

**LAND AT BOLTON HALL
BOLTON-UPON-DEARNE
ROTHERHAM**

**FLOOD RISK ASSESSMENT
& OUTLINE DRAINAGE STRATEGY**



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EXECUTIVE SUMMARY

Scope and Background

This Flood Risk Assessment (FRA) has been undertaken by LK Consult Ltd (LKC) to support a planning application for the development of land at Bolton Hall, Bolton-Upon-Dearne, Rotherham. The development comprises Bolton Hall, a former nursing home within grounds of approximately 1.23ha.

LKC has prepared this Flood Risk Assessment (FRA) in line with the NPPF and Technical Guidance where appropriate.

In considering the proposals the following key principles have therefore been applied:-

- Identification of flood risks.
- Protection of users of the new development.
- No increased flood risk to third parties.

Consultations

The Environment Agency (EA) has been consulted to inform the preparation of this report. They have provided a more detailed flood map but no modelled data was available.

Barnsley Metropolitan Borough Council and Yorkshire Water were also consulted concerning flood risk.

All relevant consultees have confirmed that there is a negligible to very low risk of flooding to this study area from all sources.

Flood Risk

Environment Agency flood maps indicate that the nearest watercourse is the River Dearne, approximately 500m south of the study area. The study area is shown on the Environment Agency's (EA) website Flood Zone Mapping as being in Flood Zone 1 (PPG, Table 1) – Very Low Risk – annual probability of flooding less than 0.1% (1 in 1000).

At the maximum extent of the Flood Zone shown on EA mapping ground levels are approximately 20m below study area levels.

The EA Surface water flood map shows that the study area is at very low risk from surface water flooding, with the exception of a small area of high flood risk (1 in 30 years), up to a depth of 300mm, which corresponds with a minor depression in the topography.

Mitigation

Design

Study area falls should be arranged to allow reasonably level access for occupants and visitors and allowing the study area to be free-draining in case of local ponding at times of heavy rainfall. Floor levels of dwellings will be set as high as possible above the flood level giving regard to necessary access for the less-able.

The development will not result in any reduction in flood plain storage compared to the existing situation.

In considering the potential drainage options for the study area at present it is assumed that surface water runoff arising from the development will discharge into the existing surface water sewer in Carr Head Lane.

The proposed development will marginally increase the proportion of the study area covered by impermeable surfaces and will therefore generate more runoff. Attenuation will therefore be required.

The outline drainage strategy considers the use of attenuation based SuDS to be feasible with a discharge to surrounding surface water sewers. Therefore the most effective strategy, in line with the SuDS management train, would be to have a sub-surface storage tank to facilitate drainage to the external surface water sewerage system. The required storage has been estimated to be between **98.1 m³** and **126.9 m³** for the 1 in 30 year greenfield flow restriction.

Similarly the estimated volume to be retained on the study area for the 1 in 100 year storm event including the allowance for climate change is between **169.1 m³** and **270.0 m³**.

The study area is considered to be at very low risk of flooding. It is recommended that the minimum finished floor levels for the development should be set at a nominal height above the proposed ground levels. This is to allow for overland flow during exceedance flows from an extreme event or a drainage failure.

Access

Access close to the study area is elevated above potential flood levels and will always provide safe access to and from the study area from Carr Head Lane.

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1 INTRODUCTION

1.1 Background

LK Consult Ltd (LKC) were commissioned to carry out a flood risk assessment (FRA) and outline drainage design by HC Development Co. 3, Ltd. The report was undertaken in support of a planning application to redevelop the study area for residential use.

The report will address the vulnerability to flooding from all possible sources and will also consider the impact of the development on surface water runoff accounting for climate change and the potential to increase flood risk elsewhere. The Outline Drainage Strategy in Section 5 will provide an overview of the SuDS techniques which could be considered on the study area. The issues of actual flood risk are discussed in Section 4.

Government policy with respect to development in flood risk areas is contained within the Department of Communities and Local Government National Planning Policy Framework¹ and accompanying Technical Guidance of March 2012 (revised to the Planning Practice Guidance (PPG)², which supersedes Planning Policy Statement 25 (PPS25) 'Development and Flood Risk'. The guidance on Climate Change allowance issued by the Environment Agency in February 2016 has also been considered.

LKC has prepared this Flood Risk Assessment (FRA) in line with the NPPF and the PPG where appropriate. The level of detail entered into in any flood risk assessment is dependent upon the scale and potential impact of the proposed development, and the vulnerability classification of the proposed land-use.

1.2 Study Area Details

A summary of the general study area details is presented in Table 1-1. Plans, Drawings and Figures are provided in Appendix A. Appendix B includes further information pertinent to the study area and the proposed development.

Location	South of Carr Head Lane, to the southeast of St Andrews Square, Bolton-upon-Dearne, S63 8DA Centred at approximate National Grid Reference 445050E, 402710N.
Area	1.23 Ha
Topography	40 metres above ordnance datum (AOD). The study area is on a ridge with slight falls from north to south.
Current Land Use	<u>Study area</u> Currently occupied by a disused, derelict nursing home. Concrete ground along road leading up to and including the southern area of the study area. Grassed areas cover the remainder of the study area, with trees along the study area boundary. <u>Surrounding Area</u> The surrounding area is predominately residential with commercial activity to the north and a park to the south.
Proposed Development	Residential dwellings with associated gardens, soft landscaping and car parking.

Table 1-1: Summary of study area details for land at Bolton Hall, Bolton-Upon-Dearne, Rotherham

¹ National Planning Policy Framework, Department of Communities and Local Government, March 2012.

² Planning Practice Guidance, Flood Risk and Coastal Change, 2015.

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2 STUDY AREA SETTING

2.1 Vulnerability

As an initial phase in identifying whether a study area is potentially at risk of flooding, LKC has consulted the Environment Agency's (EA) website Flood Zone Mapping. This mapping is (often) based on coarse scale modelling and provides only an initial indication of the flood risk to a study area. The Environment Agency Flood Zone maps were developed using a very coarse Digital Elevation Map (DEM) and are superseded by a more detailed analysis of modelled flood levels and topographic survey levels.

The Flood Zones divide the floodplain into three categories of flood risk, and do not take flood defences into account. The NPPF defines the Flood Zones as:-

- Flood Zone 1 – little or no risk, with annual probability of flooding from rivers and the sea of less than 0.1% (1 in 1000).
- Flood Zone 2 – low to medium risk, with annual probability of flooding of 0.1 to 1.0% from rivers and 0.1 to 0.5% from the sea.
- Flood Zone 3 – high risk of flooding with an annual probability of flooding of 1.0% or greater from rivers, and 0.5% or greater from the sea.

The Flood Zone Mapping indicates the study area as being within Flood Zone 1 (PPG, paragraph 065, Table 1).

The development study area is over 1 hectare in size, so under current regulations a Flood Risk Assessment will be necessary to accompany the Planning Application.

