DONNAGER CIVIL ENGINEERING	**TECHICAL NOTE** **Donnager Civil Engineering** 1 High Street Mews, London, SW19 7RG
Project: The Bus, Avenue Road, Hayling Island, PO11 0LX	**No:** L047-DON-TN-001.P01
Title: FRA Addendum: Future Flood Risk	**Date:** 03.11.2026

Introduction

Instructions were received from Mayfair Hayling Island Ltd to undertake update of the "Flood Risk Assessment and Drainage Strategy" report produced by Aqua Callidus on 11 June 2020 and submitted to Havant Borough Council under planning application number APP/20/01064, The Bus, Avenue Road, Hayling Island, PO11 0LX.

The application proposed 4 dwellings and was refused planning permission. Reason #3 relates to flood risk specifically:

The site lies within a future flood zone. The applicant has failed to demonstrate that there are no other sequentially preferable sites within the Borough for 4 dwellings; that the development would be safe from flood risk across its lifetime; or that the development would not increase the risk of flooding elsewhere. The applicant has also failed to demonstrate compliance with the exception test. In the absence of adequate information, the proposal cannot pass the Sequential or Exception Tests as set out within the National Planning Policy Framework and would represent an unsustainable, inappropriate form of development in an area at future risk of flooding. The proposal is, therefore, contrary to Policy CS15 of the Havant Borough Local Plan (Core Strategy) 2011 and the aims and objectives of the National Planning Policy Framework.

The site is located in the Flood Risk Zone 1 with low probability of flooding from all sources, (FRA Aqua Callidus, Appendix A). This has not changed and therefore present day flood risk is excluded from this FRA Addendum.

The Focus of the FRA Addendum is the site future risk classification: High Probability of flooding from Sea, and future classification of Flood Zone 3a in 2122. This technical note specifically focuses on the future flood risk as well as addressing Sequential and Exception Test, and provides evidence that the site will be safe and protected from flooding into the future.

This note does not cover Drainage Strategy or SuDS, as this was provided by Aqua Callidus (Appendix A) within original report.

Policy Updates

The policy basis of the FRA (Aqua Callidus, 2020) has been reviewed against national and local planning policy and guidance available October 2026. The following updates are relevant to reassessing the proposal and addressing the flood-risk grounds of the previous refusal

National and Local Policy Guidance

The National Planning Policy Framework (NPPF), published in August 2026, now addresses flood risk in Chapter 18, *Managing flood risk and coastal change*. Policy F5[1] expressly limits the Sequential Test search area to the development's anticipated catchment, having regard to its likely occupiers or users. Consequently, the Borough-wide search required in the previous refusal should be reconsidered against this current policy.

The Planning Practice Guidance (PPG) on Flood Risk and Coastal Change was substantially revised in August 2022 and further updated in September 2025. Paragraph 027a[2] states that the search area for non-major housing development would not normally extend beyond the relevant part of a town or city, or an individual village and its immediate neighbouring settlements. This provides a basis for a proportionate, locally focused assessment of alternative sites for the proposed four dwellings.

Havant's Flood Risk Sequential Test & Exception Test: Guidance for Applicants & Planning Officers (January 2026)[3] provides further guidance on applying the tests locally. Section 3.5 and the table on page 8 mirror PPG guidance in allowing minor residential developments of 9 swellings or less to limit search area to the specific area of the borough in which the proposal is located. Havant Specific Guidance limits the sequential test to Hayling Island only.

Other policy changes and updates from FRA (Aqua Callidus, 2020) include:

Havant Core Strategy Policy CS15, Flood and Coastal Erosion Risk (2011, p.77)[4], remains adopted and continues to provide the local policy basis for assessing present and future flood risk.

Local Plan 2036 was withdrawn on 16 March 2022[5]; references in the original FRA to its Policies E12 and E13 therefore no longer represent current emerging policy. The

[1] https://www.gov.uk/guidance/national-planning-policy-framework-chapter-18-managing-flood-risk-and-coastal-change-f1-9
[2] https://www.gov.uk/guidance/flood-risk-and-coastal-change
[3] https://www.havant.gov.uk/media/10684/download?inline
[4] https://www.havant.gov.uk/media/7437/download?inline
[5] https://www.havant.gov.uk/planning-services/planning-policy/local-plan/havant-borough-local-plan-2036-withdrawn-local-plan

replacement *Building a Better Future Plan*, Publication version 2026, includes Policy 27: Flood Risk (p.232) and Policy 29: Development on the Coast (p.243). These remain emerging policies and have not replaced CS15.

Flood Defence Policies

Flood Defence policies and strategic management of coastlines play an important role in determining if the development can be made safe in the future. While some references were made in the original FRA, this section expands on this critical factor in establishing future flood risk to the development.

National Planning Practice Guidance, paragraph 041[6], directs planning authorities to "make informed decisions about the likely presence of flood risk management infrastructure in future". This requires consideration of the strategic proposals for future coastal protection when assessing residual risk over the development's lifetime.

Policy CS15 expressly identifies the Council's intention to work with partners to implement the coastal policy zones of the North Solent Shoreline Management Plan. The relevant shoreline unit, 5AHI08[7]: West Lane (Stoke) to Langstone Bridge, identifies a Hold the Line approach across all three management periods. Its current management statement envisages phased construction of new defences to maintain the viability of the A3023, the Hayling Billy Trail and the community at Stoke.



Figure 1 - 5AHI08 shoreline unit

A significant subsequent development is the Hayling Island Coastal Management Strategy[8], adopted by Havant Borough Council on 18 December 2024 and approved by

[6] https://www.gov.uk/guidance/flood-risk-and-coastal-change#addressing-residual-flood-risk

[7] https://environment.data.gov.uk/shoreline-planning/unit/SMP13/5AHI08#policy

[8] https://havant.moderngov.co.uk/documents/s54372/Appendix%20A%20to%20Cabinet%20Report%20HICMS.pdf

the Environment Agency on 17 July 2025[9]. Its strategic management options and associated Short-term Action Plan[10] provide a more detailed framework for progressing coastal management, with implementation subject to securing the necessary funding and approvals.

The relevance of future defence provision is also recognised in the Havant SFRA, Part 4, June 2024, Section 6.2 and Table 6-1, pp.27–28. For ODU15: Stoke to Langstone Bridge Car Park, it identifies the safeguarding of land for new defences on a new alignment, with subsequent raising to accommodate climate change. The SFRA therefore provides both future flood-risk mapping and evidence of the intended management response.

Future Flood Risk

FRA Addendum technical note references Havant's SFRA Report, prepared by AECOM (Version 6, February 2024) to establish future flood risk to the development and presented on the SFRA maps.

The relevant maps are the 2122, 0.5% (1-in-200 year) Upper End, both Defended and Undefended and are presented below as well as flood Hazard and Flood Depth as defined by National and local policy framework.

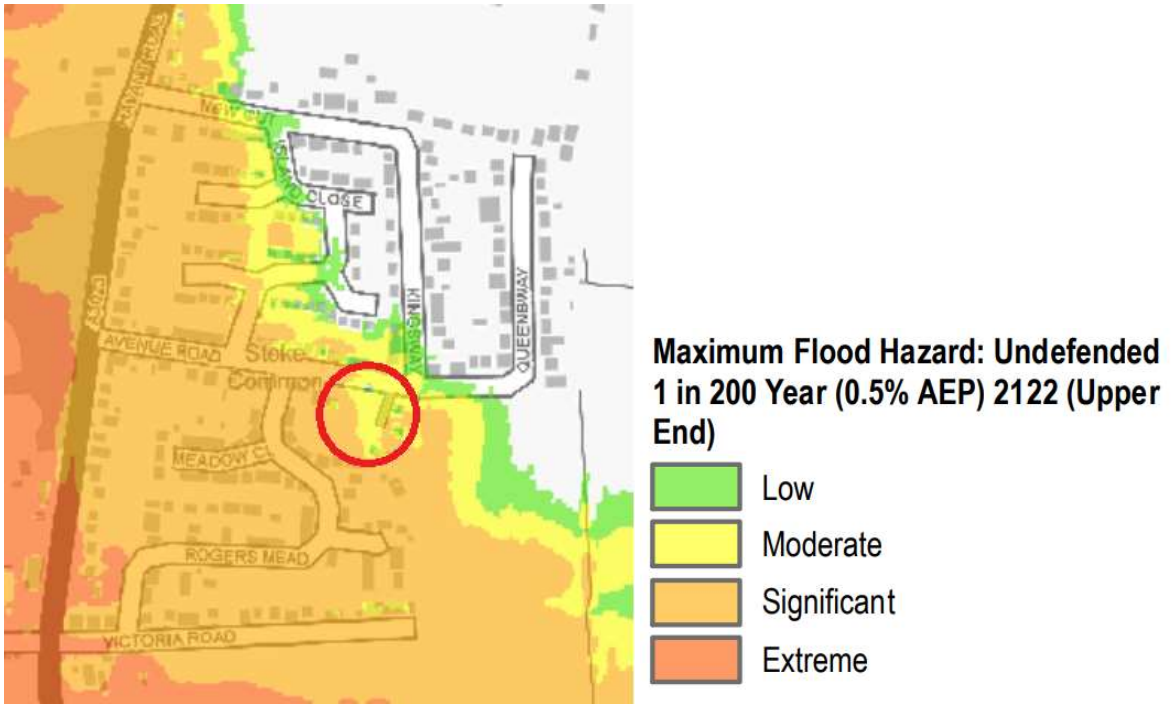


Figure 2 - Maximum Flood Hazard: Undefended 2122

[9] https://coastalpartners.org.uk/project/hayling-island-coastal-management-strategy-16/

[10] https://havant.moderngov.co.uk/documents/s54373/Appendix%20B%20to%20Cabinet%20Report%20HICMS.pdf

