

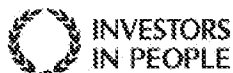


LCP Management Ltd

Riverside Industrial Estate, Littlehampton

Flood Risk Assessment & Surface Water Drainage Strategy

133965-R1(1)-FRA



JANUARY 2021



RSK GENERAL NOTES

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Client: LCP Management Ltd
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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK LDE Ltd.

LCP Properties
 Riverside Industrial Estate, Littlehampton
 Flood Risk Assessment and Surface Water Drainage Strategy
 133965-R1(1)-FRA

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1 INTRODUCTION

1.1 Context

RSK Land and Development Engineering Ltd (RSK) was commissioned to carry out a Flood Risk Assessment (FRA) for LCP Properties (the 'client'). The assessment is in support of the planning submission for the land at Riverside Industrial Estate, Littlehampton (the 'site').

The assessment has been prepared in accordance with the National Planning Policy Framework (NPPF) ^(Ref. 1) and its accompanying Planning Practice Guidance ^(Ref. 2), the Interim Code of Practice for Sustainable Drainage ^(Ref. 3), BS 8533-2011 Assessing and Managing Flood Risk in Development Code of Practice ^(Ref. 4), BS 8582:2013 Code of practice for surface water management for development sites ^(Ref. 5) and the Non-statutory technical standards for sustainable drainage systems ^(Ref. 6), with site-specific advice from the Environment Agency (EA), the Lead Local Flood Authority (LLFA), the Local Planning Authority (LPA), the architect and the client.

The NPPF sets out the criteria for development and flood risk by stating that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

The key definitions within the PPG are:

- "Flood risk" is a combination of the probability and the potential consequences of flooding from all sources – including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources; and
- "Areas at risk of flooding" means areas at risk from all sources of flooding. For fluvial (river) and sea flooding, this is principally land within Flood Zones 2 and 3. It can also include an area within Flood Zone 1 which the EA has notified the local planning authority as having critical drainage problems.

For this site, the key aspects that require the assessment are:

- The EA's indicative flood zone map shows that the site is located within Flood Zone 3; and
- The site area is 0.23ha therefore surface water drainage must be considered, and sustainable drainage systems (SuDS) incorporated, where possible.

1.2 Scope of work

A key element of project development is to prepare a FRA to establish the flood risk associated with the proposed development and to propose suitable mitigation, if required, to reduce the risk to a more acceptable level.

The scope of work relating to a FRA is based on the guidance provided in Section 14 of the NPPF ^(Ref. 1) and its accompanying Planning Practice Guidance ^(Ref. 2).

A site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere,

and, where possible, will reduce flood risk overall. The scope of this assessment therefore comprises the following elements:

- To review architect plans, planning information and other studies to determine existing site conditions;
- To obtain information on the hydrology and hydrological regime in and around the site;
- To obtain the views of the EA/LLFA including scope, location and impacts;
- To determine the possible extent of flooding and any potential impacts on the site;
- To assess the impact on the site from climate change effects and anticipated increases in rainfall over a 60 year period for a commercial use;
- To review site surface water drainage based on the proposed layout and, if necessary, to determine the extent of infrastructure required; and
- To prepare a report including calculations and summaries of the source information and elements reviewed.

Reliance has been placed on factual and anecdotal data obtained from the sources identified. RSK cannot be held responsible for the scope of work, or any omissions, misrepresentation, errors or inaccuracies with the supplied information. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

The comments given in this report and opinions expressed are subject to RSK Group Service Constraints provided in **Appendix A**.

2 SITE DESCRIPTION

2.1 Existing site

2.1.1 Location

Site Address: Riverside Industrial Estate, Bridge Road, Littlehampton, BN17 5DF

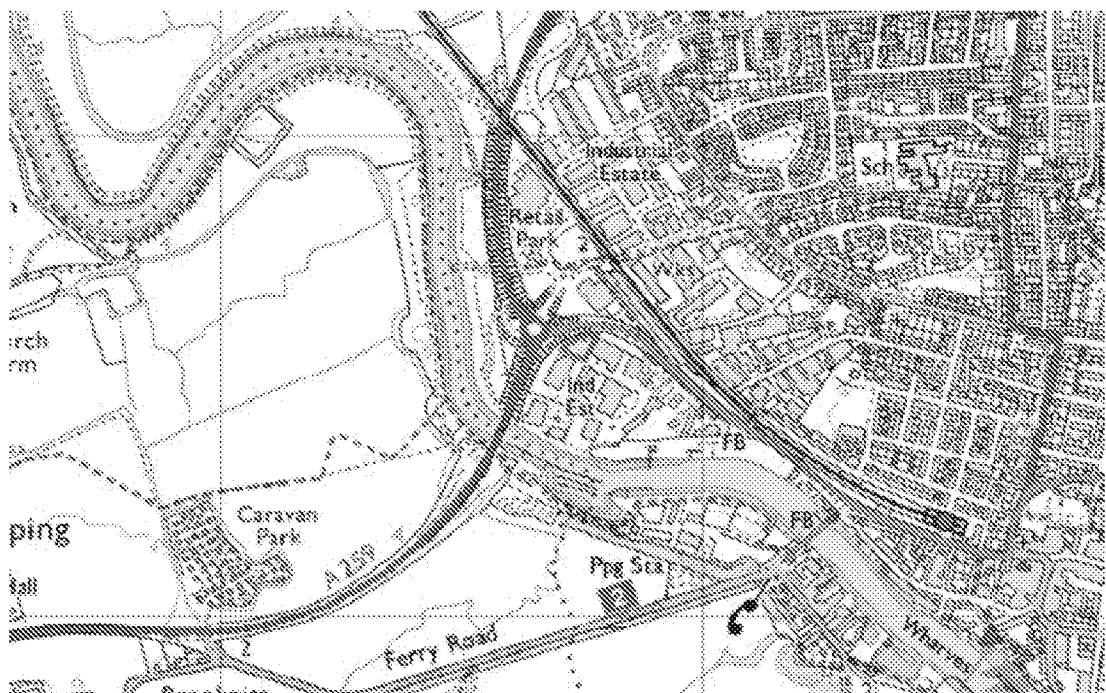
Site National Grid Reference: 501750,102562

The site currently comprises an area of hardstanding used as car parking in the northwest of the existing Riverside Industrial Estate complex. Commercial units are located to the east and south west of the site. A driveway is located directly to the south of the site, affording access to the unit to the southwest from the estate road located to the south east of the site.

An open section of unnamed EA Main River is located just beyond the sites western boundary and flows generally in a northeast to southwest direction close to the sites boundary. A second smaller drainage ditch runs along the entire length of the sites north western boundary and appears to outfall into the main river open channel to the southwest. Bridge Road (B2187) is located beyond this feature.

Figure 2.1 shows a site location map.

Figure 2.1: Site location map



2.1.2 Land use and topography

The site is currently occupied by an area of mostly hardstanding that serves the existing Riverside Industrial Estate complex. The existing impermeable area is 1,407m², representing 60% of the total site.

A site-specific topographic survey has been carried out by Hook Survey Partnership. The survey shows the existing site levels vary from 2.35m above ordnance datum (mAOD) in the south to 2.9mAOD in the north of the site.

The survey indicates that the bed of the EA Main River to the west lies between 0.70 – 1.03mAOD. The left top of bank (adjacent to the site) lies between 2.35 – 2.61mAOD.

The topographic survey and existing site plan are included in **Appendix B**.

2.1.3 Hydrology

An unnamed EA Main River watercourse is culverted beneath the north west of the site and outfalls to the aforementioned open channel to the west of the site. The river then flows in an east to west direction in open channel before entering another culvert beneath Bridge Road. Approximately 90m downstream of Bridge Road, the river discharges to the tidal River Arun.

The River Arun is also classified as an EA Main River and at its closest point is located approximately 200m to the south of the site.

EA Main River Mapping is included as **Appendix C** and a survey of the culverted section of the unnamed Main River is included as **Appendix D**.