The proposed development is for residential end use and this is classified within the 'More Vulnerable' category (PPG, paragraph 066, Table 2).

2.2 The Sequential and Exception Tests

The NPPF does not require that the Sequential Test be applied to development proposals in Flood Zones 1. Since the study area has been shown to be located in Zone 1 for flood risk (see section 3.5), a sequential approach should not be required for planning.

However, the principles should still be applied for developments within the study area such that, for example, dwellings are situated on a high part of the study area when there is a risk of local surface water flooding. The issues of actual flood risk are discussed below. The issues of safety and reduction in flood risk to others required by an Exception Test are also addressed in this document.

The Local Planning Authority (LPA) will make the final decision with regard to any planning application.

2.3 Environmental Setting

LKC have previously undertaken a Preliminary Risk Assessment for the study area (LKC 16 1223, June 2016³) and pertinent environmental information for the study area is provided in Table 2-1 below.

³ Preliminary Risk Assessment, June 2016, LKC.

Summary of Environmental Setting		
Geology	Superficial	None recorded.
	Bedrock	Mexborough Rock – Sandstone.
	BGS Boreholes	Ref. SE40SE176, 110m NE identified topsoil to 0.91m, sandy clay to 1.27m and weathered sandstone to 1.42m. Ref. SE40SW442, 443m NW identified topsoil to 0.3m, clay to 0.4m and weathered sandstone to 2.0m. Ref. SE40SE168, 291m SE identified topsoil to 0.3m, clay to 1.1m and mudstone to 3.1m.
Hydrogeology	Superficial	Not applicable.
	Bedrock	Secondary A
Hydrology	All adjacent and internal surface water	Nearest watercourse: River Dearne, approximately 500m SW of study area.
Study area History	The original Bolton Hall is seen on historical maps from 1854-55. Between 1930-1956 it is listed as a social club, and between 1988 and 2000 was demolished and replaced by the existing building. From 1855 to 1938, the surrounding land appears to be largely agricultural; although extensive residential developments occurred on this land between 1938-1988.	

Table 2-1: Environmental setting for land at Bolton Hall, Bolton-Upon-Dearne, Rotherham

2.4 Study area Reconnaissance

Bolton Hall is a disused nursing home, which is currently a derelict study area. The study area covers an area of approximately 1.23ha. The building, along with a concrete carpark and driveway, is surrounded by an overgrown grassy area planted with individual trees. The study area slopes approximately 2m from the north to the south boundary.

A series of manholes immediately south of Bolton Hall were identified, aligned in a south-easterly direction. During the study area visit, these were inaccessible and the exact outfall is unclear; however, a pumping system may be possible if the existing outfall is deemed to be impractical.

The study area is surrounded by residential properties to the North, East and West, and Public Open Space immediately to the south.

2.5 Study area and Access Levels

A topographic survey of the study area has been undertaken to OS GPS datum, and information is included on the drawings in Appendix A. Overall the study area falls approximately 2m between the northern and southern boundaries, there is a high point 30m from Carr Head Lane. The final study area levels and ground floor levels of dwellings have not yet been determined. The proposed access would join Carr Head Lane at the existing location at around 40mAOD.

3 CONSULTATIONS

Information from consultees (Environment Agency (EA), Barnsley Metropolitan Borough Council, Yorkshire Water) is summarised in Table 3-1 below.

Relevant correspondence / information is provided in Appendices C (EA) and D (others).

Source	Details	
Environment Agency	Flood Zone 1: little or no risk, with annual probability of flooding from rivers and the sea of less than 0.1% (1 in 1000).	
	Modelled Levels for River Dearne	No information received / available.
	Records of Flooding	No information available.
	Records of Flood Warning Service	No information available.
	Surface Water Flooding	Very low risk of surface water flooding up to a depth of 300mm
	Flooding from reservoirs	No risk from reservoirs
	Groundwater Source Protection Zone	Not within Source Protection Zone.
Barnsley Metropolitan Borough Council	Possible or known incidents of highway or other flooding	No information provided at time of writing the assessment.
Yorkshire Water	Likely conditions for connecting into their sewerage system	They would request conditions for a separate system with only foul draining to foul / combined sewers and surface water draining to soakaway/SuDS, watercourse or surface water sewer. With flows restricted to greenfield runoff rates equivalent to 'Q _{bar} ' (Mean annual flow rate).
	Sewer map	Surface water sewer running parallel to the study area's boundary along Carr Head Lane.
Level 1 Strategic Flood Risk Assessment (SFRA) ⁴	History of fluvial flooding at Bolton-Upon-Deane, 1909 and 2007. No records of flooding at Bolton Hall study area.	
Preliminary Flood Risk Assessment (PFRA) ⁵	The Preliminary Flood Risk Assessment (PFRA) ⁵ for the area indicates that there was flooding for the Bolton-Upon-Deane in 2007, which conforms with information supplied by the EA, although there are no records of flooding from any source at the Bolton Hall study area.	

Table 3-1: Summary of available information for land at Bolton Hall, Bolton-Upon-Deane, Rotherham

⁴ Strategic Flood Risk Assessment Level 1: Barnsley Metropolitan Borough Council (2010), JBA Consulting.

⁵ Preliminary Flood Risk Assessment. Barnsley Metropolitan Borough Council (2011)

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4 ASSESSMENT OF FLOOD RISK

4.1 Flood Zones

The detailed flood map provided by the EA indicates that the study area is in Flood Zone 1 (see Appendix C).

The EA did not have any relevant modelled levels for the stretch of the River Dearne closest to the study area. Therefore the comparison data was extracted by comparison with the flood map extents and the available topographical data provided for this study area to provide the 100-year and 1000-year plus climate change levels.

The extents of the 0.1% (1000-year) flood extents remain outside of the development area.

4.2 Sources of flooding

The risk of flooding from the following flood sources has been considered:

Fluvial – The EA has confirmed the study area is within Flood Zone 1. At the maximum extent of the Flood Zone shown on EA mapping ground levels are approximately 20m below study area levels. Therefore, the flood risk associated with this source is considered very low.

Tidal – The study area is remote from the sea and tidally influenced water bodies. Therefore, the flood risk associated with this source is considered negligible.

Pluvial (Rainfall) – If there was a drainage failure causing overland flow it would flow towards the southern boundary. No areas of shallow standing water were observed during the study area visit. Therefore, the flood risk associated with this source is considered very low.

Surface Water (Overland flow) – Carr Head Lane is served by a positive drainage system. Any surface water arising from the north of the study area is likely to be intercepted by the highway drains and therefore pose no threat to the development. There are no identified impermeable areas at a higher elevation than the study area, and therefore no source of overland flow for surface water. Therefore the flood risk associated with surface water is considered very low.

Groundwater – The BGS shows a limited potential for groundwater flooding for the study area. Superficial clay deposits or weather bedrock or mudstone is present in the study area which would make it unlikely for groundwater flooding to occur. No evidence of shallow groundwater was observed during the walkover. Therefore, the flood risk associated with this source is considered very low.

