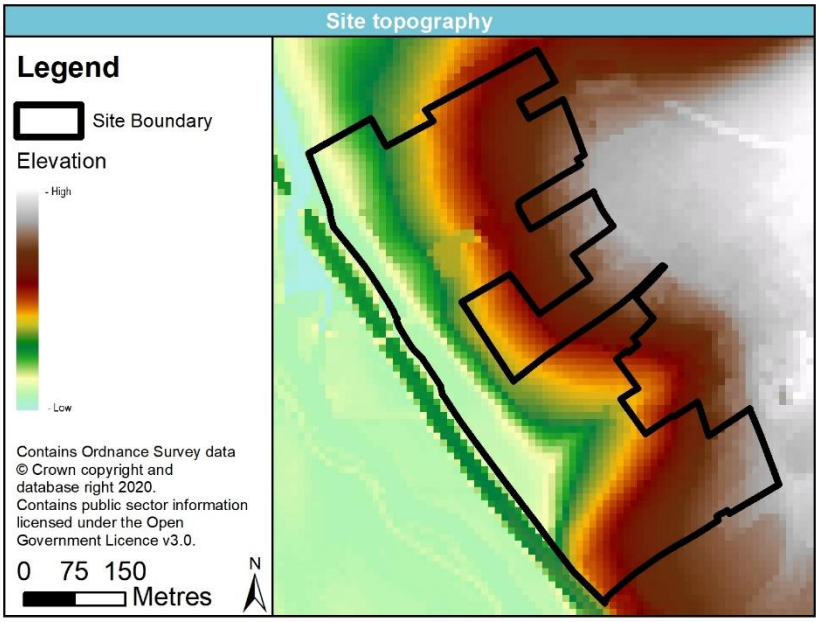
Charnwood Borough Council Strategic Flood Risk Assessment Level 2 Detailed Site Summary Tables

<table>
<tr><td rowspan="5">Site details</td><td>Site Code</td><td colspan="4">PSH484</td></tr>
<tr><td>Address</td><td colspan="4">Land off Cotes Road</td></tr>
<tr><td>Area</td><td colspan="4">21.35 ha</td></tr>
<tr><td>Current land use</td><td colspan="4">Greenfield</td></tr>
<tr><td>Proposed land use</td><td colspan="4">Residential</td></tr>
<tr><td rowspan="3">Sources of flood risk</td><td>Topography</td><td colspan="4"> 

The site is generally flat, with a slope from east to west into a topographic depression adjacent to the River Soar where a small pond is located.
• There are few small buildings located along the east site boundary.
• The ground slope across the site generally has a gradient of less than 5%.</td></tr>
<tr><td>Existing drainage features</td><td colspan="4">There are no existing drainage features in the proposed site, although there is a small pond by the western boundary by the railway embankment. The Grand Union Canal and River Soar flow along the west site boundary up to the northern corner, then the River Soar is culverted under the railway embankment adjacent to the north west corner of the site, flowing on the other side of the railway.</td></tr>
<tr><td>Fluvial</td><td colspan="4">Proportion of site at risk</td></tr>
<tr><td>FZ3b</td><td>FZ3a</td><td>FZ2</td><td>FZ1</td></tr>
<tr><td>1%</td><td>1%</td><td>1%</td><td>99%</td></tr>
<tr><td colspan="4">Highest zone of risk (Risk of Flooding from Rivers and Sea)</td></tr>
<tr><td colspan="4">High</td></tr>
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<tr><td rowspan="10"></td><td rowspan="2"></td><td colspan="3">The % Flood Zones quoted show the % of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone, e.g. FZ2 includes the FZ3 %. FZ1 is the remaining area outside FZ2 (FZ2 + FZ1 = 100%)</td></tr>
<tr><td colspan="3">Available data: The site is covered by the Environment Agency Loughborough Tributaries Scheme (2017) hydraulic model, which includes the River Soar in this location.

