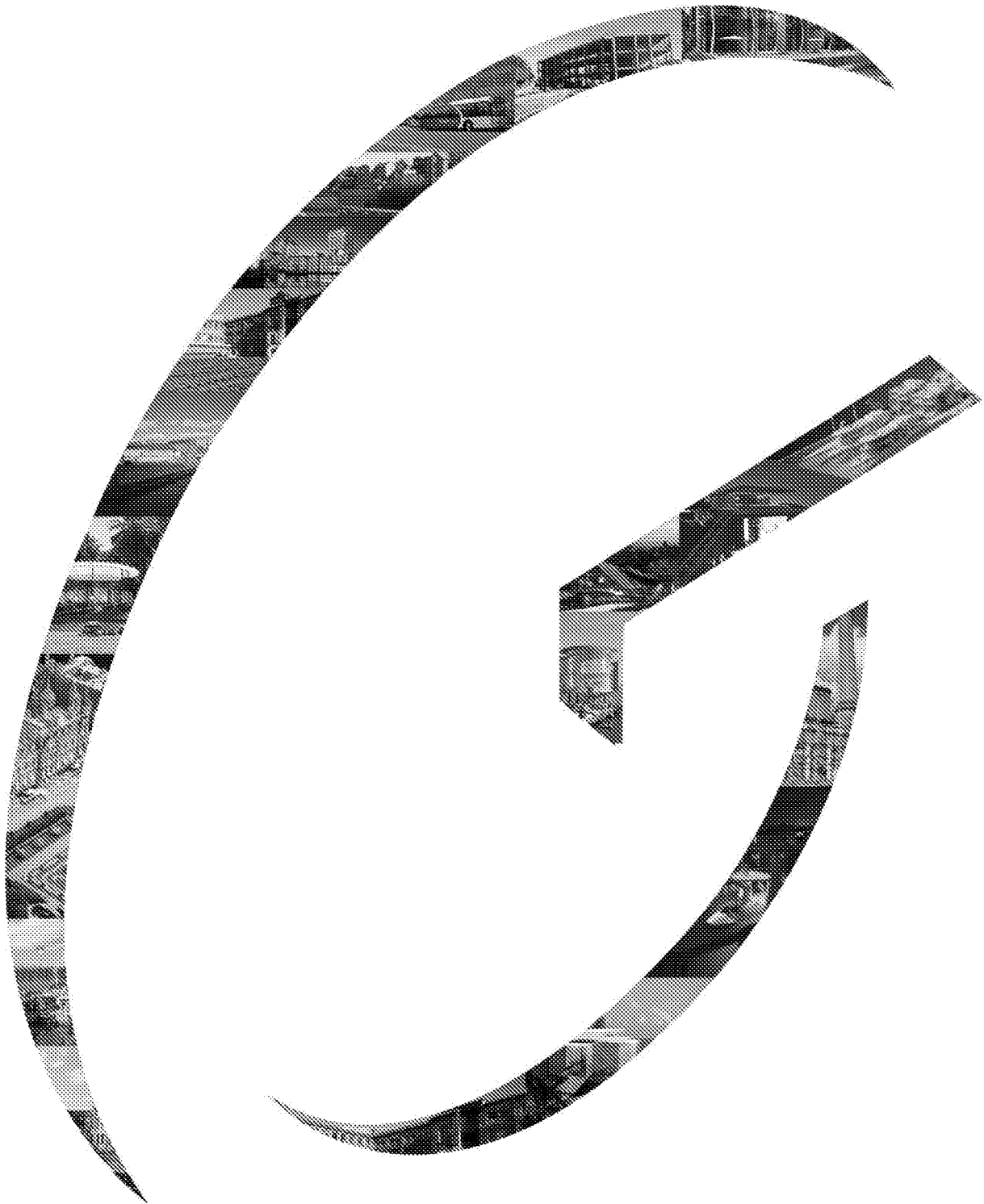




FLOOD RISK ASSESSMENT
Land at Cornfield Close, Wick, Littlehampton, BN17 6HY

Prepared for: Thakeham Client Ltd

Document History

Issue	Date	Description	Prepared By	Checked By
1	21 Sep 18	Draft for Client Comment	S McNair	C Salt / J Birch
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1.0 Introduction

- 1.1 This Flood Risk Assessment has been prepared by Glanville Consultants for Thakeham Client Ltd to accompany a Full planning application for residential development on land at Cornfield Close, Littlehampton. This application is being progressed by Thakeham Client Ltd on behalf of the applicant Clarion Housing Association.
- 1.2 The purpose of this document is to assess the existing level of flood risk to the site and its surroundings within the context of the development proposals and to demonstrate a suitable drainage strategy for the disposal of surface water from the site.
- 1.3 This report has been prepared in accordance with the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG) to the NPPF.
- 1.4 This assessment was undertaken with reference to information provided and/or published by the following bodies:
- Ordnance Survey;
 - British Geological Society;
 - Arun District Council;
 - West Sussex County Council; and
 - Environmental Agency.
- 1.5 This report concludes that the site is not at risk of flooding and can be developed safely without increasing flood risk elsewhere, and that the development proposals comply with relevant planning policy concerning flood risk. The report demonstrates that suitable provision for the disposal of surface water from the proposed development is capable of being provided.

