the

design event (1 in 100 annual probability with 14% climate change). The 2022 Loddon model which does not take account of changes in the catchment since 2009, such as the Eastern Relief Road construction suggests that the majority of the site is in Flood Zone 1 but a small area to the south eastern corner may be within Flood Zone 2, it confirms that the site is unaffected in the design event.

- 4.3.11 On balance, and given the presence of the Eastern Relief Road, the site is deemed to be within Flood Zone 1 with a Low Probability of fluvial flooding. This agrees with the findings in the Level 2 SFRA where the site, as a draft allocation, is not assessed as being at fluvial flood risk.

4.4 Flood Risk from Surface Water

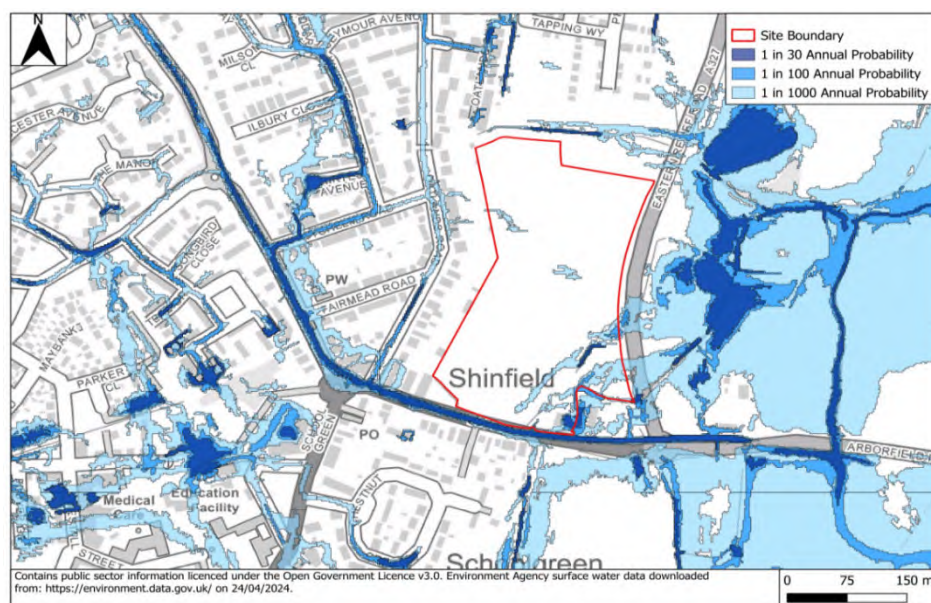
- 4.4.1 The EA's Risk of Flooding from Surface Water mapping indicates areas that could be susceptible to surface water flooding during extreme rainfall events. The EA surface water mapping defines rainfall events based on the following:

- 1 in 30 (3.3%) annual probability 'High Risk'
- 1 in 100 (1%) annual probability 'Medium Risk'
- 1 in 1000 (0.1%) annual probability 'Low Risk'
- Lower than 1 in 1000 (0.1%) annual probability 'Very Low Risk'.

- 4.4.2 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 an FRA.

- 4.4.3 **Figure 8** 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 8 – EA Flood Risk from Surface Water



- 4.4.4 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.

- 4.4.5 The WBC Level 1 and Level 2 SFRAs indicate that there have been incidents of surface water flooding within the borough but all of these incidents are located outside of the site boundary.
- 4.4.6 The EA mapping shows possible flow routes for surface water across the site's south eastern corner. It also shows the flow route along the carriageway on Arborfield Road, with more frequent flooding and deeper flooding than that shown within the site.
- 4.4.7 Generally this suggests that the surface water flow routes within the site have been generated from land drainage and surface water runoff within the site itself rather than conveying surface water from off site.
- 4.4.8 Any surface water flooding across the site will likely be intercepted by the southern ditch or the cutoff drain associated with the Eastern Relief Road. It will then be conveyed towards the site's eastern boundary and into the highways ditch alongside the Eastern Relief Road. As noted from site observations this ditch is large and runs almost the entire length of the relief road and conveys flow onwards to the east and into the Loddon tributaries.
- 4.4.9 From a review of ground levels along the site's southern boundary and Arborfield Road, and from site observations confirming the nature of the verge, it is deemed to be unlikely that any surface water flowing along the road would divert into the site. However, even if this did occur, floodwater would likely end up in the southern ditch or pond and be restricted to the site's south eastern corner up to the farm access track. It would tend to flow into the highways ditch alongside the Eastern Relief Road and then onwards to the Loddon tributaries.
- 4.4.10 The Level 2 SFRA assessment of the draft allocation site confirms that there is 'limited risk on the site itself' of surface water flooding but flags the potential issues in the south eastern corner. This assessment has shown that the flow route is not a key concern due to the presence of physical features to intercept or divert the flow.

4.5 Flood Risk from Groundwater

- 4.5.1 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.
- 4.5.2 The WBC Level 1 SFRA has assessed the area for susceptibility to groundwater flooding based off 1km grid squares. The SFRA does not contain any records of groundwater flooding to the site.
- 4.5.3 The Level 2 SFRA assessment of the draft allocation site suggests that there is a >75% susceptibility to groundwater flooding across the south end of the site; however the remainder of the site is at a <25% susceptibility. As this data is coarse (1km grid squares) it is reasonable to assume that the site itself is likely to be at a lower susceptibility than >75%. The mapping also suggests that groundwater could be less than 5m below the ground surface for a small area in the southern part of the site but this is not clear.



4.5.4 The southern part of the site is on the edge of the area of concern for groundwater flooding and the data is, as stated in the Level 2 SFRA, not a detailed assessment. Furthermore, the area affected is towards the boundary of the site with a large portion of it allocated for open space or roads.

4.5.5 The risk of flooding from groundwater sources to any built development is therefore considered to be low.

4.6 Flood Risk from Sewers

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

4.6.2 The WBC Level 1 SFRA confirms that the borough has flooded previously due to surcharging of foul, combined or surface water sewers. The number of reported incidents for the RG2 9 postcode area was 172. However, it is unclear if any of these area's affected the site as the SFRA does not specify the locations. The site itself is greenfield although there are sewers nearby. On balance the risk from sewers is deemed to be relatively low although it is recommended that the condition of sewers is confirmed at a later stage potentially as part of detailed design.

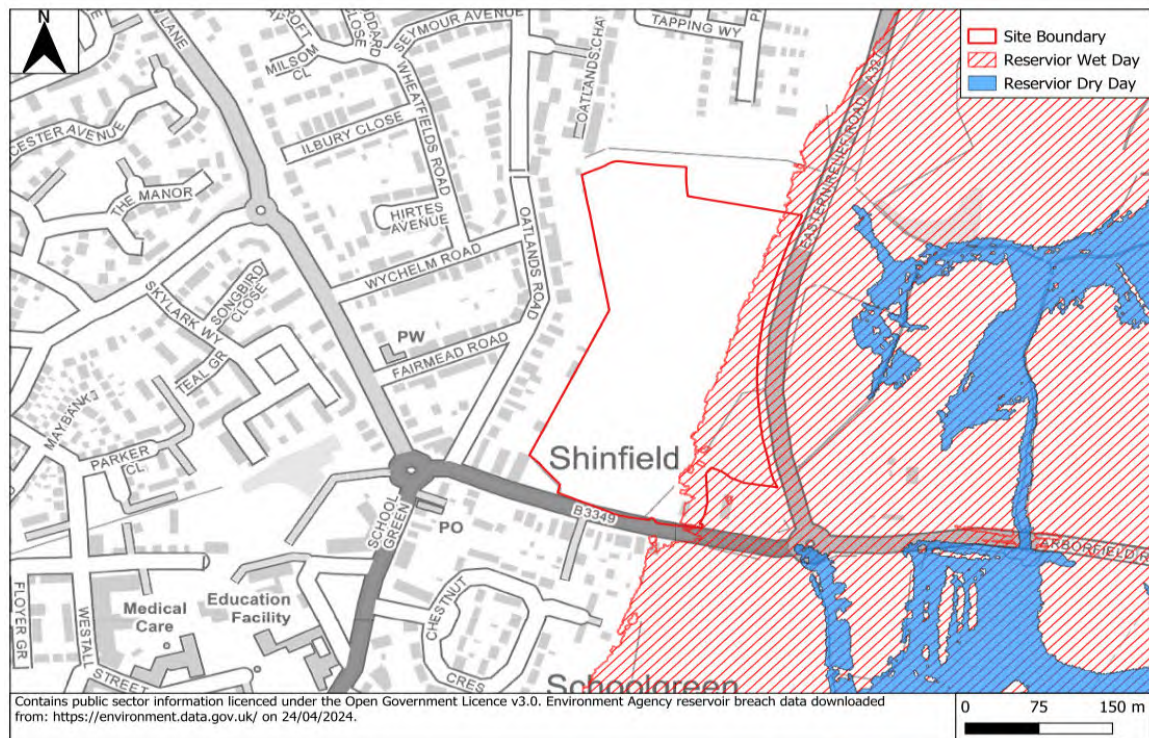
4.7 Flood Risk from Reservoirs

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

4.7.2 Figure 9 shows the flood risk from reservoirs. The mapping indicates the site is at risk of flooding from the 'Wet Day' scenario in the event of a reservoir breach. The 'Wet Day' scenario occurs when a reservoir breach occurs at the same time as fluvial flooding. The site is not at risk of flooding in the 'Dry Day' scenario.

4.7.3 The risk of reservoir flooding is primarily from Bearwood Lake which is a reservoir located east of the River Loddon and more than 3km from the site. The Level 2 SFRA assessment of the draft allocation site also suggests that Bramshill House Pond, Tundry Pond and Wellington Country Park Lake could also pose a risk of reservoir flooding for the general area; however these are located between 5 and 10km from the site to the south and are not considered further. If there were to be a breach of the Bearwood Lake reservoir, this flow would likely follow the mechanism of the fluvial event. From a review of levels and a review of the potential for water to reach the site from the eastern side of the relief road, this risk is deemed very low.

Figure 9 – EA Flood Risk from Reservoirs



4.7.4 The probability of flooding from a reservoir breach is very small. The Reservoir Act (1975) set out a mandatory requirement for all large (greater than 25,000m³) raised reservoirs to be supervised and inspected by reservoir engineers.

4.8 Flood Risk from Other Sources

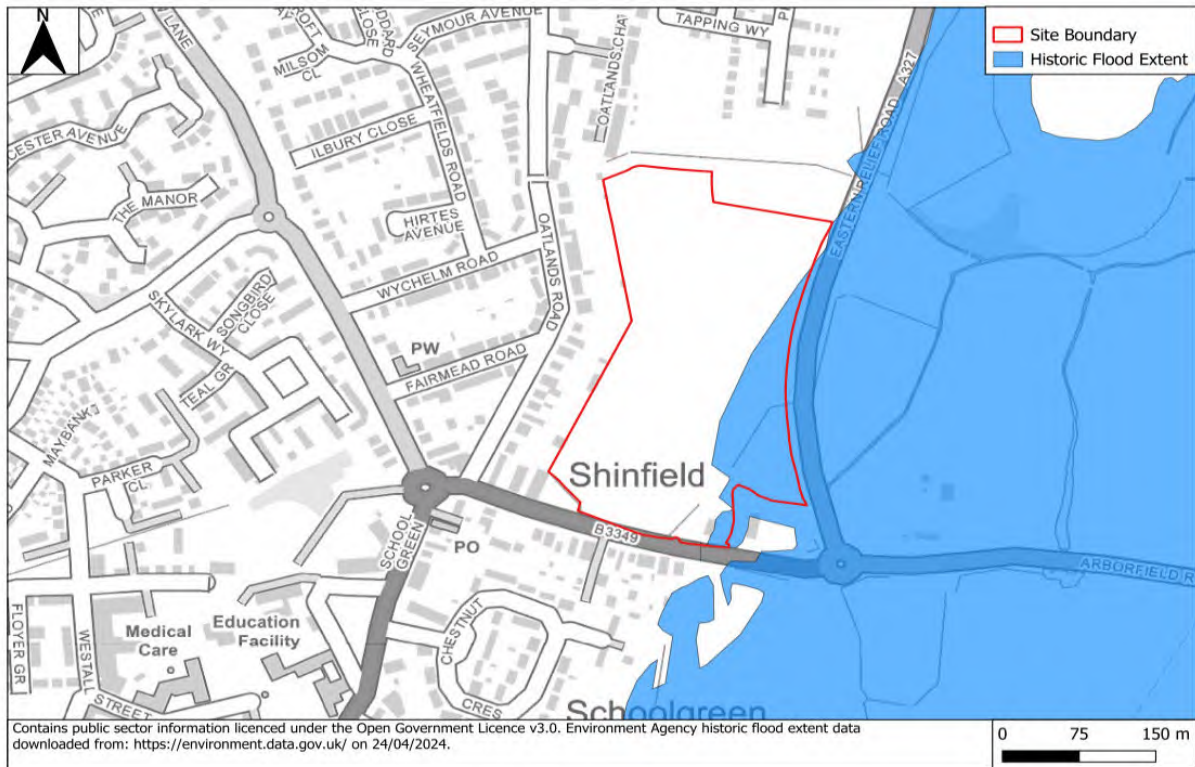
4.8.1 The EA flood risk maps, WBC Level 1 & 2 SFRA indicate that the site is not at risk of flooding from canals or other artificial sources. The level 2 SFRA confirms that the data used is the National Inundation Reservoir Mapping (long term flood risk map) from the EA.

4.9 Historic Flooding

4.9.1 The EA Historic Flood Map shows the maximum extent of recorded flood events. The mapping indicates that the eastern part of the site has been affected by historic flooding. Figure 10 shows this. It is likely that this flooding occurred before the Eastern Relief Road was constructed and the flow route is no longer achievable to the site.

4.9.2 The WBC Level 1 SFRA reports flooding in the borough but none of this affected the site.

Figure 10 Historic flood Extent



4.10 Flood Risk Summary

4.10.1 A summary of flooding from all sources is provided in **Table 4**.

Table 4 – Summary of Flood Risk

Source of Flooding	High	Medium	Low	Comments
Tidal			✓	The site is inland and not influenced by tidal levels.
Fluvial			✓	The Flood map for Planning suggests that the site is predominantly in Flood Zone 1 with an area in Flood Zone 2 and Flood Zone 3 to the site's south eastern corner and eastern boundary. However, analysis of detailed modelling commissioned by WBC suggests that the site is entirely in Flood Zone 1.
Pluvial		✓		The majority of the site is at a 'Very Low' risk of surface water flooding. There are areas of potential surface water flooding within the site and these correspond to potential flow routes for overland flow towards the sites eastern boundary. However it appears that the overland flow is generated purely within the site and is not reaching the site form



				elsewhere. This can be fully addressed through the site's water management and drainage strategy.
Groundwater			✓	From the available data the potential for groundwater flooding in the areas for built development is generally very low.
Sewers			✓	From the available data the potential for sewer flooding appears to be low.
Reservoirs			✓	The probability of reservoir flooding is very low. The available data suggests that any flooding resulting from a breach would emanate from the Loddon corridor and review of site data confirms that the Eastern Relief Road would likely prevent this from reaching the site.
Canals and other artificial sources			✓	The PFRA confirmed that there are no canals in the Borough and there was no mention in the WBC Level 1 & Level 2 SFRA.

- 4.10.2 The site is deemed to be at generally low risk of flooding. For the purposes of this FRA, the design flood event should be taken as the fluvial 1 in 100 annual probability scenario plus an allowance for climate change allowance. In this instance the relevant climate change allowance is 14% which is the Upper Central allowance for the Loddon and Tributaries Management Catchment.
- 4.10.3 The Masterplan for the proposed development has been designed with consideration of the potential for flooding and built development is not located in the site's south eastern corner. It is therefore in accordance with national and local planning policy concerning flood risk and, as such, the site is suitable for the proposed development.



5.0 Proposed Development and the Sequential Test

5.1 NPPF Sequential Test

- 5.1.1 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.
- 5.1.2 The proposed development is a draft allocation site and will therefore be subject to WBC's Sequential Test process. The Level 2 SFRA has assessed the site as having limited flooding risk and this FRA confirms it is within Flood Zone 1 with a generally low surface water flood risk and low potential of flooding from other sources.

5.2 Exception Test

- 5.2.1 The Level 2 SFRA has classified the draft allocation site as an 'Amber' site given the limited risk of surface water flooding and its location in Flood Zone 1. The Level 2 SFRA confirms that the Exception Test does not apply to these sites.
- 5.2.2 The proposed development is therefore appropriate for this site with respect to flood risk concerns.



6.0 Flood Mitigation Strategy

6.1 Sequential Approach

- 6.1.1 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. The masterplan for this development has followed this approach.

6.2 Ground Floor Levels

- 6.2.1 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'. A finished floor level of at least 300mm above the 1 in 100 annual probability plus climate change allowance is recommended.
- 6.2.2 The WBC Level 1 SFRA states FFL (finished floor levels) should be set 300mm above the 1% AEP plus climate change peak flood level. This site has been shown to be unaffected by the design event for fluvial flooding. Therefore there is no flood level.
- 6.2.3 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.

6.3 Floodplain Storage

- 6.3.1 The site has been shown to be unaffected by fluvial flooding for the design flood event. There is no requirement for floodplain storage as part of the development.

6.4 Safe Access

- 6.4.1 The site has been shown to be unaffected by fluvial flooding for the design flood event. There is no requirement for providing a safe access as part of the development.

6.5 Watercourses

- 6.5.1 To accommodate the proposed access and footpath arrangement at Arborfield Road the southern ditch will be culverted for a short section, essentially an extension of the pipe from which the channel commences. This will be sized to match the existing pipe.
- 6.5.2 A short section of the engineered cut off ditch north of the farm access track will be removed to provide the SuDS basin. A compensatory ditch of equivalent form will be provided. Details will be confirmed at a later stage and will also address any BNG elements.
- 6.5.3 The modifications to these watercourses will have no overall impact on the hydrology and conveyance mechanisms for overland flow or flood risk through the site.

6.6 Residual Risk

- 6.6.1 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'.
- 6.6.2 Residual risk to the site includes a breach or failure of a reservoir and a flood event greater than the designed standards. The Bearwood Lake is located more than 3km to the northeast of the site,



on the eastern side of the River Loddon and beyond the Eastern Relief Road. The mechanism for this to reach the site follows that of the fluvial extent and, as noted earlier, the Eastern Relief Road would prevent this flow route to the site.

- 6.6.3 The EA AIMS dataset which contains information of flood defences indicates that the site does not benefit from raised flood defences. There are no flood defences within the site boundary.
- 6.6.4 The EA mapping for reservoir breaches indicates that the eastern part of the site is located within an area at risk of flooding in the event of a reservoir breach occurring at the same time of a fluvial flood event. The probability of flooding from a reservoir breach is very small. The Reservoir Act (1975) set out a mandatory requirement for all large (greater than 25,000m³) raised reservoirs to be supervised and inspected by reservoir engineers. The residual risk is therefore confirmed to be low.



7.0 Surface Water Drainage

7.1 Introduction

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

7.2 Overall Strategy

- 7.2.1 The proposed drainage strategy has been designed in line with the NPPF by providing a comprehensive drainage system which embraces the SuDS philosophy and key principals. 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.
- 7.2.2 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.
- 7.2.3 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.
- 7.2.4 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.
- 7.2.5 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.
- 7.2.6 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.
- 7.2.7 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.



7.2.8 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.

7.2.9 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.

7.2.10 As infiltration is highly unlikely to be a viable method of disposal (Ref: Para 3.21 above), the surface water drainage proposals will be designed to attenuate runoff with controlled discharge to the existing local watercourses i.e. the existing open field ditch on site which would be feasible point of discharge.

7.2.11 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.

7.2.12 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.

7.3 Pre and Post Development Areas/Rates

7.3.1 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.

7.3.2 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): 646mm



- Soil: 0.470
- Region No.: 6

7.3.3 With an overall site area of 7.0 hectares (ha), the calculated Greenfield run off discharge rates and volumes are as presented in Figure 8. The corresponding runoff outputs created within Flow can be found within Appendix 3.

Figure 8 – Pre-Development Runoff Rates/Volumes

Annual Probability	Greenfield/Pre-Development Runoff Rate per hectare (l/s)	Greenfield/Pre-Development Volume 360 minute storm
1 in 1 year event	3.8	
QBar	4.4	
1 in 30 year event	10.2	
1 in 100 year event	14.1	2051

- 7.3.4 Based on the Masterplan, Impermeable areas have been calculated for the development with urban creep added to dwellings as appropriate.
- 7.3.5 The overall Post developed Impermeable area amounts to 2.90 hectares (ha) plus 0.31 hectares attributed to the proposed attenuation basin.
- 7.3.6 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. In this instance the development will be attenuated with discharge rates set at greenfield run off rates for each storm event.

7.4 Greenfield discharge rates

- 7.4.1 Discharge flows are to be regulated using a complex control manhole system. This manhole includes two hydrobrakes and a weir, which together allow for precise management of flow rates, ensuring they align with the greenfield runoff rate.
- 7.4.2 For the purposes of this report and to provide a robust analysis, the complex control manhole system is designed to achieve greenfield runoff rates during different storm events. The system ensures that the flow rates during various storm intensities 1 in 1 year, 1 in 30 year, and 1 in 100 year events are controlled to match the pre-development greenfield runoff rates. The achieved flow rates are detailed below:
- 1 in 1 year storm: 12.09 L/s
 - 1 in 30 year storm: 32.49 L/s
 - 1 in 100 year storm: 45.10 L/s
 - Long term Storage output: 6.40 L/s



7.4.3 The design ensures that even during more intense storms, the system controls the discharge to match the greenfield runoff rates, thereby preventing the risk of flooding upstream and discharging at prior development rates.

7.4.4 With the above measures in place, and having assessed the ability to limit the offsite discharge rate using the complex control manhole, the anticipated long term storage volumes for a for the site are as follows:

7.4.5 Formular:
$$VOL = 10 \times RD \times A \times \left[0.8 \times \left(\frac{PIMP}{100} \right) - \left(\frac{PIMP}{100} \right) \times SOIL \right]$$

7.4.6

Figure 9 – Calculated Long Term Storage Volume

Catchment	Catchment Area (ha)	Impermeable Area (ha)	Long term Storage (m ³)
1	7.03	3.19	712.9

7.5 Surface Water Proposals

7.5.1 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 and basins to provide attenuation storage and high-quality water benefits.

7.5.2 Minimal sections of existing ditch are to be retained with the exception of those outlined on the application drawings.

7.5.3 Drawings HD008-FA-501 and 502 provide an overview to the proposals, copies of which are included within **Appendix 3**.

7.5.4 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 4 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.

7.5.5 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.

7.5.6 Discharge rates will be controlled to match greenfield runoff rates for all storm events up to and including the 1 in 100 year storm with a 40% climate change allowance. This is achieved using a complex control manhole with hydrobrakes and a weir. While effective flow control is provided, long-term storage is still required to manage runoff volumes.

7.5.7 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.



- 7.5.8 Current uncontrolled pluvial runoff exhibited onsite during high rainfall events (Ref: para 3.25 above) 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 eastwards towards the Relief Road. This will be a benefit to downstream receptors.
- 7.5.9 This proposal provides suitable details of the principal components of the surface water strategy for this application and may be subject to further refinement to address any conditions. These assumptions are subject to evolution as the design is finalised with individual parcels being realised.
- 7.5.10 There is scope to utilise source control techniques (such as 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.
- 7.5.11 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.
- 7.5.12 Simulation results for the proposed surface water network are included within **Appendix 3**.

7.6 Exceedance Flood Routing

- 7.6.1 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.
- 7.6.2 The attenuation basin on the eastern edge of the Development is designed to provide 300mm freeboard and therefore can accept additional flood water from manholes upstream.

7.7 Water Quality Improvements

- 7.7.1 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.
- 7.7.2 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.
- 7.7.3 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 in **Figure 2**.



Figure 2 – 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

- 7.7.4 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.
- 7.7.5 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.
- 7.7.6 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.
- 7.7.7 The Residential Roof of the proposed development is classified as ‘Very Low’ in accordance with the Pollution Hazard Level, which equals to Total Suspended Solids: 0.2, Metals: 0.2 & Hydrocarbons: 0.05.
- 7.7.8 The Residential Roads and parking of the proposed development is classified as ‘Low’ in accordance with the Pollution Hazard Level, which equals to Total Suspended Solids: 0.5, Metals: 0.4 & Hydrocarbons: 0.4.
- 7.7.9 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 in Figure 3.

Figure 3 – 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
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7.7.10 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 detention basins (TSS: 0.5, Metals: 0.5, Hydrocarbons: 0.6) provides adequate pollution treatment.

7.7.11 Finally, silt traps will be utilised before the attenuation basin, which will further enhance the water quality of the proposed development.

7.8 SuDS Maintenance Strategy

7.8.1 For the water treatment effects of SuDS features to remain effective, a comprehensive maintenance strategy should be implemented. Refer to **Appendix G** for more details.

7.8.2 During construction, maintenance of SuDS features should be undertaken by the Contractor. Upon completion, the assets should be passed over to the client to maintain the features in perpetuity.

7.8.3 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.

7.8.4 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.

7.9 Adoption and Ownership

7.9.1 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

7.9.2 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 Southern 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.

7.9.3 Suitable adoption and maintenance regimes for SuDS will be provided to address any planning conditions.



8.0 Foul Water Drainage

8.1 Introduction

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

8.2 Overall Strategy

- 8.2.1 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 located along the southern boundary of the site
- 8.2.2 The proposed foul water sewers will be designed in collaboration with Thames Water or independent adopting authority as approving body in accordance with the new Sewerage Sector Guidance (SSG) and will be offered to Thames Water, or alternative, for adoption under S104 Agreement of the Water Industry Act.

8.3 Adoption and Ownership

- 8.3.1 The drainage system is designed to the appropriate standards including the new Sewerage Sector Guidance (SSG), the Building Regulations and British Standards.
- 8.3.2 Foul water sewers within development parcels and offsite to the point of connection are to be offered for adoption to TW or alternative under the Section 104 process of the Water Industry Act.



9.0 Conclusion

9.1 Flood Risk

9.1.1 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).

9.1.2 This Flood Risk Assessment (FRA) concludes that:

- The majority of the site is located within Flood Zone 1 'Low Probability' (land at less than 1 in 1000 (0.1%) annual probability of river or sea flooding'). The east of the site is located within Flood Zone 2 'Medium Probability' (Land between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river or sea flooding. Along the eastern boundary of the site is located within Flood Zone 3 'High probability' land at 1 in 100 (1%) annual probability of river or sea flooding.
- The site is at negligible risk of tidal flooding due to its inland location.
- Detailed fluvial flood modelling results and site specific topographical data and site observations confirm that the site is not affected in the 1 in 1000 year annual probability event or in the design event (1 in 100 annual probability event with 14% climate change).
- 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. Possible surface water flow routes across the south eastern part of the site are shown to be associated with flow generated within the site and, therefore will be completely accommodated by the development surface water drainage strategy.
- The Level 2 SFRA suggests that the southern part of the site may be a potential risk of groundwater flooding. However, the site is on the edge of the potential risk area and the data is very coarse. Furthermore, this part of the site is generally providing open space and the access so there is little potential impact on built development.
- Other sources of flooding are found to be a low risk for the site.
- No specific flood risk mitigation measures are required and finished floor levels will be set an appropriate level above the surrounding ground level (minimum of 150mm).

9.1.3 Sequential Test and Exception Test

9.1.4 The Sequential Test will be applied by WBC for this draft allocation site. The Level 2 SFRA already confirms the low level of flood risk and the detailed assessment in this FRA demonstrates that the actual risk is even lower than the SFRA mapping suggests.

9.1.5 The Level 2 SFRA confirms that the Exception Test is not required.

9.2 Surface Water Drainage Strategy

9.2.1 The proposed surface water drainage strategy will manage the flood risk posed by uncontrolled surface water runoff from the site. Any increase in surface water run-off can 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.



9.3 Summary

- 9.3.1 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



Appendix A – Plans

Illustrative Masterplan

Topographic Survey

Thames Water Sewer Asset Plan

Level 2 SFRA Extract

Planting Plans



OATLANDS ROAD

Approved & Consented
PHASE 1

presentation planning layout





Notes:

Drainage:
Inverted Covers are fitted where possible and all drainage invert information has been obtained through visual inspection only, with the exception of the Theobalds Road site where a trench was excavated to be quantified. Where drainage is of critical importance we suggest the services of a specialist drainage expert be used.

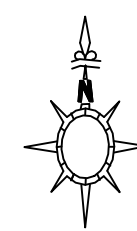
Tree:
Every effort has been made to identify and detail all trees on site. The presence of trees is noted on the map and the location of any specialist such as an arborist. Tree spread and heights are indicative only.

GPS:
Detail relative to the time and date of survey. GPS levels and bearings are obtained using industry standard guidelines and can vary according to the quality of the GPS network at the time of survey. GPS levels are subject to local magnetic factors & Horizontal and Vertical Datums are established from a central site fix and compared to a reference station utilizing ONSD correction.

Survey notes:
Survey specification is limited to the original purpose of the survey commissioned (the purpose is to be used to restore the site to its original purpose only). Survey is accurate within limitations of the site conditions at the time of survey. The survey is not intended to be used as evidence of the extent of light or dense vegetation, critical dimensions and positions should be verified following suitable clearance.

Photographs:
Detail relative to the site and bearings relative to the plotting scale.