A drainage ditch (classified as an ordinary watercourse) is located between the unnamed EA Main River and Bridge Road. This feature appears to run along the entirety of the western and northern boundaries of the Riverside Industrial Estate. WSCC have confirmed that this feature collects highway runoff from Bridge Road.

2.1.4 Geology

2.1.4.1 Desk Study

Based on published geological records for the area (British Geological Survey online mapping), the site exhibits the following geology:

- Superficial Geology: Raised Marine Deposits - Clay, Silt, Sand and Gravel.
- Base rock Geology: Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (undifferentiated) - Chalk.

BGS Borehole TQ00SW16 is located in the north of the site and confirms the presence of Sand, Clay and Chalk.

2.1.4.2 Site Investigation

At the time of writing, no site-specific intrusive ground investigation data has been undertaken for the site to confirm the underlying geology, potential contamination, permeability or groundwater levels on site.

2.1.5 Hydrogeology

Hydrogeological information was obtained from the online Magic Maps service. These maps indicate that the site is underlain by a Principal Bedrock aquifer and a Secondary A Superficial aquifer.

Principal aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. These are generally aquifers formerly classified as major aquifers.

Superficial aquifers comprise 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. These are generally aquifers formerly classified as minor aquifers.

The site is not located within a Groundwater Source Protection Zone, the closest being approximately 3.6km to the east.

The site's close proximity to various watercourses and underlying sand and gravel soils may also suggest that shallow groundwater may be present beneath the site.

2.2 Development proposals

Proposals include the construction of a new light industrial unit with an associated goods yard and car park. The proposed impermeable area will be approximately 1,283m², reducing the total sites impermeable area slightly from 60% to 55%.

The proposed site plans are shown in **Appendix E**.

3 LEGISLATION, POLICY AND GUIDANCE

3.1 National policy

Table 3.1: National legislation and policy context

Legislation	Key provisions
National Planning Policy Framework (2019) (Ref. 1)	The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.
Planning Practice Guidance (2014) (Ref. 2)	The NPPF is supported by an online Planning Practice Guidance, which provide additional guidance on flood risk.
Flood and Water Management Act 2010 (Ref. 7)	The Flood and Water Management Act (FWMA) aims to implement the findings of the 2007 Pitt Review and co-ordinate control of drainage and flood issues. There are a number of increased responsibilities within the Act that affect adoption of SuDS features and the role of the EA to expand on the mapping data they provide. The implementation of SuDS features has many beneficial impacts on the treatment of surface water during remediation works.
Water Resources Act 1991 (Ref. 8)	Section 24 – The EA is empowered under this Act to maintain and improve the quality of ‘controlled’ waters Section 85 – It is an offence to cause or knowingly permit pollution of controlled waters Section 88 – Discharge consents are required for discharges to controlled waters
Water Framework Directive (2000) (Ref. 9)	The Water Framework Directive (WFD) requires all inland and coastal waters to reach ‘good’ chemical and biological status by 2015. Flood risk management is unlikely to have a significant impact on chemical water quality except where maintenance works disturb sediment (such as de-silting) or where pollutants are mobilised from contaminated land by floodwaters. The main impact of the WFD on flood risk management, both now and in the future, relates to the ecological quality of water bodies. Channel works, such as straightening and deepening, or flood risk management schemes that modify geomorphological processes can change river morphology. The WFD aims to protect conservation sites identified by the EC Habitats Directive and Birds Directive that have water-related features, by designating them as ‘protected sites’.

3.2 Local policy

Local policies ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and making development safe without increasing flood risk elsewhere and where possible, reducing flood risk.

Table 3.2: Local policy context

LDF document	Key provisions and policies
Arun Local Plan Adopted 2018 (Ref. 10)	<u>Policy W DM2 Flood Risk</u> Development in areas at risk of flooding will only be permitted where all of the following criteria have been satisfied: - The sequential test in accordance with the National Planning Policy Guidance has been met. - A site specific Flood Risk Assessment demonstrates that the development will be safe, including access and egress, without increasing flood risk elsewhere and reduce flood risk overall. - The sustainability benefits to the wider community are clearly identified. - The scheme identifies adaptation and mitigation measures. - Appropriate flood warning and evacuation plans are in place; and - New site drainage systems are designed to take account of events which exceed the normal design standard i.e. consideration of flood flow routing and utilising temporary storage areas. <u>Policy W DM3 Sustainable Urban Drainage Systems</u> All development must identify opportunities to incorporate a range of SuDS, appropriate to the size of the development. Specific requirements outlined in Policy W DM3 are discussed further in Section 7.

3.3 Area guidance

Table 3.3: Area Guidance

Study	Overview of key provisions and policies
SFRA: Arun Strategic Flood Risk Assessment 2016 (Ref. 11)	The principle aim of the SFRA was to map all forms of flood risk in order to provide an evidence base to locate new development. It also aims to provide appropriate policies for the management of flood risk, and identify the level of detail required for site-specific FRAs. The SFRA contains information and maps detailing flood sources and risks. Information relevant to the site is detailed in Section 4 of this report.
PFRA:	Preliminary Flood Risk Assessments are produced by Lead Local Flood Authorities (LLFAs) in England and Wales. A Preliminary Flood Risk Assessment (PFRA) is the first part of the planning

Study	Overview of key provisions and policies
West Sussex Preliminary Flood Risk Assessment 2011 (Ref. 12) West Sussex Preliminary Flood Risk Assessment Addendum 2017 (Ref. 13)	cycle for flood risk management as set out in the Flood Risk Regulations (2009), which implement the requirements of the European (EU) Floods Directive (2007). The EU Floods Directive aims to provide a consistent approach to managing flooding across Europe. The PFRA is organised by the River Basin District (in this case the Arun River Basin District) and produced by the LLFA (in this case WSCC). The PFRA considers local sources of flooding that the LLFA is responsible for: ordinary watercourses, surface water, groundwater and sewers where flooding is wholly or partially caused by rainwater or other precipitation entering or affecting the system. Information is gathered from existing sources on past floods and flood models to identify Flood Risk Areas. The WSCC PFRA was first produced in 2011 with an update issued 2017. The 2017 version does not contain any additional information relating to flooding associated with the Littlehampton area. The PFRA concludes that the borough did not experience any past floods with "significant harmful consequences" (definition based on EA guidance).
CFMP: Arun and Western Streams Catchment Flood Management Plan 2009 (Ref. 14)	Catchment Flood Management Plans (CFMP) give an overview of the flood risk from inland sources across each river catchment and recommend ways of managing those risks now and over the next 50-100 years. The EA is responsible for producing CFMPs. The site falls within the 'Lower River Arun' sub-catchment and the policy applicable to this site is Policy Option 5 which states "Areas of moderate to high flood risk where we can generally take further action to reduce flood risk". The CFMP provides the following key proposed actions: • Prepare Lower Tidal River Arun Strategy to address the gap in understanding of tidal flood risk in Lower and Middle Arun and tackle the problem of the condition of parts of the river wall through Arundel. This should also address the standard of protection from Arundel to Littlehampton and this may require us to carry out appropriate works to the river wall defences. • Develop System Asset Management Plans (SAMPs) to review maintenance regimes, taking action to reduce flood risk where appropriate.
LFRMS: West Sussex Local Flood Risk Management Strategy 2013 (Ref. 15)	The West Sussex LFRMS has been prepared so that the Council meets its duties to manage local flood risk and deliver the requirements of the Flood and Water Management Act 2010. The LFRMS states that at the time of writing, surface water flooding causes the most regular impact to communities across West Sussex. Flooding from rivers and the sea occurs less frequently but presents a great impact when it does.
WSCC Report on June 2012 Flood Event 2012 (Ref. 16)	The June 2012 Flood Event Report was written in response to the widespread flooding experienced following extreme rainfall over 10th, 11th and 12th June 2012.

