A GIS revo-Luton: Visualising Fire Risk in Bedfordshire

Bedfordshire Fire & Rescue Service

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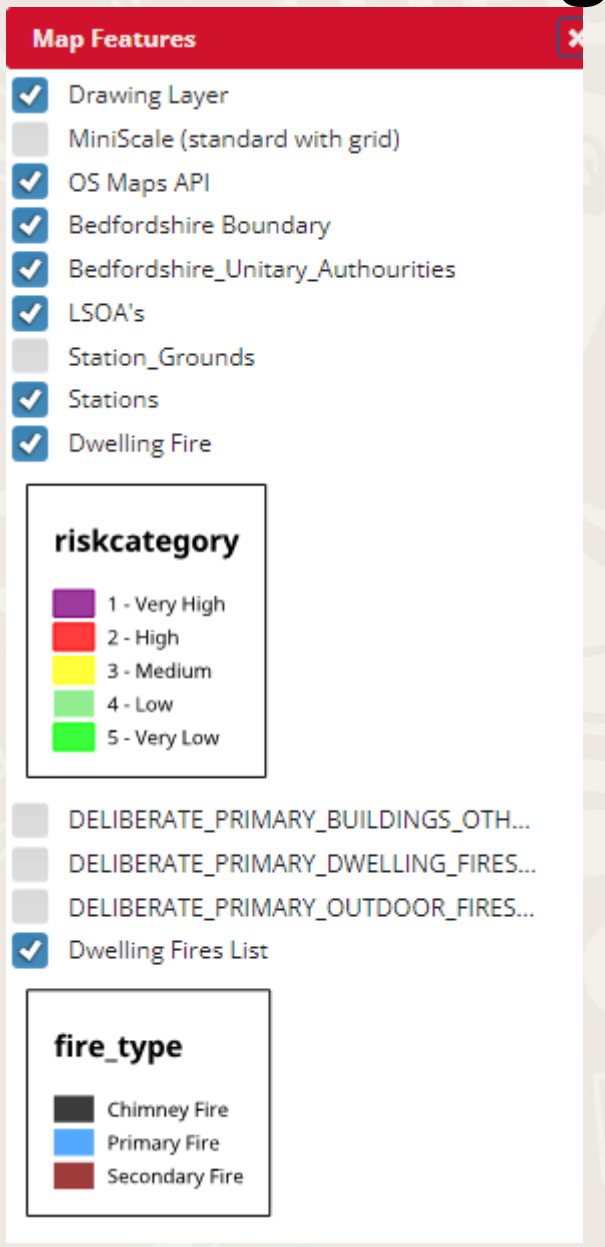
About Us

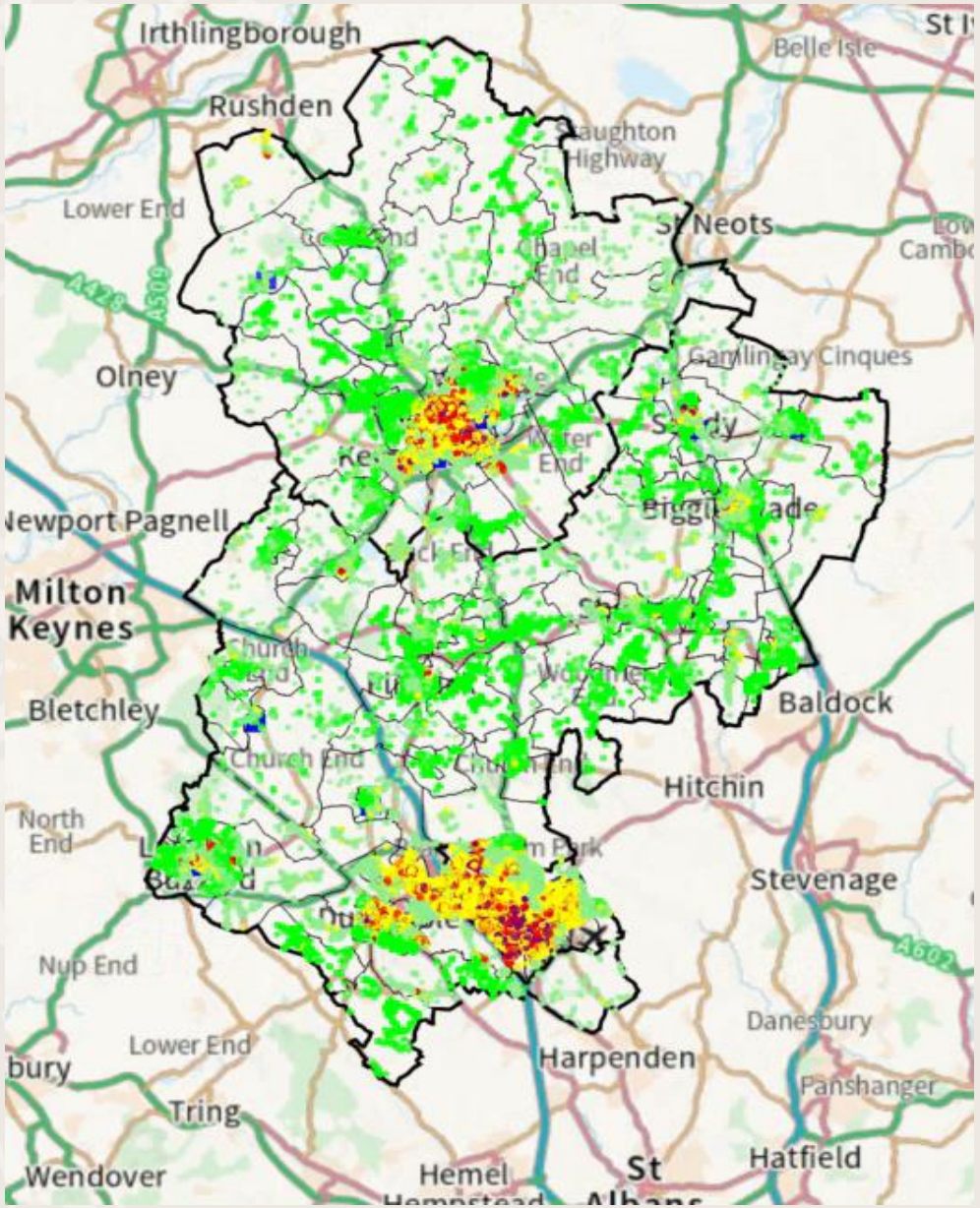
- Bedfordshire Fire & Rescue Service serves over 700,000 people across 1,235 sq km.
- Our largest towns are Luton and Bedford, also covering places such as Dunstable, Biggleswade, Ampthill & Cranfield.
- We cover Woburn Safari Park, Luton Airport, Cardington Hangars, and maybe even Universal Studios.

- We have 14 fire stations with a mix of wholetime and on-call stations.

- We bought Cadcorp in early 2022 to allow us to visualise all our data – we knew we had a significant gap and were falling behind other services.
- We implemented in 2022 but found it hard-going. Some maps delivered but time-consuming and we found we hadn't trained the right people or understood corporately what was now possible.
- We carried out a second phase of training in 2023 and that's kick-started effective use of Cadcorp including the Workload Modeller tool. We'll show some of our outputs but we could have chosen more. We know we are still learning.

