



Highway Maintenance Hierarchy & Resilient Network Strategy



Document Information

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1. Introduction

If you live, work or pass through Nottingham City you will use the largest and most visible asset Nottingham City is responsible for – the Highway Infrastructure Network.

A Highway Infrastructure Network road hierarchy is the foundation of a coherent, consistent, well managed and auditable infrastructure maintenance strategy. It is crucial to asset management planning as it enables different levels of service to be associated with different maintenance categories to ensure key infrastructure assets are maintained appropriate to their use and agreed levels of service.

Recommendation 12 of the Well-managed Highway Infrastructure Code of Practice states;
“A network hierarchy, or a series of related hierarchies, should be defined which include all elements of the highway network, including carriageways, footways, cycle routes, structures, lighting and rights of way. The hierarchy should consider current and expected use, resilience, and local economic and social factors such as industry, schools, hospitals and similar, as well as the desirability of continuity and of a consistent approach for walking and cycling.”

A highway infrastructure network hierarchy should be based on asset function, providing the foundation of a risk-based maintenance strategy in line with the risk-based approach detailed in the new Code of Practice. It is crucial in establishing achievable levels of service and to the statutory network management role for developing co-ordination and regulating occupation.

Whilst different infrastructure assets may have their own maintenance hierarchies there is a need to ensure they are related, so that they can all be considered in a holistic approach to prioritising works across all highway infrastructure assets in relation to each other and in relation to the whole highway infrastructure network.

This document explains how the Council has considered the carriageway and footway asset groups and how the maintenance hierarchy for those assets has been derived.

To ensure consistency and an understanding of maintenance hierarchies the Council has created a “series” of maintenance hierarchies for the major asset group as indicated in the following table:



Table 1 - Maintenance Hierarchy “Series”

Series	Asset Group
M100	Carriageways
M200	Footways
M300	Street Lighting*
M400	Cycle Routes*
M500	Bridges & Structures*
M600	Drainage*
M700	Traffic Signals*
M800	Street Scene*

* work is ongoing in developing maintenance hierarchies for these infrastructure asset groups

The maintenance hierarchies developed to date are dynamic and will be reviewed regularly to ensure any changes within the Council are reflected in the assets functionality and therefore considered in its maintenance strategy to reflect the current situation.

The following chapters discuss the process and consideration in the development of the maintenance hierarchy for the carriageway and footway asset groups.

Separate to maintenance hierarchies is the requirement to define and maintain a resilient network, which will be an attribute of the new maintenance hierarchies.

The Secretary of State commissioned an Independent Review of the resilience of the nation’s transport network, resulting in the 2014 Transport Resilience Review by Department for Transport (DfT). The Transport Resilience Review recommended that Local Highway Authorities should; *“Identify a ‘resilient network’ to which they will give priority, in order to maintain economic activity and access to key services during extreme weather” (DfT, 2014).*

This document also discusses the creation of the resilient network.

Local officers, inspectors, and members of the public have the opportunity to provide feedback, challenging the maintenance hierarchy and resilient network, each of which will be reviewed on an annual, and case by case basis and updates made where appropriate.

Where roads cross from Nottingham into Nottinghamshire, hierarchies will be compared to ensure the same level of service is maintained i.e. SKID resistance, safety Inspections, winter treatment routes etc., and adjusted where considered necessary.



2. M100 – Carriageway Maintenance Hierarchy

The classification of Britain's roads dates back to the 1920s, when it had become clear that it was necessary to have a system to help motorists identify good routes for driving. In the 1960s, the existing system was overhauled to help deal with an age of mass-motoring.

All UK roads (excluding motorways) fall into the following four categories:

- A roads – major roads intended to provide large - scale transport links within or between areas.
- B roads – roads intended to connect different areas, and to feed traffic between A roads and smaller roads on the network.
- C roads – smaller roads intended to connect together unclassified roads with A and B roads, and often linking a housing estate or a village to the rest of the network. Similar to 'minor roads' on an Ordnance Survey map.
- U roads – Unclassified local roads, principally residential or minor rural roads intended for local traffic. The vast majority (60%) of roads in the UK fall within this category.

As originally conceived, these four classes form a hierarchy. There has never been a comprehensive review of the road hierarchy within the Council. Maintenance need and prioritisation has always been based upon the generic road classification carried out in the 1960's, however, much has changed since that time and consequently the reliance on the road classification system to identify roads most in need of maintenance may not represent the best approach or value.

