

## NOTE TO FILE

JBA Project Code	2020s1733
Contract	Lancaster Level 1 SFRA
Client	Lancaster City Council
Day, Date and Time	29 June 2021
Author	Laura Thompson
Reviewer / Sign-off	Mike Williamson
Subject	Cumulative Impact Assessment Methodology

# 1 Appendix I - Cumulative Impact Assessment Methodology

## 1.1 Methodology

### 1.1.1 Historic flood risk

Historic flood risk was determined using Lancashire Fire and Rescue Service's Flooding Related Incidents, United Utilities' Hydraulic Internal Flooding Incident data and LCiC Reports of Internal Property Flooding data. Each point within both the United Utilities Internal Flooding Incident Dataset and LCiC Reports of Internal Property Flooding data represents a location where it is known there has been at least one flood event (however, the nature and scale of these flood events varies significantly). The data was filtered down using descriptions of flooding incidents to rule out flooding from sources such as sewer flooding and water main bursts.

Attribute data for the Lancaster City Council Reports of Property Flooding point includes the:

- Location of flood incident (street name, town and easting/northing)
- Date of incident

Attribute data for each United Utilities' Hydraulic Flooding Incidents point includes the:

- Location of flood incident (address and postcode)
- Year of incident
- Description of incident
- Number of properties affected

Lancashire Fire and Rescue Service's Flooding Related Incidents data was provided as polygon data, often only representing one property being flooded but a with large area covered by the polygon. In these cases, all catchments that a flooding incident polygon covered was counted as having one historic incident.

Attribute data for each Lancashire Fire and Rescue Service's Flooding Related Incidents polygon includes the:

- Location of flood incident
- Year of incident
- Cause of flooding

A count of each historical flood incident was conducted for each catchment to determine the historic flood risk of the catchments.

### 1.1.2 Sensitivity to increases in flood flows

This is a measure of the increase in the number of properties at risk of surface water flooding in a 1 in 100-year event to a 1 in 1000-year event. It is an indicator of where local topography makes an area more sensitive to increases in flood risk that may be due to any number of reasons, including climate change, new development etc. It is not an absolute figure or prediction of the impact that new development will have on flood risk.

The National Receptor Dataset 2014 was used to identify all the properties within Lancaster City Council's area.

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This data was intersected with the 1000-year and 100-year surface water flood extents separately to determine the number of properties in each catchment, in each surface water flood extent.

The difference between the two was then taken as a percentage of the number of properties in the 100-year surface water flood extent, e.g. if 250 properties are in the 100-year surface water flood extent, and 500 properties are in the 1000-year surface water extent, this would be a 100% increase in properties at risk of flooding.

### 1.1.3 Development

This is a measure of the area development sites within Lancaster City Council administrative area that fall within each catchment. It is an indicator of where development is likely to impact on surface water drainage and how this could potentially affect flood risk downstream.

The development site boundaries provided by Lancaster City Council were intersected with each catchment boundary to provide an area of sites within the catchments. This value was taken as a percentage of the total area of each catchment.

A summary of the datasets used to calculate the historic flood risk and the sensitivity to increases in flood flows for each catchment is shown in **Error! Reference source not found.**

A summary of the studies that were used to assess the nature of flood risk in regions downstream of catchment draining out of Lancaster City Council's area is shown in **Error! Reference source not found.**

Dataset	Coverage	Source of data	Use of data
Catchment boundaries	Lancaster City Council study area	Water Framework Directive (WFD) catchments	Defining catchment boundaries
Neighbouring Local Plan allocations	Neighbouring authorities	Neighbouring authorities	For identifying cross boundary issues with catchments that are shared by Lancaster City Council and neighbouring authorities
Historic flooding incidents	Lancaster City Council study area	United Utilities Lancaster Fire and Rescue	Assessing the number of historic flooding records in each catchment
National Receptor Dataset 2014	Lancaster City Council study area	Environment Agency supplied by	Location of buildings in the LCiC area for assessing those at risk

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Dataset	Coverage	Source of data	Use of data
		Lancaster City Council	from surface water flooding
Risk of Flooding from Surface Water (RoFSW) map, 100-year and 1000-year extents	Lancaster City Council study area	Environment Agency	Assessing the number of properties within the 100-year and 1000-year surface water flooding extent, and to work out predicted increase in surface water flood risk to sites.
Development sites	Lancaster City Council study area	Lancaster City Council	Assessing the percentage of the area of development sites within each catchment covering LCiC.

**Table 1-1: Summary of datasets used in the cumulative impact assessment**

Document	Local Authority	Catchment
Wyre Borough Council Level 1 Strategic Flood Risk Assessment (2016)	Wyre Borough Council	Wyre – Upper, Pilling Water and Cocker (Lune)

**Table 1-2: Summary of studies used to assess the nature of flood risk downstream of Lancaster**

Development data from both the South Lakeland and Craven districts was considered within the cumulative impact assessment as catchments within these districts drain into LCiC. However, as the majority of the development within these districts falls within catchments where only a small portion lies within the Lancaster City Council administrative district, and therefore unlikely to have a significant impact on LCiC, this data was omitted.

### 1.1.4 Ranking the results

The results for each assessment were ranked into high, medium and low risk as shown in **Error! Reference source not found.** below.

