

**Thurrock Council**  
**Highways Resilience Plan and Network**  
**2018**

# Document control

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0.9	Draft	31/01/2018	Alan Carr	Provisional resilient network drafted
1.0	Approved	10/01/2019	Alan Carr	Changed to dynamic network model

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# 1. Introduction and objectives

This document aims to outline Thurrock Council's creation of a resilient highway network and the associated challenges. 'Resilience' in the terms of this document refers to both the physical condition of highway assets along with other procedures put in place.

In 2014 the Department for Transport published the Transport Resilience review. In accordance with this, 3 'layers' of resilience will be focused on:

- increased physical resilience to ensure people and goods can continue to move in events of extreme weather
- processes and procedures to restore routes and services to normal as quickly as possible
- effective and clear communication to highway users to minimise impact and disruption

Extreme weather other than snow and ice will be addressed in this document as these are already covered by the Winter Maintenance Plan. The 3 primary extreme weather events looked at will be prolonged rainfall, high winds and heat waves.

## 2. Challenges, issues and recommendations

The Transport Resilience Review outlines both general challenges and ones specifically affecting 'local' roads (local in this context refers to maintained by a local authority). Recommendations have also been provided for local authorities to adopt. This section outlines the stated challenges and recommendations and how Thurrock Council plan to meet and improve upon these.

### 2.1 General challenges and issues

Table 1 (below), outlines common issues stated in the Transport Resilience Review that affect all transportation providers. Entries that are only applicable to Thurrock Council have been included.

**Table 1 – Common challenges and issues**

Challenge / issue	Thurrock Council action / plan	Future actions
Determining level of resilience realistically achievable with current budget and resource	Resilience network created from 10m subsection of PMS network based on priority scores of schools, hospital locations etc.	Periodic reviews to incorporate 'lessons learned' from events and budgets changes.
Liaisons with weather forecasters	Communication sent to Met Office in November 2017 to discuss closer liaison.	Await reply and formulate plan
Learning from the experiences of others	Communications sent to local transport authorities in November 2017 (DP World, c2c and Ensign). Shared action plan with Ensign busses and incorporation /consideration of actions that could also be applied to a highway network – for example, increased traffic due to rail replacement services.	Await replies from other transport providers. Incorporate rail replacement routes into resilient network
Developing methodologies for estimating both the social and economic costs of travel disruption	Use resilience modelling software. (for example, HIRAM – Highways Infrastructure Resilience Assessment Modelling tool.	Purchase system and analyse scenarios
Determining optimum levels of resource expenditure to apply to resilience	The provisional resilient network has been incorporated into planned maintenance prioritisation as of 2017/18. Planned gully maintenance has also increased frequency on the resilient network. Separate targets/levels of service has been set for the resilient network in the performance management framework.	Periodic review of spending effectiveness

Challenge / issue	Thurrock Council action / plan	Future actions
Physical deterioration of carriageway surfaces	Hot rolled asphalt is no longer used as a carriageway surface due to the potential for rutting development in instances of hot weather. Cracking has been identified as a high priority defect in classified roads, the main defect accelerated by winter flooding.	Model carriageway data on more subgroups. Currently only on A/B/C/U and Urban/Rural. Deterioration rates/models should be additionally based on traffic volumes
Clear and consistent communication for users to make informed decisions regarding transport plans	Updates via social media (Twitter) including retweets from relevant local travel companies. Latest tweets embedded in council website front page. Successful bid for variable message signs – to be purchased and installed during 2019/20.	Ongoing reviews/improvements

## 2.2 Local roads challenges and issues

Table 2 (below) outlines resilience issues associated with local roads as stated in the Transport Resilience Review.

**Table 2 – Local roads challenges and issues**

Challenge / issue	Thurrock Council action / plan	Future actions
Quantification of structural backlog – C and U roads	Software modelling has been performed on the C and U roads using 100% of C road condition data coverage and 79% of U road condition data coverage.	Continue upkeep of regular C road condition data and collect data gaps on U road network (expected completion 2019, 100% going forward)
Structural <sup>1</sup> backlog amount – A and B roads	Software models have been run. Current figure is approximately 1.17%/1.5km of the A & B carriageway network in terms of realistically performable schemes <sup>2</sup> . Figure is much higher if schemes are generated for every subsection of structurally deficient carriageway	Explore additional revenue streams such as government/DfT funding. Collate evidence to back up bids.

