Incidence of Fire in Heritage Buildings

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Are you more at risk from Fire in a Heritage Building?

Is it possible to quantify the incidence of fire in Heritage buildings by comparing listing information provided by Historic England with incident reports of fires completed by English Fire and Rescue Services?

The above will be demonstrated as a proof of concept using data relating to the Suffolk, Cambridgeshire and Hampshire Fire and Rescue Service response area.

Uppark 1986

How many fires are there in Heritage Buildings?

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Prior Park College 1991

Windsor Castle 1992

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Cowgate, Edinburgh 2002

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Chester 2002

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Wardington Manor 2004

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Hereford 2010

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Hastings Pier 2010

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Dartmouth 2010

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Sydenham House, 2012

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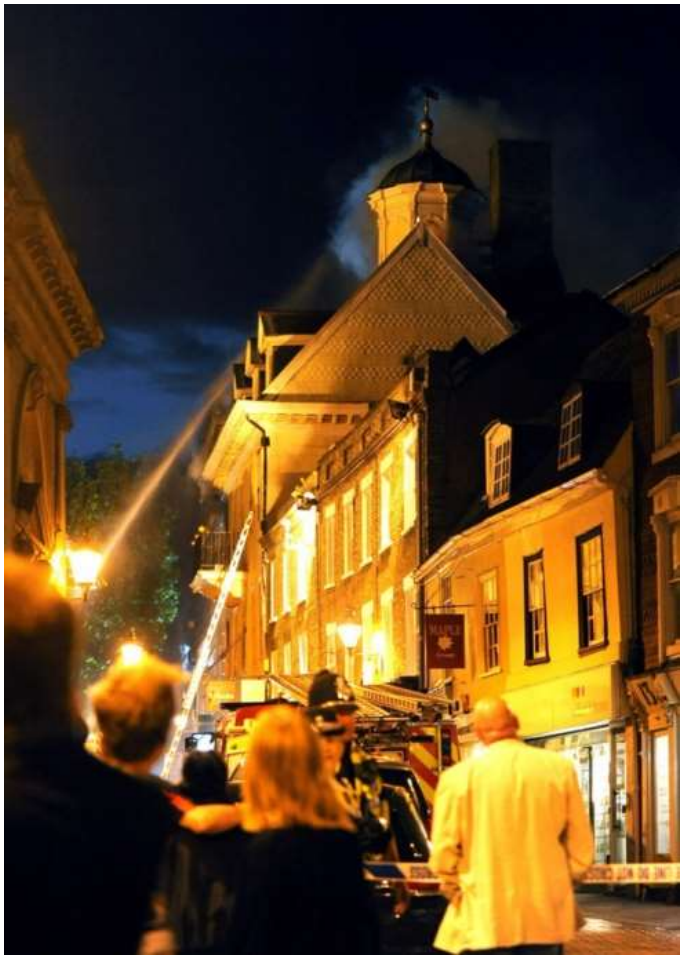
Cupola, Bury St Edmunds
June 2012



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Cumin Museum 2013

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Glasgow School of Arts 2014

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Battersea Arts Centre 2015

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Randolph Hotel Oxford 2015

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Clandon Park
April 2015

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Sudbury September 2015

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Royal Clarence Hotel Exeter October 2016

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George III and Prince of Wales Reviewing Troops

Sir William Beechey 1798, National Army Museum

The *Piazza San Marco*, Venice, looking towards the *Procuratie Nuove* and the Church of *San Geminiano* from the *Campo di San Basso*

By Canaletto, destroyed in a fire in 1940 at Castle Howard

Historic England

We do not know how many fires we have in heritage buildings !

Historic England

We do not know how many fires we have in heritage buildings !

- There are no statistics

Steve Emery

National Fire Advisor for Historic England

House of Lords - February 2016

To Summarise

- The single greatest risk to our built heritage is due to loss by fire.
- Fire destroys irreplaceable building fabric and contents
- There is much anecdotal evidence of the damage caused by fire, but there is no dataset that records the numbers of fires occurring in Heritage Buildings.

As fire statistics for fires in heritage buildings are not collected

- Risk factors leading to outbreak of fire
- How to protect heritage buildings from effect of fire
- How to measure efficacy of
  - Prevention measures
  - Fire Suppression

Without a monitoring system there is no evidence or method of evaluating

- Risk to heritage buildings, or
- Basic monitoring and evaluation of fire policies

How can we protect our heritage if we don’t understand what the risk is?