Sewers – Water Company sewer records show foul and surface water sewers within the vicinity of the study area within the surrounding housing developments. The highway drains to the north of the study area would intercept any overland flow before it enters the study area. Therefore, the flood risk associated with this source is considered very low.

Artificial sources – According to the EA online maps, the study area is not at risk from reservoir flooding. Therefore, the flood risk associated with artificial sources is considered negligible.

4.3 Summary of Flood Risk

Source of Flooding	Risk assessment Level
Fluvial	Very Low
Pluvial (Rainfall)	Very Low
Surface Water	Very Low
Tidal	Negligible
Groundwater	Very Low
Sewers	Very Low
Artificial Sources	Negligible

Table 4-1 Summary of Existing Risk Level for land at Bolton Hall, Bolton-Upon-Deane, Rotherham

The study area is located within Flood Zone 1, and a negligible to very low risk of flooding from all sources has been identified for the study area. LKC therefore consider that a strategy for surface water management will be required at the study area to mitigate any increases in risk. The assessments of a range of measures that are feasible for the study area are outlined in Section 5.

5 SURFACE WATER MANAGEMENT

The NPPF recognises that flood risk and other environmental damage can be managed by minimising changes in the volume and rate of surface run-off from development study areas through the use of Sustainable Drainage Systems (SuDS), this being complementary to the control of development within the floodplain.

SuDS will not alleviate flooding in an area prone to flooding; however, properly designed SuDS have the potential to prevent the surface water runoff from new development worsening the flood risk. The effective disposal of surface water from development is a material planning consideration in determining proposals for the development and use of land.

The accepted principles are that surface water arising from a developed area should, as far as practicable, be managed in a sustainable manner to mimic the surface water flows arising from the study area prior to the proposed development, while reducing the flood risk to the study area itself and elsewhere, taking climate change into account.

The Building Regulations Requirement H3⁶ stipulates that rainwater from roofs and paved areas is carried away from the surface to discharge to one of the following, listed in order of priority:

- a) an adequate soakaway or other adequate infiltration system,
- b) a watercourse or, where that is not practicable,
- c) a sewer.

The concept of a sustainable drainage system (SuDS) has been incorporated into the outline drainage strategy for the study area in order to comply with the Flood and Water Management Act 2010⁷.

5.1 Infiltration

The Groundwater Source Protection Zone mapping from the EA webstudy area shows that the study area is not within any identified protection zones.

British Geological Society superficial soils and bedrock aquifer classification supplemented by local records:

Classification	Description	Aquifer Description	Recorded Water Table Depth	Soakaway Potential
Superficial Clay deposits (surrounding boreholes)	Silty, sandy gravelly clay with sand lenses.	None	No water strike	Poor
Mexborough Rock	Sandstone	Secondary A	N/A	Good

Table 5-1 – Geological and Hydrogeological Setting for land at Bolton Hall, Bolton-Upon-Dearne, Rotherham

Due to possible ground conditions, infiltration methods such as shallow soakaways may not be feasible, but this may be investigated further for the detailed design if required.

⁶ Building Regulations: UK Government; 2010.

⁷ Flood and Water Management Act: UK Government; 2010.

There is a slope over the study area and surrounding area which indicates that groundwater in the vicinity of the study area would drain towards the south.

There is a surface water sewer running adjacent to the study area in Carr Head Lane.

5.2 Surface Water Drainage Strategy

The drainage options relating to the final discharge of surface water for this section of the study area are listed in Table 5-2 in order of priority within the NPPF:

Option No:	Drainage Solution	Most feasible solution	Comments
a	Soakaway/Infiltration	2	Reasoning: Low permeability of shallow deposits. Presence of superficial clay would be restrictive.
b	Connection to Watercourse.	N/A	Would require third party access, a road crossing and EA consent, and would be expensive due to distance between study area and watercourse.
c	Discharge into a sewer.	1	There are existing drains within the study area serving Bolton Hall. The drain is shown as outfalling towards the southern boundary, but its route and condition are unknown. There is a surface water sewer to the north of the study area at Carr Head Lane.

Table 5-2: Drainage options for land at Bolton Hall, Bolton Upon Dearne, Rotherham

Table 5-3 provides a summary of the SuDS options appraisal with consideration of CIRIA C697 (The SUDS Manual)⁸ for the development:

SuDS Option	Appropriate to Development	Comments
Soakaways	X	Due to the nature of the ground conditions, the use of infiltration systems may not be feasible.
Infiltration basin	X	Depressions that store and dispose of water via infiltration. May be appropriate given the ground conditions.
Sand filter	X	Treatment devices using sand beds as filter media.
Filter strip	X	Engineered filters that use vegetation to remove and treat runoff. The filter strip is sloped to allow sheet flow across the vegetated strip. A filter strip offers no storage and is used solely to remove pollutants from surface water.
Filter drains	X	Linear trenches filled with a permeable granular material, often with a perforated pipe in the base of the trench.
Detention basin	✓	Dry depressions designed to hold water for a specific retention time.
Swales	✓	Swales are shallow grass-lined channels that provide capacity for conveying flows at a controlled rate into ponds and watercourses.
Rain water harvesting	*	Rainwater harvesting collects the rain which falls onto roofs, then stores it in a tank until required for a non-potable use. When required, the water is pumped to the point of use, thus displacing what would otherwise be a demand for mains-water. In the process, a volume of water is kept out of the storm-water management system, thereby helping to reduce flooding risks. Rainwater harvesting systems are currently not included in the development proposals.
Green roofs	*	Green roof installations can help to reduce surface water runoff from roof areas depending on the system specified. Green roofs are not currently included in the development proposals.
Geo-cellular storage systems	✓	Modular block systems can be used to provide an underground storage facility. Any geo-cellular storage systems should be lined with a geo-membrane to provide attenuation storage.
Permeable Pavements – with granular and geo-cellular storage systems	✓	Permeable pavements allow inflow of rainwater into underlying construction. Any geo-cellular storage systems would have to be lined with an impermeable membrane to provide storage rather than infiltration for runoff from highways.
Ponds	✓	Attenuation ponds can be used to offset the increase in surface water flows attributable to increased area of hard standing, in order to minimise the risk of flooding to and from the proposed development. Ponds will attenuate the surface water flow prior to discharging to the public surface water sewers. The storage volume afforded by these features should not include any permanent water in the pond.
Oversized Pipes	✓	Oversizing the pipes that make up the on-study area drainage network is a cost effective method for providing attenuation storage within the network. Such systems could be considered on the parts of the development where gradients are relatively flat.
Tanks	✓	Prefabricated underground tanks could be considered at the detailed design stage in order to provide storage to attenuate surface water runoff.
Flow control devices	✓	The peak flow rates will be controlled by flow control devices e.g. hydrobrake style flow control systems, and restricted orifices. Flow control devices enable the discharge to be restricted to a constant rate from the development.

