

Drainage Strategy

14 Twyford Road, Worthing BN13 2NP

TJW Holdings Ltd

Ref: D2468/DS1.0

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DOCUMENT CONTROL

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Proposed residential development

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DRAWINGS

- PL001** Site Location Plan
- PL002** Topographic Survey with Contours
- PL003** Impermeable Areas
- PL004** Proposed Drainage Strategy

APPENDICES

- Appendix A** Architectural Development Proposals
- Appendix B** Topographic Survey
- Appendix C** Lucion Ground Engineering Limited Site Investigation Report
- Appendix D** Southern Water Public Sewer Records
- Appendix E** Wallingford Greenfield Run-off Calculations (Full Site Area)
- Appendix F** Wallingford Greenfield Run-off Calculations (Proposed Impermeable Area)
- Appendix G** Causeway Flow Hydraulic Calculations

1 INTRODUCTION

1.1 Background

- 1.1.1 BP Civils is instructed by TJW Holdings Ltd to prepare a drainage strategy to accompany a planning application a proposed residential development at 14 Twyford Road, Worthing BN13 2NP.
- 1.1.2 14 Twyford Road was demolished following a fire at the property in March 2025.
- 1.1.3 Planning approval has been granted for the replacement of the dwelling (AWDM/0861/25).
- 1.1.4 Further to the planning approval for the replacement dwelling, the client is seeking to gain approval for 2 No. dwellings at the site, an increase of 1 No. dwelling compared with historic site use and current approval.
- 1.1.5 The proposed architectural development proposal is contained within **Appendix A**.
- 1.1.6 The surface water drainage strategy has been developed in view of the National Standards for Sustainable Drainage System (June 2025) and The SuDS Manual (CIRIA C753).
- 1.1.7 In preparing this report, BP Civils has referred to the following documents and information:
- Environment Agency Flood Map for Planning
 - Long-term Flood Risk Service (Gov.uk)
 - British Geological Survey (BGS) Information and Records
 - Lucion Ground Engineering Limited Site Investigation Report
 - Southern Water Public Sewer Records
- 1.1.8 This report has been prepared for the benefit of the named client only.

2 SITE LOCATION AND DESCRIPTION

- 2.1.1 A site location plan is included within this report.
- 2.1.2 The National Grid Reference is TQ 12051 04913.
- 2.1.3 The site is located on the eastern side of Twyford Road, north of Twyford Close.
- 2.1.4 The site measures c. 335m² (0.03Ha) and is currently occupied by the concrete slab associated with the former dwelling (14 Twyford Road) in addition to paving and soft landscaping.
- 2.1.5 The client's architect has provided a site topographic survey (undated). The survey is contained within **Appendix B**.
- 2.1.6 The survey identifies levels in the range of 13.8m AOD and 14.31m AOD. Falls are largely demonstrated as prevailing in a westerly direction, toward Twyford Road.
- 2.1.7 Drawing **PL002** (Topographic Survey with Contours) has been prepared to illustrate the topography of the site.

3 GROUND CONDITIONS

- 3.1.1 Lucion Ground Engineering Limited has undertaken intrusive ground investigation at the site, primarily to inform foundation design. Site works were undertaken on 27th November 2025.
- 3.1.2 2 No. trials pits were excavated on site (TP01 and TP02) in addition to 2 No. boreholes (WS01 and WS02).
- 3.1.3 The 2 No. trial pits were excavated to depths of 700mm (TP01) and 800mm (TP02) below ground level.
- 3.1.4 The 2 No. boreholes were both excavated to a depth of 5.00m below ground level.
- 3.1.5 Ground conditions consist of made ground, underlain by Head Deposits and River Terrace Deposits.
- 3.1.6 Lucion Ground Engineering Limited's reporting, including trial pit logs and borehole records, is contained within **Appendix C**.
- 3.1.7 Reference has also been made to the BGS Geology of Britain Viewer, to verify the findings of the site specific intrusive investigation.
- 3.1.8 The BGS Geology of Britain Viewer identifies a 'Lambeth Group – Clay, silt and sand' bedrock geology.

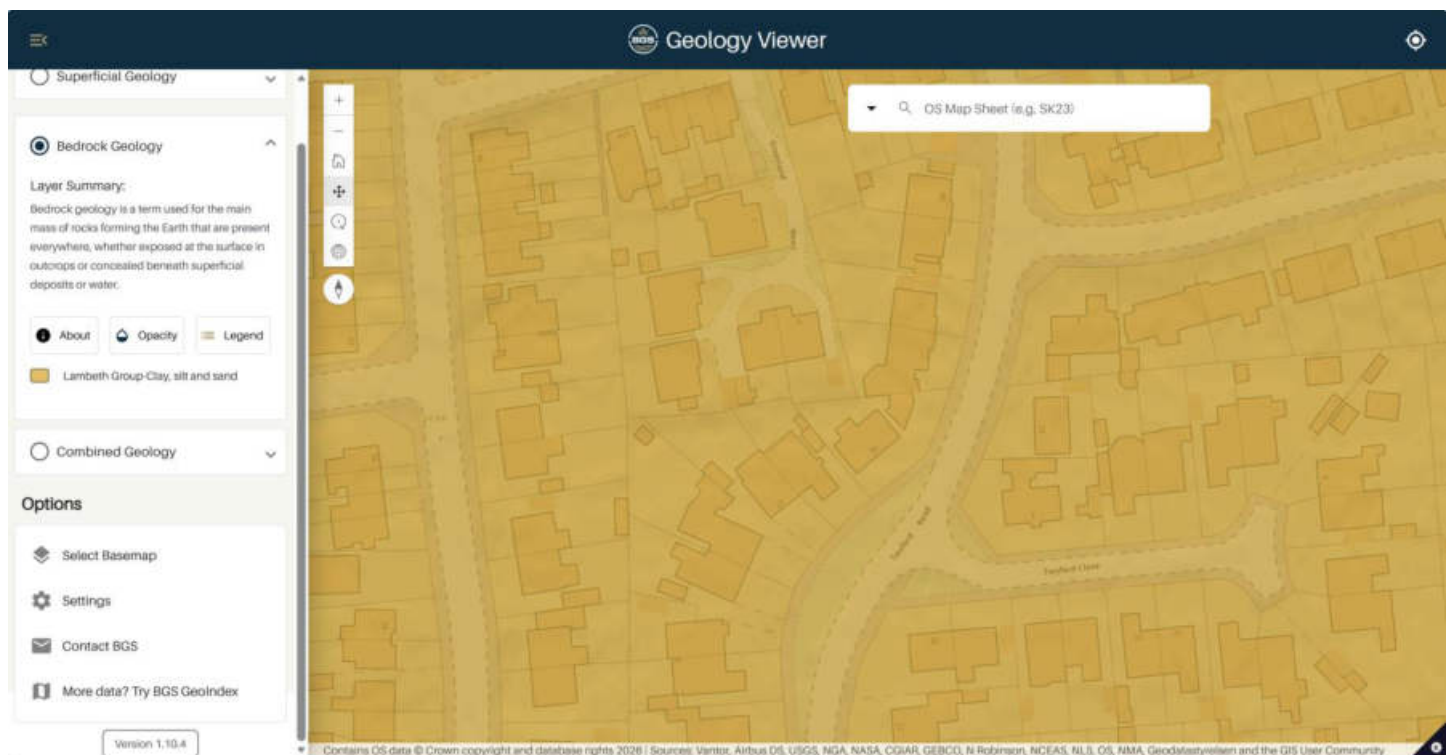


Figure 1. Geology of Britain Viewer – Bedrock Geology (BGS)

- 3.1.9 The BGS Geology of Britain Viewer identifies superficial deposits recorded as 'River Terrace Deposits (Undifferentiated) – Sand, silt and clay'.

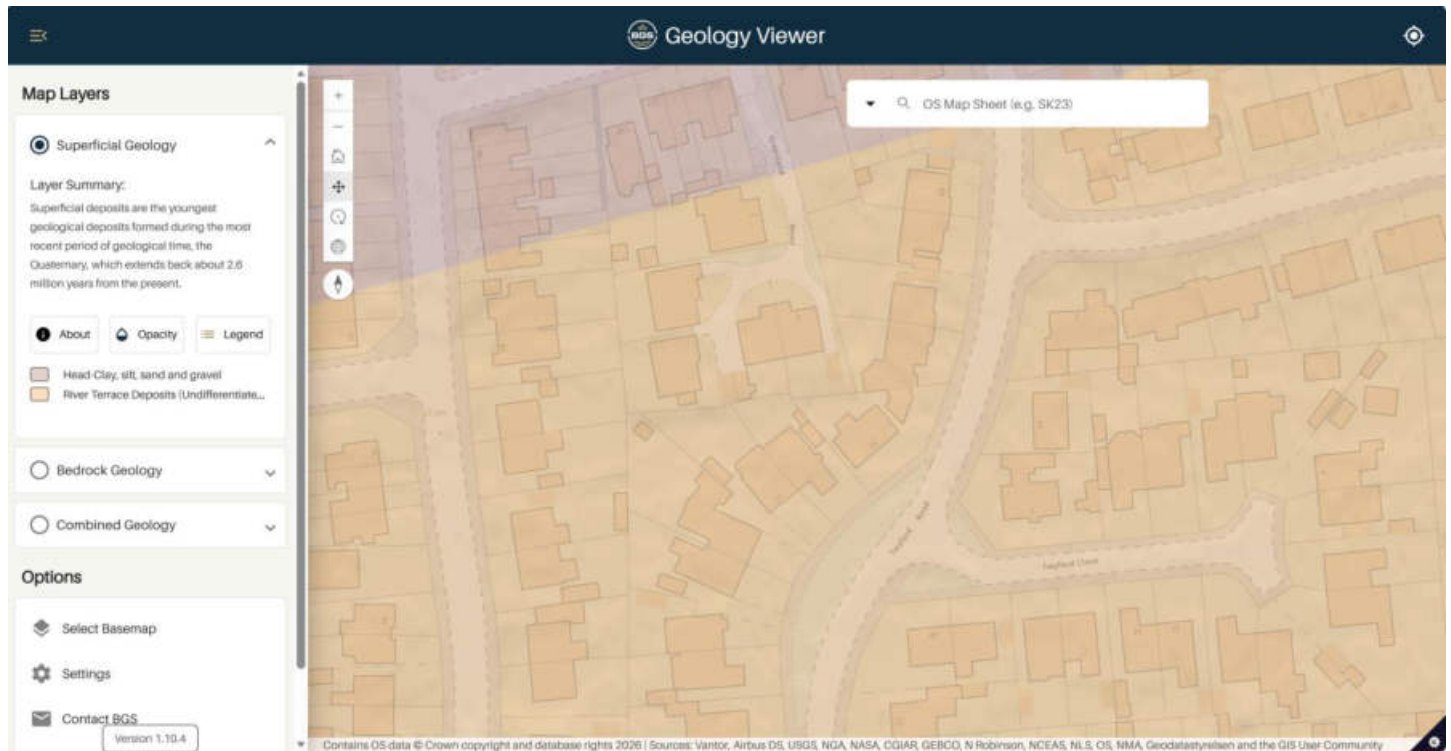


Figure 2. Geology of Britain Viewer – Superficial Deposits (BGS)

3.2 Groundwater

- 3.2.1 Lucion Ground Engineering Limited's reporting confirms that groundwater seepage was recorded at 3.60m below ground level in WS02. The groundwater level stabilised at 4.90m below ground level on completion of the borehole.
- 3.2.2 The 2 No. trial pits in addition to WS01 remained dry during excavation and on completion.
- 3.2.3 Groundwater monitoring has not been undertaken.
- 3.2.4 Mapping managed by MAGIC (magic.defra.gov.uk) provides geographic information concerning the natural environment from across government. This mapping tool has been referred to in order to confirm aquifer designations, as well as whether the site is located within any groundwater source protection zones, groundwater vulnerability zones, drinking water protected areas or drinking water safeguard zones.
- 3.2.5 The site falls within a 'Secondary A' bedrock aquifer and a 'Secondary B' Superficial drift aquifer.

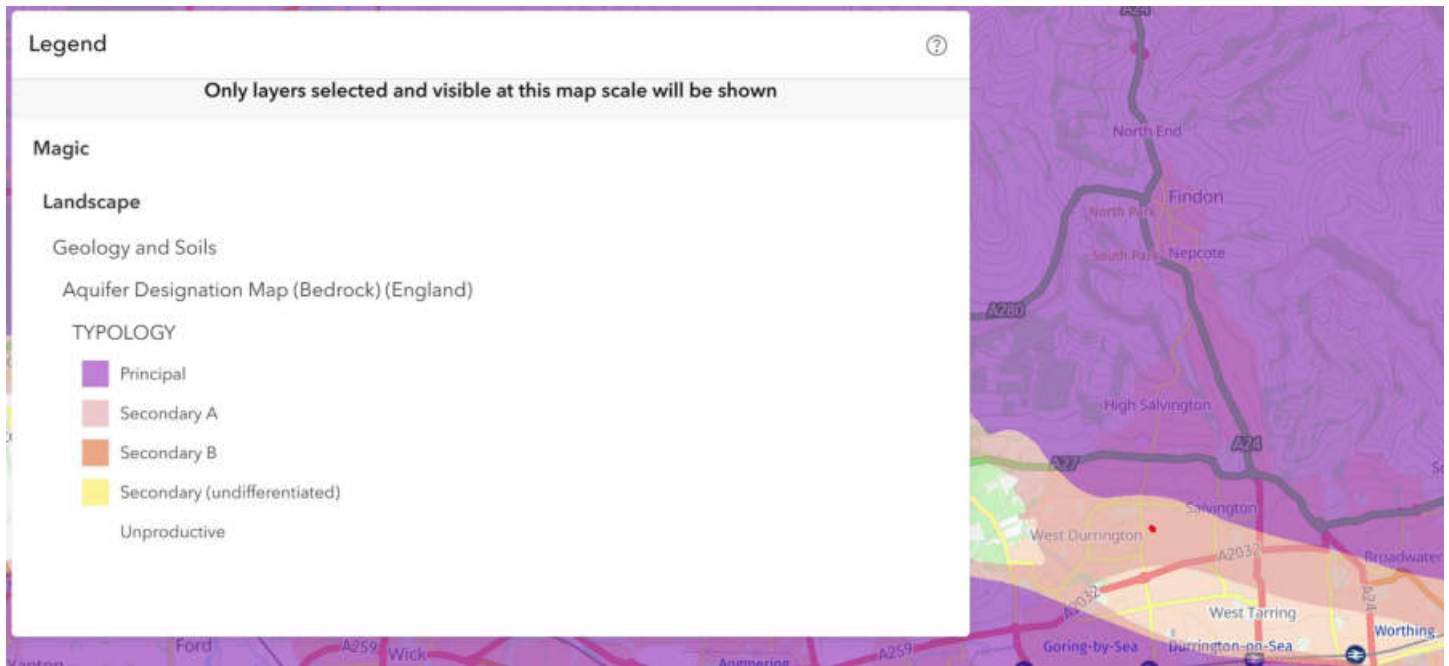


Figure 3. Bedrock Aquifer Designation Map (DEFRA)

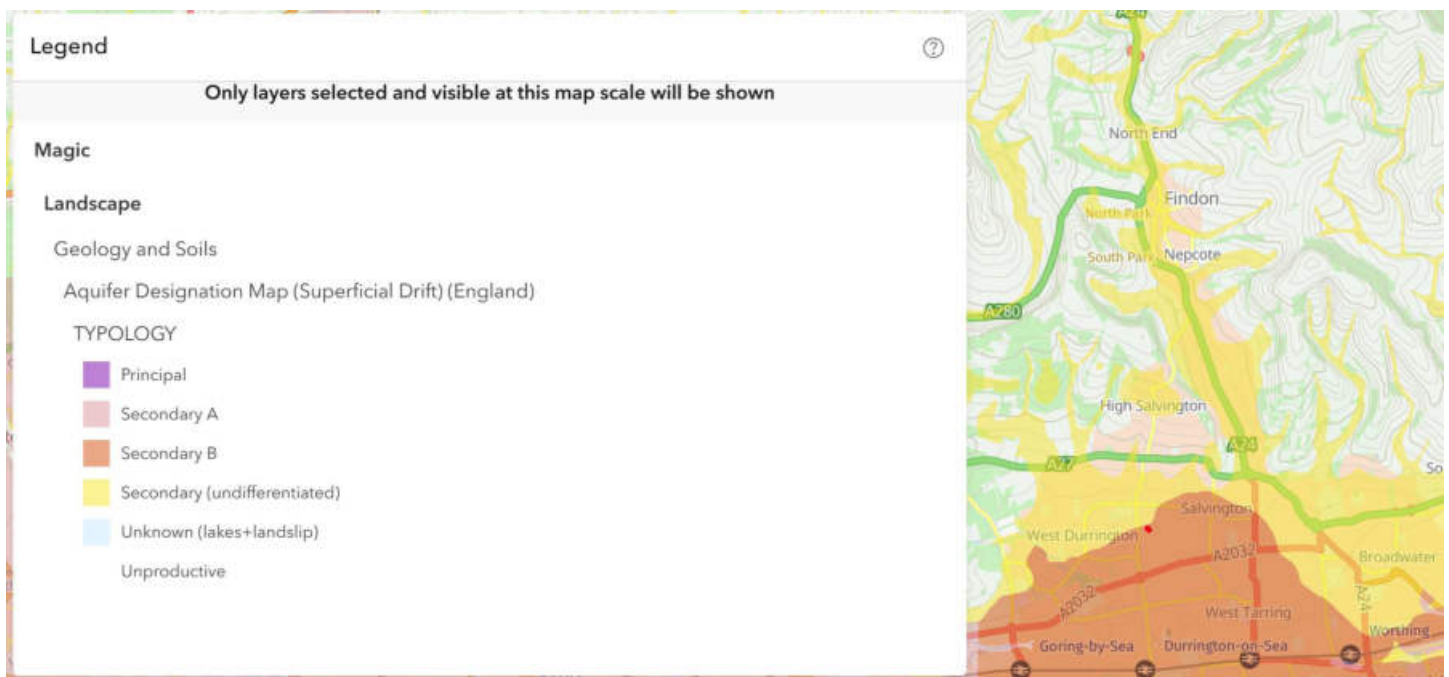


Figure 4. Superficial Drift Aquifer Designation Map (DEFRA)

3.2.6 The site falls within a 'Medium' groundwater vulnerability zone, with a soluble rock risk identified.

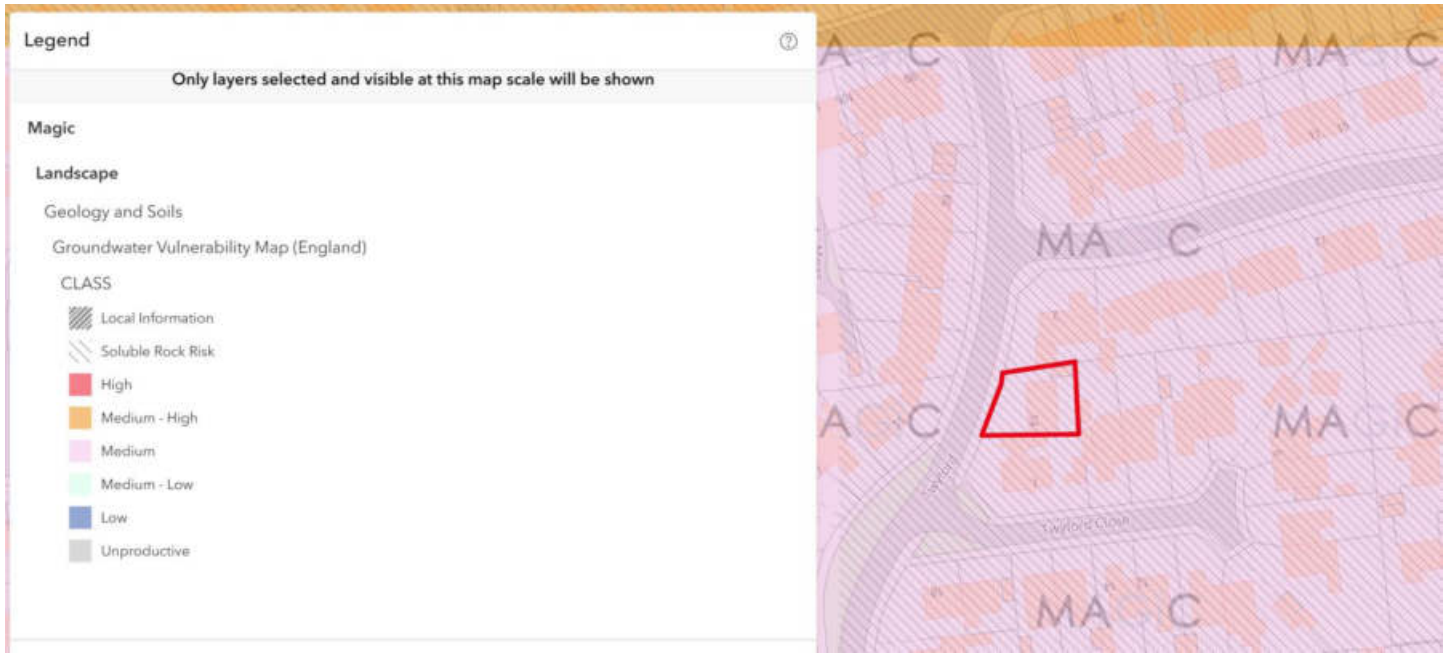


Figure 5. Groundwater Vulnerability Map (DEFRA)

3.2.7 The site is not located within any drinking water protected areas, drinking water safeguard zones or source protection zones.