Copyright:
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LEGEND

OVERALL TREE SPECIES INFORMATION

ALDER	ALD	LONDON PLANE	LPM
ASH	ASH	MAGNOLIA	MAH
ASPEN	ASP	MAPLE	MPL
BEECH	BCH	OAK	OAK
CHEERRY	CHY	PINE	PNE
ELM	ELM	POPULAR	POP
FLR	FLR	HYPOCISTADENDRONS	HDN
FRUIT	FRK	ROWAN	RWN
HAUTHORN	HAW	SILVER BIRCH	SIB
HAZEL	HAZ	SWEET CHESTNUT	SCN
HOLLY	HLY	WALNUT	WNT
HORSE CHESTNUT	HCH	WILLOW	WLW
LIME	LIM	YEW	YEW
LOCUST	LOC	SPECIES UNKNOWN	SPU
		COPPERO	COP

TREE ANNOTATIONS: Tree Species / Tree Bolt Size / No of

FENCE INFORMATION		LEVEL INFORMATION	
BARRIED WIRE FENCE	RWFF	RED LEVEL	RL
CHAIN LINK FENCE	CLF	COVER LEVEL	CL
CHESTNUT PALING FENCE	CPF	CL	CL
CONE BOARD FENCE	CBF	INVERT LEVEL	IL
CONCRETE SLAT FENCE	CSF	FOOT LEVEL	FL
CORRUGATED IRON FENCE	CIF	THRESHOLD LEVEL	THL
CORRUGATED FENCE	CF	TWO FASTER	TF
HANDRAIL	HDL	GRAVEL WATER	GW
IRON RAILINGS	IRL	UNABLE TO LIFT	UTL
LARCH LAD FENCE	LLF	WATER	W
MISCELLANEOUS FENCE	MF		
PALISADE FENCE	PSF	SURFACE INFORMATION	
PICKET FENCE	PFF		
POST AND CHAIN FENCE	PCF	CONCRETE	Cc
POST AND RAIL FENCE	PRF	BRICK CURBING	BR
POST AND WIRE FENCE	PWF	FLOWERBED	FB
SECURITY FENCE	SEF	PAVING SLABS	PS
STOCK WIRE FENCE	SWF	RETAINING WALL	RW
TRELLIS FENCE	TF	SCALPING	SC
WIRE MESH FENCE	WMF	DETAILS WALL	DW

FEATURE INFORMATION

BOLLARD	BO	NAME PLATE	NP
TELEPHONE JC	BTIC	NOTICE BOARD	NB
BUS STOP	BS	POST	P
CABLE TELEVISION JC	CATV	RAIN WATER PIPE	RWP
ELECTRIC RIG	ER	ROAD SIGN	RS
EARTHQUAKE FIGHT PBT	ELCP	ROOFTOP EYE	RE
FLAME PROOF POLE	FP	SERVICE HANDBOOK POST	SHP
FLUE HYDRANT	FH	SOIL VENT PIPE	SVP
FLAG POLE	FP	STOP VALVE	SV
GLIDE POST	GP	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TRAFFIC SIGNAL	TS
LAMP POST	LP	TRAFFIC SIGNAL JC	TSJC
LETTER BOX	LB	WASH OUT	WO
WATER OUTLET	WO	WATER METER	WM

REVISION

Level Datum:
Levels are related to previous Encompass Surveys Ltd survey control
Ref: 0AAS-Arborfield

Grid:
Grid is related to previous Encompass Surveys Ltd survey control

Northpoint:

Northpoint



Encompass Surveys Ltd
Yarmouth House
1300 Parkway
Solent Business Park
Whiteley, Fareham
Hampshire, PO15 7AX

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

Client:	Belway Homes (Thames Valley)
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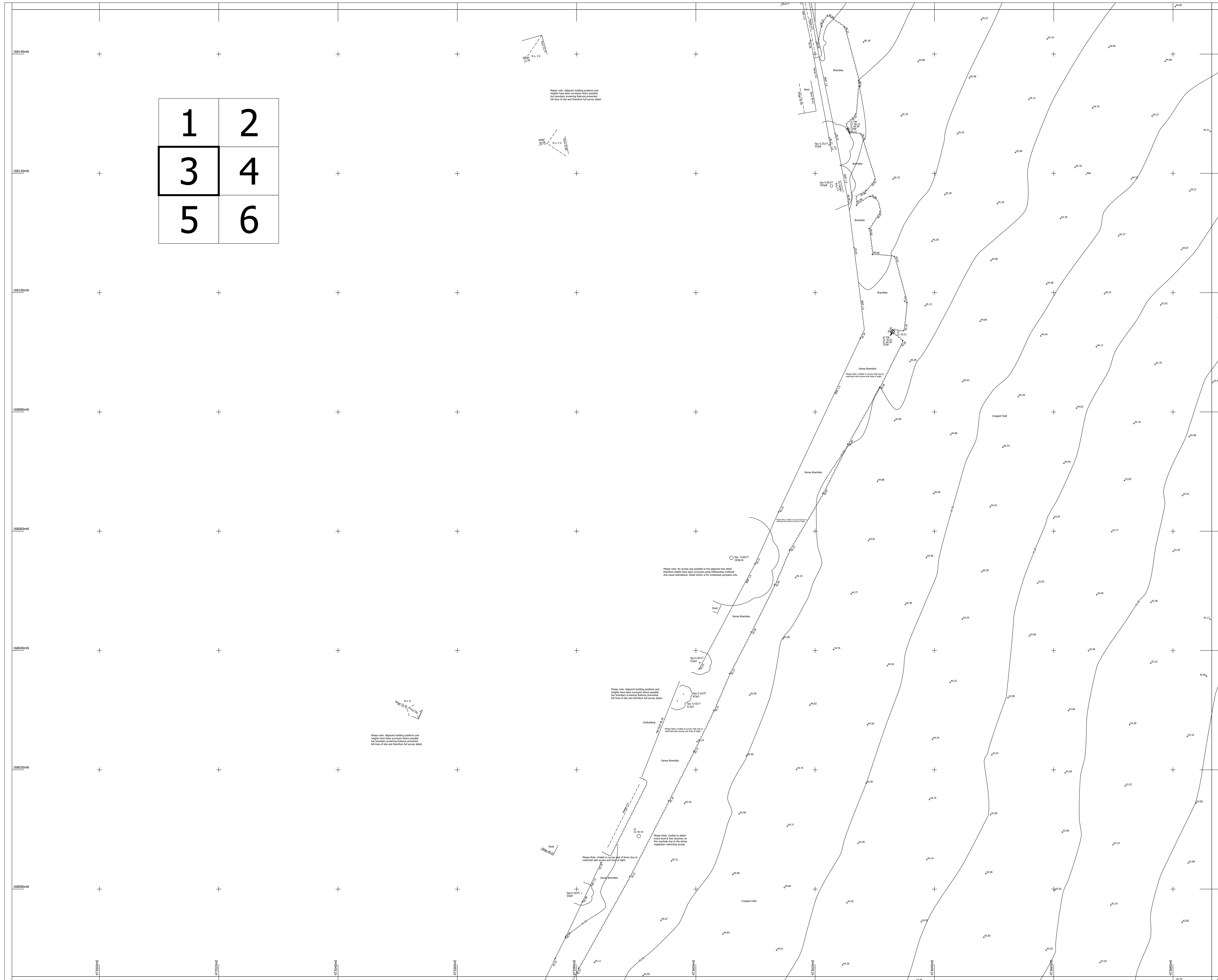
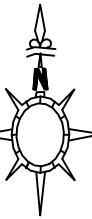
Survey Location:	Land North of Arborfield Road Shinfield Reading
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Survey type:	Topographical	Scale:	1:200@A0
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Drawing ref:	FNC/161123/3064/S1	Date:	November 202
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Drawn/QA:	BF/SH	Plot No.	Plot 2 of 6
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[illegible][illegible]

REVISION

Level Datum:
Levels are related to previous Encompass Surveys Ltd survey control
Ref: OAS-Arborfield

id:
id is related to previous Encompass Surveys Ltd survey control

orthpoint:



Encompass Surveys Ltd
Yarmouth House
1300 Parkway
Solent Business Park
Whiteley, Fareham
Hampshire, PO15 7AX

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

Client: Bellway Homes (Thames Valley)

Survey Land North of Arborfield Road

Excavation: Shinfield
Reading

Survey type:	Topographical	Scale:	1:200@A0
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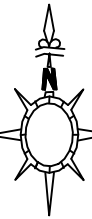
Drawing ref:	ENC/161123/3064/S1	Date:	November 2023
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Drawn/QA:	BF/SH	Plot No.	Plot 3 of 6
-----------	-------	----------	-------------



1	2
3	4
5	6

NOTES:
Drainage:
Inspection Covers are fitted 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 grids 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 utilizing 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.
Copyright:
This survey information is Copyright Encompass Surveys Ltd (2009). All rights reserved.



LEGEND

OVERALL TREE SPECIES INFORMATION

ALDER	ALD	LONDON PLANE	LPI
ASH	ASH	MAGNOLIA	MAG
ASPEN	ASP	MAPLE	MPL
BEECH	BCH	OAK	OAK
CHERRY	CHY	PINE	PIN
ELM	ELM	POPLAR	POP
FIR	FIR	RHODODENDRON	RCH
FRUIT	FRT	ROWAN	ROW
HAWTHORN	HAT	SILVER BIRCH	SCH
HAZEL	HAC	SWEET CHESTNUT	SCN
HOLLY	HCT	WILD BIRCH	WBT
HORSE CHESTNUT	HCH	WILLOW	WEW
LIME	LIM	YEW	YEW
LOCUST	LOC	SPECIES UNKNOWN	SPU
		CORTEX	COR

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

FENCE INFORMATION

BARBED WIRE FENCE	BWF	BED LEVEL	BL
CHAIN LINK FENCE	CLF	COVER LEVEL	CL
CHESTNUT PALING FENCE	CHF	FOOD LEVEL	FL
CLOSE BOARD FENCE	CBF	INVERT LEVEL	IL
CONCRETE SILL FENCE	CSF	OUTSIDE LEVEL	OL
CORRUGATED IRON FENCE	CIF	THRESHOLD LEVEL	TL
CRASH BARRIERS	CBR	FOOTWAY	FW
HANDMADE FENCE	HMF	GRABBLE TO LIFT	GL
IRON RAILINGS	IRF	WATER CREEK	WC
IRON RAIL FENCE	IRF		
MAGNOLIA FENCE	MFF		
MASTIFF FENCE	MAF		
POST AND RAIL FENCE	PRF	CONCRETE	CL
POST AND RAIL FENCE	PRF	BRICK PAVING	BP
POST AND RAIL FENCE	PRF	PAVING SLAB	PS
SECURITY FENCE	SCT	RETAINING WALL	RW
STEEL WIRE FENCE	SWF	SCAFFOLD	SCAF
THICK FENCING	TFP	TACTILE PAVING	TAC
WIRE MESH FENCE	WMF		

FEATURE INFORMATION

BOLLARD	BO	WIRE PLATE	WP
BUS STOP	BS	WATER BOARD	WB
CABLE TIE DOWN	CTD	POST	P
CANTERBURY FENCE	CR	ROAD MARKER POST	RMP
ELECTRICITY CABLE FIT	ECF	ROAD SIGN	RS
ELECTRICITY POLE	EP	RODENT BAIT	RB
FIRE HYDRANT	FH	SERVICE MARKER POST	SMP
FLAG POLE	FP	STOP VALVE	SV
GAS POST	GP	TRAFFIC SIGNAL	TS
INSPECTION COVER	IC	TRAFFIC SIGNALS	TSC
LAMP POST	LP	WASH OUT	WO
LETTER BOX	LB	WATER METER	WM
WIRE OUTLET	WO		

REVISIONS

Level Datum:
Levels are related to previous Encompass Surveys Ltd survey control
Ref: OAS-Airfield

Grid:
Grid is related to previous Encompass Surveys Ltd survey control

Northpoint:



Encompass Surveys Ltd
Vernon House
1300 Parkway
Solihull Business Park
Whitby, Cheshire
Hampshire, PO15 7AX

Tel: (+44)200 690002 Email: info@encompass-surveys.co.uk
Web: encompass-surveys.co.uk

Client: Bellway Homes (Thames Valley)

Survey Location: Land North of Airfield Road
Reading

Survey type: Topographical Scale: 1:2000/40

Drawing ref: ENC161123/3064/51 Date: November 2023

Drawn/QA: BF/SH Plot No: Plot 4 of 6

Drainage & Water Search (Commercial)



Search Details

Prepared for: IBB Law LLP Commercial Real Estate
Matter: MAWS/81730/1776
Client address: Capital Court, 30 Windsor Street, Uxbridge, Middlesex, UB8 1AB

Property:
Land north of, Arborfield Road, Shinfield

Data Supplier:
Thames Water Utilities Ltd
Thames Water Plc, PO Box 286, Swindon, SN38 2RA

Date Returned:
20/10/2023

Property type:
Commercial New Development

This search was compiled by the Data Supplier above and provided by Search Acumen Ltd - t: 0800 804 4900, e: helpdesk@searchacumen.co.uk. This search is subject to terms and conditions issued by Search Acumen which can be viewed at www.search-acumen.co.uk or supplied on request. This search is also subject to terms and conditions issued by the Data Supplier, available on request. Search Acumen is registered with the Property Codes Compliance Board (PCCB) as subscribers to the Search Code. The PCCB independently monitors how registered firms maintain compliance with the Code. Visit www.propertycodes.org.uk for more information.



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Vinters Business Park, Maidstone, Kent, ME14 5NZ
T: 0800 804 4900 E: helpdesk@searchacumen.co.uk

InfoTrack Ltd
91
Waterloo Road
London
SE1 8RT

Search address supplied	Land North Of, Arborfield Road, Shinfield
Your reference	46058453
Our reference	CDWS/CDWS Standard/2023_4899188
Received date	18 October 2023
Search date	19 October 2023

Keeping you up-to-date

Notification of Price Changes

From 1st April 2023 Thames Water property Searches will be increasing the price of it CON29DW, CommercialDW Drainage & Water Enquiries and Asset Location Searches.

Historically cost would rise in line with RPI but as this currently sits at 14.2%, we are capping it at 10%. Customer will be emailed with the new price by January 1st 2023. Any orders received with higher payments prior to 1st April 2023 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540

Question

Summary Answer

Maps

1.1	Where relevant, please include a copy of an extract from the public sewer map.	Map Provided
1.2	Where relevant, please include a copy of an extract from the map of waterworks.	Map Provided

Drainage

2.1	Does foul water from the property drain to a public sewer?	See Details
2.2	Does surface water from the property drain to a public sewer?	See Details
2.3	Is a surface water drainage charge payable?	See Details
2.4	Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?	Yes
2.4.1	Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the boundaries of the property?	No
2.5	Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?	See Details
2.5.1	Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the 50metres of any buildings within the property?	No
2.6	Are any sewers or lateral drains serving, or which are proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
2.7	Has a sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?	No
2.8	Is the building, which is or forms part of the property, at risk of internal flooding due to overloaded public sewers?	Not At Risk
2.9	Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.	3.226 Kilometres

Water

3.1	Is the property connected to mains water supply?	See Details
3.2	Are there any water mains, resource mains or discharge pipes within the boundaries of the property?	Yes
3.3	Is any water main or service pipe serving, or which is proposed to serve the property, the subject of an existing adoption agreement or an application for such an agreement?	No
3.4	Is the property at risk of receiving low water pressure or flow?	See Details
3.5	What is the classification of the water supply for the property?	See Details
3.6	Is there a meter installed at this property?	No
3.7	Please include details of the location of any water meter serving the property.	See Details

Question

Summary Answer

Charging

4.1.1	Who is responsible for providing the sewerage services for the property?	Thames Water
4.1.2	Who is responsible for providing the water services for the property?	Thames Water
4.2	Who bills the property for sewerage services?	See Details
4.3	Who bills the property for water services?	See Details

Trade Effluent

5.1	Is there a consent, on this property, to discharge Trade Effluent under S118 of the Water Industry Act(1991) into the public sewerage system?	No
-----	---	----

Wayleaves, Easements, Manhole Cover and Invert levels

6.1	Is there a wayleave/easement agreement giving Thames Water the right to lay or maintain assets or right of access to pass through private land in order to reach the Company's assets?	No
6.2	On the copy extract from the public sewer map, please show manhole cover, depth and invert levels where the information is available .	See Details

Search address supplied: Land North Of, Arborfield Road, Shinfield

Any new owner or occupier will need to contact Thames Water on 0800 316 9800 or log onto our website www.thameswater.co.uk and complete our online form to change the water and drainage services bills to their name.

The following records were searched in compiling this report: - the map of public sewers, the map of waterworks, water and sewer billing records, adoption of public sewer records, building over public sewer records, the register of properties subject to internal foul flooding, the register of properties subject to poor water pressure and the drinking water register.

Thames Water Utilities Ltd (TWUL) holds all of these.

TWUL, trading as Property Searches, are responsible in respect of the following:-

- (i) any negligent or incorrect entry in the records searched
- (ii) any negligent or incorrect interpretation of the records searched
- (iii) any negligent or incorrect recording of that interpretation in the search report
- (iv) and compensation payments

Maps

1.1 Where relevant, please include a copy of an extract from the public sewer map.

A copy of an extract of the public sewer map is included, showing the public sewers, disposal mains and lateral drains in the vicinity of the property.

1.2 Where relevant, please include a copy of an extract from the map of waterworks.

A copy of an extract of the map of waterworks is included, showing water mains, resource mains or discharge pipes in the vicinity of the property.

Drainage

2.1 Does foul water from the property drain to a public sewer?

The enquiry appears to relate to a plot of land or a recently built property. It is recommended that drainage proposals are checked with the developer.

2.2 Does surface water from the property drain to a public sewer?

Records indicate that this enquiry relates to a plot of land or a recently built property. It is recommended that the drainage proposals are checked with the developer. If the property was constructed after 6th April 2015 the Surface Water drainage may be served by a Sustainable Drainage System (SuDS). Further information may be available from the Developer.

2.3 Is a surface water drainage charge payable?

This enquiry appears to relate to a plot of land or a recently built property. It is recommended that charging proposals are checked with the developer. If the property was constructed after 6th April 2015 the Surface Water drainage may be served by a Sustainable Drainage System (SuDS). Further information may be available from the Developer.

2.4 Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundary of the property?

The public sewer map included indicates that there is a public sewer, disposal main or lateral drain within the boundaries of the property. However, from the 1st October 2011 there may be additional public sewers, disposal mains or lateral drains which are not recorded on the public sewer map but which may further prevent or restrict development of the property.

2.4.1 Does the public sewer map indicate any public pumping station or any other ancillary apparatus within the boundaries of the property?

The public sewer map included indicates that there is no public pumping station within the boundaries of the property.

2.5 Does the public sewer map indicate any public sewer within 30.48 metres (100 feet) of any buildings within the property?

The public sewer map indicates that there are no public sewers within 30.48 metres (100 feet) of any buildings within the property.

However, from the 1st October 2011 many private sewers were transferred into public ownership and may not be recorded on the public sewer map and it is our professional opinion that if the property is connected to a foul sewer it is likely that there will be a public sewer within 30.48 metres (100 feet) of any buildings within the property.

2.5.1 Does the public sewer map indicate any public pumping station or any other ancillary apparatus within 50 metres of any buildings within the property?

The public sewer map included indicates that there is no public pumping station within 50 metres of any buildings within the property.

2.6 Are any sewers or lateral drains serving, or which are proposed to serve, the property the subject of an existing adoption agreement or an application for such an agreement?

Records confirm that Foul sewers serving the development, of which the property forms part are not the subject of an existing adoption agreement or an application for such an agreement.

The Surface Water sewer(s) and/or Surface Water lateral drain(s) are not the subject of an adoption agreement.

2.7 Has a sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?

There are no records in relation to any approval or consultation about plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain. However, the sewerage undertaker might not be aware of a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain.

2.8 Is the building which is or forms part of the property, at risk of internal flooding due to overloaded public sewers?

The property is not recorded as being at risk of internal flooding due to overloaded public sewers.

From the 1st October 2011 most private sewers, disposal mains and lateral drains were transferred into public ownership. It is therefore possible that a property may be at risk of internal flooding due to an overloaded public sewer which the sewerage undertaker is not aware of. For further information it is recommended that enquiries are made of the vendor.

2.9 Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.

The nearest sewage treatment works is Arborfield STW which is 3.226 kilometres to the east of the property.

Water

3.1 Is the property connected to mains water supply?

The enquiry appears to relate to a plot of land or a recently built property. It is recommended that the water proposals are checked with the developer.

3.2 Are there any water mains, resource mains or discharge pipes within the boundary of the property?

The map of waterworks indicates that there are water mains, resource mains or discharge pipes within the boundaries of the property.

3.3 Is any water main or service pipe serving, or which is proposed to serve, the property the subject of an existing adoption agreement or an application for such an agreement?

Records confirm that water mains or service pipes serving the property are not the subject of an existing adoption agreement or an application for such an agreement.

3.4 Is the property at risk of receiving low water pressure or flow?

Records confirm that the property is not recorded on a register kept by the water undertaker as being at risk of receiving low water pressure or flow.

3.5 What is the classification of the water supply for the property?

The water supplied to the property has an average water hardness of 110.8mg/l calcium which is defined as HARD by ThamesWater.

3.6 Is there a meter installed at this property?

Records indicate that there is no meter installed at this property.

3.7 Please include details of the location of any water meter serving the property.

This enquiry appears to relate to a plot of land or a recently built property. It is recommended that drainage proposals are checked with the developer.

Charging

4.1.1 – Who is responsible for providing the sewerage services for the property?

Thames Water Utilities Limited, Clearwater Court, Reading, RG1 8DB is the sewerage undertaker for the area.

4.1.2 – Who is responsible for providing the water services for the property?

Thames Water Utilities Limited, Clearwater Court, Reading, RG1 8DB is the water undertaker for the area.

4.2 Who bills the property for sewerage services?

If you wish to know who bills the sewerage services for this property then you will need to contact the current owner. For a list of all potential retailers of sewerage services for the property please visit www.open-water.org.uk

4.3 Who bills the property for water services?

If you wish to know who bills the water services for this property then you will need to contact the current owner. For a list of all potential retailers of water services for the property please visit www.open-water.org.uk

Trade Effluent

5.1 Is there a consent, on this property, to discharge Trade Effluent under S118 of the water Industry act (1991) into the public sewerage systems?

No.

Wayleaves, Easements, Manhole Cover and Invert levels

6.1 Is there a wayleave/easement agreement giving Thames water the right to lay or maintain assets or right of access to pass through private land in order to reach the Company's assets?

No.

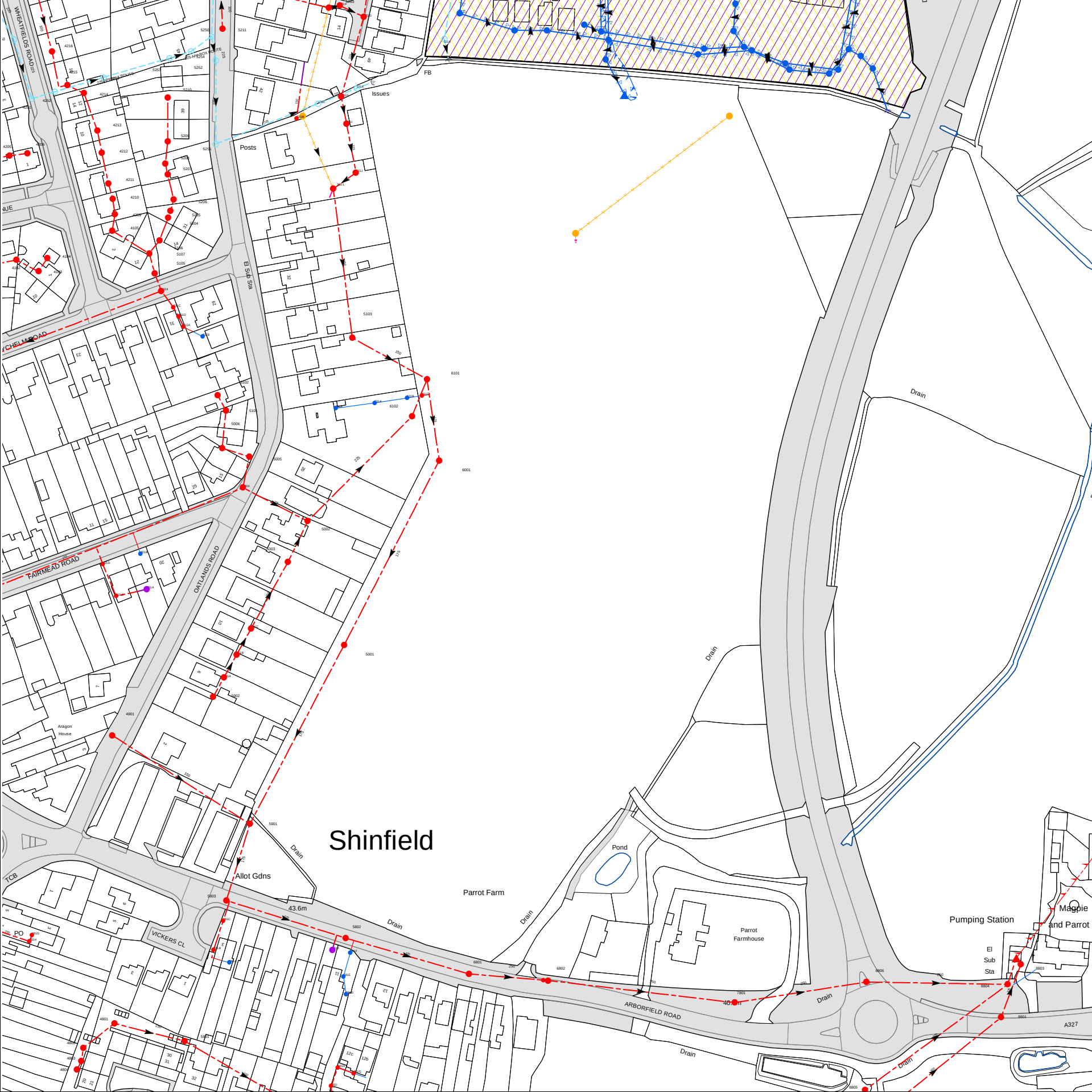
6.2 On the copy extract from the public sewer map, please show manhole cover, depth, and invert levels where the information is available.

Details of any manhole cover and invert levels applicable to this site are enclosed.

Payment for this Search

A charge will be added to your suppliers account.

CommercialDW Drainage and Water Enquiry Sewer Map- CDWS/CDWS Standard/2023 4899188



The width of the displayed area is 500m

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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Manhole Reference	Manhole Cover Level	Manhole Invert Level
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
5250	51.99	51.26
5211	n/a	n/a
4206	52.94	52.18
4251	53.19	52.03
4103	52.17	51.17
4104	52.24	51.58
4216	n/a	n/a
4252	n/a	n/a
4215	53.33	52.4
4214	53.29	52.2
4213	n/a	n/a
4212	n/a	n/a
4253	n/a	n/a
4211	n/a	n/a
4105	52.36	51.63
4210	52.95	51.38
4209	52.6	51.25
5106	n/a	n/a
5105	n/a	n/a
5107	52.17	50.98
5104	51.68	50.07
5208	52.66	51.68
5207	52.5	51.55
5210	52.87	52.11
5209	52.84	51.84
5204	n/a	n/a
5253	n/a	n/a
5205	52.19	51.27
511C	n/a	n/a
5206	52.55	51.37
511D	n/a	n/a
511A	n/a	n/a
5254	n/a	n/a
511B	n/a	n/a
5251	51.64	50.89
5252	n/a	n/a
521M	n/a	n/a
521L	n/a	n/a
5201	49.62	48.37
521H	n/a	n/a
521I	n/a	n/a
5103	47.86	46.64
521J	n/a	n/a
521K	n/a	n/a
6101	46.16	44.87
621A	49.15	47.76
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a
401D	n/a	n/a
4901	46.38	44.76
401C	n/a	n/a
401B	n/a	n/a
501A	n/a	n/a
5902	47.48	47.12
5102	50.67	49.77
5006	48.68	47.89
591A	n/a	n/a
5101	50.04	49.4
5803	44.22	42.31
501B	n/a	n/a
5004	48.4	45.94
5005	48.76	47.67
5901	n/a	n/a
501C	n/a	n/a
5003	47.22	45.59

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5002	47.11	45.41
511E	n/a	n/a
5001	45.45	43.86
611A	n/a	n/a
611B	n/a	n/a
6102	n/a	n/a
611C	n/a	n/a
6001	45.49	44.32
581E	n/a	n/a
5802	42.89	41.44
581D	n/a	n/a
581F	n/a	n/a
6801	42.19	40.73
6802	41.73	39.21
7801	41.04	38.97
8806	41.03	38.75
8801	41.777	37.957
8804	40.71	38.57
8803	40.84	37.53
481H	n/a	n/a
481G	n/a	n/a
4803	45.76	45.08
4802	45.72	44.88
4801	45.35	44.39
5801	45.4	43.64
581A	n/a	n/a
581J	n/a	n/a
581B	n/a	n/a
581C	n/a	n/a
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Con29DW Commercial Drainage and Water 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

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.

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.

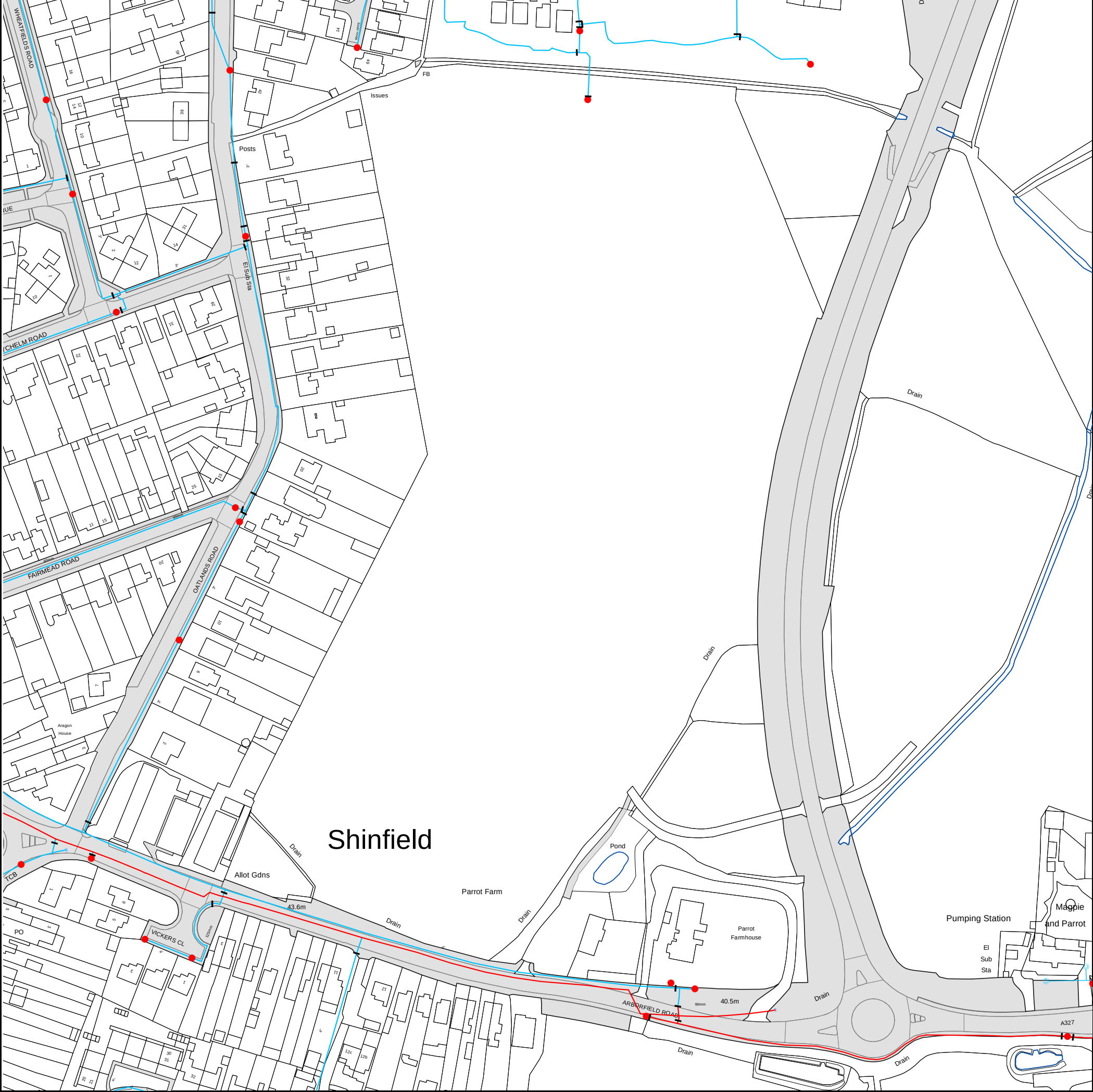
	Agreement
	Chamber
	Operational Site

Ducts or Crossings

	Casement	Ducts may contain high voltage cables. Please check with Thames Water.
	Conduit Bridge	
	Subway	
	Tunnel	

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.



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Con29DW Commercial Drainage and Water 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
-  **Caseament:** 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:** Indicates 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.

For your guidance:

- Thames Water Property Searches Complaints Procedure:
 - o Thames Water Property Searches offers a robust complaints procedure. Complaints can be made by telephone, in writing, by email (searches@thameswater.co.uk) or through our website (www.thameswater-propertysearches.co.uk)

As a minimum standard Thames Water Property Searches will:

- o endeavour to resolve any contact or complaint at the time of receipt. If this isn't possible, we will advise of timescales;
- o investigate and research the matter in detail to identify the issue raised (in some cases third party consultation will be required);
- o provide a response to the customer within 10 working days of receipt of the complaint;
- o provide compensation, if no response or acknowledgment that we are investigating the case is given within 10 working days of receipt of the complaint;
- o keep you informed of the progress and, depending on the scale of investigation required, update with new timescales as necessary;
- o provide an amended search, free of charge, if required;
- o provide a refund if we find your complaint to be justified; take the necessary action within our power to put things right.

If you want us to liaise with a third party on your behalf, just let us know.

If you are still not satisfied with the outcome provided, we will refer the matter to a Senior Manager, for resolution, who will respond again within 5 working days.

If you remain dissatisfied with our final response you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). Further information can be obtained by visiting www.tpos.co.uk or by sending an email to admin@tpos.co.uk

Question 1.1

For your guidance:

- The Water Industry Act 1991 defines Public Sewers as those which Thames Water have responsibility for. Other assets and rivers, watercourses, ponds, culverts or highway drains may be shown for information purposes only.
- The company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.
- Assets other than public sewers may be shown on the copy extract, for information.

