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Flood Risk Assessment and Surface Water Drainage Strategy AEG4746_PO11_Selsmore_07

Site Address: 24 Treloar Road
Selsmore
Hayling Island
PO11 9SE

UK Experts in Flood Modelling, Flood Risk
Assessments, and Surface Water Drainage Strategies

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Document Issue Record

Project: Flood Risk Assessment and Surface Water Drainage Strategy

Prepared for: Robert Gullan

Reference: AEG4746_PO11_Selsmore_07

Site Location: 24 Treloar Road, Selsmore, Hayling Island, PO11 9SE

Issue	Date	Author	Check	Auth.	Comments
A	15/05/2024	Jack Allen	OM	NDD	First issue
2	17/07/2024	Jack Allen	OM	NDD	Second Issue
3	19/08/2024	Jack Allen	OM	OH	Third Issue - Updated Development Plans
4	21/11/2024	Jack Allen	OH		Amendments - Council Comments (HA/2024/126293/01-L01)

Issue 4 - This FRA has been updated to address the Havant Borough Council objection (ref: HA/2024/126293/01-L01, dated 14/11/2024). A full copy of the letter can be found in Appendix E.

Climate Change

It is noted that the 1 in 200 year scenario was simulated up to the year 2115 using the UKCIP09 and 2120 using the updated UKCP18 dataset. This allows for a 91 year and 96 year lifetime of development for the UKCIP09 and 2120 using the updated UKCP18 dataset, respectively, and not the required 100 years. The additional 4 years of sea level rise has been calculated (up to 2124) below.

The average yearly incremental increase for the East Solent Coastal Model (2018) is 0.008m using the UKCIP09. As such, multiplying this value by 100 gives an increase in sea level rise of 0.8m up to the year 2024, resulting in a sea level of 4.05m AOD.

The average yearly incremental increase for the East Solent Coastal Model (2018) using the updated UKCP18 dataset is 0.011m for the higher central and 0.015m for the upper end allowances. As such, multiplying these values by 100 gives an increase in sea level rise of 1.1m and 1.5, for the higher central

and upper end, respectively. This increase would result in a sea level rise of 4.27m AOD and 4.67m AOD for the higher central and upper end, respectively.

The effects of wave overtopping are a function of the water depth, wind speed and wave height. Whilst the projections of the latter two parameters have not changed, the changes in the predicted water depth from the higher prediction of extreme sea level would result in a different wave overtopping behaviour, which could only be assessed through updated wave overtopping modelling, which is not considered appropriate for the scale of development proposed. Instead, a simplified approach has been applied whereby the reduction in water level from the coast to the site in the EA model (0.14m) has been applied to the updated extreme sea level prediction to estimate the updated flood level at the site. Using this simple approach, the resulting updated flood level, based on the latest extreme sea level predictions and sea level rise projections is estimated to be **4.13m to 4.53m AOD** for the higher central and upper end scenarios respectively.

For the higher central scenario, the depth of flooding on site varies between 2.60m and 2.97m. For the upper end scenario, this increases to between 3.0m and 3.37m for the year 2124.

The dwelling is to be located on land at 1.30m AOD. The ground floor finished floor level is to be raised 300mm above this (to 1.60m AOD) and the first-floor finished floor level is raised a further 2.7m above (to 4.30m AOD).

Mitigation

It has been identified that the risk of tidal flooding is considered to be high with depths ranging from 2.56m and 2.97m (higher central scenario) and 3.0m and 3.37m (upper end scenario) for the year 2124.

Considering access requirements, the Finished Floor Levels can be raised by a maximum of 300mm to a minimum of 1.60m AOD based on LiDAR data (existing dwelling located on land at circa. 1.30m AOD). This is the maximum possible increase in FFL height feasible for this site, considering access requirements and street scene. This represents a betterment to the existing scenario, along with raising ground floor sleeping accommodation to the first floor.

In addition to raising the floor levels, the following mitigation measures are recommended, in accordance with DCLG Report *Improving the Flood Performance of New Buildings Flood Resilient Construction (2007)*. Standards for the installation of resistance measures are available in British Standard 851188-1:2019+A1:2021:

- The external walls will be tanked using a Visqueen Torch-On Tanking Membrane to 1.5m above the FFLs (1.60m AOD + 1.5m, based on LiDAR data).
- All ground floor windows are set to 1.5m above the FFLs (1.60m AOD + 1.5m, based on LiDAR data).
- Internal access from ground floor to first floor for the lifetime of the development.
- General flood resilience measures recommended such as the below, where practical:
 - Flood proof doors and barriers at front and rear doors.
 - Units to be raised on legs above plinth.
 - Air brick covers to be installed.
 - Damp Proof Membranes (d.p.m.) should be included in any design to minimise the passage of water through ground floors.
 - Waterproof internal render such as lime based plaster.
 - Non-return valves to be fitted on new drainage associated with the WC to prevent backflow.
 - All new plumbing insulation to be of closed cell design.

The proposed development plans have been updated to include the aforementioned mitigation measures.

Flood Evacuation Plan

Details of evacuation routes and procedures are set out in the information below.

As shown in the Figure below, the fastest route off Hayling Island would be travelling south to access Seafront Road. Seafront Road should be followed west up to Seagrove Avenue, which should be followed north, up to Havant Road (A3023) which continues north off the island to Langstone.

The requirements for safe access and exit from new developments in flood risk areas are as follows, in decreasing order of preference:

- Safe dry route for people and vehicles
- Safe dry route for people
- If a dry route for people is not possible, a route for people where the flood hazard (in terms of depth and velocity of flooding) is low and should not cause a risk to people

- If a dry route for vehicles is not possible, a route for vehicles where the flood hazard (in terms of depth and velocity of flooding) is low to permit access for emergency vehicles. However, the public should not drive vehicles in floodwater.

Where a dry route is not possible and a route with low flood hazard is identified, the route should not have any service covers that could be removed, or other underwater hazards. It is often difficult to see underwater hazards even in shallow water, particularly at night or if the water is silty.

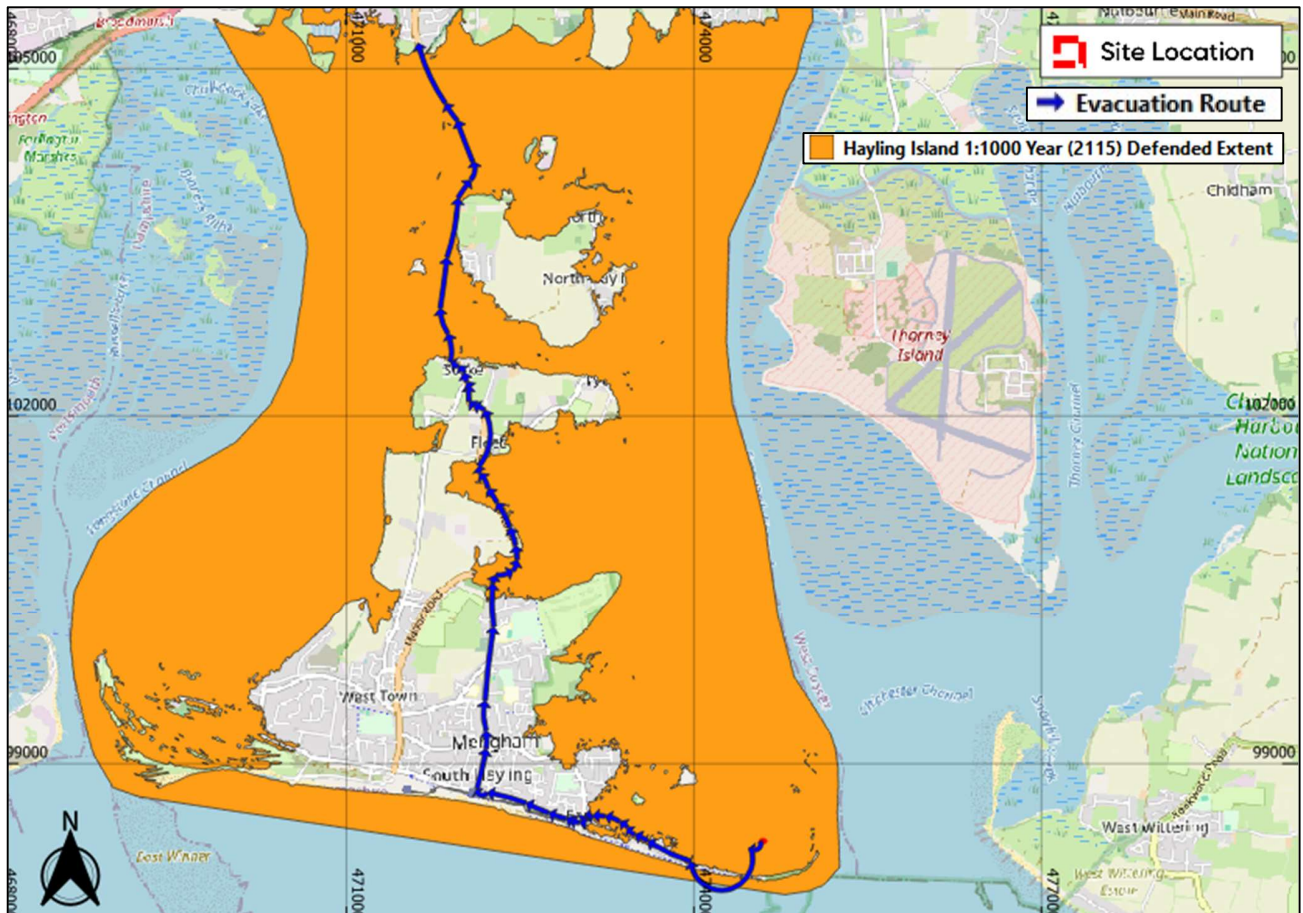


Figure 1: Evacuation Route (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

Given the modelled flood risk to the site and surrounding area, prior evacuation of the site is recommended to reduce the risk to life of occupants/ site users but also reduce the strain on the emergency services.

Prior evacuation of the site should be sought as soon as an Environment Agency 'South Hayling and South Eastoke seafront' flood warning issued.

This section therefore sets out the trigger events for implementing the FREP, who is responsible for what actions, and what procedures should be followed prior, during and after a flood event.

Flood Warnings

The site is in the Environment Agency 'South Hayling and South Eastoke seafront' flood warning service area. This service allows site owners to register an address along with contact details so that, in the event of a flood being forecast, they are sent an alert. As a further precaution and risk reduction, the owner of the site should sign up.

Flood warnings/alerts can be enforced at any time of the day or night. Signing up for this service provides site owners some notice before a flood event. The amount of time afforded before a flood occurs depends on the site-specific location (e.g. proximity to the source of flooding, topography of the surrounding area) and the flood mechanism (e.g. bank over topping versus a breach event). Flood alerts and warnings provide site managers with time to take necessary action, e.g. communication of the risk of flooding to occupants/employees etc, evacuation of occupants offsite or to a safe level, removal of valuable items out of reach of flooding and the mounting of site-specific flood defences.

Trigger Events

Three trigger stages have been identified, namely, green alert (to implement a review of the FREP procedures), place residents on amber alert (state of readiness) or issue a red alert (site evacuation):

- To implement a review of the FREP procedures
- Green alert (state of readiness)
- Issue a red alert (site evacuation).

To facilitate the implementation of the FREP, it may be necessary to situate signs, lights and / or real-time information boards around the site as prompts during a flood emergency or to direct residents towards the appropriate evacuation route.

Environment Agency flood warnings¹ and Met Office weather warnings² should be used to set evacuation triggers. There are three levels of flood warning:

- EA Flood alert / Met Office 'amber' warning.
- EA Flood warning / Met Office 'yellow' warning.
- EA Severe flood warning / Met Office 'red' warning.

In the event of receiving a flood alert or flood warning, residents should follow the instructions in the Table below. The proposed flood evacuation procedures outlined in the Table below should be reviewed on a regular basis.

