



**Former LEC Refrigeration Site,
Shripney Road, Bognor Regis**

**Flood Risk Assessment
and
Surface Water Drainage Strategy**

for

Wickes

June 2015

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EXECUTIVE SUMMARY

Flood Risk

The proposal is for the construction of a new commercial development, comprising a Wickes store, mezzanine, an OPC and a secure compound on the former LEC Refrigeration Site, Shripney Road, Bognor Regis.

This report has considered the flood risk posed to the site from all sources, as defined by the National Planning Policy Framework (NPPF) and the local Strategic Flood Risk Assessment (SFRA). The development is located in Tidal Flood Zone 3 (high risk) classification. Coastal flood defences offer a standard protection of approximately 1 in 200 (0.5%). Map D4 in the Arun District Council SFRA and correspondence with Arun District Council indicate that the Bognor Regis coastline is protected by maintained defences to this standard. The railway line directly to the east of the proposed development site offers a further level of protection. The maps within the Arun District Council SFRA show that there is no residual risk of flooding based on the modelled tidal breach extents. However, there is a chance that extreme high tides and tidal surges, together with wave action could produce water levels exceeding the design height of the frontage and therefore cause them to be overtopped. The maintained defences ensure that the development passes the requirements of the sequential test and the exception test is not required.

The assessment has also found the site to be at low risk of fluvial flooding. The site is predominantly at very low risk of surface water flooding, with some areas shown to be at low and medium risk. The site is also found to be at risk of groundwater flooding. The mitigation measures are detailed in section 4.

There is no residual flood risk from the site to the surrounding area, due to the flow restriction. The flow restriction ensures that the development does not increase the risk of surface water flooding to other adjacent neighbourhoods. Out of chamber or gully flooding for the extreme 100 year plus climate change storm event, may potentially occur within the development site and is classed as exceedance flows. Flood water from such events will be contained within the site but away from the commercial units.

Surface Water Drainage Strategy

The surface water drainage strategy is to restrict the surface water discharge from the development, to $2.78 \times 50 \times A_{imp}$ with a 40% reduction. The allowable runoff rate is subject to detailed investigation of the existing drainage network. The preferred surface water drainage solution is to discharge into the existing 450Ø culvert beneath the railway and through existing open ditches, before outfalling into Lidsey Rife. However, if a consent to discharge into the culvert cannot be obtained, surface water will be discharged into the Sainsbury's surface water sewerage system which ultimately outfalls into Aldingbourne Rife. In turn, this will generate attenuation volumes which will be retained in geocellular storage. The storage has been designed to accommodate a 1 in 100 year storm event plus 20% climate change.

Sustainable Drainage Systems (SuDS) in the form of Pollution Prevention and Site Control methods will be incorporated. A surface water drainage strategy forms part of this report.



1.0 INTRODUCTION

1.1 This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of our client Wickes Building Supplies Limited, in support of a planning application to be submitted to Arun District Council, for a proposed commercial development at the Former LEC Refrigeration Site, Shripney Road, Bognor Regis.

1.2 Local Planning Authorities are advised by the Government's National Planning Policy Framework (*NPPF*) to consult the Environment Agency (EA) on development proposals in areas at risk of flooding and/or for sites greater than 1 hectare in area. The EA would require a Flood Risk Assessment to be submitted in support of the planning application for the proposed development.

To satisfy any potential concerns the EA may have with the proposed commercial development on the Former LEC Refrigeration Site, Shripney Road, this report has been prepared to assess the requirements of the *NPPF* through:

- Providing an assessment of whether the site is likely to be affected by flooding and whether it would increase flood risk elsewhere;
- Assessing whether the proposed development is appropriate in the suggested location;
- Detailing any measures necessary to mitigate any flood risk identified, to ensure that the proposed development and occupants would be safe, and that flood risk would not be increased elsewhere.

The report considers the requirements for undertaking a Flood Risk Assessment as stipulated in the *NPPF*. Only those requirements that are appropriate to a development of this nature have been considered in the compilation of this report.

This report has been prepared in accordance with current EA policy. The EA's response to the pre-development enquiry is included in Appendix C of this report.



2.0 DEVELOPMENT DESCRIPTION AND LOCATION

2.1 Site Location

2.1.1 The site is referenced in Table 1, and a location plan is provided in Figure 1.

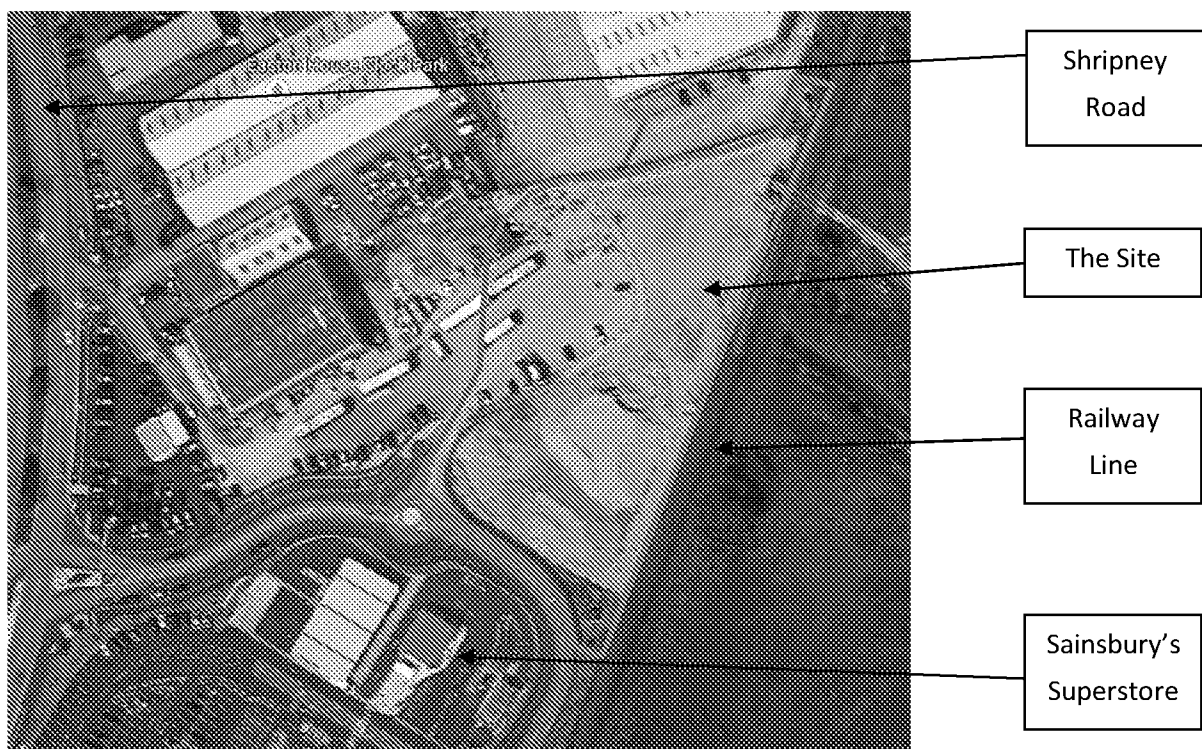
Table 1: Site Referencing Information

Item	Brief Description
Site name	Former LEC Refrigeration Site, Shripney Road, Bognor Regis
Site address and location	Former LEC Refrigeration Site, Shripney Road, Bognor Regis, PO22 9NQ
Council Area	Arun District Council
Approximate Grid Reference	OS: 494258E, 100841N
General Locality	The site is located on brownfield land at the former LEC Refrigeration Site, Shripney Road and is approximately 2.4km to the north of Bognor Regis Town Centre.

2.2 Existing Site Description

2.2.1 Location Plan

Figure 1: Location Plan





2.2.2 Area

The site area is approximately 0.74ha.

2.2.3 Boundaries and Surrounding Land

Commercial development borders the site to the north, west and south. The Easton House Clock Park Estate located to the north of the site, together with smaller commercial units. Beyond the commercial units to the west of the site lies the A29, with further industrial units beyond this. Sainsbury's is located immediately to the south of the site, beyond which is Shripney Trade Park. A railway line borders the site to the east, with open land and a disused runway beyond this.

The site boundary is shown in the drawings contained within Appendix A of this report and also in Figure 1 above.

2.2.4 Existing Land Use and Access

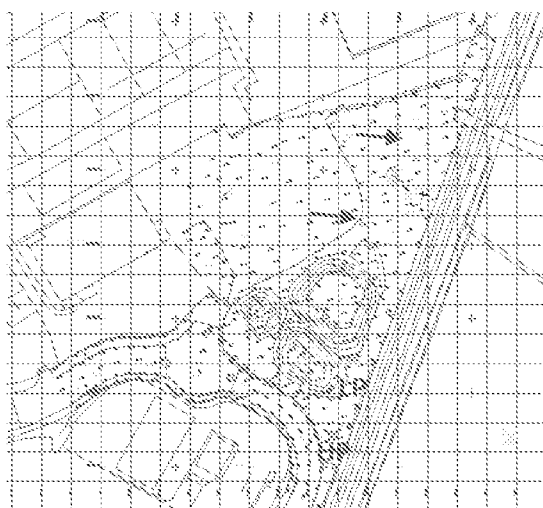
The site is classed as brownfield and is currently vacant having recently been cleared.

Vehicular access is available via the existing estate road which serves the Sainsbury's development, off the A29.

2.2.5 Elevation and Topography

A site specific topographical survey has been undertaken and indicates that the site is largely hummocky with a general fall towards the east. The highest level is in the south of the site at circa 2.72m Above Ordinance Datum (AOD) with the lowest level of 1.75m AOD in the southeast. Figure 2 shows the general fall across the site with the full survey located in Appendix B.

Figure 2: Extract of Topographical Survey





2.3 Development Proposals

2.3.1 Outline

The proposed development is for the construction of a Wickes store with mezzanine, an OPC and a secure compound. Access to the site will be from the existing estate road to the south of the site which serves the Sainsbury's development, off the A29. Further details can be found in the Site Layout in Appendix A.

2.3.2 Development Design Life

The generally accepted development design life for a commercial development in England is 60 years. As such, this assessment considers flood risk over the period 2015 to 2075.



3.0 PLANNING POLICY AND CONSULTATION

3.1 National Planning Policy Framework (NPPF)

3.1.1 The flood maps provided by the Environment Agency (EA) locate the site within Tidal Flood Zone 3, i.e. land defined as having an annual probability of 0.5% (1 in 200) or greater annual probability of flooding from the sea. As a requirement of the NPPF (2012), the proposed development has to satisfy the requirements of the Sequential Test and, where applicable, the Exception Test.

3.1.2 Sequential Test

Under the NPPF (2012), Flood Zone 3 is defined as high probability flood risk. The proposal is for a commercial development, which, in line with Table 2 of the technical guidance document is classified as 'Less Vulnerable'. Thus, according to the criteria in Table 3 (Flood Risk Vulnerability and Flood Zone 'Compatibility'), the site is classed as a Less Vulnerable development within Flood Zone 3 and as such, the 'Development is Appropriate'. The site is also protected by maintained defences.

In light of this, the Exception test is not required. Table 2 and Table 3, referred to above, can be found in the Technical Guidance to the NPPF.

3.2 Strategic Flood Risk Assessment (SFRA)

3.2.1 SFRA's assess the risk associated with all types of flooding and provide the information required to identify the amount of development permitted in an area, how drainage systems in the area should function and how risks in vulnerable areas can be reduced and/or mitigated. The NPPF states that regional planning bodies (RPB's) or local planning authorities should prepare SFRA's in consultation with the EA.

3.2.2 In February 2008, Arun District Council published a Strategic Flood Risk Assessment, produced by Capita Symonds Ltd, in accordance with Planning Policy Statement (PPS) 25 guidance (PPS 25 guidance is the previous planning document which has been superseded by the NPPF, the information in the SFRA is still valid). The purpose of the SFRA was to assess and map all known sources of flood risk including fluvial, surface water, sewer, groundwater and all impounded water bodies, whilst taking into account future climate change predictions.

3.2.3 A summary of the main elements from the SFRA are detailed below. The full report can be obtained from the Arun District Council website.

- The SFRA provides a detailed understanding of flood risk across all areas and from all sources.
- Full Sequential and Exception tests to be carried out (where applicable).



- Development should be designed so there is no flooding to the development in a 1 in 30 year event, and so there is no property flooding in a 1 in 100 year plus climate change event.
- Surface water management, including the use of Sustainable Drainage Systems (SuDS), should be incorporated.
- Aldingbourne and Lidsey Rifes, Ferring Rife and other coastal streams drain the Manhood Peninsula and are located just south of the South Downs. The topography flattens and the geology is less permeable downstream of the downs; this combined with their discharge outlets being blocked during high tides means that the area is relatively poorly drainage.
- The Arun coastline is approximately 23km, with low lying parts of the coastline at risk of flooding from high tides and storm surges on the English Channel. In most instances, sea defenses are constructed to offer protection from the 0.5% AEP storm surge.
- There is a significant proportion of land in the district that is likely to be affected by groundwater flooding as a result of the large chalk bands. The areas most at risk will be deep foundations and underground infrastructure. The maps indicate that the site is within a groundwater emergence zone.
- There are no artificial sources of flooding identified.
- No historic flood events are identified at the site.

3.3 Statutory Authority Correspondence

- 3.3.1 In compiling this report, liaison has taken place with the relevant authorities. Correspondence has been received from the Environment Agency, the Lead Local Flood Authority and Arun District Council. Listed below is a summary of the correspondence with the full responses located in Appendix C.
- 3.3.2 Mr Jon Denman, FCRM Officer at the Environment Agency provided the Product 4 data that showed the site as being within fluvial Flood Zone 1, this was confirmed by further email correspondence. The Product 4 data indicates that the site is in tidal Flood Zone 3a i.e. land assessed as having a 0.5% (1 in 200) or greater annual probability of flooding from the sea. There are no formal raised flood defences to protect this area from river flooding. Coastal flood defences offer a standard of protection of approximately 1 in 200 (0.5%).
- 3.3.3 Mr Kevin Macknay, Drainage Strategy Team Leader from West Sussex County Council confirmed that they hold no records of historic flooding at this location. The “Updated flood maps for surface water” show the site to be at low risk for the 1 in 30 and 1 in 100 year rainfall events. Based on the current ESI Ground Water Flood Risk Maps the site is at “Moderate risk” of groundwater flooding and the area has a “Low susceptibility to ground water flooding”.



3.3.4 Mr Tom Callaway, Drainage and Coastal Engineer from Arun District Council stated that any proposed surface water scheme must consider sustainable drainage principles. The following destinations must be considered in order of preference; discharge into the ground (infiltration), controlled discharge to a surface water body, controlled discharge to a surface water sewer and controlled discharge to a combined sewer. The council require groundwater monitoring results from the winter period and percolation test results (to BRE 365 or similar) to confirm whether infiltration is likely to work. If the conditions do not allow for infiltration, then discharge to a pipe/watercourse/sewer may be considered at rates on higher than pre-existing. Permissions will be required from the responsible authority to connect into these systems.



4.0 DEFINITION OF FLOOD HAZARD

4.1 Sources of information

The NPPF (2012) requires the developer to consider the impact of runoff, generated by the proposed development, onto the downstream catchment, and to assess the risk of runoff from the surrounding district impacting on the developments footprint. Further, the report is to consider flood risk from all other sources. The following section defines the flood risk receptors and anticipated flood risk.

Table 2: Sources of information used in the identification of flood risk

Source of Information	Details
Environment Agency	Indicative Flood Map
Arun District Council	Strategic Flood Risk Assessment
Southern Water	Sewer Plans

4.2 Flooding from the Sea (Tidal)

- 4.2.1 The site lies close to the Arun Coastline and is shown on the Environment Agency Product 4 data to be at high risk of tidal flooding, with the site located in Flood Zone 3a i.e. land assessed as having a 0.5% (1 in 200) or greater annual probability of flooding from the sea.
- 4.2.2 Coastal flood defences offer a standard protection of approximately 1 in 200 (0.5%). Map D4 in the Arun District Council SFRA and correspondence with Arun District Council indicate that the Bognor Regis coastline is protected by maintained defences to this standard. The railway line directly to the east of the proposed development site offers a further level of protection. The maps within the Arun District Council SFRA show that there is no residual risk of flooding based on the modelled tidal breach extents. However, there a chance that extreme high tides and tidal surges, together with wave action could produce water levels exceeding the design height of the frontage and therefore cause them to be overtopped.

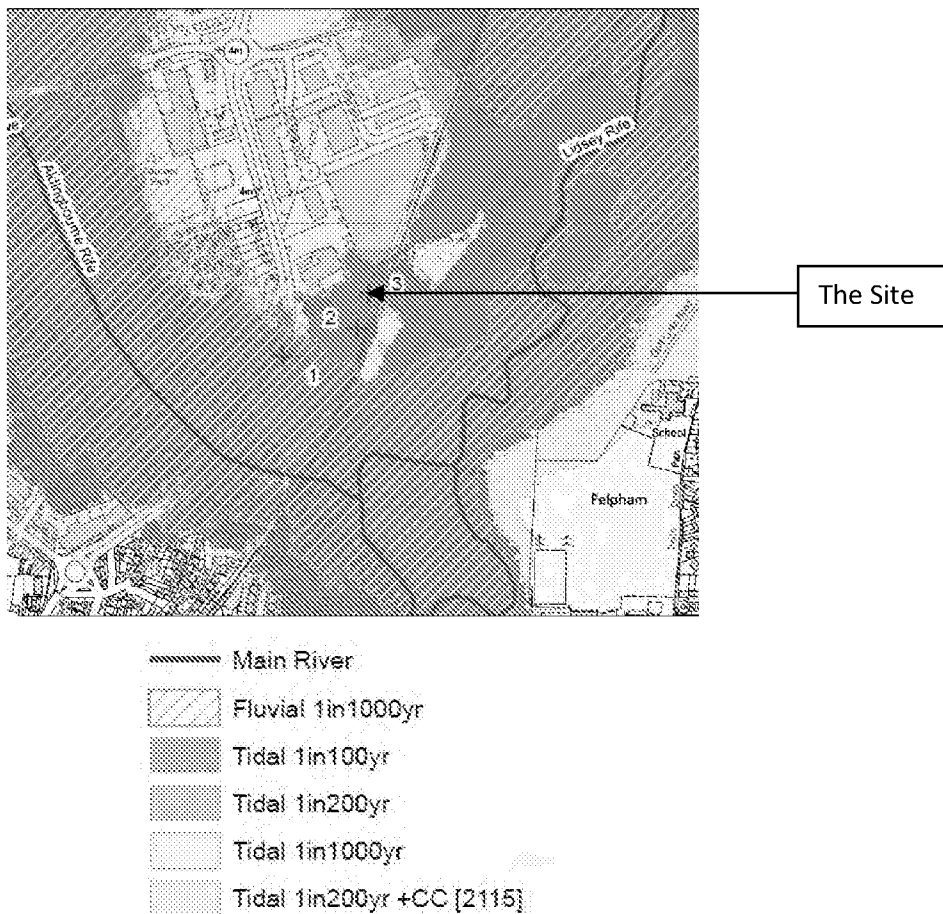
4.3 Flooding from Rivers (Fluvial)

- 4.3.1 Aldingbourne Rife is approximately 345m to the south of the site. The Lidsey Rife is located approximately 150m to the east of the site. These two Rifles converge approximately 350m to the southeast of the site.



