CLIENT:

TRINITY HOMES

DRAINAGE STRATEGY REPORT

AT

Ropetackle - Houses Site,
Old Shoreham Road,
Shoreham-by-Sea,
West Sussex,
BN43 5FL

Springfield Rag Room,
Mill Lane,
Maidstone,
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1.0. Introduction

1.1 This Drainage Strategy Report has been produced to provide information about the containment and discharge of foul and storm water relating to this development, in order to support the planning application.

1.2 A summary of flood risks is included within this report to identify any mitigation measures that may be required for the development. EA Flood risk maps are including in Appendix A and discussed in Section 7 of this report and development's Flood Risk Assessment (by Meridian) in Appendix H.

2.0 Site Location and Existing Layout

2.1 The Houses Site is located on the eastern side of Old Shoreham Road, in Shoreham-by-Sea, West Sussex. Approximately 500m West of Shoreham-by-Sea Train Station, and 200m East of the River Adur. The site was a former car wash lot, consisting of two small garages and hardstanding areas. The garages and hardstanding areas were demolished, circa 2016, as part of the Phase 1 works, and was used to store excavated spoil from Phase 1 (west of site), until circa 2021, when the site was left barren.

2.2 The site is centred on National Grid Reference (NGR) TQ 21267 05311, and Easting:Northing of 521267:105311. The site has an area of approximately 0.267ha. A site location plan is included in Appendix G.

3.0 Proposed Development and Description

3.1 The proposal is for a residential scheme. The existing commercial lot will be demolished, and seven 4-bed residential dwellings will be constructed. The dwellings will be in two separated blocks with undercroft parking at ground level. A proposed development plan is included in Appendix G.

3.2 The development will renew and reutilise part of the existing access with Old Shoreham Road, adjacent to site. The drainage proposals will consist of permeable surfacing within the central part of the parking area to provide suitable treatment and attenuation of surface water for the development, with a geocellular attenuation crate feature to provide additional storage capacity. An increase in the overall impermeable area is proposed for the development, but drainage calculations show that the proposed drainage network will accommodate for the runoff generated in a 1 in 100yr + 45% climate change event, without any flooding within the development. An Impermeable Areas Plan is included in Appendix G.

3.3 The development is situated in the west part of Shoreham-by-Sea, which has been redeveloped from industrial to residential in the last 10 years. The drainage design will incorporate SUDS features, where possible, to improve the sustainable management of water for the site and provide betterment over the existing layout.

4.0 Aim

4.1 The aim of this report is to outline the drainage strategy to be implemented in this development and identify future maintenance provisions to be carried out for the lifetime of the site.

4.2 The aim of the design is to adopt a strategy implementing a Sustainable Urban Drainage System (SUDS) concept using the best management practices as suggested in the following publications:-

- The SUDS Manual (C753) – Ciria (Ref A).
- Sustainable Drainage Systems (C609) – Ciria (Ref B).
- National Planning Policy Framework (NPPF) (Ref C).
- Sustainable Drainage Systems – Non statutory technical standard – DEFRA (Ref D).
- Level 1 Strategic Flood Risk Assessment for Local Development Framework – (July 2024) Adur and Worthing Councils (Ref E).

4.3 The drainage strategy achieves these aims by utilising a design which manages surface water runoff as close to source as possible and has considered the use of green rather than grey features where feasible; thereby following the drainage hierarchy. The methodology of drainage disposal and SUDS assessment have been undertaken for this site. The drainage has been designed in accordance with the guidance noted in point 4.2 and the Level 1 Strategic Flood Risk Assessment (Ref E).

4.4 The objective of the design is to:

Retain where possible and reduce the quantity of surface water runoff leaving the development area equal to that, or less than the Greenfield runoff pre-development for all storms up to and including the 1 in 100 year +45% climate change event by source and site control measures in line with the SUDS Manual (Ref A). For developments where the greenfield runoff rate is equal to or less than 2.0l/s the discharge rate should be reduced to at least 2.0l/s for the proposed development.

4.5 Improve the quality of the surface water runoff by filtration and treatment methods where possible.

4.6 To comply with the flood risk assessment and management requirements set out in the National Planning Policy Framework (Ref C)

5.0 Topography

5.1 A topographical survey has been undertaken for the site and is included in Appendix G. The survey has identified that the site slopes from East to West. The Western boundary with Old Shoreham Road, is approximately 2.5 metres lower than the rest of site, due to a steep sloped section. The highest level on site is 9.24m AOD, eastern corner of site, and lowest is 2.97m AOD, adjacent to Old Shoreham Road.

6.0 Geology and Hydrogeology

6.1 The BGS geology of Britain viewer identifies that the site is underlain by the bedrock geology of Newhaven Chalk Formation, comprising of Chalk. The viewer identifies that the site's superficial geology is Head Formation (clay, silt, sand and gravel). Extracts from the British Geological Survey maps are included in Appendix B

6.2 According to Environment Agency (EA) mapping, the site lies above a Principal Bedrock Aquifer, which is defined as 'comprising permeable layers that can support local water supplies and may form an important source of base flow to rivers', and above a Secondary (undifferentiated) Superficial Aquifer, which is defined as 'comprising of rock layers which have variable characteristics, and therefore can not be classified as either Secondary A or B'. Extracts from the EA maps are included in Appendix B.

6.3 The site does not lie within an Environmental Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply. However, the site is located approximately 100m south of a 'Zone 3 – Total Catchment' protection area. An extract from the EA map is included in Appendix B.

6.4 As part of the site investigation works, groundwater monitoring testing was undertaken to determine the below ground level (BGL) of the groundwater. Testing was carried out by Onyx-Geo Consulting Ltd, between mid-February 2025 to the end of March 2025. The testing results show that the groundwater levels are between 2.262m BGL and 2.480m BGL, and influenced by tidal movements. The testing results from Onyx-Geo have been included in Appendix J.

6.5 Due to the groundwater being in close proximity to the ground level, any forms of infiltration would be within 1.2 metres of the peak groundwater level, therefore; infiltration was a form of surface water discharge has been determined to be unsuitable.

7.0 Flood Risk

7.1 The Environment Agency (EA) Flood Risk for Planning Map (Appendix A1) for the area shows that the site is located within Flood Zone 3 (high risk). Land within Flood Zone 3 is classed in the NPPF as having 1 in 100 or greater annual probability of river or sea flooding, and requires a Flood Risk Assessment (FRA) for all planning applications. An extract of the EA map is included in Appendix A.

7.2 An FRA for the site was carried out by the drainage engineers (Meridian Civil Engineering Consultancy Ltd) at the planning stage of the development, and addresses the requirements involved with a development within Flood Zone 3. For the FRA (ref: MC0031 ADL Ropetackle 2B, rev. P01, dated: 17/02/2025), refer to Appendix H.

7.3 The EA's risk map of flooding for Surface Water, identifies that the site has a very low risk (>0.1%) of yearly flooding. However, the map does identify that the road to the West of site, Old Shoreham Road, has a high risk (>3.3%) of yearly flooding. An extract of the EA flood map is included in Appendix A.

7.4 The EA's risk map of flooding from Rivers and Sea, identifies that the site has a low risk (0.1 ≥ 1%) of yearly flooding. An extract of the EA flood map is included in Appendix A.

7.5 The EA's flood risk mapping indicates that there is no potential risk of flooding from Reservoirs. An extract of the EA map is included in Appendix A.

8.0 Drainage Assessment

8.1 This drainage strategy has been prepared in accordance with DEFRA's 'Non-statutory technical standards for sustainable drainage systems' (March 2015) Ref. D to ensure that the proposed development does not increase flood risk to the site or elsewhere and where practical, reduces flood risk over the lifetime of the development.

8.2 The order of priority for runoff destinations to dispose of surface water is detailed in Delivering Sustainable Drainage Systems (Ref C) in accordance with the Flood Water Management Act 2010. The disposal hierarchy is listed below:

- Discharge into the ground (infiltration); or where not reasonably practicable.
- Discharge to a surface water body; or where not reasonably practicable.
- Discharge to a surface water sewer, highway drain, or another drainage system; or where not reasonably practicable.
- Discharge to a combined sewer; or where not reasonably practicable.
- Discharge to foul sewer (with expressed consent from the Sewer Authority only).

The most suitable method of disposal for this site was considered based on the geology and hydrogeology of the land as has been outlined below:

Discharge to ground via infiltration	Not suitable for this site as it is located in Flood Zone 3 and groundwater within 2.5m below ground level.
Discharge to watercourse	River Adur is approximately 200m West, and a direct connection is not reasonably feasible.
Discharge to surface water sewer	Chosen method of disposal into surface water network of Phase 1.
Discharge to combined sewer	None located within the immediate vicinity of the site.
Discharge to foul sewer	No connection proposed.

8.3 The SUDS assessment has been carried out with the intention to implement a series of SUDS solutions following the surface water management train, referred to in the CIRIA manuals (Ref A and B).

SuDS Feature	Environmental Benefits	Water Quality Improvement	Suitability for Low Permeable Soils ($<10^{-6}$)	Groundwater Recharge	Suitable for Small Sites?	Site Specific Restrictions	Appropriate for the Site?
Green Roofs	Y	Y	Y	N	Y	Possible, but would require specialist system.	Yes
Blue Roofs	Y	Y	Y	N	Y	No flat roofs are proposed.	No
Infiltration Basins	Y	Y	N	Y	N	No infiltration on site.	No
Wetlands	Y	Y	N	Y	N	Site size not large enough.	No
Bioretention Area (External)	Y	Y	N	N	N	Site size not large enough.	No
Raingardens (Planter)	Y	Y	Y	N	Y	Possible use within planted areas.	Yes
Swales	Y	Y	Y	Y	N	Site size not large enough.	No
Filter Strips	Y	Y	Y	Y	N	No infiltration on site.	No
Permeable Surfacing (Infiltration)	Y	Y	N	Y	Y	No infiltration on site.	No
Soakaways	Y	Y	N	Y	Y	No infiltration on site.	No
Detention Bains / Retention Ponds	Y	Y	Y	N	Y	Site size not large enough.	No
Permeable Surfacing (Attenuation)	N	Y	Y	N	Y	Proposed for central area of car park.	Yes
Rainwater Harvesting	Y	N	Y	N	Y	Limited area around downpipe locations.	Yes
Underground Storage	N	N	Y	N	Y	Proposed beneath car parking area.	Yes

8.4 Based on the SUDs assessment the drainage strategy will be to intercept run-off at source utilising permeable surfacing to the central area of the shared car park, with attenuation provided within the permeable surfacing and geocellular crates beneath the car parking area to accommodate for the runoff generated in a 1 in 100yr + 45% climate change event before discharging to the Surface Water sewer at a controlled rate of 2.0l/s.

8.5 The existing pre-development peak run-off rate was calculated using the modified rational method for the 1 in 100 year storm event:

$$Q = 2.78 \times A \times i$$

(where "A" is the catchment area and "i" is the rainfall intensity. For rainfall intensity, the standard figure of 35mm/hr, outlined by the Environment Agency in Report – SC030219, is used).

This area gives an existing peak run-off from impermeable areas of 26.08l/s in the 1 in 100 years storm event (2.78 x 0.268 ha x 35mm/hr = 26.08l/s).

Greenfield runoff rates for the site have been estimated using HR Wallingford Greenfield runoff tool. The overall site area is 0.268Ha. The greenfield runoff rate calculations are included in Appendix D.

Return Period	Greenfield Runoff Rate (l/s)
Qbar	0.82
1 in 1 year	0.70
1 in 30 year	1.90
1 in 100 year	2.60

As Qbar is less than 2.0l/s/ha the discharge rate is to be limited to 2.0l/s. As such all-storm events are to be controlled to 2.0l/s or less.

9.0 Proposed Drainage Strategy

9.1 Criteria

The design has been based upon the following publications and computer software.

a) The SUDS Manual C697 by CIRIA (Ref A).
b) Sustainable Drainage Systems C609 by CIRIA (Ref B).
c) Causeway Flow+ software Dec 2024.

9.2 Factors of Safety (FOS)

The design method contains assumptions which, when combined, increase the FOS against surface flooding, these assumptions are:

- The percentage run-off is taken as 100% from the drained area and no reduction is made for losses due to surface wetting during the storm.
- A factor of safety of 2 has been used within the detailed design for the SUDs components.

9.3 Drainage Strategy

9.3.1 The proposed development has a site area of approximately 2675m². The impermeable area for the proposed development consists of roofs and hardstanding and equates to an area of 1175m² (an increase of 846.7m^2 from pre-development).

9.3.2 The proposed drainage strategy is to incorporate permeable surfacing within external paved areas (central parking area). Permeable surfacing is to be installed over a permeable sub-base allowing surface water to be attenuated and conveyed into the below ground drainage network. Non-permeable paved areas are to be served by drain channels that connect into the below ground drainage network.

9.3.3 The below-ground drainage network culminates with the geocellular storage crate structure below the central parking area, which is sized to accommodate all storm events up to and including a 1 in 100 year + 45% climate change event. All roof runoff will be directed into the below-ground drainage network, ensuring that all rainwater is pre-treated prior to discharge. Catchpit chambers are to be installed prior to each connection point to aid silt buildup prevention and to promote pollution control.

9.3.4 One Hydrobrake chamber is to be installed on-line immediately prior leaving the site boundary, to control surface water discharge and limit the overall discharge to 2.0l/s. The surface water will discharge into the existing surface water network on Phase 1, located to the west of site. This connection is made via a private run of pipework and chambers, that cross Old Shoreham Road into a new development (Ropetackle – Flats Site) to the west and then connecting into an existing chamber to the north. This connection is subject to confirmation from the Phase 1 management company.

9.3.5 Attenuation crates offer an enhanced effective storage volume due to the greater void ratio in comparison to permeable surfacing (95% to 30% respectively). The level constraints on the site also mean that crates will be a more suitable option, than wholly relying on permeable surfacing.

9.3.6 The following SUDS strategy is to be implemented:

- Permeable surfacing across the central parking area to intercept rainwater at source and act as a pre-treatment.
- Catchpit chambers prior to discharge into and out of both the permeable surfacing and geocellular attenuation to act as a further pre-treatment for sediment and pollution control.
- Restricted outflow via Hydrobrake flow control.

Permeable Surfacing The central part of the residential parking area will be constructed using permeable surfacing to aid removal of pollutants prior to entering the sub-base underneath. The surface will capture and attenuate runoff and contribute to the overall SUDS system.

Catchpits These will be located in the chambers upstream of the Geocellular Attenuation Crates and on the outlets of the permeable surfacing. These are required to prevent silt from travelling through the surface water drainage system and settling inside. Over time siltation of the system could impact the performance and reduce the amount of attenuation storage.

Flow Control The overall drainage system will attenuate the rainwater run-off from all roofs and hardstanding within the permeable surfacing and geocellular attenuation crates before discharging via one flow control device located at the downstream end of the network. The Hydrobrake flow

control will be designed to control the overall flow to <2.0l/s before leaving the site boundary and connecting to the existing surface water network in Salt Marsh Road.

10 Calculations

10.1 Calculations consider the 1 in 2, 1 in 30 +45% and 1 in 100 + 45% storm events. The results of the most critical storm events for the 1 in 100yr +45% climate change event can be found in Appendix C.

10.2 As the site is brownfield, post-development run-off should be restricted to at least 50% of the pre-development run-off rate which was calculated at 13.04l/s, however, current guidance stipulates that where possible discharge should be reduced to as near to the greenfield run-off rate as possible or if lower than 2.0l/s a rate of 2.0l/s or less should be achieved. The surface water run-off has been designed to discharge at a rate of 2.0l/s. Calculations are provided in Appendix C.

11 Water Quality

11.1 A key requirement of a SUDS system is that it protects the receiving water body or system from the risk of pollution or contamination. This can be effectively managed by designing an appropriate sequence of SUDS components that are connected in series. Frequent and short duration rainfall events tend to create the most potential contaminants (silts, fines, heavy metals and organic/inorganic contaminants).

11.2 The minimum standard of appropriate treatment within a development will depend on the sensitivity of the receiving system/ water body/groundwater and the potential hazards associated with the proposed development. The proposed development includes a combination of very low hazard (roof water) and low hazard (access road and parking area) elements as shown in the table below:

Hazard	Source	Present on-site?
Very low	Residential roof drainage.	Yes
Low	Residential amenity uses such as low frequency usage car parking and roads, other roof drainage.	Yes
Medium	Commercial, retail, industrial uses including non-residential car parking spaces and roads (excluding low frequency usage road, trunk roads and motorways).	No
High	Commercial/industrial areas used for the handling and storage of chemicals, fuels and or waste.	No

11.3 The level of treatment required depends on the level of pollution prevention applicable to the catchment and the land-use. A high hazard site will require more pollution mitigation and treatment than a low hazard one.

11.4 The levels of treatment provided by different SUDs elements will have varying capabilities for removal of different types of contaminants as shown in the table below:

Hazard	Requirements for discharge	Present on-site?
Very low	Removal of suspended solids and sediment only	Yes
Low	Simple index approach: Pollution Mitigation Indices	Yes
Medium	Simple index approach: Pollution Mitigation Indices and additional risk screening if discharging to groundwater	No
High	Discharge may require environmental permit or licence. Obtain pre-permitting advice from environmental regulator. Risk assessment likely to be required.	No

11.5 Using the HR Wallingford Pollution Mitigation Indices Tool, the site falls under the "Standard commercial yard or delivery area", due to its former use as a car sales lot, which gives the current land use a Medium Pollution Hazard Level, and Pollution Hazard Indices (TSS / Metals / Hydrocarbons) of 0.7 / 0.6 / 0.7 respectively.

11.6 The site is not currently served by any method of pollution mitigation, and therefore does not meet the acceptability criteria for HR Wallingford's Simple Index Approach. The HR Wallingford Simple Index Summary for the existing is in Appendix E.

11.7 The surface water drainage for this site has been designed to discharge to an existing surface sewer and contains permeable surfacing which will aid removal of sediment from the system. The use of both permeable surfacing and catchpit chambers as methods of pre-treatment prior to discharge into the geocellular attenuation crates will act as a further pollution control measure.

11.8 When switching the site to a "Residential Parking" the Pollution Hazard Indices (TSS / Metals / Hydrocarbons) the indices reduce to 0.5 / 0.4 / 0.4 respectively. The HR Wallingford Simple Index Summary for the proposed development is in Appendix E.

11.9 The proposals for this development exceed the indices requirement for Residential Parking. This shows that the proposed development provides betterment over existing by reducing the pollution entering the environment from this land. The HR Wallingford Simple Index Summary for the proposed development is in Appendix E.

12 Designing for Exceedance Events

12.1 As part of the site assessment, flood exceedance routes must be considered to identify whether the proposed development has an impact on neighbouring properties. The existing garages had rainwater downpipes, which freely discharged onto the concrete surfacing on site. The existing site' hardstanding areas do not have any surface water gullies, it is therefore understood that the surface water run-off flows to the western boundary, and onto Old Shoreham Road in an uncontrolled manner, or ponding on the hardstanding ground within site.

12.2 The proposed development will benefit from permeable surfacing in the centre of the parking area, with the surrounding hardstanding areas falling towards the permeable surface. Rainwater falling on the roofs and hardstanding will be stored within the drainage network, which includes permeable surfacing and attenuation crates. The stored water will be discharged at a reduced rate into public sewers, ensuring that there is no damaging impact to any properties either upstream or downstream of the proposed development area.

12.3 Proposed site levels are to remain similar to the existing levels, with the western section of site, consisting of the shared parking area and undercroft parking, being at a low level (3.00 AOD), and the rest of site, consisting of private gardens, being at a high level (6.00 AOD). Therefore, the exceedance flow direction will remain the as the current situation. To account for the potential exceedance flow, a channel drain will be installed on the junction with Old Shoreham Road and levels along the western boundary will be designed to direct flow back into the site. Exceedance routes are shown on the surface water and foul drainage strategy plan, included in Appendix G.

13 Maintenance and Management

13.1 Maintenance needs of the SUDs components will be dependent on the frequency of inspections. Regular inspections will identify problems at an early stage and enable minor defects to be rectified before any major deterioration occurs. Refer to the SUDs Maintenance Regime included in Appendix F for full details. A Management Company will be responsible for carrying out all maintenance of the proposed SUDS elements in accordance with Ciria C753 within communal areas, whilst private residents will be responsible for water butts and rainwater planters in areas of area of private ownership.

13.2 The Management Company is required to undertake maintenance responsibility for the following items:-

- ↳ Permeable surfacing
- ↳ Hydrobrake flow control device
- ↳ Geocellular Attenuation Crates
- ↳ Catchpit chambers

13.3 The permeable surfacing and geocellular attenuation crates provide the site's surface water storage and is therefore an integral part of the strategy to prevent the site from flooding. The permeable surfacing and catchpit chambers have been provided to ensure the removal of sediment and pollution from the drainage system; improving the quality of water leaving he site.

13.4 All SUDs features must be competently maintained by the Management Company thorough and regular maintenance is vital to ensuring the design life of the system and to ensure that it operates at full capacity.

14 Foul Drainage

14.1 Foul water drainage from the development will be collected via a piped system and carried by gravity to a new manhole on the existing Southern Water Foul Sewer to the west of site.

14.2 It is proposed that the drainage system will take the form of one primary foul drainage network with inspection chambers provided at connection points from each dwelling. The location of these will be developed in conjunction with the surface water network.

14.4 The performance of the foul drainage system will be designed to Design and Construction Guidance (Sewerage Sector Guidance - Appendix C / Southern Water Addendum), BS EN752 Parts 3 and 4, and the Buildings Regulations 2010 Approved Document H. This requires the following:

- Minimum pipe diameter of main drainage 100mm, branch connections minimum size 100mm.
- Minimum flow velocity 0.75m/s for self-cleansing laid no flatter than 1:80 where at least one WC is connected, or 1:40 where there are none.
- Standard pipe roughness “Ks” of 1.5.
- Manholes or inspection chambers to be located at all major junctions, at every change of alignment or gradient and whenever there is a change in pipe diameter. This allows sufficient access for rodding of the system.
- All pipes to be connected soffit-to-soffit at manholes.

15 Conclusion

15.1 The method of drainage disposal has been carefully considered to ensure the most suitable means of disposal has been chosen, and the most appropriate SUDs components have been assessed. The surface water system has been designed to accommodate all the run-off generated from the proposed development storm events up to and including the 1 in 100yr + 45% climate change event, whilst restricting the overall discharge rate to 2.0l/s.

15.2 The drainage strategy incorporates sustainable drainage techniques using the “Surface Water Management Train” principles and therefore will not increase flood risk to areas within, near to or downstream of the site.

15.3 The SUDS concept for the site has been carefully considered to ensure that it reduces run-off from site while providing pollution and contaminant control measures and providing significant betterment post-construction for the lifetime of the development.

15.4 The drainage system has been designed so that it adheres to the National Planning Policy Framework (Ref C) and DEFRA Sustainable Drainage Systems – Non-statutory technical standards for sustainable drainage systems (Ref D).

APPENDIX A – FLOOD RISK MAPS

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**521282/105308**	**20 Mar 2025 14:54**

Your selected location is in flood zone 3
– an area with a high probability of flooding.

