
Digital Switchover (DSO) Programme

Radio DSO Block 11C Birmingham

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Company Confidential

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Table of Contents

1	Birmingham DSO Narrative	4
1.1	Outgoing interference and sensitivity to other co-block multiplexes	7
1.1.1	Existing Coverage (Case 1)	7
1.1.2	Proposed DSO Coverage – Improvements to Existing Infrastructure (Case 2, Modified Network 1)	7
1.1.3	Proposed DSO Coverage (Case 3, Modified Network 2).....	8
1.1.4	Expanded DSO Coverage (Case 4, Modified Network 3).....	8
2	Coverage of Multiplex.....	10
2.1	Coverage Maps	10
2.2	Population Coverage Tables.....	23

1 Birmingham DSO Narrative

The current allocation for Birmingham is 11C and this has not been changed. The nearest co-block multiplexes are for South Yorkshire to the north, Cambridge to the east, Swindon to the south and Cardiff & Newport to the south-west. These areas are shown below in Figure 1.1.

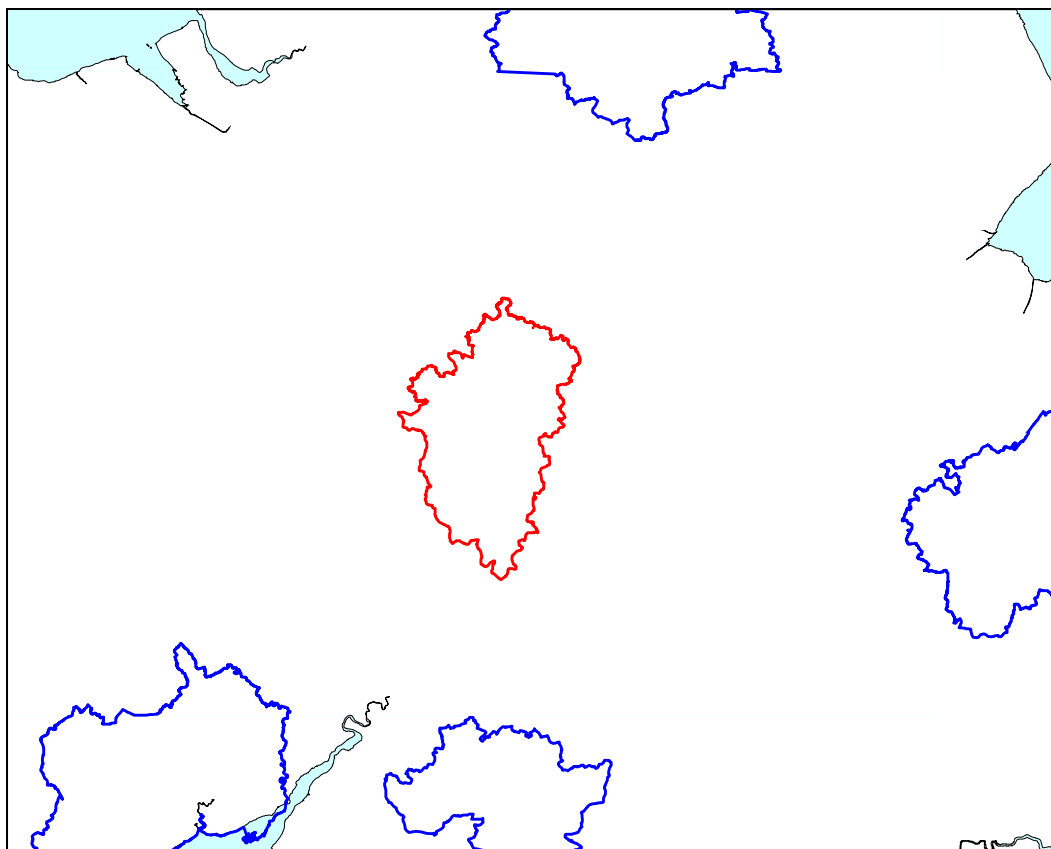


Figure 1.1: Birmingham – Adjacent 11C Multiplexes

There are four transmitters currently on air for the Birmingham multiplex; these are shown in Table 1.1.

Site Name	ERP	Site height m a.o.d.	Antenna height m a.g.l.	Antenna Type
Lichfield	1kW	152	272	Panel
Lickey Hills	1kW	280	23	Dipoles/yagis
Metropolitan House	300W	152	75	Dipoles
Turners Hill	2kW	265	46	Panels

Table 1.1: Birmingham – Current Transmission Characteristics

The editorial area for Birmingham has been changed slightly; it now includes the city of Wolverhampton to the west and slightly extended to the north and east, see figure 1.2