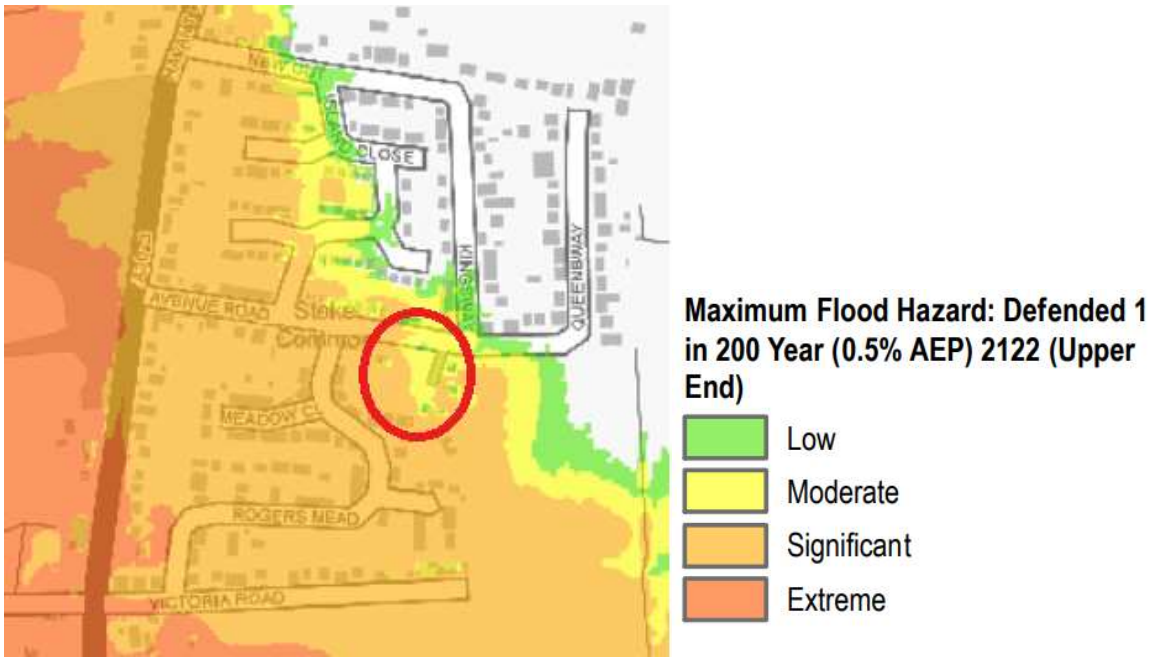


Figure 3 - Maximum Flood Hazard: Defended 2122

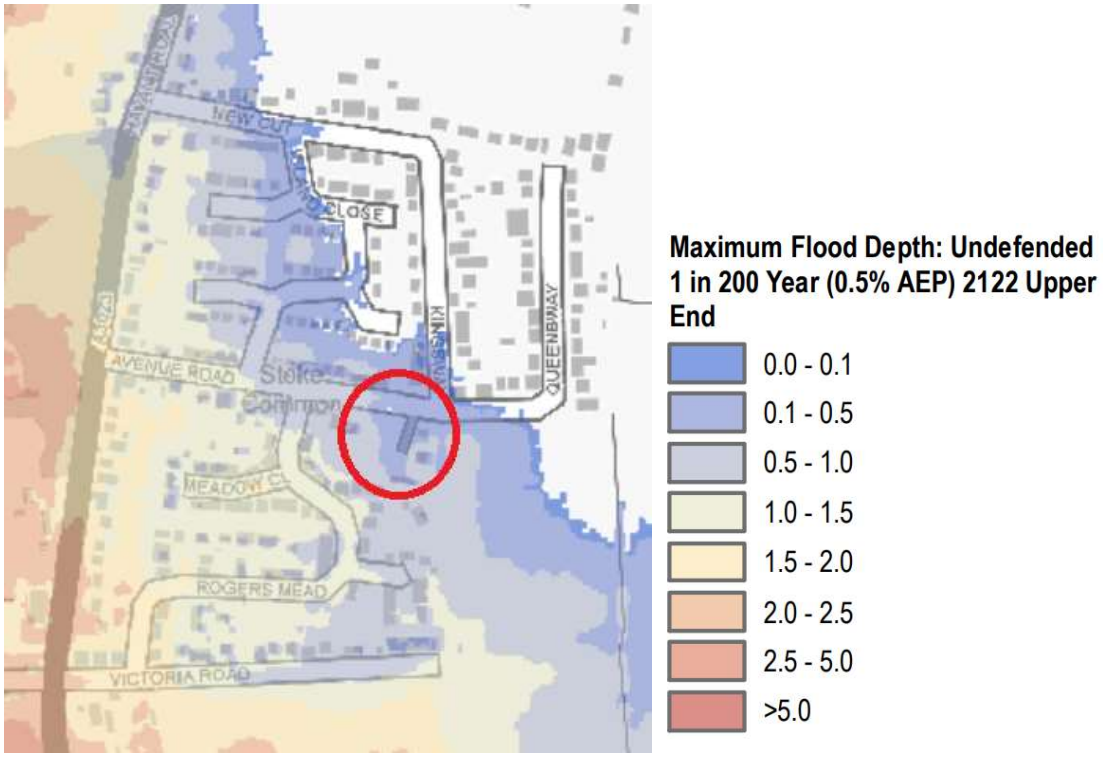


Figure 4 - Maximum Flood Depth: Undefended 2122

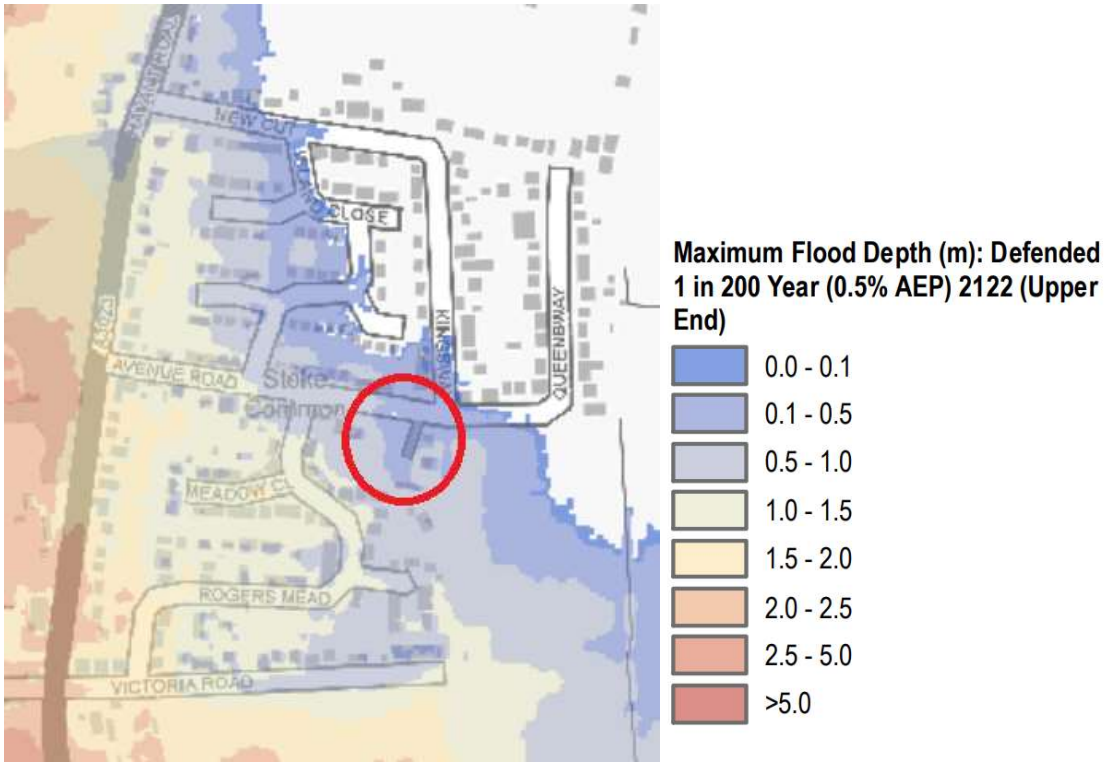


Figure 5 - Maximum Flood Depth: Defended 2122

It should be noted that the proposed future flood defence improvements were not included in the SFRA modelling. Paragraph 3.2.23 of the Havant SFRA confirms that the scenarios represent current defences, while paragraph 2.2.2 of AECOM's East Solent Technical Note[11] confirms that Hayling Island defence levels were unchanged.

The maps above therefore exclude the benefits of the proposed ODU15 improvements under the Hayling Island Coastal Management Strategy, supported by SMP policy unit 5AHI08.

The A3023 lies between the coastal frontage and the site; the proposed strategic defences protecting this route would therefore also benefit the existing dwellings at Stoke Common and the proposed development behind it.

The "defended" maps therefore do not represent the planned future standard of protection relevant to Exception Test part b)

In reality, provided the defences are implemented as planned the development would be well protected into the future.

[11] https://www.push.gov.uk/wp-content/uploads/2024/05/SFRA-Part-1-Appendix-B1-East-Solent-Technical-Note-Version-3-Final.pdf

Flood Levels

AECOM's East Solent Technical Note, Table 2-5, identifies a 2122 upper-end 0.5% AEP coastal-boundary level of 4.67 m AOD for Hayling Island.

To derive a more locally representative harbour estimate for this report, the Environment Agency's Coastal Flood Boundary dataset (2018)[12] was reviewed in QGIS software, identifying a 0.5% AEP still-water level of 3.17 m AOD at the nearest harbour inlet point.

Applying the EA's South East upper-end sea-level-rise allowances[13] from the dataset's 2017 baseline to 2122 gives an estimated future harbour level of **4.60 m AOD**, including astronomical tide and storm surge.

Below is a summary table demonstrating calculated flood levels

Year	Higher Central (70th percentile)	Upper end (95th percentile)
2017 baseline	3.17m AOD	3.17mAOD
2055	3.45m AOD	3.52m AOD
2122	4.24m AOD	4.60m AOD

Figure 6 - Predicted Flood levels

Based on the available data, the site would only reach potential flooding condition close to 2122.

Proposed Finish Floor Levels

The FRA (Aqua Callidus, 2020) previously set dwelling FFL to 4.80 m AOD and it is proposed to be retained. This provides approximately 200 mm clearance above the calculated 2122 upper-end 0.5% AEP harbour level and 560 mm above the higher-central estimate. The proposed level therefore accommodates the upper-end tidal projection without relying on the planned strategic defence improvements to lower that harbour-level benchmark.

Those future improvements provide a further basis for reducing the frequency and severity of flooding reaching the site. Additionally the flooding timeline is closer to 2122, nearly 100 years in the future. Taken together, the raised floor level, assessment of both climate-change allowances, uncertainties in climate modelling and strategic coastal-management proposals support consideration of a reduced freeboard allowance.

[12] https://www.data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018
[13] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Residual Flood Risk and Access

No present-day tidal restriction to access has been identified. The assessed 2122 upper-end scenario indicates depths of 0.1–0.5 m and moderate hazard along the access route, with lower-hazard ground approximately 40 m away. These are maximum conditions during a time-varying tidal event; their duration is not established by the SFRA. The mapping also excludes the planned ODU15 improvements, which would reduce flood exposure to the A3023 and the site.

Havant SFRA paragraph 7.5.6 allows consideration of managed safety where future dry access is unavailable. The four-dwelling scale, proximity of lower-hazard ground, raised floors and planned strategic protection support a proportionate approach to residual risk, including defence failure or delayed delivery.

Flood warning and evacuation arrangements would be developed and reviewed as required by Havant Borough Council, accounting for occupant needs and evacuation before access becomes hazardous, and established before the identified risk arises.

Sequential Test

The SFRA identifies the site within future Flood Zone 3a, circa 2122, representing a high probability of flooding from sea. A Sequential Test has therefore been undertaken in accordance with the NPPF, PPG and Havant's local guidance.

The search was undertaken in Hayling Island, consistent with the local guidance for residential proposals of nine dwellings or fewer. The alternative-site assessment prepared by DTM Planning is presented in Appendix B and considers the suitability, reasonable availability and comparative flood risk of sites capable of accommodating the proposed development.

The assessment identifies no reasonably available, suitable alternative sites at lower flood risk. Accordingly, the Sequential Test is considered to be satisfied.

Exception test

The SFRA identifies the site within future Flood Zone 3a. Given the proposed residential use, classified as More Vulnerable, an Exception Test has been undertaken in accordance with national policy and Havant's guidance.

Part (a), addressing wider sustainability benefits to the community that outweigh flood risk, has been prepared by DTM Architects and is included in Appendix C.

Part (b) is addressed by this Technical Note and considers whether the development will remain safe throughout its lifetime, without increasing flood risk elsewhere and, where possible, reducing flood risk overall.