2.0 Existing Site Characteristics

Site Description

- 2.1 The site is located in Littlehampton, West Sussex, with approximate National Grid coordinates of TQ 03368 03233. A nearby postcode is BN17 6HY. A site location plan is included in Appendix A.
- 2.2 The site is approximately 2.7ha and roughly square in shape. The entirety of the site comprises the former Daisyfields caravan park, consisting of mostly undeveloped open space with existing outbuildings at the north-east corner of the site and an access road from Cornfield Close running around the centre of site. A strip of dense woodland is located along the borders of the site to the west, south and east.
- 2.3 The site is bound by existing residential properties on Cornfield Close to the north, open space to the east, south and west, with Cornfield Primary School to the north-west. There is a single access point for vehicles, taken from Cornfield Close in the north-east corner of the site.
- 2.4 Prior to its use as a Camping and Caravan Park, a large portion of the site is believed to have been a brick field, with a kiln indicated. The site has previously been subject to land filling and as such, areas of made ground are present.

Topographical Survey

- 2.5 A topographical survey has been undertaken by Sunshine Survey Ltd in November 2017. The survey indicates that the site falls in a northerly and easterly direction, with the topographical levels ranging from approximately 8.425m Above Ordnance Datum (AOD) at the south-west of the site to approximately 7.448mAOD at the north and 7.079mAOD at the south-east corner of the site. The topographical survey is included in Appendix B.

Existing Watercourses

- 2.6 The closest watercourse designated as a main river by the Environment Agency is a tributary of a stream called Black Ditch, which is itself a tributary of the River Arun. Black Ditch is located around 600m north-west of the site at its closest point.

Site Geology

- 2.7 Geological maps published by the British Geological Survey (BGS) indicate that the entirety of the site is underlain by a bedrock geology of Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (undifferentiated). BGS mapping also indicates the site is underlain by superficial deposits of River Terrace deposits (Undifferentiated) – Sand, Silt and Clay.
- 2.8 As described above, the site has historically been used for landfilling, following its use as a brick field and kiln. Made ground is therefore present, overlying the natural strata where the landfilling has previously occurred.

- 2.9 This is confirmed by a series of 18 shallow borehole records published on the BGS website. Samples identified made ground to depths of between 1.10m and 3.30m below ground level (bgl). Underlying the made ground, River Terrace deposits were encountered, before finally chalk was encountered.

Site Investigation

- 2.10 Geo-Environmental Services Ltd (GESL) visited the site in November 2017 to carry out an intrusive site investigation. The site investigation found made ground in all of the eight trial pits and one borehole that were dug, at depths of between 1.80m and 2.70m bgl. Underlying the made ground was River Terrace deposits, with Chalk being encountered in the borehole at a depth of 6.50m bgl to the maximum depth of the borehole at 15.00m bgl.
- 2.11 A further site investigation took place in April 2018 to complete preliminary soakage testing within the natural soils present on site. Made ground was again encountered in every location, with depths ranging from 1.50m to 2.30m bgl. Underlying the made ground was River Terrace deposits that became sandier at depth.
- 2.12 Soakage rates from the April 2018 site investigation were generally poor. This is because the testing was conducted in a layer of gravel that had a high clay content. Testing within borehole WS1 was found to have a soakage rate of 1.61×10^{-7} m/s. After consultation with the Environment Agency (EA), it was agreed this demonstrated there was potential for the disposal of surface water run-off via infiltration; further information on correspondence with the EA can be found in paragraph 6.5 and Appendix K of this report.
- 2.13 GESL visited the site again in August 2018 to carry out an intrusive site investigation. The site investigation comprised of nine trial pits of depths between 2.00m and 4.60m bgl, as well as ten boreholes of depths between 10.00m to 15.00m bgl to establish soil conditions and determine the groundwater level. Groundwater levels were recorded within the range of 6.00m and 7.10m bgl during the return monitoring visits to the site.
- 2.14 The GESL report, included in Appendix C, indicates the site to be underlain by made ground to depths of between 1.70m and 2.90m bgl. Underlying the made ground, layers of River Terrace deposits were encountered at nearly every location at depths of between 2.00m and 7.00m bgl. The strata changes to medium density white Chalk at depths of between 3.60m and 6.20 bgl up to 10.00m and 15.00m bgl, which was the maximum depth of the investigation.
- 2.15 Deep soakage testing was conducted during the August 2018 site investigation and undertaken within trial pits TP201, TP205 and TP209. These tests were conducted close to the centre of the site, where it is proposed to incorporate a central soakaway within the surface water drainage strategy. The tests were undertaken within sandy River Terrace deposits with the made ground removed and the sides of the pits banked. Infiltration rates were found to range between 5.48×10^{-5} m/s and 7.69×10^{-6} m/s.
- 2.16 These site investigations have been used to inform the surface water drainage strategy, which can be found in Section 6 of this report.

- 2.17 Geological maps along with the locations and extracts from the GESL ground investigation report (Reference: 17106 – GAR/AP01/231018) are included in Appendix C.