This means:

- you may need to complete a flood risk assessment for development in this area
- you should ask the Environment Agency about the level of flood protection at your location and request a Flood Defence Breach Hazard Map (You can email the Environment Agency at: enquiries@environment-agency.gov.uk)
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (find out more at www.gov.uk/guidance/flood-risk-assessment-standing-advice)

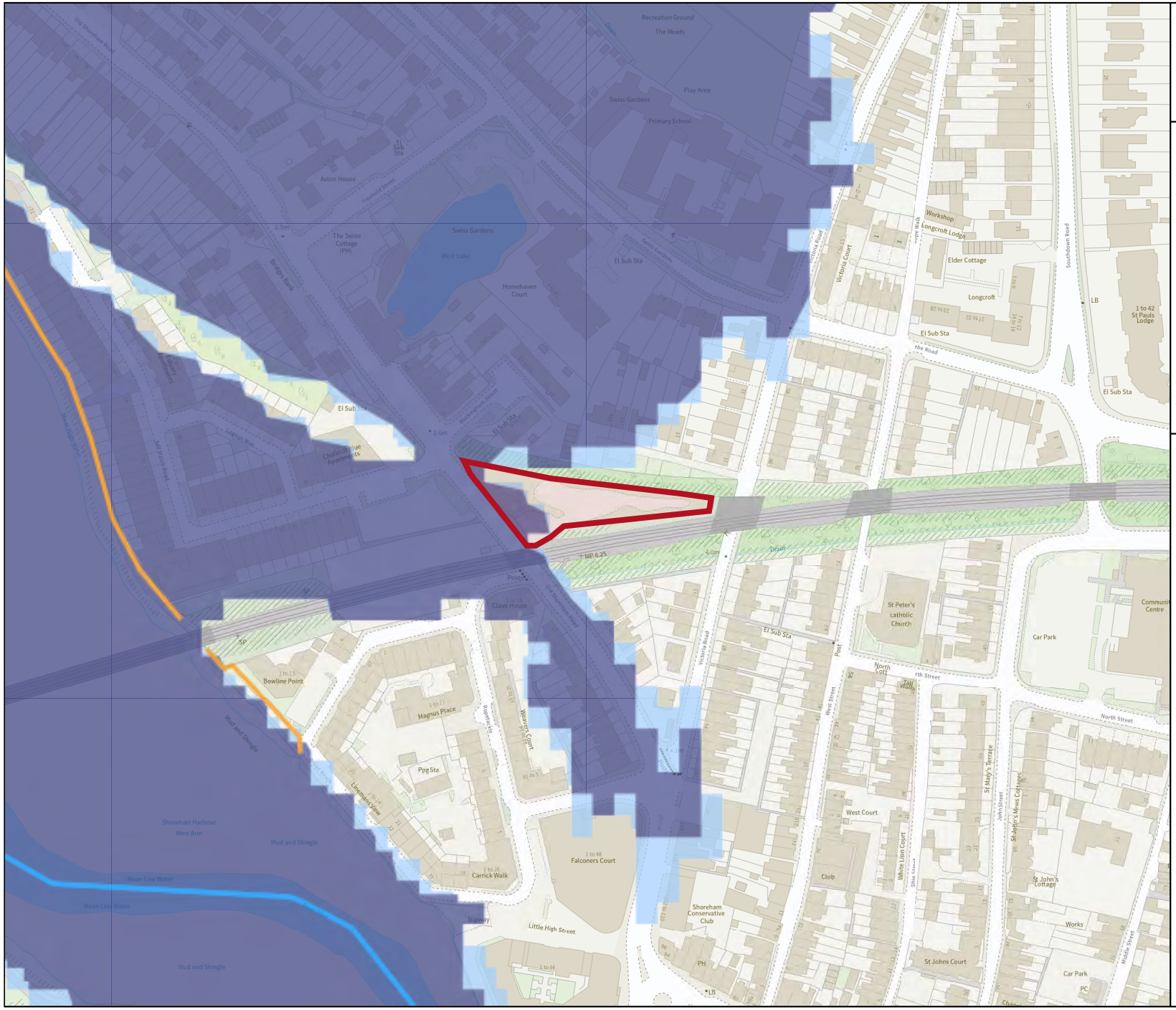
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2024 OS AC0000807064. https://flood-map-for-planning.service.gov.uk/os-terms



Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
521282/105308

Scale
1:2500

Created
20 Mar 2025 14:54

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

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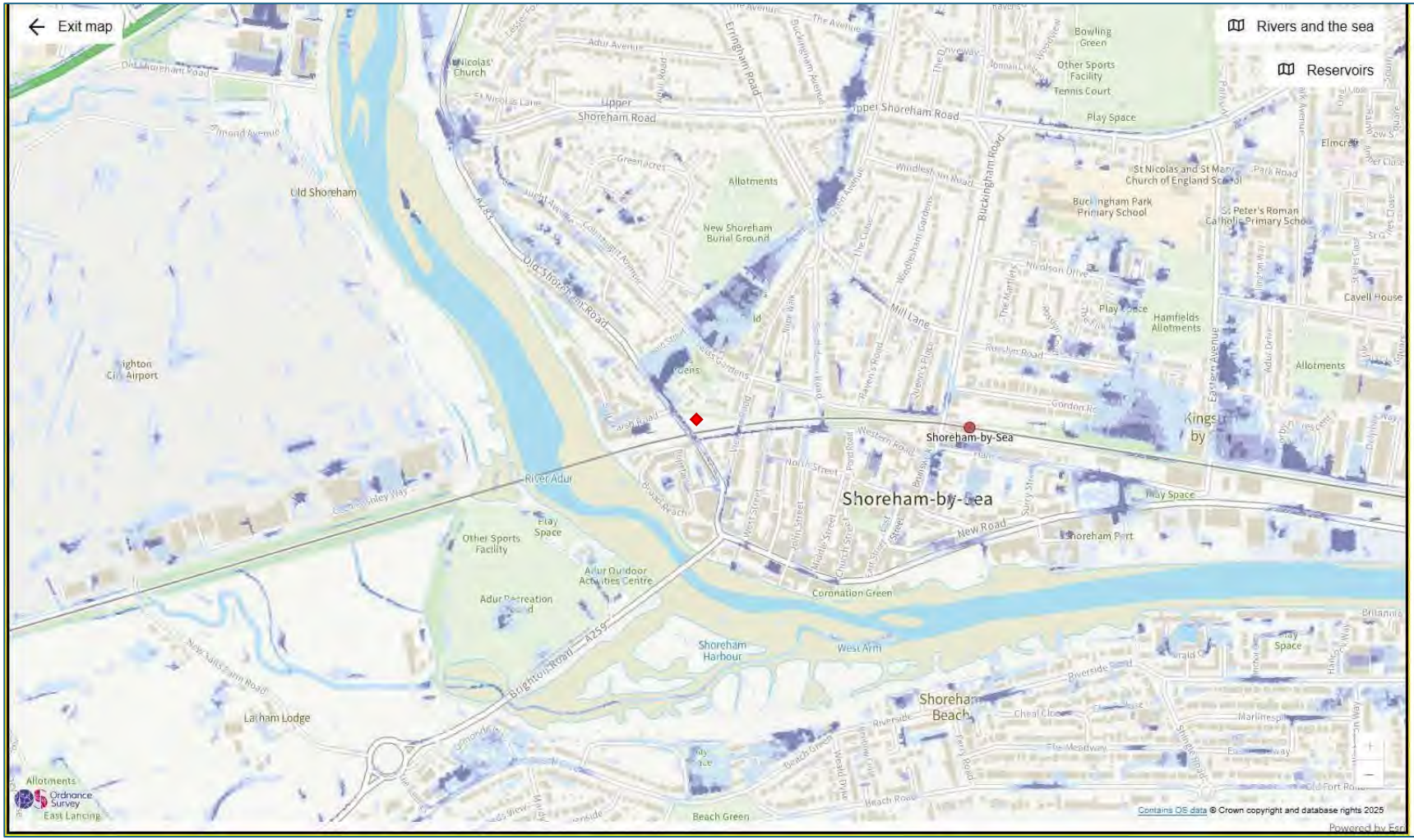


Surface water map

Yearly chance of flooding

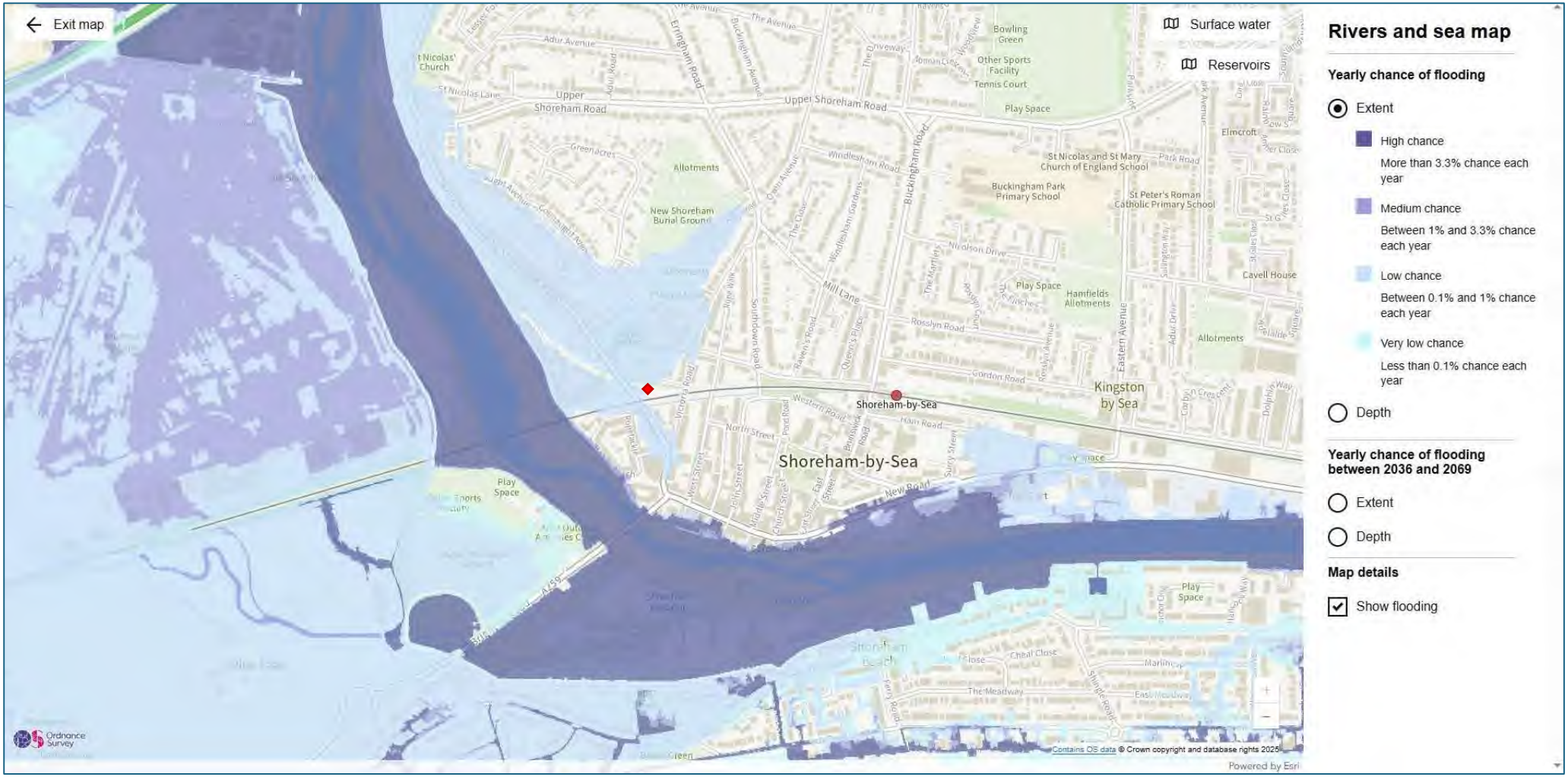
- Extent
  - High chance
    More than 3.3% chance each year
  - Medium chance
    Between 1% and 3.3% chance each year
  - Low chance
    Between 0.1% and 1% chance each year
- Depth

Yearly chance of flooding between 2040 and 2060

- Extent
- Depth

Map details

- Show flooding


Exit map
Surface water
Reservoirs
Rivers and sea map
Yearly chance of flooding
Extent
High chance
More than 3.3% chance each year
Medium chance
Between 1% and 3.3% chance each year
Low chance
Between 0.1% and 1% chance each year
Very low chance
Less than 0.1% chance each year
Depth
Yearly chance of flooding between 2036 and 2069
Extent
Depth
Map details
Show flooding
Shoreham-by-Sea
Kingston by Sea
Upper Shoreham Road
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Exit map
Surface water
Rivers and the sea
Reservoirs map
Extent
When river levels are normal
When there is also flooding from rivers
Map details
Show flooding
Shoreham-by-Sea
Kingston by Sea
Old Shoreham
Brighton City Airport
Shoreham Harbour
West Arm
Shoreham Beach
Adur Recreation Ground
Adur Outdoor Activities Centre
Latham Lodge
Coronation Green
Shoreham Port
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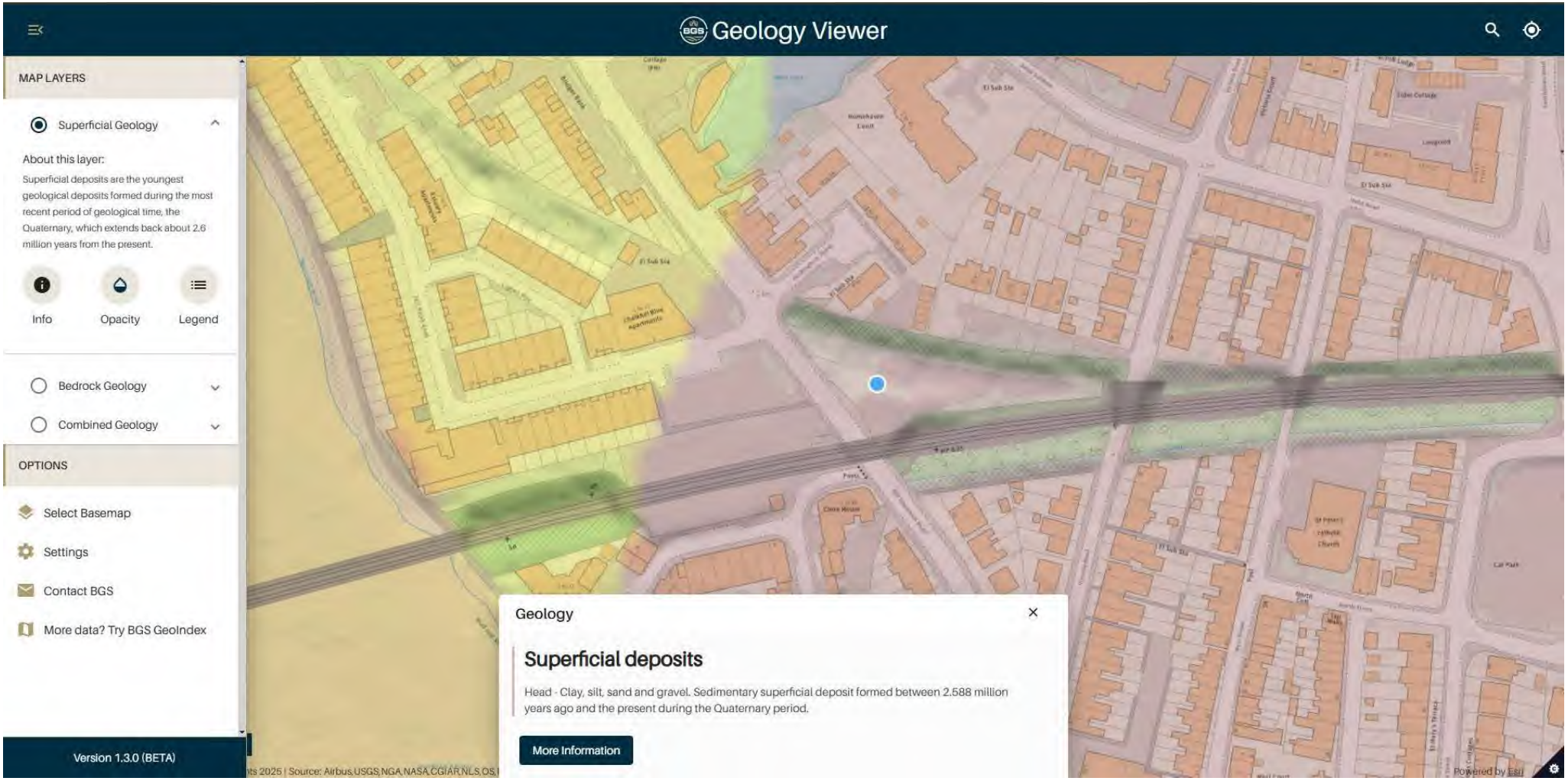
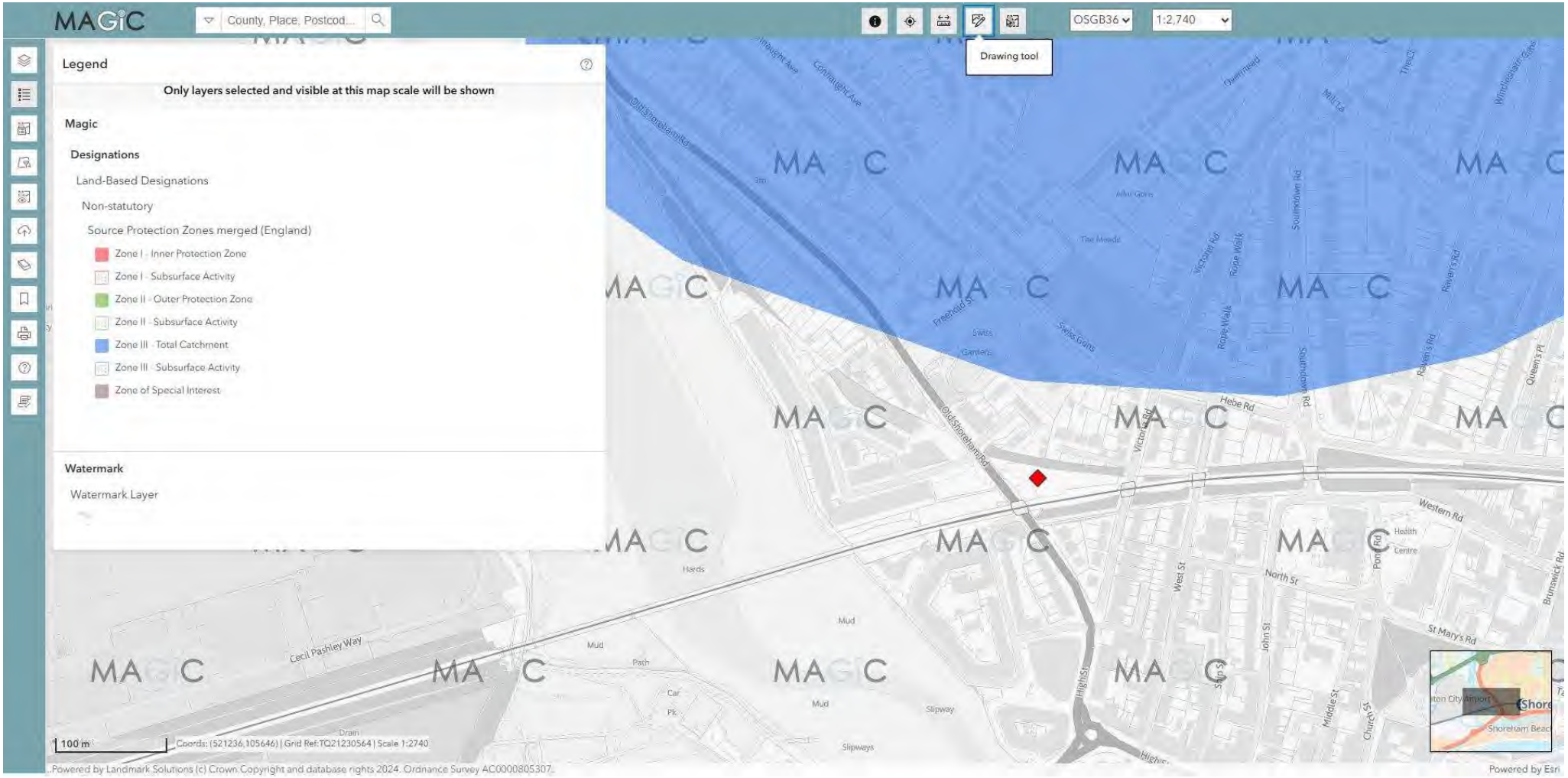
APPENDIX B – BGS GEOLOGICAL MAPS


Geology Viewer
MAP LAYERS
Superficial Geology
Bedrock Geology
About this layer:
Bedrock geology is a term used for the main mass of rocks forming the Earth that are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.
Info
Opacity
Legend
Combined Geology
OPTIONS
Select Basemap
Settings
Contact BGS
More data? Try BGS GeoIndex
Version 1.3.0 (BETA)
Geology
Bedrock geology
Newhaven Chalk Formation - Chalk. Sedimentary bedrock formed between 86.3 and 72.1 million years ago during the Cretaceous period.
More Information
Powered by Esri


Geology Viewer
MAP LAYERS
Superficial Geology
About this layer:
Superficial deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 2.6 million years from the present.
Info
Opacity
Legend
Bedrock Geology
Combined Geology
OPTIONS
Select Basemap
Settings
Contact BGS
More data? Try BGS GeoIndex
Version 1.3.0 (BETA)
Geology
Superficial deposits
Head - Clay, silt, sand and gravel. Sedimentary superficial deposit formed between 2.588 million years ago and the present during the Quaternary period.
More Information
Powered by Esri