The assessment considers the planned strategic coastal defences, their role in protecting the A3023, the town, and surrounding development, the proposed raised finished-floor levels, and the management of residual risk and access.

The mapped moderate hazard along the future access route is addressed in the Residual Flood Risk and Access section, alongside the anticipated benefits of the strategic coastal defences. Flood warning and evacuation arrangements would be developed and reviewed as required by Havant Borough Council, accounting for changing hazards, defence provision and occupant needs, before the identified access risk arises.

The accompanying Drainage Strategy (0Aqua Callidus, 2020) in Appendix A demonstrates that runoff from the development will be managed without increasing flood risk elsewhere.

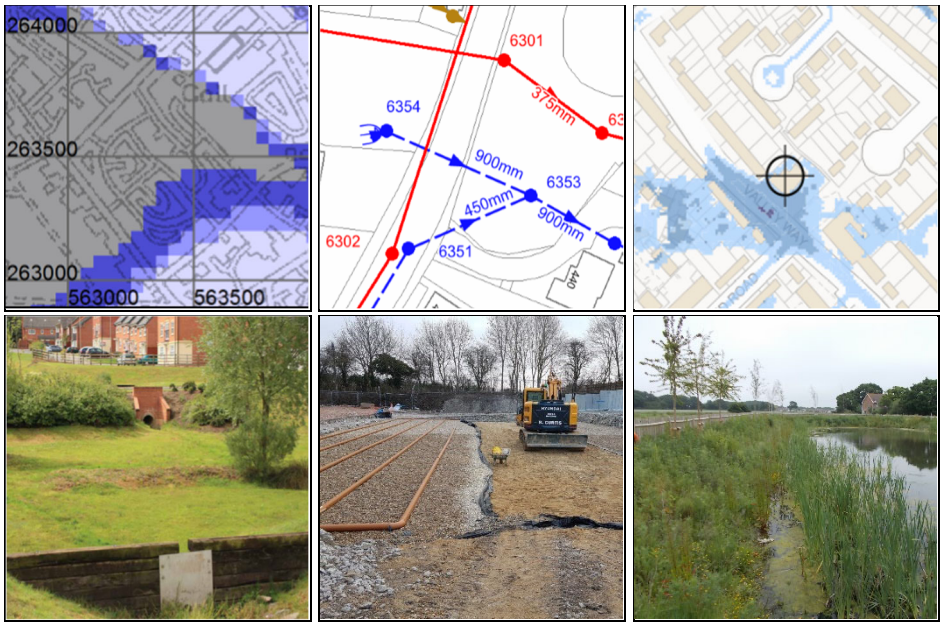
On the basis of this strategy and the lifetime-safety assessment presented in this Technical Note, Part (b) is considered to be satisfied. Together with the sustainability assessment in Appendix C, the Exception Test is therefore considered to be satisfied.

Appendix A

Flood Risk Assessment and Drainage Strategy

By Aqua Callidus

11 June 2020



Flood Risk Assessment and Drainage Strategy

The Bus, The Avenue
Hayling Island, Hants

Reference: 20005

Issue:	**Date:**
1	11/06/2020

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Appendices

A	Existing Layout & Proposed Site Layout
B	EA Flood Mappings, Local Sewer Plan & Soils Data
C	Surface Water Assessment
D	Conditions & Limitations

1. Introduction

1.1 Instructions were received from Mayfair Hayling Island Ltd to undertake a Flood Risk Assessment (FRA) and set out a Drainage Strategy (DS) for a planning application for the development of 5 residential dwellings at The Bus, The Avenue, Hayling Island, Hants PO11 0LX.

1.2 This assessment has been undertaken by A P Traves BSc CEng MIStructE MCIHT.

1.3 The client's attention is drawn to the conditions and limitations contained in Appendix D.

2. Development Description & Location

2.1 The site comprises approximately 0.19 Ha of land at The Bus, The Avenue, Hayling island, Hants (grid ref 472100 10[3150). The site extents are indicated on the annotated aerial photograph in Appendix A. The existing topography is shown on NRS Surveying drawing contained in Appendix A of this report.

2.2 The site comprises a rectangular shaped parcel of land that the Bus, The Avenue, Hayling Island. The site currently comprises soft landscaping.

2.3 It is proposed to redevelop the site for 5 dwellings. The proposed layout is shown on the ADP Architects layout drawing 1885-01-P2 contained in Appendix A of this report.

3. Local Development Documents & Strategic Flood Risk Assessment

3.1 The Strategic Flood Risk Assessment (SFRA) for Partnership for Urban South Hampshire (PUSH) has been reviewed and this indicates the following:

3.2 SFRA mapping indicates the site lies within Flood Zone FZ1.

3.3 SFRA mapping does not indicate the site to lie in a surface water flood risk zone.

3.4 SFRA mapping does not indicate the site to be at a location of sewer flooding.

3.5 SFRA mapping does not indicate any recorded groundwater flooding at the site.

3.6 Hampshire CC Groundwater Management Plan (GWMP) does not identify groundwater issues at this location on Haying Island.

3.7 Flood mapping data has been reviewed from the Environment Agency (EA) website. (refer to Appendix B). This indicates the following:

3.8 The EA mapping indicates the site lies within FZ1 low flood risk.

3.9 The EA mapping indicates the site is at very low (<0.1% AEP) risk of surface water flooding.

3.10 The EA mapping indicates the site is not in an area of reservoir flood risk.

3.11 The Havant Borough Core Strategy-March 2011 sets out environmental policy with respect to flood risk and climate change in CS15 Flood and Erosion Risk. This is supported by Havant Borough Local Plan 2036 (Draft) policies E12 Managing Flood Risk in New Development and E13 Drainage Infrastructure in New Development.

3.12 CS15 requires that unacceptable levels of flood risk are avoided and that surface water is proactively managed through promotion of sustainable drainage techniques.

3.13 E12 requires that any new development will be safe over its lifetime, including the access, without increasing flood risk elsewhere.

3.14 E13 requires that any new development will have no net increase in surface water run-off compared with the pre-development rate and the drainage system does not increase flood risk elsewhere.

3.15 Chapter 9 of this report identifies that the proposed build area is in flood zone 1 (Low risk). CS15, E12 and E13 can therefore be met by:

- Implementing a surface water drainage strategy that manages flood risk from the new development.
- Provision of a satisfactory sustainable surface water drainage system.

3.16 In essence the local policies replicate the requirements of current national policies and practice, and in meeting national policy local policy will also be met.

4. Catchment Flood Management & Shoreline Management Plans

4.1 The site is at an elevation of some 4-5 m AOD and the proposed levels are such that the proposed development will not depend upon the local Shoreline Management Plan. Shoreline Management Plans are not applicable at this location.

4.2 The South East Hampshire Catchment Flood Management Plan summary – December 2009 (CFMP) indicates the site falls within sub-area 1 Portsmouth and Langstone Harbours. The CFMP states that policy 5 is the preferred policy approach:

"Areas of moderate to high flood risk where we can generally take further action to reduce flood risk."

4.3 Overall the CFMP does not present any issues that would prohibit the development of this site with respect to flood issues provided the surface water drainage is based on SuDS principles.

5. Catchment Data

5.1 The BGS Infiltration SuDS Georeport for the site is contained in Appendix B and identifies particular attributes described in the following paragraphs.

5.2 Section 1 of Part 2 of the SuDS Georeport indicates no very significant constraints for infiltration SuDS.

5.3 Section 2 of Part 2 of the SuDS Georeport indicates that groundwater is likely to be less than 3m below the surface for at least part of the year. This classification is determined from the bedrock and superficial deposits generic permeabilities, site topography and superficial deposit thickness. Superficial deposits are indicated to be of more than 3m thickness of spatially variable permeability with a low to high characteristic permeability. Bedrock is indicated to be free draining with a very high characteristic permeability.

5.4 Section 3 of Part 2 of the SuDS Georeport considers the impact of increased infiltration upon potential ground stability hazards (soluble rocks, landslides, shallow mining, running sands, swellings clays, compressible ground and collapsible ground). Increased infiltration is reported to be generally unlikely to cause geo hazards with respect to the listed characteristics save for running sand.

5.5 Section 4 of Part 2 of the SuDS Georeport considers groundwater quality protection. The report identifies that the site is not in a Source Protection Zone (SPZ). The report also identifies that the predominant flow mechanism is to percolation through the unsaturated zone to the groundwater through either pore space in granular media or through pore space and fractures; these processes have some potential for contaminant removal and breakdown. No made ground is reported to be at the site, thus potential contamination mobilisation in fill is not applicable.

5.6 Section 5 of Part 2 of the SuDS Georeport considers the geological mapping at the site location. The superficial deposits are indicated be sand silt and clay River Terrace Deposits. The bedrock is indicated to be chalk from the Lewes Nodular Chalk Formation.

5.7 The BGS Infiltration SuDS Georeport indicates within the report limitations that the report is based on 1:50,000 digital geological maps and not site-specific data. It also identifies that the report is not an alternative for an on-site investigation or soakaway test which might reach a different conclusion.

5.8 BGS borehole record for SU70SW40 some 50m East of the site has been reviewed. A copy of the log is contained in Appendix B. The hole encountered no a clayey sand Brickearth at the surface becoming sandy Clay . No groundwater strikes were recorded.

6. Sewage Authority Data

6.1 There is an existing 150mm DN foul sewer within The Avenue to the front of the site. There is also an existing 600mm DN surface water sewer within The Avenue to the front of the site. A copy of the local sewer plan is contained in Appendix B.

6.2 The proposed development will discharge foul water (FW) to the existing public FW sewer. The proposed development will separately discharge surface water (SW) to the existing public SW sewer.

6.3 The standing wastewater Infrastructure Charge (IC), which came into force from 1st April 2018, will be paid.

6.4 The proposed drainage spines shown on the drainage schematic in Appendix C. The spatial arrangement and levels enable a gravity connections to be made to the public sewer. The particulars of individual plot connections to the new spine can be secured by standard planning condition.

7. Site Particulars

7.1 A walkover site reconnaissance was undertaken on 13th March 2020. The site is some 0.19 Ha in area and is located on the south side of The Avenue. The site currently, comprises a soft landscaped urban parcel.

7.2 The site is at a level of some 4.3m AOD with access out to The Avenue.

7.3 The land surrounding the site comprises residential dwellings.

8. Source-Pathway-Receptor Assessments

8.1 The site is remote from rivers and associated fluvial flooding.

8.2 The site is at an elevation of some 4.3m AOD and is at very low risk (<0.1%AEP) of tidal flooding.

8.3 The EA mapping indicates the site is at low risk (<0.1%AEP) of surface water flooding

8.4 The EA mapping indicates the site is not in an area of reservoir flood risk.

8.5 The SFRA does not indicate any groundwater flooding to the site.

8.6 The SFRA does not indicate any sewer flooding at the site

8.7 The critical flood source is pluvial run-off from within the site. The site surface water drainage system will accord with the principles of CIRIA C753.

