

Emergency Service Planning

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#### 2024 Community Risk Review and Assessment of Risk

Nottinghamshire Fire and Rescue Service 10<sup>th</sup> October 2024

#### **Executive Summary**



The main purpose of this project was to provide an evidence base to NFRS to support its CRMP and strategic decision making. Key outcomes include

- ORH collected key data items and successfully validated optimisation and simulation models which will remain valid over the next few years.
- Using existing station locations, it was only possible to improve first response performance at the expense of second response performance.
- Using greenfield locations, it was possible to improve first and second response performance.
- ORH has provided evidence that can be used in refining NFRS's approach to targeted prevention and protection work.
- Extensive modelling was completed to assist NFRS in forming its approach to specialist appliances within the county.
- Site search maps created for key stations where capital decisions need to be made suggest existing sites are well located to achieve effective response performance.







# Introduction



Nottinghamshire Fire and Rescue Service (NFRS) asked Operational Research in Health Ltd (ORH) to undertake a Community Risk Review and Assessment of Risk to support the planning of resourcing across Nottinghamshire

The NFRS Community Risk Management Plan (CRMP) sets out the appropriate level of resources relative to risk. Prior to the development of their next CRMP, NFRS require a Fire Cover Review that will identify the appropriate level of resources to meet the risk across the service area.

ORH has significant experience of working with fire and rescue services and other emergency services to deliver an evidence base for options for change.

#### Scope



#### The scope items for this project are summarised below and on the following slide:

Section	#	Item	Description
	1	Data Collection	Liaising with NFRS to collect necessary data for all items of the review for the period,
	T		including: historical incidents, status change, station/crewing information and GIS data.
	2	Analysis of Current Profile	Undertaking a comprehensive analytical review of historical incidents and crewing to
	2		understand demand trends, vehicle availability and response performance.
			Review the current response standard of attending all incidents within an average of 8
Operational			minutes not including call handling times.
Analysis			Results to be broken down as follows:
	З	Review of Response Standards	• All incidents
	5	Review of Response Standards	<ul> <li>All incidents with data of AFA attendances at hospitals and prisons removed</li> </ul>
			• Breakdown of performance against each incident type, P1, P2, AFA etc. (all incidents)
			Breakdown of performance against each incident type, P1, P2, AFA etc. With data of
			AFA attendances at hospitals and prisons removed (data removed)
Model Setup 1		Model Validation	Building optimisation and simulation models for NFRS to assess potential options for
Model Setup	-		change.
			To determine the optimal deployment of NFRS appliances at existing fire station
	5	NFRS-wide Optimisation Modelling using	locations.
	5	existing locations	Viability and location optimisation for Stockhill and Arnold fire stations, both stations are
			earmarked for capital work during the next CRMP life cycle
Ontimication			Optimise stations on a 'blank canvas' basis to understand the ideal configuration of
Modelling			stations, independent of current locations.
Modelling			Identify theoretically optimal locations of stations to achieve response standards based
	6	6 NFRS-wide Greenfield Modelling	on current and future demand and risk:
			<ul> <li>Scenario 1 – NFRS only, no consideration to over border mobilisations</li> </ul>
			• Scenario 2 – NFRS only, taking account of OB response times with Derbyshire FRS
			(DFRS) - Make some sensible assumptions about DFRS Pumps

#### Scope



Section	#	Item	Description
Specials	7	Review of Specialist Appliances	<ul> <li>Specialist Rescue Units:</li> <li>Scenario 1 – Maintain current provision of 2 Specialist Rescue Units (1 SRU primary capability working at height / line rescue, 1 SRU primary capability water rescue / power boat rescue. Both SRU can support each other at line or water rescue, both appliances have animal rescue and heavy rescue (HGV RTC) capability)</li> <li>Scenario 2 – Removal of 1 SRU, with the remaining SRU capable of responding to working at height / line rescue, water rescue / power boat rescue, animal rescue and heavy rescue (HGV RTC)</li> <li>Scenario 3 – Removal of both SRU, replacing them with individual vehicles, therefore, one vehicle for working at height / line rescue, one vehicle for water rescue / power boat rescue, one vehicle for animal rescues, one vehicle for heavy rescue (HGV RTC), identify optimal locations for each vehicle type based on capability / incident type</li> <li>Aerial Ladder Platforms:</li> <li>Identify optimal location</li> <li>Are 2 ALPs required based on risk &amp; demand</li> <li>Command Support Vehicle:</li> <li>Identify optimal location</li> <li>Water and Foam Unit:</li> <li>Identify optimal location</li> </ul>
Drovention	8	Risk modelling – Targeting high risk people	Undertake a county wide assessment of risk to inform a targeted approach to prevention activities over the lifecycle of CRMP 2025-28
FIEVENLION	9	Risk modelling – Road safety	Analysis of RTCs across the county to inform road safety activities
Protection	10	Risk modelling – Targeted high-risk buildings	Understand and use NFRS categorisation of high-risk and commercial buildings.



To fulfil the objectives of this project, ORH collected two key data items from NFRS:

- 5 years (January 2019 to December 2023) of CAD workload data to enable a detailed analysis of the service, in terms of demand, response and performance. All analysis of demand presented are based on full 5 years, unless stated otherwise. The analysis on Response and Performance is based on 2 years only (January 2022 to December 2023), to reflect recent operations.
- 2 years (January 2022 to December 2023) of vehicle availability data to allow for a complete understanding of availability by callsign and time of day. All slides on availability are based on this sample period.

These two data items feed directly into ORH's model validation process described on the next page.



The purpose of the model validation process was to ensure that ORH's simulation model reflects the real-life behaviour of NFRS appliances.

There are a number of stages involved in preparing a validated model. A detailed understanding of the manner in which the service functions is required (gained through data analysis and consultation), and this is combined with a sophisticated travel time calibration process.

ORH's simulation model takes into account temporal variations in demand and operational parameters, and the model validation process includes the calibration of travel times by time of day to ensure that any effects of varying travel conditions are replicated.

For the model validation, most analysed operational parameters used the sample January 2021 to December 2023. A five-year sample (January 2019 to December 2023) of historical incident locations was used to ensure a robust sample.

There was a close correspondence between the model and the actual analysed position. The model could therefore be used with confidence to explore the effects of changes in operational parameters, such as crewing and station deployments.



# **5-year Sample (January 2019 to December 2023)**

#### **Data Cleansing: Incidents and Responses Taken Forward**





#### **Data Cleansing - Exclusion Summary**



#### Data Received

Total Mobilisation Records	75,132
Non-Pump Records	5,286
Total Pump Records	69,846

#### Pump Records

	2019	2020	2021	2022	2023	Total
Initial Pump Records	13,037	12,478	<mark>13,491</mark>	15,624	15,216	69,846
Repeat Attendance	62	171	164	287	143	827
Vehicle wasn't assigned	8	8	12	14	10	52
Vehicle didn't arrive at scene	200	-	-	37	305	342
Control Time outside acceptable cut-offs	79	113	139	198	119	648
Turnout Time outside acceptable cut-offs	3	4	2	5	8	22
Time To Scene outside acceptable cut-offs	6	15	13	10	12	56
Crew Response outside acceptable cut-offs	1	2	3	1	2	9
Time At Scene outside acceptable cut-offs	21	30	42	54	38	185
Outside FRS Boundary	2	2	2	2	4	12
Total Excluded Records	182	345	377	608	641	2,153
Responses used in analysis	12,855	12,133	13,114	15,016	14,575	67,693



