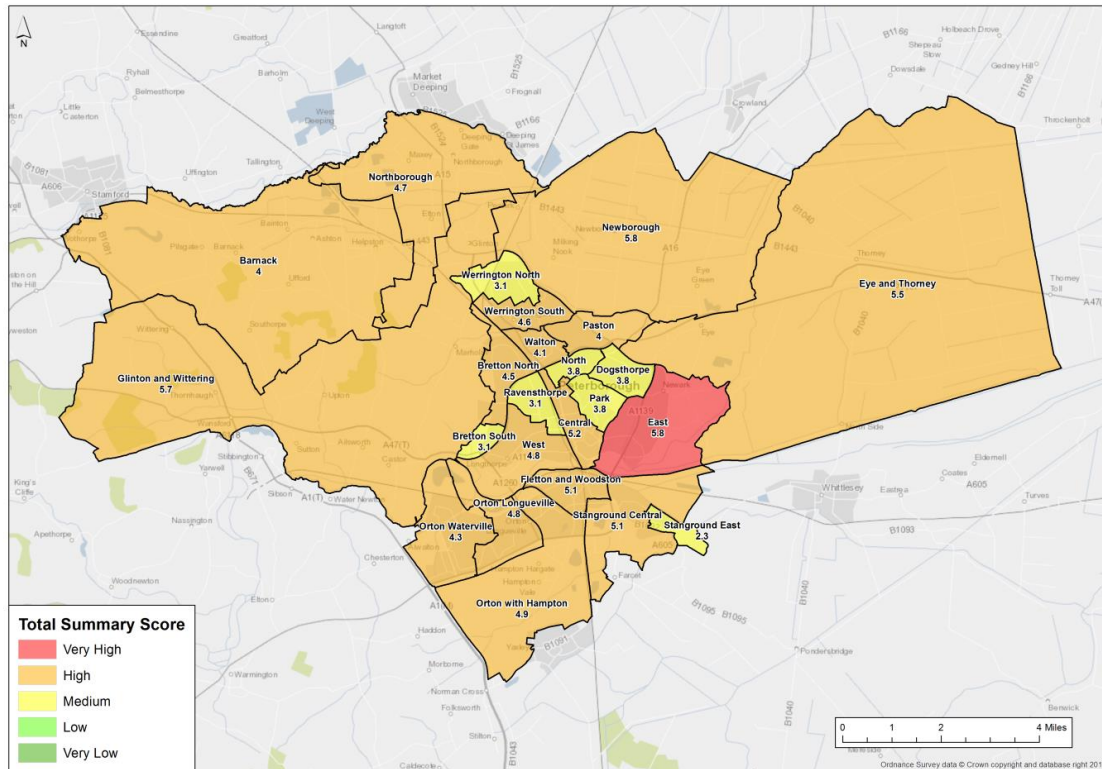


# APPENDIX E

## 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:

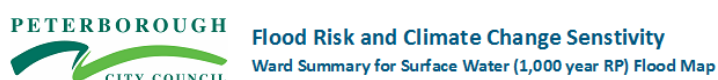
- GP capacity at risk;
- Vulnerable people at risk; and
- Hospitals at risk.

| 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               |               |  |                |                                 |                         |  |
|-------------------------------|---------------|--|----------------|---------------------------------|-------------------------|--|
| <b>Action code</b>            | <b>A</b>      | Asset related                          | <b>D</b>       | Development related             |                         |  |
|                               | <b>C</b>      | Communications related                 | <b>P</b>       | Project or scheme               |                         |  |
| <b>Management area</b>        | <b>Fens</b>   | Fens (rural north and east)            | <b>P-wide</b>  | Peterborough wide               | <b>RW</b>               | Rural west                             |
|                               | <b>U</b>      | Urban                                  |                |                                 |                         |  |
| <b>Organisations/partners</b> | <b>AW</b>     | Anglian Water                          | <b>IDBs</b>    | All Internal Drainage Boards    | <b>PCC</b>              | Peterborough City Council              |
|                               | <b>CCC</b>    | Cambridgeshire County Council          | <b>MLC</b>     | Middle Level Commissioners      | <b>Peterborough DNA</b> | Peterborough DNA future cities project |
|                               | <b>EA</b>     | Environment Agency                     | <b>NCC</b>     | Northamptonshire County Council | <b>W&amp;D IDB</b>      | Welland and Deeping IDB                |
|                               | <b>FloW</b>   | Flood and Water Management Partnership | <b>NLD IDB</b> | North Level                     | <b>WVP</b>              | Welland Valley Partnership             |
| <b>Funding source</b>         | <b>AW AMP</b> | Anglian Water Asset Management Plan    | <b>FDGiA</b>   | Flood Defence Grant in Aid      | <b>WFDGiA</b>           | 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<br><i>(in case we have to check further details later on e.g. officer or resident details)</i>  |          |
| 3               | Location of flooding.<br><i>e.g. 1 Beasley Road, Bretton<br/>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<br><i>e.g. within highway, up to properties or inside properties</i>  |          |