Distribution of fires recorded in COST Action C17

Grade	English Heritage Listings	UK Fire incidents (excl. Scotland)	%
1	8922	21	14
2*	20586	12	8
2	339401	117	78

(Mills, 2007)

Estimate of fire loss

- Lost to fire each year
  - One Grade 1
  - Three Grade 2*
  - Nine Grade 2
- In addition (mostly by Arson)
  - 20 Churches
  - 20 listed buildings that are empty or derelict

Kidd, 2nd International Fire Information Conference in May 2002.

Creating a Listed Buildings Database

- Cambridgeshire
  - Incidents within 5m and 10m of a heritage data point
- Hampshire
  - Incidents within a building outline
- Suffolk
  - Incidents matched to a UPRN

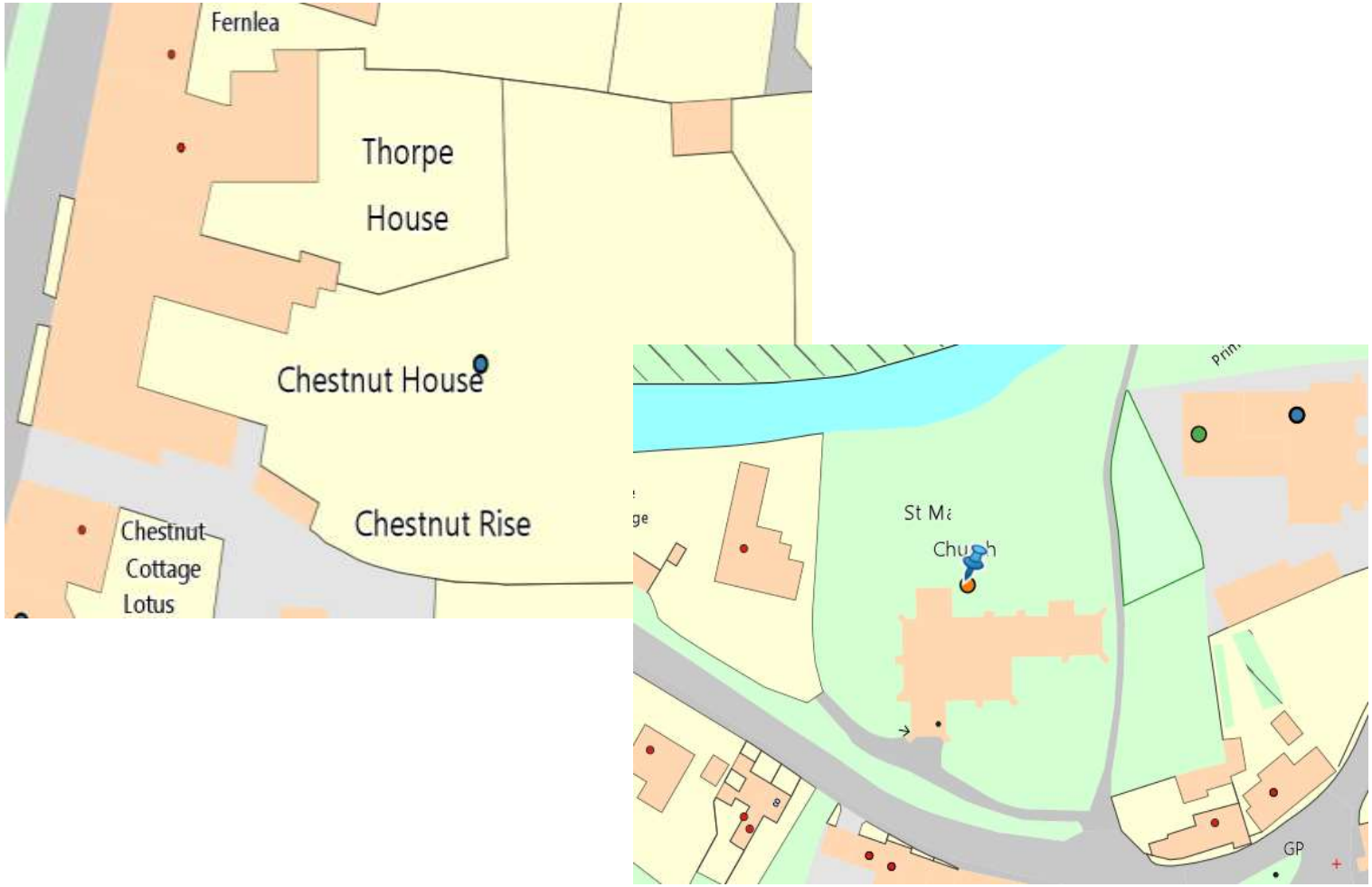
Suffolk

- The problems with UPRNs

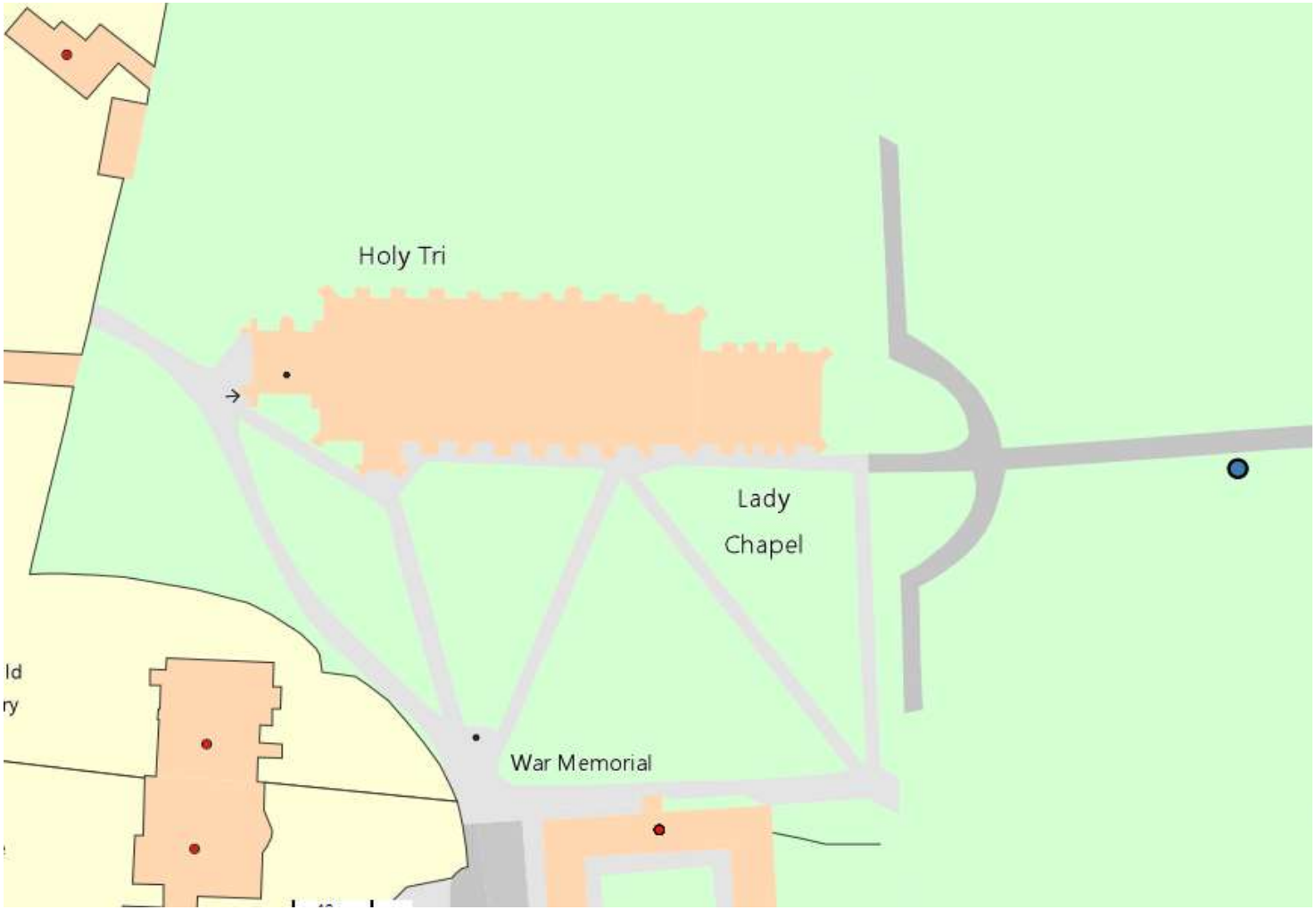
	A	B		C	D	E
Grade	EH figures	SFRS matched	% Successfully merged	Incidents recorded	Possible totals (A/B*C)	Difference (D-C)
1	399	90	22.56%	11	49	38
2*	806	475	58.93%	30	51	21
2	12027	9379	77.98%	402	515	113