Hydrological and Hydrogeological Context

- 2.18 No major artificial water bodies are located on or in the vicinity of the site. The closest artificial water feature is Swanbourne Lake, approximately 4.5 to the north-west of the site.
- 2.19 The EA defines Source Protection Zones (SPZs) for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The SPZs mapping indicates that the site is not located within an SPZ.
- 2.20 A Nitrate Vulnerable Zone (NVZ) is a conservative designation for areas of land that drain to nitrate polluted waters or waters which could become polluted by nitrates. The NVZs mapping indicates that the site is not located within an NVZ.
- 2.21 The EA defines Drinking Water Safeguard Zones (SgZs) and Drinking Water Protected Areas (DWPAs) for water sources used for public drinking water supply. SgZs define areas where additional pollution control measures are needed to avoid deterioration in water quality. DWPAs are areas where water sources need to be protected to prevent pollution. The site is not located within an SgZ or a DWPA.
- 2.22 The bedrock Aquifer Designation map published by the EA indicates that the bedrock underlying the proposed development is classed as a Principal Aquifer. Principal Aquifers indicate regions where the geology exhibits high permeability and/or provides a high level of water storage. They may also be capable of supporting water supply and may provide a source of base flow to rivers on a strategic scale.
- 2.23 The Aquifer Designation map for superficial deposits indicates that there is a Secondary A Aquifer associated with the River Terrace deposits. Secondary A Aquifers indicate areas where there is permeable strata capable of supporting water supplies at a local level and in some cases forming an important source of base flow to rivers.
- 2.24 The Groundwater Vulnerability map published by the EA indicates that the site is above a highly permeable major aquifer of high leaching potential.
- 2.25 Although the site is not located within an SPZ, NVZ, SgZ or DWPA, given the Aquifer and Groundwater Vulnerability designations by the EA, careful consideration will be given to the surface water drainage strategy for the site. This is discussed in further detail in section 6 of this report.

Existing Surface Water Drainage

- 2.26 The incumbent drainage undertaker is Southern Water. From a review of Southern Water sewer records, it is indicated there are no surface water sewers in the immediate vicinity of the site, the closest being in Olliver Acre and Worthing Road approximately 180m and 450m north-west of the site respectively.

- 2.27 The topographical survey does not indicate the presence of any gullies or drainage channels through areas of open space on the current site. Therefore, rain falling over the area of the site that was previously used as a caravan park is understood to infiltrate directly to ground.
- 2.28 Run-off from the existing residential unit on the site has been found to discharge surface water run-off via a soakaway to the ground.

Proposed Development

- 2.29 The proposals are for the demolition of existing buildings and the erection of 77 residential homes with associated access, car parking, cycle parking, refuse/recycling storage, landscaping, earthworks and infrastructure.
- 2.30 The proposed site layout is provided in Appendix D.

3.0 Planning Policy and Guidance

- 3.1 Set out below is a summary of the national and local planning policy and guidance relating to flood risk and surface water management that are relevant to the development proposals.

National

- 3.2 At a national level, the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (PPG) to the NPPF ensure flood risk is taken into account at all stages of the planning process, to avoid inappropriate development in areas at risk of flooding and to direct development towards areas at lowest flood risk. The NPPF retains a risk-based approach to the planning process and defines four Flood Zones to be used as the basis for applying the sequential test, as well as Flood Risk Vulnerability Classifications, which define the type of development that is considered appropriate within each zone.
- 3.3 The NPPF establishes the Flood Zones as the starting point for assessment with the overarching aim to steer new development to areas with the lowest probability of flooding. The Flood Zones are defined as follows:
- Flood Zone 1 (Low Probability) comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
 - Flood Zone 2 (Medium Probability) comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.
 - Flood Zone 3a (High Probability) comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
 - Flood Zone 3b (The Functional Floodplain) comprises land where water has to flow or be stored in times of flood.

Local Policy and Guidance

Arun District Council (ADC) Local Plan (2011-2031)

- 3.4 The Local Plan sets out how the District will grow over the period 2011- 2031. It includes strategic site allocations, as well as policies which help to support and deliver the long term spatial vision for the district. Section 2 of this document sets out the policy context in which Local Plans are prepared in order to assist in meeting the challenge of climate change, flooding and coastal change, as well as the methodology of identifying sites for development taking account of flood risk.

ADC Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA) (November 2016)

- 3.5 This SFRA was produced to replace the Level 1 and Level 2 SFRA originally published by ADC in February 2008. The report was prepared as part of the ADC Local Plan (2011-2031). This SFRA is a hybrid between the Level 1 and Level 2 assessment. It provides a reference and policy document to advise and inform developers of their obligations under the NPPF. The maps, accompanying reports and guidance provide a sound framework enabling consistent and sustainable choices to be made when making future planning decisions.
- 3.6 The document also provides a framework for the performance of the Sequential Test and, where necessary, the Exception Test. The Level 2 SFRA provides additional information to the Level 1 report in order to assess the suitability of potential strategic sites in terms of flood risk. This report uses information from the Level 1 SFRA, as well as additional data where necessary, and concentrates on potential development sites such that sufficient evidence can be provided for the Exception Test to be applied.

West Sussex County Council (WSCC) Local Flood Risk Management Strategy (2013-2018)

- 3.7 The Local Flood Risk Management Strategy was produced by WSCC following its appointment as Lead Local Flood Authority (LLFA), and identifies areas of the county at risk of flooding as well as setting out how WSCC carries out its flood risk responsibilities.

