Brinklow Quarry
Flood Risk Assessment

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<td>18.09.2015</td>
</tr>
<tr>
<td>Version Number</td>
<td>A2483 FRA v1</td>
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<td>Final</td>
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1. INTRODUCTION

ACCON UK Limited have been instructed by Sustainable Direction to carry out a Flood Risk Assessment (FRA).

The location of the existing quarry and proposed extension to the site is shown in Figure 1.1 below. The site is within the administrative boundary of the Warwickshire County Council.

Figure 1.1: Location Plan

This assessment has been carried out in order to determine the potential constraints of flooding on the existing site for a Section 73 application for an extension of time to the existing quarrying operations. Additionally, this assessment also considers the flood risk constraints from a proposed extended quarrying area and the extent to which there are cumulative impacts of the existing operations and extended operations occurring simultaneously.

The Environment Agency (EA) Flood Risk map indicates that all of the site falls within Flood Zone 1. This assessment has been carried out in accordance with the detailed guidance set out in Planning Practice Guidance (PPG) for Flood Risk and Coastal Change which accompanies the National Planning Policy Framework (NPPF).

A site location plan is shown in Appendix 1, whilst relevant extracts from the PPG for Flood Risk and Coastal Change are reproduced in Appendix 2.
2. **SITE DESCRIPTION**

The quarry site is located to the southwest of Brinklow Village. There are existing residential areas in the nearby villages of Brinklow and Bretford and a country park and hotel at Coombe Country Park. The nearest residential area is located on Heath Lane near Brinklow, approximately 600m to the east of the site.

The site currently comprises a working arable farm, incorporating a quarry, a mortar plant, bagging of quarry products and a waste sorting and composting facility. The main business of the quarry is in the supply and delivery of various types of sand, roadstone and gravels to the Warwickshire and West Midlands areas to both trade and household customers. Over the years the business has diversified and expanded to include composting. Green waste, waste glass, and construction and demolition waste largely comprising waste wood, topsoil and hardcore is composted or recycled on-site.

Diesel-powered generators, with a capacity of c2MW Electric (MWₑ), are currently used to provide the electricity required to power equipment, dry products, etc.

The proposed quarrying operations comprise the extension of duration for the existing consented quarry area (Section 73 application) and an extended quarry area.

The site has been identified on geological mapping as having sand and gravel deposits on outline Triassic surface geology.

A site location is presented in **Appendix 1**.
3. **FLOOD RISK MANAGEMENT**

Flooding is a natural process that has helped shape our landscape. However, the effects of flooding are not always compatible with human activity. Flooding can have a catastrophic impact on property and cause significant damage to structures. More importantly, flooding can have a tragic impact on people and animals, both directly through drowning, but also indirectly through water-borne diseases and contaminated water supplies.

Over 5 million people in England and Wales live in properties that are at risk of flooding from rivers or the sea. To safeguard the health of these 5 million people, and to safeguard their properties, it is important to ensure that development on the floodplain does not increase the risks of flooding for others, or put the new occupiers under any unnecessary risk. Therefore, it is national policy to carefully evaluate the suitability of any development that may have an impact on flood risk, and to minimise these risks wherever possible, even if this means refusing planning permission for a development.

In 2014, the Department for Communities and Local Government published Planning Practice Guidance (PPG) entitled “Flood Risk and Coastal Change” which provides guidance to enable Local Planning Authorities to implement policies set out in the NPPF relating to development in areas at risk of flooding.

3.1. **The National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG)**

This assessment has been conducted in accordance with the PPG and the NPPF. The guidance indicates that Site-Specific Flood Risk Assessments should address the following:

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

**Table 1** in the PPG sets out the Flood Zone Classifications which determines the likelihood of flooding at the site location. **Table 2** sets out the Flood Risk Vulnerability Classification under five headings. The Flood Risk Vulnerability Classification is dependent upon the use of the proposed development. **Table 3** then compares the Flood Risk Vulnerability against the Flood Zone Classification to check for compatibility between the vulnerability of the development to flooding at the proposed site location. It is then possible to see if development is appropriate for each case. These tables are reproduced as **Tables 1 to 3** in **Appendix 2**.