Table 5-3: Summary of the SuDS options appraisal for land at Bolton Hall, Bolton-Upon-Dearne, Rotherham

✓ Suitable for use given the nature and scale of the development

* Possibly suitable for use – not included in the client and architect design proposal at present

X Not suitable

⁸ CIRIA C697 - The SUDS Manual. London 2015

5.3 Surface Water Attenuation Requirements

From correspondence with the EA that the flow should be limited to a 'greenfield scenario' for estimating the attenuation volumes required. It is estimated from the supplied plan (see Appendix A) that the study area will have the following designated areas (Table 5-4).

Designated Areas	Plot Area (ha)
Total area	1.23
Developable Area	1.23
Impermeable split	0.68
Permeable split	0.55

Table 5-4: Assumed plot areas for land at Bolton Hall, Carr Head Lane, Bolton-Upon-Deerne.

Table 5-4 shows the assumed split in area included within the calculations.

5.3.1 Infiltration Storage Estimate

Data from surrounding boreholes suggests that the shallow soil is largely clay-based, and as such may be suitable for infiltration-based drainage methods. However, this can be investigated further at the detailed design stage.

5.3.2 Attenuation Estimate

Surface water storage and Greenfield Runoff estimations based on the HR Wallingford procedure (IH 124⁹) and the ADAS 345 method¹⁰ have been undertaken for the development and the output report is presented in Appendix E.

The methods of calculation use different variables and parameters to estimate Q_{bar} . The IH124 method which is commonly used for these calculations does not take into account the slope of the study area or vegetation coverage. It can often underestimate the value for Greenfield runoff, if these are particularly relevant to the plot. The ADAS method was used for many years as the basis for the Greenfield runoff calculations, and was tested mostly for calculating flows from sloping study areas; but it had a lower database of test study areas.

For the contributing catchment an estimate has been produced with the conservative assumption that 55% of the developed area comprises roofs and hard surfacing with an allowance for urban creep, and the resulting impermeable area would be 0.68ha. This gives the following runoff rates and attenuation requirements for this section based on the Wallingford IH 124 method:

- Q_{bar} : **4.15 l/s**
- 1 in 1 year greenfield runoff rate: **3.52 l/s**
- 1 in 30 year greenfield runoff rate: **6.97 l/s**
- 1 in 100 year greenfield runoff rate: **8.72 l/s**

Alternatively the ADAS 345 Report provides increased estimations from the IH 124 method below:

- Q_{bar} : **7.21 l/s**
- 1 in 1 year greenfield runoff rate: **5.83 l/s**
- 1 in 30 year greenfield runoff rate: **12.61 l/s**
- 1 in 100 year greenfield runoff rate: **16.39 l/s**

⁹ IH124 Flood Estimation of Small Catchments

¹⁰ The Agriculture and Development Advisory Service report 345

All Greenfield runoff estimates and subsequent storage estimates are included in Appendix E.

The following attenuation has been estimated for the development using Greenfield runoff rates and utilises the FSR methodology¹¹ as:

- Attenuation storage volume: **126.9 m³** (1 in 30 year event)
- Retention on study area volume: **237.0 m³** (1 in 100 year + 20% Climate Change)
- Retention on study area volume: **270.0 m³** (1 in 100 year + 40% Climate Change)

The following attenuation has been estimated for the development using ADAS 345 Greenfield runoff rates and utilises the FSR methodology as:

- Attenuation storage volume: **98.1 m³** (1 in 30 year event)
- Retention on study area volume: **169.1 m³** (1 in 100 year + 20% Climate Change)
- Retention on study area volume: **211.2 m³** (1 in 100 year + 40% Climate Change)

Attenuation storage aims to limit the peak rate of runoff from the development to the corresponding greenfield runoff for a range of annual flow rate probabilities before discharge to watercourse. As the flow from the development would be restricted to the greenfield equivalent there should be little change in the flows that enter the unnamed watercourse and thus the risk of flooding and the level of erosion created as a result from the development should be negligible.

The attenuation required for a 1 in 30 year storm event, requires a storage volume of between **98.1 m³** and **126.9 m³** and for the 1 in 100 year event, a capacity of between **169.1 m³** and **270.0 m³** will be required from on-study area retention as well as SuDS systems. All volumes can be stored within the study area boundary and discharges will be limited by flow control devices to the on-study area drainage.

The use of permeable paving may be viable dependant on the detailed design of the proposed development. If this drainage technique is considered to be feasible then it will reduce the requirement for attenuation as it will reduce the contributing area.

Assuming that the outline drainage strategy is acceptable to the Local Authority, a more detailed design can be presented and agreed with the appropriate regulatory bodies.

¹¹ Flood Studies Report Wallingford NERC 1975

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6 MITIGATION MEASURES

6.1 Proposed Study area levels and Development Level

Current Environment Agency guidance recommends that the minimum ground floor levels of residential developments are set at a nominal height above the 1% annual probability (1 in 100year) flood level including an additional fluvial allowance for climate change. It is generally accepted that vehicle parking can be accommodated within the flood zone with suitable safeguards. The 'design' flood level for the study area should therefore be the 1% annual probability event with allowance for climate change.

6.2 Safe Access

Safe and dry access is available via Carr Head Lane (40mAOD) to the North, approximately 20m above the highest elevation extent of the 1% annual probability event. Therefore no mitigation is proposed.

6.3 Flood Resistance and Resilience

The development proposed may be subject to flooding at more extreme events than those considered. However the risk appears to be sufficiently low that flood resilience measures need not be included into ground floor construction to aid recovery after any event. If utilised, typical measures would include solid floors, use of suitable materials and services fed from upper floors with outlets at high level. The need can be discussed and agreed with building control officers during detailed design.

6.4 Residual Risks

It is impossible to completely guard against flooding since extreme events greater than the design standard event are always possible. However, it is likely that with the 1% annual probability flood event with allowance for climate change significantly below the lowest study area levels, the relatively elevated position of the development will safeguard it from localised fluvial flooding during extreme rainfall events and fluvial flooding events outside the scope of this assessment. However, ground floor levels should be set above proposed levels across the study area and provide a nominal freeboard to allow overland flow under exceptional conditions. Overland flow routes should be considered in case of drainage failure and the extreme events.

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7 CONCLUSIONS

The study area is shown on published mapping to be located within the Environment Agency's Flood Zone 1. Comparison of topographical data with the EA modelled flood level data indicates that the whole study area is in Flood Zone 1 – low risk of flooding.

Risks of flooding from other sources have been identified as either very low or negligible from information provided by the EA.

The existing study area drainage outfalls into an unadopted drain behind Bolton Hall, the onwards route and conditions of this drain has not been determined.