#### Records were excluded using the following criteria:

Exclusion Criteria	Time From	Time To	Minimum accepted	Maximum accepted
Reliefs Attendance/ Delay in Assigning	Time of Call	Time Assigned	0 Mins 0 Seconds	60 Mins 0 Seconds
Mobilisation Time/Turnout Time	Time Assigned	Time Mobile	0 Mins 0 Seconds	20 Mins 0 Seconds
Time to Scene	Time Mobile	Time Arrived at Scene	0 Mins 0 Seconds	60 Mins 0 Seconds
Crew Response	Time Assigned	Time Arrived at Scene	0 Mins 0 Seconds	60 Mins 0 Seconds

#### Map of Stations by Duty System



#### 24 Stations

Home Station	Wholetime	On-Call	Day Shift Crewing
Arnold	FET26P1		
Ashfield	FET05P1*	FET05P2	FET05P1d,n*
Bingham		FET17P1	
Blidworth		FET02P1	
Carlton	FET27P1		
Collingham		FET15P1	
East Leake		FET28P1	
Eastwood		FET24P1	
Edwinstowe	FET06P1		
Harworth		FET10P1	
Highfields	FET29P1		
Hucknall		FET25P1	
London Road	FET03P1,P2		
Mansfield	FET01P1		
Misterton		FET11P1	
Newark	FET16P1	FET16P2	
Retford		FET12P2	FET12P1d,n
Southwell		FET14P1	
Stapleford		FET23P1	
Stockhill	FET20P1,P2		
Tuxford		FET13P1	
Warsop		FET07P1	
West Bridgford	FET19P1		
Worksop	FET08P1	FET08P2	

Ashfield converted to Wholetime as of 29 November 2023

Туре	Count
Wholetime	12
On-Call	16
Day Shift Crewing	2
Total	30

#### Post 29 Nov 2023:

Туре	Count
Wholetime	13
On-Call	16
Day Shift Crewing	1
Total	30



#### **Demand by Month**





## PLAN, PREPARE, PERFORM.

## **Average Daily Incidents - All Incidents**



## **Average Daily Incidents - Fire Incidents**





#### **Average Daily Incidents - Special Service Incidents**



## All Special Service Incidents – Breakdown by Type



Special Service Type	2019	2020	2021	2022	2023	Total
Effecting entry/exit	631	536	604	664	673	3,108
RTC	529	480	518	578	554	2,659
Assist other agencies	219	233	242	246	276	1,216
Other assistance to police/ambulance	166	161	178	177	203	885
Lift Release	162	114	171	171	173	791
Removal of objects from people	100	90	127	116	131	564
Flooding	120	64	65	60	86	395
Suicide/attempts	70	73	68	88	93	392
No action (not false alarm)	75	66	62	48	56	307
Removal of people from objects	41	35	66	73	60	275
Medical Incident - First responder	55	35	42	73	46	251
Other rescue/release of persons	60	50	33	36	35	214
Trapped Animal	36	31	44	50	35	196
Making Safe (not RTC)	21	38	18	36	29	142
Spills and Leaks (not RTC)	24	27	33	30	16	130
Person in water or at immediate risk of entering water	36	17	26	21	29	129
Rescue from height	14	11	20	8	17	70
Other Transport incident	14	8	14	11	20	67
Rescue from water/mud etc	16	10	10	15	5	56
Other	63	39	47	53	66	268
Total	2,452	2,118	2,388	2,554	2,603	12,115

#### **Average Daily Incidents – False Alarm Incidents**







ORH have worked with NFRS to define life risk incidents, which includes:

- Primary Fires and Secondary Fires where the Property Category is either Dwelling, Building: Non-Residential, Building: Residential.
- Special Service RTCs where person trapped (NFRS have provided a list of incident numbers to ORH).
- Special service incident types listed in the following slide.

#### Life Risk Definition – Special Services



- Assist other agencies
- Class 1: Explosives
- Class 2: Gases
- Class 3: Flammable Liquids
- Class 5: Oxidizing Materials
- Class 6: Toxic Materials
- Class 8: Corrosive Materials
- Class 9: Miscellaneous Dangerous Goods
- Combination of substances
- Effecting entry/exit
- Medical Incident First responder
- Other rescue/release of persons
- Person in water or at immediate risk of entering water
- Rescue from water/mud etc
- Suicide/attempts
- Rescue from height
- Other Transport incident
- Other assistance to police/ambulance
- Medical Incident Co-responder
- Evacuation (no fire)
- Person not in water or at imminent risk of entering water (NB water not flowing)
- Rescue from below ground

#### Life Risk Incidents by Incident Type



	N. of In	cidents	Percentage of Incident Type		
Incident Type	Life Risk	No Life Risk	Life Risk	No Life Risk	
Primary Fire	4,345	3,075	58.6%	41.4%	
Secondary Fire	-	8,367	-	100%	
Chimney Fire	-	193	-	100%	
Special Service - Other	6,548	2,912	69.2%	30.8%	
Special Service - RTC	452	2,203	17.0%	83.0%	
False Alarm – AFA Hospital	-	2,172	-	100%	
False Alarm – AFA Prison	-	80		100%	
False Alarm – AFA No Hospital & Prison	-	12,643	-	100%	
False Alarm – Good Intent	-	5,185	-	100%	
False Alarm – Malicious	-	641	-	100%	
Total	11,345	37,471	23.2%	76.8%	

#### **Priority P1 to P3 Incidents by Incident Type**



Incident Type	P1	P2	P3	Other
Primary Fire	605	4,739	2,066	9
Secondary Fire	20	320	8,021	7
Chimney Fire	3	185	5	-
Special Service - Other	1,070	1,179	1,733	5,478
Special Service - RTC	1,318	136	1,168	33
False Alarm – AFA Hospital	2	70	2,100	-
False Alarm – AFA Prison	3	9	68	-
False Alarm – AFA NoHospital&Prison	50	389	12,172	32
False Alarm – Good Intent	156	1,366	3,537	126
False Alarm – Malicious	30	91	512	8
Total	3,257	8,484	31,382	5,693

Incident Type	P1	P2	P3	Other
Primary Fire	8.2%	63.9%	27.8%	0.1%
Secondary Fire	0.2%	3.8%	95.9%	0.1%
Chimney Fire	1.6%	95.9%	2.6%	0.0%
Special Service - Other	11.3%	12.5%	18.3%	57.9%
Special Service - RTC	49.6%	5.1%	44.0%	1.2%
False Alarm – AFA Hospital	0.1%	3.2%	96.7%	-
False Alarm – AFA Prison	3.8%	11.3%	85.0%	-
False Alarm – AFA NoHospital&Prison	0.4%	3.1%	96.3%	0.3%
False Alarm – Good Intent	3.0%	26.3%	68.2%	2.4%
False Alarm – Malicious	4.7%	14.2%	79.9%	1.2%
Total	6.7%	17.4%	64.3%	11.7%

Number of Incidents by Priority Type

Priority Type percentage of Incident Type

The Priority type P1, P2 and P3 were taken from the *MobiliseIncidentType* field in the original Incidents dataset received. They include different categories of Incident types.