- 4.3.2 Figure 3 below locates the site on the Environment Agency's modelled flood outputs. The site boundary lies outside of the current statistical fluvial floodwater model footprint generated by any local watercourses i.e. probability of annual fluvial flooding of less than 1 in 1000 (<0.1%) in any one year. This was confirmed in correspondence with Jon Denman (Appendix C).
- 4.3.3 Based on information from the Environment Agency Flood Maps, there is no evidence of fluvial flooding affecting the site. Therefore the risk of fluvial flooding at the site is considered to be low.

Figure 3: The Environment Agency's modelled flood outputs



4.4 Flooding from the Land (Surface Water)

- 4.4.1 The overland flow would naturally route towards the nearest watercourse, stream or ditch. However, the exact route taken is defined by the local topography. The site currently slopes to the east, where the existing surface water outfall for the site is via a 450Ø pipe which conveys runoff under the railway and into existing open ditches to the east of the site which ultimately outfall into Lidsey Rife.
- 4.4.2 Surface water runoff from the north, west and south will be picked up by highway drainage in the surrounding roads and conveyed away from the site. Surface water runoff from the east is

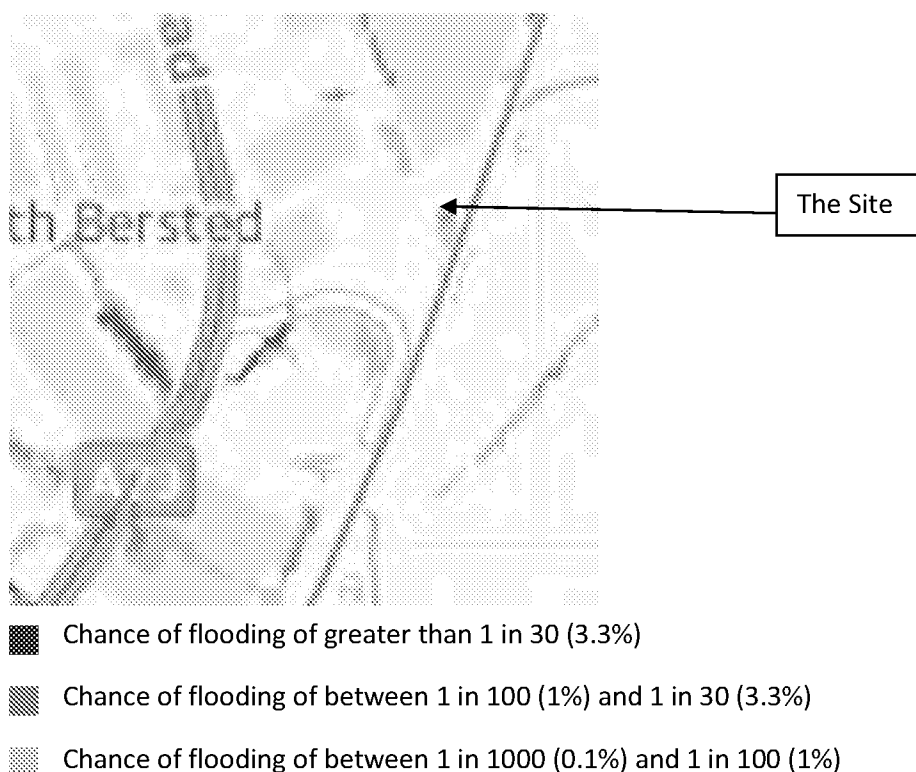


intercepted by the ordinary watercourses and conveyed away from the site. The “Updated flood maps for surface water” show the site to be at low risk for the 1 in 30 and 1 in 100 year rainfall events, but the site is at risk for the 1 in 200 year rainfall event (See Appendix C).

4.4.3 A further consultation of the Environment Agency Surface Water Flood map indicates that the majority of the site is at very low risk of surface water flooding. There is an area at low/medium/high risk associated with the topographical low points of the site.

4.4.4 In light of this, the risk of flooding from the land for most of the site is considered to be low. Furthermore, the development site will include improved drainage systems to direct rainfall to the nearest highway channel and gully and away from the new commercial buildings.

Figure 4: The Environment Agency’s Indicative Surface Water Floodplain Map



4.5 Flooding from Groundwater

4.5.1 According to the British Geological Survey Maps, Raised Marine Deposits, classified as a Secondary A Aquifer, are present beneath the site. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. The Lewes Nodour Chalk Formation, classified as a Principal Aquifer is also present. This geology has a high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale.



- 4.5.2 The SFRA indicates that there is a significant proportion of land in the district that is likely to be affected by groundwater flooding as a result of the large chalk bands. The areas most at risk will be deep foundations and underground infrastructure. The maps within the SFRA indicate that the site is within a groundwater emergence zone.
- 4.5.3 The potential risk of groundwater flooding means certain mitigation measures need to be considered at construction phase to prevent any lasting effects on the development. Basements are not recommended and are not to be included in the development. Provided foundations can be constructed at times when groundwater is suitably low (or can be controlled through dewatering) and designed such that the damp proof membrane level is raised sufficiently above expected peak groundwater levels, the flood risk from groundwater sources is considered to be low.
- 4.5.4 Provided appropriate mitigation measures such as those detailed above are adhered to, groundwater flood risk is considered to be low.

4.6 Flooding from Sewers/Highway Drains

- 4.6.1 The review of the Southern Water (SW) public sewer records indicates that there are no public surface water or foul water sewers that cross the development. There are private sewers located within the development site which will require the necessary easements. These sewers will be repaired and rebuilt where necessary as part of the proposed development.
- 4.6.2 The full extent of the existing SW sewers can be identified further in Appendix D. Therefore, the risk of flooding from sewers and highway drains is considered to be low.

4.7 Flooding from Artificial Sources

- 4.7.1 There are no canals or reservoirs in close proximity to the site. Therefore based on the available information the flood risk from artificial sources is considered to be low.



5.0 **ASSESSMENT OF FLOOD RISK ON DEVELOPMENT SITE (PROBABILITY)**

5.1 **Summary**

- 5.1.1 Table 3 considers each of the sources and defines in tabular format the probability of flood risk associated with each and the likely impacts.

Table 3: Flood Risk Summary

Source	Probability of Flood Risk	Impacts	Remarks
Tidal	High	Medium	Development site is tidally influenced. However, the site is defended.
Fluvial	Low	Low	Site is located within Flood Zone 1 and at low risk from flooding.
Surface (Overland Flood Flow)	Low	Low	The Environment Agency surface water maps indicate that the majority of the site is at very low risk.
Sewers/Highway Drains	Low	Low	There are no public sewers within the development. The existing private sewers will be repaired and rebuilt where necessary, and will be associated with the necessary easements as part of the future development.
Groundwater	Medium	Low	Mitigation measures ensure the risk of groundwater flooding is low.
Artificial Sources	Low	Low	Based on available data, flood risk from artificial sources is deemed to be low.



6.0 SURFACE WATER DRAINAGE STRATEGY

6.1 Existing Surface Water Runoff

- 6.1.1 Surface water runoff from the site flows towards the east within the existing infrastructure into a 450Ø outfall pipe beneath the railway and then through existing open ditches, prior to outfalling into the Lidsey Rife.
- 6.1.2 As the proposed development is located on brownfield land, brownfield runoff rates should be applied. These can be found in Table 4 below. The allowable brownfield runoff rate has been calculated based on $2.78 \times 50 \times A_{imp}$ with a 40% reduction. The allowable runoff rate is subject to detailed investigation of the existing drainage.

Table 4: Existing Runoff Rates

Existing Impermeable Area (ha)	Discharge Rate (l/s)	Discharge Rate with 40% reduction (l/s)
0.74	102	61

- 6.1.3 Refer to Appendix E for drainage strategy layouts, covering the site and surrounding area.

6.2 Geology

According to the BGS Maps Raised Marine Deposits underlie the site. These deposits are of variable lithology, comprising gravel (shingle), sand, silt and clay. The Lewes Nodour Chalk Formation is also present, these deposits are comprised of chalk with flints, with marl seams, nodular chalk, sponge-rich and flint seams throughout. Further infiltration tests confirmed that infiltration is not a viable SuDS technique for the site (see Appendix H).

6.3 Sustainable Drainage Systems

6.3.1 SuDS Objectives

Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed to manage both the environmental risks resulting from the urban runoff and to contribute, wherever possible, to environmental enhancement. Therefore, SuDS objectives are to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C697, 2007).



6.3.2 SuDS Design Themes

A strong design theme is essential if maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale SuDS should link with the individual plot structure, planting and amenity areas, gaining multiple benefits from a limited area of land.

6.3.3 The SuDS Management Train

The 'Management Train Approach' should be central to the surface water drainage strategy of a proposed site. The main objective is the treatment and control of runoff as near to source as possible, thus protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

1. **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes rainwater reuse.
2. **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
3. **Site Control** – Management of water in a local area and can include below ground storage/attenuation, detention basins, large infiltration devices.
4. **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

The drainage techniques for this development will seek to include, where possible, pollution prevention and site control measures.

6.3.4 SuDS Site Constraints

SuDS techniques are not suitable for all sites, therefore an assessment of the existing site is required so that SuDS limitations can be determined.

1. **Land Use Characteristics** – The size and type of development plot enables a range of pollution prevention and site control SuDS devices to be considered both above and below ground.
2. **Site Characteristics** – The use of infiltration is not a viable SuDS technique, as confirmed by further infiltration tests.
3. **Catchment Characteristics** – The site is classified as 'brownfield'. Current guidance would limit the discharge rate from the post developed site to not exceed existing brownfield rates and ideally provide a betterment.



4. **Environmental and Amenity Performance** – The inclusion of SuDS within the overall development is a key driver in providing both amenity and habitat creation. These will also assist in offsetting the loss of pre-developed natural habitat. Maintenance plans will be prepared for all SuDS devices.

6.3.5 SuDS Design Philosophy

The SuDS philosophy for a development site is the promotion of Pollution Prevention and Site Control Techniques:

The following design philosophy is proposed:

- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance to the existing private surface water sewerage system.
- Surface water discharge into the existing infrastructure in the east at a controlled rate.
- Pollution prevention measures.
- Site Control features, in the form of geocellular storage or oversized pipes, to accommodate the additional surface water runoff generated by the development site.
- Provision of suitable oil separators in line with Pollution Prevention Guidance 3 criteria (where applicable)
- Aim to limit, where possible, the impermeable fraction of development.

6.3.6 SuDS Parameters

It is proposed that the development site has two levels of treatment. Prevention and source control are considered as the first level of treatment and the site control as the second.

6.3.7 Prevention and Source Control – Principles and Objectives

The main objective of prevention and source control is the treatment and control of runoff as near to source as possible. Application of these techniques will require reduction of impermeable areas and techniques to restrict the runoff rates.

Prevention measures to be considered, where possible, as part of the overall approach to the management train at this site include rainwater harvesting. Typical examples are given in the SuDS Manual (Ciria C697) and are briefly described below. It must be noted that the effectiveness of each system is dependent on the final design as well as the actual site conditions.

Rainwater Harvesting - Similar to the use of water butts this prevention method stores rainwater runoff from roofs and external areas in below ground tanks. The water can then be used for



irrigation purposes to the soft landscaping areas or alternatively pumped to an internal storage tank where the 'Grey' water can be used for WC's and washing machines.

Permeable surfacing - Block paved and/or specialised tar macadam provides a porous surfacing for the external areas that allows water to infiltrate through and into the underlying layers. Water is temporally stored and either infiltrates to ground or is retained for controlled release into the drainage system.

Swales - Swales are linear grassed ditches that provide conveyance and storage of surface water runoff. They can be inexpensive to construct as they are very similar to normal landscaping areas, but require land. These features can be directed towards storage features such as detention basins and possibly balancing ponds before discharge to existing watercourses or ditches at controlled rates. Swales can be sized to accommodate a broad variety of flow rates.

6.3.8 Site Control – Principles and Objectives

Site control features such as ponds and basins can be designed to attenuate storm runoff and provide conditions for settlement of suspended solids. The benefits are that they satisfy the full range of SuDS requirements in terms of reducing the quantity of water, improving the quality of water and also providing the biodiversity enhancements.

Conventional piped drainage - Conventional piped drainage would be located in areas of the proposed scheme where 'over-the-edge' drainage is unsuitable. This would typically be in areas where kerbs are required, due to road user safety reasons, such as at roundabouts. Surface water runoff would be collected via conventional trapped gullies or combined kerb drainage systems, before discharging appropriately into SuDS units.

Geocellular Systems - Geocellular Systems can be used to control and manage runoff either as a soakaway or as a storage tank and can be tailored to suit the requirements of most sites. In addition they can be used for storing roof/rainwater before recycling. Geocellular Systems used for storage can be tailored to be used in contaminated land conditions to prevent infiltration.

6.4 Surface Water Drainage Strategy

6.4.1 Surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account. This is in-line with current guidance and recommendations from the EA.

6.4.2 In light of the findings from the SuDS review in Section 6.3, the following surface water drainage strategy will be implemented.



1. Due to the increase in impermeable areas from the pre-development situation, the SuDS management train approach will be incorporated.
2. Prevention measures will be the initial means of retaining the runoff. Infiltration is not a viable option for the site.
3. Rainwater runoff from roofs and hard paved areas will be directed through the prevention measures and then via the existing surface water sewer gravity network to onsite geocellular storage. The new on-site storage will account for the additional surface water runoff generated by the site and prevent increased discharge for the extreme events.
4. Discharge from the development will be restricted to the critical storm discharge for the impermeable area with a reduction of 40%. The allowable runoff rate is subject to detailed investigation of the existing drainage.

6.5 Surface Water Drainage Proposals

- 6.5.1 Surface water runoff from the roof and external areas will be directed to the below ground gravity network. This water is considered to be generally clean and with limited contamination, and may be discharged directly to the existing drainage infrastructure and new SuDS Facilities. Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps, or by the use of sustainable drainage techniques.
- 6.5.2 Although it is envisaged that prevention measures may be included in the final scheme, for outline calculation purposes a gravity network, will serve the commercial building and highway, and direct runoff to “Site Control” geocellular storage prior to discharging into the culvert under the railway. However, if a consent to discharge into the culvert cannot be obtained, surface water will be discharged into the Sainsbury’s surface water sewerage system which ultimately outfalls into Aldingbourne Rife. The discharge rate from the geocellular storage will be restricted to the critical storm discharge for the impermeable area with a reduction of 40%.
- 6.5.3 Taking into account the existing brownfield discharge rates, and assuming no preventative measures are incorporated and no infiltration to ground is possible then the worst case attenuation volumes are defined in Table 5. It is noted that these rates and volumes are preliminary for this outline assessment and are likely to alter at a detailed design stage when more site specific information is made available. The outline attenuation volumes in Table 5 have been derived using Micro Drainage Source Control Software.
- 6.5.4 The proposed impermeable areas for this site (quoted in Table 5 below) is based on 90% of the site area, taken from the Site Layout in Appendix A. Hydrock drawings C151222/101 and C151222/102 in Appendix E provide further details.



Table 5: Outline Attenuation Volumes

Estimated Impermeable Area (ha)	Approximate Attenuation Volumes		
	1yr Storm Event (61 l/s)	30yr Storm Event (61 l/s)	100yr Storm Event + 20% CC (61 l/s)
0.67	7.3m ³	12.3m ³	34.3m ³

6.5.5 The proposed drainage layout will be designed in accordance with Sewers for Adoption 7th Edition (SfA). SuDS guidance will be taken from Ciria C697. It is a requirement of SfA 7 guidance that the drainage systems be designed to not flood any part of the site in a 1 in 30 year return period design storm (3.33% annual probability of occurrence). The below ground surface water design may require that some areas of the hard standing areas experience minor flooding in extreme conditions beyond the 30 year design criteria. This is classed as Exceedance flooding or Secondary Storage and is common for this type of development. Any such flood water will be directed away from commercial units, where it will discharge into the drainage infrastructure as water levels recede. All exceedance flood water will be retained on-site up to the 100 year return period to prevent flood impact to the adjoining neighbours. All drainage designs will include the appropriate climate change allowance, in this case a 20% increase in rainfall.

6.6 Pollution Control

6.6.1 Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps, french drains with silt traps or by the use of Sustainable Drainage techniques. If appropriate, oil separators in line with Pollution Prevention Guidance criteria will be provided.



7.0 MANAGEMENT MEASURES, OFF SITE IMPACTS AND RESIDUAL RISK

7.1 Flood Risk Management Measures

- 7.1.1 The report has determined that the site is at low risk of flooding from fluvial, surface water, sewers and artificial sources.
- 7.1.2 The assessment has also found the site to be at high risk of tidal flooding, with the site located in Flood Zone 3a i.e. land assessed as having a 0.5% (1 in 200) or greater annual probability of flooding from the sea. Maintained coastal flood defences for the site offer a standard of protection of approximately 1 in 200 (0.5%) and the railway line to the east of the site offers a further level of protection. The site is predominantly at very low risk of surface water flooding, with some areas shown to be at low and medium risk. The site is also found to be at risk of groundwater flooding. The mitigation measures for these are detailed in section 4.
- 7.1.3 The preferred surface water drainage strategy for the new development site is to direct all the surface water runoff from the new commercial development to surface water networks that flows into a 450Ø pipe that is culverted beneath the railway, prior to discharging into the existing open ditches in the surrounding land and ultimately outfalling into Lidsey Rife. However, if a consent to discharge into the culvert cannot be obtained, surface water will be discharged into the Sainsbury's surface water sewerage system which ultimately outfalls into Aldingbourne Rife. Geocellular storage will be situated on the network at the low points of the site to retain the excess rainwater due to the outflow restriction. The new private surface water networks will be designed in line with current British Standard guidance up to the 100 year storm return period including an allowance for climate change. Beyond the 30 year criteria, minor out of chamber flooding may occur with flood water directed away from the commercial developments buildings where it will then be directed back in to the drainage network as the pipe water levels recede. No flood water will be allowed to discharge off the development site.
- 7.1.4 The use of SuDS with controlled (restricted) outflow in line with the required runoff rates will help mitigate any flood risk impact to the surrounding areas.
- 7.1.5 A private management company will be responsible for maintaining the gullies and drain cleansing to ensure that the surface water drainage system will always operate at its maximum efficiency.
- 7.1.6 Access and egress arrangements to and from the new development, should exceedance flooding occur, will be through the main access off the existing estate road.



