



**PROPOSED RESIDENTIAL DEVELOPMENT
SINAH LANE, HAYLING ISLAND
HAVANT**

FLOOD RISK ASSESSMENT

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Flood Risk Assessment

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1.0 Executive Summary

Rogers Cory Partnership Limited has prepared this Flood Risk Assessment (FRA) in accordance with the guidance set out in the Department for Communities and Local Government National Planning Policy Framework (NPPF).

This report summarises the methodology and results of the FRA in relation to the planning application for the residential proposal for the erection of 195 dwellings, associated open space, pumping station, sub-station with vehicular access via Sinah Lane and change of use of land from agricultural to a Wader and Brent Geese refuge.

According to data supplied by the Environment Agency (EA), the site lies wholly within Flood Zone 1 considered the lowest risk of flooding from fluvial or tidal sources. This report therefore focuses on the site-specific flood risk assessment and surface water management in line with the requirements of the Environment Agency and Hampshire County Council.

The study will also examine the effects of the development on adjacent parcels of land.

A surface water drainage strategy has been developed and hydraulically modelled incorporating sustainable urban drainage systems (SuDS) in line with the NPPF and EA standing advice. The strategy is based on a reduction in the surface water run-off rates thus ensuring that the development does not increase the risk of flooding from the site during peak storm events.

This report has therefore been prepared in support of a planning application for the residential proposal for the erection of 195 dwellings, associated open space, pumping station, sub-station with vehicular access via Sinah Lane and change of use of land from agricultural to a Wader and Brent Geese refuge

The report also aims to assess potential flood risk sources to and from the site and detail the drainage strategy for implementation on the scheme.

2.0 Introduction

Rogers Cory Partnership Limited have been instructed on behalf of Barratt David Wilson to prepare a Flood Risk Assessment (FRA) and surface water drainage strategy in support of a planning application for the proposed residential development in Hayling Island.

The development site seeks planning permission from the Havant Borough Council for the residential proposal for the erection of 195 dwellings, associated open space, pumping station, sub-station with vehicular access via Sinah Lane and change of use of land from agricultural to a Wader and Brent Geese refuge.

The National Planning Policy Framework (NPPF) was published in March 2012 by the Department of Communities and Local Government and replaced all planning policy statements including Planning Policy Statement 25 (PPS 25): Development and Flood Risk. The NPPF set out the Government's planning policy for England and how these are expected to be applied. The Planning Practice Guidance (PPG), published in March 2014, provides additional guidance and retains key elements of the now superseded PPS 25.

Initial searches into the Environment Agency's (EA) website has identified the development site to lie wholly within flood zone 1, considered to be the lowest risk of flooding from rivers or sea. In this respect requirements in the NPPF (foot note 20) states the following:

"site-specific flood risk assessment is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding."

The EA Guidance Note 3 (April 2012) highlights that a FRA is required to ensure flood risk to the proposed development is considered as well as the impact the development will have elsewhere on people and property. In addition the FRA should consider the risk of flooding from other sources (groundwater, overland flow, sewers).

The PPG sets out the objectives of a site specific FRA as to establish the following:

- *"Whether the proposed development is likely to be affected by current or future flooding from any source;*
- *Whether it will increase flood risk elsewhere;*
- *Whether the measures proposed to deal with these effects and risks are appropriate;*
- *The evidence for the local planning authority to apply (if necessary) the Sequential Test, and;*

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- *Whether the development will be safe and pass the Exception Test, if applicable.”*

As such this report has been prepared in accordance with the requirements of the NPPF, PPG and EA Guidance.

3.0 Proposed Development Site

3.1 Site Location

The site is located off Sinah Lane within the south western part of Hayling Island. The site is bounded by residential properties to the west and south, open fields and a nature reserve to the north, Hayling Billy Trail and open fields to the east with National Grid reference 470733, 99841 (See **Appendix A**).



Figure 1- Site Location and Extent

3.2 Existing Topography

A topographical survey was carried out by Siteline in June 2016 and subsequently in April 2017 and May 2018 and is related to Ordinance Survey Datum.

The survey generally shows the site to be relatively flat levels ranging from approximately 5.90mAOD in the south, falling gently northwards to 5.10mAOD (See **Appendix B**).

3.3 Development Proposals

The proposed development comprises of the erection of 195 dwellings, associated open space, pumping station, sub-station with vehicular access via Sinah Lane and change of use of land from agricultural to a Wader and Brent Geese refuge.

3.4 Existing Geological Information

According to existing British Geological Survey (BGS) maps the site is located over the London Clay Formation with a superficial Head deposit consisting of River Terrace Deposits of Sand, Silt and Clay

Intrusive ground investigations carried out by Wilson Bailey in 2015 indicate the in-situ ground as comprising of Topsoil to 0.4-0.65mbgl over a soft brickearth type silty CLAY beneath which a generally medium to coarse sand with variable gravel content to depths of less than 4mbgl and onto stiff grey clay soils of the

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London Clay was encountered. Groundwater was encountered at depths of approximately 1.5mbgl and found that the groundwater rest level was at 1.0mbgl with further tidal monitoring indicating that the groundwater is tidally influenced with a variation of between 0.05m to 0.12m. Due to the depth of the groundwater and extent of soft silty Clay, infiltration drainage is deemed inappropriate for this site.

3.5 National Policy Context

National policy regarding flood risk is contained within the National Planning Policy Framework and Technical guidance which was issued by the Department of Communities and Local Government in March 2012.

The Environment Agency's latest revision of their Flood Risk Standing Advised (FRSA) (version 3.1) was released in April 2012.

The Department for Environment, Food and Rural Affairs (DEFRA) released the Non-statutory technical standards for sustainable drainage systems in March 2015. The document sets out non-statutory technical standards for SuDS to be read in conjunction with the NPPF and PPG.

As of the 15th April 2015 the Lead Local Flood Authority (LLFA) has now become a statutory consultee on all major planning applications and as such will assess planning applications in respect of surface water drainage and sustainable drainage systems which was previously the responsibility of the Environment Agency. The LLFA's primary duties will be to ensure that flood risks from surface water run-off, groundwater and ordinary watercourses are identified and managed properly. The use of SuDS will be a material consideration in planning conditions and as such the proposed use of SuDS will need to be demonstrated on all major developments unless it can be demonstrated otherwise.

3.6 Local Planning Policies

As the site is located within Havant any future development would need to accord with the policies set out in the Havant Borough Council Core Strategy (adopted in 2011). The policies most relevant to flooding are CS15

CS15 Flood and Coastal Erosion Risk

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

- 1. It meets the sequential and exception test (where required) in relation to PPS25.*
- 2. The site is located in a low hazard area as defined in the Strategic Flood Risk Assessment.*
- 3. A site-specific flood risk assessment demonstrates that the development will be safe, including the access, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*
- 4. The scheme incorporates flood protection, flood resilience and resistance measures appropriate to the character and biodiversity of the area and the specific requirements of the site.*

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5. Appropriate flood warning and evacuation plans are in place.

6. New site drainage systems are designed taking account of events which exceed the normal design standard.

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

The council will work with partners to implement the Coastal Policy Zones in the North Solent Shoreline Management Plan to ensure that development avoids areas at risk from coastal erosion and coastal flooding and that areas required to offset coastal squeeze and prevent habitat fragmentation, to allow species to adapt to climate change, are identified and protected from development.

3.7 Existing Flood Defences

The site does not benefit from any existing flood defences.

3.8 NPPF Flood Zone and Vulnerability

The National Planning Policy Framework Table 1 confirms the flood zone Classification based upon the probability of flooding. The site is shown to lie wholly within Flood Zone 1 (low risk of tidal flooding).

Table 2 of the National Planning Policy Framework confirms the 'Flood Risk Vulnerability Classification' of a site, depending on its proposed use. The classification is then applied to Table 3 to determine whether:

- The proposed development is suitable for the flood zone in which it is located
- An Exception Test is required for the proposed development.

The proposed development is classified as 'More Vulnerable' according to the NPPF and suited for the flood zone in which it is located.

4 Flood Risk to the Site

The degree of detail appropriate to an FRA depends upon the scale and potential impact of the proposed development to and from the surrounding boundaries. In this case, the applicant has the intention of re-developing an area of land which is located wholly within Flood Zone 1, considered the lowest risk of flooding from tidal sources.



Figure 2- Extract from EA Website- Flood Map for Planning (Rivers and Sea)

4.1 Strategic Flood Risk Assessment

The National Planning Policy Framework confirms that Regional Planning Bodies (RPBs) or local planning authorities (LPAs) should prepare strategic Flood Risk Assessments (SFRAs) in consultation with the EA. The SFRA is then used to refine information on areas liable to flooding by taking into account other sources of flooding and the impacts associated with climate change in addition to the EA flood map data.

The document informs the Council's policies in the emerging Local Development framework and a strategic approach to the allocation of sites for development and the future management of flood risk, in line with the National Planning Policy Framework.

The Partnership for Urban South Hampshire (PUSH) is made up of 10 local planning authorities within Hampshire. Atkins were commissioned in 2006 to undertake a Strategic Flood Risk Assessment (SFRA), which was divided into two stages.

The first stage of the SFRA included for the collation of data and production of scoping appraisal. This stage also provided a high-level analysis of flood risk within each sub-region. This stage was developed to assist in assessing the feasibility of the PUSH housing allocation.

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The second stage of the SFRA involved the production of detailed mapping outputs to assist the Planners and Flood Risk Managers.

4.2 Existing Information on Flooding

Tidal Flood Risk

According to the EA Flood Map, see figure 2, the site appears to be located wholly within Flood Zone 1. As such the site is considered to be at low risk from tidal flooding.

Whilst the site lies wholly within Flood Zone 1, it is recognised that vehicular access on and off Hayling Island is only via Langstone Road, located further north of the site (see figure 3). Part of Langstone Road lies within Flood Zone 3 considered a high risk of Tidal Flooding. As a result, early consultation has been carried out with the Environment Agency, East Solent Coastal Partnership, Hampshire County Council and Havant Borough Council regarding flood risk and drainage matters relating to the development. As a result, a Flood Emergency Plan, describing early flood warning and procedures for the development in the event of a peak tidal surge event has been included as part of **Appendix K** which is proposed to be implemented to inform and assist future residents in the event of a peak tidal flood event.