Question 1.2

For your guidance:

- The "water mains" in this context are those, which are vested in and maintainable by the water company under statute.
- Assets other than public water mains may be shown on the plan, for information only.
- Water companies are not responsible for private supply pipes connecting the property to the public water main and do not hold details of these. These may pass through land outside of the control of the seller, or may be shared with adjacent properties. The buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Question 2.1

For your guidance:

- Water companies are not responsible for any private drains that connect the property to the public sewerage system and do not hold details of these. The property owner will normally have sole responsibility for private drains serving the property. These may pass through land outside the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.
- If foul water does not drain to the public sewerage system, the property may have private facilities in the form of a cesspit, septic tank or other type of treatment plant.
- An extract from the public sewer map is enclosed. This will show known public sewers in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

Question 2.2

For your guidance:

- Sewerage Undertakers are not responsible for any private drains that connect the property to the public sewerage system, and do not hold details of these.
- The property owner will normally have sole responsibility for private drains serving the property. These private drains may pass through land outside of the control of the seller and the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.
- In some cases, 'Sewerage Undertakers' records do not distinguish between foul and surface water connections to the public sewerage system.
- At the time of privatisation in 1989, Sewerage Undertakers were sold with poorly-kept records of sewerage infrastructure. The records did not always show which properties were connected for surface water drainage purposes. Accordingly, billing records have been used to provide an answer for this element of the drainage and water search.
- Due to the potential inadequacy of 'Sewerage Undertakers' infrastructure records with respect to surface water drainage, it is the customer's responsibility to inform the Sewerage Undertaker that they do not receive the surface water drainage service. If on inspection, the buyer finds that surface water from the property does not drain to a public sewer, then the property may be eligible for a rebate of the surface water drainage charge. If you wish to know who bills the sewerage services for this property then you will need to contact the current owner. For a list of all potential retailers of sewerage services for the property please visit www.open-water.org.uk.
- If surface water from the property does not drain to the public sewerage system, the property may have private facilities in the form of a soakaway or private connection to a watercourse.
- An extract from the public sewer map is enclosed. This will show known public sewers in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

Question 2.3

For your guidance:

- If surface water from the property drains to a public sewer, then a surface water drainage charge is payable.
- Where a surface water drainage charge is currently included in the property's water and sewerage bill but, on inspection, the buyer finds that surface water from the property does not drain to a public sewer, then the property may be eligible for a rebate of the surface water drainage charge. If you wish to know who bills the sewerage services for this property then you will need to contact the current owner. For a list of all potential retailers of sewerage services for the property please visit www.open-water.org.uk.

Question 2.4

For your guidance:

- Thames Water has a statutory right of access to carry out work on its assets. Employees of Thames Water or its contractors may, therefore, need to enter the property to carry out work.
- Please note if the property was constructed after 1st July 2011 any sewers and/or lateral drain within the boundary of the property are the responsibility of the householder.
- The approximate boundary of the property has been determined by reference to the Ordnance Survey Record or the map supplied.
- The presence of a public sewer running within the boundary of the property may restrict further development. The Company has a statutory right of access to carry out work on its assets, subject to notice. This may result in employees of the Company, or its contractors, needing to enter the property to carry out work.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Question 2.4.1

For your guidance:

- Private pumping stations installed before 1st July 2011 will be transferred into the ownership of the sewerage undertaker.
- From the 1st October 2016 private pumping stations which serve more than one property have been transferred into public ownership but may not be recorded on the public sewer map.
- The approximate boundary of the property has been determined by reference to the Ordnance Survey Record or the map supplied.
- The presence of a public pumping station within the boundary of the property may restrict further development. The company has a statutory right of access to carry out work on its assets, subject to notice. This may result in employees of the company, or its contractors, needing to enter the property to carry out work.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Question 2.5

For your guidance:

- This is because there are no buildings from which to measure the distance to any public sewers.
- The presence of a public sewer within 30.48 metres (100 feet) of the building(s) within the property can result in the local authority requiring a property to be connected to the public sewer.
- The measurement is estimated from the Ordnance Survey record, between the building(s) within the boundary of the property and the nearest public sewer.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Question 2.5.1

For your guidance:

- Private pumping stations installed before 1st July 2011 will be transferred into the ownership of the sewerage undertaker.
- From the 1st October 2016 private pumping stations which serve more than one property have been transferred into public ownership but may not be recorded on the public sewer map.
- The presence of a public pumping station within 50 metres of the building(s) within the property can result in the local authority requiring a property to be connected to the public sewer.
- The measurement is estimated from the Ordnance Survey record, between the building(s) within the boundary of the property and the nearest public sewer.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Question 2.6

For your guidance:

- Any sewers and/or lateral drains within the boundary of the property are not the subject of an adoption agreement and remain the responsibility of the householder. Adoptable sewers are normally those situated in the public highway.
- This enquiry is of interest to purchasers who will want to know whether or not the property will be linked to a public sewer.
- Where the property is part of a very recent or ongoing development and the sewers are not the subject of an adoption application, buyers should consult with the developer to ascertain the extent of private drains and sewers for which they will hold maintenance and renewal liabilities.
- Final adoption is subject to the developer complying with the terms of the adoption agreement under Section 104 of the Water Industry Act 1991 and meeting the requirements of 'Sewers for Adoption' 6th Edition.

Question 2.7

For your guidance:

- From the 1st October 2011 most private sewers, disposal mains and lateral drains were transferred into public ownership and the sewerage undertaker may not have been approved or consulted about any plans to erect a building or extension on the property over or in the vicinity of these.
- Buildings or extensions erected over a sewer in contravention of building controls may have to be removed or altered.

Question 2.8

For your guidance:

- For reporting purposes buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- A sewer is “overloaded” when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- “Internal flooding” from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- “At Risk” properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company’s reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water Utilities Ltd on Tel: 0800 316 9800 or website www.thameswater.co.uk

Question 2.9

For your guidance:

- The nearest sewage treatment works will not always be the sewage treatment works serving the catchment within which the property is situated.
- The sewerage undertaker’s records were inspected to determine the nearest sewage treatment works.
- It should be noted that there may be a private sewage treatment works closer than the one detailed above that has not been identified.
- As a responsible utility operator, Thames Water Utilities Ltd seeks to manage the impact of odour from operational sewage works on the surrounding area. This is done in accordance with the Code of Practice on Odour Nuisance from Sewage Treatment Works issued via the Department of Environment, Food and Rural Affairs (DEFRA). This Code recognises that odour from sewage treatment works can have a detrimental impact on the quality of the local environment for those living close to works. However DEFRA also recognises that sewage treatment works provide important services to communities and are essential for maintaining standards in water quality and protecting aquatic based environments. For more information visit www.thameswater.co.uk

Question 3.1

For your guidance:

- The Company does not keep details of private supplies. The situation should be checked with the current owner of the property.

Question 3.2

For your guidance:

- The boundary of the property has been determined by reference to the plan supplied. Where a plan was not supplied, the Ordnance Survey Record was used. If the Water undertaker mentioned in Question 4.1.2 is not Thames Water Utilities Ltd the boundary of the property has been determined by the Ordnance Survey.
- The presence of a public water main within the boundary of the property may restrict further development within it. Water companies have a statutory right of access to carry out work on their assets, subject to notice. This may result in employees of the Company, or its contractors, needing to enter the property to carry out work.

Question 3.3

For your guidance:

- This enquiry is of interest to purchasers who will want to know whether or not the property will be linked to the mains water supply.

Question 3.4

For your guidance:

- “Low water pressure” means water pressure below the regulatory reference level, which is the minimum pressure when demand on the system is not abnormal.
- Water Companies are required to include in the Regulatory Register that is presented annually to the Director General of Water Services, properties receiving pressure below the reference level, provided that allowable exclusions do not apply (i.e. events which can cause pressure to temporarily fall below the reference level)
- The reference level of service is a flow of 9 litres/minute at a pressure of 10metres / head on the customer's side of the outside stop valve (osv). The reference level of service must be applied on the customer's side of a meter or any other company fittings that are on the customer's side of the main stop tap. The reference level applies to a single property. Where more than one property is served by a common service pipe, the flow assumed in the reference level must be appropriately increased to take account of the total number of properties served. For two properties, a flow of 18 litres/minute at a pressure of 10metres/head on the customers' side of the osv is appropriate. For three or more properties the appropriate flow should be calculated from the standard loadings provided in BS806-3 or the Institute of Plumbing handbook.
- **Allowable exclusions** The Company is required to include in the Regulatory Register properties receiving pressure below the reference level, provided that allowable exclusions listed below do not apply.
- **Abnormal demand:** This exclusion is intended to cover abnormal peaks in demand and not the daily, weekly or monthly peaks in demand, which are normally expected. Companies should exclude from the reported figures properties which are affected by low pressure only on those days with the highest peak demands. During the report year companies may exclude, for each property, up to five days of low pressure caused by peak demand.
- **Planned maintenance:** Companies should not report low pressures caused by planned maintenance. It is not intended that companies identify the number of properties affected in each instance. However, companies must maintain sufficiently accurate records to verify that low-pressure incidents that are excluded because of planned maintenance are actually caused by maintenance.
- **One-off incidents:** This exclusion covers a number of causes of low pressure; mains bursts; failures of company equipment (such as pressure reducing valves or booster pumps); firefighting; and action by a third party. However, if problems of this type affect a property frequently, they cannot be classed as one-off events and further investigation will be required before they can be excluded.
- **Low-pressure incidents of short duration:** Properties affected by low pressure, which only occur for a short period, and for which there is evidence that incidents of a longer duration would not occur during the course of the year, may be excluded from the reported figures.
- Please contact your water undertaker mentioned in Question 4.1.2 if you require further information on water pressure.

Question 3.5

For your guidance:

- Water hardness can be expressed in various indices for example the hardness settings for dishwashers are commonly expressed in Clark's degrees, but check with the manufacturer as there are also other units. The following table shows the normal ranges of hardness.

Thames Water Hardness Category	Calcium (mg/l)	Calcium Carbonate (mg/l)	English Clarke degrees	French degrees	General/ German degrees
Soft	0 to 40	0 to 100	0 to 7	0 to 10	0 to 5.6
Medium	41 to 80	101 to 200	8 to 14	11 to 20	5.7 to 11.2
Hard	Over 80	Over 200	Over 14	Over 20	over 11.2

- Please contact your water undertaker mentioned in Question 4.1.2 if you require further information on water hardness.

Question 3.6

For your guidance:

- The Water Industry Act 1991 Section 150, The Water Resale Order 2001 provides protection for people who buy their water or sewerage services from a person or company instead of directly from a water or sewerage company. Details are available from the Office of Water Services (OFWAT) website is www.ofwat.gov.uk.
- The Company may install a meter at the premises where a buyer makes a change of use of the property or where the buyer uses water for:
 - Watering the garden other than by hand (this includes the use of sprinklers).
 - Automatically replenishing a pond or swimming pool with a capacity greater than 10,000 litres.
 - A bath with a capacity in excess of 230 litres.
 - A reverse osmosis unit Where a meter does not serve the property and the customer wishes to consider this method of charging, they should contact the current owner if they wish to know who bills the sewerage and water services for this property. For a list of all potential retailers of sewerage and water services for the property please visit www.open-water.org.uk.

Question 3.7

For your guidance:

- Where a meter does not serve the property and the customer wishes to consider this method of charging, they should contact the current owner if they wish to know who bills the water services for this property. For a list of all potential retailers of water services for the property please visit www.open-water.org.uk.

Question 5.1

For your guidance:

- If a Trade effluent consent applies to the premises which are the subject of this search, it is for the applicant to satisfy itself as to the suitability of the consent for its client's requirements. The occupier of any trade premises in the area of a sewerage undertaker may discharge any trade effluent proceeding from those premises into the undertaker's public sewers if he does so with the undertaker's consent. If, in the case of any trade premises, any trade effluent is discharged without such consent or other authorisation, the occupier of the premises shall be guilty of an offence.
- Please note any existing consent is dependent on the business being carried out at the property and will not transfer automatically upon change of ownership.
- For further information regarding Trade Effluent consents please contact: Trade Effluent Control, Crossness STW, Belvedere Road, Abbey Wood London SE2 9AQ.

Question 6.1

For your guidance:

- This question relates only to private agreements between the water company acting in a private capacity and a landowner. Such contracts may often be part of a conveyance or land transfer, or a deed of grant of easement.
- If there is no formal easement, then a sewer or water main may have been constructed following the service of notice under the provisions of the Public Health Act 1936, Water Act 1945, Water Act 1989 or Water Industry Act 1991 as applicable. The company does not hold copies of these notices. However, in the absence of evidence to the contrary there is a legal presumption that all matters were properly dealt with. All rights and obligations relating to sewers and water mains are now covered by the Water Industry Act 1991. Where rights exist at the boundary of the property, but we are not sure of the exact correlation, we will answer "Yes" to this question. A documentary right can exist even if the physical asset itself has not yet been laid, or has been moved, or removed. Likewise the position of the right and of the asset may differ.
- You may also find that an asset is protected both with contractual rights and statutory rights. Please consult your solicitor as to why this may happen, and its effects.
- We refer to "defined" assets for the following reasons: Often a contract may give the water company an expressed right to install and maintain assets within an area but without stating the exact position or route of such assets. Also, the law may imply rights where none have been mentioned specifically in a related contract, such as a conveyance. Finally, rights may come into being through long use. In any of these cases the rights are undefined, and although the water company may need to rely on them from time to time, as we cannot map the rights accurately, we will answer "no" to this question.
- Information obtainable from physical inspection (including Trial Bore Holes) overrides information contained in the report.
- Any error in answering this question is not to be regarded as a waiver of the water company's rights or title, or an agreement or representation that the water company is prepared to vary or discharge any of its rights or title.

CommercialDW Drainage and Water Enquiry Terms and Conditions

Customer and Clients are asked to note these terms, which govern the basis on which this CommercialDW Drainage & Water Enquiry is supplied

Definitions

'Client' means the person, company or body who is the intended recipient of the Report with an actual or potential interest in the Property.

'Company' means a water service company or their data service provider producing the Report.

'Customer' means the person, company, firm or other legal body placing the Order, either on their own behalf as Client, or, as an agent for a Client.

'Order' means any request completed by the Customer requesting the Report.

'Property' means the address or location supplied by the Customer in the Order.

'Report' means the drainage and/or water report prepared by The Company in respect of the Property.

'Thames Water' means Thames Water Utilities Limited registered in England and Wales under number 2366661 whose registered office is at Clearwater Court, Vastern Road, Reading, Berks, RG1 8DB;

Agreement

- 1 Thames Water agrees to supply the Report to the Customer and the Client subject to these terms. The scope and limitations of the Report are described in paragraph 2 of these terms. Where the Customer is acting as an agent for the Client then the Customer shall be responsible for bringing these terms to the attention of the Client. The Customer and Client agree that the placing of an Order for a Report indicates their acceptance of these terms.

The Report

2. Whilst Thames Water will use reasonable care and skill in producing the Report, it is provided to the Customer and the Client on the basis that they acknowledge and agree to the following:-
 - 2.1 The information contained in the Report can change on a regular basis so Thames Water cannot be responsible to the Customer and the Client for any change in the information contained in the Report after the date on which the Report was produced and sent to the Client.
 - 2.2 The Report does not give details about the actual state or condition of the Property nor should it be used or taken to indicate or exclude actual suitability or unsuitability of the Property for any particular purpose, or relied upon for determining saleability or value, or used as substitute for any physical investigation or inspection. Further advice and information from appropriate experts and professionals should always be obtained.
 - 2.3 The information contained in the Report is based upon the accuracy, completeness and legibility of the address and other information supplied by the Customer or Client.
 - 2.4 The Report provides information as to the location and connection of existing services and should not be relied on for any other purpose. The Report may contain opinions or general advice to the Customer and the Client and Thames Water cannot ensure that any such opinion or general advice is accurate, complete or valid and accepts no liability therefore.
 - 2.5 The position and depth of apparatus shown on any maps attached to the Report are approximate, and are furnished as a general guide only, and no warranty as to its correctness is given or implied. The exact positions and depths should be obtained by excavation trial holes and the maps must not be relied on in the event of excavation or other works made in the vicinity of apparatus shown on any maps.

Liability

- 3 Thames Water shall not be liable to the Client for any failure, defect or non-performance of its obligations arising from any failure of, or defect in any machine, processing system or transmission link or anything beyond Thames Water's reasonable control or the acts or omissions of any party for whom Thames Water are not responsible.
 - 3.1 Where the Customer sells this report to a Client (other than in the case of a bona fide legal adviser recharging the cost of the Report as a disbursement) Thames Water shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss or damage whatsoever and the Customer shall indemnify Thames Water in respect of any claim by the Client.
 - 3.2 Where a report is requested for an address falling within a geographical area where Thames Water and another Company separately provide Water and Sewerage Services, then it shall be deemed that liability for the information given by Thames Water or the Company as the case may be will remain with Thames Water or the Company as the case may be in respect of the accuracy of the information supplied. Where Thames Water is supplying information which has been provided to it by another Company for the purposes outlined in this agreement Thames Water will therefore not be liable in any way for the accuracy of that information and will supply that information as agent for the Company from which the information was obtained.
 - 3.3 Except in respect of death or personal injury caused by negligence, or as expressly provided in these Terms:
 - 3.3.1 The entire liability of Thames Water or the Company as the case may be in respect of all causes of action arising under or in connection with the Report (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) shall not exceed £2,000,000 (two million pounds); and
 - 3.3.2 Thames Water shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss of profit, loss of goodwill, loss of

reputation, loss of business or any indirect, special or consequential loss, damage or other claims, costs or expenses;

Copyright and Confidentiality

4. The Customer and the Client acknowledge that the Report is confidential and is intended for the personal use of the Client. The copyright and any other intellectual property rights in the Report shall remain the property of Thames Water or the Company as the case may be. No intellectual or other property rights are transferred or licensed to the Customer or the Client except to the extent expressly provided
 - 4.1 The Customer or Client is entitled to make copies of the Report but is not permitted to copy any maps contained in, or attached to the Report
 - 4.2 The maps contained in the Report are protected by Crown Copyright and must not be used for any purpose outside the context of the Report.
 - 4.3 The Customer and Client agree (in respect of both the original and any copies made) to respect and not to alter any trademark, copyright notice or other property marking which appears on the Report.

Payment

5. Unless otherwise stated all prices are inclusive of VAT. The Customer shall pay for the price of the Report specified by Thames Water, without any set off, deduction or counterclaim.
 - 5.1 Unless payment has been received in advance, Customers shall be invoiced for the agreed fee once their request has been processed. Any such invoice must be paid within 14 days. Where the Customer has an account with Thames Water, payment terms will be as agreed with Thames Water.
 - 5.2 No payment shall be deemed to have been received until Thames Water has received cleared funds.
 - 5.3 If the Customer fails to pay Thames Water any sum due Thames Water shall be entitled but not obliged to charge the Customer interest on the sum from the due date for payment at the annual rate of 2% above the base lending rate from time to time of Natwest Bank, accruing on a daily basis until payment is made. Thames Water reserves the right to claim interest under the Late Payment of Commercial Debts (Interest) Act 1998.
 - 5.4 Thames Water reserves the right to increase fees on reasonable prior written notice at any time.

Cancellations or Alterations

6. Once an Order is placed, Thames Water shall not be under any obligation to accept any request to cancel that Order and payment for the Order shall still be due upon completion of the Report. In cases where an error has been made in the original Order (e.g. the Customer has supplied an incorrect address), the Customer will need to place a second Order, detailing the correct information, and shall be liable to pay a second charge in accordance with clause 5 above.

Delivery

7. On receiving your order the reports will be posted to you within 10 working days from receipt.
 - 7.1 Delivery is subject to local post conditions and regulations. All items should arrive within 12 working days, but Thames Water cannot be held responsible should delays be caused by local post conditions, postal strikes or other causes beyond the control of Thames Water.

General

8. If any provision of these terms is or becomes invalid or unenforceable, it will be taken to be removed from the rest of these terms to the extent that it is invalid or unenforceable. No other provision of these terms shall be affected.
 - 8.1 These terms shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts.
 - 8.2 Nothing in this notice shall in any way restrict the Customer or Clients statutory or any other rights of access to the information contained in the Report.

These Terms & Conditions are available in larger print for those with impaired vision.

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.

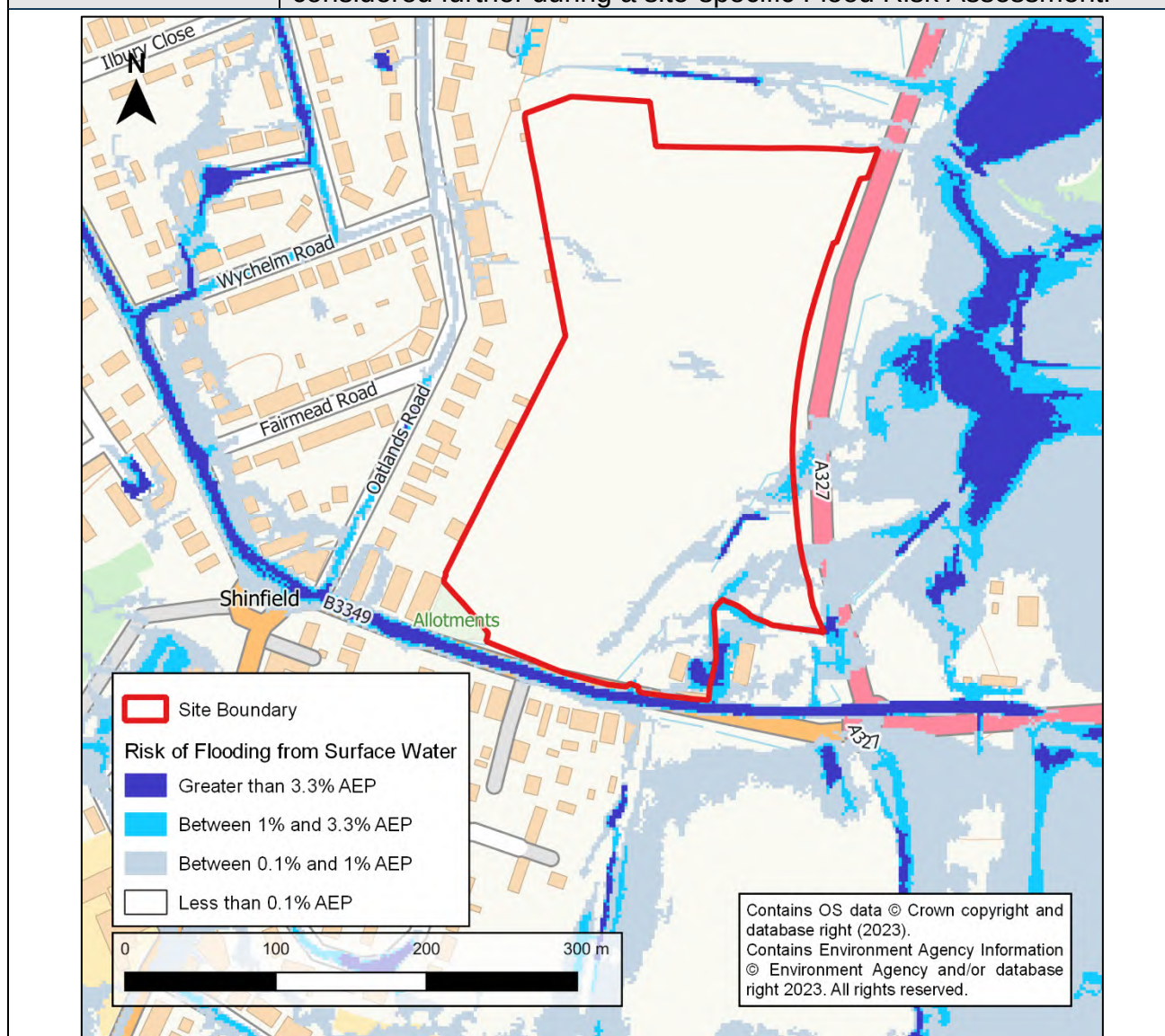
If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0300 034 2222 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria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

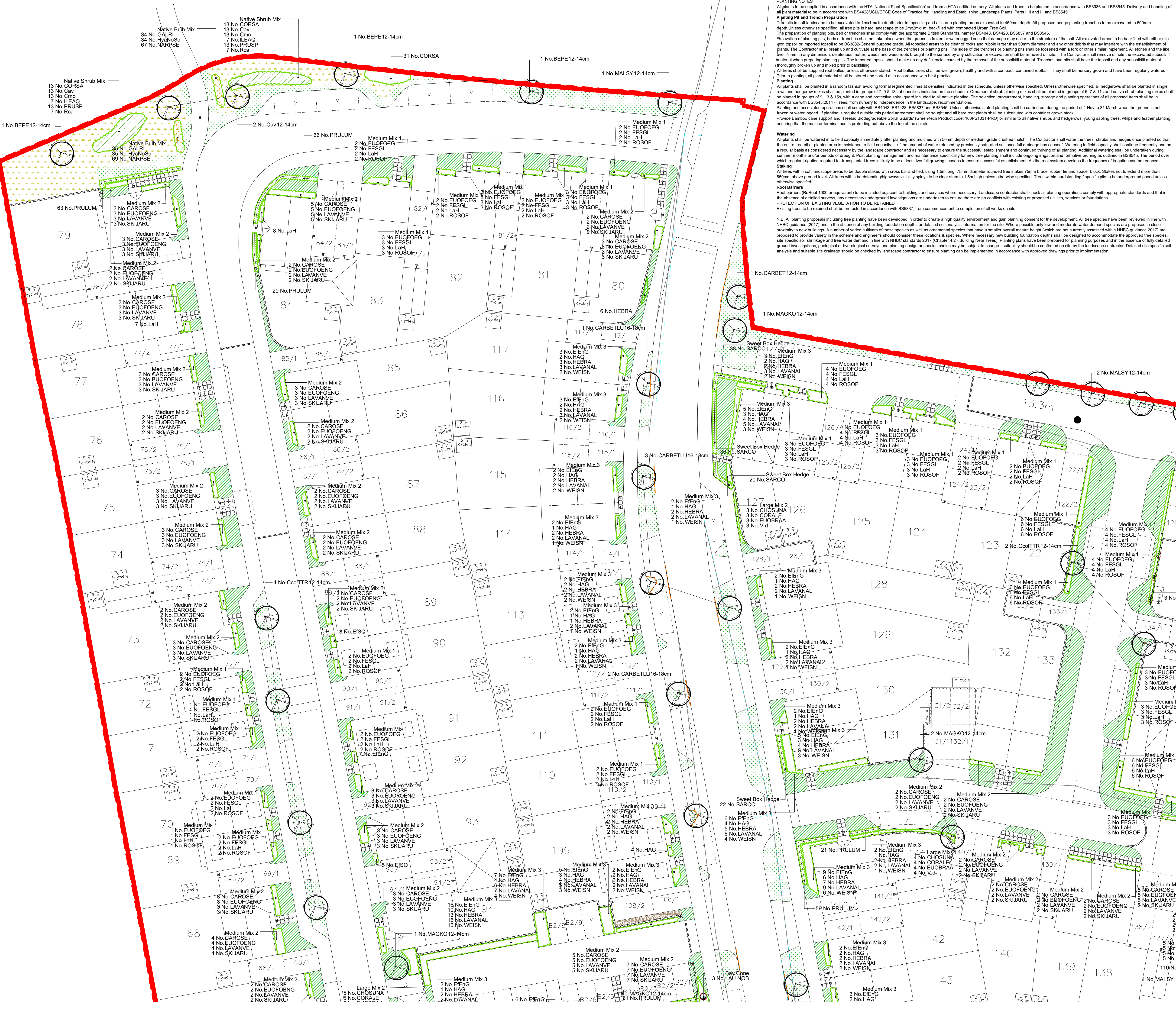
Ways to pay your bill

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 SL14WW 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.

Site Code	5SH025
Location	Land north of Arborfield Road, Shinfield
Description of surface water risk	Limited risk on the site itself but considerable flow path along the road to the south and significant issues to the east of the site which may impede access.
Additional considerations	The AStGWF map shows a >75% susceptibility to groundwater flooding across the south end of the site, with the JBA groundwater map showing groundwater levels are within 0.5m of the surface across the south end of the site. There is also a risk of reservoir flooding along the eastern boundary of the site from Bearwood Lane, Bramshill House Pond, Tundry Pond, and Wellington Country Park Lake during the 'Wet Day' scenario. Potential groundwater issues at the site and the risk of reservoir flooding should be considered further during a site-specific Flood Risk Assessment.





PLANTING NOTES
All plants to be supplied in accordance with the HTA National Plant Specification and from a HTA certified nursery. All plants and trees to be planted in accordance with BS3936 and BS8545. Delivery and handling of all plant material to be in accordance with BS4428/UCI/CPSE Code of Practice for 'Handling and Establishing Landscape Plants' Parts I, II and III and BS8545.

Planting Pit and Trench Preparation
The pits in soft landscape to be excavated to 1m x 1m x 1m depth prior to topsoiling and all shrub planting areas excavated to 450mm depth. All proposed hedge planting trenches to be excavated to 600mm depth. Unless otherwise specified, all tree pits in hard landscape to be 2m x 2m x 1m, backfilled with compacted Urban Tree Soil. The preparation of planting pits, beds or trenches shall comply with the appropriate British Standards, namely BS4043, BS4428, BS5837 and BS8545. Excavation of planting pits, beds or trenches shall not take place when the ground is frozen or waterlogged such that damage may occur to the structure of the soil. All excavated areas to be backfilled with either site topsoil or imported topsoil to be BS3882-General purpose grade. All topsoiled areas to be clear of rocks and rubble larger than 50mm diameter and any other debris that may interfere with the establishment of plants. The Contractor shall break up and cultivate at the base of the trenches or planting pits. The sides of the trenches or planting pits shall be loosened with a fork or other similar implement. All stones and the like over 15mm in any dimension, deleterious matter, weeds and weed roots brought to the surface by any cultivation or excavation shall be removed off site. The Contractor shall remove off site the excavated subsoil/fill material when preparing planting pits. The imported topsoil shall be made up of any deficiencies caused by the removal of the subsoil/fill material. Trenches and pits shall have the topsoil and any subsoil/fill material thoroughly broken up and mixed prior to backfilling. All trees shall be supplied root balled, unless otherwise stated. Root balled trees shall be well grown, healthy and with a compact, contained rootball. They shall be nursery grown and have been regularly watered. Prior to planting, all plant material shall be stored and sorted at in accordance with best practice.

Planting
All plants shall be planted in a random fashion avoiding formal regimented lines at densities indicated in the schedule, unless otherwise specified. Unless otherwise specified, all hedgerows shall be planted in single rows and hedgerow mixes shall be planted in groups of 7, 9 & 13 at densities indicated on the schedule. Ornamental shrub planting mixes shall be planted in groups of 5, 7 & 11 and native shrub planting mixes shall be planted in groups of 9, 13 & 15, with a cane and protective spiral guard included to all native planting. The selection, procurement, handling, storage and planting operations of all proposed trees shall be in accordance with BS8545:2014. Trees: From nurseries to independence in the landscape, recommendations. Planting and associated operations shall comply with BS4043, BS4428, BS5837 and BS8545. Unless otherwise stated planting shall be carried out during the period of 1 Nov to 31 March when the ground is not frozen or waterlogged. If planting is required outside this period agreement shall be sought and all bare root plants shall be substituted with container grown stock. Provide Bamboo cane support and 'Treeless Biodegradable Spiral Guards' (Green-tech Product code: 160PS1031-PRG) or similar to all native shrubs and hedgerows, young sapling trees, whips and feather planting, ensuring that the main or terminal bud is protruding out above the top of the spirals.

Watering
All plants shall be watered in to field capacity immediately after planting and mulched with 50mm depth of medium grade crushed mulch. The Contractor shall water the trees, shrubs and hedges once planted so that the entire tree pit or planted area is moistened to field capacity, i.e. "the amount of water retained by previously saturated soil once full drainage has ceased". Watering to field capacity shall continue frequently and on a regular basis as considered necessary by the landscape contractor and as necessary to ensure the successful establishment and continued thriving of all planting. Additional watering shall be undertaken during summer months and/or periods of drought. Post planting management and maintenance specifically for new tree planting shall include ongoing irrigation and formative pruning as outlined in BS8545. The period over which regular irrigation required for transplanted trees is likely to be at least two full growing seasons to ensure successful establishment. As the root system develops the frequency of irrigation can be reduced.

Staking
All trees within soft landscape areas to be double staked with cross bar and tied, using 1.5m long, 75mm diameter rounded tree stakes 75mm brace, rubber tie and spacer block. Stakes not to extend more than 600mm above ground level. All trees within hardstanding/highways visibility splays to be clear stem to 1.5m high unless otherwise specified. Trees within hardstanding / specific pits to be underground guyed unless otherwise specified.

Root Barriers
Root barriers (ReRoot 1000 or equivalent) to be included adjacent to buildings and services where necessary. Landscape contractor shall check all planting operations comply with appropriate standards and that in the absence of detailed landscaping investigations are undertaken to ensure there are no conflicts with existing or proposed utilities, services or foundations.

PROTECTION OF EXISTING VEGETATION TO BE RETAINED
Existing trees to be retained shall be protected in accordance with BS5837, from commencement to completion of all works on site.