7.2 Off Site Impacts

- 7.2.1 The report has justified that the risk of flooding to the new development layout is low. Thus, once the previously discussed mitigation measures have been implemented, the site has a low risk of flooding from all sources.
- 7.2.2 By including SuDS into the drainage system and mimicking the pre-development peak runoff at its point of discharge, this will reduce surface water flooding impact onto the downstream catchments.
- 7.2.3 As there is no flood displacement or increased rate of runoff from the proposed development, this will prevent surface water flooding impact from the development onto the downstream catchments.

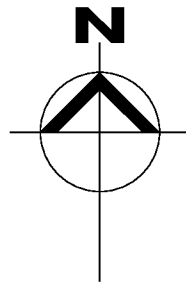
7.3 Residual Risk

- 7.3.1 Flood risk to people and property can be managed but it can never be completely removed; a residual risk remains after flood management or mitigation measures have been put in place. This relates to a rainfall event beyond what can be fully quantified. Should this occur then some out of chamber flooding could occur.



Appendix A – Site Plans

CONTENTS	
Identifier	Name
The Harris Partnership	Proposed Site Layout 13379-008



Parking

Disabled spaces	3
Van spaces	4
Car & trailer	2
Car spaces	39
Total	48

SITE FOR
PUBLIC HO USE

RIGHT OF WAY
RIGHT OF ACCESS

Compound

24m TURNING
CIRCLE

4,950 SQ.FT
OPC

20,000 sq.ft.
WICKES
+ 5,000 sq.ft. Mezz.

LINE OF 5,000 SQ.FT MEZZ

48 PARKING SPACES (INC 3 DDA, 4 VAN
AND 2 CAR AND TRAILER)

CAR & TRAILER

CAR & TRAILER

VAN

VAN

VAN

VAN

GAS PLANT

EQUIP



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A	01.01.15	REVISED GA PLAN TO 20K & OPC & PARKING LAYOUT	LB	GH
Rev	Date	Description	Rev By	Chk'd By

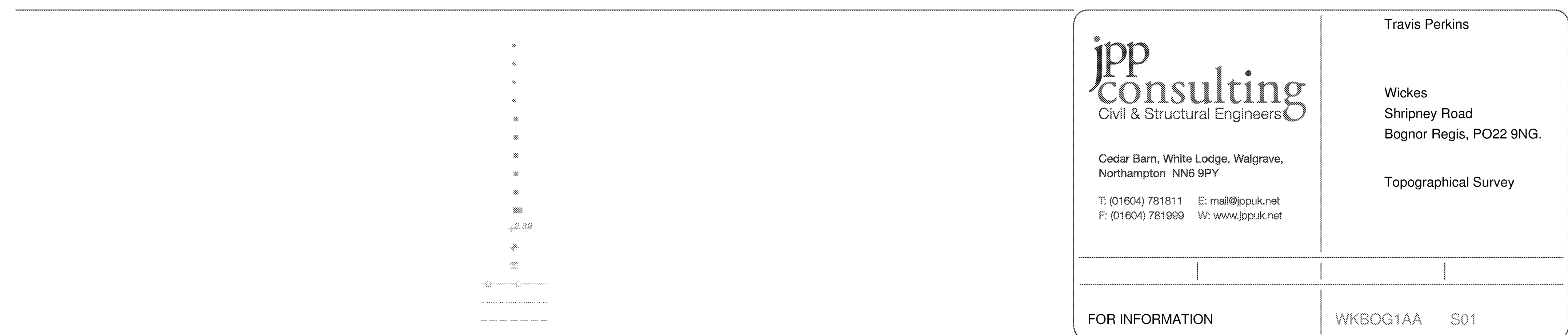
Proj ec t Title	PRO PO SED DE VE LO PM EN T				Dra wing Title	PRO PO SED SITE LA Y O U T					
	WIDDO WSON HO USE BO G NO R REG IS				Job -Dwg No	13379-006		Rev	A		
Client	TRAVIS PERKINS				THE HARRIS PARTNERSHIP MILTON KEYNES The Old Rectory, 79 High Street Newport Pagnell, MK16 8AB t. 01908 211 577 f. 01908 211 722 THE HARRIS PARTNERSHIP WAKEFIELD 2 St. Johns North, Wakefield, WF1 3QA t. 01924 291 800 f. 01924 290 072 THE HARRIS PARTNERSHIP MANCHESTER 2nd Floor, Carvers Warehouse, 77 Dale Street, Manchester, M1 2HG t. 0161 238 8555 f. 0161 244 5809 THE HARRIS PARTNERSHIP READING 101 London Road, Reading, RG1 5BY t. 0118 950 7700 f. 0118 956 8642						
Status	FEASIBILITY										
Scale	1:500		Drawing Size							A2	
Drawn By	LB	Checked By	GH	Date						29.01.15	





Appendix B – Topographical Survey

CONTENTS	
Identifier	Name
JPP Consulting	Topographical Survey WKBOG1AA – SO1



FOR INFORMATION

WKBOG1AA S01



Appendix C – Statutory Authority Correspondence

CONTENTS	
Identifier	Name
Environment Agency	Pre-development enquiry response email
LLFA	Pre-development enquiry response email
LPA	Pre-development enquiry response email

Sophie Eaton
Hydrock
St Baldred's Hall
239 Ashley Road
Hale, Cheshire
WA15 9NE

Our ref: SSD/6238
Your ref:

Date: 27/04/2015

Dear Ms Eaton

Provision of Product 4 for Former LEC Site, Shripney Road, Bognor Regis

Thank you for your request to use Environment Agency data. The information is attached.

If you have requested this information to help inform a development proposal, then you should note the detail in the attached advisory text on the use of Environment Agency Information for Flood Risk Assessments / Flood Consequence Assessments.

Supporting Information

This information is provided subject to the enclosed notice, which you should read.

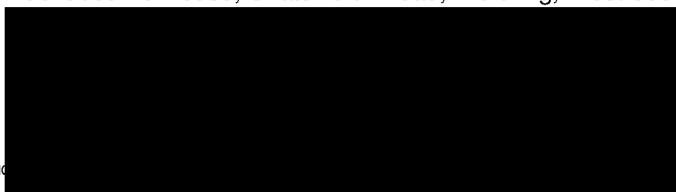
Flood History

We do not have any records of previous flood events affecting this site. I would suggest contacting Arun District Council for a more comprehensive flood history check.

Flood Defences

There are no formal raised flood defences to protect this area from river flooding. Coastal flood defences offer a standard of protection of approximately 1in200 (0.5%).

Guildbourne House, Chatsworth Road, Worthing, West Sussex BN11 1LD



If you have any queries or would like to discuss the content of this letter further please don't hesitate to contact me.

Yours faithfully



Jon Denman
FCRM Officer
Partnership and Strategic Overview Team – West Sussex

Direct dial 01903 703921

Direct e-mail jonathan.denman@environment-agency.gov.uk

Enc. Detailed FRA/FCA Map, Modelled Levels and extents, Flood Defences
[Standard Notice]

Eleanor Dale

From: Denman, Jonathan [REDACTED]
Sent: 27 April 2015 11:57
To: Eleanor Dale
Subject: RE: 150416 SSD/6238 Pre Development Enquiry - Former LEC Refrigeration Site, Shripney Road, Bognor Regis C151222

Hi Eleanor,

I can confirm that the site is within the tidal flood zones only.

If you have any further questions please don't hesitate to contact me.

Many Thanks
Jon

Jon Denman

Partnership and Strategic Overview - West Sussex
Environment Agency
Guildbourne House,
Chatsworth Road,
Worthing, West Sussex
BN11 1LD

[REDACTED]



Floods happen. Be prepared. Check if you are at risk from flooding and sign up for FREE flood warnings.

From: Eleanor Dale [REDACTED]
Sent: 27 April 2015 11:53
To: Denman, Jonathan
Cc: automate
Subject: RE: 150416 SSD/6238 Pre Development Enquiry - Former LEC Refrigeration Site, Shripney Road, Bognor Regis C151222

Hi Jon,

Many thanks for the information. Could you please confirm which flood zones the site is in, both fluvial and tidal?

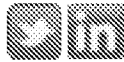
Kind regards,

Eleanor

Eleanor Dale
Infrastructure Engineer

Hydrock
St Baldred's Hall, 239 Ashley Road, Hale, Cheshire WA15 9NE

[REDACTED]



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From: Denman, Jonathan [REDACTED]

Sent: 27 April 2015 11:38

To: Sophie Eaton

Cc: SSD Enquiries

Subject: RE: 150416 SSD/6238 Pre Development Enquiry - Former LEC Refrigeration Site, Shripney Road, Bognor Regis C151222

Dear Sophie,

Thank you for your email. Please find the requested information attached.

If you have any further questions please don't hesitate to contact me.

Kind Regards

Jon

Jon Denman

Partnership and Strategic Overview - West Sussex

Environment Agency

Guildbourne House,

Chatsworth Road,

Worthing, West Sussex

BN11 1LD

[REDACTED]

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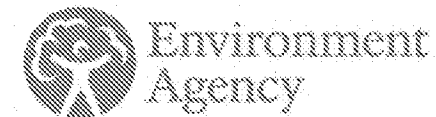
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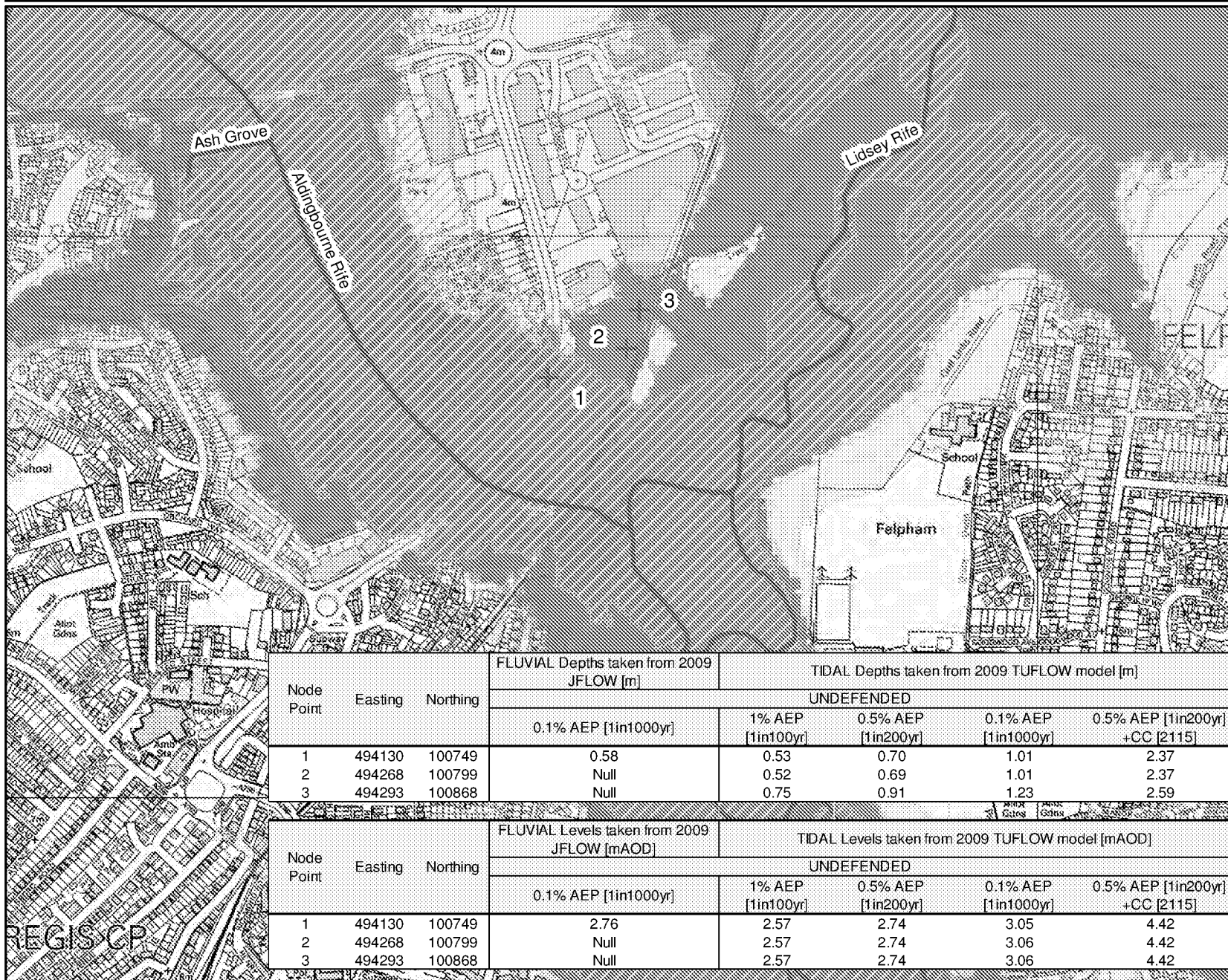
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Modelled Flood Outputs Centered on Former LEC Site, Shripney Road, Bognor Regis - Created 27/04/2015 [Ref: SSD/6238]



Legend

- Main River
- Fluvial 1in1000yr
- Tidal 1in100yr
- Tidal 1in200yr
- Tidal 1in1000yr
- Tidal 1in200yr +CC [2115]

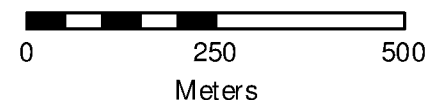


Node Point	Easting	Northing	FLUVIAL Depths taken from 2009 JFLOW [m]	TIDAL Depths taken from 2009 TUFLOW model [m]			
			0.1% AEP [1in1000yr]	UNDEFENDED			
				1% AEP [1in100yr]	0.5% AEP [1in200yr]	0.1% AEP [1in1000yr]	0.5% AEP [1in200yr] +CC [2115]
1	494130	100749	0.58	0.53	0.70	1.01	2.37
2	494268	100799	Null	0.52	0.69	1.01	2.37
3	494293	100868	Null	0.75	0.91	1.23	2.59

Node Point	Easting	Northing	FLUVIAL Levels taken from 2009 JFLOW [mAOD]	TIDAL Levels taken from 2009 TUFLOW model [mAOD]			
			0.1% AEP [1in1000yr]	UNDEFENDED			
				1% AEP [1in100yr]	0.5% AEP [1in200yr]	0.1% AEP [1in1000yr]	0.5% AEP [1in200yr] +CC [2115]
1	494130	100749	2.76	2.57	2.74	3.05	4.42
2	494268	100799	Null	2.57	2.74	3.06	4.42
3	494293	100868	Null	2.57	2.74	3.06	4.42

1:10,000 *

*when printed at A4.



From: Kevin Macknay [REDACTED]
Sent: 17 April 2015 09:56
To: Sophie Eaton
Subject: Historic flooding at the former LEC Refrigeration site
Attachments: Bognor Regis and Felpham.pdf

Sophie,

Further to your recent enquire about your site at the former LEC Refrigeration plant.

We have checked our existing records and have no records of historic flooding at this location. This should not be taken that this site has never suffered from flooding, only that it has never been reported to us, as LLFA.

Looking at our current mapping data that we have for the area:

The 'Updated flood maps for surface water (uFMfSW)' show the site to be at 'low risk' for 1 in 30 and 1 in 100 year rainfall events.

Based on the current ESI Ground Water Flood Risk Maps the site is at 'Moderate risk' of ground water flooding and the area has a 'Low susceptibility' to ground water flooding.

The A29 adjacent to your site has a positive highway drainage system which outfalls south of your site into the Aldingbourne Rife.

I have attached a copy of the 'wet spot' mapping for the Bognor area, taken from our recent 'Local Flood Risk Management Strategy', you may find this useful. As you can see the main risk to the site appears to come from the Aldingbourne and Lidsey Rifes as the site is located within the EA's Floodzone 2, so you should seek advice from the EA too.