NFCC Dwelling Fire Methodology





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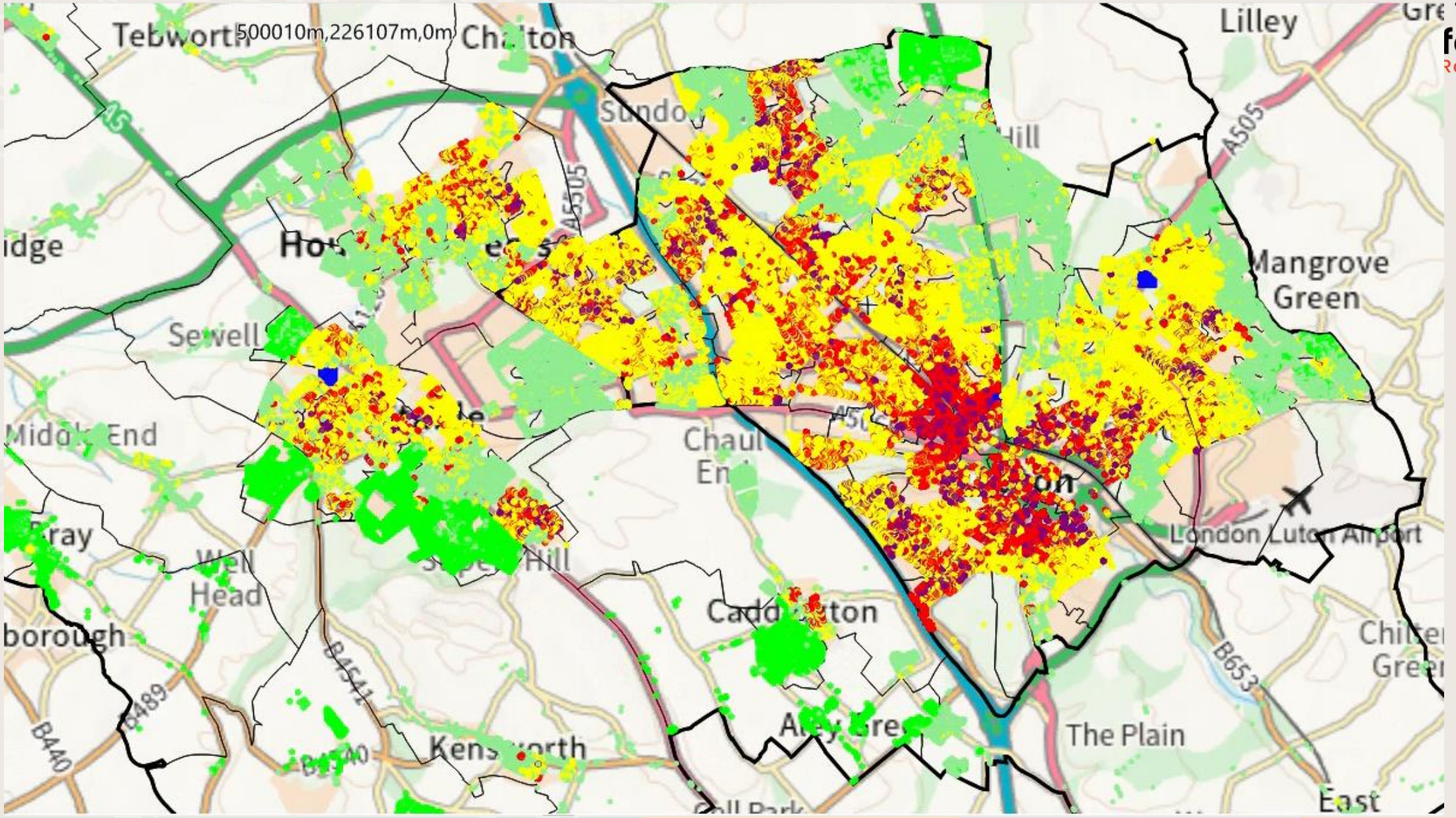
The Dwelling Fire methodology gives us a new understanding of likelihood and consequence of fire risk across Bedfordshire.

NFCC Dwelling Fire Methodology



NFCC Road Safety Methodology

NFCC
National Fire
Chiefs Council

National Risk Methodology for UK FRS: Road Traffic Collisions

May 2023

PLAN. PREPARE. PERFORM.

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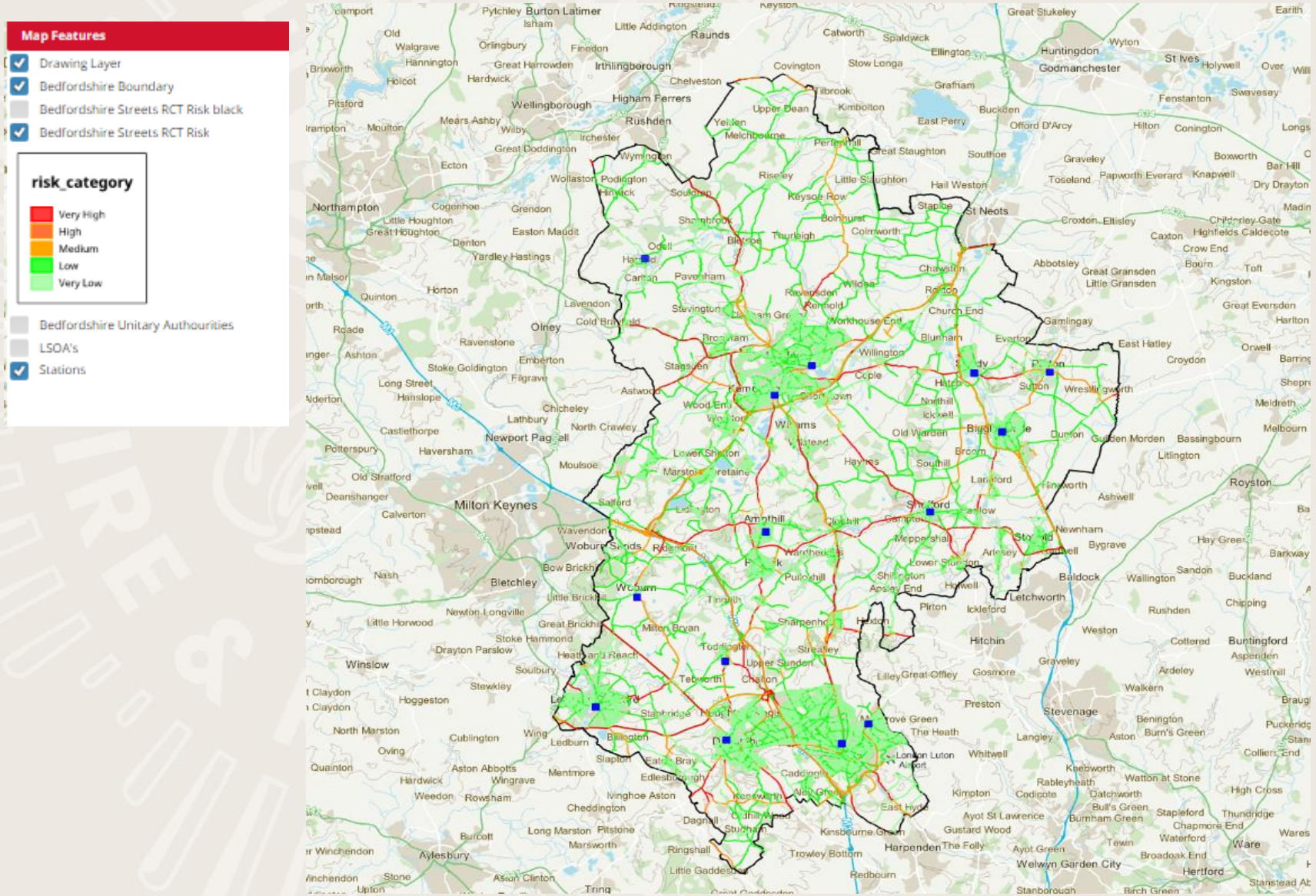
NFCC Road Safety Methodology



Using data provided by NFCC, we mapped the NFCC Road Safety Methodology to give us evidence-based data on where RTC risk lies in Bedfordshire.