MAGiC
County, Place, Postcod...
Drawing tool
OSGB36
1:2,740
Legend
Only layers selected and visible at this map scale will be shown
Magic
Designations
Land-Based Designations
Non-statutory
Source Protection Zones merged (England)
Zone I - Inner Protection Zone
Zone I - Subsurface Activity
Zone II - Outer Protection Zone
Zone II - Subsurface Activity
Zone III - Total Catchment
Zone III - Subsurface Activity
Zone of Special Interest
Watermark
Watermark Layer
Old Shoreham Rd
Hebe Rd
Western Rd
North St
St Mary's Rd
Cecil Pashley Way
Hards
Mud
Path
Slipway
Slipways
100 m
Coords: (521236,105646) | Grid Ref: TQ21230564 | Scale 1:2740
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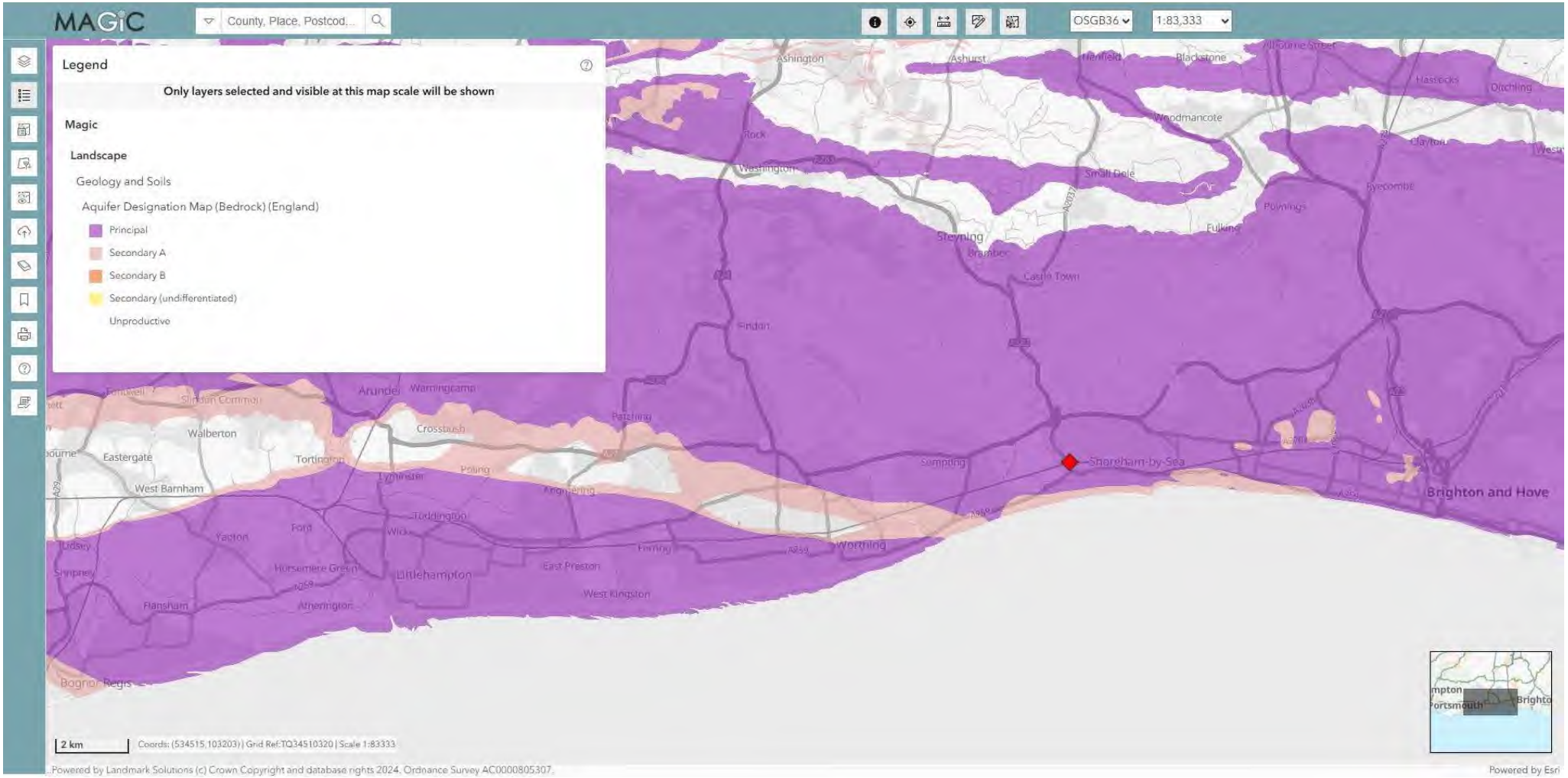
MAGiC
County, Place, Postcod...
OSGB36
1:83,333
Legend
Only layers selected and visible at this map scale will be shown
Magic
Landscape
Geology and Soils
Aquifer Designation Map (Bedrock) (England)
Principal
Secondary A
Secondary B
Secondary (undifferentiated)
Unproductive
Ashington
Ashurst
Henfield
Blackstone
Albourne Street
Hassocks
Ditchling
Woodmancote
Rock
Washington
Small Dole
Clayton
Ryecombe
Pownings
Fulking
Steyning
Brambec
Castle Town
Findon
Arundel
Warningcamp
Slindon Common
Walberton
Crossbush
Patching
Eastergate
Tortington
Lyminster
Poling
Sompting
Shoreham-by-Sea
Brighton and Hove
West Barnham
Angmering
Toddington
Yapton
Ford
Wick
Ferring
Worthing
Lidsey
Shripney
Horsemere Green
Littlehampton
East Preston
West Kingston
Flansham
Atherington
Bognor Regis
2 km
Coords: (534515,103203) | Grid Ref:TQ34510320 | Scale 1:83333
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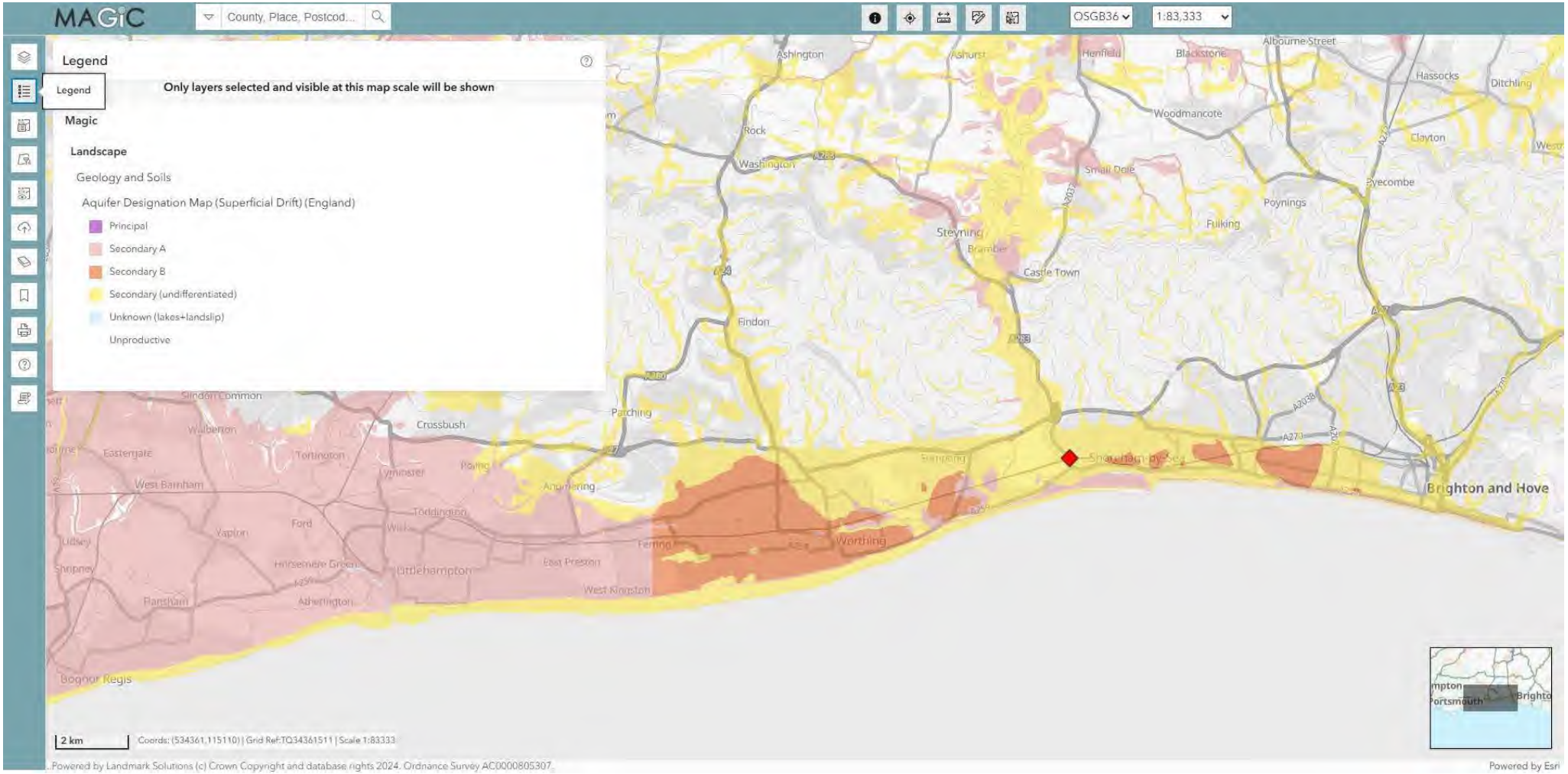
Powered by Esri


MAGiC
County, Place, Postcod...
OSGB36
1:83,333
Legend
Legend
Only layers selected and visible at this map scale will be shown
Magic
Landscape
Geology and Soils
Aquifer Designation Map (Superficial Drift) (England)
Principal
Secondary A
Secondary B
Secondary (undifferentiated)
Unknown (lakes+landslip)
Unproductive
Ashington
Ashurst
Henfield
Blackstone
Albourne Street
Hassocks
Ditchling
Woodmancote
Clayton
Rock
Washington
Small Dole
Pyecombe
Poynings
Fulking
Steyning
Brambe
Castle Town
Findon
Sidlesham Common
Walberton
Crossbush
Patching
Eastergate
Tortington
Lyminster
Poling
West Barnham
Angmering
Sompting
Shoreham-by-Sea
Brighton and Hove
Toddington
Ford
Yapton
Lidsey
Shripney
Horsemere Green
Littlehampton
East Preston
Ferring
Worthing
West Kingston
Flansham
Aldrington
Bognor Regis
2 km
Coords: (534361,115110) | Grid Ref:TQ34361511 | Scale 1:83333
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Powered by Esri



APPENDIX C – DRAINAGE ANALYSIS CALCULATIONS

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	0.075
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
RE1	0.011	5.00	6.250	250	521277.837	105304.866	0.600
SW4.0	0.015	5.00	6.250	600	521261.738	105325.142	0.909
SW4.1	0.008	5.00	6.150	600	521254.459	105328.700	0.890
RE2	0.006	5.00	3.450	250	521226.133	105325.494	0.750
SW4.2	0.008	5.00	3.450	600	521237.194	105334.277	0.918
SW4.3			6.200	600	521246.586	105322.449	3.769
SW4.4	0.015	5.00	3.500	600	521243.878	105320.301	1.112
SW5.0	0.025	5.00	3.375	600	521259.546	105298.369	0.795
PER SURF	0.015	5.00	3.000		521248.121	105312.756	0.774
TANK			3.000		521244.558	105309.926	1.625
SW4.5	0.010	5.00	3.100	1200	521242.407	105308.219	1.740
SW4.6			2.300	600	521230.146	105302.216	1.035

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	25.890	100.0	100	Circular	6.250	5.650	0.500	6.250	5.391	0.759
1.001	8.102	100.0	150	Circular	6.250	5.341	0.759	6.150	5.260	0.740
1.002	10.053	100.0	150	Circular	6.150	5.260	0.740	6.200	5.159	0.891
2.000	14.124	120.0	100	Circular	3.450	2.700	0.650	3.450	2.582	0.768
2.001	15.103	150.0	150	Circular	3.450	2.532	0.768	6.200	2.431	3.619
1.003	3.456	80.0	150	Circular	6.200	2.431	3.619	3.500	2.388	0.962
1.004	8.656	100.0	150	Circular	3.500	2.388	0.962	3.000	2.301	0.549
3.000	18.372	100.0	150	Circular	3.375	2.580	0.645	3.000	2.396	0.454
1.005	4.550	100.0	225	Circular	3.000	2.226	0.549	3.000	2.180	0.595
1.006	2.746	180.0	225	Circular	3.000	1.375	1.400	3.100	1.360	1.515
1.007	13.652	144.0	225	Circular	3.100	1.360	1.515	2.300	1.265	0.810

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE1	250	Manhole	Adoptable	SW4.0	600	Manhole	Adoptable
1.001	SW4.0	600	Manhole	Adoptable	SW4.1	600	Manhole	Adoptable
1.002	SW4.1	600	Manhole	Adoptable	SW4.3	600	Manhole	Adoptable
2.000	RE2	250	Manhole	Adoptable	SW4.2	600	Manhole	Adoptable
2.001	SW4.2	600	Manhole	Adoptable	SW4.3	600	Manhole	Adoptable
1.003	SW4.3	600	Manhole	Adoptable	SW4.4	600	Manhole	Adoptable
1.004	SW4.4	600	Manhole	Adoptable	PER SURF		Junction	
3.000	SW5.0	600	Manhole	Adoptable	PER SURF		Junction	
1.005	PER SURF		Junction		TANK		Junction	
1.006	TANK		Junction		SW4.5	1200	Manhole	Adoptable
1.007	SW4.5	1200	Manhole	Adoptable	SW4.6	600	Manhole	Adoptable

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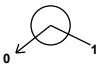
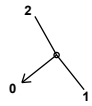
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE1	521277.837	105304.866	6.250	0.600	250				
						0	1.000	5.650	100
SW4.0	521261.738	105325.142	6.250	0.909	600		1	1.000	5.391	100
									
						0	1.001	5.341	150
SW4.1	521254.459	105328.700	6.150	0.890	600		1	1.001	5.260	150
									
						0	1.002	5.260	150
RE2	521226.133	105325.494	3.450	0.750	250				
						0	2.000	2.700	100
SW4.2	521237.194	105334.277	3.450	0.918	600		1	2.000	2.582	100
									
						0	2.001	2.532	150
SW4.3	521246.586	105322.449	6.200	3.769	600		1	2.001	2.431	150
							2	1.002	5.159	150
						0	1.003	2.431	150
SW4.4	521243.878	105320.301	3.500	1.112	600		1	1.003	2.388	150
									
						0	1.004	2.388	150
SW5.0	521259.546	105298.369	3.375	0.795	600				
						0	3.000	2.580	150
PER SURF	521248.121	105312.756	3.000	0.774			1	3.000	2.396	150
							2	1.004	2.301	150
						0	1.005	2.226	225
TANK	521244.558	105309.926	3.000	1.625			1	1.005	2.180	225
									
						0	1.006	1.375	225
SW4.5	521242.407	105308.219	3.100	1.740	1200		1	1.006	1.360	225
									
						0	1.007	1.360	225
SW4.6	521230.146	105302.216	2.300	1.035	600		1	1.007	1.265	225
									

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Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	720	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	40	0	0
100	45	0	0

Node SW4.5 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.007	Sump Available	✓
Replaces Downstream Link	x	Product Number	CTL-SHE-0064-2000-1200-2000
Invert Level (m)	1.360	Min Outlet Diameter (m)	0.100
Design Depth (m)	1.200	Min Node Diameter (mm)	1200
Design Flow (l/s)	2.0		

Node PER SURF Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.226	Slope (1:X)	250.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	100	Depth (m)	0.490
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	29.450		

Node TANK Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.375
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	352

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	61.5	0.0	1.010	61.5	0.0	1.011	0.0	0.0

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	11	5.681	0.031	1.3	0.0015	0.0000	OK
15 minute summer	SW4.0	11	5.384	0.043	2.9	0.0121	0.0000	OK
15 minute summer	SW4.1	11	5.309	0.049	3.8	0.0139	0.0000	OK
15 minute summer	RE2	11	2.724	0.024	0.7	0.0012	0.0000	OK
15 minute summer	SW4.2	11	2.565	0.033	1.6	0.0095	0.0000	OK
15 minute summer	SW4.3	11	2.493	0.062	5.4	0.0176	0.0000	OK
15 minute summer	SW4.4	11	2.456	0.068	7.1	0.0192	0.0000	OK
15 minute summer	SW5.0	10	2.621	0.041	2.9	0.0116	0.0000	OK
15 minute summer	PER SURF	12	2.294	0.068	11.6	0.8785	0.0000	OK
240 minute summer	TANK	156	1.549	0.174	4.8	10.1940	0.0000	OK
240 minute summer	SW4.5	156	1.549	0.189	1.7	0.2143	0.0000	OK
240 minute summer	SW4.6	156	1.295	0.030	1.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	SW4.0	1.2	0.603	0.204	0.0529	
15 minute summer	SW4.0	1.001	SW4.1	2.9	0.641	0.165	0.0372	
15 minute summer	SW4.1	1.002	SW4.3	3.8	0.784	0.215	0.0491	
15 minute summer	RE2	2.000	SW4.2	0.7	0.478	0.126	0.0205	
15 minute summer	SW4.2	2.001	SW4.3	1.6	0.330	0.110	0.0742	
15 minute summer	SW4.3	1.003	SW4.4	5.4	0.735	0.270	0.0253	
15 minute summer	SW4.4	1.004	PER SURF	7.0	0.933	0.396	0.0652	
15 minute summer	SW5.0	3.000	PER SURF	2.8	0.737	0.160	0.0711	
15 minute summer	PER SURF	1.005	TANK	10.6	1.043	0.204	0.0462	
240 minute summer	TANK	1.006	SW4.5	1.6	0.161	0.041	0.0944	
240 minute summer	SW4.5	1.007	SW4.6	1.7	0.525	0.039	0.0436	20.6

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Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	11	5.885	0.235	7.4	0.0115	0.0000	SURCHARGED
15 minute summer	SW4.0	11	5.558	0.217	16.0	0.0613	0.0000	SURCHARGED
15 minute summer	SW4.1	11	5.467	0.207	21.1	0.0585	0.0000	SURCHARGED
15 minute summer	RE2	12	3.087	0.387	4.1	0.0190	0.0000	SURCHARGED
15 minute summer	SW4.2	12	3.044	0.512	7.6	0.1449	0.0000	SURCHARGED
15 minute summer	SW4.3	12	3.011	0.580	27.4	0.1641	0.0000	SURCHARGED
15 minute summer	SW4.4	12	2.858	0.470	35.9	0.1330	0.0000	SURCHARGED
15 minute summer	SW5.0	10	2.699	0.119	16.9	0.0338	0.0000	OK
15 minute summer	PER SURF	13	2.413	0.187	61.2	5.6404	0.0000	OK
240 minute summer	TANK	232	2.363	0.988	19.3	57.7461	0.0000	SURCHARGED
240 minute summer	SW4.5	232	2.363	1.003	2.1	1.1348	0.0000	SURCHARGED
240 minute winter	SW4.6	236	1.296	0.031	1.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	SW4.0	6.7	0.860	1.103	0.2026	
15 minute summer	SW4.0	1.001	SW4.1	15.9	0.903	0.896	0.1426	
15 minute summer	SW4.1	1.002	SW4.3	21.0	1.195	1.183	0.1709	
15 minute summer	RE2	2.000	SW4.2	3.9	0.676	0.705	0.1105	
15 minute summer	SW4.2	2.001	SW4.3	8.5	0.484	0.590	0.2659	
15 minute summer	SW4.3	1.003	SW4.4	27.6	1.569	1.390	0.0608	
15 minute summer	SW4.4	1.004	PER SURF	35.8	2.033	2.015	0.1508	
15 minute summer	SW5.0	3.000	PER SURF	16.6	1.131	0.935	0.2703	
15 minute summer	PER SURF	1.005	TANK	52.3	1.525	1.006	0.1614	
240 minute summer	TANK	1.006	SW4.5	1.8	0.084	0.048	0.1092	
240 minute summer	SW4.5	1.007	SW4.6	1.8	0.538	0.042	0.0462	82.5

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	12	6.234	0.584	9.7	0.0286	0.0000	FLOOD RISK
15 minute summer	SW4.0	11	5.728	0.387	20.2	0.1095	0.0000	SURCHARGED
15 minute summer	SW4.1	11	5.586	0.326	26.6	0.0923	0.0000	SURCHARGED
15 minute summer	RE2	12	3.405	0.705	5.3	0.0345	0.0000	FLOOD RISK
15 minute summer	SW4.2	12	3.352	0.820	9.3	0.2320	0.0000	FLOOD RISK
15 minute summer	SW4.3	12	3.308	0.877	34.0	0.2483	0.0000	SURCHARGED
15 minute summer	SW4.4	12	3.080	0.692	44.2	0.1960	0.0000	SURCHARGED
240 minute winter	SW5.0	232	2.992	0.412	4.2	0.1167	0.0000	SURCHARGED
240 minute winter	PER SURF	232	2.992	0.766	29.4	19.0674	0.0000	FLOOD RISK
240 minute winter	TANK	232	2.992	1.617	17.0	59.0385	0.0000	FLOOD RISK
240 minute winter	SW4.5	232	2.992	1.632	2.5	1.8456	0.0000	FLOOD RISK
240 minute winter	SW4.6	232	1.300	0.035	2.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	SW4.0	8.1	1.035	1.341	0.2026	
15 minute summer	SW4.0	1.001	SW4.1	19.9	1.128	1.118	0.1426	
15 minute summer	SW4.1	1.002	SW4.3	26.3	1.496	1.484	0.1746	
15 minute summer	RE2	2.000	SW4.2	4.8	0.641	0.875	0.1105	
15 minute summer	SW4.2	2.001	SW4.3	10.2	0.579	0.705	0.2659	
15 minute summer	SW4.3	1.003	SW4.4	33.7	1.917	1.698	0.0608	
15 minute summer	SW4.4	1.004	PER SURF	44.0	2.500	2.479	0.1524	
240 minute winter	SW5.0	3.000	PER SURF	4.2	0.820	0.236	0.3234	
240 minute winter	PER SURF	1.005	TANK	17.0	1.191	0.328	0.1810	
240 minute winter	TANK	1.006	SW4.5	2.1	-0.090	0.055	0.1092	
240 minute winter	SW4.5	1.007	SW4.6	2.3	0.574	0.053	0.0543	98.3

Flow+ v14.0 Copyright © 1988-2025 Causeway Technologies Ltd

APPENDIX D – GREENFIELD RUN-OFF RATES CALCULATIONS

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

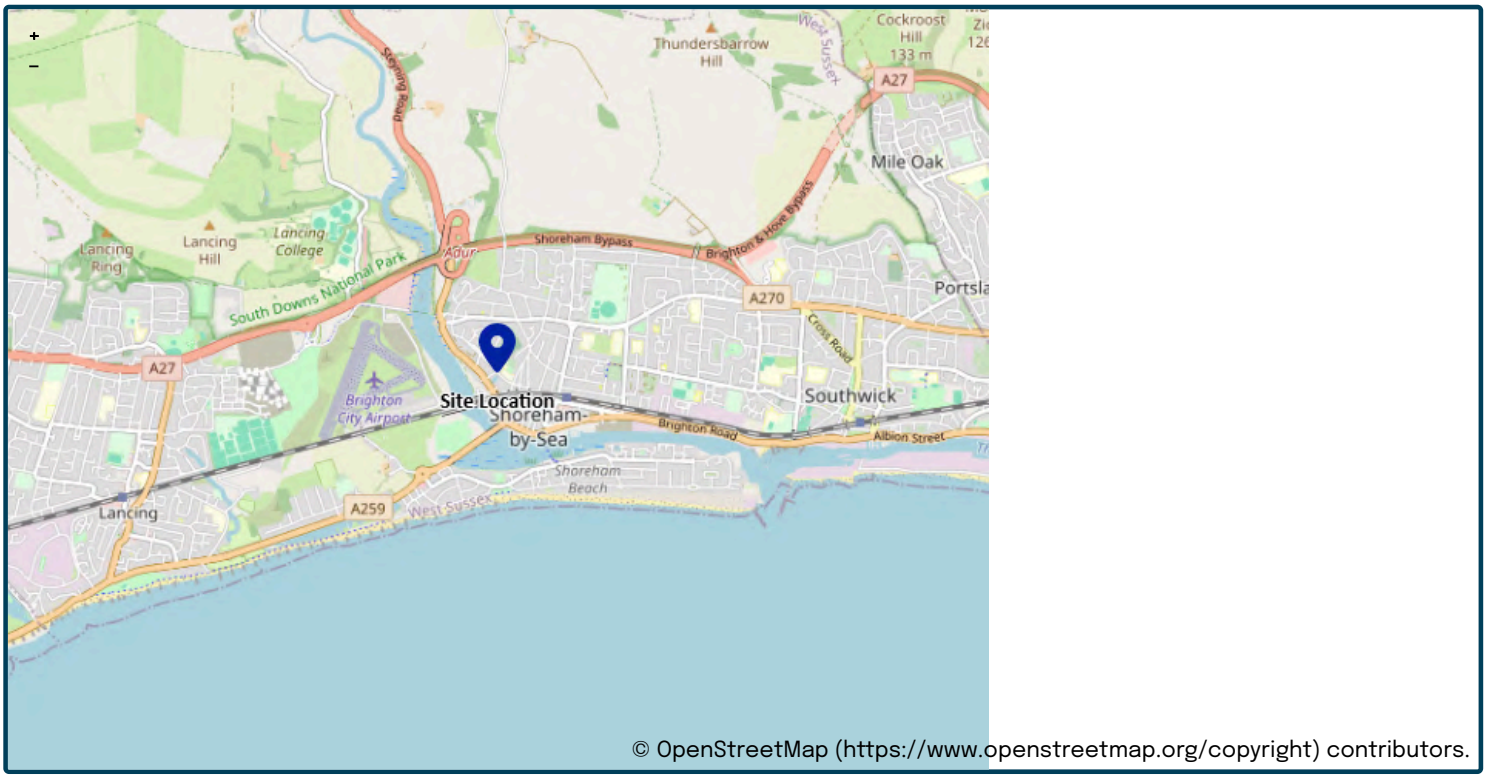
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). 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	20/03/2025
Calculated by	Andrew Peeke
Reference	Ropetackle Houses
Model version	0.6.5

Location

Site name	Ropetackle House
Site location	Shoreham-by-Sea



Site easting	521257
Site northing	105305

Site details

Total site area (ha)	0.2675 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	740 mm		740
How should SPR be derived?	WRAP soil type		
WRAP soil type	3		3
SPR	0.37		0.37
QBar (IH124) (l/s)	0.82 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	IH124
Flow rate 1 year (l/s)	0.7 l/s
Flow rate 2 year (l/s)	0.72 l/s
Flow rate 10 years (l/s)	1.3 l/s
Flow rate 30 years (l/s)	1.9 l/s
Flow rate 100 years (l/s)	2.6 l/s
Flow rate 200 years (l/s)	3.1 l/s

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (0.6.5) 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 E – HR WALLINGFORD SIMPLE INDEX SUMMARY

SIMPLE INDEX APPROACH: SUMMARY TABLE

HRW shall not be liable for any direct or indirect damage claim, loss, cost, expense or liability howsoever arising out of the use or impossibility to use the tools, even when HRW has been informed of the possibility of the same. The user hereby indemnifies HRW from and against any damage claim, loss, expense or liability resulting from any action taken against HRW that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. HRW does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Standard commercial yard or delivery area	This classification is not appropriate for haulage yards, lorry parks, waste management areas, or chemical storage/handling zones			
Pollution Hazard Level	Medium				
Pollution Hazard Indices					
TSS	0.7				
Metals	0.6				
Hydrocarbons	0.7				
SuDS components proposed					
Component 1	None				
Component 2	None				
Component 3	None				
SuDS Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
Metals	0				
Hydrocarbons	0				
Acceptability of Pollution Mitigation					
TSS	Additional TSS Mitigation Required				
Metals	Additional Metals Mitigation Required				
Hydrocarbons	Additional Hydrocarbon Mitigation Required				

SIMPLE INDEX APPROACH: SUMMARY TABLE

HRW shall not be liable for any direct or indirect damage claim, loss, cost, expense or liability howsoever arising out of the use or impossibility to use the tools, even when HRW has been informed of the possibility of the same. The user hereby indemnifies HRW from and against any damage claim, loss, expense or liability resulting from any action taken against HRW that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. HRW does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Residential parking				
Pollution Hazard Level	Low				
Pollution Hazard Indices					
TSS	0.5				
Metals	0.4				
Hydrocarbons	0.4				
SuDS components proposed					
Component 1	Pervious pavement (where the pavement is not designed as an infiltration component)	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 2	None				
Component 3	None				
SuDS Pollution Mitigation Indices					
TSS	0.7				
Metals	0.6				
Hydrocarbons	0.7				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.7	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
Metals	0.6				
Hydrocarbons	0.7				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				



APPENDIX F – SUDS MAINTENANCE REGIME & MANAGEMENT RESPONSIBILITIES

Springfield Rag Room,
Mill Lane, Maidstone
Kent, ME14 1GU

Proposed SuDS Maintenance Regime

ITEM	MAINTENANCE SCHEDULE	TASK	FREQUENCY	LOCATION	ACCESS	SPECIFIC RISKS	SPECIFIC SAFETY MEASURES	TRAFFIC MANAGEMENT REQUIRED
PERMEABLE PAVING	Regular Maintenance	Brushing and vacuuming.	3 times a year (end of winter, mid-summer and after autumn leaf fall) and as required.	Car Parking Area	Un-restricted	Carriageway and/or driveways may require closures.	Moving vehicles	Warning signs
	Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required.					
		Removal of weed.	As required.					
		Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.					
	Remedial Actions	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users.	As required.					
		Rehabilitation of surface and upper sub-structure.	As required (if infiltration performance is reduced as a result of significant clogging).					
		Initial inspection.	Monthly for 3 months after installation.					
	Monitoring	Inspect for evidence of poor operation. If required, take remedial action.	3 Monthly and after large storms.					
		Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.					
		Monitor inspection chambers.	Annually.					
SILT TRAPS AND CATCHPITS	Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.	Public Open Space	Un-restricted	None	None	No
		Debris removal from catchment surface (where may cause risks to performance).	Monthly					
		Inspection of silt traps and catchpits to assess silt accumulation.	Monthly and after large storms.					
		Removal of accumulated silt from silt traps and catch pit sumps.	Annually, or as required.					