Study	Overview of key provisions and policies
	The report outlines the problems that led to the event and sets out what needs to be done and the challenges that are to be faced.
Water. People. Places. September 2013 (Ref. 17)	This guidance outlines the process for integrating sustainable drainage systems (SuDS) into the master planning of large and small developments. The South East Lead Local Flood Authorities expect this guidance to be used as part of the initial planning and design process for all types of residential, commercial and industrial development. It has been developed through a partnership of South East Authorities and it intends to provide a consistent approach to best practice design of SuDS at the master planning stage. The document provides an overview of SuDS features, site specific conditions which will dictate their use and a number of development typologies.

3.4 Site-specific consultation

As part of this assessment, the following authorities have been contacted to obtain relevant data/guidance and establish key site constraints:

Table 3.4: Key site-specific consultations

Consultee	Date	Enquiry	Appendix
Environment Agency (EA)	Oct 2020	Product data Pre-application enquiries	Appendix F
Lead Local Flood Authority (LLFA) – West Sussex County Council (WSCC)	Oct 2020	Pre-application enquiry	Appendix G
Local Planning Authority – Arun District Council (ADC)	Sept 2020	Pre-application enquiry	Appendix H
Drainage Authority – Southern Water	Sept 2020	Asset records	Appendix I

Key findings are referred to in the relevant part of Section 4 and full details are contained in the relevant appendices.

4 SOURCES OF FLOOD RISK

4.1 Criteria

In accordance with the NPPF ^(Ref. 1) and advice from the EA, a prediction of the flood sources and levels is required along with the effects of climate change from the present for the design life of the development (in this case assumed to be 100 years).

Changes to climate change guidance in February 2016 indicate that increased allowances in peak river flow and rainfall intensity should now be incorporated within any assessment. The appropriate allowance for peak river flow is based on the sites location in the country, the lifetime of development, the relevant flood zone and the vulnerability of the proposed end use.

The flood risk elements that need to be considered for any site are defined in BS 8533 as the “Forms of Flooding” and are listed as:

- Flooding from rivers (fluvial flood risk);
- Flooding from the sea (tidal flood risk);
- Flooding from the land;
- Flooding from groundwater;
- Flooding from sewers (sewer and drain exceedance, pumping station failure etc); and
- Flooding from reservoirs, canals and other artificial structures.

The following section reviews each of these in respect of the subject site.

4.2 Flooding from rivers (fluvial flood risk)

The EA Flood Zone mapping study for England and Wales is available on their website at: <https://flood-map-for-planning.service.gov.uk>.

The latest EA published flood zone map (Figure 4.1) shows that the site lies within Flood Zone 3, representing a 1 in 100 year or greater probability of flooding from fluvial sources or a 1 in 200 year probability of flooding from tidal sources. Mapping included in the SFRA confirms that the site is located within Flood Zone 3a.

In December 2013, the EA released an additional form of mapping ‘Risk of Flooding from Rivers and Sea’, which is available at:

<https://flood-warning-information.service.gov.uk/long-term-flood-risk>

The latest ‘Flood risk from rivers or the sea’ map (Figure 4.2) indicates that the site is considered to be at ‘low’ risk of flooding, taking into account the presence of defences.

Figure 4.1: Environment Agency ‘Flood map for planning’



Figure 4.2: Environment Agency ‘Flood risk from rivers or the sea’ map



The EA have not provided any fluvial model data within their consultation response but have provided information on defences that are present in the area. Sections of embankment and flood walls are present along the left bank of the River Arun, affording the site a level of protection.

Both the EA and ADC have confirmed that they do not hold any records of historic flooding at the site, but also state that their records are not definitive.

Mapping included within the SFRA entitled 'Actual risk of Flooding from Rivers' indicates that the site is not at any 'actual' risk of flooding from this source. Given the presence of defences and the proximity of the site to the coast, for the purpose of this assessment the risk posed by the River Arun has been assessed as tidal and is discussed further in Section 4.3. Therefore, the risk of fluvial flooding is considered **low**.

4.2.1 Climate change

Fluvial flooding is likely to increase as a result of climate change. A greater intensity and frequency of precipitation is likely to raise river levels and increase the likelihood of a river overtopping its banks. Climate change guidance for river modelling was updated by the EA in February 2016.

4.3 Flooding from the sea (tidal flood risk)

The site lies within Flood Zone 3 associated with the River Arun. The main source of flood risk to the site is likely to be tidal, associated with overtopping or a breach in the defences on the River Arun.

The EA have supplied flood levels for three nodes located on the site (**Appendix F**), taken from their Arun to Adur Coastal Modelling Study (2012) and updated defended modelling (2017) completed by JBA Consulting. Flood data is given in Tables 4.1 and 4.2 below.

Table 4.1: Tidal Undefended Onsite Flood Levels

Nodes	Modelled Flood Levels (mAOD)			
	Undefended Annual Exceedance Probability (AEP)			
	0.5%	0.5% (2070)	0.5% (2115)	0.1%
1-3	3.75	4.27	4.87	3.97

Table 4.2: Tidal Defended Onsite Flood Levels

Nodes	Modelled Flood Levels (mAOD)			
	Defended Annual Exceedance Probability (AEP)			
	0.5%	0.5% (2065)	0.5% (2115)	0.1%
1-3	-	-	2.87	-

The data suggests that with the presence of defences, the site will not flood during the present day 1 in 200 year flood event, the 1 in 200 year 2065 epoch event, or the 1 in 1,000 year present day flood event. The site is only at risk of tidal flooding during the 1 in 200 year 2115 epoch scenario. Topographic information indicates that site levels range from 2.35mAOD to 2.9mAOD, indicating that during this event (2115 0.5%AEP) the site could encounter maximum flood depths of up to 0.52m.

The SFRA indicates that the site is within an area of "notable coastal and tidal risk from the River Arun" and lies within a flood warning area (065FWC2602).

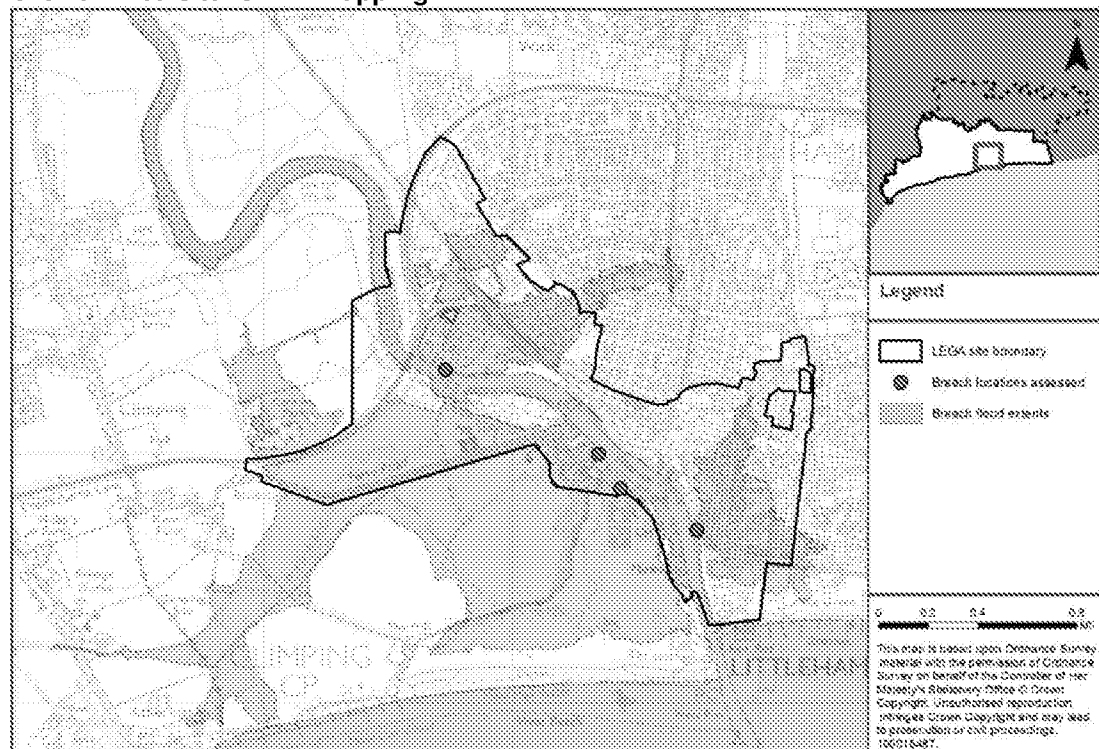
4.3.1 Breach analysis

As noted above, the site is afforded protection by the presence of the linear defences along the River Arun. Whilst the failure of the defences during an extreme tidal event is considered unlikely, the consequence of a breach or overtopping failure in terms of the rate, depth and extent of inundation will be dictated largely by the landward ground levels within the area behind the defences. The residual risk, in the event of defence failure, should therefore be assessed for the site.

