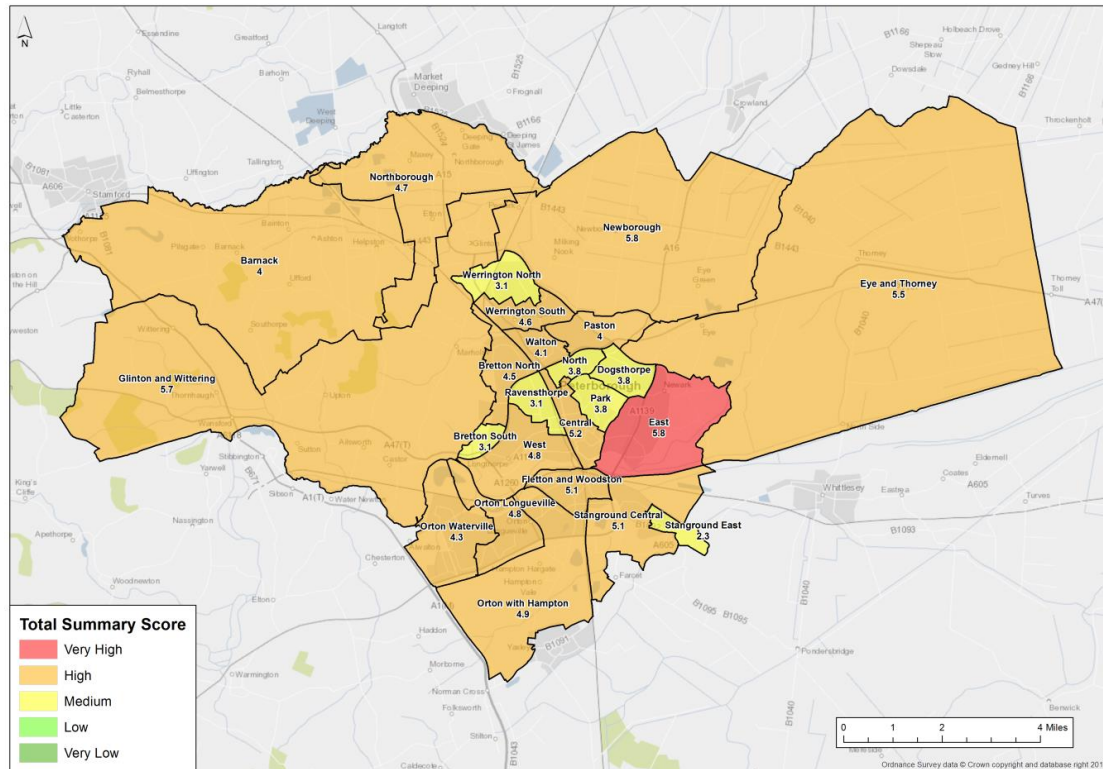


APPENDIX E

Peterborough Flood Risk and Climate Change Sensitivity

Summary of Methodology



What is it?

The Peterborough flood risk and climate change sensitivity tool, combines local and national datasets of environment and infrastructure to help understand the risk of present-day and future flooding, based on climate change predictions, within the city.

Was does it do?

The tool produces a summary score per ward based on the risk of flooding from surface water, groundwater and fluvial flooding to people, infrastructure, economy and environment; for present day and future risk.

How does it work?

A list of infrastructure and environmental receptors were identified and split into impact categories (as presented in **Table 1**). For each of the receptors in a ward, an individual score from 0 (low number of receptors impacted) to 8 (high number of receptors impacted) is calculated based on how many receptors are at risk. This is undertaken for each of different flood events. These individual receptor scores are then combined to give an overall impact score and priority grading for each ward.

Results for future risk (climate change) are calculated using the change in impact scores between the modelled results. For fluvial this is the difference between flood zone 2 and flood zone 3 and for surface water this is the change in impact score between the 1 in 30 probability event and the 1 in 1:1,000 probability event. No climate change results have been derived for groundwater.