	Remedial Actions	Repair/rehabilitation of inlets, outlet, overflows and vents.	As required.					
	Monitoring	Inspect/check all inlets, outlet, overflows and vents to ensure that they are in good condition and operating as designed.	Annually and after large storms.					
FLOW CONTROL CHAMBERS AND DEVICES	Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly.	Car Parking Areas	Restricted	None	None	No
		Debris removal from catchment surface (where may cause risks to performance).	Monthly					
		Inspection of silt traps and catchpits to assess silt accumulation.	Monthly and after large storms.					
		Removal of accumulated silt from silt traps and catch pit sumps.	Annually, or as required.					
	Remedial Actions	Repair/rehabilitation of inlets, outlet, overflows and vents.	As required.					
	Monitoring	Inspect/check all inlets, outlet, overflows and vents to ensure that they are in good condition and operating as designed.	Annually and after large storms.					
GEOCELLULAR STORAGE	Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.	Car Parking Areas	Restricted	None	None	Yes, car park to be closed during works.
		Remove debris from the catchment surface (where it may cause risks to performance).	Monthly.					
		For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually.					
		Remove sediment from pre-treatment structures and/or internal forebays.	Annually, or as required.					
	Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents.	As required.					
	Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually.					
		Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.					

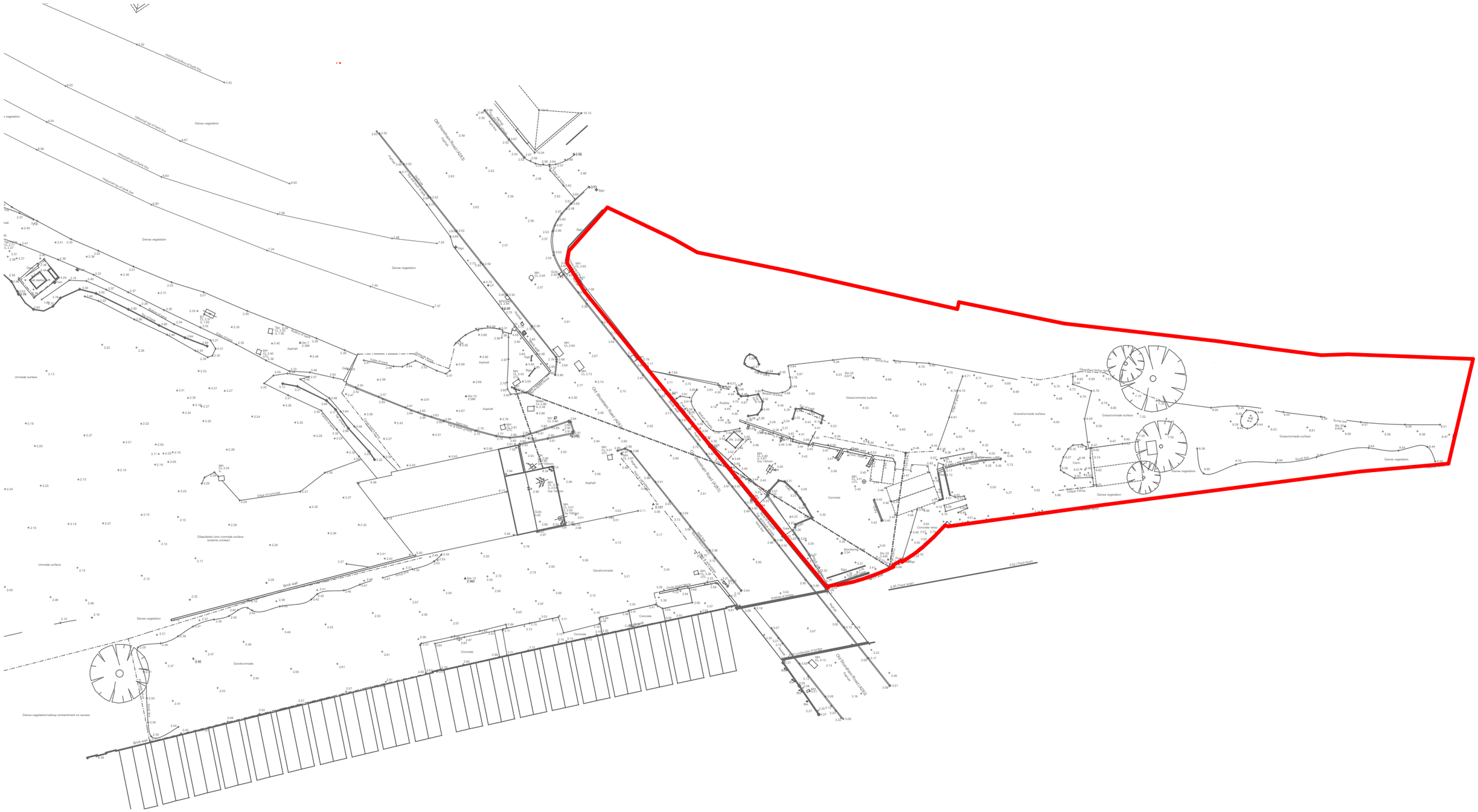
Springfield Rag Room,
Mill Lane, Maidstone
Kent, ME14 1GU

Division of Responsibilities for the SUDS

The client will be responsible for the maintenance of SuDS components and replace the cellular crates, concrete soakaways and catchpits if required.

DEVICE	LOCATION	RESPONSIBILITY AND REPLACEMENT
Permeable Paving	Car Parking Areas	Management Company
Silt Traps and Catchpits	Public Open Space	Management Company
Flow Control Chambers and Devices	Car Parking Areas	Management Company
Geocellular Storage	Car Parking Areas	Management Company

APPENDIX G – DRAWINGS


Old Shoreham Road (A283)
Old Shoreham Road (A283)
Old Shoreham Road (A283)
Old Shoreham Road (A283)
Dense vegetation
Unmade surface
Gravel/unmade
Concrete
Asphalt
Grass/unmade surface
Scrub
Brick wall
Fence
Hedge
Edge of track
Edge of kerb
Edge of concrete
Historical bottom of bank line
Historical top of bank line
Dilapidated conc./unmade surface (extents unclear)
Dense vegetation/railway embankment no access
Overhead telephone wires
Sign
Bollard
Gully
Manhole
Tree
Bus Stop
Bus Shelter
Monitoring Point
Concrete ramp
Timber Fence
Scrub bund
Grass/unmade surface
Gravel/unmade surface
Dense vegetation
Scrub line
Edge of track
Edge of concrete
Edge of kerb
Edge of drive
Edge of path
Edge of hedge
Edge of fence
Edge of grass
Edge of gravel
Edge of scrub
Edge of bund
Edge of timber fence
Edge of concrete ramp
Edge of monitoring point
Edge of bus stop
Edge of bus shelter
Edge of tree
Edge of gully
Edge of manhole
Edge of sign
Edge of bollard
Edge of overhead telephone wires
Edge of dense vegetation
Edge of unmade surface
Edge of gravel/unmade
Edge of concrete
Edge of asphalt
Edge of grass/unmade surface



Revision B - 22/12/2022 Further illustrated Boundary trees and garden fences
Revision A - 4/01/2022 Updated drawing title to indicate North, East, South or West.

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NOT TO BE SCALED. DIMENSIONS TO BE CHECKED ON SITE
SCALING FOR LOCAL AUTHORITY PURPOSES ONLY

NOTES

All Structural Elements including steel beams, pad stones, all timber joists, lintels and ground floor structure to be carried out in accordance with Structural Engineers details. Any Structural sizes shown on this drawing are indicative only and must be read in conjunction with the Structural Engineers report.

Client
Adur Developments Limited

Drawing
Ropetackle - Old Shoreham Road
Proposed Site Plan

Scale
1:500 @ A3

Drawing No.
20.012.521

Status
Planning
SR / MW

Revision
B
9th Dec 2022

Architect
Innovate 4 Limited
72 Catisfield Lane, Catisfield
Hampshire
PO15 5NS
www.innovate4.com

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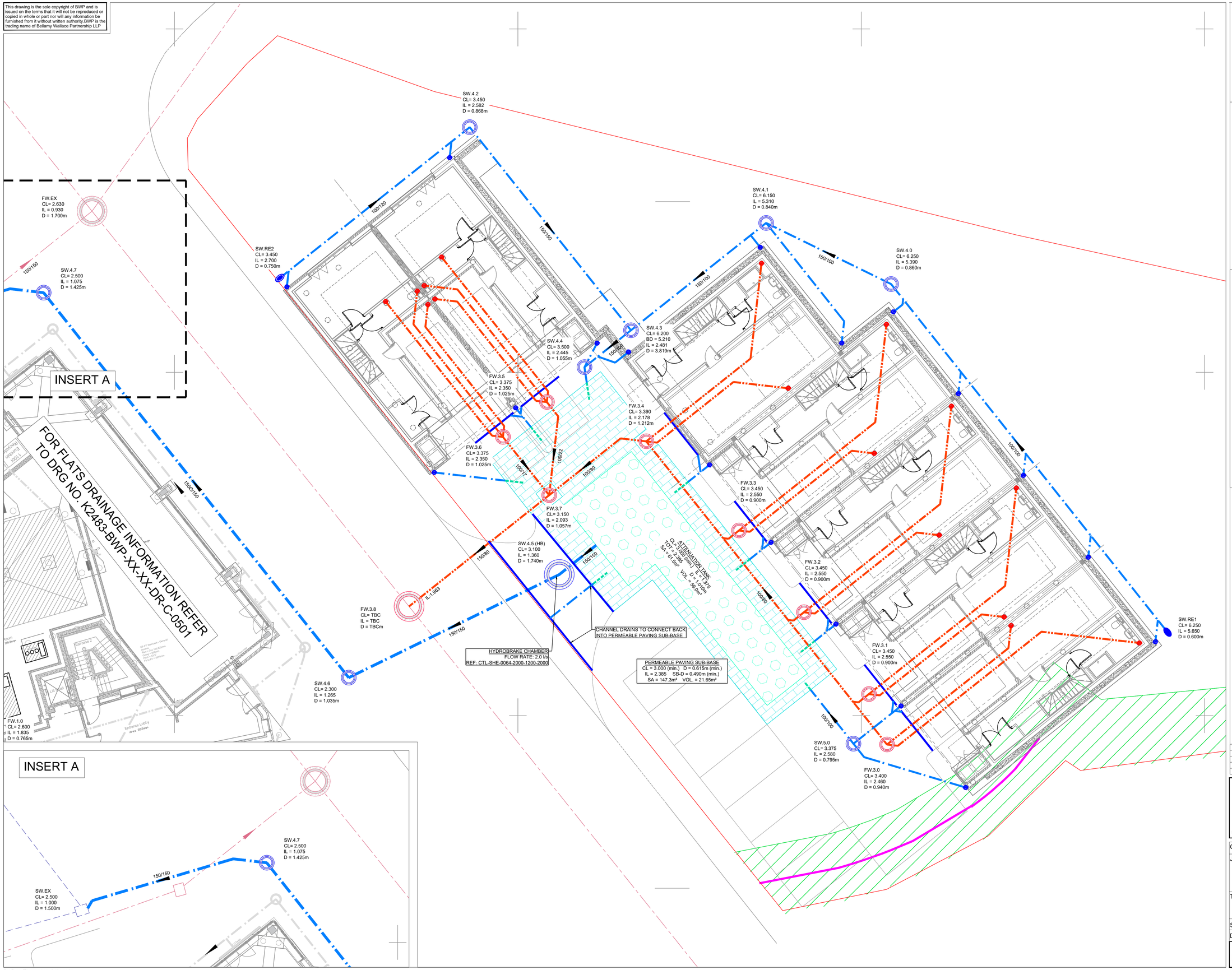

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BACKGROUND INFORMATION BASED ON ARHCITECT'S DRAWING "7843-ECE-V2-ZZ-GA-A-1010" RECEIVED "11.03.2025" AND TOPOGRAPHICAL SURVEY "9852" BY M.J.ZARA ASSOCIATES, DATED "OCTOBER 2024".

DRAINAGE NOTES:

1. ALL FOUL WATER DRAINAGE TO BE 100mm DIAMETER, UNLESS OTHERWISE STATED, WITH A MINIMUM FALL OF 1:60, WITH A MIN. FALL OF 1:40 BENATH BUILDINGS,
2. ALL PRIVATE STORM DRAINAGE TO BE 100mm DIAMETER, UNLESS OTHERWISE STATED, WITH A MINIMUM FALL OF 1:100,
3. ALL DRAINAGE TO BE HEPWORTH OR WAVIN, UNLESS OTHERWISE STATED OR APPROVED BY BWP LTD,
4. FOUL WATER CONNECTION INTO EXISTING FOUL WATER SEWER TO BE CONFIRMED & APPROVED BY SOUTHERN WATER (LOCAL WATER AUTHORITY),
5. SURFACE WATER CONNECTION INTO PHASE 1 SURFACE WATER SEWER TO BE CONFIRMED & APPROVED BY PHASE 1 MANAGEMENT COMPANY,
6. DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER BWP DRAWINGS,
7. GEOCELLUAR TANKS SPECIFICATION TO BE BBA CERTIFICATED FOR MIN. 60 YEARS, NHBC REQUIREMENT,
8. RAINWATER DROP-POINTS (RWP) TO HAVE ACCESS POINT ABOVE GROUND FOR RODDING PURPOSES.

LEGEND:

- SURFACE WATER PIPEWORK
- SURFACE WATER CHAMBER
- SW PERFORATED PIPEWORK
- SW RAINWATER DOWNPIPE
- SW CHANNEL DRAIN
- SW RODDING EYE
- SW GEOCELLUAR CRATES - 2 x 'POLYSTORM R' + 1 x 'PSM3/POLYSTORM XTRA'
- SW PERMEABLE PAVING
- FOUL WATER PIPEWORK
- FOUL WATER CHAMBER
- FOUL WATER POP-UPS
- EXISTING SW DRAINAGE
- EXISTING FW DRAINAGE
- NETWORK RAIL EASEMENT (4m)
- NETWORK RAIL NO-GO ZONE BOUNDARY (2m)

PRELIMINARY ISSUE

Rev	Date	Description	
P04	11.08.2025	CHANGES FOLLOWING LLFA COMMENTS	DNT
P03	27.06.2025	CHANGES FOLLOWING LEVELS CHANGES	DNT
P02	03.04.2025	ISSUED FOR INFORMATION	DNT
P01	21.03.2025	ISSUED FOR INFORMATION	DNT

Springfield Rag Room
Mill Lane
Maidstone
Kent. ME14 1GU

Bellamy Wallace Partnership
Consulting Structural Engineers

E-mail: kent@bwp-eng.co.uk
Tel. 01622 630675

Client:	TRINITY HOMES LTD
Job:	ROPETACKLE FLATS AND HOUSES SHOREHAM
Title:	DRAINAGE LAYOUT SHEET 2 OF 2 HOUSES
Scale @ A1 - 1:100	Drawn by: AP
Date: MAR 25	Checked by: DNT

Project	Originator	Zone	Level	Type	Displ.	Drawing No.	Rev.
K2483	-BWP-	XX-	XX-	DR -	C -	0502	- P04

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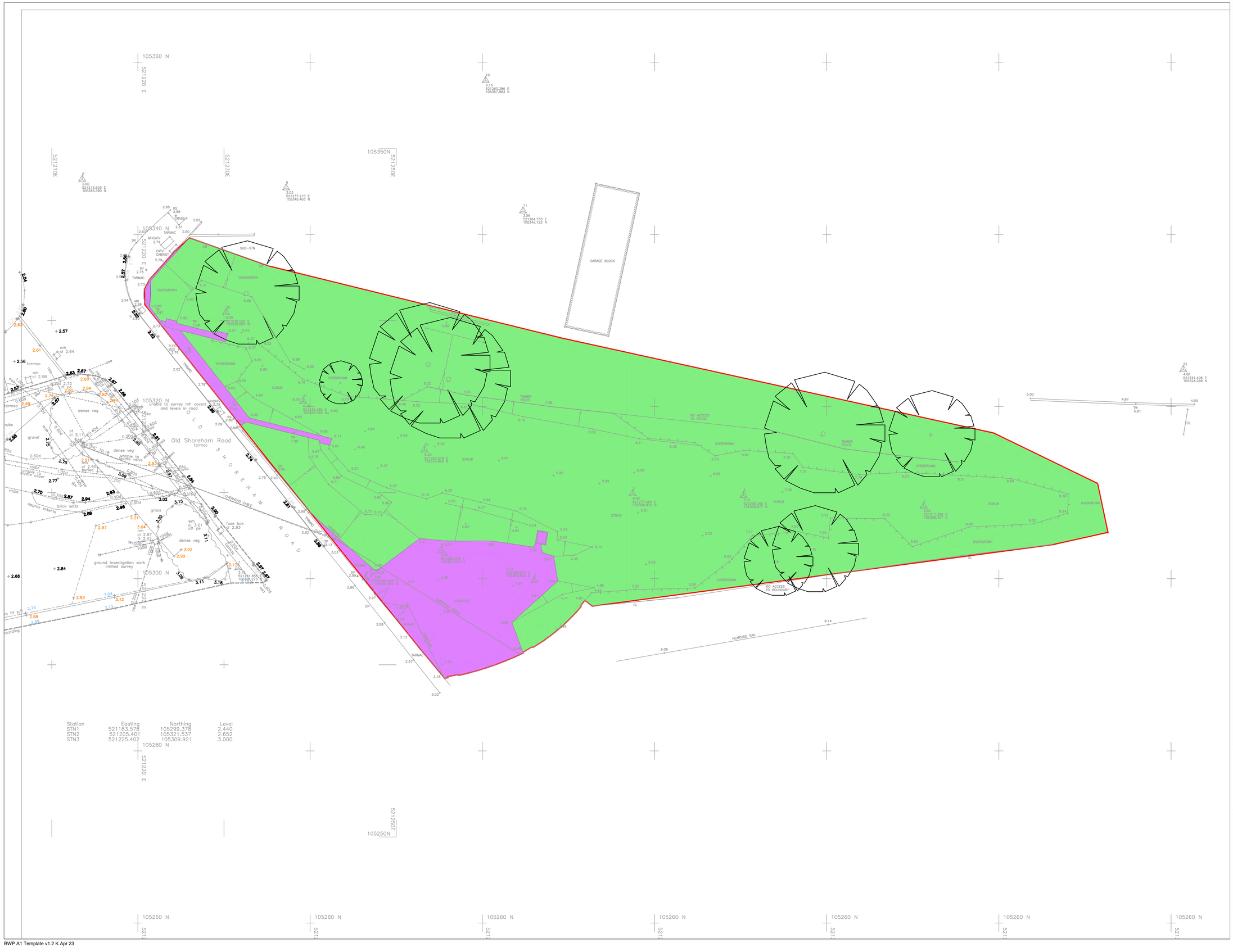

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BACKGROUND INFORMATION BASED ON ARHCITECT'S DRAWING "7843-ECE-V2-ZZ-GA-A-1010" RECEIVED "11.03.2025" AND TOPOGRAPHICAL SURVEY "9852" BY M.J.ZARA ASSOCIATES, DATED "OCTOBER 2024".

LEGEND:

	IMPERMEABLE AREA	= 278.3m² = 10.4%
	PERMEABLE AREA	= 2403.5m² = 79.6%
	TOTAL AREA	= 2681.8m²

NOTES:

TOPOGRAPHICAL SURVEY CARRIED OUT POST DEMOLITION (CIRCA 2016) AND PRE-DEVELOPMENT.

ISSUED FOR INFORMATION

Rev	Date	Description	CHD
P01	21.03.2025	ISSUE FOR INFORMATION	DNT

Springfield Rag Room
Mill Lane
Maidstone
Kent. ME14 1GU

Bellamy Wallace Partnership
Consulting Structural Engineers

E-mail: kent@bwp-eng.co.uk

Tel. 01622 630675

Client: TRINITY HOMES LTD

Job: ROPETACKLE FLATS AND HOUSES SHOREHAM

Title: IMPERMEABLE AREAS HOUSES EXISTING - POST DEMO

Scale @ A1 - 1:200 | Drawn by: ANP

Date: MAR 25 | Checked by: DNT

Project	Originator	Zone	Level	Type	Displ.	Drawing No.	Rev.
K2483	-BWP-	XX-	XX-	DR -	C-	0521	-P01

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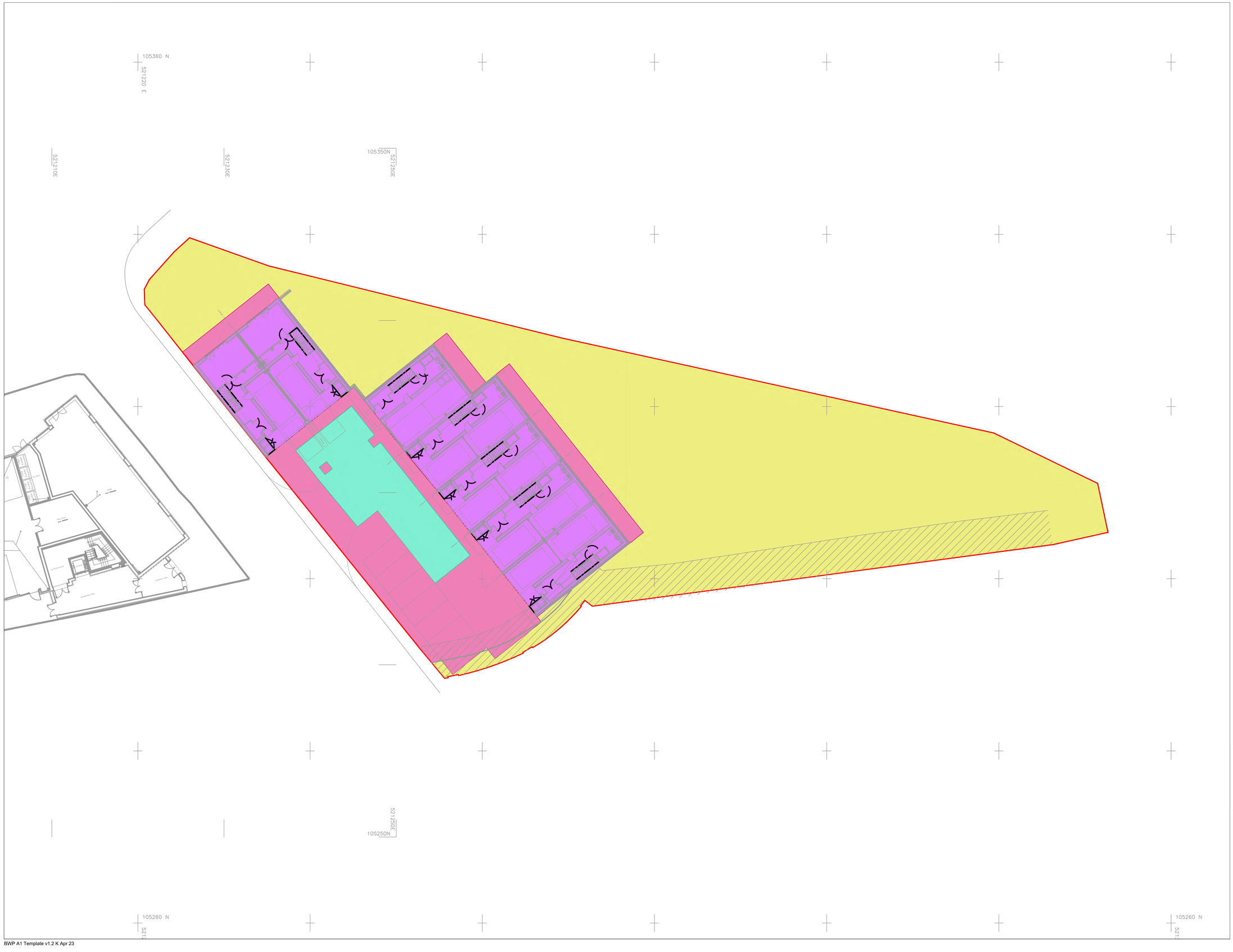

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BACKGROUND INFORMATION BASED ON ARHCITECT'S DRAWING "7843-ECE-V2-ZZ-GA-A-1010" RECEIVED "11.03.2025" AND TOPOGRAPHICAL SURVEY "9852" BY M.J.ZARA ASSOCIATES, DATED "OCTOBER 2024".

