

Linland Ltd

Beachlands, Hayling Island

Beachlands, Hayling Island, Portsmouth, PO11 0AG

Flood Risk Assessment & Drainage Statement

**REPORT REF.
2400840-ACE-XX-XX-RP-C-0301 – Rev A**

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1. Introduction

Overview

- 1.1. Ardent Consulting Engineers (hereafter referred to as 'Ardent'), has been appointed by Linland Ltd., to prepare a Flood Risk Assessment (FRA) and Drainage Strategy to support a planning application for a proposed development at the land at Beachlands Hayling Island, PO11 0AG.
- 1.2. This Flood Risk Assessment has been prepared with specific reference to the requirements of the National Planning Framework (NPPF – December 2023) and the Planning Practice Guidance (March 2014 – flood risk section updated in August 2022). The report demonstrates that the site can be suitably developed whilst complying with the requirements of the NPPF in terms of Flood Risk.

Existing Site

- 1.3. The Site is approximately 0.81ha and is centred at Ordnance Survey grid reference 471374, 98801 on Hayling Island coastline, south of Sea Front in South Hayling. Refer to Figure 1-1 below for a site Location Plan. The existing site is currently occupied by the Beachland Amusement Arcade and Coffee Shop with a car park further to the beach.



Figure 1-1: Site Location Plan

Development Proposals

- 1.4. The scheme proposals comprise of the construction of 2 buildings with ground floor commercial units and 32No. flats above with a mix of two-bedroom and three-bedroom units. The development is classified as having an overall 'More Vulnerable' classification within the NPPF. The proposed development layout plans are provided in Appendix A.

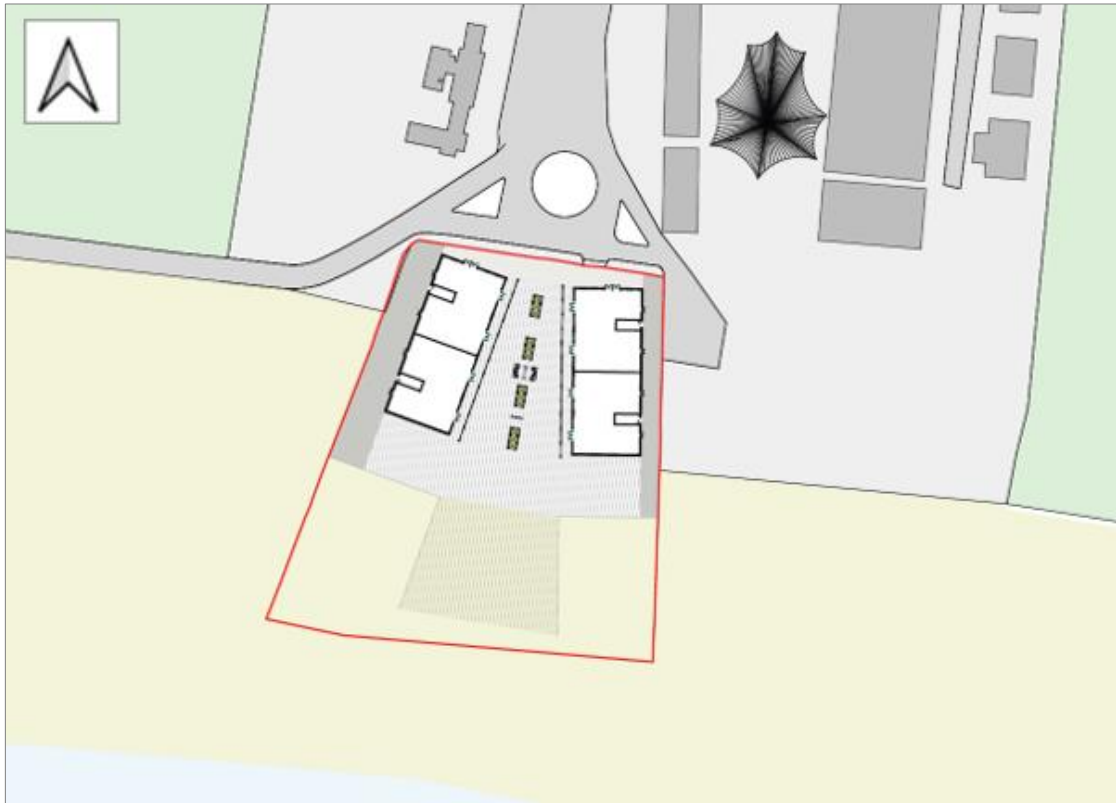


Figure 1-2: Proposed Ground Floor Development

2. Policy Context

National Planning Policy Framework

- 2.1. The National Planning Policy Framework (NPPF) was revised in December 2023; where paragraphs 165 to 175 inclusive establish the Planning Policy relating to flood risk management. The Technical Guide to the NPPF has been superseded by the Planning Practice Guidance (PPG) in March 2014. The Flood risk and coastal change guidance was updated in August 2022.
- 2.2. The PPG states that when planning or decision making in terms of flood risk, the process followed should be to avoid, control, mitigate and manage residual risk.
- 2.3. 'Avoiding' risk relates to the application of the sequential and exception tests, as discussed in detail for the site in Section 6 and summarised below:
- In plan-making, a sequential approach should be employed. This involves applying the 'Sequential Test' and, if needed, the 'Exception Test'
 - In decision-making, where necessary, planning authorities also apply the Sequential Test and, if needed, the Exception Test, to ensure that flood risk is minimised and appropriately addressed.
 - Where the sequential and the exception tests have been applied as necessary and not met, development should not be allowed.
 - Substitute lower vulnerability uses for higher vulnerability uses.
 - Within sites, using site layout to locate the most vulnerable aspects of development in areas of lowest flood risk, unless there are overriding reasons to prefer a different location. In addition, measures to avoid flood risk vertically can then be taken, by locating the most vulnerable uses on upper storeys, and by raising finished floor and/or ground levels, where appropriate and that such techniques are suitably designed. Such measures should also account for residual flood risks from flood risk management infrastructure.
- 2.4. The PPG provides the methodology required to undertake the Sequential and Exception Tests and this should be applied to all sources of flooding.

- 2.5. 'Controlling' the risk relates to measures that will control the risk of flooding affecting the site. Early discussions with relevant flood risk management authorities, reference to Strategic Flood Risk Assessments and any programme of flood and coastal erosion risk management schemes will help to identify such opportunities.
- 2.6. 'Mitigating' the risk relates to the use of flood resistance and resilience measures to address any residual risks after the use of avoidance and control measures.
- 2.7. 'Managing' the risk relates to considering further management measures to deal with any residual risk remaining after avoidance, control and mitigation have been utilized such as providing safe access and escape routes and considering whether adequate flood warning would be available to people using the development. Residual risks will need to be safely managed to ensure people are not exposed to hazardous flooding.

Flood and Water Management Act (2010)

- 2.8. The Flood and Water Management Act places a duty on all flood risk management authorities to co-operate with each other. The act also provides lead local flood authorities and the Environment Agency with a power to request information required in connection with their flood risk management functions.
- 2.9. The Lead Local Flood Authority (LLFA) for the proposed development is Hampshire County Council.

Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems (March 2015)

- 2.10. The non-statutory technical standards for sustainable drainage systems were published in March 2015. This document sets out non-statutory technical standards for sustainable drainage systems. They should be used in conjunction with the Planning Practice Guidance. In addition, the Best Practice Guidance for the Planning Practice Guidance was published in July 2015.
- 2.11. The Local Planning Authority (LPA) may set local requirements for planning permission that have the effect of more stringent requirements than these non-statutory technical standards. In addition, SuDS should be designed in accordance with CIRIA 753 SuDS Manual, which represents current best practice.

Hampshire County Council Local Flood and Water Management Strategy (2019)

2.12. As part of its duties as the designated LLFA under the Flood and Water Management Act 2010, Hampshire County Council is required to develop, maintain, implement, and monitor a Local Flood Risk Management Strategy (LFRMS).

2.13. The Local Strategy is a document which sets out how Hampshire County Council is responding to identified local flood risk with the key policies focussing on primarily effective partnerships and communication, both internally and with developers and the residents, alongside strong record keeping and investigation of flood events to be better prepared to identify risks in the future.

Partnership for South Hampshire Level 1 Strategic Flood Risk Assessment (2024)

2.14. The purpose of the SFRA is to assess and map all forms of flood risk from groundwater, surface water, impounded water bodies, sewer, river and tidal sources, taking into account future climate change.

2.15. It also provides recommendations on the management of flood risk and the application of a sequential approach in determining site selection so that development is, as far as reasonably possible, located where the risk of flooding from all sources is lowest, taking account of climate change and the vulnerability of future users to flood risk. In plan-making this involves applying the Sequential Test, and where necessary the Exception Test to Local Plans.

2.16. The Sequential Test must be applied for all major and non-major developments in areas at risk of flooding and, as such, applies to the development site.

2.17. The SFRA goes on to state that a site-specific FRA is required in the following circumstances:

- Proposals for new development (including minor development and change of use) in Flood Zones 2 and 3.
- Proposals in Flood Zone 1 with a site area of 1 hectare or more.

- Proposals for new development (including minor development and change of use) in an area within Flood Zone 1 which has critical drainage problems (as notified to the LPA by the Environment Agency).
- Proposals in an area within Flood Zone 1, which was identified in a SFRA as being at increased flood risk in future.
- Where proposed development or a change of use increases the vulnerability classification and where the SFRA shows it is at risk from other sources of flooding.

2.18. The site-specific FRAs should be proportionate to the degree of flood risk (inclusive of residual risk), the scale and nature of the development, its vulnerability classification, and the status of the site in relation to the Sequential and Exception Tests

Havant Borough Council Core Strategy (2011)

2.19. The Havant Borough Core Strategy is the principle document setting out the broad detail and direction of development in the borough up to 2026.