Regards,

Kevin

Kevin Macknay
Drainage Strategy Team Leader
Residents' Services - Highways and Transport
West Sussex County Council

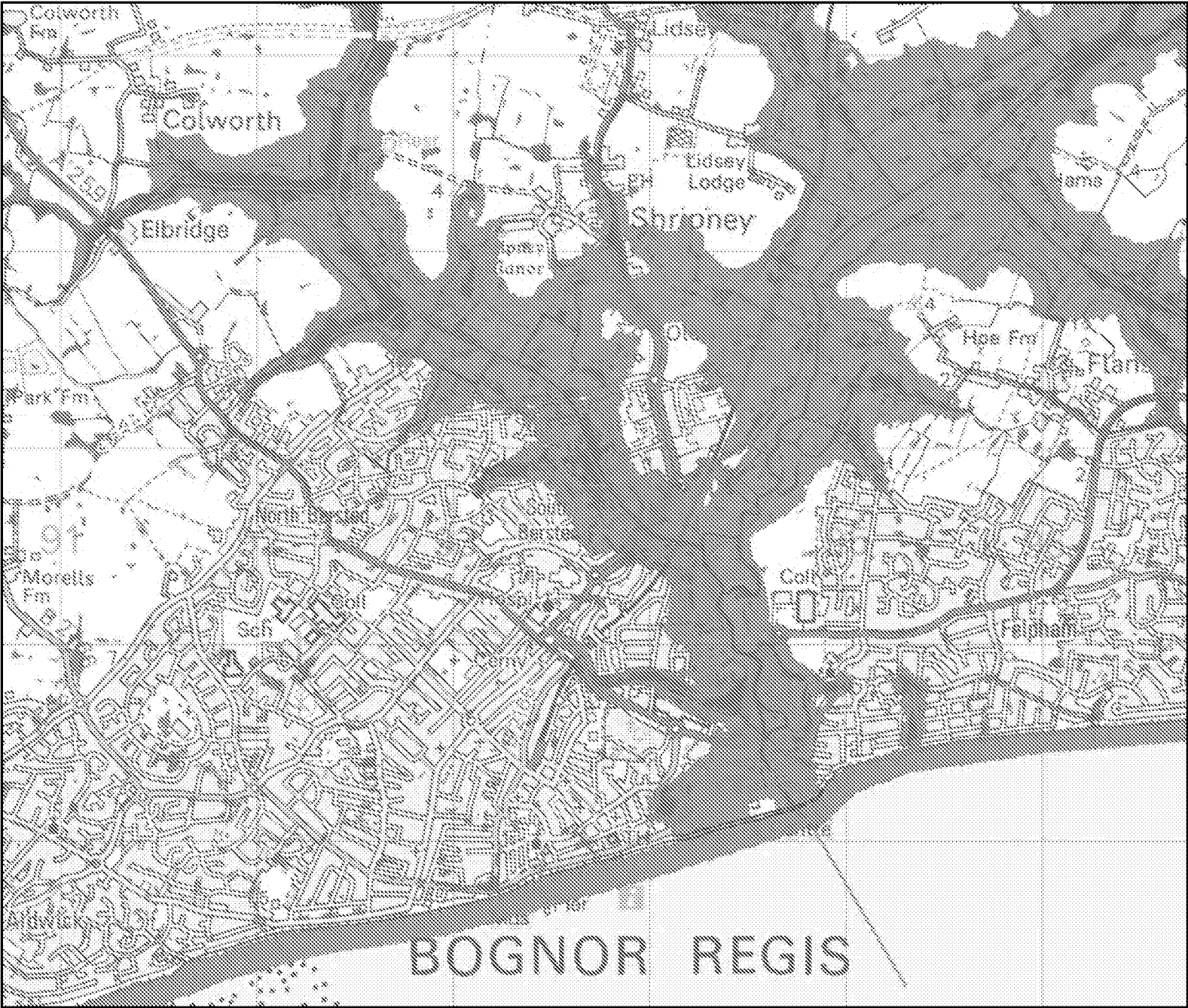
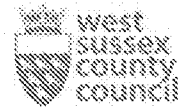
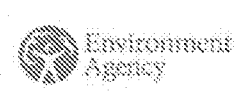
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Bognor Regis & Felpham Wet Spot



Legend

- Surface Water Flood Map
1 in 200 yr rainfall event
- Rivers and Sea Flood Map
1 in 100 year river event,
1 in 200 year sea event

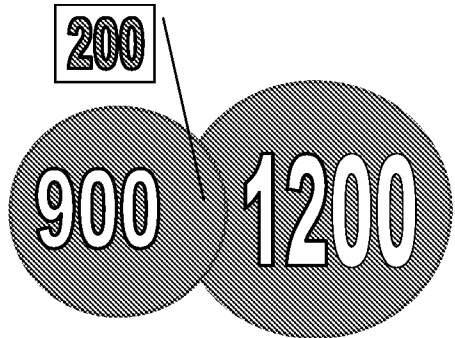
River obstructions

- ARTIFICIAL
- NATURAL
- UNKNOWN

River network

- Primary River
- Secondary River
- Tertiary River
- D/S of High Water Mark
- D/S of Seaward Extension
- Lake / Reservoir
- Canal
- Extended Culvert (> 50m)
- Canal Tunnel
- Underground River (inferred)
- Underground River
(local knowledge)

Numbers of properties at risk from
surface water vs. rivers and sea



Eleanor Dale

From: Thomas Callaway [REDACTED]
Sent: 29 April 2015 15:11
To: Sophie Eaton
Cc: Paul Cann; Neil Crowther
Subject: RE: LLFA - Former LEC Refrigeration Site, Shripney Road, Bognor Regis C151222
Attachments: Drainage - Supplementary Guidance Notes.pdf

Hi Sophie

Please find our surface water drainage supplementary guidance notes attached. The information in this document should be followed so that surface water drainage conditions may be discharged. This will require winter groundwater monitoring and percolation testing, if this hasn't already been done.

For historic flooding records it would be worth contacting Kevin Macknay [REDACTED] West Sussex County Council.

Also, Jamie Fielding [REDACTED] of the Environment Agency will have information regarding the Aldingbourne Rife study that is currently being undertaken.

Regards

Tom Callaway

Thomas Callaway | Drainage & Coastal Engineer, Engineering Services, Arun District Council | Location: Second Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF

Internal: 37818 | External: +44 (0) 1903 737818 | Fax: +44 (0) 1903 716019 | E-mail: Thomas.Callaway@arun.gov.uk

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From: Neil Crowther
Sent: 29 April 2015 15:02
To: Paul Cann; Thomas Callaway
Subject: FW: LLFA - Former LEC Refrigeration Site, Shripney Road, Bognor Regis C151222

This one seems to be for you.

Neil Crowther | Strategic Development Manager, Arun District Council | Location: First Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF

Internal: 37839 | External: +44 (0) 1903 737839 | E-mail: neil.crowther@arun.gov.uk

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From: Sophie Eaton [REDACTED]
Sent: 29 April 2015 14:54
To: Neil Crowther
Cc: automate; Eleanor Dale
Subject: LLFA - Former LEC Refrigeration Site, Shripney Road, Bognor Regis C151222

Hi Neil,

We are undertaking a site specific flood risk assessment for the site at the Former LEC Refrigeration Site, Shripney Road, Bognor Regis that will form part of a planning application for a proposed commercial development at the site. This assessment will be in accordance with the relevant guidelines, including National Planning Policy Framework guidance and Environment Agency guidance.

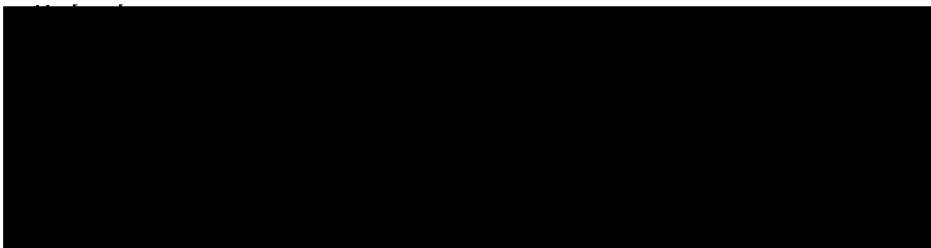
Could you please provide us with any information on historical flooding at the site and advise as to whether you require any parameters in terms of surface water drainage strategy above those requested by the environment agency.

Kind Regard,

Sophie

Sophie Eaton

Office Administrator



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Supplementary Requirements for Surface Water Drainage Proposals

Any proposed surface water scheme must consider sustainable drainage principles.

SuDS Selection

The following destinations must be considered for surface runoff in order of preference:

1. Discharge into the ground (infiltration);
2. Controlled discharge to a surface water body;
3. Controlled discharge to a surface water sewer.

Surface water must not be discharged into the foul sewer system. Infiltration structures include soakaways, basins, swales and permeable paving. Discharge to surface water bodies and surface water sewers must be restricted to an agreed rate.

SuDS selection hierarchy based on:

CIRIA C697 - The SuDS Manual

BS8582:2013 – Code of Practice for Surface Water Management for Development Sites

Approved Document H of the Building Regulations

Infiltration Drainage Design

Infiltration rates for soakage structures are to be based on percolation tests undertaken in the winter period at the location and depth of the proposed structures. The percolation tests must be carried out in accordance with BRE 365, CIRIA R156 or a similar approved method, and cater for the 1 in 10 year storm event between the invert of the lowest entry pipe into the infiltration structure and the base. For the purpose of design, the percolation rate must be applied to the sides of the infiltration structure only and the rate for the base must be zero. This does not apply to infiltration basins or permeable pavements, whereby the percolation rate is applied to the base only. There must be provision to ensure that there is capacity in the system to contain the 1 in 100 year storm event plus 30% on stored volumes, as an allowance for climate change. The infiltration structure should also drain 50% of its total volume in 24 hours or less for both the 1 in 10 and 1 in 100 year (plus 30%) storm events, in order to provide spare capacity for subsequent storms.

Any infiltration drainage design must include adequate winter groundwater monitoring data to determine the highest winter groundwater table. Residential developments in excess of five properties will require ground water monitoring to be carried out between October and March inclusive. The extent of monitoring required for smaller developments will be subject to agreement with the Council's Engineers.

Adequate freeboard must be provided between the base of the soakaway structure and the highest recorded groundwater level identified in that location.

Restricted Discharge

Discharge to a watercourse or surface water sewer must be restricted to the estimated mean greenfield runoff rate (Q_{bar}) by means of a controlled outflow (or restricted to existing runoff rates for brownfield sites). This can be derived from IH124 or a similar approved method. Any storage design must be submitted with groundwater monitoring data where applicable to ensure there will be no detrimental effect on the structure or storage. Storage areas are preferred to be in an 'open' form such as ponds, rather than underground tanks.

Flow Exceedance Routes

The drainage design should show flow routes through the proposed development, demonstrating where surface water will be conveyed for three types of flow:

1. Low flow routes

Regular flow from source control features such as permeable pavements should travel in low flow channels through the development in a controlled way contributing to landscape quality.

2. Overflows

In the event of local blockages or surcharge a simple overflow arrangement should allow water to bypass the obstruction and return to the management train sequence until conditions return to normal.

3. Exceedance routes

When SuDS are overwhelmed by exceptional rainfall, then exceedance routes are required to protect people and property. These provide unobstructed overland flow routes from the development and should be considered for all drainage schemes. Exceedance routes should also be protected from future changes in land use.

Culverting a Watercourse

Culverting (piping) a watercourse is not advised unless there is no alternative. The resulting reduction in storage volume, flow capacity and habitat potential would be unacceptable. Culverted watercourses are also more difficult to maintain due to the limited accessibility.

Land Drainage Consent must be sought from the Lead Local Flood Authority (West Sussex County Council), or its agent (Arun District Council – land.drainage@arun.gov.uk), prior to starting any works (temporary or permanent) that affect the flow of water in the watercourse. Such works may include culverting, channel diversion and the installation of trash screens.

The development layout must take account of any existing watercourses (open or culverted) to ensure that future access for maintenance is not restricted.

See also:

Land Drainage Act 1991 (amended 1994)

Maintenance and Management

Ditches and watercourses should retain a three metre easement with access that allows for its future maintenance.

Details of the maintenance and management of the SuDS system are to be set out in writing in a site specific maintenance manual. This manual shall include details of the financial management and arrangements for the replacement of components at the end of the manufacturers recommended design life. This document is then to be submitted as part of the planning process.

References

The Building Regulations 2000
Drainage and waste disposal
Approved document H
ISBN: 1-859462-08-1

Building Research Establishment,
Soakaway Design – Digest 365 (BRE 365)
ISBN: 1 86081 604 5, 1991

Centre for Ecology and Hydrology
Flood Estimation for Small Catchments - IH Report 124
Marshall, D.C.W. & Bayliss, A.C.
ISBN: 0948540621, 1994

CIRIA
C697 The SUDs Manual
Woods-Ballard, B.; Kellagher, R. et al
ISBN: 978-0-86017-697-8, 2007

CIRIA
R156 Infiltration Drainage – Manual of Good Practice
Bettess, R.
ISBN: 0 86017 457 3

British Standards Institution
BS8582:2013 – Code of Practice for Surface Water Management for Development Sites
ISBN: 978 0 580 76700 5



Appendix D – Southern Water Sewer Records

CONTENTS	
Identifier	Name
Southern Water	Sewer Records

Your Search Results :
Former LEC Refrigeration Site
Shripney Road
Bognor Regis
West Sussex
PO22 9NG



LandSearches





Hydrock
St Baldreds Hall 239,Ashley Road
Hale
Cheshire
WA15 9NE

Your Ref
C151222
Our Ref
LS/U1094069/S.B.
Date
27 Apr 2015
Contact

Dear Sir/Madam

Your Search Results: Former LEC Refrigeration Site, Shripney Road

Please find enclosed the results of your property search request. If you have any questions arising from the results please call our helpline on 0330 303 0276, which is open from 08.00 to 17.00hrs or send your enquiry to the following email address: Searches@southernwater.co.uk.

Yours faithfully

Southern Water Land Searches

**Former LEC Refrigeration Site
Shripney Road
Bognor Regis
West Sussex
PO22 9NG**



Hydrock
St Baldreds Hall 239,Ashley Road
Hale
Cheshire
WA15 9NE

Your Ref
C151222
Our Ref
LS/U1094069/S.B.
Date
27 Apr 2015
Contact

VAT RECEIPT

VAT Registration Number: 813 0378 56

Service	VAT Code	Costs
Enquiry On: Former LEC Refrigeration Site, Shripney Road, Bognor Regis , West Sussex, PO22 9NG	A	£99.84
	Net Total	£99.84
	VAT	£19.97
	Total	£119.81
		Paid in Full

Thank you for payment received on: 27 Apr 2015

**Former LEC Refrigeration Site
Shripney Road
Bognor Regis
West Sussex
PO22 9NG**

Land Search: Former LEC Refrigeration Site, Shripney Road, Bognor Regis , West Sussex, P
Ref: LS/U1094069/S.B.
Date: 27 Apr 2015
Contact: Southern Water Services

MAPS

Public Sewer Map

1.1 Q: Where relevant, please include a copy of an extract from the public sewer map.

A: A copy of the statutory sewer map is provided

1. The Water Industry Act 1991 defines Public sewers as those which The Company have responsibility for. Other assets and rivers, watercourses, ponds, culverts or highway drains may be shown for information purpose only.

2. Any Private Sewers or Lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Map of Waterworks

1.2 Q: Where relevant, please include a copy of an extract from the map of waterworks.

A: The water supply for this area is provided by Portsmouth Water Plc, PO Box 8, West Street, Havant, Hants, PO9 1LG. Tel No: 02392 499888 and a copy of the map of waterworks is provided.

1. Assets other than vested water mains may be shown on the plan, for information only.

2. The company is not responsible for private supply pipes connecting the property to the public water main and does not hold details of these. These may pass through land outside of the control of the seller, or may be shared with adjacent properties. The buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.

3. If an extract of the public water main record is enclosed. This will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

DRAINAGE

Foul Water

2.1 Q: Does foul drainage from the property drain to a public sewer?

A: This enquiry appears to relate to a plot of land or a recently built property. It is recommended that drainage proposals are checked with the developer.

1. The company is not responsible for those private drains and sewers which connect the property to the public sewerage system, and does not hold details of these. The property owner will normally have sole responsibility for private drains serving the property and may have shared responsibility, with other users, if the property is served by a private sewer which also serves other properties. These may pass through land outside of the control of the seller, the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.

2. An extract from the public sewer map is enclosed. This will show known public sewers in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

3. If foul water does not drain to the public sewerage system the property may have private facilities in the form of a cesspit, septic tank or other type of treatment plant.

Surface Water Drainage

2.2 Q: Does surface water from the property drain to a public sewer?

A: This enquiry appears to relate to a plot of land or a recently built property. It is recommended that drainage proposals are checked with the developer.

1. The company is not responsible for private drains and sewers that connect the property to the public sewerage system and does not hold details of these. The property owner will normally have sole responsibility for private drains serving the property and may have shared responsibility, with other users, if the property is served by a private sewer which also serves other properties. These may pass through land outside of the control of the seller, the buyer may wish to investigate whether separate rights or easements are needed for their inspection, repair or renewal.

2. An extract from the public sewer map is enclosed. This will show known public sewers in the vicinity of the property and it should be possible to estimate the likely length and route of any private drains and/or sewers connecting the property to the public sewerage system.

3. In some cases company records do not distinguish between foul and surface water connections to the public sewerage system. If on inspection the buyer finds that the property is not connected for surface water drainage, the property may be eligible for a rebate of the surface water drainage charge. Details can be obtained from the company.

4. If surface water does not drain to the public sewerage system the property may have private facilities in the form of a soakaway or private connection to a watercourse

Surface Water Drainage Charges

2.3 Q: Is a surface water drainage charge payable?

A: Records indicate that this enquiry relates to a plot of land or recently built property. It is recommended that the charging proposals are checked with the developer.

1. Where surface water from a property does not drain to the public sewerage system no surface water drainage charges are payable.

2. Where surface water drainage charges are payable but if on inspection the buyer finds that the property is not connected for surface water drainage, the property may be eligible for rebate of the surface water drainage charge. Details can be obtained from the Sewerage Undertaker.

Location of Sewers

2.4 Q: Does the public sewer map indicate any public sewer, disposal main or lateral drain within the boundaries of the property?

A: The public sewer map indicates that there are no public sewers, disposal mains or lateral drains within the boundaries of the property. It is recommended that investigations are made into the drainage arrangements of the property as the owner may be liable for repairs to the drainage system.

1. The Approximate boundary of the property has been determined by reference to the Ordnance Survey record or the map supplied.

Sewer within 100 feet

2.5 Q: Does the public sewer map indicate any public sewer within 30.48 meters (100 feet) of any buildings within the property?

A: The public sewer map indicates that there are no public sewers within 30.48 metres (100 feet) of a building within the property.

1. It is recommended that investigations are made into the drainage arrangements of the property as the owner may be liable for repairs to the drainage system.

Adoption Agreements

2.6 Q: Are any sewers or lateral drains serving or which are proposed to serve the property the subject of an existing adoption agreement or an application for such an agreement?

A: The company's records indicate that the sewers serving the development, of which this property forms part, are not the subject of an application for adoption under S104 of the Water Industry Act 1991. Where the property is part of an established development it would not normally be subject to an adoption agreement under Section 104 of the Water Industry Act 1991.

1. Where the property is part of a very recent or ongoing development and the sewers are not the subject of an adoption application, buyers should consult with the developer to ascertain the extent of private drains and sewers for which they will hold maintenance and renewal liabilities.

2. Final adoption is subject to the developer complying with the terms of the adoption agreement under Section 104 of the Water Industry Act 1991.

Building Over Agreement

2.7 Q: Has the sewerage undertaker approved or been consulted about any plans to erect a building or extension on the property over or in the vicinity of a public sewer, disposal main or drain?