#### **Station Districts**





#### **Average Daily Incidents by Station Area**





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## **Average Daily Incidents by District**







#### **Average Hourly Demand – All Incidents**

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#### **Average Hourly Demand – Fire Incidents**





#### **Average Hourly Demand – Special Service Incidents**





#### **Average Hourly Demand – False Alarm Incidents**





#### **Incident Locations – All Incidents**







#### **Incident Locations – Life Risk Incidents**







#### **Incident Locations – Average Demand per Year**





#### **Incident Locations – Incident Relative Density Heat Maps**





#### **Incident Locations – Average Demand per Year - Fire**




### **Incident Locations – Average Demand per Year - Special Service**







### **Incident Locations – Average Demand per Year - AFA**





### **Incident Locations – False Alarm**





#### False Alarm – Good Intent

**False Alarm Malicious** 



### **Incident Locations – Other Fires**





Average Demand per Year (2019-2023) Rumberside 10 6 5 South Yorkshire Derbyehire Lincolnehire \* Elfdword Southwell eicesterchire 621 kilometres

**Road Vehicle Fires** 

### **Responses by Over The Border Pumps into Nottinghamshire**







## Pump Availability 2 years (January 2022 to December 2023)

### **Availability Data**



Availability data collected included vehicle status records for:

- Wholetime appliances April 2022 to April 2024
- Day Shift Crewing January 2022 to December 2023
- On-Call Appliances January 2016 to April 2024

Therefore, analysis was completed for data using January 2022 to December 2023 (unless specified otherwise on the slide)

Duty System	Callsign	Start date	End Date
Wholetime	T01P1	01/04/2022	11/03/2024
Wholetime	T03P1	04/04/2022	10/02/2024
Wholetime	T03P2	09/05/2022	11/03/2024
Wholetime	T06P1	03/04/2022	08/04/2024
Wholetime	T08P1	03/04/2022	10/04/2024
Wholetime	T16P1	03/04/2022	09/04/2024
Wholetime	T19P1	11/04/2022	02/04/2024
Wholetime	T20P1	01/04/2022	11/04/2024
Wholetime	T20P2	01/04/2022	25/03/2024
Wholetime	T26P1	07/04/2022	13/03/2024
Wholetime	T27P1	11/04/2022	04/04/2024
Wholetime	T29P1	11/04/2022	31/12/2023
Day Shift Crewing	T05P1	01/01/2022	31/12/2023
Day Shift Crewing	T12P1	01/01/2022	31/12/2023
On-Call	T02P1	07/01/2016	11/04/2024
On-Call	T05P2	01/01/2022	31/12/2023
On-Call	T07P1	04/01/2016	11/04/2024
On-Call	T08P2	02/01/2016	11/04/2024
On-Call	T10P1	11/01/2016	11/04/2024
On-Call	T11P1	01/01/2016	11/04/2024
On-Call	T12P2	01/01/2022	31/12/2023
On-Call	T13P1	02/01/2016	11/04/2024
On-Call	T14P1	01/01/2016	11/04/2024
On-Call	T15P1	11/01/2016	11/04/2024
On-Call	T16P2	01/01/2016	11/04/2024
On-Call	T17P1	01/01/2016	11/04/2024
On-Call	T23P1	09/01/2016	11/04/2024
On-Call	T24P1	01/01/2016	11/04/2024
On-Call	T25P1	05/01/2016	11/04/2024
On-Call	T28P1	16/01/2016	11/04/2024

### **Appliance Availability**



Availability – 2year sample



### Availability by Month by Duty System





### **Appliance Availability by Year**







### **Demand and Appliance Availability by Hour**

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### **On Call Appliance Availability by Station Area**









## **Response and Performance** 2-year Sample (January 2022 to December 2023)

## **Station Responses by Duty System**





### Average Daily Responses by Callsign







## **Pumps Per Incident**

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For each incident and response, the time stamps associated with the call, incident and responding vehicles were provided. ORH calculated the time intervals to build up a profile of how NFRS responds to incidents. Based on the most recent two calendar years :

- The average time to dispatch the first pump to an incident was 1m 57s.
- The average turnout time was 2m 18s, but this varies depending on the duty system and time of day.
- The average travel time to scene was 5m 56s, but this varies depending on the proximity to the closest available pumps.
- The average time spent at the scene of the incident was 26m 14s, but this varies depending on the type of incident attended.

While averages are presented and commented on within this report, ORH's models take account in fluctuations related to observed differences depending on the:

- Time and day
- Type of incident
- Duty system (and individual station) of the pump responding
- Responder number

### **Call/Incident Cycle Times – 1<sup>st</sup> Response to All Incidents**





Some records do not have complete Time Mobile field. These are still used in calculating the Response Time but not the Turnout Time or Time to Scene.

### Call Components by Year – 1<sup>st</sup> Response to All Incidents





## PLAN, PREPARE, PERFORM.

#### Call Components by Month – 1<sup>st</sup> Response to All Incidents



### Call Components by Hour – 1<sup>st</sup> Response to All Incidents





#### Average Turnout Time by Hour and Duty System 1<sup>st</sup> Response to All Incidents





#### Average Turnout Time by Hour and Duty System 1<sup>st</sup> Response to All Incidents





### Average Turnout Time by Day/Night





### Average Turnout Time by Callsign





### **Responses to AFA Incidents**



AFA Category	Total Incidents	Total Responses	Average Responses per Incident	Total Occupied Time, hours	Average Occupied Time, mm:ss
AFA - Hospital	828	990	1.2	328	19:51
AFA - Prison	36	82	2.3	56	40:59
AFA - Hospital & Prison	864	1,072	1.2	384	21:28
AFA - Excluding Hospital & Prison	5,905	8,945	1.5	3,147	21:06
Total AFA	6,769	10,017	1.5	3,531	21:08

### **Responses AFA Hospital and Prison By Callsign**



			AFA-H	lospital	AFA-I	Prison	Total		
Callsign	Station	Duty System	Responses	Occupied Time, mm:ss	Responses	Occupied Time, mm:ss	Responses	Occupied Time, mm:ss	
FET29P1	Highfields	Wholetime	337	18:53	1	13:27	338	18:52	
FET26P1	Arnold	Wholetime	155	18:44	3	23:57	158	18:50	
FET20P1	Stockhill	Wholetime	94	21:22	4	29:05	98	21:41	
FET19P1	West Bridgford	Wholetime	75	20:56	10	43:31	85	23:35	
FET03P1	London Road	Wholetime	55	22:09	4	41:13	59	23:27	
FET20P2	Stockhill	Wholetime	50	22:04	2	25:35	52	22:12	
FET01P1	Mansfield	Wholetime	48	15:39	0	-	48	15:39	
FET16P1	Newark	Wholetime	19	14:39	12	42:10	31	25:18	
FET03P2	London Road	Wholetime	28	19:40	1	03:37	29	21:11	
FET08P1	Worksop	Wholetime	28	21:18	1	47:40	29	22:12	
FET27P1	Carlton	Wholetime	11	21:25	3	46:22	14	26:46	
FET06P1	Edwinstowe	Wholetime	3	46:46	3	39:58	6	43:22	
FET05P1	Ashfield	Day Shift Crewing	44	19:32	0	-	44	19:32	
FET12P1	Retford	Day Shift Crewing	4	19:09	6	49:26	10	37:19	
FET17P1	Bingham	On-Call	0	-	13	41:25	13	41:25	
FET23P1	Stapleford	On-Call	9	15:26	1	11:38	10	15:03	
FET12P2	Retford	On-Call	3	32:12	6	44:13	9	40:13	
FET05P2	Ashfield	On-Call	7	22:22	0	-	7	22:22	
FET24P1	Eastwood	On-Call	5	30:58	1	28:59	6	30:38	
FET16P2	Newark	On-Call	4	24:26	1	40:36	5	27:40	
FET25P1	Hucknall	On-Call	4	24:29	1	42:01	5	28:00	
FET08P2	Worksop	On-Call	3	54:24	0	-	3	54:24	
FET13P1	Tuxford	On-Call	0	-	3	50:07	3	50:07	
FET15P1	Collingham	On-Call	0	-	3	39:46	3	39:46	
FET02P1	Blidworth	On-Call	2	25:46	0	-	2	25:46	
FET07P1	Warsop	On-Call	2	19:48	0	-	2	19:48	
FET11P1	Misterton	On-Call	0	-	2	47:39	2	47:39	
FET10P1	Harworth	On-Call	0	-	1	42:52	1	42:52	
Total			990	19:51	82	40:59	1072	21:28	

**Occupied Time** is the average time spent by each appliance/crew at an incident (i.e. time difference between time assigned and time available).