Table: Evacuation Triggers and Procedures

Warning trigger	Trigger stage	Procedures
EA Flood Alert <i>A flood alert means you need to prepare, flooding is possible.</i> Met Office Amber Warning <i>You should check the details of the forecast and consider taking steps to minimise impacts for you and your household.</i>	Green Alert - Review FREP	Green Alert represents a state of readiness ahead of a potential flood situation. • Check your flood risk https://naturalresources.wales/flooding/sign-up-to-receive-flood-warnings/?lang=en • Keep up to date with the latest situation - call Floodline on 0345 988 1188 or follow @NatResWales and #floodaware on X (formerly Twitter) for the latest flood updates. • Ensure residents are aware of the situation and know what to do should the situation escalate. • Have a bag ready with vital items like insurance documents and medications in case you need to leave your home. • Check you know how to turn off your gas, electricity and water mains supplies. • Plan how you'll move family and pets to safety

¹ <https://check-for-flooding.service.gov.uk/alerts-and-warnings>

² <https://www.metoffice.gov.uk/weather/warnings-and-advice/seasonal-advice/when-and-why-do-we-issue-warnings>

Warning trigger	Trigger stage	Procedures
EA Flood Warning <i>A flood warning means you need to act, flooding is expected.</i> Met Office Yellow Warning <i>You should change plans that could be impacted by the weather and take action to protect yourself and your property.</i>	Amber Alert	Amber Alert means you should be prepared to act if necessary, ahead of a potential flood situation. • Move vehicles to higher ground if it's safe to do so. • Secure any materials or large loose items that may float and cause damage during a flood. • Move vehicles to higher ground if it's safe to do so. • Move family and pets to safety. • Turn off gas, electricity and water supplies if it's safe to do so (never touch an electrical switch if you're standing in water)
EA Severe Flood Warning or <i>A severe flood warning means there is danger to life, you must act now.</i> Met Office Red Warning <i>You should take direct action to keep yourself and others safe from impacts of the weather. It's likely there will be a risk to life, as well as substantial disruption to travel and infrastructure</i>	Red Alert	Red Alert means that you must act. • Call 999 if you're in immediate danger. • Follow advice from the emergency services and evacuate if you're told to do so. • Avoid driving or walking through flood water: just 30cm (1 foot) of fast flowing water could move your car and even shallow moving water can knock you off your feet. It may also contain heavy debris, sharp objects, open manhole covers, sewage and chemicals. • Make sure you have an emergency kit including a torch, spare batteries, mobile phone and charger, warm clothes, important numbers like your home insurance, water, food, first aid kit and any medicines and baby care items you may need. • Alert neighbours and offer help if it's safe to do so. • Dwellings should not be re-entered until flood warning has been lifted or unless instructed by emergency services.

Responsibilities

It is the responsibility of the individual property owners to make the FREP procedures available and communicated to tenants where appropriate. Where properties are rented, the owners should ensure the occupants have access/ means to receive Flood Warnings from the EA.

It is the responsibility of the individual occupants/residents to implement the FREP at the trigger event of receiving a Flood Warning.

Where possible, occupants should seek to coordinate their evacuation of the site with the neighbouring buildings. This is to keep as many people evacuating the area to Flood Zone 1 together as possible. Additional strain would be placed on the emergency services if multiple smaller groups of people were trying to evacuate an area and became stranded.

Preparation for Flood Events

There are a multitude of ways that property owners can prepare for the potential of a flood event. These are set out as follows:

- Important documents (such as passports and insurance certificates) can be placed into sealable polythene bags to protect them from flood water or can be placed in a high and secure location.
- Ensure that the insurance policy for the property covers for flood damage.
- Sign up to the Natural Resource Wales flood alert and warning service which will notify you by telephone/email/SMS when flooding is likely.
- Identify who can assist during a flood event – friends or family that can help you store possessions and stay somewhere safe when flooding is imminent. Similarly, you can look out for friends, neighbours and family who may need help themselves during a flood event.
- If there are pets within the residence, identify somewhere safe they can be taken during a flood event.
- If there are cars within the residence, identify somewhere safe they can be moved prior to a flood event. Do not attempt to move your car if it is already in flood water.

In addition, it is advised you prepare a flood kit which can be quickly accessed when flooding is imminent to equip you with everything you may need. You should consider the following:

- Important documents such as passports and insurance certificates – if these cannot be safely stored within the property it would be advised to take them with you as they are expensive to replace.

- Torch – In the case that it floods at night and power is affected (Wind Up torch is preferred)
- Radio – A wind up or battery radio will help to monitor local news and weather broadcasts for the latest flooding situation.
- Batteries – Have spare batteries in order to power the torch and radio should it be required.
- Bottled Water – Water from the tap could become contaminated during a flood so bottled water should be available.
- First Aid Kit – Keep a first aid kit to hand in case of minor injuries. Put any prescription medication in your kit so that you can have easy access to it.
- Mobile Phone – Keep a fully charged mobile with you so that you can contact people in an emergency or call for help. If the phone has internet access you can use it to monitor the local news and latest flood situation.
- Waterproof Clothing – Keep wellies and rubber gloves available should you need to enter the flood water.
- Non-Perishable or Tinned Food

What to Do to Prepare/ During Flooding

The main priority during a flooding event is the safety of all site users and residents. As such a key part of protecting everyone is making sure that you are fully aware of the ongoing situation and know where to access the most up to date information. Below is a list of advised actions that should be carried out during a flood event:

- Where possible, switch off all electrical and gas appliances at the mains.
- Monitor websites distributing flooding information including <https://flood-warning.naturalresources.wales/>.
- Monitor emails for up-to-date flood warnings.
- Monitor local press, radio, and regional TV.
- Pay close attention to the advice given by emergency services and local authority. Take all of the warnings seriously and respond quickly.

- Do not drive through flood water. Less than two feet of flood water can be enough to float a vehicle.
- Avoid contact with flood water when possible. Flood water is typically contaminated with sewage and other hazardous substance. Wear rubber gloves and boots and wash thoroughly if you do come into contact with flood water. Do not attempt to swim through flood water.
- Do not enter a property that has been flooded unless you are sure it is structurally safe. If in doubt, have the property checked by a professional.
- Do not turn on your electrical or gas supplies until they have been checked by a professionally qualified electrician or engineer. Take care of gas leaks – do not smoke or use open flames.
- Do not use petrol or diesel generators indoors as they produce carbon monoxide.

Proposed Flood Evacuation Route and Access/ Egress

During a worse-case scenario (similar to the modelled undefended event) it may not be possible to ensure that the designated evacuation route is safe from flooding.

If defences were to breach (as modelled) then it may not be possible to evacuate the site safely via the designated route.

Flooding would not occur instantaneously (or instantaneously) which should give sufficient time for residents to evacuate.

Nevertheless, it is highly recommended that upon receipt of an EA Flood Warning occupants and residents should evacuate the site.

On Site Safe Refuge

It is possible that occupants can be within the upper floors of the building during a flood event. However, it is stressed that prior evacuation upon receipt of a flood warning should be considered the best option. This service should allow for sufficient time between the Warning being issued and flooding occurring on site and the surrounding area.

If flooding has already occurred along the proposed evacuation route or users have not evacuated within 10 hours of the EA Flood Warning being issued, it may not be safe for evacuees to enter flood

water. In such a scenario, to mitigate the risk to life, safe refuge must be sought within the property itself, at the highest floor possible, and the emergency services must be notified.

However, it is extremely important to note that prior evacuation should be sought before flooding occurs. Do not wait for flooding to occur to react. It should be reiterated that prior evacuation is the preferred option and safe refuge on site should only be sought in the very worst-case scenario where flooding occurred, and the refuge on site is to mitigate the risk to life.

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Summary

Development Description	Existing	Proposed
Development Type	A residential dwelling	It is understood that the proposed development is for the demolition of the existing dwelling and construction of a new dwelling on site.
EA Vulnerability Classification	More Vulnerable	More Vulnerable
Ground Floor Level	The LiDAR data shows the ground elevation of the site varies between approximately 1.16m AOD and 1.53m AOD.	The Finished Floor Levels (FFLs) are proposed to be raised by 300mm to a minimum of 1.46m AOD based on LiDAR data.
Level of Sleeping Accommodation	Ground floor	First floor
Impermeable Surface Area	141m ²	158m ²
Surface Water Drainage	Southern Water Asset plans show separate surface and foul water public sewer network beneath Treloar Road flowing from south to north.	It is proposed to connect surface water sewer beneath Treloar Road (manhole reference: 5352). Foul flows are proposed to discharge into the existing foul water connection on site.
Risk to Development	Summary	Comment
EA Flood Zone	Flood Zone 3	Modelled flood level data has been provided by the EA which does not include the latest extreme sea level predictions or sea level rise projections. In the absence of updated wave overtopping modelling, a simplified assessment has been undertaken which indicates the site could be flooded with depths ranging from 2.59m and 2.96m (higher central scenario) and 2.97m and 3.34m (upper end scenario) for the year 2124.
Flood Source	Tidal and Pluvial	The site is also considered to be at a moderate risk of surface water flooding with depths of 600mm during the 1.0% AEP storm event and 900mm during the 0.1% AEP storm event.
SFRA Available	Strategic Flood Risk Assessment 2016 Update (Partnership for South Hampshire, 2016).	

Management Measures	Summary	Comment
Ground floor level above extreme flood levels	No	Floor levels are to be raised by 300mm to a minimum of 1.46m AOD based on LiDAR data. This represents a betterment to the existing scenario, along with raising ground floor sleeping accommodation to the first floor.
Safe Access/Egress Route	As existing	The development is for the construction of a dwelling in place of an existing dwelling. As such, access/egress is to remain as existing.
Flood Resilient Design	Yes	Flood resilience measures are recommended in accordance with DCLG Report Improving the Flood Performance of New Buildings Flood Resilient Construction (2007). Standards for the installation and retrofit of resistance measures are available in British Standard 851188-1:2019+A1:2021.
Site Drainage Plan	Yes	It is proposed to connect surface water sewer beneath Treloar Road (manhole reference: 5352). Foul flows are proposed to discharge into the existing foul water connection on site. See section 6 for the Surface Water Drainage Strategy.
Flood Warning and Evacuation Plan	N/A	Recommended that occupier monitor Met Office Weather Warnings for extreme weather events. The site is in the Environment Agency 'South Hayling and South Eastoke seafront' flood warning service area.
Offsite Impacts	Summary	Comment
Displacement of floodwater	Negligible	The proposed development is for the demolition of the existing dwelling (141m ² footprint) with a proposed new dwelling (158m ² footprint), representing a negligible increase in

Impact on hydraulic performance of channels		impermeable area as a result of the proposed dwelling.
	No	There are no watercourses located within the site's boundary.

¹ not required for this assessment ² data not available.

1. Introduction

- 1.1. Aegaea were commissioned by Robert Gullan to undertake a Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS) for the proposed development. This FRA and SWDS have been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.
- 1.2. This FRA and SWDS are intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Site Overview

- 1.3. The site of the proposed development is 24 Treloar Road, Selsmore, Hayling Island, PO11 9SE (Figure 1).



Figure 2: Site Location (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors)

- 1.4. It is understood that the proposed development is for the demolition of the existing dwelling and construction of a new dwelling on site. The development proposals will be included in this report as Appendix A.
- 1.5. In the absence of a topographical survey, Environment Agency Light Detection and Ranging (LiDAR) data Digital Terrain Model has been used to review the topography of the site. The LiDAR data shows the ground elevation of the site varies between approximately 1.16m AOD (metres Above Ordnance Datum) and 1.53m AOD (Figure 2). The existing building is located on land at approximately 1.30m AOD.