LEGEND:

	ROOF AREA	= 594.0m²
	IMPERMEABLE	= 22.1%
	PAVED AREA	= 383.7m²
	IMPERMEABLE	= 14.3%
	PERMEABLE SURFACE	= 147.3m²
	IMPERMEABLE	= 5.5%
	LANDSCAPED AREA	= 1556.8m²
	PERMEABLE	= 57.9%
	TOTAL AREA	= 2681.8m²

IMPERMEABLE AREA = 1125.0m²
- EXISTING AREA = 278.3m²
- AREA DIFFERENCE = +846.7m² *(+304.2%)*

PERMEABLE AREA = 1556.8m²
- EXISTING AREA = 2403.5m²
- AREA DIFFERENCE = -846.7m² *(-35.2%)*

ISSUED FOR INFORMATION

Rev	Date	Description	Drn
P01	21.03.2025	ISSUED FOR INFORMATION	DNT

Springfield Rag Room
Mill Lane
Maidstone
Kent. ME14 1GU

Bellamy Wallace Partnership
Consulting Structural Engineers

E-mail: kent@bwp-eng.co.uk
Tel. 01622 630675

Client: TRINITY HOMES LTD

Job: ROPETACKLE FLATS AND HOUSES SHOREHAM

Title: IMPERMEABLE AREAS HOUSES PROPOSED

Scale @ A1 - 1:200 | Drawn by: AP

Date: MAR 25 | Checked by: DNT

Project	Originator	Zone	Level	Type	Displ.	Drawing No.	Rev.
K2483	-BWP-	XX-	XX-	DR -	C-	0523	-P01

APPENDIX H – FLOOD RISK ASSESSMENT BY MERIDIAN LTD

MERIDIAN

CIVIL ENGINEERING CONSULTANCY

SITE2B ROPETACKLE NORTH

SHOREHAM WATERFRONT

OLD SHOREHAM ROAD, SHOREHAM,

BN43 5FL

FLOOD RISK ASSESSMENT

&

SURFACE WATER DRAINAGE STRATEGY

OCTOBER 2021

Ref: MC0031 ADL Ropetackle 2B

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APPENDICES

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APPENDIX IV	Calculations
APPENDIX V	Proposed SuDS Strategy

Client : Adur Developments Limited

Rev	Date	Prepared by	Checked by	Approved by
	20/10/2021	Mark Naumann		
P01	17/02/2025	GH	MN	MN

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1.0 INTRODUCTION

1.1 Meridian Civil Engineering Consultancy LTD (MCEC) has been instructed by 2b Adur Developments Limited to prepare a site-specific Flood Risk Assessment (FRA) and Surface Water drainage strategy (SWDS) for the redevelopment of Site2B Ropetackle North, Shoreham Waterfront, Old Shoreham Road, Shoreham, BN43 5FL.

1.2 It is understood the development is for demolition of the existing buildings on site and construction of new 9 new residential dwelling houses with associated parking and landscaping. Details of the site and development proposals have been provided by the Client to clarify the scope of the proposed development and the existing site conditions.

1.3 The Environment Agency (EA) mapping for Flood Risk, shows the majority of the site located within Flood Zone 1 (low risk of fluvial or tidal flooding). Flood Zone 1 is described as land having a less than 1 in 1,000 annual probability of river or sea flooding. The entrance area of the site is shown within Flood Zone 3 (High risk of fluvial or tidal flooding). Flood Zone 3 is described as Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.

1.4 The Environment Agency Flood Risk from Surface Water map shows the proposed development location to be within an area of 'Very Low' risk of flooding from surface water. The EA state 'Very low risk means that each year this area has a chance of flooding of less than 0.1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.' Flood risk from sewer and groundwater sources are also considered low based on the data included in this report.

1.5 Geology at the site is shown to be Head - Clay, silt, sand and gravel sedimentary superficial deposit with Newhaven Chalk Formation bedrock as published by the British Geological Survey online. Head deposits are normally of low permeability and therefore infiltration of storm water runoff is unlikely to be effective.

1.6 The Environment Agency has recently completed construction of the Shoreham Adur Tidal Walls flood defence scheme. The scheme was to update existing flood defences in the Adur estuary which did not provide high enough level of protection and were in poor condition leaving Shoreham-by-Sea, Lancing and the surrounding areas at risk of flooding. The scheme provides protection of extreme events with 0.33% probability (1-in-300-year), allowing for 50 years of sea level rise. The Adur Tidal walls have been constructed at a level of 5.57mAOD.

1.7 This report has been produced broadly in accordance with the National Planning Policy Framework (NPPF), West Sussex County Council and associated Local Planning Authority technical guidance.

1.8 It is proposed to provide water butts to the new dwellings to collect rain water for re-use in garden and amenity areas.

1.9 The majority of rainwater is proposed to be stored on site prior to release to the storm sewer at a reduced rate at 2l/s in line Adur and Worthing Councils *Supplementary Requirements for Surface Water Drainage Proposals* document. It can be seen from table 3 that 2l/s is less than 50% of the pre-development runoff rate generated by the existing hard surface on site for the 2yr rainfall event offering betterment to others in terms of reduced peak offsite flow rates.

1.10 It is understood that storage must be provided 20m away from the railway bridge so storage can only be provided in the north of the site.

1.11 Based on a maximum 2l/s outflow rate from the proposed development the drainage network would need to accommodate surface water storage volume of 80.52m^3 to accommodate rainfall from rainfall events up to and including the 1in100yr+45% climate change event. This storage can be accommodated within 120sqm the permeable paved parking area at the front of the site. To provide the storage a permeable subbase depth of 400mm of 6-20mm clean crushed stone

offering 30% void is needed overlaying supplemental crate storage 800mm thk and 87sqm in plan area.

1.12 As stated previously peak tide levels for the 1in100yr Tidal event plus climate change at the site using the Higher Central allowance would be 5.3mAOD and the Upper end would be 5.7mAOD. Current EA standing advice is that floor levels should be a minimum of 600m above the estimated river or sea flood level. Therefore FFLs of habitable rooms should be ideally located above 6.3mAOD. This can be seen to be accommodated in the architectural plans with only garages, storage and WC shown on the ground floor.

1.13 Residual risks would be as a result of blockage or an exceedance event resulting in overland flows or breach of the defences. Careful design of external levels to raise plots above surrounding ground levels and to direct water away from buildings will mitigate this risk.

1.14 With the main risk at the development site being tidal the risk from high tides can be forecasted and residents notified allowing evacuation should the residents require. Should a breach or overtopping event occur, as the habitable rooms of the proposed properties are above the potential peak tide levels (above 6.3mAOD), the residents would have safe refuge within the proposed dwelling for the duration of the flood event.

1.15 Should an exceedance rainfall event occur then overland flow would be directed towards Old Shoreham Road as per the existing situation for the hard surface shown on the topographic surveys. The exceedance flow routes are shown on the Surface Water strategy plan in Appendix V.

1.16 Non return valves should be placed on offsite drainage connections to reduce the likelihood of surcharged drains offsite affecting the site or on-site drainage.

1.17 Given these factors and characteristics the flood risk from the development proposal can be seen to be appropriately managed and that residual risks can be mitigated through the development and implementation of flood management measures outlined in this report

1.18 This report has been produced broadly in accordance with the National Planning Policy Framework (NPPF), West Sussex County Council and associated Local Planning Authority technical guidance.

2.0 POLICY COMPLIANCE

2.1 The purpose of this assessment is to demonstrate that the development proposal outlined above can be satisfactorily accommodated without worsening flood risk for the area and without placing the development itself at risk of flooding, as per the:

- National Planning Policy Framework
- West Sussex LLFA Policy for the Management of Surface Water
- Adur and Worthing Councils Strategic Flood Risk Assessment
- Adur and Worthing Councils Supplementary Requirements for Surface Water Drainage Proposals
- DEFRA Sustainable drainage systems: non-statutory technical standards
- Ciria SuDS Manual C753

3.0 SITE LOCATION AND PROPOSALS

3.1 Site2B Ropetackle North, Shoreham Waterfront, Old Shoreham Road, Shoreham, BN43 5FL is located close to the centre of Shoreham-by-Sea and directly north of the South Coast Mainline railway between Brighton and Portsmouth.

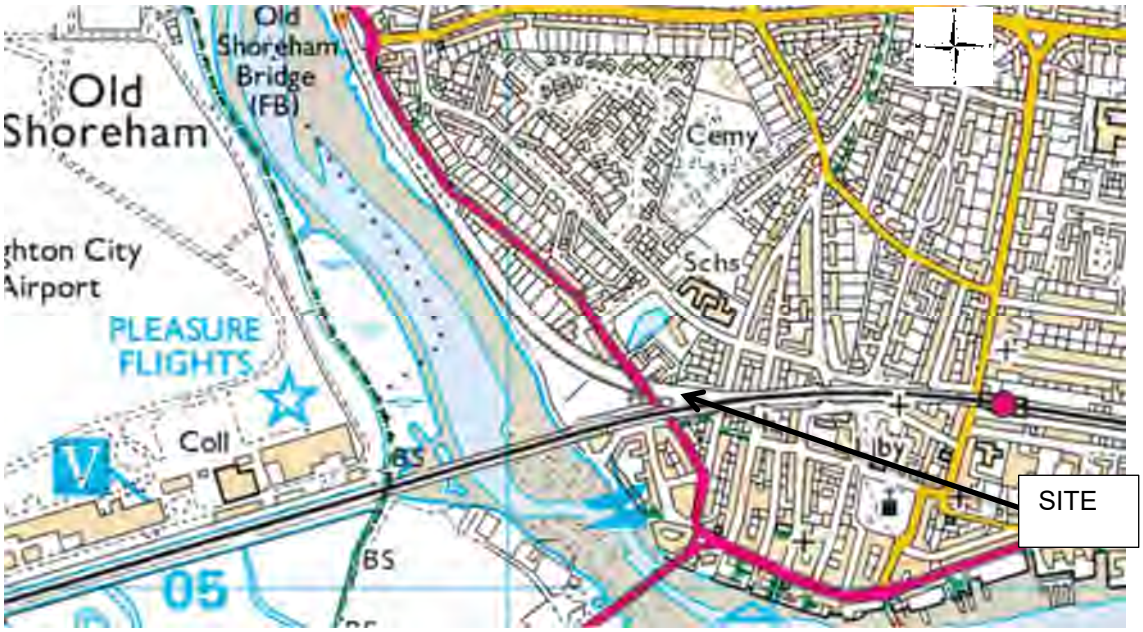

Figure 1: Site location

3.2 The site is currently a site compound area related to the larger 'The Waterfront' development currently being constructed on the opposite of the A283 Old Shoreham Road. The development area was shown as part of Phase 2 of the initial wider outline planning approval AWDM/0935/13.

3.3 Prior to use as a site compound the site previously contained hard surfacing and small warehouse buildings. A topographical survey of the site prior to demolition and site clearance of the hard surface and warehouse units is included in Appendix I.

3.4 It is understood the development at Site 2b is for demolition of the existing buildings on site and construction of 7 new residential dwelling houses with associated parking and landscaping. Architects plans are included in Appendix I.

3.5 The site redline boundary is approximately 2900sqm. Proposed hard surface areas are approximately 1114sqm. Topographic site levels range from 3.2 AOD on the west boundary entrance near the railway bridge to approximately 6.7m AOD on the railway bund along the north boundary.

3.6 The general topography on site slopes towards Old Shoreham Road to the west but Old Shoreham Road falls northwards away from the site. Site levels and layout can be seen on the topographical survey of the site included in Appendix I.

4.0 GEOLOGY AND INFILTRATION POTENTIAL

4.1 Geology at the site is shown to be Head - Clay, silt, sand and gravel sedimentary superficial deposit with Newhaven Chalk Formation bedrock as published by the British Geological Survey online. Head deposits are normally of low permeability and therefore infiltration of storm water runoff is unlikely to be effective.



Figure 2: BGS online mapping extract

4.2 A review of DEFRA's Magic Map online resource indicates that the formation underneath the site is an 'Unproductive' aquifer. A review of DEFRA's Magic Map online resource indicates the site is not within an EA groundwater Source Protection Zone.

4.3 Given the expected clay subsoil, and proximity to the tidal river, it is not expected that infiltration of surface water would be a viable drainage solution on this site.

4.4 The ground investigation undertaken to support the wider development undertook water monitoring and reported the following: *The spot monitoring identified water in BH3A at 0.07m below ground level (2.20m AOD) on the 9 February 2016, with the data logging indicating that this was approaching the peak of a period of spring tides. This accords with the data from the 2008 investigation which also identified very shallow groundwater in this part of the site.*

5.0 EXISTING DRAINAGE INFRASTRUCTURE

5.1 The existing topographical survey of the site shows surface water drainage infrastructure present to the hardstanding areas to the front of the site. The connectivity of this drainage is unknown but given the clay subgrade limiting infiltration potential, it is assumed this would drain to the public sewer.

5.2 The Southern Water sewer records available for the local area show the main sewer within Old Shoreham road to be a foul sewer only running southwards towards the railway line. Once the sewer passes under the railway bridge the sewer becomes designated as combined and it is shown draining to a pump station within the Ropetackle South development area.

5.3 The drainage strategy for the wider site submitted as part of the AWDM/0935/13 application shows the proposed development site (Ropetackle 2B) to route surface water drainage to the main drainage network on the main Ropetackle north development site. The later discharge of condition drainage drawings do not seem to show this connection maintained.

6.0 SEQUENTIAL TEST/EXCEPTION TEST

6.1 Under the NPPF, all new planning applications should undergo a Sequential Test. This test should be implemented by local planning authorities with a view to locating particularly vulnerable new developments (e.g. residential, hospitals, mobile homes etc.) outside of the floodplain.

6.2 The Environment Agency (EA) mapping for Flood Risk, shows the site located within Flood Zone 1 (low risk of fluvial or tidal flooding). Flood zone one is described as land having a less than 1 in 1,000 annual probability of river or sea flooding.

6.3 Following the published Flood Risk and Coastal Change Planning Policy Guidance (PPG) Table 2 and NPPF guidelines, the existing residential use on site is considered 'More Vulnerable' development. The proposed development is classed as 'More Vulnerable' development due to the continues residential use, so it is considered that the NPPF vulnerability of the site will be unchanged post development.

6.4 The NPPF Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table is reproduced below;

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	**Zone 1**	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	×	Exception Test Required	✓
	Zone 3b *Functional Floodplain*	Exception Test Required	✓	×	×	×

Table 1 The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Please note: ✓ means development is appropriate; × means the development should not be permitted.

6.5 Using the principles of the Sequential Test outlined above, the proposed development is classed as 'More Vulnerable' under the NPPF. The majority of proposed development for this site is shown located within Flood Zone 1 (as defined by the EA flood map for planning in Figure 3) and therefore, in accordance with Table 3 of the Flood Risk and Coastal Change Planning Policy Guidance (PPG), the proposed development is appropriate for this flood zone location and does not require the application of the Exception Test.

6.6 Of the proposed development arrangement 2 units are shown within Flood Zone 3 and therefore would require the Exception Test to be applied.

6.7 The Exception Test, as set out in paragraph 160 of the Framework, is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available. Essentially, the 2 parts to the Test require proposed development to show that it will provide wider sustainability benefits to the community that outweigh flood risk, and that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

6.8 In terms of sustainability benefits the proposed development would bring back into use current land that was previously derelict or of low value in a manner sympathetic to the new housing development opposite.

6.9 In terms of flood risk the units are in a position whereby the floors can be raised to reduce the risk of flooding to the units. As risk to the site is tidal in nature floodable areas can be managed on site to ensure there is no increased flood risk to others as a result of development.

7.0 CLIMATE CHANGE ALLOWANCES

7.1 Making an allowance for climate change in the design of surface water drainage systems will help to minimise vulnerability and provide resilience to flooding and coastal change in the future. Climate Change allowances vary across the UK subject to catchment conditions and are based on climate change projections and different scenarios of carbon dioxide (CO2) emissions to the atmosphere.

7.2 Climate change allowances were recently updated by the EA and the climate change allowances are now defined by River Catchment peak rainfall allowances

7.3 The data published on the DEFRA database shows the site located within the Adur and Ouse Management Catchment. For this development, an upper end allowance of 45% should be applied to rainfall events as the climate change allowance within this region for 'more vulnerable' developments.

7.4 There are a range of allowances for each river basin district and epoch for sea level rise. For flood risk assessments and strategic flood risk assessments, the NPPF requires assessment of both the higher central and upper end allowances.

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
South east	Higher central	5.7 (200)	8.7 (261)	11.6 (348)	13.1 (393)	1.20
South east	Upper end	6.9 (242)	11.3 (339)	15.8 (474)	18.2 (546)	1.60

8.0 SOURCES OF FLOODING

8.1 Tidal and Fluvial

8.1.1 The Environment Agency (EA) mapping for Flood Risk (Figure 3), shows the site located within Flood Zone 1 (low risk of fluvial or tidal flooding). Flood zone one is described as land having a less than 1 in 1,000 annual probability of river or sea flooding.



Figure 3: EA Flood map for planning extract

8.1.2 The Environment Agency has recently completed construction of the Shoreham Adur Tidal Walls flood defence scheme. The scheme was to update existing flood defences in the Adur estuary which did not provide high enough level of protection and were in poor condition leaving Shoreham-by-Sea, Lancing and the surrounding areas at risk of flooding. The scheme provides protection of extreme events with 0.33% probability (1-in-300-year), allowing for 50 years of sea level rise. The Adur Tidal walls have been constructed at a level of 5.57mAOD.

8.1.3 Current tidal levels for the 1in100yr event for the Adur-Worthing coastline have been calculated at an average of 4.1mAOD for the present day 1in100yr tidal event. In line with current guidance within the NPPF both the Higher central and Upper end allowances should be assessed as part of FRAs and SFRAs.

8.1.4 Therefore peak tide levels for the 1in100yr Tidal event plus climate change at the site using the Higher Central allowance would be 5.3mAOD and the Upper end would be 5.7mAOD. Current EA standing advice is that floor levels should be a minimum of 600m above the estimated river or sea flood level. Therefore FFLs of habitable rooms should be ideally located above 6.3mAOD. This can be seen to be accommodated in the architectural plans with only garages, storage and WC shown on the ground floor.

8.2 Surface Water (Pluvial)

8.2.1 The Environment Agency Flood Risk from Surface Water map (Figure 4) shows the proposed development location to be within an area of 'Very Low' risk of flooding from surface water. The EA state *'Very low risk means that each year this area has a chance of flooding of less than 0.1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.'*

8.2.2 It can be seen the road outside the site is shown to be at low risk of surface water flooding. Low risk means that each year this area has a chance of flooding of between 0.1% and 1%.



Figure 4: EA Risk of Flooding from Surface Water map extract

8.2.3 Following a review of the updated RoFSW GIS data it is understood the site is at very low risk of surface water flooding. Inundation of 0.3m is shown along the western boundary. The site remains at a very low risk between 2040 and 2060.

8.3 Groundwater

8.3.1 The Adur and Worthing Councils Strategic Flood Risk Assessment contains mapping showing the potential for groundwater flooding included in Appendix H (extracted below). This shows the site to be located in a No Risk area. As such risk from this source can be considered low.