Impact Category	Receptor types	
Health	GP Surgeries	
	Hospitals	
	Nursing Homes (vulnerable people at risk)	
Social	Residential Properties in 40% Most Deprived Areas	
	Residential Properties in 40% to 80% Most Deprived Areas	
	Residential Properties in 20% Least Deprived Areas	
Economics	Residential Properties	
	Non-Residential Properties	
Environmental	Environmental Designations	
	Listed Buildings	
Infrastructure	Roads	Trunk Roads
		Strategic Routes
		Main Distributor Roads
		Secondary Distributor Roads
		Link Roads
		Local Access Roads
	Rail	Railway Lines
		Railway Stations
	Schools	Primary Schools
		Secondary Schools
	Emergency Services	
	Sewage Treatment Works	
	Power Network	Electricity Sub Stations
		Gas Compression Sites
Power Stations		

Table 1 – List of Infrastructure and environmental receptors

Example of how the Peterborough flood risk and climate change sensitivity tool works

For each ward the total number of a specific receptor (e.g. GP surgeries) are identified. The locations of these receptors are then reviewed against the risk of flooding.

The Dogsthorpe Ward has two GP surgeries located within its ward boundary, Dogsthorpe Medical Centre and Welland Medical Practice (red dots on the map to the right).



For a 1 in 30 probability surface water event (blue outline on the map below) only the Welland Medical Practice is affected.



The tool uses this information to determine the ‘GP capacity at risk score’ which is based on the percentage of GP surgeries within a ward that are at risk (Table 2). The score in Dogsthorpe Ward for GP risk is 5 (25% – 50% at risk) based on one of the two GP surgeries being affected. For a larger surface water event, the score increases to an 8, as both the surgeries would be affected by flooding.

The overall health impact score is calculated for each type of flood risk by taking the **highest score** from the following health receptors:

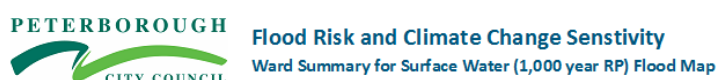
- GP capacity at risk;
- Vulnerable people at risk; and
- Hospitals at risk.

Score	Criteria
1	None at risk
3	1% – 25% at risk
5	25% – 50% at risk
8	More than 50% at risk

Table 2 – Scoring criteria for GP’s surgeries

An impact score is then calculated for each of the five impact categories.

The impact scores are then combined and displayed as an average. The average impact score is then calculated and converted into a priority grading. The results for the 1 in 1000 probability surface water event are displayed below. Dogsthorpe is classed as being Very High.



Ward	Health	Social	Economics	Environmental	Infrastructure	Average Score	Priority Grading
Barnack	3	5	3	8	8	5.4	High
Bretton North	8	8	5	5	8	6.8	Very High
Bretton South	8	5	3	2	8	5.2	High
Central	8	8	5	8	8	7.4	Very High
Dogsthorpe	8	8	5	2	8	6.2	Very High
East	8	8	5	8	8	7.4	Very High
Eye and Thorney	8	8	5	8	8	7.4	Very High
Fletton and Woodston	8	8	5	5	8	6.8	Very High
Glington and Wittering	8	5	5	8	8	6.8	Very High
Newborough	8	5	3	8	8	6.4	Very High
North	8	8	3	3	8	6.0	High
Northborough	8	5	3	8	8	6.4	Very High
Orton Longueville	8	8	5	8	8	7.4	Very High
Orton Waterville	8	5	5	8	8	6.8	Very High

Table 3 – Results for the 1 in 1000 probability flood event

The tool provides summary scores for different types of flood events along with a combined score for all the flood types.

Further reading

A more detailed methodology report is available, outlining all the classifications, queries and scoring used within the tool.

Appendix F - List of completed actions

Version 3

KEY TO ACRONYMS						
Action code	A	Asset related	D	Development related		
	C	Communications related	P	Project or scheme		
Management area	Fens	Fens (rural north and east)	P-wide	Peterborough wide	RW	Rural west
	U	Urban				
Organisations/partners	AW	Anglian Water	IDBs	All Internal Drainage Boards	PCC	Peterborough City Council
	CCC	Cambridgeshire County Council	MLC	Middle Level Commissioners	Peterborough DNA	Peterborough DNA future cities project
	EA	Environment Agency	NCC	Northamptonshire County Council	W&D IDB	Welland and Deeping IDB
	FloW	Flood and Water Management Partnership	NLD IDB	North Level	WVP	Welland Valley Partnership
Funding source	AW AMP	Anglian Water Asset Management Plan	FDGiA	Flood Defence Grant in Aid	WFDGiA	Water Framework Directive Grant in Aid