WSCC SFRA (January 2010)

- 3.8 This SFRA provides a Level 1 SFRA approach to determining flood risk over the whole county, while also including Level 2 SFRA information for 'key locations'. This SFRA acts as a further reference document to help advise and inform developers.

WSCC Preliminary Flood Risk Assessment (PFRA) (May 2011)

- 3.9 This PFRA provides a high level overview of flood risk from local flood sources in order to develop a clear overall understanding of the flood risk across West Sussex. The report incorporates flood risk data and records of historic flooding from a variety of local and national sources. The purpose of the information provided by the PFRA was to inform the Local Flood Risk Management Strategy for West Sussex which looks at all sources of flood risk at a local scale.

(WSCC) LLFA Policy for the Management of Surface Water

- 3.10 This report sets out how WSCC, in its role as LLFA, will review drainage strategies and surface water management provisions associated with applications for development.

4.0 Sources of Potential Flooding

- 4.1 Flood risk to the site is considered from all likely sources of flooding, as defined in the NPPF and the PPG to the NPPF. These include fluvial, tidal, artificial sources, groundwater, sewer and surface water. The following paragraphs consider flood risk to the site from all of these sources.

Fluvial

- 4.2 The Environment Agency (EA) publishes flood zone mapping on the GOV.UK website which shows the modelled extents of fluvial flooding. The flood zone mapping indicates that the site is entirely located within Flood Zone 1, at the lowest risk of fluvial flooding. An extract from the EA mapping is included in Appendix E.
- 4.3 Table 1 of the PPG to the NPPF defines land located within Flood Zone 1 as areas which are outside the floodplain and have little or no chance of flooding.

Tidal / Coastal

- 4.4 The watercourse stated in Section 2 is not subject to tidal influences. The nearest watercourse subject to tidal influences is the River Arun (approximately 1.9km south-west of the site), where the lower reaches water levels are affected by tidal levels. The English Channel is also located approximately 2km south of the site.
- 4.5 The EA flood zone mapping shows the modelled extent of tidal flooding. The site is shown to be located in Flood Zone 1, at the lowest risk of tidal flooding. Table 1 of the PPG to the NPPF defines land located within Flood Zone 1 as areas which are outside the floodplain and have little or no chance of flooding.

Artificial Sources

- 4.6 The site is not located near any major artificial water features, with the closest being Swanbourne Lake approximately 4.5km to the north-west of the site. The EA publishes indicative mapping on the GOV.UK website which shows the maximum extent of reservoir flooding in the unlikely event that a reservoir should fail. The mapping indicates that the site and the surrounding area are not located within a reservoir flood risk area.

Groundwater

- 4.7 The Level 1 and Level 2 SFRA states that understanding of the risks posed by groundwater flooding is limited, in comparison with other sources of flood risk. Nevertheless the SFRA does publish mapping for the district showing the Areas Susceptible to Groundwater Flooding (AStGWF). The AStGWF map is a strategic-scale map showing flood areas on a 1km square grid, with areas highlighted showing the proportion of the 1km grid square where geological and hydrogeological conditions indicate the possibility of groundwater emergence. The SFRA advises that this map does not show the likelihood of flooding and should only be used for high level assessment, and not to understand flood risk to individual properties. On a site-specific scale it is recommended that the AStGW map is used in conjunction with other sources of data to assess the likely risk.

- 4.8 The AStGWF shows that the site is in a 1km grid square of land where 25% and 50% of the land is at risk of groundwater emergence. This map is included in Appendix F.
- 4.9 Appendix J of the Level 1 and Level 2 SFRA shows historic flood records for Arun District. It indicates that there have been no recorded incidents of groundwater flooding on or in the vicinity of the site. There is also no anecdotal evidence of flooding at the site.
- 4.10 The site investigation discussed in Section 2 shows groundwater was encountered at depths between 6.00m and 7.10m bgl. Given that groundwater levels are low it is considered that the risk of flooding from groundwater is low.

Sewer

- 4.11 The SFRA includes data from the Southern Water DG5 sewer flooding register. This register provides information on the number of recorded sewer flooding incidents by postcode area. There are 3 recorded incidents of sewer flooding occurring in the postcode area associated with the site for the relevant time period, however these records do not necessarily represent the current or future sewer flood risk situation. Comparing the postcode associated with the site to other postcodes in the area, it can be seen that there are generally less recorded flood incidents within the sites postcode compared to other areas in the district. The topographical survey in Appendix B shows that the existing drainage infrastructure found in Cornfield Close is at a much lower elevation meaning the risk to the site is considered to be negligible.

Surface Water

- 4.12 The Environment Agency publishes a 'Flood Risk from Surface Water' map (FRfSW) on the GOV.UK website which indicates the predicted risk of surface water flooding in the event that rainwater does not drain away through normal drainage systems or soak into the ground. The mapping indicates that the entirety of the site is considered at a very low risk of surface water flooding. This map is included in Appendix G.

Historic Flooding

- 4.13 The Level 1 and Level 2 SFRA 'Historical Flooding' map details the locations of recorded historic flooding events from fluvial, unknown, coastal, surface water, tidal and flooding from defence failure events. The map reveals that there have been no recorded incidents of flooding within the vicinity of the site, with 3 incidents of surface water flooding and 3 incidents of unknown cause all occurring over 0.5km away from the proposed development. The historic flood map is included in Appendix H.