NFCC Road Safety Methodology

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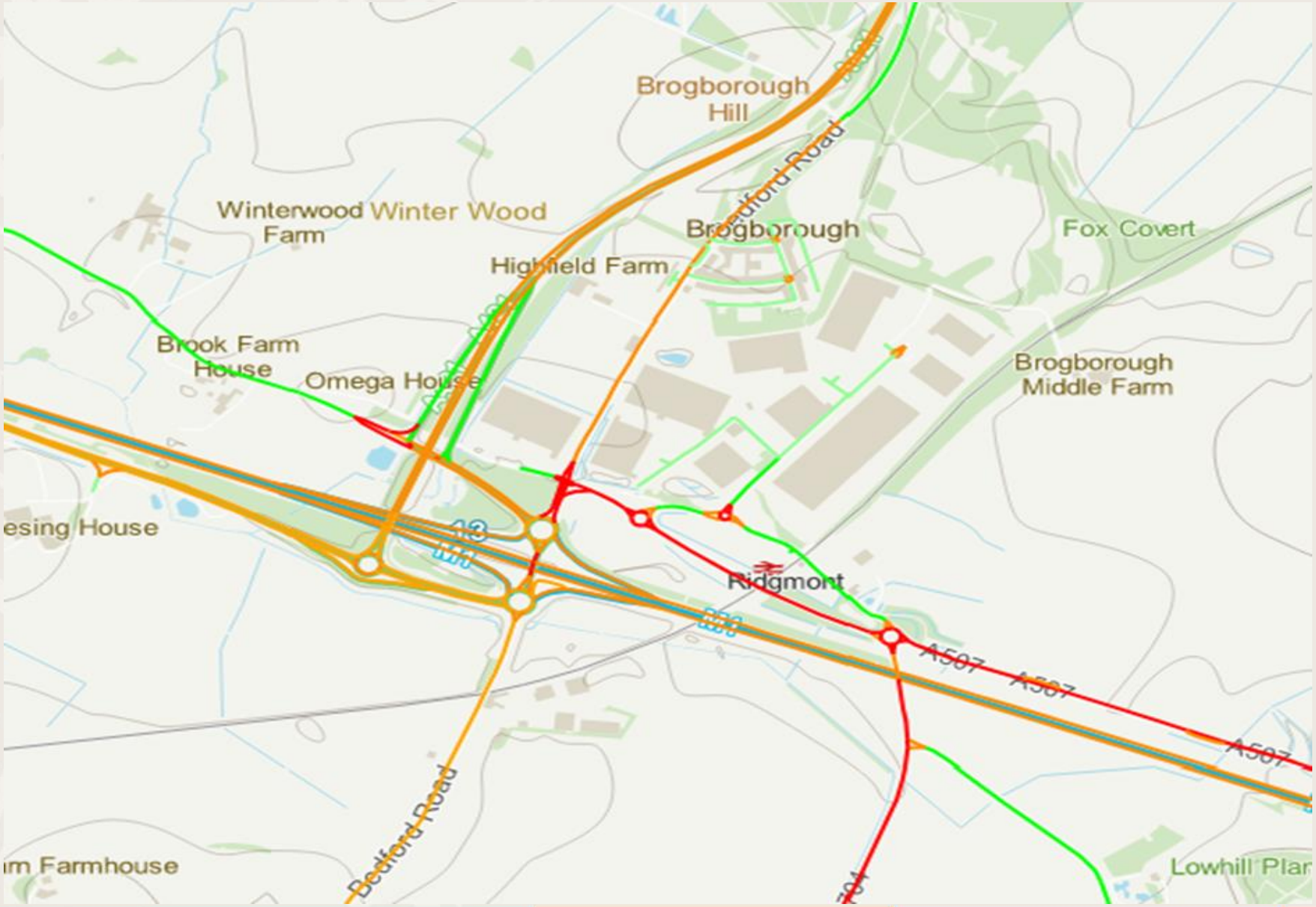

Emergency Cover Review Project

- Using Workload Modeller, our approach has been to compare what we currently have (existing stations) (Scenario 1) with a single ‘change’ state.
- E.g Scenario 2 is adding a new station at Leagrave TA Centre, with a single wholetime pump and so on.
- We’ve explored how to use Cadcorp to show the impact of making this change and presented our findings to the FRA.

Scenario examples

Scenario 01	Base scenario	All current stations
Scenario 02	TA centre	Add TA centre

*** Now at 33 Scenarios**

Emergency Cover Review

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We've done two key pieces of impact analysis for each:

1) **Area-based coverage**

We can show visually which areas of Bedfordshire can be reached within 5/10/15 minutes from our stations (green/yellow/red) or cannot be reached (white).

This drive time includes turnout times. This is our theoretical coverage map – an **isochrone** map.

2) **Incident response coverage**

This uses the Cadcorp Workload Modeller tool and 5 years of incident data to understand how the new/changed station would be used in practice. This includes crewing types, turnout times, availability, predicted demand on different days/times, and route cost analysis based on our highway network.

The output includes average response times, how often our response standards are met, and how many callouts the new station would receive.

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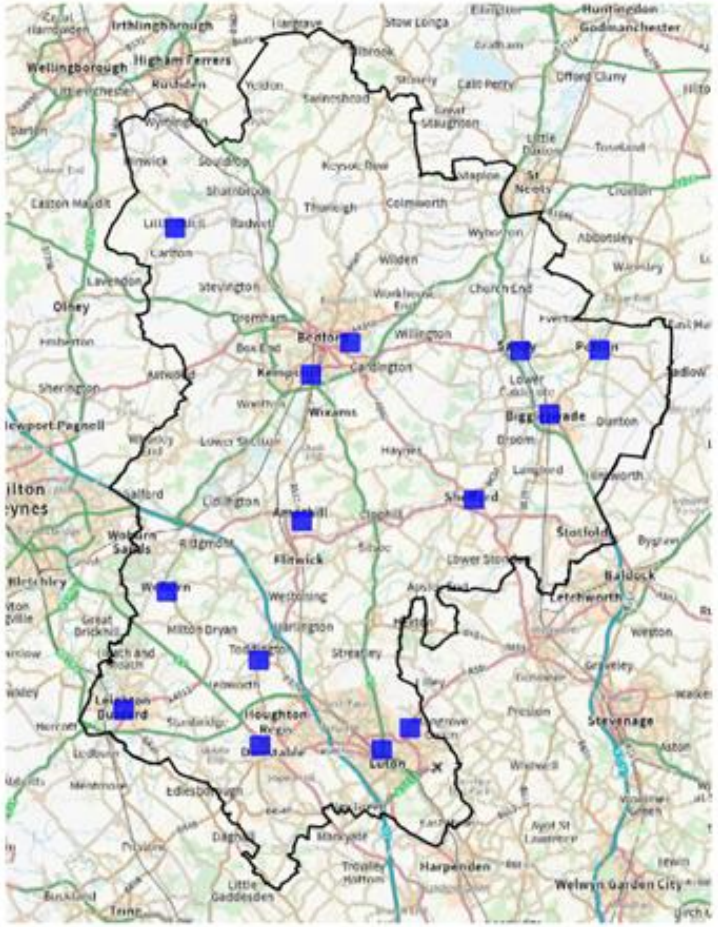
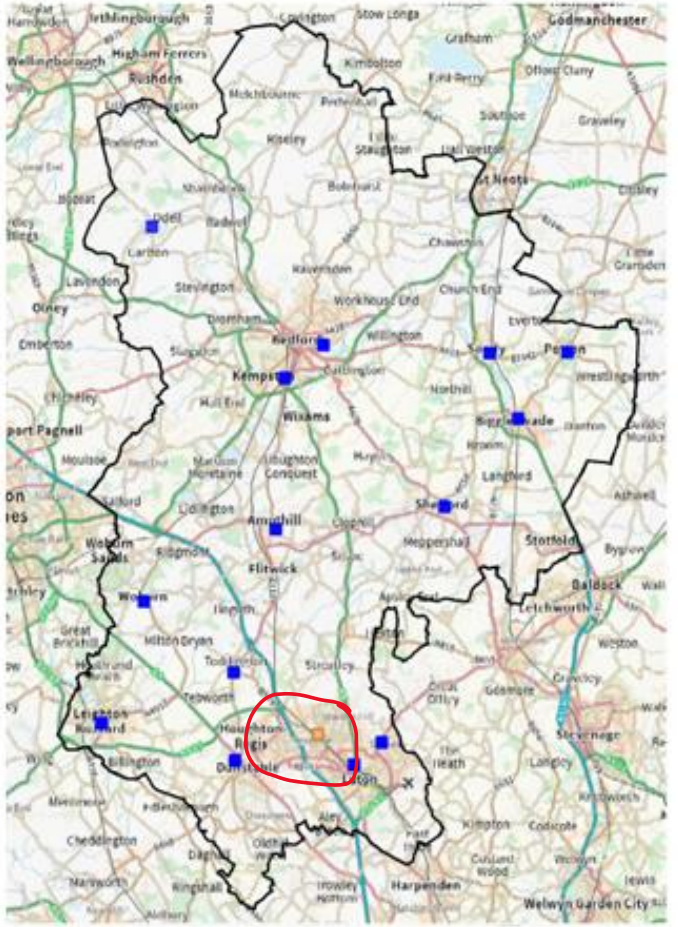
Mapping