A: The company's records indicate that there is not a statutory agreement or consent in respect of building over a public sewer at this property. For historical reasons the company may not be aware of some agreements or consent's which have been entered into by the local authority.

Risk of Flooding Due to Overloading Public Sewers

2.8 Q: Is any building which is or forms part of the property at risk of internal flooding due to overloaded public sewers?

A: The property is not recorded as being at risk of internal flooding due to overloaded public sewers. From the 1st October 2011 private sewers, disposal mains and lateral drains were transferred into public ownership. It is therefore possible that a property may be at risk of internal flooding due to an overloaded public sewer which the sewerage undertaker is not aware of. For further information it is recommended that enquiries are made of the vendor.

1. A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.

2. "Internal flooding" from the public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.

3. "At Risk" properties are those that the water company is required to include in the Regulatory Register that is reported annually to the Water Services Regulatory Authority. These are defined as properties that have suffered or are likely to suffer internal flooding from the public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Sewerage Undertaker's reporting procedure.

4. Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the at Risk register.

5. Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Sewerage Undertaker.

6. Public Sewers are defined as those for which the Sewerage Undertaker holds statutory responsibility under the Water Industry Act 1991.

7. It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Sewerage Undertaker. This report excludes flooding from the private sewers and drains and the Sewerage Undertaker makes no comment upon this matter.

Sewerage Treatment Works

2.9 Q: Please state the distance from the property to the nearest boundary of the nearest sewage treatment works.

A: The nearest sewage treatment works is 2.3 kilometres North of the property. The name of the sewage treatment works is LIDSEY WTW, which is responsibility of Southern Water Services, Southern House, Capstone Road, Chatham, Kent ME5 7QA company.

1. The nearest sewerage treatment works will not always be the sewerage treatment works serving the catchment within which the property is situated.

2. The Sewerage undertaker's records were inspected to determine the nearest sewerage treatment works.

3. It should be noted therefore that there may be private sewerage treatment works closer than the one detailed above that have not been identified.

WATER

Connection to Mains Water Supply

3.1 Q: Is the property connected to mains water supply?

A: This enquiry relates to a plot of land or a recently built property. It is recommended that the water supply proposals are checked with the developer.

Location of Water Mains

3.2 Q: Are there any water mains, resource mains or discharge pipes within the boundaries of the property?

A: The water supply for this area is provided by Portsmouth Water Plc, PO Box 8, West Street, Havant, Hants, PO9 1LG. Tel No: 02392 499888 whose records do not show any vested water mains within the boundary of the property.

1. The boundary of the property has been determined by reference to the Ordnance Survey record.

2. The presence of a vested water main within the boundary of the property may restrict further development within it. The company has a statutory right of access to carry out work on its assets, subject to notice. This may result in employees of the company or its contractors needing to enter the property to carry out work.

Adoption of Water Mains and Services Pipes

3.3 Q: Is any water main or service pipe serving or which is proposed to serve the property the subject of an existing adoption agreement or an application for such an agreement?

A: Records confirm that water mains or service pipes serving the property are not the subject of an existing adoption agreement or an application for such an agreement.

1. This enquiry is of interest to purchasers of new homes who will want to know whether or not the property will be linked to the mains water supply.

Risk of Low Water Pressure or Flow

3.4 Q: Is the property at risk of receiving low water pressure or flow?

A: Records confirm that the property is not recorded on a register kept by the water undertaker as being at risk of receiving low water pressure or flow.

1. The boundary of the property has been determined by reference to the Ordnance Survey record.

2. "Low water pressure" means water pressure below the regulatory reference level which is the minimum pressure when demand on the system is not abnormal.

3. Water Companies are required to include in the Regulatory Register that is reported annually to the Water Services Regulatory Authority properties receiving pressure below the reference level, provided that allowable exclusions do not apply (i.e. events which can cause pressure to temporarily fall below the reference level).

4. The reference level of service is a flow of 9 litres/minute at a pressure of 10metres head on the customers side of the main stop tap (mst). The reference level of service must be applied on the customers side of a meter or any other company fittings that are on the customers side of the main stop tap.

The reference level applies to a single property. Where more than one property is served by a common service pipe, the flow assumed in the reference level must be appropriately increased to take account of the total number of properties served.

For two properties, a flow of 18 litres/minute at a pressure of 10metres head on the customers' side of the mst is appropriate. For three or more properties the appropriate flow should be calculated from the standard loadings provided in BS6700 or Institute of Plumbing handbook.

5. Allowable exclusions

The Company is required to include in the Regulatory Register properties receiving pressure below the reference level, provided that allowable exclusions listed below do not apply

6. Abnormal demand:

This exclusion is intended to cover abnormal peaks in demand and not the daily, weekly or monthly peaks in demand which are normally expected.

Companies should exclude from the reported DG2 figures properties which are affected by low pressure only on those days with the highest peak demands. During the report year companies may exclude, for each property, up to five days of low pressure caused by peak demand.

7. Planned maintenance:

Companies should not report under DG2 low pressures caused by planned maintenance.

It is not intended that companies identify the number of properties affected in each instance. However, companies must maintain sufficiently accurate records to verify that low pressure incidents that are excluded from DG2 because of planned maintenance are actually caused by maintenance.

8. One-off incidents:

This exclusion covers a number of causes of low pressure; mains bursts; Failures of company equipment (such as PRVs or booster pumps);

Firefighting; and Action by a third party. However, if problems of this type affect a property frequently, they cannot be

classed as one-off events and further investigation will be required before they can be excluded.

9. Low pressure incidents of short duration:

Properties affected by low pressures which only occur for a short period, and for which there is evidence that incidents of a longer duration would not occur

during the course of the year, may be excluded from the reported DG2 figures.

Water Quality Analysis

3.5 Q: Please include details of a water quality analysis made by the water undertaker for the water supply zone in respect of the most recent calendar year.

A: The analysis confirmed that all tests met the standards prescribed by the 2000 Regulations or the 2001 Regulations

1. Water companies have a duty to provide wholesome water that meets the standards of the Water Supply (Water Quality) Regulations 2000.

However, the householder is responsible for any deterioration in water quality that is a result of the domestic distribution system (the supply pipe and the plumbing within the property) that results in the standards not being met.

2. In England and Wales these Regulations implement the requirements of the European Drinking Directive 98/83/EC. The 2000 Regulations impose standards for a range of parameters, which are either health based to ensure the water is safe to drink or to ensure the water is aesthetically acceptable. They also require that drinking water should not contain any element, organism or substance (whether or not a parameter) at a concentration or value which would be detrimental to public health.

3. Water quality is normally tested at the tap used for domestic consumption normally the kitchen. However, the householder is responsible for any of deterioration in water quality that is a result of the domestic distribution system (the supply pipe and the plumbing within the property) that results in the standards not being met.

4. If there are concerns that lead pipes within the property may be causing high levels of lead in your drinking water please contact your water company (give contact details) for further advice.

5. The water company undertakes a monitoring programme to establish water quality that includes random sampling from domestic properties. It will notify the consumers of any failures to meet the water quality standards that are due to the condition or maintenance of the domestic distribution system.

6. The data collected by the company is subject to external review by the drinking water inspectorate (DWI) and by local and health authorities. In addition to reviewing quality data the DWI also carry out audits during which any area of the company's operational can be examined.

7. If there are concerns that lead pipes within the property may be causing high levels of lead in your drinking water please contact the company (see below) for further advice.

Water Quality Standards

3.6 Q: Please include details of any departures authorised by the Secretary of State or National Assembly for Wales under Part 6 of the 2000 Regulations from the provisions of Part 3 of those Regulations.

A: There are no such authorised departures for the water supply zone.

1. Authorised departments are not permitted if the extent of the departure from the standard is likely to constitute a potential danger to human health.

2. Please contact your water company if you require further information.

Water Meters

3.7 Q: Please include details of the location of any water meter serving the property.

A: Records indicate that this enquiry relates to a plot of land or recently built property. It is recommended that the charging proposals are checked with the developer.

*1. Where the property is not served by a water meter and the customer wishes to consider this method of charging they should contact:
Portsmouth Water Plc, PO Box 8, West Street, Havant, Hants, PO9 1LG. Tel No: 02392 499888*

CHARGING

Sewerage And Water Undertakers

4.1 Q: Who are the sewerage and water undertakers for the area?

A: The sewerage undertaker for the area is Southern Water Services, Southern House, Yeoman Road, Worthing, Sussex BN13 3NX

Portsmouth Water Plc, PO Box 8, West Street, Havant, Hants, PO9 1LG. Tel No: 02392 499888

Sewerage Bills

4.2 Q: Who bills the property for sewerage services?

A: Records indicate that this enquiry relates to a plot of land or recently built property. It is recommended that the charging proposals are checked with the developer.

Water Bills

4.3 Q: Who bills the property for water services?

A: Records indicate that this enquiry relates to a plot of land or recently built property. It is recommended that the charging proposals are checked with the developer.

Current Basis for Sewerage and Water Charges

4.4 Q: What is the current basis for charging for sewerage and/or water services at the property?

A: This enquiry relates to a plot of land or a recently built property. It is recommended that the water supply proposals are checked with the developer.

1. Measured (metered) charges can apply where the buyer makes a change of use of the property or where the buyer uses water

- where the principal use of the premises is not as a home*
- where there is garden watering other than by hand*
- which automatically replenishes a pond or swimming pool with a capacity in excess of 10,000litres*
- in a bath with a capacity in excess of 230Litres*
- in a power shower*
- in a reverse osmosis unit*

2. If a property is measured (metered) upon change of occupation this property will remain as a metered property.

3. Water and sewerage companies full charges are set out in their charges schemes which are available from the company free of charge upon request.

Trade Effluent Information

4.5 Q: Is there a Consent, on this property, to discharge Trade Effluent under S118 of the Water Industry Act (1991) into the public sewerage system?

A: The trader operating at this commercial property does not hold either a Trade Effluent Consent, or an acknowledgement of a trade effluent discharge, as issued by Southern Water.

1. Please note any existing consent is dependant on the business being carried out at the property and will not transfer automatically upon change of ownership.

Other Information

Is there a Meter fitted at the property?

Not Known - New Developement

If not, Rateable Value used for charging purposes:

ADDITIONAL METER INFORMATION

Southern Water does not hold meter serial or location details for this property. This is because Southern Water does not supply the water for this property.

DISCLAIMER - These replies and information, including that shown on the enclosed plans(s), are given on the distinct understanding that neither the company nor any of its representatives is legally liable for its accuracy or for any action or omission to act whatsoever by anyone on the strength of that information, save as to obvious error. In particular, any person proposing to construct or excavate on land on the basis of information hereby provided should carry out all necessary on-site investigations.

A GUIDE TO NEW DEVELOPMENT

WASTEWATER INFORMATION

The information contained below is for general guidance only. It is recommended that Southern Water's Network Development department be contacted for further details concerning new infrastructure development.

Sewer Requisitions

It may be necessary for a developer to request that Southern Water provides a public sewer to connect a development site to the existing public system. The developer is responsible for the cost of the work, although a discount will be applied based on the future predicted income from the development served by the new sewer.

Sewer Diversions

If a public sewer crosses private land, it may be possible for the landowner/developer to request the sewer be diverted. In the majority of cases Southern Water will allow the developer to undertake this work under close supervision. Whether Southern Water or the developer undertakes the diversionary works the costs are the responsibility of the developer.

Building-over Sewers

Public sewers are afforded statutory protection and consequently there is no right to build over or in close proximity to a public sewer. If an existing public sewer either crosses a development site or is located in close proximity to a development site it is essential that a developer contact Southern Water.

Sewer Connections

A developer can serve notice on Southern Water that it wishes to make a connection to the public sewerage system. The developer must provide 21 days notice and the work will be supervised by Southern Water.

Contact Us

For specific information on Southern Water's Network Development service, including details on how to contact the right person, please visit our website on:-

FURTHER QUERIES

SOUTHERN WATER LAND SEARCH SERVICE

If you have any queries regarding this Commercial Landsearch, please do not hesitate to contact the Southern Water Land Search Service using the details below.

Mailing Address: The Land Search Service
SOUTHERN WATER
SOUTHERN House
Capstone Road
Chatham
Kent
ME5 7QA

Email Address:

Helpdesk Tel:

Helpdesk Fax:

DX:



SOUTHERN WATER NETWORK DEVELOPMENT SERVICE

Contact Us

For specific information on Southern Water's Network Development service, including details on how to contact the right person, please visit our website on:-

www.southernwater.co.uk/developers

COMMERCIAL DRAINAGE & WATER ENQUIRY **TERMS AND CONDITIONS**

Customer and Clients are asked to note these terms, which govern the basis on which this commercial drainage and water report is supplied

Definitions

'Company' means the water service company operating within the Southern Water drainage area that provides information to Southern Water for this commercial search Report.

'Order' means any request completed by the Customer requesting the Report.

'Report' means the drainage and water report prepared by The Company in respect of the Property.

'Property' means the address or location supplied by the Customer in the Order.

'Customer' means the person, company, firm or other legal body placing the Order, either on their own behalf as Client, or, as an agent for a Client.

'Client' means the person, company or body who is the intended recipient of the Report with an actual or potential interest in the Property.

Agreement

1. Southern Water agrees to supply the Report subject to these terms. The scope and limitations of the Report are described in paragraph 2 of these terms. Where the Customer is acting as an agent for the Client then the Customer shall be responsible for bringing these terms to the attention of the Client.

The Customer and Client agree that the placing of an Order for a Report indicates their acceptance of these terms.

The Report

2. Whilst Southern Water will use reasonable care and skill in producing the Report, it is provided to the Client on the basis that they acknowledge and agree to the following:-

2.1 The information contained in the Report can change on a regular basis so Southern Water cannot be responsible to the Client for any change in the information contained in the Report after the date on which the Report was produced and sent to the Client.

2.2 The Report does not give details about the actual state or condition of the Property nor should it be used or taken to indicate or exclude actual suitability or unsuitability of the Property for any particular purpose, or relied upon for determining saleability or value, or used as a substitute for any physical investigation or inspection. Further advice and information from appropriate experts and professionals should always be obtained.

2.3 The information contained in the Report is based upon the accuracy of the address supplied by the Customer or Client.

2.4 The Report provides information as to the location & connection of existing services, and details of trade effluent consents. It should not be relied upon for any other purpose. The Report may contain opinions or general advice to the Customer and the Client and Southern Water cannot ensure that any such opinion or general advice is accurate, complete or valid and accepts no liability therefore.

2.5 The position and depth of apparatus shown on any maps attached to the Report are approximate, and are furnished as a general guide only, and no warranty as to its correctness is given or implied. The exact positions and depths should be obtained by excavation trial holes.

Liability

3.1 Southern Water shall not be liable to the Client for any failure defect or non-performance of its Obligations arising from any failure of or defect in any machine, processing system or transmission link or anything beyond Southern Water's reasonable control or the acts or omissions of any party for whom Southern Water is not responsible.

3.2 Where a Report is requested for an address falling within a geographical area where Southern Water and another Company separately provide Water and Sewerage Services, then it shall be deemed that liability for the information given by Southern Water or the Company as the case may be will remain with Southern Water or the Company as the case may be in respect of the accuracy of the information supplied. Where Southern Water is supplying information which has been provided to it by another Company for the purposes outlined in this agreement, Southern Water will therefore not be liable in any way for the accuracy of that information.

3.3 Where the Customer sells this Report to a Client (other than in the case of a bona fide legal adviser recharging the cost of the Report as a disbursement) Southern Water or the company as the case may be shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss or damage whatsoever (save to the extent provided by clause 3.4) and the Customer shall indemnify Southern Water in respect of any claim (other than a claim covered by clause 3.4) by the Client.

3.4 Southern Water shall accept liability for death or personal injury arising from its negligence.

3.5 The entire liability of Southern Water or the Company as the case may be in respect of all causes of action arising under or in connection with the Report (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) shall not exceed £2,000,000 (two million pounds); and Southern Water or the Company as the case may be shall not in any circumstances (whether for breach of contract, negligence or any other tort, under statute or statutory duty or otherwise at all) be liable for any loss of profit, loss of goodwill, loss of reputation, loss of business or any indirect, special or consequential loss, damage or other claims, costs or expenses;

Copyright and Confidentiality

4.1 The Customer and the Client acknowledge that the Report is confidential and is intended for the personal use of the Client. The copyright and any other intellectual property rights in the Report shall remain the property of Southern Water. No intellectual or other property rights are transferred or licensed to the Customer or the Client except to the extent expressly provided.

4.2 The Customer or Client is entitled to make copies of the Report (other than any maps contained in the, or attached to the Report, where no copying is permitted).

4.3 The Customer and Client agree (in respect of both the original and any copies made) to respect and not to alter any trademark, copyright notice or other property marking which appears on the Report.

4.4 The maps contained in the Report are protected by Crown Copyright and must not be used for any purpose outside the context of the Report.

4.5 The Customer and the Client agree to indemnify Southern Water or the Company as the case may be against any losses, costs, claims and damage suffered by Southern Water or the Company as the case may be, as a result of any breach by either of them of the terms of paragraphs 4.1 to 4.4 inclusive.

Payment

5.1 Unless otherwise stated all prices are inclusive of VAT. The Customer shall pay for the price of the Report specified by Southern Water, without any set off, deduction or counterclaim. Unless the Customer or Client has an account with Southern Water for payment for Reports, payments for Reports must be received in full by Southern Water before the Report is produced. For Customers or Clients with accounts, payment terms will be as agreed with Southern Water.