Breach modelling included within the SFRA identifies the site as being “*susceptible to breach associated with failure of the flood defences along the River Arun*”. The breach modelling was undertaken for the defended 1 in 200 year flood event, but only details the indicative flood extents. Analysis of flood depths, velocities and hazard to people was not included.

SFRA breach extent mapping has been replicated as Figure 4.3.

Figure 4.3: ‘Flood extents from breach modelling at the Littlehampton Economic Growth Area site’ SFRA mapping



Given the likelihood of a breach or overtopping event occurring, the resultant tidal flood risk is considered to be **low** to **moderate**, however, given the likely flood depths that could occur on site, if an extreme flood event were to occur, the effects could be significant.

4.3.2 Climate change

Tidal flooding is likely to increase as a result of climate change. Data provided by the EA includes an allowance for future climate change up the year 2115.

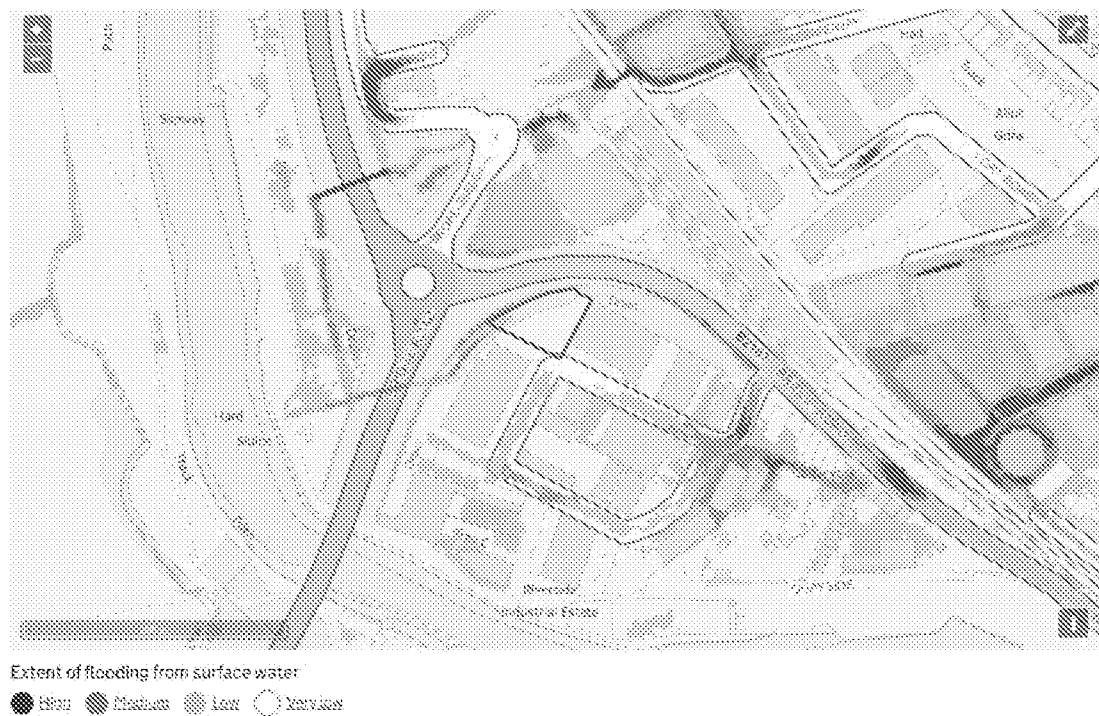
4.4 Flooding from the land (overland pluvial flood risk)

If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or other watercourse.

Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff can occur. Excess surface water flows from the site are believed to drain naturally to the local water features, either by overland flow or through infiltration.

The EA's surface water flood map (Figure 4.4) shows that the vast majority of the site is located within an area of very low surface water flood risk. A small area of the western corner of the site is located within an area of low risk, thought to be associated with the EA Main River and specifically the open channel section of this watercourse.

Figure 4.4: Environment Agency 'Flood risk from surface water' map



WSCC have stated that they do not consider the site to be at risk of flooding from this source and have not received reports of surface water flooding in this area.

SFRA mapping indicates that the site is not located within an area at risk of surface water flooding; the site is not predicted to flood up to or during the 1 in 1,000 year rainfall event.

The topography on site shows the site is relatively level, with slight falls from the centre of the site towards the north, west and predominately the south. The proposed development is likely to generate significant quantities of on-site surface water runoff, which needs to be controlled to prevent surface water flooding elsewhere. This is discussed further in Section 7.

The topography survey also indicates that no land immediately surrounding the site falls towards the site. Any potential overland flow emanating from Bridge Road will be

intercepted by the drainage ditch and/or the open section of EA Main River. The upstream rainfall catchment is therefore considered to be small and it is considered unlikely that significant runoff generated from the surrounding areas would flow towards the site. Given this, the potential runoff is considered low.

The risk of surface water flooding at the site is considered to be **low**.

4.4.1 Climate change

Surface water flooding is likely to increase as a result of climate change in a similar ratio to fluvial flooding. Increased intensity and frequency of precipitation is likely to lead to reduced infiltration and increased overland flow. Climate change guidance for rainfall intensity was updated by the EA in February 2016. Revised allowances for climate change have been included in the indicative drainage strategy (Section 7).

4.5 Flooding from groundwater

Groundwater flooding tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

ADC have confirmed that their groundwater flooding susceptibility mapping indicates that the site is within an area of $\geq 75\%$ probability. However, WSCC have stated that groundwater does not pose a risk to the site.

There is no ground investigation data available for the site to confirm the geology and groundwater levels on the site.

The proposed development does not include any basement proposals. Therefore, aside from shallow foundations works, the proposals will have no material impact on the risk of groundwater flooding both to and from the development. The resulting risk of groundwater flooding to the site is assessed as low.

The resultant groundwater flood risk is considered to be **low**.

4.5.1 Climate change

Climate change could increase the risk of groundwater flooding as a result of increased precipitation filtering into the groundwater body. If winter rainfall becomes more frequent and heavier, groundwater levels may increase. Higher winter recharge may however be balanced by lower recharge during the predicted hotter and drier summers. This is less likely to cause a significant change to flood risk than from other sources, since groundwater flow is not as confined. It is probable that any locally perched aquifers may be more affected, but these are likely to be isolated. The change in flood risk is likely to be low.

4.6 Flooding from sewers

Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its conveyance capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. A sewer flood is often caused by surface water drains discharging into the combined sewer systems; sewer capacity is exceeded in large rainfall events causing the backing up of floodwaters within properties or discharging through manholes.

Sewer details have been referenced from sewer record plans obtained from Southern Water (**Appendix I**). The plans indicate that there are no public sewers present beneath or surrounding the site. The closest Southern Water asset is a surface water sewer that outfalls to a watercourse to the north of the railway line, approximately 200m to the east of the site.

The topographic survey includes a survey of private utilities on and surrounding the site. This survey indicates that surface water runoff from the site and part of the site to the east is conveyed to the south of the site in a series of 150mm diameter surface water sewers. From here, surface water is conveyed north west in a 300mm diameter surface water sewer before outfalling to the culverted section of the unnamed EA Main River.

