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### **5.3 Reference to the detailed records of future floods and their possible consequences in the spreadsheet (Annex 2)**

Section 5.2 has described Derbyshire's methodology used in identifying future floods, although specific consequences have only been identified on a km grid square. The principle reason for this is that there has been insufficient time to validate the Flood Maps for Surface Water and the council has reservations where areas of standing water and flood paths do not accord with local experience. To publish this PFRA and include drawings, maps and spreadsheets identifying specific streets or properties at this stage is not seen as being reasonable given the reservations over the data used and the high level screening exercise this PFRA is principally aimed at delivering.

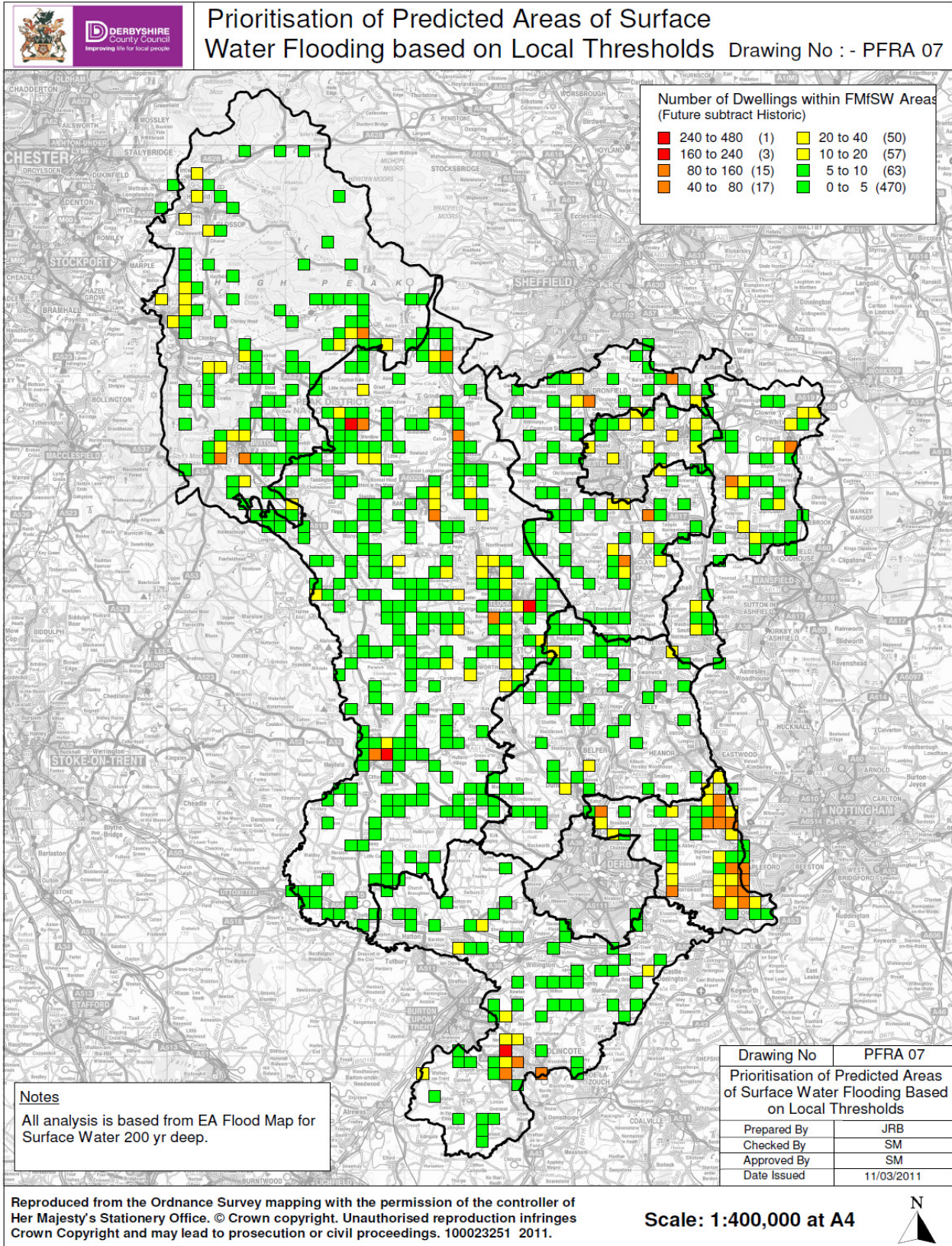
Consequently Derbyshire County Council will be assessing the risk posed by the grid squares identified in Drawing Nos;


PFRA 05 Future Surface Water Flood Risk – (Urban based on local threshold)  
 PFRA 05/1 Future Surface Water Flood Risk – (Rural based on local threshold)  
 PFRA 05/2 Future Surface Water Flood Risk – (Combined Urban and Rural Split)  
 PFRA 06 Predicted of Surface Water Flooding based on Local Thresholds

.... and have produced a draft assessment of priorities based on the number of Dwellings affected in each of the OS grid square.