### Average Response Performance by Incident Category

Incident Type	1st Response Average	2nd Response Average
Primary Fire - Dwelling	07:18	09:49
Primary Fire - Other Residential	08:17	10:58
Primary Fire - Non-Residential	08:54	12:19
Primary Fire - Other	09:44	13:59
Secondary Fire	09:04	11:55
Chimney Fire	10:51	15:38
False Alarm – AFA Hospital	06:29	08:12
False Alarm – AFA Prison	12:23	17:55
False Alarm – AFA Hospital&Prison	06:44	10:26
False Alarm – AFA Excl. Hospital&Prison	07:14	07:26
False Alarm – Good Intent	09:10	10:12
False Alarm – Malicious	06:51	07:37
Special Service - Other	07:44	15:18
Special Service - RTC	08:51	12:50
Overall Excluding AFA Hospital&Prison	08:10	10:25
Overall	08:07	10:26

Mean response time measured from time assigned (Excl. Call Handling)

### Average Response Performance by Incident Category – P1 & P2



Incident Type	1st Response Average	2nd Response Average
Primary Fire - Dwelling	07:10	09:53
Primary Fire - Other Residential	08:25	11:16
Primary Fire - Non-Residential	09:08	12:30
Primary Fire - Other	09:19	13:34
Secondary Fire	08:39	10:15
Chimney Fire	10:58	16:01
False Alarm – AFA Hospital	06:38	08:23
False Alarm – AFA Prison	10:08	15:18
False Alarm – AFA HospPrison	07:11	09:26
False Alarm – AFA NO HospPrison	06:58	08:59
False Alarm – Good Intent	08:12	10:15
False Alarm – Malicious	07:16	10:09
Special Service - Other	06:42	14:21
Special Service - RTC	09:29	12:43
Overall Excl. AFA Hospital&Prison	08:07	11:30
Overall	08:07	11:29

Mean response time measured from time assigned (Excl. Call Handling)

## Average Response Performance by Incident Category – Life Risk

Incident Type	1st Response Average	2nd Response Average
Fire Primary LR	07:49	10:42
Fire Primary Non LR	09:44	13:59
Secondary & Chimney Fires	09:06	12:07
SS RTC LR	09:04	12:44
SS RTC Non LR	08:49	12:53
SS Other LR	08:07	15:22
SS Other Non LR	06:50	14:56
AFA Hospital	06:29	08:12
AFA Prison	12:23	17:55
AFA NO Hospital & Prison	07:14	07:26
FA Other	08:53	09:36
Overall Life Risk	08:02	11:41
Overall	08:07	10:26

## Average Response Performance by Incident Category – Life Risk OR

1 <sup>st</sup> Response	20	19	20	)20	20	)21	20	22	20	23
Incident Category	Response Time	N.of Responses								
Fire Primary LR	07:14	879	07:34	796	07:26	831	07:32	856	08:04	983
Fire Primary Non LR	09:12	622	08:58	611	09:24	633	09:50	700	09:37	509
Secondary & Chimney Fires	08:32	1,596	08:48	1,480	08:37	1,693	09:12	2,461	08:55	1,330
SS RTC LR	08:08	106	09:04	73	09:28	92	09:14	86	08:55	95
SS RTC Non LR	08:40	422	08:12	408	08:17	423	08:47	486	08:51	464
SS Other LR	07:58	1,323	07:57	1,151	07:52	1,270	07:51	1,366	08:23	1,438
SS Other Non LR	07:05	601	07:26	486	06:46	603	06:26	616	07:14	606
AFA Hospital	05:49	509	05:55	472	05:58	363	06:20	395	06:37	433
AFA Prison	13:40	16	12:19	22	11:45	6	11:29	17	13:11	19
AFA Hospital & Prison	06:03	525	06:12	494	06:03	369	06:33	412	06:54	452
AFA No Hospital & Prison	06:55	2,171	06:59	2,154	06:55	2,413	07:04	2,723	07:23	3,182
FA Other	08:37	1,146	08:15	1,143	08:28	1,097	08:58	1,222	08:49	1,218
Overall	07:47	9,391	07:50	8,796	07:47	9,424	08:06	10,928	08:07	10,277

2nd Response	20	2019		2020		2021		2022		2023	
Incident Category	Response Time	N.of Responses									
Fire Primary LR	09:53	581	10:17	558	10:01	607	10:13	609	11:06	741	
Fire Primary Non LR	12:46	156	12:54	161	13:37	184	13:57	192	14:01	148	
Secondary & Chimney Fires	12:24	101	12:10	117	12:19	131	12:02	226	12:21	77	
SS RTC LR	13:18	94	13:43	66	13:24	84	12:25	75	13:01	80	
SS RTC Non LR	12:47	130	11:19	103	11:59	131	13:16	166	12:28	161	
SS Other LR	15:09	113	14:30	91	15:17	151	15:36	133	15:12	183	
SS Other Non LR	13:03	26	14:40	31	12:30	29	14:07	39	16:13	25	
AFA Hospital	08:00	438	07:53	406	08:10	319	08:06	96	08:45	18	
AFA Prison	18:11	16	17:32	22	17:58	6	18:02	17	17:48	17	
AFA Hospital & Prison	08:22	454	08:23	428	08:21	325	09:36	113	13:08	35	
AFA No Hospital & Prison	07:20	517	07:55	519	07:21	633	07:09	761	07:42	779	
FA Other	09:10	331	08:53	303	09:15	287	09:14	272	09:55	308	
Overall	09:49	2,503	09:53	2,377	09:59	2,562	10:13	2,586	10:39	2,537	

### **Average Response Performance by District**





### **Average Response Performance by Station Area**







# **Model Validation**

### **Model Validation**




#### **Model Validation**





Mean 1st Response by District

■Modelled ■Analysed



Responses by Station

#### **Model Base**



The model validation process ensured that the model accurately replicates the operational regime of NFRS; however, it was necessary to establish a modelled base position that reflects the 'expected' position of the service. The model base position was then used to compare all modelled changes against.

The following parameters were agreed with NFRS for setting the modelled base:

- Ashfield Day Shift Crewing pump replaced with Wholetime pump
- Worksop station relocated to the development site off Sandy Lane

Reporting Measures used are:

- Average 1st response to life-risk incidents
- Average 2nd response to life-risk incidents
- The percentage of life-risk incidents responded to within 15 minutes
- Average 1st pump response to all incidents

ORH reported these metrics NFRS-wide and also by district.

## **Base Position Performance**



		Life-Risk Incidents		All Incidents
District	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-Wide	8:02	11:41	94.1%	8:07
Ashfield	9:35	12:28	93.8%	9:19
Bassetlaw	8:59	16:28	89.2%	9:38
Broxtowe	7:43	11:37	95.4%	7:43
City of Nottingham	6:44	8:26	98.7%	6:39
Gedling	6:55	10:53	97.3%	7:32
Mansfield	7:17	12:10	97.9%	7:54
Newark & Sherwood	9:49	15:54	86.3%	10:18
Rushcliffe	9:46	12:53	87.1%	9:48

#### Modelled Base (Times in mm:ss, measured from Time Assigned)



# Optimisation Modelling Existing Stations

### **Optimisation Approach**







NFRS asked ORH to look at the optimal distribution of pumping appliances across existing stations whilst maintaining the existing number of appliances. Appliances have been optimised against first response to life risk incidents, service-wide.

There are currently 13 wholetime, 1 day shift crewing and 16 on-call pumps operating across the county. NFRS currently operate with two double wholetime stations (London Road and Stockhill). ORH have therefore created optimal solutions:

- One where two double wholetime stations continue to exist
- One where the constraint of two double wholetime stations is removed

Once the optimisation runs were completed and scenarios generated, simulation modelling was used to assess the impact on modelled response performance. For these configurations it has been assumed that the OC crews maintain their current availability once moved to their new locations.