Most adopted surface water drainage networks are designed to the criteria set out in Sewers for Adoption ^(Ref. 18). One of the design parameters is that sewer systems be designed such that no flooding of any part of the site occurs in a 1 in 30 year rainfall event. By definition a 1 in 100 year event would exceed the capacity of the surrounding sewer network as well as any proposed drainage.

When exceeded, the surcharged pipe work could lead to flooding from backed up manholes and gully connections. This could lead to immediate flooding within highways surrounding the site. As described above, surface water from Bridge Road to the north would be intercepted by the ordinary watercourse drainage ditch that links into the EA Main River that can be found between the site and Bridge Road. Any surface water from the site or the industrial estate to the south would most likely follow the road levels and flow away from the site to the south or be captured in the existing site drainage infrastructure.

To ensure that sewer and surface water flooding is not exacerbated; surface water must be considered within the design of the site. This ensures that surface water and overland flows are managed correctly, to minimise flood risk to the site and the surrounding area. The proposed surface water network on the site should be designed to ensure exceedance of the network has been considered and that flood risk is not increased as a result of redevelopment. The drainage philosophy for the site redevelopment is discussed further in Section 7.

The resultant sewer flood risk is considered to be **low**.

4.6.1 Climate change

The impact of climate change is likely to be negative regarding flooding from sewers. Increased rainfall and more frequent flooding put existing sewer and drainage systems under additional pressure resulting in the potential for more frequent surcharging and

potential flooding. This would increase the frequency of local sewer flooding but would not be significant in terms of the proposed development.

4.7 Other sources of flooding

4.7.1 Reservoirs

Flood events can occur from a sudden release of large volumes of water from reservoirs, canals and artificial structures.

The EA reservoir flood map (reproduced as Figure 4.5) shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. Since this is a prediction of a worst-case scenario, it is unlikely that any actual flood would be this large. According to the EA Reservoir flood maps the site is not at risk of flooding from reservoirs.

Figure 4.5: Environment Agency ‘Flood risk from reservoirs’ map



The resultant flood risk is considered to be **low**.

Reservoirs can be managed over time, controlling inflow/outflow of water and therefore there is the capacity to control the effects of climate change. Increased rainfall has the potential to increase base flow, but this should be minimal. It is unlikely that there will be a substantial change to the risk of flooding for this site.

4.7.2 Canals

There are no Canal & River Trust owned canals within the site vicinity.

As a result, the risk of flooding from canals is **low**.

4.7.3 Blockages of artificial drainage systems

There is a possibility that flooding may result due to culverts and/or sewers being blocked by debris or structural failure. This can cause water to backup and result in localised flooding, as well as placing areas with lower ground levels at risk.

The culvert that crosses beneath the site is classified as a main river and the corresponding flood risk has been discussed previously, however, in the event of this culvert becoming blocked there is a residual flood risk to the site.

Given that the area to the west of the site is relatively densely populated with trees, it is considered more likely that some degree of blockage may occur here. However, the topographic survey indicates that the channel will likely provide satisfactory capacity should a partial blockage occur being c. ~1.5m deep and ~5m in width.

A bridge crosses another section of open channel 210m downstream of the site. However, given the proximity of this feature to the site it is not considered to pose a risk.

The risk of flooding from the blockage of artificial drainage systems is therefore considered to be **low**.

Climate change is unlikely to affect the flooding risk to the site from such blockages.

4.7.4 Tide Locking

Tide locking occurs when a high rainfall event coincides with a high tide rather than a fluvial flood. Tide locking can often be a regular and frequent occurrence. However, the period of tide lock is confined to the peak of the tide and therefore its duration is generally limited and any flooding is both minor and localised.

The site eventually drains to the unnamed EA Main River, which in turn discharges to the tidal River Arun some distance downstream and as a result could be subject to tide locking in the vicinity of the final outfall. However, this is not considered to pose a flood risk to the site itself due to the distance from the final outfall. Additionally, as part of the development, surface water attenuation measures are proposed and will provide some mitigation to ensure surface water will be able to runoff from the site and be attenuated before discharging offsite.

The risk of flooding from this source is therefore considered to be **low**.

The effect of tide locking could be exacerbated by climate change as a result of more frequent higher tides and increased surface runoff.

5 FLOOD MITIGATION MEASURES

5.1 Overland flood flow

No further overland flow control measures are proposed as all surface water runoff up to the 1 in 100 year climate change storm will be stored on site and ultimately discharged to the adjacent watercourse. Surface flows may be generated due to drainage capacity exceedance, which can be conveyed into the neighbouring watercourse through careful levels design and exceedance flow routing.

5.2 Finished floor levels

As this site is not predicted to be affected by fluvial/tidal flooding within the lifetime of the development (60 years) there is no need to incorporate any freeboard levels into the finished floor levels of the design. Low lying areas that could lead to ponding of surface flows will be avoided by careful design of finished levels.

5.3 Environmental Permit/Ordinary watercourse easement and consents

Under the Water Resources Act 1991 and associated byelaws, works in, over, under or adjacent to main rivers require the consent of the EA. This is to ensure that they neither interfere with the EA's work nor adversely affect the environment, fisheries, wildlife and flood defence in the locality.

ADC have confirmed that the site falls within the River Arun Internal Drainage District (IDD), but that the EA currently acts as the IDD regulator. Therefore, any activity that may impact the EA Main River must be done with prior consent and the relevant permit from the EA.

Correspondence with the EA (**Appendix F**) indicates that the proposed building should be located within 3-4m of the EA Main River. The current layout has taken this easement into account and demonstrated in **Appendix J**.

Any consent works usually take place post planning, prior to construction, however, the principals of any development within the appropriate easements should be agreed at the planning stage.

5.4 Floodplain compensation

The site is shown to lie outside the 1 in 100 year climate change floodplain given the presence of defences, so floodplain compensatory measures are not deemed necessary.

5.5 Safe access/egress

The PPG indicates that a FRA must demonstrate that occupants will have safe dry access and egress during a flood or that occupants will have a safe, dry place of refuge.

As discussed previously, the flood level data shows that the site will potentially be impacted by flood waters during a breach or overtopping event. Therefore, the default position for future users of the site will be dependent on flood warnings issued by the EA and as a last resort, directing people offsite to an area outside the floodplain or to refuge at first floor level within the warehouse.

The proposal includes an internal stairwell from ground floor level through to the mezzanine office. In the event of a breach in the defences, safe refuge can be sought from the upper floor of the building.

5.6 Flood resistance and resilience measures

As a precautionary measure, flood resistant and flood resilient techniques could be incorporated. Flood Resistant measures are used to prevent floodwater reaching or entering properties and include demountable barriers, bunds and external waterproofing measures. Flood Resilient measures are methods to minimise damage caused by floodwaters and include internal water-resistant materials and siting of electrical services above flood levels.

6 PLANNING CONTEXT

6.1 Application of planning policy

Section 14 of the NPPF includes measures specifically dealing with development planning and flood risk using a sequential characterisation of risk based on planning zones and the EA Flood Map. The main study requirement is to identify the flood zones and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions.

6.2 Land use vulnerability

Planning Practice Guidance (PPG) includes a list of appropriate land uses in each flood zone dependent on vulnerability to flooding. In applying the Sequential Test, reference is made to Table 6.1 below, reproduced from Table 3 of PPG.

Table 6.1: Flood risk vulnerability and flood zone 'compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
	Zone 2	Appropriate	Appropriate	Exception Test Required	Appropriate	Appropriate
	Zone 3a	Exception Test Required	Appropriate	Should not be permitted	Exception Test Required	Appropriate
	Zone 3b functional floodplain	Exception Test Required	Appropriate	Should not be permitted	Should not be permitted	Should not be permitted

With reference to Table 2 of the PPG, the proposed development, based on its light industrial use, is classed as 'Less Vulnerable'. This classification of development is appropriate for areas within Flood Zone 3 and therefore appropriate for the subject site.

6.3 Sequential Test

The Sequential Test is required to assess flood risk and the PPG recommends that the test be applied at all stages of the planning process to direct new development to areas with the lowest probability of flooding (Flood Zone 1).