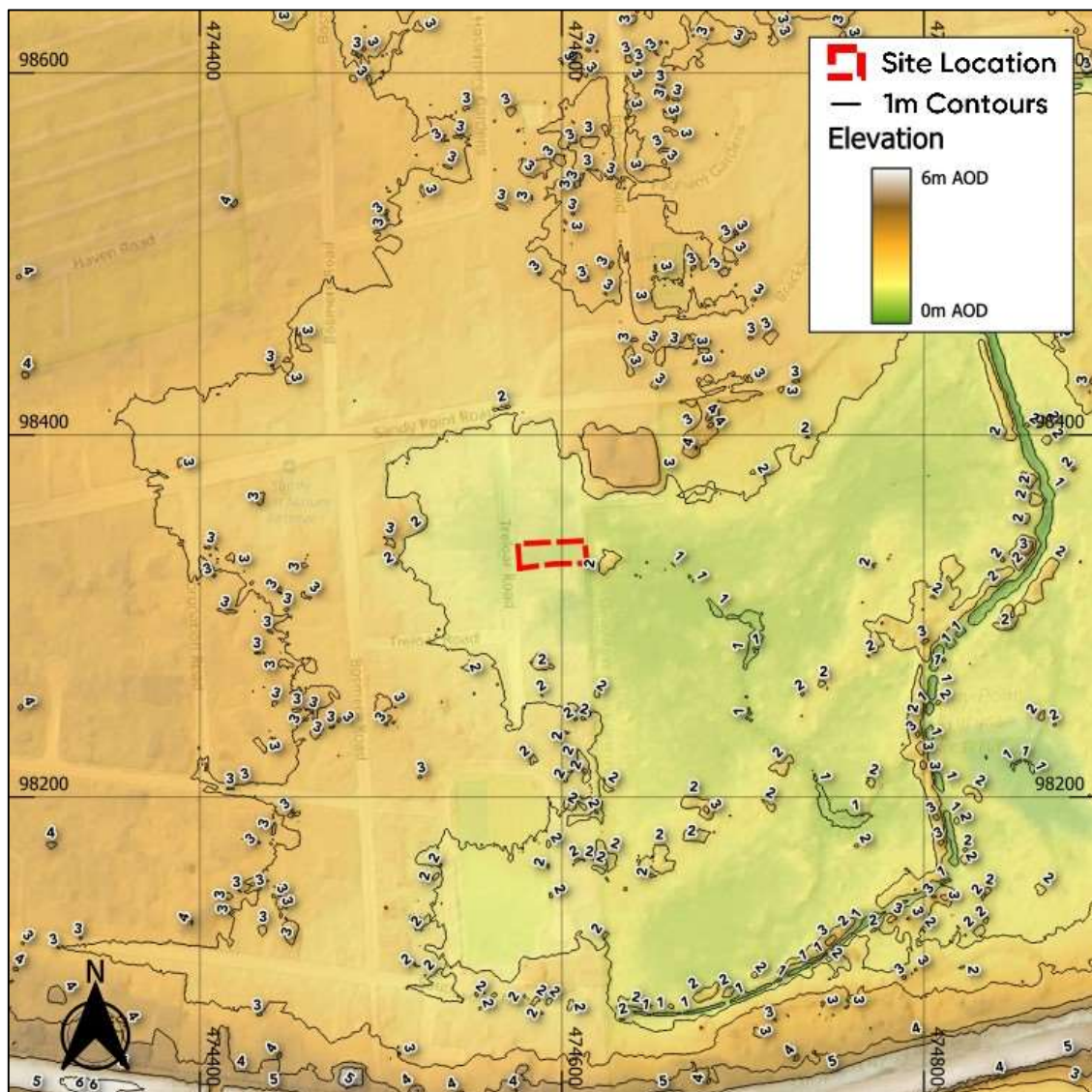


Figure 3: Site Topography (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 1.6. Havant Borough Council is the Local Planning Authority (LPA) for the site and Hampshire County Council is the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency's Solent and South Downs region.

Planning Policy and Guidance

- 1.7. UK government planning guidance states³ that an FRA is required for developments which are:

- *in flood zone 2 or 3 including minor development and change of use*
- *more than 1 hectare (ha) in flood zone 1*
- *less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs)*
- *in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency*

- 1.8. The site is within Flood Zone 3 and therefore an FRA is required in accordance with the NPPF.
- 1.9. The objective of this FRA is to demonstrate that the proposals are acceptable in terms of flood risk. This report summarises the findings of the study and specifically addresses the following issues in the context of the current legislative regime:
- Fluvial/tidal flood risk
 - Surface water flood risk
 - Risk of flooding from other sources

³ <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment>

2. Planning Policy

- 2.1. Inappropriate development in a flood risk area could pose significant risk in terms of personal safety and damage to property for the occupiers of the development or for people elsewhere. The approach taken in the assessment of flood risk at the planning stage is set out in national, regional, and local planning policy and associated guidance. This section summarises the key policies and guidance relevant to the proposed development.

National Planning Policy Framework (NPPF)

- 2.2. The National Planning Policy Framework⁴ (NPPF) (DLUHC, 2023) which includes UK Government policy on development and flood risk states:

165. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

173. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*

⁴ <https://www.gov.uk/guidance/national-planning-policy-framework>, last updated Dec 2023

- d) any residual risk can be safely managed; and*
- e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.*

174. Applications for some minor development and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 59.

2.3. Footnote 59 of the NPPF states:

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

2.4. Flood Zones in England are defined as follows:

Table 1: Flood Zone Definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having less than 1 in 1,000 annual probability of river or sea flooding (all land outside Zones 2 and 3).
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a High Probability	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.
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

- 2.5. An FRA should be appropriate to the scale, nature, and location of the development. It should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.
- 2.6. An assessment of hydrological impacts should be undertaken, including to surface water runoff and impacts to drainage networks in order to demonstrate how flood risk to others will be managed following development and taking climate change into account.

Havant Borough Core Strategy (2011)

- 2.7. The Local Plan prepared by the Local Planning Authority, Havant Borough Council, sets out the policies for development in the local area.
- 2.8. Policy CS15 Flood and Erosion Risk outlines the requirements for new development within the area. It states:

Policy CS15 Flood and Coastal Erosion Risk

Development in areas at risk of flooding now and in the future as identified on the latest Environment Agency flood risk maps and Strategic Flood Risk Assessment climate change maps will only be permitted where:

- 1. It meets the sequential and exception test (where required) in relation to PPS25.*
- 2. The site is located in a low hazard area as defined in the Strategic Flood Risk Assessment.*
- 3. A site-specific flood risk assessment demonstrates that the development will be safe, including the access, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*
- 4. The scheme incorporates flood protection, flood resilience and resistance measures appropriate to the character and biodiversity of the area and the specific requirements of the site.*
- 5. Appropriate flood warning and evacuation plans are in place.*
- 6. New site drainage systems are designed taking account of events which exceed the normal design standard.*

All development will be required to ensure that there is no net increase in surface water run off. Priority should be given to incorporating Sustainable Drainage Systems (SuDS) to manage surface water drainage, unless it is proven that SuDS are not appropriate. Where SuDS are provided arrangements must be put in place for their whole life management and maintenance.

The council will work with partners to implement the Coastal Policy Zones in the North Solent Shoreline Management Plan to ensure that development avoids areas at risk from coastal erosion and coastal flooding and that areas required to offset

coastal squeeze and prevent habitat fragmentation, to allow species to adapt to climate change, are identified and protected from development.

Sequential and Exception Tests

- 2.9. The Sequential and Exception Tests are applied in specific cases defined by UK Government policy. Their purpose is to drive development to areas of low flood risk and to support developments which improve flood risk for developments in areas at risk of flooding.
- 2.10. The proposed development is for the construction of a residential dwelling in place of an existing dwelling on site. The proposals do not increase the number of units on the site and provide an opportunity to include flood resilience and resistance measures. The existing dwelling does not have any flood resilience or resistance measures in place; therefore, the proposals constitute a betterment over the existing scenario. Appropriate flood risk mitigation measures are recommended in Section 5 of this report.

3. Consultation and Review

Consultation

- 3.1. The site is within the remit of Hampshire County Council as Lead Local Flood Authority (LLFA).
- 3.2. The Environment Agency (EA) have provided Product 6 data that will be assessed in Section 4 of this report.

Documents and Online Mapping

- 3.3. Local Governments and Lead Local Flood Authorities provide documents which contain data and policies on flood risk and new development in their areas. These documents are introduced and briefly summarised below. For the purposes of this FRA, these documents have been reviewed for relevant information and any relevant data is discussed within the appropriate sub heading of this report.
- 3.4. The following sources of information have been reviewed for this assessment:
 - Flood Map for Planning on the Environment Agency website <https://flood-map-for-planning.service.gov.uk/>
 - Long Term Flood Risk Information on the Environment Agency website <https://www.gov.uk/check-long-term-flood-risk>
 - National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2023)
 - Planning Practice Guidance - Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022)
 - Geoindex Onshore (British Geological Survey, 2023)
 - Havant Borough Council Core Strategy⁵ (2011).

⁵ <https://cdn.havant.gov.uk/public/documents/ADOPTED%20CORE%20STRATEGY%20.pdf>

- Hampshire County Council Preliminary Flood Risk Assessment⁶ (PFRA), (2011).
- The Partnership for Urban South Hampshire (PUSH) SFRA⁷ (2016)
- The North Solent Shoreline Management Plan⁸ (2010)

Preliminary Flood Risk Assessment (PFRA)

- 3.5. The PFRA, published in 2011 and 2017, is a high-level appraisal of flood risk across Lead Local Flood Authority Hampshire County Council. The flood risk from all sources, including fluvial, surface water, groundwater, and surcharged sewers is evaluated. It is the basis upon which the Local Flood Risk Management Strategy is produced.
- 3.6. The PFRA summarises historical flood incidents in Hampshire County Council. The site is recorded as having been affected by a flood event.

Strategic Flood Risk Assessment (SFRA)

- 3.7. The SFRA, published in 2007 and 2016, provides the evidence base for the Local Planning Authority Havant Borough Council Local Plan and guidance for consideration when determining planning applications.
- 3.8. The SFRA seeks to place new development into areas of lower flood risk taking into account current flood risk, future flood risk, and the effect a proposed development would have on the risk of flooding.
- 3.9. The SFRA mapping provided by Havant Borough Council has been used throughout production of this report as a source of information, particularly pertaining to historical flood incidents.

⁶ https://documents.hants.gov.uk/flood-water-management/watercourses/PFRAReportsavedJan2016.pdf?_gl=1*1llz90e*_ga*MTA0Mzk4NzYyNy4xNjU1ODE4ODU0*_ga_8ZVSPZWL5T*MTY1NTgxODg1NC4xLjAuMTY1NTgxODg1NC4w

⁷ <https://www.portsmouth.gov.uk/wp-content/uploads/2021/12/PUSH-Strategic-Flood-Risk-Assessment-2016-update-main-report-February-2016-accessible.pdf>

⁸ https://www.northsolentsmp.co.uk/media/1574/NSSMP-Summary-Booklet-Dec-2010/pdf/NSSMP_Summary_Booklet_Dec_2010.pdf?m=637514898113500000

Local Flood Risk Management Strategy (LFRMS)

- 3.10. The Local Flood Risk Management Strategy sets out roles and responsibilities for flood risk management, assesses the risk of flooding in the area, where funding can be found to manage flood risk, and the policies, objectives, and actions of the Lead Local Flood Authority.
- 3.11. The Hampshire County Council LFRMS is used within this report to identify any flood management infrastructure and historical incidences of flooding.

4. Sources of Flood Risk

Tidal

- 4.1. Tidal flooding occurs when a high tide and high winds combine to elevate sea levels. An area behind coastal flood defences can still flood if waves overtop the defences or break through them. Tidal flooding can also occur a long way from the coast by raising river levels. Water may overtop the river bank or river defences when tide levels are high.

Main Rivers and Ordinary Watercourses

- 4.2. The site is located approximately 350m north and 550m west of the Chichester Channel (tidally influenced).

Existing Flood Defence Infrastructure

- 4.3. Figure 3 below shows that there are currently flood defences (raised embankments) on the coast south of the site and to the east.
- 4.4. The SFRA mapping shows that the majority of defences are protecting the site for events up and greater than the 1 in 1000 year event at present (2007).

