

TV White Space

UK Address Separation Distances

Digital UK Technical Note

23rd March 2012

SUMMARY

Consideration is being given to the use of a 20m separation distance in the Reference Geometry for assessing the impact of fixed White Space installations on fixed DTT reception.

This note investigates the address separation distances found in the UK, and concludes that 20m is too great a distance for the reference geometry to realistically represent the typical situation.

ADDRESS SEPARATION DISTANCES

High quality address location data for the UK and Northern Ireland is available from the Ordnance Survey and Ordnance Survey Northern Ireland as commercially licensed products. Equivalent data is also available from other sources for the Isle of Man and Channel Islands, but these jurisdictions are excluded from this analysis.

The address data is at a positional resolution of 10cm, in many cases determined by GPS positioning. The physical point in the address selected for the location is determined by the OS product purchased, and varies from a point somewhere within the dwelling for the basic product through to the precise location of the postal delivery point, usually the letter box, in the premium product.

It is possible to process the positional data to determine the distance between address locations which is a first approximation to the separation between dwellings. The data available to Digital UK is at the lowest order of accuracy, i.e. the address position represents a point somewhere within the dwelling, but not necessarily the Delivery Point.

The "MapInfo" GIS software package includes a tool to calculate separation distances and this can be used to find the "nearest neighbour" to selected addresses. The tool is computationally intensive and the computational resource available to Digital UK means that analysis must be restricted to relative small geographical areas.

MapInfo was initially used to assess the address separations in Uckfield, a typical small rural town in East Sussex. The assessment area and the delivery points are shown in Figure 1:

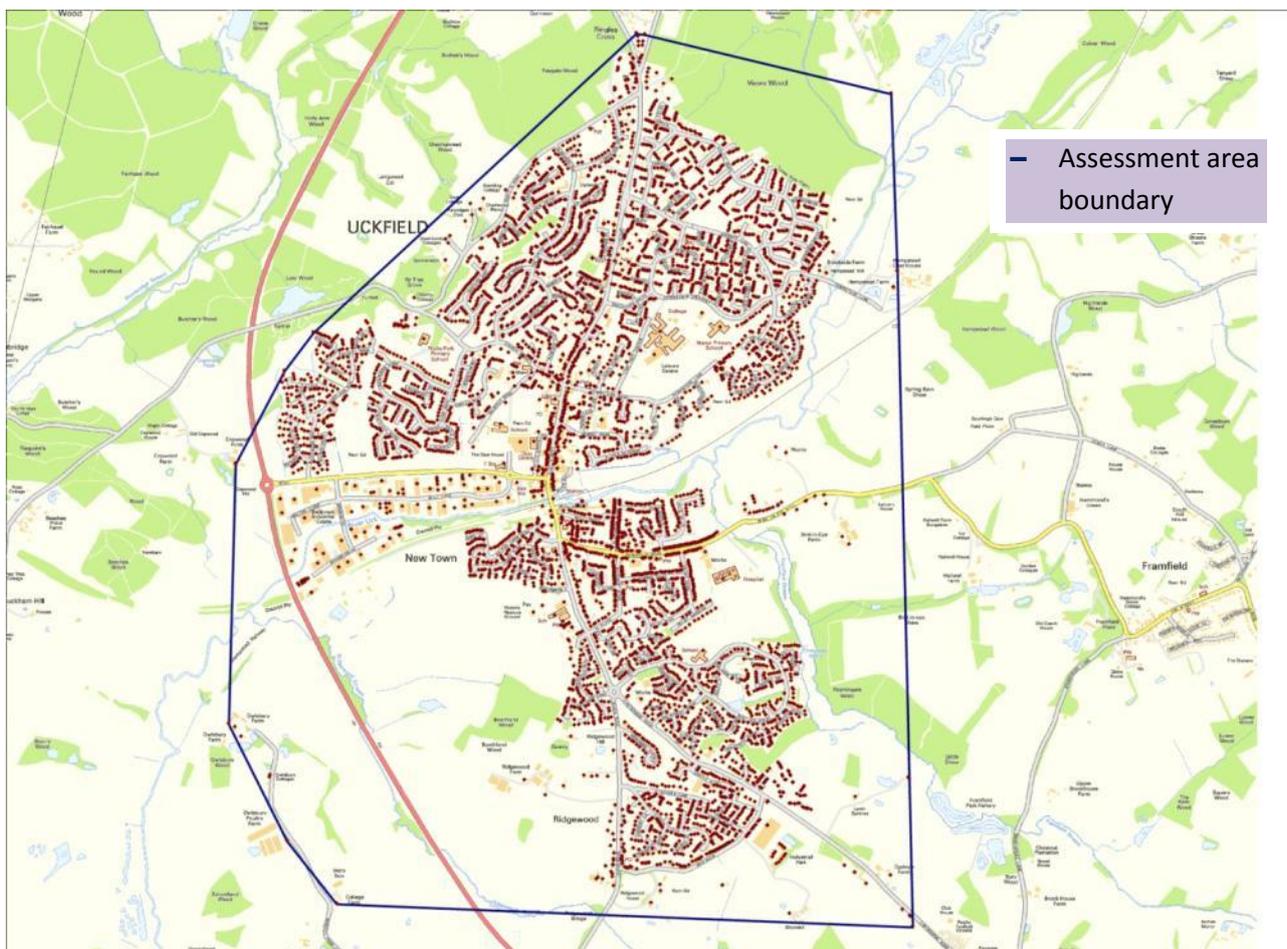


Figure 1

This area contains 6,730 separation distances of 1 metre or more. Separations of less than 1 metre are treated as co-located addresses and therefore have been ignored. Similarly, addresses in multi-occupancy dwellings have been ignored, the building being treated as having a single address, rather than multiple addresses. This will tend to skew the results towards an over-estimate, rather than an under-estimate of the separation distances for the affected premises.

Figure 2 shows the frequency of occurrence of the distances, to the nearest metre. Note that the curve has a long tail and has been truncated at 50m for clarity. The maximum separation distance in this area is 373m.

A closer view of the Newtown area, which is in the central part of the town to the south of the railway station, is given in Figure 5. Newtown comprises a mix of housing types and ages, typical of the town. The map also shows the OS address points, the 100m tiles with address count, and the nearest-neighbour derivation. The corresponding separation distance histogram is given in Figure 3.