#### **Optimisation Results**



If two double wholetime stations exist, modelling has shown it is not possible to improve first response performance by re-distributing appliances across existing locations. This shows that pumps are already well positioned to achieve first response performance.

It is possible to improve first response performance by removing the double wholetime constraint, and redistributing these wholetime pumps across the county in an optimal manner by:

- Swapping the second WT pump at London Road with the OC pump at Hucknall
- Swapping the second WT pump at Stockhill with the OC pump at Stapleford

It is worth noting that this improvement in first response is at the expense of second response performance.



### **Optimal Configuration**





This optimal deployment involves the following changes from the base:

- Swapping the second WT pump at London Road with the OC pump at Hucknall
- Swapping the second WT pump at Stockhill with the OC pump at Stapleford

#### **Modelled Performance**



#### **Optimal Configuration** Life-Risk Incidents All Incidents District Average 2nd % of 1st in 15 Minutes Average 1st Average 1st Service-Wide 7:56 12:17 94.2% 8:03 Ashfield 8:47 12:19 95.0% 8:30 Bassetlaw 16:28 89.2% 9:38 8:59 Broxtowe 6:47 10:43 96.4% 6:53 City of Nottingham 9:55 98.8% 6:48 6:53 Gedling 6:51 11:03 97.6% 7:26 Mansfield 7:16 12:09 97.9% 7:53 Newark & Sherwood 15:55 86.2% 9:49 10:18 Rushcliffe 9:49 13:12 86.8% 9:51

In this scenario first response performance to Life-Risk incidents improves by 6 seconds service-wide, but second response degrades by 36 seconds

#### Impact from Base

District		All Incidents		
District	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-Wide	-0:06	+0:36	0.1%	-0:04
Ashfield	-0:48	-0:09	1.2%	-0:49
Bassetlaw	0:00	0:00	0.0%	0:00
Broxtowe	-0:56	-0:54	1.0%	-0:50
City of Nottingham	+0:09	+1:29	0.1%	+0:09
Gedling	-0:04	+0:10	0.3%	-0:06
Mansfield	-0:01	-0:01	0.0%	-0:01
Newark & Sherwood	0:00	+0:01	-0.1%	0:00
Rushcliffe	+0:03	+0:19	-0.3%	+0:03



# **Optimisation Modelling Greenfield Stations**



Using optimisation modelling, ORH identified the optimal configuration of stations using a 'blank-canvas' approach – stations could be located anywhere within Nottinghamshire. The modelling considered the same number of stations (24) and pumping appliances (30) by duty system as the current position. Locations and appliances have been optimised against life risk incidents, whilst removing any demand on the main 4 prisons of Lowdham Grange, Ranby, Whatton, HMP Prison.

There are currently 13 wholetime, 1 day shift crewing and 16 on-call pumps operating across the county. NFRS currently operate with two double wholetime stations (London Road and Stockhill). ORH have created two optimal solutions:

- One where the requirement for two double wholetime stations continue to exist
- One where the requirement double wholetime stations is removed completely (therefore maximising first response performance).

It is important to understand that the solution provided here is the mathematical best solution and does not take into account things like operational practices, political barriers or financial constraints.

Once the optimisation runs were completed and scenarios generated, simulation modelling was used to assess the impact on modelled response performance. For these configurations it has been assumed that the OC crews have availability as per averages of the current pumps.



Many of the optimised locations are close to existing stations and the general spread of stations is similar to the current deployment.

The optimal deployments with two double wholetime stations would improve average first response by around 31 seconds and second response by around 16 seconds across NFRS. When the requirement for two double wholetime stations is removed, first response improves by 42 seconds in total, but second response degrades by 15 seconds from the original base.

The model favours positioning one of the double wholetime stations in the Mansfield area, rather than having both of them in City of Nottingham and notable new station locations have been identified in the areas near to:

- Clifton
- Ollerton junction
- Beckingham

Exact co-ordinates of greenfield locations are provided in the appendix.



## **Greenfield Optimisation Configurations**



### **Appliance Summary – Greenfield Optimisation Configurations**



Base Position:				
District	Wholetime	Day Shift Crewing	On Call	Stations
Ashfield	1	0	2	2
Bassetlaw	1	1	5	5
Broxtowe	1	0	2	3
City of Nottingham	4	0	0	2
Gedling	2	0	0	2
Mansfield	1	0	1	2
Newark & Sherwood	2	0	4	5
Rushcliffe	1	0	2	3
Total	13	1	16	24

#### Two Double Wholetime Locations:

District	Wholetime	Day Shift Crewing	On Call	Stations
Ashfield	1	0	2	3
Bassetlaw	2	0	3	4
Broxtowe	1	0	2	3
City of Nottingham	4	0	3	5
Gedling	1	1	1	2
Mansfield	2	0	1	2
Newark & Sherwood	1	0	3	3
Rushcliffe	1	0	1	2
Total	13	1	16	24

#### Difference to Base:

District	Wholetime	Day Shift Crewing	On Call	Stations
Ashfield	0	0	0	1
Bassetlaw	1	-1	-2	-1
Broxtowe	0	0	0	0
City of Nottingham	0	0	3	3
Gedling	-1	1	1	0
Mansfield	1	0	0	0
Newark & Sherwood	-1	0	-1	-2
Rushcliffe	0	0	-1	-1
Total	0	0	0	0

#### Zero Double Wholetime Locations:

District	Wholetime	Day Shift Crewing	On Call	Stations	
Ashfield	2	0	1	3	
Bassetlaw	2	0	3	4	
Broxtowe	1	0	2	3	
City of Nottingham	4	0	3	5	
Gedling	1	1	1	2	
Mansfield	1	0	2	2	
Newark & Sherwood	1	0	3	3	
Rushcliffe	1	0	1	2	
Total	13	1	16	24	

#### Difference to Base:

District	Wholetime	Day Shift Crewing	On Call	Stations
Ashfield	1	0	-1	1
Bassetlaw	1	-1	-2	-1
Broxtowe	0	0	0	0
City of Nottingham	0	0	3	3
Gedling	-1	1	1	0
Mansfield	0	0	1	0
Newark & Sherwood	-1	0	-1	-2
Rushcliffe	0	0	-1	-1
Total	0	0	0	0

#### **Modelled Performance – Greenfield Optimisation Configurations**



#### Life-Risk Incidents All Incidents Average 2nd % of 1st in 15 District Average 1st Average 1st Minutes Service-Wide 7:31 11:25 93.2% 7:32 Ashfield 8:58 13:14 90.9% 8:55 Bassetlaw 88.7% 8:05 18:47 8:52 Broxtowe 7:11 10:49 96.2% 7:10 99.7% 5:23 City of Nottingham 5:32 7:51 Gedling 7:17 9:39 97.1% 7:51 6:57 Mansfield 6:36 6:39 98.7% Newark & Sherwood 10:38 16:35 81.0% 11:19 Rushcliffe 10:30 13:36 82.4% 10:38

Greenfield Optimisation – Two Double Wholetime Locations

#### Impact from Base Position

	Li	fe-Risk Incider	nts	_All Incidents_
District	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-Wide	-0:31	-0:16	-0.9%	-0:35
Ashfield	-0:37	+0:46	-2.9%	-0:24
Bassetlaw	-0:54	+2:19	-0.5%	-0:46
Broxtowe	-0:32	-0:48	0.8%	-0:33
City of Nottingham	-1:12	-0:35	1.0%	-1:16
Gedling	+0:22	-1:14	-0.2%	+0:19
Mansfield	-0:41	-5:31	0.8%	-0:57
Newark & Sherwood	+0:49	+0:41	-5.3%	+1:01
Rushcliffe	+0:44	+0:43	-4.7%	+0:50