Summary

- 4.14 In summary, the site is at low risk of flooding from all sources. The proposed development of the site is considered appropriate in flood risk terms according to the NPPF.

5.0 Flood Risk Assessment

- 5.1 The NPPF encourages a sequential, risk-based approach to determine the suitability of land for development. This document advises that the development of sites within Flood Zone 1 should be given preference where available.
- 5.2 Table 2 of the Planning Practice Guidance (PPG) to the NPPF categorises different types of development into five flood risk vulnerability classifications:
- Essential Infrastructure;
 - Highly Vulnerable;
 - More Vulnerable;
 - Less Vulnerable; and
 - Water Compatible Development.
- 5.3 The NPPF classifies the proposed residential use of the site as being 'More Vulnerable'.
- 5.4 As discussed in Section 4, the site is located entirely within Flood Zone 1. Table 3 of the PPG states that all uses of land are appropriate for Flood Zone 1. Therefore, the proposed development use is compatible with the flood zone of the site and developing the site for its intended purpose is considered appropriate in terms of flood risk. As such, the Sequential Test and Exception Test are not required to be applied to this development.
- 5.5 The risk of flooding from existing drainage infrastructure within the vicinity of the site is considered to be negligible, as the site is at a higher elevation than the nearest sewers. The new foul drainage infrastructure on the site will be designed in accordance with Building Regulations and therefore no significant flood risk is expected from the proposed on-site foul water drainage. New on-site surface water drainage will be designed to accommodate a 1 in 100 year with a 40% allowance for climate change without creating a flood hazard.
- 5.6 The site is considered to be at low or very low risk from all other sources of flooding.
- 5.7 The development site is proposed to be accessed from the A259 Worthing Road, which is entirely located within Flood Zone 1. As such, safe, dry access and egress is capable of being provided to the entirety of the development during times of flooding.

6.0 Surface Water Drainage Strategy

Sustainable Drainage

- 6.1 The PPG recommends that priority should be given to the use of sustainable drainage systems (SuDS) as they are designed to control surface water run-off where it falls and mimic natural drainage as closely as possible. SuDS also provide opportunities for the following:
- Reduce the causes and impacts of flooding
 - Remove pollutants from urban run-off at source; and
 - Combine water management with green space with benefits for amenity, recreation and wildlife.
- 6.2 SuDS encompass a wide range of drainage techniques intended to minimise the rate of discharge, volume and environmental impact of run-off. Infiltration based techniques are high up in the hierarchy of techniques available due to the ability for close to source dispersion of surface water. These techniques are considered the closest solution to mimic the natural drainage of undeveloped sites.
- 6.3 The Building Regulations part H3 stipulates that rainwater from roofs and paved areas is carried away from surface to discharge to one of the following, listed in order of priority:
- a) An adequate soakaway or some other adequate infiltration system; or, where that is not practical;
 - b) A watercourse; or, where that is not practical
 - c) A sewer.

Site Constraints

- 6.4 As discussed in Section 2, intrusive site investigations have shown that the site is underlain by a bedrock geology of Chalk, with superficial deposits of River Terrace deposits – sand, silt, clay. Infiltration testing was also undertaken and good soakage potential was recorded for the sandy River Terrace deposits at circa 4m bgl. Therefore, the use of infiltration drainage techniques are considered feasible. However, made ground is present in some areas of the site at depths of up to 2.90m bgl. Potentially leachable contaminants within the made ground could be mobilised by surface water flows via any infiltration features, therefore caution has to be exercised in the design of any infiltration features.
- 6.5 The Environment Agency (EA) has confirmed that the disposal of surface water run-off vertically through superficial natural uncontaminated soils, with appropriate pollution control measures, would be acceptable (correspondence included in Appendix K). This could be achieved by the removal of made ground from areas surrounding potential infiltration features and discharging water via the lower layer of River Terrace deposits (sands) at circa 4m bgl. This would prevent potentially leachable contaminants within the made ground from being mobilised and impacting upon the aquifer underlying the site, as mentioned in Section 2. Therefore the use of infiltration drainage techniques are proposed to be used on this site, and will be designed in line with these recommendations.

- 6.6 There are no watercourses within or in the vicinity of the site which may provide a suitable outfall.

Proposed Surface Water Drainage Strategy

- 6.7 The proposed strategy strives to utilise sustainable drainage techniques in accordance with the guidance described in CIRIA C753. With this in mind, the strategy employs a soakaway to facilitate the discharge of surface water run-off via infiltration to the underlying soil strata.
- 6.8 All surface water run-off generated by hardstanding areas within the site will be conveyed to a soakaway, consisting of geocellular crates. The soakaway will be located close to the centre of the site, in the open public space. In accordance with EA recommendations, made ground will be removed from the area surrounding the soakaway before the installation. The base of the geocellular crates will be located at approximately 4.5m bgl, below levels where made ground is currently found. The sides and top of the soakaway will be lined, in order to prevent the mobilisation of any potential residual contamination from horizontal discharge from the soakaway. The design of the soakaway is therefore in accordance with EA guidance and site-specific recommendations and will not mobilise any residual contaminants within the site soils which may adversely affect groundwater.
- 6.9 MicroDrainage calculations included in Appendix J demonstrate that the soakaway has been sized to accommodate the 1 in 100 year + 40% climate change storm event without flooding from surface water. The MicroDrainage calculations included in Appendix J also demonstrate the proposed soakaway has a half-drain time of less than twenty four hours for the 1 in 10 year storm, in line with the guidance prescribed in CIRIA C753.
- 6.10 As discussed in Section 2, soakage testing was carried out on site, with infiltration rates found to range between 5.48×10^{-5} m/s and 7.69×10^{-6} m/s in the River Terrace deposits. A conservative rate of 3.845×10^{-6} m/s has been used to produce this surface water drainage strategy; this represents 50% of the lowest infiltration rate found in the relevant trial pits from the site investigation. This value, alongside the factor of safety used in MicroDrainage, has been used to protect against the effects of long term use of the soakaway, such as possible siltation. Nevertheless, trapped gullies and silt traps will be incorporated within the development which will assist with preventing siltation of the soakaway.
- 6.11 The outline surface water strategy is illustrated on drawing CV8171223 – SK04 included in Appendix I. A fully detailed drainage strategy will be developed at the detailed design stage.