The current road network hierarchy should reflect the needs, priorities and actual use of each road and the new code makes particular reference to the importance of continuity with the road hierarchy of neighbouring authorities. The benefit of providing consistency of approach across the region is that it will strengthen a Council's legal position on its management of the highway network and ensure the same levels of service are adopted between the authorities

2.1. Process in Developing the Carriageway Maintenance Hierarchy

In order to develop the carriageway maintenance hierarchy, there is a need to identify a criterion which affects the maintenance of each road maintenance category. The Council has decided to follow the new Code of Practice to deliver its maintenance hierarchy and make a fresh assessment of the importance and use of the network. Therefore, there has been no consideration of its existing road hierarchy and each road section has been assessed on its own merits based around data which is auditable, repeatable and transparent. The hierarchy definitions contained in Table 2 were developed through the course of the process.



Table 2 – Carriageway Hierarchy Definitions

Maintenance Hierarchy	Type of Road	Description
M101	Strategic Roads	Major national cross-country roads between places of traffic importance across the UK, with the aim of providing easily identifiable routes to access the whole of the country i.e. motorway network. Typically, major dual carriageways and major single A roads.
M102	Main Distributors	Primary roads within the city providing quick access to urban areas, linking to major industrial/ retail areas and main centres of employment. These roads will typically be inner and outer ring roads.
M103	Secondary Distributors	Roads connecting urban areas to the inner and outer ring road. Typically, major bus routes and roads serving smaller retail i.e. District Centres, business and leisure facilities. Also including roads serving the city centre from the inner ring roads.
M104	Tertiary Distributors	Roads providing alternative but less direct links between urban areas and the inner and outer ring roads. They typically are the main routes through residential and industrial areas and will have less traffic than secondary roads.
M105	Collector Roads	Roads providing links within residential areas, often bus routes, small shopping frontages <4 shops. Typically, the spine road through an urban estate, collecting traffic from access and minor residential roads.
M106	Access Roads	Roads serving to distribute users from major residential roads to minor residential roads, often with on street parking serving >30 properties including long cul-de-sacs and minor industrial estate roads
M107	Minor Residential Roads	Urban residential roads including those with a shared road space. Typically, cul-de-sacs with <30 properties, including paved service roads i.e. rear of residential properties/shops
M108	Back/service Roads	Unpaved/gravel roads



2.2. Nottingham's Six Steps to Creating a Carriageway Maintenance Hierarchy

Step 1

A workshop was held in Nottingham where the network was produced on Four 1:10000 A1 size plans, printed to cover the complete road network. Using the experience and local knowledge of a group of highway technicians a first attempt was then made to determine roads that were included in the top four hierarchies. Roads were coloured with felt tip pen to identify hierarchies M101, M102, M103 and M104. Though based on local knowledge only this was a useful exercise in that it developed the thought processes required.

Step 2

The road hierarchies determined within step 1, were transferred to GIS such that it could be represented alongside the Local street Gazetteer.

Step 3

The digital plans produced in Process 2 were then sense checked against available traffic flow data for the City.

The data used can be found here:

<https://drakewell01.drakewell.com/multinodemap.asp>

As a result, some significant changes were made to certain routes. In the course of scrutinising the traffic data some clear bandings of AADT (Annual Average Daily Traffic) emerged to provide differentiation between hierarchies M101, M102 and M103. Roads previously identified as Hierarchy M104 were also sense checked using traffic data, where available and against a definition which had now been established as 'the main routes within and through residential and industrial areas.

Step 4

Public transport routes were assessed using the following resources:

http://www.Nottinghamsbus.info/images/Nottingham_a.pdf

<http://www.Nottinghamconnected.com/wp-content/uploads/2016/05/Nottingham-public-transport-map-2016.pdf>

Bus routes were added to the digitised map representation parts of which were already covered by hierarchies M101, M102 M103 and M104. Any bus / public transport routes that were not covered by the top four hierarchies were assigned to hierarchy M105.

Step 5

Attention then switched to establishing the lower hierarchy levels.

The lowest level was agreed to be unsurfaced roads M108.

From examining the road layouts, particularly in residential areas, it was clear that there were a large number of small cul-de-sacs and then there were other roads that collected traffic from these cul-de-sacs to feed in turn to hierarchies M105 and M104. Further examination of the numbers of properties served by the small cul-de-sacs enabled a definition to be established in that they would serve 30 or fewer properties.