An assessment of these risks in conjunction with the development proposals have resulted in the following recommendations for the safe development of the study area:

- The finished floor level should be set at a nominal height above the finished ground levels to allow for overland flow routes in extreme events and drainage failures.
- Pedestrian and vehicular safe access to and from the study area is achievable under all conditions via the access road off Carr Head Lane.
- Surface water flow will probably need to be attenuated to a rate agreed with Yorkshire Water.
- Surface water arising from the study area could potentially discharge into a surface water sewer. In Carr Head Lane, it would require pumping from the lower areas of the study area.
- There is potential for use of a storage tank for rainwater disposal; however this should be investigated further at the detailed design phase.
- A formal evacuation plan is not considered necessary.

Further details on the proposed mitigation measures are provided in Section 6. All proposed measures should be agreed with the Local Authority prior to commencement of the development.

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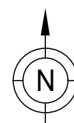
APPENDIX A

FIGURES, PLANS, AND DRAWINGS



Figure 1: Site Location Plan, Bolton Hall, Rotherham

Drawn: June 2016 Scale: 1:25,000 @ A4 (see scale bar)



KEY



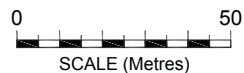
Site Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



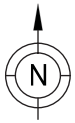
Client:			
HC Development Co 3 Ltd			
Site:			
Bolton Hall, Rotherham			
Title:			
Site Boundary Plan			
Job No:	Scale (See Scale Bar)	Figure:	Revision
LKC 16 1223	1:1250 @ A4	2	
Drawn By:	Checked By:	Drawn:	
AC	AT	Jul 2016	

Extract from: H.M. Land Registry
Drawing Ref: Ordnance Survey Plan, Title No. SYK150054 (March 2016)



APPENDIX B

STUDY AREA INFORMATION



KEY

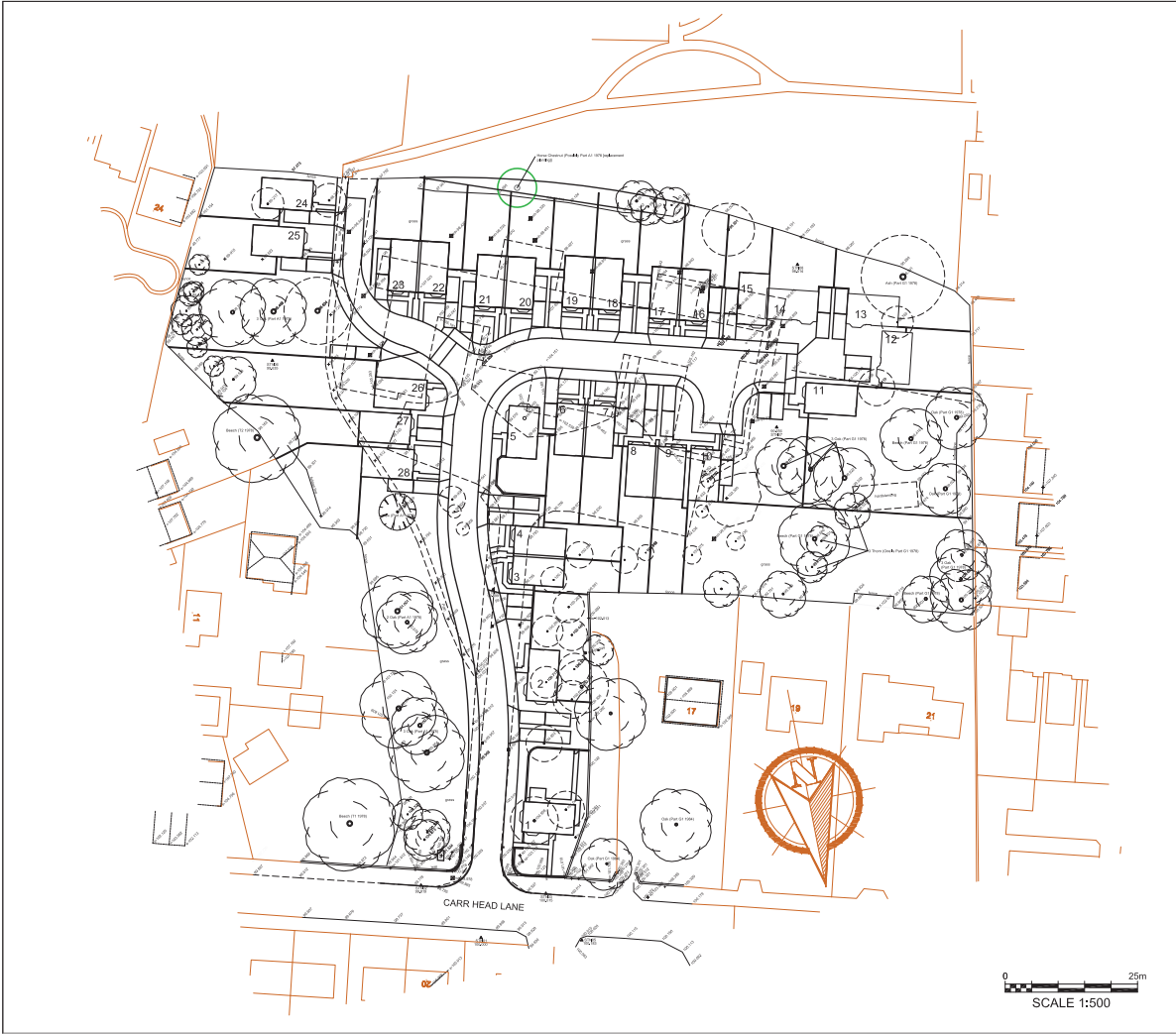
 Site Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client:			
HC Development Co 3 Ltd			
Site:			
Bolton Hall, Rotherham			
Title:			
Proposed Site Use			
Job No:	Scale (See Scale Bar)	Figure:	Revision
LKC 16 1223	1:1000 @ A4	3	
Drawn By:	Checked By:	Drawn:	
AC	AT	Jul 2016	

Extract from: Howard and Seddon Architects Preliminary Proposed Site Plan
Drawing Ref: 12387 201 Rev. C



NOTES

ALL DIMENSIONS TO BE CHECKED ON SITE PRIOR TO ANY MANUFACTURING OR FABRICATION AND ANY ANOMALIES TO BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

LEGEND

28no DWELLINGS:-

2 1/2 Storey

4 bed dwellings

200% parking

SUBJECT TO LA APPROVAL

C	TREE CONSTRAINTS ALTS TO LAYOUT	BLW	13.06.16
B	TREE CONSTRAINTS ALTS TO LAYOUT	BLW	10.06.16
A	FIRST ISSUE		27.04.16
REV	AMENDMENTS	BY	DATE

PROJECT

PROPOSED DEVELOPMENT
BOLTON HALL NURSING HOME
CARR HEAD LANE
ROTHERHAM
S63 8DA

CLIENT

MR ANDY HALL

DRAWING TITLE

PRELIMINARY
PROPOSED SITE PLAN

DRAWN	BLWORTHINGTON	DATE	27.04.16
CHECKED		SCALE	1:500 (A2)
APPROVED			

HOWARD & SEDDON A.R.I.B.A.
CHARTERED ARCHITECTS
64 WASHWAY ROAD,
SALE, CHESHIRE M33 7RE.
TEL No. 0161 - 973 9296
FAX No. 0161 - 962 3485
e-mail : admin@howardandseddon.co.uk