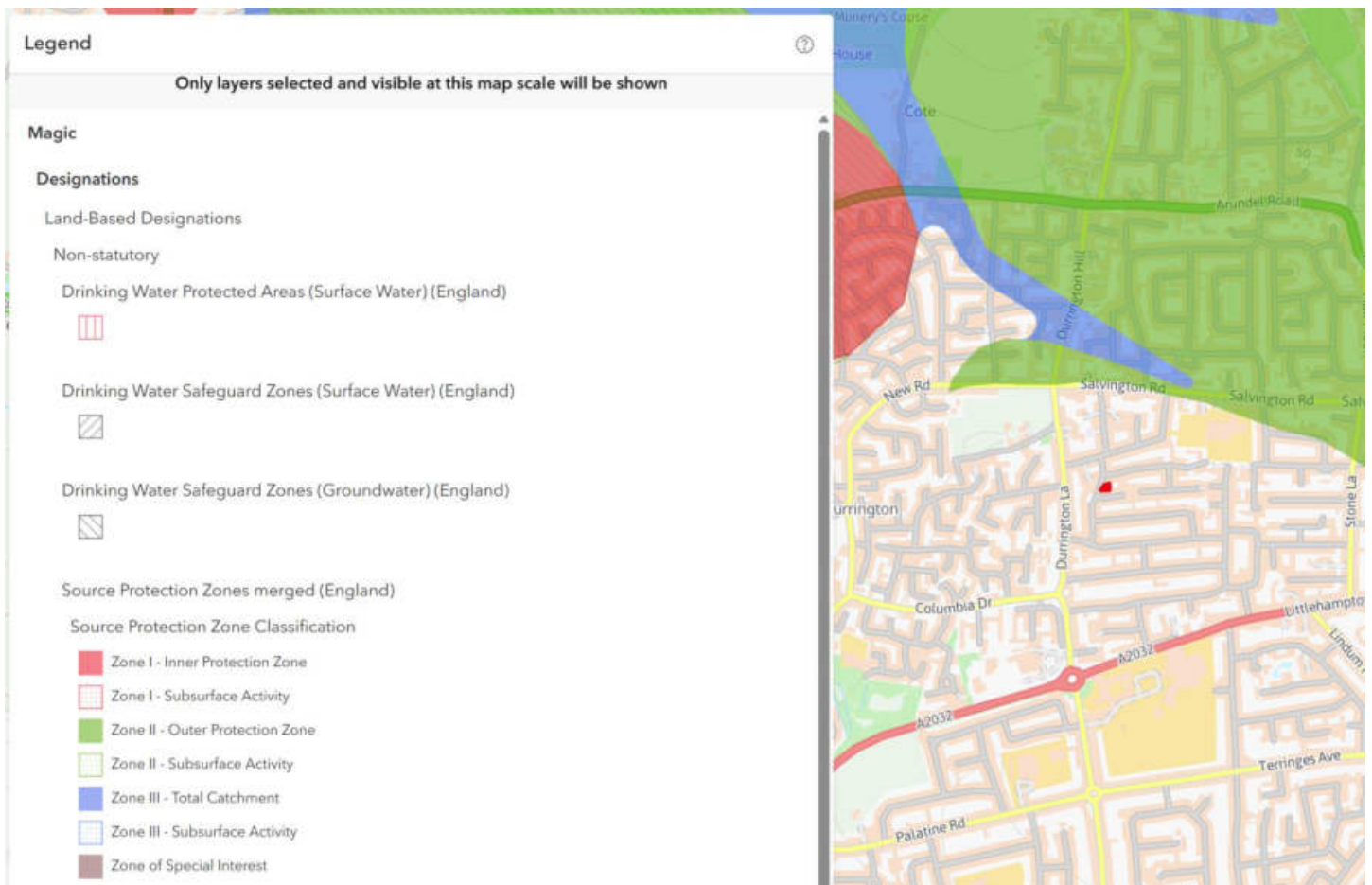


Figure 6. Drinking Water Protected Areas, Drinking Water Safeguard Zones and Source Protection Zones Map (DEFRA)

4 EXISTING DRAINAGE

4.1 Surface Water

- 4.1.1 Southern Water is the local sewerage authority.
- 4.1.2 Public sewer records obtained from Southern Water (**Appendix D**) identify a public surface water sewer beneath Twyford Road within the immediate vicinity of the site.
- 4.1.3 The existing below ground surface water drainage arrangements on site have not been verified.
- 4.1.4 A single inspection chamber is identified on site as per the site topographic survey. This is assumed to relate to the site's historic foul water drainage arrangement. It is possible there may have been surface water flows from the previous dwelling's roof area draining to this system, although this is unconfirmed. It is understood that rainwater pipes from the previous dwelling discharged below ground.
- 4.1.5 Greenfield run-off rates have been established in relation to the site area (335m²) and also the proposed positively drained catchment (220m²) using HR Wallingford's 'Greenfield run-off rate estimation' tool. The calculated rates are as follows:

	Site Area (335m ²)	Proposed Positively Drained Catchment (220m ²)
QBAR	0.1 l/s	0.04 l/s
1 in 1 Year	0.1 l/s	0.04 l/s
1 in 2 Year	0.1 l/s	0.1 l/s
1 in 10 Year	0.1 l/s	0.1 l/s
1 in 30 Year	0.1 l/s	0.1 l/s
1 in 100 Year	0.2 l/s	0.1 l/s
1 in 200 Year	0.2 l/s	0.2 l/s

- 4.1.6 Given the site's developed state and associated impermeable area, existing run-off rates will be greater than the greenfield run-off rates as established above.
- 4.1.7 Based on a flat rainfall rate methodology with a rainfall intensity of 50mm an hour, the existing impermeable area of 232m² will generate a rate of brownfield run-off totalling 3.22 l/s.

4.2 Foul Water

- 4.2.1 Southern Water's public sewer records identify public foul water sewers within the vicinity of the site.
- 4.2.2 As referenced in 4.1.4, the single inspection chamber identified on site as per the site topographic survey is assumed to provide foul drainage connectivity to the public foul water sewer network. This, however, has not been confirmed.

4.3 Highway Drainage

- 4.3.1 Twyford Road is served by traditional road gullies, which are assumed to drain to Southern Water's public surface water sewer network.

5 FLOOD RISK

5.1 Flood Maps and Modelling

5.1.1 Flood Map for Planning identifies the site falling within Flood Zone 1 (present day).



Figure 7. Flood Map for Planning – Present Day (Gov.uk)

5.1.2 In respect of climate change (2070 to 2125) the site is not identified as being at increased risk of flooding.



Figure 8. Flood Map for Planning – Climate Change (Gov.uk)

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b).
Zone 2 Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map).
Zone 3a High Probability	Land having a 1% or greater annual probability of river flooding; or land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map).
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of function floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: - Land having a 3.3% or greater annual probability of flooding, with any existing flood management infrastructure operating effectively; or - Land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map).

5.1.4 The site is not identified as being at risk of surface water flooding in the 1 in 30, 1 in 100 or 1 in 1000 annual exceedance probability events (present day).



Figure 9. Flood Map for Planning – Surface Water 1:30, Present Day (Gov.uk)

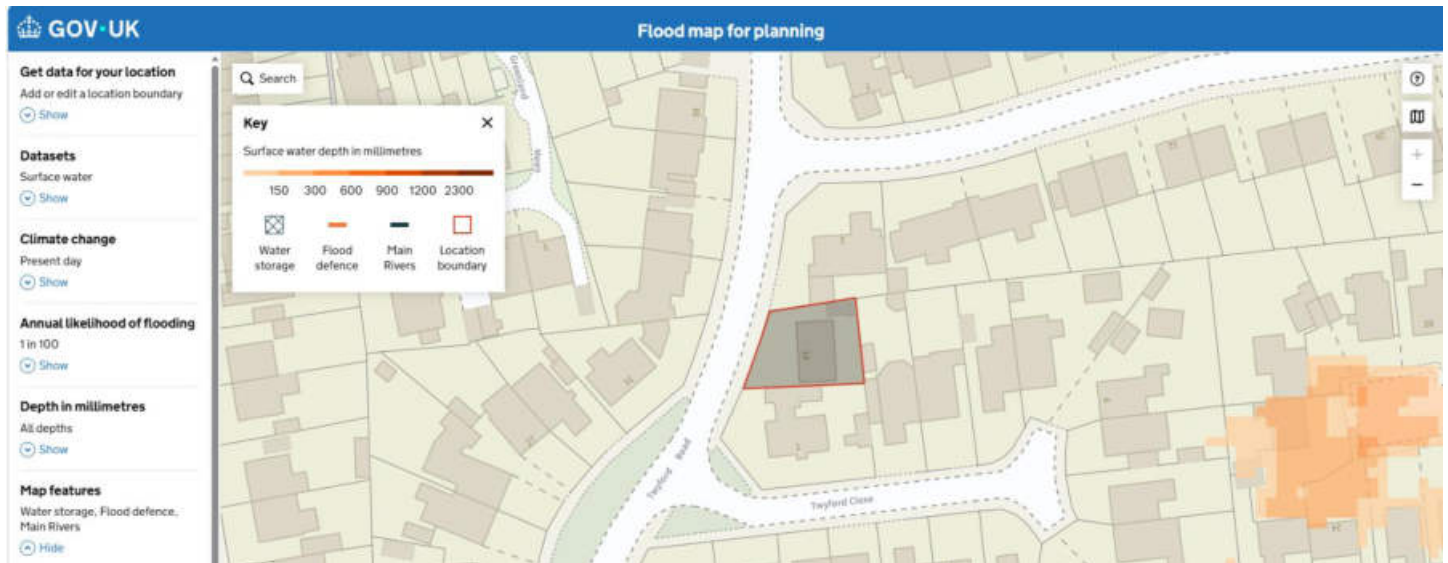


Figure 10. Flood Map for Planning – Surface Water 1:100, Present Day (Gov.uk)



Figure 11. Flood Map for Planning - Surface Water 1:1000, Present Day (Gov.uk)

- 5.1.5 The site is also not identified as being at risk of surface flooding in respect of climate change (2061 to 2125) in the 1 in 30, 1 in 100 or 1 in 1000 annual exceedance probability events.

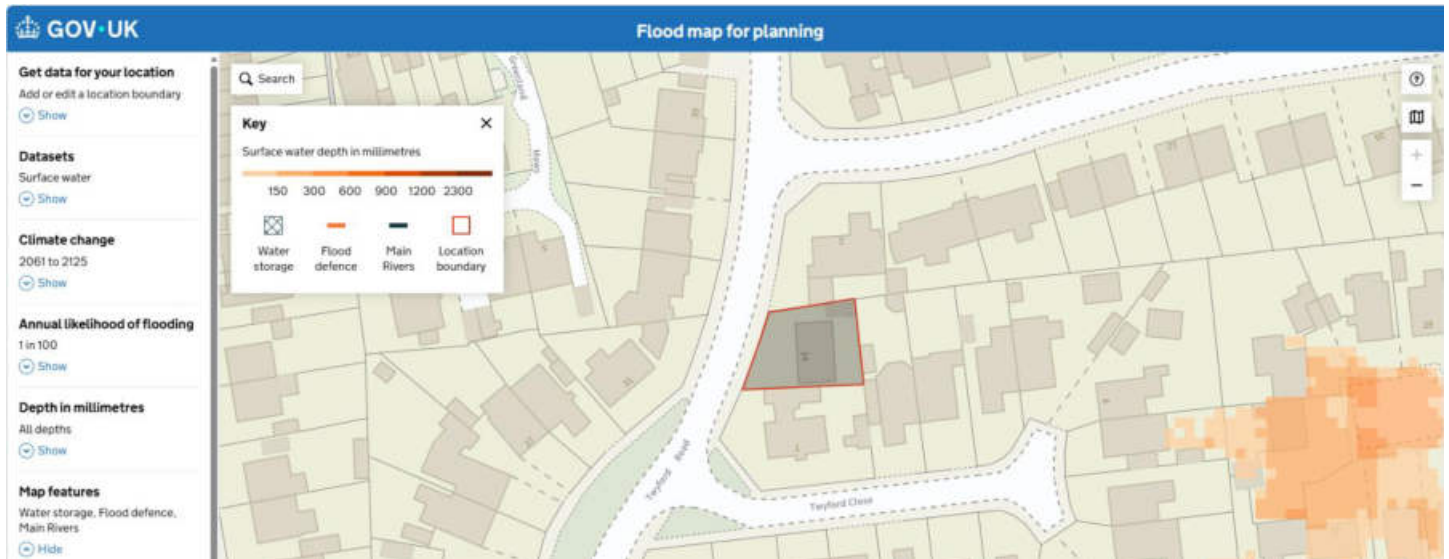


Figure 12. Flood Map for Planning - Surface Water 1:30, Climate Change (Gov.uk)



Figure 13. Flood Map for Planning - Surface Water 1:100, Climate Change (Gov.uk)



Figure 14. Flood Map for Planning - Surface Water 1:1000, Climate Change (Gov.uk)

- 5.1.6 The Long-term Flood Risk Service indicates that the site is outside of groundwater flood alert areas and that flooding from reservoirs is 'unlikely' in this area.

5.2 Historic Flooding

- 5.2.1 No evidence of historic flooding has been identified at the site in view of the sources of information reviewed in the undertaking of this report.

5.3 Summary of Flood Risk

5.3.1 The potential sources of flooding are:

Source of Flooding	Level of Risk
Rivers and Coastal	Low The site is located in Flood Zone 1 (present day) and is not identified as being at increased risk of flooding in respect of climate change (2070 to 2125).
Surface Water	Very Low The site is not identified as being at risk of surface water flooding in the 1 in 30, 1 in 100 and 1 in 1000 annual exceedance probability events, in the present day, or in respect of current climate change projections (2061 to 2125).
Groundwater	Very Low Groundwater monitoring has not been undertaken. Groundwater seepage was recorded at WS02 at depths of 3.60m below ground level. Upon completion of the borehole, groundwater was recorded at 4.90m below ground level. The remaining trial pits and borehole remained dry.
Sewers	Very Low No instances of historic sewer flooding have been identified.
Artificial Sources	None The site is not shown to be at risk of flooding due to artificial sources.

6 PROPOSED DEVELOPMENT

6.1 Description of Development

- 6.1.1 The proposed development will involve the construction of 2 No. dwellings on site, as demonstrated by the architectural development proposals contained within **Appendix A**.
- 6.1.2 The type of development proposed falls within the "More Vulnerable" flood risk vulnerability classification (Annex 3: Flood risk vulnerability classification, NPPF) and is appropriate in Flood Zones 1.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone 1	✓	✓	✓	✓	✓
Flood Zone 2	✓	Exception Test Required	✓	✓	✓
Flood Zone 3a†	Exception Test Required †	✗	Exception Test Required	✓	✓
Flood Zone 3b*	Exceptions Test Required *	✗	✗	✗	✓*
✓ = Development is appropriate ✗ = Development should not be permitted					

- 6.1.3 The proposed development will result in an impermeable area of 220m², which is to be positively drained.
- 6.1.4 This represents an reduction of 12m² in comparison with the current site use.
- 6.1.5 The use of SuDS methods and techniques, where site conditions and constraints allow, will be utilised to assist in the management of surface water run-off generated by the proposed development, whilst adhering to the principles and standards contained within the National Standard for Sustainable Drainage Systems (June 2025).

7 PROPOSED SURFACE WATER DRAINAGE STRATEGY

7.1.1 The National Standards for Sustainable Drainage Systems (June 2025) detail principles and standards for the management of surface water run-off for new infrastructure and development.

7.1.2 There are two types of standards:

- i. The hierarchy standard (Standard 1) gives criteria for prioritising the choice of final run-off destination
- ii. Fixed standards (Standards 2 to 7) state the minimum design criteria that all surface water drainage systems should satisfy and how they should be built, maintained and operated.

Both types of standards have accompanying requirements which provide details on how to interpret, deliver and evaluate each standard.

7.1.3 The seven standards are complementary, and the delivery of each standard should support delivery of the other standards. A surface water drainage system design that delivers multiple benefits will include a range of features and each of these should contribute to the delivery of several, if not all, of the standards.

7.1.4 There may be specific circumstances or constraints, such as the type or size of a development that mean it is not possible to deliver one or more of the standards. In these circumstances the opportunity to meet the standard shall be maximised and justification be developed in consultation with the approving body, who may agree to a departure unless regulatory controls prohibit such a departure.

7.1.5 The National Standards for Sustainable Drainage Systems can be viewed at <https://www.gov.uk/government/publications/national-standards-for-sustainable-drainage-systems/national-standards-for-sustainable-drainage-systems-suds>

7.2 Standard 1: Run-off Destinations

A 'SuDS approach' shall be adopted to address the management of surface water by the development and where it should be discharged. Runoff shall be treated as a resource and managed in a way that avoids negative impacts of the development on flood risk, the morphology and water quality of receiving waters and the associated ecology.

Runoff from the development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:

- Collected for non-potable use
- Infiltrated to ground
- Discharged to an above ground surface water body
- Discharged to a surface water sewer, or another piped surface water drainage system
- Discharged to a combined sewer
- To utilise a lesser priority final destination, appropriate evidence shall be provided that demonstrates all higher priority final destinations have been utilised to the maximum extent practicable.

Note 1: priority 1 is the highest priority and priority 5 is the lowest.

Note 2: for the purposes of this standard, a combined sewer is a sewer intended to receive both foul sewage and surface runoff and does not include a sewer intended to receive only foul sewage, even if it has the capacity to accommodate additional flows or has an element of surface water in it already.

To utilise a lesser priority final destination, appropriate evidence shall be provided that demonstrates all higher priority final destinations have been utilised to the maximum extent practicable. Higher cost alone shall not be a reason to utilise lower priority final destinations.

Where more than one final destination is utilised, each final destination's ability to accept runoff shall be maximised in order of priority.

- 7.2.1 Potential run-off destinations have been considered, in accordance with the hierarchy detailed within the National Standards for Sustainable Drainage Systems (June 2025), in respect of the proposed development:

Run-off Destination	Viable?	Justification
Collected for non-potable use	Yes	Standard 1 states that rainwater harvesting shall be considered where there is a demand for non-potable water, if there is a need for landscape irrigation, or in areas that are identified as 'Seriously Water Stressed'. Given the small scale and nature of the proposed development, there is no significant demand for a supply of non-potable water, or for landscape irrigation. The site is located within an area that is classified as 'Seriously Water Stressed'. It is proposed that rainwater butts will be provided on the 2 No. plots to provide occupants with a supply of non-potable water for general householder activities, such as gardening.
Infiltrated to ground	No	Infiltration testing and/or groundwater monitoring has not been undertaken on site to confirm infiltration potential or viability. Soakaways must be positioned at least 5.00m away from existing and/or proposed structures, which in view of site

		spatial constraints, cannot be achieved. As a result, infiltration is not considered a viable means of providing surface water drainage functionality at the site.
Discharged to an above ground surface water body	No	There are no such features on site, within the immediate vicinity of the site, or the wider local area.
Discharged to a surface water sewer, or another piped surface water drainage system	Yes	Southern Water's public sewer records identify a public surface water sewer beneath Twyford Road within the immediate vicinity of the site. The site may already have existing connectivity to this sewer, although this has not been confirmed.
Discharged to a combined sewer	No	No combined sewers exist within the vicinity of the site.

- 7.2.2 As detailed within the table above, and justified, post-development run-off will discharge to public surface water sewer located beneath Twyford Road.
- 7.2.3 Existing drainage infrastructure is to be investigated on site to identify any existing off-site connections.
- 7.2.4 Connection to Southern Water's public surface water sewer is subject to approval from Southern Water, with a S106 application required.
- 7.2.5 A capacity check has been submitted to Southern Water in relation to the proposed surface water drainage connection. The result has not yet been received.
- 7.2.6 Consideration has also been afforded as to the SuDS methods and techniques which can be introduced to support the development:

SuDS Method / Technique	Suitable	Comments
Green roofs or walls	No	Such features are not viable in view of the development proposals.
Rainwater harvesting systems	Yes	Rainwater harvesting is not proposed as no need for significant quantities of non-potable water has been identified. Rainwater butts are proposed to provide residents with a

		supply of non-potable water for householder activities, such as gardening.
Soakaway or infiltrations systems	No	Site spatial constraints dictate that soakaways cannot be accommodated.
Permeable surfaces	Yes	Permeable paving is proposed in respect of the 2 No. private parking areas.
Swales and filter strips	No	Such features are not viable in view of the proposed site use and spatial constraints.
Basins and ponds (such as wetlands, balancing ponds, detention basins, retention ponds)	No	Such features are not viable in view of the proposed site use and spatial constraints.
Tanked systems	Yes	Level/depth constraints need to be considered if suggesting such measures, where a connection to the public sewer network is proposed.

- 7.2.7 It is proposed that permeable paving will be introduced on site in respect of the property frontages/on-site parking. The permeable paving will be tanked, providing attenuated storage. A 550mm thick sub-base is proposed.
- 7.2.8 Run-off will be restricted to a maximum of 0.5 l/s for all simulated storm events, up to and including the 1 in 100-year event, inclusive of climate change allowances. Refer to Section 7.4 for commentary on discharge rates.
- 7.2.9 The proposed surface water drainage arrangement is shown on drawing **PL004 'Proposed Drainage Strategy'**.

7.3 Standard 2: Management of Everyday Run-off (Interception)

Apply a 'SuDS approach' so that at least the first 5mm of rainfall for the majority of rainfall events does not result in run-off from the site to surface waters or piped drainage systems.