Flood characteristics:
The Environment Agency’s Flood Map for Planning Flood Zones show only a small proportion of the north-west corner of the site is located within Flood Zone 3a and Flood Zone 2. There is also a small ditch along the embankment which is not part of the modelling but is picked up in the surface water dataset.
The maximum 100-year depth in this small encroachment in the north-western corner is however high, at 1.12m, likely where there is a topographic low point or vegetation against the railway embankment. There is no velocity or hazard data provided for this event.</td></tr>
<tr><td rowspan="8">Surface Water</td><td colspan="3">Proportion of site at risk (RoFfSW)</td></tr>
<tr><td>30-year</td><td>100-year</td><td>1,000-year</td></tr>
<tr><td>3%</td><td>6%</td><td>9%</td></tr>
<tr><td colspan="3">Max depths (m)</td></tr>
<tr><td>0.6-0.9</td><td>0.6-0.9</td><td>0.9-1.2</td></tr>
<tr><td colspan="3">Max velocity (m/s)</td></tr>
<tr><td>0.25-0.5</td><td>1-2</td><td>>2</td></tr>
<tr><td colspan="3">The % SW extents quoted show the % of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 100-year includes the 30-year %)</td></tr>
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	Address	Land off Cotes Road		
	Area	21.35 ha		
	Current land use	Greenfield		
	Proposed land use	Residential		
		Description of surface water flow paths: There is surface water flooding from a flow path across the lower half of the site for the 100-year and 1,000-year events, originating from Catsick Hill, flowing linearly to the railway line. Ponding also accumulates along the western boundary, due to raised ground for the railway and a topographic low stretch parallel with the railway, causing surface water flooding for all events here. Depths are fairly high due to the topography and nature of ponding parallel with the railway. RoFfSW takes account of building footprints so the flood risk may be affected by existing buildings on the site. It also only considers flood risk where the hazard rating is greater than 0.575.		
	Groundwater	The Areas Susceptible to Groundwater Flooding dataset shows the majority of the site is located within a 1 km grid square where >=75% of the area is predicted to be at risk of groundwater flooding. The remainder of the site falls within a grid square where <25% of the area is predicted to be at risk of groundwater flooding. The AStGWF data should be used only in combination with other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale where finer resolution datasets exist. Ground investigations may be required at the site.		
	Reservoir	The available online maps show that the maximum extent from reservoir flooding reaches the site, alongside the railway track.		
	Flood history	The eastern boundary, where surface water accumulates due to the raised ground for the railway, experienced flooding due to the River Soar's channel capacity being exceeded in 1998. Leicestershire County Council may hold additional records which are not available at this time. These records detail historical flood incidents from all sources, whereas the Environment Agency dataset only records incidents of fluvial, tidal or coastal flooding. The Lead Local Flood Authority should be contacted to obtain further details.		
Flood risk manageme	**Defences**	**Defence Type**	**Standard of Protection**	**Condition**
		High ground	N/A	N/A

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nt infrastructure		This site is protected by high ground which runs along the Grand Union Canal to the west of the site. The standard of protection and condition of the defence is unknown.
	Residual risk	The Grand Union Canal is culverted under the railway embankment close to the north west corner of the site. If this structure were to become blocked, flood risk to the site could increase. The potential for blockage may need to be considered in a site-specific assessment.
Emergency planning	**Flood warning**	The site is partially situated within the Environment Agency's Lower River Soar in Leicestershire (034WAF428) Flood Alert area and the East Midlands Flood Warning area (034FWFSOCOTES).
	Access and egress	Access and egress to the site can be gained via Cotes Road located along the eastern boundary of the site for all fluvial and surface water events. It should be noted that the surface water flood risk bisects the site with a flow path travelling from east to west in the 100-year and 1,000-year events. Development should seek to avoid this flow route. The depths, velocities, hazards, durations and speeds of onset of surface water and fluvial flooding along access/ egress routes should be investigated further in a site-specific assessment, to confirm whether access for emergency vehicles could still be obtained.