Action Name	Action Code	Management Area	Ward	Action Description	Lead Partner	Other Partners	Risk source	Funding Source	Cost (£)	FMS Objectives				Progress Notes
										1	2	3	4	
Parish dykes	A	RW & U	Several Wards	Asset survey of Parish dykes	PCC		Ordinary watercourse	PCC	10 - 50 k	1				Completed
Staffing 1	D	P-wide	All	Creation of Flood and Water Management Officer post	PCC		All	PCC	10 - 50 k	1	2	3	4	Completed
Staffing 2	D	P-wide	All	Creation of a Drainage Team - recruitment	PCC		Surface water	PCC	50 - 100 k	1	2	3	4	Completed
Planning	D	P-wide	All	Improve consideration of drainage in planning considerations - greater involvement of PCC Drainage Team and raising awareness of future sustainable drainage requirements	PCC		Surface water	PCC	Staff-time	1				Completed
Training	D	P-wide	All	Training of Drainage Team and all council officers to be involved in sustainable drainage processes	PCC		All	PCC	≤ 10 k	1				Completed
Planning policy	D	P-wide	All	Development, adoption and implementation of Flood and Water Management Supplementary Planning Document as part of planning policy framework.	PCC	FloW Partnership	Main river & surface water	PCC	Staff-time	1			4	Completed
SuDS software	D	P-wide	All	Purchase new software to manage SuDS inspection and adoption process	PCC		Surface runoff, ordinary watercourse, groundwater	PCC	10 - 50 k		2			Completed
Land drainage consent	D	U & RW	All	Establish a Council system for approval of third party works on ordinary watercourses and raise awareness among planners and developers	PCC		Ordinary watercourse	PCC	Staff-time	1			4	Completed
Padholme	D	U & RNE	East	Put in place final processes for completing the conditions of the Padholme Catchment agreement	PCC	HCA, EA, NLD IDB	Main river & ordinary watercourse	Padholme Agreement (HCA)	Staff-time		2			Completed

CPLRF	C	P-wide		Strengthen relationships within the Cambridge and Peterborough Local Resilience Forum	PCC	LRF		PCC, CPLRF	Staff-time		2			Completed
Red Cross support	C	P-wide		Develop relationship with the Red Cross to enable improved recovery procedures and facilities.	PCC	LRF	All	PCC	Staff-time		2			Completed
Flood wardens	C	P-wide		Increase the number of Peterborough flood wardens	PCC	EA	All	EA,PCC	Staff-time	1	2	3		Completed
Partnership creation	C	P-wide		Create Peterborough Flood Risk Partnership	PCC	FloW Partnership	All	PCC	Staff-time		2			Completed
RFCC input	C	P-wide		Strengthen the involvement of PCC in the Regional Flood and Coastal Committee - regular attendance, amended voting regime, officer attendance	PCC	EA	All	PCC, RFCC	≤ 10 k	1	2	3	4	Completed
Keep it Clear Central Ward	C	U	Central Ward	Reduce the chance of sewer flooding in Central Ward - Keep it Clear campaign, working with businesses and residents to keep fats, oils , greases and rag out of sewers.	AW		Foul sewer	AW	10 - 50 k	1		3		Completed
Keep it Clear Stanground	C	U	Stanground Central	Reduce the chance of sewer flooding in Stanground Central Ward - Keep it Clear campaign, working with businesses and residents to keep fats, oils , greases and rag out of sewers.	AW		Foul sewer	AW	10 - 50 k	1		3		Completed
Insurance	C	P-wide		Stay abreast of changes to the flood insurance situation; keep flood wardens up-to-date, develop procedure for residents with insurance queries and lobby with the RFCC for improvements.			All	PCC	Staff-time	1				Completed
Surface water maps	C	P-wide		Develop and publish first set of surface water maps on Environment Agency website (uFMfSW)	EA		Surface runoff	EA	50 - 100 k	1		3		Completed
Main River map update	C	P-wide		Publish new format Main River flood risk maps on Environment Agency website	EA		Main river	EA	10 - 50 k	1		3		Completed
Flood fair	C	U	West Ward	Work with Flood Wardens and community to put on a Flood Fair in Thorpe Meadows	Flood Warden(s)	FloW Partnership	All	EA, PCC, Community, Ramada Hotel	≤ 10 k	1		3		Completed
PCC water web pages	C	P-wide		Keep flood and water web pages up-to-date and useful	PCC		All	PCC	Staff-time	1				Completed
SuDS website	C	P-wide		Develop new SuDS website (microsite)	PCC		Surface runoff, ordinary watercourse, groundwater	PCC	≤ 10 k	1			4	Completed
North Bank highway protocols	C	RNE	Eye and Thorney	Review of Highway Protocol document relating to closures of North Bank caused by flooding	PCC	EA	Surface runoff	PCC	Staff-time		2	3		Completed
FloW Partnership	C	P-wide		Change function of Peterborough Flood Risk Partnership to cover all water issues - becoming the Peterborough Flood and Water Management (FloW) Partnership	PCC	FloW Partnership	All	PCC	Staff-time		2		4	Completed
ADA Demonstration event	C	RNE	Eye and Thorney	ADA Demonstration Event to raise awareness of IDB roles and drainage capabilities and equipment	NLD IDB	FloW Partnership	Ordinary watercourse	NLD IDB, ADA, many other organisations	10 - 50 k	1				Completed