Figure 3- Extract from EA Website- Flood Map for Planning (Rivers and Sea)

Fluvial Flood Risk

The site is located within Flood Zone 1, considered lowest risk of flooding from fluvial sources.

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Sewer Flood Risk

There are no recorded incidences of sewer flooding within the vicinity of the site. Any potential future risk to the proposed development from sewer flooding events is considered low in the context that the finished levels on the site will be designed to ensure that any overland flow is directed away from the buildings and not pose a risk to people or property.

Surface Water Flood Risk

Searches of the EA Risk of Flooding from Surface Water flood map confirm that the site lies mainly outside the of any risk of flooding from surface water with exception of areas within the south eastern part which indicate to be a low risk of flooding from surface water (between 0.1% to 1% probability). The areas are reflective of localised low points within the site and the risk to the future development can be mitigated thorough the detailed design of the finished ground levels of the development.



Figure 4 Extract: – Extract from Environment Agency Risk of Surface Water Flood Risk Maps

Groundwater Flood Risk

A review of the groundwater levels indicates that the risk of groundwater flooding to the development is low.

Any potential residual risk to the new development will be mitigated through the detailed design of the finished ground levels which will seek to have building floor levels above the existing ground levels and ensure adequate falls away from the building to protect both building and people.

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Flood Warning

The EA's Flood Warning service is aimed to mitigate the impact of flooding for people who live in areas subject to flooding and is available for the areas within the floodplain of the main rivers in England and Wales.

4.3 Climate Change

As of the 19th February 2016, the EA has updated guidance on the application of climate changes allowances for the following:

- peak river flow by river basin district
- peak rainfall intensity
- sea level rise
- offshore wind speed and extreme wave height

Peak river flow allowances are now to be based on River Basin areas thus making them more geographically relevant, based on the range of predicted allowances.

Rainfall – increases in peak rainfall over time is to be assessed on two scenarios to assess the sensitivity of the areas as per table 1 below

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%

Table 1: Extract from www.gov.uk website- Table 2 – peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

As a conservative approach, a lifetime of the development should be considered of up to 100 years (i.e. up to 2118) when assessing flood risk for residential developments. According to Table 1 above, an increase of 20% to 40% on the peak rainfall intensity should be expected. To mitigate any residual risk at the site as a result of climate change, an appropriate climate change allowance (i.e. 40% increase in rainfall intensity) will therefore be considered and accommodated within the design strategy for managing surface water run-off.

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4.4 The Sequential Test

The sequential test approach is aimed to steer new development to areas of lowest probability of flooding. In this regard to determine the suitability and classification of the development, as a check of the proposed scheme, consultation has been made to tables 2 and 3 of the NPPF.

Table 2 of the NPPF technical guidance determines that the proposed development is considered to be a 'more vulnerable' land class usage, in terms of flood risk, as illustrated in Figure 4.

More vulnerable
• Hospitals.
• Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
• Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
• Non-residential uses for health services, nurseries and educational establishments.
• Landfill and sites used for waste management facilities for hazardous waste ⁶ .
• Sites used for holiday or short-let caravans and camping, <i>subject to a specific warning and evacuation plan.</i> ⁷

Figure 5: Extract of Table 2: Flood Risk Vulnerability Classification

Table 3 of the NPPF considers sites providing a 'more vulnerable' land-class usage in a Flood Risk Zone 3 area to require the application of the Exception Test, (see Figure 4):

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓
	Zone 2	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✗	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✗	✗	✗

Key: ✓ Development is appropriate.
 ✗ Development should not be permitted.

Figure 6: Table 3 - Flood Risk Vulnerability and Flood Zone 'Compatibility'

As the site lies wholly within Flood Zone 1, it is deemed suitable for residential development in terms of flood risk vulnerability.

5 Surface Water Management

Hampshire County Council (HCC) are the Lead local flood Authority for Havant Borough Council and statutory consultee on surface water management on all planning applications within the County.

The surface water management section should ensure that there is no adverse impact on flood risk elsewhere as a result of a change in the surface water runoff regime from the re-development.

A meeting was held with the LLFA on the 7th June 2017 as part of their pre-application process. Details of the key elements of the constraints and opportunities discussed at the meeting are noted below:

- HCC are not averse to the strategy using pumping provided we can demonstrate that this is the only alternative and content that pumping was being proposed, efforts have been made to bring in SuDS to manage the water quality and quantity;
- HCC would expect to see the site discharge to the greenfield run-off rates.

A site meeting and walkover was also carried out with the Havant Borough Council Drainage Engineer on the 14th June 2017, where the route of the existing ditch and outfall was reviewed and recommendations for CCTV drainage surveys to be undertaken on the sections of ordinary watercourse once it entered culverted sections. A copy of the meeting note summarising the key items of the meeting is provided in **Appendix F**. It should be noted that since this meeting, the scheme proposals have developed and the proposed point of discharge from the SuDS scheme is now being taken to another ditch system further north, which drains into a pond and ultimately to a watercourse which discharges into the Sinah Lake.

The drainage strategy has been developed with the above key items in consideration. Infiltration has not been deemed suitable based on the intrusive investigations carried out onsite which indicate a highly silty CLAY geology in conjunction with the high groundwater table.

5.1 Existing Surface Water Drainage Regime

A base line hydrology plan has been produced to review the current surface water run-off from this Greenfield site and into the existing ordinary watercourses along its eastern and northern boundary. This plan is presented as **Appendix G**.

5.2 Pre-Development Run Off

The historic Greenfield run-off rate is based on the IH Report 124 'Flood estimation for small catchments' (Marshall and Bayliss, 1994).

Using the Micro drainage source control suite ICP SuDS methodology the following baseline parameters were used to determine the sites historic Greenfield run off rates:

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SAAR (mm): 700

Soil: 0.40

Region 7

Area: 2.913ha (impermeable area of proposed site)

Return Period: 100 Year

The historic Greenfield run-off rates have been summarised in Table 2 below:

Area (Ha)	QBar Urban (L/sec)	Q1 Year (L/Sec)	Q30 Year (L/Sec)	Q100 Year (L/Sec)	Greenfield Run-off Volume (m3)
2.913	9.9	8.4	22.5	31.6	661.756

Table 2: Summary of Greenfield runoff rates and volumes

5.3 Design Principles

Key design principles in the following guidance documents steer the approach to managing surface water runoff at sites:

- Building Regulations hierarchy of drainage (H3);
- Interim Code of Practice for SuDS; and
- CIRIA best practice guidance, including the use of the 'SUDS management train'

Building Regulations hierarchy of drainage outlines the preferred methods for the disposal of surface water with infiltration methods being the preferred option. If this is not possible the next favoured option is to drain to an existing watercourse. If neither of these options are feasible, the regulations state that rainwater discharge should be directed to a sewer.

The Interim Code of Practice for SUDS provides guidance about the hydraulic design criteria for Sustainable drainage systems. This in general refers to both peak rate of runoff and the volume of runoff, post development. Prior to mitigation measures such as the use of SuDS attenuation features, both the volume and peak rate of runoff may increase post development.

The design principles for surface water management extend beyond simple hydraulic criteria. CIRIA guidance promotes the use of the SUDS management train, a concept where SUDS techniques are used to treat, convey and store surface water runoff. This approach is considered as part of the SUDS selection methodology.

Sustainable Drainage Systems

To drain the development in a sustainable manner whilst complying with the requirements of the NPPF, the scheme should seek to adopt an appropriate form(s) of sustainable urban drainage systems (SuDS).

SuDS techniques comprise of implementation of infiltration drainage devices to discharge surface water to the underlying soil stratum (where ground conditions permit). These may be in the form of conventional soakaways, infiltration basins and ponds, filter strips, bio-retention areas, swales, permeable surfaces, green roofs, over-sized pipes/tanks or geo-cellular attenuation units.

An additional 40% storage provision should be provided as an allowance for any potential climate change impact (as stated in Table 1: Peak rainfall intensity allowance in small and urban catchment associated with a residential scheme).

The SuDS philosophy is steered to maximize the benefits and minimise the negative impacts of surface water runoff from developed areas. CIRIA C753 The SuDS Manual determines the design criteria for SuDS to be based upon water quantity, water quality, amenity and biodiversity. Table 7.1 of The SuDS Manual assesses each SuDS component to the delivery of the design criteria. Where broadly ranking the SuDS, components depicted in Table 7.2 by applying a score for the deliverance of the design criteria, a theoretical SuDS hierarchy can be determined for the selection of SuDS against the design criteria as represented in Table 3 below.

SuDS in the form of an attenuation ponds, basins and bio-retention areas have been incorporated within the scheme. It has therefore been concluded that the SuDS design criteria as described in the SuDS Manual has been met and accords with current best practice.

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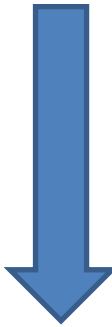
SuDS Component	Potential of delivering SuDS Design Criteria
Infiltration Systems	High  Low
Swales	
Bioretention systems	
Pervious Pavements	
Detention Basins	
Trees	
Green Roofs	
Ponds and Wetlands	
Filter Drains	
Filter Strips	
Rainwater Harvesting Systems	
Proprietary Treatment Systems	
Attenuation Storage Tanks	

Table 3: Theoretical SuDS Hierarchy**Infiltration Drainage**

Intrusive ground investigations carried out indicate that the underlying strata consists of firm clay and silt with low permeability in conjunction with relatively shallow groundwater. As such full infiltration drainage has not been deemed suitable for this site.

Existing Watercourses

There is an existing ditch system located on the eastern boundary of the site, which in turn flows northwards into an existing ordinary watercourse and a final outfall into Sinah Lake.