8.8 The flood receptors of the development would be:

- Residential dwellings
- Users of the residential dwellings

8.9 The proposed development and existing site classifications to Table 2 (Paragraph 066 Reference ID: 7-066-20140306) are as follows:

- Existing agricultural — Less vulnerable
- Proposed residential — More vulnerable

9. Flood Probability

9.1 The EA flood zones shown on the outputs and included in Appendix B represents current best estimates of zone 2 and zone 3 flooding. It does not take account of potential climate change impacts. The flood zone definitions to Table 1 (NPPG Reference ID: 7-065-20140306) are as follows:

Zone 1	Low probability of flooding (<0.1% AEP)
Zone 2	Medium probability of tidal flooding (0.1-0.5% AEP) Medium probability of fluvial flooding (0.1-1% AEP)
Zone 3a	High probability of tidal flooding (>0.5% AEP) High probability of fluvial flooding (>1% AEP)
Zone 3b	Functional floodplain (>5% AEP probability of flooding)

The flood map does not differentiate between zones 3a and 3b.
Zone 3b is only considered appropriate for water-compatible development.
Zone 3a is additionally considered appropriate for less vulnerable uses.

9.2 The site is located in Flood Zone 1 (low risk).

10. Climate Change

10.1 The new climate change allowances for flood risk assessment GOV.UK 17 December 2019 update have been used. Climate change values for the site are:

- Peak river flow: Table 1, South East, third epoch, higher central +45%
- Peak rainfall intensity: Table 2, third epoch, upper end +40%
- Sea level rise: Table 3 South East, higher central to 2120 +1.15m

10.2 Surface water drainage strategy is discussed in Chapter 11. The volumes and flows for this strategy have been derived in accordance with CIRIA C753 and include for climate change effects.

10.3 The proposed minimum FFL of 4.8m is well above 2120_{AD} 0.5% AEP Extreme Tidal Level of 4.45m AOD.

11. Detailed Development Proposals & Surface Water Strategy

11.1 Surface water drainage must accord with a receptor hierarchy in which Tier 1 (infiltration) must be considered first.

11.2 Several different sources of evidence strongly suggest that a Tier 1 infiltration discharge approach is very unlikely to be feasible. The local BGS borehole record indicates a clayey Brickearth soil. The local sewer plan indicates an extensive network of surface water sewers within the existing estate. The BGS infiltration Georeport indicates a high seasonal GWL which would be associative to the close proximity of the sea and the elevation of the site. There is no watercourse on the site to facilitate a Tier 2 discharge strategy to watercourse. The site is located adjacent the public surface water sewer so a Tier 3 discharge to surface water sewer strategy will be required

11.3 The existing site comprises softscape. A UKsuds IOH124 greenfield runoff calculation for the site has been made (Refer to Appendix C). This indicated the following rates:

Q_{bar} 0.54 l/sec
Q_1 0.46 l/sec
Q_{30} 1.25 l/sec
Q_{100} 1.73 l/sec

There are two approaches to setting post development discharge rates. Either a variable rate discharge and provision of separate long-term storage which itself is limited to a discharge rate of 2 l/sec/Ha; or set a flat discharge of Q_{BAR} or 2 l/sec/Ha and provide adequate storage to facilitate this. In both cases there is a pragmatic lower threshold to mitigate the potential blockage risk associated with small orifices for low flow rates. This is accepted to be 5 l/sec where discharging to open water bodies to allow for vegetation or 2 l/sec where discharging into sewers or piped systems which inherently have no vegetation.

11.4 The proposed positively drained site surfaces (roofs, and drives) amount to some 980m^2. An assessment calculation for the storage required for 980m^2 drained area attenuated to 2 l/sec for a 1%AEP +40% Climate Change +10% urban creep storm is contained in Appendix C. This indicates a storage volume of approximately 60m^3 would be required. There are a number of means by which this volume could be provided and a geocellular tanks have been used for illustration purposes. Examination of the proposed site layout indicates there would be sufficient space to accommodate the required tank footprints to allow gravitational discharge to the public surface water sewer. The proposed drainage schematic is contained in Appendix C. the drainage spines and attenuation storage have been positioned to avoid the RPA to tree 3.

11.5 The UKSUDS surface water storage assessment tool has been used to confirm the sizings. A copy of this calculation is contained in Appendix C.

11.6 The surface water drainage system will be designed to accommodate a 1 in 100 year +40% climate change and 10% urban creep rainfall event. With respect to the Non-statutory Technical Standards for Sustainable Drainage Systems (NTS SuDS) the design accords with requirements S2 and S5-9. Design and construction details will accord with Building Regulations, so according with S10-11 and S13-14. The surface water design does not include pumping so S12 is not applicable. The detailed design can be secured by standard planning condition as usual.

11.7 Water butts should be installed to intercept roof water run-off. These will reduce the annual volume of surface water discharge but will not make a material contribution to regulation of critical run-off as these tend to be full during Winter months as there is minimal demand for irrigation in these months.

11.8 In summary source control will be provided by:

- Attenuation storage as outlined in paragraph 11.4
- Provision of water butts as outlined in paragraph 11.7

11.9 The surface water strategy mimics the existing run-off regime. There will therefore be no adverse impact on flood flow rates outside the site.

11.10 The use comprises generally low and very low pollution hazard levels (C753 Table 26.2) and does not require groundwater risk screening.

11.11 Simple index approach calculations are contained in Appendix C. These demonstrate that the proposed SuDS infrastructure can provide the mitigation necessary. It is proposed to provide a Downstream Defender vortex separator.

11.12 For exceedance events the site will continue to drain out to The Avenue.

11.13 A schedule of O&M maintenance requirements for the SuDS infrastructure is also contained in Appendix C. Individual plot drainage will be maintained by the owners. Common assets will be maintained by the estate management company

12. Sequential & Exceptions Tests

12.1 The proposed dwellings are located in FZ1 and inherently meet the Sequential Test.

12.2 Application of the Exceptions Test is not required.

13. Flood Risk Management Measures

13.1 The source pathway receptor assessment is contained in Chapter 8.

13.2 Paragraph 8.7 identifies that on site surface run-off is the governing flood source. The management of the storage and conveyance of these volumes and flows is provided for by the surface water strategy set out in Chapter 11. The strategy accords with CIRIA C753 SuDS Manual.

13.3 The surface water strategy mimics the existing run-off regime. There will therefore be no adverse impact on flood flow rates outside the site.

14. Off Site Impacts

14.1 The surface water strategy mimics the existing run-off regime. There will therefore be no adverse impact on flood flow rates outside the site .

15. Residual Risks

15.1 The proposed surface water strategy for the development provides for flood events up to 1:100 year 2020_{AD} + CC rainfall. The residual flood risk is therefore pluvial events in excess of 1:100 year 2020_{AD} + CC rainfall.

15.2 Proposed minimum FFLs are well above 0.5% AEP 2120_{AD} Extreme Tidal Level The residual flood risk is therefore tidal events in excess of 0.5% AEP 2120_{AD} Extreme Tidal Level. It should also be noted that the site lies behind North Solent Shoreline Management Plan unit 5AHI08 which has a Hold The Line policy to maintain the coastal defences for all three epoch through to $2105_{AD.}$ No information is provided for the period beyond 2105_{AD}, however the proposed minimum FFLs are set above the 2120_{AD} Extreme Tidal Level as set out above.

Appendix A



Site location



NOTES:

This Drawing is for the Topographical Survey completed at Avenue Road, Hayling Island, PO11 0LX.

Ordnance Survey (OS) national grid coordinates have been established for survey control points using GPS and related to OSTN15(GB). The survey grid is orientated Grid North. All levels relate to Ordnance Survey (OS) level datum at survey control points.

Station Values:
NRS001: 472130.242E, 103184.975N, 4.426Z.
NRS002: 472078.808E, 103184.387N, 4.187Z.
NRS003: 472118.858E, 103178.720N, 4.297Z.

Survey completed on site 10/03/2020 - N.Rogers.

Rev - Issued to client: 11/03/2020 - N.Rogers.

smas worksafe contractor
www.smasltd.com

SAFEMARK
HEALTH AND SAFETY APPROVED BY RHEC
certification mark

CHAS
CONTRACTORS HEALTH & SAFETY ASSESSMENT SCHEME
Accredited Contractor
www.chas.gov.uk

nrs surveying limited

NRS Surveying Limited,
6 Purbrook Way,
Havant,
Hampshire
PO9 3RY
Mobile:
07564 602518.
Email:
nrsurveying@gmail.com

Client: adp architects ltd
architects & urban designers

Project: The Bus, Avenue RD, Hayling Island PO11 0LX.

Drawing Title:
Topographical Survey Land Opposite 31 Avenue Rd, Hayling Island - Anita Barney.

Scale @ A1: xxxxx	Drawn Date: 11/03/2020.	Project Number: ADP-005-Rev -.
Drawn By: Nick Rogers.		Checked By: Nick Rogers.

SITE LAYOUT 1:250
FEASIBILITY
PRELIMINARY

0 2 4 6 8 10 12 14 16 18 20m

LINEAR SCALE 1:250
A2 @ 1:250

N
W E
S
Indicative

adp architects & urban designers
Tel: 0845 365 1475
Email: mail@adp-ltd.co.uk
www.adparchitectsltd.co.uk
Richmond Court, 94 Botley Road, Park Gate, Southampton, SO31 1BA

The site is based on a topogaphical survey undertaken by NRS Surveying Ltd Ref: ADP–005–Rev A.
Surrounding information copied from Ordnance Surveys Promap. Crown Copyright. Licence Number 100022432

Schedule of Accommodation

PLOT	BEDS	TYPE	GIA sqm	GIA sqft	REMARKS
1	3B	DET	109	1173	
2	3B	DET	114	1227	
3	4B	DET	153	1646	
4	4B	DET	153	1646	
5	4B	DET	169	1818	
Total GIA			698	7510	

PARKING
2 car spaces per 3 bed unit
3 car spaces per 4 bed unit
13 parking spaces shown in total

CYCLES (per unit)
2 secure & covered residents cycle spaces for each dwelling (Cycle shed or similar)
1 visitor cycle space near front entrance (wall hoop or similar)

SITE AREA/DENSITY
0.19 Hectares = 26 DPH

- Existing trees
- Existing trees to be removed
- Existing hedges/planting
- Existing hedges/planting to be removed
- Proposed planting (subject to detailed landscape design)
- Existing foul drainage
- Proposed foul drainage

Foul & sw drains where shown are for guidance purposes only & may vary due to site conditions, water authority & building control approval, etc.
Water authority approval will be required when building over or close to a sewer. Previously shared private drains are now likely to be considered public sewers.