Werrington Brook	P	U	North Bretton, Walton, Werrington North, Werrington South	Werrington Brook Improvements Project - Feasibility Study	PCC	EA, WVP, WNC	Main river & surface runoff	WVP, EA, PCC	10 - 50 k				4	Completed
SWMP	P	P-wide	All	Improving baseline knowledge about surface water flood risk through the Surface Water Management Plan process - feeds directly into development of the Peterborough Flood Risk Management Strategy. Includes identification of partner roles, existing maintenance, hotspots, key actions required etc.	PCC	FloW Partnership	Surface runoff	Defra	10 - 50 k	1	2	3		Completed
Corporate Tactical Team	P	P-wide		Create and implement improve internal emergency planning procedures across the Council - Establish a council Tactical Team of officers who can co-ordinate /prepare for any emergency	PCC		All	PCC	Staff-time					Completed
Test emergency plans	P	P-wide		Carry out response exercises with other emergency responders and services	CPLRF		All	CPLRF	10 - 50 k		2			Completed
Whitecross subway	P	U	Ravensthorpe and Bretton North	Flood reduction scheme in Whitecross subway	PCC		Surface runoff	PCC	£5,000			3		Completed
Rural highway drainage assets	P	RW & RNE	Several wards	CCTV surveys of rural highway assets	PCC		Surface runoff, ordinary watercourse, groundwater	PCC	10 - 50 k	1	2			Completed
New England sewers	P	U	North Ward	Investigate and resolve flooding issues in New England - large scale cleanse of sewers along Lincoln Road and removal of tree roots from surface water sewer under A47	AW	FloW Partnership	Foul and surface water sewers	AW	10 - 50 k			3		Completed
Ham Lane ditch	P	U	Orton Waterville	Ham Lane ditch works	PCC		Ordinary watercourse	PCC, NPT	≤ 10 k			3		Completed
Upton highway drainage works	P	RW	Glington and Wittering	Jetting and cleansing of the highway drainage system, Church Walk, Upton	PCC		Surface runoff	PCC	≤ 10 k			3		Completed
Gully connection investigations	P	U	Several Wards	Investigations of problem gully lateral connections - various locations	PCC		Surface runoff	PCC	≤ 10 k	1				Completed
CCTV and root cutting various	P	P-wide	Several Wards	CCTV and root cutting, cleansing at Cannons Barn Farm Lincoln Road Werrington, Rectory Lane Etton and Church Walk Marholm.	PCC		Surface runoff, ordinary watercourse, groundwater	PCC	≤ 10 k	1		3		Completed
Monarch Avenue	P	U	Stanground Central	Monarch Avenue CCTV and cleansing	PCC		Surface runoff	PCC	≤ 10 k	1		3		Completed
Stewards House Drain	P	RNE	Eye and Thorney	Stewards House Drain surveys, investigation and scheme design	NLD IDB	PCC	Ordinary watercourse	NLD IDB, PCC	≤ 10 k		2	3		Completed
Parkway drains	P	U	Several wards	Major cleansing and de-rooting programme of parkway highway drains	PCC		Surface runoff	PCC	50 - 100 k	1		3		Completed
Nene measurement boards	P	U	West Ward, Central Ward	Nene measurement boards at Thorpe Meadows and Town Bridge	PCC		Main river	PCC	≤ 10 k	1				Completed
Dams Pond de-silt	P	U	West	De-silting of Dams Pond	PCC		Ordinary watercourse	PCC	10 - 50 k			3		Completed