Evidence shall be provided that the approach to managing run-off from 'everyday' rainfall has been developed alongside and in support of the management of run-off quality (Standard 4) and the delivery of amenity and biodiversity benefits (Standards 5 and 6).

- 7.3.1 Opportunities to achieve interception compliance are limited given that infiltration is not viable.
- 7.3.2 The National Standards for SuDS state that the following features may be used to provide interception. Commentary is provided in relation to each to confirm their suitability:

- Green roofs or walls

The proposed development is residential in nature – green roofs and walls are not considered appropriate in view of this. Green roofs require more frequent inspection and maintenance than

a traditional roof, and on a residential property, this may lead to residents attempting to inspect or undertake maintenance activities themselves. This would introduce a risk of working at height. From a CDM design perspective, the inclusion of green roofs is considered inappropriate and not financially viable in view of the proposed scheme.

- Rainwater harvesting systems

There are no significant areas of communal soft landscaping on site that would benefit from a rainwater harvesting system providing a non-potable water supply for irrigation. With the proposed development being residential, rainwater harvesting systems to serve individual properties is not considered appropriate or viable. Rainwater re-use on a plot level basis is proposed with the introduction of rainwater butts. Whilst it is accepted that rainwater butts do not achieve interception in view of the standard, these will capture rainfall and reduce the volume of run-off draining off-site.

- Soakaways or infiltration systems

Soakaways cannot be accommodated on site, owing to spatial constraints.

- Permeable surfaces

Permeable paving is proposed in respect of the on-site parking provision.

- Swales

Such features are not suitable in view of the proposed development, whilst would be unacceptable to Southern Water where it is proposed surface water will drain to the public sewer network.

- Infiltration trenches

As mentioned above, infiltration is not viable.

- Detention basins

Such features are inappropriate and disproportionate to the proposed level of development.

- Bioretention areas and rain gardens

Such features must remain unlined, and therefore cannot be included to provide interception benefits given discharge to Southern Water's public sewer network is proposed.

7.3.3 In view of the above factors, a relaxation is requested in respect of Standard 2: Management of Everyday run-off (Interception), specifically in relation to run-off from the proposed roofs of the proposed buildings.

7.3.4 The proposed permeable paving extents comply with the standard.

7.4 Standard 3: Management of Extreme Rainfall and Flooding

A 'SuDS approach' shall be adopted to address the management of development run-off during extreme rainfall, including allowances for climate change and urban creep to:

- protect people and property on the development from flooding of the surface water

drainage system

- mitigate any increased flood risk to people and property adjacent to or downstream of the development
- protect the receiving water body from morphological damage or minimise the impact on sewer capacity

When discharging to an infiltration feature, the system shall be appropriately sized to accommodate the design event based on ground conditions and contributing areas.

When discharging to an above ground surface water body, sewer or other piped drainage system, the surface water run-off (rate and volume) for the 1% annual exceedance probability (AEP) event shall be controlled to ensure the run-off from the development does not increase flood risk elsewhere.

When discharging to an above ground surface water body, sewer or other piped drainage system, the surface water run-off rate for the 50% AEP event shall be controlled to ensure development run-off from an event of this magnitude has no negative impact.

Any flooding from the surface water drainage system for events up to the 1% AEP event shall be managed within the development.

Any flooding from off-site sources for the 1% AEP event should be managed on site or safely routed through the site, ensuring any downstream risks are not increased compared to the pre-development scenario.

The risks (both on and off the development) associated with flooding from the surface water drainage system for exceedance events greater than the 1% AEP event shall be appropriately managed.

- 7.4.1 Standard 3 allows a 'relaxation factor' to the target 50% and 1% AEP greenfield runoff rates for previously developed sites.
- 7.4.2 As a result of the above, with a relaxation of up to x5 on the 0.1 l/s (QBAR) rate established, a flow rate of 0.5 l/s is permitted.
- 7.4.3 It is proposed that post-development, flows will be restricted to 0.5 l/s.
- 7.4.4 The surface water drainage system for the proposed replacement building has been designed to accommodate a 1 in 100-year storm event, inclusive of allowances for climate change.
- 7.4.5 In respect of climate change, Gov.uk provides guidance for local planning authorities preparing strategic flood risk assessments and developers and their agents preparing flood risk assessments for planning applications, and development consent orders for nationally significant infrastructure projects.
- 7.4.6 Climate change allowances are predictions of anticipated change for peak river flow, peak rainfall intensity, sea level rise and offshore wind speed and extreme wave height.
- 7.4.7 Allowance for climate change shall be provided in the undertaking of site-specific flood risk assessments where new development is proposed to minimise vulnerability and provide resilience to flooding and coastal change.
- 7.4.8 The 'Peak Rainfall Allowances Map' shows anticipated changes in peak rainfall intensity.
- 7.4.9 Based on the latest allowances, for the 3.3% annual exceedance rainfall event, an increase of 40% should be applied to peak rainfall in relation to the proposed development.

7.4.10 For the 1% annual exceedance rainfall event, an increase of 45% should be applied to peak rainfall in relation to the proposed development.

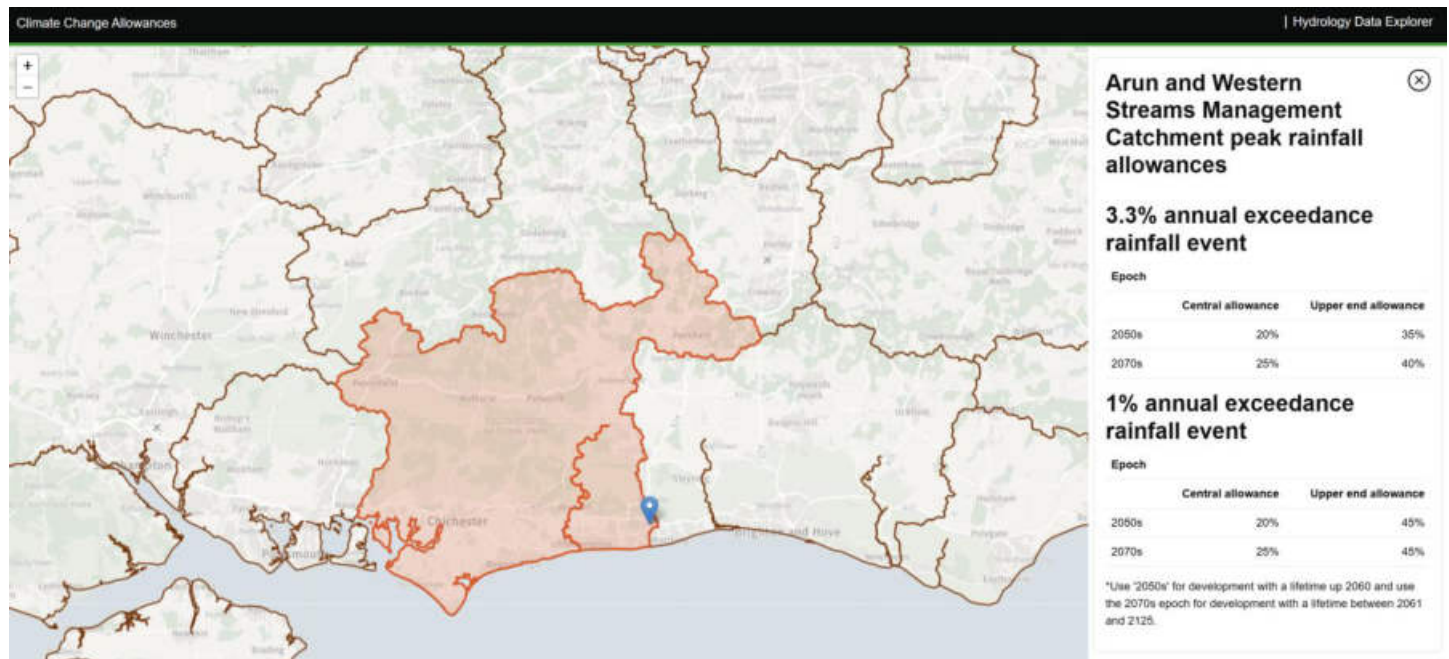


Figure 14. Climate Change Allowances – Peak Rainfall Allowances (Gov.uk)

7.4.11 An allowance of 10% has been made for the potential impacts of urban creep at the site, in respect of the proposed roof area of the 2 No. plots.

7.5 Standard 4: Water Quality

Apply a 'SuDS approach' that protects surface waters, groundwater and coastal waters by managing the quality of the surface water run-off to adequately address water quality risks from development.

The proposed SuDS management train(s) shall be based on robust water quality risk assessment, appropriate to the pollution hazard and sensitivity of receiving waters, reflecting industry recognised guidance or other quantitative assessment as agreed with the approving body and permitting requirements.

7.5.1 In accordance with the SuDS Manual (CIRIA C753) regarding methods for managing pollution risks, the risk posed by surface water run-off to the receiving environment depends on the pollution hazard at the site (the source), SuDS treatment techniques (the pathway), and the sensitivity of the environment (the receptor).

7.5.2 The simple index approach considers whether SuDS techniques are appropriate for the site. The states that for SuDS components to deliver adequate treatment, the total pollution mitigation index for each contaminant type should equal or exceed the pollution hazard index.

7.5.3 The SuDS Manual outlines three categories of pollution hazard identification, which vary depending on proposed land use, which are as follows:

- Total Suspended Solids (TSS).
- Metals (M).

- Hydrocarbons (H).

7.5.4 In accordance with C753 Table 26.2, the proposed land uses at the site are categorised as follows:

- Residential Roofs – Very Low/TSS=0.2/M=0.2/H=0.05
- Individual Property Driveways – Low/TSS=0.5/M=0.4/H=0.4

7.5.5 In accordance with C753 Table 26.3, the values of SuDS Mitigation indices are provided for the following measures:

- Permeable Paving – TSS=0.7/M=0.6/H=0.7

7.5.6 As the pollution hazard index does/will not exceed any pollution mitigation index for any contaminant type, the proposed SuDS methods will provide sufficient treatment for the proposed development.

7.6 Standard 5: Amenity

A 'SuDS approach' shall be adopted that maximises benefits for amenity through the creation of multi-functional places and landscapes.

- 7.6.1 The small scale of the site and proposed development limits the ability to provide significant amenity benefits in respect of the proposed surface water drainage system.
- 7.6.2 The proposed permeable paving provides a multi-functional surface which provides wider use and benefit beyond drainage functionality and water quality benefits.
- 7.6.3 The proposed SuDS pods/planters are considered to provide additional amenity benefit.
- 7.6.4 The inclusion of rainwater butts will provide a supply of non-potable water which can be used for householder activities, such as gardening.

7.7 Standard 6: Biodiversity

A 'SuDS approach' shall be adopted to ensure the surface water drainage system maximises biodiversity benefits throughout the development lifecycle.

The surface water drainage system shall add biodiversity value by:

- creating diverse, self-sustaining, resilient local ecosystems which contribute to net gains in biodiversity
- supporting and promoting natural local habitat and species, for example, through local nature recovery strategies
- contributing to the delivery of local biodiversity strategies
- contributing to habitat connectivity

7.7.1 There are also limited opportunities for the proposed surface water drainage system to provide

biodiversity benefits given the small scale of the site and proposed development.

- 7.7.2 The proposed SuDS pods/planters are considered to provide biodiversity benefits in respect of the proposed surface water drainage system.

7.8 Standard 7: Design of Drainage for Construction, Operation, Maintenance, Decommissioning and Structural Integrity

A 'SuDS approach' shall be adopted to ensure that surface water drainage systems are designed so they can be easily and safely constructed, operated and maintained taking account of the need to minimise negative impacts on natural resources and the environment.

The designer shall provide a management and maintenance plan that supports the design objectives detailed in standards 1 to 6 and ensures the performance of the surface water drainage system with regards to run-off destinations, everyday and extreme rainfall, water quality, amenity and biodiversity is maintained throughout the lifetime of the development.

Surface water drainage design shall examine for the likelihood and consequences of potential failure scenarios that may occur during the operation phase and safely manage the associated risks.

The surface water drainage system shall be designed to ensure structural integrity of all components under anticipated loading conditions for the design life of the development so that it does not affect the structural integrity of any existing or proposed components within, or adjacent to, the development.

- 7.8.1 The proposed development does not currently have planning approval. As such, detailing full maintenance and management requirements and responsibilities is considered premature.
- 7.8.2 Maintenance is required to ensure the long-term operational performance of the proposed surface water drainage system.
- 7.8.3 The drainage system has been designed to minimise maintenance requirements; however a number of key tasks will need to be undertaken so that the system remains in optimal condition.
- 7.8.4 As the proposed development does not currently have planning approval, it is suggested that confirmation of the necessary maintenance activities and associated frequencies can be secured by the local planning authority through a suitably worded planning condition.
- 7.8.5 It is not envisaged that any materials are to be stored on site once the development has been completed, which could cause major spills and/or potential pollution issues within the drainage system.
- 7.8.6 If this situation alters in the future consultation with a specialist will be required in order to confirm if any upgrades to the existing system are necessary.
- 7.8.7 Any future alterations to the foul and/or surface water drainage systems should confirmed by a specialist.

8 PROPOSED FOUL WATER DRAINAGE STRATEGY

- 8.1.1 It is proposed that the site will drain to Southern Water's public foul water sewer network, post-development.
- 8.1.2 Existing connectivity to Southern Water's public foul water sewer network is assumed, although the existing point connection has not been confirmed.
- 8.1.3 Investigation is required on site to ascertain existing connectivity, which may be retained and utilised subject to confirmation of line, level, condition and connectivity.
- 8.1.4 Post development, peak foul water flows have been calculated as 0.09 l/s (based on Sewer Sector Guidance, Appendix C, Design and Construction Guidance).
- 8.1.5 Connection to the public foul water sewer network will be subject to a S106 application, and approval from Southern Water.
- 8.1.6 Recent changes to infrastructure and connection charges (OFWAT Charging Rules) place the onus on the sewerage undertaker to reinforce their network should there no longer be sufficient capacity to serve the new development. Funding for this is provided by revised charging arrangements for infrastructure and connection charges for each dwelling constructed comprising a Network Reinforcement Charge and Site-Specific Charges. The revised charging arrangement (funded by the developer) covers alterations to the Existing Sewer Network and the sewerage undertaker remains responsible for the cost of reinforcing their Strategic Assets. The developer is responsible for connecting the development to the public sewer network.

9 OFFSITE IMPACTS

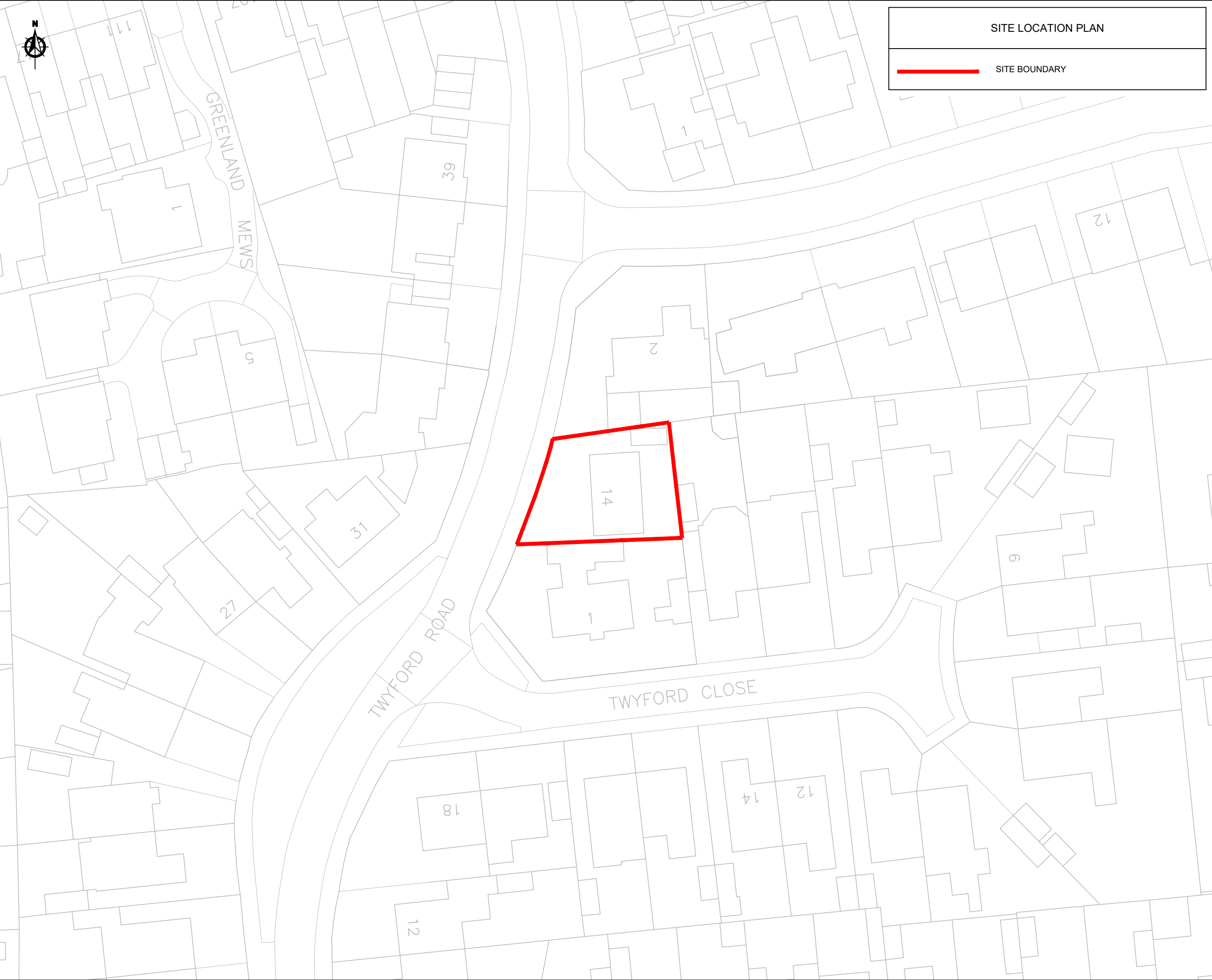
- 9.1.1 Post development, surface water will drain to Southern Water's public surface water sewer network. A capacity check has been submitted in respect of the proposed connection.
- 9.1.2 Attenuation is to be introduced, which therefore represents betterment compared with the existing drainage arrangement.
- 9.1.3 There will be a minimal reduction in impermeable area on site, following completion of the proposed development.
- 9.1.4 Climate change has been consider in respect of the design to ensure flood risk resilience.

10 SUMMARY

- 10.1.1 The proposed development will involve the construction of 2 No. dwellings on site. Development proposals are contained within **Appendix A**.
- 10.1.2 The site measures c. 335m² and is located on the eastern side of Twyford Road.
- 10.1.3 The site topographic survey identifies levels in the range of 13.8m AOD and 14.31m AOD. Falls are largely demonstrated as prevailing in a westerly direction, toward Twyford Road.
- 10.1.4 Drawing **PL002** (Topographic Survey with Contours) has been prepared to illustrate the topography of the site.
- 10.1.5 The existing below ground drainage arrangements on site have not been verified.
- 10.1.6 A single inspection chamber is identified on site as per the site topographic survey. This is assumed to relate the site's historic foul water drainage arrangement. It is possible there may have been surface water flows from the previous dwelling's roof area draining to this system, although this is unconfirmed. It is understood that rainwater pipes from the previous dwelling discharged below ground.
- 10.1.7 Post development, surface water will drain to Southern Water's public surface water sewer network. Flows will be restricted to 0.5 l/s.
- 10.1.8 Foul water will drain to Southern Water's public foul water sewer network. Existing connectivity is to be explored, with existing connections retained if/where viable.
- 10.1.9 Connection(s) to the public sewer network will be subject to S106 approval from Southern Water.
- 10.1.10 The completion of the development will not increase flood risk on or off the site.
- 10.1.11 In conclusion, this development is suitable with regards to flood risk and surface water drainage.

DRAWINGS

- PL001** Site Location Plan
- PL002** Topographic Survey with Contours
- PL003** Impermeable Areas
- PL004** Proposed Drainage Strategy



SITE LOCATION PLAN

SITE BOUNDARY

NOTES

A3

1. This drawing is to be read in conjunction with all other BP Civils drawings, and with all relevant Architect's and Engineer's drawings and specification. Any discrepancies found are to be reported immediately to the Engineer.

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3. Do not scale, work to figured dimensions only. All dimensions are in millimeters unless noted otherwise and all levels are in metres from the topographic survey datum.

4. Any information given regarding existing underground services is given in good faith after consultation with the relevant authority, however accuracy is not certain. The main contractor is responsible for checking all information on site prior to work commencing and taking due care whilst undertaking the works.

5. All dimensions to be checked on site. All details and dimensions relating to sub-contractors work must be checked and agreed between the sub-contractor or supplier and the general contractor.

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P1

17/08/26

Original Issue

Rev.

Date

Amendments

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Drawing Status

PLANNING

NOT FOR CONSTRUCTION

Client

TJW Holdings Ltd

Project

Twyford Road, Worthing, BN13 2NP

Drawing Title

Site Location Plan

Scale at A3

Date

Drawn By

Checked By

Project No.