Scenario 1: Base Case Stations



Scenario 2: Add new wholetime station at the TA centre (LU3 2RX)



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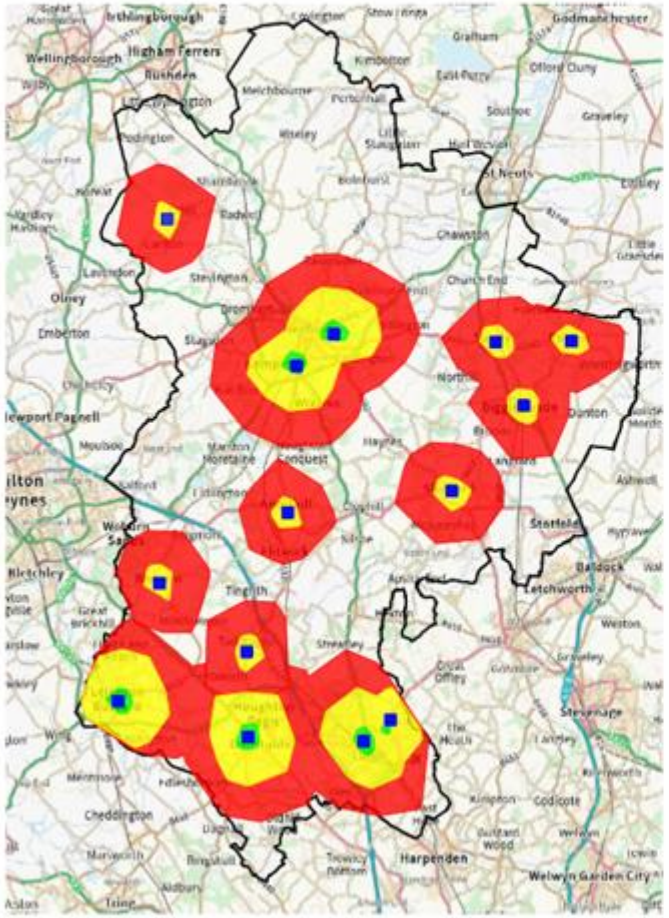
Isochrones for area

Scenario 1: Base Case Stations



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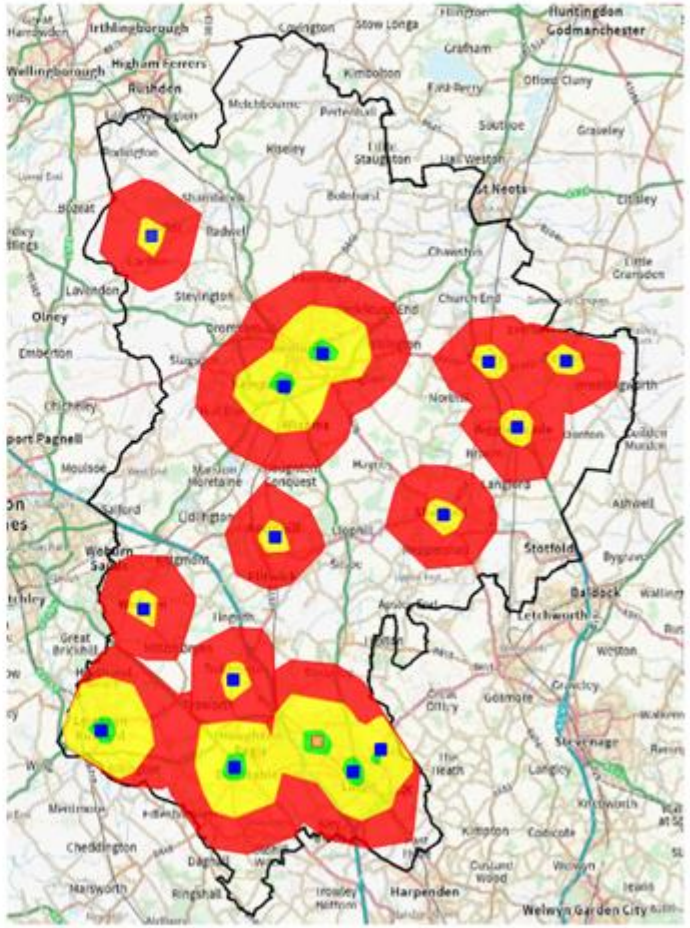

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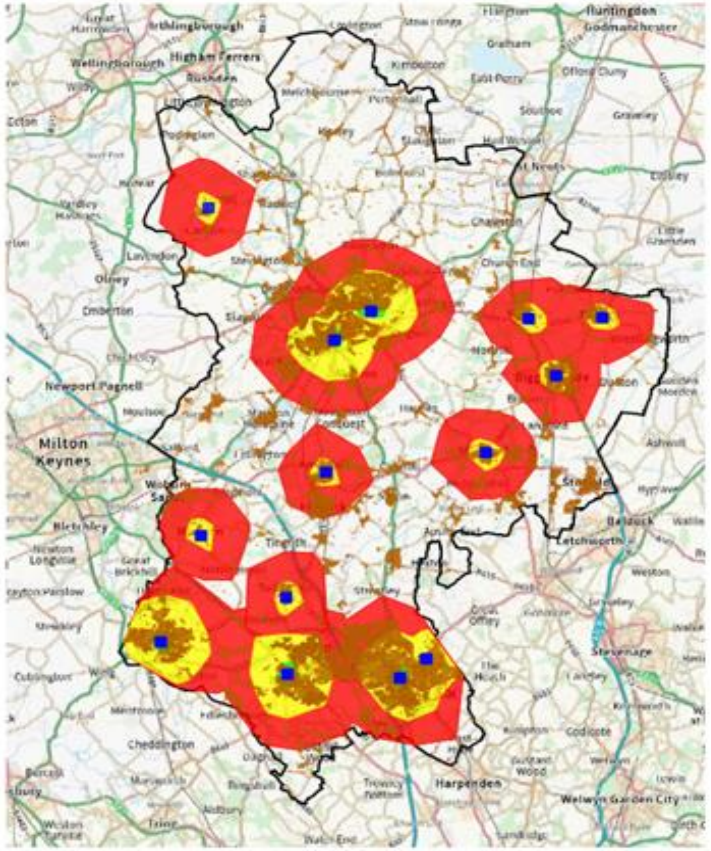
Households per area

Scenario 1: Base Case Stations



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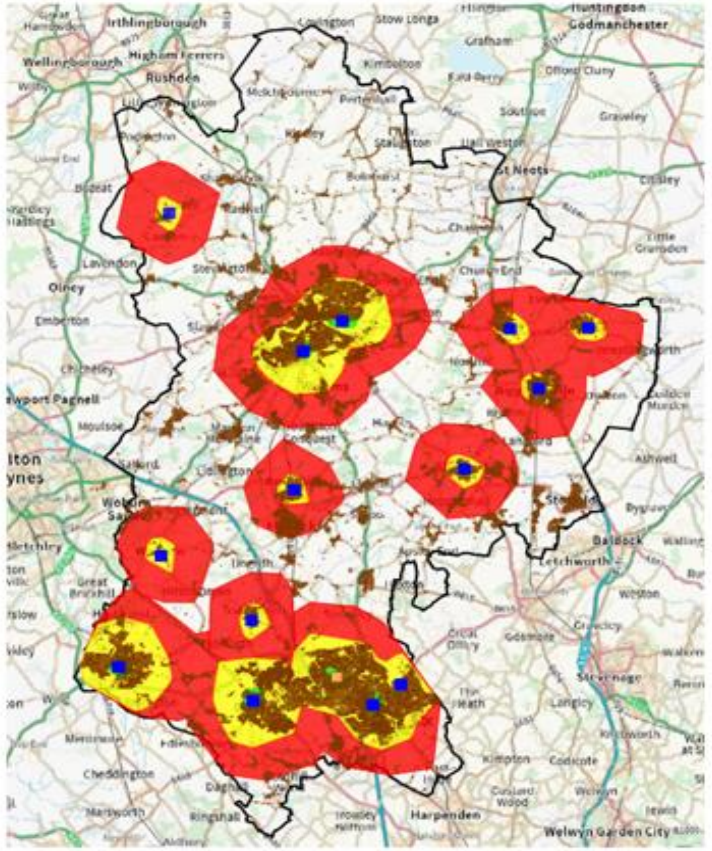

Dots here represent households. How many are in green/yellow/ red/white areas?