Water Quality

- 6.12 Pollution control measures are designed to minimise the transmittal of any pollutants collected by run-off flowing over hard paved areas to the receiving infiltration feature.

- 6.13 The site currently does not benefit from any positive drainage system and so rainfall is currently able to percolate through areas of made ground present on site to the natural soil strata below. The proposed drainage strategy will direct surface water run-off generated by the impermeable areas on site to a soakaway, which will discharge flows by infiltration through clean soils, not made ground, and will therefore provide an improvement in water quality discharging to the underlying aquifer.
- 6.14 Run-off from roofs will be directed to the soakaway whereby it will infiltrate through the underlying soil prior to discharge to groundwater. The soakaway has been designed such that there is a 1.5m zone of unsaturated material between the base of the soakaway and the highest recorded groundwater level, which exceeds the 1m buffer zone as recommended by the SuDS manual and EA guidance. This will also ensure adequate protection is provided to underlying aquifers described in section 2, and, as already noted, the redevelopment of the site will improve the quality of water discharging to the aquifer by the removal of contaminated made ground.
- 6.15 Permeable paving will be included for car parking spaces provided for the apartment blocks. This will be lined to prevent infiltration into made ground but will provide water quality improvements prior to discharge via the central soakaway. The network will also utilise trapped gullies and silt traps in order to prevent blockages and siltation within the geocellular crates and will improve water quality.

Maintenance

- 6.16 All new surface water infrastructure would be designed in accordance with Building Regulations and best practice as appropriate.
- 6.17 The drainage system would remain under private ownership and be maintained by a management company. All drainage located within private areas will be the responsibility of the property owner or will be maintained by a private management company as appropriate.
- 6.18 Suitable maintenance regimes for SuDS, incorporating advice from system manufacturers and installers, will be developed by the site management company and implemented prior to occupation of the development. A summary of typical items to be included is given in Table 3.

Table 3: SuDS Maintenance Schedule

Drainage Feature	Inspection and Maintenance	Frequency
Permeable pavements	Brushing and vacuuming of surface to remove detrimental materials such as debris, dirt and sediment.	Annually
	Stabilise / mow adjacent verges, and remove weeds from pavement surface.	Occasional (as required)
	Ensure paving dewaters after rain and between storms: check joints for sedimentation; mechanically clean or jet wash and sweep surface free from silt, etc; refill joints with sealing grit.	As required
	Inspect and repair any rutting and cracked or broken blocks, and replace lost jointing material.	Occasional (as required)
	Rehabilitate surface and upper substructure.	Occasional (every 10-15 years)
Central Soakaway - geocellular storage tank*	Ensure inlets and pre-treatment structures are clear and free of debris.	Every 3 months
Hardstanding areas	Sweep regularly to prevent silt being washed off the surface.	Frequently
Gullies	Inspect and remove any sediment / debris.	Every 3 months
Silt Traps	Inspect and remove any sediment / debris.	Every 3 months

*Refer to manufacturer's guidance for specific maintenance instructions.

7.0 Summary & Conclusions

- 7.1 This report has been prepared by Glanville Consultants on behalf of Thakeham Client Ltd to accompany a Full planning application for the residential development of land at Cornfield Close, Littlehampton. This application is being progressed by Thakeham Client Ltd on behalf of the applicant Clarion Housing Association.
- 7.2 This site-specific Flood Risk Assessment has been prepared in accordance with the requirements of National and Local Planning Policy and concludes that the site is at low risk of flooding from all sources and can be developed safely without increasing flood risk elsewhere. This report has undertaken an assessment considering flood risk from all sources, including an allowance for climate change.
- 7.3 An intrusive investigation has been undertaken, which confirmed the feasibility of infiltration drainage techniques.
- 7.4 The proposed strategy strives to utilise sustainable drainage techniques in accordance with the guidance described in CIRIA C753 and employs a geocellular crate soakaway in the open public space on site, following removal of made ground. The strategy also utilises permeable paving in parking spaces provided for the apartment blocks.
- 7.5 Infiltration and attenuation features will provide storage for the 1 in 100 year + 40% climate change storm event without flooding from surface water and discharge volumes from the site will not increase as a result of the proposed development for all storm durations up to and including this event.
- 7.6 The proposed drainage strategy will direct surface water run-off generated on site to a soakaway, which will discharge flows by infiltration through clean soils, not made ground, and will therefore provide an improvement in water quality discharging to the underlying aquifer.