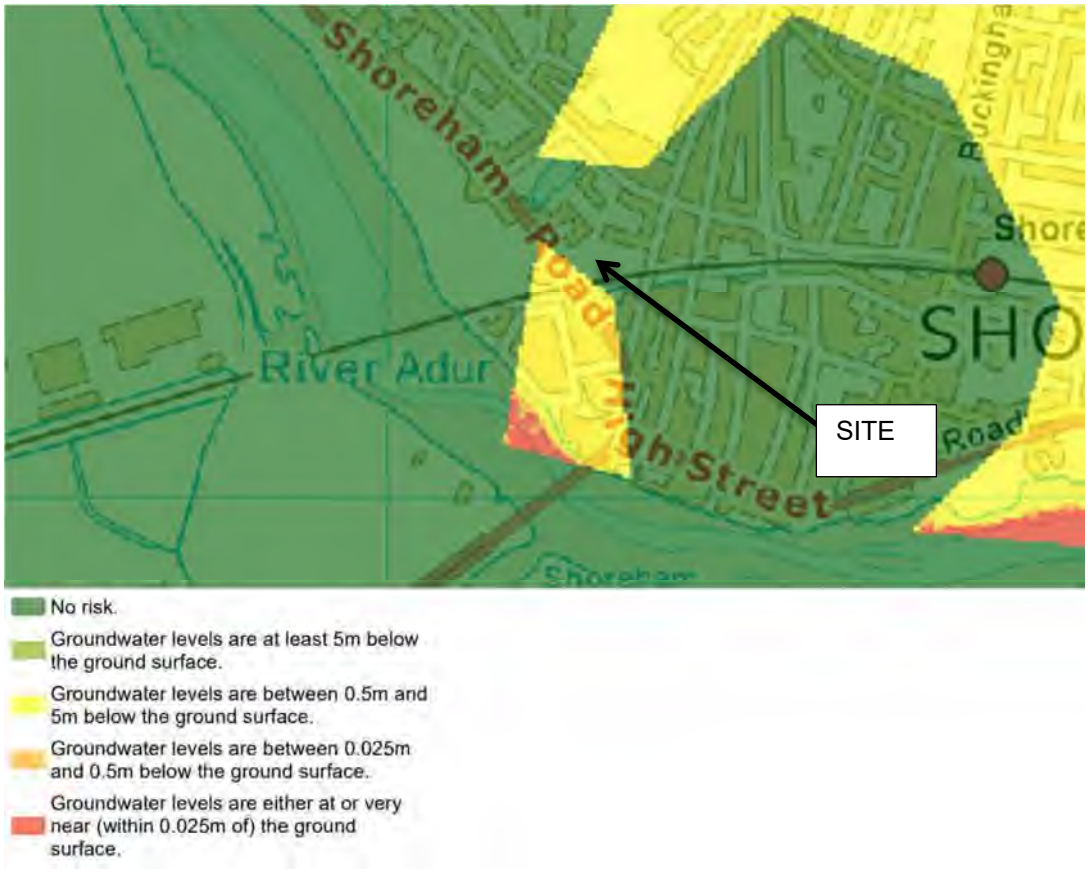

Figure 5: Adur and Worthing Councils map for elevated groundwater risk extract

8.4 Sewer

8.4.1 The Adur and Worthing Councils Strategic Flood Risk Assessment Appendix A includes mapping showing historic flood incidents. This shows there are no recorded incidents of sewer flooding recorded close to the proposed development site

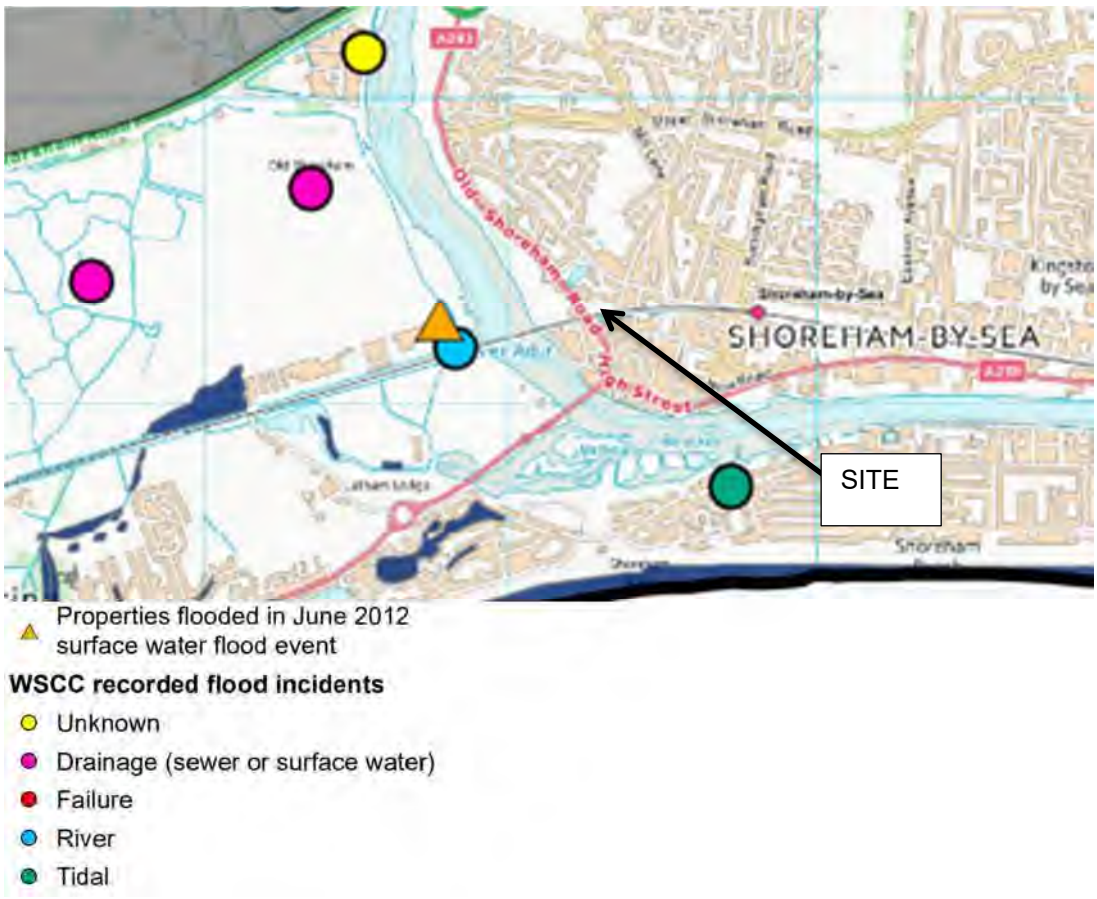

Figure 6:RBKT Borough map of historic flood incidents

8.4.2 Table 6-4 of the Adur and Worthing Councils Strategic Flood Risk Assessment contains a record of the Sewer Incidence report for the Adur and Worthing Borough SFRA areas. This shows the postcode area of BN43 5 -- to have had 1 recorded sewer flood incidence.

8.4.3 As such flood risk from this source can be considered low.

9.0 SUSTAINABLE URBAN DRAINAGE ASSESSMENT

9.1 In accordance with the SuDS management train approach, the use of various SuDS measures to reduce and control surface water flows have been considered in detail for the development.

9.2 The management of surface water has been considered in respect to the SuDS hierarchy below as detailed in the CIRIA 753 'The SUDS Manual', Section 3.2.3:

SuDS Drainage Hierarchy			
		Suitability	Comment
1.	Store rainwater for later use	✓	Rainwater harvesting is being considered by the developer and could be used around the wider site where feasible
2.	Use infiltration techniques, such as porous surfaces in non-clay areas	x	Infiltration in the underlying soils is likely to be poor due to the clay and silt head deposits.
3.	Attenuate rainwater in ponds or open water features for gradual release	x	Given the site scale open features are not viable, although permeable paving should be utilised to treat runoff from parking areas and minimise below ground tanks systems.
4.	Attenuate rainwater by storing in tanks or sealed water features for gradual release	✓	A feasible option given the constraints, preference to permeable pavements and storage
5.	Discharge rainwater direct to a watercourse	x	No watercourses near the site
6.	Discharge rainwater to a surface water sewer/drain	✓	Existing surface water drainage is located north of the site running from the pond at Swiss gardens eastwards across the Old Shoreham Road.
7.	Discharge rainwater to Combined Sewer	✓	A combined sewer is shown south of the site under the railway line bridge.

Table 2: SuDS Drainage Hierarchy

9.3 Following the SuDS drainage hierarchy, infiltration has been considered. As per the section Geology and Infiltration Potential, the site is unlikely to be suitable for full infiltration methods.

9.4 There is a nearby surface water sewer shown on the sewer records (see Appendix II) located within Old Shoreham Road to the north of the site. It is recommended the client commissions a CCTV drain survey to establish the connection location of any existing storm drainage on site should any existing drainage still exist.

9.5 It is proposed to provide water butts to the new dwelling to collect rain water for re-use in garden and amenity areas.

9.6 The majority of rainwater is proposed to be stored on site prior to release to the storm sewer at a reduced rate at, or as close as feasible to, Greenfield runoff rates, in line with current Ciria SUDS Manual and Adur and Worthing Councils Supplementary Requirements for Surface Water Drainage Proposals SUDS Guidance.

9.7 It is understood that storage must be provided 20m away from the railway bridge so storage can only be provided in the north of the site.

9.8 Storage on site can be provided with permeable pavement provided with in some of the proposed driveway area and the proposed patio area. The total plan area of permeable paving is approximately 120sqm. Given the volume of storage required the proposal is to use supplemental crate storage under the permeable paving sub-base to boost the available storage volume.

9.9 All new drainage should be designed to accommodate the 1:100yr design rainfall event with +45% climate change allowance. No surface flooding should occur during a 1:30yr rainfall event and

any flooding during the 1:100yr event should be managed on site and not affect either property on site of those downstream of the site.

9.10 For the purposes of the calculations rainfall has been generated using the FEH methodology and a CV of 1.0 applied to all hard surface areas in accordance with WSCC guidance.

10.0 SURFACE WATER DRAINAGE STRATEGY

10.1 Surface water discharge rates have been calculated in line with current Ciria SUDS Manual and Adur and Worthing Councils Supplementary Requirements for Surface Water Drainage Proposals SUDS Guidance as outlined below and supporting calculations are included in Appendix III.

Surface Water Discharge Rates Summary						
	Area (ha)	Discharge Rates (l/s)				
		1 year	2 year/Q_{BAR}	30 year	100 year	100 year+45%CC
Greenfield Rates	0.114	0.5	0.59	1.35	1.87	
Brownfield Runoff Rates	0.034	-	6.8	18.6	23.6	34.2
Proposed Runoff Rates	0.114	-	1.6	1.6	1.6	1.9

Table 3: Calculated Runoff rates

10.2 Current Sustainable drainage guidance is to achieve as close to greenfield runoff rates as feasible for new developments. Given calculated greenfield rates for this site are very low the lowest practical runoff rate is deemed as 2l/s as defined by Adur and Worthing Councils *Supplementary Requirements for Surface Water Drainage Proposals* document and can be achieved using a minimum 50mm aperture hydro brake to minimise blockage as advised by the Code for Adoption. It can be seen that 2l/s is less than 50% of the pre-development runoff rate generated by the existing hard surface on site for the 2yr rainfall event.

10.3 Based on a maximum 2l/s outflow rate from the proposed development the drainage network would need to accommodate surface water storage volume of 80.52m^3 to accommodate rainfall from rainfall events up to and including the 1in100yr+45% climate change event. This storage can be accommodated within 120sqm the permeable paved parking area at the front of the site. To provide the storage a permeable subbase depth of 400mm of 6-20mm clean crushed stone offering 30% void is needed overlaying supplemental crate storage 800mm thk and 87sqm in plan area.

10.4 The half drain time for the storage is shown in the calculations to be 596mins for the supplemental crate storage and 68mins for the permeable paving storage.

10.5 A scheme proposed storm water drainage strategy plan layout is included in Appendix V. The final form of storage may vary subject to the outfall location and offsite drainage depths and potential use of other storage areas on site such as the high-level rear garden areas.

10.6 Storm runoff would need to drain to the storm drainage network serving the initial phase of the Ropetackle North development opposite (as outlined in the original planning drawings included in Appendix III) or to the existing storm water sewer from Swiss Gardens to the north of the site in accordance with the methodology of the SuDS hierarchy.

10.7 Any offsite connections from the new development should be approved by the relevant sewer authority prior to commencement.

11.0 FOUL DRAINAGE STRATEGY

11.1 The existing topographical survey of the site shows drainage infrastructure present to the hardstanding areas to the front of the site. The connectivity of this drainage is unknown but given the clay subgrade limiting infiltration potential, it is assumed this would drain to the public sewer. It is assumed a foul sewer would be present to cater for former site uses.

11.2 The Southern Water sewer records available for the local area show the main sewer within Old Shoreham road to be a foul sewer only running southwards towards the railway line. Once the sewer passes under the railway bridge the sewer becomes designated as combined and it is shown draining to a pump station with the Ropetackle South development area.

11.3 The drainage strategy for the wider site submitted as part of the AWDM/0935/13 application shows the proposed development site (Ropetackle 2B) to route foul drainage to the main foul drain within Old Shoreham Road outside of the site. The current proposals would be to maintain this proposed connection route.

11.4 An application has been made to Southern Water to confirm capacity of the offsite sewer network but a response to this has not been received at the time of writing.

11.5 A scheme proposed storm water drainage strategy plan layout is included in Appendix V. Any offsite connections from the new development should be approved by the relevant sewer authority prior to commencement.

12.0 PROPOSED SCHEDULE OF MAINTENANCE

12.1 All onsite SuDS and drainage systems will be privately maintained. A long-term maintenance regime should be agreed with the site owners before adoption. In addition to a long-term maintenance regime, it is recommended that all drainage elements implemented on site should be inspected following the first rainfall event post-construction and monthly for the first quarter following construction. General maintenance of key SuDS components are provided below.

12.2 The property owner will be responsible for the management and maintenance of SuDS devices.

Typical Key Suds Components Operation And Maintenance Acitivies

Operation and Maintenance Activity	SuDS Component												
	Pond	Wetlands	Detention Basin	Infiltration Basin	Soakaway	Infiltration Trench	Filter Drain	Modular Storage	Pervious pavement	Swale/Bioretention	Filter Strip	Green Roofs	Proprietary Treatment
Regular Maintenance													
Inspection		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Litter/debris removal	✓	✓	✓	✓	-	✓	✓	-	✓	✓	✓	x	-
Grass cutting	✓	✓	✓	✓	-	✓	✓	-	-	✓	✓	x	x
Weed/invasive plant control	-	-	-	-	x	-	-	x	-	x	-	✓	x
Shrub management	-	-	-	-	x	x	x	x	-	-	-	x	x
Shoreline vegetation management	✓	✓	-	x	x	x	x	x	x	x	x	x	x
Aquatic vegetation management	✓	✓	-	x	x	x	x	x	x	x	x	x	x
Occasional Maintenance													
Sediment management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vegetation replacement	-	-	-	-	x	x	x	x	x	-	-	✓	x
Vacuum sweeping and brushing	x	x	x	x	x	x	x	x	✓	x	x	x	x
Remedial Maintenance													
Structure rehabilitation/repair	-	-	-	-	-	-	-	-	-	-	-	-	x
Infiltration surface reconditioning	x	x	x	-	-	-	-	x	-	-	-	x	x

Key:					
Will be Required		May be Required		Not Normally Required	

Table 4: General Maintenance Requirements (Source: CIRIA SuDS Manual C753)

12.3 Drainage systems should be maintained as per the recommended maintenance schedule shown below:

Proposed Schedule of Maintenance for Below Ground Drainage:

Item	Visual Inspection	Cleanse / De-sludge	CCTV Survey	Comments
Foul Drainage System (pipework, chambers etc.)	5 years	10 years	10 years	Cleansing to be carried out as necessary
Surface Water Drainage System (pipework, chambers etc.)	5 years	10 years	10 years	Cleansing to be carried out as necessary
Gullies/Channels/Catch pits	1 year	1 year	N/A	Cleansing to be carried out as necessary
Permeable Paving	3 months	'Swept' clean of debris every year	N/A	Cleansing to be carried out as necessary
Hydrobrake	6 months	As required	N/A	Cleansing to be carried out as necessary
Attenuation tank	See comments	See comments	See comments	Maintained in accordance with manufacturers recommendations

13.0 RESIDUAL RISKS

13.1 Residual risks will be limited to exceedance rainfall events causing overtopping of the designed flood defences, or blockage in underground drainage.

13.2 With the main risk at the development site being tidal the risk from high tides can be forecasted and residents notified allowing evacuation should the residents require. Should a breach or overtopping event occur, as the habitable rooms of the proposed properties are above the potential peak tide levels (above 6.3mAOD), the residents would have safe refuge within the proposed dwelling for the duration of the flood event.

13.3 Should an exceedance rainfall event occur then overland flow would be directed towards Old Shoreham Road as per the existing situation for the hard surface shown on the topographic surveys. The exceedance flow routes are shown on the Surface Water strategy plan in Appendix V.

14.0 FLOOD RISK MANAGEMENT MEASURES

14.1 Given the development site is situated in a largely low flood risk area with only limited risk from extreme surface water flood events the necessary flood mitigation measures are limited.

14.2 As stated previously peak tide levels for the 1in100yr Tidal event plus climate change at the site using the Higher Central allowance would be 5.3mAOD and the Upper end would be 5.7mAOD. Current EA standing advice is that floor levels should be a minimum of 600m above the

estimated river or sea flood level. Therefore FFLs of habitable rooms should be ideally located above 6.3mAOD.

14.3 Surface water runoff should be managed on site to a rate as close as practical to greenfield runoff rates to reduce flood risk to others as a result of development. Given calculated greenfield rates for this site are very low the lowest practical runoff rate is deemed as 2l/s as defined by Adur and Worthing Councils *Supplementary Requirements for Surface Water Drainage Proposals* document. It can be seen from table 3 that 2l/s is less than 50% of the pre-development runoff rate generated by the existing hard surface on site for the 2yr rainfall event offering betterment to others in terms of reduced peak offsite flow rates.

14.4 Non return valves should be placed on offsite drainage connections to reduce the likelihood of surcharged drains offsite affecting the site or on-site drainage.

15.0 CONCLUSION

15.1 Meridian Civil Engineering Consultancy LTD (MCEC) has been instructed by 2b Adur Developments Limited to prepare a site-specific Flood Risk Assessment (FRA) and Surface Water drainage strategy (SWDS) for the redevelopment of Site2B Ropetackle North, Shoreham Waterfront, Old Shoreham Road, Shoreham, BN43 5FL.

15.2 It is understood the development is for demolition of the existing buildings on site and construction of new 9 new residential dwelling houses with associated parking and landscaping. Details of the site and development proposals have been provided by the Client to clarify the scope of the proposed development and the existing site conditions.

15.3 The Environment Agency (EA) mapping for Flood Risk, shows the majority of the site located within Flood Zone 1 (low risk of fluvial or tidal flooding). Flood Zone 1 is described as land having a less than 1 in 1,000 annual probability of river or sea flooding. The entrance area of the site is shown within Flood Zone 3 (High risk of fluvial or tidal flooding). Flood Zone 3 is described as Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.

15.4 The Environment Agency Flood Risk from Surface Water map shows the proposed development location to be within an area of 'Very Low' risk of flooding from surface water. The EA state 'Very low risk means that each year this area has a chance of flooding of less than 0.1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.' Flood risk from sewer and groundwater sources are also considered low based on the data included in this report.

15.5 Geology at the site is shown to be Head - Clay, silt, sand and gravel sedimentary superficial deposit with Newhaven Chalk Formation bedrock as published by the British Geological Survey online. Head deposits are normally of low permeability and therefore infiltration of storm water runoff is unlikely to be effective.

15.6 The Environment Agency has recently completed construction of the Shoreham Adur Tidal Walls flood defence scheme. The scheme was to update existing flood defences in the Adur estuary which did not provide high enough level of protection and were in poor condition leaving Shoreham-by-Sea, Lancing and the surrounding areas at risk of flooding. The scheme provides protection of extreme events with 0.33% probability (1-in-300-year), allowing for 50 years of sea level rise. The Adur Tidal walls have been constructed at a level of 5.57mAOD.

15.7 This report has been produced broadly in accordance with the National Planning Policy Framework (NPPF), West Sussex County Council and associated Local Planning Authority technical guidance.

15.8 It is proposed to provide water butts to the new dwellings to collect rain water for re-use in garden and amenity areas.

15.9 The majority of rainwater is proposed to be stored on site prior to release to the storm sewer at a reduced rate at 2l/s in line Adur and Worthing Councils *Supplementary Requirements for Surface Water Drainage Proposals* document. It can be seen from table 3 that 2l/s is less than 50% of the pre-development runoff rate generated by the existing hard surface on site for the 2yr rainfall event offering betterment to others in terms of reduced peak offsite flow rates.

15.10 It is understood that storage must be provided 20m away from the railway bridge so storage can only be provided in the north of the site.

15.11 Based on a maximum 2l/s outflow rate from the proposed development the drainage network would need to accommodate surface water storage volume of 80.52m^3 to accommodate rainfall

from rainfall events up to and including the 1in100yr+45% climate change event. This storage can be accommodated within 120sqm the permeable paved parking area at the front of the site. To provide the storage a permeable subbase depth of 400mm of 6-20mm clean crushed stone offering 30% void is needed overlaying supplemental crate storage 800mm thk and 87sqm in plan area.

15.12 As stated previously peak tide levels for the 1in100yr Tidal event plus climate change at the site using the Higher Central allowance would be 5.3mAOD and the Upper end would be 5.7mAOD. Current EA standing advice is that floor levels should be a minimum of 600m above the estimated river or sea flood level. Therefore FFLs of habitable rooms should be ideally located above 6.3mAOD. This can be seen to be accommodated in the architectural plans with only garages, storage and WC shown on the ground floor.

15.13 Residual risks would be as a result of blockage or an exceedance event resulting in overland flows or breach of the defences. Careful design of external levels to raise plots above surrounding ground levels and to direct water away from buildings will mitigate this risk.

15.14 With the main risk at the development site being tidal the risk from high tides can be forecasted and residents notified allowing evacuation should the residents require. Should a breach or overtopping event occur, as the habitable rooms of the proposed properties are above the potential peak tide levels (above 6.3mAOD), the residents would have safe refuge within the proposed dwelling for the duration of the flood event.

15.15 Should an exceedance rainfall event occur then overland flow would be directed towards Old Shoreham Road as per the existing situation for the hard surface shown on the topographic surveys. The exceedance flow routes are shown on the Surface Water strategy plan in Appendix V.

15.16 Non return valves should be placed on offsite drainage connections to reduce the likelihood of surcharged drains offsite affecting the site or on-site drainage.

15.17 Given these factors and characteristics the flood risk from the development proposal can be seen to be appropriately managed and that residual risks can be mitigated through the development and implementation of flood management measures outlined in this report.

15.18 This report has been produced broadly in accordance with the National Planning Policy Framework (NPPF), West Sussex County Council and associated Local Planning Authority technical guidance.

APPENDIX I Architects plans



GROUND FLOOR PLANS

0 2m 4m 6m 8m 10m 12m 14m

1:200@ A2

CDM 2015 Health & Safety Information

This information relates only to 'Significant Hazards' identified on this drawing and is to be read in conjunction with the Designer's Hazard Register.

Rev	Date	Revision Details	Dr	Ch
C	23.01.25	Trees omitted	NS	NS
B	14.01.25	Dashed outline of approved ground floor footprint indicated.	NS	NS
A	09.01.25	Buildings moved North West to allow for min 2m clear zone to Network Rail bridge & floor plans of plots 4-7 extended to rear to align with floor above.	NS	CB

London: 76 Great Suffolk Street, London, SE1 0BL
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Sussex: 64 - 68 Brighton Road, Worthing, West Sussex, BN11 2EN
T 01903 248777 E sussex@ecearchitecture.com
Bristol: Westworks, Beacon Tower, Colston Street, Bristol, BS1 4XE
T 0117 214 1101 E bristol@ecewestworks.com
ECE Architecture
www.ecearchitecture.com

Client's Name
Trinity Homes

Job Title
Ropetackle,Old Shoreham Road Shoreham

Drawing Title
Ground Floor Plans

Scale
1:200 @ A2

metres 4 8 12 16 20

Drawn	Checked	Date
ns	cb	04.12.24

Job No	Drawing No	Rev
7483	PL01	C

Status
APPROVAL

CAD Plot date: 23/01/2025 - 15:49:34 7483 - houses planning.dwg



FIRST FLOOR PLANS

0 2m 4m 6m 8m 10m 12m 14m

1:200@ A2

CDM 2015 Health & Safety Information

This information relates only to 'Significant Hazards' identified on this drawing and is to be read in conjunction with the Designer's Hazard Register.

Rev	Date	Revision Details	Dr	Ch
B	23.01.25	Trees omitted	NS	NS
A	09.01.25	Buildings moved North West to allow for min 2m clear zone to Network Rail bridge.	NS	CB

London: 76 Great Suffolk Street, London, SE1 0BL
T 0207 928 2773 E london@ecearchitecture.com
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T 0117 214 1101 E bristol@ecewestworks.com
ECE Architecture
www.ecearchitecture.com

Client's Name
Trinity Homes

Job Title
Ropetackle,Old Shoreham Road Shoreham

Drawing Title
First Floor Plans

Scale
1:200 @ A2

metres 4 8 12 16 20

Drawn	Checked	Date
ns	cb	04.12.24

Job No	Drawing No	Rev
7483	PL02	B

Status
APPROVAL

CAD Plot date: 23/01/2025 - 15:52:27 7483 - houses planning.dwg



SECOND FLOOR PLANS

0 2m 4m 6m 8m 10m 12m 14m

1:200@ A2

CDM 2015 Health & Safety Information

This information relates only to 'Significant Hazards' identified on this drawing and is to be read in conjunction with the Designer's Hazard Register.