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Site details	**Site Code**	**PSH484**
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Climate Change	**Implications for the site**	• Increased storm intensities due to climate change may increase the extent, depth, velocity, hazard and frequency of both fluvial and surface water flooding. • Detailed fluvial modelling showing the implications of climate change has been carried out at this site. Results show very little difference between the Flood Zone and climate change extents. • Using the 50-year and 75-year defended outputs from the Loughborough Tributaries (2017) hydraulic model, there is a minor increase in extent. This means that Flood Zone 3b has the potential to increase in the future. However, the increase is only estimated to be small and remains confined to the north west corner of the site. • Climate change also needs to be considered for surface water events; at the site-specific stage, the 100-year +40% event is considered as part of surface water drainage strategies, or surface water modelling. • Climate change also needs to be considered for surface water events; at the site-specific stage, the 100-year +40% event is considered as part of surface water drainage strategies, or surface water modelling. The current day 1,000-year surface water extent provides an indication of the likely increase in extent of the more frequent events. A flow route originating from Cotes Road is predicted to increase in magnitude during this event and therefore could occur in the future as a result of climate change. This would require a detailed FRA to assess the site layout and design. • Developers should consider SuDS strategies to reduce the impacts of climate change from surface water in a detailed site-specific FRA.
Requirements for drainage control and impact mitigation	**Bedrock Geology**	The entire site's bedrock geology consists of mudstone, siltstone and sandstone.
	Superficial Geology	The site has no superficial deposits.
	Soils	Half of the site has lime-rich loamy and clayey soils with impeded drainage and the other half has slightly acid loamy and clayey soils with impeded drainage. However, directly adjacent the railway there is perhaps loamy and clayey floodplain soils with naturally high groundwater

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	Source Protection Zone	The site is not located within any Environment Agency designated Source Protection Zone.
	Historic Landfill Site	The site is not designated by the Environment Agency as previously being a landfill site.

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	Broad scale assessment of possible SuDS	Implementation of SuDS at the site could provide opportunities to deliver multiple benefits including volume control, water quality, amenity and biodiversity. This could provide wider sustainability benefits to the site and surrounding area. Proposals to use SuDS techniques should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. Development at this site should not increase flood risk either on or off site. The design of the surface water management proposals should take into account the impacts of future climate change over the projected lifetime of the development. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible opportunities and constraints. The following techniques are considered suitable for the site: • Most source control techniques are likely to be suitable. Mapping suggests that permeable paving may have to use non-infiltrating systems given the possible risk from groundwater. • Mapping suggests that there is a high risk of groundwater flooding at this location, therefore it is likely infiltration techniques will not be suitable. This should be confirmed via site investigations to assess the potential for infiltration. • This option may be feasible provided site slopes are < 5% at the location of the detention feature. A liner maybe required to prevent the egress of groundwater. • This feature is probably suitable provided site slopes are <5% and the depth to the water table is >1m. A liner maybe required to prevent the egress of groundwater. • All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. A liner maybe required to prevent the egress of groundwater.

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NPPF and planning implications	**Exception Test requirements**	The Local Authority have carried out the Sequential Test in line with national guidance. The Sequential Test will need to be satisfied based on fluvial and other sources of flood risk before the Exception Test is applied. Residential development is classified as 'More Vulnerable'. It is recommended that proposed development will be sequentially located within Flood Zone 1 areas of the site. The Exception test will need to be applied if: • More Vulnerable and Essential Infrastructure development is located in FZ3a and for Highly Vulnerable development located in FZ2. • Highly Vulnerable infrastructure should not be permitted within FZ3a and FZ3b. • More Vulnerable and Less Vulnerable Infrastructure should not be permitted within FZ3b. Development will not be permitted for the following scenario: • Highly vulnerable development within FZ3a. • Highly vulnerable, More vulnerable and / or Less vulnerable development within FZ3b.