Please refer to "Drawing No PFRA 07 - Prioritisation of Predicted Areas of Surface Water Flooding based on Local Thresholds" on the following page.





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The Council will be reviewing the properties affected and Flood Maps for Surface Water polygons prior to publishing any more detailed information regarding the risk to specific Districts Parishes, Streets and Properties.

The detailed records of future surface water floods and their possible consequences in the spreadsheet (Annex 2) will therefore be a high level review of future floods based on the information made available by the Environment Agency in their Flood Maps for Surface Water (FMfSW) 1 in 200 Deep. To aid in understanding how this may affect Derbyshire an analysis of the future risk to each of Derbyshire's eight Borough / District Councils is outlined in the table below, ranking the Borough / Districts based on % of grid squares likely to be subject to future flooding;

Borough / District	Number of km grid squares within Borough/District	Number of km grid squares at risk of future flooding	Percentage	Future Risk Ranking
Chesterfield	67	56	84%	1
Amber Valley	296	160	54%	2
Erewash	136	70	52%	3
North East Derbyshire	273	129	47%	4
Bolsover	193	82	43%	5
Derbyshire Dales	848	329	39%	6
High Peak	574	172	30%	7
South Derbyshire	395	114	29%	8


**Table 1.7 Summary of future flood increase by Borough / District**

A preliminary analysis of future surface water floods and their possible consequences, where they may affect the local transport network of county roads has also been undertaken. This identifies 3.9km (0.07%) of the 5,500km of county roads to be at risk from future flooding based on the Flood Maps for Surface Water. Whilst the table below illustrates the distribution of potential highways flooding, there are reservations as to whether all of these are flood events where standing water may be a danger to users, as some may be roads that have historically been a flood path for water at a much lesser depth than 300mm.

Hierarchy	Road Length at Risk from Surface Water (m)
1a HA Trunk Road	199
2a County Strategic Route	236
3a Main Distributor	238
3b Secondary Distributor	387
4a Link Road	865
4b Local Access Road	1,939
Not Specified	23
<b>Total Road Length at Risk</b>	<b>3,887</b>

**Table 1.8 Summary of future flood risk to local transport infrastructure - county roads**



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## 5.4 Climate change and long term developments

The impacts of climate change on future flood risk are not fully understood. United Kingdom Climate Projections 2009 (UKCP09) information has been used in this PFRA to provide an insight into the possible impacts of climate change on future flood risk within Derbyshire.

There is scientific evidence that global climate change is happening now and cannot be ignored. Over the past century around the UK sea levels have risen and more winter rain falls in intense wet spells. Seasonal rainfall is highly variable and seems to have decreased in summer and increased in winter. Some of the changes might reflect natural variation, however the broad trends are in line with projections from climate models.

Greenhouse gas (GHG) levels in the atmosphere are likely to cause higher winter rainfall in future and past GHG emissions suggest some climate change is inevitable in the next 20-30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s. There is enough confidence in large scale climate models to require a plan for change and whilst there is more uncertainty at a local level, model results can help in planning to adapt. eg. rain storms may become more intense, but there is no certainty about exactly where or when. By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm in a day) and it is plausible that the amount of rain in extreme storms could increase locally by 40%.

The climate change projections provided by UKCP09 currently reflect the best scientific understanding of how the climate system operates and might change in the future.

Using UKCP09 – 2011, climate projections were obtained for the year 2020 this date being closest to 2017, when the next PFRA will be produced by each LLFA. The climate projections used were based on a 50% probability and medium emissions scenario in the East Midlands region. Therefore for a 50% probability at a given location, it should be interpreted that there is a 50% likelihood that the climate variable will be equal to or less than the predicted climate variable value.

By 2020, for the East Midlands region and for a medium emissions scenario, the following rainfall statistics are estimated.

- Mean winter precipitation is estimated to increase by up to 5%.
- Mean summer precipitation is estimated to decrease by up to 8%.
- Precipitation on the wettest day in winter is estimated to increase by up to 10%.
- Precipitation on the wettest day in summer is estimated to increase by up to 10%.

The consequences being an increase in surface water flooding due to increased levels of precipitation. During the winter months flooding may increase as a result of higher rainfall. During the summer months with estimated increased temperatures there is a possibility of increased convective rain storms with high intensity rainfall events. Climate changes can affect local flood risk in several ways as impacts will depend on local conditions and vulnerability. Wetter winters and more rain falling in wet spells may increase river flooding with more intense rainfall causing more surface runoff, increasing localised flooding and erosion. In turn, this may


increase pressure on drains, sewers and water quality. Storm intensity in summer could increase, even in drier summers, so there is a need to be prepared for the unexpected. In adapting to change there is a requirement to plan ahead and understand current and future vulnerability to flooding, to develop plans for increased resilience and build capacity to adapt to achieve long-term, sustainable benefits. Local information will be invaluable in understanding climate impacts in detail, including effects from other factors, such as land use. Sustainable development and sustainable drainage (SuDs) will help in adapting to climate change and managing the risk of damaging floods in future.