1:500

JUN 26

LM

MJA

D2468

Drawing Code

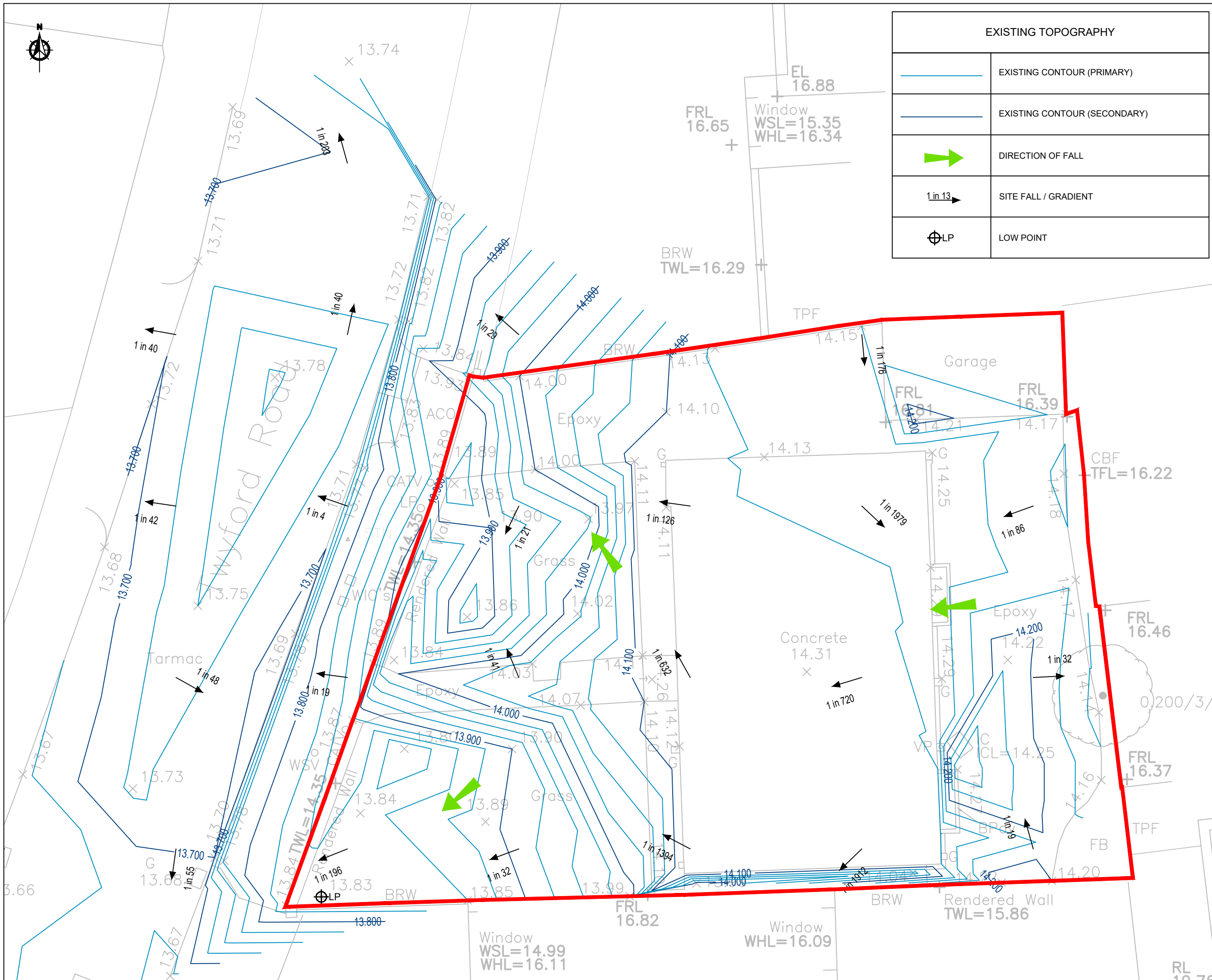
Drawing No.

Rev.

000-BPC-WD-ZZ-D-C

PL001

P1



EXISTING TOPOGRAPHY	
	EXISTING CONTOUR (PRIMARY)
	EXISTING CONTOUR (SECONDARY)
	DIRECTION OF FALL
	SITE FALL / GRADIENT
	LOW POINT

- # NOTES
- A3
-
1. This drawing is to be read in conjunction with all other BP Civils drawings, and with all relevant Architect's and Engineer's drawings and specification. Any discrepancies found are to be reported immediately to the Engineer.
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Drawing Status

PLANNING

NOT FOR CONSTRUCTION

Client	TJW Holdings Ltd
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Project	Twyford Road, Worthing, BN13 2NP
---------	-------------------------------------

Drawing Title	Topographic Survey with Contours
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Scale at A3 1:200	Date JUN 26	Drawn By LM	Checked By MJA	Project No. D2468
Drawing Code 000-BPC-WD-ZZ-D-C			Drawing No. PL002	Rev. P1



IMPERMEABLE AREAS	
	EXISTING IMPERMEABLE AREA - 232m ² (0.02Ha)
	PROPOSED IMPERMEABLE AREA - 220m ² (0.02Ha)

NOTES

A3

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P1	17/08/26	Original Issue
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Drawing Status

PLANNING

NOT FOR CONSTRUCTION

Client

TJW Holdings Ltd

Project

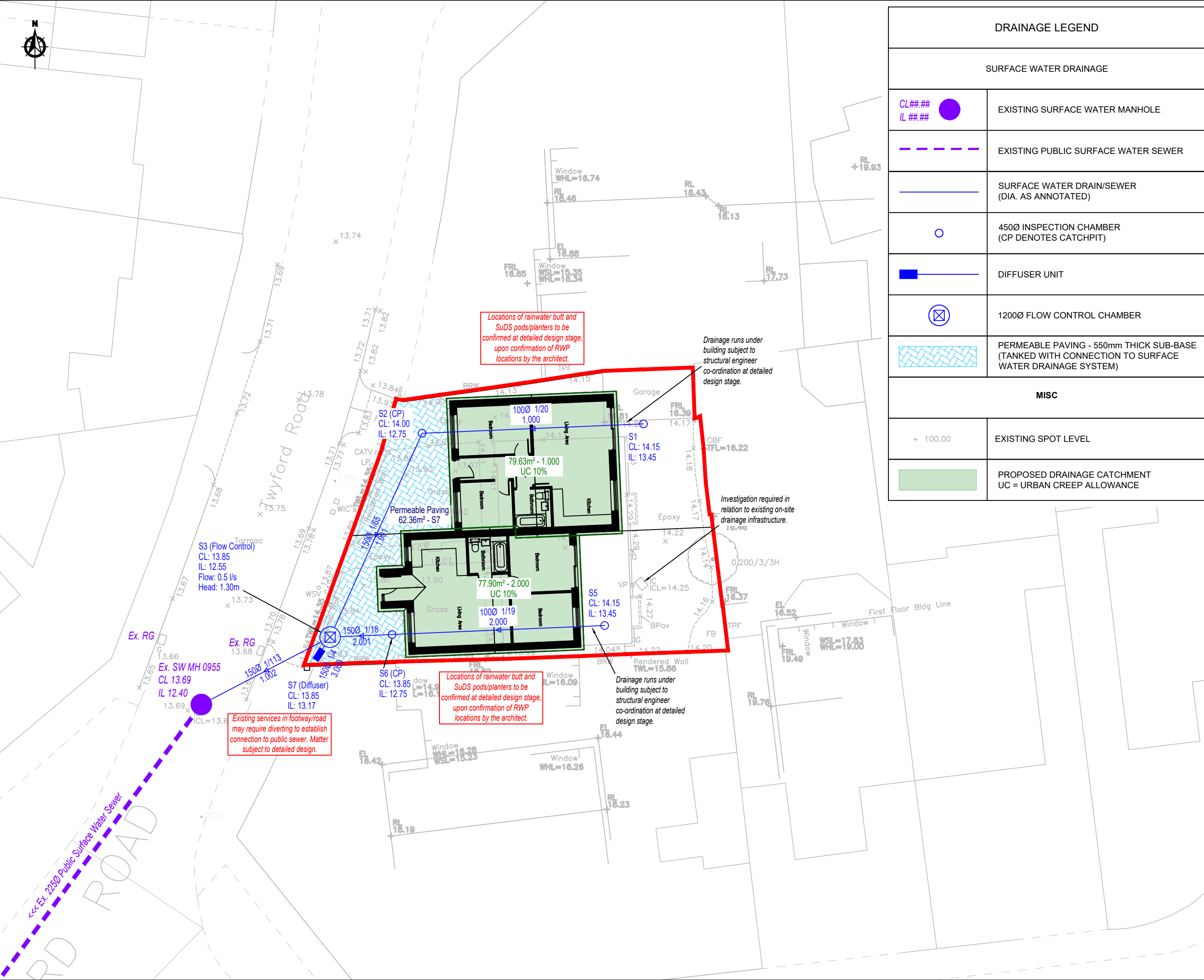
Twyford Road, Worthing, BN13 2NP

Drawing Title

Impermeable Areas

Scale at A3	Date	Drawn By	Checked By	Project No.
1:200	JUN 26	LM	MJA	D2468

Drawing Code	Drawing No.	Rev.
000-BPC-WD-ZZ-D-C	PL003	P1



DRAINAGE LEGEND	
SURFACE WATER DRAINAGE	
CL### IL###	EXISTING SURFACE WATER MANHOLE
---	EXISTING PUBLIC SURFACE WATER SEWER
---	SURFACE WATER DRAIN/SEWER (DIA. AS ANNOTATED)
○	450Ø INSPECTION CHAMBER (CP DENOTES CATCHPIT)
■	DIFFUSER UNIT
⊗	1200Ø FLOW CONTROL CHAMBER
▨	PERMEABLE PAVING - 550mm THICK SUB-BASE (TANKED WITH CONNECTION TO SURFACE WATER DRAINAGE SYSTEM)
MISC	
+ 100.00	EXISTING SPOT LEVEL
■	PROPOSED DRAINAGE CATCHMENT UC = URBAN CREEP ALLOWANCE

NOTES

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8. The client shall ensure all licences, consents and approvals required to implement the works are in place prior to commencing construction.

RESIDUAL HAZARDS

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

1. Buried services. Contractor to refer to record drawings and use CAT to locate existing services and undertake necessary precautions and investigation prior to excavating.

2. Working in live traffic. Contractor to ensure traffic management is designed, erected and maintained to protect the workforce and the public. Contractor to undertake necessary precautions and ensure suitable traffic management is in place prior to commencement.

3. Working in live sewers. Contractor to ensure operatives are familiar and competent with the dangers of working in live sewers.

4. Excavations close to existing structures. Contractor to prepare method statement to ensure stability of existing structure.

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved risk assessment and method statement.

P117/08/26Original Issue

Rev.DateAmendments

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Drawing Status

PLANNING

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Client

TJW Holdings Ltd

Project

Twyford Road, Worthing, BN13 2NP

Drawing Title

Proposed Drainage Strategy

Scale at A3

Date

Drawn By

Checked By

Project No.

1:200

JUN 26

LM

MJA

D2468

Drawing Code

Drawing No.

Rev.

000-BPC-WD-ZZ-D-C

PL004

P1

APPENDICES

Appendix A Architectural Development Proposals

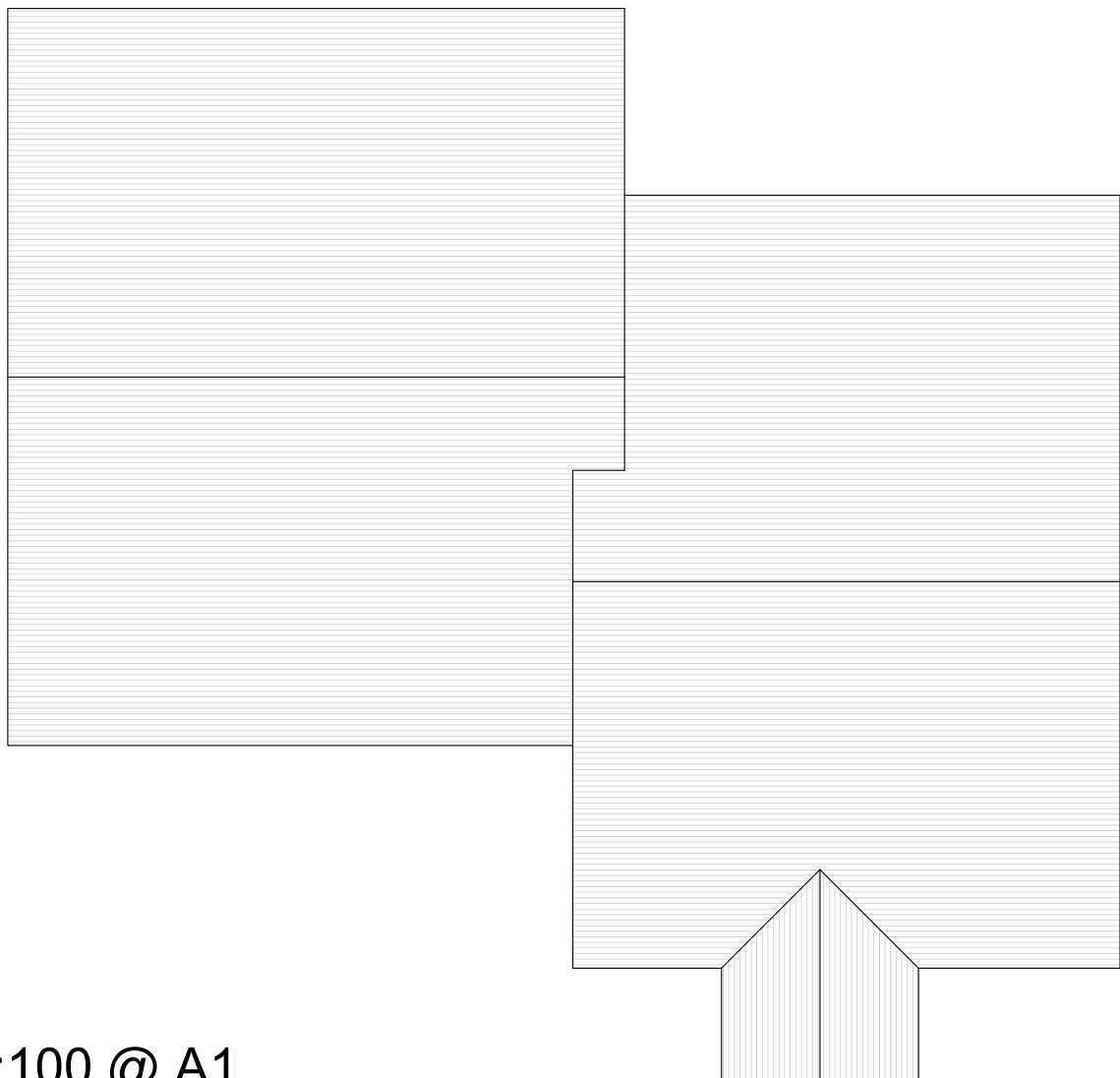
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Ground Floor Plan 1:100 @ A1

Roof Plan 1:100 @ A1



REV	DATE	BY	AMENDMENT
folkesarchitects 151905 820028 info@folkesarchitects.co.uk The Old Forge 6 Church Street Durrington Worthing BN13 2NP			
CLIENT			
Mr T Wilson			
JOB TITLE			
Proposed Development 14 Twyford Road Durrington Worthing BN13 2NP			
DRAWING TITLE			
General Arrangement Drawings As Proposed			
DRAWING STATUS			
Planning			
NOT FOR CONSTRUCTION USE UNLESS STATED AS 'CONSTRUCTION'			
DATE	SCALE	DRAWN BY	
Feb 2026	1:100@A1	BH	
		CHECKED BY	
		EC	
JOB NO.	DRAWING NO.	REVISION	
26028	2.02	/	

Appendix B Topographic Survey

Appendix C Lucion Ground Engineering Limited Site Investigation Report



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Peterborough
PE1 5UA
Registered in England No 6929574
01733 566566
geadmin@luciongroup.com

GROUND INVESTIGATION REPORT

AT

14 TWYFORD ROAD

WORTHING

WEST SUSSEX

Report Reference No. 138779

On behalf of:-

Gateley Smithers Purslow Limited
One Eleven
Edmund Street
Birmingham
B3 2HJ

January 2026

CONTENTS

Introduction	Page 1
Location, Topography and Geology of the site	Page 2
Site Work	Page 4
Laboratory Work	Page 6
Ground Conditions	Page 7
Comments on the Ground Conditions in Relation to Foundation Design and Construction	Page 10

PLANS

Site Location Plan
Exploratory Hole Location Plan

RECORDS & RESULTS

Exploratory Hole Records
Geotechnical Laboratory Test Results

FIGURES

Figure 1 SPT 'N' value plot vs depth below ground level
Figure 2 Apparent Cohesion plot vs depth below ground level

APPENDICES

Concrete Requirements Against Sulphate Attack	Appendix 1
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GATELEY SMITHERS PURSLOW LIMITED

GROUND INVESTIGATION REPORT

FOR

PROPOSED RESIDENTIAL DEVELOPMENT

AT

14 TWYFORD ROAD

WORTHING

WEST SUSSEX

Report Reference No. 138779

January 2026

INTRODUCTION

The client, Gateley Smithers Purslow Limited, are involved in the design of a new bungalow at 14 Twyford Road, Worthing, replacing a recently demolished bungalow. It is understood that the proposed development will comprise rebuilding on the existing foundations, or on a new footing, with associated parking, driveway and garden areas. A plan of the existing/proposed layout is presented to the rear of this report text.

Lucion Ground Engineering Limited was commissioned by the client to carry out a ground investigation to determine the nature and geotechnical properties of the underlying soils and provide information for the design and construction of the foundations.

LOCATION, TOPOGRAPHY AND GEOLOGY OF THE SITE

Location

The site, No.14 Twyford Road, is located on the eastern side of Twyford Road, to the south of its junction with Twyford Gardens, Durrington, Worthing. The site is approximately 1.7km north of Durrington-on-Sea railway station, and 3km north-west of Worthing railway station. The site is centred at National Grid Reference TQ 12047 04913 and its location is shown on plans following this report text.

The approximately rectangular shaped site has a 15m long frontage along Twyford Road to the west, and extends approximately 20m east. The site is bound by Nos.1 and 3 Twyford Close, residential properties to the south and east; No.2 Twyford Gardens to the north; and Twyford Road to the west.

At the time of this investigation the former bungalow had been demolished down to ground floor slab level, with a driveway on its northern side and detached single garage in the rear north-eastern corner. A grassed area with paths was present to the front (west), and a painted concrete patio was present to the rear of the former bungalow location. A planted border with shrubs and a tree is present at the back of the patio along the rear eastern boundary of the site.

Topography

The site is at approximately 14mOD on level ground approximately 3km north of the English Channel.

Geology

The 2006 geological map for the area at 1:50,000 scale, sheet 318, 'Brighton and Worthing', shows the site to be underlain by superficial Aeolian deposits (formerly Brickearth), and denoted as River Terrace Deposits on the current British Geological Survey website, with

superficial Head Deposits ('hillwash') to the north of the site. These superficial deposits cover the solid geology of the Lambeth Group at depth.

SITE WORK

The site work conducted on 27th November 2025 comprised two window sample boreholes (WS01 & WS02), and two hand excavated foundation inspection pits (TP01 & TP02). The positions are shown on the exploratory hole location plan following this report text.

Public utility service drawings were sourced and consulted prior to determining the exploratory hole positions. Prior to excavation, any surface hardstanding was broken out and a service scan was made at each position using a CAT (Cable Avoidance Tool) to check for the absence of detectable buried services that may otherwise have been damaged by the investigation.

The exploratory hole records, presented following the plans, give the descriptions and depths of the various strata encountered, details of all samples taken, in-situ tests, and the groundwater conditions observed during and on completion of boring or drilling.

Window Sample Boreholes

Prior to boring a starter pit was dug at the borehole positions to 1.20m below ground level using hand tools, in order to ensure the absence of buried services. The window sample boreholes were completed at a depth of 5.00m below ground level.

The boreholes were formed by a small track-mounted window sampling and super heavy dynamic probing rig. The window sampling equipment consisted of drive-in sample tubes of specially constructed and strengthened steel, lined with a plastic core-liner. The barrels were initially of 87mm internal diameter and were reduced in diameter with successive barrels with increasing depth. Upon extraction, a continuous ‘undisturbed’ profile of the soil was obtained within the plastic liners.

Representative small disturbed samples of soil were taken from the boreholes at regular intervals throughout their depth.

Standard penetration tests were undertaken in the window sample boreholes in order to give an indication of the in-situ relative density of the material. The tests were made by

driving a 50mm diameter solid cone (C), into the soil at the base of the borehole by means of an automatic trip hammer weighing 63.50kg falling freely through 750mm. The penetration resistance was determined as the number of blows required to drive the tool the final 300mm of a total penetration of 450mm into the soil ahead of the borehole. The results have been tabulated to the rear of the window sample borehole records and plotted against depth in Figure 1.

The boreholes were backfilled with arisings on completion and the surfaces reinstated.

Foundation Inspection Trial Pits

Trial pits TP01 and TP02 were excavated using hand digging tools to depths of 0.70m and 0.80m respectively, against the southern flank of the garage, and southern edge of the former bungalow foundation.

The exposed strata were logged and sampled by an engineer, and samples collected for subsequent laboratory testing. A profile of the existing foundation details and photographs are presented following the respective trial pit records.

Representative disturbed samples were taken at regular intervals throughout the depth of the pits.

On completion, the trial pits were backfilled with arisings and the surfaces reinstated.