	Requirements and guidance for site-specific Flood Risk Assessment	**Flood Risk Assessment:**
		• At the planning application stage, a site-specific Flood Risk Assessment will be required for this site as development is located within Flood Zone 2 and may be subject to other sources of flooding and the development may introduce a more vulnerable use. It will also be required where development sites:
		  ○ are 1 hectare or more in size;
		  ○ contain land which has been identified by the Environment Agency as having critical drainage problems; or
		  ○ contain land identified in the strategic flood risk assessment as being at increased flood risk in future.
		• Other sources of flooding must be considered as part of any site-specific Flood Risk Assessment, including surface water and groundwater.
		• Consideration should be given to the potential effects of climate change, particularly with respect to surface water. Proposals should consider the opportunity to include measures that provide for a reduction in the predicted surface water flood risk at existing development.
		• Where there is a reasonable likelihood of multiple sources of flood risk having significant impact in combination it is recommended that consideration is given to assessing the combined risks of these.
		• Any FRA should be carried out in line with the National Planning Policy Framework, Flood Risk and Coastal Change Planning Practice Guidance, Charnwood Council's Local Plan policies and the LLFA's SuDS guidance.
		• Consultation with the Local Authority, Local Lead Flood Authority and the Environment Agency should be undertaken at an early stage.
		• The development should be designed using a sequential approach. Development should be steered away from areas of fluvial flood risk and surface water flow routes, preserving these spaces as green infrastructure. Development must be in line with Table 3: flood risk vulnerability and flood zone compatibility of the NPPG.
		• Development in FZ3b should be avoided unless appropriate use can be demonstrated in line with NPPF.
		• Development in FZ3 may require floodplain compensation and this should be confirmed with the EA at FRA stage.
		
		Guidance for site design and making development safe:
		• The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
		• Safe access and egress will need to be demonstrated in the 1 in 100-year plus climate change fluvial and rainfall events, using the depth, velocity and hazard outputs. Raising of access routes must not impact on surface water flow routes. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.
		• Resilience measures will be required if buildings are situated in the flood risk area. Raising Finished Floor Levels above

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		the design event may remove the need for resilience measures.
		• The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, to ensure that runoff from the development is not increased by placing development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure there is no increase in runoff beyond the current greenfield rates.
		• On site attenuation schemes would need to be tested against the watercourse to ensure flows are not exacerbated downstream within the catchment.
		• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff. Assessment for runoff should include allowance for climate change effects.
		• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
		  ○ Reducing volume and rate of runoff
		  ○ Relocating development to zones with lower flood risk
		  ○ Creating space for flooding.
		• All development should adopt source control SuDS techniques to reduce the risk of frequent low impact flooding due to post development runoff.
		• SuDS should be designed to deliver multiple benefits including water quality, biodiversity, amenity, green infrastructure etc. Example features include swales, attenuation features, green roofs, rainwater capture and reuse and permeable paving.
		• Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.
		• Efforts should be made to limit runoff to greenfield rates and discharge rates from the site should not increase downstream flood risk.

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Key messages		The flood risk element of the Exception Test is likely to be passed if: • Development is limited to the 91% of the site outside of the Risk of Flooding from Surface Water zones and therefore should be steered away from the west site boundary of the site. • It should be noted that the surface water flood risk bisects the site with a flow path travelling from east to west. Development should also avoid this flow route. • Areas in Flood Zone 2 are used for the least vulnerable parts of the development in accordance with Table 2 in the NPPF. No residential development is permitted in Flood Zone 3 and no development at all is permitted in Flood Zone 3b. • If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another). • Space for green infrastructure should be considered in the areas of highest flood risk. Refer to the 'detailed guidance for developers' section (above) for further information on the measures that are appropriate for this site.

Mapping Information

The key datasets used to make planning recommendations regarding this site was the Environment Agency's Risk of Flooding from Surface Water mapping. More details regarding data used for this assessment can be found below.

Flood Zones	The Flood Zone data is based on the EA's Flood Map for Planning Flood Zones 2 and 3a and the Loughborough Tributaries Scheme (2017) hydraulic model for FZ3b (defended 20-year).
Climate change	Climate change was based on the Environment Agency's Loughborough Tributaries Scheme (2017) hydraulic model, with the latest uplifts modelled on the 100-year event.
Fluvial depth, velocity and hazard mapping	The modelled outputs used to assess depth, velocity and hazard are from the detailed Environment Agency Loughborough Tributaries Scheme (2017) hydraulic model.
Surface Water	The Risk of Flooding from Surface Water has been used to define areas at risk from surface water flooding.

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Surface water depth, velocity and hazard mapping		The surface water depth, velocity and hazard mapping for the 1 in 30-year (high risk), 1 in 100-year (medium risk) and 1 in 1,000-year (low risk) events is taken from the Environment Agency's Risk of Flooding from Surface Water mapping.