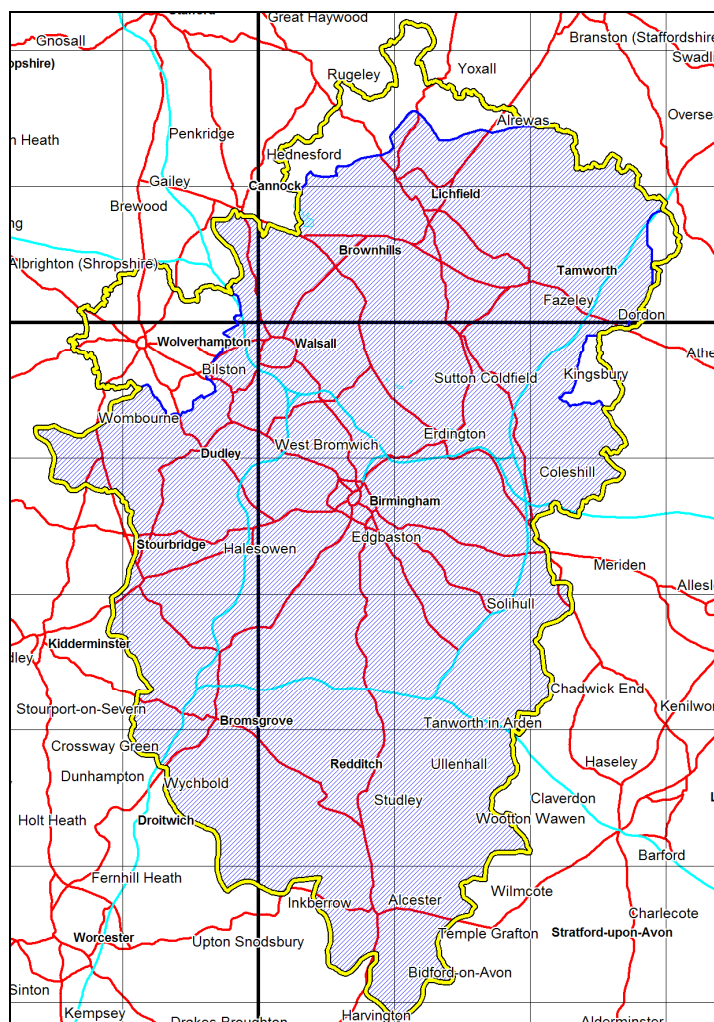


Figure 1.2: Birmingham – Changes to the editorial area.

Existing area is shown in Blue and the new editorial area is shown in Yellow.

The Birmingham multiplex is surrounded by six other multiplexes, as shown in Figure 1.3. There is significant overlap to the west with Wolverhampton & Shrewsbury, and Hereford & Worcester to the south-west and Coventry to the south-east multiplexes.

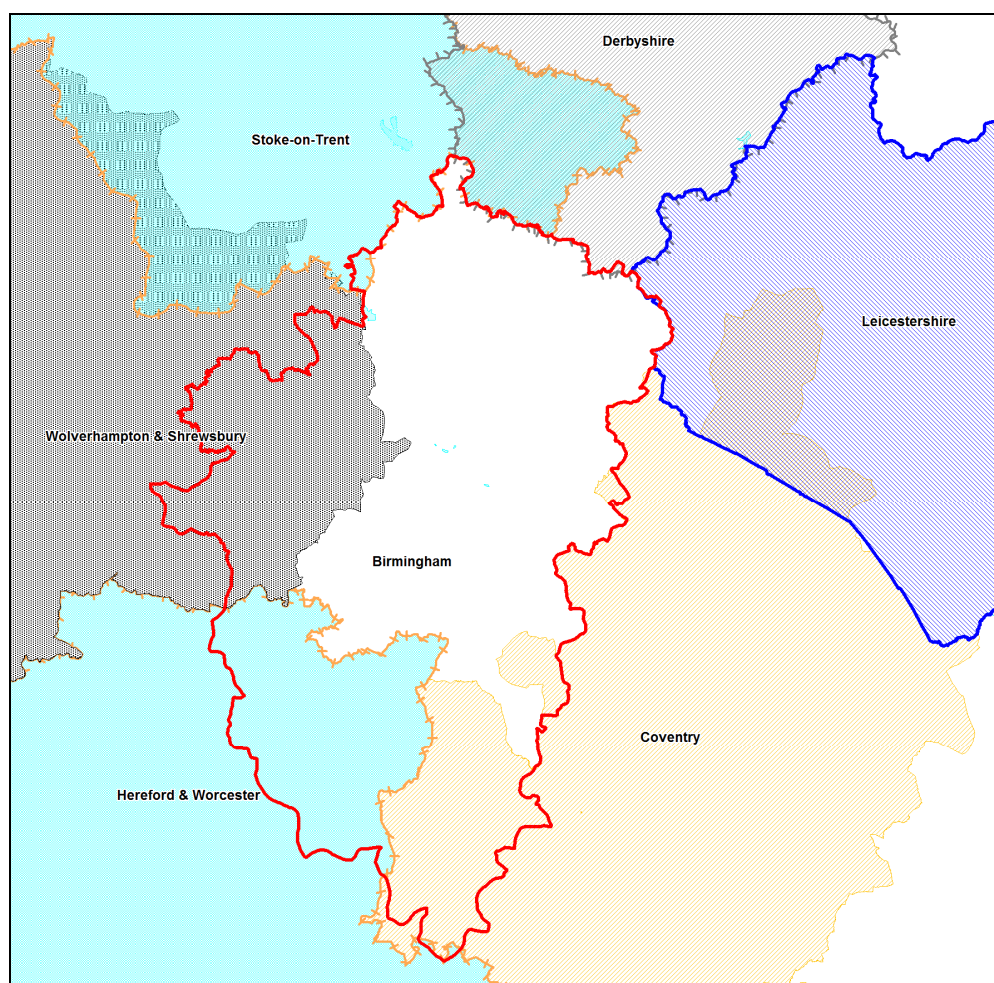


Figure 1.3: Birmingham Multiplex – Adjacent Multiplexes

In planning for each multiplex Ofcom have required coverage assessments:

- For each area four maps should be produced as follows:
 1. **Current Situation** - Map showing current actual coverage (or launch plans where a mux hasn't yet launched), including any transmitters which are required as part of the current licence, but which are not yet operational.
 2. **Modified Network 1** - Map showing the above, plus any improvements to existing infrastructure.
 3. **Modified Network 2** - Map of the above, plus additional smaller infill transmitters focused on areas where FM coverage is robust.
 4. **Modified Network 3** - Map of the above, plus additional transmitters to provide near universal coverage.

1.1 Outgoing interference and sensitivity to other co-block multiplexes

1.1.1 Existing Coverage (Case 1)

The existing Birmingham multiplex is quite vulnerable to co-channel interference, especially to the south of the editorial area. However the major population centres are fairly well protected.

The existing coverage is restricted by co-block interference from the Cambridge, Swindon and Manchester multiplexes. No particular multiplex dominates the incoming interference.

The **noise** limited coverage for the existing coverage is shown in Figure 2.1 and the Figure 2.2 shows the coverage for existing 1% time interference limited. This Figure 2.3 shows the mobile outdoor coverage for interference at 1% time, for case 1, coverage is more restricted than the indoor coverage.

1.1.2 Proposed DSO Coverage – Improvements to Existing Infrastructure (Case 2, Modified Network 1)

Within the DSO proposals being considered within this study, the Manchester multiplex is moving away from the 11C frequency block. This will mitigate some of the impact of the incoming co-block interference for DSO options; but increases in incoming interference from expanded services at Swindon, South Yorkshire and Cambridge do still have a significant impact within the Birmingham editorial area.

It is proposed to increase the ERP at the Lichfield transmitter to 2.5 kW to improve the network with the current infrastructure.

In order to seek to minimise the impact of outgoing interference from the increased ERP at Lichfield, this ERP is not necessarily the maximum that may be possible on the existing Lichfield infrastructure. However, outgoing interference from Lichfield has a severe detrimental impact on the Swindon multiplex if the ERP from Lichfield is increased beyond 2.5 kW; even limiting the ERP to 2.5 kW the impact is still significant.

Limiting the ERP at Lichfield to 2.5kW also helps to reduce the impact of interference on the Cambridge multiplex area.

The interference coverage for case 2 is shown in Figure 2.4, figure 2.5 shows the mobile outdoor 1% time interference limited coverage, which is more restricted than the indoor coverage shown in figure 2.4.

For information, figure 2.6 shows the coverage for mobile outdoor coverage for case 2 with incoming interference predicted at 5% time.

1.1.3 Proposed DSO Coverage (Case 3, Modified Network 2)

In order to improve the coverage of the Birmingham multiplex, the Sedley Beacon transmitter has been considered to endeavour to provide DAB coverage where there is robust FM coverage. This transmitter improves the coverage in the Dudley to Wolverhampton area.

The southern part of the Birmingham editorial area, around Redditch and Alcester does not currently receive robust FM coverage, so no attempt had been made to provide additional coverage to this area for case 3.

Figure 2.7 shows the Case 3, Modified Network 2 coverage at 1% time. Figure 2.8 shows the mobile outdoor coverage, there is incoming co-block interference, which impacts the coverage, the mobile outdoor coverage is more restricted than the indoor coverage.

For information, figure 2.9 shows the coverage for mobile outdoor coverage for case 3 with incoming interference predicted at 5% time.

The indoor and mobile populations for the 5% time interference limited coverages are also included with this report in the "Population Coverage Table" section.

1.1.4 Expanded DSO Coverage (Case 4, Modified Network 3)

In addition, while reviewing the coverage (after version 1 of this report was completed), it became apparent that there was a significant area to the north-west of the Turners Hill transmitter that still has poor coverage. This area is not particularly large geographically but it is populated. Alternative antennas on this site had not been considered. Consequently, an additional transmitter (called Turners Hill B) has been added to this report; to improve the coverage to this area. It consists of a single panel, mounted at the same height as the existing Turners Hill antenna, with an ERP of 2kW firing on a bearing of 300° ETN, given more time, a complete re-evaluation of the options for Turners Hill antenna, would need to be undertaken. It may be possible to share the national omni-directional antenna at this site.

This additional panel antenna at Turners Hill does not unduly increase outgoing co-block interference to the surrounding 11C multiplexes. Analysis of the use of the national omni-directional antenna, with respect to outgoing interference, has not at this time been undertaken.

Figures 2.10, 2.11 and 2.12 have been updated to include this second transmitter at Turners Hill, as have the population tables.

In order to expand the network for Birmingham to the south of the Birmingham multiplex the transmitters at Brierley Hill and Headless Cross have been added.

Figure 2.10 shows the Case 4, Modified Network 3 and the Headless Cross and Brierley Hill transmitters have been included.