JOB No.	12387	DRG No.	201	REVISION	C
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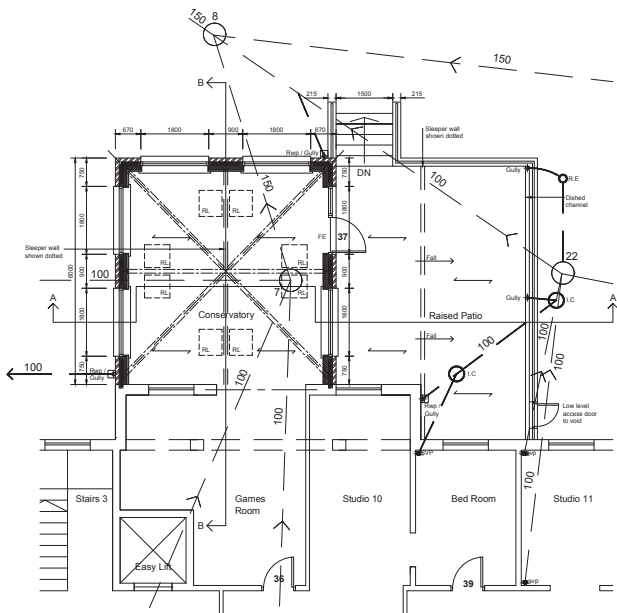
Proposed West Elevation 1:100



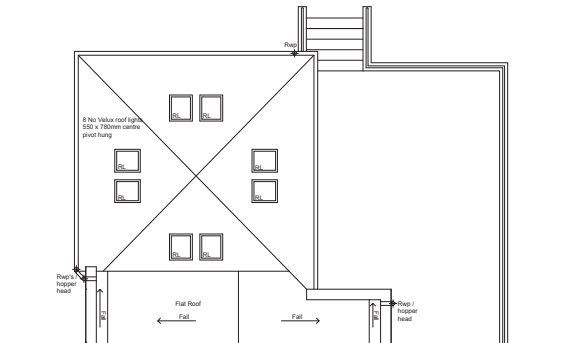
Proposed South Elevation 1:100



Proposed East Elevation 1:100



Proposed Part Floor Plan 1:50



Proposed Roof Plan 1:50

□ All Original Sheet Size
Actual Size 50mm 75mm 90mm
Revision

20 Bolton House

Client
Bolton Hall Care Home

Drawing
Proposed Conservatory
Plans & Elevations

Scale/Date/Drawn/CHK
1:50 1:100 / 09.07.2015 / RR

CSM+
ARCHITECTS

1 Boyd Street
2nd Floor
Newcastle upon Tyne
NE2 1BP
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Web Site www.csmanarchitects.co.uk

4373

/ 15

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	WMGR	Infilled Ground	Artificial Deposit	Cenozoic - Cenozoic
	WGR	Worked Ground (Undivided)	Void	Holocene - Holocene
	MGR	Made Ground (Undivided)	Artificial Deposit	Holocene - Holocene

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay and Silt	Flandrian - Flandrian
	TILMP	Till, Mid Pleistocene	Diamicton	Ipswichian - Cromerian

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MXR	Mexborough Rock	Sandstone	Bolsovia - Bolsovia
	AR	Ackworth Rock	Sandstone	Bolsovia - Bolsovia
	PUCM	Pennine Upper Coal Measures Formation	Mudstone, Siltstone and Sandstone	Westphalian D - Bolsovia
	PUCM	Pennine Upper Coal Measures Formation	Sandstone	Westphalian D - Bolsovia
	PMCM	Pennine Middle Coal Measures Formation	Mudstone, Siltstone and Sandstone	Bolsovia - Duckmantian
	PMCM	Pennine Middle Coal Measures Formation	Sandstone	Bolsovia - Duckmantian
	OR	Oaks Rock	Sandstone	Duckmantian - Duckmantian
		Faults		
		Rock Segments		



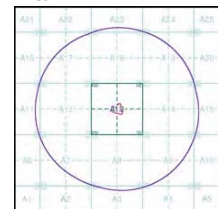
Geology 1:50,000 Maps

This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps. The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID: 1
Map Sheet No: 087
Map Name: Barnsley
Map Date: 2008
Bedrock Geology: Available
Superficial Geology: Available
Artificial Geology: Not Available
Faults: Not Supplied
Landslip: Available
Rock Segments: Not Supplied

Geology 1:50,000 Maps - Slice A



Order Details:

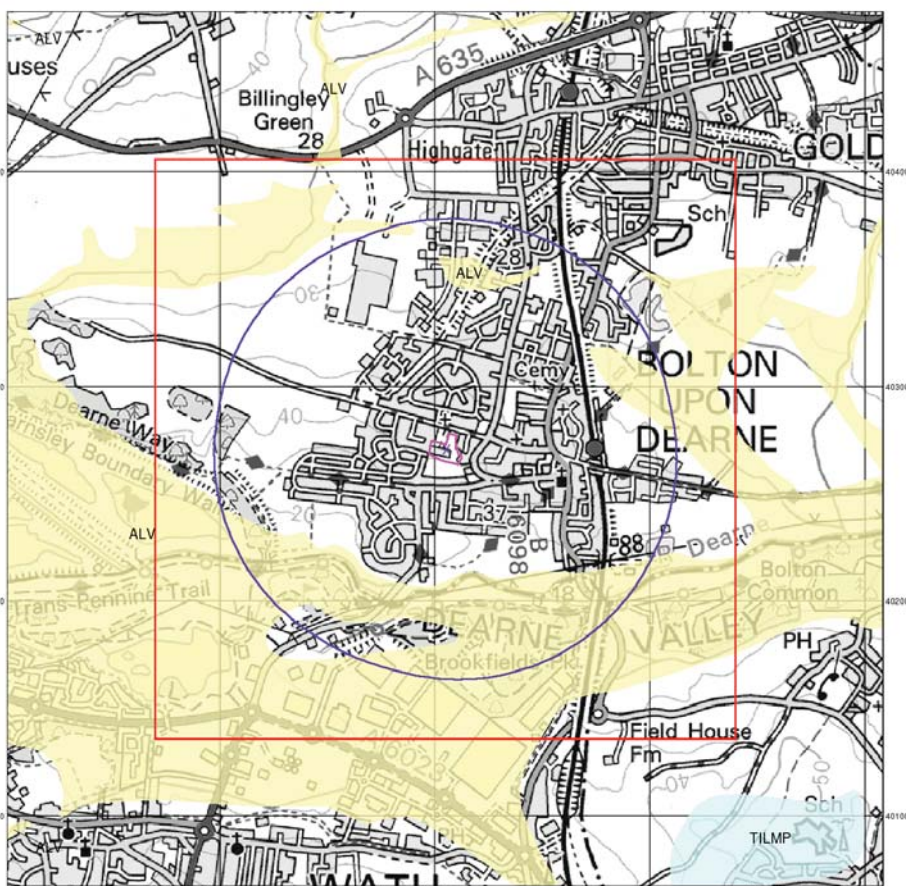
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Customer Reference: LKC 16 1223
National Grid Reference: 445050, 402710
Slice: A
Site Area (Ha): 1.23
Search Buffer (m): 1000