**Table 3** within the guidance determines whether development is acceptable or not given the Flood Risk Vulnerability and Flood Zone Compatibility. However, in certain circumstances, it recommends that an Exception Test is passed to ensure that the development will not increase the flood risk.
3.2. Warwickshire County Council

3.2.1. Strategic Flood Risk Assessment

A Level 1 Strategic Flood Risk Assessment (SFRA) was produced by URS (Final Report September 2013) on behalf of Warwickshire County Council, Stratford on Avon DC, North Warwickshire BC and Rugby BC. Figure 3.1 below identifies that the quarry site is not within Flood Zones 2, 3a or 3b.

Figure 3.1: SFRA Flood Risk Mapping

3.3. Rugby Borough Council

The Level 1 Strategic Flood Risk Assessment (PFRA) published in September 2013, was developed to inform the revision of flooding policies and to assist in allocating land for future development.

The SFRA identifies areas around the Borough into Zones 1, 2, 3(a) and 3(b). The site is not in Zones 2 or 3 and therefore, as it has been identified as being located in Flood Zone 1, flooding is very low risk and assumed to occur with a 1 in 1000 annual probability.

There are no specific policies in the Local Plan which relate to minerals sites and flood issues.
4. **FLOOD RISK – EXISTING CONDITIONS**

4.1. **Environment Agency Flood Zone Maps**

The EA has published Flood Zone Mapping based upon the probability of flooding using flood zone designations outlined in the PPG. **Table 4.1** summarises these Flood Zones, with full details in **Appendix 2**. It should be noted that as it is up to Local Planning Authorities to subdivide Zone 3 floodplains into the (a) and (b) categories, the EA maps do not divide Zone 3 floodplains in this manner.

**Table 4.1: Flood Zone Designations**

<table>
<thead>
<tr>
<th>Flood Zone</th>
<th>Probability of Flooding</th>
<th>Annual Probability of Flooding (from rivers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1</td>
<td>Low</td>
<td>Less than 1 in 1,000</td>
</tr>
<tr>
<td>Zone 2</td>
<td>Medium</td>
<td>Between 1 in 100 and 1 in 1,000</td>
</tr>
<tr>
<td>Zone 3a</td>
<td>High</td>
<td>Greater than 1 in 100</td>
</tr>
<tr>
<td>Zone 3b</td>
<td>The Functional Floodplain</td>
<td>Greater than 1 in 20 (where water should be stored during flood events)</td>
</tr>
</tbody>
</table>

The EA’s flood mapping for the proposed site, as confirmed in correspondence with the EA, identifies that none of the site is within Flood Zones 2 or 3. The site is identified as being within Flood Zone 1 (see **Appendix 4**). The PPG defines Flood Zone 1 as “Land having a less than 1 in 1,000 annual probability of river or sea flooding.” Accordingly, by its very location alone the site is not considered to be at risk of flooding and additionally is identified in Appendix 2 as being ‘Water-compatible development’ which is appropriate for all Flood Zones.

4.2. **British Geological Survey Flood Data**

The British Geological Survey (BGS) provides two data sets available to flood risk assessors to help assess flood risk. The BGS provides data regarding groundwater flooding susceptibility and data regarding the geological indicators of flooding (see **Appendix 5**).

The groundwater flooding susceptibility data shows the degree to which areas of England, Scotland and Wales are susceptible to groundwater flooding on the basis of geological and hydrogeological conditions. It does not show the likelihood of groundwater flooding occurring, i.e. it is a hazard not a risk-based dataset, it merely states that groundwater flooding could occur.

The groundwater flooding susceptibility data shows that the site is not within an area which has the “potential for groundwater flooding to occur at surface”. There is some potential for groundwater flooding to occur on areas of land to the north, south and west of the site.

4.3. **Historical Flood Events**

Data obtained from Landmark indicates that the site is not located in an area which was flooded historically.