For the mobile outdoor coverage, there is significant incoming co-block interference, see Figure 2.11. The extent of the incoming co-block interference at 1% time is significant, although not catastrophic.

For information, a 5% time interference limited coverage map has been included for the case 4, modified network 3 coverage for Birmingham. This can be seen in figure 2.12.

The indoor and mobile populations for the 5% time interference limited coverages are also included with this report in the “Population Coverage Table” section.

At this time, the population tables have NOT been reordered to take account of the significant contribution afforded by the addition of the 2nd antenna on the Turners Hill site, Turners Hill B. Thus Turners Hill B is shown as part of the Case 4 option. It is highly likely that if it is possible to use the omni-directional antenna on Turners Hill that is used by the BBC, Digital 1 and MXR West Midlands (without significantly compromising the co-block multiplexes at Swindon, Cambridge, Cardiff and Newport or South Yorkshire), then this would be a Case 2 option (Modified Network 1, changes of the existing infrastructure.) Time constraints do not permit this re-analysis at the moment.

2 Coverage of Multiplex

2.1 Coverage Maps

Coverage maps for DAB are presented with three colours.

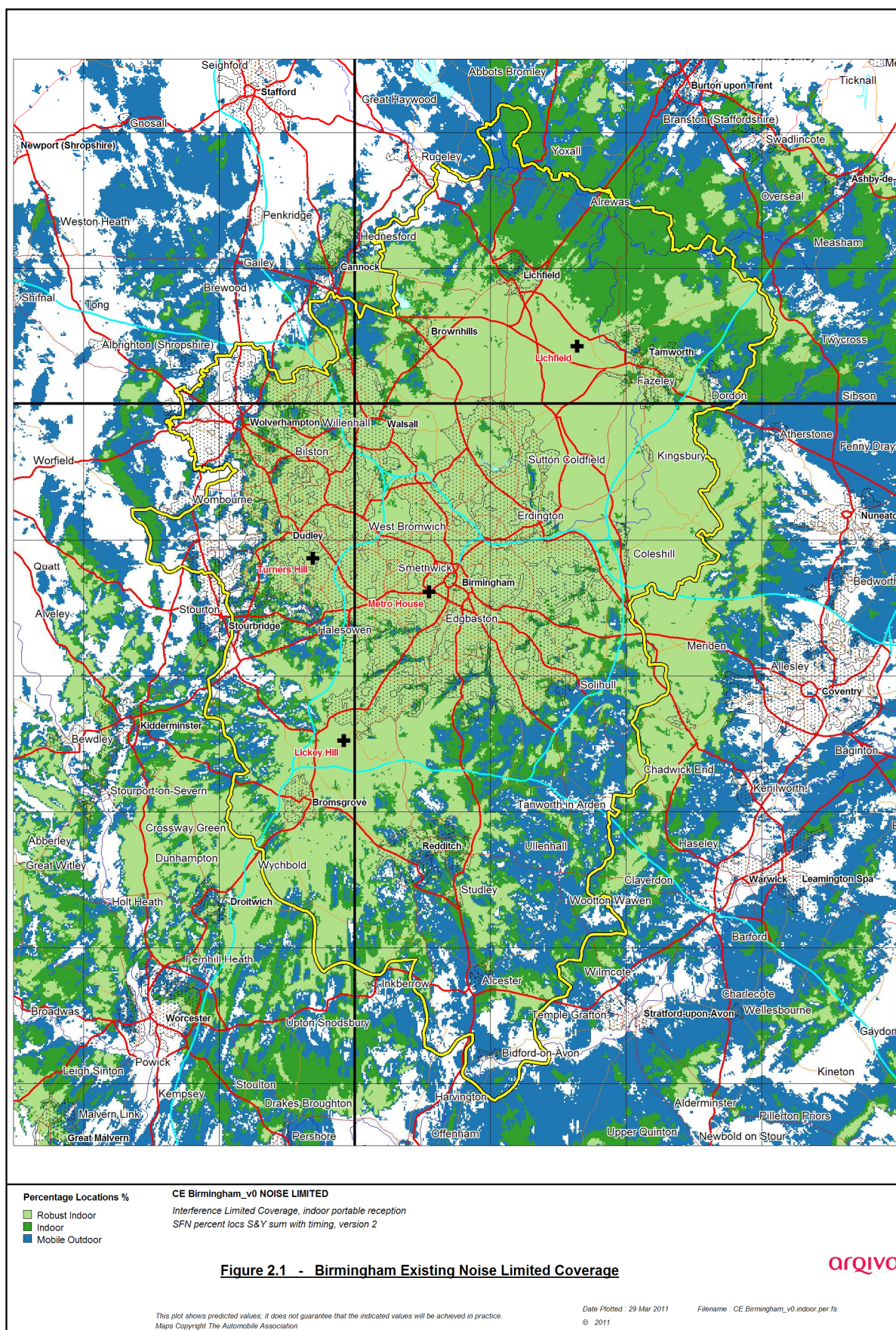
Blue = Mobile coverage (99% locations at 99% time)