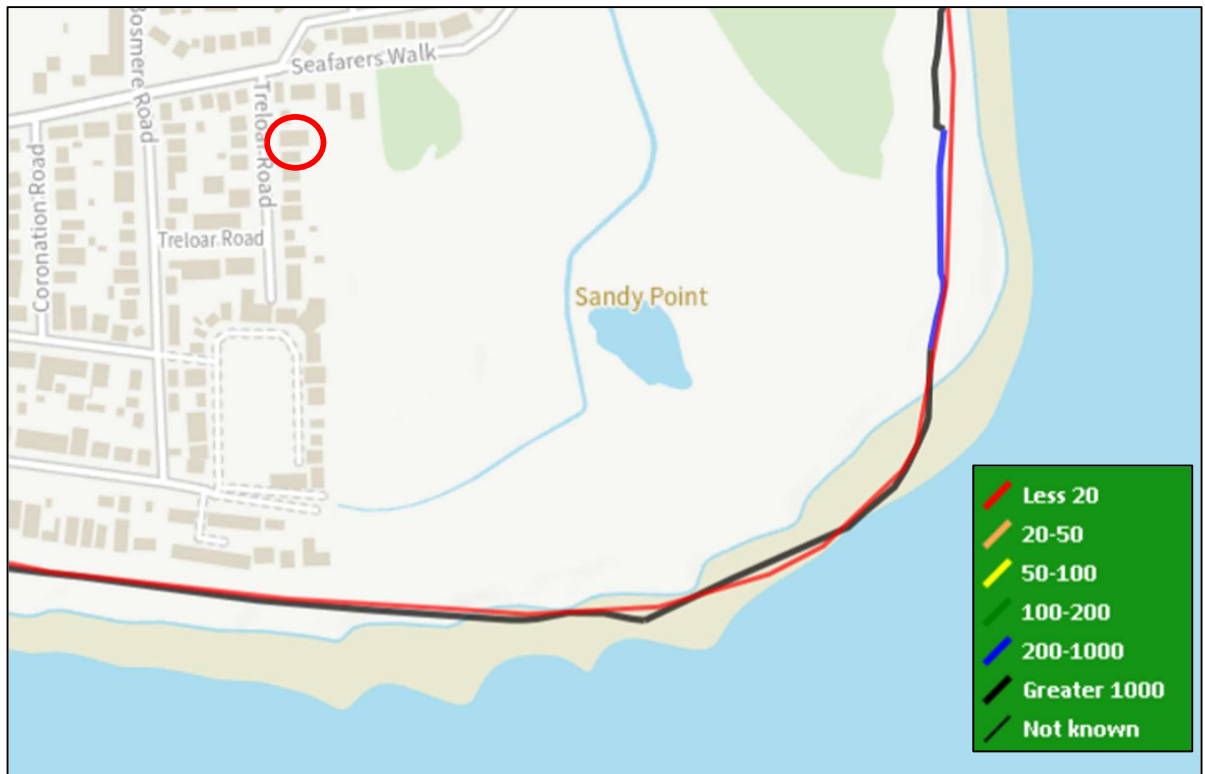


Figure 3: PUSH SFRA Present Day (2007) Infrastructure Defence Levels (Site in Red)

- 4.5. Figure 4 (SFRA mapping) shows that the majority of defences are protecting the site for events up and greater than the 1 in 1000 year event for 2115. However, there is a portion of the coast directly east of the site that are only offering less than a 20 year standard of protection.

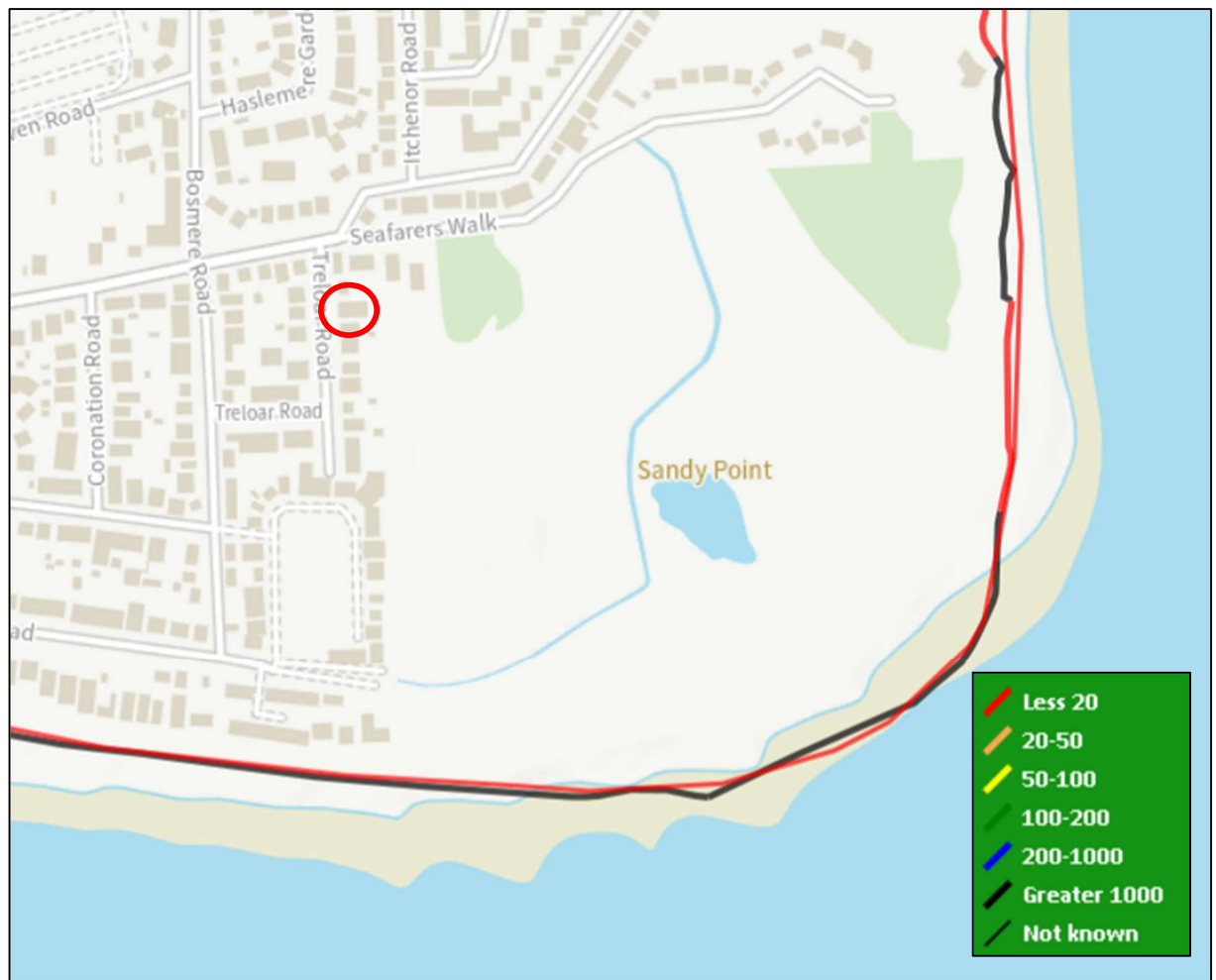


Figure 4: PUSH SFRA 2115 Infrastructure Defence Levels (Site in Red)

Environment Agency Flood Map for Planning

- 4.6. According to the EA Flood Map for Planning (Figure 5) the site is located within Flood Zone 3. Flood Zone 3 denotes a risk of flooding from tidal sources greater than 1 in 200 (0.5%). Interrogation of the Flood Map for Planning shows that the risk is tidally influenced.



Figure 5: EA Flood Map for Planning (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 4.7. The EA's Recorded and Historical Flood Outlines (Figure6) shows sea tidal or sea flooding on-site in 2005 caused by overtopping of defences.

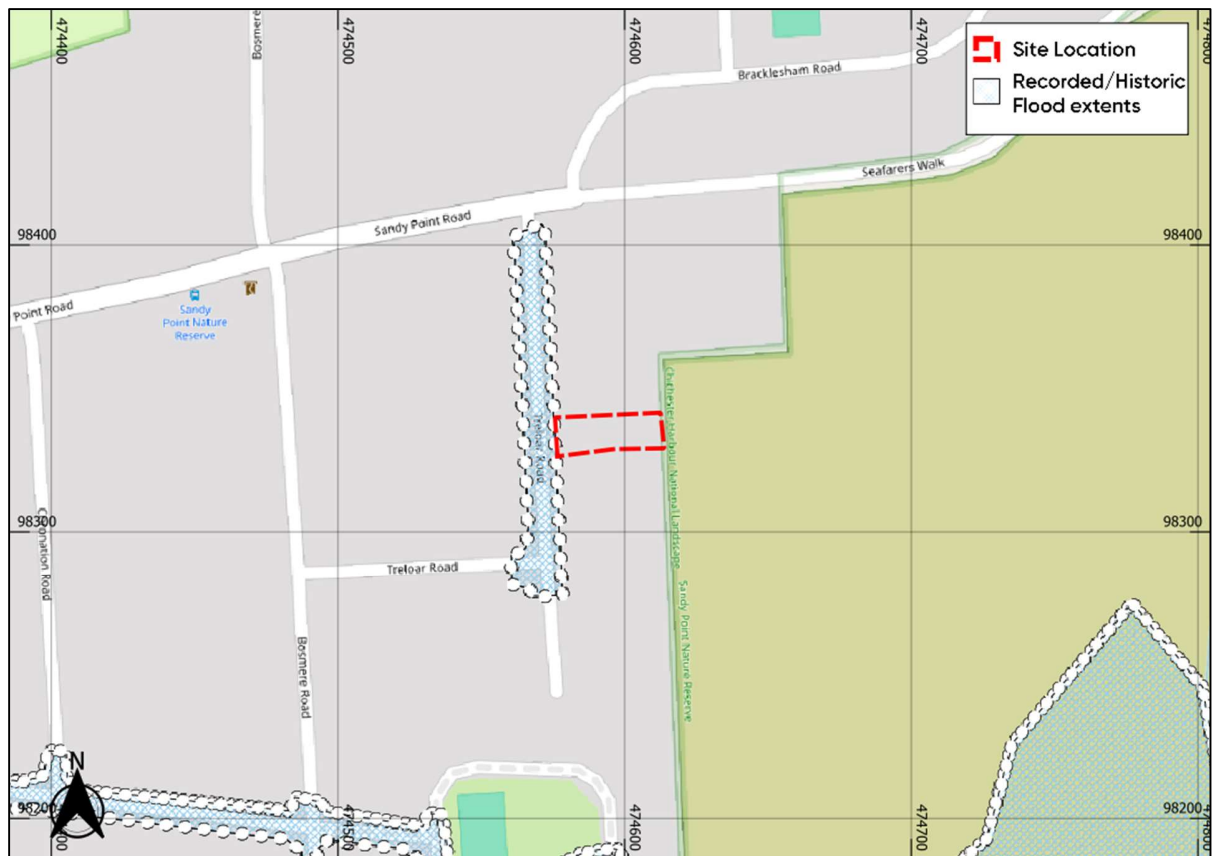


Figure 6: EA Historic Flood Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 4.8. The PUSH SFRA online mapping indicates the site is located in Flood Zone 3 in the year 2115 (i.e. due to the impacts of climate change on sea level rise) as shown in Figure 7.



Figure 7: PUSH SFRA Flood Zones with climate change for the year 2115. Flood Zone 3 (2115) indicated by dark blue extent. Site location outlined in red.

East Solent Coastal Model (2018)

- 4.9. The EA has provided modelled flood data taken from the East Solent Coastal Model which was produced in 2018 by JBA. The data has been interrogated to establish the depth and extent of flooding under the 'design flood' event. The 'design flood' is an event with a 1 in 200 year Annual Exceedance Probability (AEP) including an allowance for climate change over the lifetime of the development (100 years).
- 4.10. The modelled flood level data provided by the EA identifies that the predicted flood level data is 4.13m AOD at the sites location under the design flood conditions (1 in 200 year event plus allowance for climate change). The depth of flooding is expected to range between 2.6m and 2.97m based on site elevation information by LiDAR data of 1.16m AOD and 1.53m AOD.
- 4.11. The flood level information provided by the EA does not take into account the latest predictions of Extreme Sea Levels from Coastal Flood Boundary (CFB) conditions database (2018) nor sea level rise projections from the UK Climate Projections 2018 (UKCP18). The table below shows the difference in the sea level estimates for current day and future climate conditions from the EA's model and based on the latest information available.

- 4.12. 'BNDRY_2' has been referenced from the '*JBA Model Development Report – East Solent Models*' as this is located closest to the site, which represents CFB chainage point 4610 from the previous iteration of the CFB dataset. Chainage 4610 has been referenced from the latest CFB dataset which is a sub-set of the Extreme Sea Levels for Estuaries.
- 4.13. Estimates are provided for both the higher central (70% percentile) and upper end (95% percentile) climate change scenarios based on the latest information.

Table 2: Comparison of Extreme Sea Level and Sea Level Rise projections.