By this process hierarchies M108 (unsurfaced roads), M107 (small cul-de-sacs serving less than 30 properties) and M106 (roads collecting traffic from the small cul-de-sacs to feed into hierarchies M104 and M105) were established.

Hierarchies M106, M107 and M108 were then added to the digitised layer.

During the course of digitising M106, M107 and M108 some additional M104 and M105 routes were established on the basis that they shared the characteristics of routes already assigned to these hierarchies.

Step 6

The technician team developed a good and developing understanding of assigning hierarchies to Nottingham City's roads in the course of the whole exercise. As understanding developed previous work was reviewed and sense checked multiple times to ensure that a consistent approach was applied across the city.

Figures 1 & 2 illustrate the above process which was adopted in determining the maintenance hierarchy.



Figure 1 – Carriageway Maintenance Hierarchy Process

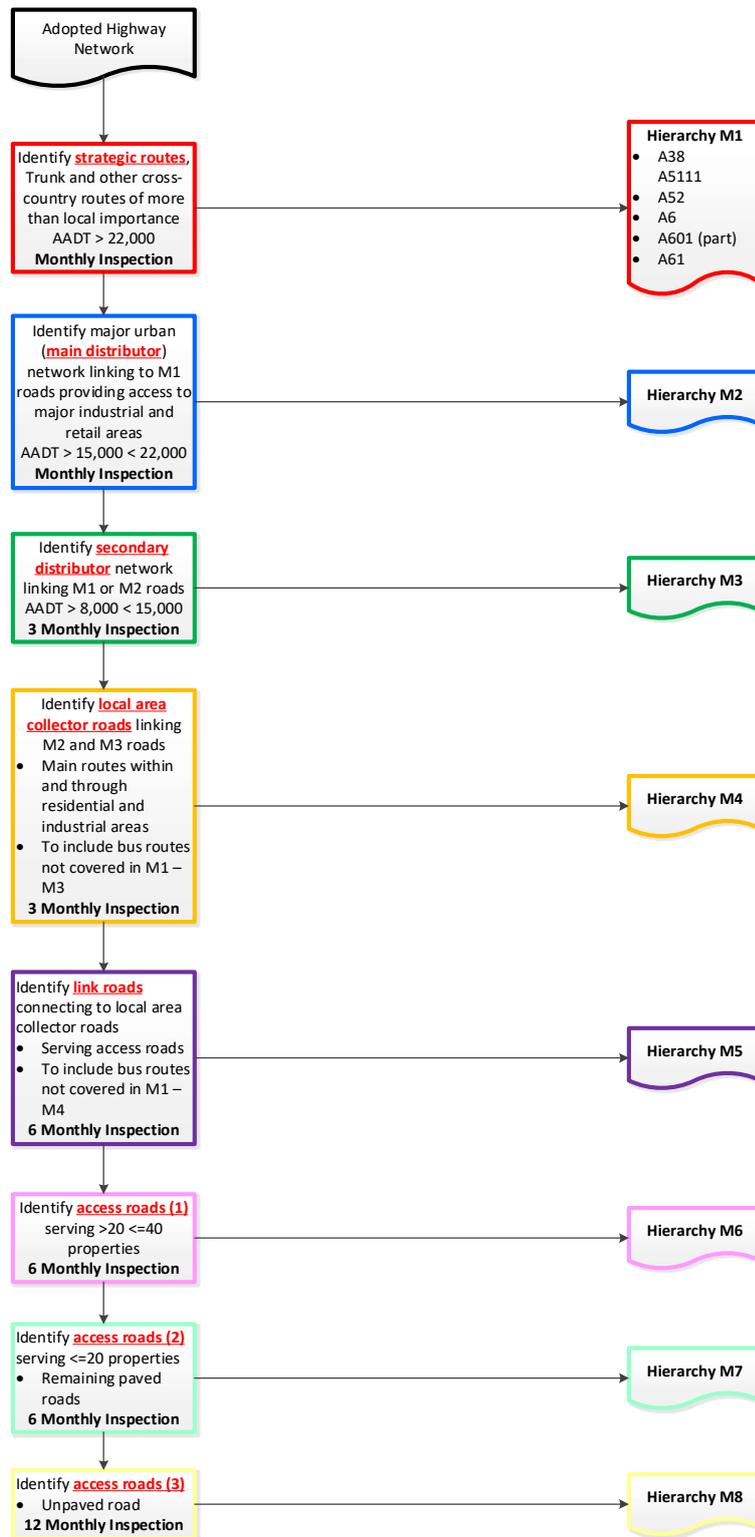




Figure 2 – Carriageway Maintenance Hierarchy Process

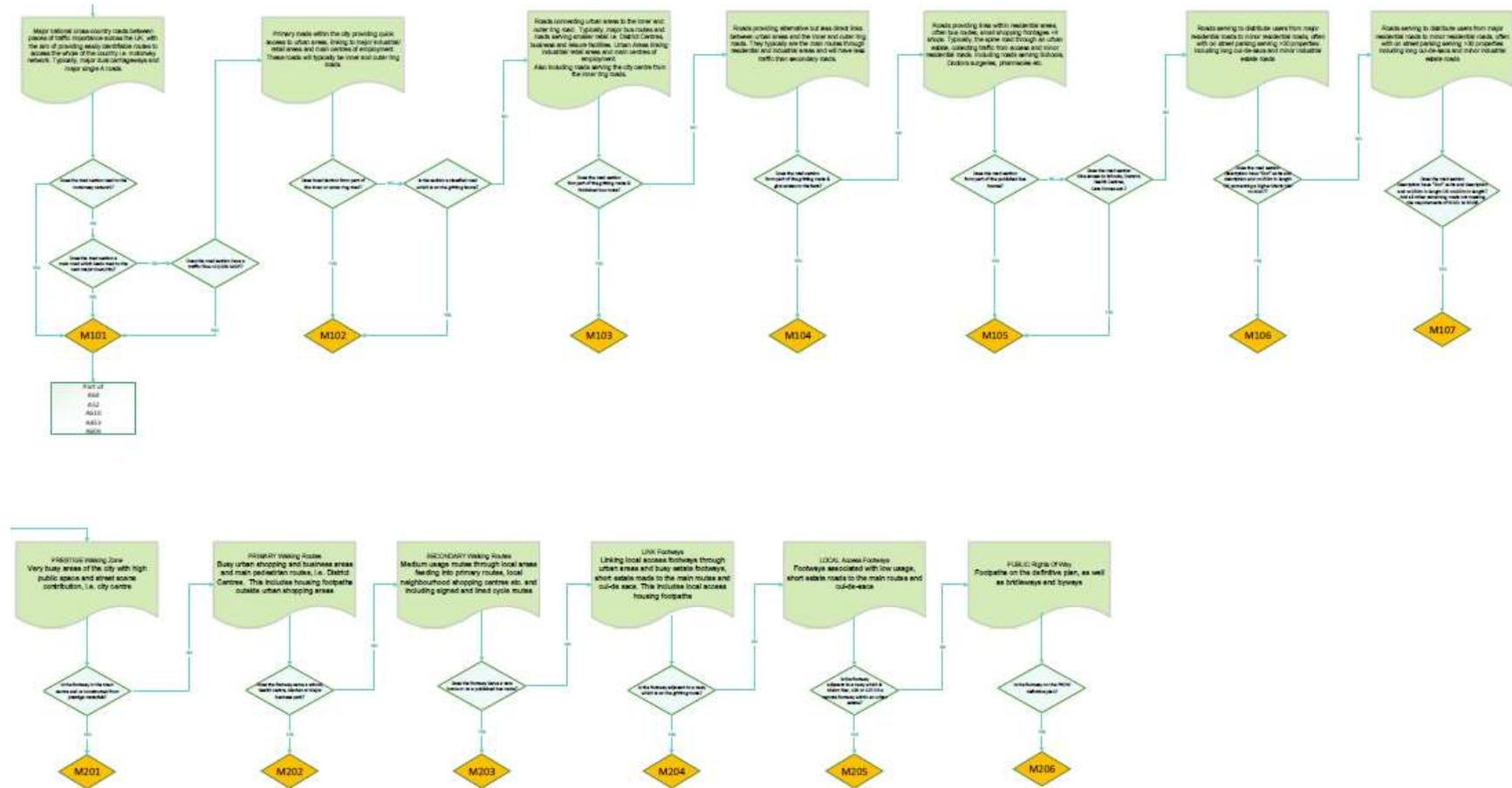




Figure 3 – Carriageway Maintenance Hierarchy– Hierarchies 1 & 2



Figure 5 – Carriageway Maintenance Hierarchy– Hierarchies 5, 6, 7 & 8



3. M200 – Footway Maintenance Hierarchy

Whilst the classification of Britain’s roads dates back to the 1920s, footway hierarchies existed for authorities but weren’t officially defined until the introduction of the Local Authority Association publication of the Highway Maintenance Code of Good Practice (LAA Code). The TRL Report, TRL535 (2002), saw the introduction of the following footway hierarchies which were adopted nationally and formed the basis for Best Value reporting BV187.