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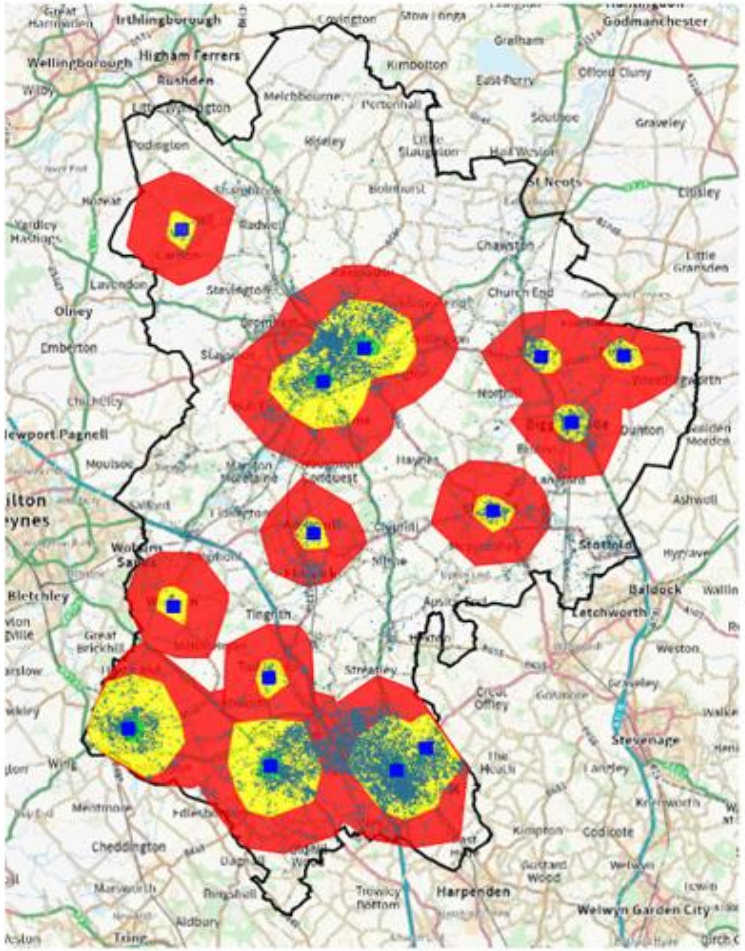
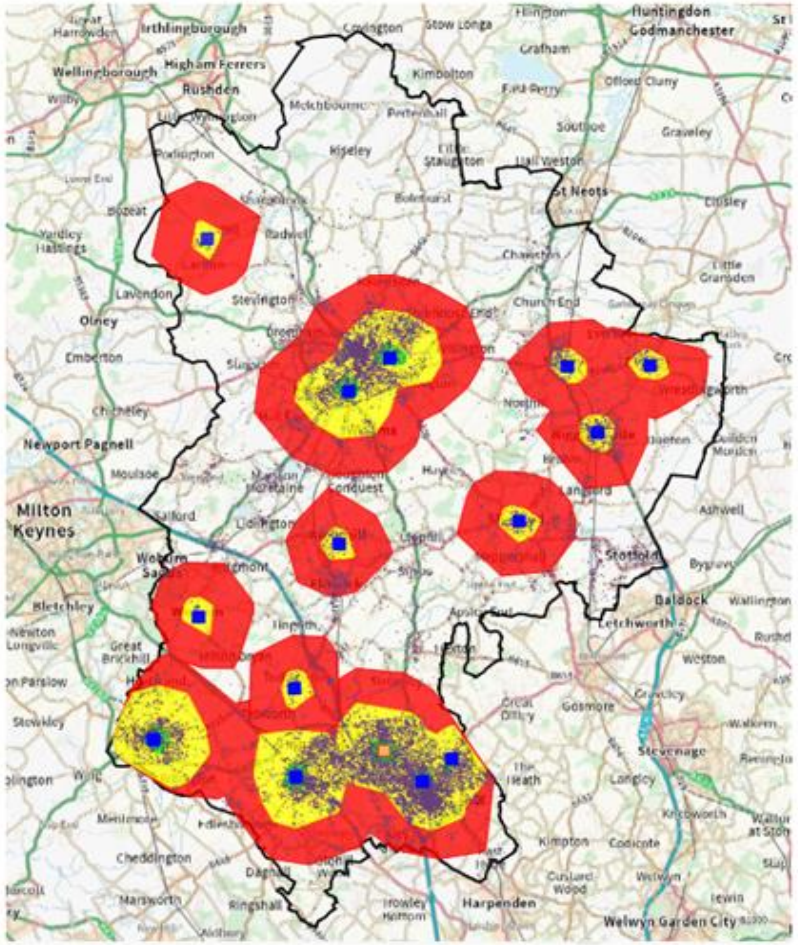
Incidents Per Area

Scenario 1: Base Case Stations



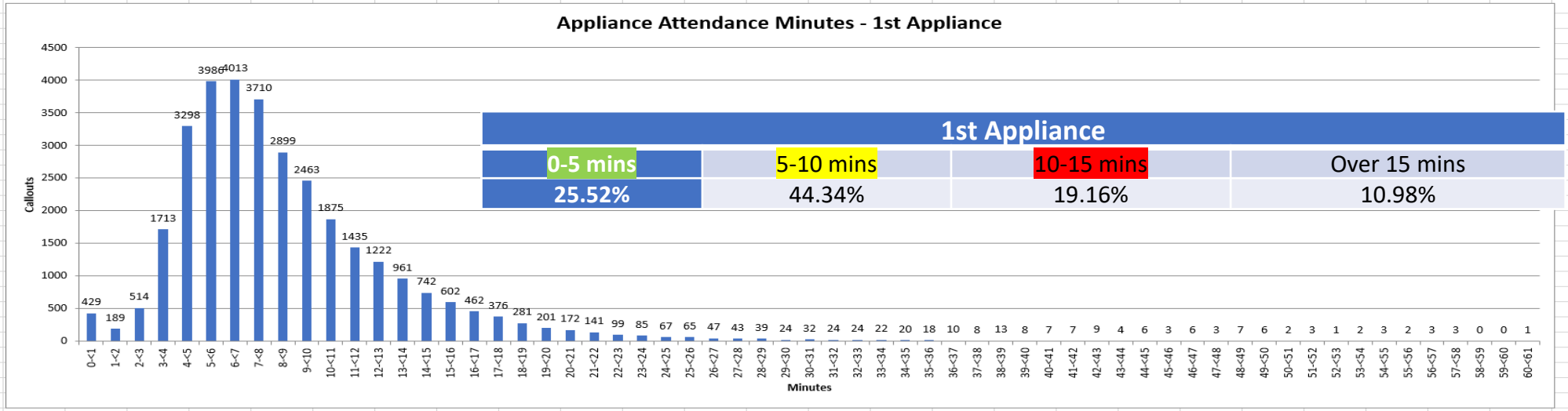
Scenario 2: Add new wholetime station at the TA centre (LU3 2RX)



Dots here represent incidents. Again we ask how many are in each coverage area.