According to the NPPF, if there is no reasonably available site in Flood Zone 1, the flood vulnerability of the proposed development (see PPG Table 2) can be taken into account in locating development in Flood Zone 2 and then Flood Zone 3. Within each Flood Zone new development should be directed to sites at the lowest probability of flooding from all sources.



The development proposal is for a 'Less Vulnerable' industrial use to be developed on the site. With reference to Table 6.1 above, this development would be appropriate for areas within Flood Zone 3. Therefore, the proposed development passes the Sequential Test and does not require the Exception Test to be satisfied.

7 SURFACE AND FOUL WATER DRAINAGE STRATEGY

The drainage strategy for the proposed site has been produced by Abstract Consulting Limited. Abstract's drainage strategy report and associated calculations and drawings are included in **Appendix J**.

To summarise; the proposed surface water drainage strategy proposes to reduce offsite flows to 2l/s. The majority of the site will be drained to a new surface water drainage system comprising high capacity channel drains and a below ground attenuation tank, with the remaining pathed areas discharging to adjacent soft landscaping where surface water will then infiltrate. The attenuation system has been sized to accept surface water from all storm events up to the 1 in 100 year rainfall event including a 40% allowance for climate change and will discharge to the existing private 300mm surface water sewer in the south west of the site before discharging to the newly diverted EA Main River.

Given the potential vehicle types (HGVs) that will use the site, surface water flows will pass through a Class 1 By Pass Separator to improve water quality prior to discharge.

The proposed development will divert the existing private foul water drainage system around the new built footprint, connecting to the existing foul system to the south via gravity. New foul drainage will be provided to service the new unit and will connect into the newly diverted system.

8 CONCLUSIONS AND RECOMMENDATIONS

This FRA complies with the NPPF and Planning Practice Guidance and demonstrates that flood risk from all sources has been considered in the proposed development. It is also consistent with the Local Planning Authority requirements with regard to flood risk.

The proposed development site lies in an area designated by the EA as Flood Zone 3, but is defended against the 1 in 200 year flood event, the 1 in 1,000 year flood event and the 1 in 200 year 2065 epoch event.

NPPF sets out a Sequential Test, which states that preference should be given to development located within Flood Zone 1. Although the site is located within Flood Zone 3, the requirements of the Sequential Test have been met as the proposal for a 'Less Vulnerable' development is appropriate for areas within this flood zone.

This flood risk assessment has considered multiple sources of flooding and concluded the following:

Table 8.1: Flood risk summary

Source	Level of risk	Mitigation
Fluvial	Low Flood Zone 3	Flood risk from the River Arun is considered predominantly tidal in nature.
Tidal	Low to Moderate Flood Zone 3	The site is not predicted to be affected by tidal flooding within the lifetime of the development (60 years). As a result, it is not considered necessary to incorporate mitigation measures.
Surface water	Low	N/A
Groundwater	Low	N/A
Sewers	Low	N/A
Artificial sources	Low	N/A

The proposals will follow best practice regarding site drainage to ensure that any surface water runoff from the development is managed, ensuring flood risk is not increased elsewhere. Surface water from the proposed development will be attenuated and discharged to the nearby sewer, which immediately discharges to EA Main River. In order to prevent flooding, both on and off the site, Sustainable Drainage Systems (SuDS) will be utilised to control surface water flows, including an attenuation tank. This feature will be designed to store the volume of water associated with a 1 in 100 year rainfall event, plus an additional allowance to account for increased rainfall due to climate change, providing a betterment over the existing scenario.

Overall, taking into account the above points, the development of the site should not be precluded on flood risk grounds.

9 REFERENCES

1. Communities and Local Government, 'National Planning Policy Framework', February 2019.
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<http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>
3. DEFRA, 'Interim Code of Practice for Sustainable Drainage Systems' National SUDS Working Group, July 2004.
4. BSI, 'BS 8533:2011 Assessing and managing flood risk in development Code of practice', October 2011.
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6. DEFRA, 'Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems', March 2015.
7. Flood and Water Management Act, 2010.
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10. Arun District Council, 'Arun Local Plan 2011-2031', July 2018.
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12. West Sussex County Council, 'West Sussex Preliminary Flood Risk Assessment', May 2011.
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14. Environment Agency, 'Arun and Western Streams Catchment Flood Management Plan', December 2009.
15. West Sussex County Council, 'West Sussex Local Flood Risk Management Strategy' Final for Approval, December 2013.
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17. AECOM, 'Water. People. Places. – A guide for master planning sustainable drainage into developments', September 2013.
18. WRC, 'Sewers for Adoption' 7th Edition, August 2012.

APPENDIX A

RSK GROUP SERVICE CONSTRAINTS

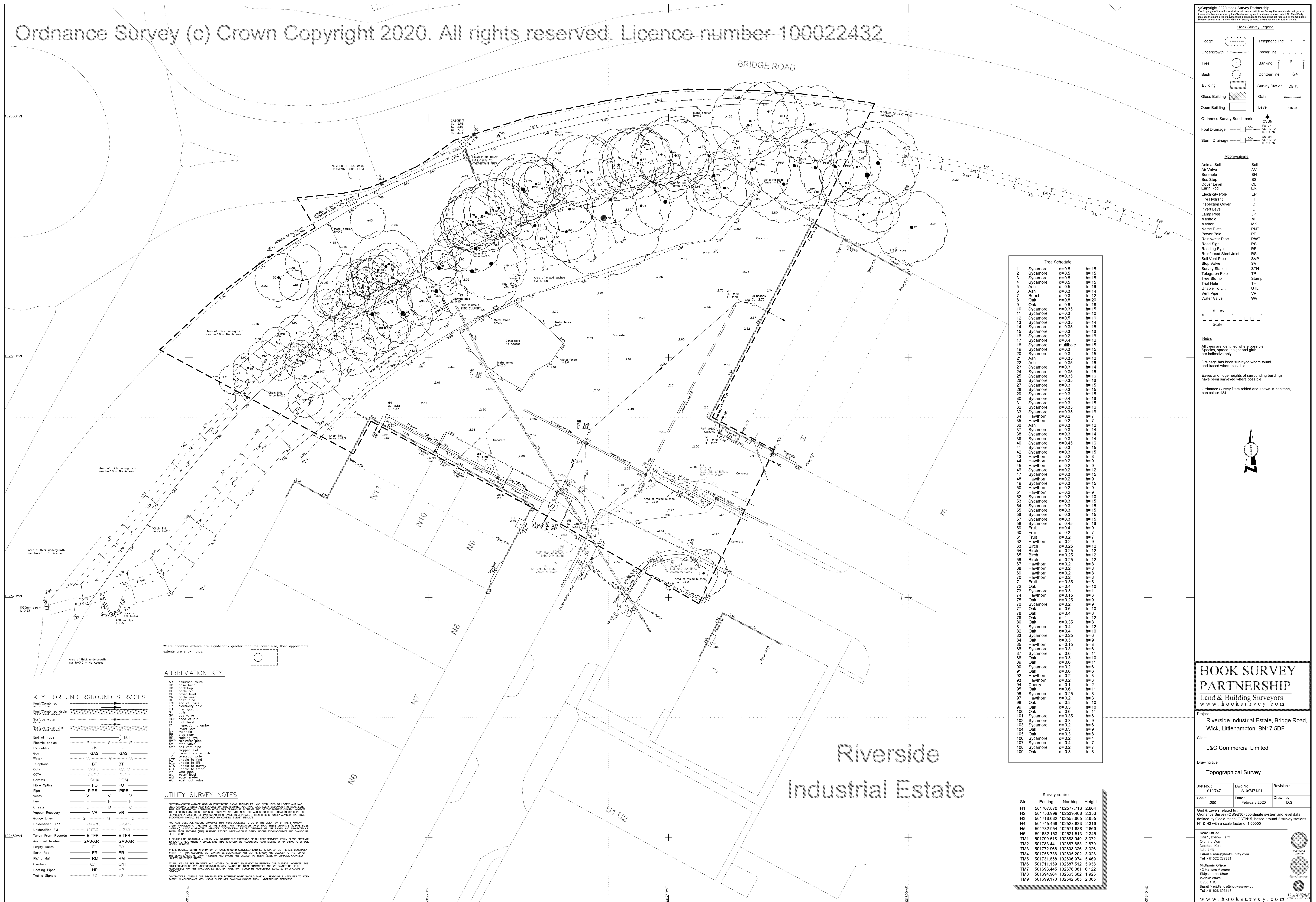
1. This report and the drainage design carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for LCP Properties (the "client") in accordance with the terms of a contract between RSK and the "client" dated August 2020. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable civil engineer at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing, the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.
7. The Services are based upon RSK's observations of existing physical conditions at the site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.
8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (boreholes, trial pits etc) annotated on site plans are not drawn to scale but are centred over the appropriate location. Such features should not be used for setting out and should be considered indicative only.