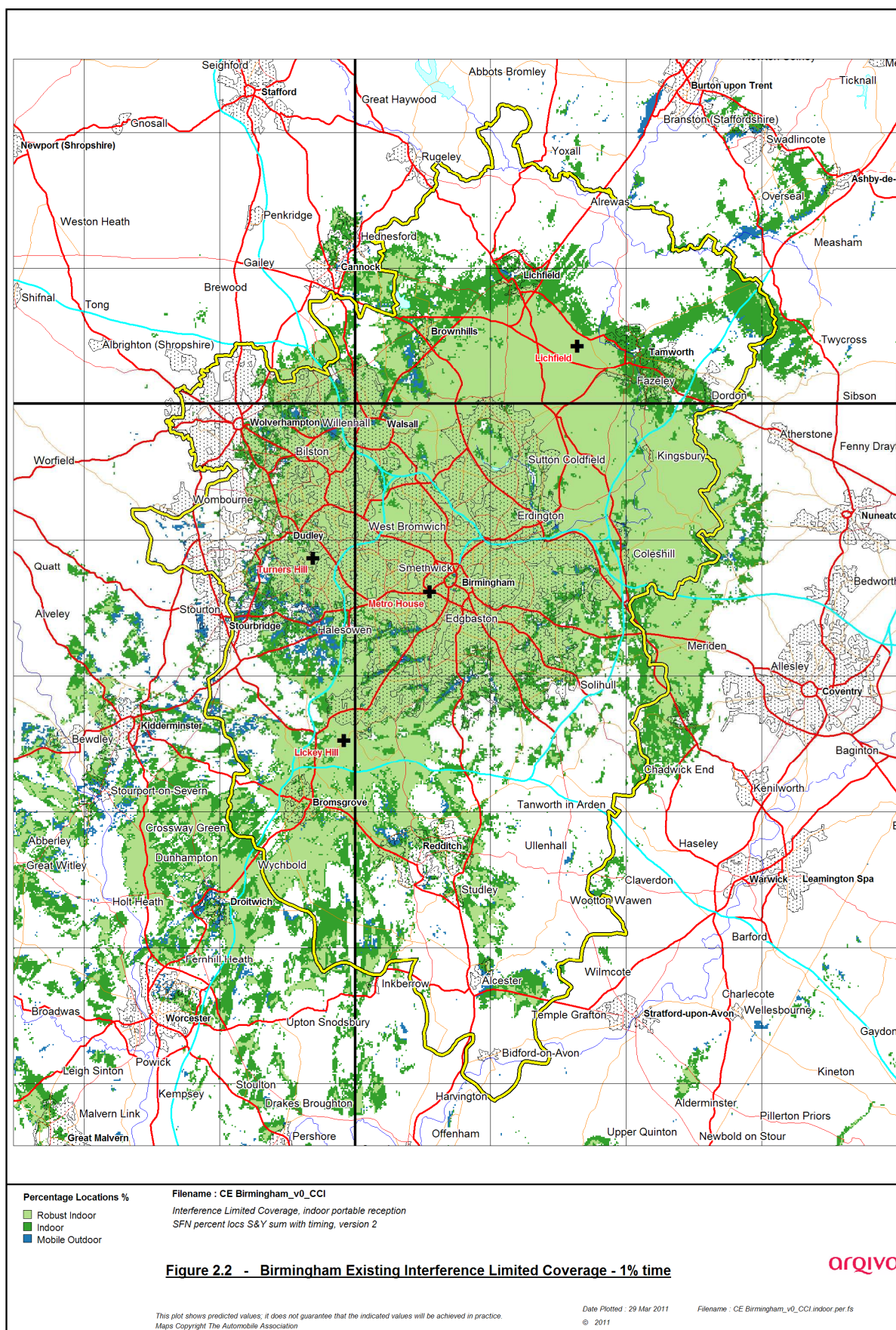
Dark Green = Indoor coverage (80-95% locations at 99% time)