Site Details:

Carr Head Lane, Bolton-upon-Deame, Rotherham, S63 8DA



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.emercheck.co.uk



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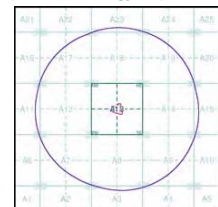
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



Order Details:

Order Number: 89063416_1_1
 Customer Reference: LKC 16 1223
 National Grid Reference: 445050, 402710
 Slice: A
 Site Area (Ha): 1.23
 Search Buffer (m): 1000

Site Details:

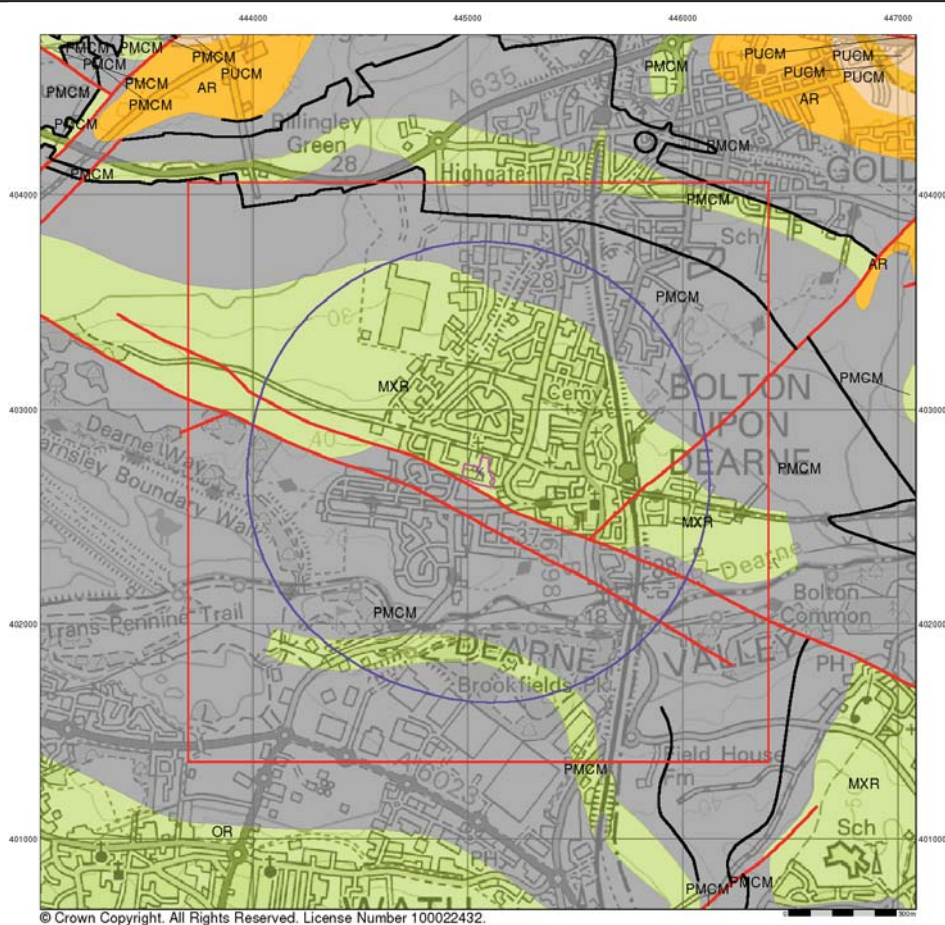
Carr Head Lane, Bolton-upon-Deane, Rotherham, S63 8DA



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v15.0 20-Jun-2016

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Bedrock and Faults

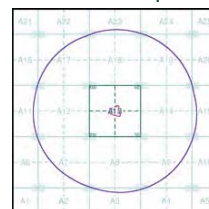
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A



Order Details:

Order Number: 89063416_1_1
Customer Reference: LKC 16 1223
National Grid Reference: 445050, 402710
Slice: A
Site Area (Ha): 1.23
Search Buffer (m): 1000

Site Details:

Carr Head Lane, Bolton-upon-Dearne, Rotherham, S63 8DA



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Page 4 of 5



Photograph 1
(facing S):
View of Bolton Hall,
taken from
entrance at Carr
Head Road



Photograph 2
(facing SW):
Western wing of
building and car
park



Photograph 3
(facing SW):
Western wing of
building from edge
of driveway.

	Photograph 4 (facing S): View towards the eastern wing of building, facing away from northern boundary.
	Photograph 5 (facing NW): Taken on driveway, facing towards Carr Head Lane
	Photograph 6 (facing E): Southern end of study area, facing towards eastern boundary



Photograph 7
(facing N):
Carr Head Lane at
northern boundary
of study area



Photograph 8
(southern end of site):
Open manhole
towards southern
end of site – main
outfall from site.

APPENDIX C

ENVIRONMENT AGENCY DATA

Mark Jones

From: Enquiries, Unit <enquiries@environment-agency.gov.uk>
Sent: 21 June 2016 09:02
To: Mark Jones
Subject: 160621/DP01 - Flood Risk Assessment - south of Carr Head Lane, Bolton-upon-Dearne, Barnsley, Yorkshire.
Attachments: Site boundary A.pdf

Dear Mark

I have passed your enquiry to our customer team for the Yorkshire area and they will be in touch with you shortly.

The Freedom of Information Act and Environmental Information Regulations state that a public authority must respond to requests for information within 20 working days. We are currently receiving a higher than normal number of requests. We shall endeavour to respond as soon as we can.

You can find more information about our service commitment by clicking on the link below:

<https://www.gov.uk/government/publications/environment-agency-customer-service-commitment>

Should you wish to contact the customer team directly, please use the contact details below. Please quote your Enquiry Reference 160621/DP01 in any correspondence with us regarding this matter.

Customers and Engagement
Environment Planning & Engagement
Environment Agency
Yorkshire Area
Lateral
8 City Walk
LEEDS
LS11 9AT

Tel: 03708 506506

Regards

David Powell

Customer Service Advisor
National Customer Contact Centre - Part of National Operations Services

Tel: 03708 506 506

Web Site: www.gov.uk/environment-agency

Click an icon to keep in touch with us:-



So how did we do...?