Table 3 – Footway Hierarchy Definitions LAA Code

Footway Category	Category Name	Description
1a	Prestige walking Zones	Prestige areas in towns and cities with exceptionally high usage, such as Princes Street in Edinburgh and Oxford Street in London
1	Primary walking zones	Busy urban shopping and business areas, and main pedestrian routes linking interchanges between different modes of transport, such as railway and underground stations and bus stops etc
2	Secondary walking zones	Medium usage routes through local areas feeding into primary routes, local shopping centres, large schools and industrial centres etc.
3	Link footways	Linking local access footways through urban areas and busy rural footways.
4	Local access footways	Footways associated with low usage, including estate roads and cul-de-sac.

To align with the new Code of Practice, and in particular “... a series of related hierarchies, should be defined which include all elements of the highway network, including carriageways, footways ...”, a review of the footway hierarchies is required to ensure they follow the same principles as carriageways, in that they recognised the use and importance of the footways.

3.1. Process in Developing the Footway Maintenance Network

In order to develop the footway maintenance hierarchy, there is a need to identify a criterion which affects the maintenance of each footway maintenance category. The Council has decided to follow the new Code of Practice to deliver the maintenance hierarchy and therefore there has been no



consideration of its existing footway hierarchy but a fresh assessment of each footway section on its own merits, based around data which is auditable, repeatable and transparent. This will then help towards any disclosure packs required to defend claims against the Council. The hierarchy definitions contained in Table 4 will be developed,

Table 4 – Footway Maintenance Hierarchies

Maintenance Hierarchy	Type of Footway / Cycleway	Description
M201	Prestige Walking Zones	Very busy areas of towns and cities with high public space and street scene contribution - City Centre shopping areas
M202	Primary Walking Routes	Busy urban shopping and business areas and main pedestrian routes – District shopping centres
M203	Secondary Walking Routes	Medium usage routes through local areas feeding into primary routes. Presence of schools and other significant local amenities. (See Footway Hierarchy determination process 2)
M204	Link Footways	Routes principally found in residential areas linking or collecting footfall from local access footways. Collecting pedestrian traffic from more than 100 properties associated with neighbouring roads
M205	Local Access Footways	Low usage footways serving individual streets or lower than link footway threshold
M206	Public Rights of Way	Footpaths on the definitive plan, as well as bridleways and byways



Plan to be inserted on completion of *Nottingham's Footway Maintenance Hierarchy*

Figure 6 – Footway Maintenance Hierarchy

4. Safety Inspection Frequency

The safety inspection frequency for a given street section will be the shorter of the inspection frequencies determined separately for the carriageway and footway elements, i.e.. where carriageway hierarchy dictates an inspection frequency of 3 monthly and footway hierarchy requires an inspection frequency of monthly the street will be inspected monthly

A table of inspection frequencies for carriageways is indicated below, followed by a plan setting out inspection frequencies across the city;

Table 5 - Carriageway Maintenance Hierarchy Inspection Frequencies

Colour Code on Map	Maintenance Hierarchy	Type of Road	Inspection Frequencies
	M101	Strategic Roads	MONTHLY
	M102	Main Distributors	
	M103	Secondary Distributors	3 MONTHLY
	M104	Tertiary Distributors	
	M105	Collector Roads	6 MONTHLY
	M106	Access Roads	
	M107	Minor Residential Roads	12 MONTHLY



Colour Code on Map	Maintenance Hierarchy	Type of Road		Inspection Frequencies
	M108	Back/service Roads		

A table of inspection frequencies for footways will be derived similar to that below, once the footway hierarchy has been defined

Table 6 - Footway Maintenance Hierarchy Inspection Frequencies

Colour Code on Map	Maintenance Hierarchy	Type of Footway / Cycleway	Inspection Frequency
	M201	Prestige Walking Zones	FORTNIGHTLY
	M202	Primary Walking Routes	MONTHLY
	M203	Secondary Walking Routes	3 MONTHLY
	M204	Link Footways	6 MONTHLY
	M205	Local Access Footways	12 MONTHLY
	M206	Public Rights of Way	



Resilient Network

The Resilient Network IS NOT a maintenance hierarchy, it is the network of roads used to maintain economic activity, access to key services and to enable the citizens, businesses and visitors of Nottingham to go about their daily business in times of extreme weather, or other significant disruption.