Racecourse Drain	P	U	East	De-silting culverted and open sections of Racecourse Drain - two phases	PCC		Ordinary watercourse	Padholme Agreement (HCA)	50 - 100 k			3		Completed
Hampton investigations	P	U	Orton with Hampton	Investigations into foul sewer issues and first phase implementation measures related to resilience of pumping station control panel	AW		Foul and surface water sewers	AW	10 - 50 k			3		Completed
North Ward flood alleviation works 1	P	U	North Ward	Works to improve surface water drainage system on Welland Road, removing inadequate soakaway function	AW and PCC		Surface runoff	AW	≤ 10 k			3		Completed
North Ward flood alleviation works 2	P	U	North Ward	Works to improve surface water drainage system in Welland Close	AW and PCC		Surface runoff	AW	≤ 10 k			3		Completed

Appendix G - Flood Incident Notification Form

Please note that the Peterborough thresholds for the investigation under section 19 of the Flood and Water Management Act 2010 are set out at the end of this form.

Incident notification being sent to Peterborough City Council by:

These details will not be included in the published results

INDIVIDUAL OR ORGANISATION	✓	INDIVIDUAL OR ORGANISATION	✓
Peterborough Resident		North Level District IDB	
Peterborough Business		Peterborough City Council officer	
Anglian Water		Peterborough City Council call centre	
Cambridgeshire Fire and Rescue		Peterborough Highway Services	
Cambridgeshire Police		Welland and Deepings	
Environment Agency		Whittlesey and District	
Middle Level Commissioners		Other (please specify)	

NAME OF PERSON REPORTING	TELEPHONE	EMAIL ADDRESS

Incident details

Question number	Question	Response
1	Date and time	
2	Name and contact details of person reporting incident <i>(in case we have to check further details later on e.g. officer or resident details)</i>	
3	Location of flooding. <i>e.g. 1 Beasley Road, Bretton Must include a clear address, or landmark (such as or the junction of X and Y roads or outside Z school) or will be rejected. By the bus stop on Thorpe Rd is no good!</i>	
4	Depth and extent of water <i>e.g. within highway, up to properties or inside properties</i>	

Question number	Question	Response
5	Duration of flooding <i>e.g. if residents tell you it has been like that for 2 hours</i>	
6	Suspected cause of flooding <i>e.g. from sewers, river</i>	
7	Other notes <i>e.g.</i> <ul style="list-style-type: none">• <i>any significant weather to note</i>• <i>has this happened before</i>• <i>is it getting worse?</i>	