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

## Initial flood category rating

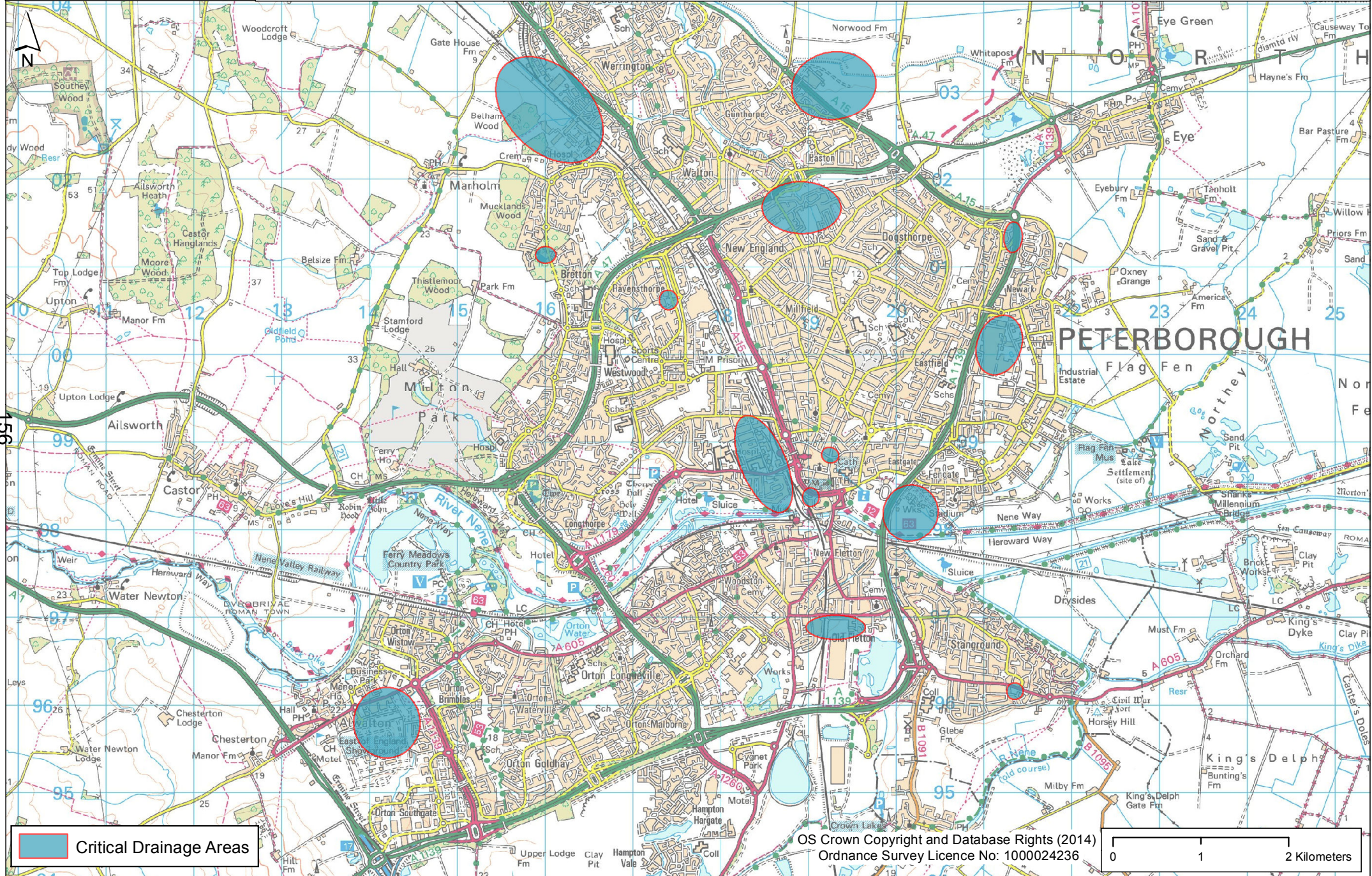
| Category | Description  | Tick relevant category based on information above |
|----------|--|---|
| 1        | Meets a PCC threshold  |   |
| 2        | Doesn't meet a PCC threshold but flooding is very close to a property or with fair chance of reaching property with similar future rain events e.g.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