LABORATORY WORK

The samples were inspected in the laboratory and assessments of the soil characteristics have been taken into account during preparation of the exploratory hole records. The soil descriptions have been made in accordance with BS5930:2015+A1:2020. The geotechnical test results, undertaken in accordance with BS1377:1990, 2016 & 2022 and BS EN ISO 17892, are presented following the exploratory hole records.

The window sample plastic liners were split by a geotechnical engineer who sub-sampled them, with the remaining samples re-sealed within the plastic liners.

The moisture content and index properties of selected soil samples were determined as a guide to soil classification and behaviour. The liquid limit was determined by a cone penetrometer.

An indication of the shear strength of clay soils within the window sample liners at various depths within WS01 and WS02 was made using a hand shear vane (V), and the readings are presented on the borehole records. These tests were not undertaken on the in-situ clay soils, and the result should only be used as a guide to the shear strength. The hand vane results have been plotted against depth in Figure 2.

Selected samples of soil were analysed to determine the concentration of soluble sulphates. The pH values were also determined.

GROUND CONDITIONS

The ground conditions initially comprised a surface layer of concrete in TP01, and layers of made ground encountered to between 0.50m and 1.00m depth. The made ground was underlain by superficial Head Deposits ('hillwash') covering superficial River Terrace Deposits to at least 5.00m below ground level in the boreholes. A groundwater seepage was recorded at 3.60m below ground level in WS02 during the investigation.

Made Ground

In the rear patio area, a 0.12m thick surface layer of concrete was encountered in TP01 adjacent the garage. The concrete was underlain by a sub-base layer of grey, sandy gravel fill to 0.30m below ground level. The gravel fraction comprised flint, quartz and concrete.

The made ground generally comprised soft, locally firm, brown and dark brown, slightly sandy, slightly gravelly, silty clay fill, and locally slightly clayey, gravelly sand fill (TP02), to between 0.50m and 0.70m depth. At 0.70m to 1.00m depth in WS01, beneath the front lawn, a layer of gravel size broken glass was encountered. The gravel fraction comprised quartz, quartzite, flint, chalk, glazed pottery, coal, concrete, glass and brick fragments.

Head Deposits

Beneath the made ground at between 0.50m (TP01) and 1.00m (WS01) depth, soft locally firm, brown, orange brown and dark brown, slightly sandy, slightly gravelly, silty clay with occasional to abundant black organic specks was encountered. The gravel fraction comprised angular to rounded flint, quartz and quartzite.

These soils are considered to represent superficial Head Deposits, which were encountered to at least the base of the trial pits at 0.70m/0.80m depth, to 1.40m depth in WS02 and 2.30m depth in WS01.

River Terrace Deposits

The River Terrace Deposits were met beneath the made ground and Head Deposits at 1.40m depth in WS02 and 2.30m depth in WS01. The River Terrace Deposits initially comprised firm, locally stiff, light brown, orange brown and off-white, slightly sandy, slightly gravelly, silty clay, with a gravel fraction of angular to rounded flint and chalk.

At 2.60m depth in WS02, loose, off-white, clayey, silty sand and gravel with a gravel fraction of angular to rounded flint and chalk was encountered to 3.65m depth. Below 4.60m depth in WS01, and 4.75m depth in WS02, medium dense, light brown and off-white, clayey to very clayey, silty sand and gravel, varying to silty, slightly sandy gravel was encountered to at least the base of the boreholes at 5.00m depth. The gravel fraction comprised angular to rounded flint and chalk.

Groundwater

A groundwater seepage was noted at 3.60m depth in WS02. Groundwater was recorded at 4.90m depth on completion of WS02. The shallow trial pits, and borehole WS01, were dry during excavation/boring and on completion.

Observations

Roots were observed in all of the exploratory holes, and to a maximum 1.90m depth in WS02 adjacent trees/shrubs in the rear border of the patio.

Existing Foundation Details

Trial pit TP01 was undertaken against the southern side of the detached garage. The trial pit exposed brickwork to 0.11m depth, supported by a 0.04m thick concrete slab to a depth of 0.15m, with a projection of 0.18m. The concrete slab was supported by a 0.40m thick concrete foundation, bearing upon soft, naturally deposited, slightly gravelly, silty clay Head Deposit at 0.55m depth.

Trial pit TP02 was undertaken against the southern edge of the former bungalow foundation. The pit exposed brickwork to 0.60m depth. The brickwork was supported by a 0.05m thick concrete foundation to a depth of 0.65m, with a projection of 0.17m. The foundation was also bearing upon a soft, naturally deposited, slightly gravelly, silty clay Head Deposit.

COMMENTS ON THE GROUND CONDITIONS IN RELATION TO FOUNDATION DESIGN AND CONSTRUCTION

This investigation found made ground to depths of between 0.50m and 1.00m, covering a layer of superficial Head Deposit, and in turn superficial River Terrace Deposits, which were found to at least 5.00m depth. A groundwater seepage was recorded at 3.60m below ground level during the investigation. The superficial Head Deposit/River Terrace Deposits could offer support for traditional foundations. The proposed development is understood to be on the same layout as the existing, and is presented on a plan to the rear of this report.

Foundations will need to extend through made ground, and any root affected clay soils, into the Head Deposit/River Terrace Deposits. Excavations for traditional foundations would not be expected to encounter groundwater, however if shallow groundwater seepages are encountered it would need to be controlled.

Traditional Foundations

Large scale processes of natural sedimentation allow a certain degree of confidence to be placed in the absence of important variation of the engineering properties of natural soils across sites. The made ground, which had variable bearing properties, was found to a maximum depth of 1.00m (WS01), and should be avoided as a bearing stratum.

Samples of the near surface clay had modified plasticity indices of between 9% and 21%, and this clay is rated as having a low to medium volume change potential based on NHBC Standards Chapter 4.2 'Building near trees' (2026). A minimum foundation depth of 0.90m in the naturally deposited clay soils beneath this site, where remote from trees, would be considered appropriate in order to penetrate the zone affected by seasonal moisture content and volume change.

Based on the findings of this investigation, the existing foundations are at insufficient depth to comply with modern standards, and would need to be underpinned or replaced.

Based on the findings of this investigation, the soft Head Deposit clay at 0.90m depth would have a maximum safe bearing capacity of 65kN/m² beneath a 0.60m wide strip footing, with a factor of safety of 3.0 applied against shear failure, for settlement within 25mm. It is recommended that foundations should bear within a consistent soil type to avoid differential settlement.

Foundations within the range of influence of trees, whether they are removed or retained, will have to be separated from clay soils by a suitable void former. The required gap dimensions for footings in the medium volume change potential soils are detailed in the previously cited NHBC document.

Excavations

The made ground together with the underlying soils should be easily removed within excavations for the proposed development. The sides of excavations within any made ground, Head Deposit and River Terrace Deposit may be unstable and should not be relied upon to stand unsupported.

Excavations for traditional footings would not be expected to encounter groundwater, however shallower seepages from the made ground and Head Deposit could be anticipated at wetter times of the year. Care should be taken not to excavate below the water table in the absence of suitable groundwater control, such as dewatering via screened sumps and close side support. Care should be taken to keep the excavations dry.

Attention should be given where personnel are to enter deep excavations, when sides should either be safely battered back, or close side support provided, in order to comply with statutory safety requirements and prevent sidewall collapse.

Floor Slab

A ground bearing floor slab should not be adopted for the new bungalow in root affected clay soils, unless the root affected clay soils are removed and replaced with coarse grained fill in accordance with NHBC guidelines. Damaging differential heave movements

could occur across such slabs, particularly where they cover any clay affected by recently severed tree roots.

Hardstanding

Made ground or naturally deposited soft silty clay was encountered at sub-grade level across this site.

Based on IAN 73/06, Table 5.1 recommends a design CBR value of 3.0% for clay with a plasticity index of 10%.

The sub-grade should be suitably compacted and inspected, with any topsoil, very soft, organic or desiccated clays being removed and replaced with suitable well-graded coarse-grained fill. Care should be taken not to allow exposed silty clay soils at sub-grade level to become exposed to inclement weather conditions, since they are prone to rapid softening and deterioration.

Sulphate Conditions

Sulphate analysis of selected samples of soil yielded soluble sulphate concentrations within Design Sulphate Class DS-1 of the BRE Special Digest 1, Table C1 (2001), presented in Appendix 1. The pH results of the samples ranged between 7.4 and 8.0, indicating alkaline conditions.

These results indicate an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-1 for buried concrete. This ACEC Class should be considered when specifying a Design Chemical Class (DC Class) for buried concrete on this site, as detailed in the above cited BRE document.

LUCION GROUND ENGINEERING LIMITED



S. WEATHERLEY

B.Eng.(Hons.),

C.Geol., F.G.S.

Associate



S. J. FLEMING

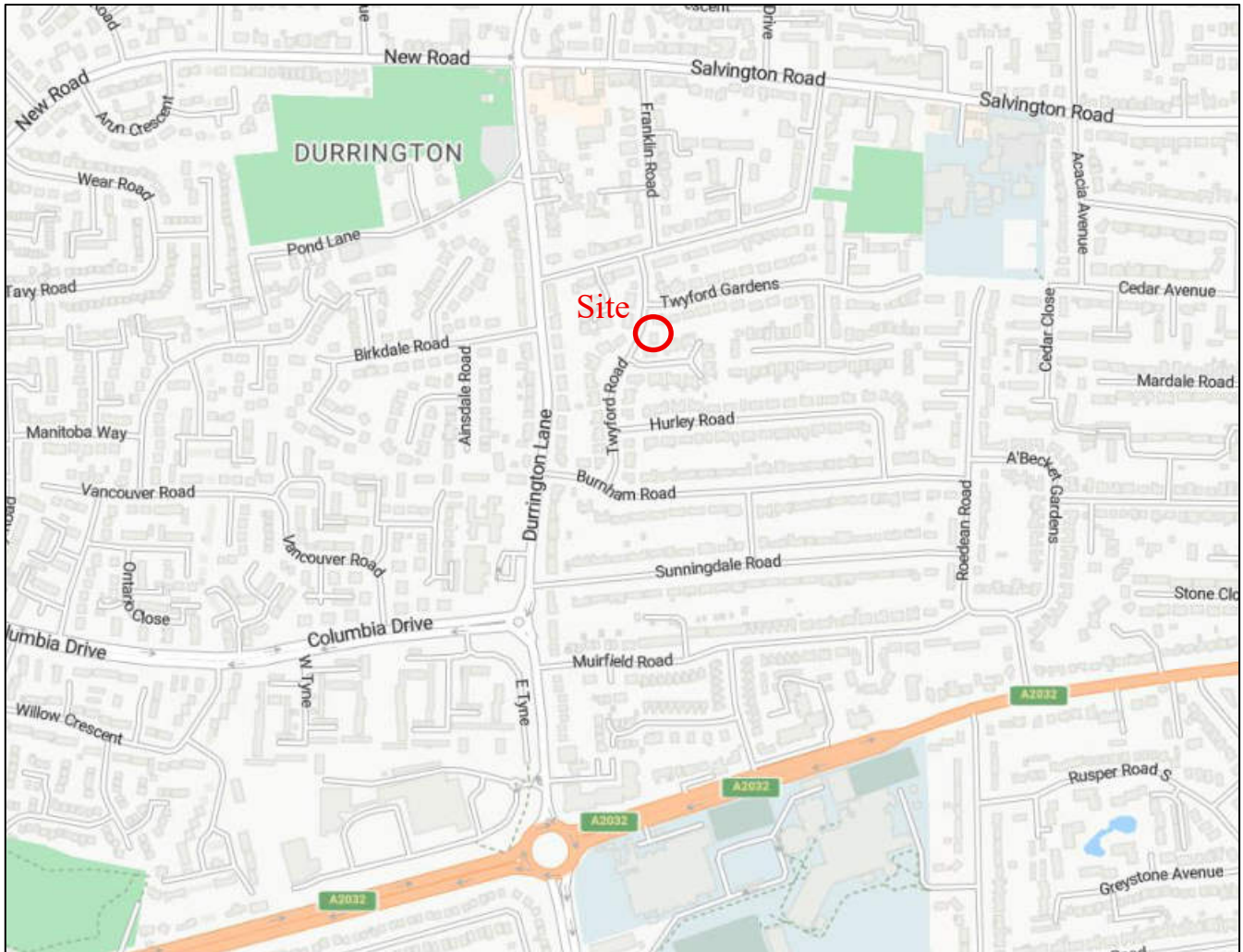
M.Sc., M.S.C.M.,

C.Geol., F.G.S.

Ground Engineering Director

Site Location Plan

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0m 500m

Project : 14 Twyford Road, Worthing

Client : Gateley Smithers Purslow Limited

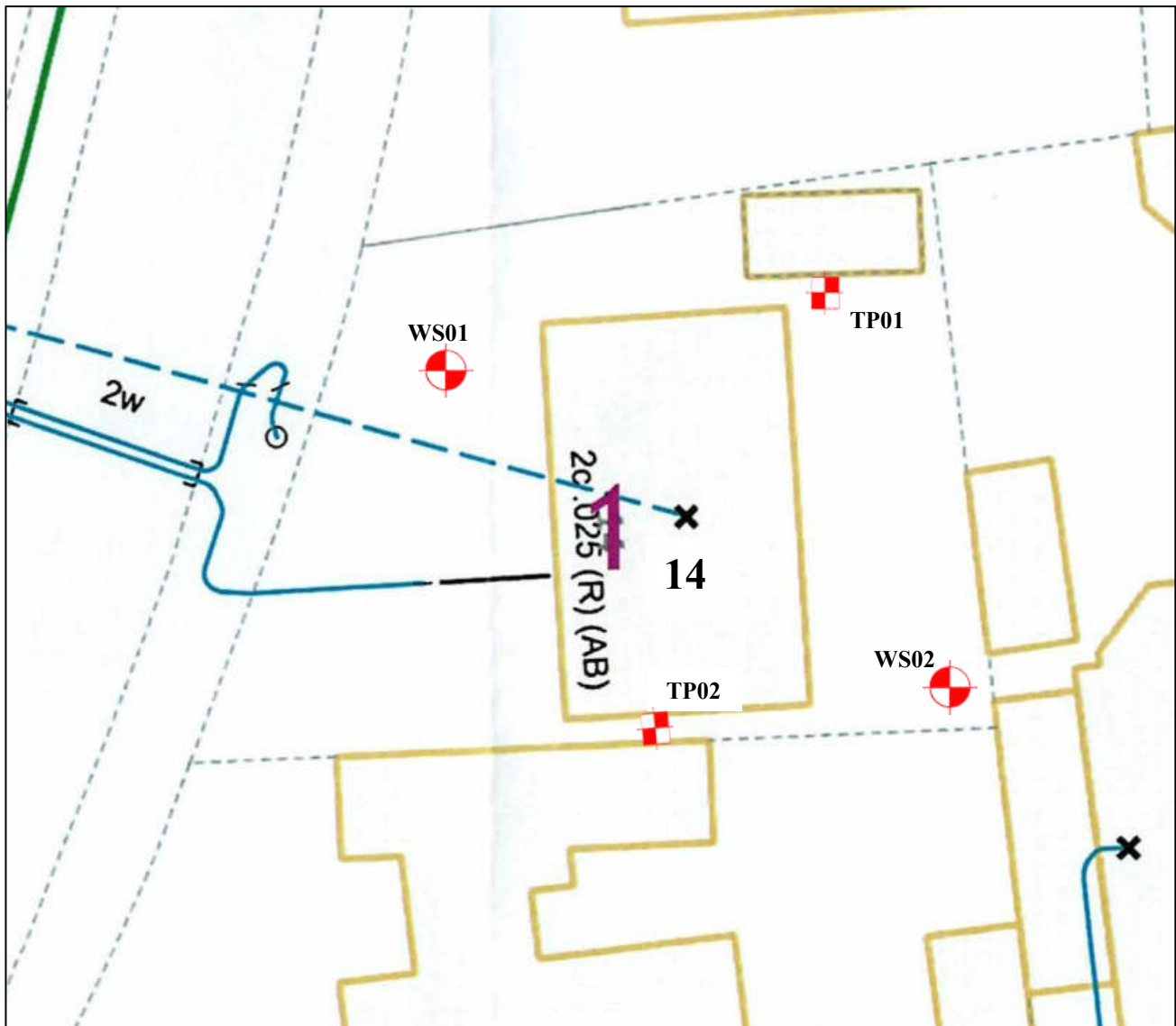


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Project No.
138779

Exploratory Hole Location Plan

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0m 25m

Key

Foundation Trial Pit



Window Sample Borehole



Project : 14 Twyford Road, Worthing

Client : Gateley Smithers Purslow Limited



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Peterborough Tel : 01733 566566

Project No.
138779

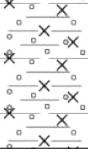
Lucion imaging people and places LUCION GROUND ENGINEERING LTD. Peterborough Tel : 01733 566566			Site: 14 Twyford Road, Worthing				WINDOW SAMPLE WS01					
27/11/2025			Final Depth 5.00 m		Equipment Dynamic Sampling Rig							
Samples and In Situ Testing			Water Levels (Casing)	Stratum Description			Legend	Depth (m)				
Depth (m)	Type	Results										
0.30	D1	[38kPa] [47kPa] [37kPa]		MADE GROUND - Soft, brown, gravelly, silty CLAY. Gravel is flint, chalk and brick. (TOPSOIL)				0.40				
0.60	D2			MADE GROUND - Soft, brown and orange brown, slightly gravelly, silty CLAY. Gravel is flint, quartzite, chalk and glass.				0.70				
0.90	D3			MADE GROUND - GRAVEL of broken glass.				1.00				
1.20-2.00	U1			Soft, locally firm, brown and orange brown, slightly sandy, silty CLAY with occasional black carbonaceous specks.				2.30				
1.30	D4			(HEAD DEPOSIT)								
1.30	V1			...Becomes slightly gravelly below 1.85m depth. Gravel is sub-angular flint.								
1.60	V2											
1.70	D5											
1.80	V3											
2.00-3.00	U2											
2.40	V4	[86kPa]		Stiff, light brown and off-white, slightly sandy, slightly gravelly, silty CLAY. Gravel is angular to rounded flint and chalk.								
2.45	D6	(RIVER TERRACE DEPOSIT)										
2.70	D7	...Becomes gravelly below 3.00m depth with occasional cobbles of flint.										
3.00-4.00	U3	[40kPa] [42kPa] [42kPa]		Firm, light brown, slightly gravelly, silty CLAY with occasional black carbonaceous specks. Gravel is sub-angular to rounded flint and chalk.				3.45				
3.65	V5			(RIVER TERRACE DEPOSIT)								
3.75	V6											
4.00-5.00	U4											
4.30	V7											
5.15-5.45	CPT	N28 (13/6,8,7,7)		Light brown and off-white, silty, very clayey SAND AND GRAVEL. Gravel is angular to rounded flint and chalk.				4.60				
				(RIVER TERRACE DEPOSIT)								
				End of Borehole at 5.00m				5.00				
Remarks						Hole Diameter by Depth		Project No. 138779				
1. Starter pit excavated to 1.20m depth. 2. Roots observed to 0.60m depth. 3. Borehole cased to 2.00m depth.						Depth (m) Diameter (mm)						
						2.00 87 4.00 67 5.00 57		Scale: 1:50	Page 1/1			
KEY				Groundwater Strike			Groundwater Observations					
D - Disturbed Sample		MP - Mackintosh Probe		Strike (m)	Rose To (m)	Casing (m)	Sealed	Remarks	Date	Depth (m)	Casing (m)	Water (m)
B - Bulk Sample		V - Vane Shear Test							27/11/2025	5.00		Dry
U - Undisturbed Sample		N/* - SPT Blows										
W - Water Sample		ES - Environmental Sample										
S/C - SPT Spoon/Cone		☒ - Level On Completion										
☒ - Water Strike		☒ - Level Casing Withdrawn										
☒ - Water Rise		☒ - Standpipe Level										

 LUCION GROUND ENGINEERING LTD. Peterborough Tel : 01733 566566		Site: 14 Twyford Road, Worthing			WINDOW SAMPLE WS02			
27/11/2025		Final Depth 5.00 m	Equipment Dynamic Sampling Rig					
Samples and In Situ Testing			Water Levels (Casing)	Stratum Description	Legend	Depth (m)		
Depth (m)	Type	Results						
0.30	D1	[55kPa]	C	MADE GROUND - Soft, brown and dark brown, slightly gravelly, silty CLAY. Gravel is flint and chalk. (TOPSOIL)		0.60		
0.60	D2			Soft, locally firm, brown and orange brown, slightly gravelly, silty CLAY with occasional to abundant black organic specks. Gravel is angular to sub-rounded flint. (HEAD DEPOSIT)				
0.90	D3							
1.20	D4			Firm, light brown and orange brown, slightly gravelly, silty CLAY. Gravel is angular flint. (RIVER TERRACE DEPOSIT)		1.40		
1.20-2.00	U1							
1.40	V1							
1.50	D5							
1.70	D6							
1.70	V2	[47kPa]		2.60				
1.85	V3	[59kPa]						
2.00-3.00	U2							
3.00-4.00	U3	N8 (4/3,3,1,1)		Loose, off-white, clayey, silty SAND AND GRAVEL. Gravel is angular to rounded flint and chalk. (RIVER TERRACE DEPOSIT)		3.65		
3.15-3.45	CPT							
4.00-5.00	U4			Firm, light brown and orange brown, slightly gravelly, silty CLAY. Gravel is angular to rounded flint and chalk. (RIVER TERRACE DEPOSIT)				
4.15-4.45	CPT	N10 (6/3,2,2,3)		4.75				
5.15-5.45	CPT	N25 (14/7,6,6,6)	Medium dense, light brown and off-white, clayey, silty SAND AND GRAVEL. Gravel is angular to rounded flint and chalk. (RIVER TERRACE DEPOSIT)					
			Medium dense, brown, silty, slightly sandy GRAVEL. Gravel is angular to sub-rounded flint. (RIVER TERRACE DEPOSIT)					
				End of Borehole at 5.00m		4.95		
						5.00		
Remarks					Project No. 138779			
1. Starter pit excavated to 1.20m depth.					Hole Diameter by Depth			
2. Roots observed to 1.90m depth.					Depth (m) Diameter (mm)			
					2.00 87			
					4.00 67			
					5.00 57			
					Scale: 1:50			
					Page 1/1			
KEY			Groundwater Strike			Groundwater Observations		
D - Disturbed Sample			Strike (m)			Date		
B - Bulk Sample			Rose To (m)			Depth (m)		
U - Undisturbed Sample			Casing (m)			Casing (m)		
W - Water Sample			Sealed			Water (m)		
S/C - SPT Spoon/Cone			Remarks					
S - Water Strike			3.60			27/11/2025		
W - Water Rise						5.00		
MP - Mackintosh Probe						4.90		
V - Vane Shear Test								
N/* - SPT Blows								
ES - Environmental Sample								
V - Level On Completion								
V - Level Casing Withdrawn								
V - Standpipe Level								