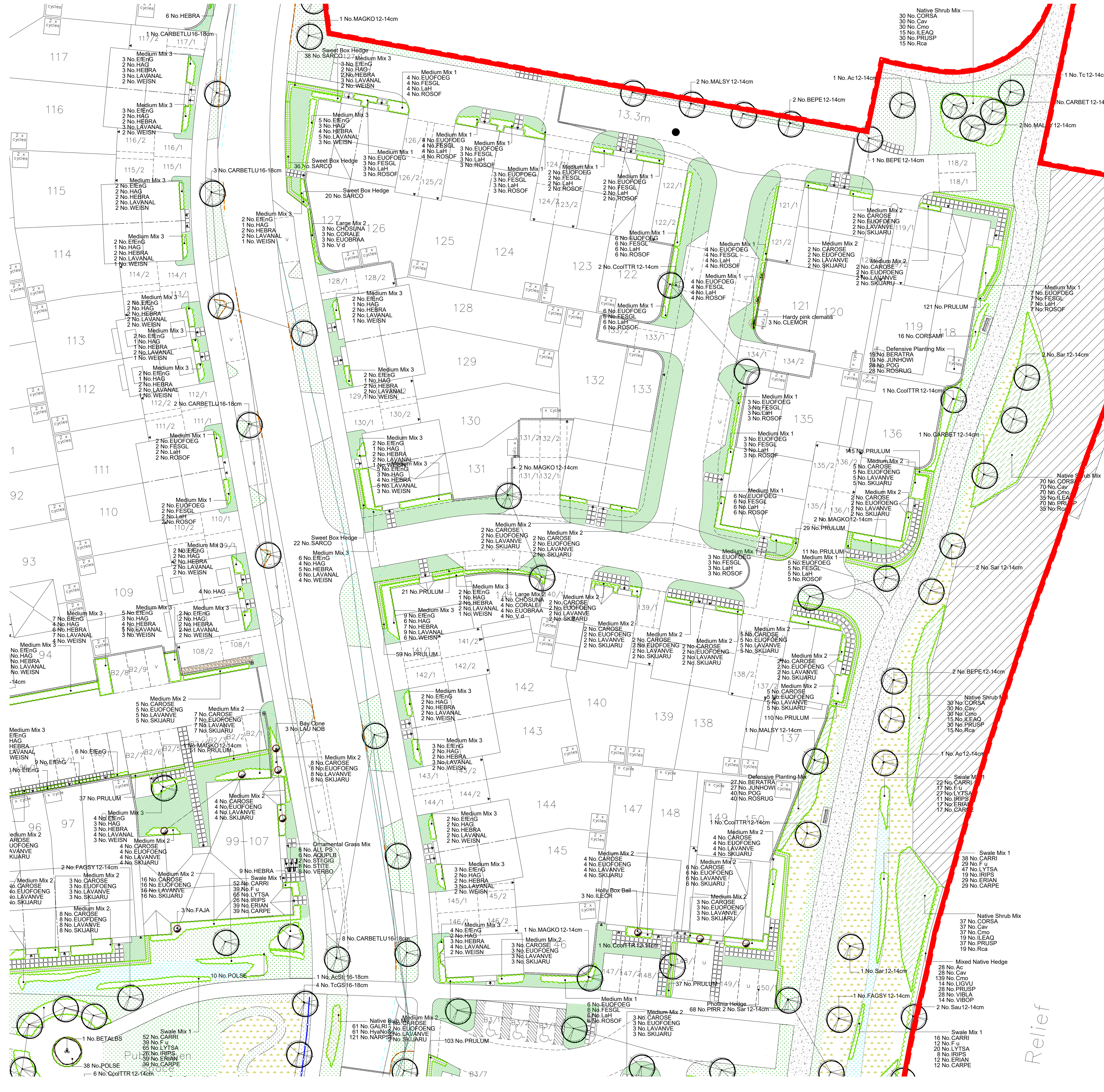
N.B. All planting proposals including tree planting have been developed in order to create a high quality environment and gain planning consent for the development. All tree species have been reviewed in line with NHC guidance (2017) and in the absence of any building foundation depths or detailed soil analysis information for the site. Where possible only low and moderate water demand species are proposed in close proximity to new buildings. A number of varied cultivars of these species as well as ornamental species that have a smaller overall mature height (which are not currently assessed within NHC guidance 2017) are proposed to provide variety in the scheme and engineer's should consider these locations & species. Where necessary new building foundation depths shall be designed to accommodate the approved tree species, site specific soil shrinkage and tree water demand in line with NHC standards 2017 (Chapter 4.2 - Building Near Trees). Planting plans have been prepared for planning purposes and in the absence of fully detailed ground investigations, geological or hydrological surveys and planting design or species choice may be subject to change - suitability should be confirmed on site by the landscape contractor. Detailed site specific soil analysis and suitable site drainage should be checked by landscape contractor to ensure planting can be implemented in accordance with approved drawings prior to implementation.

KEY:

- Site Boundary
- Existing Trees
- Existing Shrubs
- Proposed Multistem Trees
- Proposed Trees (to be positioned 2m from highway boundary and 1m from kerb edge)
- Proposed Native Hedge (Cane and Rabbit guards added with 50mm bark mulch)
- Proposed Ornamental Hedge (Initially clipped to 0.5m high and subsequently maintained at 0.6m high, offset 0.5m from back of highway boundary with a 0.5m bark mulch strip)
- Proposed Feature Shrub
- Proposed Climbers (Fixed onto pressure-treated golden brown timber fan trellis - Dimensions: H1055 x W514mm.)
- Proposed Ornamental Shrubs (50mm Bark mulch to be included around planting)
- Proposed Native Shrub Planting (50mm Bark mulch to be included around planting)
- Proposed Bulb Planting (Scattered Randomly where to be planted)
- Proposed Premium Grade Turf (150mm min gravel strip with timber edge to be installed along building edge)
- Proposed Amenity Grass Seed (Flowering Lawn Mixture: Sown at 40kg/ha. Strong Lawn Grass Mixture: Sown on mown grass pathways at 250kg/ha.)
- Proposed Wildflower Mix (General Purpose Meadow Mixture: Sown at 40kg/ha)
- Proposed Wet/Wildflower Mix (Meadow Mixture for wetlands: Sown at 40kg/ha)
- Small 30mm Decorative Gravel overlaid over geotextile membrane (Gravel to be agreed with Bellway before installation and include a timber edge)
- Proposed Root Barrier
- Proposed Mown Grass Footpath 1.2m wide
- Proposed Tarmac Footpath
- Proposed Short Span Timber Bridge (Finish: FSC Certified Treated Hardwood Width: 2000mm Min. Length: 3000mm)
- Proposed Timber Bench (Finish: Treated Softwood timber Size: L2000mm W580mm H770mm Root Fixed Length 300mm)
- Canopied Litter Bin (Size: Ø560mm H900mm Fixing: Set of 4 Shield Anchor Bolts for installation Fixed onto Tarmac Capacity: 90 Litres)
- Natural Boulders (Approx. L1.2m x W0.8m x H0.8m / 1200kg)
- Proposed 1.2m High Black Vertical Railing
- Visplay
- Proposed Rocks / Boulders (Mixed Glacial Boulders or similar approved Supplier: CED Stone Landscape Size: Mix of approximately 200kg, 800kg & 1200kg)
- Proposed Small 20mm Decorative Gravel (Flint ECOGravel or similar approved Supplier: CED Stone Landscape Size: 20mm Average coverage: 10m²/Tonne at 50mm depth)

NB: Decorative Bark mulch to be supplied in 30-40mm chip size and applied at a depth of 50mm around landscaping to restrict weed growth and retain moisture.

REV	DATE	NOTE	SP	CW
G	15.04.2024	Updated to latest layout & officer comments	SP	CW
F	27.03.2024	Rain garden added	SP	CW
E	21.03.2024	Updated to latest layout & officer comments	SP	CW
D	21.03.2024	Updated to latest layout & officer comments	SP	CW
C	22.01.2024	Street lighting and tree locations updated to comments	SP	CW
B	19.08.2024	Revised tree and shrub planting to client comments & PCB boundary	CW	CW
A	15.08.2024	Updated to comments	SP	CW
REV	DATE	NOTE		Drawn/Chkd



NOTES:
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Aspect Landscape Planning Ltd, West Court, Hardwick Business Park, Noral Way, Banbury OX16 2AF.
Licence 10006345

Copyright reserved 1:250 @ A1

0m 2m 4m 10m

KEY:

- Site Boundary
- Existing Trees
- Existing Shrubs
- Proposed Multistem Trees
- Proposed Trees
(to be positioned 2m from highway boundary and 1m from kerb edge)
- Proposed Native Hedge
(Cared and Rabbit guards added with 50mm bark mulch)
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(Initially clipped to 0.5m high and subsequently maintained at 0.6m high, offset 0.5m from back of highway boundary with a 0.5m bark mulch strip)
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- Proposed Ornamental Shrubs
(50mm Bark mulch to be included around planting)
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(50mm Bark mulch to be included around planting)
- Proposed Bulb Planting
(Scattered Randomly where to be planted)
- Proposed Premium Grade Turf
(150mm min gravel strip with timber edge to be installed along building edge)
Turf Fills to joint frontages
- Proposed Amenity Grass Seed
Flowering Lawn Mixture: Sown at 40kg/ha.
Strong Lawn Grass Mixture: Sown on mown grass pathways at 250kg/ha.
- Proposed Wildflower Mix
General Purpose Meadow Mixture: Sown at 40kg/ha
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Meadow Mixture for wetlands: Sown at 40kg/ha
- Small 30mm Decorative Gravel
overlay over geotextile membrane
(Gravel to be agreed with Bellway before installation and include a timber edge)
- Proposed Root Barrier
- Proposed Mown Grass Footpath 1.2m wide
- Proposed Tarmac Footpath
- Proposed Short Span Timber Bridge
Finish: FSC Certified Treated Hardwood
Width: 2000mm
Min. Length: 3000mm
- Proposed Timber Bench
Finish: Treated Softwood timber
Size: L2000mm W580mm H770mm
Root Fixed Length 300mm
- Canopied Litter Bin
Size: Ø560mm H900mm
Fixing: Set of 4 Shield Anchor Bolts
for Installation Fixed onto Tarmac
Capacity: 90 Litres
- Natural Boulders
Approx. L1.2m x W0.8m x H0.8m / 1200kg
- Proposed 1.2m High Black Vertical Railing
- Visplay
- Proposed Rocks / Boulders
Mixed Gabbro Boulders or similar approved Supplier: CED Stone Landscape
Size: Mix of approximately 200kg, 800kg & 1200kg
Proposed Small 20mm Decorative Gravel
Flint ECOGravel or similar approved Supplier: CED Stone Landscape
Size: 20mm
Average coverage: 10m²/Tonne at 50mm depth

NB: Decorative Bark mulch to be supplied in 30-40mm chip size and applied at a depth of 50mm around landscaping to restrict weed growth and retain moisture.

PLANTING NOTES

All plants to be supplied in accordance with the HTA 'National Plant Specification' and from a HTA certified nursery. All plants and trees to be planted in accordance with BS3936 and BS8545. Delivery and handling of all plant material to be in accordance with BS4428/JCL/PCSE Code of Practice for 'Handling and Establishing Landscape Plants' Parts I, II and III and BS8545.

Planting Pit and Trench Preparation

Tree pits in soft landscape to be excavated to 1m x 1m x 1m depth prior to topsoiling and all shrub planting areas excavated to 450mm depth. All proposed hedge planting trenches to be excavated to 500mm depth. Unless otherwise specified, all tree pits in hard landscape to be 2m x 2m x 1m, backfilled with compacted Urban Free Soil.

The preparation of planting pits, beds or trenches shall comply with the appropriate British Standards, namely BS4043, BS4428, BS5837 and BS8545.

Excavation of planting pits, beds or trenches shall not take place when the ground is frozen or waterlogged such that damage may occur to the structure of the soil. All excavated areas to be backfilled with either site won topsoil or imported topsoil to be BS3882-General purpose grade. All topsoiled areas to be clear of rocks and rubble larger than 50mm diameter and any other debris that may interfere with the establishment of plants. The Contractor shall break up and cultivate at the base of the trenches or planting pits. The sides of the trenches or planting pits shall be loosened with a fork or other similar implement. All stones and the like over 75mm in any dimension, deleterious matter, weeds and weed roots brought to the surface by any cultivation or excavation shall be removed off site. The Contractor shall remove off site the excavated subsoil material when preparing planting pits. The imported topsoil should make up any deficiencies caused by the removal of the subsoil material. Trenches and pits shall have the topsoil and any subsoil material thoroughly broken up and mixed prior to backfilling.

All trees shall be supplied root balled, unless otherwise stated. Root balled trees shall be well grown, healthy and with a compact, contained rootball. They shall be nursery grown and have been regularly watered. Prior to planting, all plant material shall be stored and sorted at in accordance with best practice.

Planting

All plants shall be planted in a random fashion avoiding formal regimented lines at densities indicated in the schedule, unless otherwise specified. Unless otherwise specified, all hedgerows shall be planted in single rows and hedgerow mixes shall be planted in groups of 7, 9 & 13 at densities indicated on the schedule. Ornamental shrub planting mixes shall be planted in groups of 5, 7 & 11 and native shrub planting mixes shall be planted in groups of 9, 13 & 15, with a cane and protective spiral guard included to all native planting. The selection, procurement, handling, storage and planting operations of all proposed trees shall be in accordance with BS5854:2014 - 'Trees: from nursery to independence in the landscape, recommendations'.

Planting and associated operations shall comply with BS4043, BS4428, BS5837 and BS8545. Unless otherwise stated planting shall be carried out during the period of 1 Nov to 31 March when the ground is not frozen or waterlogged. If planting is required outside this period agreement shall be sought and all bare root plants shall be substituted with container grown stock.

Provide Bamboo cane support and 'Treebio Biodegradable Spiral Guards' (Green-tech Product code: 160PS 1031-PRO) or similar to all native shrubs and hedgerows, young sapling trees, whips and feather planting, ensuring that the main or terminal bud is protruding out above the top of the spirals.

Watering

All plants shall be watered in to field capacity immediately after planting and mulched with 50mm depth of medium grade crushed mulch. The Contractor shall water the trees, shrubs and hedges once planted so that the entire tree pit or planted area is moistened to field capacity, i.e. 'the amount of water retained by previously saturated soil once full drainage has ceased'. Watering to field capacity shall continue frequently and on a regular basis as considered necessary by the landscape contractor and as necessary to ensure the successful establishment and continued thriving of all planting. Additional watering shall be undertaken during summer months and/or periods of drought. Post planting management and maintenance specifically for new tree planting shall include ongoing irrigation and formative pruning as outlined in BS8545. The period over which regular irrigation required for transplanted trees is likely to be at least two full growing seasons to ensure successful establishment. As the root system develops the frequency of irrigation can be reduced.

Staking

All trees with soft landscape areas to be double staked with cross bar and tied, using 1.5m long, 75mm diameter rounded tree stakes 75mm brace, rubber tie and spacer block. Stakes not to extend more than 600mm above ground level. All trees within hardstanding/hedges visibility plays to be clear to 1.5m high unless otherwise specified. Trees within hardstanding / specific pits to be underground guyed unless otherwise specified.

Root Barriers

Root barriers (ReRoot 1000 or equivalent) to be included adjacent to buildings and services where necessary. Landscape contractor shall check all planting operations comply with appropriate standards and that in the absence of detailed surveys, any necessary underground investigations are undertaken to ensure there are no conflicts with existing or proposed utilities, services or foundations.

PROTECTION OF EXISTING VEGETATION TO BE RETAINED

Existing trees to be retained shall be protected in accordance with BS5837, from commencement to completion of all works on site.

N.B. All planting proposals including tree planting have been developed in order to create a high quality environment and gain planning consent for the development. All tree species have been reviewed in line with NBSG guidance (G17) and in the absence of any building foundation depths or detailed soil analysis information for the site. Where possible only low and moderate water demand species are proposed in close proximity to new buildings. A number of varied cultivars of these species as well as ornamental species that have a smaller overall mature height (which are not currently assessed within NBSG guidance 2017) are proposed to provide variety in the scheme and engineer's should consider these locations & species. Where necessary new building foundation depths shall be designed to accommodate the approved tree species, site specific soil shrinkage and tree water demand in line with NBSG standard 2017 (Chapter 4.2 - Building Near Trees). Planting plans have been prepared for planning purposes and in the absence of fully detailed ground investigations, geological or hydrological surveys and planting design or species choice may be subject to change - suitability should be confirmed on site by the landscape contractor. Detailed site specific soil analysis and suitable site drainage should be checked by landscape contractor to ensure planting can be implemented in accordance with approved drawings prior to implementation.

REV DATE NOTE

G	15.04.2024	Updated to latest layout & officer comments	SP	CW
F	27.03.2024	Rain garden added	SP	CW
E	21.03.2024	Updated to latest layout & officer comments	SP	CW
D	09.02.2024	Updated to latest layout & officer comments	SP	CW
C	15.08.2024	Revised tree and shrub planting to Client comments & PCS boundary treatment	CW	CW
A	15.08.2024	Updated to client comments	SP	CW
REV	DATE	NOTE	Drawn	Chkd

aspect landscape planning

TITLE

Land North of Arborfield Road, Shinfield

Planting Plan 2 of 6

CLIENT

Bellway Homes Limited (Thames Valley)

SCALE 1:250@A1

DATE JUL 2024

DRAWN SP

CHKD CW

DRAWING NUMBER 8395.PP.1.2

REVISION G

PLANTING NOTES

All plants to be supplied in accordance with the HTA 'National Plant Specification' and from a HTA certified nursery. All plants and trees to be planted in accordance with BS5936 and BS5845. Delivery and handling of all plant material to be in accordance with BS4428/JCLICPSE Code of Practice for 'Handling and Establishing Landscape Plants' Parts I, II and III and BS8545.

Planting Pit and Trench Preparation
Tree pits in soft landscape to be excavated to 1m x 1m x 1m depth prior to topsoiling and all shrub planting areas excavated to 450mm depth. All proposed hedge planting trenches to be excavated to 600mm depth. Unless otherwise specified, all tree pits in hard landscape to be 2m x 2m x 1m, backfilled with compacted Urban Tree Soil.

The preparation of planting pits, beds or trenches shall comply with the appropriate British Standards, namely BS4443, BS4428, BS5837 and BS8545.
Excavation of planting pits, beds or trenches shall not take place when the ground is frozen or waterlogged such that damage may occur to the structure of the soil. All excavated areas to be backfilled with either site won topsoil or imported topsoil to be BS3882 general purpose grade. All topsoiled areas to be clear of rocks and rubble larger than 50mm diameter and any other debris that may interfere with the establishment of plants. The Contractor shall break up and cultivate at the base of the trenches or planting pits. The sides of the trenches or planting pits shall be loosened with a fork or other similar implement. All stones and the like over 75mm in any dimension, deleterious matter, weeds and weed roots brought to the surface by any cultivation or excavation shall be removed off site. The Contractor shall remove off site the excavated subsoil/fill material when preparing planting pits. The imported topsoil should make up any deficiencies caused by the removal of the subsoil/fill material. Trenches and pits shall have the topsoil and any subsoil/fill material thoroughly broken up and mixed prior to backfilling.

All trees shall be supplied root balled, unless otherwise stated. Root balled trees shall be well grown, healthy and with a compact, contained rootball. They shall be nursery grown and have been regularly watered. Prior to planting, all plant material shall be stored and sorted at in accordance with best practice.

Planting
All plants shall be planted in a random fashion avoiding formal regimented lines at densities indicated in the schedule, unless otherwise specified. Unless otherwise specified, all hedgerows shall be planted in single rows and hedgerow mixes shall be planted in groups of 7, 9 & 13 at densities indicated on the schedule. Ornamental shrub planting mixes shall be planted in groups of 5, 7 & 11s and native shrub planting mixes shall be planted in groups of 9, 13 & 15s, with a cane and protective spiral guard included at all native planting. The selection, procurement, handling, storage and planting operations of all proposed trees shall be in accordance with BS8545:2014 - Trees: from nursery to independence in the landscape, recommendations.

Planting and associated operations shall comply with BS4043, BS4428, BS5837 and BS8545. Unless otherwise stated planting shall be carried out during the period of 1 Nov to 31 March when the ground is not frozen or water logged. If planting is required outside this period agreement shall be sought and all bare root plants shall be substituted with container grown stock.
Provide Bamboo cane support and 'Treebio Biodegradable Spiral Guards' (Green-tech Product code: 10FPS1031-PRO) or similar to all native shrubs and hedgerows, young sapling trees, whips and feather planting, ensuring that the main or terminal bud is protruding out above the top of the spirals.

Watering
All plants shall be watered in to field capacity immediately after planting and mulched with 50mm depth of medium grade crushed mulch. The Contractor shall water the trees, shrubs and hedges once planted so that the entire tree pit or planted area is moistened to field capacity, i.e. "the amount of water retained by previously saturated soil once full drainage has ceased". Watering to field capacity shall continue frequently and on a regular basis as considered necessary by the landscape contractor and as necessary to ensure the successful establishment and continued thriving of all planting. Additional watering shall be undertaken during summer months and/or periods of drought. Post planting management and maintenance specifically for new tree planting shall include ongoing irrigation and formative pruning as outlined in BS8545. The period over which regular irrigation required for transplanted trees is likely to be at least two full growing seasons to ensure successful establishment. As the root system develops the frequency of irrigation can be reduced.

Staking
All trees within soft landscape areas to be double staked with cross bar and tied, using 1.5m long, 75mm diameter rounded tree stakes 75mm brace, rubber tie and spacer block. Stakes not to extend more than 650mm above ground level. All trees within hardstanding/highways visibility plays to be clear stem to 1.5m high unless otherwise specified. Trees within hardstanding / specific pits to be underground guyed unless otherwise specified.

Root Barriers
Root barriers (ReRoot 1000 or equivalent) to be included adjacent to buildings and services where necessary. Landscape contractor shall check all planting operations comply with appropriate standards and that in the absence of detailed surveys, any necessary underground investigations are undertaken to ensure there are no conflicts with existing or proposed utilities, services or foundations.

PROTECTION OF EXISTING VEGETATION TO BE RETAINED
Existing trees to be retained shall be protected in accordance with BS5837, from commencement to completion of all works on site.

N.B. All planting proposals including tree planting have been developed in order to create a high quality environment and gain planning consent for the development. All tree species have been reviewed in line with NHC guidance (2017) and in the absence of any building foundation depths or detailed soil analysis information for the site. Where possible only low and moderate water demand species are proposed in close proximity to new buildings. A number of varied cultivars of these species as well as ornamental species that have a smaller overall mature height (which are not currently assessed within NHC guidance 2017) are proposed to provide variety in the scheme and engineer's should consider these locations & species. Where necessary new building foundation depths shall be designed to accommodate the approved tree species, site specific soil shrinkage and tree water demand in line with NHC standards 2017 (Chapter 4.2 - Building Near Trees). Planting plans have been prepared for planning purposes and in the absence of fully detailed ground investigations, geological or hydrological surveys and planting design or species choice may be subject to change - suitability should be confirmed on site by the landscape contractor. Detailed site specific soil analysis and suitable site drainage should be checked by landscape contractor to ensure planting can be implemented in accordance with approved drawings prior to implementation.

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KEY:

Site Boundary

Existing Trees

Existing Shrubs

Proposed Multistem Trees

Proposed Trees
(to be positioned 2m from highway boundary and 1m from kerb edge)

Proposed Native Hedge
(Cane and Rabbit guards added with 50mm bark mulch)

Proposed Ornamental Hedge
(Initially clipped to 0.5m high and subsequently maintained at 0.6m high, offset 0.5m from back of highway boundary with a 0.5m bark mulch strip)

Proposed Feature Shrub

Proposed Climbers
(Fixed onto pressure-treated golden brown timber fan trellis - Dimensions: H1055 x W614mm.)

Proposed Ornamental Shrubs
(50mm Bark mulch to be included around planting)

Proposed Native Shrub Planting
(50mm Bark mulch to be included around planting)

Proposed Bulb Planting
(Scattered Randomly where to be planted)

Proposed Premium Grade Turf
(150mm min gravel strip with timber edge to be installed along building edge)

Proposed Amenity Grass Seed
(Flowering Lawn Mixture. Sown at 40kg/ha. Strong Lawn Grass Mixture. Sown on mown grass pathways at 250kg/ha.)

Proposed Wildflower Mix
(General Purpose Meadow Mixture. Sown at 40kg/ha)

Proposed Wet/Wildflower Mix
(Meadow Mixture for wetlands. Sown at 40kg/ha)

Small 30mm Decorative Gravel
overlay over geotextile membrane
(Gravel to be agreed with Bellway before installation and include a timber edge)

Proposed Root Barrier

Proposed Mown Grass Footpath 1.2m wide

Proposed Tarmac Footpath

Proposed Short Span Timber Bridge
Finish: FSC Certified Treated Hardwood
Width: 2000mm
Min. Length: 3000mm

Proposed Timber Bench
Finish: Treated Softwood timber
Size: L2000mm W580mm H770mm
Root Fixed Length 300mm

Canopied Litter Bin
Size: Ø560mm H900mm
Fixing: Set of 4 Shield Anchor Bolts
for installation Fixed onto Tarmac
Capacity: 90 Litres

Natural Boulders
Approx. L1.2m x W0.8m x H0.8m / 1200kg

Proposed 1.2m High Black Vertical Railing

Playway

Proposed Rocks / Boulders
Mixed Glacial Boulders or similar approved
Supplier: CED Stone Landscape
Size: Mix of approximately 200kg, 800kg & 1200kg
Proposed Small 20mm Decorative Gravel
Flint ECOGravel or similar approved
Supplier: CED Stone Landscape
Size: 20mm
Average coverage: 10m²/Tonne at 50mm depth

NB: Decorative Bark mulch to be supplied in 30-40mm chip size and applied at a depth of 50mm around landscaping to restrict weed growth and retain moisture.

REV DATE NOTE

15 04 2024 Updated to latest layout & officer comments SP CW

16 04 2024 Rain garden added SP CW

17 04 2024 Related to comments SP CW

18 04 2024 Updated to latest layout & officer comments SP CW

19 04 2024 Street lighting and tree locations updated to comments SP CW

20 04 2024 Reviewed site and plants planting to client comments & PCB boundary SP CW

21 04 2024 Updated to comments SP CW

22 04 2024 NOTE Drawn Chkd

23 04 2024

24 04 2024

25 04 2024

26 04 2024

27 04 2024

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PLANTING NOTES

All plants to be supplied in accordance with the HTA 'National Plant Specification' and from a HTA certified nursery. All plants and trees to be planted in accordance with BS3306 and BS8545. Delivery and handling of all plant material to be in accordance with BS4428/JCL/CPS/CE Code of Practice for 'Handling and Establishing Landscape Plants' Parts I, II and III and BS8545.

Planting Pit and Trench Preparation

Tree pits in soft landscape to be excavated to 1m x 1m x 1m depth prior to topsoiling and all shrub planting areas excavated to 450mm depth. All proposed hedge planting trenches to be excavated to 600mm depth. Unless otherwise specified, all tree pits in hard landscape to be 2m x 2m x 1m, backfilled with compacted Urban Tree Soil.

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Planting and associated operations shall comply with BS4043, BS4428, BS5837 and BS8545. Unless otherwise stated planting shall be carried out during the period of 1 Nov to 31 March when the ground is not frozen or waterlogged. If planting is required outside this period agreement shall be sought and all bare root plants shall be substituted with container grown stock.

Provide Bamboo cane support and 'Tree-toe Biodegradable Spiral Guards' (Green-tech Product code: 160PS1031-PRO) or similar to all native shrubs and hedgerows, young sapling trees, whips and feather planting, ensuring that the main or terminal bud is protruding out above the top of the spirals.

Watering

All plants shall be watered in to field capacity immediately after planting and mulched with 50mm depth of medium grade crushed mulch. The Contractor shall water the trees, shrubs and hedges once planted so that the entire tree or planted area is moistened to field capacity, i.e. the amount of water retained by previously saturated soil once full drainage has ceased. Watering to field capacity shall continue frequently and on a regular basis as considered necessary by the landscape contractor and as necessary to ensure the successful establishment and continued thriving of all planting. Additional watering shall be undertaken during summer months and/or periods of drought. Post planting management and maintenance specifically for new tree planting shall include ongoing irrigation and formative pruning as outlined in BS8545. The period over which regular irrigation required for transplanted trees is likely to be at least two full growing seasons to ensure successful establishment. As the root system develops the frequency of irrigation can be reduced.

Staking

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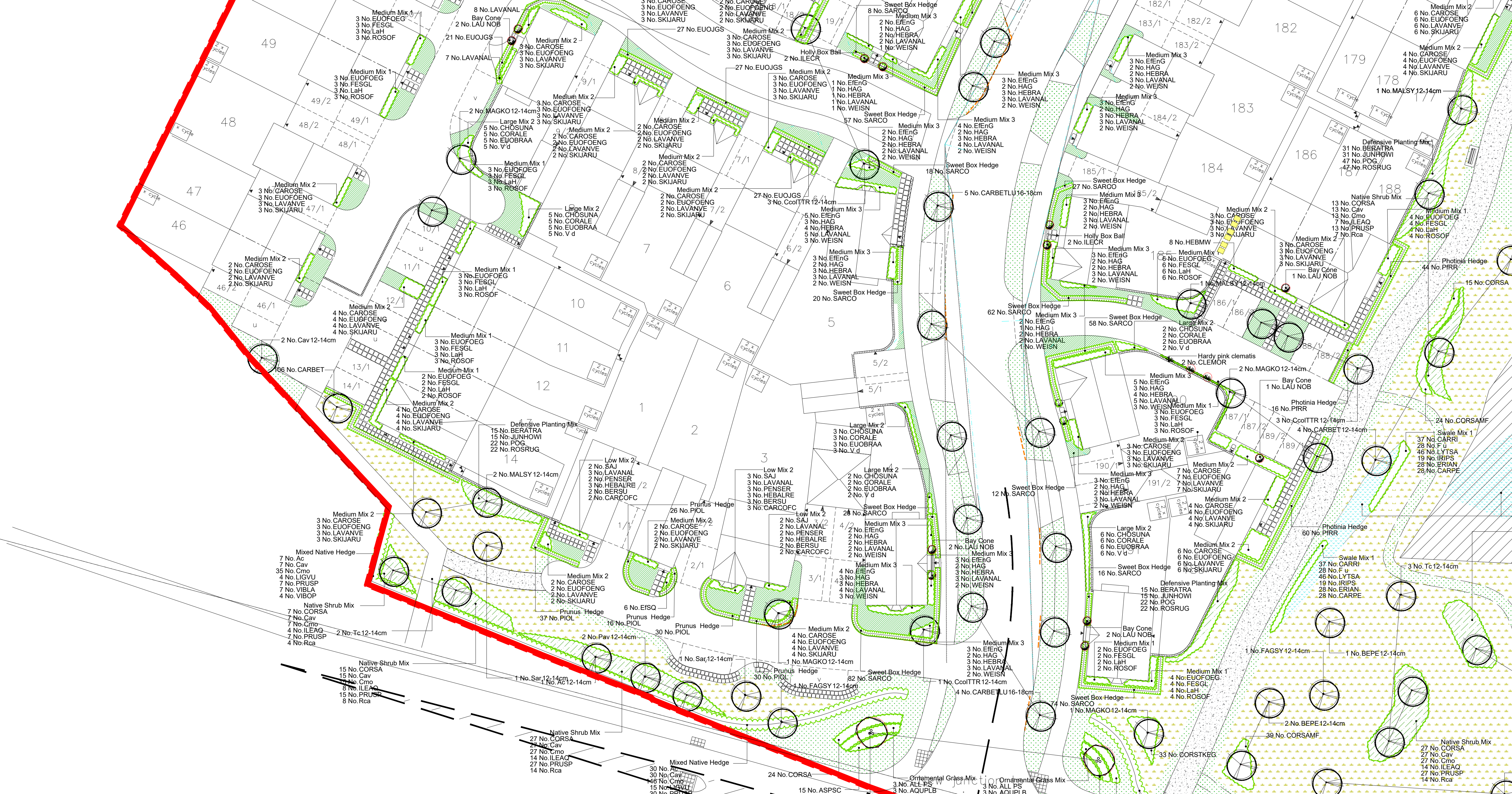
Root Barriers

Root barriers (ReRoot 1000 or equivalent) to be included adjacent to buildings and services where necessary. Landscape contractor shall check all planting operations comply with appropriate standards and that in the absence of detailed surveys, any necessary underground investigations are undertaken to ensure there are no conflicts with existing or proposed utilities, services or foundations.

PROTECTION OF EXISTING VEGETATION TO BE RETAINED

Existing trees to be retained shall be protected in accordance with BS5837, from commencement to completion of all work on site.