2.20. Policy CS15 relates to managing flood risk and coastal erosion risk in new developments. It states development in areas at risk of flooding now and in the future will only be permitted where the development is sequentially approached and gives significant consideration to the flood risk and mitigation as well as the safety of the occupants. The management of surface water runoff also needs to be adequately assessed.

Havant Borough Council Local Plan (Allocations) (2014)

2.21. The Havant Borough Local Plan (Allocations) is a continuation of the Havant Borough Local Plan (Core Strategy) that aims to outline the Borough's vision for growth and prosperity until 2026, as detailed in the Havant Borough Local Plan (Core Strategy).

2.22. Chapter 6 sets out the allocations and designations for Hayling Island. The intention of the Council to build on the Hayling Seafront Masterplan and do further master planning that focuses on the regeneration of Beachlands (HY45).

2.23. The development site is described as: '*Prominent site on the seafront at Hayling Island comprising a funfair, amusement centre, tourist information office and car parks*' with specific development requirements with the key points with regard to flood risk being:

- Flood Risk Assessment to support planning application.
- Avoid residential provision at ground floor level to minimise flood risk.
- Investigate ground quality conditions, as part of a planning application, and address any matters arising as relevant.
- Connection to the sewerage system at the nearest point of adequate capacity.
- Appropriate easement from existing sewage/waste infrastructure.
- A 15-metre gap is required between the pumping station and sensitive development, such as residential to avoid significant impacts from noise, odour and vibration.
- Need to consider a wider range of flood risk management measures and the possibility of land/road raising.

Hayling Island Coastal Management Strategy (2022)

2.24. The primary aim of the Hayling Coastal Management Strategy is to develop Strategic Coastal management options for Hayling Island for next 100 years to ensure adequate management of the coastal flooding and erosion with priorities to reduce the threat of coastal flooding and erosion to people and their property and benefit the environment, society and the economy as far as possible, in line with the Government's 'sustainable development principles'.

Climate Change Allowances

2.25. Climate change allowances for rainfall intensity, in the Planning Practice Guidance, were updated in May 2022. Climate change allowances are now broken down into management catchments. To allow for the predicted impacts of climate change on

surface water runoff within East Hampshire Management Catchment the peak rainfall allowance increases, detailed in Table 2-1 below, should be allowed for. For residential developments the minimum lifetime is 100 years and the upper end allowances should be used.

3.3% (1 in 30-year) Annual Exceedance Rainfall Event (%)		
Epoch	Central Allowance	Upper End Allowance
2050s	20%	35%
2070s	25%	40%
1% (1 in 100-year) Annual Exceedance Rainfall Event (%)		
Epoch	Central Allowance	Upper End Allowance
2050s	20%	40%
2070s	25%	45%

Table 2-1: East Hampshire Management Catchment Peak Rainfall Allowances

2.26. Therefore, under the NPPF an allowance of 45% for the effects of climate change for the 1% annual exceedance rainfall event would achieve the policy requirements in designing the drainage elements the proposed residential redevelopment (the design event).

2.27. The Planning Practice Guidance states that to allow for the predicted impacts of climate change on sea level rise within the East Solent area, the increases presented in Table 2-2 should be allowed for.

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 (meters)
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
South West	Higher Central	5.8 (203)	8.8 (264)	11.7 (351)	13.1 (393)	1.21
South West	Upper End	7 (245)	11.4 (342)	16 (480)	18.4 (552)	1.62

Table 2-2: Sea level allowances by river basin district for each epoch in mm for each year (based on 1981 to 2000 baseline) – the total sea level rise for each epoch is in brackets

2.28. According to the SFRA (2024), the East Solent Study that includes three inundation models for Hayling Island, Portsea Island, and Gosport to Warsash has been updated to reflect most recent sea level rise.

3. Sequential Test

- 3.1. The site is situated in Flood Zone 3 according to the Environment Agency flood mapping. Therefore, the sequential test would need to be undertaken. However, the site was allocated in the 2014 Havant Borough Local Plan as Beachlands (HYY2/HY45) for potential development in housing, leisure and tourism. The Sequential Test at that time was completed as part of the allocation process and therefore does not need to be undertaken again. The allocation is confirmed within the Strategic Flood Risk Assessment (Local Plan Sites) in November 2018 to inform the Local Plan update.

4. Existing Site Conditions

Topographical Survey

- 4.1. A detailed topographical survey was undertaken by P Stubbington Land Services Ltd. in July 2024 which demonstrates that the site is largely hardstanding at the northern end before grading into stone and gravel primarily associated with beach deposits.
- 4.2. The site is noted as being relatively flat with the highest levels being around the existing buildings at circa 5.05mAOD. There is a slight slope to the north of average 1:63 to a level of 4.74mAOD associated with the access road down from Sea Front.
- 4.3. Similarly, there is a slope down towards the beach to a level of circa 4.0mAOD at the edge of the developable area. The beach, further south, undulates between 5.0mAOD and 4.0mAOD within the site boundary before gradually sloping down to the Channel bed level.
- 4.4. The full topographic survey has been provided in Appendix B of this report for further reference.

Hydrology

- 4.5. Whilst there are no inland watercourses within the vicinity of the site, the English Channel and associated beach does form a border to the south of the site. The Solent estuary into the English Channel is located circa 12km to the west of the site whilst a series of lakes and channels surround the site up to 2km from boundary which form the border to the island.

Sewerage Undertaker Asset Plans

- 4.6. The public sewer asset record plan for the local area has been obtained from the Sewerage Undertaker for the region, Southern Water, which illustrates that there are no strategic surface water public sewers which traverse the site.
- 4.7. A 150mm diameter foul water sewer runs to the north of the site at an approximate depth of 1.7m below ground level (to the invert). A copy of the public sewer asset record plans has been provided within Appendix C.

Geology

- 4.8. At the time of writing, no intrusive site investigation works have been undertaken. However, a desktop review of the British Geological Survey (BGS) record plans for the area indicate the site is underlain by superficial Storm Beach Deposits (gravels) which form the stone beach to the south of the site. This is further underlain by a bedrock of Wittering Formation (sand, silt and clay), as illustrated in Figure 4-1 and Figure 4-2, respectively.
- 4.9. Nearby historic boreholes to the west of the site, but located on the same geological extent, identified groundwater at depths of 1.5m to 2.5m below ground level.



Figure 4-1: Extract of BGS's Superficial Geology (Source: BGS)



Figure 4-2: Extract of BGS's Bedrock Geology (Source: BGS)

5. Sources of Flooding

5.1. The NPPF requires flood risk from the following sources to be assessed, each of which are assessed separately below:

- Tidal sources (flooding from the sea).
- Fluvial sources (river flooding).
- Pluvial sources (flooding resulting from overland flows).
- Groundwater sources.
- Sewer Flooding.
- Artificial sources, canals, reservoirs etc.
- It also requires the risk from increases in surface water discharge to be assessed (surface water management).

Flood Zone Designation

5.2. Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. The NPPF Planning Practice Guidance defines Flood Zones as follows:

- **Flood Zone 1: Low Probability.** Land having a less than 1 in 1,000 annual probability of river or sea flooding.
- **Flood 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.
- **Flood 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.
- **Flood 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).

Fluvial / Tidal Flooding

5.3. According to the EA Flood Map for Planning (Figure 5-1) the majority of the site is located in land designated as Flood Zone 3 (high probability of fluvial flooding).

5.4. The northern part of the site shown to be in Flood Zone 1 (low probability of flooding) and Flood Zone 2 (medium probability of flooding).

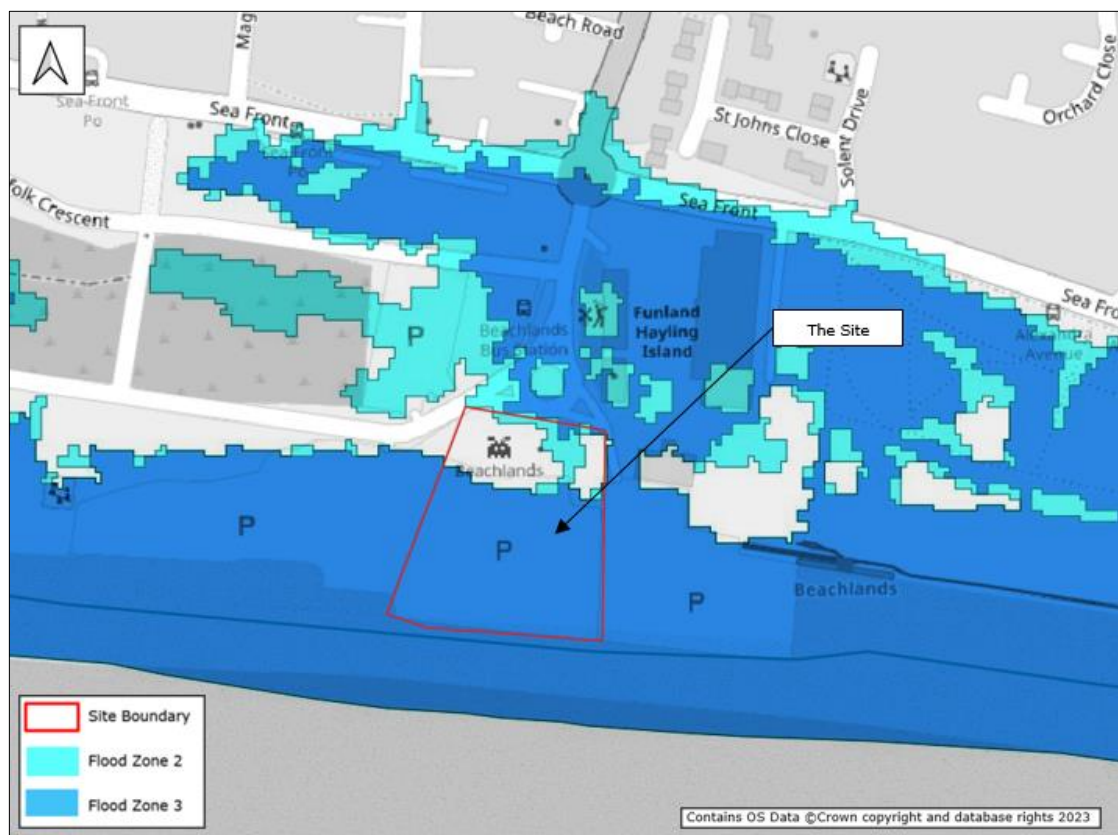


Figure 5-1: EA Flood Map for Planning (Rivers and Sea)