<sup>1</sup> Areas requiring either reconstruction or deep inlay treatments, excluding surface treatments and shallow inlays

<sup>2</sup> It is economically unviable to treat small (<50m) stretches of carriageway so these have been excluded

Challenge / issue	Thurrock Council action / plan	Future actions
Structural <sup>3</sup> backlog amount – C and U roads	Software models have been run. Current figure is approximately 3.34%/16.4km of the A and B carriageway network in terms of realistically performable schemes <sup>4</sup> . Figure is much higher if schemes are generated for every subsection of structurally deficient carriageway	Explore additional revenue streams such as government/DfT funding. Collate evidence to back up bids.
Pressure on resource budget	Additional carriageway treatments have been explored for the 2017/18 schemes with a plan to implement for 2019/20. Particular focus on cracking treatments to alleviate accelerated deterioration due to flooding events. Drainage also impacted as resource is not currently available to carry out full inventory surveys resulting in gaps in knowledge – for example, soakaway locations and condition). Budget received does not take into account Thurrock specific issues (see section 3)	Explore additional revenue streams such as government/DfT funding. Collate evidence to back up bids.
Determining optimum levels of resource expenditure to apply to resilience	The provisional resilient network has been incorporated into planned maintenance prioritisation as of 2017/18. Planned gully maintenance has also increased frequency on the resilient network. Separate targets/levels of service are scheduled to be added into the performance management framework	Periodic review of spending effectiveness
Consideration of 'End to End' journeys	The provisional resilient network has been selected in such a way that it is not a 'closed loop'. Routes to key transport nodes (train and bus stations) are included, along with routes in and out of the borough	Periodic reviews considering new transport development (including the future lower Thames crossing)
Assets on neighbouring private properties	A communication has been sent to Gloucestershire County Council (a case study outlined in the Transport Resilience Review) to obtain details as the URL in the Transport Resilience Review is out of date. This will be used as a base to build a land owner code of responsibility	Await response from Gloucestershire and build code of responsibility

<sup>3</sup> Areas requiring either reconstruction or deep inlay treatments, excluding surface treatments and shallow inlays

<sup>4</sup> It is economically unviable to treat small (<50m) stretches of carriageway so these have been excluded

Challenge / issue	Thurrock Council action / plan	Future actions
Drainage asset knowledge gap – locations, condition etc.	A gap analysis has been performed on all highway assets (including drainage). This is outlined in the asset register held internally	Follow actions set out in the asset register. Explore revenue streams for collection of data as this is not feasible within current and projected budgets
Drainage cyclic / reactive backlog	Quantification of this is difficult as any overrunning work carried across from previous years is combined. According to figures from 2017 cyclic drainage works overrunning has remained steady, however the total backlog of cyclic works (from 2017) has been cleared and it can be assumed this includes a significant amount of drainage items.	Review priority and location for backlog clearances – for example, prioritise the resilient network over other routes)
Insufficient resilience and adaptability of local highways due to historical design <sup>5***</sup>	Ensure any construction/reconstruction works performed on carriageways are up to modern standards to increase resilience and carriageway asset life. E.g. planned reconstruction of Stonehouse Lane (2019-completion date unknown)	(Ongoing) Keep up-to-date with future developments in carriageway structural engineering

## 2.3 Recommendations

Recommendations outlined in the Transport Resilience Review that are applicable to local authorities are listed in Table 3 (below), along with Thurrock Council actions that either currently meet or plan to meet these.

**Table 3 – Transport resilience recommendations**

Recommendation	Current status	Thurrock Council action / plan
Establish a clear channel for receiving forecasts of extreme weather events	Complete	A direct channel exists between the Met Office and the Environment and Highways directorate
Communication: use of everyday language, photos on social media and website prominence	In Progress	Currently liaising with communication team. Thurrock Council Twitter is currently used with occasional photos. <a href="https://twitter.com/thurrockcouncil">https://twitter.com/thurrockcouncil</a>
Identify routes at risk of flooding	Complete	Has been done via GIS. Key routes within flood zone 3 and extents of historical flooding have been selected from the overall highway network.