5.4 Surface Water Drainage Strategy

In view of the requirements of the NPPF, PPG, HCC the design parameters and constraints associated with redeveloping this site, a surface water drainage strategy design has been devised and hydraulically modeled to demonstrate that the scheme can be suitably implemented without increasing the level of flood risk, when the

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surface water drainage system experiences a 1:100 year rainfall event (including climate change).

The surface water drainage scheme has been designed to ensure:

- A reduction in the pre-development site discharge for peak storm events.
- Sustainable Urban Drainage systems are wholly incorporated within the scheme.
- Consideration is given for the improvement of water quality within the design.
- The designed drainage scheme can satisfactorily retain a critical 1 in 100 Year storm event with climate change.

Having taken into consideration the above points, a scheme has been devised and hydraulically modelled based on attenuation techniques with a restricted discharge to the existing watercourse at the predevelopment Greenfield run-off rates. A copy of the proposed surface water strategy can be found in **Appendix I**.

5.4.1 Access Roads, Shared Surfaces, Private Drives and Roof Drainage

The proposed run-off from the access roads, drives and parking bays will be conveyed to the new below ground surface water network via trapped gullies. Rainfall run-off from the roofs of the new properties will discharge directly into the below ground surface water network

The surface water network will convey the flows, under gravity, north eastwards towards a new attenuation basin and SuDS swales which will provide attenuation of the restricted flow prior to discharging to an existing ditch system located on the eastern boundary of the site, which in turn flows northwards into an existing ordinary watercourse and a final outfall into Sinah Lake.

Due to the very limited fall available on the site, (approximately 800mm over the entire site) and depth of the proposed outfall ditch, consideration of how to achieve a gravity connection to the existing watercourse system was undertaken whilst still ensuring a sufficient depth of attenuation could be achieved. The following options were considered:

- Raising ground levels to achieve a gravity connection to the ditch in the north- This option was discounted due to the need to raise the ground levels across the site and most significantly along the southern and western boundaries of the site, which was not permitted due to the sensitivities of the ground levels interface with the neighboring properties;
- The use of shallow SuDS drainage techniques, such as swales and lined permeable paving. This option was considered but discounted as the use of shallow SuDS alone would not mitigate the need for a surface water pumping solution, without land raising as well. Furthermore, the proposed roads and

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sewers are to be put forward for adoption by HCC and a Local Sewerage Authority, who would not permit the use of a line permeable paving for the conveyance of surface water drainage within the main access roads.

As a result, a surface water pumping solution has been proposed to overcome the limited fall available on the site and a positive gravity connection from the main attenuation basin to the existing watercourse system.

The proposed onsite surface water pumping station is to be offered for adoption as part of an adoptable surface water drainage scheme and thus will become the responsibility of a Local Sewerage Authority.

In addition to the provision of emergency storage, the pumping station has been located in the north eastern part of the site adjacent to the proposed swales and attenuation basin and includes for a provision for exceedance overflow into the basin in the event of a pump failure, thus ensuring flows would continue into the SuDS attenuation systems.

5.4.3 Flow Control

A maximum overall development discharge is proposed to be limited to the greenfield equivalent run-off rates.

The hydraulic calculations have been simulated under various scenarios up to and included the critical 1 in 100 Year storm event with additional 40% allowance for climate change. The simulations confirm that the storm can be managed and maintained within the site without flooding.

The hydraulic model of the proposed surface water network, incorporating the SuDS attenuation systems can be found in **Appendix I**.

Impermeable Development Area (Ha)	Q1 Year (L/sec)	Q30 Year (L/Sec)	Q100 Year Plus Climate (L/Sec)	Discharge Volume (m3) (360min Winter)
2.814	8.0	9.9	9.9	314.180

Table 5: Summary of Post Development Runoff with mitigation measures

5.4.4 Water Quality

It is important to address issues with regards to quality when considering surface water management. As the surface water is proposed to be discharge to the existing downstream watercourses, treatment is proposed as part of a SuDS Management Train in accordance with the recommendations of the SuDS Manual (CIRIA 753) and as required by the LLFA.

Chapter 26 of the CIRIA SuDS Manual (2015) provides guidance on methods that should be used to design SuDS to meet the water quality design criteria and good

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practice design standards. Diffuse urban pollution is a significant factor in compromising groundwater and receiving water standards that are required under the EA Water Framework Directive. Chapter 4 of the SuDS Manual summarises factors, which influence pollution levels in urban run-off. This summary is presented in **Table 6 below:**

Factors influencing pollution levels in urban run-off
The amount and type of pollution washed off a surface will depend on many things including: • Planning activities on, above and adjacent to the surface that affect the deposition of pollutants, their retention on the surface and the extent to which they are mixed with runoff (including pollution prevention strategies) • Unplanned activities (accidents and spillages) that can cause temporary unexpected high pollution concentrations • The surface location and type, affecting wash-off rates and contaminant movement mechanisms • The drainage path • The length of the dry weather period before the rainfall event • The intensity and the duration of the rainfall, and the associated flow velocities Any further pollutant transformations occurring during residence and conveyance within gullies, chambers, pipe or channel networks, gravels, soils and vegetation and quiescent bodies of water.

Table 6: Extract of Box 4.1 of the SuDS Manual (CIRIA 753)

Table 4.3 of the SuDS Manual classifies the pollution hazard level for residential sites, including residential car parks, low traffic roads as being “low” and thus only requiring a “Simple index approach” in terms of the requirements for the discharge to surface waters, including coasts and estuaries.

The SuDS Manual summarises the steps for the simple index approach:

Step 1 – *Allocated suitable pollution hazard indices for the proposed land use*

Step 2 – *Select SuDS with a total pollution mitigation index that equals or exceeds the pollution index*

Step 3 – *Where the discharge to a protected surface waters or groundwater, consider the need for a more precautionary approach*

The SuDS Manual describes “protected surface waters” as protected surface water resources, which include those designated for drinking water abstraction or for other environmental protection reasons

Table 26.2 of the SuDS manual notes the following pollution hazard indices for residential land use development:

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Land Use	Pollution Hazard Level	Total suspended solids (TSS)	Metals	Hydrocarbons
Individual property driveways, residential car parks, low traffic roads (eg. cul-de sacs, home zones and general access roads) and non-residential car parking with infrequent change (eg schools, offices)ie. Less than 300 vehicle movements/day	Low	0.5	0.4	0.4

Figure 7: Extract of Table 26.2 of SuDS Manual (2015)

Table 26.3 of the SuDS Manual provides details of the SuDS pollution mitigation indices for various types of SuDS components

Type of SuDS component	Mitigation indices		
	TSS	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable Paving	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

Figure 8: Extract of Table 26.3 of SuDS Manual (2015)

As such the total SuDS mitigation index (figure 8) must be greater than the pollution hazard index (figure 6), furthermore when used in combination of two or more SuDS components, a factor of 0.5 is used to account for the reduced performance of the secondary or tertiary components associated with the already reduced inflow of concentration, therefore:

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5(\text{mitigation index}_2)$$

As such all the run-off from the development site is proposed to be conveyed through attenuation basins, bioretention areas and swales thus providing a far greater SuDS mitigation index than what is required to meet the minimum standards.

5.4.5 Long Term Maintenance

Consideration has been given to the long-term maintenance of the proposed drainage structures. SuDS attenuation basins, bio retention areas, granular filter drainage and all associated external pipework, chambers and manholes will be the responsibility of a management company.

A detailed maintenance schedule will be provided by the designers during the detailed design stage of the surface water proposals.

5.4.6 Exceedance

Whilst the drainage system has been designed to a very high standard (1 in 100 Year storm event including climate change), it is possible that a more extreme event will occur and that the design standard for the system will be exceeded. It is best practice to design the drainage system to shed water, primarily into landscaped and other areas, therefore reducing the risk of flooding areas of built development during extreme events.

A strategy for directing overland flows for the site will be confirmed using overland flow modeling as part of the detailed design once key ground levels or development levels across the site have been finalized. .

5.4.7 Safe means of access and egress.

A safe means of emergency dry access and egress is proposed from the development site through the proposed access roads to Sinah Lane. A Flood Plan is provided in **Appendix K** which outlines options and procedures for future occupants to consider in the event of a peak tidal surge event should they wish to leave Hayling Island during such occurrence.

6 Foul Water Drainage Strategy

Southern Water Services Limited (SWSL) are the Local Sewerage Authority in this area. The development proposals will seek to discharge to the existing Southern Water public sewer network.

The proposed foul water discharge generated by the site has been calculated at 9.02l/s (based on 195 dwellings at 4000l/dwelling/day) in accordance with Sewers for Adoption 7th Edition.

It should be noted that as of April 2018, under the new Charging Rules for New Connection Services (English Undertakers) published by Ofwat, SWSL has introduced a new Charging Arrangement which includes methods for calculating charges and any Income Offsets and Asset Payments that will apply in relation to the provision of new mains and sewers; provisions of service connections, lateral drawings and waste connections, adoption agreements and diversions.

Under the new Charging Arrangements that SWSL will limit the charge for a New Sewer to the cost of connecting to the nearest reasonably practicable point on the network where the existing sewer is at least the same diameter as the New Sewer that is required to provide the capacity of the development.

The new development parcel will seek to connect to nearest existing Southern Water foul sewer via an onsite adoptable pumping station to the existing 200mm diameter sewer located just north west of the development site, subject to agreement with Southern Water.

Connections to the existing foul sewer can be made under Section 106 of the Water Industry Act 1991. Therefore, an application will need to be made to SWSL to connect to the public sewers. Should any of the onsite foul water networks be offered for adoption, then this will be carried out under Section 104 of the Water Industry Act 1991.

All domestic foul drainage will be designed in accordance with Part H of the Building Regulations.

7 Conclusion

This site-specific flood risk assessment has demonstrated that the development proposals are appropriate in terms of flood risk and the provision of flood mitigation measures.

A preliminary design surface water drainage strategy has been prepared and hydraulically modelled which demonstrates that the redevelopment proposals can be successfully implemented and designed to withstand the impact of a 1:100 year rainfall event (including climate change), in accordance with the NPPF, PPG and HCC requirements

The development's surface water discharge is proposed to be attenuated to the pre-development Greenfield run-off rates through the use of SuDS techniques and re-use of existing resources.