Hydraulic Modelling

- 5.5. The East Solent Flood Inundation Model for Hayling Island, Portsea Island, Gosport to Warsash was re-simulated for Partnership for South Hampshire Strategic Flood Risk Assessment (2024) (Portsmouth City Council).
- 5.6. The SFRA model is based on the existing 2D hydrodynamic tidal models from the East Solent Study which was completed in 2015 – 2018 with the results of this model being provided.
- 5.7. The 2018 hydraulic model was simulated for a range of scenarios (with defences and without defences) and a range of events to understand the present day and future flood risk from tidal sources. This was used to update the Flood Map for Planning Flood Zones and enable the mapping of 'areas benefitting from defences' (ABDs) at that time.
- 5.8. For each flood model, the following events were simulated:
- 10%, 4%, 3.33%, 1.33%, 1%, 0.5%, 0.2% and 0.1% Annual Exceedance Probability (AEP) events for the Present Day (2015).
 - 0.5% and 0.1% AEP events using UKCP09 climate change guidance medium emissions scenario and projected to the years 2031, 2065 and 2115.
- 5.9. The 2018 study indicates levels for the 0.5% climate change event 2115 epoch the level on the site is 5.13m AOD and for the 0.1% climate change event epoch 2115 is 5.22m AOD. The defence level at this location is 5.00m AOD.

Pluvial Flooding

- 5.10. The risk of flooding from surface water is presented in the GOV.UK online map at a strategic scale. It can be seen from the surface water flood map in Figure 5-2 that the site is shown to have a very low to low risk of flooding. The low flood risk covers a small western part of the site.

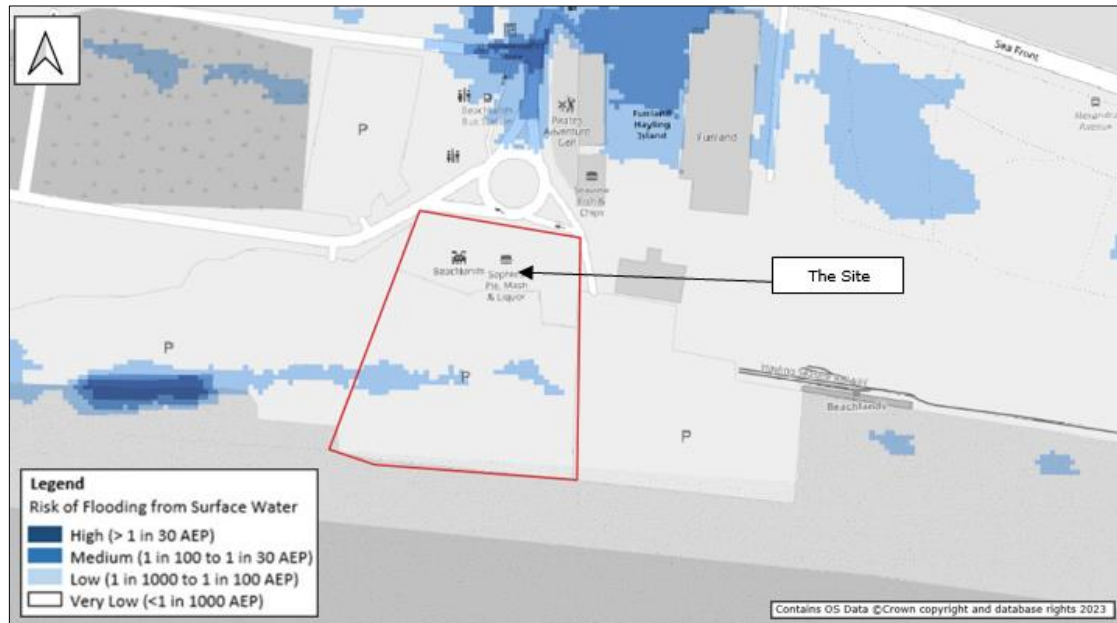


Figure 5-2: Environment Agency Flood Map for Surface Water

Groundwater Flooding

5.11. The site is underlain by Wittering Formation – Sand, silt and clay. This is overlain by superficial Storm Beach Deposits – Gravel. According to SFRA 2024, the site is located within medium area susceptible to groundwater flooding; see Figure 5-3.

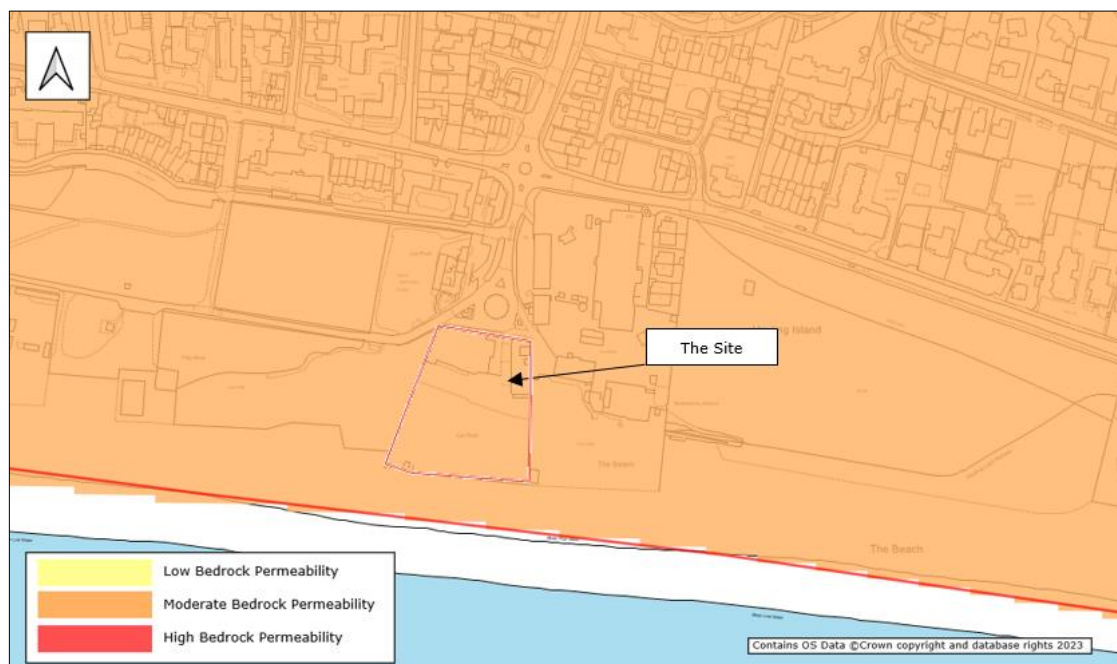


Figure 5-3: Geological Permeability Map (Source; SFRA)

5.12. According to the records held on the British Geological Survey website, a borehole (BGS Reference SZ79NW59) is located 300m north from the site. The borehole was drilled to a depth of 3.91m (1.13mbgl). Groundwater was encountered at a depth of 4.59m (0.5m bgl). However, boreholes to the west of the site within similar strata identified groundwater at a depth of 1.5m – 2.5m bgl.

Sewer Flooding

5.13. There are no surface water sewers located in the vicinity of the site whilst the risk of flooding from foul water sewers is considered 'very low'. The overall risk of sewer flooding is therefore considered 'very low'.

Artificial Sources

5.14. There are no canals or reservoirs within the vicinity of the site and the Environment Agency mapping shows that there is no flood risk from these sources at the development site.

Summary of Flood Risk

5.15. A summary of the assessed risk of flooding from all sources is shown in Table 5-1 below.

<i>Source</i>	<i>Level of Flood Risk</i>
Tidal/Fluvial	Low - High
Pluvial	Low
Groundwater	Low
Sewer	Very Low
Artificial Sources	Negligible

Table 5-1: Summary of Flood Risk

6. Surface Water Management

Existing Surface Water Drainage

- 6.1. The existing site is currently occupied by the Beachland Amusement Arcade and Coffee Shop with a car park further to the beach. The topographical survey does pick up existing gulleys and downpipes but gives no indication as to the outfall location. It is assumed, given that there are no public sewers, and the site is located adjacent to the English Channel and beach, that the site currently drains via infiltration.

Existing Discharge Rates

- 6.2. The overall site area is approximately 0.81ha, however, as much of the site is to remain as per the existing scenario it has been calculated that the developable area equates to approximately 0.48ha. The entire impermeable area is located within this 0.48ha which equates to 73% of the developable area, or 0.35ha of impermeable area.
- 6.3. The existing runoff rates from the developable area were determined using the Wallingford Procedure Rational Method for an assumed critical 5-minute storm:

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

Where:

Q = Peak Discharge (l/s)

i = Rainfall Intensity (mm/hr)

(50.8mm/hr for 1yr 5 min storm - TRRL Report 595)

A = Contributing Impermeable Areas (ha)

- 6.4. The surface water run-off generated from the Site during the 1 year, 30 year, and 100 year rainfall events are provided in Appendix D. For comparison the equivalent Greenfield runoff rates from the Site have been determined using the ICP SuDS Mean Annual Flow Method (IoH 124).
- 6.5. A summary of both the Brownfield and equivalent Greenfield runoff rates are provided in *Table 6-1* below with the calculations provided in Appendix E.