4.4. **Flood Maps**

The following conclusions can be drawn from flood maps issued from various sources:

- EA maps indicate that the site is not located in an area at risk of significant surface water flooding or which is “at risk of flooding from reservoirs”;
The JBA Canal Failure Map indicates that the site is not located in an area liable to canal failure;
The EA/NRW Flood Data Map shows that the site is located in Flood Zone 1, which has a low probability of flooding (1 in 1000 annual probability) and all uses of land are appropriate in this flood zone; and
The ESI Groundwater Flood Map indicates that the site is not located in an area of groundwater flood risk.
The BGS Flood data – Geological Indicators of Flooding indicates that the site is not in an area at risk of flooding.
5. HYDROLOGY AND HYDROGEOLOGY

This section provides a brief description of the potential impacts of the development on hydrology and hydrogeology.

5.1. Hydrology

The whole site appears to lie above the 80m AOD contour. There are limited significant local surface water features on the site with the principal ones being the ponds presently left by the existing quarrying activity. Whilst, there are a number of secondary and tertiary rivers identified by Envirocheck® at distances of 800 metres and beyond, the closest other water feature is estimated to be at a distance of 147 metres from the site and is recorded as a surface drain. As such it is not anticipated that continued or extended mineral extraction would result in any impacts on those existing features.

5.2. Hydrogeology

No borehole information has been made available for the site, although groundwater levels will be at some depth below the surface such that any sand and gravel extraction at depth will to some extent fill with groundwater. Whilst, the extraction of minerals will remove the ability of the ground to absorb rainfall the mineral voids left during operation will provide an effective storage compensation area. As quarrying is an entirely water compatible use of the site, as demonstrated by existing quarrying on the site, no direct impacts are envisaged either on or off site.
6. CONCLUSIONS

The EA has determined the site to be wholly located within Flood Zone 1, and as a site for quarrying is considered to be water compatible there are no flood issues identified with the site.
Appendix 1
Site Location Plan
Appendix 1.1: Site Location Plan

LEGEND

Site boundary

Client: Sustainable Direction

Description: Site Location Plan

Design: DM 18.09.2015

Drawn: DM 18.09.2015

Checked: CP 18.09.2015

Approved: GP 18.09.2015

Scale: Not to Scale

Proposed Extended Area

Weighbridge and Offices

Quarry Access Road

Existing Quarry Location

Existing Quarry Location

Quarry Access

Road

Proposed

Extended Area

Appendix 1.1
Appendix 2
Planning Practice Guidance
### Appendix 2: Extracts from PPG for Flood Risk & Coastal Change

**Table 1: Flood Zones (para 065 Ref ID:7-065-20140306)**

(Note: These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences)

<table>
<thead>
<tr>
<th>Zone 1 Low Probability</th>
<th>Definition</th>
<th>Land having a less than 1 in 1000 annual probability of river or sea flooding in any year.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appropriate uses</strong></td>
<td>All uses of land are appropriate in this zone.</td>
<td></td>
</tr>
</tbody>
</table>

**FRA requirements**

For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or other local considerations require particular attention.

**Policy aims**

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

<table>
<thead>
<tr>
<th>Zone 2 Medium Probability</th>
<th>Definition</th>
<th>Land having between a 1 in 100 and 1 in 1000 annual probability of river flooding or land having between a 1 in 200 and 1 in 1000 annual probability of sea flooding.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appropriate uses</strong></td>
<td>Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses of land as set out in Table 2 are appropriate in this zone. The highly vulnerable uses in Table D.2 are only appropriate in this zone if the Exception Test is passed.</td>
<td></td>
</tr>
</tbody>
</table>

**FRA requirements**

All development proposals in this zone should be accompanied by a FRA.

**Policy aims**

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

<table>
<thead>
<tr>
<th>Zone 3a High Probability</th>
<th>Definition</th>
<th>Land having a 1 in 100 or greater annual probability of river flooding or land having a 1 in 200 or greater annual probability of sea flooding.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appropriate uses</strong></td>
<td>The water-compatible and less vulnerable uses of land in Table 2 are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.</td>
<td></td>
</tr>
</tbody>
</table>

**FRA requirements**

All development proposals in this zone should be accompanied by a FRA.