In view of this assessment, the report concludes that:

- i. The site is located wholly within Flood Zones 1 considered lowest risk of flooding from Rivers or Sea;
- ii. The Development and its occupants are not at an increased risk of flooding;
- iii. The Development does not increase the risk of flooding elsewhere;
- iv. The Development can be drained in a sustainable manner utilizing SuDS techniques;
- v. The Development will satisfactorily manage and maintain a 1 in 100 Year storm event with allowance for climate change

The findings of this report identify the opportunity to promote the sustainable re-use of existing resources and potential to implement an appropriate SUDS strategy.

Appendix (A)

Site Location Plan



Rev. Date Details By Chkd/Appd			
Client:-			
			
Site:- Sinah Lane Hayling Island		Drawing Title:- Site Location Plan	
Date: June 2018	Drawn: TRS	Checked: TRS	Approved: TRS
Drawing No. BSO/E4513/006		Scales: NTS	
FOR INFORMATION ONLY			
 Rogers Cory Partnership Architectural and Civil Consultants The Old School Old School Road Hook Hampshire RG27 9N4 T: 01256 769269 E: mail@rcpconsultants.co.uk W: rcpconsultants.co.uk			

Appendix (B)

Topographical Survey

TREES
A Ash
AL Alder
AP Apple
B Beech
CB Cedar
CH Cherry
CY Cypress
E Elm
EU Eucalyptus
FM Field Maple
FR Fruit
H Hazel
HZ Horse Chestnut
HO Horn Oak
HW Hawthorn
HOL Holly
JM Japanese Maple
LB Laburnum
LM Lime
LO Locust Tree
LR Laurel
M Maple
MG Magnolia
P Oak
PA Palm
PL Plane
PM Plum
PO Poplar
PP Passardi Plum
R Rose
RH Redwood
SB Silver Birch
S Silver Birch
SP Spruce
SY Sycamore
U Unidentified
W Willow
WN Walnut
T Tree

Species / Dia / Spread (max) / Ht
e.g. OK / 0.5 / 8 / 15

KEY
BT British Telecom
BOL Bollard
CB Control Box
CL Cover Level
CTV Cable Television
EL Electric
EP Electricity Pole
GH Gas Hydrant
GSV Gas Stop Valve
H Height
HVC High Voltage Cable
IC Inspection Cover
IL Invert Level
LP Lamp Post
MH Manhole
MKR Marker
MW Monitoring Well
OH Overhead
PG Road Gully
PC Post Crossing
RNP Road Name Plate
RS Road Sign
SUA Soakaway
SV Stop Valve (Unidentified)
TB Telephone Box
TIC Telecom
TH Trail Hole
TL Traffic Light
TP Telegraph Pole
UL Unstable to Lift
VP Vent pipe
WM Water Meter
WSV Water Stop Valve

FENCES
BWF Barbed Wire Fence
CSP Closed Sward Fence
CP Concrete Post
CWF Chestnut Paling Fence
IF Iron Fencing
PKF Picket Fence
PWF Post & Rail Fence
SFP Security Fence
SP Steel Post
WMP Wire Mesh Fence
WPF Wood Panel Fence

SURVEY STATIONS				
Name	Easting	Northing	Height	Type
S1	470868.438	99738.849	6.150	Nail
S2	470766.938	99763.865	6.048	Nail
S3	470869.727	99717.708	6.079	Nail
S4	470874.362	99754.775	5.941	Peg
S5	470892.752	99984.630	5.952	Peg
S6	470771.590	99992.519	5.402	Peg
S7	470861.440	99984.643	5.857	Peg
S10	471094.142	100188.088	5.010	Peg
S12	470861.907	100225.840	4.793	Peg
S13	471103.006	100187.407	4.885	Peg
EP1	470884.062	99984.677	7.505	Nail
EP2	470765.997	99991.367	7.224	Nail
EP3	470858.901	99811.340	7.887	Nail

Revision B - May 2018
Survey extended to north outfall

Revision A - April 2017
Survey extended to the north

NOTES:

The survey grid has been related to a local determination of OS National Grid using a flat earth projection and metric scales factor of 1, centred on Station S1. Levels are related to OS datum determined from the National GPS Network using OSGM02.

No assumptions should be made regarding the intersection of manholes. Drainage details have been obtained from surface inspection and should be verified if of critical importance.

The position and height of adjacent buildings have been obtained using higher level reflectorless measurement and may not take account of single storey extensions or conservatories below the line of sight.

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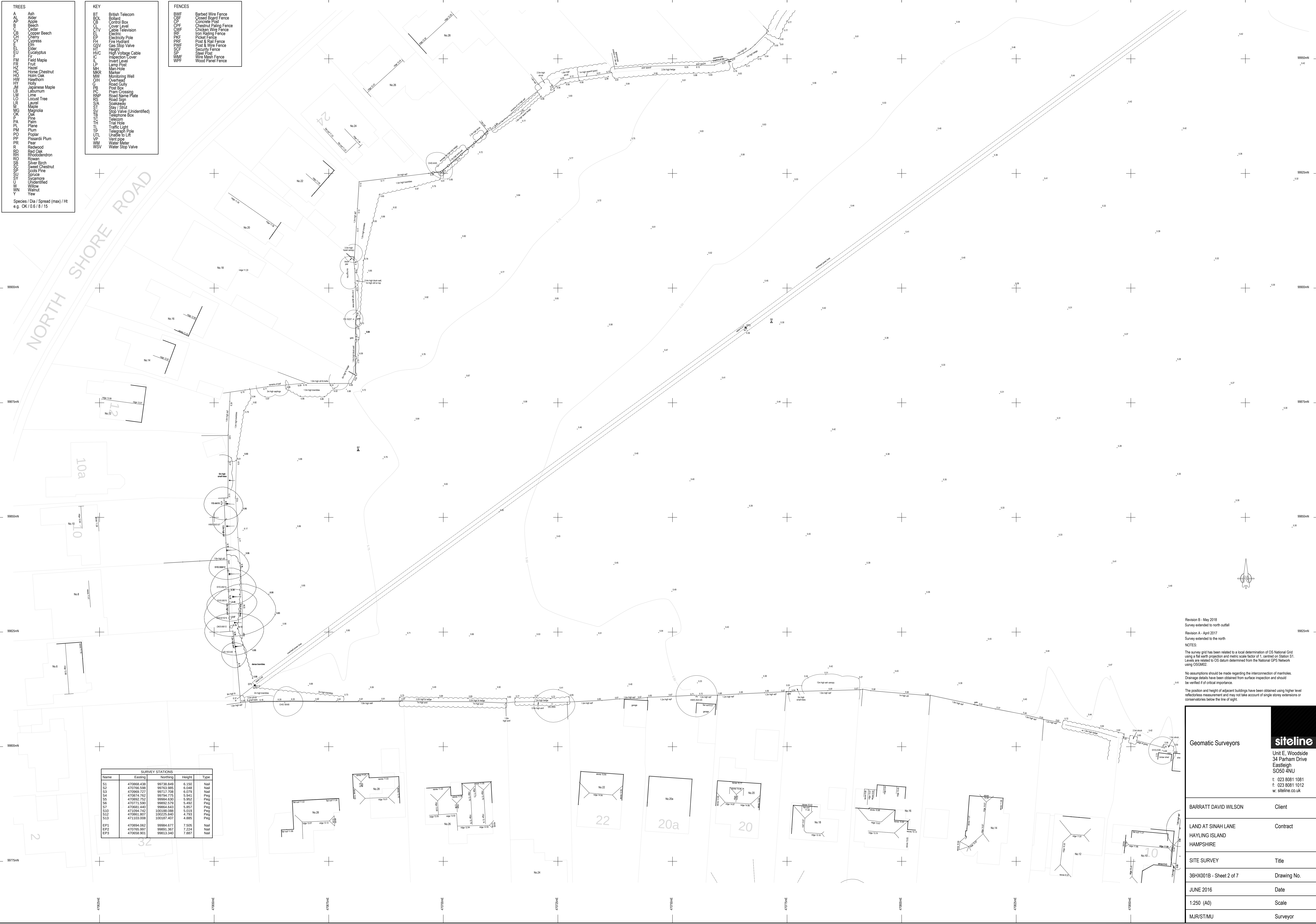
BARRATT DAVID WILSON	Client
LAND AT SINAH LANE HAYLING ISLAND HAMPSHIRE	Contract
SITE SURVEY	Title
36HX001B - Sheet 1 of 7	Drawing No.
JUNE 2016	Date
1:250 (A0)	Scale
MJR/ST/MU	Surveyor

TREES
A Ash
AL Alder
AP Apple
S Sycamore
CB Cedar
CH Cherry
CY Cypress
EU Eucalyptus
FM Field Maple
H Hazel
HC Horse Chestnut
HO Horn Oak
HW Hawthorn
J Japanese Maple
L Laburnum
LM Lime
LO Locust Tree
LR Laurel
M Magnolia
MG Maple
P Palm
PL Plane
PM Plum
PO Poplar
PP Pissardi Plum
R Redwood
RH Red Oak
RO Rhododendron
S Silver Birch
SC Silver Chestnut
SP Scots Pine
SR Spruce
SY Sycamore
U Unidentified
W Willow
WN Walnut
T Tree

KEY
BT British Telecom
BOL Bollard
CB Control Box
CTV Cable Television
EL Electric
EP Electricity Pole
FHT Fire Hydrant
GSV Gas Stop Valve
HVC High Voltage Cable
IC Inspection Cover
IL Invert Level
LP Lamp Post
MH Manhole
MK Marker
MW Monitoring Well
OH Overhead
P Road Gully
PB Post Box
PC Tram Crossing
RNP Road Name Plate
RS Road Sign
SUA Soakaway
SV Stop Valve (Unidentified)
TB Telephone Box
TLC Telecom
TH Trail Hole
TL Traffic Light
TP Traffic Pole
UTL Unstable to Lift
VP Vent Pipe
WM Water Meter
WSV Water Stop Valve