General

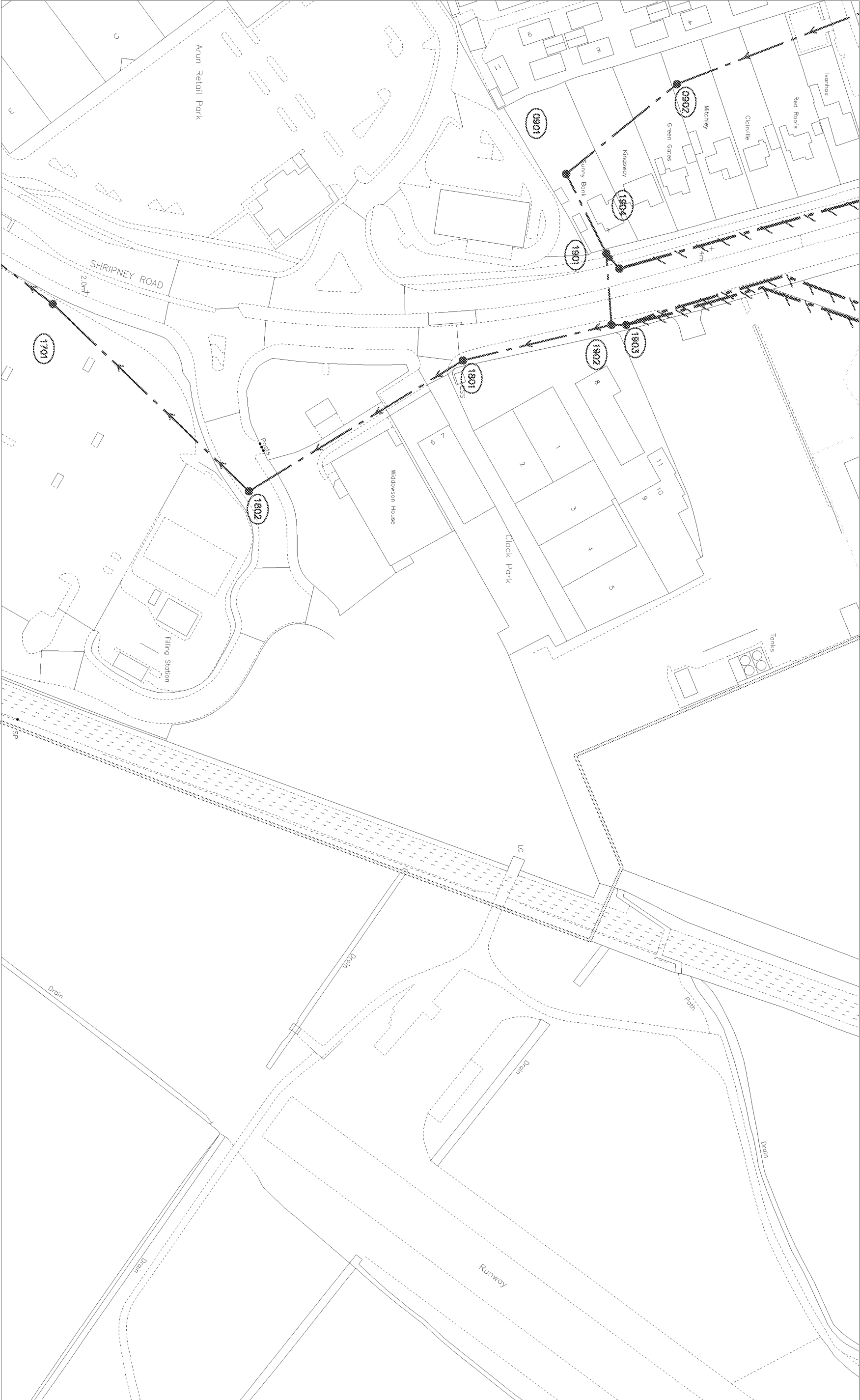
6.1 If any provision of these terms is or becomes invalid or unenforceable, it will be taken to be removed from the rest of these terms to the extent that it is invalid or unenforceable. No other provision of these terms shall be affected.

6.2 These terms shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts.

6.3 Nothing in this notice shall in any way restrict your statutory or any other rights of access to the information contained in the Report.

SEWER RECORDS PAGE 1 OF 2

101008



100720

O.S. REF. SU9400NW		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. WATERWORKS, SEWER, POWER AND COMMUNICATIONS OF BURIED UTILITIES INFORMATION WATERWORKS, SEWER, POWER AND COMMUNICATIONS INFORMATION	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298550.		
Drawn by: banerin	Scale: 1:1250				
Title: Former LEC Refrigeration Site		Date: 27/04/2015			

494031

494502

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
0901X	3.31		150	VC	CIRC												
0902X	4.2		150	VC	CIRC												
1701X	1.99	-0.8	225	VC	CIRC												
1801X	2.96	-0.22	225	CP	CIRC												
1802X	2.08	-0.55	225	CP	CIRC												
1801X	3.32	0.52	150	VC	CIRC												
1802X	3.45	0.55	225	CP	CIRC												
1803X	3.41	2.05	225	VC	CIRC												
1904X	3.3	2	UNK	UNK	CIRC												

LINE STYLES / COLOURS		MATERIALS	
Blue	----- Road	AK	Asbestos
	----- Front Slopes Sewer	BRC	Brick (Common)
	----- Front Slopes Main	BRC	Brick (Refractory)
	----- Pot Biting Main	CC	Concrete Box Culvert
Red	----- Combined	CI	Cast Iron
	----- Combined Siphon Sewer	CO	Concrete (r-SB)
	----- Combined Rising Main	CS	Concrete Segmental
	----- Building Over Agreement Area	CSB	Concrete Segments (boxed)
Orange	----- Sewer Catchment	DI	Ductile Iron
Dark Blue	----- Sewer Trained Effluent	GC	Glass Reinforced Concrete
	----- Sludge	GCPR	Glass Reinforced Plastic
	----- Sewer Catchment	MAC	Masonry in random Courses
	----- Section 104 Area	MAC	Masonry in regular Courses
	----- Surface Water	PF	Patch Fibre
Light Blue	----- Surface Water	PP	Polypropylene
	----- Surface Water Rising Main	PPG	Polypropylene Glass Reinforced Plastic
Yellow	----- Private	SI	Spun Iron
Green	----- Access Shaft	ST	Steel
	----- Discontinued	VC	VC Clay
		ZZZ	Unknown

LEGEND - SEWERS	
	Manhole (SV)
	Manhole (F&C)
	Lamp hole (SV)
	Lamp hole (F&C)
	Pumping Station (SV)
	Pumping Station (F&C)
	Side entry manhole (SV)
	Blind detail (SV)
	Blind detail (F&C)
	Ejector station (SV)
	Ejector station (F&C)
	Wateright door (SV)
	Wateright door (F&C)
	Flushing sh. 1/4" (SV)
	Flushing sh. 1/4" (F&C)
	Flushing sh. 1/2" (SV)
	Flushing sh. 1/2" (F&C)
	Demarcation Chamber

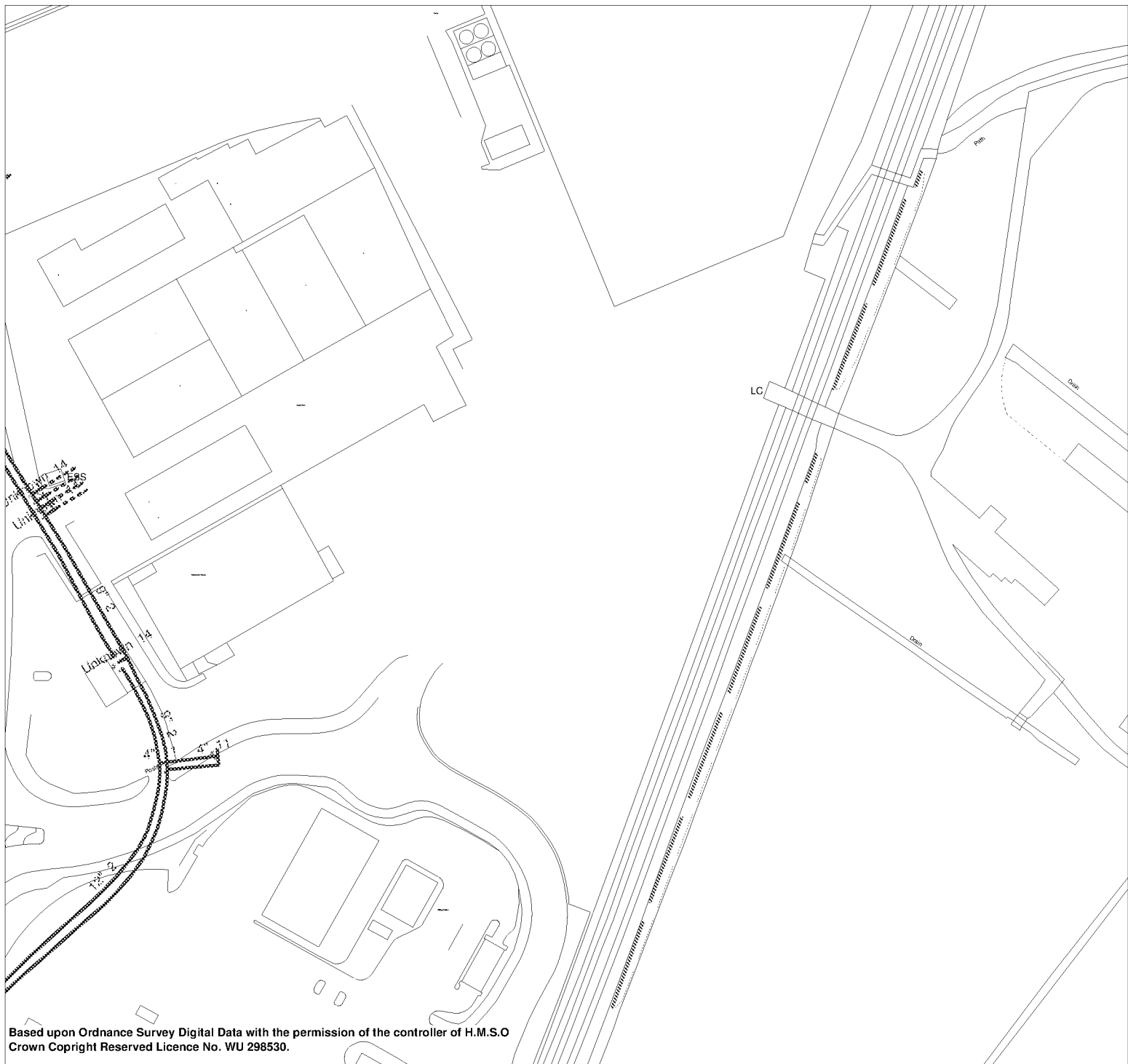
LEGEND - SEWERS	
	Chimney (S)
	Chimney (F)
	Change in sewer (S)
	Change in sewer (F)
	Racking Eye (F&C)
	Racking Eye (SV)
	Gauging point (F&C)
	Gauging point (SV)
	Interrog chamber (F&C)
	Interrog chamber (SV)
	Storm Tank (F&C)
	Storm Tank (SV)
	Vortex chamber (F&C)
	Vortex chamber (SV)
	Label ellipse
	Dummy/S&F manhole
	Outlet
	Penstock chamber
	Penstock chamber
	Storm Overflow
	Backdrop manhole

LEGEND - SEWERS	
	Wastewater treatment works
	Marine treatment works
	Outfall headworks
	Vent
	Water column
	Tide gauge bank
	Blind end
	Head of Public Sewer
	Main Pumping Station

LEGEND - SEWERS	
	Archway
	Circular
	H
	I
	J
	K
	L
	M
	N
	O
	P
	Q
	R
	S
	T
	U
	V
	W
	X
	Y
	Z

LEGEND - SEWERS	
	Archway
	Circular
	H
	I
	J
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	L
	M
	N
	O
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	Q
	R
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	U
	V
	W
	X
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	Z

LEGEND - SEWERS	
	Archway
	Circular
	H
	I
	J
	K
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	M
	N
	O
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	Q
	R
	S
	T
	U
	V
	W
	X
	Y
	Z



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This information is provided as part of a
CON29DW by:

**LandSearches
from
Southern Water**

Southern House
Capstone Road
Chatham
Kent ME5 7QA
Telephone: 0845 270 0212
Fax: 01634 844514

The information supplied is given in good faith as a guide to locating underground apparatus. It's accuracy cannot be guaranteed, nor does it include comprehensive information about the existence or location of services pipes or cables to individual premises. The responsibility for locating and avoiding damage to apparatus on site shall be that of the persons proposing to excavate in the street who shall be liable to the apparatus owner and any third party who may be affected in any way for any loss or damage caused by their failure to do so.

Legend

-----	Water Main
-----	Abandoned Main
.....	Private Main
*	Hydrants / Washout
*	Hydrants
)	Valves / Fittings

Materials

BP	Black Polyethelene	MDPE	Medium Density Polyethelene
CI	Cast Iron	PSC	Pre-Stressed Concrete
CP	Copper	PVC	Polyvinyl Chloride
DI	Ductile Iron	ST	Steel
FRC	Fibre Reinforced Cement	??	Unknown
HDPE	High Density Polyethelene		

Scale	1:1250	Date:	27/04/2015
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Portsmouth Water Ltd
Public Record - Water Quality Summary
01/01/2013 to 31/12/2013
Bognor Supply Zone

General Information	ZONE – BOGNOR	2013
Comments on Water Quality: Based on all the samples taken in 2013, this water meets the chemical and microbiological requirements of the Water Supply (Water Quality) Regulations 2000 (Amendment) Regulations 2007.		
Action taken to comply with Section 19 undertakings There are no improvement programmes in operation in this zone.		

Determinands Analysed

METALS		
SUBSTANCE TESTED	WHAT IT MEANS	REGULATORY STANDARD
Antimony	These metals can occur naturally in source water at low levels. Some may also come from plumbing systems and industrial processes. The standards provide wide safety margins on known levels of toxicity.	5.0 µg /l
Cadmium		5.0 µg/l
Chromium		50 µg /l
Nickel		20 µg/l
Mercury		1.0 µg /l
Selenium		10 µg /l
Aluminium	Aluminium occurs naturally and is also used during treatment to remove impurities. Concerns have been expressed about a link between aluminium and Alzheimer's disease, but there is no proven connection, although research on this is ongoing.	200 µg/l
Arsenic	This occurs naturally in water at low levels.	10 µg /l
Boron	Low levels of boron can be found in some waters due to its use in detergents.	1.0 mg/l
Copper	Traces of copper can sometimes be found in water, usually as a result of old, corroding plumbing or new plastic pipes. This can cause a metallic taste.	2.0 mg/l
Lead	Lead is rarely present in water sources but many properties built before the mid-1960's have a lead supply pipe or some lead plumbing. Portsmouth Water adds phosphate to most of the water supplied to reduce the amount of lead dissolved from pipes.	25 µg /l (In Dec 2013 the standard dropped to 10 µg /l)
Iron	Iron can naturally occur in some water sources and is removed during treatment. Iron in the water supplies may also be derived from old iron mains or domestic pipe work. This is not a health hazard, but can cause the water to become discoloured.	200 µg/l
Manganese	This can naturally occur in some water sources and is removed during treatment. Disruption to water mains can stir up sediment, containing manganese.	50 µg/l
Sodium	Sodium is a naturally occurring substance that can increase as an effect of softening the water. If you use a water softener you should retain an un-softened supply for drinking.	200 mg/l

NON-METALS		
SUBSTANCE TESTED	WHAT IT MEANS	REGULATORY STANDARD
Ammonium	Ammonia occurs naturally in many water sources. It is not harmful and is normally removed by treatment.	0.5 mg/l
Bromate	Bromate can potentially form when hypochlorite or ozone are used in water treatment. We control the treatment process tightly to minimize this.	10 µg/l
Chloride	Chloride occurs naturally in water but may give a salty taste to the water and contribute to corrosion.	250 mg/l
Cyanide	Cyanide is rarely found in water. When it is detected it is normally in areas of heavy industry.	50 µg/l
Fluoride	Fluoride occurs naturally at low levels in some of Portsmouth Water's supplies. None of our supplies are artificially fluoridated.	1.5 mg/l
Nitrate	Nitrate arises from the use of fertilizer on agricultural land.	50 mg/l
Nitrite	Nitrite occurs at much lower levels than nitrate and conversion from one form to another occurs readily. The regulations also require that the Nitrate:Nitrite ratio $[\text{nitrate}]/50 + [\text{nitrite}]/3 \leq 1.0$.	0.5 mg/l at Customers tap 0.1 mg/l at Water Treatment Works
Sulphate	Sulphate occurs naturally in water and comes from mineral deposits.	250 mg/l

BACTERIA		
SUBSTANCE TESTED	WHAT IT MEANS	REGULATORY STANDARD
Faecal Coliforms (E.coli)	These bacteria are specific inhabitants of the digestive systems of warm blooded animals. They are an indication of possible contamination (with other harmful bacteria possibly being present). Any detection is investigated as a matter of urgency.	0 per 100ml
Total Coliforms	These are bacteria that provide a general and very sensitive measure of microbiological quality. They are removed by water treatment processes, but where they are detected it is often because they can grow within taps in the home. Any detection is investigated as a matter of urgency.	0 per 100ml
Enterococci	As with coliforms, the presence of these organisms can indicate possible contamination in the water supply so they are investigated as a matter of urgency.	0 per 100ml
Colony Count at 37°C	Small numbers of bacteria can be present in treated water. The information obtained from these tests is used to maintain the efficiency of the water treatment processes and the cleanliness of water mains. Any unusually high levels are investigated.	No abnormal change from a long term average. Number per 1ml
Colony Count at 22°C		
Clostridium Perfringens	As with coliforms, the presence of these organisms can indicate contamination in the water supply so they are investigated as a matter of urgency.	0 per 100ml

ORGANIC CHEMICALS: PESTICIDES

SUBSTANCE TESTED	WHAT IT MEANS	REGULATORY STANDARD
Aldrin	Pesticides consist of chemicals used by farmers, local authorities and gardeners. The traces of these found in untreated water are typically far less than the maximum advised to protect public health.	0.03 µg/l
Dieldrin		0.03 µg/l
Heptachlor		0.03 µg/l
Heptachlor epoxide		0.03 µg/l
Other individual Pesticides	The pesticides tested for will vary from area to area, depending on the usage of pesticides in the surrounding area of each water source.	0.1 µg/l
Total Pesticides	This is the total amount of each pesticide detected in the water sample tested.	0.5 µg/l

ORGANIC CHEMICALS: OTHERS

SUBSTANCE TESTED	WHAT IT MEANS	REGULATORY STANDARD
Benzene	Benzene is rarely found in water but is removed in treatment processes. It arises from petroleum products and industries.	1.0 µg/l
Trichloromethane ^	These compounds are known as trihalomethanes (THM's). They are formed when chlorine comes into contact with organic compounds in untreated water.	100 ug/l (^For the total amount of these four compounds)
Dichlorobromomethane ^		
Dibromochloromethane ^		
Tribromomethane ^		
Tetrachloromethane	These substances are known as solvents. They arise from industrial processes and are removed from the water during the treatment stage.	3.0 µg/l
1,2 Dichloroethane		3.0 µg/l
Trichloroethene * and Tetrachloroethene *		10 µg/l (*For the total amount of these two compounds)
Benzo-a-pyrene	These compounds are known as polycyclic aromatic hydrocarbons (PAH's). They are rare substances and are seldom found in water. Where they do occur, the cause is usually coal tar pitch lining from iron mains.	0.01 µg/l
Benzo-b-fluoranthene *		0.1 µg/l (*For the total amount of these four compounds)
Benzo-k-fluoranthene *		
Benzo-ghi-perylene *		
Indeno-123-cd-pyrene *		