### 5.5 New or proposed major developments which may increase local flood risk

With regards to future developments the number of proposals shown within the LDF would prove difficult to assess against the criteria due to the uncertainty of those likely to be progressed and the likely timescales. To provide a more appropriate response relevant to the timescale of this PFRA only those most likely to come forward within the next six to ten years have been included. No assessment of the likely impact of these proposals has been undertaken as the information available at this time is not sufficient to provide a reasonable projection.

Development Title	Location; i.e. town, village	Type of development; i.e. housing, industry, etc.	Size; i.e. no of houses, approx area	Current position; Under Construction Submitted for planning Long term proposals (i.e. Waterside Chesterfield)
Waterside	Chesterfield	Residential, retail & employment	1500 dwellings, offices, retail, hotel, car parks	Outline planning consent granted
Silkstone	Clay Cross	Residential & employment	950 dwellings, offices, hotel and limited retail	Outline planning consent granted
The Avenue coking plant	Wingerworth	Residential and employment	800 dwellings, offices, mixed employment	Master planning stage, Application imminent
Bolsover North	Bolsover	Residential + ancillary community uses	900 dwellings, school, limited retail	Master planning stage
Staveley	Chesterfield	Residential & employment	2000 dwellings and 28ha employment	Pre-application/ Master planning stage
Drakelow Park	Drakelow	Residential, retail & employment	2000 dwellings, school, retail, employment, leisure	Resolution to grant planning permission
Stanton Pipes / Ironwork	Ilkeston	Residential, retail & employment		Outline application pending
Cawdor Quarry	Matlock	Residential	400 Dwellings	Outline planning consent granted

**Table 1.9 New or proposed major developments**

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New, proposed or long term developments may affect the occurrence and significance of flooding, however current planning policy aims to prevent new development from increasing flood risk. In England, Planning Policy Statement 25 (PPS25) aims to "ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall." However, in exceptional circumstances the Local Planning Authority may accept that flood risk can be increased, contrary to Government policy, because of the wider benefits of a new or proposed major development. Any exceptions would not be expected to increase risk to levels which represent 'significant harmful consequences' at national level.

## **6 Review of Indicative Flood Risk Areas**

### **6.1 Review Indicative Flood Risk Areas provided by the Environment Agency**

There are no indicative flood risk areas identified by DEFRA within Derbyshire.

## **7 Identification of Flood Risk Areas**

### **7.1 Amendments to Indicative Flood Risk Areas (due to geography, information about past flooding or information about future flooding)**

Using the methodology identified within the guidance provided, no further indicative flood risk areas haven been identified within Derbyshire.


### **7.2 Justification of New Flood Risk Areas (using information about past flooding or information about future flooding), or state why no Flood Risk Areas have been identified**

Using the methodology identified within the guidance provided, no further indicative flood risk areas haven been identified within Derbyshire.

## **8 Next Steps**

### **8.1 Proposed measures to support the review of the PFRA every six Years**

As previously referred to in the introduction, the PFRA is the first step in developing a Local Flood Risk Strategy and the production of a PFRA is not a 'one off' event but the start of a six yearly assessment of the flood risk in Derbyshire. Data will continue to be collected relating to flood incidents, investigations and capturing the history of past flood events, and consequently

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the information held will grow in detail as well as volume providing a solid basis for future resistance and resilience against the risk of future floods.

Key to this is the rationalisation of data into meaningful information; a flood is not just a spot on the map as much of the historic data is. Measures are in place to capture data through call centres, borough, district and parish councils and other sources to better assess the;

- Area flooded
- Source and type of flooding
- Types of properties affected
- Frequency and duration of flooding, providing data to help determine the probability

Further information is being sought on some of the more difficult areas such as;

- Groundwater arising from springs, underground cave, mines
- Abandoned coal pits
- Flood Action Groups

And from other sources such as;

- Network Rail
- Association of British Insurers

As information improves the thresholds for locally significant harmful consequences may be amended to reflect the reliability of the new data and this could be refined to 100m grid squares in urban areas to provide a more accurate identification of the problems. The next PFRA will also benefit from six years of local understanding and skills development in the LLFAs.