FENCES
BWF Barbed Wire Fence
CSP Closest Spaced Fence
CPF Concrete Post
CWF Chestnut Paling Fence
CWP Chicken Wire Fence
IF Iron Railings Fence
PKF Picket Fence
PWF Post & Rail Fence
PWF Post & Wire Fence
SFP Security Fence
SP Steel Post
WMP Wire Mesh Fence
WPF Wood Panel Fence

Species / Dia / Spread (max) / Ht
e.g. OK / 0.5 / 8 / 15



SURVEY STATIONS				
Name	Eastings	Northing	Height	Type
S1	470868.438	99738.849	6.150	Nail
S2	470768.588	99763.885	6.049	Nail
S3	470868.727	99717.708	6.079	Nail
S4	470874.762	99794.775	5.941	Peg
S5	470868.732	99864.620	5.952	Peg
S6	470771.590	99892.579	5.492	Peg
S7	470868.440	99864.643	5.897	Peg
S10	471094.742	100188.086	5.019	Peg
S12	470868.807	100225.840	4.793	Peg
S13	471103.008	100187.407	4.885	Peg
EP1	470884.062	99884.677	7.505	Nail
EP2	470765.997	99891.367	7.224	Nail
EP3	470658.901	99813.340	7.887	Nail

Revision B - May 2018
Survey extended to north outfall
Revision A - April 2017
Survey extended to the north
NOTES:
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BARRATT DAVID WILSON

Client

LAND AT SINAH LANE
HAYLING ISLAND
HAMPSHIRE

Contract

SITE SURVEY

Title

36HX001B - Sheet 2 of 7

Drawing No.

JUNE 2016

Date

1:250 (A0)

Scale

MJR/ST/MU

Surveyor

TREES

A
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LV
MG
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PM
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PP
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RH
SB
S
SU
SY
W
WN

Ash
Alder
Apple
Beech
Cedar
Copper Beech
Cherry
Cypress
Elder
Eucalyptus
Field Maple
Fruit
Hazel
Horse Chestnut
Horn Oak
Hawthorn
Holly
Japanese Maple
Laburnum
Lime
Locust Tree
Maple
Magnolia
Oak
Palm
Plane
Pine
Pum
Poplar
Pissardi Plum
Rear
Redwood
Red Oak
Rhododendron
Rowan
Silver Birch
Sweet Chestnut
Scots Pine
Spruce
Sycamore
Unidentified
Willow
Walnut
Yew

Species / Dia / Spread (max) / Ht
e.g. OK / 0.5 / 8 / 15

KEY

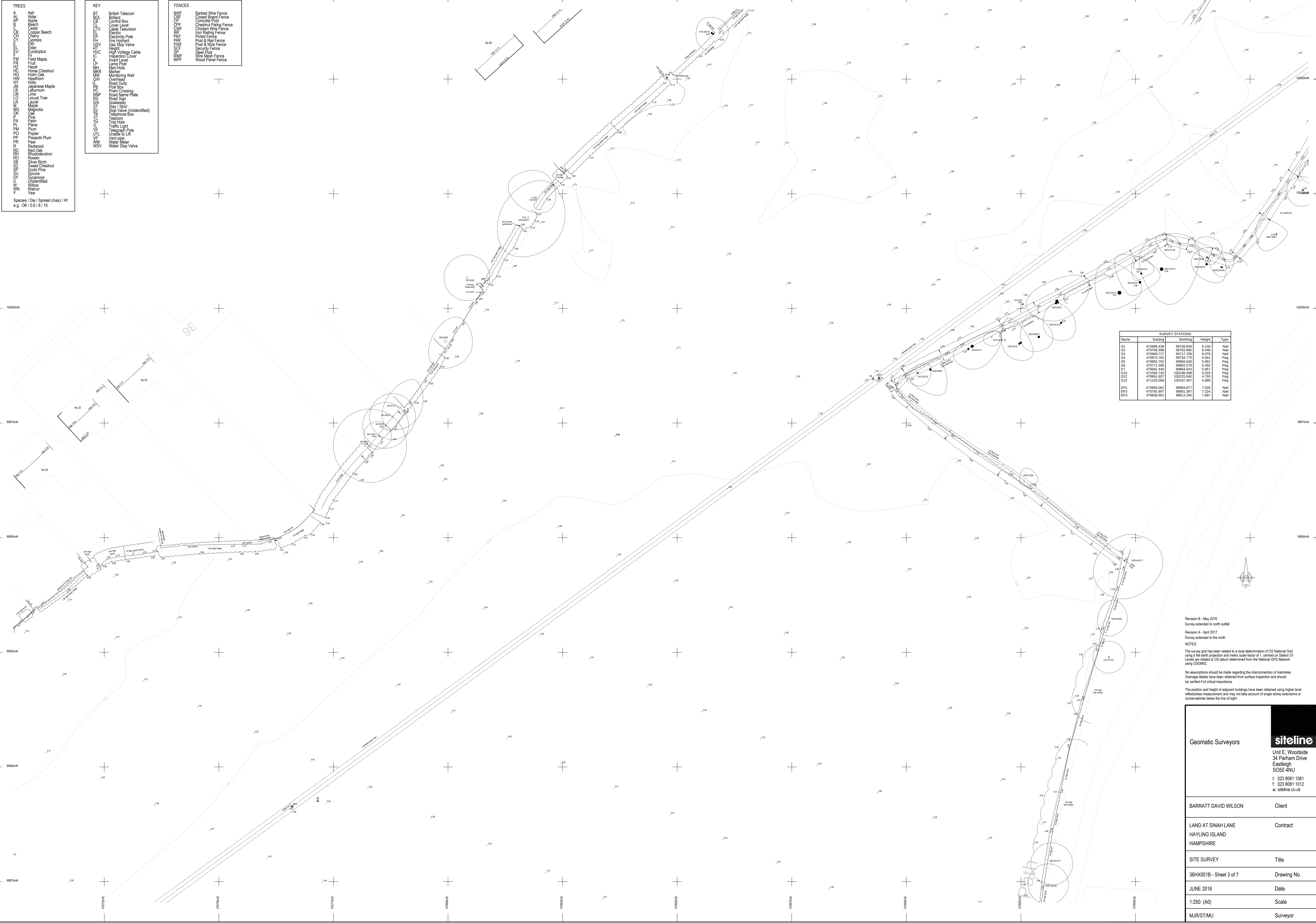
BT
BOL
CB
CL
CTV
EL
EP
GH
HT
HVS
IC
IL
LP
MH
MR
MW
OH
PG
Q
RNP
RS
S/A
SV
T
TIC
TH
TL
TM
TP
UTL
VP
WM
WSV

British Telecom
Bollard
Control Box
Cover Level
Cable Television
Electric
Electricity Pole
Fire Hydrant
Gas Stop Valve
Height
High Voltage Cable
Inspection Cover
Invert Level
Lamp Post
Man Hole
Marker
Monitoring Well
Overhead
Road Gully
Post Box
Pit Crossing
Road Name Plate
Road Sign
Soakaway
Stay / Strut
Stop Valve (Unidentified)
Telephone Box
Tree Hole
Traffic Light
Telegraph Pole
Unstable Soil
Vent pipe
Water Meter
Water Stop Valve

FENCES

BWF
CBF
CP
COP
CWF
IRF
PKF
RPF
RWF
SP
WMP
WPF

Barbed Wire Fence
Close Board Fence
Concrete Post
Chestnut Paling Fence
Chicken Wire Fence
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Post & Rail Fence
Security Fence
Steel Post
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Wood Panel Fence



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Revision B - May 2018
Survey extended to north outfall

Revision A - April 2017
Survey extended to the north

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BARRATT DAVID WILSON

Client

LAND AT SINAH LANE
HAYLING ISLAND
HAMPSHIRE

Contract

SITE SURVEY

Title

36HX001B - Sheet 3 of 7

Drawing No.

JUNE 2016

Date

1:250 (A0)