During periods of prolonged extreme weather, the highway network can be disrupted. This was highlighted during the winters of 2013/14 where many areas of the Country suffered disruption due to the severe weather. In response, the Secretary of State commissioned an Independent Review of the resilience of the nation's transport network, resulting in the 2014 Transport Resilience Review by Department for Transport (DfT). This review made 63 recommendations; 14 of which were directed at Local Authorities.

The Transport Resilience Review recommended that Local Highway Authorities should;
"Identify a 'resilient network' to which they will give priority, in order to maintain economic activity and access to key services during extreme weather" (DfT, 2014).

This has been reinforced with the release of the Well-managed Highway Infrastructure Code of Practice.

Recommendation 20 of the Well-managed Highway Infrastructure Code of Practice states that a "Resilient Network" should be identified to which priority is given through maintenance and other measures to maintain economic activity and access to key services during extreme weather. The process for identifying the Resilient Network considers which routes are absolutely essential and those which can be considered less of a priority, and managed without for some time. Its about priorities in a time of difficulty when resources may be limited or otherwise engaged. Its about which roads are key to

- The preservation of life and property
- The protection of those who are vulnerable
- Providing access for emergency services
- The availability of food, water electricity, gas and communications
- Maintaining a viable economy

It is implicit that these decisions will not simply follow road classification or categorisation and that the process in determining the resilient network for Nottingham City should engage key business, stakeholders, interest groups and involve the community.

It has previously been accepted that the "Resilient network" is generally the primary winter service route. This is no longer the case. The resilient network is based on risk and need. It should also align with the networks of neighbouring areas and be consistent with the wider resilience strategy for Nottinghamshire and surrounding areas



The Government considers asset management to be a key part of the provision and ongoing maintenance of an available resilient network, as well as effective contingency planning and prioritisation.

The increase in potential for extreme weather events is generally acknowledged to be an impact of climate change and this is likely to increase the severity and magnitude of weather events.

Local authorities are expected to make the best use of the most up-to-date climate change forecasting information available and to consider this in the prioritisation of works to increase the resilience to climate change of the highway infrastructure assets.

Drainage is considered an important function in addressing the increase localised flooding issues resultant of climate change and understanding the condition of the drainage network and ensuring its effective maintenance assists in minimising the damage caused by extreme weather events.

The Government response to the Transport Resilience Review identifies the importance of maintaining an effective drainage infrastructure to ensure a reduction of scale and threat of flooding with a focus on known problem areas.

4.1. Process in Developing the Resilient Network

In order to develop the resilient network, there is a need to identify routes that can fulfil the more specific role of the resilient network for a range of issues beyond cold weather. The resilient network is the bare minimum a highway authority needs to maintain when resources are scarce, and it should consider;

Key Service Locations

- Highway Depots
- Ministry of Defence
- Police stations
- Ambulance stations
- Fire stations
- Hospitals with Accident and Emergency
- Bus Stations
- Railway Stations
- Access to motorway network
- Critical infrastructure identified in the council's emergency plan
- COMAH sites
- Petrol Stations



- Power Distribution Points
- Communications i.e. essential fibre optic cables etc.

Key locations of Economic value

- Main Business parks
- Main Industrial estates
- Main employment centre

Where appropriate it may also be necessary to consider;

- Care Homes with Nursing Care facilities
- Educational Facilities (weekdays)
- Large Medical Clinics/ non A and E hospitals
- Utility facilities in need of access (on request)
- Town and District Centres
- Large Retail/ Business Parks
- Secondary bus routes and school routes

The resilient network should also consider locations which under certain conditions should be shut and bypassed for safety purposes, i.e. those known to be prone to;

- Sections of road liable to flood.
- Exposed locations in extreme weather conditions.
 - ice or snow build up
 - strong winds
- Where it is dangerous or impractical to maintain open routes for all road users

4.2. Responses by Potential Event

When responding to a particular event the council will prioritise clearing/repair of the resilient network routes to keep it open. Nottingham will consider the need to minimise the risk of

- Snow & Ice
- Flooding
- Heatwaves
- High Winds
- Other incidents

Actions will include but will not be limited to gritting the roads, snow plough (removal of snow and debris), closing roads and defect repairs.