<sup>5</sup> Identified from the HMEP Potholes Review (2012)



Recommendation	Current status	Thurrock Council action / plan
Identify a resilient network for priority to ensure economic activity is maintained and access to key services can continue during extreme weather	Complete / Ongoing	Resilient network changed from set routes to a priority based spending routes (as per Asset Management Strategy)
Hold a formal review of winter events	Scheduled	Review scheduled for after each winter period
Maintenance of a long term asset management plan	Ongoing	As part of Thurrock Council's aim to reach HMEP band 3 an asset management plan along with a suite of linked documents (including this one) is being developed. Life cycle planning for all assets is considered. Resilience is planned to be incorporated into carriageway life cycle plans.
Adoption of benchmarking	Ongoing	The majority of items outlined in the Performance Management Framework are benchmarked with either a neighbouring authority or national averages. Work is ongoing in benchmarking resilience targets/levels of service. Thurrock Council are also a member of the EHA (Eastern Highways Alliance)
Engaging local communities	N/A	Part of wider council communication policy and objectives
Completing DfT returns as soon as possible	Ongoing	In comparison to the last financial year, figures reported from condition surveys used for national reports are stored on one document which is universally accessible. When condition figures are available from annual surveys this is populated ready to be input into DfT data collection forms when they are released.
Adopting and implementing contingency plans	Planned	No action as of present in regards to the resilient network.

### 3. Thurrock-specific issues

The location and composition of the highway network in Thurrock poses unique challenges not outlined clearly within the Transport Resilience Review. Many factors contribute showing a general increased difficulty in establishing network resilience varying from socio-economic – that is, increased prevalence of HGV traffic) to physical (soil composition, flood risk, and so on.

HGV traffic is much more prevalent within Thurrock than the majority of other local authorities. This leads to a much quicker degradation of assets (in particular carriageways), in turn increasing the amount of revenue needed to maintain resilience and the asset in general.

Rainfall is more prevalent in the South of England, paired with the soil composition (primarily clayey soils with high groundwater) increases the risk of flooding from groundwater sources and increases difficulty in maintaining drainage assets. A lack of knowledge of location of soakaway assets, paired with the reduced efficiency of these on clayey soils is a serious challenge. Flooding and water damage has been identified in the Transport Resilience review as the primary source of disruption for transport operators.

Approximately 28% of land within the boundary of the borough falls within Flood Zone 3 (excluding areas covered by the Thames). Appendix 2 shows a map of maintained highways within Thurrock, areas of historic flood events and the Environment Agency's definition of 'Flood Zone 3' (areas with a roughly 1% chance of flooding from rivers and/or a 0.5% chance of flooding from seas annually) – approximately 100km/18%.

The highway composition of Thurrock also greatly varies from the national average. Principal roads make up approximately 1.8x more of the road network here compared to the national average. This means an increased level of traffic in general as the borough is a key location in linking the North and South of the Thames as well as linking areas in the east with London.

Thurrock is directly linked to the Dartford Crossing; the busiest crossing in the UK. Any disruption to the crossing has serious implications on network availability here In Thurrock. Bridge closures due to high wind, traffic accidents and other factors cause a huge backlog of traffic within the network. Therefore routes leading to the crossing must have a higher level of resilience than average, an issue not encountered by the majority of other local authorities in the country.

## 4. Essential maintenance requirements

From the Transport Resilience review, 3 areas of essential maintenance have been identified for ensuring increased resilience of a transportation network. All items below also fall under the remit of our maintenance policy and HAMS (Highways Asset Management Strategy).

**Clearing of drains, gullies and ditches** – The maintenance of drainage assets was reviewed in 2017. Maintenance frequencies have been assigned on a risk based basis.

**Clearance of vegetation** – An out-of-hours team is always on standby with at least one licensed chainsaw operator. Extreme vegetation events outside of day-to-day council capacity are handled by an on-call tree contractor. The council is also in the process of procuring a new, more robust tree management system to enable a greater number of planned works.