Flood risk ranking	% increase in properties within each catchment at risk of flooding in a 1-100 year to 1-1000 year event	Total number of data points in United Utilities Historic Flooding Incidents, Lancashire F&R Incident Recording System and LCiC Flooding Data	% of development sites within each catchment
Low risk	<250%	0 to 2	<2%

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Flood risk ranking	% increase in properties within each catchment at risk of flooding in a 1-100 year to 1-1000 year event	Total number of data points in United Utilities Historic Flooding Incidents, Lancashire F&R Incident Recording System and LCiC Flooding Data	% of development sites within each catchment
Medium risk	250 to 500%	3 to 5	2 to 4%
High risk	>500%	>6	>4%

**Table 1-3: Ranking the results**

The ranking results were combined from both assessments to give an overall high, medium and low ranking for all catchments within the borough as shown in **Error! Reference source not found.** Specific policies are provided for each risk category. To enable a quantitative ranking of catchments, a score was assigned to each of the rankings.

- High = 3
- Medium = 2
- Low = 1

Predicted flood risk ranking	Historic flood risk ranking			
	High	Medium	Low	
High	High	High	Medium	
Medium	High	Medium	Low	
Low	Medium	Low	Low	

**Table 1-4: Final combined rankings**

### 1.1.5 Additional considerations

Skewed results:

Due to the nature of the assessment, catchments with a very small number of properties within the surface water extents could see skewed results, e.g. the Pilling Water Catchment, which has 1 property within the 100-year surface water flood extent and 10 within the 1,000-year surface water flood extent. This gave a result of 900% increase in properties at risk between a 1 in 100-year and 1 in 1000-year event. This meant that this catchment had an overall ranking of high, however the catchment is largely outside of the study area. Incidences of this mainly occurred where only a small area of the catchment lies within Lancaster City Council administrative area and therefore the effect on the study area is minimal. For this reason, the Pilling Water Catchment was given a final ranking of low.

Growth in neighbouring authorities:

Development in neighbouring authorities can affect flood risk in Lancaster City Council, especially if the catchment is draining towards the study area. Development sites in neighbouring authorities were assessed to determine if any neighbouring development would affect flood risk in Lancaster City Council.

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There were 15 development sites in Craven District that are located in the Greta and Wenning – Lower catchments that drain into the east of Lancaster City Council. There were also 20 development sites were identified within the South Lakeland District within the Keer and Keer – Upper catchments that drain into the north of Lancaster. In the remaining neighbouring authorities, there are no significant development sites on catchments draining into Lancaster City Council. With there being so few allocated sites for development within the neighbouring local authorities, it is unlikely that this will have a significant impact on flood risk within Lancaster. However, it is recommended that Lancaster City Council, South Lakeland District and Craven District Councils work together to ensure policies on flood risk and drainage are compatible.

Growth in Lancaster City Council administrative area:

Development within Lancaster City council has the potential to affect flood risk in the neighbouring authorities, especially if there are existing flood risk issues. Previous SFRA studies have been used to identify if each of the catchments that drain into neighbouring Local Authorities have existing flood risk issues, including:

- Wyre Council Level 1 2016 SFRA

All catchments identified as having the potential to impact existing flood risk issues in neighbouring Local Authorities, due to channels draining out of LCiC into other districts, were assigned a score of 2. This contributed to the final score of the catchment and the subsequent rating.

A number of settlements on the River Wyre, including the area north of Garstang and coastal parts of the borough, are at significant risk of flooding from rivers or the sea. Development in the upper catchments of the River Wyre that exist within Lancaster City Council have the potential to exacerbate this issue due to an increase in impermeable land.

Neighbouring Local Planning Authorities should work alongside each other and the Lead Local Flood Authority to develop complementary Local Planning Policies for the Wyre and Lancaster districts. Local Planning Policy should aim to include measures such as SuDS, natural flood management techniques and green infrastructure within development to contribute to a reduction of flood risk downstream.

### 1.1.6 Assumptions

The assumptions made when conducting the Cumulative Impact Assessment are shown below in **Error! Reference source not found.**

Assessment aspect	Assumption made	Details of limitation in method	Justification of method used
Sensitivity to increases in flood flows	Location of properties	Assumption that all properties have been included in the in the National Receptor Dataset 2014. It may not include all new build properties.	This was the most up to date and accurate data available.

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Assessment aspect	Assumption made	Details of limitation in method	Justification of method used
United Utilities' Hydraulic Flooding Incidents	Severity of historic flooding	Each point represents a location where it is known there has been at least one flood event (however the nature and scale of these flood events varies significantly). The severity of the historic flooding event relating to the point has not been considered, just the total number of points within each catchment where there has been a historic flood event.	This is a conservative approach to consider the 'worst case' of flood risk.
Lancashire Fire and Rescue Incident data	Severity of historic flooding	Data was provided as polygon shapefiles detailing incidents of historic flooding. Polygons referred to one instance of historic flooding but often covered multiple catchments. This was combatted by counting one historic flooding event per catchment each polygon covered.	This is a conservative approach to consider the 'worst case' of flood risk.

**Table 1-5: Assumptions of the cumulative impact assessment**