#### Greenfield Optimisation – Zero Double Wholetime Locations

	Li	fe-Risk Incider	nts	_All Incidents_
District	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st
Service-Wide	7:20	11:56	93.6%	7:23
Ashfield	7:53	13:11	92.5%	7:52
Bassetlaw	8:05	18:48	88.6%	8:52
Broxtowe	7:10	10:43	96.3%	7:09
City of Nottingham	5:22	8:31	99.9%	5:16
Gedling	7:13	9:46	97.6%	7:45
Mansfield	6:50	9:53	98.4%	7:13
Newark & Sherwood	10:39	16:50	80.7%	11:21
Rushcliffe	9:50	13:16	86.0%	9:58

#### Impact from Base Position

	Li	Life-Risk Incidents				
District	Average 1st	Average 2nd	% of 1st in 15 Minutes	Average 1st		
Service-Wide	-0:42	+0:15	-0.5%	-0:44		
Ashfield	-1:42	+0:43	-1.3%	-1:27		
Bassetlaw	-0:54	+2:20	-0.6%	-0:46		
Broxtowe	-0:33	-0:54	0.9%	-0:34		
City of Nottingham	-1:22	+0:05	1.2%	-1:23		
Gedling	+0:18	-1:07	0.3%	+0:13		
Mansfield	-0:27	-2:17	0.5%	-0:41		
Newark & Sherwood	+0:50	+0:56	-5.6%	+1:03		
Rushcliffe	+0:04	+0:23	-1.1%	+0:10		



## **List of Greenfield Locations**

Street Address	v	v	2 Double	Wholetime	Locations	0 Double	Wholetime	Locations
Street Address	^	1	PWT	PDC	POC	PWT	PDC	POC
Mansfield Rd near Church Crescent	457870	345342	1	0	1	1	0	1
Intersection of Ollerton RD & Main St	465559	367605	0	0	1	0	0	1
Lenton Boulevard near Recreation Ground	455511	340070	1	0	0	1	0	0
Intersection of Ratcliffe Gate & St Peter's Way	454218	361008	2	0	0	1	0	1
On North Gate near to Water Lane	479871	354207	1	0	1	1	0	1
Intersection of Eastgate & Carlton Rd	458557	379301	1	0	1	1	0	1
Intersection of Arlington Way & Albert Rd	470726	380709	1	0	0	1	0	0
Intersection of Huntingdon St & Kent St	457619	340273	2	0	0	1	0	1
Intersection of Bulwell High Rd & Main St	454032	345373	0	0	1	0	0	1
Intersection of Lammas Rd & Carsic Lane	449251	359002	1	0	0	1	0	0
Melton Rd near to Charnwood Grove	458305	337218	1	0	0	1	0	0
On B6006 by Nether St	453073	336673	1	0	0	1	0	0
Scrooby Rd near Church	462459	391514	0	0	1	0	0	1
Roundabout where Burton Rd meets Carlton Hill	461357	341451	0	1	0	0	1	0
Intersection of Watnall Rd & Derbyshire Lane	453487	349068	0	0	1	1	0	0
Intersection of Green Ln & Southchurch Drive	455345	334149	0	0	1	1	0	0
Intersection of Nuthall Rd & Stockhill Ln	454125	343041	1	0	1	1	0	1
Near to Bingham Interchange Roundabout	468206	339693	0	0	1	0	0	1
Intersection of Nottigham Rd & Dovecote Rd	447537	346507	0	0	1	0	0	1
Intersection of Hickings Lane & Ewe Lanb Lane	449712	338299	0	0	1	0	0	1
Sherwood St near to High St	456702	367890	0	0	1	0	0	1
Kingsway near park	450722	355881	0	0	1	0	0	1
Intersection of Station Rd & Newark Rd	470536	354242	0	0	1	0	0	1
Roundabout where Beckingham Rd meets A631	477129	390218	0	0	1	0	0	1



# NFCC Risk Methodology

#### **NFCC Dwelling Fire Risk Methodology**



The National Fire Chiefs Council (NFCC) in collaboration with ORH have produced a methodology for dwelling fire risk categorisation as part of NFCC's Definition of Risk project. The overall objective as defined by NFCC was "to deliver an evidence-based and consistent methodology for determining 'level of risk'". NFCC and ORH took a datadriven approach to researching the risk factors that underpin the likelihood and consequence of dwelling fires.

The step-by-step framework brings together national modelling on the likelihood and consequence of dwelling fires to develop a ranking of all Lower Super Output Areas (LSOAs) in a fire service, which can then form the local categorisation of risk. This is primarily based on place and property data, rather than individuals. ORH has applied this methodology, using publicly available data, to determine risk in Nottinghamshire FRS.

The key outcome is a risk score for each LSOA in Nottinghamshire. Based on the national analysis, LSOAs are categorised as follows:

- Very High = Top 5% of LSOAs (1<sup>st</sup> to 5<sup>th</sup> percentile)
- High = Next 10% of LSOAs (6<sup>th</sup> to 15<sup>th</sup> percentile)
- Medium = Next 25% of LSOAs (16<sup>th</sup> to 40<sup>th</sup> percentile)
- Low = Next 40% of LSOAs (41st to 80th percentile)
- Very Low = Bottom 20% of LSOAs (81st to 100th percentile)

These proportions are designed so that it is easy to identify LSOAs with likelihood scores that stand out across an individual fire service.

Separately, ORH have also supplied the NFCC UPRN based risk modelling alongside shape files for the NFRS GIS team to utilise internally

## NFCC Dwelling Fire Risk Methodology



#### Key Factors for LSOA Likelihood Model

Data Field	Direction of Relationship	National Weighting
Probability of Ownership / Shared Ownership	Negative	20.4%
Probability Living in Flat	Positive	13.6%
Probability Living in Semi Detached	Negative	11.3%
Probability of Having no Car or Van	Positive	11.3%
Probability No Children in Household	Negative	5.4%
Probability of Having One or Less Rooms than Required	Positive	5.4%
Probability of being Unemployed	Positive	4.1%
IMD Employment Ranking		8.1%
IMD Living Environment Ranking		6.8%
IMD Crime Ranking	Negative (as data	5.4%
IMD Health Deprivation and Disability Ranking	is a raining)	5.4%
IMD Income Ranking		2.7%

#### Key Factors for LSOA Life Consequence Model

Data Field	Direction of Relationship	National Weighting
Probability Property is Council Tax Band A or B	Positive	19.0%
Probability of Individual being in Very Bad Health	Positive	15.4%
Probability of Individual is Unemployed	Positive	12.3%
Probability of Individual Working Full Time	Negative	9.8%
Probability that Individuals' Main Language is not English	Positive	8.9%
Probability of Dependent Children Living in Household	Positive	7.5%
IMD Crime Ranking	Negative (as	13.7%
IMD Living Environment Ranking	ranking)	13.5%

The NFCC method uses a range of public available data at LSOA and UPRN level which includes potential influencing factors:

- · local environment, social and economic factors;
- property factors, such as type, condition and occupancy;
- data on household and individuals in terms of their behavioural patterns;

Some of the factors are positively correlated with likelihood or consequence for example probability of individual being in Very Bad Health – Dwelling fires that occur in LSOAs with a higher percentage of people who are in very bad health are likely to have a greater consequence on life.