Scale

MJR/ST/MU

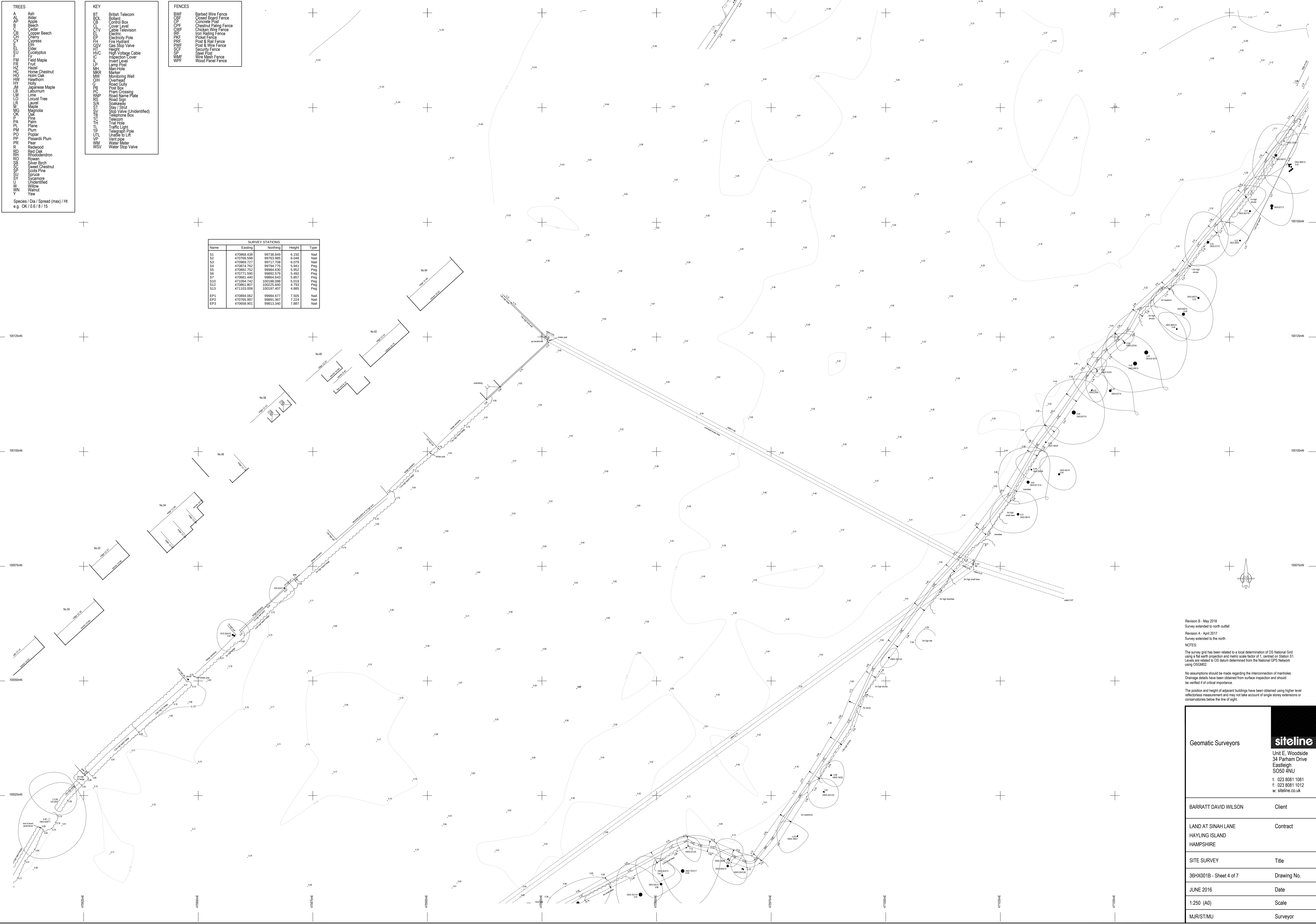
Surveyor

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CL Cover Level
CTV Cable Television
EL Electric
EP Electricity Pole
SH Fire Hydrant
OSV Gas Stop Valve
HT Height
HVC High Voltage Cable
IC Inspection Cover
IL Invert Level
LP Lamp Post
MH Man Hole
MKR Marker
MW Monitoring Well
OH Overhead
G Road Gully
PB Post Box
PC Tram Crossing
RNP Road Name Plate
RS Road Sign
S/A Soakaway
SV Stop Valve (Undertended)
T Telephone Box
TC Telecon
TH Trial Hole
TL Traffic Light
TP Telegraph Pole
UL Unable to Lift
VP Vent pipe
WM Water Meter
WSV Water Stop Valve

FENCES
BWF Barbed Wire Fence
CSP Closed Spand Fence
CPF Concrete Post
CWF Chestnut Paling Fence
CWF Chicken Wire Fence
IF Iron Railings Fence
PKF Picket Fence
PWF Post & Rail Fence
PWF Post & Wire Fence
SP Security Fence
SP Steel Post
WMP Wire Mesh Fence
WPF Wood Panel Fence





Revision B - May 2018
Survey extended to north outfall
Revision A - April 2017
Survey extended to the north
NOTES:
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BARRATT DAVID WILSON	Client
LAND AT SINAH LANE HAYLING ISLAND HAMPSHIRE	Contract
SITE SURVEY	Title
36HX001B - Sheet 5 of 7	Drawing No.
JUNE 2016	Date
1:250 (A0)	Scale
MJR/ST/MU	Surveyor

Appendix (C)

Feasibility Study – Site Layout Plan

Appendix (D)

Geotechnical Information

Hole Type	WLS
-----------	-----

Scale
1:50

Logged By
DPB



Project Name
Sinah Lane Development Site

Project No.
J16123

Co-ords: -

Hole Type
WLS

Location: Hayling Island, Hampshire

Level: -

Scale
1:50

Client: BDW Southampton

Dates: 22/09/2014

Logged By
DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	D		0.50			TOPSOIL	
		1.00	D					Pale yellowish grey brown silty sandy fine to medium flint GRAVEL	1
		1.50	D		1.40			Pale orange-brown and yellowish brown sandy locally silty clayey SILT	2
		2.00	D						
		2.50	D		2.60			Stiff dark bluish grey fissured CLAY	3
		3.00	D						
		3.50	D						
		4.00	D		4.00			End of Borehole at 4.00 m	4
									5
									6
									7
									8
									9

Remarks: Groundwater encountered at 1.80m. Standpipe installed with a response zone from 1.00m to 4.00m.

Project Name
Sinah Lane Development Site

Project No.
J16123

Co-ords: -

Hole Type
WLS

Location: Hayling Island, Hampshire

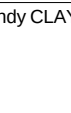
Level: -

Scale
1:50

Client: BDW Southampton

Dates: 22/09/2014

Logged By
DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
▽		0.25	D	N=39 (4,10/ 12,11,8,8)	0.30			TOPSOIL	1
		0.50	D				Firm pale yellowish brown silty sandy CLAY with scattered fine flint gravel		
		0.75	D						
		1.00	SPT		N=21 (3,6/ 5,6,5,5)		1.10		
		1.00	D						
		1.50	D	N=45 (1,2/ 2,1,13,29)	1.40			Pale grey becoming orange-brown silty SAND with occasional fine flint gravel	2
		2.00	SPT						
		2.00	D						
		2.50	D	2.80			Stiff dark bluish grey silty CLAY with claystone at 3.20m.	3	
		3.00	SPT						
		3.00	D						
		3.50	D	4.00			End of Borehole at 4.00 m	4	
		4.00	D						
								5	
								6	
								7	
								8	
								9	

Remarks: Groundwater encountered at 1.70m.

							Borehole No BH4 Sheet 1 of 1		
Project Name Sinah Lane Development Site				Project No. J16123		Co-ords: -		Hole Type WLS	
Location: Hayling Island, Hampshire						Level: -		Scale 1:50	
Client: BDW Southampton						Dates: 22/09/2014		Logged By DPB	

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.40		 TOPSOIL		
	0.50	D					 Firm pale brown silty sandy CLAY	1	
	1.00	D							
	1.50	D			1.60				
					1.70		 Firm pale grey mottled pale brown silty CLAY		
	2.00	D			2.10		 Pale orange-brown silty sandy fine to medium flint GRAVEL	2	
	2.50	D					 Pale orange-brown silty SAND with abundant fine flint gravel		
	3.00	D						3	
	3.50	D			3.60		 Stiff dark bluish grey locally silty CLAY		
4.00	D			4.00		End of Borehole at 4.00 m		4	
								5	
								6	
								7	
								8	
								9	

Remarks: Groundwater encountered at 1.80m.									
--	--	--	--	--	--	--	--	---	--

Project Name
Sinah Lane Development Site

Project No.
J16123

Co-ords: -

Hole Type
WLS

Location: Hayling Island, Hampshire

Level: -

Scale
1:50

Client: BDW Southampton

Dates: 22/09/2014

Logged By
DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.25			TOPSOIL	
		0.50	D					Firm orange-brown silty sandy CLAY with occasional fine flint gravel	1
		1.00	D						
		1.30							
		1.50	D					Orange-brown silty sandy fine to medium flint GRAVEL	
		2.00	D		1.90			Pale yellowish brown silty SAND	2
		2.50	D						
		3.00	D						3
		3.50	D		3.50			Firm pale brown and brown silty sandy CLAY	
		4.00	D		3.90 4.00			Stiff dark bluish grey silty CLAY	4
								End of Borehole at 4.00 m	
									5
									6
									7
									8
									9

Remarks: Groundwater encountered at 1.70m.

							Borehole No BH6 Sheet 1 of 1		
Project Name Sinah Lane Development Site				Project No. J16123		Co-ords: -		Hole Type WLS	
Location: Hayling Island, Hampshire						Level: -		Scale 1:50	
Client: BDW Southampton						Dates: 22/09/2014		Logged By DPB	

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	D		0.50			TOPSOIL with abundant fine to medium flint gravel	
		1.00	D					"Stiff" pale grey and orange-brown silty sandy CLAY - desiccated	1
		1.50	D		1.50			Pale grey and brown silty sandy locally clayey fine to medium flint GRAVEL	2
		2.00	D		2.10	Orange-brown and brown silty locally clayey SAND			
		2.50	D						
		3.00	D		3.00	End of Borehole at 3.00 m			3
								4	
								5	
								6	
								7	
								8	
								9	

Remarks: Groundwater encountered at 1.90m.									
--	--	--	--	--	--	--	--	---	--



Project Name
Sinah Lane Development Site

Project No.
J16123

Co-ords: -

Hole Type
WLS

Location: Hayling Island, Hampshire

Level: -

Scale
1:50

Client: BDW Southampton

Dates: 22/09/2014

Logged By
DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
▽					0.20			TOPSOIL	
		0.50	D					Firm brown silty sandy CLAY	
		0.75	D						
		1.00	SPT	N=22	0.90			Pale grey silty sandy fine to medium flint GRAVEL	1
		1.00	D	(6,9/ 5,5,5,7)	1.20				
		1.50	D					Orange-brown silty fine SAND with occasional fine flint gravel	
		2.00	SPT	N=0					2
		2.00	D	(2,1/ -, -, -, -)					
		2.50	D		2.60				
		3.00	SPT	N=8	3.00			Stiff dark bluish grey silty CLAY	3
		3.00	D	(1,1/ 2,2,2,2)				End of Borehole at 3.00 m	
									4
									5
									6
									7
									8
									9

Remarks: Groundwater encountered at 1.30m.

Dates: 22/09/2014

End of Borehole at 4.00 m



Project Name
Sinah Lane Development Site

Project No.
J16123

Co-ords: -

Hole Type
WLS

Location: Hayling Island, Hampshire

Level: -

Scale
1:50

Client: BDW Southampton

Dates: 23/09/2016

Logged By
DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20			TOPSOIL	
		0.50	D		0.60			"Stiff" brown silty sandy CLAY - desiccated with root hairs	
		1.00	D					Firm brown becoming pale brown silty locally sandy CLAY	1
		1.50	D						
		1.70			1.70			Yellowish brown silty sandy fine to medium flint GRAVEL	
		2.00	D		1.90			Brown and pale brown silty fine SAND with soft clay layers	2
		2.50	D						
		3.00	D						3
		3.50	D						
		4.00	D		3.70			Stiff dark grey very silty CLAY	4
					4.00			End of Borehole at 4.00 m	
									5
									6
									7
									8
									9

Remarks: Groundwater encountered at 1.70m.