**Monitoring of structures and earthworks** – All structures are visually inspected on a four year cycle and prioritised based upon the national BCI (Bridge Condition Index).

## **5. Extreme weather events – impacts and actions**

Three primary extreme weather events have been identified for resilience focus in the Transport Resilience Review. These are: prolonged rainfall, strong winds and heat waves. Particular focus will be applied to prolonged rainfall as this is perceived to be the biggest threat of the three to disruption on Thurrock's Highway Network. Projections for changes in these events have been researched by the Fifth Assessment Report of the Intergovernmental Panel on Climate Change and summarised in the Transport Resilience Review.

### **5.1 Prolonged rainfall**

In general, winters are projected to become wetter, however potential exists for an increase in prolonged rainfall across all seasons with five of the last summers being wetter than average. Flooding and rainfall events have many impacts on highway assets from accelerated degradation of carriageways to increased accidents on the network (particularly wet skidding).

In September 2017 Thurrock completed a review of skidding site categories; areas of carriageway identified to have a need for higher skid resistance (approaches to pedestrian crossings, tight bends etc.). These can be compared against the annual SCRIM survey to identify deficient areas. Additional surface treatments are being investigated to restore skidding resistance/texture of the carriageway surface without having to do deeper, more expensive works.

A drainage inventory survey was collected in 2018 covering all drainage assets on major routes within the borough.

### **5.2 Strong winds**

The Transport Resilience review has outlined that changes in wind are the least studied aspect of climate change, however recent studies do suggest an increase in high wind events. As stated in section 3 (Thurrock Specific Issues) the Dartford Crossing bridge is closed upon events of high winds (>60mph projected crosswinds) and speed limits are reduced and lane closures enforced at levels below this (crosswinds >50mph). Due to this a larger number of resilient routes are needed in Thurrock compared to the majority of other local authorities.

Further to the information stated in section 4, maintenance teams are on call during extreme weather events along with an external contractor. Each team will have licenced chainsaw operators ready to clear fallen trees and vegetation as soon as possible.

### **5.3 Heatwaves**

Evidence provided in the Transport Resilience Review has shown an increase in heat waves since 1950. In terms of physical resilience of the network the most susceptible road surface to heat events (hot rolled asphalt - HRA) has not been used in Thurrock for around 10 years. Hot rolled asphalt has a much higher tendency to soften during heat events, leading to a much higher rate of structural defectiveness (i.e. rutting). Currently road closures on these events are not feasible in heat events due to the economic and social costs on the network, instead any remaining instances of HRA will be monitored on an annual basis and replaced when thresholds/criteria's for treatments are met.

## **6. Other events**

This section will cover other events that do not fall under the category of extreme weather but still require resilience to be considered.

### **6.1 Industrial action**

In the event of possible industrial action maintenance contractors are on hand to take over emergency works until normal service can continue. These include both our term maintenance contractor and the on-hand tree contractor.

## **7. The Resilient Network**

### **7.1 Methodology for determining the Resilient Network**

For the provisional resilient network set routes were assigned to be part of either the primary or secondary resilient network. This has been changed in 2019 to be a more dynamic resilient network with areas where higher resilience is needed based on the priority matrix used for planned maintenance (outlined in the Highways Asset Management Strategy).

A few modifications have been made to the matrix to establish the resilient network, including:

- all priority score multiplied based on road class:
  - A Roads – x2
  - B Roads – x1.5
  - C Roads – x1.25
  - Unclassified Roads – x1
- any classified road not scoring anything based on the priority matrix has been assigned a value of 0.25 (the lowest possible priority score) as these require a higher level of resilience than unclassified roads