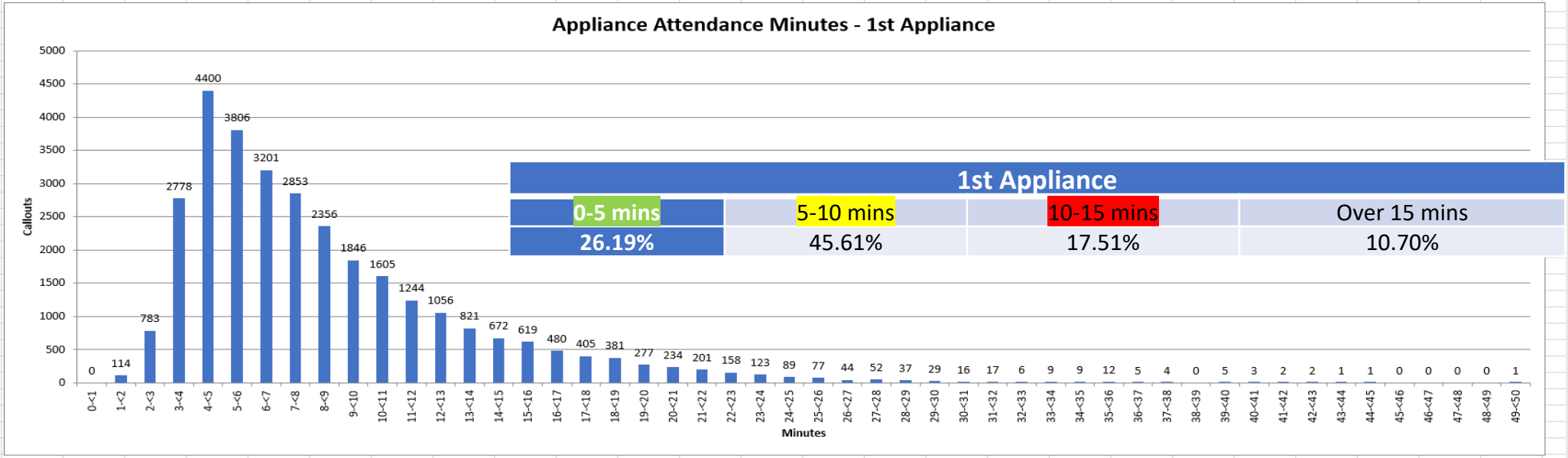
Standard Attendance Analysis - 1st Appliance

Scenario 1: Current Stations



1st Appliance			
0-5 mins	5-10 mins	10-15 mins	Over 15 mins
25.52%	44.34%	19.16%	10.98%

Scenario 2 : Add TA Centre



1st Appliance			
0-5 mins	5-10 mins	10-15 mins	Over 15 mins
26.19%	45.61%	17.51%	10.70%

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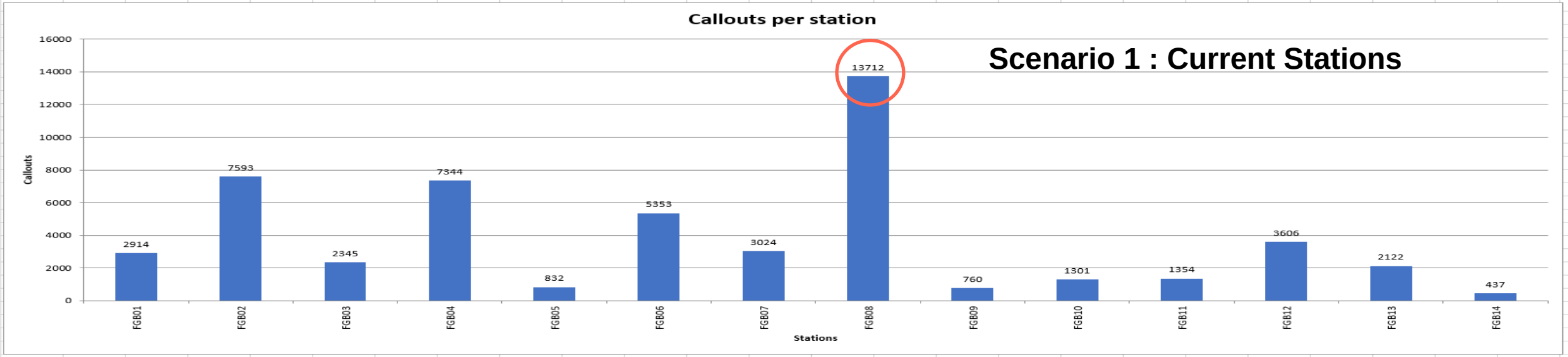
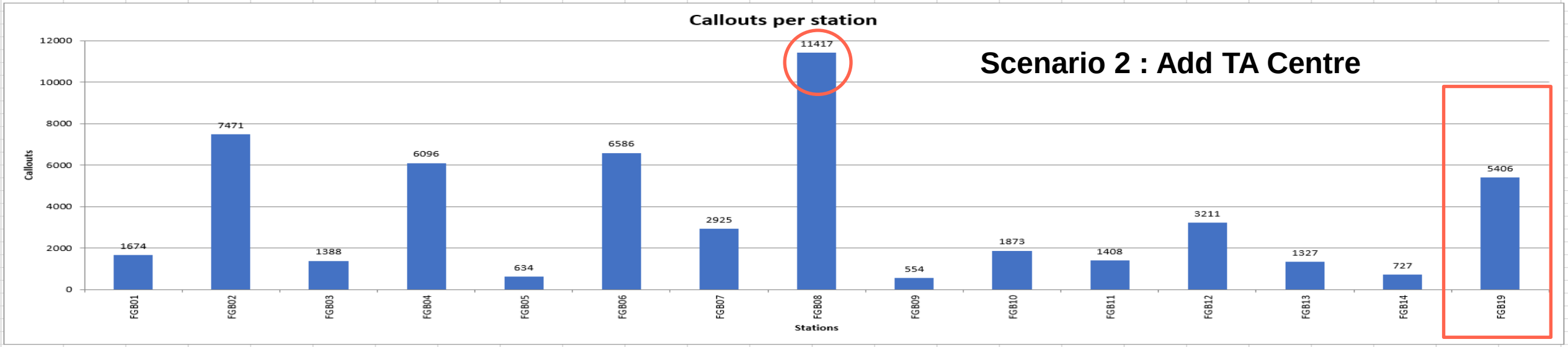
Predicted Callouts Per Station





Emergency Cover Review - Summary

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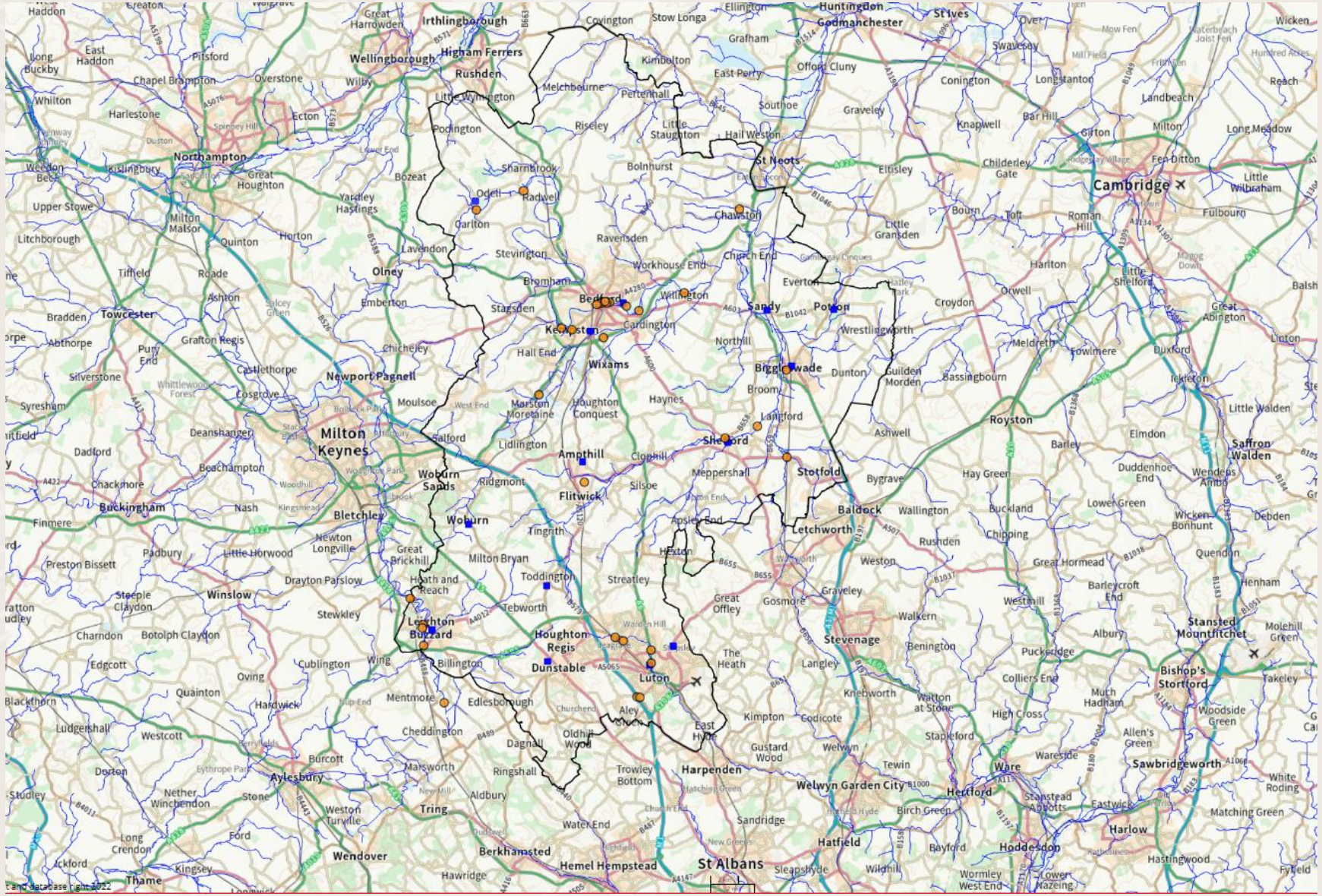
We compared 33 scenarios of station sets vs. existing stations analysing:

- Area coverage
- Incident coverage
- Coverage to high risk households
- Impact on average response times
- Impact on our response standards
- Mapping against special risk sites
- Mapping against future development sites

We used a rating system to create a league table, presented the top 10 to our Fire & Rescue Authority, who approved full business cases for the top 4 scenarios. These are being worked on now.

This would have been near-impossible for us, without the use of Cadcorp.

Water Rescues Map 22-23



This is an example of our wider specials review where we can see where specialist demand is.

Flexi Duty Officers Map

We have a policy that says that a number of officers will be on duty from their home location with the following requirements.

1. The geographical location will provide a cover area of at least 30% (37,171 hectares) of the Service area (123,905 hectares); or
2. The geographical cover area would include at least 20% of the total Service calls to Primary Fires and road traffic collisions (excluding 'make safe') that occurred in the preceding complete 5 calendar years; and

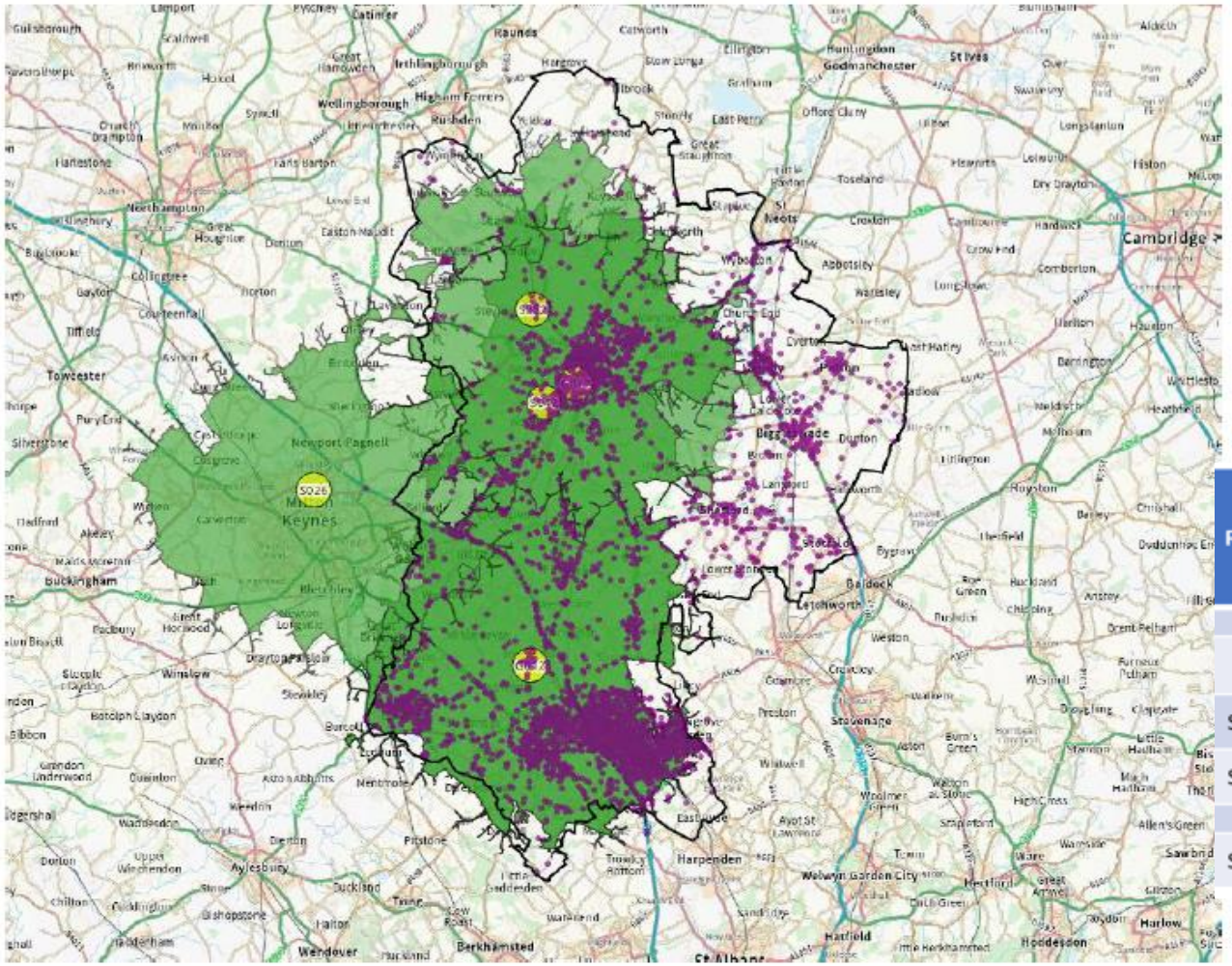
These Officers serve in four groups. We were asked to analyse and compare coverage in each group based on each officer's home location.
We previously had no way of checking compliance, but with Cadcorp, we can visualise the officers and group locations on the map and measure coverage against standard.

Process
20-minute drive time isochrones were created in Cadcorp using OS Open roads data. These isochrones have been used to show on a map, the physical distance from each officers' location and the furthest they can reach within 20 minutes from their respective locations.

These calculations have been done in Cadcorp using Network speeds meaning that Cadcorp considers the road speed of every road on the network when making these calculations.

Flexi Duty Officers Map

Group A map including all Incidents.



Map Features

- [x] Drawing Layer
- [ ] OS Maps API
- [ ] MiniScale (standard with grid)
- [ ] ISOCHRONES_FDS_OFFICERS_GROUP_A
- [ ] ISOCHRONES_FDS_OFFICERS_GROUP_B
- [ ] ISOCHRONES_FDS_OFFICERS_GROUP_C
- [ ] ISOCHRONES_FDS_OFFICERS_GROUP_D
- [x] Bedfordshire Boundary
- [x] FDS_OFFICER_ROTA_GROUP_A
- [ ] FDS_OFFICER_ROTA_GROUP_B
- [ ] FDS_OFFICER_ROTA_GROUP_C
- [ ] FDS_OFFICER_ROTA_GROUP_D
- [ ] BFRS Beds Stations X and Y
- [ ] FDS Officers Incidents
- [ ] FDSOFFICERINCIDENTS_PRIMARY_FIRE
- [ ] FDSOFFICERINCIDENTS_RTC