Parameter	EA model dataset	Up-to-date predictions
1 in 200 year extreme sea level – current day	3.25m AOD	3.17m AOD
Sea level rise projections	UKCIP09	UKCP18
Future Year	2115	2120
Future extreme sea level (mAOD)	(+0.744m) 3.99m AOD	4.26m AOD (Higher Central) 4.64m AOD (Upper End)

- 4.14. From Table 2 it can be seen that the predicted extreme sea level under current day conditions is lower than in the EA's model, however, with the updated climate change projections, the future extreme sea level is projected to be higher under both the Higher Central and Upper End climate change scenarios.
- 4.15. It is not appropriate to directly apply the extreme water levels shown in Table 2 to the subject site as the EA's modelling of the impacts of waves overtopping at the coastline results in a lower flood level at the site (4.13m AOD) than the direct extreme sea level for the same scenario (3.99m AOD).
- 4.16. The effects of wave overtopping are a function of the water depth, wind speed and wave height. Whilst the projections of the latter two parameters have not changed, the changes in the predicted water depth from the higher prediction of extreme sea level would result in a different wave overtopping behaviour, which could only be assessed through updated wave overtopping modelling, which is not considered appropriate for the scale of development proposed. Instead, a simplified approach has been applied whereby the reduction in water level from the coast to the site in the EA model (0.14m) has been applied to the updated extreme sea level prediction to estimate the updated flood level at the site. Using this simple approach, the resulting

updated flood level, based on the latest extreme sea level predictions and sea level rise projections is estimated to be **4.12m to 4.50m AOD** for the higher central and upper end scenarios respectively.

- 4.17. For the higher central scenario, the depth of flooding on site varies between 2.59m and 2.96m. For the upper end scenario, this increases to between 2.97m and 3.34m.

Tidal Flood Risk Summary

- 4.18. In summary, the risk of tidal flooding is considered to be high. As such, appropriate mitigation measures are recommended in Section 5 of this report.

Fluvial

- 4.19. Flooding from watercourses arises when flows exceed the capacity of the channel, or where a restrictive structure is encountered, resulting in water overtopping the banks into the floodplain.
- 4.20. There are no fluvial watercourses near the site and the site is not located in a fluvial flood zone.
- 4.21. Therefore, the risk of fluvial flooding is considered to be low.

Canals

- 4.22. The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders, and boreholes and manages water levels by transferring it within the canal system.
- 4.23. There are no canals within a 1km radius of the site.
- 4.24. The risk of flooding to this site from canals is considered to be low.

Pluvial

- 4.25. Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.
- 4.26. Annual surface water flood risk is labelled by the EA as:
- 'High Risk'; >3.3% AEP (annual probability greater than 1 in 30).
 - 'Medium Risk'; 1.1% to 3.3% AEP (annual probability between 1 in 100 and 1 in 30).
 - 'Low Risk'; 0.1% to 1% AEP (annual probability between 1 in 1000 and 1 in 100).

- 'Very Low Risk'; <0.1% AEP (annual probability less than 1 in 1000).

4.27. Examination of the EA's Flood Risk from Surface Water mapping for High Risk, Medium Risk, and Low Risk AEP flood events shows the site is at risk of flooding in the modelled 'Medium' and 'Low' risk surface water flood events (Figure 8).

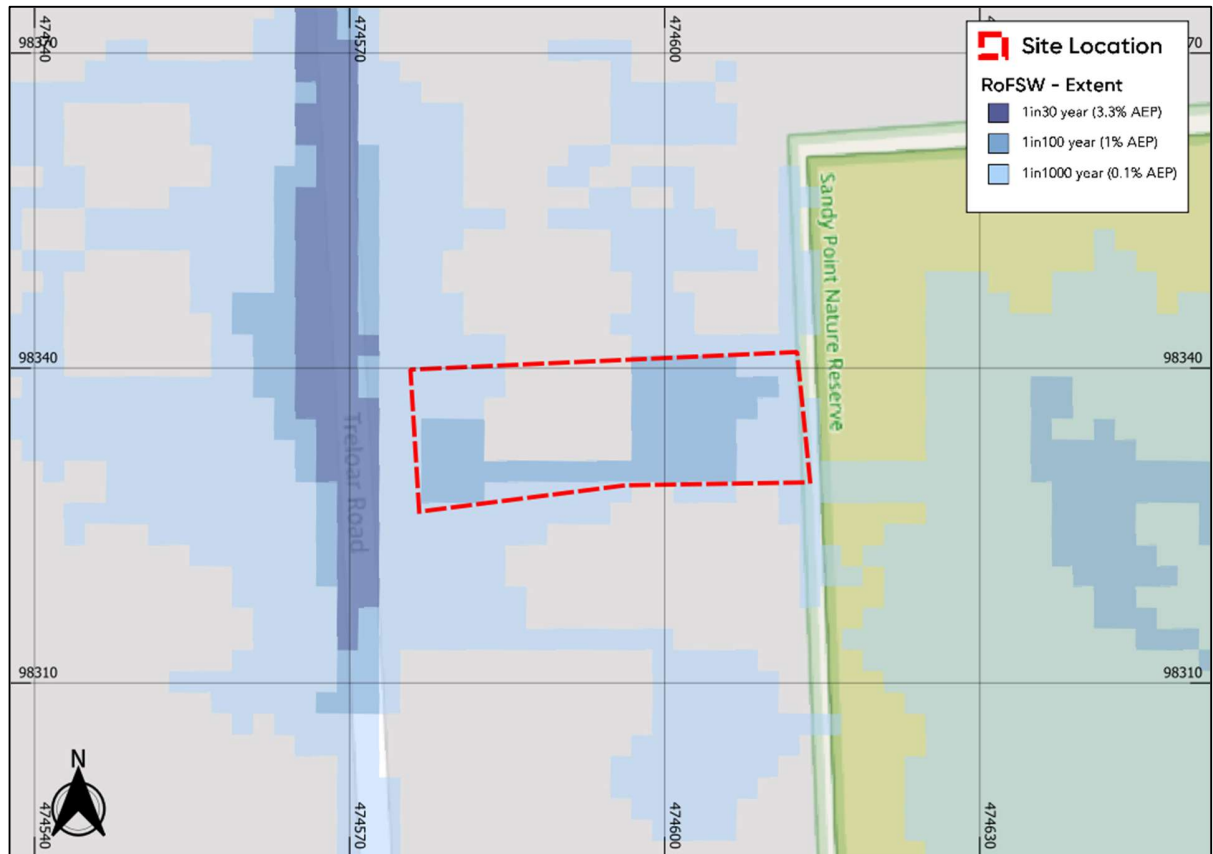


Figure 4: EA Surface Water Flood Risk Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

4.28. Figure 9 shows that the maximum depth of surface water flooding during the modelled 1.0% AEP storm event is 600mm.

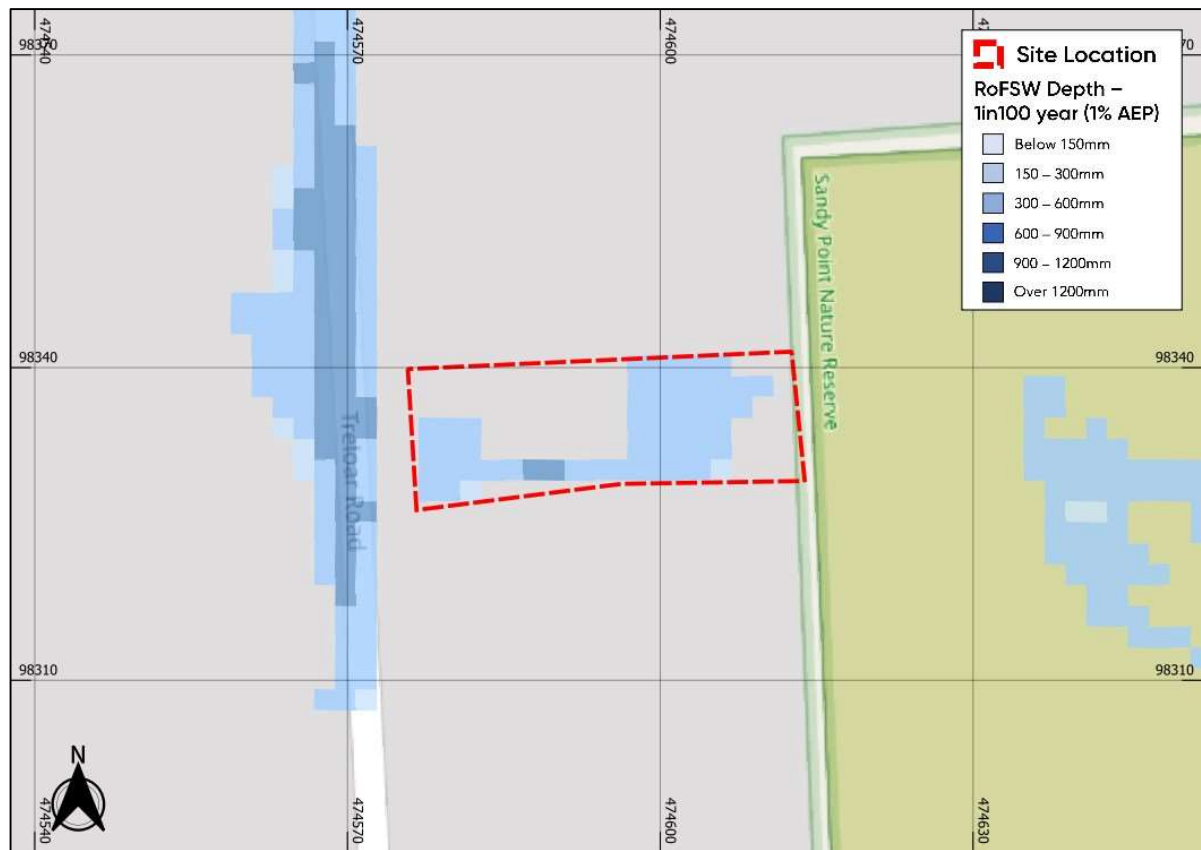


Figure 5: EA Surface Water Flood Depth Mapping – 1.0% AEP (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 4.29. Figure 10 shows that the maximum modelled depth of surface water flooding during the 0.1% AEP storm event is 900mm.

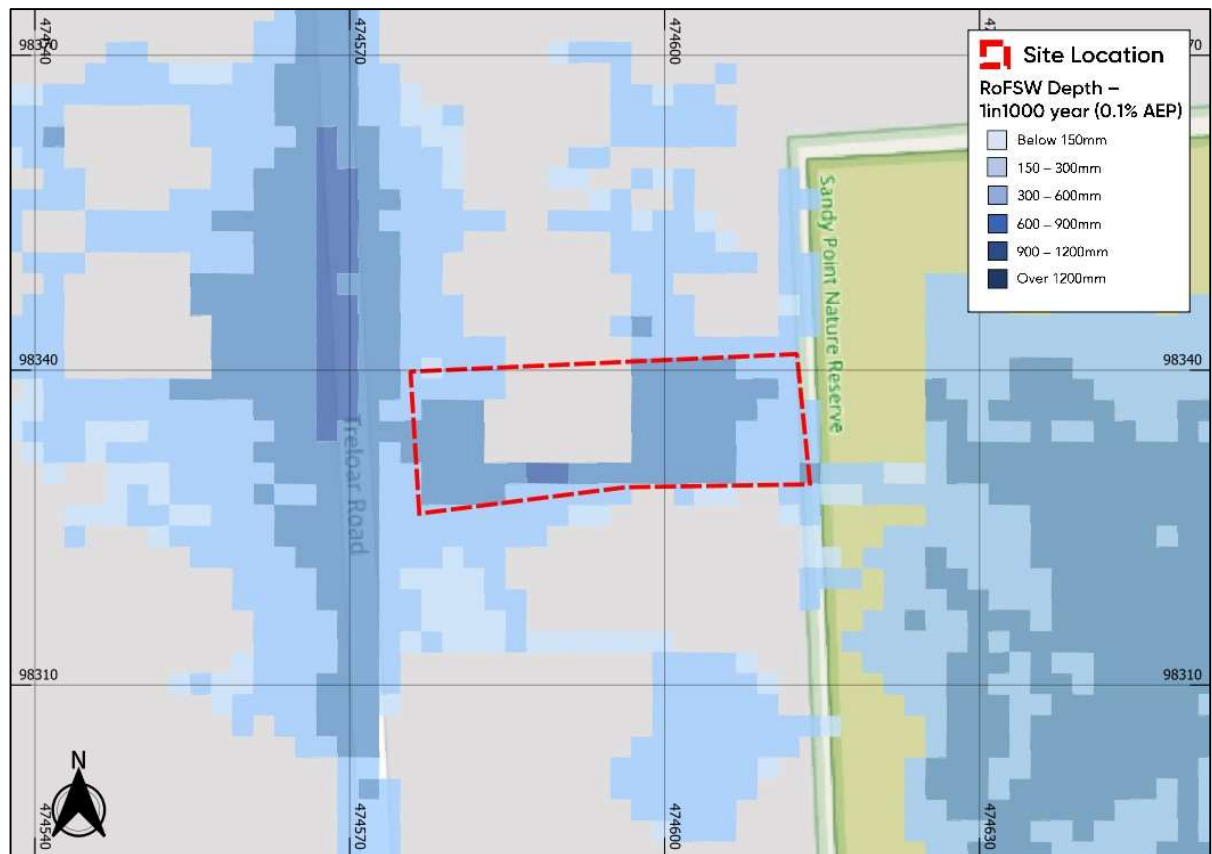


Figure 6: EA Surface Water Flood Depth Mapping – 0.1% AEP (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 4.30. As the development is for the demolition of an existing dwelling for the construction of a new dwelling the access/ egress arrangements are to remain as per the existing scenario on Treloar Road. If safe access/egress cannot be achieved, then the residents should seek safe refuge on site on the first floor.
- 4.31. Based on the information available the site is considered to be at a moderate risk of surface water flooding.