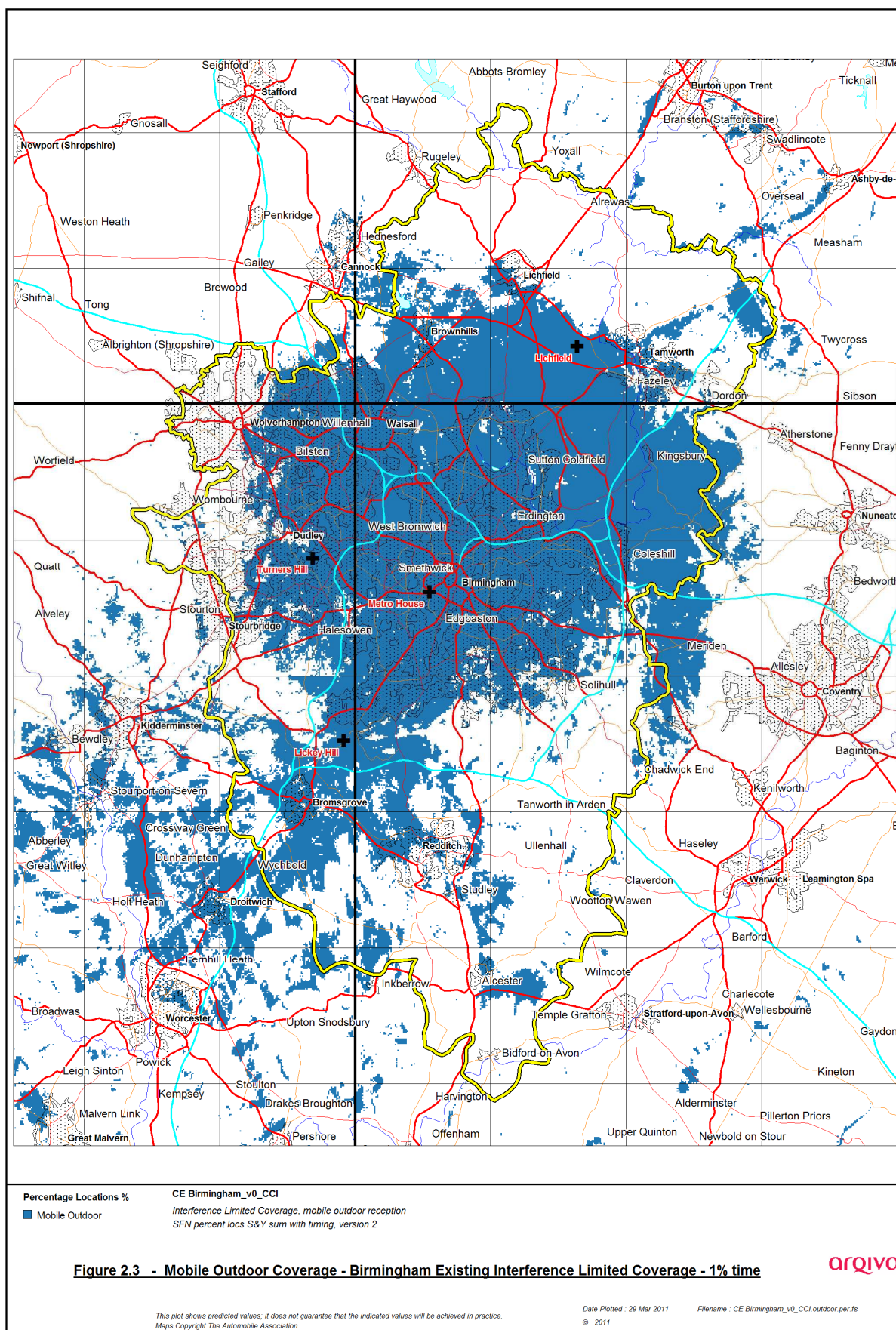
Light Green = Robust Indoor coverage (>95% locations at 99% time)

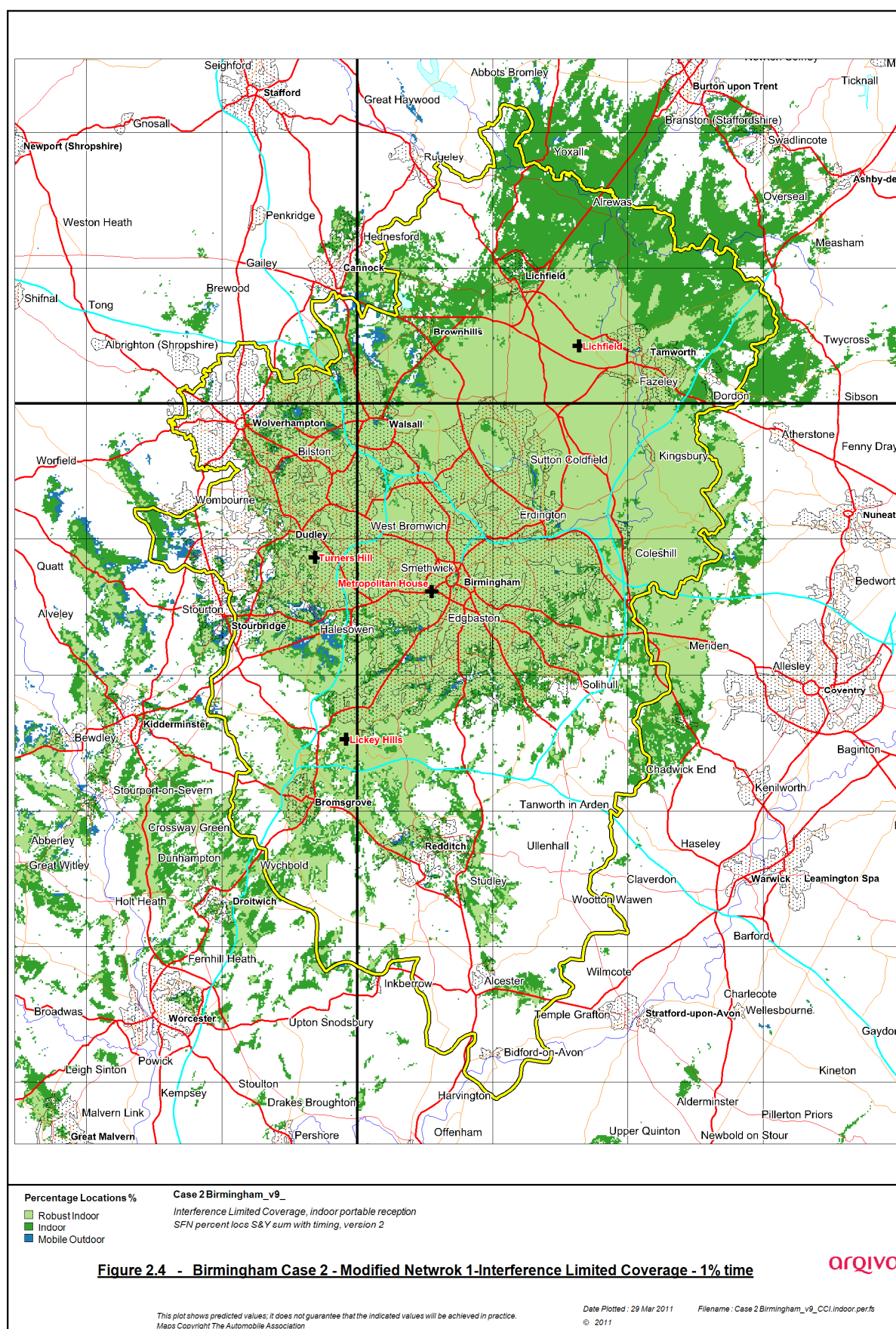
These maps included with this report are shown below.