**Policy aims**

In this zone, developers and local authorities should seek opportunities to:
- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;
- relocate existing development to land in zones with a lower probability of flooding; and create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.
Zone 3b The Functional Floodplain
Definition
Land where water has to flow or be stored in times of flood.
Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

Appropriate uses
Only the water-compatible uses and the essential infrastructure listed in Table 2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

FRA requirements
All development proposals in this zone should be accompanied by a FRA.

Policy aims
In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and
- re-locate existing development to land with a lower probability of flooding.

Table 2: Flood Risk Vulnerability Classification (para 066 Ref ID:7-066-20140306)

<table>
<thead>
<tr>
<th>Essential Infrastructure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential Transport Infrastructure</td>
<td>Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.</td>
</tr>
<tr>
<td>Essential Utility Infrastructure</td>
<td>Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.</td>
</tr>
<tr>
<td>Wind Turbines</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Highly Vulnerable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.</td>
<td></td>
</tr>
<tr>
<td>Emergency dispersal points.</td>
<td></td>
</tr>
<tr>
<td>Basement dwellings.</td>
<td></td>
</tr>
<tr>
<td>Caravans, mobile homes and park homes intended for permanent residential use.</td>
<td></td>
</tr>
<tr>
<td>Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as ‘Essential Infrastructure’).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>More Vulnerable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals</td>
<td></td>
</tr>
<tr>
<td>Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels.</td>
<td></td>
</tr>
<tr>
<td>Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.</td>
<td></td>
</tr>
<tr>
<td>Non–residential uses for health services, nurseries and educational establishments.</td>
<td></td>
</tr>
<tr>
<td>Landfill and sites used for waste management facilities for hazardous waste.</td>
<td></td>
</tr>
<tr>
<td>Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Less Vulnerable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Police, ambulance and fire stations which are not required to be operational during flooding.</td>
<td></td>
</tr>
<tr>
<td>Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the ‘More Vulnerable’ class; and assembly and</td>
<td></td>
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### Table 3: Flood Risk Vulnerability and Flood Zone 'Compatibility' (para 067 Ref ID: 7-067-20140306)

<table>
<thead>
<tr>
<th>Flood Risk Vulnerability classification (see Table A2)</th>
<th>Essential Infrastructure</th>
<th>Highly Vulnerable</th>
<th>More Vulnerable</th>
<th>Less Vulnerable</th>
<th>Water Compatible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Zone 2</td>
<td>✓</td>
<td>Exception Test required</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Zone 3a</td>
<td>Exception Test required</td>
<td>✓</td>
<td>Exception Test required</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Zone 3b</td>
<td>Exception Test required*</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>✓ *</td>
</tr>
</tbody>
</table>

**Key:**
- ✓ Development is appropriate
- × Development should not be permitted

*In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage; and
- not impede water flows and not increase flood risk elsewhere.
Appendix 3
Environment Agency Flood Map
Appendix 3.1: Areas susceptible to Surface Water Flooding – EA/NRW Mapping

LEGEND

<table>
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<tr>
<th>Surface Water Depth</th>
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<tbody>
<tr>
<td>1-0.15m</td>
</tr>
<tr>
<td>0.15-0.30m</td>
</tr>
<tr>
<td>0.30-0.50m</td>
</tr>
<tr>
<td>0.50-1.00m</td>
</tr>
<tr>
<td>1.00-1.50m</td>
</tr>
<tr>
<td>&gt;1.50m</td>
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Client: Sustainable Direction
Description: Areas susceptible to Surface Water Flooding (1 in 100 year return)
Design: DM 18.09.2015
Checked: GP 18.09.2015
Approved: GP 18.09.2015

Appendix 4.3
Scale: Not to Scale
Appendix 4
British Geological Survey Flood Data
Appendix 4.1: BGS Flood Data – Geological Indicators of Flooding

LEGEND

- Centre of site
- Coastal
- Inland
- Bodies of Water
Appendix 4.2: BGS Flood Data – Groundwater Flooding Susceptibility

LEGEND

- Centre of site
- Potential for Groundwater Flooding to occur at surface
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Limited Potential for Groundwater Flooding to occur

Client: Sustainable Direction
Description: BGS Flood Data – Groundwater Flooding Susceptibility
Design: DM 18.09.2015
Drawn: DM 18.09.2015
Checked: CP 18.09.2015
Approved: GP 18.09.2015
Scale: Not to Scale