4.2.1. Snow

Issues are likely to arise as part of snow conditions are: Reduced visibility, Reduced surface friction, Failure in road signals, Roads become impassable due to snow and vehicular accidents.

4.2.2. Flooding

A flooding event may result in the closure of roads and footpaths, therefore, to minimise the risk Nottingham have consulted with the Flood Risk Management team to understand which routes may be affected and therefore to consider alternative routes as part of the resilient network.

4.2.3. Heatwaves

Issues are likely to arise as part of any heatwave emergency, such as power failures and transport disruption, and these will be dealt with by the departments concerned as part of a coordinated response unless they became the overriding concern, in which case the overall central government department lead may transfer responsibility

4.2.4. High Wind

Issues likely to arise as part of high wind include; fallen trees or branches, debris in the road, difficult driving conditions (potential increase crash risk), electrical failure.

Consultation on Weather warnings for high winds will provide information on the likelihood of driving in extreme dangerous weather the expectation of widespread uprooting of trees, widespread damage to buildings, with potential for severe structural damage. Public may be advised not to venture outdoors unless really necessary.

4.2.5. Other Incidents

Other incidents not related to weather, i.e. acts of terrorism may impact on the highway and will have the same highway prioritisation applied where appropriate.

4.3. Consultation

The following groups have been consulted with during the formulation of the resilient network. A letter was sent to all asking for their requirements for a resilient network.

- Neighbouring Highway Authorities – Nottinghamshire County Council
- Nottinghamshire Fire and Rescue
- Nottinghamshire Ambulance Service
- Nottinghamshire Police
- Network Rail
- Bus Operators
- D2N2 (Nottingham and Nottingham City) Local Enterprise Partnership
- Nottingham Chamber of Commerce
- Ministry of Defence
- Nottingham City Emergency Planning department



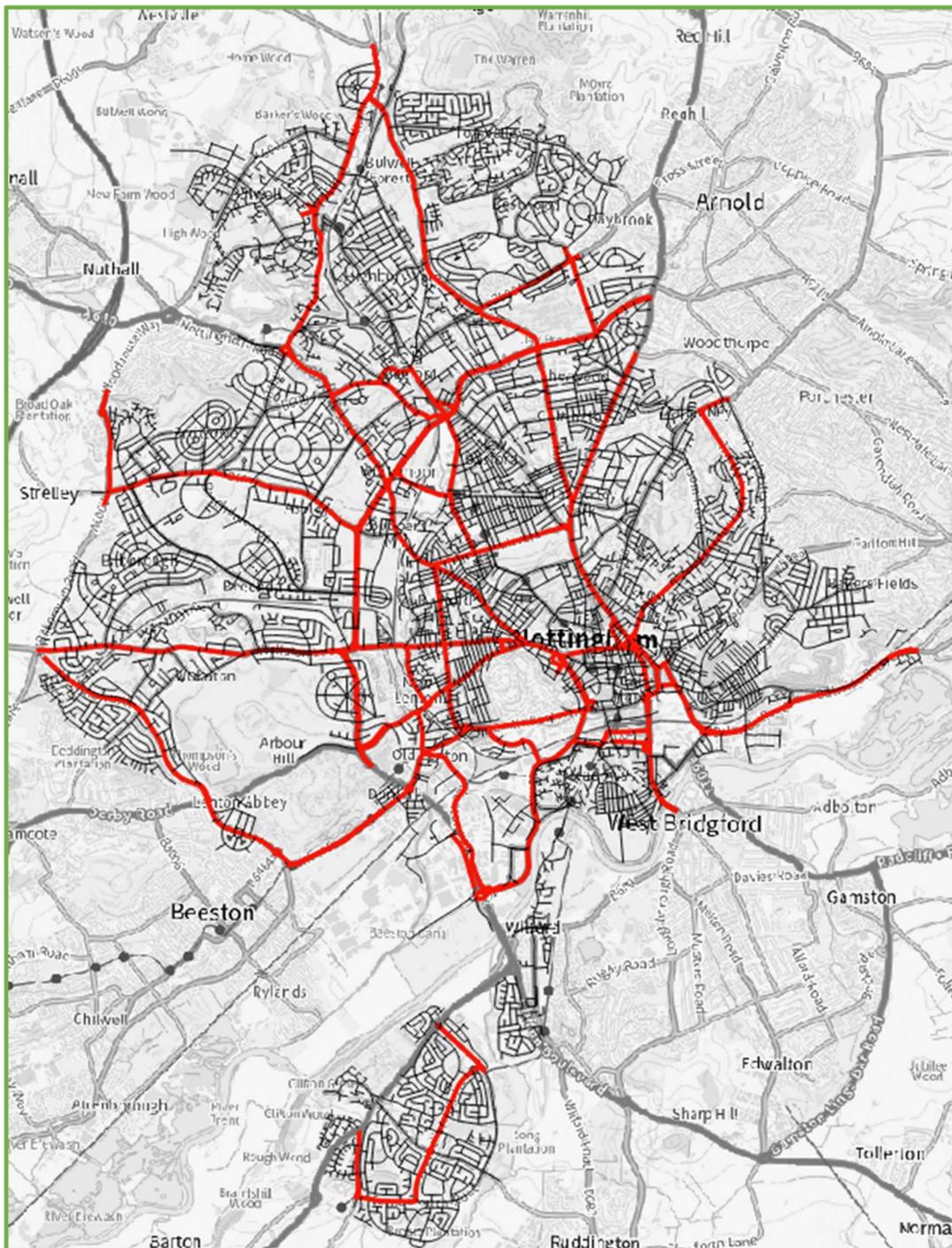
- Utility Operators
- Nottingham City Council Stakeholders
 - Highways Maintenance
 - Traffic and Safety
 - Street lighting
 - Structures
 - Public Rights of Way