Surfacing within RPA's subject to Arb/ consultant recommendations & LPA approval

Proposed car barn – pad foundations & ground base subject to Arb. consultant details & LPA approval

Proposed car barn

Pad/piled foundations subject to Arb. consultant details & LPA approval

Avenue Road

Kingsway

House
Bungalow
Warberry Cott
Roots
Anchorage
Chalet
Orchard Cottage
20 House

rev: date: note:

adp architects & urban designers
Tel: 0845 365 1475
Email: mail@adp-ltd.co.uk
www.adparchitectsltd.co.uk
Richmond Court, 94 Botley Road, Park Gate, Southampton, SO31 1BA

project name/address:
Residential Development
The Bus
Avenue Road
Hayling Island

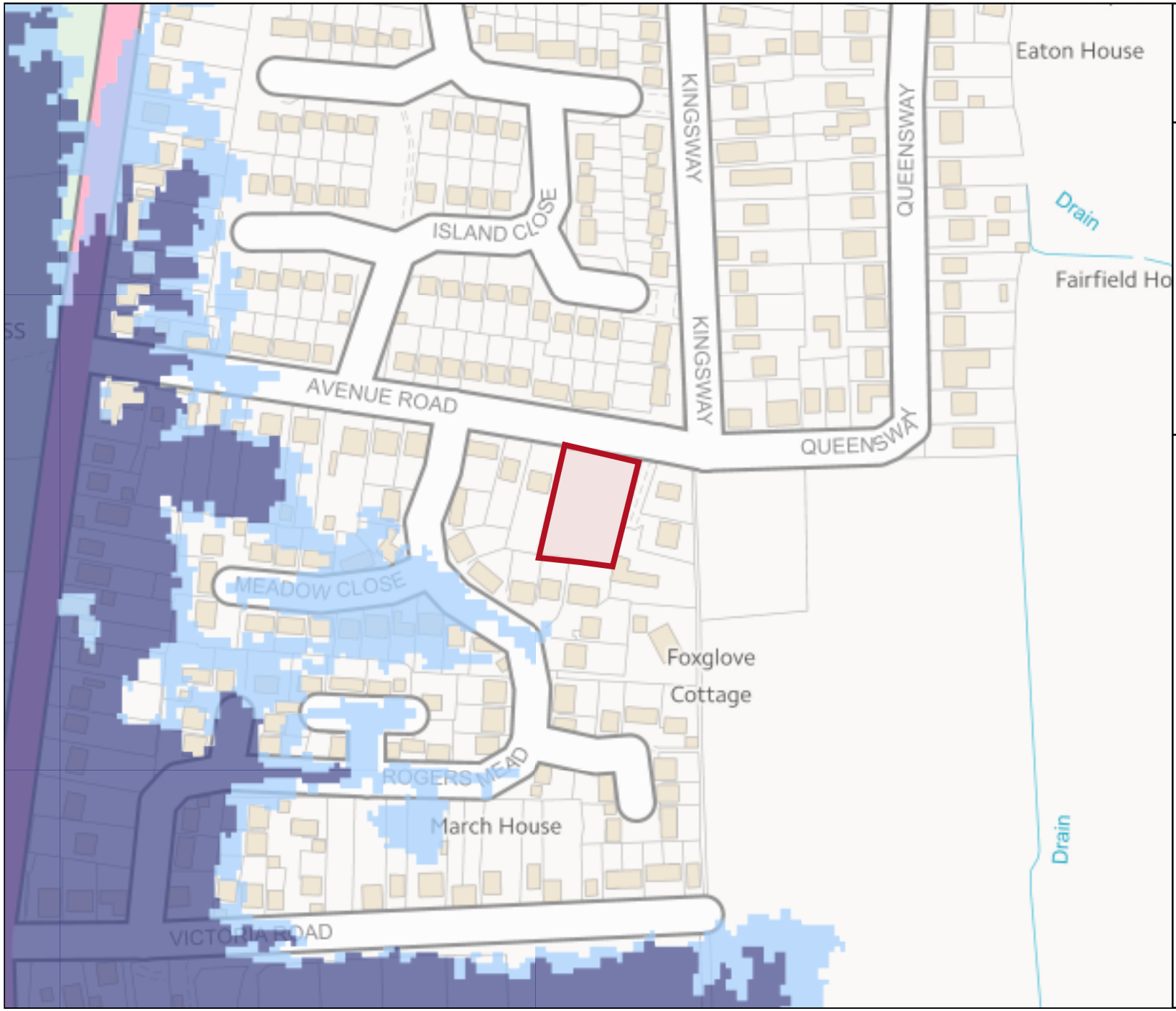
client:
Mafair Hampshire Ltd

drawing title:
Site Layout

job number:	drawing number:	revision:
1885	01	P2

drawing scale/size:	date:	drawn:
1:250 (A2)	Apr 20	

Appendix B



Environment Agency

Flood map for planning

Your reference
20005

Location (easting/northing)
472087/103153

Scale
1:2500

Created
23 Jan 2020 14:18

- Selected area
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

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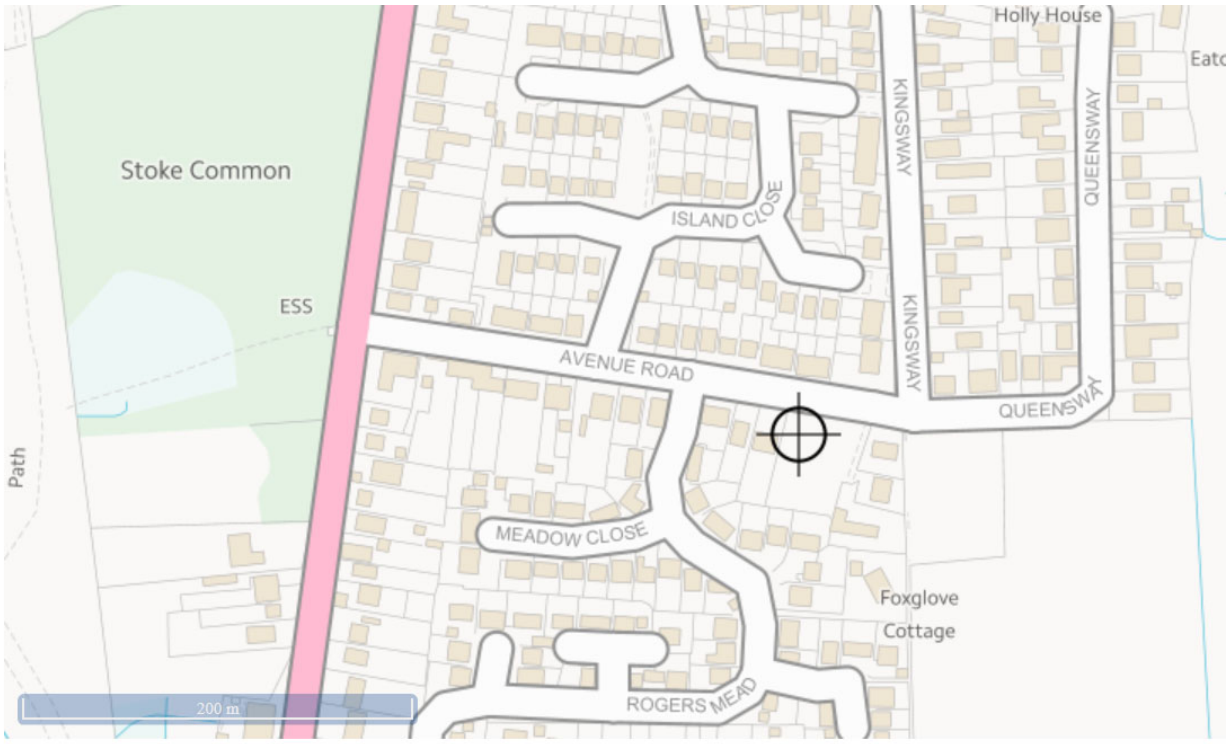
Extent of flooding from surface water