N.B. All planting proposals including tree planting have been developed in order to create a high quality environment and gain planning consent for the development. All tree species have been reviewed in line with NHC guidance (2017) and in the absence of detailed surveys, any necessary underground investigations are undertaken to ensure there are no conflicts with existing or proposed utilities, services or foundations. Where possible only low and moderate water demand species shall be specified in close proximity to new buildings. A number of varied cultivars of these species as well as ornamental species that have a relatively overall mature height (which are not currently assessed within NHC guidance 2017) are proposed to provide variety in the scheme and engineers should consider these locations & species. Where necessary new building foundation depths shall be designed to accommodate the approved tree species, allow specific soil shrinkage and tree water demand in line with NHC standards 2017 (Chapter 4.2 - Building Near Trees). Planting plans have been prepared for planning purposes and in the absence of fully detailed ground investigations, geological or hydrological surveys and planting design or species choice may be subject to change - suitability should be confirmed on site by the landscape contractor. Detailed site specific soil analysis and suitable site drainage should be checked by landscape contractor to ensure planting can be implemented in accordance with approved drawings prior to implementation.



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0m 2m 4m 10m
1:250 @ A1

- KEY:**
- Site Boundary
 - Existing Trees
 - Existing Shrubs
 - Proposed Multistem Trees
 - Proposed Trees
(to be positioned 2m from highway boundary and 1m from kerb edge)
 - Proposed Native Hedge
(Cane and Rabbit guards added with 50mm bark mulch)
 - Proposed Ornamental Hedge
(Initially clipped to 0.5m high and subsequently maintained at 0.6m high, offset 0.5m from back of highway boundary with a 0.5m bark mulch strip)
 - Proposed Feature Shrub
 - Proposed Climbers
(Fixed onto pressure-treated golden brown timber fan trellis - Dimensions: H1055 x W514mm.)
 - Proposed Ornamental Shrubs
(50mm Bark mulch to be included around planting)
 - Proposed Native Shrub Planting
(50mm Bark mulch to be included around planting)
 - Proposed Bulb Planting
(Scattered Randomly where to be planted)
 - Proposed Premium Grade Turf
(150mm min gravel strip with timber edge to be installed along building edge)
 - Proposed Amenity Grass Seed
(Flowering Lawn Mixture: Sown at 40g/m².
Strong Lawn Grass Mixture: Sown on mown grass pathways at 250g/m².)
 - Proposed Wildflower Mix
(General Purpose Meadow Mixture: Sown at 40g/m²)
 - Proposed Wet/Wildflower Mix
(Meadow Mixture for wetlands: Sown at 40g/m²)
 - Small 30mm Decorative Gravel
overlay over geotextile membrane
(Gravel to be agreed with Bellway before installation and include a timber edge)
 - Proposed Root Barrier
 - Proposed Mown Grass Footpath 1.2m wide
 - Proposed Tarmac Footpath
 - Proposed Short Span Timber Bridge
Finish: FSC Certified Treated Hardwood
Width: 2000mm
Min. Length: 3000mm
 - Proposed Timber Bench
Finish: Treated Softwood timber
Size: L2000mm W580mm H770mm
Root Fixed Length 300mm
 - Canopied Litter Bin
Size: Ø560mm H900mm
Fixing: Set of 4 Shovel Anchor Bolts
for installation Fixed onto Tarmac
Capacity: 90 Litres
 - Natural Boulders
Approx. L1.2m x W0.8m x H0.8m / 1200kg
 - Proposed 1.2m High Black Vertical Railing
 - Playslip
 - Proposed Rocks / Boulders
Mixed Glacial Boulders or similar approved
Supplier: CED Stone Landscape
Size: Mix of approximately 200kg, 800kg & 1200kg
Proposed Small 20mm Decorative Gravel
Flint ECOGravel or similar approved
Supplier: CED Stone Landscape
Size: 20mm
Average coverage: 10m²/Tonne at 50mm depth

NB: Decorative Bark mulch to be supplied in 30-40mm chip size and applied at a depth of 50mm around landscaping to restrict weed growth and retain moisture.

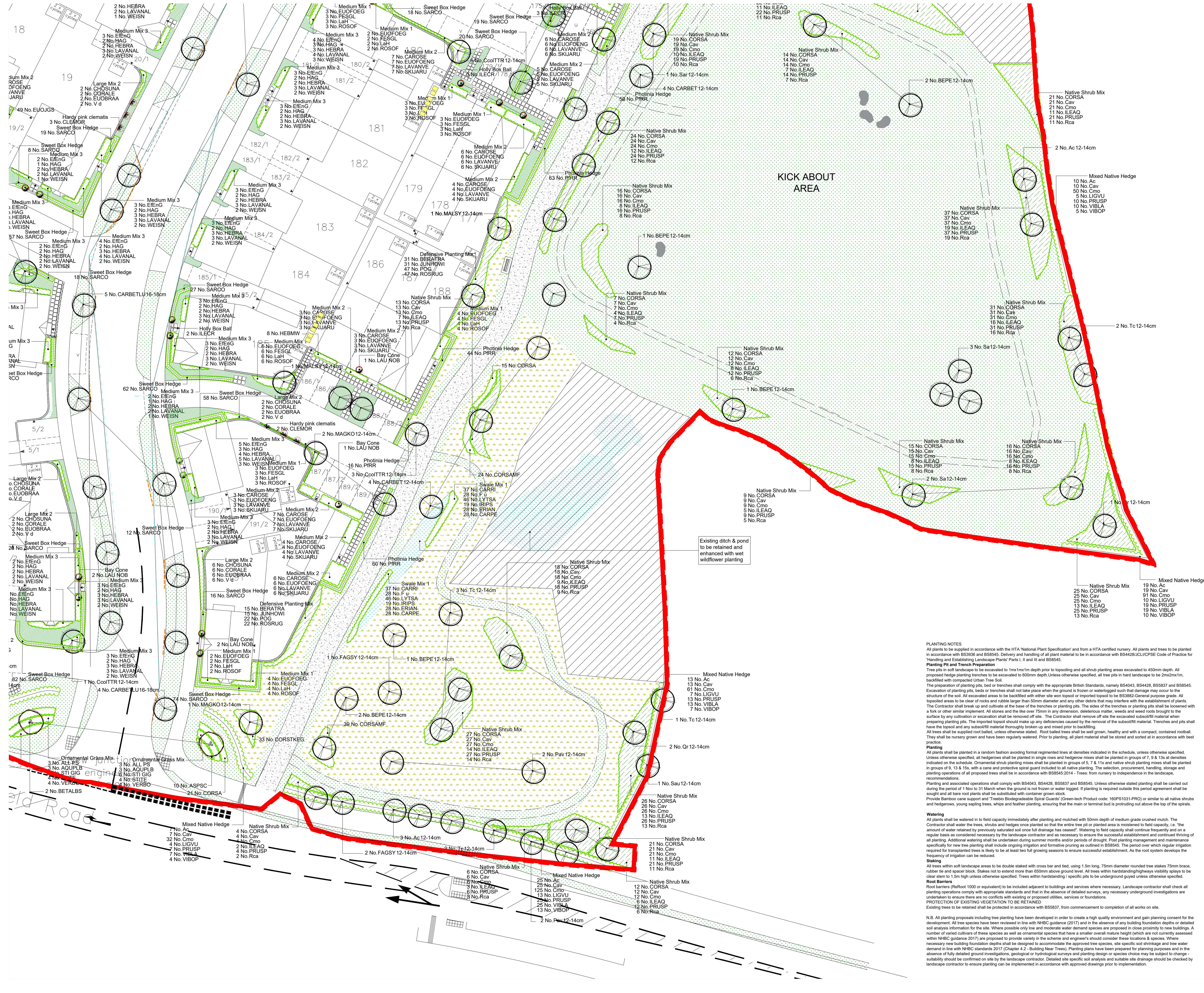
G	15/04/2024	Updated to latest layout & officer comments	SP	CW
F	27/03/2024	Rain garden added	SP	CW
E	21/03/2024	Updated to comments	SP	CW
C	21/03/2024	Updated to latest layout & officer comments	SP	CW
B	15/08/2024	Revised tree and shrub planting to Client comments & PCB boundary survey	CW	CW
A	15/08/2024	Updated to comments	SP	CW
REV	DATE	NOTE		Drawn/Chkd

aspect landscape planning

TITLE
Land North of Arborfield Road, Shinfield
Planting Plan 5 of 6

CLIENT
Bellway Homes Limited (Thames Valley)

SCALE 1:250@A1	DATE JUL 2024	DRAWN SP	CHKD CW
DRAWING NUMBER 8395.PP.1.5	REVISION G		



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KEY:

- Site Boundary
- Existing Trees
- Existing Shrubs
- Proposed Multistem Trees
- Proposed Trees
(to be positioned 2m from highway boundary and 1m from kerb edge)
- Proposed Native Hedge
(Cared and Rabbit guards added with 50mm bark mulch)
- Proposed Ornamental Hedge
(Initially clipped to 0.5m high and subsequently maintained at 0.6m high, offset 0.5m from back of highway boundary with a 0.5m bark mulch strip)
- Proposed Feature Shrub
- Proposed Climbers
(Fixed onto pressure-treated golden brown timber fan trellis - Dimensions: H1055 x W514mm.)
- Proposed Ornamental Shrubs
(50mm Bark mulch to be included around planting)
- Proposed Native Shrub Planting
(50mm Bark mulch to be included around planting)
- Proposed Bulb Planting
(Scattered Randomly where to be planted)
- Proposed Premium Grade Turf
(150mm min gravel strip with timber edge to be installed along building edge)
Turf Rolls to suit frontage
- Proposed Amenity Grass Seed
Flowering Lawn Mixture. Sown at 40kg/ha.
Strong Lawn Grass Mixture. Sown on mown grass pathways at 250kg/ha.
- Proposed Wildflower Mix
General Purpose Meadow Mixture. Sown at 40kg/ha
- Proposed Wet/Wildflower Mix
Meadow Mixture for wetlands. Sown at 40kg/ha
- Small 30mm Decorative Gravel
overlay over geotextile membrane
(Gravel to be agreed with Bellway before installation and include a timber edge)
- Proposed Root Barrier
- Proposed Mown Grass Footpath 1.2m wide
- Proposed Tarmac Footpath
- Proposed Short Span Timber Bridge
Finish: FSC Certified Treated Hardwood
Width: 2000mm
Min. Length: 3000mm
- Proposed Timber Bench
Finish: Treated Softwood timber
Size: L2000mm W580mm H770mm
Root Fixed Length 300mm
- Canopied Litter Bin
Size: Ø560mm H900mm
Fixing: Set of 4 Shaped Anchor Bolts
for Installation Fixed onto Tarmac
Capacity: 90 Litres
- Natural Boulders
Approx. L1.2m x W0.8m x H0.8m / 1200kg
- Proposed 1.2m High Black Vertical Railing
- Visplay
- Proposed Rocks / Boulders
Mixed Glacial Boulders or similar approved
Supplier: CED Stone Landscape
Size: Mix of approximately 200kg, 800kg & 1200kg
- Proposed Small 20mm Decorative Gravel
Flint ECO Gravel or similar approved
Supplier: CED Stone Landscape
Size: 20mm
Average coverage: 10m²/Tonne at 50mm depth

NB: Decorative Bark mulch to be supplied in 30-40mm chip size and applied at a depth of 50mm around landscaping to restrict weed growth and retain moisture.

PLANTING NOTES

All plants to be supplied in accordance with the HTA 'National Plant Specification' and from a HTA certified nursery. All plants and trees to be planted in accordance with BS3936 and BS8545. Delivery and handling of all plant material to be in accordance with BS4428/JCL/CPSE Code of Practice for Handling and Establishing Landscape Plants' Parts I, II and III and BS8545.

Planting Pit and Trench Preparation

Tree pits in soft landscape to be excavated to 1mx1mx1m depth prior to topsoiling and all shrub planting areas excavated to 450mm depth. All proposed hedge planting trenches to be excavated to 600mm depth. Unless otherwise specified, all tree pits in hard landscape to be 2mx2mx1m, backfilled with compacted Urban Tree Soil.

The preparation of planting pits, bed or trenches shall comply with the appropriate British Standards, namely BS4043, BS4428, BS5837 and BS8545. Excavation of planting pits, beds or trenches shall not take place when the ground is frozen or waterlogged such that damage may occur to the structure of the soil. All excavated areas to be backfilled with either site won topsoil or imported topsoil to be BS3883 General purpose grade. All topsoiled areas to be clear of rocks and rubble larger than 50mm diameter and any other debris that may interfere with the establishment of plants. The Contractor shall break up and cultivate at the base of the trenches or planting pits. The sides of the trenches or planting pits shall be loosened with a fork or other similar implement. All stones and the like over 75mm in any dimension, deleterious matter, weeds and weed roots brought to the surface by any cultivation or excavation shall be removed off site. The Contractor shall remove off site the excavated subsoil/fill material when preparing planting pits. The imported topsoil should make up any deficiencies caused by the removal of the subsoil/fill material. Trenches and pits shall have the topsoil and any subsoil material thoroughly broken up and mixed prior to backfilling.

All trees shall be supplied root balled, unless otherwise stated. Root balled trees shall be well grown, healthy and with a compact, contained rootball. They shall be nursery grown and have been regularly watered. Prior to planting, all plant material shall be stored and sorted at in accordance with best practice.

Planting

All plants shall be planted in a random fashion avoiding formal regimented lines at densities indicated in the schedule, unless otherwise specified. Unless otherwise specified, all hedgerows shall be planted in single rows and hedgerow mixes shall be planted in groups of 7, 9, 13s at densities indicated on the schedule. Ornamental shrub planting mixes shall be planted in groups of 5, 7, 8, 11s and native shrub planting mixes shall be planted in groups of 9, 13 & 15s, with a cane and protective spiral guard included to all native planting. The selection, procurement, handling, storage and planting operations of all proposed trees shall be in accordance with BS8545:2014 - Trees: from nursery to independence in the landscape, recommendations.

Planting and associated operations shall comply with BS4043, BS4428, BS5837 and BS8545. Unless otherwise stated planting shall be carried out during the period of 1 Nov to 31 March when the ground is not frozen or waterlogged. If planting is required outside this period agreement shall be sought and all bare root plants shall be substituted with container grown stock.

Provide Bamboo cane support and Treobio Biodegradable Spiral Guard (Green-tech Product code: 160PS1031-PRO) or similar to all native shrubs and hedgerows, young sapling trees, whips and feather planting, ensuring that the main or terminal bud is protruding out above the top of the spirals.

Watering

All plants shall be watered in to field capacity immediately after planting and mulched with 50mm depth of medium grade crushed mulch. The Contractor shall water the trees, shrubs and hedges once planted so that the entire tree pit or planted area is moistened to field capacity, i.e. 'the amount of water retained by previously saturated soil once full drainage has ceased'. Watering to field capacity shall continue frequently and on a regular basis as considered necessary by the landscape contractor and as necessary to ensure the successful establishment and continued thriving of all planting. Additional watering shall be undertaken during summer months and/or periods of drought. Post planting management and maintenance specifically for new tree planting shall include ongoing irrigation and formative pruning as outlined in BS8545. The period over which regular irrigation required for transplanted trees is likely to be at least two full growing seasons to ensure successful establishment. As the root system develops the frequency of irrigation can be reduced.

Staking

All trees within soft landscape areas to be double staked with cross bar and tied, using 1.5m long, 75mm diameter rounded tree stakes 75mm brace, rubber tie and spacer block. Stakes not to extend more than 650mm above ground level. All trees within hardstanding/highways visibility splay to be clear stem to 1.5m high unless otherwise specified. Trees within hardstanding / specific pits to be underground guyed unless otherwise specified.

Root Barriers

Root barriers (ReRoot 1000 or equivalent) to be included adjacent to buildings and services where necessary. Landscape contractor shall check all planting operations comply with appropriate standards and that in the absence of detailed surveys, any necessary underground investigations are undertaken to ensure there are no conflicts with existing or proposed utilities, services or foundations.

PROTECTION OF EXISTING VEGETATION TO BE RETAINED

Existing trees to be retained shall be protected in accordance with BS5837, from commencement to completion of all works on site.

N.B. All planting proposals including tree planting have been developed in order to create a high quality environment and gain planning consent for the development. All tree species have been reviewed in line with NHRBC guidance (2017) and in the absence of any building foundation depths or detailed soil analysis information for the site. Where possible only low and moderate water demand species are proposed in close proximity to new buildings. A number of varied cultivars of these species as well as ornamental species that have a smaller overall mature height (which are not currently assessed within NHRBC guidance 2017) are proposed to provide variety in the scheme and engineer's should consider these locations & species. Where necessary new building foundation depths shall be designed to accommodate the approved tree species, site specific soil shrinkage and tree water demand in line with NHRBC standards 2017 (Chapter 4.2 - Building Near Trees). Planting plans have been prepared for planning purposes and in the absence of fully detailed ground investigations, geological or hydrological surveys and planting design or species choice may be subject to change - suitability should be confirmed on site by the landscape contractor. Detailed site specific soil analysis and suitable site drainage should be checked by landscape contractor to ensure planting can be implemented in accordance with approved drawings prior to implementation.

G	15.04.2024	Updated to latest layout & officer comments	SP	CW
F	27.03.2024	Rain garden added	SP	CW
E	21.03.2024	Updated to latest layout & officer comments	SP	CW
D	15.03.2024	Updated to latest layout & officer comments	SP	CW
C	15.03.2024	Updated to latest layout & officer comments	SP	CW
B	15.03.2024	Updated to latest layout & officer comments	SP	CW
A	15.03.2024	Updated to latest layout & officer comments	SP	CW
REV	DATE	NOTE	SP	CW

Drawn: CW

TITLE

Land North of Arborfield Road, Shinfield

Planting Plan 6 of 6

CLIENT

Bellway Homes Limited (Thames Valley)

SCALE

1:250@A1

JUL 2024

DRAWN

SP

CHKD

CW

DRAWING NUMBER

8395.PP.1.6

REVISION

G



Appendix B – LLFA Developer Checklist

Major Development Full Application (and/or discharge of conditions or reserved matters)

Full planning applications for Major Development and/or discharge of conditions or reserved matters must include the following information and details on the proposed drainage strategy and system(s).

Ref.	Documentation required	Requirement met/included
	In addition to documentation required for outline applications, the applicant shall also submit: ■ Confirmation of the destination of discharge(s) (in accordance with Building Regulation Part H hierarchy) with appropriate justification for the(ir) selection; ■ Details of any offsite works required, together with any necessary consents; ■ Where necessary, a full planting schedule with accompanying plan; ■ Where proposing to discharge to ground the results of site specific ground investigation (accounting for the variability in ground conditions), including geo-environmental characterisation and infiltration test results shall be provided. These investigations shall account for: • Evidence of infiltration tests, providing representative results, at the location and depth of any intended infiltration device; • Records of recorded groundwater levels over a number of visits to establish confidence in seasonal variability on groundwater levels. ■ Exceedence routes – confirmation that exceedence routes will remain clear of development in perpetuity; ■ Confirmation of the arrangements for the adoption, management / operation and maintenance of the drainage system, including but not necessarily limited to: • Details of which body will be responsible for operating and maintenance for the drainage proposals including their written confirmation; • A management statement to outline the management goals for the site and required maintenance; • Description of maintenance schedule and materials and tools needed; • A maintenance schedule; • Legal agreements to ensure the continued operation and maintenance of the drainage system for the lifetime of the development; • Health and safety plan, if appropriate, considering all potential health and safety risks posed by the proposed drainage system including but not limited to areas of open water, confined spaces, and steep slopes; • Access arrangements for maintenance of all aspects of the proposed drainage systems; and • Operational characteristics of any mechanical features including maintenance and energy requirements.	Included in report Included in report Plan Included in Appendix 1, completed by others. Included in report Included in report Included in report Included in report

Plans & Drawings Required

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	In addition to plan and drawing required for outline applications, the applicant shall also submit: ■ Detail drawings of connections (including flow control devices) to water bodies, sewers, public surface water sewers, highway drains and SuDS; ■ Phasing plans for implementation of the drainage system(s); ■ Details of source control measures including location, type levels and detail drawing; ■ Details of site control measures including location, type levels and detail drawing; ■ Where appropriate, details of regional control measures including location, type levels and detail drawing; ■ Details of all other drainage features including levels, detail location and detail drawings; ■ Details of those components of the drainage system(s) comprising the 'management train' for the site; ■ Conveyance and exceedance routes; ■ The destination of runoff with clearly defined outfall locations; and ■ Any surface water/groundwater flow routes entering the development from adjacent land.	Plans are included in Appendix 3 Shown in Plans Not applicable Shown in Plans Shown in Plans Shown in Plans Shown in Plans Shown in Plans Included in report Shown in Plans Not applicable
	Calculations Required	
	In addition to calculations required for outline applications, the applicant shall also submit: ■ Full design calculations and design parameters to demonstrate conformity with best practice standards. This shall include a calculation pack for the following storm events: • 1:1 year; • 1:30 year; • 1:100 year; and, • 1:100 year with climate change. The calculations shall be able to be referenced to appropriate drawings of the drainage system with pipe and manhole references and clearly labelled storage and conveyance features (basins, swales, tanks etc.); and, ■ Confirmation of attenuation volumes provided in each storage feature along with details of freeboard allowance for each feature.	Shown In Appendix 3 FEH-22 uses 1:2 year storm, there for this was used instead of 1:1 year Attenuation Volume shown in plans and shown in calcs

Additional requirements for a large site or multi-plot development.

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.	Site is small, phasing plan is not applicable



Appendix C – Drainage Strategy

Calculations

Drainage Layout

Drainage Catchment Areas

Drainage Construction Details

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	9.999
CV	1.000	Preferred Cover Depth (m)	1.250
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
16	0.010	5.00	42.776	1350	473784.332	168143.845	1.402
3	0.122	5.00	46.694	1350	473646.245	168163.761	1.551
10			43.455	1500	473715.089	168089.301	1.885
39		5.00	42.000		473748.102	167975.212	1.500
48	0.013	5.00	43.164	1350	473621.436	167885.704	1.475
40_OUT			41.900	1200	473755.657	167988.657	1.500
40			41.900	1800	473752.169	167983.437	1.474
19			42.797	1800	473762.380	168056.307	1.856
18	0.100	5.00	42.800	1800	473771.831	168084.502	1.800
11			43.230	1500	473737.944	168081.738	1.919
15	0.035	5.00	43.914	1350	473732.858	168152.983	1.475
13	0.063	5.00	43.493	1350	473764.312	168206.705	1.644
12	0.071	5.00	43.889	1350	473747.160	168210.745	1.700
21	0.070	5.00	42.650	1800	473748.242	168025.342	1.777
38_OUT			42.000		473730.743	167962.141	1.440
38	0.072	5.00	42.469	1800	473721.575	167968.478	1.797
37	0.165	5.00	43.340	1800	473672.869	167993.134	2.470
36	0.136	5.00	43.263	1500	473702.569	168052.319	1.916
33	0.048	5.00	45.151	1350	473655.035	168080.138	2.151
32	0.147	5.00	45.483	1350	473634.789	168040.061	2.823
9	0.058	5.00	43.546	1350	473714.933	168105.100	1.763
5	0.021	5.00	45.351	1350	473658.409	168094.569	2.015
4	0.130	5.00	45.621	1350	473656.021	168111.098	1.844
1	0.059	5.00	47.844	1350	473635.772	168220.181	1.475
8	0.205	5.00	44.179	1350	473706.840	168149.322	1.856
7	0.117	5.00	44.894	1350	473698.572	168200.748	1.632
6	0.043	5.00	45.704	1350	473704.857	168246.339	1.798
29	0.041	5.00	43.067	1500	473645.568	167922.785	1.490
28	0.054	5.00	42.765	1350	473649.724	167898.321	1.475
27	0.008	5.00	42.559	1350	473649.472	167882.589	1.455
30	0.055	5.00	43.357	1500	473647.411	167942.703	1.850
31	0.078	5.00	43.614	1500	473659.377	167968.034	2.163
25	0.044	5.00	44.647	1350	473596.793	167968.320	2.777
22	0.063	5.00	45.242	1350	473621.932	168015.719	2.770
24	0.118	5.00	44.188	1200	473576.136	167929.409	1.988

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
35	0.068	5.00	43.364	1350	473710.382	168075.529	1.952
23	0.114	5.00	44.941	1350	473608.550	167990.991	2.556
2	0.101	5.00	47.252	1350	473641.157	168191.172	1.475
26	0.057	5.00	43.467	1350	473601.358	167891.904	1.550
41	0.014	5.00	45.094	1350	473698.989	168216.486	1.550
42			43.036	1500	473757.436	168088.487	1.789
43	0.071	5.00	47.776	1350	473648.586	168249.843	1.645
44	0.058	5.00	46.347	1200	473684.765	168250.173	2.103
45	0.119	5.00	43.399	1350	473755.745	168150.086	1.859
46			45.351		473668.583	168093.674	2.047
47			43.742		473699.025	168096.140	2.175
49	0.109	5.00	44.139	1500	473618.840	167954.046	2.494
50			42.000		473722.233	167939.632	1.440
51			42.439	1200	473704.146	167932.528	1.709
52	0.051	5.00	42.395	1350	473691.183	167910.615	1.561
54	0.008	5.00	42.108	1200	473674.711	167876.074	1.117
55			42.564	1350	473654.734	167877.179	1.491
56		5.00	43.270	1350	473773.230	168205.496	1.181
57			43.267	1350	473692.574	168032.301	1.980

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	43	44	36.181	0.600	46.131	44.244	1.887	19.2	225	5.20	50.0
1.001	44	6	20.458	0.600	44.244	43.981	0.263	77.9	225	5.43	49.3
1.002	6	41	30.424	0.600	43.906	43.544	0.362	84.0	300	5.73	48.1
1.003	41	7	15.744	0.600	43.544	43.337	0.207	75.9	300	5.87	47.5
1.004	7	8	52.086	0.600	43.262	42.398	0.864	60.3	375	6.24	46.2
1.005	8	9	44.956	0.600	42.323	41.783	0.540	83.3	450	6.58	45.1
1.006	9	10	15.800	0.600	41.783	41.645	0.138	114.3	450	6.72	44.6
1.007	10	11	24.074	0.600	41.570	41.311	0.259	93.1	525	6.89	44.0
1.008	11	42	20.627	0.600	41.311	41.247	0.065	319.3	525	7.17	43.2
1.009	42	18	14.942	0.600	41.247	41.150	0.097	154.5	525	7.30	42.8
2.000	12	13	17.621	0.600	42.189	41.924	0.265	66.5	225	5.18	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	3.002	119.4	12.9	1.420	1.878	0.071	0.0	50	1.980
1.001	1.483	59.0	23.0	1.878	1.498	0.129	0.0	97	1.391
1.002	1.716	121.3	30.0	1.498	1.250	0.173	0.0	101	1.429
1.003	1.806	127.7	32.0	1.250	1.257	0.186	0.0	102	1.508
1.004	2.337	258.1	50.6	1.257	1.406	0.303	0.0	112	1.828
1.005	2.228	354.4	82.8	1.406	1.313	0.508	0.0	147	1.832
1.006	1.901	302.3	91.3	1.313	1.360	0.566	0.0	169	1.674
1.007	2.322	502.6	90.1	1.360	1.394	0.566	0.0	149	1.777
1.008	1.248	270.1	88.4	1.394	1.264	0.566	0.0	206	1.121
1.009	1.800	389.6	87.6	1.264	1.125	0.566	0.0	168	1.465
2.000	1.606	63.9	12.8	1.475	1.344	0.071	0.0	68	1.261

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	56	13	9.000	0.600	42.089	41.999	0.090	100.0	150	5.15	50.0
2.001	13	45	57.263	0.600	41.849	41.615	0.234	244.7	300	6.14	46.5
4.000	15	45	23.110	0.600	42.439	41.690	0.749	30.9	225	5.16	50.0
2.002	45	16	29.260	0.600	41.540	41.449	0.091	321.5	375	6.62	44.9
2.003	16	18	60.656	0.600	41.374	41.225	0.149	407.1	450	7.63	41.9
1.010	18	19	29.737	0.600	41.000	40.941	0.059	504.0	675	8.06	40.7
1.011	19	21	34.040	0.600	40.941	40.873	0.068	500.6	675	8.55	39.5
1.012	21	38	62.806	0.600	40.873	40.747	0.126	498.5	675	9.44	37.5
5.000	1	2	29.505	0.600	46.369	45.777	0.592	49.8	225	5.26	49.9
5.001	2	3	27.879	0.600	45.777	45.218	0.559	49.9	225	5.52	48.9
5.002	3	4	53.563	0.600	45.143	43.852	1.291	41.5	300	5.88	47.5
5.003	4	5	16.701	0.600	43.777	43.336	0.441	37.8	375	5.97	47.1
5.004	5	46	10.213	0.600	43.336	43.304	0.032	319.2	375	6.14	46.5
5.005	46	47	30.542	0.600	43.304	41.567	1.737	17.6	375	6.26	46.1
6.000	46	47	30.542	0.012	44.652	43.242	1.410	21.7	500	5.07	50.0
5.006	47	35	23.533	0.012	41.567	41.487	0.080	294.2	375	6.65	44.8
5.007	35	36	24.490	0.012	41.412	41.347	0.065	376.8	450	7.06	43.5
5.008	36	57	22.375	0.012	41.347	41.287	0.060	372.9	450	7.43	42.5
5.009	57	37	43.845	0.012	41.287	41.170	0.117	374.7	450	8.16	40.5
7.000	33	32	44.901	0.600	43.000	42.735	0.265	169.4	225	5.75	48.0
7.001	32	22	27.529	0.600	42.660	42.547	0.113	243.6	300	6.20	46.3
7.002	22	23	28.117	0.600	42.472	42.385	0.087	323.2	375	6.67	44.8
7.003	23	25	25.538	0.600	42.385	41.945	0.440	58.0	375	6.85	44.2
8.000	24	25	44.054	0.600	42.200	42.020	0.180	244.7	300	5.73	48.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	1.005	17.8	0.0	1.031	1.344	0.000	0.0	0	0.000
2.001	1.000	70.7	22.5	1.344	1.484	0.134	0.0	116	0.890
4.000	2.363	94.0	6.3	1.250	1.484	0.035	0.0	39	1.353
2.002	1.005	111.0	46.8	1.484	0.952	0.288	0.0	170	0.963
2.003	1.001	159.2	45.1	0.952	1.125	0.298	0.0	163	0.865
1.010	1.160	415.2	141.9	1.125	1.181	0.964	0.0	271	1.055
1.011	1.164	416.6	137.8	1.181	1.102	0.964	0.0	266	1.049
1.012	1.167	417.5	140.2	1.102	1.047	1.034	0.0	269	1.056
5.000	1.857	73.8	10.6	1.250	1.250	0.059	0.0	58	1.331
5.001	1.856	73.8	28.2	1.250	1.251	0.160	0.0	96	1.734
5.002	2.447	173.0	48.3	1.251	1.469	0.282	0.0	108	2.108
5.003	2.953	326.1	70.1	1.469	1.640	0.412	0.0	118	2.373
5.004	1.009	111.4	72.8	1.640	1.672	0.433	0.0	222	1.073
5.005	4.338	479.1	72.2	1.672	1.800	0.433	0.0	98	3.162
6.000	7.536	7536.1	0.0	0.199	0.000	0.000	0.0	0	0.000
5.006	1.003	110.7	70.1	1.800	1.502	0.433	0.0	216	1.061
5.007	1.001	159.1	78.8	1.502	1.466	0.501	0.0	224	0.998
5.008	1.006	159.9	97.8	1.466	1.530	0.637	0.0	254	1.056
5.009	1.003	159.6	93.2	1.530	1.720	0.637	0.0	247	1.043
7.000	1.001	39.8	8.3	1.926	2.523	0.048	0.0	70	0.796
7.001	1.003	70.9	32.7	2.523	2.395	0.195	0.0	143	0.984
7.002	1.002	110.7	41.8	2.395	2.181	0.258	0.0	159	0.934
7.003	2.382	263.1	59.5	2.181	2.327	0.373	0.0	120	1.938
8.000	1.000	70.7	20.5	1.688	2.327	0.118	0.0	110	0.870