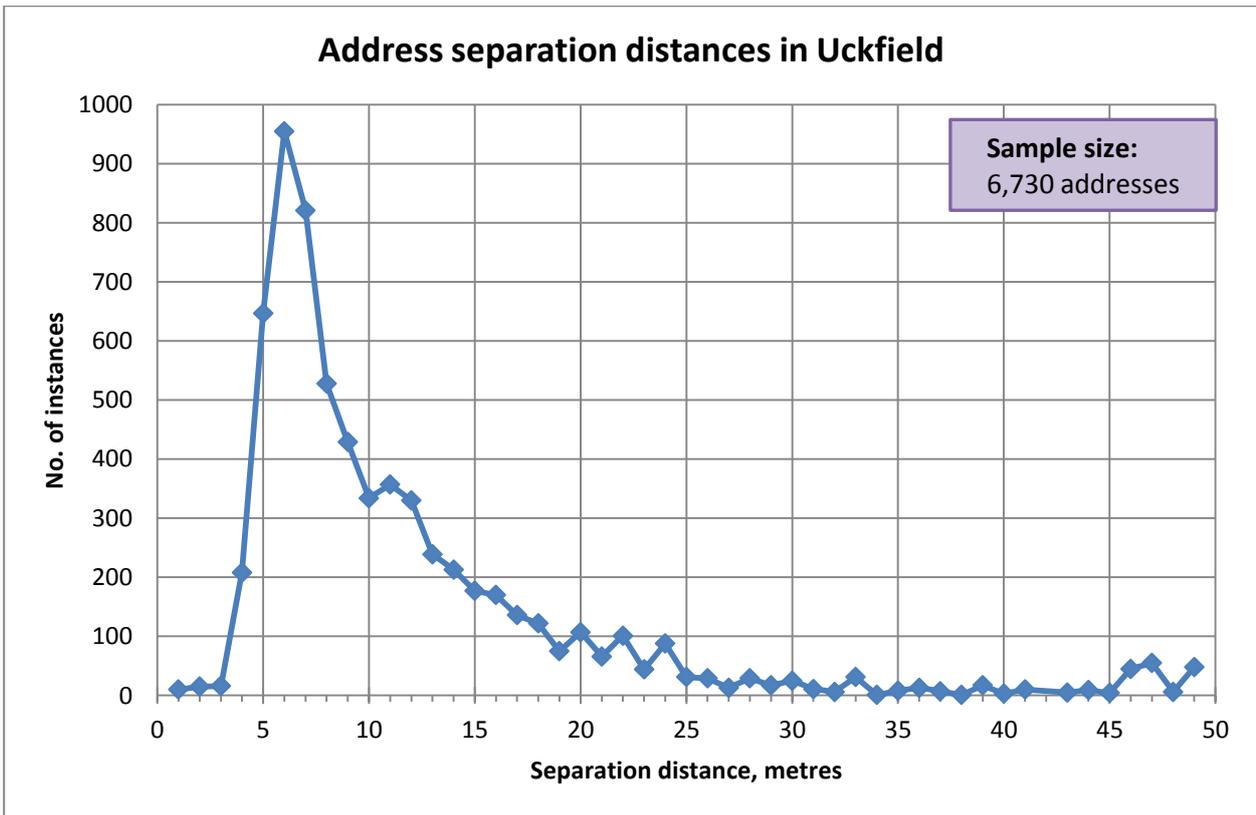


Figure 2

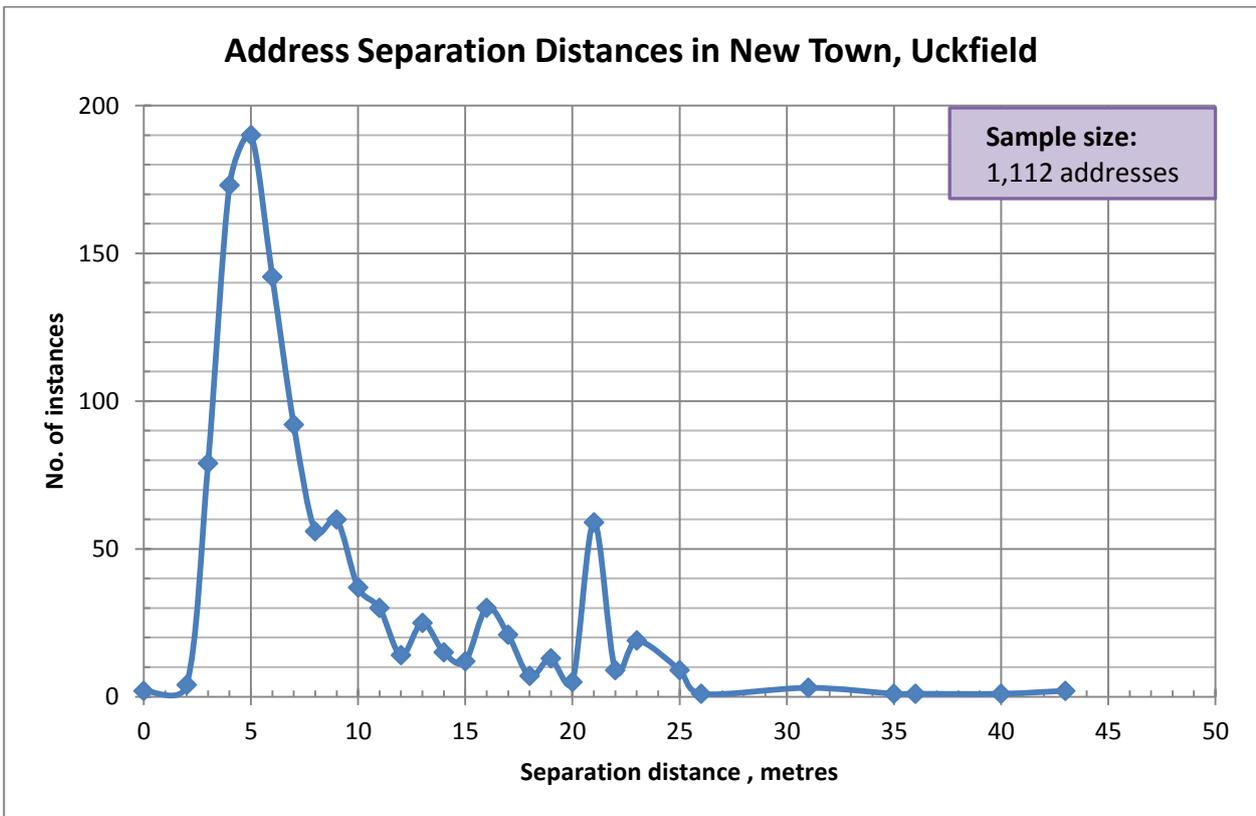


Figure 3

By way of comparison, a MapInfo assessment has also been made of a small sample area in Islington, London. The area selected is shown in Figure 6. As for Newtown, the map also shows

the OS address points, the 100m tiles with address count, and the nearest-neighbour derivation. The corresponding separation distance histogram is given in Figure 4.