Multiple UPRNs in single building

UPRN not within building



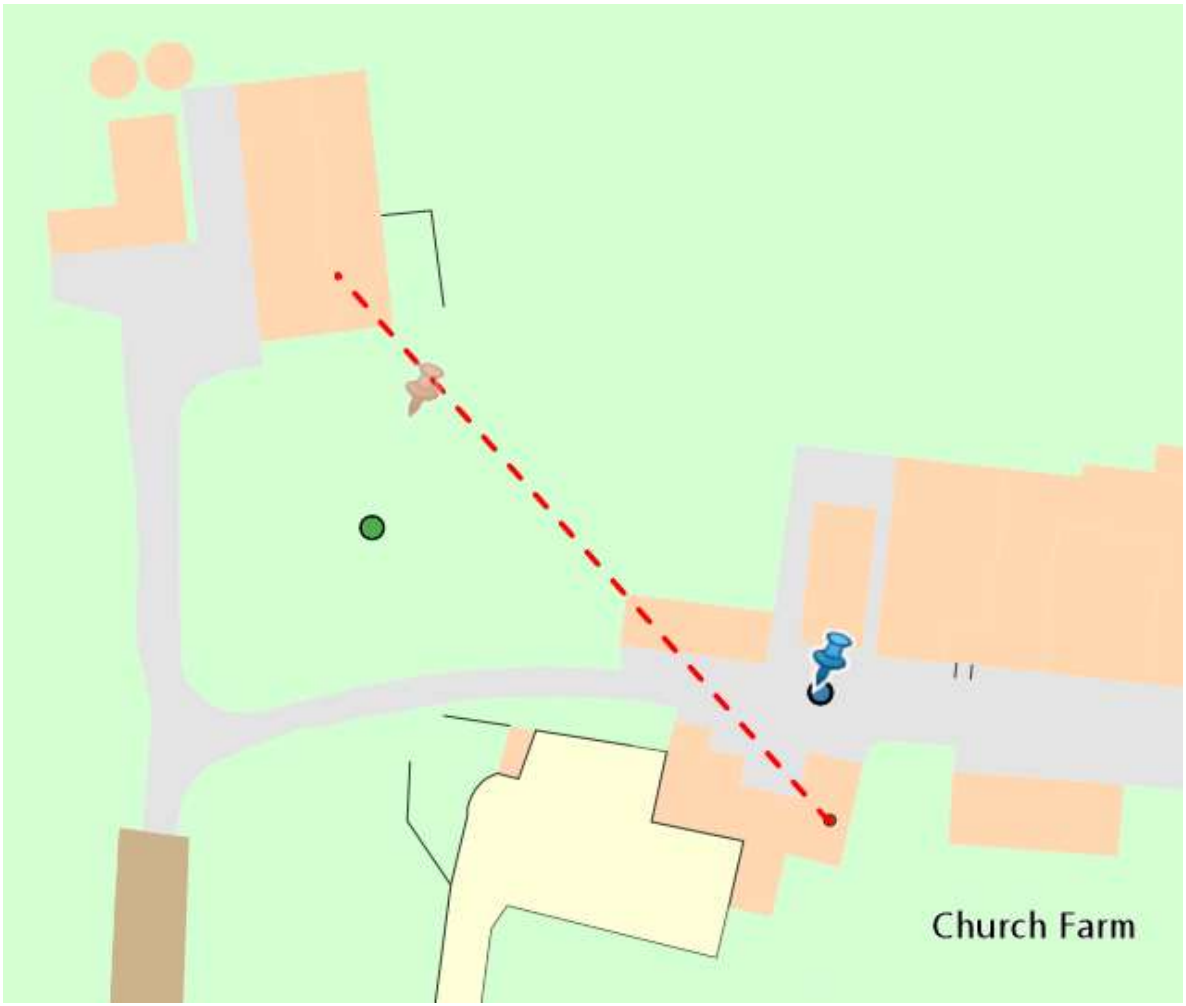
No UPRN



No UPRN


Polstead Hall
29.0m
29.0m
Track
Path (um)
25.6m
Gospel Oak
St Mary's Church
War Memorial
FS
St Mary House

No UPRN



Grade 1 listed barn 60m NE of Church Farmhouse, North Cove

Multiple Buildings

Listing data, recorded incidents

and

Fire Frequency

Listed Buildings

	England *	Suffolk	Cambridgeshire	Hampshire
Grade 1	9412 (2.5%)	399	304	179
Grade 2*	20706 (5.5%)	806	486	513
Grade 2	346352 (92%)	12027	7408	9388
Total	376470	13232	8198	10080