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
7.004	25	49	26.264	0.600	41.870	41.720	0.150	174.7	450	7.14	43.3
7.005	49	30	30.740	0.600	41.645	41.582	0.063	487.9	525	7.65	41.9
7.006	30	31	28.015	0.600	41.507	41.451	0.056	500.0	600	8.08	40.7
7.007	31	37	28.496	0.600	41.451	41.020	0.431	66.2	600	8.24	40.3
5.010	37	38	54.591	0.012	40.870	40.672	0.198	275.7	750	8.79	39.0
1.013	38	38_OUT	11.145	0.600	40.672	40.650	0.022	506.6	750	9.59	37.2
9.000	26	48	21.013	0.600	41.917	41.689	0.228	92.2	225	5.26	49.9
9.001	48	27	28.209	0.600	41.689	41.179	0.510	55.3	225	5.52	48.9
10.000	29	28	24.815	0.600	41.577	41.290	0.287	86.5	225	5.29	49.8
10.001	28	27	15.734	0.600	41.290	41.179	0.111	141.7	225	5.53	48.9
9.002	27	55	7.547	0.600	41.104	41.073	0.031	243.5	300	5.66	48.4
9.003	55	54	20.008	0.600	41.073	40.991	0.082	244.0	300	5.99	47.0
9.004	54	52	38.268	0.600	40.991	40.834	0.157	243.7	300	6.63	44.9
9.005	52	51	25.460	0.600	40.834	40.730	0.104	244.8	300	7.05	43.5
9.006	51	50	19.432	0.600	40.730	40.650	0.080	242.9	300	7.37	42.6
11.000	39	40	9.176	0.600	40.500	40.426	0.074	124.0	300	5.11	50.0
11.001	40	40_OUT	6.278	0.600	40.426	40.400	0.026	241.5	300	5.21	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
7.004	1.535	244.1	83.8	2.327	1.969	0.535	0.0	181	1.397
7.005	1.007	218.0	97.6	1.969	1.250	0.645	0.0	246	0.980
7.006	1.082	305.9	102.9	1.250	1.563	0.700	0.0	239	0.979
7.007	2.996	847.2	113.4	1.563	1.720	0.778	0.0	147	2.117
5.010	1.644	726.3	222.6	1.720	1.047	1.581	0.0	285	1.445
1.013	1.236	546.1	361.2	1.047	0.600	2.687	0.0	446	1.316
9.000	1.362	54.2	10.3	1.325	1.250	0.057	0.0	66	1.055
9.001	1.762	70.1	12.4	1.250	1.155	0.070	0.0	64	1.335
10.000	1.407	55.9	7.3	1.265	1.250	0.041	0.0	55	0.981
10.001	1.096	43.6	16.6	1.250	1.155	0.094	0.0	96	1.024
9.002	1.003	70.9	30.0	1.155	1.191	0.172	0.0	136	0.963
9.003	1.002	70.8	29.2	1.191	0.817	0.172	0.0	134	0.954
9.004	1.002	70.9	29.2	0.817	1.261	0.180	0.0	134	0.955
9.005	1.000	70.7	36.2	1.261	1.409	0.230	0.0	152	1.006
9.006	1.004	71.0	35.5	1.409	1.050	0.230	0.0	150	1.003
11.000	1.410	99.7	0.0	1.200	1.174	0.000	0.0	0	0.000
11.001	1.007	71.2	0.0	1.174	1.200	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	36.181	19.2	225	PH1	47.776	46.131	1.420	46.347	44.244	1.878
1.001	20.458	77.9	225	PH1	46.347	44.244	1.878	45.704	43.981	1.498
1.002	30.424	84.0	300	PH1	45.704	43.906	1.498	45.094	43.544	1.250
1.003	15.744	75.9	300	PH1	45.094	43.544	1.250	44.894	43.337	1.257
1.004	52.086	60.3	375	PH1	44.894	43.262	1.257	44.179	42.398	1.406
1.005	44.956	83.3	450	PH1	44.179	42.323	1.406	43.546	41.783	1.313
1.006	15.800	114.3	450	PH1	43.546	41.783	1.313	43.455	41.645	1.360
1.007	24.074	93.1	525	PH1	43.455	41.570	1.360	43.230	41.311	1.394
1.008	20.627	319.3	525	PH1	43.230	41.311	1.394	43.036	41.247	1.264
1.009	14.942	154.5	525	PH1	43.036	41.247	1.264	42.800	41.150	1.125
2.000	17.621	66.5	225	PH1	43.889	42.189	1.475	43.493	41.924	1.344
3.000	9.000	100.0	150	PH1	43.270	42.089	1.031	43.493	41.999	1.344
2.001	57.263	244.7	300	PH1	43.493	41.849	1.344	43.399	41.615	1.484
4.000	23.110	30.9	225	PH1	43.914	42.439	1.250	43.399	41.690	1.484
2.002	29.260	321.5	375	PH1	43.399	41.540	1.484	42.776	41.449	0.952
2.003	60.656	407.1	450	PH1	42.776	41.374	0.952	42.800	41.225	1.125
1.010	29.737	504.0	675	PH1	42.800	41.000	1.125	42.797	40.941	1.181
1.011	34.040	500.6	675	PH1	42.797	40.941	1.181	42.650	40.873	1.102
1.012	62.806	498.5	675	PH1	42.650	40.873	1.102	42.469	40.747	1.047
5.000	29.505	49.8	225	PH1	47.844	46.369	1.250	47.252	45.777	1.250
5.001	27.879	49.9	225	PH1	47.252	45.777	1.250	46.694	45.218	1.251
5.002	53.563	41.5	300	PH1	46.694	45.143	1.251	45.621	43.852	1.469
5.003	16.701	37.8	375	PH1	45.621	43.777	1.469	45.351	43.336	1.640
5.004	10.213	319.2	375	PH1	45.351	43.336	1.640	45.351	43.304	1.672
5.005	30.542	17.6	375	PH1	45.351	43.304	1.672	43.742	41.567	1.800

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	43	1350	Manhole	Adoptable	44	1200	Manhole	Adoptable
1.001	44	1200	Manhole	Adoptable	6	1350	Manhole	Adoptable
1.002	6	1350	Manhole	Adoptable	41	1350	Manhole	Adoptable
1.003	41	1350	Manhole	Adoptable	7	1350	Manhole	Adoptable
1.004	7	1350	Manhole	Adoptable	8	1350	Manhole	Adoptable
1.005	8	1350	Manhole	Adoptable	9	1350	Manhole	Adoptable
1.006	9	1350	Manhole	Adoptable	10	1500	Manhole	Adoptable
1.007	10	1500	Manhole	Adoptable	11	1500	Manhole	Adoptable
1.008	11	1500	Manhole	Adoptable	42	1500	Manhole	Adoptable
1.009	42	1500	Manhole	Adoptable	18	1800	Manhole	Adoptable
2.000	12	1350	Manhole	Adoptable	13	1350	Manhole	Adoptable
3.000	56	1350	Manhole	Adoptable	13	1350	Manhole	Adoptable
2.001	13	1350	Manhole	Adoptable	45	1350	Manhole	Adoptable
4.000	15	1350	Manhole	Adoptable	45	1350	Manhole	Adoptable
2.002	45	1350	Manhole	Adoptable	16	1350	Manhole	Adoptable
2.003	16	1350	Manhole	Adoptable	18	1800	Manhole	Adoptable
1.010	18	1800	Manhole	Adoptable	19	1800	Manhole	Adoptable
1.011	19	1800	Manhole	Adoptable	21	1800	Manhole	Adoptable
1.012	21	1800	Manhole	Adoptable	38	1800	Manhole	Adoptable
5.000	1	1350	Manhole	Adoptable	2	1350	Manhole	Adoptable
5.001	2	1350	Manhole	Adoptable	3	1350	Manhole	Adoptable
5.002	3	1350	Manhole	Adoptable	4	1350	Manhole	Adoptable
5.003	4	1350	Manhole	Adoptable	5	1350	Manhole	Adoptable
5.004	5	1350	Manhole	Adoptable	46	Junction		
5.005	46		Junction		47	Junction		

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
6.000	30.542	21.7	500	0.5mSwale	45.351	44.652	0.199	43.742	43.242	0.000
5.006	23.533	294.2	375	PH1	43.742	41.567	1.800	43.364	41.487	1.502
5.007	24.490	376.8	450	PH1	43.364	41.412	1.502	43.263	41.347	1.466
5.008	22.375	372.9	450	PH1	43.263	41.347	1.466	43.267	41.287	1.530
5.009	43.845	374.7	450	PH1	43.267	41.287	1.530	43.340	41.170	1.720
7.000	44.901	169.4	225	PH1	45.151	43.000	1.926	45.483	42.735	2.523
7.001	27.529	243.6	300	PH1	45.483	42.660	2.523	45.242	42.547	2.395
7.002	28.117	323.2	375	PH1	45.242	42.472	2.395	44.941	42.385	2.181
7.003	25.538	58.0	375	PH1	44.941	42.385	2.181	44.647	41.945	2.327
8.000	44.054	244.7	300	PH1	44.188	42.200	1.688	44.647	42.020	2.327
7.004	26.264	174.7	450	PH1	44.647	41.870	2.327	44.139	41.720	1.969
7.005	30.740	487.9	525	PH1	44.139	41.645	1.969	43.357	41.582	1.250
7.006	28.015	500.0	600	PH1	43.357	41.507	1.250	43.614	41.451	1.563
7.007	28.496	66.2	600	PH1	43.614	41.451	1.563	43.340	41.020	1.720
5.010	54.591	275.7	750	PH1	43.340	40.870	1.720	42.469	40.672	1.047
1.013	11.145	506.6	750	PH1	42.469	40.672	1.047	42.000	40.650	0.600
9.000	21.013	92.2	225	PH1	43.467	41.917	1.325	43.164	41.689	1.250
9.001	28.209	55.3	225	PH1	43.164	41.689	1.250	42.559	41.179	1.155
10.000	24.815	86.5	225	PH1	43.067	41.577	1.265	42.765	41.290	1.250
10.001	15.734	141.7	225	PH1	42.765	41.290	1.250	42.559	41.179	1.155
9.002	7.547	243.5	300	PH1	42.559	41.104	1.155	42.564	41.073	1.191
9.003	20.008	244.0	300	PH1	42.564	41.073	1.191	42.108	40.991	0.817
9.004	38.268	243.7	300	PH1	42.108	40.991	0.817	42.395	40.834	1.261
9.005	25.460	244.8	300	PH1	42.395	40.834	1.261	42.439	40.730	1.409
9.006	19.432	242.9	300	PH1	42.439	40.730	1.409	42.000	40.650	1.050

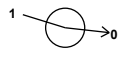
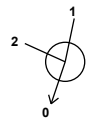
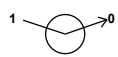
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
6.000	46		Junction		47		Junction	
5.006	47		Junction		35	1350	Manhole	Adoptable
5.007	35	1350	Manhole	Adoptable	36	1500	Manhole	Adoptable
5.008	36	1500	Manhole	Adoptable	57	1350	Manhole	Adoptable
5.009	57	1350	Manhole	Adoptable	37	1800	Manhole	Adoptable
7.000	33	1350	Manhole	Adoptable	32	1350	Manhole	Adoptable
7.001	32	1350	Manhole	Adoptable	22	1350	Manhole	Adoptable
7.002	22	1350	Manhole	Adoptable	23	1350	Manhole	Adoptable
7.003	23	1350	Manhole	Adoptable	25	1350	Manhole	Adoptable
8.000	24	1200	Manhole	Adoptable	25	1350	Manhole	Adoptable
7.004	25	1350	Manhole	Adoptable	49	1500	Manhole	Adoptable
7.005	49	1500	Manhole	Adoptable	30	1500	Manhole	Adoptable
7.006	30	1500	Manhole	Adoptable	31	1500	Manhole	Adoptable
7.007	31	1500	Manhole	Adoptable	37	1800	Manhole	Adoptable
5.010	37	1800	Manhole	Adoptable	38	1800	Manhole	Adoptable
1.013	38	1800	Manhole	Adoptable	38_OUT		Junction	
9.000	26	1350	Manhole	ADOPTABLE	48	1350	Manhole	Adoptable
9.001	48	1350	Manhole	Adoptable	27	1350	Manhole	Adoptable
10.000	29	1500	Manhole	Adoptable	28	1350	Manhole	Adoptable
10.001	28	1350	Manhole	Adoptable	27	1350	Manhole	Adoptable
9.002	27	1350	Manhole	Adoptable	55	1350	Manhole	Adoptable
9.003	55	1350	Manhole	Adoptable	54	1200	Manhole	Adoptable
9.004	54	1200	Manhole	Adoptable	52	1350	Manhole	Adoptable
9.005	52	1350	Manhole	Adoptable	51	1200	Manhole	Adoptable
9.006	51	1200	Manhole	Adoptable	50		Junction	

Pipeline Schedule

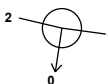
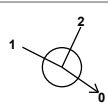
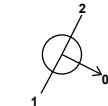
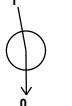
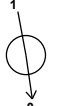
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
11.000	9.176	124.0	300	PH1	42.000	40.500	1.200	41.900	40.426	1.174
11.001	6.278	241.5	300	PH1	41.900	40.426	1.174	41.900	40.400	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
11.000	39		Junction		40	1800	Manhole	Adoptable
11.001	40	1800	Manhole	Adoptable	40_OUT	1200	Manhole	Adoptable

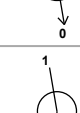
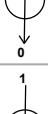
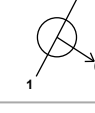
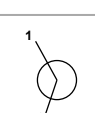
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
16	473784.332	168143.845	42.776	1.402	1350		1 2.002	41.449	375
3	473646.245	168163.761	46.694	1.551	1350		1 5.001	45.218	225
10	473715.089	168089.301	43.455	1.885	1500		1 1.006	41.645	450
39	473748.102	167975.212	42.000	1.500			0 11.000	40.500	300
48	473621.436	167885.704	43.164	1.475	1350		1 9.000	41.689	225
40_OUT	473755.657	167988.657	41.900	1.500	1200		1 11.001	40.400	300
40	473752.169	167983.437	41.900	1.474	1800		1 11.000	40.426	300
19	473762.380	168056.307	42.797	1.856	1800		1 1.010	40.941	675
18	473771.831	168084.502	42.800	1.800	1800		1 2.003	41.225	450
11	473737.944	168081.738	43.230	1.919	1500		1 1.007	41.311	525
							0 1.008	41.311	525

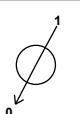
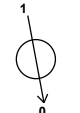
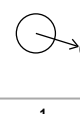
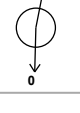
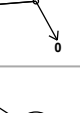
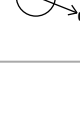
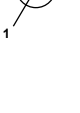
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
15	473732.858	168152.983	43.914	1.475	1350	 0	4.000	42.439	225
13	473764.312	168206.705	43.493	1.644	1350	1 	3.000	41.999	150
						2 2	2.000	41.924	225
						0 0	2.001	41.849	300
12	473747.160	168210.745	43.889	1.700	1350	 0	2.000	42.189	225
21	473748.242	168025.342	42.650	1.777	1800	 1 0	1.011	40.873	675
38_OUT	473730.743	167962.141	42.000	1.440		0 	1.012	40.873	675
						1 	1.013	40.650	750
38	473721.575	167968.478	42.469	1.797	1800	1 2 	5.010	40.672	750
						2 0	1.012	40.747	675
						0 0	1.013	40.672	750
37	473672.869	167993.134	43.340	2.470	1800	1 2 	7.007	41.020	600
						2 0	5.009	41.170	450
						0 0	5.010	40.870	750
36	473702.569	168052.319	43.263	1.916	1500	 1 0	5.007	41.347	450
33	473655.035	168080.138	45.151	2.151	1350	1 	7.000	43.000	225
						0 0	7.000	42.735	225
32	473634.789	168040.061	45.483	2.823	1350	 1 0	7.001	42.660	300
9	473714.933	168105.100	43.546	1.763	1350	 1 0	1.005	41.783	450
5	473658.409	168094.569	45.351	2.015	1350	1 	5.003	43.336	375
						0 0	5.004	43.336	375
4	473656.021	168111.098	45.621	1.844	1350	 1 0	5.002	43.852	300
						0 0	5.003	43.777	375

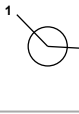
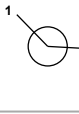
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	473635.772	168220.181	47.844	1.475	1350		0	5.000	46.369	225
8	473706.840	168149.322	44.179	1.856	1350		1	1.004	42.398	375
							0	1.005	42.323	450
7	473698.572	168200.748	44.894	1.632	1350		1	1.003	43.337	300
							0	1.004	43.262	375
6	473704.857	168246.339	45.704	1.798	1350		1	1.001	43.981	225
							0	1.002	43.906	300
29	473645.568	167922.785	43.067	1.490	1500		0	10.000	41.577	225
28	473649.724	167898.321	42.765	1.475	1350		1	10.000	41.290	225
							0	10.001	41.290	225
27	473649.472	167882.589	42.559	1.455	1350		1	10.001	41.179	225
							2	9.001	41.179	225
							0	9.002	41.104	300
30	473647.411	167942.703	43.357	1.850	1500		1	7.005	41.582	525
							0	7.006	41.507	600
31	473659.377	167968.034	43.614	2.163	1500		1	7.006	41.451	600
							0	7.007	41.451	600
25	473596.793	167968.320	44.647	2.777	1350		1	8.000	42.020	300
							2	7.003	41.945	375
							0	7.004	41.870	450
22	473621.932	168015.719	45.242	2.770	1350		1	7.001	42.547	300
							0	7.002	42.472	375
24	473576.136	167929.409	44.188	1.988	1200		0	8.000	42.200	300
35	473710.382	168075.529	43.364	1.952	1350		1	5.006	41.487	375
							0	5.007	41.412	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
23	473608.550	167990.991	44.941	2.556	1350	 1 0	7.002	42.385	375
2	473641.157	168191.172	47.252	1.475	1350	 1 0	5.000	45.777	225
26	473601.358	167891.904	43.467	1.550	1350	 0	9.000	41.917	225
41	473698.989	168216.486	45.094	1.550	1350	 1 0	1.002	43.544	300
42	473757.436	168088.487	43.036	1.789	1500	 1 0	1.008	41.247	525
43	473648.586	168249.843	47.776	1.645	1350	 0	1.009	41.247	525
44	473684.765	168250.173	46.347	2.103	1200	 1 0	1.000	46.131	225
45	473755.745	168150.086	43.399	1.859	1350	 1 0	1.001	44.244	225
46	473668.583	168093.674	45.351	2.047		 1 0-1 0-2	4.000 2.001 2.002	41.690 41.615 41.540	225 300 375
47	473699.025	168096.140	43.742	2.175		 2 0	5.004 5.005	43.304 43.242	375 500
49	473618.840	167954.046	44.139	2.494	1500	 1 0	6.000 5.005	43.242 41.567	500 375
50	473722.233	167939.632	42.000	1.440		 1 0	7.004 7.005	41.720 41.645	450 525
51	473704.146	167932.528	42.439	1.709	1200	 1 0	9.006 9.006	40.650 40.730	300 300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
52	473691.183	167910.615	42.395	1.561	1350		1	9.004	40.834	300
54	473674.711	167876.074	42.108	1.117	1200		1	9.005	40.834	300
							0	9.003	40.991	300
55	473654.734	167877.179	42.564	1.491	1350		1	9.004	40.991	300
							0	9.002	41.073	300
56	473773.230	168205.496	43.270	1.181	1350		0	9.003	41.073	300
							0	3.000	42.089	150
57	473692.574	168032.301	43.267	1.980	1350		1	5.008	41.287	450
							0	5.009	41.287	450

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	2 year (l/s)	6.4
Rainfall Events	Singular	Drain Down Time (mins)	240	30 year (l/s)	32.4
Summer CV	1.000	Additional Storage (m³/ha)	0.0	100 year (l/s)	45.0
Winter CV	1.000	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Detailed	Check Discharge Rate(s)	✓		

Storm Durations

60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	5	0
30	0	5	0
100	40	5	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	1.000	Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	4	Q 1 year (l/s)	
SPR	0.47	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Node 40 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	40.426	Product Number	CTL-SHE-0125-6300-0397-6300
Design Depth (m)	0.397	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.3	Min Node Diameter (mm)	1200

Node 40 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	40.857	Product Number	CTL-SHE-0228-2570-0500-2570
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	25.7	Min Node Diameter (mm)	1500

Node 40 Online Weir Control

Flap Valve	x	Invert Level (m)	41.550	Discharge Coefficient	0.590
Replaces Downstream Link	x	Width (m)	1.500		

Node 38 OUT Online Orifice Control

Flap Valve	x	Invert Level (m)	40.560	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.975		

Node 50 Online Orifice Control

Flap Valve	x	Invert Level (m)	40.560	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.375		

Node 26- Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	70.0	125.0	0.400	70.0	140.9	0.401	0.0	140.9

Node 39 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	30.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	40.500	Main Channel Slope (1:X)	500.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.035

Inlets

50 | 38_OUT

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1918.0	1918.0	1.500	3083.7	3238.1

Results for 2 year +5% A Critical Storm Duration. Lowest mass balance: 99.72%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	16	34	41.521	0.147	33.0	0.2101	0.0000	OK
60 minute summer	3	33	45.230	0.087	31.9	0.1245	0.0000	OK
60 minute summer	10	34	41.704	0.135	63.1	0.2377	0.0000	OK
600 minute winter	39	600	40.854	0.354	55.0	0.0000	0.0000	SURCHARGED
60 minute summer	48	33	41.740	0.051	7.9	0.0735	0.0000	OK
120 minute summer	40_OUT	64	40.460	0.060	6.5	0.0000	0.0000	OK
600 minute winter	40	600	40.854	0.428	27.9	1.0887	0.0000	SURCHARGED
60 minute summer	19	35	41.176	0.235	105.4	0.5968	0.0000	OK
60 minute summer	18	35	41.250	0.250	105.8	0.6366	0.0000	OK
60 minute summer	11	34	41.492	0.181	63.3	0.3200	0.0000	OK
60 minute summer	15	33	42.471	0.032	4.0	0.0458	0.0000	OK
60 minute summer	13	34	41.944	0.095	15.1	0.1366	0.0000	OK
60 minute summer	12	33	42.244	0.055	8.0	0.0794	0.0000	OK
60 minute summer	21	36	41.118	0.245	112.1	0.6246	0.0000	OK
60 minute summer	38_OUT	36	40.906	0.346	286.2	0.0000	0.0000	OK
60 minute summer	38	35	41.048	0.376	289.3	0.9576	0.0000	OK
60 minute summer	37	34	41.142	0.272	173.6	0.6927	0.0000	OK
60 minute summer	36	34	41.565	0.218	70.8	0.3850	0.0000	OK
60 minute summer	33	33	43.055	0.055	5.4	0.0793	0.0000	OK
60 minute summer	32	33	42.775	0.115	22.0	0.1642	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	16	2.003	18	32.5	0.815	0.204	2.4192	
60 minute summer	3	5.002	4	31.8	1.886	0.184	0.9021	
60 minute summer	10	1.007	11	63.3	1.161	0.126	1.3189	
600 minute winter	39	11.000	40	27.9	0.567	0.280	0.6462	
60 minute summer	48	9.001	27	7.9	1.167	0.112	0.1902	
600 minute winter	40	11.001	40_OUT	6.2	0.631	0.088	0.0634	247.5
60 minute summer	19	1.011	21	105.3	0.934	0.253	3.8591	
60 minute summer	18	1.010	19	105.4	0.922	0.254	3.4236	
60 minute summer	11	1.008	42	63.2	1.028	0.234	1.2699	
60 minute summer	15	4.000	45	4.0	1.172	0.043	0.0788	
60 minute summer	13	2.001	45	14.8	0.789	0.210	1.0770	
60 minute summer	12	2.000	13	8.0	1.081	0.125	0.1304	
60 minute summer	21	1.012	38	110.6	0.820	0.265	8.5147	
60 minute summer	38_OUT	Flow through Pond	39	220.4	0.066	0.002	329.8687	
60 minute summer	38	1.013	38_OUT	286.2	1.415	0.524	2.2540	
60 minute summer	37	5.010	38	172.8	0.963	0.238	9.9647	
60 minute summer	36	5.008	57	70.8	0.932	0.442	1.7096	
60 minute summer	33	7.000	32	5.3	0.704	0.133	0.3387	
60 minute summer	32	7.001	22	21.9	0.896	0.309	0.6735	

Results for 2 year +5% A Critical Storm Duration. Lowest mass balance: 99.72%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	9	34	41.935	0.152	63.4	0.2179	0.0000	OK
60 minute summer	5	33	43.501	0.165	48.9	0.2363	0.0000	OK
60 minute summer	4	33	43.872	0.095	46.6	0.1354	0.0000	OK
60 minute summer	1	33	46.415	0.046	6.7	0.0653	0.0000	OK
60 minute summer	8	33	42.443	0.120	57.1	0.1718	0.0000	OK
60 minute summer	7	33	43.353	0.091	34.2	0.1308	0.0000	OK
60 minute summer	6	33	43.990	0.084	19.6	0.1202	0.0000	OK
60 minute summer	29	33	41.620	0.043	4.6	0.0767	0.0000	OK
60 minute summer	28	33	41.368	0.078	10.7	0.1113	0.0000	OK
60 minute summer	27	33	41.224	0.120	19.4	0.1715	0.0000	OK
60 minute summer	30	34	41.699	0.193	78.1	0.3403	0.0000	OK
60 minute summer	31	34	41.587	0.136	86.7	0.2402	0.0000	OK
60 minute summer	25	33	42.032	0.162	60.1	0.2321	0.0000	OK
60 minute summer	22	33	42.600	0.128	29.1	0.1832	0.0000	OK
60 minute summer	24	33	42.290	0.090	13.4	0.1018	0.0000	OK
60 minute summer	35	34	41.613	0.201	56.1	0.2878	0.0000	OK
60 minute summer	23	33	42.492	0.107	42.1	0.1536	0.0000	OK
60 minute summer	2	33	45.853	0.076	18.1	0.1091	0.0000	OK
60 minute summer	26	33	41.970	0.053	6.5	0.0757	0.0000	OK
60 minute summer	41	33	43.627	0.083	21.1	0.1191	0.0000	OK
60 minute summer	42	34	41.410	0.163	63.2	0.2885	0.0000	OK
60 minute summer	43	33	46.171	0.040	8.1	0.0567	0.0000	OK
60 minute summer	44	33	44.324	0.081	14.7	0.0911	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	9	1.006	10	63.1	1.434	0.209	0.6956	
60 minute summer	5	5.004	46	48.7	1.557	0.437	0.3262	
60 minute summer	4	5.003	5	46.5	1.375	0.143	0.5720	
60 minute summer	1	5.000	2	6.7	0.774	0.091	0.2592	
60 minute summer	8	1.005	9	56.9	1.408	0.161	1.8211	
60 minute summer	7	1.004	8	33.8	1.645	0.131	1.0733	
60 minute summer	6	1.002	41	19.5	1.220	0.161	0.4872	
60 minute summer	29	10.000	28	4.6	0.536	0.082	0.2172	
60 minute summer	28	10.001	27	10.7	0.897	0.245	0.1870	
60 minute summer	27	9.002	55	19.4	0.761	0.273	0.1923	
60 minute summer	30	7.006	31	78.3	1.253	0.256	1.7622	
60 minute summer	31	7.007	37	86.6	1.902	0.102	1.2993	
60 minute summer	25	7.004	49	59.9	1.233	0.245	1.2764	
60 minute summer	22	7.002	23	29.1	0.984	0.263	0.8318	
60 minute summer	24	8.000	25	13.3	0.766	0.188	0.7634	
60 minute summer	35	5.007	36	56.2	0.778	0.353	1.7703	
60 minute summer	23	7.003	25	41.8	1.691	0.159	0.6318	
60 minute summer	2	5.001	3	18.1	1.539	0.245	0.3274	
60 minute summer	26	9.000	48	6.5	0.935	0.120	0.1462	
60 minute summer	41	1.003	7	21.0	1.339	0.164	0.2472	
60 minute summer	42	1.009	18	62.8	1.222	0.161	0.7706	
60 minute summer	43	1.000	44	8.1	0.960	0.068	0.3157	
60 minute summer	44	1.001	6	14.7	1.195	0.249	0.2509	

Results for 2 year +5% A Critical Storm Duration. Lowest mass balance: 99.72%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	45	33	41.691	0.151	32.2	0.2154	0.0000	OK
60 minute summer	46	33	43.384	0.080	48.7	0.0000	0.0000	OK
60 minute summer	47	34	41.745	0.178	48.8	0.0000	0.0000	OK
60 minute summer	49	34	41.857	0.212	72.0	0.3751	0.0000	OK
600 minute winter	50	600	40.855	0.295	4.7	0.0000	0.0000	OK
600 minute winter	51	585	40.857	0.127	4.7	0.1433	0.0000	OK
60 minute summer	52	34	40.962	0.128	25.6	0.1829	0.0000	OK
60 minute summer	54	34	41.101	0.110	20.1	0.1245	0.0000	OK
60 minute summer	55	33	41.188	0.115	19.4	0.1639	0.0000	OK
60 minute summer	56	1	42.089	0.000	0.0	0.0000	0.0000	OK
60 minute summer	57	35	41.507	0.220	70.8	0.3145	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	45	2.002	16	31.9	0.858	0.288	1.0902	
60 minute summer	46	5.005	47	48.8	1.464	0.102	1.0440	
60 minute summer	46	6.000	47	0.0	0.000	0.000	0.0005	
60 minute summer	47	5.006	35	48.7	1.014	0.440	1.1295	
60 minute summer	49	7.005	30	72.2	0.992	0.331	2.2401	
600 minute winter	50	Flow through Pond	39	38.1	0.023	0.000	663.1442	
600 minute winter	51	9.006	50	4.7	0.577	0.066	0.7690	
60 minute summer	52	9.005	51	25.6	0.903	0.362	0.7210	
60 minute summer	54	9.004	52	20.2	0.778	0.285	0.9955	
60 minute summer	55	9.003	54	19.3	0.805	0.273	0.4811	
60 minute summer	56	3.000	13	0.0	0.000	0.000	0.0000	
60 minute summer	57	5.009	37	70.1	1.022	0.439	3.0093	

Results for 30 year +5% A Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	16	36	41.687	0.313	102.2	0.4475	0.0000	OK
60 minute summer	3	33	45.306	0.163	98.4	0.2327	0.0000	OK
60 minute summer	10	33	41.842	0.272	195.7	0.4813	0.0000	OK
360 minute winter	39	336	41.123	0.623	99.6	0.0000	0.0000	SURCHARGED
60 minute summer	48	33	41.780	0.091	24.5	0.1306	0.0000	OK
360 minute winter	40_OUT	336	40.539	0.139	32.7	0.0000	0.0000	OK
360 minute winter	40	336	41.114	0.688	32.7	1.7510	0.0000	SURCHARGED
60 minute summer	19	35	41.577	0.636	298.7	1.6183	0.0000	OK
60 minute summer	18	35	41.623	0.623	321.6	1.5858	0.0000	OK
60 minute summer	11	35	41.716	0.405	195.7	0.7152	0.0000	OK
60 minute summer	15	33	42.494	0.055	12.2	0.0781	0.0000	OK
60 minute summer	13	33	42.028	0.179	46.7	0.2563	0.0000	OK
60 minute summer	12	33	42.292	0.103	24.8	0.1470	0.0000	OK
60 minute summer	21	35	41.545	0.672	321.5	1.7094	0.0000	OK
60 minute summer	38_OUT	35	41.295	0.735	850.4	0.0000	0.0000	OK
60 minute summer	38	35	41.455	0.783	850.4	1.9918	0.0000	SURCHARGED
60 minute summer	37	35	41.616	0.746	545.1	1.8992	0.0000	OK
60 minute summer	36	34	41.994	0.647	217.7	1.1436	0.0000	SURCHARGED
60 minute summer	33	33	43.101	0.101	16.7	0.1440	0.0000	OK
60 minute summer	32	33	42.890	0.230	68.2	0.3285	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	16	2.003	18	100.4	0.989	0.631	8.0392	
60 minute summer	3	5.002	4	98.3	2.545	0.568	2.0694	
60 minute summer	10	1.007	11	195.7	1.399	0.389	3.4274	
360 minute winter	39	11.000	40	32.7	0.531	0.328	0.6462	
60 minute summer	48	9.001	27	24.5	1.225	0.350	0.7048	
360 minute winter	40	11.001	40_OUT	32.7	0.998	0.460	0.2060	714.4
60 minute summer	19	1.011	21	303.6	1.004	0.729	12.0039	
60 minute summer	18	1.010	19	298.7	1.076	0.720	10.3051	
60 minute summer	11	1.008	42	193.2	1.203	0.715	3.7525	
60 minute summer	15	4.000	45	12.2	1.327	0.130	0.4423	
60 minute summer	13	2.001	45	46.9	0.906	0.663	2.9740	
60 minute summer	12	2.000	13	24.8	1.403	0.388	0.3135	
60 minute summer	21	1.012	38	329.3	0.931	0.789	22.4081	
60 minute summer	38_OUT	Flow through Pond	39	469.8	0.096	0.004	1013.1937	
60 minute summer	38	1.013	38_OUT	850.4	1.967	1.557	4.6968	
60 minute summer	37	5.010	38	521.8	1.204	0.718	24.0139	
60 minute summer	36	5.008	57	218.4	1.378	1.365	3.5452	
60 minute summer	33	7.000	32	16.7	0.790	0.419	1.0383	
60 minute summer	32	7.001	22	67.9	1.248	0.958	1.4958	