Project Name
Sinah Lane Development Site

Project No.
J16123

Co-ords: -

Hole Type
WLS

Location: Hayling Island, Hampshire

Level: -

Scale
1:50

Client: BDW Southampton

Dates: 23/09/2016

Logged By
DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30			TOPSOIL	
		0.50	D		0.60			"Stiff" brown silty sandy CLAY with rootlets - desiccated	
		1.00	D					Pale brown and yellowish brown silty sandy fine to medium flint GRAVEL	1
		1.50	D						
		2.00	D		1.85			Pale brown silty SAND with abundant fine flint gravel	2
		2.50	D						
		3.00	D						3
		3.50	D						
		4.00	D		3.85 4.00			Stiff dark bluish grey CLAY	4
								End of Borehole at 4.00 m	
									5
									6
									7
									8
									9

Remarks: Gorundwater encounterd at 1.30m. Standpipe installed with a response zone from 0.50m to 3.00m.

Project Name
Sinah Lane Development Site

Project No.
J16123

Co-ords: -

Hole Type
WLS

Location: Hayling Island, Hampshire

Level: -

Scale
1:50

Client: BDW Southampton

Dates: 23/09/2016

Logged By
DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.25	D		0.25			TOPSOIL	
		0.50	D					Soft pale grey and brown mottled sandy CLAY	
		1.00	D						1
		1.30			1.30			Pale grey silty fine SAND	
		1.40			1.40				
		1.50	D		1.70			Pale grey very silty very sandy scattered fine to medium flint GRAVEL	
		2.00	D					Orange-brown and yellowish brown silty fine SAND with scattered fine flint gravel	2
		2.50	D						
		3.00	D						3
		3.50	D						
		4.00	D		3.90			Stiff dark grey very silty CLAY	4
					4.00			End of Borehole at 4.00 m	
									5
									6
									7
									8
									9

Remarks: Groundwater encountered at 1.70m.

Project Name
Sinah Lane Development Site

Project No.
J16123

Co-ords: -

Hole Type
WLS

Location: Hayling Island, Hampshire

Level: -

Scale
1:50

Client: BDW Southampton

Dates: 23/09/2016

Logged By
DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.20			TOPSOIL	
		0.50	D					Firm pale brown silty sandy CLAY	
		1.00	D		0.90				
								Pale brown and grey silty sandy clayey fine to medium flint GRAVEL	1
		1.50	D		1.50				
								Pale brown and greyish brown silty fine SAND with scattered fine flint gravel and occasional pockets of clayey sand	2
		2.00	D						
		2.50	D						
		3.00	D						3
		3.50	D						
		4.00	D		3.70 3.80 3.90 4.00			Dark orange-brown very sandy CLAY	
								Dark orange-brown very sandy CLAY	4
								Stiff dark grey CLAY	
								End of Borehole at 4.00 m	
									5
									6
									7
									8
									9

Remarks: Groundwater encountered at 1.60m.

Hole Type	WLS
1	0.0000
2	0.0000
3	0.0000
4	0.0000
5	0.0000
6	0.0000
7	0.0000
8	0.0000
9	0.0000
10	0.0000
11	0.0000
12	0.0000
13	0.0000
14	0.0000
15	0.0000
16	0.0000
17	0.0000
18	0.0000
19	0.0000
20	0.0000
21	0.0000
22	0.0000
23	0.0000
24	0.0000
25	0.0000
26	0.0000
27	0.0000
28	0.0000
29	0.0000
30	0.0000
31	0.0000
32	0.0000
33	0.0000
34	0.0000
35	0.0000
36	0.0000
37	0.0000
38	0.0000
39	0.0000
40	0.0000
41	0.0000
42	0.0000
43	0.0000
44	0.0000
45	0.0000
46	0.0000
47	0.0000
48	0.0000
49	0.0000
50	0.0000
51	0.0000
52	0.0000
53	0.0000
54	0.0000
55	0.0000
56	0.0000
57	0.0000
58	0.0000
59	0.0000
60	0.0000
61	0.0000
62	0.0000
63	0.0000
64	0.0000
65	0.0000
66	0.0000
67	0.0000
68	0.0000
69	0.0000
70	0.0000
71	0.0000
72	0.0000
73	0.0000
74	0.0000
75	0.0000
76	0.0000
77	0.0000
78	0.0000
79	0.0000
80	0.0000
81	0.0000
82	0.0000
83	0.0000
84	0.0000
85	0.0000
86	0.0000
87	0.0000
88	0.0000
89	0.0000
90	0.0000
91	0.0000
92	0.0000
93	0.0000
94	0.0000
95	0.0000
96	0.0000
97	0.0000
98	0.0000
99	0.0000
100	0.0000

Scale
1:50

Logged By
DPB

A vertical axis with tick marks and labels 1 through 9.



Project Name
Sinah Lane Development Site

Project No.
J16123

Co-ords: -

Hole Type
WLS

Location: Hayling Island, Hampshire

Level: -

Scale
1:50

Client: BDW Southampton

Dates: 23/09/2016

Logged By
DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.30			TOPSOIL	
		0.50	D					Firm brown silty sandy CLAY	1
		1.00	D						
	▽	1.50	D		1.40			Pale grey and brown mottled silty sandy fine to medium flint GRAVEL	2
		2.00	D		2.10				
		2.50	D					Orange-brown silty fine SAND with scattered fine flint gravel and layers of soft very sandy clay	3
		3.00	D						
		3.50	D						
		4.00	D		3.90 4.00			Stiff dark grey sandy silty CLAY	4
								End of Borehole at 4.00 m	
									5
									6
									7
									8
									9
			Type	Results					

Remarks: Groundwater encountered at 1.50m.

Project Name
Sinah Lane Development Site

Project No.
J16123

Co-ords: -

Hole Type
WLS

Location: Hayling Island, Hampshire

Level: -

Scale
1:50

Client: BDW Southampton

Dates: 23/09/2016

Logged By
DPB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30			0.30			TOPSOIL	
		0.50	D					Firm orange-brown and brown silty sandy CLAY	1
		1.00	D						
		1.50	D		1.60				
		2.00	D					Orange-brown silty SAND with fine flint gravel	2
		2.50	D						
		3.00	D						3
		3.50	D						
		4.00	D		4.00			End of Borehole at 4.00 m	4
									5
									6
									7
									8
									9

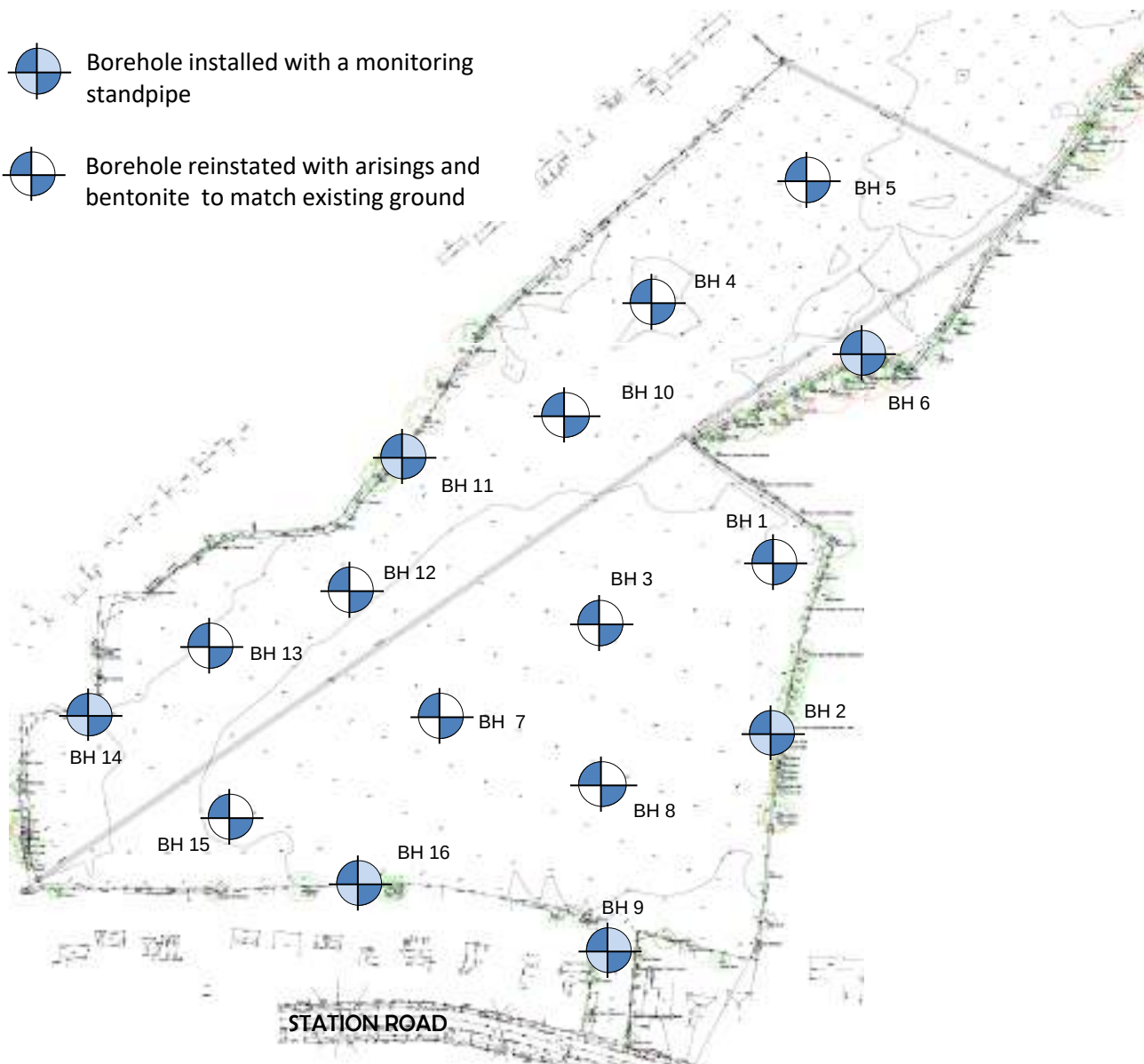
Remarks: Groundwater encountered at 1.60m. Standpipe installed with a response zone from 1.00m to 3.00m. Borehole collapsed to 3.00m.