Reservoirs

- 4.32. Large waterbodies or reservoirs that have walls built above the surrounding ground level pose a risk of flooding. Walls could fail due to old age, accident, or because excess flood water has been added to the reservoir. Although a breach is unlikely, the consequences would be significant, leading to rapid inundation of the downstream floodplain.

- 4.33. According to the EA's Flood Risk from Reservoirs mapping (Figure 7) the site is outside modelled flood extents in the event of reservoir flooding.



Figure 7: EA Reservoir Flood Risk Mapping (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). ©<https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

- 4.34. The site has not been flagged as being at risk of flooding following a reservoir failure.

Groundwater

- 4.35. Groundwater flooding occurs in areas where underlying geology is permeable, and water can rise within the strata sufficiently to breach the surface.
- 4.36. The British Geological Survey's (BGS) mapping shows superficial deposits of River Terrace Deposits, comprising sand, silt and clay underlying the site. The bedrock underlying the site is Portsmouth Sand Member and Whitecliff sand member comprising sand.
- 4.37. The PUSH SFRA mapping indicates the site is located in an area with 'Moderate Bedrock Permeability' though there are no recorded groundwater flooding incidents near the site.

- 4.38. Furthermore, the development proposals do not include any proposed basements.
- 4.39. The risk from groundwater to the development is therefore considered to be low.

Sewers

- 4.40. Foul or surface water sewers can be a cause of flooding if the drainage network becomes overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.
- 4.41. The SFRA provides mapping of historical sewer flood incident records kept by the local authority. No incidents have been recorded in the vicinity of the site.
- 4.42. Southern Water Asset plan has been provided and is included as Figure 12 of this report. The plans show that there is a separate surface and foul water public sewer network beneath Treloar Road flowing from south to north.
- 4.43. The development is therefore considered to be at low risk of flooding from sewers. It is recommended that all new drainage associated with the scheme be fitted with non-return valves and that any new plumbing should be constructed in a closed cell design.

5. Flood Risk Mitigation

Tidal and Pluvial Flood Risk Mitigation

- 5.1. It has been identified that the risk of tidal flooding is considered to be high with depths ranging from 2.59m and 2.96m (higher central scenario) and 2.97m and 3.34m (upper end scenario) for the year 2124.
- 5.2. However, the SFRA mapping shows that the majority of defences are protecting the site for events up and greater than the 1 in 1000 year event at present (2007).
- 5.3. SFRA mapping also shows that the majority of defences are protecting the site for events up and greater than the 1 in 1000 year event for 2115. However, there is a portion of the coast directly east of the site that are only offering less than a 20 year standard of protection.
- 5.4. Data provided by the EA indicates that these defences could be overtopped in a 1 in 200 year event by 2115.
- 5.5. Based on the information available the site is considered to be at a moderate risk of surface water flooding with depths of 600mm during the 1.0% AEP storm event and 900mm during the 0.1% AEP storm event.
- 5.6. Considering access requirements, the Finished Floor Levels can be raised by a maximum of 300mm to a minimum of 1.46m AOD based on LiDAR data. This represents a betterment to the existing scenario, along with raising ground floor sleeping accommodation to the first floor. In addition to raising the floor levels, the following mitigation measures are recommended, in accordance with DCLG Report *Improving the Flood Performance of New Buildings Flood Resilient Construction (2007)*. Standards for the installation of resistance measures are available in British Standard 851188-1:2019+A1:2021:
 - The external walls will be tanked using a Visqueen Torch-On Tanking Membrane to 1.5m above the FFLs (1.46m AOD + 1.5m, based on LiDAR data).
 - All ground floor windows are set to 1.5m above the FFLs (1.46m AOD + 1.5m, based on LiDAR data).
 - Internal access from ground floor to first floor for the lifetime of the development.
 - General flood resilience measures recommended such as the below, where practical:
 - Flood proof doors and barriers at front and rear doors.

- Units to be raised on legs above plinth.
- Air brick covers to be installed.
- Damp Proof Membranes (d.p.m.) should be included in any design to minimise the passage of water through ground floors.
- Waterproof internal render such as lime based plaster.
- Non-return valves to be fitted on new drainage associated with the WC to prevent backflow.
- All new plumbing insulation to be of closed cell design.

Fluvial, Reservoirs, Groundwater, Canals and Sewers

- 5.7. Flood risk from other sources is deemed to be low, therefore mitigation is not required.

Increase to Flood Risk Elsewhere

- 5.8. The existing dwellings impermeable area is 141m² whereas the proposed development will see an impermeable area of 158m². Despite the negligible increase in impermeable area a Surface Water Drainage Strategy is included in this report as Section 6.
- 5.9. According to paragraph 049 of NPPG;

"The loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is solely tidal."

- 5.10. As such, the proposed development will not affect flood risk elsewhere.

Flood Warnings

- 5.11. The site is in the Environment Agency 'South Hayling and South Eastoke seafront' flood warning service area. This service allows site owners to register an address along with contact details so that, in the event of a flood being forecast, they are sent an alert. As a further precaution and risk reduction, the owner of the site should sign up.
- 5.12. Flood warnings/alerts can be enforced at any time of the day or night. Signing up for this service provides site owners some notice before a flood event. The amount of time afforded before a flood occurs depends on the site-specific location (e.g. proximity to the source of flooding, topography of the surrounding area) and the flood mechanism (e.g. bank over topping versus a

breach event). Flood alerts and warnings provide site managers with time to take necessary action, e.g. communication of the risk of flooding to occupants/employees etc, evacuation of occupants offsite or to a safe level, removal of valuable items out of reach of flooding and the mounting of site-specific flood defences.

6. Surface Water Drainage Strategy

Ground Conditions and Nearby Watercourses

- 6.1. The British Geological Survey's (BGS) mapping shows superficial deposits of River Terrace Deposits, comprising sand, silt and clay underlying the site. The bedrock underlying the site is Portsmouth Sand Member and Whitecliff sand member comprising Sand.
- 6.2. The PUSH SFRA mapping indicates the site is located in an area with 'Moderate Bedrock Permeability' though there are no recorded groundwater flooding incidents near the site.
- 6.3. However, online soil information suggests that underlying the site are "Loamy soils with naturally high groundwater". As such, infiltration will likely not be feasible at the site.
- 6.4. There are no nearby watercourses that could provide an outfall for the proposed development.

Existing Drainage Infrastructure

- 6.5. A Southern Water Asset Plan is included as Appendix B. The asset plan is reproduced as Figure 12 below.
- 6.6. Figure 12 shows that there is a separate surface and foul water public sewer network beneath Treloar Road flowing from south to north.

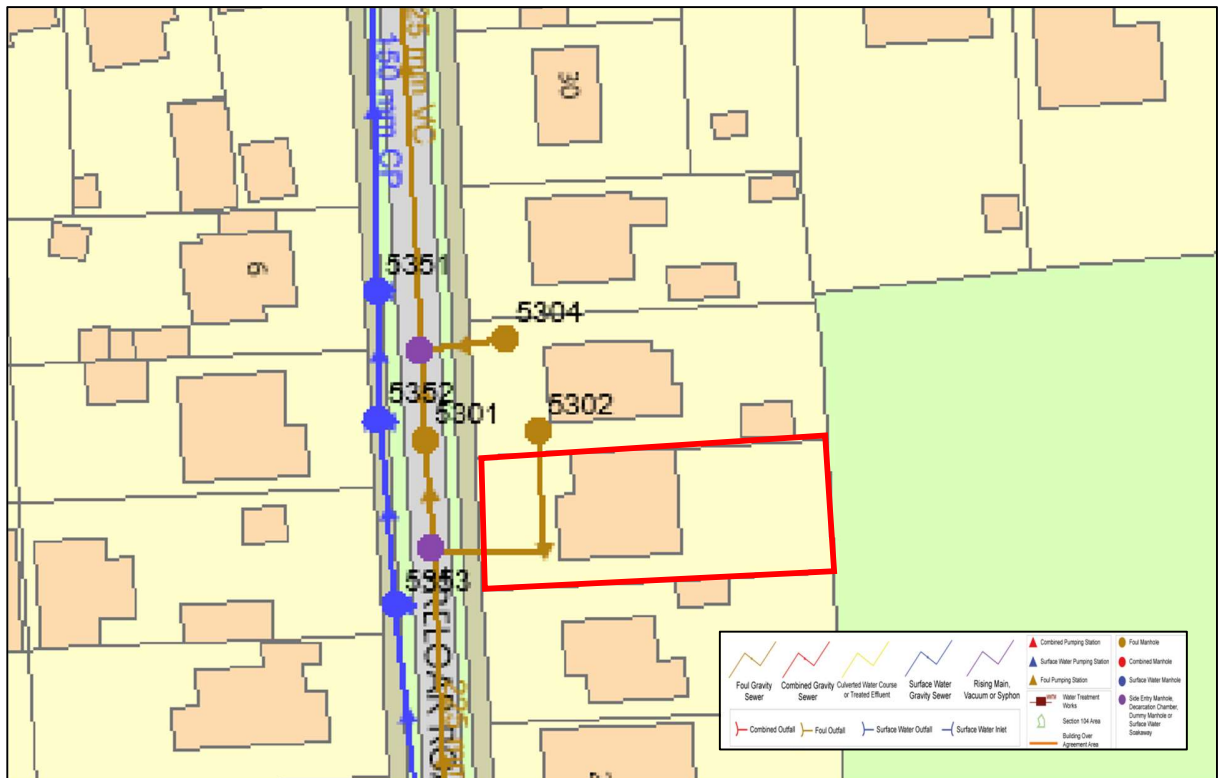


Figure 8: Southern Water Asset Plans (Site in Red)

- 6.7. A CCTV survey has been conducted at the site which is included in this report as Appendix C. The survey shows that the site is currently drained via a combined surface and foul water drain. The drains discharge into the public foul sewer beneath Treloar Road.
- 6.8. The existing onsite sewer connection cannot be reused as this discharges into a foul sewer. As such, a new surface water connection is proposed, discharging into surface water manhole 5352. Runoff rates will be limited to 1.0l/s for all events up to the 1 in 100 (plus an allowance for climate change) storm event to provide a betterment to the existing scenario.

Existing Runoff Rate

- 6.9. The existing roof area that is positively drained covers an area of 158m². InfoDrainage Software (v2025.2) was used to calculate the existing runoff rates from the existing dwelling.
- 6.10. Calculations in Table 3 show the present day maximum outflow rates. Therefore, restricting rates to 1l/s would provide a betterment to the existing scenario in terms of surface water runoff.

Table 3: Existing (unrestricted) and proposed runoff rates.

Catchment	Area	1 in 2 Year	1 in 30 Year	1 in 100 Year
Existing	0.014ha	3.1l/s	6.8l/s	8.5l/s
Proposed	0.016ha	1.0l/s	1.0l/s	1.0l/s
% Betterment	-	67.74%	85.29%	88.24%

Surface Water Drainage Strategy

- 6.11. 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.
- 6.12. The management of surface water has been considered in respect to the SuDS hierarchy below in Table 4, as detailed in the CIRIA 753 "The SuDS Manual" (section 3.2.3).