Results for 30 year +5% A Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	9	33	42.089	0.306	196.7	0.4372	0.0000	OK
60 minute summer	5	33	43.647	0.311	150.9	0.4454	0.0000	OK
60 minute summer	4	33	43.971	0.193	143.8	0.2766	0.0000	OK
60 minute summer	1	33	46.450	0.081	20.5	0.1153	0.0000	OK
60 minute summer	8	33	42.545	0.222	176.8	0.3182	0.0000	OK
60 minute summer	7	33	43.428	0.167	105.5	0.2387	0.0000	OK
60 minute summer	6	33	44.066	0.160	60.2	0.2292	0.0000	OK
60 minute summer	29	33	41.654	0.077	14.2	0.1357	0.0000	OK
60 minute summer	28	33	41.448	0.158	32.9	0.2265	0.0000	OK
60 minute summer	27	34	41.365	0.261	60.0	0.3730	0.0000	OK
60 minute summer	30	33	41.846	0.340	241.0	0.6003	0.0000	OK
60 minute summer	31	32	41.691	0.241	267.6	0.4252	0.0000	OK
60 minute summer	25	33	42.220	0.350	186.7	0.5007	0.0000	OK
60 minute summer	22	33	42.711	0.239	90.0	0.3424	0.0000	OK
60 minute summer	24	32	42.370	0.170	41.3	0.1924	0.0000	OK
60 minute summer	35	34	42.090	0.678	170.5	0.9704	0.0000	SURCHARGED
60 minute summer	23	33	42.589	0.204	129.9	0.2916	0.0000	OK
60 minute summer	2	33	45.925	0.148	55.8	0.2121	0.0000	OK
60 minute summer	26	33	42.013	0.096	20.0	0.1369	0.0000	OK
60 minute summer	41	33	43.699	0.155	65.0	0.2222	0.0000	OK
60 minute summer	42	35	41.667	0.420	193.2	0.7419	0.0000	OK
60 minute summer	43	33	46.200	0.069	24.9	0.0994	0.0000	OK
60 minute summer	44	33	44.409	0.165	45.2	0.1870	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	9	1.006	10	195.7	1.876	0.647	1.6482	
60 minute summer	5	5.004	46	168.1	2.398	1.509	0.6994	
60 minute summer	4	5.003	5	143.6	1.876	0.440	1.2946	
60 minute summer	1	5.000	2	20.5	1.014	0.278	0.5974	
60 minute summer	8	1.005	9	176.5	1.827	0.498	4.3301	
60 minute summer	7	1.004	8	105.1	2.244	0.407	2.4396	
60 minute summer	6	1.002	41	60.2	1.604	0.496	1.1416	
60 minute summer	29	10.000	28	14.2	0.682	0.254	0.5185	
60 minute summer	28	10.001	27	32.8	1.075	0.753	0.5091	
60 minute summer	27	9.002	55	59.3	0.943	0.836	0.4800	
60 minute summer	30	7.006	31	241.5	1.850	0.790	3.7571	
60 minute summer	31	7.007	37	271.9	1.920	0.321	5.3602	
60 minute summer	25	7.004	49	184.8	1.424	0.757	3.4109	
60 minute summer	22	7.002	23	89.9	1.336	0.812	1.9029	
60 minute summer	24	8.000	25	41.6	0.966	0.588	2.0002	
60 minute summer	35	5.007	36	170.2	1.074	1.069	3.8803	
60 minute summer	23	7.003	25	129.7	1.831	0.493	1.8864	
60 minute summer	2	5.001	3	55.8	2.038	0.756	0.7633	
60 minute summer	26	9.000	48	20.0	1.284	0.369	0.3274	
60 minute summer	41	1.003	7	64.8	1.802	0.508	0.5663	
60 minute summer	42	1.009	18	187.7	1.354	0.482	2.9146	
60 minute summer	43	1.000	44	24.9	1.204	0.209	0.7541	
60 minute summer	44	1.001	6	45.1	1.540	0.765	0.5986	

Results for 30 year +5% A Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	45	34	41.854	0.314	100.7	0.4491	0.0000	OK
60 minute summer	46	33	43.449	0.145	168.1	0.0000	0.0000	OK
60 minute summer	47	34	42.264	0.697	151.9	0.0000	0.0000	SURCHARGED
60 minute summer	49	34	42.057	0.413	222.8	0.7292	0.0000	OK
360 minute winter	50	328	41.126	0.566	14.6	0.0000	0.0000	OK
360 minute winter	51	336	41.124	0.394	15.3	0.4451	0.0000	SURCHARGED
360 minute winter	52	328	41.124	0.290	15.3	0.4147	0.0000	OK
60 minute summer	54	34	41.233	0.242	61.4	0.2737	0.0000	OK
60 minute summer	55	34	41.321	0.248	59.3	0.3545	0.0000	OK
60 minute summer	56	1	42.089	0.000	0.0	0.0000	0.0000	OK
60 minute summer	57	34	41.863	0.576	218.4	0.8243	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	45	2.002	16	98.9	1.153	0.891	2.4853	
60 minute summer	46	5.005	47	151.9	1.729	0.317	2.2827	
60 minute summer	46	6.000	47	0.0	0.000	0.000	0.0005	
60 minute summer	47	5.006	35	147.4	1.337	1.331	2.5956	
60 minute summer	49	7.005	30	222.7	1.387	1.022	4.9078	
360 minute winter	50	Flow through Pond	39	99.6	0.056	0.001	1275.2289	
360 minute winter	51	9.006	50	14.6	0.712	0.206	1.3684	
360 minute winter	52	9.005	51	15.3	0.782	0.216	1.7838	
60 minute summer	54	9.004	52	60.9	0.936	0.860	2.4930	
60 minute summer	55	9.003	54	58.9	0.986	0.831	1.2316	
60 minute summer	56	3.000	13	0.0	0.000	0.000	0.0108	
60 minute summer	57	5.009	37	215.4	1.378	1.350	6.9426	

Results for 100 year +40% CC +5% A Critical Storm Duration. Lowest mass balance: 99.13%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	16	34	42.776	1.402	169.3	2.0063	1.8400	FLOOD
60 minute summer	3	34	46.030	0.887	172.6	1.2692	0.0000	SURCHARGED
60 minute summer	10	34	43.105	1.535	324.5	2.7128	0.0000	SURCHARGED
360 minute winter	39	352	41.538	1.038	180.2	0.0000	0.0000	SURCHARGED
60 minute summer	48	35	42.508	0.819	41.9	1.1715	0.0000	SURCHARGED
360 minute winter	40_OUT	352	40.552	0.152	38.9	0.0000	0.0000	OK
360 minute winter	40	352	41.525	1.099	39.1	2.7968	0.0000	SURCHARGED
60 minute summer	19	34	42.431	1.490	532.5	3.7917	0.0000	SURCHARGED
60 minute summer	18	34	42.601	1.601	531.1	4.0747	0.0000	FLOOD RISK
60 minute summer	11	34	42.917	1.605	323.7	2.8363	0.0000	SURCHARGED
60 minute summer	15	34	43.142	0.703	22.5	1.0064	0.0000	SURCHARGED
60 minute summer	13	34	43.356	1.507	82.0	2.1560	0.0000	FLOOD RISK
60 minute summer	12	34	43.519	1.330	45.5	1.9030	0.0000	SURCHARGED
60 minute summer	21	34	42.306	1.433	573.4	3.6474	0.0000	SURCHARGED
360 minute winter	38_OUT	336	41.618	1.058	301.6	0.0000	0.0000	OK
60 minute summer	38	34	42.005	1.333	1470.1	3.3934	0.0000	SURCHARGED
60 minute summer	37	34	42.478	1.608	853.4	4.0929	0.0000	SURCHARGED
60 minute summer	36	34	43.219	1.872	307.6	3.3077	0.0000	FLOOD RISK
60 minute summer	33	34	44.622	1.622	30.7	2.3211	0.0000	SURCHARGED
60 minute summer	32	34	44.489	1.829	116.9	2.6175	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	16	2.003	18	156.1	0.985	0.981	9.6105	
60 minute summer	3	5.002	4	160.2	2.729	0.926	3.7719	
60 minute summer	10	1.007	11	323.7	1.499	0.644	5.2008	
360 minute winter	39	11.000	40	39.1	0.592	0.392	0.6462	
60 minute summer	48	9.001	27	36.6	1.210	0.522	1.1219	
360 minute winter	40	11.001	40_OUT	38.9	1.052	0.546	0.2321	994.2
60 minute summer	19	1.011	21	534.1	1.496	1.282	12.1515	
60 minute summer	18	1.010	19	532.5	1.492	1.282	10.6155	
60 minute summer	11	1.008	42	325.3	1.506	1.204	4.4561	
60 minute summer	15	4.000	45	22.3	1.306	0.237	0.9191	
60 minute summer	13	2.001	45	70.5	1.002	0.998	4.0324	
60 minute summer	12	2.000	13	43.7	1.408	0.685	0.7008	
60 minute summer	21	1.012	38	574.0	1.608	1.375	22.4204	
360 minute winter	38_OUT	Flow through Pond	39	180.2	0.048	0.002	2328.1318	
60 minute summer	38	1.013	38_OUT	1469.7	3.340	2.691	4.9051	
60 minute summer	37	5.010	38	853.2	1.939	1.175	24.0266	
60 minute summer	36	5.008	57	310.9	1.962	1.944	3.5452	
60 minute summer	33	7.000	32	32.0	0.805	0.804	1.7858	
60 minute summer	32	7.001	22	115.4	1.639	1.629	1.9386	

Results for 100 year +40% CC +5% A Critical Storm Duration. Lowest mass balance: 99.13%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	9	34	43.381	1.597	325.7	2.2860	0.0000	FLOOD RISK
60 minute summer	5	35	44.480	1.144	250.5	1.6367	0.0000	SURCHARGED
60 minute summer	4	35	44.828	1.051	240.0	1.5042	0.0000	SURCHARGED
60 minute summer	1	35	47.099	0.730	37.7	1.0451	0.0000	SURCHARGED
60 minute summer	8	34	43.778	1.455	295.6	2.0819	0.0000	SURCHARGED
60 minute summer	7	34	44.173	0.911	186.6	1.3036	0.0000	SURCHARGED
60 minute summer	6	35	44.648	0.741	106.6	1.0609	0.0000	SURCHARGED
60 minute summer	29	35	42.571	0.994	26.2	1.7564	0.0000	SURCHARGED
60 minute summer	28	35	42.525	1.235	55.2	1.7671	0.0000	FLOOD RISK
60 minute summer	27	36	42.349	1.245	92.1	1.7814	0.0000	FLOOD RISK
60 minute summer	30	34	42.844	1.337	418.0	2.3630	0.0000	SURCHARGED
60 minute summer	31	34	42.681	1.231	465.5	2.1749	0.0000	SURCHARGED
60 minute summer	25	34	43.523	1.653	319.0	2.3648	0.0000	SURCHARGED
60 minute summer	22	34	44.161	1.689	153.1	2.4170	0.0000	SURCHARGED
60 minute summer	24	34	43.749	1.549	75.9	1.7515	0.0000	SURCHARGED
60 minute summer	35	34	43.364	1.952	262.8	2.7933	5.6453	FLOOD
60 minute summer	23	34	43.979	1.594	221.5	2.2805	0.0000	SURCHARGED
60 minute summer	2	35	46.960	1.183	99.0	1.6935	0.0000	FLOOD RISK
60 minute summer	26	35	42.587	0.670	36.7	0.9582	0.0000	SURCHARGED
60 minute summer	41	35	44.332	0.788	114.0	1.1272	0.0000	SURCHARGED
60 minute summer	42	34	42.765	1.519	325.3	2.6832	0.0000	FLOOD RISK
60 minute summer	43	33	46.227	0.096	45.7	0.1375	0.0000	OK
60 minute summer	44	35	45.184	0.940	83.0	1.0628	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	9	1.006	10	324.5	2.048	1.073	2.5034	
60 minute summer	5	5.004	46	248.6	2.541	2.232	1.1265	
60 minute summer	4	5.003	5	237.8	2.156	0.729	1.8421	
60 minute summer	1	5.000	2	38.7	1.062	0.525	1.1734	
60 minute summer	8	1.005	9	290.5	1.929	0.820	7.1230	
60 minute summer	7	1.004	8	173.6	2.335	0.673	5.7449	
60 minute summer	6	1.002	41	105.2	1.768	0.867	2.1424	
60 minute summer	29	10.000	28	21.4	0.700	0.382	0.9869	
60 minute summer	28	10.001	27	50.8	1.278	1.166	0.6258	
60 minute summer	27	9.002	55	89.7	1.275	1.266	0.5315	
60 minute summer	30	7.006	31	417.6	1.865	1.365	7.8912	
60 minute summer	31	7.007	37	465.3	1.912	0.549	8.0267	
60 minute summer	25	7.004	49	318.2	2.009	1.304	4.1614	
60 minute summer	22	7.002	23	154.3	1.399	1.394	3.1012	
60 minute summer	24	8.000	25	72.1	1.024	1.019	3.1023	
60 minute summer	35	5.007	36	265.9	1.678	1.671	3.8803	
60 minute summer	23	7.003	25	221.0	2.004	0.840	2.8168	
60 minute summer	2	5.001	3	94.4	2.374	1.279	1.1088	
60 minute summer	26	9.000	48	34.1	1.432	0.630	0.8357	
60 minute summer	41	1.003	7	112.8	2.012	0.884	1.1087	
60 minute summer	42	1.009	18	326.6	1.512	0.838	3.2280	
60 minute summer	43	1.000	44	45.7	1.403	0.383	1.0118	
60 minute summer	44	1.001	6	78.8	1.982	1.337	0.8136	

Results for 100 year +40% CC +5% A Critical Storm Duration. Lowest mass balance: 99.13%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	45	34	43.090	1.550	162.6	2.2185	0.0000	SURCHARGED
60 minute summer	46	35	44.211	0.907	248.6	0.0000	0.0000	SURCHARGED
60 minute summer	47	35	43.742	2.175	247.3	0.0000	2.9340	FLOOD
60 minute summer	49	34	43.123	1.479	385.0	2.6126	0.0000	SURCHARGED
360 minute winter	50	352	41.540	0.980	25.0	0.0000	0.0000	OK
360 minute winter	51	352	41.538	0.808	25.1	0.9138	0.0000	SURCHARGED
60 minute summer	52	36	41.752	0.918	119.9	1.3135	0.0000	SURCHARGED
60 minute summer	54	36	42.073	1.082	92.9	1.2241	0.0000	FLOOD RISK
60 minute summer	55	36	42.261	1.188	89.7	1.6999	0.0000	SURCHARGED
60 minute summer	56	34	43.270	1.181	14.8	1.6900	1.4893	FLOOD
60 minute summer	57	34	42.982	1.695	310.9	2.4254	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	45	2.002	16	163.3	1.480	1.471	3.2273	
60 minute summer	46	5.005	47	247.3	2.243	0.516	3.3687	
60 minute summer	46	6.000	47	0.0	0.000	0.000	15.2729	
60 minute summer	47	5.006	35	243.1	2.204	2.195	2.5956	
60 minute summer	49	7.005	30	384.4	1.779	1.763	6.6408	
360 minute winter	50	Flow through Pond	39	180.2	0.048	0.002	2328.1318	
360 minute winter	51	9.006	50	25.0	0.699	0.352	1.3684	
60 minute summer	52	9.005	51	118.9	1.689	1.682	1.7929	
60 minute summer	54	9.004	52	92.4	1.313	1.305	2.6948	
60 minute summer	55	9.003	54	88.7	1.260	1.253	1.4089	
60 minute summer	56	3.000	13	-14.8	-0.843	-0.836	0.1584	
60 minute summer	57	5.009	37	313.4	1.978	1.964	6.9470	



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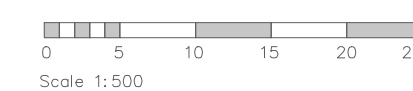
DRAINAGE NOTES:

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 the sewerage undertaker's jurisdiction.
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 - z25
 - footways and pedestrian areas - b125
 - gardens/landscaping - a15
9. All sewer pipes, up to, and including 225mm are to be vitrified clay to bs EN259. All sewer pipes 300mm diameter and above to be concrete pipe to bs EN1916. Where agreed with the adopting authority sewer pipes up to and including 600mm diameter can be PVC-U to BS EN1401.
10. All drainage shall be installed and tested strictly in accordance with the manufacturers' printed instructions, bs en 752, bs en 1560 and 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.
14. Drainage laid beneath paths, footways and pedestrian areas with less than 900mm of cover shall be similarly treated.
15. Chambers with outgoing pipes larger than 600mm diameter shall be fitted with guard bars, safety chains or other approved safety devices.
16. The use of precast concrete products made with sulphate resisting cement is mandatory, unless a laboratory report proves such precautions are not necessary.
17. All sewers to be abandoned must be surveyed to identify any blockages or connections that still live with any found to be reported to the engineer.
18. All foul and storm water drains which are not to be adopted as public sewers shall be in accordance with document 6 of the building regulations, together with nhbc standards chapter 5.3 and sb3801.
19. Where pipes pass through footings, retaining or screen walls, lintels to be provided over covers.
20. Where inverts are less than 1.0m (depth inspection chambers 0.75m to 1.00m) or for fittings (depth 2.5 to 1.00m) 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 dn300).
21. Where required 1m deep root barrier on an approved type to be installed vertically along the back edging kerb of all areas of footway/ demarcation to protect from both proposed and existing plantations.
22. 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.



G	02.26	Updated drainage design	TC	JS
F	06.25	Updated Title Block & Frame	SI	SI
D	08.24	Contours updated to suit latest layout	LC	DS
C	08.24	Updated Layout	TC	EP
B	07.24	Updated Design	TC	EP
A	07.24	First Issue	LC	DS
Rev	Date	Description	Drawn	Checked



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Client

BELLWAY HOMES

Project
**LAND NORTH OF
ARBORFIELD ROAD,
SHINFIELD**

Title
FULL APPLICATION
DRAINAGE LAYOUT
SHEET 1

Status	
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Scale 1:500 @ A1	Date JUNE 2024	Drawn LC	Checked DS
Drawing No HD008-FA-501			Revision G



KEY

- FOUL STORM
- Existing Adopted Sewer
- Proposed adoptable sewer & MH
- Highway gully and 150mmØ connection
- Headwall
- Existing Foul drainage run to be abandoned, removed and trench back filled with suitable material.
- Proposed Catchpit manhole
- Proposed Control manhole

COMPLEX CONTROL
MANHOLE LIMITS FLOW RATES TO GREENFIELD RATES DEPENDING ON THE STORM. SEE TABLE BELOW

Storm (1:24 Year)	1/s/ha	Discharge (l/s)
1 in 2	3.0	12.47
1 in 10	30.16	124.69
1 in 100	34.1	45.30

TWO HYDROBRAKES

H1 REF: CTL-SHE-6300-0397-6300
DESIGN HEAD: 0.397m
DESIGN FLOW: 6.3l/s
OUTLET DIA: 150mm
INVERT LEVEL: 40.450m

H2 REF: CTL-SHE-0229-2600-0500-2600
DESIGN HEAD: 0.500m
DESIGN FLOW: 26l/s
OUTLET DIA: 300mm
INVERT LEVEL: 40.857m

WEIR
WIDTH: 1.5m
INVERT LEVEL: 41.550m

BASIN TO CONTAIN SEDIMENTATION BED AND REED BEDS AT OUTFALL LOCATIONS TO PROVIDE WATER TREATMENT

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- All adoptable drainage works to be constructed as detailed in design and construction guidance or as stipulated in the water authorities addendum.
- All public sewers are to be the subject of a section 104 agreement of the water industry act 1991.
- Invert levels of existing manholes and sewers are to be checked on site before construction commences and results reported to engineers.
- 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.
- 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
- All sewer pipes, up to, and including 225mm are to be vitrified clay to BS EN252. All sewer pipes 300mm diameter and above to be concrete pipes to BS EN1916. Where agreed with adopting authority pipes up to and including 600mm diameter can be PVC-U to BS EN1401.
- 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.
- All bedding shall be class s unless noted otherwise.
- All trenches under existing and proposed public highways are to be backfilled with thoroughly compacted type 1 granular sub-base material.
- 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.
- Chambers with outgoing pipes greater than 600mm diameter shall be fitted with guard bars, safety chains or other approved safety devices.
- The use of precast concrete products made with sulphate resisting cement is mandatory, unless a laboratory report proves such precautions are not necessary.
- 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.
- 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.
- Where pipes pass through footings, retaining or screen walls, lintels to be provided over drains.
- Where inverters 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).
- 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.
- 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.

Scale 1:500

Rev	Date	Description	Drawn	Checked
G	02.26	Updated drainage design	TC	JS
F	06.25	Hydrobrake details and basin volume added, Updated Title Block & Frame	SI	SI
E	02.25	Updated to suit latest layout & comments.	LC	DS
D	08.24	Updated Outfall information	TC	DS
C	08.24	Updated Layout	TC	EP
B	07.24	Updated Design	TC	EP
A	07.24	First Issue	LC	DS

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Client

BELLWAY HOMES

Project

LAND NORTH OF ARBORFIELD ROAD, SHINFIELD

Title

FULL APPLICATION DRAINAGE LAYOUT SHEET 2

Status

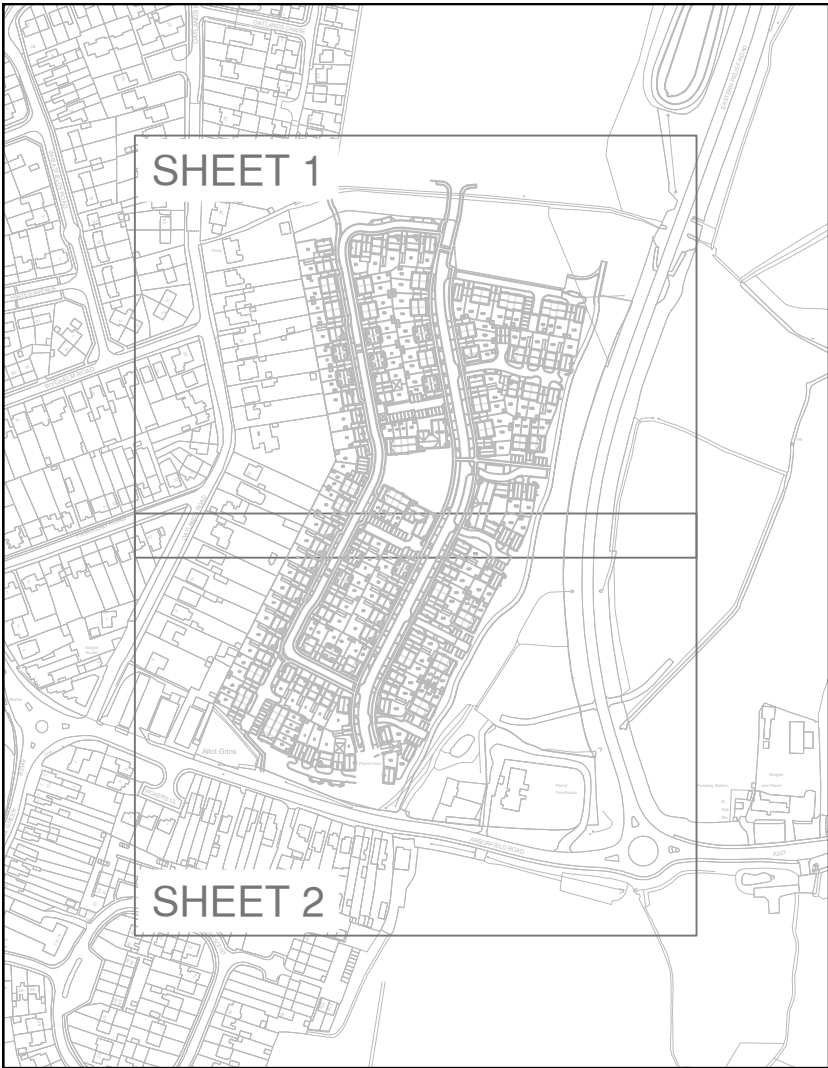
Scale	Date	Drawn	Checked
1:500 @ A1	JUNE 2024	LC	DS

Drawing No

HD008-FA-502

Revision

G



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SURFACE WATER CATCHMENT NOTES:

- Do not scale.
- 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.
- Total catchment areas shown do not include urban creep. Refer to drainage calculations.
- Catchment areas refer only to parcels under current RM application.
- Coefficient of discharge (Cv) has been modelled at 1.0 for robustness.

KEY

- Existing Adopted Sewer
- Proposed adoptable sewer & MH
- Adoptable manholes Type 4
- Highway gully and 150mmØ connection
- Headwall
- Drainage Area

0 5 10 15 20 25m
Scale 1:500

F	02/26	Updated drainage design to suit latest layout	RP	DS
E	03/25	Updated drainage design to suit latest layout & comments.	LC	DS
D	08/24	Catchments updated	TC	DS
C	08/24	Updated Layout	TC	EP
B	07/24	Updated Drainage Design	AS	DS
A	06/24	First Issue	LC	DS

Rev	Date	Description	Drawn	Checked

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Client

BELLWAY HOMES

Project

LAND NORTH OF ARBORFIELD ROAD, SHINFIELD

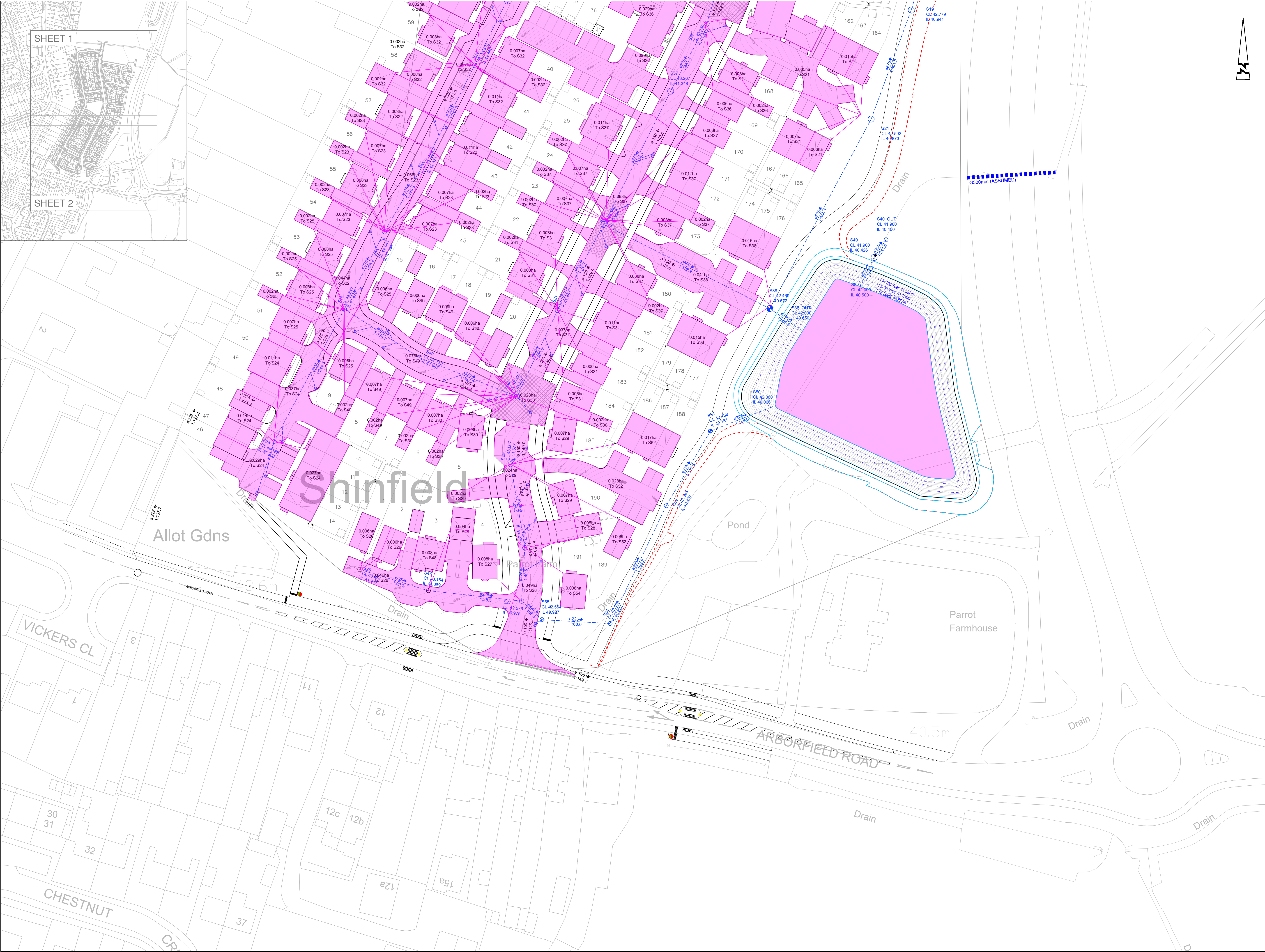
Title

FULL APPLICATION SW CATCHMENT PLAN SHEET 1

Status

Scale	Date	Drawn	Checked
1:500 @ A1	JUNE 2024	LC	DS

Drawing No	Revision
HD008-FA-511	F



SHEET 1

SHEET 2



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- SURFACE WATER CATCHMENT 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. Total catchment areas shown do not include urban creep. Refer to drainage calculations.
 4. Catchment areas refer only to parcels under current RM application.
 5. Coefficient of discharge (Cv) has been modelled at 1.0 for robustness.