Other factors are negatively correlated for example Probability of Individual Working Full Time – Dwelling fires that occur in LSOAs where fulltime working is higher are likely to have a lesser consequence on life

Further information on this methodology can be found in the published NFCC documentation

### LSOA Dwelling Fire Risk Analysis





### LSOA Dwelling Fire Risk Analysis (5-year sample)



Category	Category Description	LSOAs	Min Score	Max Score	Dwelling Fires	Population	Incidents with Victims	DFs per LSOA per Year	DFs per 1,000 people per year	Incs with Victims per LSOA per Year	Incs with Victims per 1,000 people per year
5 - Very High	Top 5% of LSOAs (1st to 5th percentile)	33	66.86	83.57	315	60,143	35	1.91	1.05	0.21	0.12
4 - High	Next 10% of LSOAs (6th to 15th percentile)	68	53.69	66.05	577	121,763	62	1.70	0.95	0.18	0.10
3 - Medium	Next 25% of LSOAs (16th to 40th percentile)	170	31.10	53.69	1,027	294,066	108	1.21	0.70	0.13	0.07
2 - Low	Next 40% of LSOAs (41st to 80th percentile)	272	8.69	31.07	839	457,725	91	0.62	0.37	0.07	0.04
1 - Very Low	Bottom 20% of LSOAs (81st to 100th percentile)	136	1.37	8.66	257	227,427	28	0.38	0.23	0.04	0.02
Total		679	1.37	83.57	3,015	1,161,124	324	0.89	0.52	0.10	0.06

The LSOA categorisation correlates well to the number of Victims and Dwelling Fires per LSOA and per 1,000 people

#### LSOA Dwelling Fire Risk Analysis (5-year sample)





Percentage of Properties Visited

## LSOA Dwelling Fire Risk Analysis (5-year sample)







NFCC and ORH have also produced a report into the likelihood, consequence and risk of Road Traffic Collisions (RTCs). The project required multiple data sources, to calculate the likelihood of RTCs by type of road.

NFCC/ORH analysed the likelihood and consequence of RTCs in terms of the total number, relative proportions and annual rates per kilometre of road. Stats19 data fields were then examined in relation to the effect of incidents on people, vehicles, the road network and potentially the responding FRS. Different metrics for classifying incident consequence were tested before finalising an approach that provided a suitable breakdown of high, medium or low consequence incidents.

A four-factor categorisation has been applied to every segment of road in determining the final likelihood, consequence and risk values:

- Road class (Motorway, Primary A road, Local Road, etc)
- Road Type (single carriageway, junctions, etc)
- Road Speed (posted speed limit)
- Urban/Rural Classification (ONS classification, simplified to four categories: Urban conurbations, Urban towns, Rural towns, Rural villages))

### **NFCC RTC Risk Analysis**









### **NFCC RTC Risk Analysis**



Likelihood Score	Length (km)	% of Road Length	National Comparison
Very Low	1,925	31%	38%
Low	1,921	31%	30%
Medium	1,615	26%	22%
High	597	10%	9%
Very High	90	1%	1%

Consequence Score	Length (km)	% of Road Length	National Comparison
Very Low	2,727	44%	39%
Low	2,050	33%	29%
Medium	697	11%	21%
High	630	10%	9%
Very High	45	1%	1%

<b>Risk Category</b>	Length (km)	% of Road Length	National Comparison
Very Low	2,719	44%	40%
Low	2,047	33%	39%
Medium	548	9%	7%
High	456	7%	8%
Very High	377	6%	6%

Proportions of roads within risk categories in Nottinghamshire is broadly in line with national profile on all scores



The National Fire Chiefs Council (NFCC) in collaboration with ORH have produced a methodology for Other Building Fires (OBFs) risk categorisation as part of NFCC's Definition of Risk project. The overall objective as defined by was "to deliver an evidence-based and consistent methodology for determining 'level of risk' that also provides a national benchmarking capability".

NFCC and ORH worked collaboratively to complete this report, taking a data-driven approach to researching the likelihood and consequence of OBFs, and the influencing factors that underpin the risk of these incidents. The approach involved collecting incident data from IRS, Ordnance Survey data on building locations and property types that NFCC/ORH grouped into 23 appropriate building categories, and publicly available information on a wide range of potential influencing factors.

This methodology has been published in draft form and is awaiting final release from NFCC. Therefore, results should be treated as draft and could be subject to change in the future, depending on how things are finalised with the broader NFCC approach.

Separately, ORH have supplied the NFCC other building fires full output for the NFRS GIS team to utilise internally.



### **NFCC Other Building Fires**



Examples of Buildings in the Very High category include:

- Prisons
- Hospitals
- Care Homes

Examples of Buildings in the High category include:

- HMO
- Residential Accommodation
- Sheltered Accommodation



# **Specialist Appliances**

#### **Specialist Appliances**



NFRS have asked ORH to conduct a review of certain specialist appliances:

- Specialist Rescue Units (SRU)
- Aerial Ladder Platforms (ALP)
- Command Support Unit (CSU)
- Water and Foam Unit (WFU)

ORH first analysed demand levels and created maps of historical incidents which these specialist vehicles have attended in the last 5 years. ORH have also gathered building heights data from Ordnance Survey to assist with the ALP optimisation.

Special Appliance Type	Current Number of Appliances	Station	Callsign	No of Incidents
Aerial Ladder Platform (ALP)	2	Mansfield, London Road	FET01A1, FET03A1	548
Specialist Rescue Unit (SRU)	2	Newark, Highfields	FET16R1, FET29R1	1,174
Command Support Unit (CSU)	1	Mansfield	FET01C1	88
Water & Foam Unit (WFU)	1	Worksop	FET08W1	126

### **Specialist Incident Types**



#### Number of incidents per year:

ORHCallsign	Station	Vehicle Type	2019	2020	2021	2022	2023	Total
FET01A1	Mansfield	ALP	14	20	27	46	53	160
FET03A1	London Road	ALP	35	32	60	90	178	395
FET16R1	Newark	SRU	98	91	117	119	136	561
FET29R1	Highfields	SRU	146	103	146	168	171	734
FET01C1	Mansfield	CSU	9	8	14	29	28	88
FET08W1	Worksop	WFU	2	22	22	62	18	126
Total			304	276	386	514	584	2,064

Special Rescue Type	2019	2020	2021	2022	2023	Total
Animal Rescue	67	57	71	80	62	337
Water Rescue	52	32	39	37	58	218
Rescue from Height	12	5	9	6	6	38
Total	131	94	119	123	126	593

Special Rescue Incident definition is detailed on the following slide

## **Specialist Rescue Incident Definition**



MobIncType	Specialist Rescue Type
RESCUE LARGE ANIMAL P3	Animal Rescue
RESCUE SMALL ANIMAL P3	Animal Rescue
RESCUE SMALL ANIMAL FROM WATER P3	Animal Rescue
RESCUE LARGE ANIMAL FROM HEIGHT P3	Animal Rescue
RESCUE SMALL ANIMAL FROM HEIGHT P3	Animal Rescue
RESCUE LARGE ANIMAL FROM UNSTABLE SURFACE P3	Animal Rescue
RESCUE LARGE ANIMAL FROM WATER P3	Animal Rescue
WATER RESCUE SWIFT P1	Water Rescue
WATER RESCUE LAKES/PONDS P1	Water Rescue
SUICIDE THREAT TO JUMP INTO WATER P1	Water Rescue
WATER RESCUE VEHICLE FLOOD WATER P1	Water Rescue
RESCUE FROM HEIGHT P1	Rescue from Height

#### **Demand Maps**





#### **Aerial Ladder Platforms**



## **OS Building Heights Over 10 Meters - Optimised Locations**







## **Building Height - Optimised Locations**

Deployment	Mean Coverage		% in 15		
Deployment	(mm:ss)	50%	75%	90%	minutes
Current: London Road, Mansfield	09:28	05:54	11:44	22:49	81.8%
Optimal 1 Stn: London Road	12:52	06:39	20:44	33:09	69.6%
Optimal 2 Stns: London Road, Edwinstowe	09:06	06:34	12:49	17:39	81.6%