* C denotes test using a solid cone
S denotes test using a split barrel sampler

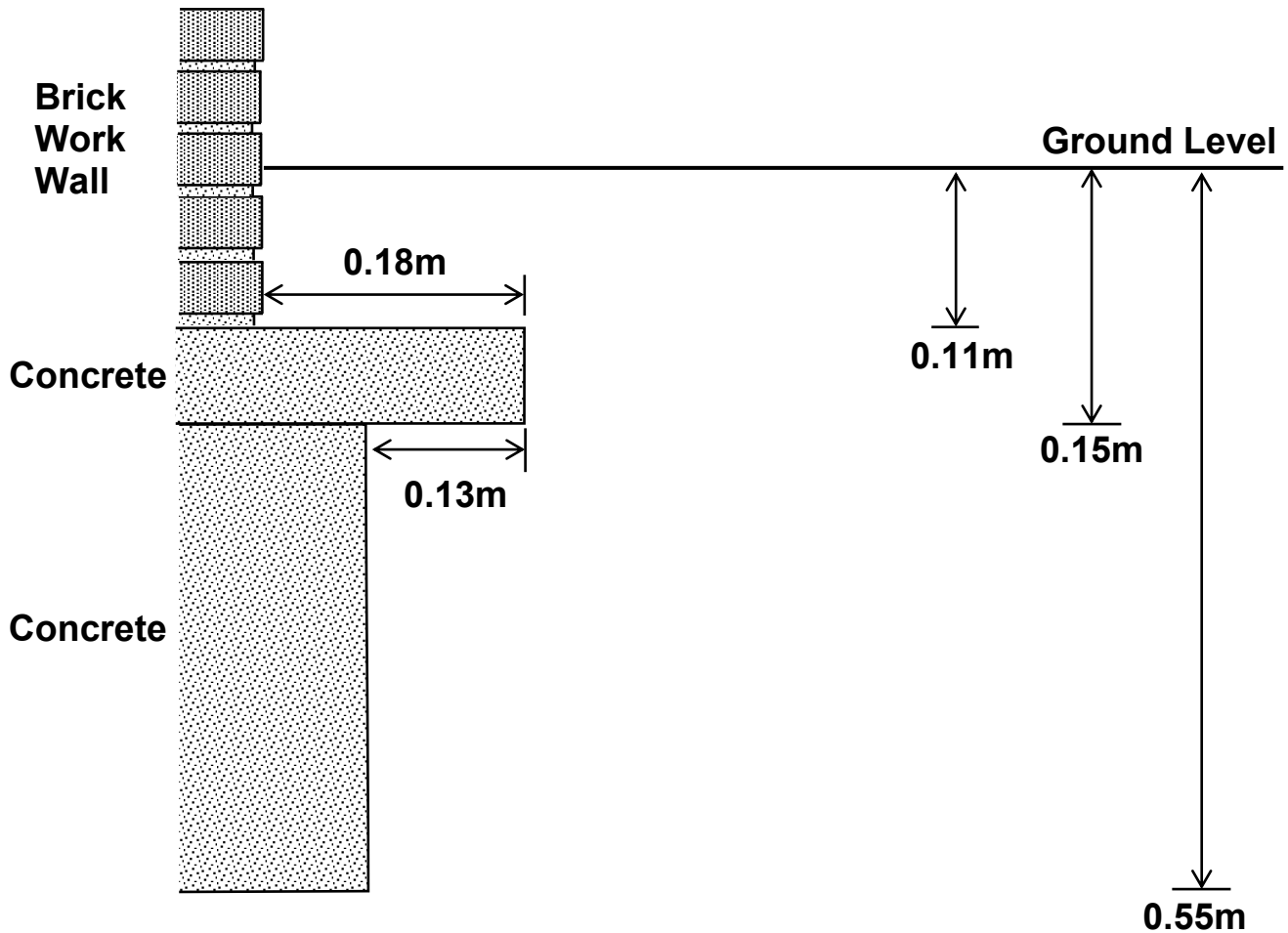
 LUCION GROUND ENGINEERING LTD. Peterborough Tel : 01733 566566			Site: 14 Twyford Road, Worthing			TRIAL PIT TP01	
			27/11/2025	Final Depth 0.70 m	Equipment Hand Tools		

Samples and In Situ Testing			Water Levels	Stratum Description	Legend	Depth (m)
Depth (m)	Type	Results				
0.20	D1			MADE GROUND - CONCRETE.		0.12
				MADE GROUND - Grey, sandy GRAVEL. Gravel is flint, quartz and concrete.		
0.45	D2			MADE GROUND - Soft, locally firm, brown, gravelly, silty CLAY. Gravel is flint, concrete, igneous rock, quartz and ash.		0.30
				Soft, brown, slightly gravelly, silty CLAY. Gravel is sub-angular to rounded flint, quartz and quartzite.		
0.70	D3			(HEAD DEPOSIT)		0.50
			End of Trial Pit at 0.70m	0.70		

Remarks 1. Dead roots observed to at least 0.70m depth. 2. Pit sides stable.				Dimensions		Project No. 138779	
				Length (m)	Width (m)		
				0.50	0.40	Scale: 1:10	Page 1/1

KEY D - Disturbed Sample MP - Mackintosh Probe B - Bulk Sample V - Vane Shear Test U - Undisturbed Sample N/* - SPT Blows W - Water Sample ES - Environmental Sample S/C - SPT Spoon/Cone ▼ - Level On Completion  - Water Strike ▼ - Level Casing Withdrawn  - Water Rise ▼ - Standpipe Level		Water Strike			Completion
		Strike (m)	Rose To (m)	Remarks	Depth (m)
					Dry

Trial Pit TP01 Cross Section



Project : 14 Twyford Road, Worthing

Client : Gateley Smithers Purslow Limited



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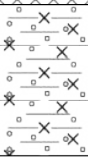
Project No.
138779

Trial Pit TP01 Photographs

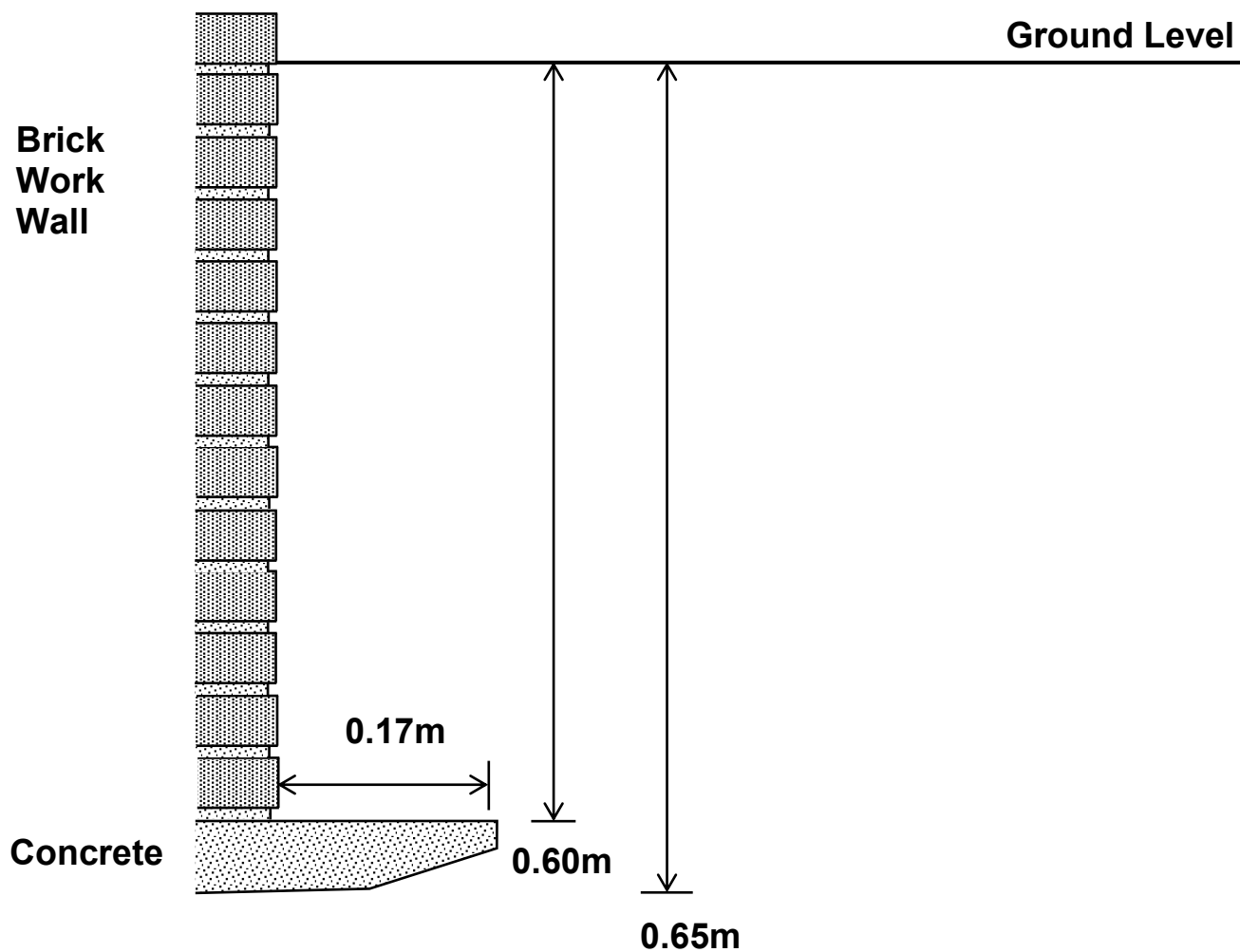


Project : 14 Twyford Road, Worthing

Client : Gateley Smithers Purslow Limited

 LUCION GROUND ENGINEERING LTD. Peterborough Tel : 01733 566566			Site: 14 Twyford Road, Worthing			TRIAL PIT TP02		
			27/11/2025	Final Depth 0.80 m	Equipment Hand Tools			
Samples and In Situ Testing			Water Levels	Stratum Description	Legend	Depth (m)		
Depth (m)	Type	Results						
0.05	D1			MADE GROUND - Brown and grey, slightly clayey, gravelly SAND. Gravel is flint, quartz, quartzite, glazed pottery, brick and glass.		0.10		
0.25	D2			MADE GROUND - Soft, brown and grey, slightly sandy, slightly gravelly, silty CLAY. Gravel is flint, quartz, chalk, brick, glass and coal.				
0.55	D3			Soft, brown and dark brown, slightly gravelly, silty CLAY. Gravel is fine and medium grained, sub-angular flint.		0.60		
0.80	D4			(HEAD DEPOSIT)		0.80		
				End of Trial Pit at 0.80m				
Remarks 1. Roots observed to 0.25m depth. 2. Pit sides stable.					Dimensions Length (m) Width (m) 0.30 0.30		Project No. 138779	
							Scale: 1:10	Page 1/1
KEY D - Disturbed Sample MP - Mackintosh Probe B - Bulk Sample V - Vane Shear Test U - Undisturbed Sample N/* - SPT Blows W - Water Sample ES - Environmental Sample S/C - SPT Spoon/Cone ▼ - Level On Completion  - Water Strike ▼ - Level Casing Withdrawn  - Water Rise ▼ - Standpipe Level				Water Strike Strike (m) Rose To (m) Remarks 		Completion Depth (m) Dry		

Trial Pit TP02 Cross Section A-A



Project : 14 Twyford Road, Worthing

Client : Gateley Smithers Purslow Limited

Trial Pit TP02 Photographs



Project : 14 Twyford Road, Worthing

Client : Gateley Smithers Purslow Limited



LUCION GROUND ENGINEERING LIMITED
Peterborough Tel : 01733 566566

Project No.
138779



Lucion Ground Engineering Limited
Summary of Test Results

Project No.	Project Name																								
138779	14 Twyford Road, Worthing																								

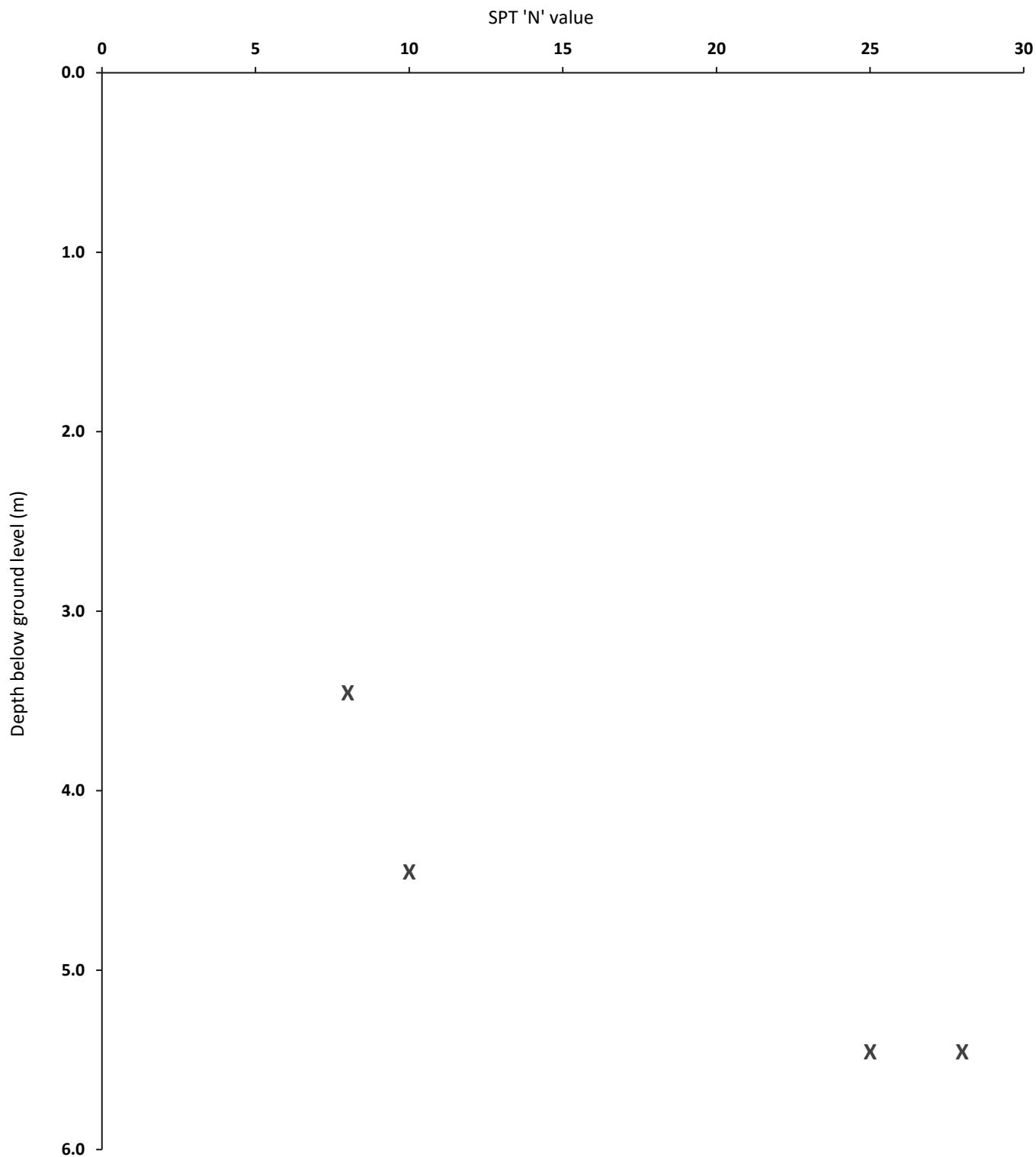
Sample					Density		Classification											Sulphates (SO4) 2:1				CBR						
Location	Ref	Top	Base	Type	Bulk	Dry	Moisture Content %			Class	LL	PL	PI	Retained on 425µm	Type	Max Deviator Stress	Cell pressure	Shear Strength	Angle of Shear Resistance	Soil	Water	pH	Organic Content	Top	Base	Retained on 20mm	Hand Vane	Remarks
		m	m			Mg/m ³	NMC	TRX	CBR		%	%	%	%		kPa	kPa	kPa	Degrees	mg/l	mg/l		%	%	%	%		
WS01	D4	1.30		D			25		CI	39	19	20	1															
WS01	D5	1.70		D																49		7.8						
WS01	D6	2.45		D			16		CL	30	18	12	6															
WS01	D7	2.70		D																107		8.0						
WS02	D3	0.90		D			27		CI	36	19	17	1															
WS02	D4	1.20		D																58		7.4						
WS02	D5	1.50		D			23		CI	40	19	21	1															
WS02	D6	1.70		D																66		7.7						



Project No.	Project Name
138779	14 Twyford Road, Worthing

[illegible]

Key U - Undisturbed D - Disturbed B - Bulk C - Core W - Water		All tests performed in accordance with BS1377-2:2022 and BS EN ISO 17892 unless specified otherwise.	Sheet Reference: LGLLab/C/1974 Iss 2 Rev 32
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Key: WS01 & WS02 = X

SPT 'N' value v Depth below ground level (m)

SITE: 14 Twyford Road, Worthing

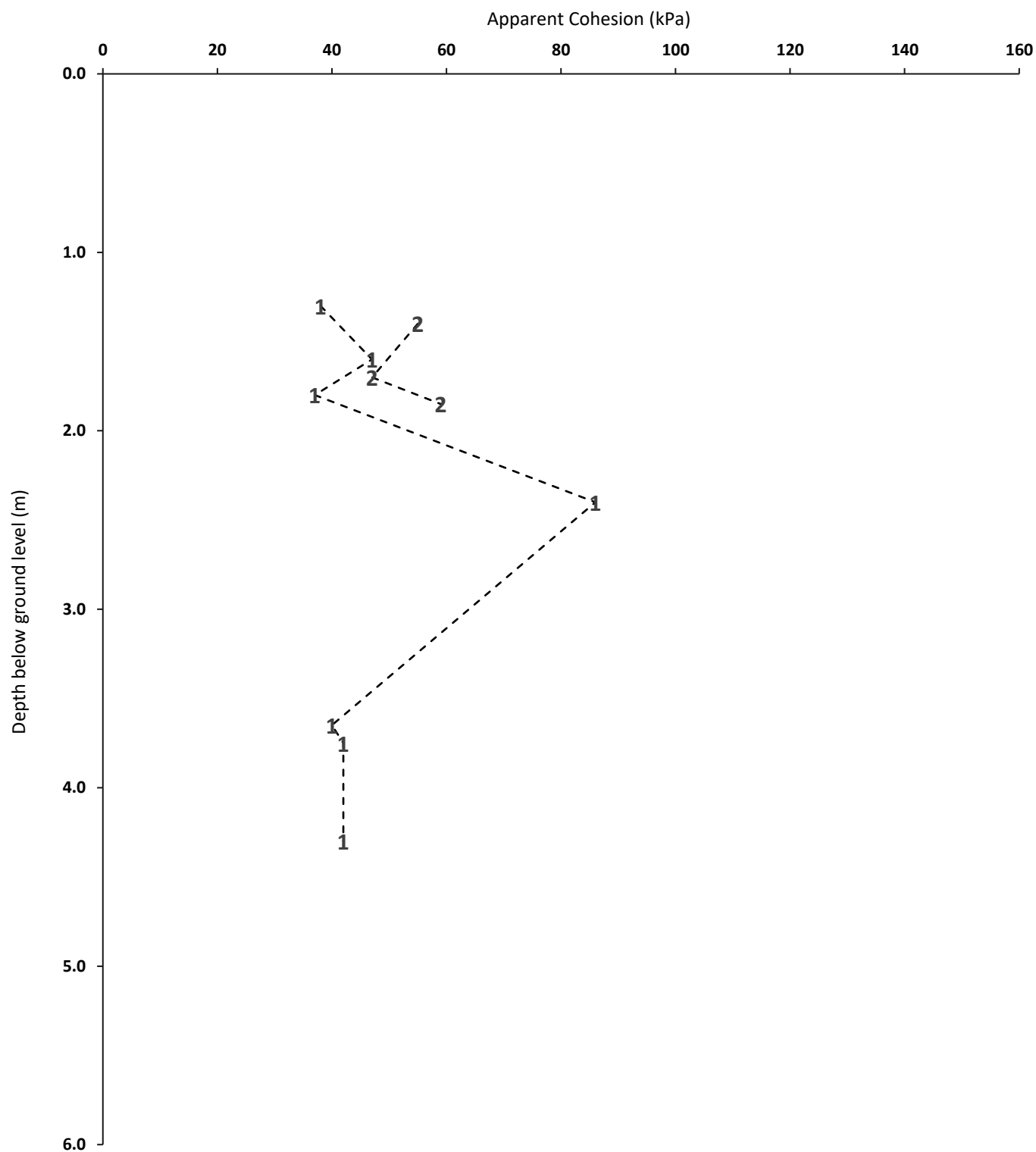
CLIENT: Gateley Smithers Purslow Limited



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Project No. 138779

Figure 1



Key: WS01 - 1 & WS02 - 2

Apparent Cohesion kPa v Depth below ground level (m)

SITE: 14 Twyford Road, Worthing

CLIENT: Gateley Smithers Purslow Limited



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138779

Figure 2

APPENDIX 1

CLASSIFICATION OF AGGRESSIVE CHEMICAL ENVIRONMENT FOR BURIED CONCRETE

**TABLE C1 – AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE
(ACEC) CLASSIFICATION FOR NATURAL GROUND LOCATIONS^a**

Table C1 – Aggressive Chemical Environment for Concrete (ACEC) Classification for Natural Ground Locations						
Sulfate				Groundwater		ACEC
Design Sulfate	2:1 water/soil	Groundwater	Total potential	Static	Mobile	Class for
Class for location	extract^b		sulfate^c	water	water	location
1	2	3	4	5	6	7
	(SO₄ mg/l)	(SO₄ mg/l)	(SO₄ %)	(pH)	(pH)	
DS-1	< 500	< 400	< 0.24	> 2.5		AC-1s
					> 5.5 ^d	AC-1 ^s
					2.5–5.5	AC-2z
DS-2	500–1500	400–1400	0.24–0.6	> 3.5		AC-1s
					> 5.5	AC-2
				2.5–3.5		AC-2s
					2.5–5.5	AC-3z
DS-3	1600–3000	1500–3000	0.7–1.2	> 3.5		AC-2s
					> 5.5	AC-3
				2.5–3.5		AC-3s
					2.5–5.5	AC-4
DS-4	3100–6000	3100–6000	1.3–2.4	> 3.5		AC-3s
					> 5.5	AC-4
				2.5–3.5		AC-4s
					2.5–5.5	AC-5
DS-5	> 6000	> 6000	> 2.4	> 3.5		AC-4s
				2.5–3.5	> 2.5	AC-5

Notes

- a Applies to locations on sites that comprise either undisturbed ground that is in its natural state (ie is not browned – Table C2) or brown fill derived from such ground.
- b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).
- c Applies only to locations where concrete will be exposed to sulfate ions (SO₄) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).
- d For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15 mg/l (Section C2.2.3), increase the ACEC Class to AC-2z.