Scenario	Area	$Q_{Bar.}$	$Q_{1yr.}$	$Q_{30yr.}$	$Q_{100yr.}$
<i>Brownfield</i>	0.350 ha	-	49.4 l/s	109.9 l/s	140.0 l/s
<i>Greenfield</i>	0.480 ha	1.7 l/s	1.4 l/s	3.8 l/s	5.4 l/s

Table 6-1: Comparative Brownfield and Greenfield Runoff Rates

Drainage Hierarchy

6.6. In accordance with the NPPF Planning Practice Guidance, surface water runoff should be disposed of according to the following hierarchy:

1. Store rainwater for later use (for example rainwater harvesting, blue roofs for irrigation;
2. Use infiltration techniques, such as porous surfaces in non-clay areas;
3. Rainwater attenuation in green infrastructure features for gradual release;
4. Discharge rainwater direct to a watercourse;
5. Controlled discharge to a surface water sewer/drain; and
6. Controlled discharge to the combined sewer.

6.7. These are assessed in full below.

Store Rainwater for Later Use

6.8. Rainwater harvesting methods provide localised storage of water for re-use across the site as potable water. Large scale measures are not considered feasible at the site given the individual property usage and limited shared space which will also be formed of timber as a boardwalk. This method has therefore been discounted at the development site.

Into the Ground (Infiltration)

- 6.9. The site is located on Storm Beach Deposits (gravels) which form the stone beach to the south of the site which further underlain by a bedrock of Wittering Formation (sand, silt and clay).
- 6.10. The superficial deposits are likely to promote infiltration whilst it is noted that Wittering Formation can have variable infiltration potential. Given the potential and proximity of the site to the coast and topography, infiltration is considered an appropriate means of discharge from the site.
- 6.11. In-situ testing should be undertaken at the site to ascertain an accurate rate for the development site but at the time of writing this is not available. As such, it is proposed to utilise a conservative value of infiltration through the geological strata of 1×10^{-5} m/s, although the storm beach deposits are likely to provide a much greater rate.

Rainwater Attenuation in Green Infrastructure

- 6.12. Due to the location of the site, there is limited potential for green infrastructure to be provided at the site. However, it is not that infiltration techniques are high up the drainage hierarchy and are therefore the preferred method of discharge.

To a Watercourse

- 6.13. The nearest watercourse is the English Channel to the south of the site. However, a positive connection to the channel is not possible due to the recreational use of the beach; it is likely that infiltration techniques will lead to water discharging through the superficial deposits into the wider beach area and subsequently into the Channel.

To a surface water sewer, highway drain, or another drainage system

- 6.14. There are no known existing surface water sewers within the vicinity of the site and has therefore been discounted as a means of discharge from the site.

To a Combined Sewer

6.15. There are no combined water sewers and drains within the vicinity of the site. As this is further down the hierarchy than infiltration this method of discharge has not been considered.

Proposed Sustainable Drainage Systems (SuDS)

6.16. The constraints and opportunities for the use of SuDS techniques within the Site is appraised in Table 6-2 below, adopting the management train approach outlined in CIRIA C753 'The SuDS Manual'.

Type	<i>Infiltration Devices (Source Control)</i>
Constraints	High groundwater and variable infiltration potential could inhibit infiltration techniques.
Opportunities	Superficial Storm Beach Deposits are likely to have a very high infiltration potential and connect to the wider beach and Channel hydrology thus providing an appropriate discharge point.
Type	<i>Permeable Paving (Source Control)</i>
Constraints	Limited paving within the development and provision of services that will be required for the new development limits available space.
Opportunities	None considered.
Type	<i>Rainwater Harvesting (Source Control)</i>
Constraints	The benefits of rainwater harvesting on a specific design storm event cannot be quantified, due to the seasonal availability of storage within the structure.
Opportunities	None given the site use and materials surrounding the development.
Type	<i>Swales etc. (Permeable Conveyance)</i>
Constraints	Significant land requirement to accommodate 1:3 side slopes.
Opportunities	None.
Type	<i>Bio Retention Systems</i>
Constraints	Limited benefits to attenuation requirements in larger developments.

Opportunities	No significant streetside trees or planting is proposed and therefore opportunities are extremely limited.
Type	Living Roofs
Constraints	Limited benefits to attenuation requirements in larger developments and require additional structural integrity.
Opportunities	Potential use of living roofs on the development subject to structural design capacity.
Type	Attenuation Tanks (End of Line Treatment)
Constraints	None.
Opportunities	Oversize pipes or geocellular storage could be utilised if required.

Table 6-2: C753 SuDS Management Train

6.17. After consideration of the CIRIA C753 approach the most viable SuDS option for the development site is considered to be high-level infiltration devices in the form of an ring soakaways combined with an infiltration trench within the gravel beach deposits.

Pre and Post Development Impermeable Area

6.18. The overall site area is approximately 0.81ha, however, as much of the site is to remain as per the existing scenario it has been calculated that the developable area equates to approximately 0.48ha. The entire impermeable area is located within this 0.48ha which equates to 73% of the developable area, or 0.35ha of impermeable area. The post-development changes increase the impermeable area through the introduction of the new buildings and a boardwalk which is conservatively considered impermeable for the purpose of this assessment.

6.19. A summary of the change in impermeable area across the site is provided in Table 6-3 below.

Site Ref.	Total Developable Area (ha)	Impermeable Area (ha)	Permeable Area (ha)	% Impermeable
<i>Pre-Development</i>	0.480 ha	0.350 ha	0.130 ha	73 %
<i>Post-Development</i>	0.480 ha	0.472 ha	0.008 ha	98 %

Table 6-3: Summary of Pre- and Post-Development Impermeable Areas

Proposed Discharge Rates

6.20. As it is proposed to discharge the surface water drainage through infiltration, it is not necessary to set a restricted discharge rate from the site. As introduced earlier, there are currently no in-situ investigative results available at the time of writing and it is therefore proposed to proceed with a conservative estimation of infiltration of 1×10^{-5} m/s for any infiltration device.

Proposed Surface Water Attenuation

6.21. In order to facilitate the infiltration devices, it is good practice to attenuation across the site for the surface water runoff. However, given the location of the site, it is proposed to utilise the gravel beach deposits as an infiltration system allowing for an effective area which will manage the network in coordination with a conventional piped network and distribution boxes similar to those use with permeable paving. The proposed surface water drainage strategy layout is provided in Appendix F.

6.22. The *Causeway Flow* design software has been utilised to calculate the storage requirements for the 1 in 1 year, 1 in 30-year, 1 in 30-year + 40% climate change allowance, 1 in 100-year and 1 in 100-year + 45% climate change allowance events with a total storage volume of 219 m³ required; this is based on an effective area of 1460m² with a 0.5m depth and 30% porosity. These calculations can be found in full in Appendix H.

6.23. The drainage strategy is currently indicative, and the proposed infiltration design is subject to the results of in-situ testing to confirm the infiltration rate achievable on site.

Urban Creep

6.24. As the proposed development is for flats and commercial units there is no requirement for urban creep to be considered for the development.

Long Term Storage

6.25. Although there will be an increase in impermeable area as a result of the development, the proposals are to discharge via natural infiltration measures in

accordance with the drainage hierarchy. Therefore, there is no requirement for Long Term Storage.

Maintenance and Management of System

6.26. The maintenance of all SuDS components will be in accord with the best practices and the CIRIA Manual C753. The responsibility will lie with a Management Company appointed by the developer. The name of the Management Company is to be advised at a later date.

Surface Water Quality

6.27. The recommended stage of treatment in terms of water quality will be provided through the aforementioned SuDS features. In line with the SuDS Manual C753, Tables 26.2 and 26.3, the pollution hazard and mitigation indices associated with residential roofs can be mitigated by the provision of SuDS features.

6.28. A summary of the pollution hazard and mitigation indices associated to the development proposals has been conservatively provided in Table 6-4 below. This demonstrates that the infiltration through the granular material provides enough treatment to the runoff without any consideration needed for any additional treatment structures.

<i>For surface water discharge from Residential Roofs</i>			
	<i>Required mitigation indices</i>		
<i>Source</i>	<i>TSS</i>	<i>Metals</i>	<i>Hydrocarbons</i>
Very Low	0.20	0.20	0.05
<i>Type of SuDS Component Provided</i>			
Filter Drain / Infiltration	0.40	0.40	0.40
Total	0.40	0.40	0.40
Check	+0.20	+0.20	+0.35

Table 6-4: CIRIA C753 SuDS Mitigation Indices

7. Proposed Foul Water Drainage Strategy

- 7.1. The existing site is currently occupied by an amusement arcade and coffee shop and therefore has limited foul water discharge, estimated to be 0.248 l/s, based on the British Flows and Loads guidance.
- 7.2. Calculations for the proposed development have been undertaken, also based on the British Flows and Loads guidance, where it is estimated that the proposed development will produce a peak foul flow from the site equating to 1.759 l/s. Refer to the Foul Loading Calculations provided in Appendix H.
- 7.3. It is proposed that foul flows from the development will discharge into Southern Water sewer located to the north of the site subject to confirmation of the invert level of the head of the run. A preliminary layout of the foul water drainage is provided in Appendix I.