Appendix 4.2
Appendix 4.3: ESI Groundwater Flood Map

LEGEND

Client: Sustainable Direction
Description: BGS Flood Data – Groundwater Flooding Susceptibility
Project: Brinklow Quarry

Design: DM 18.09.2015
Drawn: DM 18.09.2015
Checked: CP 18.09.2015
Approved: GP 18.09.2015

Scale: Not to Scale

Appendix 4.3
Appendix 4.4: Risk Management Solutions Flood Modelling – 1 in 75 year Flood Event

LEGEND

X  Centre of site

Pluvial Depth
- < 1cm     Fluvial Depth
- 0.5mm - 10cm
- 1cm - 10cm
- 10cm - 30cm
- 30cm - 1m
- > 1m

<table>
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<tr>
<th>Rev:</th>
<th>Description:</th>
<th>Project:</th>
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<tbody>
<tr>
<td>A</td>
<td>FINAL</td>
<td>Brinklow Quarry</td>
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</table>

Client: Sustainable Direction
Description: RMS Flood Modelling – 1 in 75 year flood event

Design: DM 18.09.2015
Drawn: DM 18.09.2015
Checked: CP 18.09.2015
Approved: GP 18.09.2015

Appendix 4.4
Scale: Not to Scale
Appendix 4.5: Risk Management Solutions Flood Modelling – 1 in 100 year Flood Event

<table>
<thead>
<tr>
<th>Client: Sustainable Direction</th>
<th>Description: RMS Flood Modelling – 1 in 100 year flood event</th>
<th>Design</th>
<th>DM</th>
<th>18.09.2015</th>
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<tbody>
<tr>
<td>Rev: A</td>
<td>Description: FINAL</td>
<td>Drawn</td>
<td>DM</td>
<td>18.09.2015</td>
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<td></td>
<td>Project: Brinklow Quarry</td>
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<td>18.09.2015</td>
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<td></td>
<td></td>
<td>Approved</td>
<td>GP</td>
<td>18.09.2015</td>
</tr>
</tbody>
</table>

LEGEND

- Centre of site
- Pluvial Depth:
  - < 1cm
  - 1cm - 10cm
  - 10cm - 30cm
  - 30cm - 1m
  - > 1m

- Fluvial Depth:
  - 0.5m - 10cm
  - 10cm - 30cm
  - 30cm - 1m
  - > 1m

Scale: Not to Scale
Appendix 4.6: Risk Management Solutions Flood Modelling – 1 in 200 year Flood Event

LEGEND

Centre of site

Pluvial Depth

- < 1m
- 1cm - 10cm
- 10cm - 30cm
- 30cm - 1m
- 1m

Fluvial Depth

- 0.5mm - 10cm
- 10cm - 30cm
- 30cm - 1m
- > 1m

Client: Sustainable Direction
Description: RMS Flood Modelling – 1 in 200 year Flood Event
Design DM 18.09.2015
Drawn DM 18.09.2015
Checked CP 18.09.2015
Approved GP 18.09.2015

Scale Not to Scale

Project: Brinklow Quarry

Rev: A
Description: FINAL

18.09.2015
Appendix 4.7: Risk Management Solutions Flood Modelling – 1 in 1,000 year Flood

LEGEND

<table>
<thead>
<tr>
<th>Pluvial Depth</th>
<th>Fluvial Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 cm</td>
<td>0.5 mm - 10 cm</td>
</tr>
<tr>
<td>1 cm - 10 cm</td>
<td>10 cm - 30 cm</td>
</tr>
<tr>
<td>10 cm - 30 cm</td>
<td>30 cm - 1 m</td>
</tr>
<tr>
<td>30 cm - 1 m</td>
<td>&gt; 1 m</td>
</tr>
</tbody>
</table>

Centre of site

Client: Sustainable Direction
Description: RMS Flood Modelling – 1 in 1,000 year Flood Event
Design: DM 18.09.2015
Drawn: DM 18.09.2015
Checked: CP 18.09.2015
Approved: GP 18.09.2015
Scale: Not to Scale
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