Grade	Suffolk	Total fires /year	Cambs	Total fires /year	Hants	Total fires /year	Total fires/ Grade
Grade 1	11	1.48	5	0.833	4	1.33	20
Grade 2*	30	4.04	9	1.5	27	9	66
Grade 2	402	54.20	129	21.5	191	63.66	722
Months covered by dataset	89		72		36		
Total Fires/County	443		143		222		808

Fires/1000 Buildings Suffolk

	Total number of properties in Suffolk	Total number of fires/year in Suffolk	Fires/1000 properties/year
Grade 1	399	1.48	3.71
Grade 2*	806	4.04	5.01
Grade 2	12027	54.20	4.51

Fires/1000 Buildings Cambridgeshire

	Total number of properties in Cambridgeshire	Total number of fires/year in Cambridgeshire	Fires/1000 properties/year
Grade 1	304	0.833	2.74
Grade 2*	486	1.5	3.09
Grade 2	7408	21.5	2.90

Fires/1000 Buildings Hampshire

	Total number of properties in Hampshire	Total number of fires/year in Hampshire	Fires/1000 properties/year
Grade 1	179	1.33	7.45
Grade 2*	513	9	17.54
Grade 2	9388	63.66	6.78

Fires/1000 Buildings Combined

	Total number of properties in 3 County dataset	Total number of fires/year in 3 County dataset	Fires/1000 properties/year
Grade 1	882	3.643	4.13
Grade 2*	1805	14.54	8.06
Grade 2	28823	139.36	4.84

Fire frequency from national statistics Suffolk

	Numbers in Suffolk	Fires/year	Fires/1000 buildings/year
Dwellings *	337198[a]	507	1.50
Other Buildings	107961	229	2.12
Total Primary Fires	445159[b]	736	1.65

Relative Risk of fire in Historic buildings

Building Class	Fire Frequency		Increased risk rate
	National Statistics	Heritage Buildings	
All Suffolk Buildings [a]	1.65	4.51	273%

Best Value Performance Indicator

- BVPI 142 iii
- Number of accidental fires in dwellings per 10,000 dwellings.
- Suffolk 2003/2004
- 14.5 Fires/10,000 buildings =
- 1.45 fires/1000 buildings

Causes of Fire – Suffolk

Data Analysis

Distribution of fire calls - Suffolk

Cause	Grade 1	Grade 2*	Grade 2	Total
Accidental	9	26	367	402
Deliberate	1	2	22	25
Not known	1	2	13	16
Counted Fires	11	30	402	443
Not counted fires*	2	4	65	71
Total Fires	13	34	467	514

Table 19 Fires in Suffolk by Cause

*The data provided by Suffolk includes outdoor fires and fires in road vehicles that were linked to a UPRN identified as being a listed building. In all of these cases it is likely that the fire was external to the property and only linked to it as being the closest address to the fire. These have therefore been excluded from the calculations of fire frequency.

Chimney fires

	Grade 1	Grade 2*	Grade 2	Total
Accidental Primary Fires	6	13	184	203
Chimney Fires	3	13	183	199
Total	9	26	367	402

Table 17 Number of accidental fires in Suffolk, primary fires and chimney fires

Fires by property type

Property Category	Cause	Grade 1	Grade 2*	Grade 2	Total
Dwelling	Accidental	1	9	229	239
	Deliberate	-	-	7	7
	Not Known	-	1	8	9
Non Residential	Accidental	6	12	98	116
	Deliberate	-	2	8	10
	Not Known	-	-	2	2
Other Residential	Accidental	-	4	25	29
	Deliberate	-	-	1	1
	Not Known	-	-	-	0

Fires by property type

Outdoor Structure	Accidental	2	1	15	18
	Deliberate	1	-	6	7
	Not Known	1	1	3	5
Outdoor*	Accidental	-	1	33	34
	Deliberate	2	1	8	11
	Not Known	-	-	4	4
Road Vehicle*	Accidental	-	2	14	16
	Deliberate	-	-	2	2
	Not Known	-	-	4	4
Totals		13	34	467	514

Fires by Ignition Source

IgnitionSource	Grade 1	Grade 2*	Grade 2
Apparatus - batteries, generators			2
Blow lamp/Paint remover		1	2
Candles			3
Central heating/Hot water			4
Chimney		1	13
Cigarette lighter			1
Cooker incl. oven	1		13
Deep fat fryer	1		5
Dishwasher		1	2
Dryer			2
Fluorescent lights			9
Fridge/Freezer			2
Gases			1
Grill/Toaster			3
Heating/Fire	2	2	17
Lighted paper or card, or other naked flame			2
Manufacturing equipment		1	1
Microwave oven			1
Natural occurrence			3
Not known		1	5
Not Stated			12
Other			9