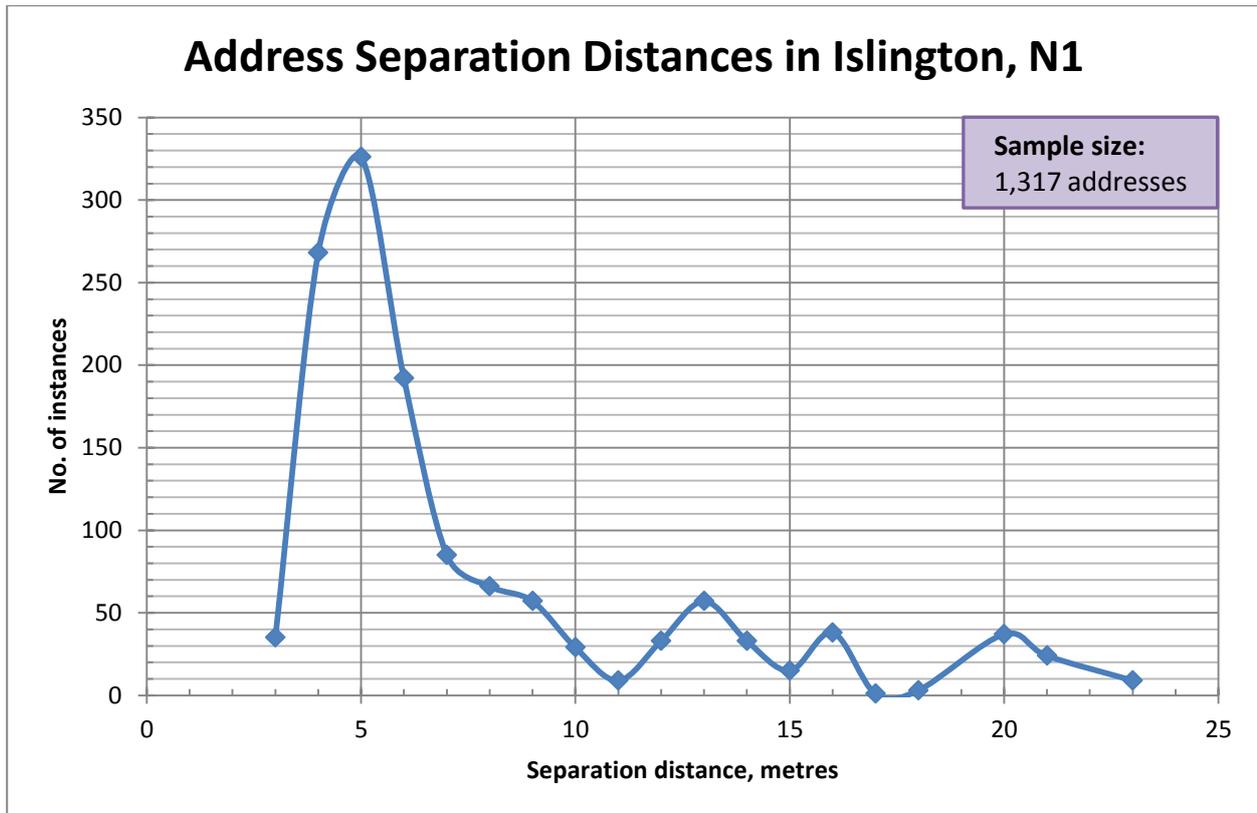


Figure 4

Conclusion

This limited analysis demonstrates that the typical Ordnance Survey address separation distance in both areas is around 5m. In many cases this will be an over-estimate because the Ordnance Survey position is located somewhere within the dwelling, whereas in many cases the address in the sample areas are terraced or semi-detached which means that parts of the adjacent dwellings are much closer to each other than 5m.



Figure 5: Address locations and nearest neighbours in Newtown, Uckfield



Figure 6: Address locations and nearest neighbours in Islington, N1

WIDER ANALYSIS

Although the areas for the initial analysis were selected at random, it is not a given that they are representative of the wider UK situation. While interesting, it is not necessary to identify and map the nearest neighbours to each address; rather, the separation distance alone provides sufficient information to make the necessary assessment.

To permit larger areas to be analysed within the available computing power, a “Nearest Neighbour” routine was developed in MySQL. While still computationally intensive, this can calculate the separation distances for larger datasets than is possible using MapInfo. Even so, the realistic upper limit is around 450,000 addresses, which still takes in excess of 12 hours to compute.

The computational limitations make it necessary to sub-sample the 26.1million UK addresses to allow calculation to be possible. One way would be to select blocks of addresses based on the National Grid, but this would be hit-and-miss as to the number of addresses contained within each block. An alternative, more convenient, method is to use UK post areas – identified by the initial letter or two letters of the address postcode – because post areas generally contain fewer than 450,000 addresses and generally (but not always) have boundaries in more sparsely populated areas.

It is acknowledged that any analysis area with artificial, rather than natural, boundaries (i.e. where the boundary is not uninhabited water!) will introduce a degree of error because the nearest neighbour to a perimeter address may be outside the boundary selected, but the proportion of the total number of distances so affected will be small, and the error will tend to over-estimate, rather than under-estimate, the minimum separation distance so the overall results will not be skewed to be lower than reality.

The post areas selected for the analysis provide a range of geographies. The areas are shown in Figure 7, and the details are set out in Table 1.

The normalised frequency of separation distance found in the analysed post areas is shown in Figure 8 and the CDF in Figure 9.

Conclusion

The wider analysis of 7,546,955 address locations demonstrates that, except for the remote rural areas represented by the HS, ZE, and to a lesser extent, IV post areas, the typical Ordnance Survey address separation distance is 6m. As for the initial analysis, this will tend to be an over-estimate because the Ordnance Survey position is located somewhere within the dwelling, whereas in many cases the address in the sample areas are terraced or semi-detached which means that parts of the adjacent dwellings are much closer to each other than 6m.

The analysis also shows that, except in the sparsely populated remote rural areas, at least 60% of addresses have the nearest neighbour within 10m, and over 80% of addresses are within 20m of their nearest neighbour