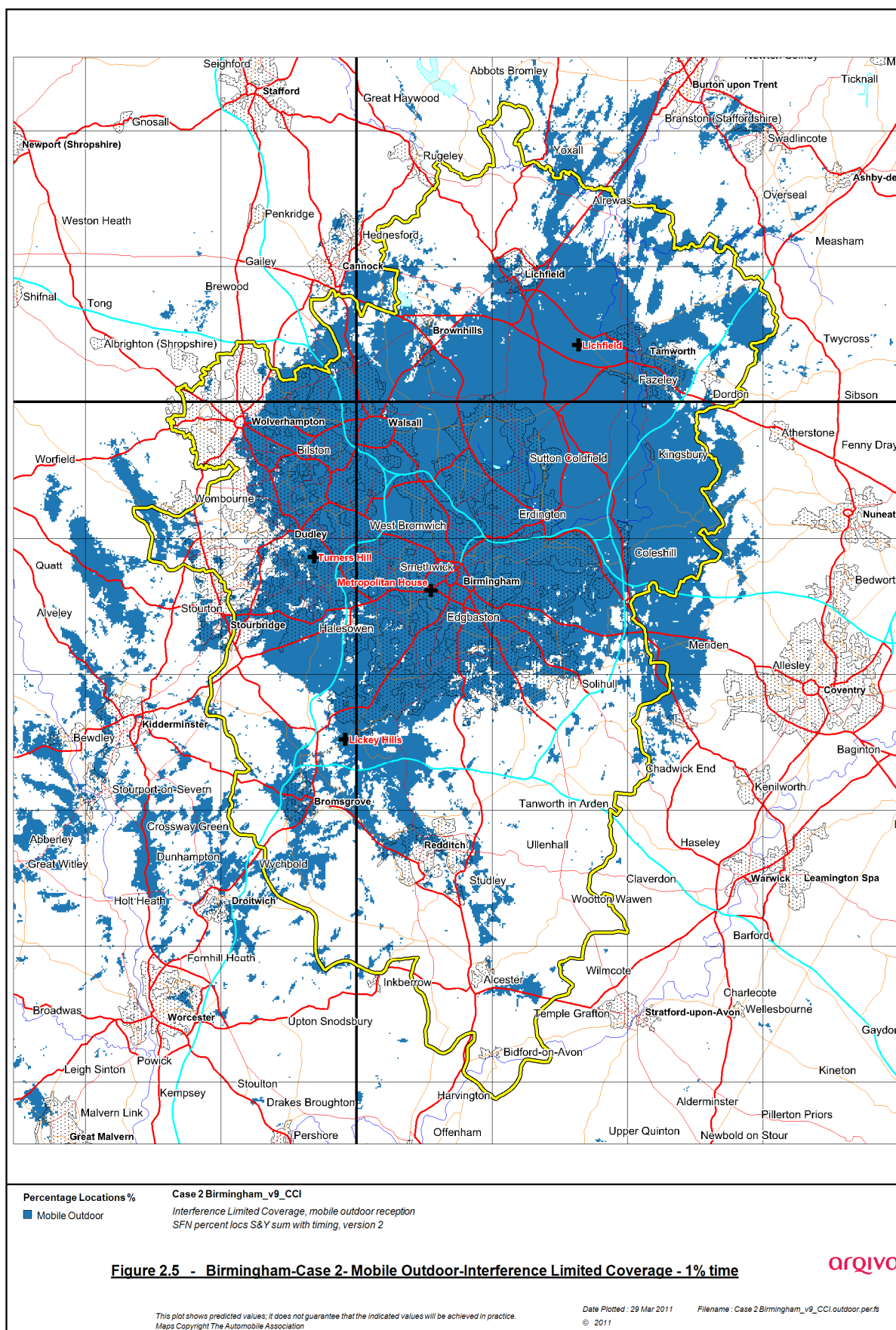
Figure 2.1	Case 1 -Current NOISE limited coverage for Birmingham (<i>4 transmitters</i>)
Figure 2.2	Case1 - Current interference limited coverage for Birmingham, 1% time - (<i>4 transmitters</i>)
Figure 2.3	Case 1 - Mobile outdoor Coverage for Birmingham interference limited for Cambridge, 1% time - (<i>4 transmitters</i>)
Figure 2.4	Case 2, Interference limited coverage for Birmingham, Modified network 1% times - (<i>4 transmitters</i>)
Figure 2.5	Case 2 Interference limited coverage for Birmingham, Modified network 2 1% time - (<i>4 transmitters</i>)
Figure 2.6	Case 2, Mobile outdoor - Coverage for Birmingham, Modified network 2, 5% time - (<i>4 transmitters</i>)
Figure 2.7	Case 3, Interference limited coverage for Birmingham Modified network 3, 1% time - (<i>5 transmitters</i>)
Figure 2.8	Case 3, Interference limited coverage for Birmingham, Modified network 3 1% time - (<i>5 transmitters</i>)
Figure 2.9	Case 3, Mobile outdoor - Coverage for Birmingham, Modified network 3, 5% time - (<i>5 transmitters</i>)
Figure 2.10	Case 4, Interference limited coverage for Birmingham, Modified network 3, 1% time - (<i>7 transmitters</i>)
Figure 2.11	Case 4, Interference limited coverage for Birmingham, Modified network 3, 1% time - (<i>7 transmitters</i>)
Figure 2.12	Case 4, Mobile outdoor - Coverage for Birmingham, Modified network 3, 5% time - (<i>7 transmitters</i>)