Initial flood category rating

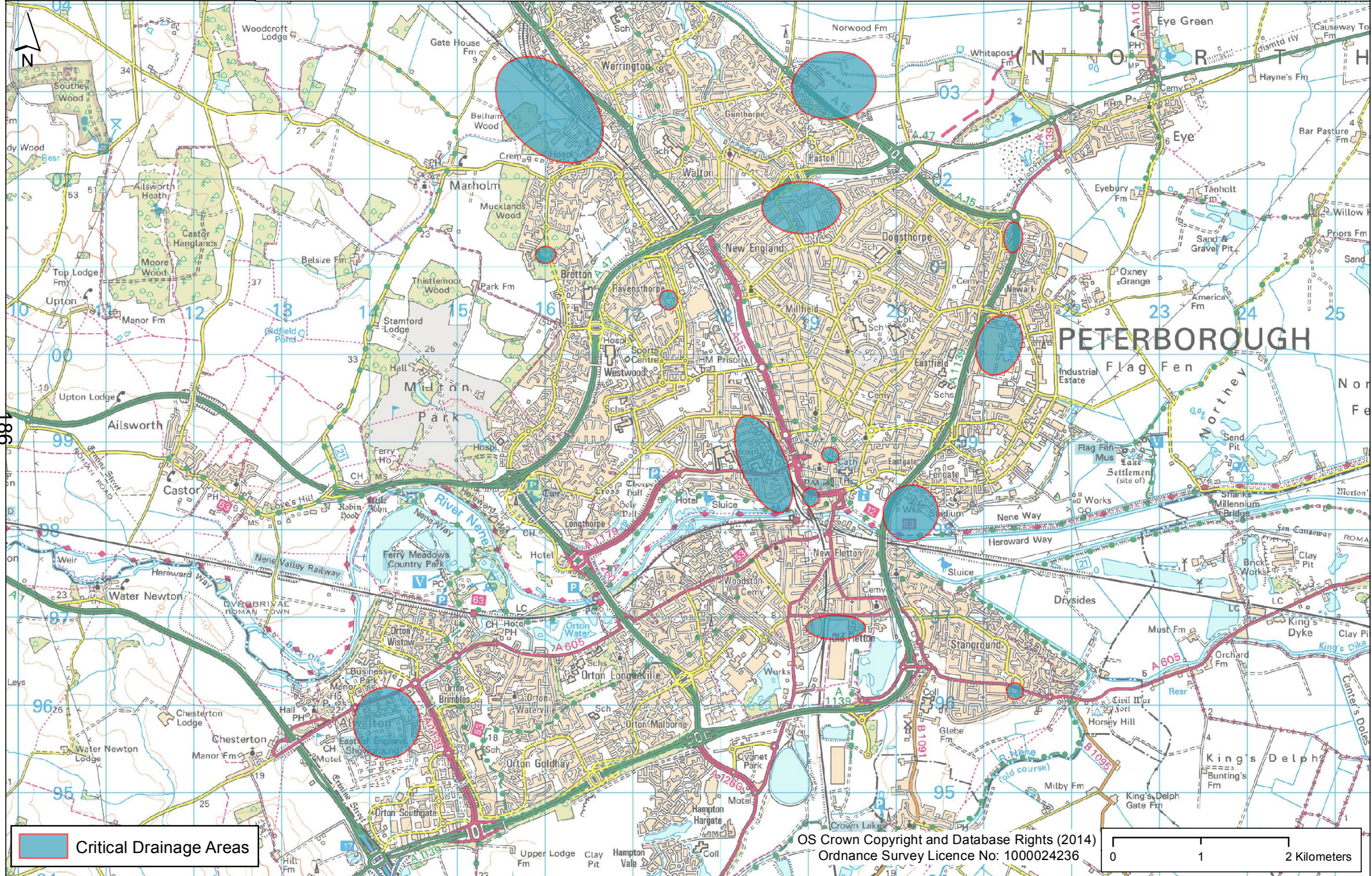
Category	Description	Tick relevant category based on information above
1	Meets a PCC threshold	
2	Doesn't meet a PCC threshold but flooding is very close to a property or with fair chance of reaching property with similar future rain events e.g. within property boundary	
3	Flooding within carriageway or within a field with low chance of reaching property	

Peterborough City Council thresholds (for information)

1. Flooding internally to one or more residential properties
2. Flooding to critical infrastructure (e.g. electricity substation)
3. Flooding to five or more commercial properties
4. Flooding which causes a transport link to be totally impassable for a significant period*
5. Reoccurring flooding on five or more occasions over a period of separate flood events of strategic highway routes or within property boundaries

For the purposes of threshold 4 above the definition of "significant period" is dependant on the transport link affected. The highway categories are as set out in Table 1 of the UKRLG Code of Practice for Highway Maintenance, but the timings for significant period have been derived for the purpose of the Local Flood Risk Management Strategy They are as follows:

- Category 1 Motorway - over 2 hours
- Category 2 Strategic Route (Trunk Roads and some Principal "A" roads) – over 4 hours
- Category 3a Main Distributor (Major Urban Network and Inter-Primary Links) – over 4 hours
- Category 3b Secondary Distributor (Classified Road (B and C class) – over 10 hours
- Category 4a Link Road (Roads linking the main distributor network to the Secondary Distributor) – over 10 hours
- Category 4b Local Access Road (Roads serving limited numbers of properties carrying only access traffic) – over 24 hours



Critical Drainage Areas

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0 1 2 Kilometers