Fires by Ignition Source

Other appliance or equipment			1
Other computer equipment			1
Other cooking appliance		1	4
Other domestic style appliance			1
Other heating equipment		1	4
Other incandescent light bulbs			2
Other lights	1	2	2
Ring/hot plate (separate appliance)			3
Smoking materials			1
Solids; coal, coke, wood, card			6
Spot lights		1	7
Spread from secondary fire			3
Tumble dryer			2
Washing machine			2
Welding/Cutting equipment			1
Wiring, cabling, plugs	1	1	31
Total	6	13	184

Table 21 Causes of fires in accidental fires in Suffolk

Summary of causes of accidental fires

Ignition Source	Grade 1	Grade 2*	Grade 2	Total	% of 402 incidents
Electrical	2	5	60	67	16.67%
Cooking	2	1	29	32	7.96%
Other Heat Source	2	6	63	71	17.67%
Other or unknown	0	1	32	33	8.2%
Total	6	13	184	203	50.5%

Table 22 Accidental fires in Suffolk by main Cause (excluding chimney fires).

Discussion of Relative Risk

Relative Fire Risk

Building Class	Fire Frequency		Increased risk rate
	National Statistics	Heritage Buildings	
All Suffolk Buildings [a]	1.65	4.51	273%

Table 23 Increased risk of fire in Suffolk comparing listed building fire frequency with national statistics fire frequency.

Distribution of building type, presuming that the distribution of incidents reported are proportional to the distribution of building types

	Grade 1	Grade 2*	Grade 2	Total fires
Dwellings	5	12	268	285
Other Buildings	6	18	134	158
% Dwellings	45%	40%	66.66%	-
% Other Buildings	55%	60%	33.33%	-

Percentage distribution

	Total listed	Distribution	Total by building type
Grade 1	399	45% Dwellings	180
		55% Other Buildings	219
Grade 2*	806	40% Dwellings	322
		60% Other Buildings	484
Grade 2	12027	66.66% Dwellings	8018
		33.33% Other Buildings	4009
Total Dwellings			8520
Total Other Buildings			4712

Table 25 Number of listed properties in Suffolk in each grade by use

Fire frequency from derived figures

	Total	Incidents (89 months)	Incidents (/year)	Fire Frequency (Fires/Year/1000 Buildings)
Dwellings	8520	285	38.43	4.51
Other Buildings	4712	158	21.30	4.52

Table 26 Fire Frequency calculated for Dwellings and Other Buildings in Suffolk

Fire Frequency of unlisted buildings in Suffolk

	Dwellings	Other Buildings
Total in Suffolk	337198	107961
Total Listed	8520	4712
Total not listed	328678	103249
Fires/year total	507.143	235.25
Fires /year listed	38.43	21.30
Total fires not listed	468.713	213.95
Fire Frequency	1.43	2.07

Table 27 Calculation of the fire frequency in buildings that are not listed in Suffolk

Increased fire risk in Heritage Buildings

Building Class	Fire Frequency		Increased risk rate
	National Statistics	Heritage Buildings	
Dwellings	1.43	4.51	315%
Other Buildings	2.07	4.52	218%