APPENDIX B

TOPOGRAPHIC SURVEY

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Hook Survey Legend

Hedge		Telephone line	
Undergrowth		Power line	
Tree		Banking	
Bush		Contour line	
Building		Survey Station	
Glass Building		Gate	
Open Building			
Ordinance Survey Benchmark		OSBM	
Foul Drainage		7.5 m	
Storm Drainage		CL 112.10	
		IL 116.75	
		SW 112.10	
		IL 116.75	

Abbreviations

Animal Set	BS
Air Valve	BH
Borehole	BS
Bus Stop	CL
Cover Level	ER
Earth Rod	EP
Electricity Pole	EP
Fire Hydrant	EP
Inspection Cover	IC
Invert Level	IL
Lamp Post	LP
Manhole	MH
Marker	MK
Name Plate	RNP
Power Pole	PP
Rain water Pipe	RWP
Road Sign	RS
Rodding Eye	RE
Reinforced Steel Joint	RSJ
Sol Vent Pipe	SVP
Stop Valve	SV
Survey Station	STN
Telegraph Pole	TP
Tree Stump	TS
Trill Hole	TH
Unable To Lift	UTL
Vent Pipe	VP
Water Valve	WW

0 Metres 5 10
Scale

Notes

All trees are identified where possible.
 Species, spread, height and girth are indicative only.

Drainage has been surveyed where found, and traced where possible.

Eaves and ridge heights of surrounding buildings have been surveyed where possible.

Ordinance Survey Data added and shown in half-tone, pen colour 134.

Hook Survey Partnership
 Land & Building Surveyors
 www.hooksurvey.com

Project: **Riverside Industrial Estate, Broad Road, Wick, Littlehampton, BN17 5DF**

Client: **LC&C Commercial Limited**

Drawing title: **Topographical Survey**

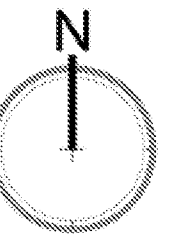
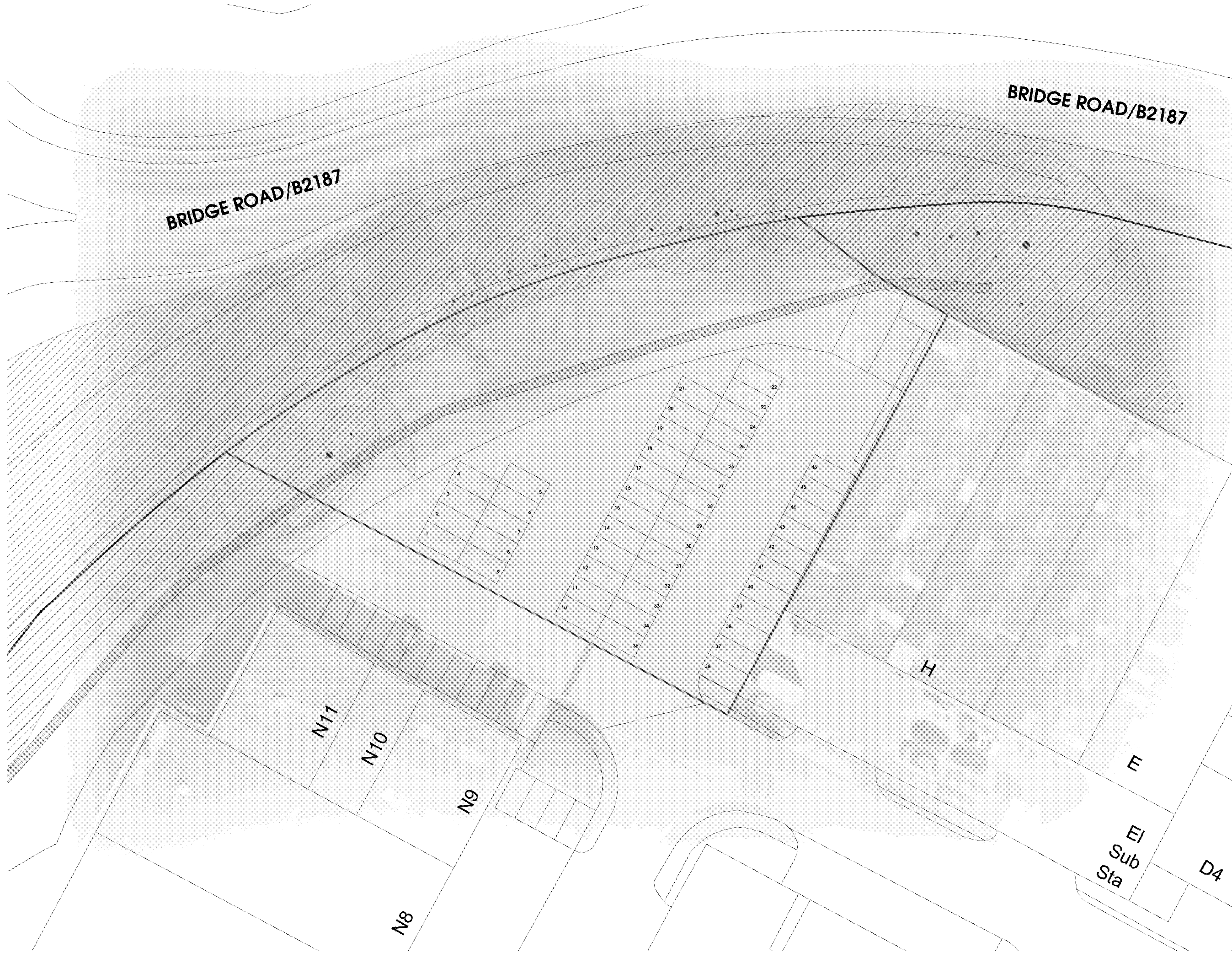
Drawn by: S19/7471	Dwg No.: S19/7471/01	Revision: -
Date: February 2020	Drawn by: D.S.	