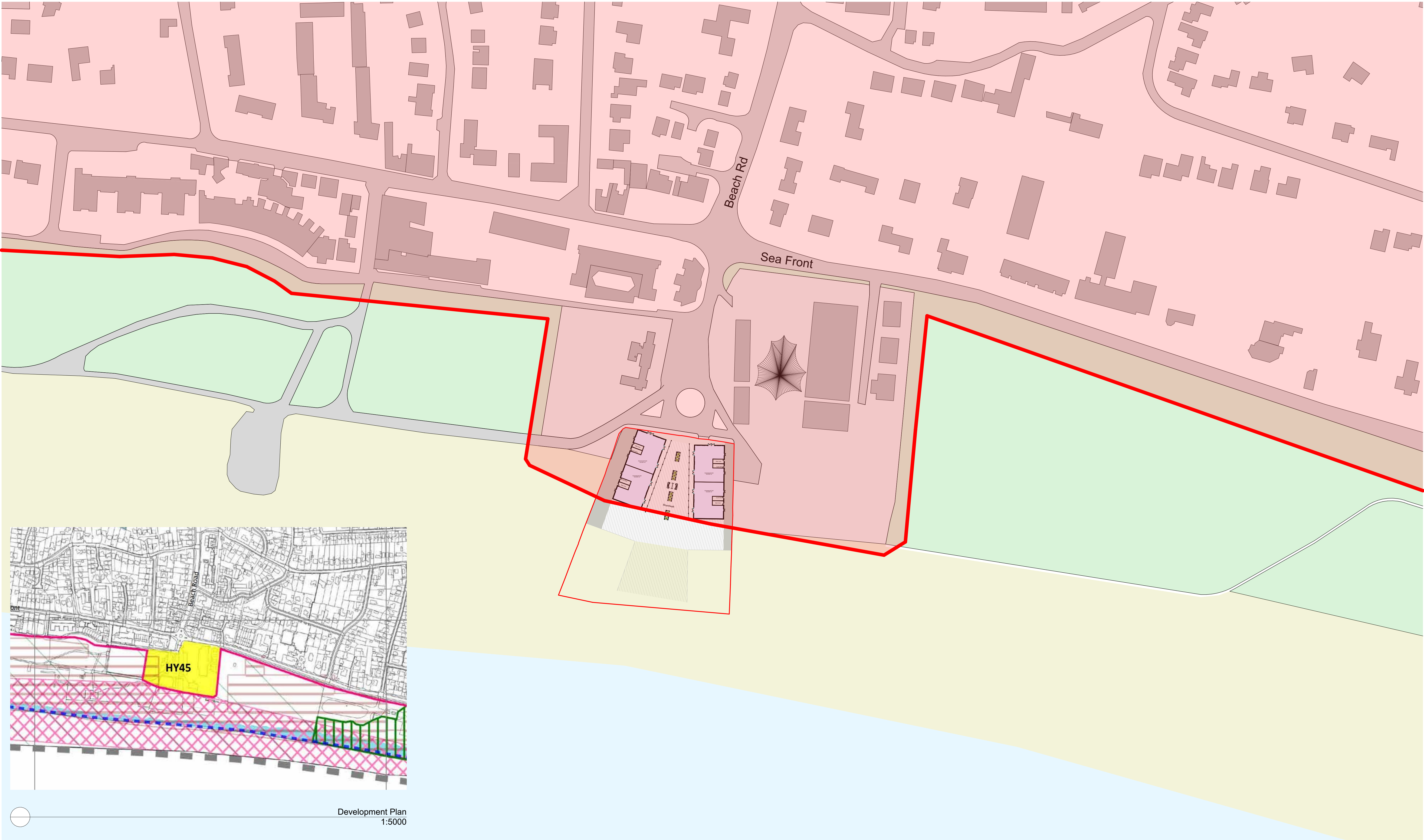
8. Conclusions

- 8.1. Ardent Consulting Engineers (hereafter referred to as 'Ardent'), has been appointed by Linland Ltd., to prepare a Flood Risk Assessment (FRA) and Drainage Strategy to support a development at the land at Beachlands Hayling Island, PO11 0AG.
- 8.2. The Site is approximately 0.81ha and is centred at Ordnance Survey grid reference 471374, 98801 on Hayling Island coastline, south of Sea Front in South Hayling. The existing site is currently occupied by the Beachland Amusement Arcade and Coffee Shop with a car park further to the beach.
- 8.3. The scheme proposals comprise of the construction of 4 buildings with a ground floor commercial units, 8 two-bedroom flats per floor, with 32 flats in total with 78 parking spaces. The development is classified as having an overall 'More Vulnerable' classification within the NPPF.
- 8.4. According to the EA Flood Map for Planning the majority of the site is located in land designated as Flood Zone 3 (high probability of fluvial flooding). The northern part of the site shown to be in Flood Zone 1 (low probability of flooding) with some areas in Flood Zone 2 (medium probability of flooding).
- 8.5. Given that the site is situated in Flood Zone 2 and Flood Zone 3, the sequential test would need to be undertaken. However, the site was allocated in the 2014 Havant Borough Local Plan as Beachlands (HYY2/HY45) for potential development in housing, leisure and tourism. The Sequential Test at that time was completed as part of the allocation process and therefore does not need to be undertaken again. The allocation is confirmed within the Strategic Flood Risk Assessment (Local Plan Sites) in November 2018 to inform the Local Plan update.
- 8.6. The 2018 East Solent Flood Inundation Model for Hayling Island study indicates levels for the 0.5% climate change event 2115 epoch the level on the site is 5.13m AOD and for the 0.1% climate change event epoch 2115 is 5.22m AOD. The defence level at this location is 5.00m AOD.
- 8.7. The risk of flooding from surface water is presented in the GOV.UK online map at a strategic scale and the site is shown to have a very low to low risk of flooding. The low flood risk covers a small western part of the site.

- 8.8. The site is underlain by Wittering Formation – Sand, silt and clay. This is overlain by superficial Storm Beach Deposits – Gravel. According to SFRA 2024, the site is located within medium area susceptible to groundwater flooding.
- 8.9. Groundwater levels are noted to range in the vicinity of the site but boreholes to the west of the site within similar strata identified groundwater at a depth of 1.5m – 2.5m bgl.
- 8.10. The superficial deposits are likely to promote infiltration whilst it is noted that Wittering Formation can have variable infiltration potential. Given the potential and proximity of the site to the coast and topography, infiltration is considered an appropriate means of discharge from the site.
- 8.11. In order to facilitate the infiltration devices, it is good practice to attenuation across the site for the surface water runoff. However, given the location of the site, it is proposed to utilise the gravel beach deposits as an infiltration system allowing for an effective area which will manage the network in coordination with a conventional piped network and distribution boxes similar to those use with permeable paving.
- 8.12. In-situ testing has not been undertaken for the development site at the time of writing. As such, it is proposed to utilise a conservative value of infiltration through chalk strata of 1×10^{-5} m/s.
- 8.13. The *Causeway Flow* design software has been utilised to calculate the storage requirements for the 1 in 1 year, 1 in 30-year, 1 in 30-year + 40% climate change allowance, 1 in 100-year and 1 in 100-year + 45% climate change allowance events with a total combined storage volume of 219 m³ required; this is based on an effective area of 1460m² with a 0.5m depth and 30% porosity.
- 8.14. It is estimated that the proposed development will produce a peak foul flow from the site equating to 1.759 l/s which will discharge into Southern Water located to the north of the site subject to confirmation of the invert level of the head of the run.
- 8.15. In conclusion, this FRA demonstrates that the proposals are consistent with the aims of NPPF, PPG and Development Plan. The site would not be at risk of flooding or increase the flood risk to others as a result of the proposed development and the proposed management of surface water runoff is proportionate for the development.

Appendix A

Proposed Development Plans



Development Plan
1:5000

Site Plan
1:1000

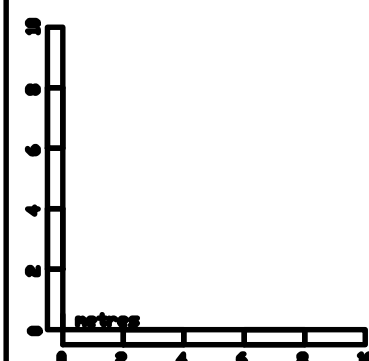
Appendix B

Topographical Survey



98800N

987501



KTY	British Telecom
kt	Control Box
ch	Covered Road
cw	Cable Television
clv	Drop Kiosk
sp	Electricity Pole
rh	Fire Hydrant
g	Gully
gv	Gas Stop Valve
n	Haight
ic	Inspection Cover
l	Invert
lv	Lamp Post
r	Narrows
a/h	Overhead
p	Park Lane
sv	Road Crossing
rp	Name Plate
ss	Sidewalk
av	Stop Valve
st	Telephone Box
t	Traffic
tt	Top of Tree
th	Threshold
ut	Top of Wall
uk	Unable to Lift
v	Underpass
vt	Vacuum Valve
wp	Water Stop Valve

NOTED
LEVELS RELATE TO D.S. DATUM
THAT SPICES SHOULD BE VERIFIED WHERE OF
CRITICAL IMPORTANCE
THE APPARENT SHARP SATURTY THEREABOUTS OF ALL THREE
LEVELS OF THE SITE OF THE DRAINAGE DITCH
OTHER CONSIDERATION OF HAZARDOUS SHOULD BE VERIFIED
WHERE OF CRITICAL IMPORTANCE USING CCTV
PIPE SCOPES & SURVEYS DETERMINED WITHOUT
ENTRY TO HAZARDOUS
ALL DIMENSIONS & LEVELS SHOWN IN METRES
ON SITE DIMENSION ACCURACY IS TAKEN RELATIVE TO
THE POSITION OF THE DRAINAGE DITCH CHECKED ON SITE
WHERE OF CRITICAL IMPORTANCE