Site Sinah Lane Site, Hayling Island, Hampshire

Client BDW Southampton

 Borehole installed with a monitoring standpipe

 Borehole reinstated with arisings and bentonite to match existing ground



Winter Water Level Monitoring Records 2017/2018

	BH 2	BH 6	BH 9	BH 11	BH 14	BH 16
09/10/2017	1.79	2.52	1.62	1.66	1.35	0.89
03/11/2017	1.62	2.41	1.62	1.66	1.21	0.92
07/12/2017	1.59	2.23	1.62	1.67	1.11	1.10
10/01/2018	0.48	1.13	1.16	1.00	0.82	0.40
06/02/2018	0.52	1.13	1.22	1.00	0.89	0.52
05/03/2018	0.45	1.13	1.18	1.09	0.91	0.43



Approximate Scale in metres



Appendix (E)

Environment Agency Correspondence

From: Karren Johnston
To: ["Maskell, Jon"](#)
Subject: RE: Sinah Lane, Hayling Island, PO11 OEY - Flooding
Date: 11 May 2017 19:55:38
Attachments: [image001.jpg](#)
[image002.png](#)
[image003.jpg](#)

Jon

Thank you for your response.

I have been in touch with the LLFA, but I just wanted to check that there were no special issues relating to Hayling Island that the EA were interested parties to. From your response I note that I should continue to liaise with the LLFA.

Thank you again for your time.

Kind regards,

Karren

Karren Johnston BEng (Hons) CEng MICE
Engineering Associate



Rogers Cory Partnership Ltd
Architectural & Civil Consultants
The Old School Old School Road
Hook Hampshire RG27 9NJ
t 01256 769269 e karren@rcpconsultants.co.uk
m 07484060847 w rcpconsultants.co.uk

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From: Maskell, Jon [<mailto:jon.maskell@environment-agency.gov.uk>]
Sent: 09 May 2017 16:34
To: Karren Johnston <Karren@rcpconsultants.co.uk>
Subject: RE: Sinah Lane, Hayling Island, PO11 OEY - Flooding

Hello Karren,

Thanks for your email regarding the above site in Havant.

As you have pointed out, the site you are proposing to develop falls within Flood Zone 1 (areas with a low probability of river or sea flooding). In line with Development Management Procedure Order the Environment Agency is not a statutory consultee for development in flood zone 1 and therefore we would not be consulted at the planning stage and therefore not provide any comment to the Local Planning Authority (LPA).

Legally we are only allowed to recover costs for work that we would be statutory on at the planning

stage and therefore I am afraid that we will not be able to provide you with any detailed advice with regards to the site in this instance.

I have however, provided some generic advice that may be of help below:

Access & Egress

Whilst the site itself is not in a high flood risk area (flood zone 2 or 3) it is pertinent to highlight the potentially significant flood risk facing the primary access and egress routes from Hayling Island. This is especially important given the lack of services, such as a hospital available on Hayling. It is for the council to assess the sustainability of development (now and in the future) in this location and ensure that flood risk is a significant part of this. This should include consideration of the flood risk management hierarchy including your preference for either safe access and egress, flood warning and evacuation and / or safe refuge in an extreme flood event. We would recommend that you liaise with Havant Borough Council and their Emergency Planners on this issue.

It is a requirement of the NPPF that any planning application submitted for development that is over 1 hectare in size in Flood Zone 1 is accompanied by a Flood Risk Assessment (FRA). Guidance on the requirements for undertaking a FRA can be found online at:

<https://www.gov.uk/guidance/flood-risk-assessment-in-flood-zone-1-and-critical-drainage-areas>; and

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/311502/LIT_9193.pdf

Surface Water:

-

Amendments to the Development Management Procedure Order (DMPO) came into effect on 15 April 2015. As a result we are no longer a statutory consultee on 'development of land over 1 hectare' (Para 2f of DMPO 2010, Schedule 5) and will therefore no longer provide comment on the surface water aspects of these proposals. Please be aware that we are still statutory consultee on any development (other than minor development) in Flood Zones 2 and 3.

Hampshire County Council, as the Lead Local Flood Authority is now statutory consultee for 'Major development with Surface Water Drainage', we therefore recommend that you consult them on this issue.

Kind Regards

Jon

Jon Maskell | Sustainable Places Advisor | Solent and South Downs Area | Environment Planning and Engagement
Environment Agency | Romsey District Office | Canal Walk | Romsey | Hampshire | SO51 7LP

Tel: 020 8474 5888

jon.maskell@environment-agency.gov.uk

We offer a cost recovery service for bespoke pre-application advice. For more information go to: [gov.uk](https://www.gov.uk) or [email us](#)

Flood Risk Standing Advice was updated on 15 April 2015. For more information please follow the links below:

For developers: [FRSA developers page](#)

For councils: [FRSA council's page](#)



Our **climate change allowances** for planning were updated on 19 February 2016. The guidance is accessible here: [Flood risk assessment: Climate change allowances](#)

From: Karren Johnston [<mailto:Karren@rcpconsultants.co.uk>]
Sent: 08 May 2017 16:39
To: Maskell, Jon <jon.maskell@environment-agency.gov.uk>
Subject: Sinah Lane, Hayling Island, PO11 0EY - Flooding

Jon,

I've been given your contact details by Terry Seymour.

Our Client is looking to develop the above site with circa 150 residential houses. I have attached a location plan to show where the site is. We are currently undertaking to support the planning application and would like to meet with you to discuss the site and any issues that we may need to deal with from the Environment Agencies point of view. In particular with respect to flood risk and coastal flood risk especially as we are on Hayling Island. The site is shown as being in Flood Zone 1 by the EA flood maps. EA maps also currently show no issue with coastal flooding, although there do seem to be some pockets of surface water flooding on the maps within the site.

Are there any particular issues with regard to the main road access to the island that we need to be aware of?

Is it possible to give me some dates when you are available in the coming weeks so that we can meet with you to discuss the site. Any information that you feel relevant in the meantime regarding the site would be gratefully received. If you need any further information regarding the site then please let me know.

Kind regards,

Karren

Karren Johnston BEng (Hons) CEng MICE
Engineering Associate



Rogers Cory Partnership Ltd
Architectural & Civil Consultants
The Old School Old School Road
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m 07484060847 w rcpconsultants.co.uk

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Appendix (F)

Local Authority Correspondence

Sinah Lane, Hayling Island Meeting / Site Visit Notes



Location: Site off Sinah Lane, Hayling Island

Date: 14th June

Time: 10am

Present: Steve Mountain - Havant Borough council (SM)
Karren Johnston – RCP (KJ)

Purpose: To walk the downstream ditches to establish condition given that this site will discharge at greenfield rate to the existing ditch network.

Notes of Meeting / Walkround:

1. We discussed the lay of the land. RCP to clarify topographical survey levels and include in submission reasons why part of the site cannot fall to the existing sewer in Sinah Lane.
2. Steve Mountain queried the lack of SuDS features amongst the residential units. RCP to include in submission technical note explaining how strategy is arrived at and why on site SuDS features cannot be utilised. Steve also confirmed given his locally knowledge that the ground water was high and had tidal fluctuations.
3. The surface water drainage strategy was discussed. RCP will put together a comprehensive technical note on how the strategy has been arrived at given the lack of SuDS on the development site, but with the use of a pond adjacent the site.
4. SM had a plan from Southern Water showing the wider area from that obtained for the site specific asset search. This has the ditch network, which eventually outfalls to the Southern Water Network.
5. SM suggested that we contact Southern Water to discuss capacity in their piped system to the north of the island. KJ agreed noting item 6 below.
6. It was noted that the greenfield runoff had been calculated and that the site discharge from the pond would be restricted at this rate. This would mean that the runoff from the site would mimic the existing situation. Therefore the discharge in the ditches would not increase and therefore no more capacity required in the Southern Water network.
7. The ditch runs first in a westerly direction under the Hayling Billy Coastal Path before turning North. SM pointed out areas where the existing ditch network floods. These were areas of open common land and did not affect any local residents.

Sinah Lane, Hayling Island Meeting / Site Visit Notes



8. SM asked that the developer assess the condition of any piped sections for the downstream ditch system especially that as it leaves the site to cross the Hayling Billy Coastal Path.
 9. The ditch runs mainly through open farmed fields, but in the north runs under a property not shown on the plan. The owner of the property confronted us as we were standing in the field looking at the headwall to the rear of his property as he knew the owner of the field. The owner was able to give interesting local knowledge and was comforted when SM told him we were walking the ditches to check they were clear before winter.
 10. The owner said that he had recently cleared the ditch at the rear of his property (we could see the matt of grass cutting that he had cleared on the bank) as it was backing up and was in danger of flooding his property which was at a lower level than the field at the rear. SM was encouraged to see that the resident had taken responsibility to clear the ditch. The owner had no objection to a cctv survey of the pipe under his house being carried out with notice being given.
 11. The ditch in the front garden was well maintained with gabion walling as it was quite deep. The incoming pipe (under the house) was about 600mm diameter. The outgoing pipe running under the road was also about 600mm diameter.
 12. Generally the ditches were 900mm to 1200mm deep, well defined and in good condition. They were overgrown as expected at this time of year, but not overly impeding volume or flow.
-

Sinah Lane, Hayling Island Meeting / Site Visit Notes



Southern Water Asset Plan – Showing Ditch Locations