Grid & Levels related to **Ordinance Survey (OSGB36)** coordinate system and level data defined by Geoid model **OSN15**, based around 2 survey stations 1 & 142 with a scale factor of 1.00000

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THE SURVEY ASSOCIATION



**schedule of
accommodation**

46 no. car parking spaces

culvert drainage pipe to be diverted
away from new unit

existing culvert

tree canopy extent

riverside industrial estate, littlehampton
existing site plan

number: 4076/p001b | date: dec 2020

scale: 1:200@A1 | drr: lh chkd: ge appd: ge

client: London and Cambridge Properties
subject to site survey and l.o. approvals

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APPENDIX C

ENVIRONMENT AGENCY MAIN RIVER

MAPPING

Main River Map: Rationalising Main River Network



2/6/2019, 1:09:06 PM

Statutory Main River Map Variations: Rationalising the Main River Network

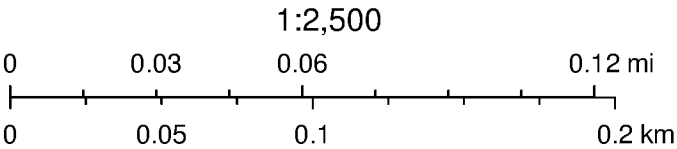
Consultation - De-mainment

Pending Determination

Appeals

Pending Appeals

Statutory_Main_River_Map



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APPENDIX D

CULVERT SURVEY



TOPOGRAPHICAL SURVEY LEGEND

GENERAL

AV	AIR VALVE	LH	LAMP HOLE
BB	BOLISHA BEACON	LP	LAMP POST
Bdy	BOUNDARY	MK	MARKER POST
BH	BORHOLE	MS	MILE STONE
BL	BED LEVEL	NB	NOTICE BOARD
BO	BOLLARD	NP	NAME-PLATE
BS	BUS STOP	OSBM	ORDNANCE SURVEY BENCH MARK
BKW	BRICK WALL	OH	OVERHEAD
CATV	CABLE TELEVISION	PE	PENSTOCK
CG	CATTLE GRID	PM	PARKING METER
CH	CHANNEL LEVEL	PO	POST
Conc	CONCRETE	RB	RUBBISH BIN
Corr	CORRUGATED	RS	ROAD SIGN
CO	COPING LEVEL	RTW	RETAINING WALL
CPS	CONC. PAVING SLABS	RWP	RAIN WATER PIPE
CR	CROWN LEVEL	SAP	SAPLING
CUL	CULVERT	SC	STOP COCK
DK	DROP KERB	SL	SOFT LEVEL
DP	DOWN PIPE	SV	SOIL VENT PIPE
EB	ELECTRICITY BOX	SP	SIGN POST
EC	ELECTRICITY CABLE	STN	SURVEY STATION
EdmH	ELECTRICITY MANHOLE	SV	STOP VALVE
EP	ELECTRICITY POLE	SW	SURFACE WATER
EPY	ELECTRICITY Pylon	TB	TEMPORARY BENCH MARK
ER	EARTHING ROD	TBM	TEMPORARY BENCH MARK
FI	FIRE HYDRANT	TCB	TELEPHONE CALL BOX
FLR	FLOOR LEVEL	TH	THRESHOLD
FM	FLOW METER	TL	TRAFFIC LIGHT
FB	FLOWER BED	TMH	TELEPHONE MANHOLE
FW	FULL WATER	TOW	TOP OF WALL
GL	GROUND LEVEL	TP	TELEGRAPH POLE
GP	GATE POST	TS	TREE STUMP
GV	GAS VALVE	UG	UNDERGROUND
H	HIGH	VA	VALVE
HO	HOLE	VP	VENT PIPE
HW	HEADWALL	W	WIDE
IC	INSPECTION COVER	WL	WATER LEVEL
JB	JUNCTION BOX	WM	WATER METER
KL	KEEP LEFT ROAD SIGN	WO	WASH OUT
LB	LETTER BOX	WP	WOODEN POST
		WW	WATER VALVE

FENCE TYPES

BWF	BARBED WIRE FENCE	IWF	FENCE INTERWOVEN
CBF	CLOSE BOARDED FENCE	LUF	FENCE LARCH LAP
CLF	CHAINLINK FENCE	PAL	FENCE PALISADE FENCE
CPF	CHESTNUT FENCING	PRF	POST & RAIL FENCE
CMF	FENCE CHICKEN WIRE	PMF	POST & WIRE FENCE
IRF	FENCE IRON RAILING	TR	TRELLIS

TREE TYPES

AA	ACACIA	ED	ELDER	OR	ORNAMENTAL
AH	ASH	EM	ELM	PE	PINE
AL	ALDER	FR	FIR	PD	POLLARDED
AN	ASPEN	HB	HORNBEECH	PR	POPULAR
AP	APPLE	HC	HORSE CHESTNUT	SB	SILVER BIRCH
BH	BEECH	HN	HAWTHORN	SC	SWEET CHESTNUT
BL	BLACKTHORN	HY	HOLLY	SU	SPRUCE
BR	BIRCH	LA	LARCH	SY	SYCAMORE
CE	CHERRY	LE	LIME	WB	WHITEBEECH
CO	CONIFER	LN	LONDON PLANE	WT	WALNUT
CR	CEDAR	ME	MAPLE	WW	WILLOW
CY	CYPRESS	OK	OAK	YW	YEW
DD	DEAD			XX	UNKNOWN

SERVICE ABBREVIATIONS

AC	ASSUMED CONNECTION	IL	INVERT LEVEL
AR	ASSUMED ROUTE	KIG	KERB INLET GULLY
BD	BACK DROP	MH	MANHOLE
CC	CONFIRMED CONNECTION	OHL	OVERHEAD LINE
CD	CHAMBER DEPTH	PI	PETROL INTERCEPTOR
COW	CABLE ON WALL	RD	FROM RECORD DRAWINGS
CI	COVER LEVEL	RE	RODGING EYE
CP	CATCH PIT	SK	SOAKAWAY
CS	CABLE RISER	TPT	TRACE POINT
DTB	DEPTH TO BASE	UNK	UNKNOWN SERVICE
D	DEPTH	UTL	UNABLE TO LOCATE
(DB)	DISBURSED	UTR	UNABLE TO RAISE
EOT	END OF TRACE	UTT	UNABLE TO TRACE
GU	GULLY	UTS	UNABLE TO SURVEY

UTILITY LEGEND AND NOTES

UTILITY DEPTHS

SERVICES ARE DRAWN IN 3D WITH THE LEVEL CORRESPONDING TO THE CENTRE OF THE UTILITY. EXCEPTIONS TO THIS ARE SERVICES AND FEATURES DETECTED BY GPR WHERE THE LEVEL IS THAT OF THE TOP OF THE UTILITY. THESE ARE DENOTED BY GPR LAYERS OR LINETYPES SHOWN ABOVE OR BY SPECIFIC LABELLING OF THE DRAWINGS.

CONFIDENCE RATING

CONFIDENCE RATINGS FOR UTILITIES TRACED ARE IDENTIFIED AS LAID OUT IN SECTION 5 OF THE PAS 128:2014 SPECIFICATION FOR UNDERGROUND UTILITY DETECTION, VERIFICATION AND LOCATION

CAUTIONARY NOTES

ELECTRO-DETECTION TECHNIQUES HAVE BEEN USED IN THE LOCATION OF UNDERGROUND SERVICES. THE RESULTS ARE NOT INFALLIBLE AND TRIAL EXCAVATIONS MUST BE CARRIED OUT TO CONFIRM SERVICE IDENTIFICATION, POSITIONS AND PARTICULARLY DEPTHS. ALTHOUGH ALL REASONABLE EFFORT HAS BEEN MADE IN SEARCHING AVAILABLE RECORD DRAWINGS, THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED. INFORMATION OBTAINED BY GPR IS INDICATIVE OF BURIED INFRASTRUCTURE THAT MAY NOT BE DETECTABLE BY OTHER MEANS.

DRAINAGE NOTES

PIPES ON THE REPORT ARE REFERENCED CLOCKWISE FROM THE OUTGOING PIPE WITH THE MH NUMBER AS THE PREFIX I.E. MH01A. END POINT LOCATIONS WITHIN BUILDINGS ARE INDICATIVE UNLESS STATED.

TECHNICAL NOTES

ALL LEVELS ARE BASED ON ORDNANCE SURVEY DATUM OBTAINED FROM ACTIVE GPS NETWORK (OSGB36/19)

ALL KERB LEVELS ARE TAKEN IN CHANNEL

A SCALE FACTOR OF 1.000000 HAS BEEN APPLIED TO THIS DRAWING

Rev. Date Description By

Drawn by FQL Surveyed by FQL Checked by RCR

Project: AQHFDQNC HMCTRSQHX DRS@SD LITTLEHAMPTON

Drawing title: PIPELINE TRACE

Client: LONDON & CAMBRIDGE

Drawing No: SDS 207324.01 Revision: A

Scale 1:200 Date: JUNE 2020 Sheet size: A1

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APPENDIX E PROPOSALS