The time line for this process was;

12 March 2021	Initial consultation letter sent
30 July 2021	2 nd Request letter sent Consultation Closed
18 October 2021	Final Request Sent All responses collated
Februray 2022	Responses Collated. Consultation Closed Meeting held where all resilience requests were considered, and a Draft Resilient Network produced for consultation
March 2022	Draft Resilient Network issued for comment
March 2022	Consultation closed Final Resilient Network created for 2022

The Resilient Network will form part of the annual infrastructure review.

Figure 7 – Agreed Resilient Network 2022/23





5. Monitoring and Review

The network has been created using data currently available. To ensure the network is kept current and up to date a review will be undertaken annually to take consideration of any lessons learned.

This will involve the following –

- Review critical service locations and updating GIS information;
- Updating traffic flow data;
- Review neighbouring Council resilient networks;

Review Date	Comments	By



Appendix A – Consultation Letter – Resilient Network

Your ref

Our ref

Contact

email

Tel

Fax

Minicom

Date

Dear Sir/Madam

RE: CREATION OF A RESILIENT HIGHWAY NETWORK

During periods of prolonged extreme weather or unexpected events, the local and / or national highway network can be disrupted. This was highlighted during the recent flooding events of 2007, 2009/2010, 2012 and the winter of 2013/14 where many areas of the country suffered disruption due to the severe weather. In response, the Secretary of State commissioned an Independent Review of the resilience of the nation's transport network, resulting in the Department for Transport's (DfT) 2014 Transport Resilience Review.

The Review recommended that local highway authorities should "identify a 'resilient network' to which they will give priority, in order to maintain economic activity and access to key services during extreme weather". This has been reinforced with the release of the Well-Managed Highway Infrastructure Code of Practice: October 2016 as one of 36 recommendations.

Therefore, we are contacting all key service providers and identifying areas of economic value and to ascertain locations which are essential to maintain access to or consider in the management of a resilient network.

I am writing to you to determine whether you have any assets which you consider would need maintaining or require access to in the event of a prolonged period of network disruption or that are vulnerable should the roads, footways, verges, or structures that support or carry your assets fail in the future.

The process for identifying the Resilient Network will consider which routes are essential and which can be managed without for a short time. The Resilient Network will be the bare minimum a highway



authority will need to maintain when unforeseen events or extreme weather reduce the capacity of the Council's resources. It is implicit that these decisions will not simply follow road classification or categorisation, so your information is essential to enable the Council to make an informed decision.

We would be grateful if you could respond within **28 days of receipt of this letter**, with a plan (preferably GIS) or a description of your asset(s) with bulleted reasons justifying why you require access during these periods. In addition, state any concerns over the delivery of your service in the event the road, footway, verge or structure your asset is located in fails, i.e., voids, bridge collapse, retaining wall failure, land slip.

If you are not in a position to respond with the information required within 28 days, then please let me know at your earliest convenience, as otherwise we shall conclude that you do not have an essential asset to maintain.

I look forward to your reply.

Yours sincerely

Highway Asset Team Leader