Explanation of suffix symbols to ACEC Class

- * Suffix 's' indicates that the water has been classified as static.
- * Concrete placed in ACEC Classes that include the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements or combinations listed in Table D2 on page 42.

Appendix D Southern Water Public Sewer Records

Appendix E Wallingford Greenfield Run-off Calculations (Full Site Area)

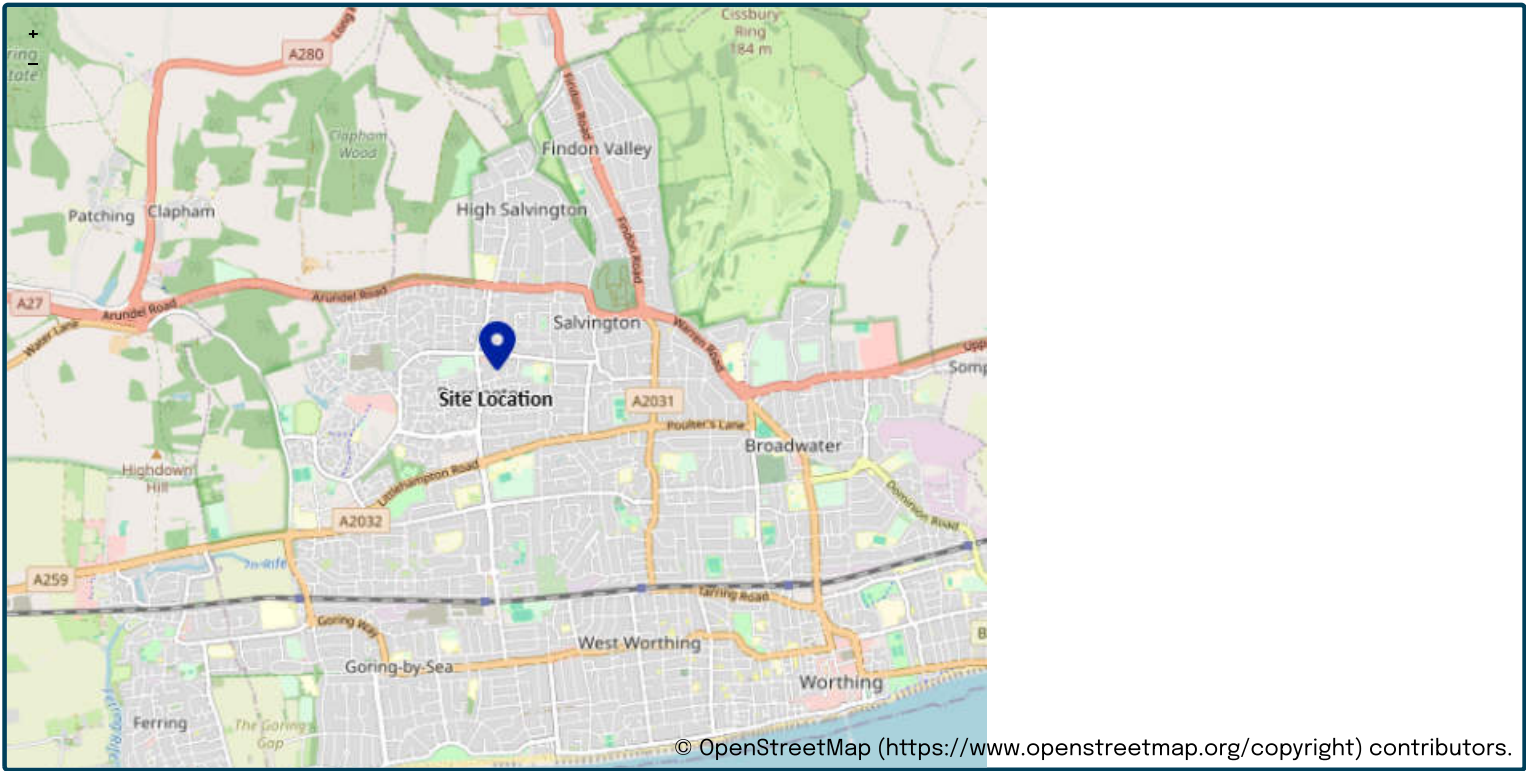
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	17/08/2026
Calculated by	BP Civils
Reference	D2468 14 Twyford Road
Model version	2.2.3

Location

Site name	D2468 14 Twyford Road
Site location	



Site easting (British National Grid)	512055
Site northing (British National Grid)	104912

Site details

Total site area (ha)	0.0335	ha
----------------------	--------	----

Greenfield runoff

Method

Method	FEH statistical (2025)
--------	------------------------

FEH statistical (2025)

	My value	Map value
SAAR9120 (mm)	799	mm
BFIHOST19scaled	0.689	
QMed-QBar conversion	1.136	1.136
QMed (l/s)	0.1	l/s
QBar (FEH statistical 2025) (l/s)	0.1	l/s

Growth curve factors

	My value	Map value
Hydrological region	7	7
1 year growth factor	0.85	
2 year growth factor	0.88	
10 year growth factor	1.62	
30 year growth factor	2.3	
100 year growth factor	3.19	
200 year growth factor	3.74	

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	0.1
Flow rate 2 year (l/s)	0.1
Flow rate 10 years (l/s)	0.1
Flow rate 30 years (l/s)	0.1
Flow rate 100 years (l/s)	0.2
Flow rate 200 years (l/s)	0.2

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix F Wallingford Greenfield Run-off Calculations (Proposed Impermeable Area)

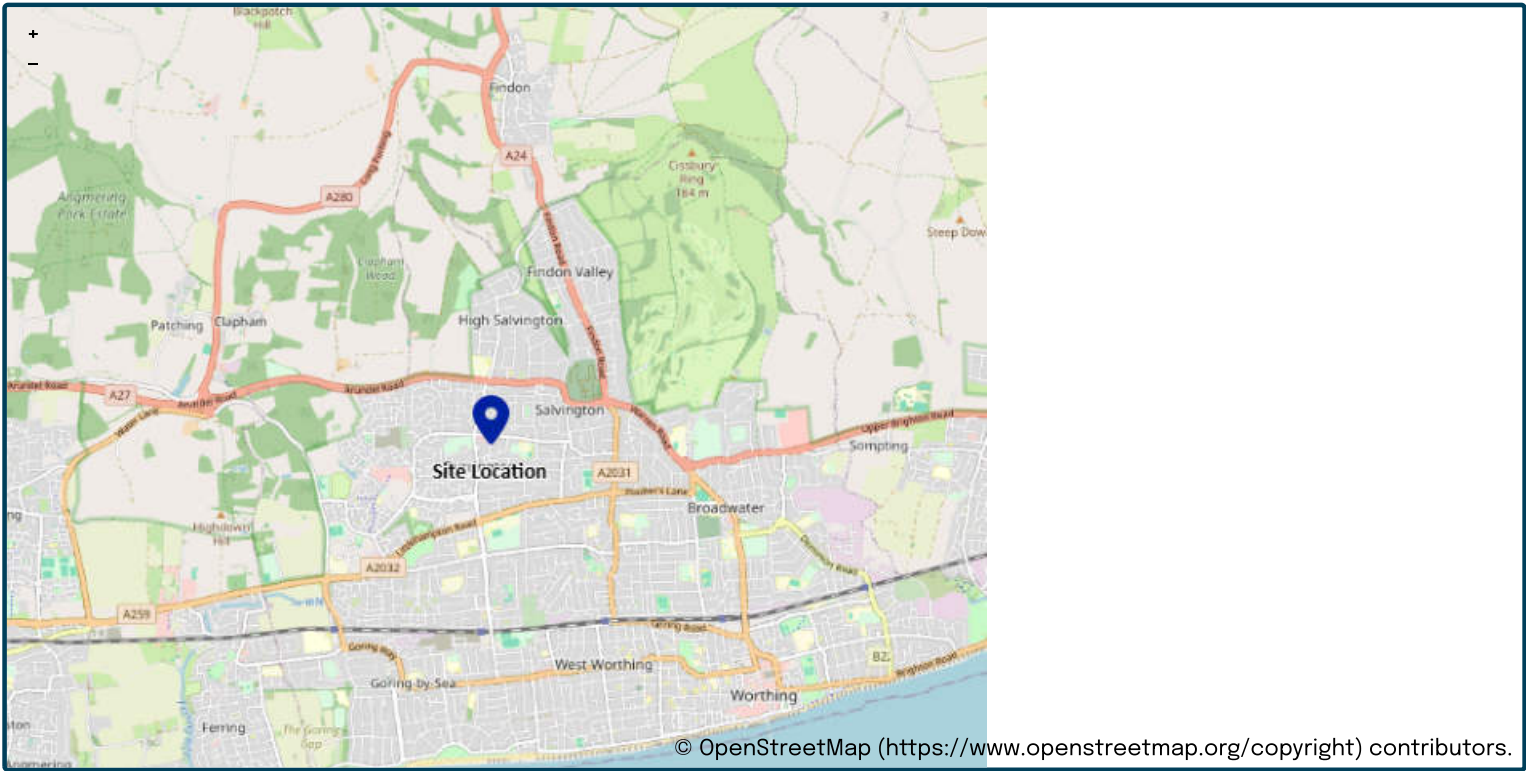
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	17/08/2026
Calculated by	BP Civils
Reference	D2468 14 Twyford Road
Model version	2.2.3

Location

Site name	D2468 14 Twyford Road
Site location	



Site easting (British National Grid)	512055
Site northing (British National Grid)	104912

Site details

Total site area (ha)	0.0220	ha
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Greenfield runoff

Method

Method	FEH statistical (2025)
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FEH statistical (2025)

	<u>My value</u>	<u>Map value</u>
SAAR9120 (mm)	799	mm
BFIHOST19scaled	0.689	
QMed-QBar conversion	1.136	1.136
QMed (l/s)	0.04	l/s
QBar (FEH statistical 2025) (l/s)	0.04	l/s

Growth curve factors

	<u>My value</u>	<u>Map value</u>
Hydrological region	7	7
1 year growth factor	0.85	
2 year growth factor	0.88	
10 year growth factor	1.62	
30 year growth factor	2.3	
100 year growth factor	3.19	
200 year growth factor	3.74	

Results

Method	FEH statistical (2025)	
Flow rate 1 year (l/s)	0.04	l/s
Flow rate 2 year (l/s)	0.04	l/s
Flow rate 10 years (l/s)	0.1	l/s
Flow rate 30 years (l/s)	0.1	l/s
Flow rate 100 years (l/s)	0.1	l/s
Flow rate 200 years (l/s)	0.2	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

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Appendix G Causeway Flow Hydraulic Calculations

Network Details

Manhole Schedule

Manhole	Catchment Area (ha)	Size (mm)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
S1	0.009	450	Unknown	14.150	13.450	0.600	512054.067	104919.780
S2	0.000	450	Unknown	14.000	12.750	1.100	512041.168	104919.233
S5	0.009	450	Unknown	14.150	13.450	0.600	512051.807	104908.036
S6	0.000	450	Unknown	13.850	12.750	0.950	512039.419	104907.511
S7	0.006	708x354	Unknown	13.850	13.170	0.530	512034.812	104905.177
S3	0.000	1200	Unknown	13.850	12.550	1.150	512035.810	104907.357
S4	0.000	1200	Unknown	13.686	12.475	1.061	512028.302	104903.434

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (mm)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.000	S1	13.450	S2	12.800	Circ	100	12.910	20	0.600	0.600	1.100
1.001	S2	12.750	S3	12.550	Circ	150	13.028	65	0.600	1.100	1.150
2.000	S5	13.450	S6	12.800	Circ	100	12.399	19	0.600	0.600	0.950
2.001	S6	12.750	S3	12.550	Circ	150	3.612	18	0.600	0.950	1.150
3.000	S7	13.170	S3	12.550	Circ	150	2.398	4	0.600	0.530	1.150
1.002	S3	12.550	S4	12.475	Circ	150	8.471	113	0.600	1.150	1.061

Permeable Paving Schedule

Permeable Paving	Assigned Manhole	Effective Storage Volume (m3)	CL (m)	IL (m)	Storage Infil Rate (m/hr)	Safety Factor	Easting (m)	Northing (m)
Permeable Paving	S7	10.289	13.850	13.170	0.00000000	2.00	512040.482	104916.232

Outfall Details

Outfall Manhole S4 : Free Discharge

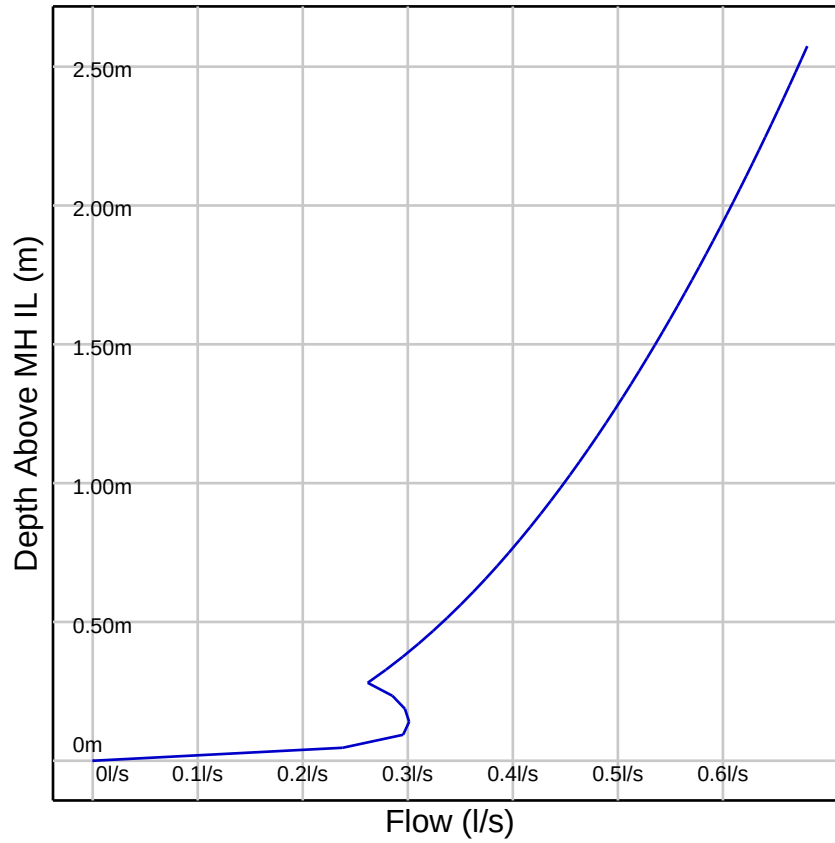
Flow Control Details

Controls within Manhole S3

Hydro-Brake® Optimum Control

Model Ref	Design Depth (m)	Design Flow (l/s)	Invert Offset (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0030-5000-1300-5000	1.300	0.500	0.000	0.134	0.301	0.271	0.258

Hydro-Brake® Optimum Control from S3 to S4



Simulation Settings

FEH2022 (point): Filename=FEH_Point_Descriptors_512048_104916_v5_1_0.xml

Summer (Cv: 1.00), Winter (Cv: 1.00)

Global Time of Entry: 5.0 mins

Durations (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Periods (yrs) + Climate Change: (1, +0%), (2, +0%), (10, +0%), (30, +0%), (30, +40%), (100, +0%), (100, +45%)

Manhole Flood Risk Freeboard: 0.300m

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
1Yr 15Min Winter	15.084	0.00	0.00	30Yr 720Min Winter	5.496	0.00	0.00
1Yr 15Min Summer	15.084	0.00	0.00	30Yr 960Min Summer	4.329	0.00	0.00
1Yr 30Min Winter	9.529	0.00	0.00	30Yr 960Min Winter	4.329	0.00	0.00
1Yr 30Min Summer	9.529	0.00	0.00	30Yr 1440Min Summer	3.096	0.00	0.00
1Yr 60Min Winter	6.115	0.00	0.00	30Yr 1440Min Winter	3.096	0.00	0.00
1Yr 60Min Summer	6.115	0.00	0.00	30Yr 2160Min Summer	2.232	0.00	0.00
1Yr 120Min Winter	5.132	0.00	0.00	30Yr 2160Min Winter	2.232	0.00	0.00
1Yr 120Min Summer	5.132	0.00	0.00	30Yr 2880Min Summer	1.781	0.00	0.00
1Yr 180Min Winter	4.408	0.00	0.00	30Yr 2880Min Winter	1.781	0.00	0.00
1Yr 180Min Summer	4.408	0.00	0.00	30Yr 4320Min Summer	1.316	0.00	0.00
1Yr 240Min Winter	3.682	0.00	0.00	30Yr 4320Min Winter	1.316	0.00	0.00
1Yr 240Min Summer	3.682	0.00	0.00	30Yr 5760Min Summer	1.075	0.00	0.00
1Yr 360Min Winter	2.883	0.00	0.00	30Yr 5760Min Winter	1.075	0.00	0.00
1Yr 360Min Summer	2.883	0.00	0.00	30Yr 7200Min Summer	0.928	0.00	0.00
1Yr 480Min Winter	2.401	0.00	0.00	30Yr 7200Min Winter	0.928	0.00	0.00
1Yr 480Min Summer	2.401	0.00	0.00	30Yr 8640Min Summer	0.828	0.00	0.00
1Yr 600Min Summer	2.049	0.00	0.00	30Yr 8640Min Winter	0.828	0.00	0.00
1Yr 600Min Winter	2.049	0.00	0.00	30Yr 10080Min Summer	0.755	0.00	0.00
1Yr 720Min Winter	1.788	0.00	0.00	30Yr 10080Min Winter	0.755	0.00	0.00
1Yr 720Min Summer	1.788	0.00	0.00	30Yr+40% 15Min Summer	121.263	0.00	0.00
1Yr 960Min Summer	1.454	0.00	0.00	30Yr+40% 15Min Winter	121.263	0.00	0.00
1Yr 960Min Winter	1.454	0.00	0.00	30Yr+40% 30Min Summer	80.627	0.00	0.00
1Yr 1440Min Summer	1.099	0.00	0.00	30Yr+40% 30Min Winter	80.627	0.00	0.00
1Yr 1440Min Winter	1.099	0.00	0.00	30Yr+40% 60Min Summer	51.271	0.00	0.00
1Yr 2160Min Summer	0.837	0.00	0.00	30Yr+40% 60Min Winter	51.271	0.00	0.00
1Yr 2160Min Winter	0.837	0.00	0.00	30Yr+40% 120Min Summer	31.379	0.00	0.00
1Yr 2880Min Winter	0.694	0.00	0.00	30Yr+40% 120Min Winter	31.379	0.00	0.00
1Yr 2880Min Summer	0.694	0.00	0.00	30Yr+40% 180Min Summer	23.232	0.00	0.00
1Yr 4320Min Summer	0.551	0.00	0.00	30Yr+40% 180Min Winter	23.232	0.00	0.00
1Yr 4320Min Winter	0.551	0.00	0.00	30Yr+40% 240Min Summer	18.648	0.00	0.00
1Yr 5760Min Summer	0.478	0.00	0.00	30Yr+40% 240Min Winter	18.648	0.00	0.00
1Yr 5760Min Winter	0.478	0.00	0.00	30Yr+40% 360Min Summer	13.547	0.00	0.00
1Yr 7200Min Winter	0.432	0.00	0.00	30Yr+40% 360Min Winter	13.547	0.00	0.00
1Yr 7200Min Summer	0.432	0.00	0.00	30Yr+40% 480Min Summer	10.749	0.00	0.00
1Yr 8640Min Summer	0.399	0.00	0.00	30Yr+40% 480Min Winter	10.749	0.00	0.00
1Yr 8640Min Winter	0.399	0.00	0.00	30Yr+40% 600Min Summer	8.953	0.00	0.00
1Yr 10080Min Winter	0.375	0.00	0.00	30Yr+40% 600Min Winter	8.953	0.00	0.00
1Yr 10080Min Summer	0.375	0.00	0.00	30Yr+40% 720Min Summer	7.695	0.00	0.00
2Yr 15Min Winter	32.744	0.00	0.00	30Yr+40% 720Min Winter	7.695	0.00	0.00
2Yr 15Min Summer	32.744	0.00	0.00	30Yr+40% 960Min Summer	6.060	0.00	0.00
2Yr 30Min Winter	21.400	0.00	0.00	30Yr+40% 960Min Winter	6.060	0.00	0.00
2Yr 30Min Summer	21.400	0.00	0.00	30Yr+40% 1440Min Summer	4.335	0.00	0.00
2Yr 60Min Summer	13.586	0.00	0.00	30Yr+40% 1440Min Winter	4.335	0.00	0.00
2Yr 60Min Winter	13.586	0.00	0.00	30Yr+40% 2160Min Summer	3.125	0.00	0.00
2Yr 120Min Summer	9.593	0.00	0.00	30Yr+40% 2160Min Winter	3.125	0.00	0.00
2Yr 120Min Winter	9.593	0.00	0.00	30Yr+40% 2880Min Summer	2.494	0.00	0.00
2Yr 180Min Summer	7.635	0.00	0.00	30Yr+40% 2880Min Winter	2.494	0.00	0.00
2Yr 180Min Winter	7.635	0.00	0.00	30Yr+40% 4320Min Summer	1.842	0.00	0.00
2Yr 240Min Winter	6.220	0.00	0.00	30Yr+40% 4320Min Winter	1.842	0.00	0.00
2Yr 240Min Summer	6.220	0.00	0.00	30Yr+40% 5760Min Summer	1.505	0.00	0.00
2Yr 360Min Summer	4.679	0.00	0.00	30Yr+40% 5760Min Winter	1.505	0.00	0.00
2Yr 360Min Winter	4.679	0.00	0.00	30Yr+40% 7200Min Summer	1.299	0.00	0.00
2Yr 480Min Summer	3.805	0.00	0.00	30Yr+40% 7200Min Winter	1.299	0.00	0.00
2Yr 480Min Winter	3.805	0.00	0.00	30Yr+40% 8640Min Summer	1.159	0.00	0.00