Conclusion

- 7.7 In conclusion, this report has demonstrated that the proposed residential development:
- is in accordance with the National Planning Policy Framework;
 - will not be at an unacceptable risk from fluvial flooding;
 - will not increase flood risk elsewhere; and
 - will employ a surface water drainage strategy based on the principles of sustainable drainage.
- 7.8 On this basis, the proposals are considered to fully comply with National, Regional and Local planning policy.

Appendices

Appendix A
Site Location Plan

NOTES

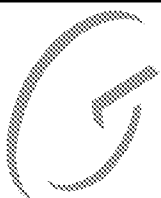
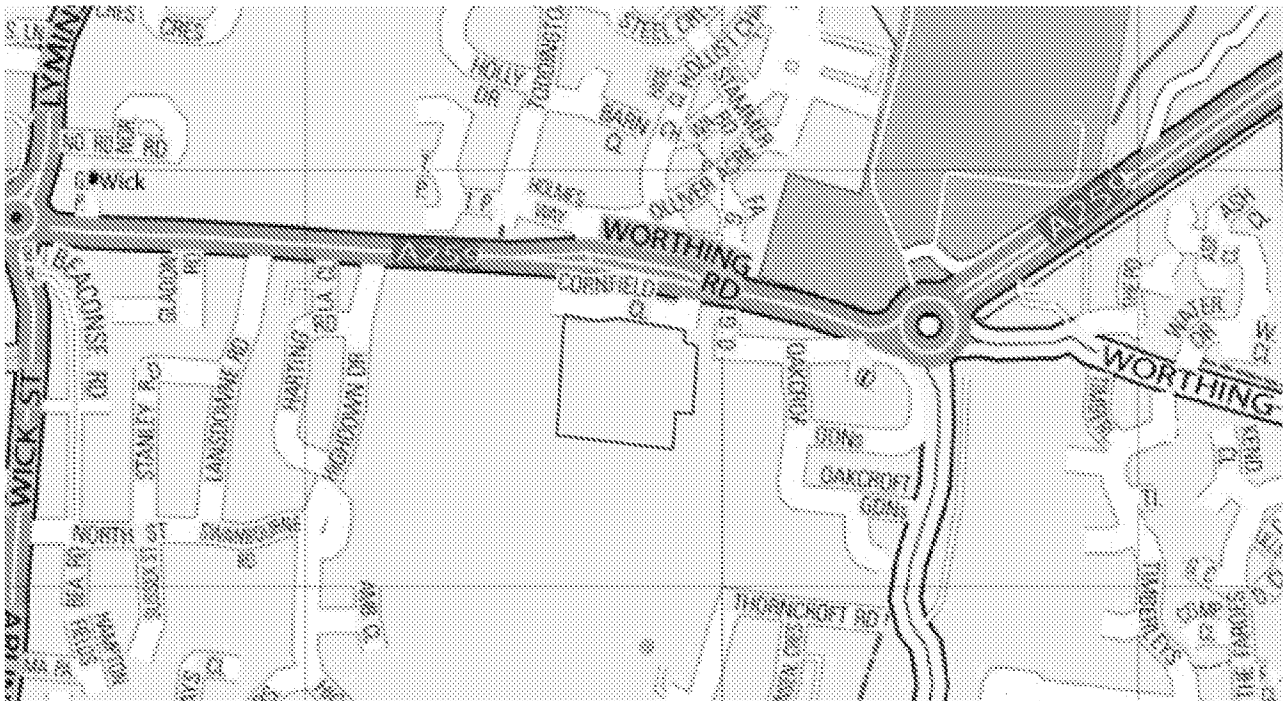
1. This drawing is to be read in conjunction with all other documents and specifications
2. Dimensions not to be scaled from drawing

LOCATION

Nearby postcode: BN17 6HY
Grid reference: Easting: 503368
Northings: 103254

KEY

Approximate site boundary —————



Glanville

Cornerstone House
62 Foxhall Road, Didcot
Oxon, OX11 7AD

Tel: (01235) 515550 Fax: (01235) 817798
post@glanvillegroup.co.uk www.glanvillegroup.co.uk

Project :

Land at Cornfield Close, Wick, Littlehampton, BN17 6HY

Title :

Site Location Plan

Project Engineer: C. Salt

Scale: NTS

Project Director : J. Birch

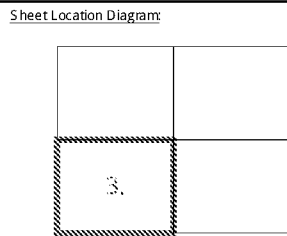
Date: Sep 2018

Drawing No.

8171223-SK01

Rev
P1

Appendix B
Topographical Survey



Symbols:

Service Pipe:  (Under Ground)

Manhole Inspection Number: 

Inlet:  Outlet: 

Control Station: 

Gates: Single  Double  Style 

Wet Marsh/Land: 

Bush/Tree: 

Tree: 

Tree (Multi-Stem): 

Tree (Coppice): 

Note: Tree heights are indicative

Building Levels

Ridge Level: 

Line Types:

Enhancement: 

Top of Right: 

Overhead: 

Telecom Line: 

Overhead Line: 

Drop & Hub: 

Contours: 

Hedge: 

Root Line: 

Filling: 

Tree Canopy: 

Fence: 

Change in Type/Height: 

Hatching

Building: 

Building Shell: 

Glass House: 

Note: Buildings and trees surveyed outside the boundary of the site in adjacent properties have been measured remotely; information shown is indicative

Notes:

The accuracy and detail shown in this drawing is dependent on the original specification. Sunline Survey Ltd. should be consulted before use of scales other than those stated.