High Medium Low Very low Location you selected

Surface Water Flood Risk



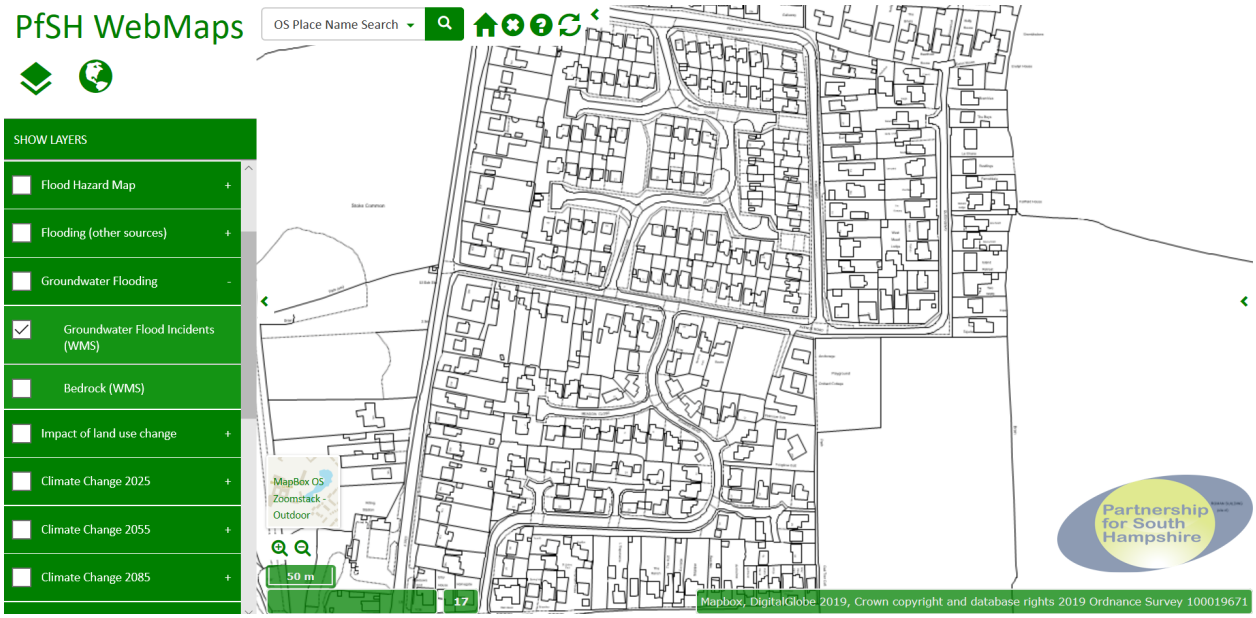
Extent of flooding from reservoirs

Maximum extent of flooding Location you selected

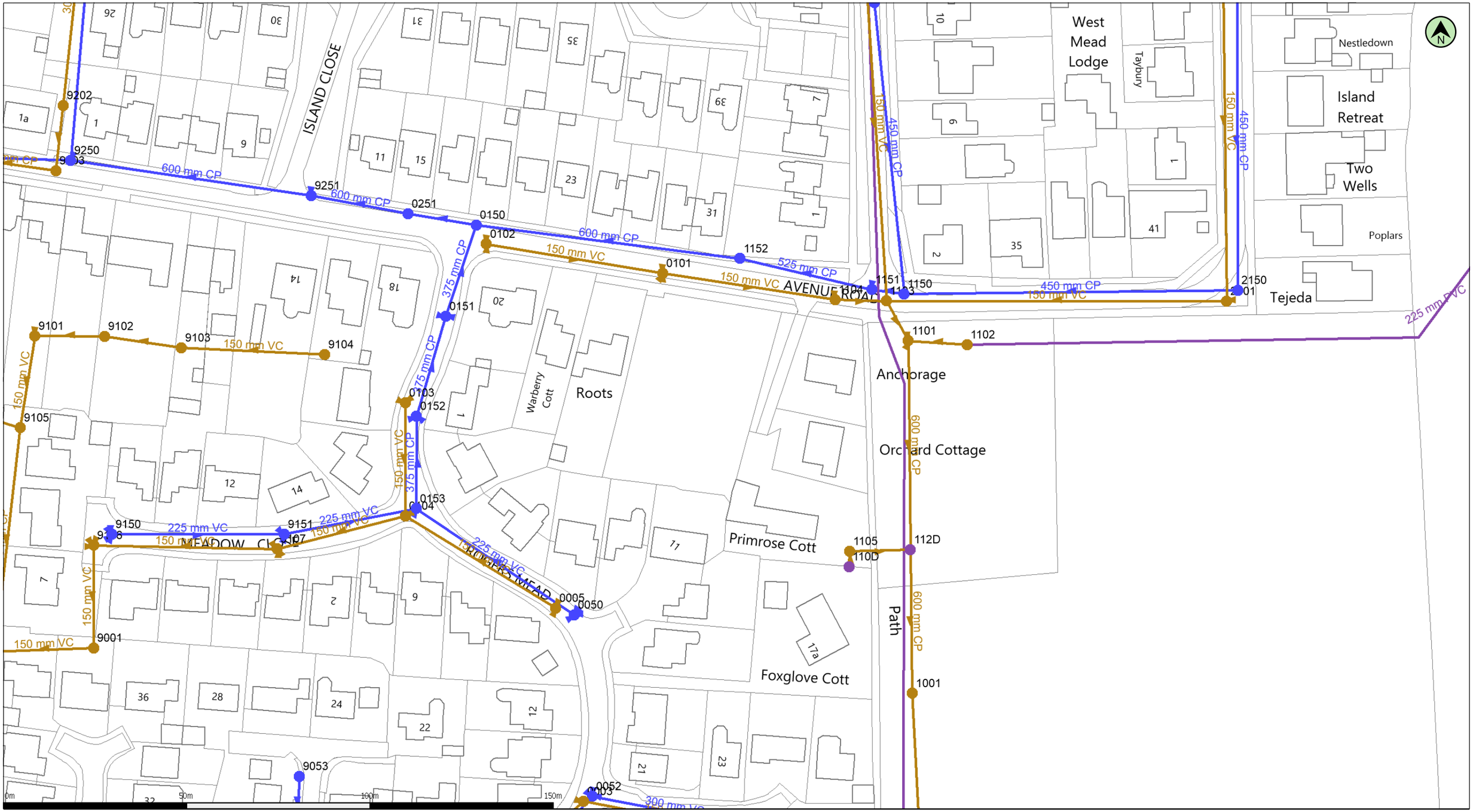
Reservoir flood risk



SFRA sewer flooding



SFRA groundwater flooding

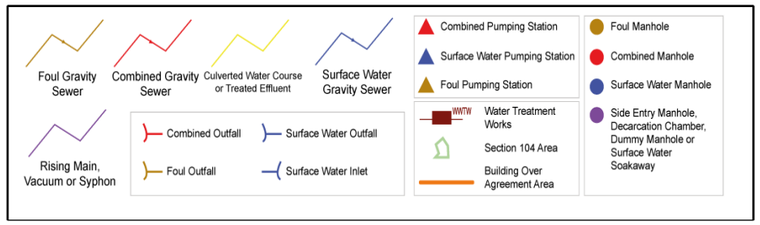


(c) Crown copyright and database rights 2020 Ordnance Survey 100031673 | Date: 10/03/20 | Scale: 1:1000 | Map Centre: 472100,103150 | Data updated: 18/12/19 | Our Ref: 375625 - 1 | Wastewater Plan A3

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 2020 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.



andytraves247@gmail.com

20005 The Bus

WATER for LIFE from Southern Water

FOUNDATION ENGINEERING Ltd.

SU 70 SW/40

7215.0317

BOREHOLE LOG

LOCATION : Hayling Island

BOREHOLE No. : 35

1in 331

BOREHOLE DIA. : 12"

GROUND LEVEL :

DATE (Start) : 26.6.62.

WATER LEVEL : 8'-0"

Dates	Description	Thickness	Depth		Sample	Remarks
	Topsoil	1'-0"	0'-0" 1'-0" (0.30m)			
	Loose brown clayey sand and flints [chalk content increases with depth]	4'-0"			1	
			5'-0" (1.52m)		2	Brickearth
	Soft brown sandy clay and flints. [Chalk content increases with depth]	6'-0"			3	
			11'-0" (3.35m)		4	
						End of borehole.

K.T.W.
27.10.82

BOREHOLE SCALE : 1"=5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

British Geological Survey

Appendix C

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Andy Traves
Site name:	The Bus
Site location:	Hayling Island

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

Site Details

Latitude:	50.82359° N
Longitude:	0.97754° W
Reference:	483502855
Date:	May 13 2020 09:37

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.188

Methodology

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

Soil characteristics

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

Hydrological characteristics

	Default	Edited
SAAR (mm):	704	704
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

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

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

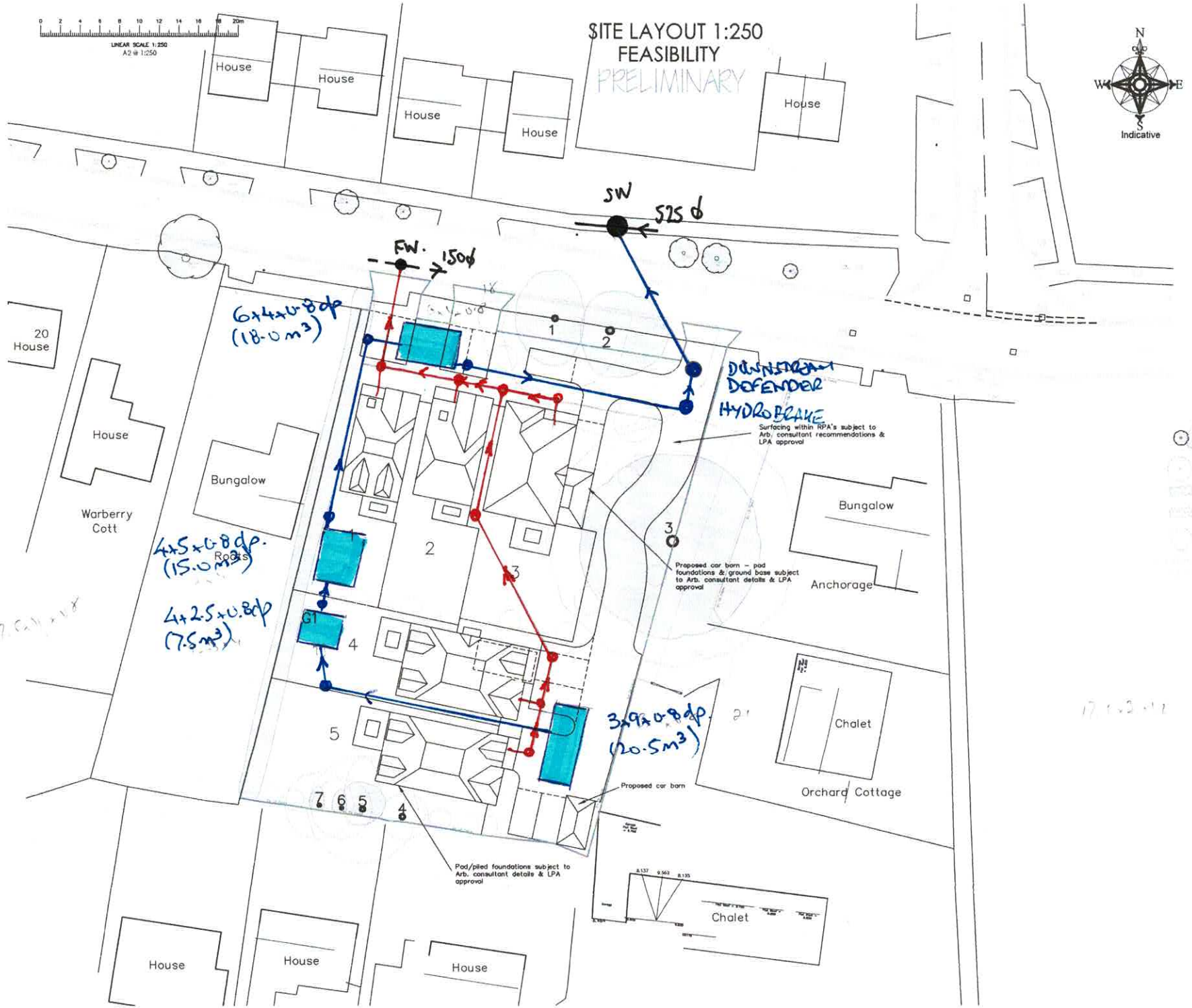
(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.54	0.54
1 in 1 year (l/s):	0.46	0.46
1 in 30 years (l/s):	1.25	1.25
1 in 100 year (l/s):	1.73	1.73
1 in 200 years (l/s):	2.03	2.03

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



adp

0845 365 1475
mail@adp-ltd.co.uk

Richmond Court, 94 Bolley Road, Park Gate, Southampton, SO31 1BA

The site is based on a topogaphical survey undertaken by NRS Surveying Ltd Ref: ADP-005-Rev A. Surrounding information copied from Ordnance Surveys Promap. Crown Copyright. Licence Number 100022432

Schedule of Accommodation

PLOT	BEDS	TYPE	GIA sqm	GIA sqft	REMARKS
1	3B	DET	109	1173	
2	3B	DET	114	1227	
3	4B	DET	153	1646	
4	4B	DET	153	1646	
5	4B	DET	169	1818	
Total GIA			698	7510	

PARKING
2 car spaces per 3 bed unit
3 car spaces per 4 bed unit
13 parking spaces shown in total

CYCLES (per unit)
2 secure & covered residents cycle spaces for each dwelling (Cycle shed or similar)
1 visitor cycle space near front entrance (wall hoop or similar)

SITE AREA/DENSITY
0.19 Hectares = 26 DPH

Existing trees

Existing trees to be removed

Existing hedges/planting

Existing hedges/planting to be removed

Proposed planting
(subject to detailed landscape design)

Existing foul drainage

Proposed foul drainage
Foul & sw drains where shown are for guidance purposes only & may vary due to site conditions, water authority & building control approval, etc.
Water authority approval will be required when building over or close to a sewer. Previously shared private drains are now likely to be considered public sewers.

adp

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Richmond Court, 94 Bolley Road, Park Gate, Southampton, SO31 1BA

project / name/address:
Residential Development
The Bus
Avenue Road
Hayling Island

client:
Mafair Hampshire Ltd

drawing title:
Site Layout

job number:	drawing number:	revision:
1885	**01**	**P2**

drawing scale/size:	date:	drawn:
1:250 (A2)	**Apr 20**	

Aqua Callidus Consulting Ltd
52 Common Lane
Titchfield, Hants,
PO14 4BU

t: 07717 759 149

www.aquacallidus.co.uk

Project No.: 20005
Project Title: The Bus

Rectangular Detention Tank Assessment to CIRIA C753

No infiltration

Site Location: Hayling Island
Catchment ID: gross

r = 0.36 *(range 0.12 to 0.45)*
C_v = 1.00

Drained Area = 980 m^2
Design storm 1 in = 100 year
Runoff volume uplift = 40 % for climate change
10 % for urban creep

Technical Assessment

Base axis Length L_x = 17.50 m
Base axis Length L_y = 3.00 m
Discharge rate = 2.0 l/s
Tank depth = 1.20 m
tank porosity = 95 %

Base area = 52.5 m^2
Tank volume = 59.9 m^3
Design volume = 59.9 m^3
M5-60 Rainfall = 20 mm