Table 4: SuDS Drainage Hierarchy

SUDS DRAINAGE HIERARCHY			
		Suitability	Comment
1.	Infiltration	x	The British Geological Survey's (BGS) mapping shows superficial deposits of River Terrace Deposits, comprising sand, silt and clay underlying the site. The bedrock underlying the site is Portsmouth Sand Member and Whitecliff sand member comprising Sand. The PUSH SFRA mapping indicates the site is located in an area with 'Moderate Bedrock Permeability' though there are no recorded groundwater flooding incidents near the site. However, online soil information suggests that underlying the site are "Loamy soils with naturally high groundwater". As such, infiltration will likely not be feasible at the site.
2.	Discharge to surface water	x	There are no watercourses within the site boundary.
3.	Discharge to surface water sewer, highway drain or similar	✓	It is proposed to discharge surface water from the site into surface water sewer beneath Treloar Road (surface water manhole – 5352).
4.	Discharge to a combined sewer	x	Surface water sewers are a preferred method of discharge in the drainage hierarchy.

- 6.13. On review of the SuDS drainage hierarchy, and with reference to both national and local policy, it is proposed that the surface water runoff from the development is managed via a geocellular storage tank and SuDS planters. The existing onsite sewer connection cannot be reused as this discharges into a foul sewer. As such, a new surface water connection is proposed, discharging into surface water manhole 5352. Runoff rates will be limited to 1.0l/s for all events up to the 1 in 100 (plus an allowance for climate change) storm event to provide a betterment to the existing scenario.
- 6.14. A geocellular tank to be used with a shallow 0.3m cover depth. A shallow attenuation design will allow for the system to connect into the shallow surface water sewer beneath Treloar Road. Due to the shallow cover of the tank, an impermeable membrane is required on top of the tank to prevent roots penetrating.

InfoDrainage Calculations

- 6.15. InfoDrainage Software (v2025.2) was used to calculate the indicative attenuation volumes from the area of proposed development. The criteria for the calculations is shown in Table 3.
- 6.16. Total proposed impermeable area was calculated to be 158m² (0.016ha).
- 6.17. The drainage model included the following stormwater controls:
- Geocellular storage tank: 63.75m² plan area, with a depth of 0.15m and an outlet with flows restricted to 1.0l/s. – to be used to allow for a shallow, 0.3m cover depth. The total available storage volume in the tank is 9.384m³.

Climate Change

- 6.18. The Environment Agency Peak Rainfall Climate Change Allowance guidance (updated in May 2022) was reviewed and subsequently the DEFRA Peak Rainfall Allowances Map was assessed to determine appropriate climate change allowances to inform the surface water drainage strategy. In line with this guidance, the upper end allowances for the East Hampshire Management Catchment have been used for both the 1% and 3.3% annual exceedance probability events. An allowance of 40% has been used for the 3.3% AEP event and an allowance of 45% has been used for the 1% AEP event.

Simulation Criteria

- 6.19. The simulation criteria used in this model has been shown below in Table 5.

Table 5: Simulation Criteria

Parameter	Value
Rainfall Data	FEH22
Total Area	0.016 Ha (+10% Urban Creep = 0.018)
M5-60	759.0
Return Periods	2, 30, 30+40%CC, 100, 100+45%CC. Summer and Winter
Storm Durations	15, 30, 60, 120, 240, 360, 480, 960, 1440 minute
Volumetric Runoff Coefficient	0.9 (summer and winter storms)
Percentage Impervious	100%
Time of Concentration	5 minutes

InfoDrainage Results

- 6.20. The InfoDrainage Calculations have been included in this report as Appendix D although the 1 in 100 year +45% climate change results have been summarised below;
- The maximum depth in the 0.15m geocellular storage tank is 0.127m during the 1 in 100 year (+45% climate change) critical storm event (120 mins summer);
 - The maximum discharge rate from the proposed geocellular tank is 1.0l/s during the 1 in 100 year (+45% climate change) critical storm event (120 mins summer);
- 6.21. As such, according to the model, the proposed drainage network has capacity for a development of this size.

Surface Water Drainage Arrangement

- 6.22. The principles of the surface water drainage arrangements are outlined below. The surface water drainage arrangement is included as Appendix C.
- All surface water generated by the proposed development will be captured via a combination of rainwater downpipes, source control SuDS features (e.g. bioretention areas etc.).
 - Surface water will be conveyed via gravity through a subsurface piped network to the shallow geocellular tank to the east of the dwelling.
 - A vortex flow control unit (i.e. Hydrobrake ref: CHE-0058-1000-0150-1000) is proposed on the outlet of the geocellular storage tank.
 - From the tank, flow is conveyed into the surface water sewer beneath Treloar Road (manhole reference: 5352) at 1l/s.

Designing for Exceedance

- 6.23. Periods of exceedance occur when the rate of surface water runoff exceeds the drainage system capacity. Conveyance beneath the ground cannot, generally, be economically or sustainably constructed to the scale required for the most extreme rainfall events. This may result, on occasion, in the surface water runoff exceeding the capacity of the drainage network, with excess water (exceedance flow) being conveyed above ground.
- 6.24. For situations where extreme rainfall intensity exceeds inlet capacities, or for extreme storm events exceeding the design flood event considered for drainage design, the proposed site levels should direct surface water away from the dwelling into the rear garden.

Water Quality

- 6.25. A key element of SuDS is that they have the potential to improve the quality of surface water discharged from a site. In order to assess this, the “Pollution hazard indices for different land use classifications”, provided in the CIRIA SuDS Manual (C753) as table 26.2, has been reviewed. The indices use four different methods of assessing pollution potential based on the hazard level, total suspended solids (TSS), Metals, and Hydrocarbons.
- 6.26. The Pollution Hazard Indices are summarised in Table 6 below (with reference to table 26.3 in the CIRIA SuDS manual).

Table 6: Pollutant Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very Low	0.2	0.2	0.05

Table 7: Mitigation Hazard Indices

SuDS	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Bioretention Systems (SuDS Planters)	0.8	0.8	0.8

- 6.27. Runoff from roofs is generally considered low contamination risk and does not usually warrant any significant treatment. However, to prevent potential sediment from impacting the SuDS system, sediment traps should be provided on the outlet to the storage structures to prevent sedimentation in the below ground network, with rodding access provided either side for cleaning and maintenance.

7. Conclusions

- 7.1. This FRA and SWDS has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at 24 Treloar Road, Selsmore, Hayling Island, PO11 9SE. It has been written and prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.
- 7.2. An assessment of the risk of flooding from all sources has been undertaken and is summarised in the table below:

Source of Flooding	Flood Risk Summary
Tidal	The site is located within Flood Zone 3. Modelled flood level data has been provided by the EA which does not include the latest extreme sea level predictions or sea level rise projections. In the absence of updated wave overtopping modelling, a simplified assessment has been undertaken which indicates the site could be flooded with depths ranging from 2.59m and 2.96m (higher central scenario) and 2.97m and 3.34m (upper end scenario) for the year 2124. Considering access requirements, the Finished Floor Levels can be raised by a maximum of 300mm to a minimum of 1.46m AOD based on LiDAR data. This represents a betterment to the existing scenario, along with raising ground floor sleeping accommodation to the first floor.. In addition to raising the floor levels, the following mitigation measures are recommended, in accordance with DCLG Report Improving the Flood Performance of New Buildings Flood Resilient Construction (2007). Standards for the installation of resistance measures are available in British Standard 851188-1:2019+A1:2021: • The external walls will be tanked using a Visqueen Torch-On Tanking Membrane to 1.5m above the FFLs (1.46m AOD + 1.5m, based on LiDAR data). • All ground floor windows are set to 1.5m above the FFLs (1.46m AOD + 1.5m, based on LiDAR data). • Internal access from ground floor to first floor for the lifetime of the development. • General flood resilience measures recommended such as the below, where practical: • Units to be raised on legs above plinth.

	• Air brick covers to be installed. • Damp Proof Membranes (d.p.m.) should be included in any design to minimise the passage of water through ground floors. • Waterproof internal render such as lime based plaster. • Non-return valves to be fitted on new drainage associated with the WC to prevent backflow. • All new plumbing insulation to be of closed cell design. Due to an absence of safe access at the peak of the flood event, residents should sign up to the EA's Flood Warning service to enable them to prepare for a flood event and evacuate to an area outside the flood extent prior to the onset of flooding. A lead in time of 12-24 hours would be expected given the tidal nature of the flood risk.
Pluvial	Based on the information available the site is considered to be at a moderate risk of surface water flooding with depths of 600mm during the 1.0% AEP storm event and 900mm during the 0.1% AEP storm event.
Fluvial Reservoirs Groundwater Sewers Canals	The site is considered to be at low risk from other sources.

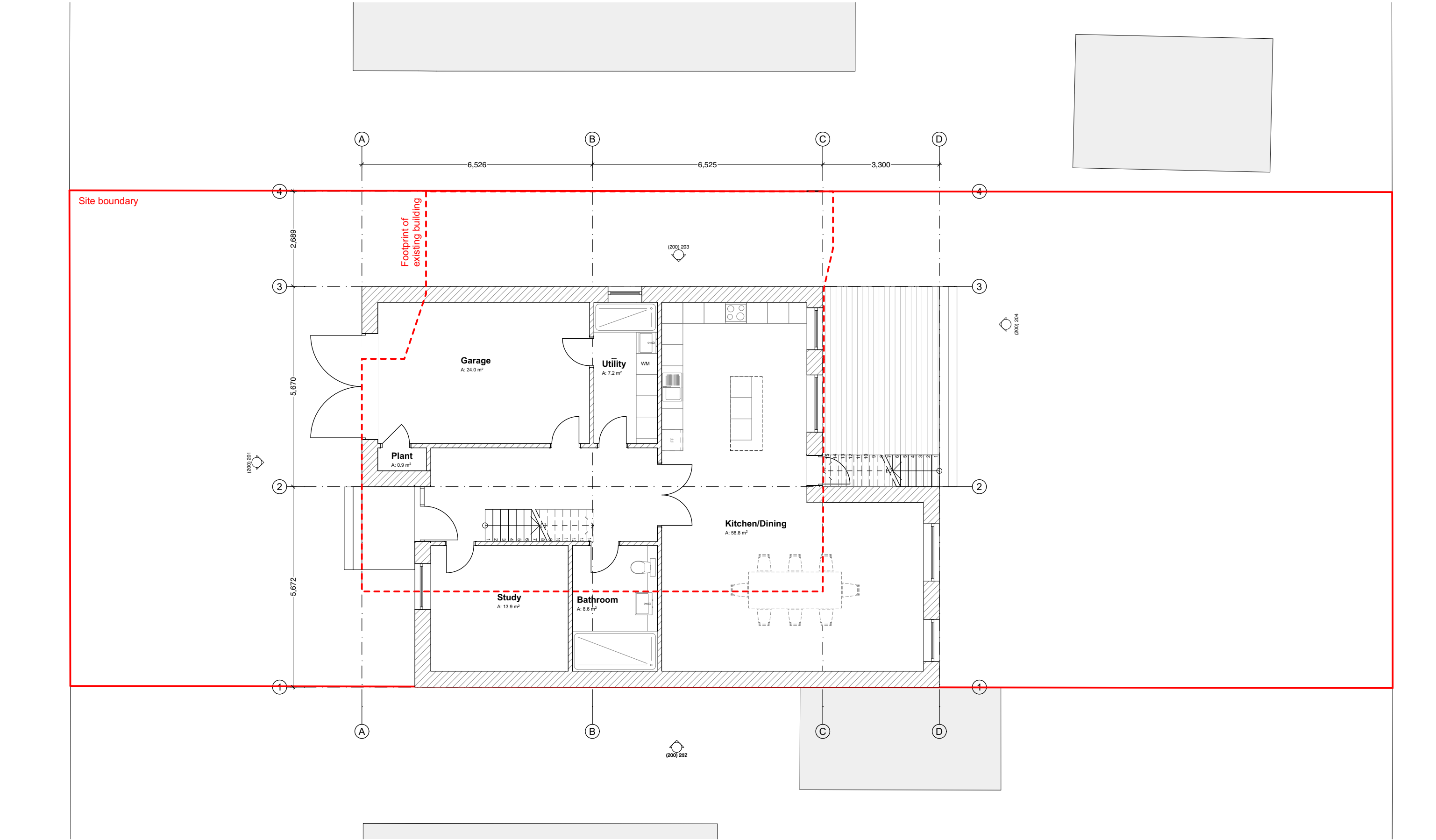
SuDS Arrangement

- All surface water generated by the proposed development will be captured via a combination of rainwater downpipes, source control SuDS features (e.g. bioretention areas etc.).
- Surface water will be conveyed via gravity through a subsurface piped network to the shallow geocellular tank to the east of the dwelling.
- A vortex flow control unit (i.e. Hydrobrake ref: CHE-0058-1000-0150-1000) is proposed on the outlet of the geocellular storage tank.
- From the tank, flow is conveyed into the surface water sewer beneath Treloar Road (manhole reference: 5352) at 1l/s.