Rev	Date	Revision Details	Dr	Ch
B	23.01.25	Trees omitted	NS	NS
A	09.01.25	Buildings moved North West to allow for min 2m clear zone to Network Rail bridge.	NS	CB

London: 76 Great Suffolk Street, London, SE1 0BL
T 0207 928 2773 E london@ecearchitecture.com
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ECE Architecture
www.ecearchitecture.com

Client's Name

Trinity Homes

Job Title

Ropetackle,Old Shoreham Road Shoreham

Drawing Title

Second Floor Plans

Scale

1:200 @ A2

metres 4 8 12 16 20

Drawn	Checked	Date
ns	cb	04.12.24

Job No	Drawing No	Rev
7483	PL03	B

Status

APPROVAL

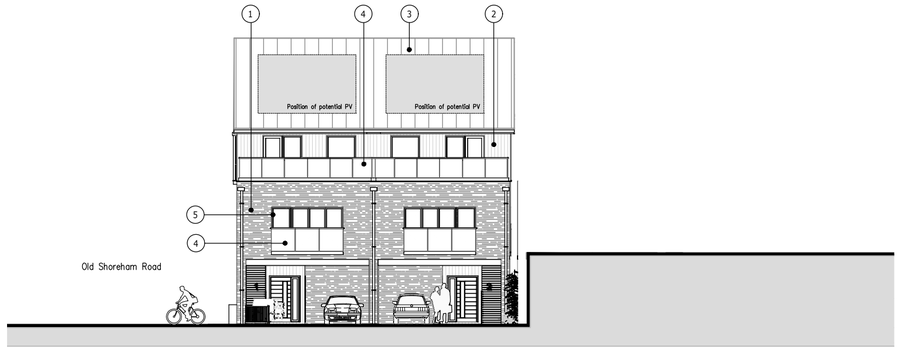
CAD Plot date: 23/01/2025 - 16:04:45 7483 - houses planning.dwg



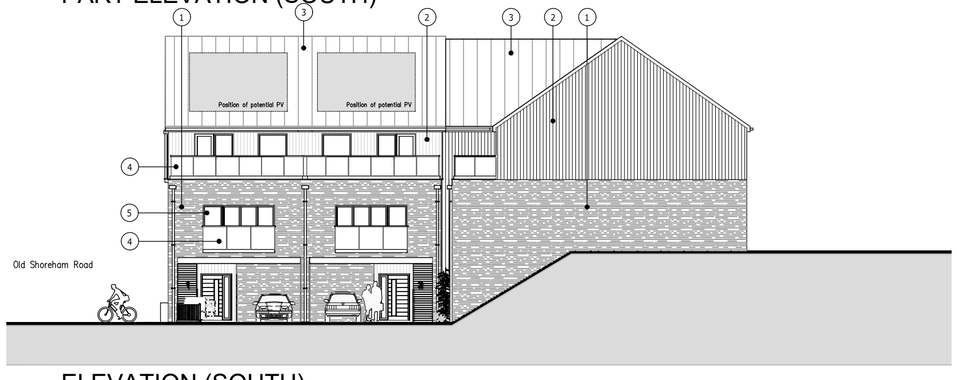
ELEVATION TO OLD SHOREHAM ROAD



REAR ELEVATION (EAST)



PART ELEVATION (SOUTH)



ELEVATION (SOUTH)



REAR ELEVATION (NORTH)

0 2m 4m 6m 8m 10m 12m 14m

1:200@ A2

CDM 2015 Health & Safety Information

This information relates only to 'Significant Hazards' identified on this drawing and is to be read in conjunction with the Designer's Hazard Register.

Building Materials Key

1. Face Brickwork (Buff or similar)
2. Grey / Black effect cladding
3. Metal Roofing (Grey or similar)
4. Glass Balustrade
5. Windows (Grey)

Rev	Date	Revision Details	Dr	Ch
A	24.01.25	Materials key added	NS	NS

London: 76 Great Suffolk Street, London, SE1 0BL
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ECE Architecture
www.ecearchitecture.com

Client's Name

Trinity Homes

Job Title

Ropetackle,Old Shoreham Road Shoreham

Drawing Title

Elevations

Scale

1:200 @ A2

metres 4 8 12 16 20

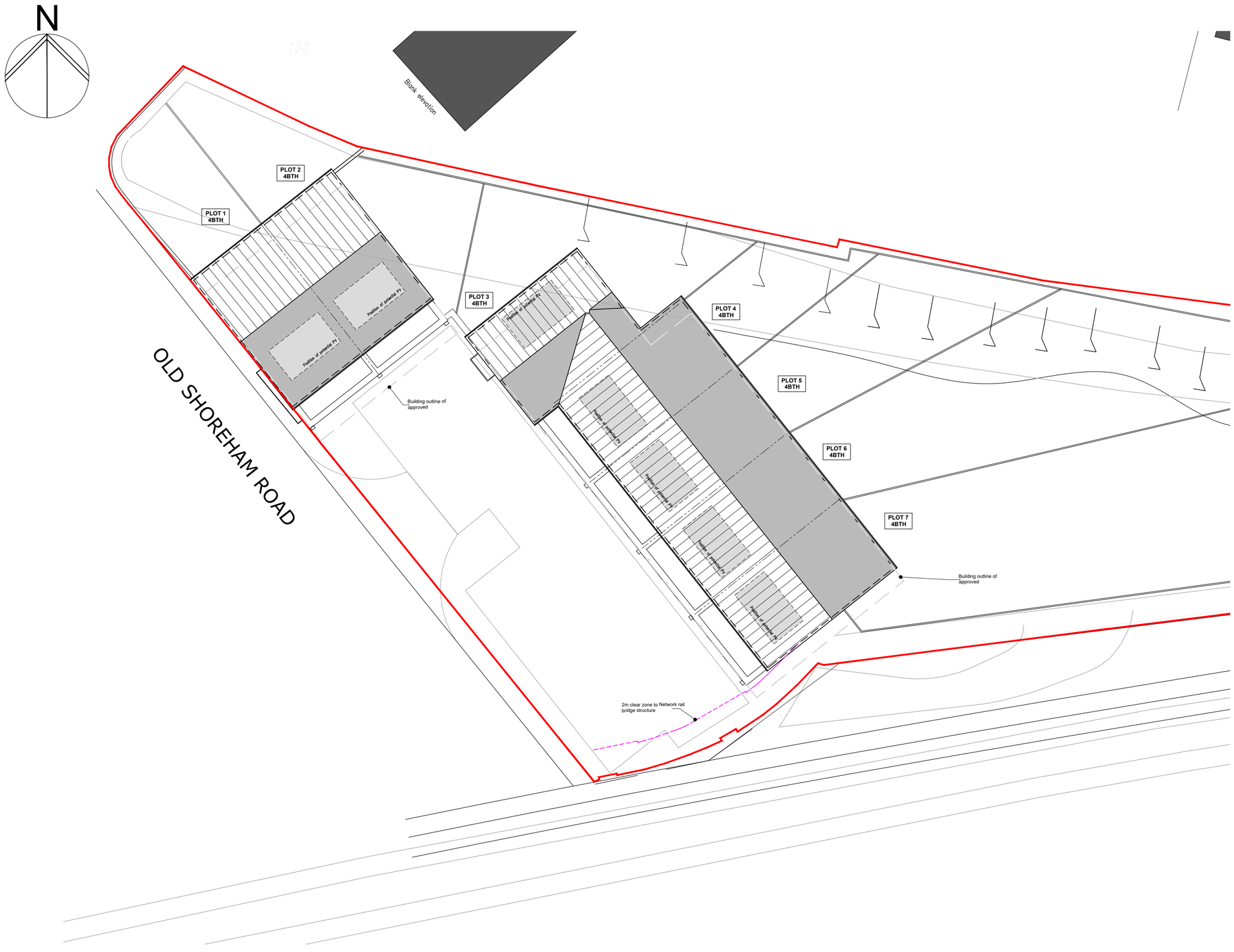
Drawn	Checked	Date
ns	cb	04.12.24

Job No	Drawing No	Rev
7483	PL04	A

Status

APPROVAL

CAD Plot date: 24/01/2025 - 11:17:57 7483 - houses planning.dwg



ROOF PLANS

0 2m 4m 6m 8m 10m 12m 14m

1:200@ A2

CDM 2015 Health & Safety Information

This information relates only to 'Significant Hazards' identified on this drawing and is to be read in conjunction with the Designer's Hazard Register.

Rev	Date	Revision Details	Dr	Ch

London: 76 Great Suffolk Street, London, SE1 0BL
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ECE Architecture
www.ecearchitecture.com

Client's Name

Trinity Homes

Job Title

Ropetackle,Old Shoreham Road Shoreham

Drawing Title

Roof Plan

Scale

1:200 @ A2

metres 4 8 12 16 20

Drawn	Checked	Date
ns	cb	24.01.25

Job No	Drawing No	Rev
7483	PL05	

Status

APPROVAL

CAD Plot date: 24/01/2025 - 10:12:35 7483 - houses planning.dwg



GROUND FLOOR PLANS

0 2m 4m 6m 8m 10m 12m 14m

1:200@ A2

CDM 2015 Health & Safety Information

This information relates only to 'Significant Hazards' identified on this drawing and is to be read in conjunction with the Designer's Hazard Register.

- Planning drawing showing anticipated RWP positions

Rev	Date	Revision Details	Dr	Ch

London: 76 Great Suffolk Street, London, SE1 0BL
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T 0117 214 1101 E bristol@ecewestworks.com
ECE Architecture
www.ecearchitecture.com

Client's Name
Trinity Homes

Job Title
Ropetackle,Old Shoreham Road
Shoreham

Drawing Title
Ground Floor Plans
RWP locations

Scale
1:200 @ A2

metres 4 8 12 16 20

Drawn	Checked	Date
nb	ns	11.02.25

Job No	Drawing No	Rev
7483	PL06	

Status
INFORMATION

CAD Plot date: 11/02/2025 - 09:55:14 7483 - houses planning rwp locations.dwg

APPENDIX II Sewer Record Plans

BULLET POINT NOTES:

- THIS DRAWING IS BASED ON HISTORICAL AND O.S. DATA. INCONSISTENCY IN DATA SHOULD BE CHECKED AND VERIFIED BEFORE COMMENCING DETAIL DESIGN
- EXISTING AND INDICATIVE PIPE ROUTES BASED ON GIS DATA. SOUTHERN WATER SERVICES LTD. ACCEPT NO RESPONSIBILITY IN THE EVENT OF INACCURACY. THE ROUTES ARE TO BE CHECKED AND VERIFIED BEFORE DETAIL DESIGN AND ARE SHOWN PURELY FOR OUTLINE DESIGN.

EXG 300mm DIA SEWER

NEW MH 1.1200mm DIA 1.2m DEEP.

UPSIZE EXISTING 25.0m LENGTH 150mm DIA SEWER TO 225mm DIA OPEN CUT

EXG MH TQ2105140102

EXG MHTQ21051401 TO BE REFURBISHED

EXG 300mm DIA SEWER

PROPOSED CONNECTION EXG MH TQ21052301. CONNECTION TO BE DESIGNED AND CONSTRUCTED BY DEVELOPER

SWISS GARDENS

OLD SHOREHAM ROAD

DEVELOPMENT SITE

RAILWAY

BROAD REACH

ROPETACKLE

VICTORIA ROAD

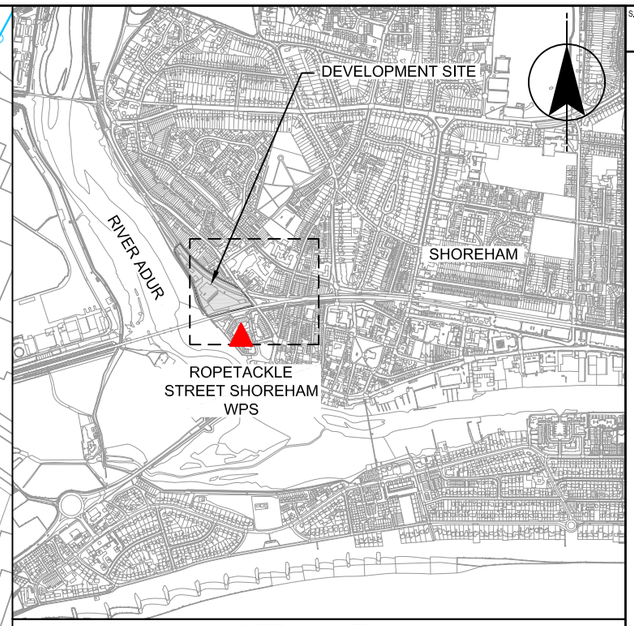
WEST STREET

RIVER ADUR

EXG FOUL RISING MAIN

INCREASE PUMP RATE FROM 151l/s TO 154l/s AT ROPETACKLE STREET SHOREHAM WPS

SITE LAYOUT
SCALE 1:1250



SITE LOCATION
SCALE 1:20000

SCALE 1 : 1250
m50 0 50m

SCALE 1 : 20000
m1000 0 1000m

S.W. DRAWING NO. JN.670008-818.0Z0801 | REVISION A

NOTES
1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.

LEGEND
- CSEW — EXISTING COMBINED SEWER AND MANHOLE
- SW — EXISTING SURFACE WATER SEWER AND MANHOLE
- FW — EXISTING FOUL WATER SEWER AND MANHOLE
- EXISTING FOUL WATER RISING MAIN
- PW — EXISTING POTABLE WATER
- EXISTING PRIVATE MAIN AND MANHOLE
- PROPOSED SEWER
- PROPOSED MANHOLE
- PROPOSED PUMPING STATION WORKS
- FUTURE DEVELOPMENT

CURRENT VERSION INFORMATION

DATE	DRWN	CHKD	REVD	REV	REASON FOR ISSUE
05.02.2018	MC	RK	MB	A	FOR INFORMATION

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Southern Water
In Partnership with MWH
Southern House
Yeoman Road
Worthing
West Sussex
BN13 3NX
telephone (01903) 264444
fax (01903) 691435

PROJECT TITLE
S98 ROPETACKLE NORTH SL1
SHOREHAM BY SEA
SUSSEX

DRAWING TITLE
PROPOSED SITE LAYOUT PLAN

SITE UNIT MNEMONIC		SITE UNIT NO.	
PRN 670008-818	SCALE AS SHOWN	MASTER SIZE A3	
S.W. DRAWING NO. JN.670008-818.0Z0801		REVISION A	

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APPENDIX III Planning portal drawings

NOTE:
Planning permission was granted for the Adur Tidal Walls scheme after the outline approval for this site was granted. However, the precise and final position of the Walls is likely to require adjustment and minor realignments as the works are implemented. For these reasons the river frontage application site boundary and tidal wall boundary are currently not in the same position on the plans but will coincide and share a common boundary once the Tidal Wall are constructed.

RIVER ADUR

Chainlink fence

Environment Agency Flood Wall

New 2.3m High wall to 1& 2 Bridges bank

DRAWING KEY



FREEHOLD STREET

SWISS GARDENS

El Sub Sta

OLD SHOREHAM ROAD

BUCKINGHAM STREET

PHASE 2

PHASE 2
(FOR ILLUSTRATION ONLY)

RAILWAY LINE

N

The Hyde Group
Making a lasting difference

ROPETACKLE, SHOREHAM
BOUNDARY TREATMENT

HGP ARCHITECTS

PLANNING

© 16 November 2016

13.152.330

A

HEMSLEY ORRELL PARTNERSHIP
CONSULTING CIVIL & STRUCTURAL ENGINEERS

ISSUED FOR INFORMATION

NOTES:

1. GENERAL

(i) This drawing is not to be scaled, work to figured dimensions only, contractor to verify.

(ii) This drawing is to be read in conjunction with all relevant architectural drawings, detailed specifications where applicable and all associated drawings in the series.

(iii) Any discrepancy on this drawing is to be reported immediately to the partnership for clarification.

(iv) The contractor is responsible for all temporary works and for the stability of the works in progress.



LEGEND

- SITE BOUNDARY
- PROPOSED FOUL WATER SEWER
- PROPOSED SURFACE WATER SEWER
- PROPOSED FOUL WATER DRAIN
- PROPOSED SURFACE WATER DRAIN
- PROPOSED FOUL/SURFACE WATER COMBINED DRAIN
- EXISTING FOUL/SURFACE WATER SEWER
- EXISTING FOUL WATER DRAIN
- EXISTING SURFACE WATER DRAIN
- EXISTING COMBINED DRAIN
- TYPE 1 MH/ CONCRETE MANHOLE
- TYPE 2 MH/ BRICK MANHOLE
- TYPE 3 MH/ BRICK MANHOLE
- FOUL MH/ PIPE
- SW MH/ PIPE
- VAD (FOUL/ ROAD GULLY/ KERB GULLY)
- PUMPING STATION
- PROPOSED FOUL WATER MANHOLE WITH 300mm DIAMETER HOOD
- HDPE DUCT
- HDPE TEMPORARY MAIN
- HDPE SHEET PILED GRAVITY MAIN INVERT LEVEL
- AREA IN ABEYANCE
- FFL/FL/TOS 2.400 PROPOSED FINISHED FLOOR/GROUND/ROAD LEVEL

FOR INFORMATION	07.06.2016	TH	-
Issue	Date	By	Rev. No.

Client: THE HYDE GROUP

Project: ROPETACKLE, SHOREHAM

Title: DRAINAGE SCHEMATIC
SHEET 3 OF 3

HEMSLEY ORRELL PARTNERSHIP
CONSULTING CIVIL & STRUCTURAL ENGINEERS

Scale	Date	Drawn	Checked	Approved	Rev. Status
1:250	APRIL 16	K. BRYAN	K.B.	-	PRELIM

Project No.	Title No.	Orig. No.	Rev. No.
12234	06	SKDR03	-

APPENDIX IV Calculations

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.034	4.00	3.500	1200	0.116	94.955	1.350
2			3.500	1200	6.440	94.764	1.457

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	6.327	0.600	2.150	2.043	0.107	59.1	150	4.08	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.310	23.2	8.9	1.200	1.307	0.034	0.0	65	1.228

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	6.327	59.1	150	Circular	3.500	2.150	1.200	3.500	2.043	1.307

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	45	0	0

Flow+ v12.0 Copyright © 1988-2025 Causeway Technologies Ltd

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	2.210	0.060	6.8	0.0683	0.0000	OK
15 minute summer	2	10	2.099	0.056	6.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	6.8	1.082	0.294	0.0398	2.6

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Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	2.268	0.118	18.6	0.1334	0.0000	OK
15 minute summer	2	10	2.145	0.102	18.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	18.6	1.347	0.803	0.0871	7.2

Flow+ v12.0 Copyright © 1988-2025 Causeway Technologies Ltd

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	2.344	0.194	23.7	0.2190	0.0000	SURCHARGED
15 minute summer	2	10	2.180	0.137	23.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	23.6	1.372	1.020	0.1090	9.2

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	10	2.527	0.377	34.2	0.4264	0.0000	SURCHARGED
15 minute summer	2	9	2.185	0.142	34.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	34.2	1.943	1.478	0.1103	13.3

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Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	George Hoare
Site name:	Ropetackle
Site location:	Shoreham-by-Sea

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

Site Details

Latitude:	50.83461° N
Longitude:	0.27916° W
Reference:	1254842319
Date:	Feb 18 2025 15:08

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.114

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	3	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	740	740
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

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OK, I AGREE MORE INFO

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):	0.35	0.59
1 in 1 year (l/s):	0.3	0.5
1 in 30 years (l/s):	0.8	1.35
1 in 100 year (l/s):	1.11	1.87
1 in 200 years (l/s):	1.31	2.2

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

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Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
6		4.00	3.200	100	107.330	-11.547	0.400
7	0.114	4.00	3.200		87.865	12.489	1.500
8			3.200	1200	87.911	4.683	1.684
9			3.200	450	76.410	3.766	1.709
10			3.200	450	94.619	4.148	0.602

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	6	10	20.197	0.600	2.800	2.598	0.202	100.0	100	4.44	50.0
1.001	10	7	10.733	0.600	2.598	2.491	0.107	100.0	100	4.67	50.0
1.002	7	8	7.806	0.600	1.700	1.591	0.109	71.6	225	4.75	50.0
1.003	8	9	11.538	0.600	1.516	1.491	0.025	461.5	300	5.02	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.769	6.0	0.0	0.300	0.502	0.000	0.0	0	0.000
1.001	0.769	6.0	0.0	0.502	0.609	0.000	0.0	0	0.000
1.002	1.547	61.5	29.9	1.275	1.384	0.114	0.0	110	1.534
1.003	0.725	51.3	29.9	1.384	1.409	0.114	0.0	165	0.753

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	20.197	100.0	100	SW_Standard	3.200	2.800	0.300	3.200	2.598	0.502
1.001	10.733	100.0	100	SW_Perforated	3.200	2.598	0.502	3.200	2.491	0.609
1.002	7.806	71.6	225	SW_Standard	3.200	1.700	1.275	3.200	1.591	1.384
1.003	11.538	461.5	300	SW_Standard	3.200	1.516	1.384	3.200	1.491	1.409

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	6	100	Manhole	SW_RE	10	450	Manhole	SW_Standard
1.001	10	450	Manhole	SW_Standard	7		Junction	
1.002	7		Junction		8	1200	Manhole	SW_HB
1.003	8	1200	Manhole	SW_HB	9	450	Manhole	SW_Standard

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.950	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	0.950	Additional Storage (m³/ha)	0.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	45	0	0

Node 8 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.516	Product Number	CTL-SHE-0061-2000-1511-2000
Design Depth (m)	1.511	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node 7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.500	Slope (1:X)	9999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	68	Depth (m)	0.400
Safety Factor	2.0	Width (m)	120.000	Inf Depth (m)	
Porosity	0.30	Length (m)	1.000		

Node 7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.700
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	596

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	87.0	0.0	0.800	87.0	0.0	0.801	0.0	0.0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	6	1	2.800	0.000	0.0	0.0000	0.0000	OK
180 minute summer	7	128	1.853	0.153	11.9	12.6264	0.0000	OK
240 minute summer	8	160	1.861	0.345	7.6	0.3900	0.0000	SURCHARGED
15 minute summer	9	1	1.491	0.000	1.6	0.0000	0.0000	OK
15 minute summer	10	1	2.598	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	6	1.000	10	0.0	0.000	0.000	0.0000	
180 minute summer	7	1.002	8	7.7	0.635	0.125	0.2672	
240 minute summer	8	Hydro-Brake®	9	1.6				26.8
15 minute summer	10	1.001	7	0.0	0.000	0.000	0.0000	

SUPERSEDED

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

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	6	1	2.800	0.000	0.0	0.0000	0.0000	OK
180 minute winter	7	176	2.167	0.467	12.4	38.6258	0.0000	SURCHARGED
180 minute winter	8	176	2.173	0.657	6.8	0.7427	0.0000	SURCHARGED
15 minute summer	9	1	1.491	0.000	1.6	0.0000	0.0000	OK
15 minute summer	10	1	2.598	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	6	1.000	10	0.0	0.000	0.000	0.0000	
180 minute winter	7	1.002	8	6.8	0.629	0.111	0.3105	
180 minute winter	8	Hydro-Brake®	9	1.6				53.1
15 minute summer	10	1.001	7	0.0	0.000	0.000	0.0000	

SUPERSEDED

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	6	1	2.800	0.000	0.0	0.0000	0.0000	OK
240 minute winter	7	232	2.317	0.617	12.5	50.9672	0.0000	SURCHARGED
240 minute winter	8	232	2.321	0.805	6.9	0.9106	0.0000	SURCHARGED
15 minute summer	9	1	1.491	0.000	1.6	0.0000	0.0000	OK
15 minute summer	10	1	2.598	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	6	1.000	10	0.0	0.000	0.000	0.0000	
240 minute winter	7	1.002	8	6.9	0.648	0.112	0.3105	
240 minute winter	8	Hydro-Brake®	9	1.6				71.1
15 minute summer	10	1.001	7	0.0	0.000	0.000	0.0000	

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	6	232	2.869	0.069	0.1	0.0006	0.0000	OK
240 minute winter	7	232	2.869	1.169	18.1	79.4178	0.0000	SURCHARGED
240 minute winter	8	232	2.869	1.353	6.6	1.5298	0.0000	SURCHARGED
15 minute summer	9	1	1.491	0.000	1.6	0.0000	0.0000	OK
240 minute winter	10	232	2.869	0.271	0.4	0.0431	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	6	1.000	10	0.1	-0.017	0.015	0.1370	
240 minute winter	7	1.002	8	6.6	0.658	0.107	0.3105	
240 minute winter	8	Hydro-Brake®	9	1.9				103.4
240 minute winter	10	1.001	7	-0.4	-0.060	-0.065	0.0840	