Table 1: Post Areas analysed

Post Area	Description	Addresses	Geography
BH	Bournemouth	266,765	Urban, sub-urban and rural
CF	Cardiff	453,344	Urban, sub-urban and rural
CO	Colchester	195,262	Urban, sub-urban and rural
CV	Coventry	368,537	Urban, sub-urban and rural
DD	Dundee	141,821	Small towns and rural
DG	Dumfries & Galloway	77,231	Small towns and rural
DL	Darlington	174,147	Urban, sub-urban and rural
E	East London	385,555	Urban, sub-urban and rural
EH	Edinburgh	429,401	Urban, sub-urban and rural
EX	Exeter	264,317	Small towns and rural
FY	Fylde	137,793	Urban, sub-urban and rural
HS	Western Isles	15,475	Sparsely populated, remote rural
IG	Ilford	127,509	Urban, sub-urban and rural
IV	Inverness	113,483	Small towns, rural and remote rural
KT	Kingston-upon-Thames	230,976	Urban and sub-urban
KY	Kirkcaldy	177,506	Small towns and rural
LA	Lancaster	163,135	Small towns and rural
LN	Lincoln	140,447	Small towns and rural
LS	Leeds	364,705	Urban and sub-urban
LU	Luton	139,825	Urban, sub-urban and rural
ME	Medway	267,007	Urban, sub-urban and rural
NR	Norwich	351,709	Small towns and rural
NW	North West London	212,186	Urban and sub-urban
PA	Paisley	165,468	Small towns and rural
PO	Portsmouth and Isle of Wight	383,881	Urban, sub-urban and rural
RH	Redhill	234,140	Urban, sub-urban and rural
SK	Stockport	285,297	Urban and sub-urban
SN	Swindon	207,362	Urban, sub-urban and rural
SO	Southampton	297,604	Urban, sub-urban and rural
SR	Sunderland	117,584	Urban and sub-urban
SY	Shrewsbury and mid-Wales	158,566	Urban, sub-urban and rural
TD	Galashiels	60,127	Small towns and rural
TR	Truro	146,930	Small towns and rural
UB	Uxbridge	138,143	Urban and sub-urban
WN	Warrington	142,152	Urban, sub-urban and rural
ZE	Shetland	11,565	Sparsely populated, remote rural
	Total	7,546,955	