**P STUBBINGTON
LAND SURVEYS LTD**

**THE HEAD
DURLEY BROOK ROAD
DURLEY
SOUTHAMPTON
HAMPSHIRE
SO32 2AR**

TEL : 023 8060 1876

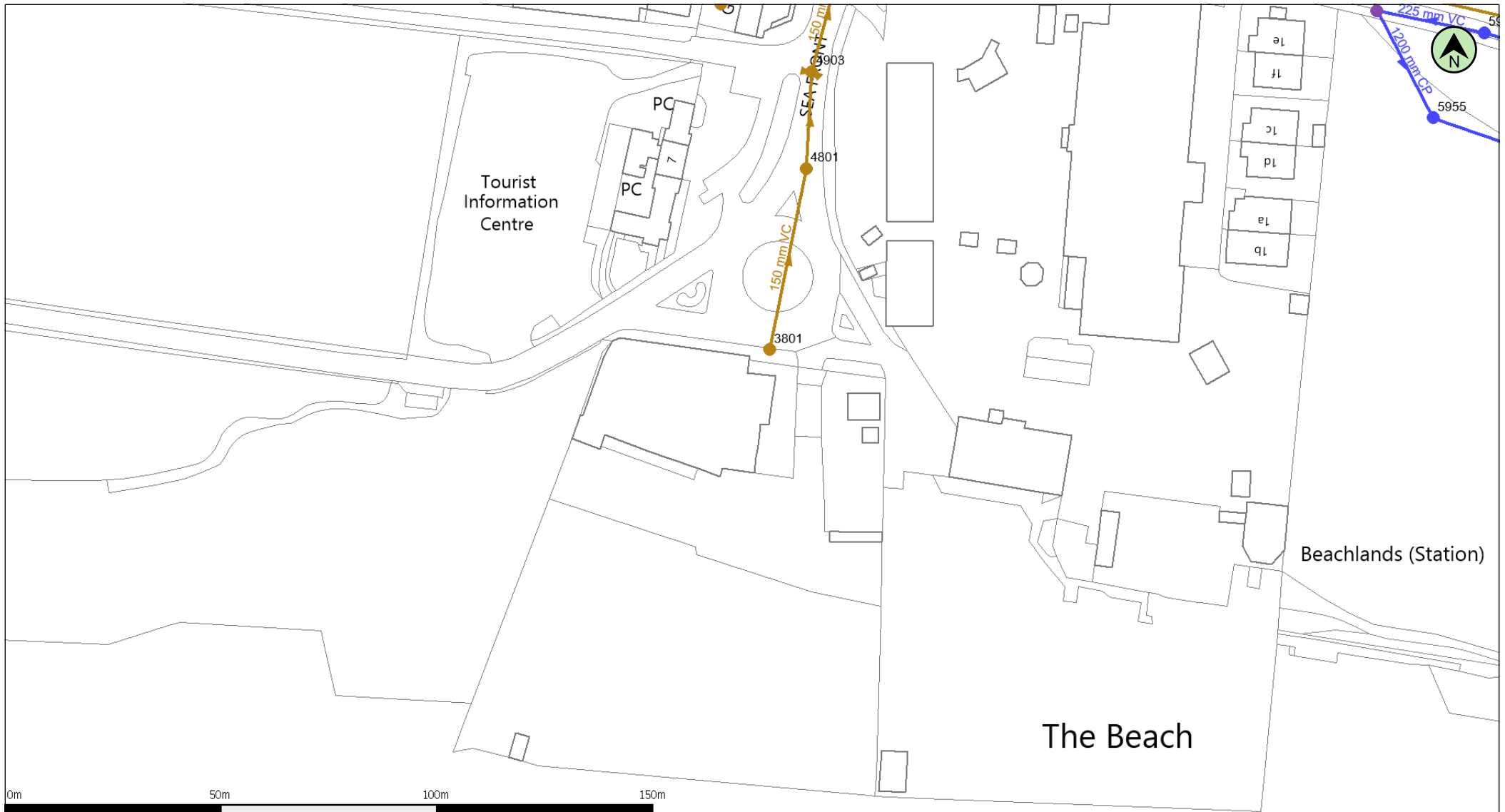
**MOBILE -
07793 348165**

**EMAIL -
PAUL@ISLANDSURVEYS.CO**

CLIENT: -	M L SAVAGE
CONTRACT: -	BEACHLANDS HAYLING ISLAND POLI OAG
TITLE: -	TOPOGRAPHIC SURVEY
SCALE: -	1:250 @A1
DRAWING NO.	11252/01
DATE: -	JULY 2024
SURVEYOR: -	PS

Appendix C

Southern Water Asset Plans

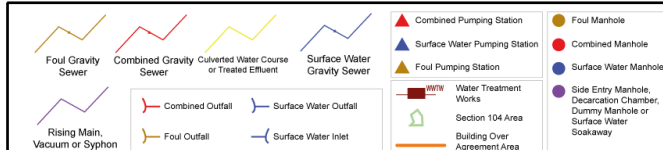


(c) Crown copyright and database rights 2024 Ordnance Survey 100031673 Date: 02/09/24 Scale: 1:1250 Map Centre: 471390,98833 Data updated: 22/08/24 Our Ref: 1558687 - 1 Wastewater Plan A4 Powered by digdat

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.



lbarrett@ardent-ce.co.uk
Beachland



Appendix D

Existing Brownfield Runoff Calculations

EXISTING SURFACE WATER

Existing site information:

Site Boundary Area	8100	m2
Developable Area	0.48	ha
Impermeable Area	0.3500	ha



Modified Rational Method Equation: $Q_n = 2.78 CiA$

where:

- C Runoff Coeffic = 1 (in this case 1 as using impermeable area)
- i_n Rainfall Intensity for n return period (mm/hr)
- A Impermeable Area (Ha)
- Q_n Runoff for n return period (l/s)

The rainfall intensities for various return periods were extracted from Table 1(a) of the Transport and Road Research Laboratory Report - Estimated rainfall for drainage calculations in the United Kingdom (TRRL Report LR 595) by C. P. Young. For the 5 min duration.

i_1	50.8 mm/hr
i_{30}	113.02 mm/hr
i_{100}	143.9 mm/hr

Existing Surface Water Runoff:

Therefore:

			C		i_n		A		Q_n
Q_1	2.78	x	1	x	50.8	x	0.35	=	49.43 l/s
Q_{30}	2.78	x	1	x	113.0	x	0.35	=	109.97 l/s
Q_{100}	2.78	x	1	x	143.9	x	0.35	=	140.01 l/s

Appendix E

Surface Water Greenfield Runoff Calculations

Ardent Consulting Engineers		Page 1
Suite 207	2400840	
One Alie Street	Beachlands	
London E1 8DE	Greenfield Rates	
Date 01/09/2024	Designed by LB	
File	Checked by CC	
Innovyze	Source Control 2020.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years) 2 SAAR (mm) 721 Urban 0.000

Area (ha) 0.480 Soil 0.400 Region Number Region 7

Results 1/s

QBAR Rural 1.7

QBAR Urban 1.7

Q2 years 1.5

Q1 year 1.4

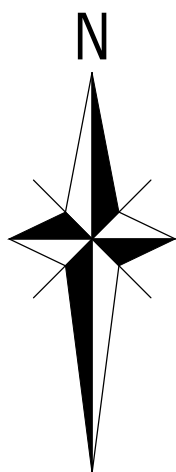
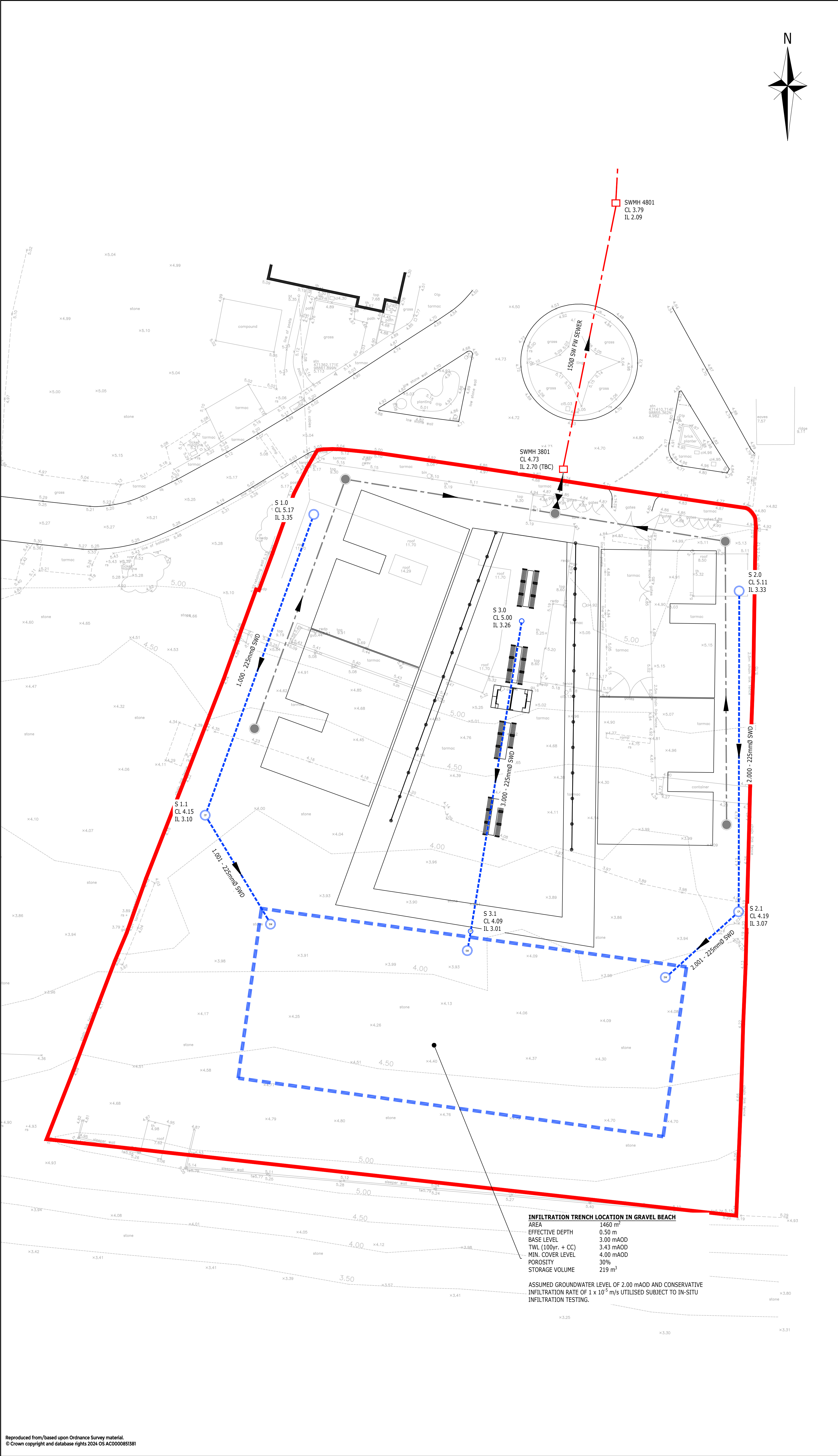
Q30 years 3.8

Q100 years 5.4

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Appendix F

24000840-ACE-XX-XX-DR-C-0301: Proposed Surface Water Drainage Layout



- NOTES:
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION, INC. RISK ASSESSMENTS AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
 - DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
 - ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES UNLESS OTHERWISE STATED.
 - ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
 - NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.