This drawing provides position and description of features on the ground at the time the survey was undertaken. It does not imply any warranty or liability on the part of Sunline Survey Ltd.

Where boundary alignment lines are added to the survey drawing and are taken from legal documents or other information supplied they are done so within the constraints of drawing of legal documents. They are positioned on the basis of opinion and do not imply legal advice.

Detail required outside of the boundaries with no permission for access or partial entry of way will be surveyed and shown on the drawing. The use of the drawing is limited to the title. This also applies to areas within the site which have no access due to dense underground or unstable areas.

All care has been taken in the preparation of this drawing as discrepancies found should be reported to Sunline Survey Ltd. immediately.

Underground Services:

Where underground service information is shown, all care has been taken to comply to the original specification. Although Sunline Survey Ltd. has taken care in establishing the whereabouts of underground services the information shown on this plan is given without obligation or warranty, the accuracy and reliability cannot be guaranteed. No liability of any kind is accepted by Sunline Survey Ltd. or its agents for any error or omission.

All underground service information is gained from measurements within drainage channels, connections and alignments of piped assets are indicative. Where appropriate local information will be sought and used to confirm the position of services. The use of the drawing is limited to the title. The completeness and accuracy before undertaking any works, safe digging practices should be used.

Level Datum:
All levels relate to OS Newlyn datum using geoid model OSGM15 at C control Station A

Business Reply Address:
28 Cadogan Road, Bury St. Edmunds, Suffolk, IP33 3QJ
Tel: 01284 850255
Email: info@sunshinesurvey.co.uk
Web: www.sunshinesurvey.co.uk

Project Title: LAND AT CORNFIELD CLOSE LITTLEHAMPTON			
Client: THAKEHAM HOMES			
Description: TOPOGRAPHICAL SURVEY			
(5 sheet 3 of 4)			
Date	27-11-2017	Scale	1/200 @ A1
Job No.	GY4624	Surveyor	GY
Dwg No.	1/001	Drawn	GY

Appendix C

Geological Maps and Ground Investigation Report Extracts

KEY

Approximate site boundary

Bedrock Geology



Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation And Portsdown Chalk Formation (undifferentiated) - Chalk

Superficial Deposits



River Terrace Deposits (undifferentiated) - Sand, Silt And Clay

NOTES

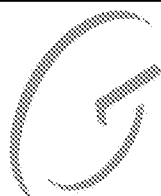
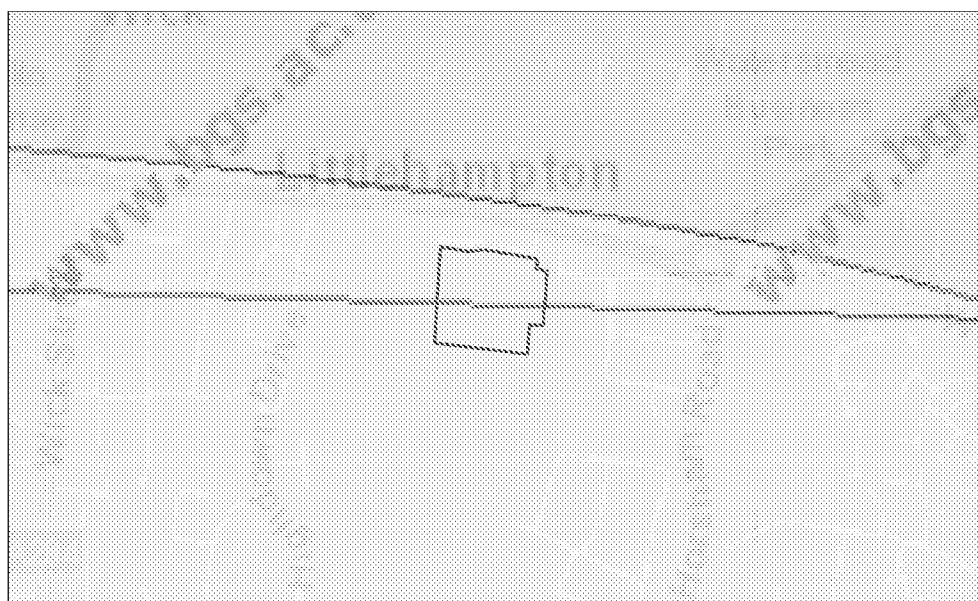
1. This drawing is to be read in conjunction with all other documents and specifications
2. Dimensions not to be scaled from drawing



Bedrock Geology



Superficial Deposits



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Project :

Land at Cornfield Close, Wick, Littlehampton, BN17 6HY

Title :

British Geological Survey Mapping Extract

Project Engineer : C. Salt

Scale : NTS

Project Director : J. Birch

Date : Sep 2018

Drawing No. 8171223 - SK05

Rev
P1