Our National Customer Contact Centre relies on customer feedback, so we really value your thoughts on how we are doing. We will always make changes where we can to improve our service. This will only take three minutes to complete:

<http://www.smartsurvey.co.uk/s/NCCCcustomer/>

From: Mark Jones [mailto:M.Jones@thelkgroup.com]
Sent: 15 June 2016 17:14
To: Enquiries, Unit
Subject: Flood Risk Assessment - south of Carr Head Lane, Bolton-upon-Dearne, Barnsley, Yorkshire.

Dear Sir/Madam

LK Consult Ltd. has been commissioned to undertake a Flood Risk Assessment (FRA), of a site located on Land south of Carr Head Lane, Bolton-upon-Deane, Nr. Barnsley. The site is in a central position in the village. Nearest Postcode S63 8DA.

Centred at approximate National Grid Reference 445060E, 402705N. The area of interest appears to be within Flood Zone 1

The site is currently used as a nursing home and grounds.

To complete the FRA we would be grateful if you could supply us with the following, if available, for the vicinity of the site:

- The modelled 1% and 0.1% annual probability fluvial flood level, the 1% annual probability plus climate change flood level and any lower order flood levels, in particular the modelled 5% fluvial flood level if relevant for functional floodplain, (with confirmation of the reference datum used for the levels – i.e. Local OSBM or OSGPS) if available.
- Details of any flood defences in the immediate area, including their extent, crest levels (and datum), assumed level of standard, construction and maintenance regime, as well as any other structures which may influence the local hydraulics.
- Proposed defence levels and timescale for implementation.
- Results of any breach analyses for defences in the area which may be relevant.
- Records of any historic flood events and potential sources of flooding from rivers, land drainage, groundwater, foul and surface water sewers on site and in the area.
- Any restrictions to infiltration and discharge.
- A copy of your detailed flood zone map and the modelled flood extent plans for the area.
- We understand that the site may be affected by overland flow under flood conditions, and therefore any output from 2D modelling that would quantify that would be appreciated.



If you have any queries please get in touch with me.

We are, of course, happy to pay your reasonable charge for this service. Please let me know by return what information is available and what the charge will be and we will pay the relevant fees by debit card as soon as possible.

We will also contact Yorkshire Water, and Barnsley Metropolitan Borough Council as well for their information and requirements

Any advice or recommendations you may have regarding the potential discharges from the development of this site? The site slopes down to the watercourse from Saves Lane.

We will be in contact with all other relevant risk management authorities to get a more complete understanding of the issues in the area.

Regards

Mark Jones



Mark Jones
Associate
0161 763 7200 – 0780 076 8584 www.thelkgroup.com
Manchester | Liverpool | Glasgow



Disclaimer Information [Here](#)

This message has been scanned and no issues discovered.

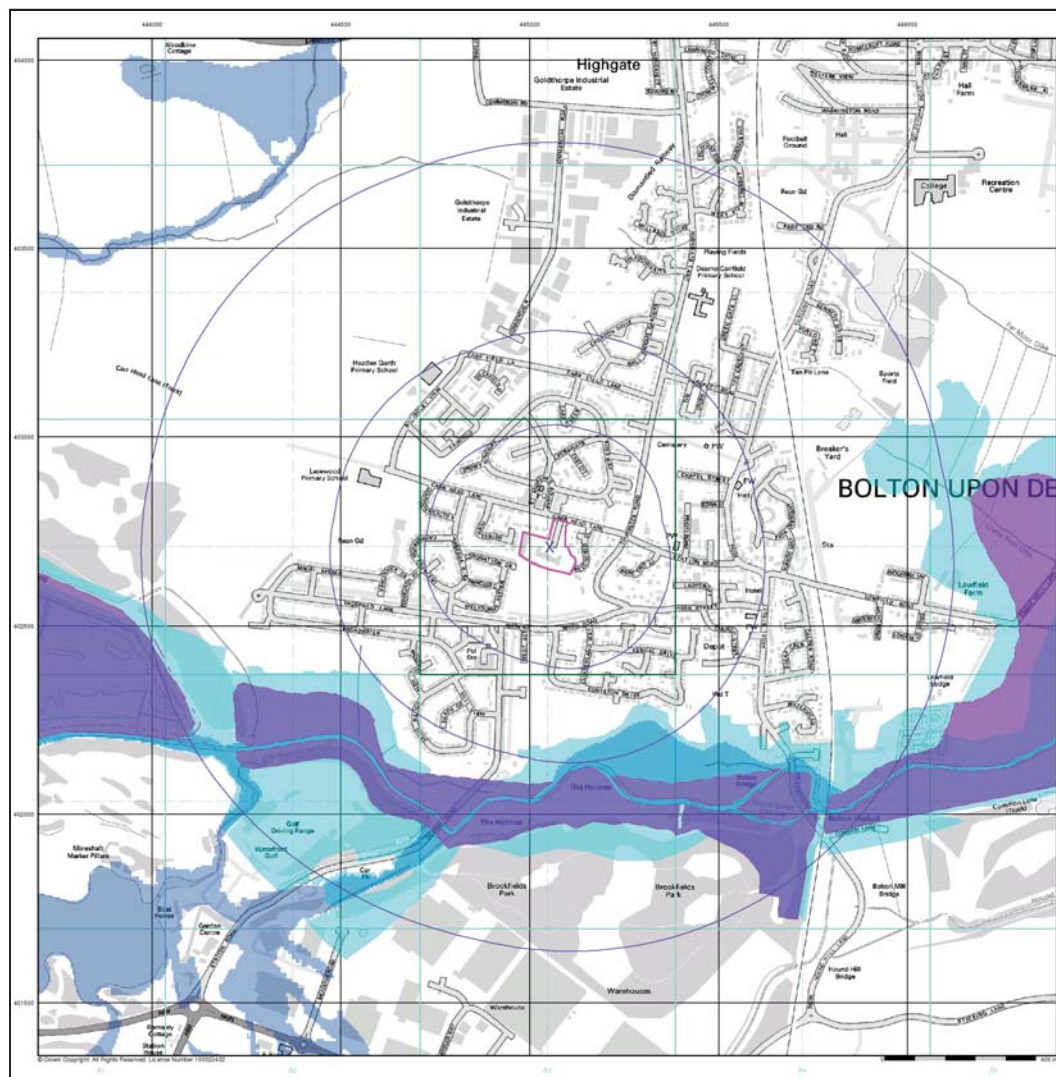
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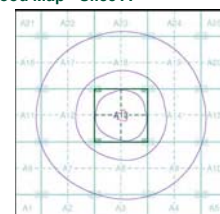
General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

Agency and Hydrological (Flood)

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- ▨ Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Flood Map - Slice A



Order Details

Order Number: 89063416_1.1
 Customer Ref: LKC 16 1223
 National Grid Reference: 445050, 402710
 Slice: A
 Site Area (Ha): 1.23
 Search Buffer (m): 1000

Site Details

Carr Head Lane, Bolton-upon-Deane, Rotherham, S63 8DA



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