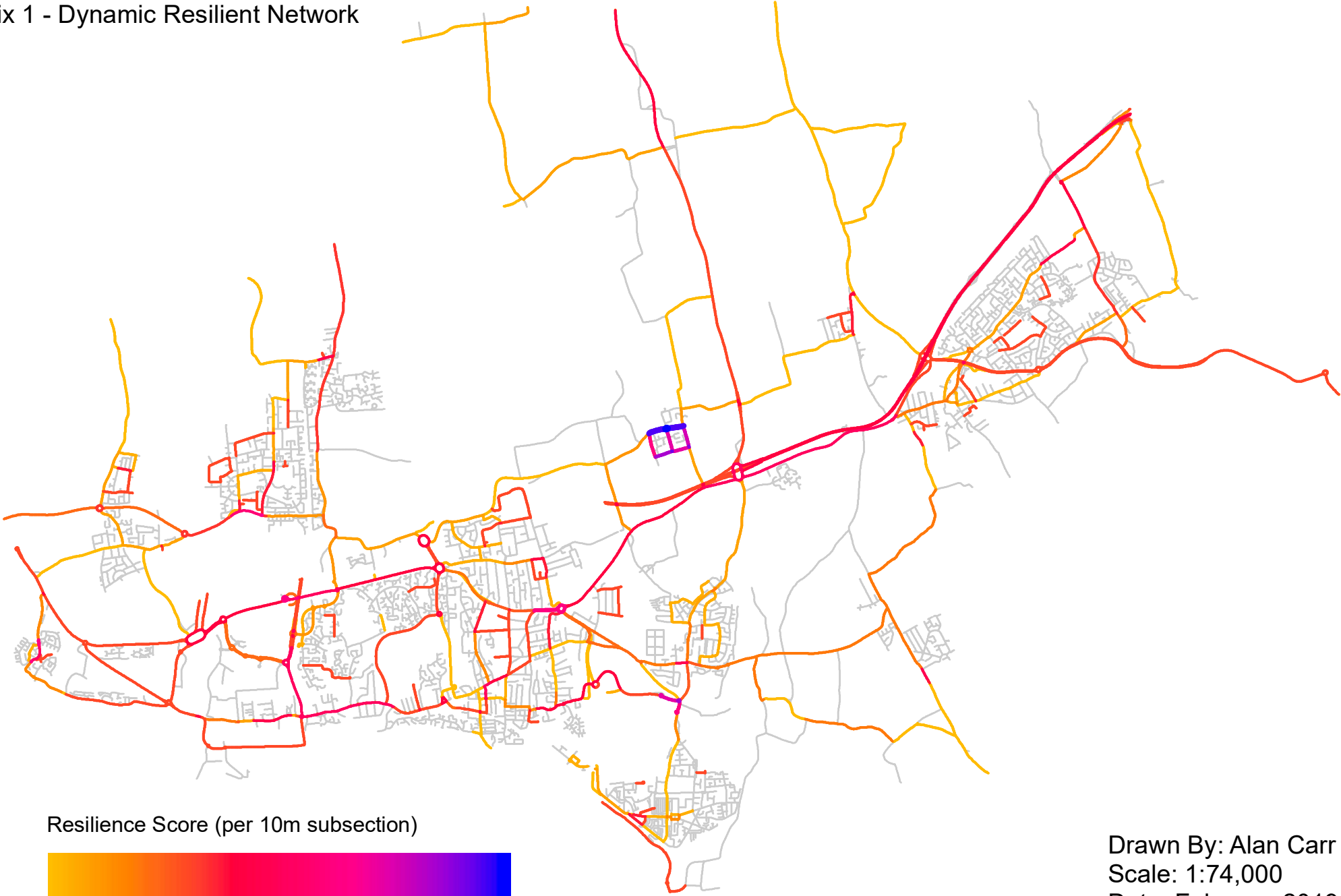
When robust traffic level data is available on a network level this will also be incorporated. Data is planned to be collected at approximately 250 sites across the borough during 2019.

### **7.2 Risks associated with the Resilient Network**

The main risk associated is varying/static planned maintenance budgets (which have been the case in recent years) with no regard from funding sources for inflation. This is why reviews will be undertaken on a biennial basis or when significant new data becomes available.

# Appendix 1 – Dynamic Resilient Network

Appendix 1 - Dynamic Resilient Network



Resilience Score (per 10m subsection)



Drawn By: Alan Carr  
Scale: 1:74,000  
Date: February 2019