OTHER PARAMETERS		
SUBSTANCE TESTED	WHAT IT MEANS	REGULATORY STANDARD
Colour	Chemical changes in the water source or pressure changes in the distribution main can give the water a tinge of colour.	20 mg/l Pt/Co
Conductivity	This is a measure of the level of natural mineral salts contained in the water. This is measured by passing an electrical current through the water.	2500 μ S per cm at 20°C
pH (Hydrogen Ion)	This is a measure of the acidity or alkalinity of the water. A pH of 7 is neutral.	Between 6.5 and 9.5
Taste Dilution Number	This is to check if the water has any unpleasant taste or smell. It is measured using panellists to taste and smell the water in strictly controlled conditions.	Dilution Number 0 at 25°C
Odour Dilution Number		
Temperature	Temperature is checked to monitor changes in the water system.	No legal limit
Total Chlorine	Sufficient chlorine is added to all our supplies to ensure the absence of harmful bacteria. Portsmouth Water also aims to keep the levels at customer's taps low to minimize associated taste and odour issues.	No legal limit
Free Chlorine		
Total Organic Carbon	TOC is a measure of the organic material present in the water. It varies naturally depending on the source of the water and is monitored for any unusual changes (which could be caused by oil spills or other pollutants).	No abnormal change
Turbidity	This is a measure of suspended material in the water.	4.0 NTU at Customers tap 1.0 NTU at Water Treatment Works



Appendix E – Hydrock Drawings

CONTENTS	
Identifier	Name
Hydrock	C151222/101 Drainage Strategy Option 1
Hydrock	C151222/102 Drainage Strategy Option 2



Appendix F – Hydrock Hydraulic Calculations

Proposed Drainage

- I. 1 year summary Attenuation Volumes
- II. 30 year summary Attenuation Volumes
- III. 100 year summary Attenuation Volumes (Including the 20% allowance for Climate Change)

Hydrock Consultants Ltd				Page 1		
.		Shripney Road				
.		Bognor Regis				
.						
Date 01/05/2015		Designed by EJD				
File 1.SRCX		Checked by PG				
XP Solutions		Source Control 2014.1.1				
<u>Summary of Results for 1 year Return Period</u>						
Storm Event		Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer		1.301	0.101	9.9	5.1	O K
30 min Summer		1.318	0.118	13.1	5.9	O K
60 min Summer		1.335	0.135	16.7	6.7	O K
120 min Summer		1.337	0.137	17.2	6.9	O K
180 min Summer		1.336	0.136	17.0	6.8	O K
240 min Summer		1.334	0.134	16.4	6.7	O K
360 min Summer		1.326	0.126	14.8	6.3	O K
480 min Summer		1.319	0.119	13.2	5.9	O K
600 min Summer		1.312	0.112	11.9	5.6	O K
720 min Summer		1.307	0.107	10.9	5.3	O K
960 min Summer		1.298	0.098	9.3	4.9	O K
1440 min Summer		1.287	0.087	7.4	4.3	O K
2160 min Summer		1.276	0.076	5.7	3.8	O K
2880 min Summer		1.269	0.069	4.8	3.5	O K
4320 min Summer		1.260	0.060	3.7	3.0	O K
5760 min Summer		1.254	0.054	3.0	2.7	O K
7200 min Summer		1.250	0.050	2.6	2.5	O K
8640 min Summer		1.247	0.047	2.3	2.4	O K
10080 min Summer		1.245	0.045	2.1	2.2	O K
Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer		28.110	0.0	35.3	45	
30 min Summer		18.645	0.0	46.8	50	
60 min Summer		12.084	0.0	60.7	62	
120 min Summer		7.690	0.0	77.3	92	
180 min Summer		5.881	0.0	88.6	124	
240 min Summer		4.857	0.0	97.6	154	
360 min Summer		3.685	0.0	111.1	214	
480 min Summer		3.020	0.0	121.4	272	
600 min Summer		2.589	0.0	130.1	334	
720 min Summer		2.283	0.0	137.6	398	
960 min Summer		1.872	0.0	150.5	512	
1440 min Summer		1.416	0.0	170.8	752	
2160 min Summer		1.071	0.0	193.6	1120	
2880 min Summer		0.878	0.0	211.7	1476	
4320 min Summer		0.664	0.0	240.2	2192	
5760 min Summer		0.545	0.0	262.9	2896	
7200 min Summer		0.468	0.0	282.1	3600	
8640 min Summer		0.412	0.0	298.1	4328	
10080 min Summer		0.370	0.0	312.1	5072	
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Date 01/05/2015		Designed by EJD			
File 1.SRCX		Checked by PG			
XP Solutions		Source Control 2014.1.1			
<u>Summary of Results for 1 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	1.308	0.108	11.1	5.4	O K
30 min Winter	1.326	0.126	14.7	6.3	O K
60 min Winter	1.344	0.144	18.8	7.2	O K
120 min Winter	1.345	0.145	19.1	7.3	O K
180 min Winter	1.340	0.140	17.8	7.0	O K
240 min Winter	1.333	0.133	16.2	6.6	O K
360 min Winter	1.319	0.119	13.3	6.0	O K
480 min Winter	1.309	0.109	11.3	5.4	O K
600 min Winter	1.301	0.101	9.9	5.1	O K
720 min Winter	1.295	0.095	8.8	4.8	O K
960 min Winter	1.286	0.086	7.3	4.3	O K
1440 min Winter	1.275	0.075	5.5	3.7	O K
2160 min Winter	1.265	0.065	4.2	3.2	O K
2880 min Winter	1.259	0.059	3.5	2.9	O K
4320 min Winter	1.251	0.051	2.6	2.5	O K
5760 min Winter	1.246	0.046	2.2	2.3	O K
7200 min Winter	1.243	0.043	1.9	2.1	O K
8640 min Winter	1.240	0.040	1.6	2.0	O K
10080 min Winter	1.238	0.038	1.5	1.9	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Winter	28.110	0.0	39.5	41	
30 min Winter	18.645	0.0	52.4	45	
60 min Winter	12.084	0.0	68.0	62	
120 min Winter	7.690	0.0	86.5	94	
180 min Winter	5.881	0.0	99.3	124	
240 min Winter	4.857	0.0	109.3	154	
360 min Winter	3.685	0.0	124.4	212	
480 min Winter	3.020	0.0	136.0	276	
600 min Winter	2.589	0.0	145.7	332	
720 min Winter	2.283	0.0	154.1	390	
960 min Winter	1.872	0.0	168.5	516	
1440 min Winter	1.416	0.0	191.2	766	
2160 min Winter	1.071	0.0	216.9	1124	
2880 min Winter	0.878	0.0	237.1	1464	
4320 min Winter	0.664	0.0	269.0	2188	
5760 min Winter	0.545	0.0	294.4	2920	
7200 min Winter	0.468	0.0	316.0	3688	
8640 min Winter	0.412	0.0	333.9	4296	
10080 min Winter	0.370	0.0	349.6	5080	
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Date 01/05/2015	Designed by EJD	
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XP Solutions	Source Control 2014.1.1	

Model Details

Storage is Online Cover Level (m) 2.000

Tank or Pond Structure

Invert Level (m) 1.200

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	50.0	0.800	50.0

Hydro-Brake Optimum® Outflow Control

Unit Reference MD-SHE-0323-6100-0800-6100

Design Head (m) 0.800

Design Flow (l/s) 61.0

Flush-Flo™ Calculated

Objective Minimise upstream storage

Diameter (mm) 323

Invert Level (m) 1.200

Minimum Outlet Pipe Diameter (mm) 375

Suggested Manhole Diameter (mm) 1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	60.9
Flush-Flo™	0.448	60.8
Kick-Flo®	0.682	56.4
Mean Flow over Head Range	-	46.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.6	1.600	85.1	5.000	148.4
0.200	33.0	1.800	90.2	5.500	155.5
0.300	58.2	2.000	94.9	6.000	162.2
0.400	60.6	2.200	99.4	6.500	168.7
0.500	60.6	2.400	103.7	7.000	175.0
0.600	59.0	2.600	107.8	7.500	181.0
0.800	60.9	3.000	115.6	8.000	186.8
1.000	67.8	3.500	124.7	8.500	190.8
1.200	74.1	4.000	133.1	9.000	196.4
1.400	79.8	4.500	140.9	9.500	201.9

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Date 01/05/2015		Designed by EJD				
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XP Solutions		Source Control 2014.1.1				
<u>Summary of Results for 30 year Return Period</u>						
Storm Event		Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer		1.366	0.166	24.2	8.3	O K
30 min Summer		1.397	0.197	32.3	9.9	O K
60 min Summer		1.428	0.228	40.5	11.4	O K
120 min Summer		1.428	0.228	40.5	11.4	O K
180 min Summer		1.423	0.223	39.3	11.2	O K
240 min Summer		1.416	0.216	37.2	10.8	O K
360 min Summer		1.398	0.198	32.5	9.9	O K
480 min Summer		1.383	0.183	28.5	9.2	O K
600 min Summer		1.372	0.172	25.6	8.6	O K
720 min Summer		1.362	0.162	23.1	8.1	O K
960 min Summer		1.347	0.147	19.4	7.3	O K
1440 min Summer		1.327	0.127	14.9	6.3	O K
2160 min Summer		1.309	0.109	11.3	5.4	O K
2880 min Summer		1.298	0.098	9.2	4.9	O K
4320 min Summer		1.283	0.083	6.8	4.2	O K
5760 min Summer		1.274	0.074	5.5	3.7	O K
7200 min Summer		1.268	0.068	4.6	3.4	O K
8640 min Summer		1.263	0.063	4.0	3.2	O K
10080 min Summer		1.259	0.059	3.5	3.0	O K
Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer		68.836	0.0	86.5	42	
30 min Summer		45.828	0.0	115.1	44	
60 min Summer		29.238	0.0	146.9	62	
120 min Summer		18.112	0.0	182.0	94	
180 min Summer		13.534	0.0	204.0	122	
240 min Summer		10.952	0.0	220.1	152	
360 min Summer		8.106	0.0	244.4	212	
480 min Summer		6.544	0.0	263.0	274	
600 min Summer		5.539	0.0	278.3	332	
720 min Summer		4.832	0.0	291.3	396	
960 min Summer		3.892	0.0	312.9	512	
1440 min Summer		2.866	0.0	345.6	752	
2160 min Summer		2.108	0.0	381.2	1108	
2880 min Summer		1.693	0.0	408.3	1472	
4320 min Summer		1.242	0.0	449.3	2200	
5760 min Summer		0.996	0.0	480.5	2920	
7200 min Summer		0.839	0.0	505.9	3600	
8640 min Summer		0.730	0.0	527.9	4352	
10080 min Summer		0.648	0.0	547.4	5008	
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.		Bognor Regis			
.					
Date 01/05/2015		Designed by EJD			
File 30.SRCX		Checked by PG			
XP Solutions		Source Control 2014.1.1			
<u>Summary of Results for 30 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	1.378	0.178	27.1	8.9	O K
30 min Winter	1.411	0.211	36.0	10.6	O K
60 min Winter	1.446	0.246	45.5	12.3	O K
120 min Winter	1.444	0.244	44.9	12.2	O K
180 min Winter	1.430	0.230	41.1	11.5	O K
240 min Winter	1.413	0.213	36.6	10.7	O K
360 min Winter	1.386	0.186	29.3	9.3	O K
480 min Winter	1.367	0.167	24.4	8.4	O K
600 min Winter	1.354	0.154	21.1	7.7	O K
720 min Winter	1.343	0.143	18.6	7.2	O K
960 min Winter	1.328	0.128	15.1	6.4	O K
1440 min Winter	1.309	0.109	11.3	5.4	O K
2160 min Winter	1.293	0.093	8.4	4.6	O K
2880 min Winter	1.283	0.083	6.7	4.1	O K
4320 min Winter	1.270	0.070	4.9	3.5	O K
5760 min Winter	1.263	0.063	4.0	3.1	O K
7200 min Winter	1.257	0.057	3.3	2.9	O K
8640 min Winter	1.253	0.053	2.9	2.7	O K
10080 min Winter	1.250	0.050	2.6	2.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Winter	68.836	0.0	96.8	31	
30 min Winter	45.828	0.0	128.9	47	
60 min Winter	29.238	0.0	164.5	62	
120 min Winter	18.112	0.0	203.8	94	
180 min Winter	13.534	0.0	228.5	122	
240 min Winter	10.952	0.0	246.5	152	
360 min Winter	8.106	0.0	273.7	212	
480 min Winter	6.544	0.0	294.6	274	
600 min Winter	5.539	0.0	311.7	336	
720 min Winter	4.832	0.0	326.3	392	
960 min Winter	3.892	0.0	350.5	510	
1440 min Winter	2.866	0.0	387.1	754	
2160 min Winter	2.108	0.0	427.0	1116	
2880 min Winter	1.693	0.0	457.3	1492	
4320 min Winter	1.242	0.0	503.2	2208	
5760 min Winter	0.996	0.0	538.1	2920	
7200 min Winter	0.839	0.0	566.6	3688	
8640 min Winter	0.730	0.0	591.3	4432	
10080 min Winter	0.648	0.0	613.0	5136	
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Date 01/05/2015	Designed by EJD	
File 30.SRCX	Checked by PG	
XP Solutions	Source Control 2014.1.1	

Model Details

Storage is Online Cover Level (m) 2.000

Tank or Pond Structure

Invert Level (m) 1.200

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	50.0	0.800	50.0

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0323-6100-0800-6100
Design Head (m)	0.800
Design Flow (l/s)	61.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	323
Invert Level (m)	1.200
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	60.9
Flush-Flo™	0.448	60.8
Kick-Flo®	0.682	56.4
Mean Flow over Head Range	-	46.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.6	1.600	85.1	5.000	148.4
0.200	33.0	1.800	90.2	5.500	155.5
0.300	58.2	2.000	94.9	6.000	162.2
0.400	60.6	2.200	99.4	6.500	168.7
0.500	60.6	2.400	103.7	7.000	175.0
0.600	59.0	2.600	107.8	7.500	181.0
0.800	60.9	3.000	115.6	8.000	186.8
1.000	67.8	3.500	124.7	8.500	190.8
1.200	74.1	4.000	133.1	9.000	196.4
1.400	79.8	4.500	140.9	9.500	201.9

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Date 01/05/2015		Designed by EJD				
File 100 + CC.SRCX		Checked by PG				
XP Solutions		Source Control 2014.1.1				
<u>Summary of Results for 100 year Return Period (+20%)</u>						
Storm Event		Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer		1.417	0.217	37.6	10.9	O K
30 min Summer		1.466	0.266	50.5	13.3	O K
60 min Summer		1.574	0.374	60.3	18.7	O K
120 min Summer		1.608	0.408	60.7	20.4	O K
180 min Summer		1.545	0.345	59.8	17.3	O K
240 min Summer		1.499	0.299	58.1	15.0	O K
360 min Summer		1.466	0.266	50.6	13.3	O K
480 min Summer		1.442	0.242	44.2	12.1	O K
600 min Summer		1.423	0.223	39.3	11.2	O K
720 min Summer		1.409	0.209	35.3	10.4	O K
960 min Summer		1.387	0.187	29.6	9.4	O K
1440 min Summer		1.360	0.160	22.6	8.0	O K
2160 min Summer		1.336	0.136	16.9	6.8	O K
2880 min Summer		1.321	0.121	13.8	6.1	O K
4320 min Summer		1.302	0.102	10.0	5.1	O K
5760 min Summer		1.291	0.091	8.0	4.5	O K
7200 min Summer		1.283	0.083	6.7	4.1	O K
8640 min Summer		1.277	0.077	5.8	3.8	O K
10080 min Summer		1.272	0.072	5.1	3.6	O K
Storm Event		Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer		106.828	0.0	134.2	40	
30 min Summer		71.819	0.0	180.4	46	
60 min Summer		46.096	0.0	231.6	70	
120 min Summer		28.574	0.0	287.2	104	
180 min Summer		21.285	0.0	320.9	130	
240 min Summer		17.148	0.0	344.7	154	
360 min Summer		12.605	0.0	380.0	214	
480 min Summer		10.130	0.0	407.2	272	
600 min Summer		8.542	0.0	429.2	332	
720 min Summer		7.427	0.0	447.8	394	
960 min Summer		5.951	0.0	478.5	512	
1440 min Summer		4.347	0.0	524.2	754	
2160 min Summer		3.168	0.0	573.1	1116	
2880 min Summer		2.528	0.0	609.7	1476	
4320 min Summer		1.836	0.0	664.1	2204	
5760 min Summer		1.461	0.0	704.8	2928	
7200 min Summer		1.223	0.0	737.5	3624	
8640 min Summer		1.059	0.0	766.0	4352	
10080 min Summer		0.937	0.0	791.1	5008	
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Date 01/05/2015		Designed by EJD			
File 100 + CC.SRCX		Checked by PG			
XP Solutions		Source Control 2014.1.1			
<u>Summary of Results for 100 year Return Period (+20%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	1.434	0.234	42.1	11.7	O K
30 min Winter	1.492	0.292	56.5	14.6	O K
60 min Winter	1.875	0.675	60.8	33.7	Flood Risk
120 min Winter	1.886	0.686	60.8	34.3	Flood Risk
180 min Winter	1.607	0.407	60.7	20.4	O K
240 min Winter	1.495	0.295	57.2	14.7	O K
360 min Winter	1.447	0.247	45.6	12.3	O K
480 min Winter	1.418	0.218	37.9	10.9	O K
600 min Winter	1.398	0.198	32.5	9.9	O K
720 min Winter	1.383	0.183	28.5	9.2	O K
960 min Winter	1.362	0.162	23.2	8.1	O K
1440 min Winter	1.337	0.137	17.1	6.8	O K
2160 min Winter	1.315	0.115	12.5	5.8	O K
2880 min Winter	1.302	0.102	10.0	5.1	O K
4320 min Winter	1.286	0.086	7.3	4.3	O K
5760 min Winter	1.277	0.077	5.8	3.8	O K
7200 min Winter	1.270	0.070	4.9	3.5	O K
8640 min Winter	1.265	0.065	4.2	3.2	O K
10080 min Winter	1.261	0.061	3.7	3.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Winter	106.828	0.0	150.3	35	
30 min Winter	71.819	0.0	202.1	46	
60 min Winter	46.096	0.0	259.4	82	
120 min Winter	28.574	0.0	321.6	112	
180 min Winter	21.285	0.0	359.4	132	
240 min Winter	17.148	0.0	386.0	154	
360 min Winter	12.605	0.0	425.6	212	
480 min Winter	10.130	0.0	456.1	272	
600 min Winter	8.542	0.0	480.7	332	
720 min Winter	7.427	0.0	501.6	392	
960 min Winter	5.951	0.0	535.9	510	
1440 min Winter	4.347	0.0	587.1	752	
2160 min Winter	3.168	0.0	641.9	1128	
2880 min Winter	2.528	0.0	682.9	1488	
4320 min Winter	1.836	0.0	743.8	2184	
5760 min Winter	1.461	0.0	789.4	2896	
7200 min Winter	1.223	0.0	826.0	3712	
8640 min Winter	1.059	0.0	857.9	4328	
10080 min Winter	0.937	0.0	886.1	5032	
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Date 01/05/2015	Designed by EJD	
File 100 + CC.SRCX	Checked by PG	
XP Solutions	Source Control 2014.1.1	