In order to support future PFRA Derbyshire will:-

- Continue to develop and populate it's GIS systems
- Capture data that meets with requirements of the PFRA Annexes
- Continue to assess the relevance of historic flood events through investigation
- Develop strategies to reduce local flood risk
- promote local flood fairs and support local communities in developing inexpensive solutions to localised SW flooding
- undertake further analysis of the Flood Maps for Surface Water to verify future indicators of flooding which conflict with local knowledge
- undertake further analysis of the transport infrastructure within Derbyshire (County roads and National railways) to identify where critical sections of the transport infrastructure may be affected by areas identified within the Flood Maps for Surface Water.



## 9 Scrutiny, Review and Approval

Scrutiny and review procedures are set out by the European Commission

All LLFAs have been advised to approach Scrutiny to ensure that an internal review of the PFRA has been undertaken. Derbyshire's Scrutiny and Improvement Group have been concerned about the consequences of flooding for some time and have a sub group which has addressed issues regarding Highways Surface Water Flooding and the need for better gully cleansing procedures. This PFRA has been developed with advice from the Scrutiny Flooding Sub Group and has been presented to the full Scrutiny group for their comments and agreement prior to being laid before the Councils Full Cabinet for final approval.

Cabinet Meeting	Date of Meeting	Outcome
Scrutiny and Improvement	16 <sup>th</sup> March 2011	Recommended for Approval
Derbyshire Full Cabinet	10 <sup>th</sup> May 2011	Approved

**Table 2.0 Review and Approvals timetable**

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## **11 Annexes**

### **11.1 Annex 1 Records of past floods and their significant consequences (Preliminary Assessment Report Spreadsheet)**

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Please refer to Annex 1 of the Preliminary Assessment Spreadsheet attached with this report. Due to the lack of comprehensive historic flood information, no events included within Annex 1 have been considered to have 'significant harmful consequences' at a national level. However they are deemed as significant at a local level.

## **11.2 Annex 2 Records of future floods and their consequences (Preliminary Assessment Report Spreadsheet)**

Please refer to Annex 2 of the Preliminary Assessment Spreadsheet attached with this report.

## **11.3 Annex 3 Records of Flood Risk Areas and their rationale (Preliminary Assessment Report Spreadsheet)**

Using the methodology identified within the guidance provided no indicative flood risk areas have been identified within Derbyshire, consequently Annex 3 has not been completed.

## **11.4 Annex 4 Review Checklist**

Please refer to Annex 4 attached to this report, which contains the Review Checklist that has been provided by the Environment Agency to act as a checklist for reviewing the PFRA submission.

## **11.5 GIS layer of flood risk area(s) if one/any exist**

Using the methodology identified within the guidance provided no further indicative flood risk areas have been identified within Derbyshire.

## **11.6 Methodology for data analysis in MapInfo**

The methodology for identifying grid squares as undertaken by Derbyshire County Council where the numbers of Dwellings, Critical Services and Non Residential Properties are in excess of the thresholds for local 'significant harmful consequences' is detailed below.


Step	Description
1	Open MasterMap within MapInfo
2	Open a new browser window and select Topo Area
3	Select the appropriate building type within the Legend column and run an SQL query to extract (Legend 0321 Building). Save the query as a new sub set of data.
4	Open Flood Map for Surface Water 1 in 200 300mm deep layer provided by the Environment Agency.
5	Using the new (0321 Building layer) and the Flood Map for Surface Water select the buildings that Intersect with the flood zone outline using an INTERSECT query. This allows buildings (polygons) to be selected if entirely





	contained within the flood zone as well as those being partially exposed. Save the query as a new sub set of data.
6	Open the National Receptor Database (NRD)
7	Using an SQL query join the information contained within the NRD to the new layer (0321 Buildings) which now only contains buildings which may be at future flood risk. Once joined save this sub set of data.
8	Now run numerous queries to categories the NRD building types into:- Dwellings Critical Services Non Residential Properties** **some of the NRD data did not provide an OS Class therefore it was not known specifically what the building may be. However these have been included for consistency with the national mapping data set used to identify 'indicative flood areas', which also included these buildings. The use of this information may result in an over-estimate of properties 'at risk' within this category.
9	On completion of the queries save three individual mapping layers as per the above categories; Dwellings, Critical Services and Non Residential Properties
10	To undertake a county wide analysis, open an OS 1km grid square layer and identify specific squares which may be affected by future Surface Water Flooding using an SQL query and the local thresholds for Significant Harmful Consequence determined in Section 4.2. Finally open the three 'approved category' layers and using a table update process count the number of each type of building or critical service falls within a 1km grid square.
11	An individual property count is now available for each of the categories; Dwellings, Critical Services and Non Residential Properties




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# Annex 1

## Records of past floods and their significant consequences (Preliminary Assessment Report Spreadsheet)






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## Annex 2

# Records of future floods and their consequences (Preliminary Assessment Report Spreadsheet)






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# **Annex 3** **Records of Flood Risk Areas and their rationale (Preliminary Assessment Report Spreadsheet)**



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# Annex 4

## Review Checklist