Storm Duration	5 min	10 min	15 min	30 min	1 hr	2 hr	4 hr	6 hr	10 hr	24 hr
(secs)	300	600	900	1800	3600	7200	14400	21600	36000	86400
r= 0.36 Value Z1	0.36	0.51	0.62	0.79	1.00	1.22	1.48	1.67	1.90	2.42
Rainfall M5 (mm)	7.2	10.2	12.4	15.8	20.0	24.4	29.6	33.4	38.0	48.4
M100/M5 gf Value Z2	1.84	1.91	1.95	2.00	2.03	2.01	1.97	1.94	1.91	1.82
Rainfall M100 (mm)	**13.3**	**19.5**	**24.2**	**31.5**	**40.6**	**49.1**	**58.4**	**64.9**	**72.4**	**88.2**
ith climate uplift (mm)	**18.6**	**27.3**	**33.8**	**44.2**	**56.8**	**68.7**	**81.8**	**90.8**	**101.4**	**123.5**
With urban creep (mm)	**20.4**	**30.1**	**37.2**	**48.6**	**62.5**	**75.6**	**89.9**	**99.9**	**111.5**	**135.9**
RUNOFF (m^3)	**20.0**	**29.5**	**36.5**	**47.6**	**61.3**	**74.1**	**88.1**	**97.9**	**109.3**	**133.1**
inflow rate (l/s)	66.7	49.1	40.5	26.4	17.0	10.3	6.1	4.5	3.0	1.5
storage rate (l/s)	64.7	47.1	38.5	24.4	15.0	8.3	4.1	2.5	1.0	0.0
Discharge (m^3)	**0.6**	**1.2**	**1.8**	**3.6**	**7.2**	**14.4**	**28.8**	**43.2**	**72.0**	**133.1**
Req'd STORAGE (m^3)	**19.4**	**28.3**	**34.7**	**44.0**	**54.1**	**59.7**	**59.3**	**54.7**	**37.3**	**0.0**
Residual drain time (h)	**2.7**	**3.9**	**4.8**	**6.1**	**7.5**	**8.3**	**8.2**	**7.6**	**5.2**	**0.0**

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Andy Traves
Site name:	The Bus
Site location:	Hayling Island

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	50.82360° N
Longitude:	0.97749° W
Reference:	1348187108
Date:	May 13 2020 09:42

Site characteristics

Total site area (ha):	0.188
Significant public open space (ha):	0
Area positively drained (ha):	0.188
Impermeable area (ha):	0.098
Percentage of drained area that is impermeable (%):	52
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.19
Net impermable area for storage volume design (ha):	0.1
Pervious area contribution to runoff (%):	10

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	3	3
SPR:	0.37	0.37

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	93.94
FEH / FSR conversion factor:	1.22	1.22
SAAR (mm):	704	704
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.62	1.62
Growth curve factor 30 year:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Q_{BAR} for total site area (l/s):	0.54	0.54
Q_{BAR} for net site area (l/s):	0.54	0.54

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Flow control to max of 2 l/s/ha or Qbar
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	2	2
1 in 30 years (l/s):	2	2
1 in 100 year (l/s):	2	2

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	60	60
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	60	60

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

Aqua Callidus Consulting Ltd
52 Common Lane, Titchfield,
Hants, PO14 4BU

t: 07717 759149
www.aquacallidus.co.uk

Date: 10/06/2020

Site Ref The Bus

SuDS Water Quality Management CIRIA C753 Ch26 **Simple Index Approach**

Catchment Roofs

Is discharge to: SPZ1? N Drinking Water Protection Area ? N

Is site in close proximity to an area with sensitive environmental designation? N

if so how close? m

Is an additional treatment component required due to sensistivity? Y

Land Use	Hazard	TSS index	Metals index	HydroCar index
roofs-residential	very low	0.2	0.2	0.05

**2 residential roofs remove gross solids and sediments*

Treatments

To surface water discharge Y

	Component	TSS MIndex	Metals MIndex	HydroCa MIndex	factor
1	Separator	0.5	0.4	0.8	1.00
2	N/A	0	0	0	0.50
3	N/A	0	0	0	0.50
	mitigation index	**0.5**	**0.4**	**0.8**	
X1	N/A	0	0	0	1.00
	Enhanced mitigation index	**0.5**	**0.4**	**0.8**	
	Residual pollution index	**0**	**0**	**0**	

Land Use	Hazard	TSS index	Metals index	HydroCar index	
roofs-residential	very low	**0**	**0**	**0**	*residual*

**2 residential roofs remove gross solids and sediments*

Treatments

To groundwater discharge N

	Infiltration surface	TSS MIndex	Metals MIndex	HydroCa MIndex	factor
1	N/A	0	0	0	1.00
2	N/A	0	0	0	0.50
	Final residual pollution index	**0**	**0**	**0**	

Is a groundwater risk screening required? **N**

Notes:

Downstream Defender

Aqua Callidus Consulting Ltd
52 Common Lane, Titchfield,
Hants, PO14 4BU

t: 07717 759149
www.aquacallidus.co.uk

Date: 10/06/2020

Site Ref The Bus

SuDS Water Quality Management CIRIA C753 Ch26 **Simple Index Approach**

Catchment Drives

Is discharge to: SPZ1? N Drinking Water Protection Area ? N

Is site in close proximity to an area with sensitive environmental designation? N

if so how close? m

Is an additional treatment component required due to sensistivity? Y

Land Use	Hazard	TSS index	Metals index	HydroCar index
driveways (individual)	low	0.5	0.4	0.4

Treatments

To surface water discharge Y

	Component	TSS MIndex	Metals MIndex	HydroCa MIndex	factor
1	Separator	0.5	0.4	0.8	1.00
2	N/A	0	0	0	0.50
3	N/A	0	0	0	0.50
	mitigation index	**0.5**	**0.4**	**0.8**	
X1	N/A	0	0	0	1.00
	Enhanced mitigation index	**0.5**	**0.4**	**0.8**	
	Residual pollution index	**0**	**0**	**0**	

Land Use	Hazard	TSS index	Metals index	HydroCar index	*residual*
driveways (individual)	low	**0**	**0**	**0**	

Treatments

To groundwater discharge N

	Infiltration surface	TSS MIndex	Metals MIndex	HydroCa MIndex	factor
1	N/A	0	0	0	1.00
2	N/A	0	0	0	0.50
	Final residual pollution index	**0**	**0**	**0**	

Is a groundwater risk screening required? N

Notes:

Downstream Defender

SUDS operation and maintenance - general

There are three categories on maintenance activities:

Regular maintenance consists of basic tasks done on a frequent and predictable schedule, including vegetation management, litter and debris removal, and inspections.

Occasional maintenance comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example). The table below summarises the likely maintenance activities required for each SUDS component and specific maintenance activities is given in the following sections.

Remedial maintenance comprises intermittent tasks that may be required to rectify faults associated with the system. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict. Remedial maintenance items can comprise items such as:

- inlet/outlet repairs
- erosion repairs
- reinstatement or realignment of edgings, barriers, rip-rap or other erosion control
- infiltration surface rehabilitation
- replacement of blocked filter fabrics
- construction stage sediment removal (although this activity should have been undertaken before the maintenance contract)
- system rehabilitation immediately following a pollution event.

	SUDS component												
O&M activity	Pond	Wetland	Detention basin	Infiltration basin	Soakawayu	Infiltration trench	Filter trench	Modular storage	Pervios pavements	Swale/bioretention/greenroofs	Filter strip	Sand filter	Pre-treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter/debris removal	■	■	■	■	□	■	■	□	■	■	■	■	■
Grass cutting	■	■	■	■	□	■	■	□	□	■	■	□	□
Wee/invasive plant control	□	□	□	□		□	□		□	□	□	□	□
Shrub management	□	□	□	□					□	□	□		□
Shoreline vegetation management	■	■	□										□
Aquatic vegetation management	■	■	□										□
Occasional maintenance													
Sediment management *	■	■	■	■	■	■	■	■	■	■	■	■	■
Vegetation/plant replacement	□	□	□	□						□	□		□
Vacuum sweeping and brushing									■				
Remedial maintenance													
Structure rehabilitation/repair	□	□	□	□	□	□	□	□	□	□	□	□	□
Infiltration surface reconditioning				□	□	□	□		□	□	□	□	

■ will be required □ may be required * sediment to be collected upstream of the main device

GENERAL MAINTENANCE

Litter/debris removal

This is an integral part of SUDS maintenance and reduces the risks of inlet and outlet blockages, retains amenity value and minimises pollution risks. High litter removal frequencies may be required at high profile commercial/retail parks where aesthetics are a major driver.

Grass cutting

It is recommended that grass cutting be minimised around SUDS facilities, apart from swales and filter strips and structural embankments where a height of 100–150 mm is recommended to prevent the plants falling over, or "lodging", when water flows across the surface. In general, allowing grass to grow tends to enhance water quality performance. Short grass around a wet system such as pond or wetland provides an ideal habitat for nuisance species such as geese; allowing the grass to grow is an effective means of discouraging them. Grass around wet pond or wetland systems should not be cut to the edge of the permanent water. Grass cutting is an activity undertaken primarily to enhance the perceived aesthetics of the facility. The frequency of cutting will tend to depend on surrounding land uses, and public requirements. Therefore, grass cutting should be done as infrequently as possible, recognising the aesthetic concerns of local residents. However, grass around inlet and outlet infrastructure should be strimmed closely to reduce risks to system performance. If a manicured, parkland effect is required, then cutting will need to be undertaken more regularly than for meadow type grass areas, which aim to maximise habitat and biodiversity potential.

Weed/invasive plant control

Weeds are generally defined as vegetation types that are unwanted in a particular area. For SUDS, weeds are often alien or invasive species, which do not enhance the technical performance or aesthetic value of the system, or non-native species and the spread of which is undesirable. In some places, weeding has to be done by hand to prevent the destruction of surrounding vegetation (hand weeding should generally be required only during the first year, ie during plant establishment). However, over grassed surfaces, mowing can be an effective management measure. The use of herbicides and pesticides should be prohibited since they cause water quality deterioration. The use of fertilisers should also be limited or prohibited to minimise nutrient loadings which are damaging to water bodies.

Shrub management

Shrubs tend to be densely planted and are likely to require weeding at the base, especially during the first year to ensure that they get enough water. Shrubs should be selected so they can grow to their maximum natural height without pruning.

Aquatic/shoreline vegetation management

Aquatic plant aftercare in the first 1–3 years may be required to ensure establishment of planted vegetation and control nuisance weeds/invasive plants. Once established, the build-up of dead vegetation from previous seasons should be removed at convenient intervals to reduce organic silt accumulation (eg every three years and at the end of landscape contract periods).

Emergent vegetation may need to be harvested every 5–10 years to maintain flood attenuation volumes, optimise water quality treatment potential and ensure fresh growth, although this is often not required. Care should be taken to avoid nesting birds during the breeding season and to avoid great crested newt and water vole habitats. The typical window for this activity is towards the end of the growing season (September and October). As vegetation matures, plant height may also become a safety issue in residential areas.

Where emergent vegetation is managed, up to 25 per cent can be removed by cutting at 100 mm above soil level using shearing action machinery. Up to 25 per cent of submerged vegetation can be cut and raked out at any one time, using approved rakes, grabs or other techniques, depending on whether clay or waterproof membranes are present. Aquatic vegetation arisings should be stacked close to the water's edge for 48 hours to de-water and allow wildlife to return to the SUDS feature. They should then be removed to wildlife piles, compost heaps or off site before decomposition, rotting or damage to existing vegetation can occur.