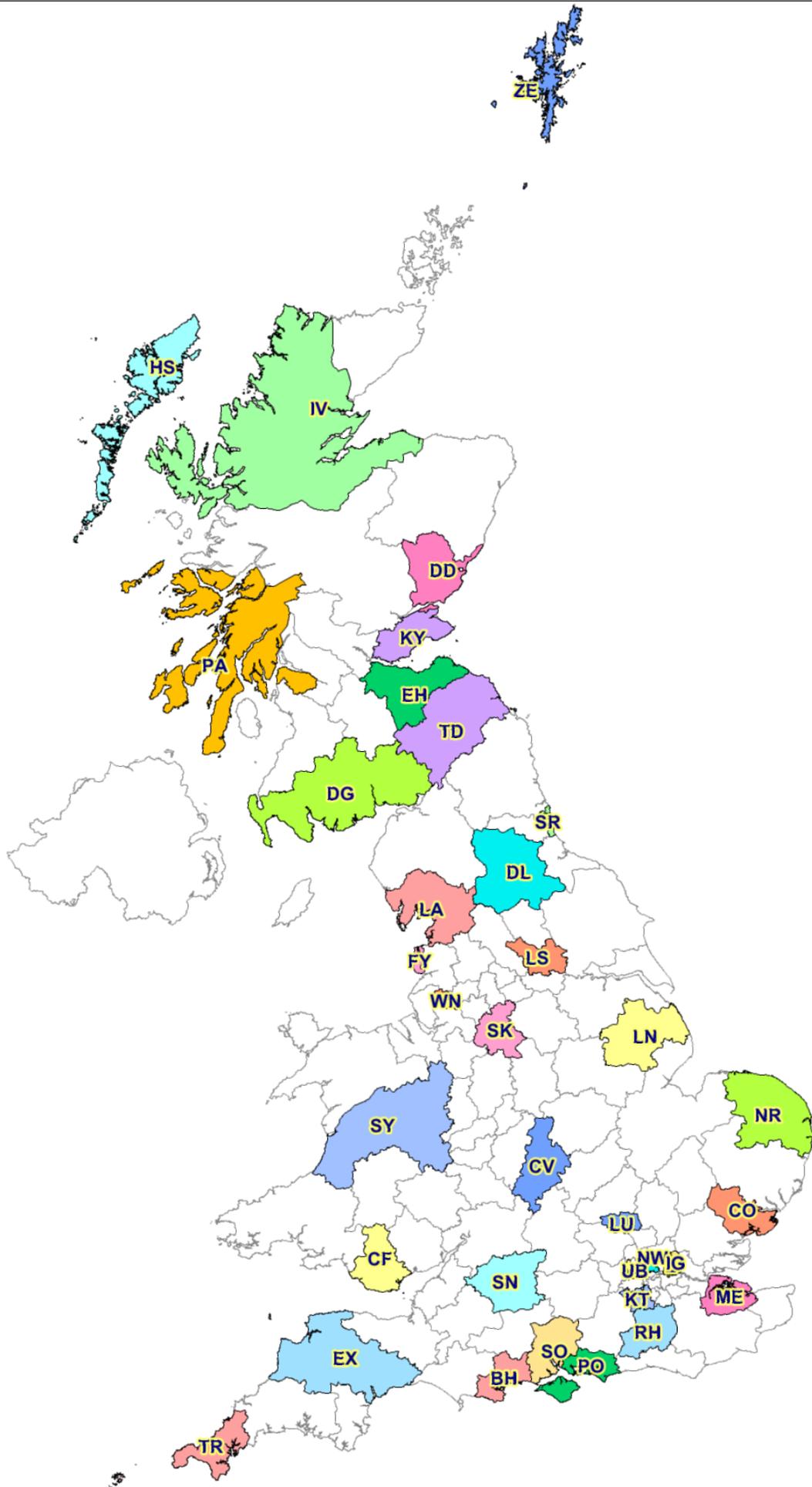


Figure 7 : Post Areas selected for analysis