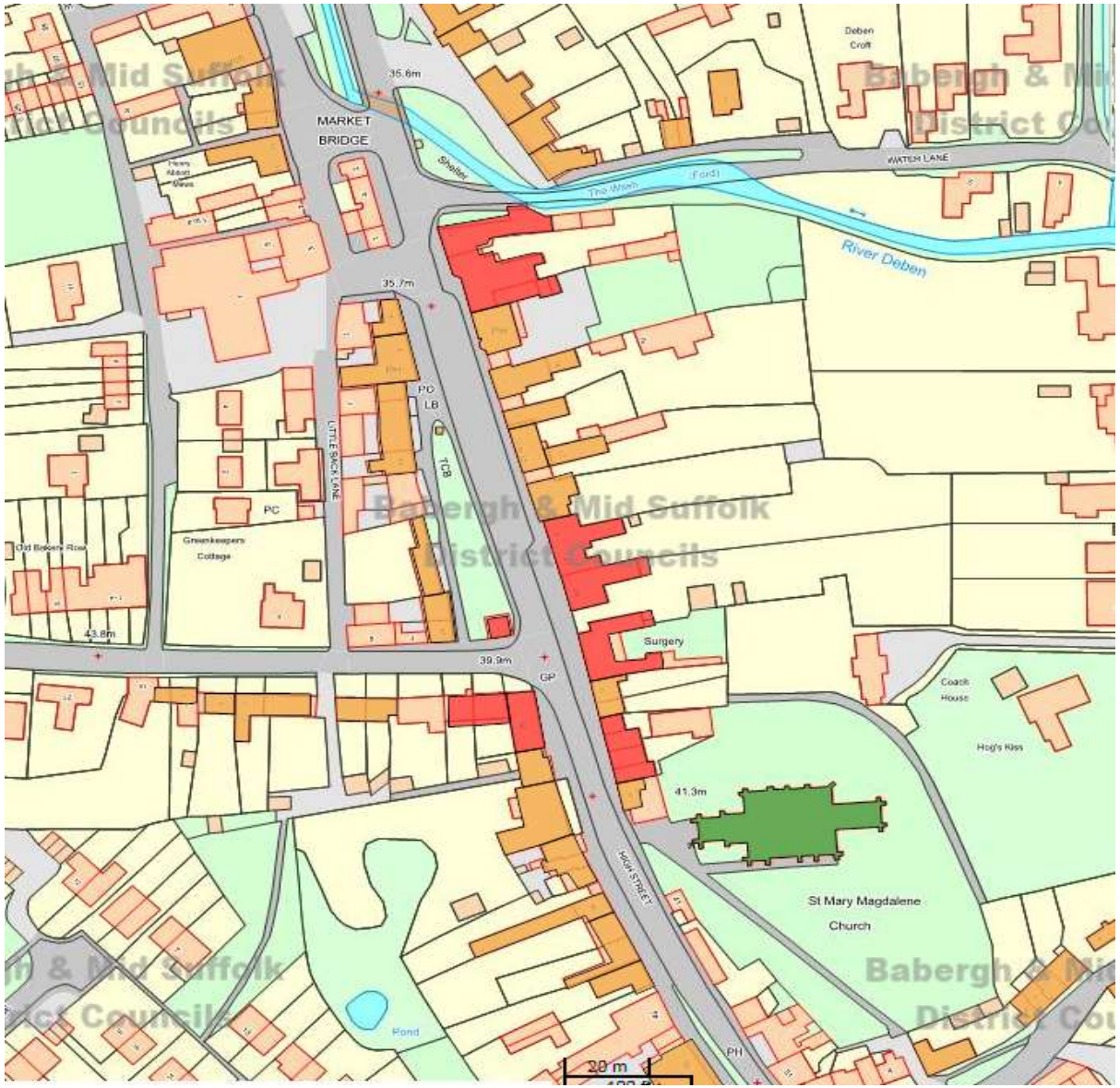
Table 28 Increased risk of fire in Suffolk comparing listed building fire frequency with national statistics fire frequency.

CONCLUSIONS AND RECOMMENDATIONS

Listed buildings dataset

- Each Fire and Rescue Service should create a dataset of listed buildings using the point data provided by Historic England and the Building Outline provided by OS MasterMap through the Public Service Mapping Agreement.
- UPRNs should **NOT** be used to perform this mapping.
- Data points from Historic England that do not fall within a Building Outline should be examined and the dataset should be updated as required.
- Listing data should be examined to identify listings that are for more than one building outline and the dataset should be updated as required.
- The curtilage of the listed building should be mapped in the Dataset