INFORMATION SUMMARY			
INFORMATION TYPE	SOURCE	REFERENCE	REVISION & DATE
SITE LAYOUT	PWP ARCHITECTS	-	16.07.2024
TOPOGRAPHICAL SURVEY	P STUBBINGTON LAND SURVEYS LTD.	11252 / 01	JULY 2024
OS	-	-	-
FLOOD DATA	-	-	-
LANDSCAPE	-	-	-
HIGHWAYS LAYOUT	-	-	-
STRATEGIC HIGHWAY LAYOUT	-	-	-
STRATEGIC DRAINAGE	-	-	-
STRATEGIC LEVELS	-	-	-

- DRAINAGE KEY**
- SITE BOUNDARY
 - EXISTING SOUTHERN WATER FOUL WATER SEWER & MANHOLE (MH) / INSEPTION CHAMBER (IC)
 - PROPOSED SURFACE WATER SEWER & MANHOLE (MH) / INSEPTION CHAMBER (IC)
 - CATCHPIT MANHOLE / INSEPTION CHAMBER
 - ≡ NON-RETURN VALVE
 - PROPOSED FOUL WATER SEWER & MANHOLE (MH) / INSEPTION CHAMBER (IC)
 - INFILTRATION TRENCH EXTENTS (30% VOID RATIO)
 - PROPOSED CONCRETE RING SOAKAWAY
 - ➔ PROPOSED EXCEEDANCE FLOW ROUTES

PRELIMINARY



INFILTRATION TRENCH LOCATION IN GRAVEL BEACH

AREA	1460 m²
EFFECTIVE DEPTH	0.50 m
BASE LEVEL	3.00 mAO
TWL (100yr. + CC)	3.43 mAO
MIN. COVER LEVEL	4.00 mAO
POROSITY	30%
STORAGE VOLUME	219 m³

ASSUMED GROUNDWATER LEVEL OF 2.00 mAO AND CONSERVATIVE INFILTRATION RATE OF 1×10^{-3} m/s UTILISED SUBJECT TO IN-SITU INFILTRATION TESTING.

Appendix G

Proposed Surface Water Drainage Hydraulic Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Depth (m)
S 1.0	0.076	4.00	5.170	Manhole	Adoptable	600	1.816
S 1.1	0.097	4.00	4.150	Manhole	Adoptable	600	1.053
S 2.0	0.069	4.00	5.110	Manhole	Adoptable	600	1.779
S 2.1	0.077	4.00	4.190	Manhole	Adoptable	600	1.117
S 3.0	0.153	4.00	5.000	Manhole	Adoptable	600	1.733
S 3.1	0.000		4.090	Manhole	Adoptable	600	1.080
Infiltration Area	0.000		4.000	Manhole	Adoptable	600	1.075
Outfall	0.000		4.000	Manhole	Adoptable	600	1.178

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type
1.000	S 1.0	S 1.1	43.668	0.600	3.354	3.097	0.257	170.0	225	Circular
1.001	S 1.1	Infiltration Area	16.483	0.600	3.097	3.000	0.097	170.0	225	Circular
2.000	S 2.0	S 2.1	43.801	0.600	3.331	3.073	0.258	170.0	225	Circular
2.001	S 2.1	Infiltration Area	12.430	0.600	3.073	3.000	0.073	170.0	225	Circular
3.000	S 3.0	S 3.1	43.774	0.600	3.267	3.010	0.257	170.0	225	Circular
3.001	S 3.1	Infiltration Area	1.713	0.600	3.010	3.000	0.010	170.0	225	Circular
1.002	Infiltration Area	Outfall	25.000	0.600	2.925	2.822	0.103	242.7	300	Circular

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Maximum Depth (m)	Σ Area (ha)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	S 1.0	S 1.1	1.000	39.7	10.3	1.591	0.828	1.591	0.076	78	0.841
1.001	S 1.1	Infiltration Area	1.000	39.7	23.4	0.828	0.775	0.828	0.173	124	1.040
2.000	S 2.0	S 2.1	1.000	39.7	9.4	1.554	0.892	1.554	0.069	74	0.821
2.001	S 2.1	Infiltration Area	1.000	39.7	19.8	0.892	0.775	0.892	0.146	112	0.998
3.000	S 3.0	S 3.1	1.000	39.7	20.7	1.508	0.855	1.508	0.153	116	1.011
3.001	S 3.1	Infiltration Area	1.000	39.7	20.7	0.855	0.775	0.855	0.153	116	1.011
1.002	Infiltration Area	Outfall	1.005	71.0	64.0	0.775	0.878	0.878	0.472	224	1.132

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

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	0	0	0
100	45	0	0

Node Outfall Online Pump Control

Flap Valve	x	Design Depth (m)	2.500	Switch off depth (m)	2.400
Replaces Downstream Link	✓	Design Flow (l/s)	0.1		
Invert Level (m)	2.822	Switch on depth (m)	2.500		

Depth (m)	Flow (l/s)
0.001	0.100

Node Infiltration Area Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.03600	Invert Level (m)	3.000	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.03600	Time to half empty (mins)	196	Depth (m)	0.500
Safety Factor	2.0	Width (m)	24.150	Inf Depth (m)	0.500
Porosity	0.30	Length (m)	60.500		

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.22%

US Node	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
S 1.0	3.428	0.074	9.6	0.0834	0.0000	OK
S 1.1	3.221	0.124	21.7	0.2633	0.0000	OK
S 2.0	3.402	0.071	8.7	0.0748	0.0000	OK
S 2.1	3.186	0.113	18.3	0.1881	0.0000	OK
S 3.0	3.379	0.112	19.3	0.2289	0.0000	OK
S 3.1	3.137	0.127	19.4	0.0358	0.0000	OK
Infiltration Area	3.084	0.159	29.3	23.6668	0.0000	OK
Outfall	3.086	0.264	4.0	0.0748	0.0000	OK

US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
S 1.0	1.000	S 1.1	9.6	0.572	0.240	0.7392	
S 1.1	1.001	Infiltration Area	21.1	0.986	0.532	0.3536	
S 2.0	2.000	S 2.1	8.7	0.570	0.218	0.6716	
S 2.1	2.001	Infiltration Area	17.9	0.940	0.451	0.2370	
S 3.0	3.000	S 3.1	19.4	0.913	0.489	0.9330	
S 3.1	3.001	Infiltration Area	19.0	0.905	0.479	0.0360	
Infiltration Area	1.002	Outfall	4.0	0.443	0.056	1.2962	
Infiltration Area	Infiltration		7.3				
Outfall	Pump		0.0				0.0

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.22%

US Node	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
S 1.0	3.792	0.438	32.8	0.4910	0.0000	SURCHARGED
S 1.1	3.608	0.511	72.9	1.0865	0.0000	SURCHARGED
S 2.0	3.534	0.203	29.8	0.2145	0.0000	OK
S 2.1	3.418	0.345	59.9	0.5737	0.0000	SURCHARGED
S 3.0	4.059	0.792	66.0	1.6213	0.0000	SURCHARGED
S 3.1	3.312	0.302	19.8	0.0855	0.0000	SURCHARGED
Infiltration Area	3.312	0.387	60.6	122.9593	0.0000	SURCHARGED
Outfall	3.312	0.490	6.0	0.1387	0.0000	OK

US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
S 1.0	1.000	S 1.1	31.1	0.783	0.783	1.7367	
S 1.1	1.001	Infiltration Area	71.2	1.790	1.791	0.6457	
S 2.0	2.000	S 2.1	28.1	0.708	0.708	1.6966	
S 2.1	2.001	Infiltration Area	59.2	1.491	1.490	0.4784	
S 3.0	3.000	S 3.1	63.4	1.594	1.594	1.7409	
S 3.1	3.001	Infiltration Area	19.3	0.783	0.485	0.0681	
Infiltration Area	1.002	Outfall	6.0	0.472	0.084	1.7605	
Infiltration Area	Infiltration		7.5				
Outfall	Pump		0.0				0.0

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.22%

US Node	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
S 1.0	3.684	0.330	30.2	0.3696	0.0000	SURCHARGED
S 1.1	3.523	0.426	67.6	0.9043	0.0000	SURCHARGED
S 2.0	3.482	0.151	27.4	0.1600	0.0000	OK
S 2.1	3.390	0.317	56.8	0.5273	0.0000	SURCHARGED
S 3.0	3.933	0.666	60.8	1.3642	0.0000	SURCHARGED
S 3.1	3.290	0.280	18.6	0.0793	0.0000	SURCHARGED
Infiltration Area	3.290	0.365	56.8	113.3812	0.0000	SURCHARGED
Outfall	3.290	0.468	5.5	0.1325	0.0000	OK