Algae removal may be undertaken for aesthetic purposes during the first 3–5 years of a pond/wetland's life. The growth of algae, which is considered by some to be visually intrusive, is encouraged by nutrients introduced into the water body. This situation should settle down once upstream construction activities are complete.

Management of green waste
Appropriate methods should be implemented to dispose of green waste, including

- The development of wildlife piles
- On- or off-site composting
- Disposal to landfill

REMEDIAL MAINTENANCE

Structure rehabilitation/repair
There will come a time with most SUDS techniques when a major overhaul of the system is required to remove clogged filters, geotextiles, gravel etc. This will typically be between 10 and 25 years, depending on the technique and factors such as the type of catchment and sediment load. For example the use of geotextiles close to the surface in pervious surfaces traps the majority of sediment in a relatively easily accessible location. Reconstruction of the surface layer and bedding layer is all that is required, rather than reconstruction of the whole pavement depth.

Major overhaul is most likely to be required on techniques that rely on filtration through soils or aggregates, such as sand filters and infiltration devices. Other SUDS techniques are unlikely to need major overhaul if routine maintenance is undertaken as required (for example ponds and wetlands).

Rehabilitation activities for each SUDS component are described on the following tables.

Infiltration surface rehabilitation
In the event that grassed surface permeability has reduced, there are a number of landscape techniques that can be used to open the surface to encourage infiltration. Such activities are not commonplace and are likely to be required only in circumstances where silt has not been effectively managed upstream.

1. Scarifying to remove "thatch". Thatch is a tightly intermingled organic layer of dead and living shoots, stems and roots, developing between the zone of green vegetation and the soil surface. Scarifying with tractor-drawn or self-propelled equipment to a depth of at least 50 mm breaks up silt deposits, removes dead grass and other organic matter and relieves compaction of the soil surface.
2. Spiking or tining the soil, using aerating equipment to encourage water percolation. This is particularly effective if followed by top dressing with a medium to fine sand, and is best undertaken when the soil is moist. Spiking or tining with tractor drawn or self-propelled equipment penetrates and perforates soil layers to a depth of at least 100 mm (at 100 mm centres) and allows the entry of air, water, nutrients and top dressing materials.
3. As a last resort, it may be necessary to remove and replace the grass and topsoil by:
    - removing accumulated silt and (subject to a toxicity test) applying to land or dispose of to landfill
    - removing damaged turf which should be composted
    - cultivating remaining topsoil to required levels
    - re turfing (using turf of a quality and appearance to match existing) or reseeding (to BS 7370: Part 3, Clause 12.6 (BSI, 1991) using seed to match existing turf) area to required levels. It may be necessary to supply and fix fully biodegradable coir blanket to protect seeded soil. Turf and seeded areas should be top dressed with fine sieved topsoil to BS 3882 (BSI, 1994) to achieve final design levels. Watering will be required to promote successful germination and/or establishment.

Water butts operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris..	Annually (or following poor performance).
Occasional maintenance	Replacement of any filters.	As required
Remedial actions	Repair of erosion damage, or damage to tank.	As required
Monitoring	Inspection of the tank for debris and sediment build up.	Annually (or following poor performance).
	Inspection of inlets, outlets and withdrawal devices.	Annually (or following poor performance).
	Inspection of areas receiving overflow, for evidence of erosion.	After extreme storms.
	Inspection of roof drain filters	Annually (or following poor performance).

Separators/interceptors operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Removal of litter and debris.	6 monthly
Occasional maintenance	Change of filter media.	As required
	Removal of sediment, oil, grease and floatables.	As required
Remedial actions	Replacement of malfunctioning parts.	As required
Monitoring	Inspect for evidence of poor operation.	6 monthly
	Inspect filter media and establish appropriate replacement frequencies.	6 monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies.	Monthly in the first year of operation, then every 6 months.

For oil/water separators, the following items should be undertaken every six months as a minimum:

- check volume of sludge
- check thickness of light liquid
- check function of automatic closure device
- empty the separator if required
- check the coalescing material and clean or change if necessary (Class 1 only)
- check the function of the warning device (if fitted).

General inspection of oil/water separators should occur at a maximum frequency of five years, and should cover the following:

- watertightness of system
- structural condition
- internal coatings
- in-built parts
- electrical devices and installations
- checking of adjustment of automatic closure devices.
-

It is of key importance that the separator is filled with clean water before it is put into operation and each time after it is emptied for maintenance. Failure to do so will cause the separator to malfunction until stormwater builds up the required permanent water level in the facility. It is possible to fit an alarm to separators that will indicate when the collected oil volume is at a maximum, and this may be a regulatory requirement.

Modular systems operation and maintenance

Maintenance schedule	Required action	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually, or as required
Occasional maintenance	-	-
Remedial actions	Repair/rehabilitation of inlets, outlet , overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms

Appendix D

ENGINEER'S INSPECTION
CONDITIONS AND LIMITATIONS

1. The report is a record of a visual inspection carried out by, or under the direction of a Chartered Structural Engineer and must not be misinterpreted as a Structural Survey such as would be carried out by a Chartered Surveyor. The report is not a Valuation Survey.

2. The inspection is strictly limited to the items requested and these will be detailed in the report. No consideration will be given to any other aspects or parts of the building.

3. The report is confidential to the Client(s) and has been prepared to their instructions for their own purposes only and it is not permitted to disclose this report to any other parties (except the Clients own Solicitors, Surveyors, Building Societies or Estate Agents) without the prior consent of Aqua Callidus Consulting Ltd.

4. The copyright of this report remains the property of Aqua Callidus Consulting Ltd.

5. No liability for the contents of this report is accepted to any parties other than the Client(s). No parties other than the client should rely upon this report.

6. Unless specifically stated otherwise:-

   a) Trial holes will not be excavated prior to the preparation of the report and the depth and construction of the foundations and type of sub-soil will not be inspected.

   b) All external observations will be carried out by eye from the ground level only. Internal inspection is made within the limits of ready accessibility and it is not normal practice to lift floor coverings or floor boards, remove fixtures, panels or plaster, or move heavy items of furniture or bulky goods or materials.

   c) No inspection will be made of any roof voids, floor joists, wall cavities, drainage pipework or any other hidden or inaccessible parts.

   d) No timbers will be checked for damp, rot, infestation by wood-boring insects or other defects.

   e) It should not be construed that any parts of the construction comply with the requirements of the Building Regulations Act or standard practice either current or as current at the time of original construction. No enquiries to any Authorities will be made.

   f) No testing or enquiries into the presence of or susceptibility to pollution, contamination, radiation, methane, radon or other gases or hazardous substances has been carried out.

7. Unless specifically stated otherwise in the report, any recommendations for works given in the report are outline only and are to be confirmed or modified as appropriate at detailed design stage.

8. Where trial holes are specifically included in our instructions the condition of the footing and the founding soil relates only to the point of excavation and does not necessarily confirm a continuation of the same conditions throughout the non-inspected areas of the structure. Whilst such trial pits will usually provide a reasonable indication as to the general state of the foundations and ground conditions, these can not be determined with complete certainty.

9. Under the Construction (Design & Management) Regulations latest edition, the Client has obligations for ensuring Health and Safety arising from any construction work. If it is proposed to proceed with construction work based upon information or recommendations contained in this report, these regulations apply. Further details of any issues arising from our report or the Clients obligations generally are available on request.

10. Unless dealt with more specifically above the Association of Consulting Engineers Conditions of Engagement Short Form Agreement 2002 apply.

Appendix B

Sequential Test

Alternative Searched Sites

SHELAA Ref	Site name	SHELAA Category	Yield / capacity	Further assessment	Reason
HI04	Rear of 107 Havant Road	**Developable**	94	**EXCLUDED**	SHELAA states delivery in 6-10 year period
HI05	Havant Road and Castlemans Lane	**Developable**	62	**EXCLUDED**	SHELAA states delivery in 6-10 year period
HI07	Land between Manor Road and West Lane	**Developable**	244	**EXCLUDED**	SHELAA states delivery in 6-10 year period
HI08	North of Saltmarsh Lane	**Developable**	280	**EXCLUDED**	SHELAA states delivery in 6-10 year period
HI10	West of Glebe Close	**Developable**	140	**EXCLUDED**	SHELAA states delivery in 6-10 year period
HI11	Land north of The Oysters	**Developable**	29	**EXCLUDED**	SHELAA states delivery in 6-10 year period
HI15	Fathoms Reach	**Developable**	51	**EXCLUDED**	SHELAA states delivery in 6-10 year period
HI16	Rook Farm	**Developable**	300	**EXCLUDED**	SHELAA states delivery in 6-10 year period
HI17	115 Elm Grove	**Developable**	7	**EXCLUDED**	See Canditate Permissions List
HI33	Hayling Island Holiday Park	**Developable**	200	**EXCLUDED**	Site is promoted for over 55s accommodation
HI01	Northney Marina	**Discounted**	40	**EXCLUDED**	Equivalent flood risk
HI02	West of 207 Havant Road	**Discounted**	40	**EXCLUDED**	Equivalent flood risk
HI03	Land off Victoria Road	**Discounted**	22	**EXCLUDED**	Equivalent flood risk
HI06	Fleet Meadows	**Discounted**	65	**EXCLUDED**	Equivalent flood risk
HI09	South of Saltmarsh Lane	**Discounted**	60	**EXCLUDED**	Equivalent flood risk
HI12	Land at Hayling College	**Discounted**	45	**EXCLUDED**	Unavailable according to landowner
HI13	Land north of Tournerbury Lane	**Discounted**	65	**EXCLUDED**	Unavailable according to landowner
HI14	Land east of 17-29 Laburnum Grove	**Discounted**	24	**EXCLUDED**	Equivalent flood risk
HI21	North of Selsmore Lane	**Discounted**	47	**EXCLUDED**	Equivalent flood risk
HI22	Beachlands Public Car Park & Toilets	**Discounted**	28	**EXCLUDED**	Equivalent flood risk
HI23	Beachlands Amusements & Cafe	**Discounted**	32	**EXCLUDED**	Equivalent flood risk
HI24	Funlands Amusement Park	**Discounted**	113	**EXCLUDED**	Equivalent flood risk
HI25	186 Sea Front	**Discounted**	7	**EXCLUDED**	Alternative development type (Park Home for over 55s)
HI26	Eastoke Corner	**Discounted**	20	**EXCLUDED**	Equivalent flood risk
HI27	Nab Car Park	**Discounted**	35	**EXCLUDED**	Equivalent flood risk
HI28	Southwood Road Open Space	**Discounted**	12	**EXCLUDED**	Equivalent flood risk
HI29	Fishery Lane	**Discounted**	16	**EXCLUDED**	Equivalent flood risk
HI32	Land at Avenue Road	**Discounted**	22	**EXCLUDED**	Equivalent flood risk
HI09	Land rear of 25 Mengham Road	**Below threshold**	<5 dwellings	**EXCLUDED**	See Canditate Permissions List
HI18	Land rear of 13-21 Mengham Road	**Below threshold**	<5 dwellings	**EXCLUDED**	See Canditate Permissions List
HI30	Coastal Yard	**Below threshold**	<5 dwellings	**EXCLUDED**	Equivalent flood risk
HI31	Old School Drive	**Below threshold**	<5 dwellings	**EXCLUDED**	Equivalent flood risk

Source: Havant Borough Council Strategic Housing and Economic Land Availability Assessment

Appendix C

Exception Test Part

Part (a) - sustainability benefits