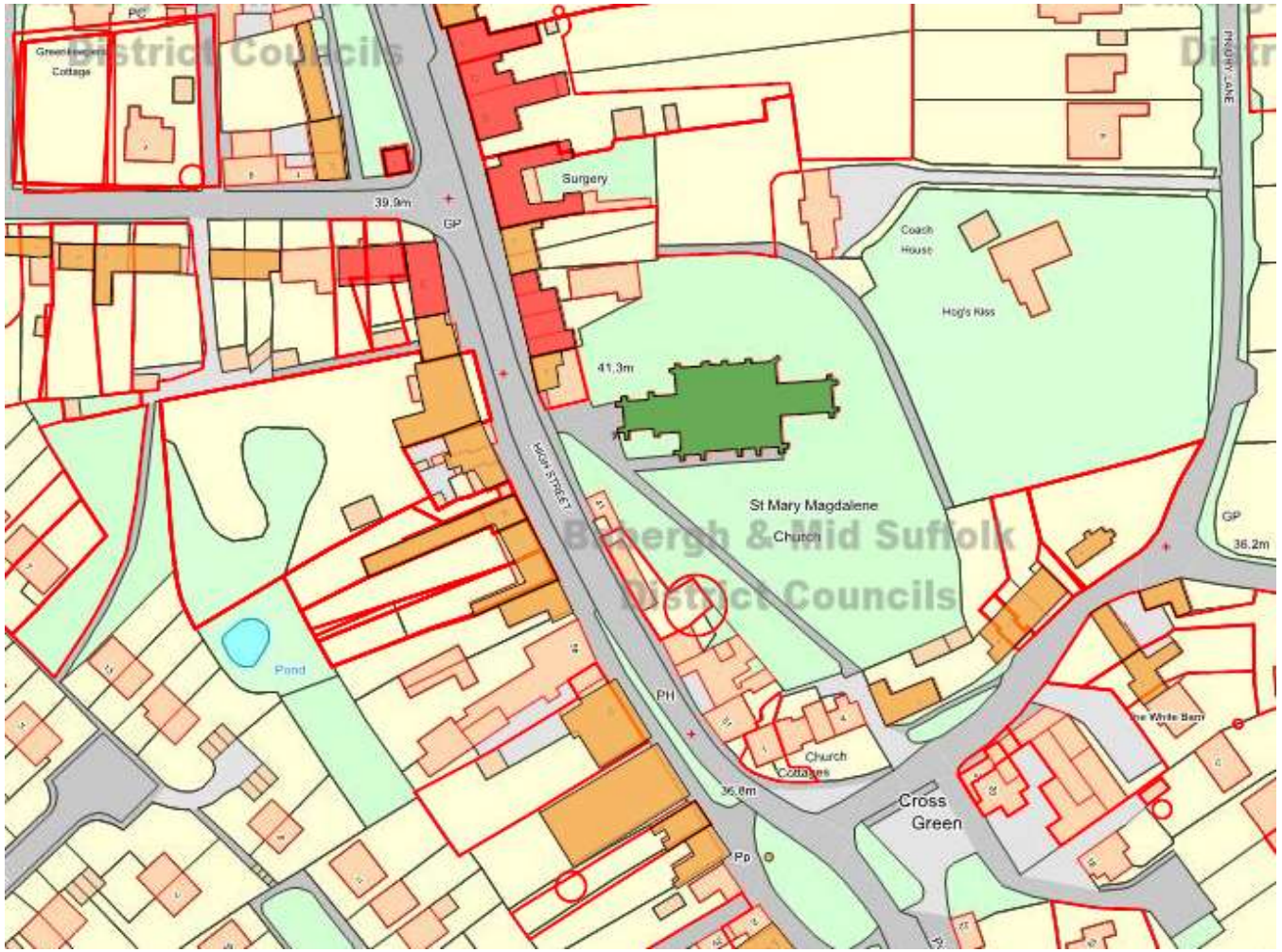
Historic England
Data Points



Listed Buildings

- Grade I
- Grade II
- Grade II*

Building Outlines



Building Outlines and Curtilage

Mapping incidents in listed buildings

- Incidents should be geocoded on the FRS GIS system at high resolution to ensure the accurate placement of the incident.
- Easting and Northings should be used to determine the location of the incident when combining it with the Listed Building Dataset.
- FRS should differentiate between incidents within the listed building and within the curtilage of a listed building.
- The use of the building should be recorded to differentiate between Dwellings and Other Buildings.
- In Other Buildings, the FSEC group should be recorded as this will allow Protection Departments to plan their Risk Based Inspection Program.

Recommendations to Fire and Rescue Services

- FRS should update their control and mobilising data within their systems to include the listing of the building with the mobilising data.
- Mobile Data Terminals should display Listed Building operational information for fire fighter operational safety and tactical firefighting plans.
- Grade 1 and Grade 2* buildings should be assigned a specific pre-determined attendance appropriate to the risk and the location of any Premises Information Box and any special procedures and salvage requirements should be recorded.
- 7(2)d risk familiarisation visits should be made by operational crews to test intervention plans and familiarise themselves with the salvage arrangements for the building.

Recommendations for HM Government

- The Incident Recording System should be modified to require the mandatory reporting of the grade of all incidents involving Listed Buildings
- National Statistics should collate reports in their annual bulletins of fire in Listed Buildings in the United Kingdom.

Historic England

- Historic England and their equivalent departments in the other nations, may wish to provide the merged dataset outlined above to ensure that all FRS had a confirmed dataset of listed buildings that could be used by them for risk modelling.

Any Questions?