US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
S 1.0	1.000	S 1.1	29.1	0.732	0.733	1.7367	
S 1.1	1.001	Infiltration Area	63.8	1.605	1.605	0.6397	
S 2.0	2.000	S 2.1	26.3	0.732	0.662	1.4925	
S 2.1	2.001	Infiltration Area	55.9	1.411	1.406	0.4743	
S 3.0	3.000	S 3.1	58.6	1.473	1.474	1.7409	
S 3.1	3.001	Infiltration Area	18.1	0.781	0.455	0.0681	
Infiltration Area	1.002	Outfall	5.5	0.465	0.077	1.7605	
Infiltration Area	Infiltration		7.5				
Outfall	Pump		0.0				0.0

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.22%

US Node	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
S 1.0	4.260	0.906	43.8	1.0149	0.0000	SURCHARGED
S 1.1	3.928	0.831	98.0	1.7649	0.0000	FLOOD RISK
S 2.0	3.937	0.606	39.8	0.6408	0.0000	SURCHARGED
S 2.1	3.648	0.575	83.6	0.9554	0.0000	SURCHARGED
S 3.0	4.661	1.394	88.1	2.8540	0.0000	SURCHARGED
S 3.1	3.452	0.442	20.1	0.1250	0.0000	SURCHARGED
Infiltration Area	3.452	0.527	59.7	184.0767	0.0000	SURCHARGED
Outfall	3.452	0.630	3.5	0.1782	0.0000	OK

US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
S 1.0	1.000	S 1.1	42.1	1.058	1.058	1.7367	
S 1.1	1.001	Infiltration Area	95.6	2.405	2.406	0.6555	
S 2.0	2.000	S 2.1	39.2	0.986	0.987	1.7420	
S 2.1	2.001	Infiltration Area	83.0	2.088	2.089	0.4944	
S 3.0	3.000	S 3.1	82.8	2.081	2.082	1.7409	
S 3.1	3.001	Infiltration Area	19.8	0.613	0.498	0.0681	
Infiltration Area	1.002	Outfall	3.5	0.406	0.049	1.7605	
Infiltration Area	Infiltration		7.7				
Outfall	Pump		0.0				0.0

Appendix H

Proposed Foul Water Calculations



EXISTING FOUL WATER

Unit Type	Existing Area/Units	Hours (hrs)	Foul Water Flow Rate l/day	Peak Factor	Peaked Loading l/s	Loading (l/s)
Commercial	1080 sq.m	24	300 per 100 sq.m	6.6	0.0229167 per 100 sq.m	0.248

TOTAL EXISTING FOUL LOADING

=

0.248

PROPOSED FOUL WATER

Unit Type	Proposed Area/Units	Hours (hrs)	Foul Water Flow Rate l/day	Peak Factor	Peaked Loading l/s	Loading (l/s)
General Housing	32 Units	24	600 per unit	6.6	0.0458333 per property	1.467
Commercial	1274 sq.m	24	300 per 100 sq.m	6.6	0.0229167 per 100 sq.m	0.292

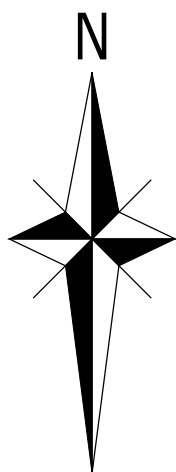
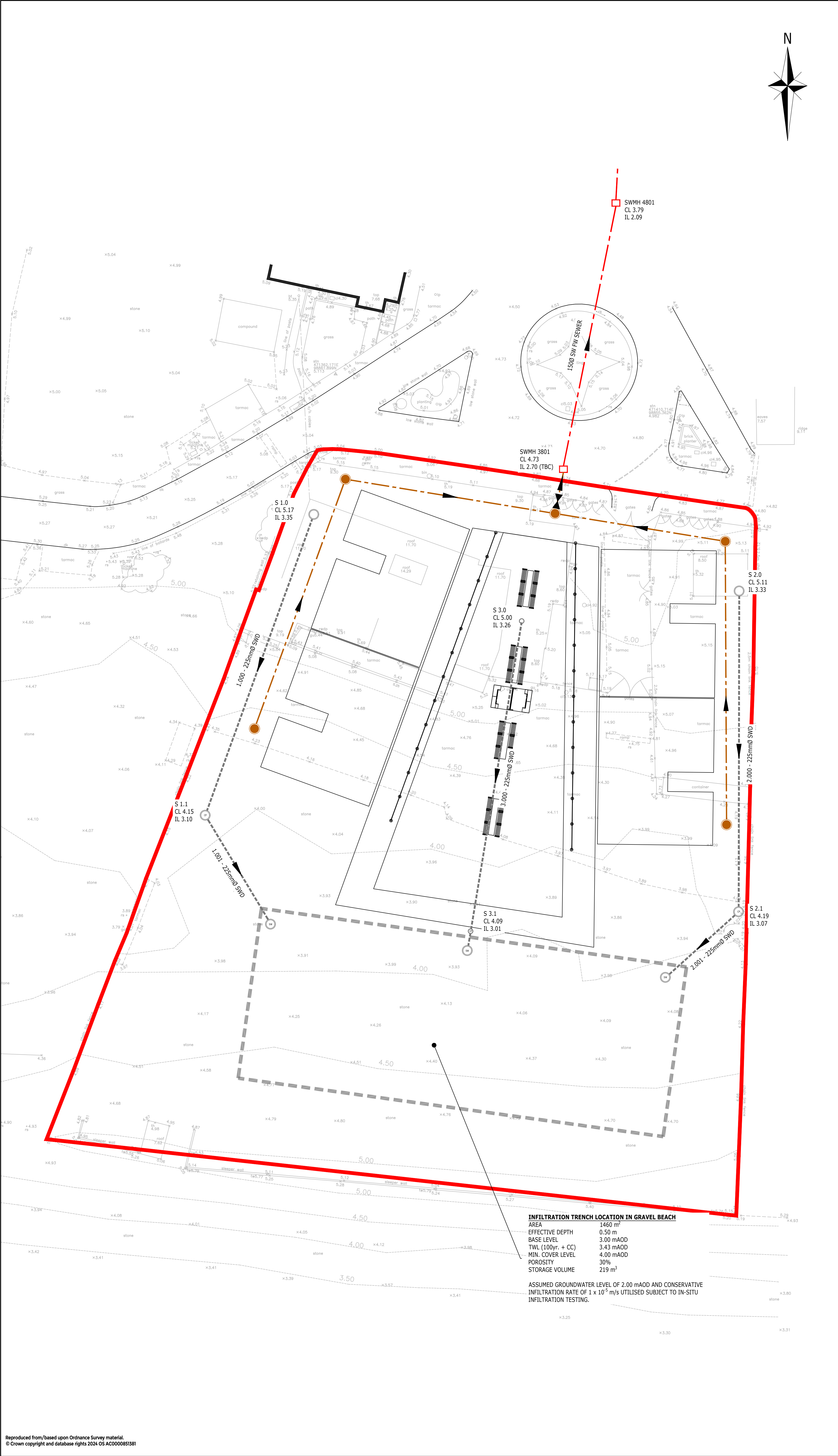
TOTAL PROPOSED FOUL LOADING

=

1.759

Appendix I

2400840-ACE-XX-XX-DR-C-0302: Proposed Foul Water Drainage Layout



NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION, INC. RISK ASSESSMENTS AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.

2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.

3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES UNLESS OTHERWISE STATED.

4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.

5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.

INFORMATION SUMMARY

INFORMATION TYPE	SOURCE	REFERENCE	REVISION & DATE
SITE LAYOUT	PWP ARCHITECTS	-	16.07.2024
TOPOGRAPHICAL SURVEY	P STUBBINGTON LAND SURVEYS LTD.	11252 / 01	JULY 2024
OS	-	-	-
FLOOD DATA	-	-	-
LANDSCAPE	-	-	-
HIGHWAYS LAYOUT	-	-	-
STRATEGIC HIGHWAY LAYOUT	-	-	-
STRATEGIC DRAINAGE	-	-	-
STRATEGIC LEVELS	-	-	-

DRAINAGE KEY

	SITE BOUNDARY
	EXISTING SOUTHERN WATER FOUL WATER SEWER & MANHOLE (MH) / INSEPCION CHAMBER (IC)
	PROPOSED SURFACE WATER SEWER & MANHOLE (MH) / INSEPCION CHAMBER (IC)
	CATCHPIT MANHOLE / INSEPCION CHAMBER
	NON-RETURN VALVE
	PROPOSED FOUL WATER SEWER & MANHOLE (MH) / INSEPCION CHAMBER (IC)
	INFILTRATION TRENCH EXTENTS (30% VOID RATIO)
	PROPOSED CONCRETE RING SOAKAWAY
	PROPOSED EXCEEDANCE FLOW ROUTES

PRELIMINARY

0m2m10m

Scale: 1:250 @ A1

Rev	Description	Drn	Chk	App	Date
ARDENT CONSULTING ENGINEERS AN EMPLOYEE OWNED COMPANY Third Floor The Hallmark Building 52-56 Leadenhall Street London EC3M 5JE Tel: 020 7690 4088 Web: www.ardent-ce.co.uk E-mail: enquiries@ardent-ce.co.uk 					
Client					
LINLAND LTD					
Project Title:					
BEACHLANDS HAYLING ISLAND					
Drawing Title:					
PROPOSED SURFACE WATER DRAINAGE LAYOUT					
Drawn by		Checked by		Approved by	
LB		LB		CC	
A1 Scale		Date		Revision	
1:250		Sept. 2024		-	
Drawing Number					
2401650-ACE-XX-00-DR-C-0301					