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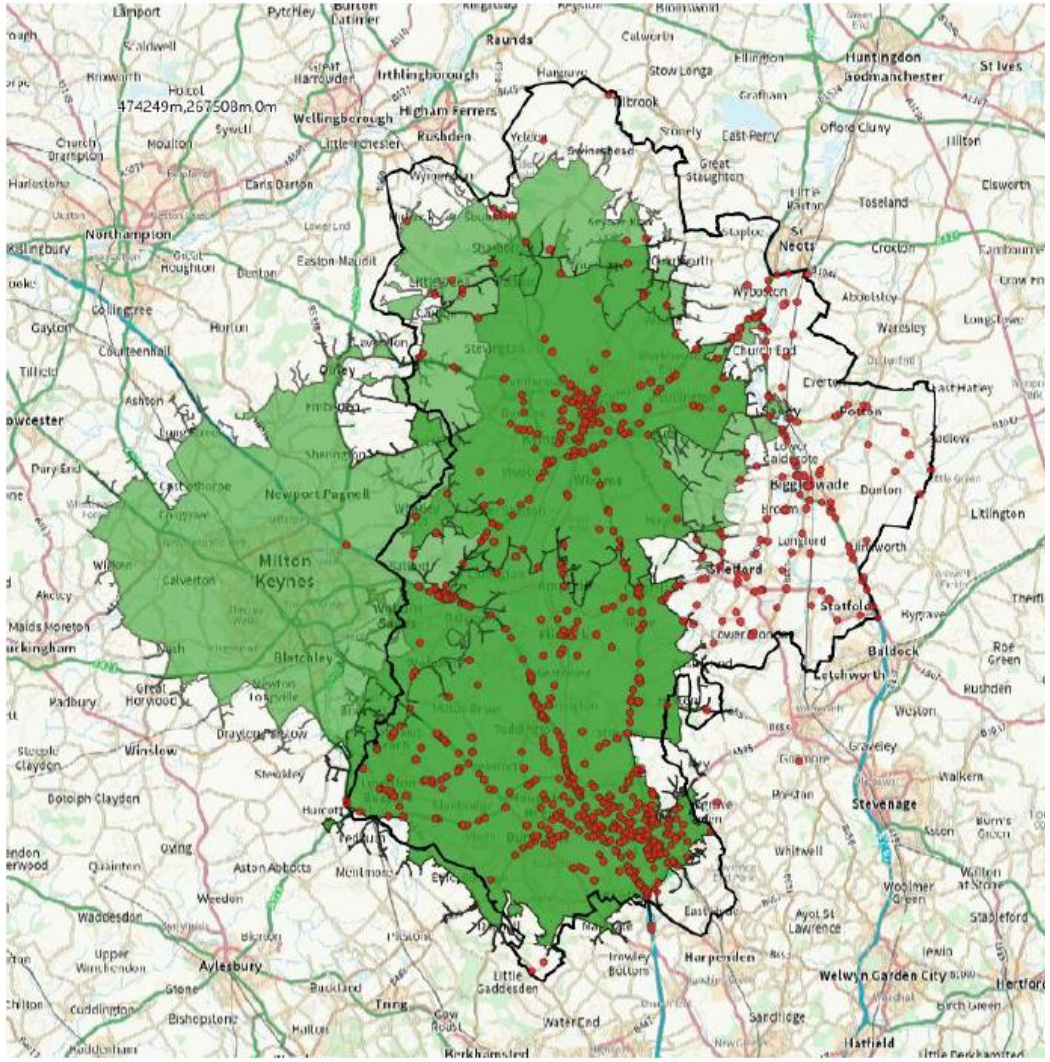
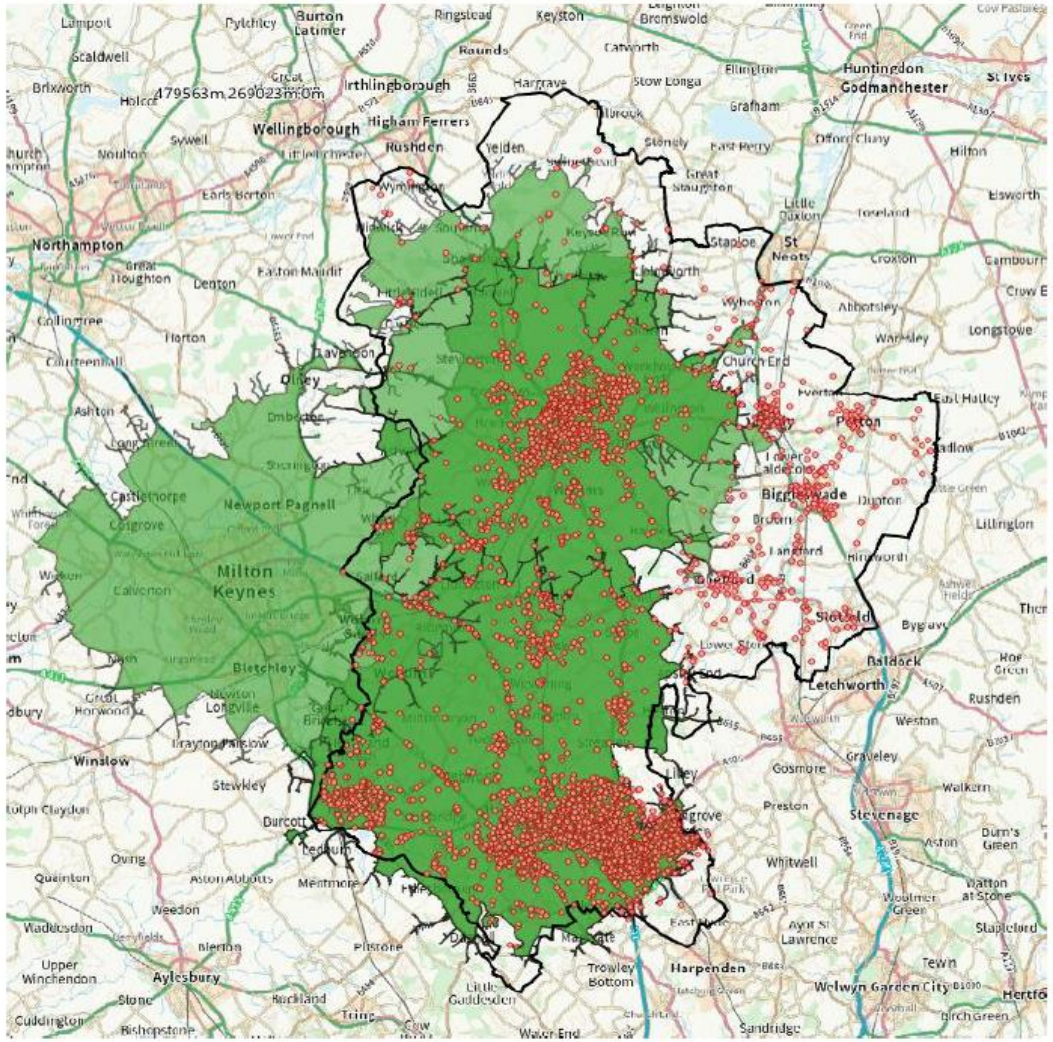
Rank	%age of Bedfordshire covered	%age against standard	%age of incidents covered	%age against standard	%age of primary fires covered	%age against standard	%age of RTC's covered	%age against standard
GC	29.38	-0.62	31.55	11.55	31.51	11.51	32.43	12.43
GC	29.90	-0.10	60.08	40.08	60.55	40.55	57.40	37.40
StnC	24.06	-5.94	25.39	5.39	26.22	6.22	20.46	0.46
StnC	28.78	-1.22	30.83	10.83	30.95	10.95	30.76	10.76
GC	29.90	-0.10	60.08	40.08	60.55	40.55	57.40	37.40
StnC	3.31	-26.69	2.68	-17.32	2.17	-17.83	6.18	-13.82

Flexi Duty Officers Map

Group A map including all RTC's.



Group A map including all Primary Fires.



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Flexi Duty Officers Map

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Conclusion:
Very few officers can meet the 30% area policy. However, most meet incident (Primary fires and RTC) policy of 20%. It is also worth noting that the standard met for RTC was met by Officers for primary fires and vice versa. There is no indication that one was not met by the FDS officers if the other was.

For the first time, we have evidence that the policy isn't right for filtering suitable locations for officers.

Without Cadcorp, we'd have had no consistent or fair approach for measuring this.

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Questions?