#### Mean Coverage (mm:ss):

Region	Current	Optimal 1 Station	Optimal 2 Stations	11m+ Buildings
Ashfield	10:48	19:16	16:43	804
Bassetlaw	25:55	40:39	17:00	1,614
Broxtowe	11:19	11:20	11:20	851
City of Nottingham	05:06	05:06	05:06	8,747
Gedling	09:01	10:25	10:22	795
Mansfield	03:56	23:52	11:37	978
Newark & Sherwood	21:10	24:31	17:18	1,349
Rushcliffe	08:46	08:46	08:46	1,299
All Regions	09:28	12:52	09:06	16,437

# PLAN, PREPARE, PERFORM.

## **ALP Historical Responses - Optimised Locations**




# ALP - Optimised Location (1 and 2 Stations)

Deployment	Mean Coverage	Percentiles			% in 15	
	(mm:ss)	50%	75%	90%	minutes	
Current: London Road, Mansfield	06:00	03:39	06:59	11:59	93.1%	
Optimal 1 Stn: London Road	10:47	05:24	21:54	23:14	70.6%	
Optimal 2 Stns: London Road, Mansfield	06:00	03:39	06:59	11:59	93.1%	

Region	Current	Optimal 1 Station	Optimal 2 Stations	5-year Demand
Ashfield	08:14	21:42	08:14	22
Bassetlaw	25:27	40:43	25:27	19
Broxtowe	12:19	12:19	12:19	19
City of Nottingham	04:07	04:07	04:07	335
Gedling	08:09	08:09	08:09	13
Mansfield	03:20	23:08	03:20	98
Newark & Sherwood	17:24	22:25	17:24	18
Rushcliffe	11:13	11:13	11:13	24
All Regions	06:00	10:47	06:00	548

# **Demand Maps**



**Command Support Unit** Humberside Misto South Yorkshire Retiord Turaford Warsop Edwinstowe Derbyshire Lincolnshire elidworth/ • Southwell Newark ണ്ടി Einghem Stap WestBrid CSU STation filord o Station Location CSU Incidents 4 2 Leicestershire • 0.4 last I **O**R kilometres

Water and Foam



# **Command Support Unit Historical Responses - Optimised Location**







### The optimal site is selected at London Road

Mean		I	% in 30		
Deployment	(mm:ss)	50%	75%	90%	minutes
Current - Mansfield	22:53	22:44	25:19	32:04	87.5%
Optimal – London Road	14:24	08:09	21:39	39:40	81.8%

5-year Demand
3
5
13
3
49
3
3
8
6
88

# Water & Foam Historical Responses - Optimised Location







### The optimal site is selected at Edwinstowe

Mean		P	% in 30		
Deployment	(mm:ss)	50%	75%	90%	minutes
Current - Worksop	17:41	16:59	23:44	30:54	97.7%
Optimal – Edwinstowe	16:03	14:04	20:19	26:24	96.8%

Region	Current	Optimal	5-year Demand
Ashfield	25:56	18:20	6
Bassetlaw	10:17	15:52	61
Broxtowe	35:39	30:19	1
City of Nottingham	00:00	00:00	0
Gedling	38:04	26:59	1
Mansfield	21:24	12:44	16
Newark & Sherwood	22:15	14:02	34
Rushcliffe	40:54	29:52	6
All Regions	17:41	16:03	126



# **Special Rescue Units**



# **Animal Rescue - Optimised Location**







# The optimal site is selected at Arnold

Mean		P	% in 30		
Deployment	(mm:ss)	50%	75%	90%	minutes
Current - Newark	25:01	26:44	30:34	32:54	71.8%
Optimal – Arnold	17:39	15:09	23:29	33:44	84.0%

Region	Current	Optimal	5-year Demand
Ashfield	31:30	16:18	31
Bassetlaw	27:20	35:45	51
Broxtowe	33:27	14:08	29
City of Nottingham	27:28	07:55	86
Gedling	23:57	07:09	22
Mansfield	26:53	18:15	29
Newark & Sherwood	11:35	24:16	49
Rushcliffe	21:35	15:50	39
All Regions	25:01	17:39	337

# Large Animal Rescue Only - Optimised Location







### The optimal site is selected at Southwell

Denlaument	Mean Percentiles				% in 30
Deployment	(mm:ss)	50%	75%	90%	minutes
Current- Newark	23:09	23:19	31:54	34:49	66.3%
Optimal – Southwell	22:22	21:54	26:49	34:24	89.3%

### Mean Coverage (mm:ss):

Region	Current	Optimal	5-year Demand*
Ashfield	32:43	24:35	7
Bassetlaw	27:29	30:56	19
Broxtowe	34:13	28:22	10
City of Nottingham	29:07	21:21	5
Gedling	24:12	15:46	3
Mansfield	26:56	20:28	6
Newark & Sherwood	12:30	14:00	26
Rushcliffe	21:14	23:31	15
All Regions	23:09	22:22	92

\*Large Animal Incidents only

# Water Rescue - Optimised Location







# The optimal site is selected at London Road

Mean		F	% in 30		
Deployment	(mm:ss)	50%	75%	90%	minutes
Current	13:08	10:29	18:29	24:19	97.7%
Optimal – London Road	15:21	12:54	23:19	35:19	86.2%

Region	Current	Optimal	5-year Demand
Ashfield	22:16	21:12	14
Bassetlaw	26:06	39:39	25
Broxtowe	10:02	13:31	13
City of Nottingham	07:43	03:36	58
Gedling	16:01	11:19	10
Mansfield	27:47	28:19	3
Newark & Sherwood	11:05	23:08	51
Rushcliffe	11:35	06:43	44
All Regions	13:08	15:21	218



# Water Rescue - Optimised Locations





### The optimal sites are selected at London Road and Edwinstowe

	Mean	Percentiles			% in 30
Deployment	(mm:ss)	50%	75%	90%	minutes
Current	13:08	10:29	18:29	24:19	97.7%
Optimal – London Road & Edwinstowe	10:21	09:59	15:29	19:54	99.5%

Region	Current	Optimal	5-year Demand
Ashfield	22:16	16:13	14
Bassetlaw	26:06	15:59	25
Broxtowe	10:02	13:31	13
City of Nottingham	07:43	03:36	58
Gedling	16:01	11:19	10
Mansfield	27:47	10:24	3
Newark & Sherwood	11:05	15:48	51
Rushcliffe	11:35	06:43	44
All Regions	13:08	10:21	218

# **Rescue from Height- Optimised Location**





### The optimal site is selected at London Road

	Mean	Percentiles			% in 30
Deployment	(mm:ss)	50%	75%	90%	minutes
Current - Highfields	19:51	13:19	30:09	43:39	73.7%
Optimal – London Road	16:22	09:04	23:59	38:54	78.9%

Region	Current	Optimal	5-year Demand*
Ashfield	25:09	23:49	2
Bassetlaw	43:28	39:58	7
Broxtowe	09:31	12:24	2
City of Nottingham	08:20	04:42	16
Gedling	14:29	10:52	2
Mansfield	26:19	23:34	1
Newark & Sherwood	35:01	28:59	3
Rushcliffe	17:29	12:25	5
All Regions	19:51	16:22	38



# Site Search Maps



NFRS asked ORH to produce site search maps for three existing locations of Arnold, Eastwood and Stockhill.

Locations and appliances have been optimised against life risk incidents and all other locations are fixed when looking at each individual station location

Once optimal locations were found simulation modelling was used to test the impacts on response performance

Due to the proximity of the optimal locations to their existing locations, and existing locations being already well positioned, impacts on response performance are small



# Arnold





# Eastwood





# Stockhill







# Find Out More A construction of the second of the seco