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
2Yr 600Min Summer	3.209	0.00	0.00	30Yr+40% 8640Min Winter	1.159	0.00	0.00
2Yr 600Min Winter	3.209	0.00	0.00	30Yr+40% 10080Min Summer	1.058	0.00	0.00
2Yr 720Min Winter	2.778	0.00	0.00	30Yr+40% 10080Min Winter	1.058	0.00	0.00
2Yr 720Min Summer	2.778	0.00	0.00	100Yr 15Min Summer	108.799	0.00	0.00
2Yr 960Min Summer	2.221	0.00	0.00	100Yr 15Min Winter	108.799	0.00	0.00
2Yr 960Min Winter	2.221	0.00	0.00	100Yr 30Min Summer	72.999	0.00	0.00
2Yr 1440Min Summer	1.629	0.00	0.00	100Yr 30Min Winter	72.999	0.00	0.00
2Yr 1440Min Winter	1.629	0.00	0.00	100Yr 60Min Summer	46.808	0.00	0.00
2Yr 2160Min Summer	1.209	0.00	0.00	100Yr 60Min Winter	46.808	0.00	0.00
2Yr 2160Min Winter	1.209	0.00	0.00	100Yr 120Min Summer	28.071	0.00	0.00
2Yr 2880Min Summer	0.988	0.00	0.00	100Yr 120Min Winter	28.071	0.00	0.00
2Yr 2880Min Winter	0.988	0.00	0.00	100Yr 180Min Summer	20.581	0.00	0.00
2Yr 4320Min Summer	0.760	0.00	0.00	100Yr 180Min Winter	20.581	0.00	0.00
2Yr 4320Min Winter	0.760	0.00	0.00	100Yr 240Min Summer	16.538	0.00	0.00
2Yr 5760Min Summer	0.642	0.00	0.00	100Yr 240Min Winter	16.538	0.00	0.00
2Yr 5760Min Winter	0.642	0.00	0.00	100Yr 360Min Summer	12.007	0.00	0.00
2Yr 7200Min Summer	0.570	0.00	0.00	100Yr 360Min Winter	12.007	0.00	0.00
2Yr 7200Min Winter	0.570	0.00	0.00	100Yr 480Min Summer	9.532	0.00	0.00
2Yr 8640Min Summer	0.521	0.00	0.00	100Yr 480Min Winter	9.532	0.00	0.00
2Yr 8640Min Winter	0.521	0.00	0.00	100Yr 600Min Summer	7.959	0.00	0.00
2Yr 10080Min Summer	0.485	0.00	0.00	100Yr 600Min Winter	7.959	0.00	0.00
2Yr 10080Min Winter	0.485	0.00	0.00	100Yr 720Min Summer	6.856	0.00	0.00
10Yr 15Min Summer	65.967	0.00	0.00	100Yr 720Min Winter	6.856	0.00	0.00
10Yr 15Min Winter	65.967	0.00	0.00	100Yr 960Min Summer	5.405	0.00	0.00
10Yr 30Min Summer	43.416	0.00	0.00	100Yr 960Min Winter	5.405	0.00	0.00
10Yr 30Min Winter	43.416	0.00	0.00	100Yr 1440Min Summer	3.865	0.00	0.00
10Yr 60Min Summer	27.500	0.00	0.00	100Yr 1440Min Winter	3.865	0.00	0.00
10Yr 60Min Winter	27.500	0.00	0.00	100Yr 2160Min Summer	2.776	0.00	0.00
10Yr 120Min Summer	17.454	0.00	0.00	100Yr 2160Min Winter	2.776	0.00	0.00
10Yr 120Min Winter	17.454	0.00	0.00	100Yr 2880Min Summer	2.199	0.00	0.00
10Yr 180Min Summer	13.173	0.00	0.00	100Yr 2880Min Winter	2.199	0.00	0.00
10Yr 180Min Winter	13.173	0.00	0.00	100Yr 4320Min Summer	1.603	0.00	0.00
10Yr 240Min Summer	10.577	0.00	0.00	100Yr 4320Min Winter	1.603	0.00	0.00
10Yr 240Min Winter	10.577	0.00	0.00	100Yr 5760Min Summer	1.295	0.00	0.00
10Yr 360Min Winter	7.731	0.00	0.00	100Yr 5760Min Winter	1.295	0.00	0.00
10Yr 360Min Summer	7.731	0.00	0.00	100Yr 7200Min Summer	1.107	0.00	0.00
10Yr 480Min Summer	6.164	0.00	0.00	100Yr 7200Min Winter	1.107	0.00	0.00
10Yr 480Min Winter	6.164	0.00	0.00	100Yr 8640Min Summer	0.979	0.00	0.00
10Yr 600Min Summer	5.142	0.00	0.00	100Yr 8640Min Winter	0.979	0.00	0.00
10Yr 600Min Winter	5.142	0.00	0.00	100Yr 10080Min Summer	0.887	0.00	0.00
10Yr 720Min Summer	4.421	0.00	0.00	100Yr 10080Min Winter	0.887	0.00	0.00
10Yr 720Min Winter	4.421	0.00	0.00	100Yr+45% 15Min Summer	157.758	0.00	0.00
10Yr 960Min Summer	3.492	0.00	0.00	100Yr+45% 15Min Winter	157.758	0.00	0.00
10Yr 960Min Winter	3.492	0.00	0.00	100Yr+45% 30Min Summer	105.849	0.00	0.00
10Yr 1440Min Winter	2.512	0.00	0.00	100Yr+45% 30Min Winter	105.849	0.00	0.00
10Yr 1440Min Summer	2.512	0.00	0.00	100Yr+45% 60Min Summer	67.871	0.00	0.00
10Yr 2160Min Summer	1.823	0.00	0.00	100Yr+45% 60Min Winter	67.871	0.00	0.00
10Yr 2160Min Winter	1.823	0.00	0.00	100Yr+45% 120Min Summer	40.703	0.00	0.00
10Yr 2880Min Summer	1.465	0.00	0.00	100Yr+45% 120Min Winter	40.703	0.00	0.26
10Yr 2880Min Winter	1.465	0.00	0.00	100Yr+45% 180Min Summer	29.843	0.00	0.00
10Yr 4320Min Summer	1.096	0.00	0.00	100Yr+45% 180Min Winter	29.843	0.00	0.29
10Yr 4320Min Winter	1.096	0.00	0.00	100Yr+45% 240Min Summer	23.980	0.00	0.10
10Yr 5760Min Summer	0.906	0.00	0.00	100Yr+45% 240Min Winter	23.980	0.00	0.10
10Yr 5760Min Winter	0.906	0.00	0.00	100Yr+45% 360Min Summer	17.410	0.00	1.25
10Yr 7200Min Summer	0.789	0.00	0.00	100Yr+45% 360Min Winter	17.410	0.00	0.12
10Yr 7200Min Winter	0.789	0.00	0.00	100Yr+45% 480Min Summer	13.821	0.00	0.00
10Yr 8640Min Summer	0.710	0.00	0.00	100Yr+45% 480Min Winter	13.821	0.00	0.21
10Yr 8640Min Winter	0.710	0.00	0.00	100Yr+45% 600Min Summer	11.540	0.00	0.00
10Yr 10080Min Summer	0.652	0.00	0.00	100Yr+45% 600Min Winter	11.540	0.00	0.00
10Yr 10080Min Winter	0.652	0.00	0.00	100Yr+45% 720Min Summer	9.942	0.00	0.00
30Yr 15Min Summer	86.616	0.00	0.00	100Yr+45% 720Min Winter	9.942	0.00	0.00
30Yr 15Min Winter	86.616	0.00	0.00	100Yr+45% 960Min Summer	7.838	0.00	0.00
30Yr 30Min Summer	57.590	0.00	0.00	100Yr+45% 960Min Winter	7.838	0.00	0.00
30Yr 30Min Winter	57.590	0.00	0.00	100Yr+45% 1440Min Summer	5.605	0.00	0.00
30Yr 60Min Summer	36.622	0.00	0.00	100Yr+45% 1440Min Winter	5.605	0.00	0.00
30Yr 60Min Winter	36.622	0.00	0.00	100Yr+45% 2160Min Summer	4.025	0.00	0.00
30Yr 120Min Summer	22.413	0.00	0.00	100Yr+45% 2160Min Winter	4.025	0.00	0.00
30Yr 120Min Winter	22.413	0.00	0.00	100Yr+45% 2880Min Summer	3.189	0.00	0.00

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
30Yr 180Min Summer	16.595	0.00	0.00	100Yr+45% 2880Min Winter	3.189	0.00	0.00
30Yr 180Min Winter	16.595	0.00	0.00	100Yr+45% 4320Min Summer	2.324	0.00	0.00
30Yr 240Min Summer	13.320	0.00	0.00	100Yr+45% 4320Min Winter	2.324	0.00	0.00
30Yr 240Min Winter	13.320	0.00	0.00	100Yr+45% 5760Min Summer	1.878	0.00	0.00
30Yr 360Min Summer	9.677	0.00	0.00	100Yr+45% 5760Min Winter	1.878	0.00	0.00
30Yr 360Min Winter	9.677	0.00	0.00	100Yr+45% 7200Min Summer	1.605	0.00	0.00
30Yr 480Min Summer	7.678	0.00	0.00	100Yr+45% 7200Min Winter	1.605	0.00	0.00
30Yr 480Min Winter	7.678	0.00	0.00	100Yr+45% 8640Min Summer	1.420	0.00	0.00
30Yr 600Min Summer	6.395	0.00	0.00	100Yr+45% 8640Min Winter	1.420	0.00	0.00
30Yr 600Min Winter	6.395	0.00	0.00	100Yr+45% 10080Min Winter	1.285	0.00	0.00
30Yr 720Min Summer	5.496	0.00	0.00	100Yr+45% 10080Min Summer	1.285	0.00	0.00

Simulation Results

Return Period (yrs) + Climate Change (%):
1yr+0%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Summer	8	13.466	0.016	0.780		OK
S2	180 min Summer	121	12.886	0.136	0.090		OK
S5	15 min Summer	8	13.466	0.016	0.763		OK
S6	180 min Summer	123	12.886	0.136	0.081		OK
S7	180 min Summer	104	13.174	0.004	0.174		OK
S3	180 min Summer	123	12.886	0.336	0.291		Surcharged
S4	480 min Winter	253	12.488	0.013	0.301		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	180 min Summer	121	S1	S2	0.046	0.786	0.409	0.030	OK
1.001	180 min Summer	121	S2	S3	0.143	0.246	0.409	0.019	OK
2.000	180 min Summer	123	S5	S6	0.046	0.791	0.400	0.029	OK
2.001	180 min Summer	123	S6	S3	0.143	0.281	0.441	0.010	OK
3.000	180 min Summer	104	S7	S3	0.077	0.053	0.174	0.002	OK
1.002	480 min Winter	253	S3	S4	0.013	0.384	0.301	0.018	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Surface Runoff (m3)	Status
Permeable Paving	180 min Summer	104	13.179	0.009	0.173			OK

Return Period (yrs) + Climate Change (%):

2yr+0%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Summer	8	13.474	0.024	1.693		OK
S2	180 min Summer	125	13.192	0.442	0.131		Surcharged
S5	15 min Summer	8	13.473	0.023	1.656		OK
S6	180 min Summer	125	13.192	0.442	0.128		Surcharged
S7	180 min Summer	124	13.192	0.022	0.085		OK
S3	180 min Summer	124	13.192	0.642	0.358		Surcharged
S4	180 min Summer	124	12.490	0.015	0.367		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	30 min Summer	18	S1	S2	0.060	1.139	1.487	0.109	OK
1.001	15 min Summer	12	S2	S3	0.150	0.402	1.528	0.069	Surcharged
2.000	60 min Summer	33	S5	S6	0.059	1.043	1.100	0.079	OK
2.001	30 min Summer	19	S6	S3	0.150	0.654	1.948	0.046	Surcharged
3.000	180 min Summer	124	S7	S3	0.086	0.043	0.396	0.004	OK
1.002	180 min Summer	124	S3	S4	0.015	0.409	0.367	0.022	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Surface Runoff (m3)	Status
Permeable Paving	180 min Summer	123	13.192	0.022	0.100			OK

Return Period (yrs) + Climate Change (%):

10yr+0%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Summer	8	13.484	0.034	3.409		OK
S2	180 min Winter	150	13.324	0.574	0.140		Surcharged
S5	15 min Summer	8	13.483	0.033	3.335		OK
S6	180 min Winter	154	13.324	0.574	0.126		Surcharged
S7	180 min Winter	150	13.324	0.154	0.697		Surcharged
S3	180 min Winter	150	13.325	0.775	0.319		Surcharged
S4	180 min Winter	151	12.490	0.015	0.398		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	8	S1	S2	0.067	1.328	3.395	0.249	OK
1.001	15 min Winter	8	S2	S3	0.150	0.439	1.849	0.084	Surcharged
2.000	15 min Summer	8	S5	S6	0.066	1.341	3.325	0.238	OK
2.001	15 min Winter	8	S6	S3	0.150	0.828	2.260	0.054	Surcharged
3.000	180 min Summer	210	S7	S3	0.150	0.152	2.509	0.028	Surcharged
1.002	180 min Winter	151	S3	S4	0.015	0.418	0.398	0.024	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Surface Runoff (m3)	Status
Permeable Paving	180 min Winter	148	13.325	0.155	0.105			OK

Return Period (yrs) + Climate Change (%):

30yr+0%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	15 min Summer	8	13.489	0.039	4.476		OK
S2	180 min Winter	166	13.414	0.664	0.135		Surcharged
S5	15 min Summer	8	13.488	0.038	4.378		OK
S6	180 min Winter	159	13.414	0.664	0.154		Surcharged
S7	180 min Winter	166	13.413	0.243	0.041		Surcharged
S3	180 min Winter	162	13.414	0.864	0.277		Surcharged
S4	180 min Winter	159	12.491	0.016	0.418		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	8	S1	S2	0.069	1.435	4.460	0.326	OK
1.001	30 min Summer	17	S2	S3	0.150	0.444	3.249	0.148	Surcharged
2.000	15 min Summer	8	S5	S6	0.069	1.448	4.363	0.313	OK
2.001	15 min Winter	7	S6	S3	0.150	0.857	3.546	0.084	Surcharged
3.000	180 min Summer	290	S7	S3	0.150	0.162	2.761	0.030	Surcharged
1.002	180 min Winter	159	S3	S4	0.016	0.423	0.418	0.025	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Surface Runoff (m3)	Status
Permeable Paving	180 min Winter	156	13.414	0.244	0.114			OK

Return Period (yrs) + Climate Change (%):

30yr+40%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	240 min Winter	212	13.583	0.133	0.167		Surcharged
S2	180 min Winter	166	13.582	0.832	0.193		Surcharged
S5	240 min Winter	212	13.582	0.132	0.164		Surcharged
S6	180 min Winter	169	13.582	0.832	0.185		Flood Risk
S7	180 min Winter	173	13.584	0.414	0.014		Flood Risk
S3	240 min Winter	207	13.581	1.031	0.590		Flood Risk
S4	240 min Winter	213	12.491	0.016	0.452		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	180 min Summer	125	S1	S2	0.100	0.740	2.156	0.158	Surcharged
1.001	30 min Summer	16	S2	S3	0.150	0.480	5.095	0.231	Surcharged
2.000	180 min Summer	124	S5	S6	0.100	0.747	2.109	0.151	Surcharged
2.001	30 min Summer	16	S6	S3	0.150	0.790	5.005	0.119	Surcharged
3.000	360 min Winter	595	S7	S3	0.150	0.166	2.852	0.031	Surcharged
1.002	240 min Winter	213	S3	S4	0.016	0.432	0.452	0.027	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Surface Runoff (m3)	Status
Permeable Paving	180 min Winter	172	13.583	0.413	0.148			OK

Return Period (yrs) + Climate Change (%):

100yr+0%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	180 min Winter	170	13.516	0.066	0.153		OK
S2	180 min Winter	170	13.516	0.766	0.128		Surcharged
S5	180 min Winter	171	13.515	0.065	0.144		OK
S6	180 min Winter	171	13.516	0.766	0.201		Surcharged
S7	180 min Winter	171	13.517	0.347	0.000		Surcharged
S3	180 min Winter	167	13.516	0.966	0.337		Surcharged
S4	180 min Winter	171	12.491	0.016	0.439		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	180 min Winter	170	S1	S2	0.083	0.807	1.249	0.091	OK
1.001	30 min Summer	17	S2	S3	0.150	0.472	4.540	0.206	Surcharged
2.000	180 min Winter	171	S5	S6	0.083	0.814	1.222	0.088	OK
2.001	30 min Summer	17	S6	S3	0.150	0.804	4.425	0.105	Surcharged
3.000	180 min Summer	387	S7	S3	0.150	0.168	2.878	0.032	Surcharged
1.002	180 min Winter	171	S3	S4	0.016	0.429	0.439	0.026	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Surface Runoff (m3)	Status
Permeable Paving	180 min Winter	165	13.516	0.346	0.123			OK

Return Period (yrs) + Climate Change (%):

100yr+45%

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S1	240 min Winter	226	13.826	0.376	0.181		Surcharged
S2	240 min Winter	225	13.826	1.076	0.182		Flood Risk
S5	240 min Winter	228	13.826	0.376	0.168		Surcharged
S6	240 min Winter	226	13.826	1.076	0.186		Flood Risk
S7	240 min Winter	225	13.824	0.654	0.028		Flood Risk
S3	240 min Winter	228	13.827	1.277	0.730		Flood Risk
S4	240 min Winter	225	12.492	0.017	0.496		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	30 min Summer	32	S1	S2	0.100	1.089	7.208	0.528	Surcharged
1.001	15 min Winter	9	S2	S3	0.150	0.501	6.842	0.311	Surcharged
2.000	30 min Winter	32	S5	S6	0.100	1.218	5.730	0.411	Surcharged
2.001	15 min Winter	9	S6	S3	0.150	0.652	6.917	0.164	Surcharged
3.000	720 min Winter	993	S7	S3	0.150	0.168	2.889	0.032	Surcharged
1.002	240 min Winter	225	S3	S4	0.017	0.444	0.496	0.030	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Surface Runoff (m3)	Status
Permeable Paving	240 min Winter	225	13.831	0.661	0.133			Flood Risk