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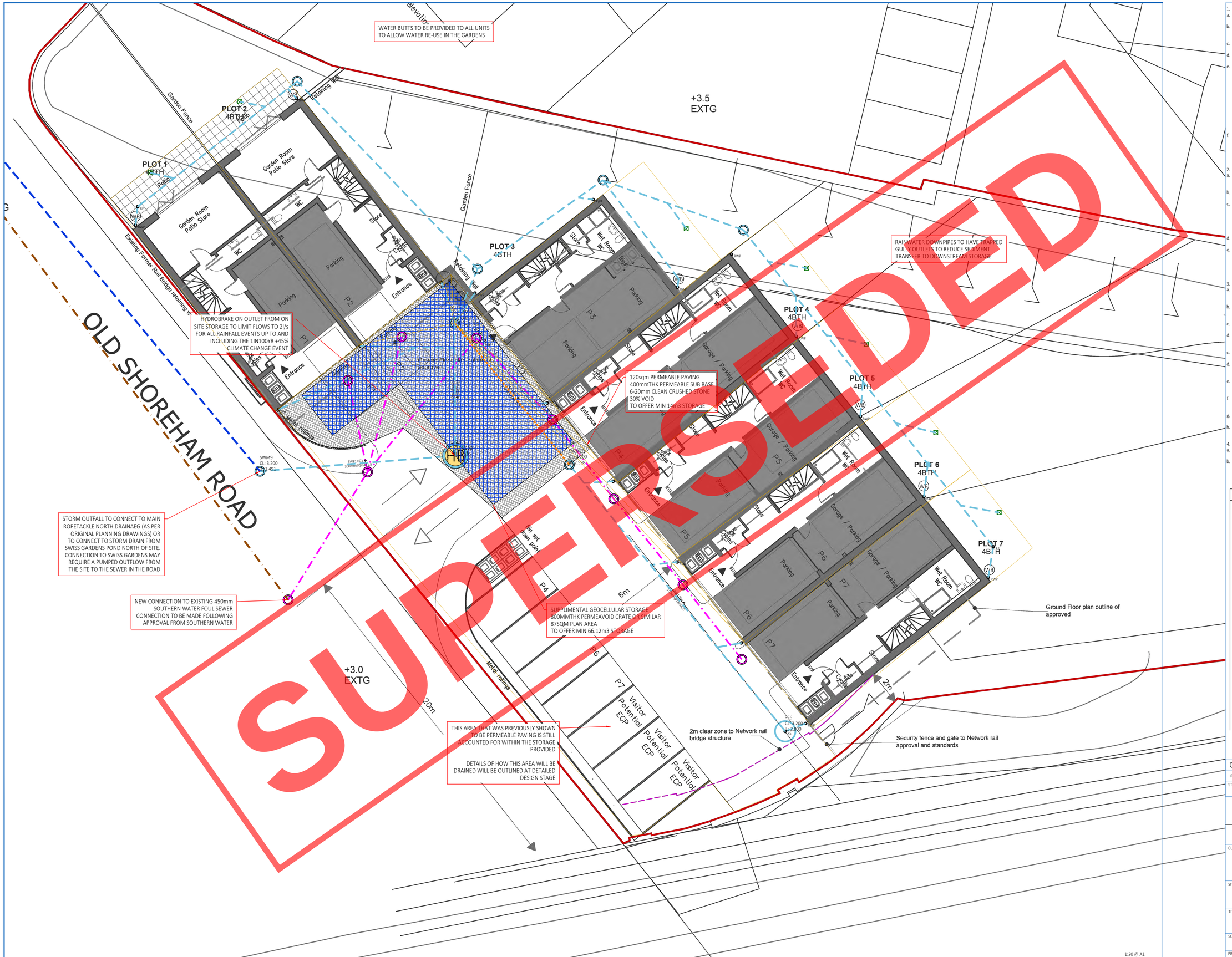
APPENDIX V Proposed SuDS Strategy



1. GENERAL
a. THIS DRAWING IS NOT TO BE SCALED, WORK TO FIGURED DIMENSIONS ONLY, CONFIRMED ON SITE.
b. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL DRAWINGS, DETAILED SPECIFICATIONS WHERE APPLICABLE AND ALL ASSOCIATED DRAWINGS IN THIS SERIES.
c. ANY DISCREPANCY ON THIS DRAWING IS TO BE REPORTED IMMEDIATELY TO THE PARTNERSHIP FOR CLARIFICATION.
d. THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS.
e. CDM REGULATIONS 2015. ALL CURRENT DRAWINGS AND SPECIFICATIONS MUST BE READ IN CONJUNCTION WITH THE DESIGNER'S HAZARD RISK ASK AND ENVIRONMENT ASSESSMENT RECORD. DESIGN HAS BEEN PRODUCED BASED ON INFORMATION PROVIDED BY THE CLIENT/PRINCIPLE DESIGNER AVAILABLE AT TIME OF ISSUE. CONTRACTOR TO REVIEW DRAWING AND SPECIFICATION IN CONTEXT WITH THE WIDER SITE AND SPECIFIC SITE INVESTIGATION, CONTAMINATION ASSESSMENT, ASBESTOS SURVEY, ENVIRONMENTAL SURVEY, UXO SURVEY AND ANY OTHER RELEVANT INFORMATION AND MANAGE RISKS RELATING TO THE WORKS OUTLINED IN THE DRAWINGS AND SPECIFICATION. PRINCIPLE CONTRACTOR TO MAKE DESIGNER AND CLIENT AWARE OF SITE SPECIFIC RISKS THAT MAY AFFECT THE DRAWING AND SPECIFICATION.
f. CDM REGULATIONS 2015. FOR GENERIC MAINTENANCE AND MANAGEMENT RISKS REFER TO CHAPTER 36 OF CIRIA 752 SUDS MANUAL. FOR PROPRIETARY SYSTEMS SEE MANUFACTURER'S MANAGEMENT AND MAINTENANCE DETAILS AND RISK ASSESSMENT WITH REGARDS TO MAINTENANCE OF PROPRIETARY SYSTEMS.

2. CONSTRUCTION NOTE
a. THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF ALL TEMPORARY WORKS, AND IS ALSO RESPONSIBLE FOR THE SAFE MAINTENANCE AND STABILITY OF EXISTING BUILDINGS AT ALL TIMES.
b. THE MAIN CONTRACTOR IS RESPONSIBLE FOR ALL OCCURRENCES OF GROUND WATER DURING THE CONSTRUCTION PERIOD.
c. 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 AND ATTENTION WHILST UNDERTAKING THE WORKS.
d. THE CONTRACTOR MUST COMPLY WITH ALL CURRENT LEGISLATION RELATING TO HEALTH & SAFETY.
e. ALL PRODUCTS SPECIFIED SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS AND INSTRUCTIONS. IF THERE ARE DISCREPANCIES BETWEEN THAT INFORMATION AND THE DETAILS ON ANY MERIDIAN DRAWINGS, THE MANUFACTURERS INSTRUCTIONS MUST BE USED

3. BELOW GROUND DRAINAGE
a. UPVC-U PIPES TO BS 4660: 2000 AND PLASTIC INSPECTION CHAMBERS AND FITTINGS TO BS EN 13598-1:2020. CLAY PIPES TO BS EN 295-1:2013. CONCRETE MANHOLE AND INSPECTION CHAMBERS TO BS EN 1917:2002
b. ALL ADOPTABLE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE App C - DESIGN AND CONSTRUCTION GUIDANCE AND THE RELEVANT COUNCIL DESIGN GUIDE.
c. ALL PRIVATE FOUL WATER SEWERS TO BE LAID AT 1 IN 40 AT THE HEAD OF PIPE RUNS AND 1 IN 80 ELSEWHERE UNLESS OTHERWISE STATED.
d. ALL PRIVATE FOUL SEWER PIPES TO BE 100mm DIAMETER FROM SOIL STACKS UNLESS OTHERWISE STATED ON THE DRAWING AND 150mm WHERE SERVING MORE THAN 9 PROPERTIES.
e. ALL PRIVATE SURFACE WATER SEWERS TO BE LAID AT 1 IN 100 UNLESS OTHERWISE STATED ON THE DRAWING.
d. ALL PRIVATE SURFACE WATER SEWER PIPES TO BE 100mm DIAMETER FROM DOWNPIPES AND 150mm DIAMETER ELSEWHERE UNLESS OTHERWISE STATED ON THE DRAWING.
e. ALLOW FOR RODDING ACCESS ABOVE GROUND WHERE RAINWATER DOWNPIPES OR SOIL STACKS DO NOT HAVE A DIRECT CONNECTION TO AN INSPECTION CHAMBER.
f. EXISTING SEWER PIPE TO BE RE-USED TO BE SURVEYED AND LEVELED PRIOR TO COMMENCEMENT OF THE DRAINAGE WORKS AND REFURBISHED IF NECESSARY.
g. CONNECTIONS TO AN ADOPTED SEWER ONLY TO BE MADE FOLLOWING APPROVAL FROM THE RELEVANT ADOPTING AUTHORITY.
h. ALL DRAINS, SEWER PIPES AND MANHOLES TO BE CLEANED AND TESTED FOR WATER TIGHTNESS ON COMPLETION OF CONSTRUCTION.

4. MANHOLE COVERS AND FRAMES
a. MANHOLE COVERS TO BE CLASS D400 IN HIGHWAYS, CLASS B125 IN FOOTWAYS AND VERGES, CLASS A15 IN NON-TRAFFICKED AREAS.
b. MANHOLE COVER AND FRAME TO BE BEDDED AND SURROUNDED IN 1:3 MORTAR.

LEGEND

	PROPOSED SW PIPE RUN
	PROPOSED PERFORATED SW DRAIN
	PROPOSED FW PIPE RUN
	PROPOSED TYPE 3 SW INSPECTION CHAMBER
	PROPOSED TYPE 3 FW INSPECTION CHAMBER
HB	PROPOSED HYDROBRAKE MANHOLE
RE	PROPOSED SW RODDING EYE
RWP	PROPOSED SW RAINWATER PIPE
	PROPOSED SW BOTTLE GULLY
	PERMEABLE PAVING - NOT TANKED
	GEOCELLULAR ATTENUATION - NOT TANKED
WB	RWP ROUTED THROUGH WATER BUTT

REV:	DESCRIPTION:	BY:	DATE:
01	Changes to site layout	GH	18/02/25

STATUS: Preliminary

MERIDIAN
CIVIL ENGINEERING CONSULTANCY

CLIENT: Trinitry Homes

SITE: Ropetackle
Shoreham, BN43 5FL

TITLE: SW and FW
Drainage Layout

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:100	18/02/2025	GH	SL

PROJECT NO:	DRAWING NO:	REVISION:
MC0031	CIV01	01

1:20 @ A1
0 200 400 600 800 1000mm

APPENDIX J – GROUNDWATER MONITORING REPORT BY ONYX-GEO LTD.

Stuart Goldsworthy-Trapp
Trinity Homes (UK) Ltd
By email

Report Ref: 251010-ON-XX-XX-RP-X-716-C01

Date: 27/03/25

Dear Stuart,

ON251010: Groundwater Monitoring at Ropetackle Housing Site,

1 INTRODUCTION

Onyx Geo Consulting Ltd (referred to as Onyx Geo hereafter) was appointed by Trinity Homes (UK) Limited to undertake groundwater monitoring at the Ropetackle Housing site at land off Old Shoreham Road, BN43 5TA, as shown on Figure 1 Appendix B.

The appointment was confirmed via email on 17th February 2025 signed by Stuart Goldsworthy-Trapp of Trinity Homes (UK) Limited.

The work was undertaken based on Onyx Geo's fee proposal letter dated 14th February 2025, Quote Ref: ON241010, including the outlined Terms and Conditions. This serves as the contractual agreement between Onyx Geo and Trinity Homes (UK) Limited.

1.1. OBJECTIVES

To support the drainage design, information on groundwater levels below the site is required. The objective of our appointment is to confirm groundwater levels below the site over an agreed monitoring period (mid-February 2025 to end of March 2025).

1.2. PREVIOUS REPORTS

The following relevant report has previously been prepared by others for the site:

- Desk Study and Ground Investigation by GEA Ltd ref: J24311 Rev 0 dated January 2025

1.3. LIMITATIONS

The client was made aware that our work would cover the end of a typical groundwater monitoring period (normally run from October to March) and further monitoring may be required.

One monitoring well (WS04) was available for use and had been installed by others. Details of the well installation are not known.

The location including the ground level of WS04 has not been surveyed, as such groundwater levels have not been corrected to metres above ordnance datum (m AOD) and are reported as metres below existing ground level (m bgl).

2 Site Information

2.1. Site Description

The site is irregular in shape and located to the east of Old Shoreham Road at approximate grid reference 521268, 105309 and is approximately 2,900 m^2 in area. The land is not currently in use. A large area of raised ground is present across the majority of the site and thought to be associated with a historical railway embankment and deposited waste soils from an earlier phase of development at Ropetackle. Access is via locked gates along the western boundary. The site is located approximately 170 m east of the River Adur.

2.2. Background

Based on the site investigation report by GEA Ltd (ref: J24311 Rev 0 dated January 2025) we understand that a single monitoring well was installed at WS04. Ground conditions at WS04 (named as BH4 by GEA Ltd) were recorded as made ground soils to 3.0 m bgl; over pale brown clay to 3.50 m; over structureless silty CHALK proven to 6.0 m. The details of the monitoring well installation are not fully understood, as the log records the base of the well to 2.50 m bgl. However, during monitoring visits it was found that the well extended to at least to 5.31 m bgl, albeit heavily silted at base. Anecdotal reports from the subcontracted drillers employed by GEA were that a 6.0 m well was installed.

3 Groundwater Monitoring

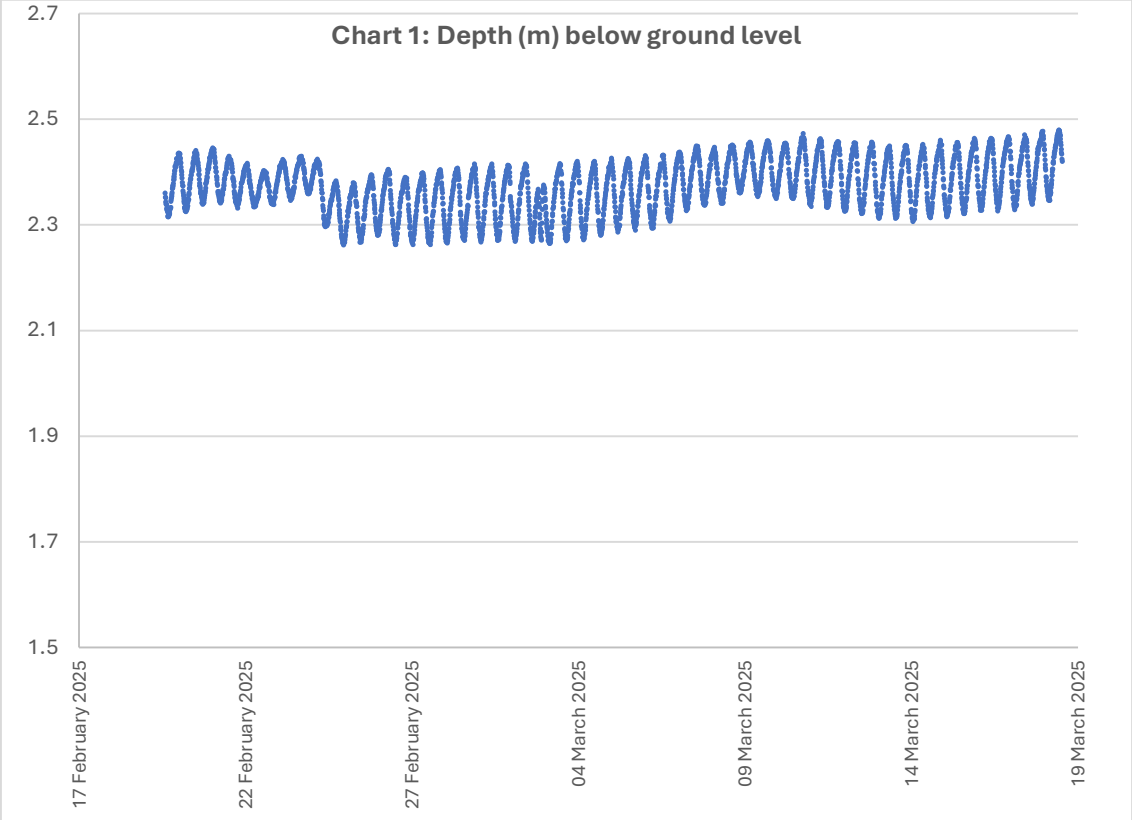
Four groundwater monitoring visits were conducted over a five-week period from 19/02/25 to 26/03/25.

A groundwater level logger and a barometric pressure logger were installed in WS04 over a four-week period from 19/02/25 to 18/03/25. A summary of the monitoring visits is provided in Table 1 below and the results of the groundwater level logger (corrected for barometric pressure change) are shown on Chart 1.

Table 1: Summary of groundwater level readings

Location	Depth to groundwater m bgl and time recorded			
	19/02/25 (13:51)	06/03/25 (11:40)	18/03/25 (12:37)	26/03/25 (13:52)
WS04	2.360	2.385	2.375	2.435

m bgl = metres below ground level



4 SUMMARY

Over a five-week period groundwater levels were recorded at the site. The groundwater levels at WS04 were reported between 2.262 m bgl to 2.480 m bgl. The datalogger shows that the ground water at the site is tidally influenced.

The borehole log for WS04, reported a clay layer between 3.00 to 3.50 m bgl. It is not known if this acts to confine groundwater or if groundwater in the made ground and chalk aquifer are hydraulically connected as full details of the well installation are not known.

Author	Martin Weil	**Technical Reviewer**	Sarah Cook
Qualifications	BSc MA C.WEM CSci CEnv	**Qualifications**	LLM MSci CGeol FGS RoGEP
Signature	[redacted]	**Signature**	[redacted]

Document History				
Revision ref.	Date	Reason for revision	Amended by:	Approved by:

This report has been prepared with all reasonable skill, care and diligence, considering the terms agreed upon between Onyx Geo Consulting Ltd and the client. It is intended solely for the use of the client, and no responsibility is accepted by Onyx Geo Consulting Ltd for its use by third parties unless prior, formal agreement has been obtained. Any third party who uses this report does so at their own risk. The report has been prepared based on the specific details of the proposed development as supplied by the client, and all findings, conclusions and recommendations would not be applicable to any other project or development regardless of similarities.

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Please see Appendix A for limitations to the current investigation and report.

This report is subject to the quality management system of Onyx Geo Consulting Ltd.

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Appendix A – Limitations

A.1 Service Constraints

This report, including any related study, inspection, testing, sampling, or interpretation (collectively referred to as "deliverables"), was prepared by Onyx Geo Consulting Limited (Onyx Geo), for the client specified in the first paragraph, following the terms outlined in Onyx Geo's fee proposal and standard terms (the "Appointment"). Onyx Geo delivered the Services with the level of expertise typical of geo-environmental consultants at the time. The report does not imply any specific fitness for purpose. The Services were completed within the limitations of scope, timing, and resources as agreed between Onyx Geo and the Client.

Except as specified above, Onyx Geo makes no further representations or warranties, either express or implied, concerning the Services. Liability for any actions related to this report expires six years from the report date or as legally specified, unless altered within the Appointment terms.

Onyx Geo conducted the Services exclusively for the Client's intended purpose. If this report or its contents are used by any third party without explicit written consent from Onyx Geo, any risk or liability lies solely with that party. It is recommended that third parties seek their own independent geo-environmental consultation.

The Client may not transfer or assign the benefits of this report to any third party without written permission from Onyx Geo. Should an assignment be agreed upon, any third-party rights provided will require a fee and will not extend beyond the terms initially agreed with the Client.

Onyx Geo understands this report is intended for the purpose outlined in its introduction. Any alterations in the site's intended use may invalidate the report. Onyx Geo is not liable for any use of this report outside its original purpose without a formal review.

Over time, changes in site conditions, regulations, technology, or economic circumstances may affect the accuracy or relevance of this report. For future reliance, written confirmation from Onyx Geo is advised.

The conclusions in this report are based on the specific Services provided as outlined in the Appointment. Onyx Geo holds no responsibility for undiscovered conditions that fall outside the scope of services originally agreed upon.

The Services were based on visible site conditions, historical site data, and publicly available information, relying on third-party data where applicable. Onyx Geo is not liable for inaccuracies in this information or for failing to independently verify third-party data.

Drawings included in this report are illustrative and may not be suitable for precise measurements. Marked features are approximate and for reference only.

Any subsequent review or update of this report may require additional fees at the agreed rates.

A.2 Additional Constraints for Reports with Intrusive Ground Investigations

The conclusions from ground investigations rely on samples taken from specific site locations and represent only a limited area around these points. Chemical analysis includes only parameters agreed upon with the Client.

Site conditions, particularly ground and groundwater variables, may change seasonally, and additional undisclosed contamination cannot be ruled out.

The presence of asbestos, if any, is not fully assessed within this report. A comprehensive asbestos survey is recommended for any thorough evaluation.

Appendix B – Figures and drawings



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Project Name: Ropetackle Groundwater Monitoring

Client: Trinity Homes (UK) Ltd

Drawing Number: 251010-ON-XX-XX-DR-X-111-C01

Description: Figure 1 Site location plan

Project No: ON251010	Rev: C01	Date: 27/03/2025	Scale @A4: 1:20,000

Drawn: MW	Checked: SC	Approved: MW	0 250 500 m Do not scale drawing

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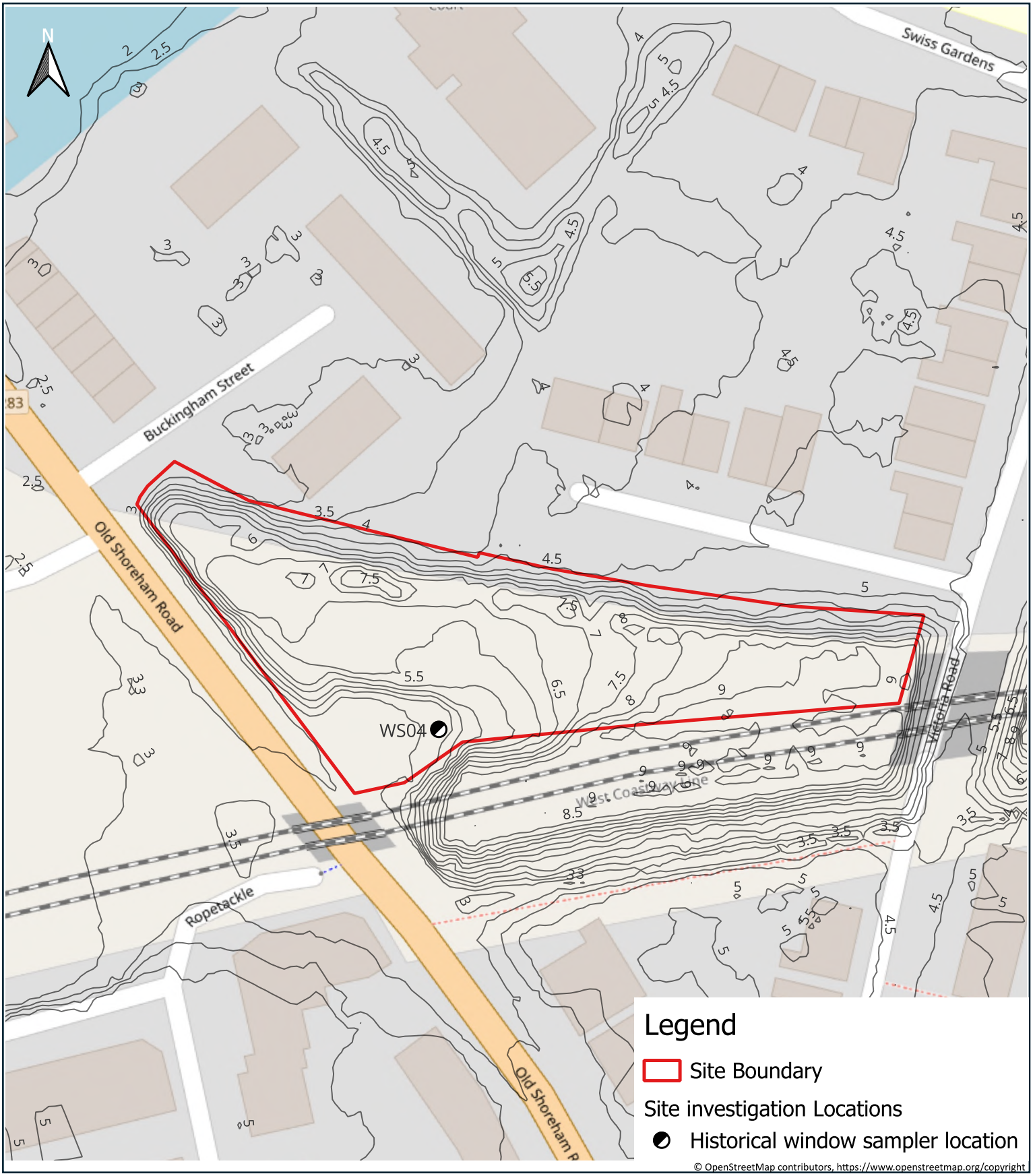

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Project Name: Ropetackle Groundwater Monitoring			
Client: Trinity Homes (UK) Ltd			
Drawing Number: 251010-ON-XX-XX-DR-X-222-C01			
Description: Figure 2 Monitoring well location			
Project No: ON251010	Rev: C01	Date: 27/03/2025	Scale @A4: 1:800
Drawn: MW	Checked: SC	Approved: MW	0 10 20 m Do not scale drawing

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