Model Details

Storage is Online Cover Level (m) 2.000

Tank or Pond Structure

Invert Level (m) 1.200

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	50.0	0.800	50.0

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0323-6100-0800-6100
Design Head (m)	0.800
Design Flow (l/s)	61.0
Flush-Flo TM	Calculated
Objective	Minimise upstream storage
Diameter (mm)	323
Invert Level (m)	1.200
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	60.9
Flush-Flo TM	0.448	60.8
Kick-Flo®	0.682	56.4
Mean Flow over Head Range	-	46.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

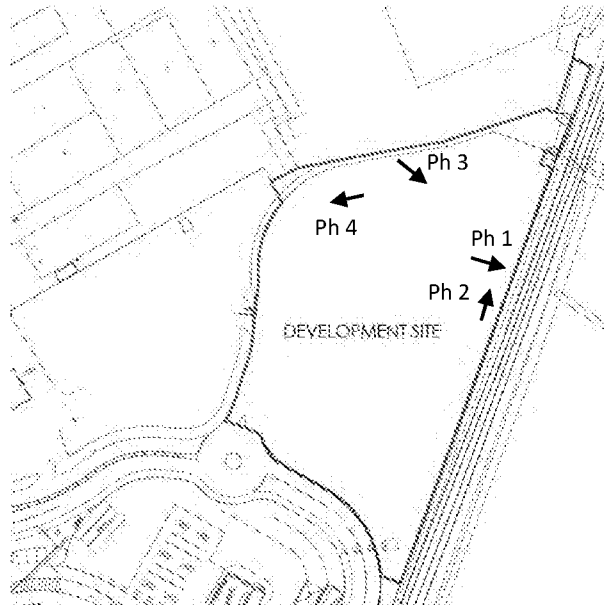
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.6	1.600	85.1	5.000	148.4
0.200	33.0	1.800	90.2	5.500	155.5
0.300	58.2	2.000	94.9	6.000	162.2
0.400	60.6	2.200	99.4	6.500	168.7
0.500	60.6	2.400	103.7	7.000	175.0
0.600	59.0	2.600	107.8	7.500	181.0
0.800	60.9	3.000	115.6	8.000	186.8
1.000	67.8	3.500	124.7	8.500	190.8
1.200	74.1	4.000	133.1	9.000	196.4
1.400	79.8	4.500	140.9	9.500	201.9

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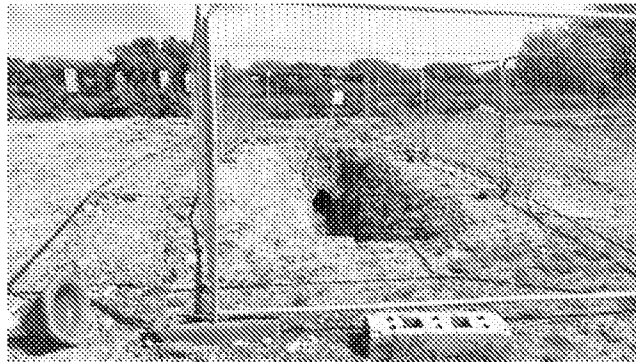


Appendix G – Site Photographs

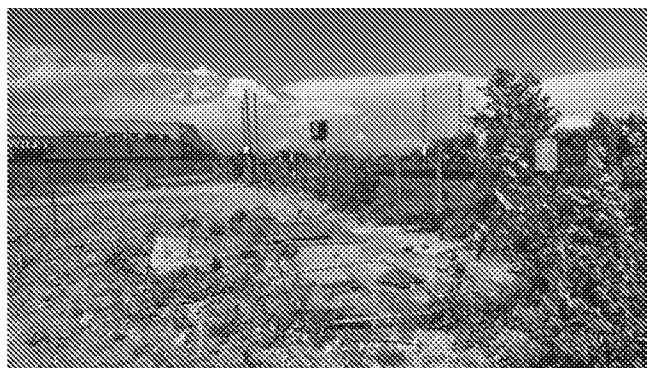
Photograph Location Plan



Photograph 1: Looking east towards the railway line and current site outfall

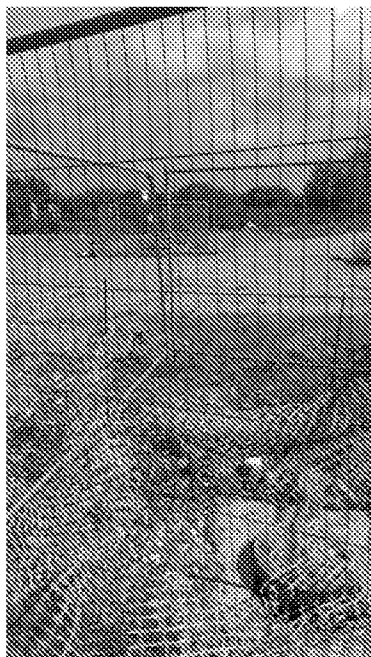


Photograph 2: Looking north along the eastern boundary

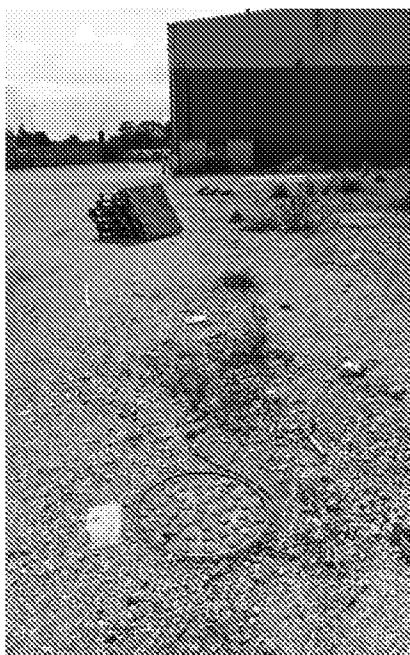




Photograph 3: Looking southeast from northern boundary



Photograph 4: Looking southwest across the site





Appendix H – Infiltration Test Results

CONTENTS	
Identifier	Name
Hydrock	Infiltration Assessment C151222/003



Document ref: C151222/003

3rd June 2015

For the attention of Tim Rainbird

Quod
Ingeni Building
17 Broadwick Street
London
W1F 0AX



Dear Tim,

Re: Infiltration Rate Testing, Shripney Road, Bognor Regis

1.0 Introduction

Further to receipt of your email date 7th May 2015, please find below the results of the infiltration rate testing at Shripney Road, Bognor Regis.

The purpose of the investigation is to provide infiltrate rates for the near surface Made Ground to allow detailed drainage design for permeable paving.

2.0 Site Description

The site is located at the former LEC Refrigeration factory off Shripney Road, Bognor Regis PO22 9NQ. The NGR of the approximate centre of the site is 494254E, 100816N.

Details of the site include the following:

- The site is approximately 4 hectares in area and currently comprises an area of open land.
- The site was formerly developed as part of a refrigeration factory.
- The previous investigation shows the natural geology to be overlain by up to >2.00m of Made Ground.
- Groundwater levels have historically been recorded at depths of approximately 0.60m to 2.10m bgl.

3.0 Site Work

Six machine excavated pits were dug on 29th May 2015 to depths of between 0.70m and 0.80m bgl. The purpose of the pits was to allow infiltration rate testing to be undertaken in the Made Ground above the anticipated groundwater level. The pits were excavated in areas of proposed parking and landscaping.

The ground conditions generally comprised gravelly sand over stiff gravelly clay. Gravels comprised concrete, brick, flint and glass. All the soils encountered were variable Made Ground as detailed on the attached trial pit logs.

The pits were filled with fresh water and the soakage was monitored from ground level with an electronic 'dip-tape'. This process was undertaken over a number of hours to allow a data set for infiltration rate calculation. This was in general compliance with BRE 365.

It was noted on site that infiltration rates were slow with a drop in head of between 10mm and 90mm over a range of approximately five hours. The infiltration rate data is enclosed.

On completion the pits were bailed out and backfilled with arisings.

4.0 Assessment

There was insufficient soakage to allow an infiltration rate to be calculated.

5.0 Conclusion

Soakage into the shallow soils was at a slow rate. As the soakage was slow, an infiltration rate cannot be calculated.

In general, Made Ground is likely to be very laterally and vertically variable and exhibit inconsistent infiltration rates.

We trust that the above meets your requirements. However, if you have any queries or require any additional information, please don't hesitate to contact us.

Yours sincerely,
for Hydrock Consultants Ltd



G Jenkins

Geo-environmental Consultant

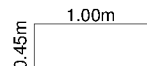


Encl: Trial Pit Logs
Infiltration Rate Assessment Sheets

Project Name
Shripney RoadProject No.
C151222Co-ords: -
Level: -Date
29/05/2015

Location: Bognor Regis

Dimensions:

Scale
1:25

Client: Quod

Trial Pit Stability :
Stable.Plant Used:
Minidigger

Samples & In Situ Testing

Depth (m)	Type	Results	Legend	Depth (m)	Stratum Description	Level (m AOD)
				0.20	Brown gravelly SAND with many crushed concrete. (MADE GROUND)	
				0.70	Firm to stiff orange brown mottled grey slightly sandy gravelly CLAY with some brick fragments, boulder size concrete, crushed concrete and broken glass. Gravel is fine to coarse angular to subrounded flint. (MADE GROUND)	
					----- Trial pit complete at 0.70 m -----	

Remarks: Soakaway test undertaken at base of pit. Backfilled with arisings on completion.

HSV = Hand Shear Vane reading (kPa)
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
AJ = Amber Jar
PT = Plastic Tub
V = Vial
ES = Environmental Sample (AJ, PT & V)

Groundwater: No groundwater encountered.

Logged By : UU

Checked By : SC

Project Name
Shripney RoadProject No.
C151222Co-ords: -
Level: -Date
29/05/2015

Location: Bognor Regis

Dimensions: 0.45m 0.90m

Scale
1:25

Client: Quod

Trial Pit Stability :
Stable.Plant Used:
Minidigger

Samples & In Situ Testing

Depth (m)	Type	Results	Legend	Depth (m)	Stratum Description	Level (m AOD)
				0.30	Brown grey gravelly SAND with many crushed concrete and brick fragments. (MADE GROUND)	
				0.80	Firm dark grey slightly sandy slightly gravelly CLAY with some crushed concrete, brick fragments and whole brick. Gravel is fine to coarse angular to subrounded flint. (MADE GROUND)	
					----- Trial pit complete at 0.80 m	

Remarks: Soakaway test undertaken at base of pit. Backfilled with arisings on completion.

HSV = Hand Shear Vane reading (kPa)
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
AJ = Amber Jar
PT = Plastic Tub
V = Vial
ES = Environmental Sample (AJ, PT & V)

Groundwater: No groundwater encountered.

Logged By : UU

Checked By : SC

Project Name
Shripney RoadProject No.
C151222Co-ords: -
Level: -Date
29/05/2015

Location: Bognor Regis

Dimensions: 0.45m 1.10m

Scale
1:25

Client: Quod

Trial Pit Stability :
Stable.Plant Used:
Minidigger

Samples & In Situ Testing

Depth (m)	Type	Results	Legend	Depth (m)	Stratum Description	Level (m AOD)
				0.20	Firm to stiff brown orange gravelly sandy CLAY with many crushed concrete, asphalt, plastic, wood and metal. Gravel is fine to coarse angular to subrounded flint. (MADE GROUND)	
				0.50	Brown orange gravelly SAND with many brick fragments, crushed concrete and asphalt. Gravel is fine to coarse angular to subrounded flint. (MADE GROUND)	
				0.70	Firm orange brown mottled grey gravelly sandy CLAY with crushed concrete and brick fragments. Gravel is fine to coarse angular to subrounded flint. (MADE GROUND)	
Trial pit complete at 0.70 m						

Remarks: Soakaway test undertaken at base of pit. Backfilled with arisings on completion.

HSV = Hand Shear Vane reading (kPa)
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
AJ = Amber Jar
PT = Plastic Tub
V = Vial
ES = Environmental Sample (AJ, PT & V)

Groundwater: No groundwater encountered.

Logged By : UU

Checked By : SC

Project Name
Shripney RoadProject No.
C151222Co-ords: -
Level: -Date
29/05/2015

Location: Bognor Regis

Dimensions: 0.45m 1.10m

Scale
1:25

Client: Quod

Trial Pit Stability :
Satble.Plant Used:
Minidigger

Samples & In Situ Testing

Depth (m)	Type	Results	Legend	Depth (m)	Stratum Description	Level (m AOD)
					Brown orange gravelly SAND with some brick fragments, crushed concrete and metal. Gravel is fine to coarse angular to subrounded flint. (MADE GROUND)	
				0.50		
				0.70	Firm grey black slightly sandy CLAY with some brick fragments, broken glass and crushed concrete. (MADE GROUND)	
					Trial pit complete at 0.70 m	

Remarks: Soakaway test undertaken at base of pit. Backfilled with arisings on completion.

HSV = Hand Shear Vane reading (kPa)
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
AJ = Amber Jar
PT = Plastic Tub
V = Vial
ES = Environmental Sample (AJ, PT & V)

Groundwater: No groundwater encountered.

Logged By : UU

Checked By : SC

Project Name
Shripney RoadProject No.
C151222Co-ords: -
Level: -Date
29/05/2015

Location: Bognor Regis

Dimensions: 0.45m 1.10m

Scale
1:25

Client: Quod

Trial Pit Stability :
Stable.Plant Used:
Minidigger

Samples & In Situ Testing

Depth (m)	Type	Results	Legend	Depth (m)	Stratum Description	Level (m AOD)
				0.70	Firm to stiff orange brown slightly sandy gravelly CLAY with many crushed concrete, metal, brick fragments and asphalt. Gravel is fine to coarse angular to subrounded flint. (MADE GROUND)	
					Trial pit complete at 0.70 m	

Remarks: Soakaway test undertaken at base of pit. Backfilled with arisings on completion.

HSV = Hand Shear Vane reading (kPa)
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
AJ = Amber Jar
PT = Plastic Tub
V = Vial
ES = Environmental Sample (AJ, PT & V)

Groundwater: No groundwater encountered.

Logged By : UU

Checked By : SC

Project Name
Shripney RoadProject No.
C151222Co-ords: -
Level: -Date
29/05/2015

Location: Bognor Regis

Dimensions: 0.45m 1.10m

Scale
1:25

Client: Quod

Trial Pit Stability :
Stable.Plant Used:
Minidigger

Samples & In Situ Testing

Depth (m)	Type	Results	Legend	Depth (m)	Stratum Description	Level (m AOD)
				0.30	Brown grey gravelly SAND with many crushed concrete and plastic. Gravel is fine to coarse angular to subrounded flint. (MADE GROUND)	
				0.80	Firm black orange slightly sandy slightly gravelly CLAY with whole brick and brick fragments, broken glass, crushed concrete, asphalt and metal. Gravel is fine to coarse angular to subrounded flint. (MADE GROUND)	
					----- Trial pit complete at 0.80 m	

Remarks: Soakaway test undertaken at base of pit. Backfilled with arisings on completion.

HSV = Hand Shear Vane reading (kPa)
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
AJ = Amber Jar
PT = Plastic Tub
V = Vial
ES = Environmental Sample (AJ, PT & V)

Groundwater: No groundwater encountered.

Logged By : UU

Checked By : SC

BRE BR365 - Trial Pit Soakaway Data Sheet

Site: Bognor Regis

Client: Quod

Test Location	SA201	Date of start of testing	29.05.2015	Date at end of testing	29.05.2015
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[illegible]

Note: Groundwater table taken as base of pit for infiltration rate calculation.

BRE BR365 - Trial Pit Soakaway Data Sheet

Site: Bognor Regis

Client: Quod

Test Location	SA202	Date of start of testing	29.05.2015	Date at end of testing	29.05.2015
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[illegible]

Note: Groundwater table taken as base of pit for infiltration rate calculation.

BRE BR365 - Trial Pit Soakaway Data Sheet

Site: Bognor Regis

Client: Quod

Test Location SA203

Date of start of testing

29.05.2015

Date at end of testing

29.05.2015

[illegible]

Note: Groundwater table taken as base of pit for infiltration rate calculation.

BRE BR365 - Trial Pit Soakaway Data Sheet

Site: Bognor Regis

Client: Quod

Test Location	SA204	Date of start of testing	27.05.2015	Date at end of testing	27.05.2015
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[illegible]

Note: Groundwater table taken as base of pit for infiltration rate calculation.

BRE BR365 - Trial Pit Soakaway Data Sheet

Site: Bognor

Client: Quod

Test Location	SA205
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Date of start of testing

27.05.2015 **Date at end of testing**

27.05.2015

[illegible]

Note: Groundwater table taken as base of pit for infiltration rate calculation.

BRE BR365 - Trial Pit Soakaway Data Sheet

Site: Bognor Regis

Client: Quod

Test Location	SA206
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Date of start of testing

29.05.2015

5 Date at end of testing

29.05.2015

[illegible]

Note: Groundwater table taken as base of pit for infiltration rate calculation.

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