- KEY**
- Existing Adopted Sewer
 - Proposed adoptable sewer & MH
 - Adoptable manholes Type 4
 - Highway gully and 150mmØ connection
 - Headwall
 - Drainage Area



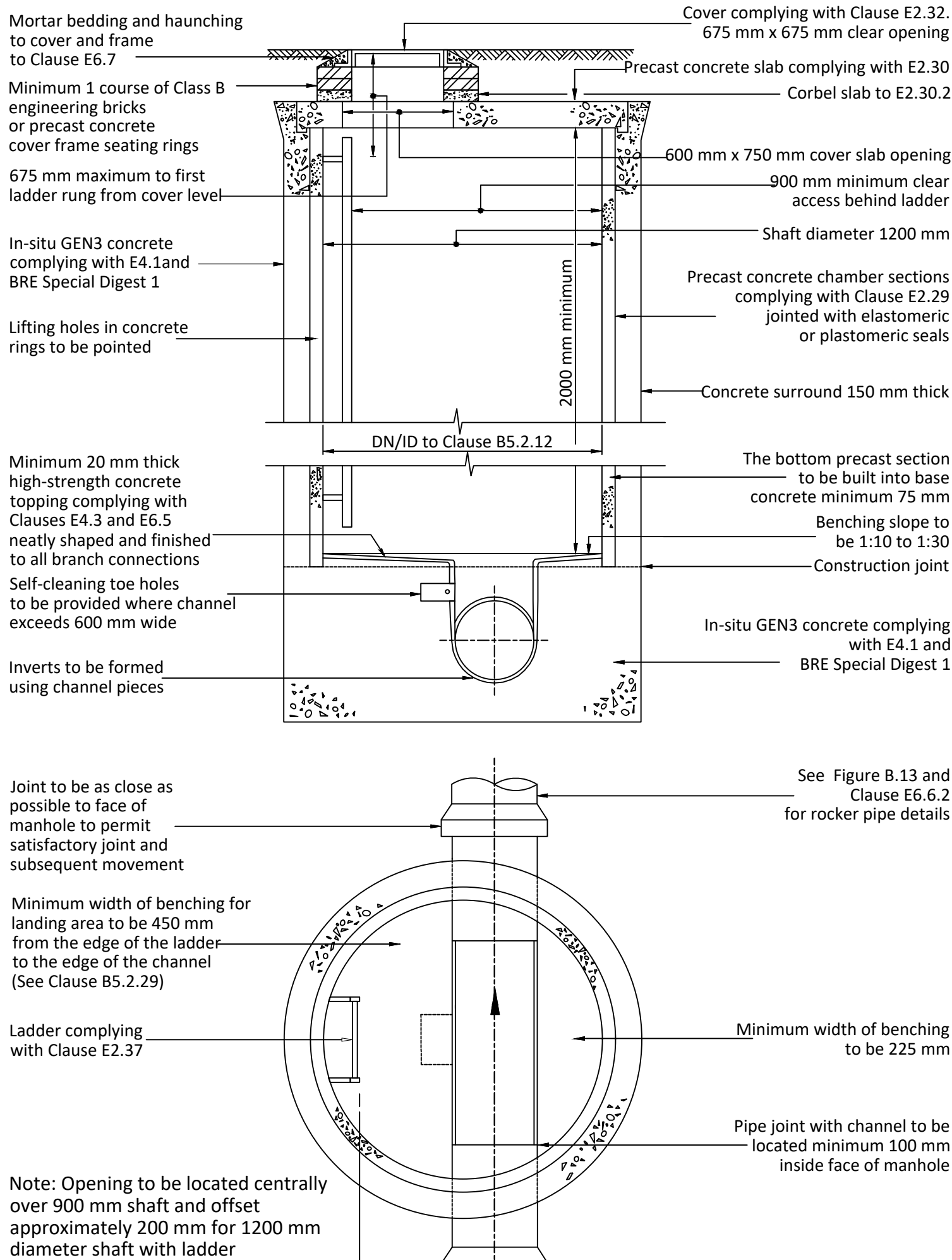
F	02/26	Updated drainage design to suit latest layout	RP	DS
E	03/25	Updated drainage design to suit latest layout & comments.	LC	DS
D	08/24	Catchments updated	TC	DS
C	08/24	Updated Layout	TC	EP
B	07/24	Updated Drainage Design	AS	DS
A	06/24	First Issue	LC	DS



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BELLWAY HOMES				
Project LAND AND NORTH OF ARBORFIELD ROAD, SHINFIELD				
Title FULL APPLICATION SW CATCHMENT PLAN SHEET 2				
Status				
Drawing No 500 @ A1		Date JUNE 2024	Drawn LC	Checked DS
Drawing No HD008-FA-512				Revision F

Figure B 7
Typical manhole cover - Type A2
Depth from cover level to soffit of pipe 3 m to 6 m with ladder
Alternative rigid material construction with concrete surround



CLASS S BEDDING
(On trafficked areas)

Nominal bore of pipe (mm)	Alternative Aggregate sizes (mm)	
	Single sized	Graded
100	10	-
150	10 or 14	14-5
225-300	14 or 20	14-5 or 20-5
375-525	14 or 20	14-5 or 20-5
>525	14, 20 or 40	14-5, 20-5 or 40-5

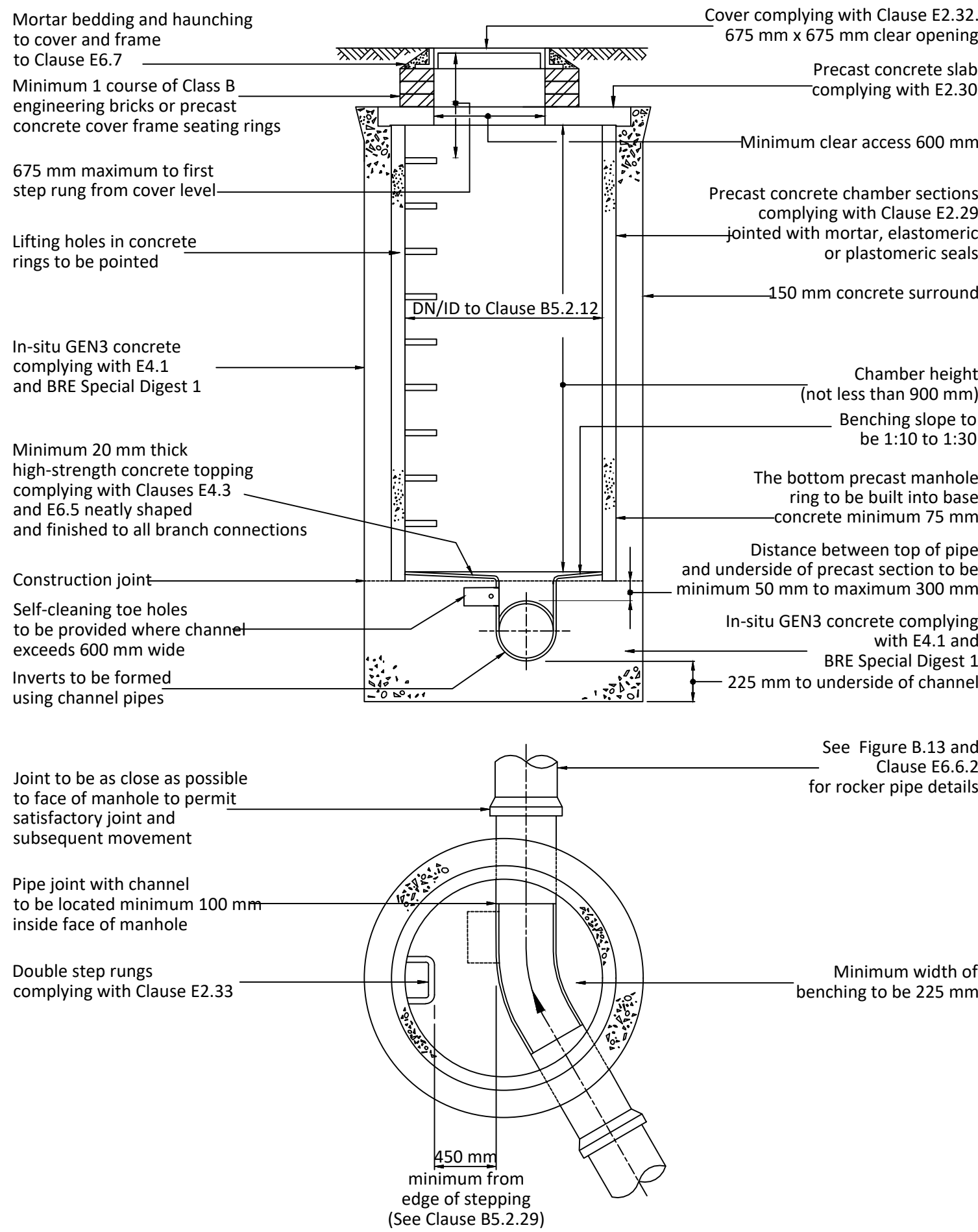
Granular bedding for pipes and backfilling material for temporary drains (trench sub-drains) shall consist of aggregates from natural sources to BS EN 13242 and BS EN 1744-1 or sintered pulverised fuel ash complying with the relevant provisions of BS 3892; sized in accordance with the above table

Selected fill material, whether selected from locally excavated material or imported, shall consist of uniform, readily compactible material, free from vegetable matter, building rubbish and frozen material, or materials susceptible to spontaneous combustion, and excluding clay of liquid limit greater than 80 and/or plastic limit greater than 55 and materials of excessively high moisture content. Clay lumps and stones shall be retained on 100mm and 40mm sieves respectively.

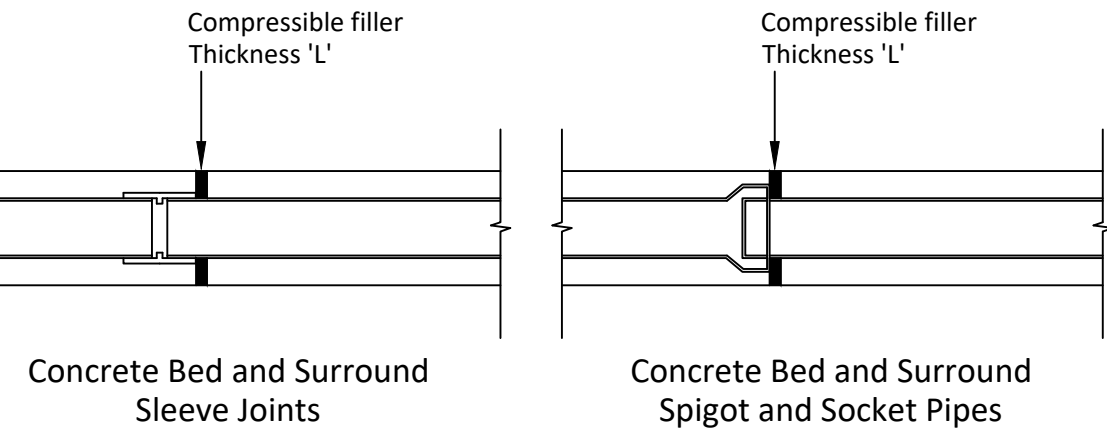
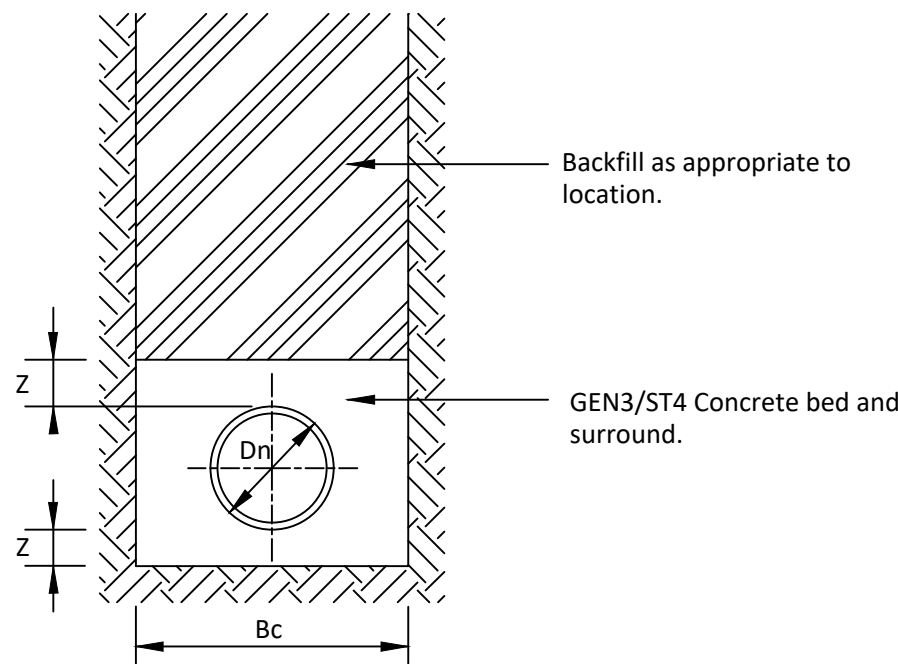
TRENCH WIDTHS & KEY DIMENSIONS

Dia Dn (mm)	Width Bc (mm)		Y (mm)		L (mm)	Z MIN (mm)
	Max	Min	Y1 (Uniform Soil)	Y2 (Rock)		
100	550	450	100	200	18	150
150	600	490	150	200		150
225	700	580	150	200		150
300	750	680	150	200	18	150
375	1050	950	150	200		150
450	1150	1030	150	200		150
525	1200	1120	150	200	36	150
600	1350	1240	150	200		150
675	1450	1330	150	200		225
750	1500	1400	150	200	36	225
825	1600	1490	150	225		225
900	2100	1900	150	225		225
975	2150	1950	175	250	300	300
1050	2250	2050	175	275		300
1200	2500	2250	200	300		300
OVER 1200	O.D+1000	O.D+800	I.D/6	I.D/4	54	400

Figure B 10
Typical manhole detail - Type B
Depth from cover level to soffit of pipe 1.5 m to 3.0 m
Alternative Rigid material construction with concrete surround



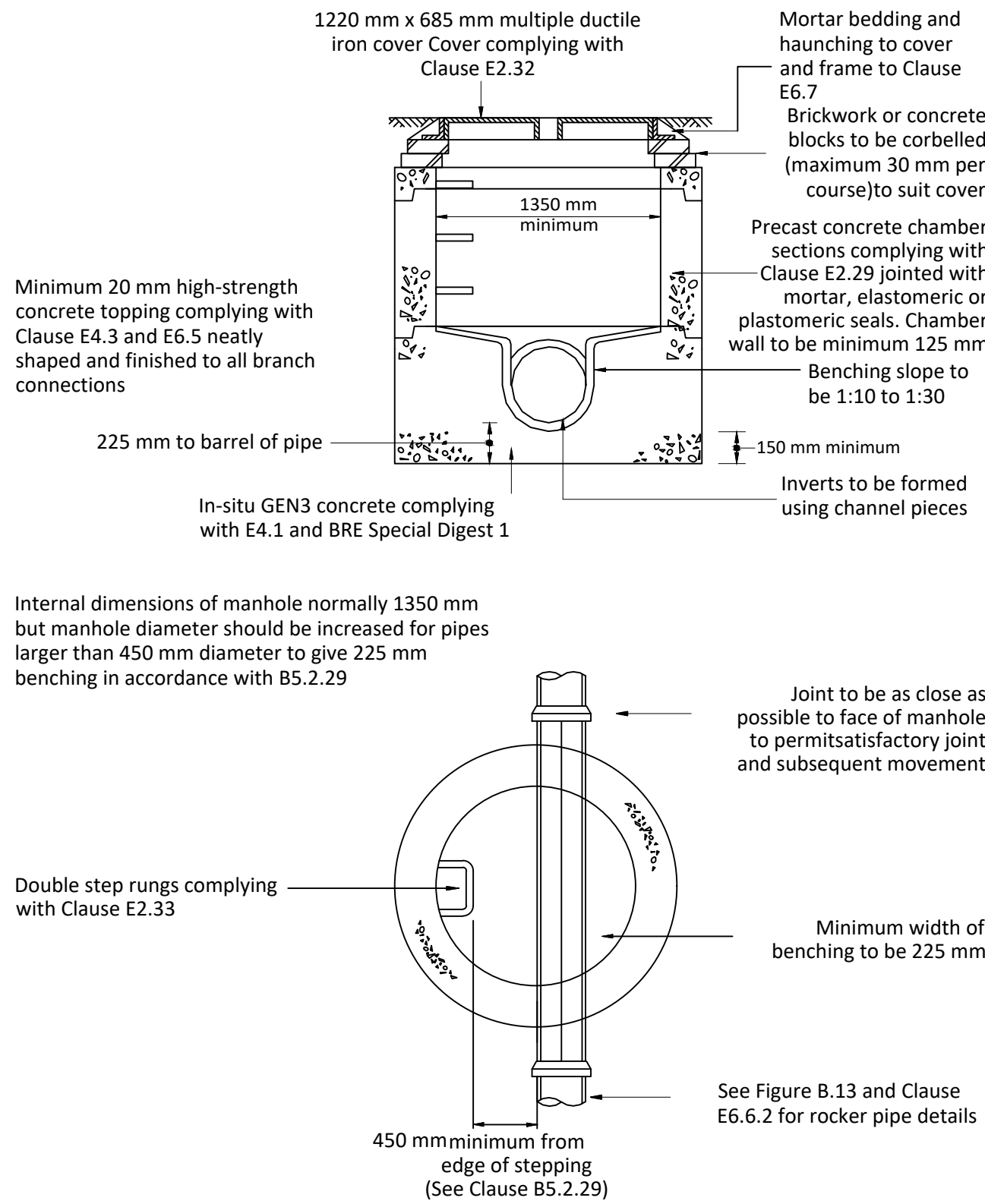
CLASS Z BEDDING
(Cover to pipe <1.2m or as specified)



Flexible Joint Details

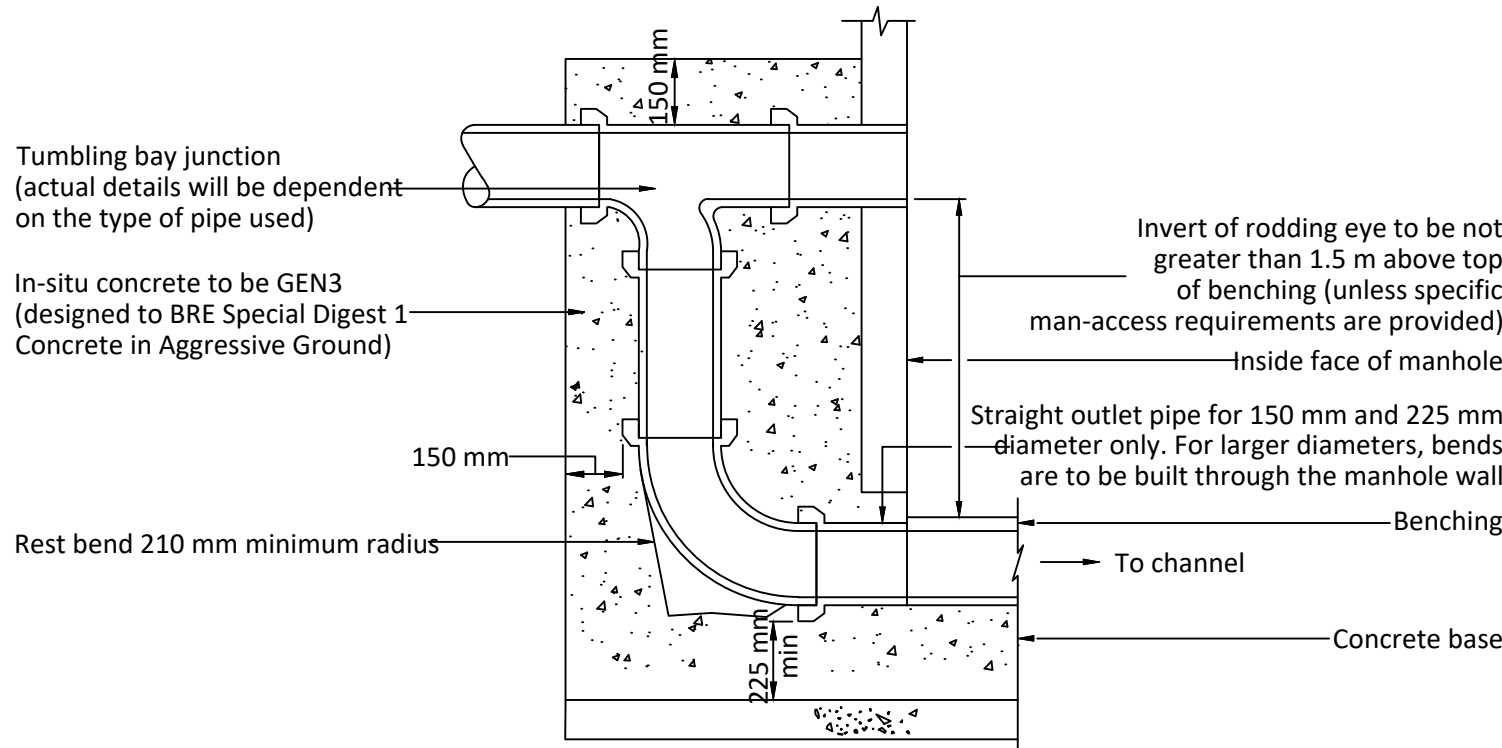
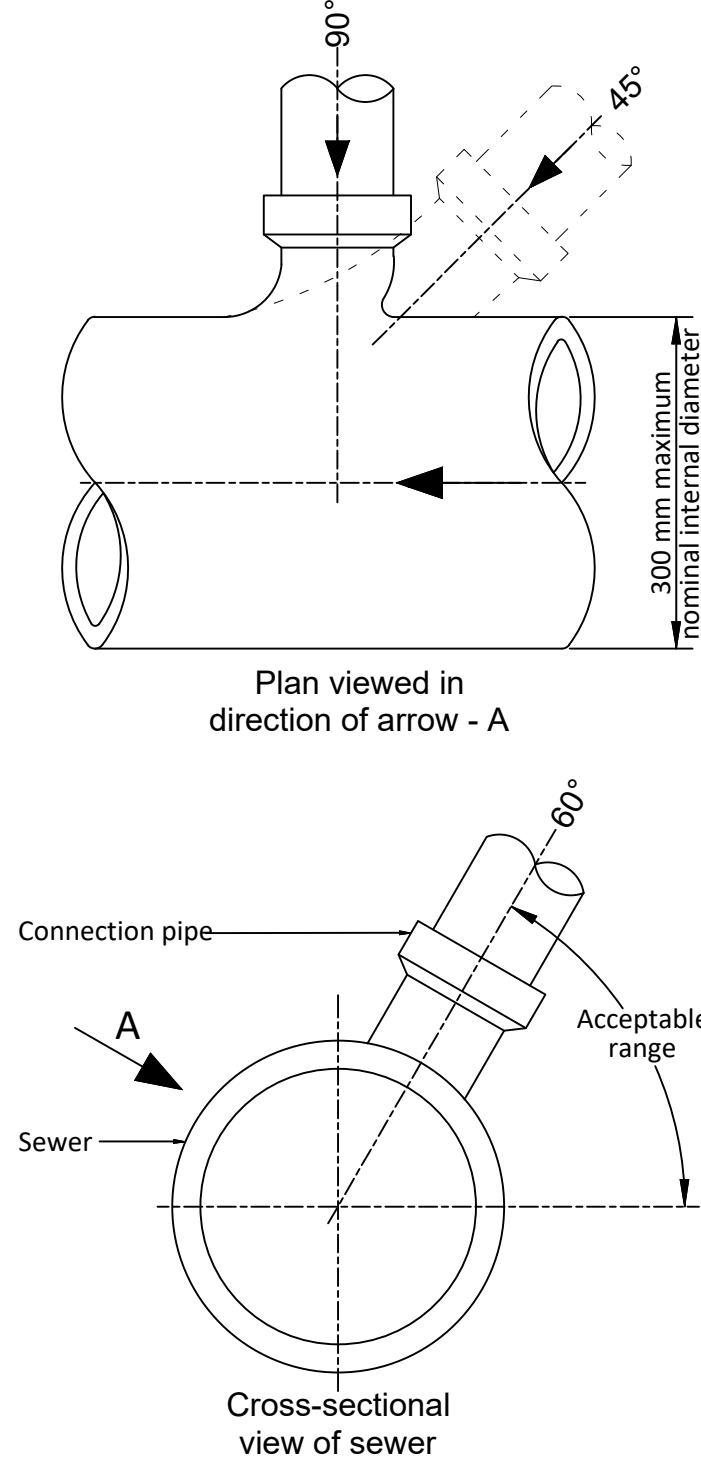
Form vertical construction joints in GEN3/ST4 concrete surround at face of every pipe joint using compressible board (refer to table for thickness 'L', precut to finished profile of concrete and pipe. Fill any gap between spigot and socket with resilient material to prevent entry.

Figure B 15
Typical manhole detail - Type C
Depth from cover level to soffit of pipe less than 1.5 m
Rigid material construction

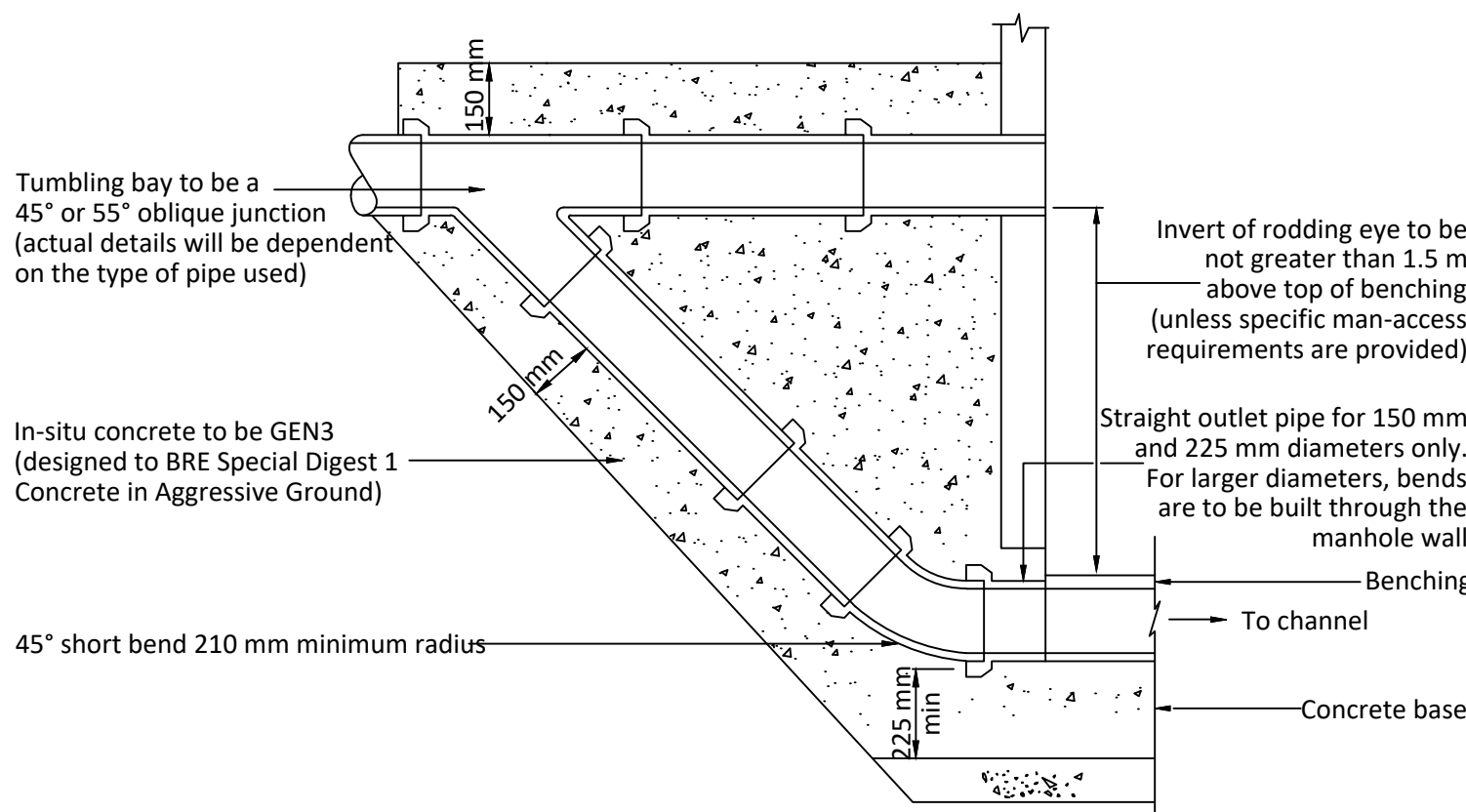


Note: The use of precast concrete chamber units to E2.29 with 150 mm GEN3 in-situ concrete complying with E4.1 and BRE Special Digest 1 in place of brickwork construction is permitted.

Figure B 26
Connections to sewer



External Vertical Backdrop



External Ramped Backdrop

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- 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
- 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 EN1916. Where agreed with adopting authority pipes up to and including 600mm diameter can be PVC-U to BS EN1404.
- 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.
- All bedding shall be class s unless noted otherwise.
- All trenches under existing and proposed public highways are to be backfilled with thoroughly compacted type 1 granular sub-base material.
- 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.
- Chambers with outgoing pipes greater than 600mm diameter shall be fitted with guard bars, safety chains or other approved safety devices.
- The use of precast concrete products made with sulphate resisting cement is mandatory, unless a laboratory report proves such precautions are not necessary.
- 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.
- 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 rhbc standards chapter 5.3 and bs8301.
- Where pipes pass through footings, retaining or screen walls, lintels to be provided over drains.
- 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).
- 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.
- 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

B	02.26	Title box updated with current logo	RP	DS
A	06.24	First Issue	LC	DS
Rev	Date	Description	Drawn	Checked



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Client

BELLWAY HOMES

Project
LAND NORTH OF
ARBORFIELD ROAD,
SHINFIELD

Title
FULL APPLICATION
DRAINAGE CONSTRUCTION
DETAILS SHEET 1

Status

Scale

AS SHN @ A1

Date

JUNE 2024

Drawn

LC

Checked

DS

Drawing No

HD008-FA-551

Revision

B

Mortar bedding and haunching to cover and frame to Clause E6.7

1-3 precast concrete cover frame seating rings with 350 mm diameter or 300 mm x 300 mm opening or class B engineering bricks

Temporarily cap manhole shaft during construction

Granular type I sub-base material to Clause E2.43 (thickness varies)

Pipes built into chamber wall or joint formed with watertight seals

Granular bedding material

100 mm precast base

Cover complying with Clause E2.32

Surface course
Binder course
Base course

If distance from cover level to soffit of pipe is > 1m, access opening shall be restricted to 350 mm diameter or 300 mm x 300 mm

Precast concrete chamber sections complying with Clause E2.29 jointed with elastomeric or plastomeric seals

Minimum internal dimensions
450 mm diameter
or 450 mm x 450 mm

Minimum 150 mm thick granular type I sub-base material to Clause E2.43 or GEN3 in-situ concrete surrounding complying with E4.1 and BRE Special Digest 1

Base unit to have all connections with soffit levels set no lower than that of the main pipe

Joint to be as close as possible to face of chamber to permit satisfactory joint and subsequent movement
See Figure B.13 and Clause E6.6.2 for rocker pipe details
Invert of connecting pipe at least 50 mm above that of the main pipe

Not to scale

Sectional Plan

No junction less than 90° from outgoing sewer

Preformed swept channels

Rocker pipe required for rigid pipes

675mm x 675mm CLEAR OPENING MANHOLE D400 COVER AND FRAME 150mm DEEP TO BE BS EN 124. RESIN BONDED MORTAR.

2 COURSES OF CLASS 'B' ENGINEERING BRICKS LAID ENGLISH BOND OR PRECAST SEATING RINGS CONCRETE COVER FRAME

ADDITIONAL INCOMING SEWER IF SPECIFIC.

150 THICK CONCRETE SURROUND, CLASS C20 WITH SULPHATE RESISTING CEMENT.

INFLOW WITH 150mm CONCRETE SURROUND IF REQUIRED.

CL.

EYE BRACKET FOR BYPASS DOOR OPERATING ROPE

HYDROBRAKE OPTIMUM FLOW CONTROL UNITS BOLTED TO CHAMBER WALL IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.

HYDROBRAKE CONFIGURATION SPECIFIC TO CONTROL MANHOLE. REFER TO DRAINAGE DESIGNS FOR ADDITIONAL INFORMATION.

1500mm INTERNAL DIAMETER CHAMBER RING MANHOLE DETAILS TO BE AS SFA STANDARD TYPE '2' CONSTRUCTION.

OUT FLOW WITH 150mm CONCRETE SURROUND IF REQUIRED.

AS REQ'D

NEOPRENE RUBBER GASKET.

75mm THICK C2C BLINDING OR GEOTEXTILE LAID OVER 150mm MIN. CONSOLIDATED THICKNESS OF TYPE I GRANULAR MATERIAL DEPENDING ON GROUND CONDITIONS

SUMP TO BE SIZED IN ACCORDANCE WITH HYDROBRAKE MANUFACTURERS RECOMMENDATIONS.

HIGH STRENGTH CONCRETE TOPPING TO BE BROUGHT UP TO A DENSE SMOOTH FACE NEATLY SHAPED AND FINISHED (MINIMUM THICKNESS 20mm).

INCOMING IL

OUTGOING IL

Rigid pipes built into manhole should have a flexible joint as close as feasible to the external face of the structure and the length of the port rocker pipe should be as shown.

Nominal diameter (mm)	Maximum effective length (m)
150 - 600	0.6
601 - 750	1.00
over 750	1.25

NTS
TYPICAL CONTROL MANHOLE DETAIL

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5. All public sewers are to be the subject of a section 104 agreement of the water industry act 1991.
6. All lines 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 and 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 - 4000
 - footways and verges - 4000
 - footways and pedestrian areas - b125
 - gardens/landscaping - a15
9. All sewer pipes, up to, and including 225mm are to be vitrified clay to BS EN259. All sewer pipes 300mm diameter and above to be concrete pipes to BS EN1915. 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 manufacturer's printed instructions, ie, en 752, ie, 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 and surrounded with compacted 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.
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20. Where required 1m deep root barrier of an approved type to be installed vertically along the back edge/kerb of all areas of footway/ demarcation to protect from both proposed and future contamination.
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

C	02.26	Storage tank detail removed	TC	DS
B	03.25	Storage Tank detail added	TC	DS
A	06.24	First Issue	LC	DS
Rev	Date	Description	Drawn	Checked



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Client _____

Project
LAND NORTH OF
ARBORFIELD ROAD,
SHINFIELD

Title
FULL APPLICATION
DRAINAGE CONSTRUCTION
DETAILS SHEET 2

Status

Scale AS SHN @ A1	Date JUNE 2024	Drawn LC	Checked DS
Drawing No HD008-FA-552			Revision C