InfoDrainage Results

- 7.3. The InfoDrainage Calculations have been included in this report as Appendix D although the 1 in 100 year +45% climate change results have been summarised below;
- The maximum depth in the 0.15m geocellular storage tank is 0.127m during the 1 in 100 year (+45% climate change) critical storm event (120 mins summer);
 - The maximum discharge rate from the proposed geocellular tank is 1.0l/s during the 1 in 100 year (+45% climate change) critical storm event (120 mins summer);
- 7.4. This Flood Risk Assessment and Surface Water Drainage Strategy should be submitted as part of the planning application to satisfy the requirements under NPPF.

Appendix A - Development Proposals



SALT ARCHITECTS

Church Hill Cottage
Itchenor Road
Chichester
PO20 7DL
www.saltarchitects.uk

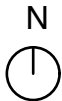
DO NOT SCALE FROM THIS DRAWING EXCEPT FOR PLANNING PURPOSES

All measurements given are indicative, on site dimensions must be determined prior to the purchaser manufacture of any components. All discrepancies between indicative dimensions given and those measured on site to be brought to architect's attention.

HEALTH, SAFETY AND ENVIRONMENTAL INFORMATION BOX



Notes: This drawing is to be read in conjunction with the risk register produced for inclusion in the health and safety plan. The hazard notes are in addition to normal hazards and risks faced by a competent contractor when dealing with the type of works detailed on the drawing.



0m 1m 2m 5m

Revision	Issued	Issue Title
01	11/03/2024	Sketch
02	02/04/2024	Sketch
03	13/06/2024	Pre-Application
P-01	07/08/2024	Planning

Proposed Ground Floor Plan

PROJECT:
24 Treloar Road
CLIENT:
Rob Gullan
DRAWING STATUS:
Planning
Project:

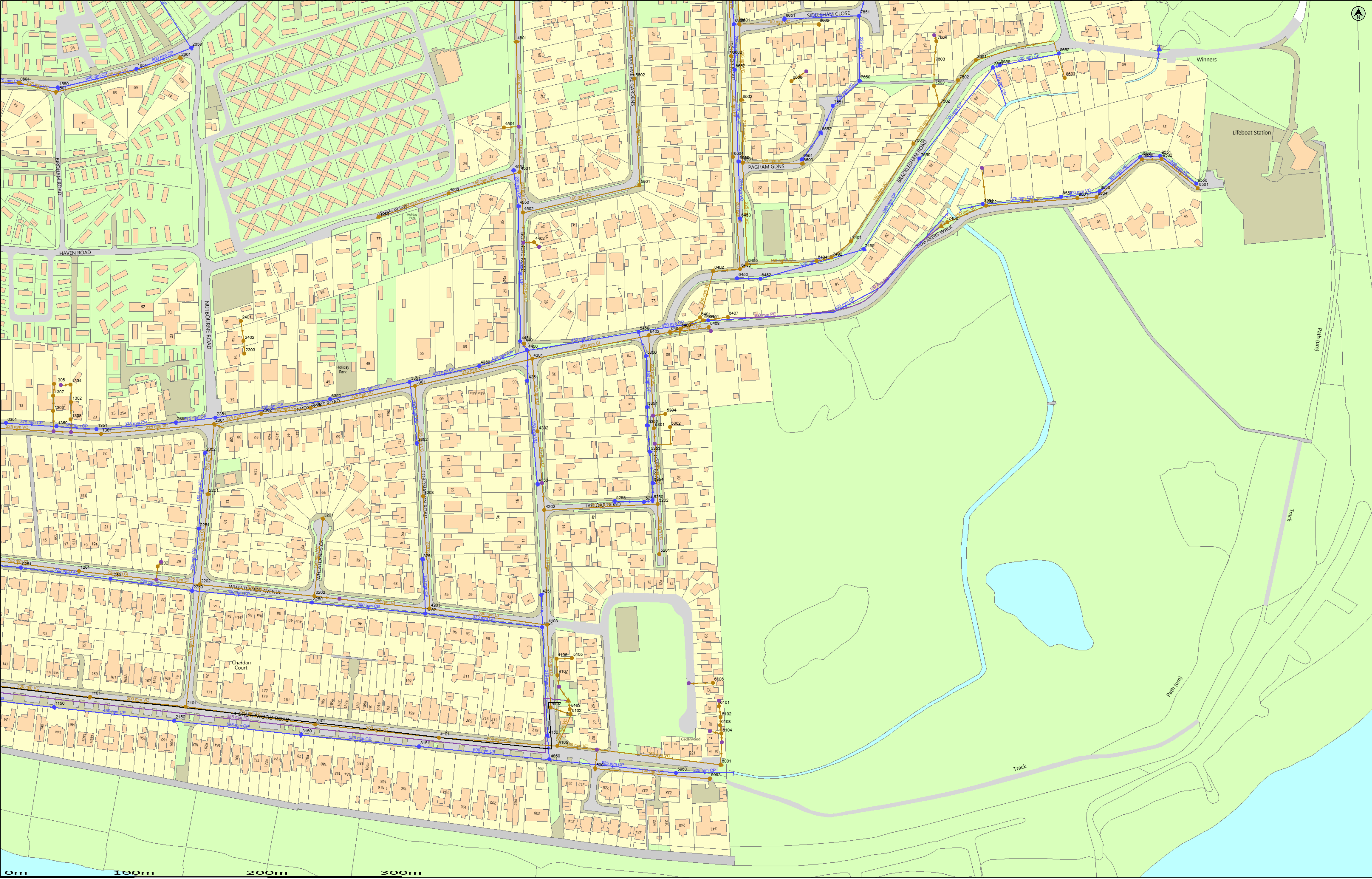
DATE:
08/08/2024
SCALE:
1:100 @ A3
Revision:
Drawing No.

017

(100) 01

P-01

Appendix B - Southern Water Asset Plans



(c) Crown copyright and database rights 2024 Ordnance Survey 100031673 Date: 08/05/24 Scale: 1:1250 Map Centre: 474595,98334 Data updated: 12/04/24 Our Ref: 1463776 - 1 Wastewater Plan A1

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2024 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

nick@aegaea.com

4746



Appendix C - Surface Water Drainage Layout

- ## LEGEND

CLIENT: ROBERT GULLAN

DRAWING: SURFACE WATER DRAINAGE STRATEGY

DATE: 07/08/2024	REV: A
------------------	--------

DRAWING SCALE: 1:150@A3

**PRELIMINARY DRAWING
FOR PLANNING ONLY - NOT FOR
CONSTRUCTION**

degadea
water, civils and environment

MANHOLE 5352
COVER LEVEL: 1.39m
AOD
INVERT LEVEL: 0.85m
AOD

RAINWATER DOWNPIPES AND
SuDS PLANTERS ARE INDICATE
ONLY. EXACT LOCATIONS ARE
TO BE CONFIRMED BY THE
ARCHITECT.

Appendix D - InfoDrainage Calculations

Project: Proposed Network AEG4746_Selsmore 24 Treloar Road (PO11 9SE)	Date: 29/08/2024			
Report Details: Type: Inflows Storm Phase: Phase	Designed by: JA	Checked by:	Approved By:	
	Company Address: Aegaea			



New dwelling roof

Type : Catchment Area

Area (ha)	0.016
-----------	-------

Dynamic Sizing	
Runoff Method	Time of Concentration
Summer Volumetric Runoff	0.900
Winter Volumetric Runoff	0.900
Time of Concentration (mins)	5
Percentage Impervious (%)	100

Project: Proposed Network AEG4746_Selsmore 24 Treloar Road (PO11 9SE)		Date: 29/08/2024			
Report Details: Type: Stormwater Controls Storm Phase: Phase		Designed by: JA	Checked by:		Approved By:
		Company Address: Aegaea			



Cellular Storage

Type : Cellular Storage

Dimensions

Exceedance Level (m)	1.400
Depth (m)	0.150
Base Level (m)	0.950
Number of Crates Long	1
Number of Crates Wide	1
Number of Crates High	1
Porosity (%)	95
Crate Length (m)	8.5
Crate Width (m)	7.5
Crate Height (m)	0.15
Total Volume (m³)	9.384

Inlets

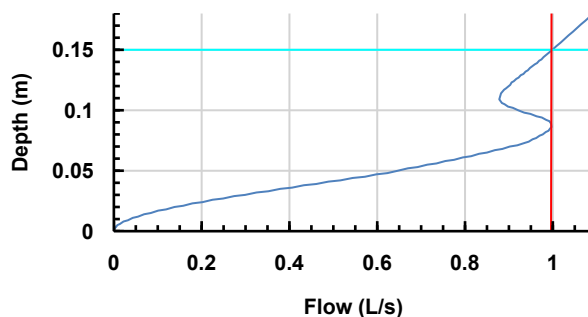
Inlet

Inlet Type	Point Inflow
Incoming Item(s)	New dwelling roof
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet (1)

Outgoing Connection	Pipe
Outlet Type	Hydro-Brake®
Invert Level (m)	0.950
Design Depth (m)	0.150
Design Flow (L/s)	1.0
Objective	Minimise Upstream Storage Requirements
Application	Surface Water Only
Sump Available	☐
Unit Reference	CHE-0058-1000-0150-1000



Project: Proposed Network AEG4746_Selsmore 24 Treloar Road (PO11 9SE)		Date: 29/08/2024			
		Designed by: JA	Checked by:		Approved By:
Report Details: Type: Inflow Summary Storm Phase: Phase		Company Address: Aegaea			

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
New dwelling roof	Cellular Storage		Time of Concentration	0.016	100	10	110	0.018
TOTAL		0.0		0.016				0.018

Project:	Date:			
Proposed Network	29/08/2024			
AEG4746_Selsmore	Designed by:	Checked by:	Approved By:	
24 Treloar Road (PO11 9SE)	JA			
Report Title:	Company Address:			
Rainfall Analysis Criteria	Aegaea			

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	10
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Project: Proposed Network AEG4746_Selsmore 24 Treloar Road (PO11 9SE)		Date: 29/08/2024			
Report Details: Type: Inflows Summary Storm Phase: Phase		Designed by: JA	Checked by:		Approved By:
		Company Address: Aegaea			



Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m³)
New dwelling roof	FEH: 100 years: +45 %: 15 mins: Summer	0.02	12.7	5.603

Project: Proposed Network AEG4746_Selsmore 24 Treloar Road (PO11 9SE)		Date: 29/08/2024			
		Designed by: JA	Checked by:		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase		Company Address: Aegaea			



Critical Storm Per Item: Rank By: Max. Resident Volume

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Lost Volume (m³)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Cellular Storage	FEH: 100 years: +45 %: 120 mins: Summer	1.077	1.077	0.127	0.127	5.2	7.682	0.000	1.0	0.000	8.292	18.135	OK

Project: Proposed Network AEG4746_Selsmore 24 Treloar Road (PO11 9SE)		Date: 29/08/2024			
Report Details: Type: Phase Management Storm Phase: Phase		Designed by: JA	Checked by:		Approved By:
		Company Address: Aegaea			



Phase
 FEH: 100 years: Increase Rainfall (%): +45: 120 mins: Summer

Tables

Name	Max. Inflow (L/s)	Total Inflow Volume (m³)	Max. Outflow (L/s)	Total Outflow Volume (m³)
5352			1.0	8.275
TOTAL	5.2	10.952	1.0	8.275

Graphs