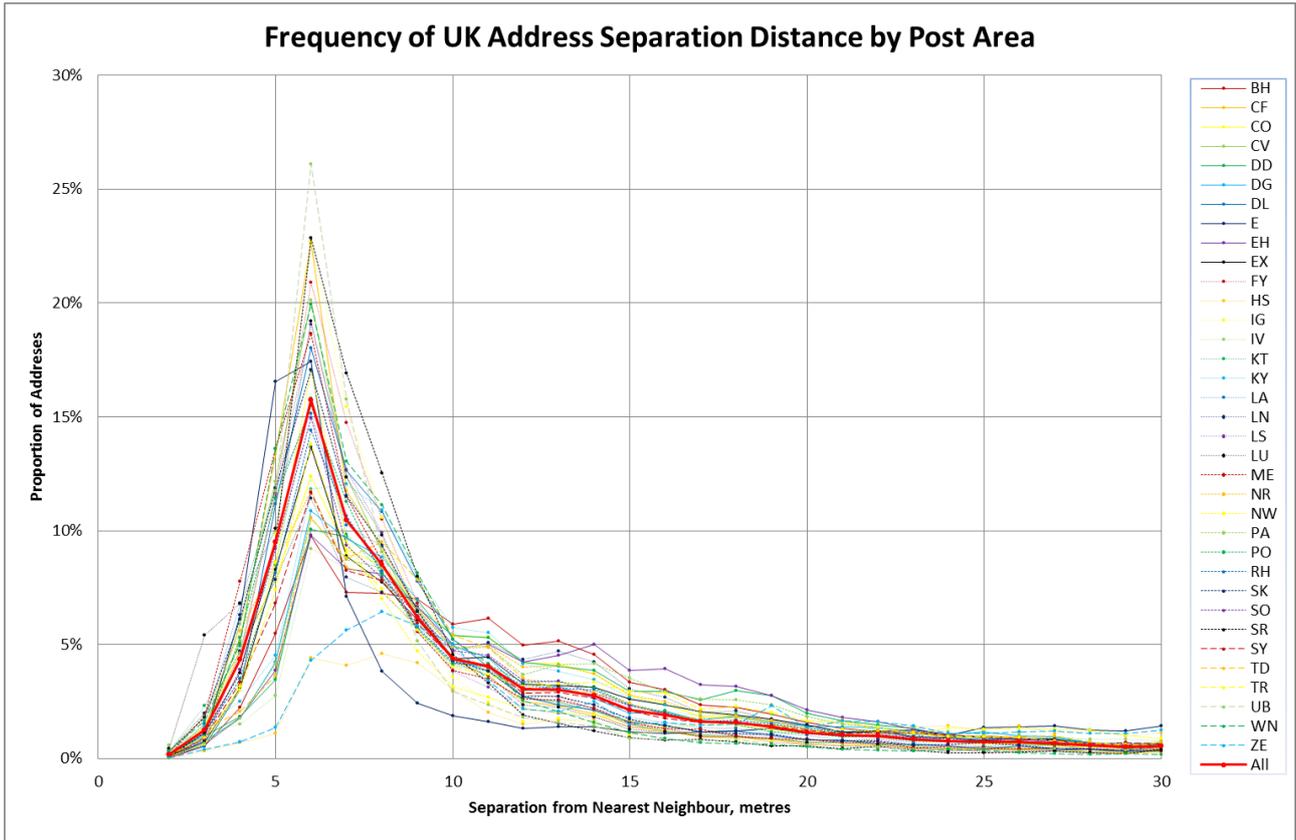


Figure 8

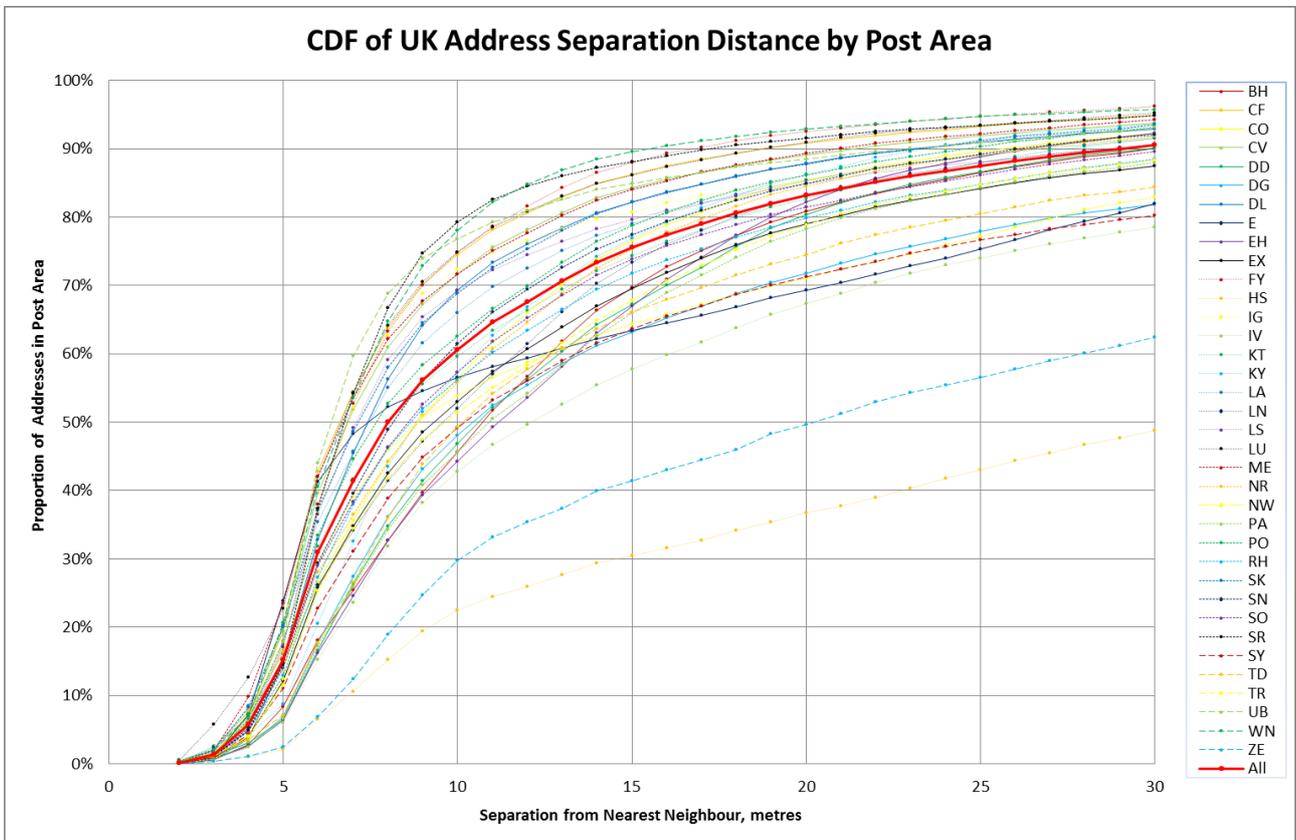


Figure 9