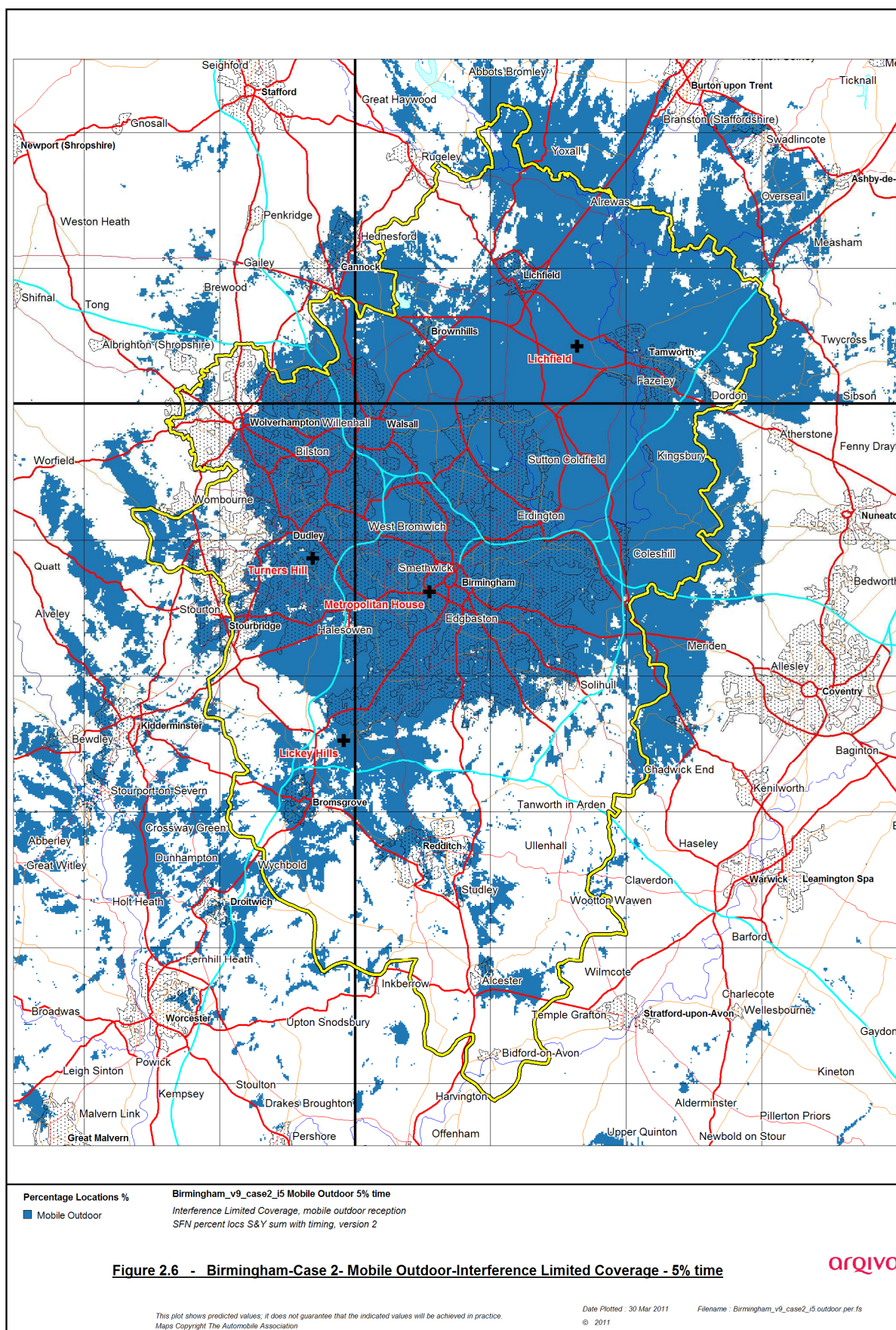


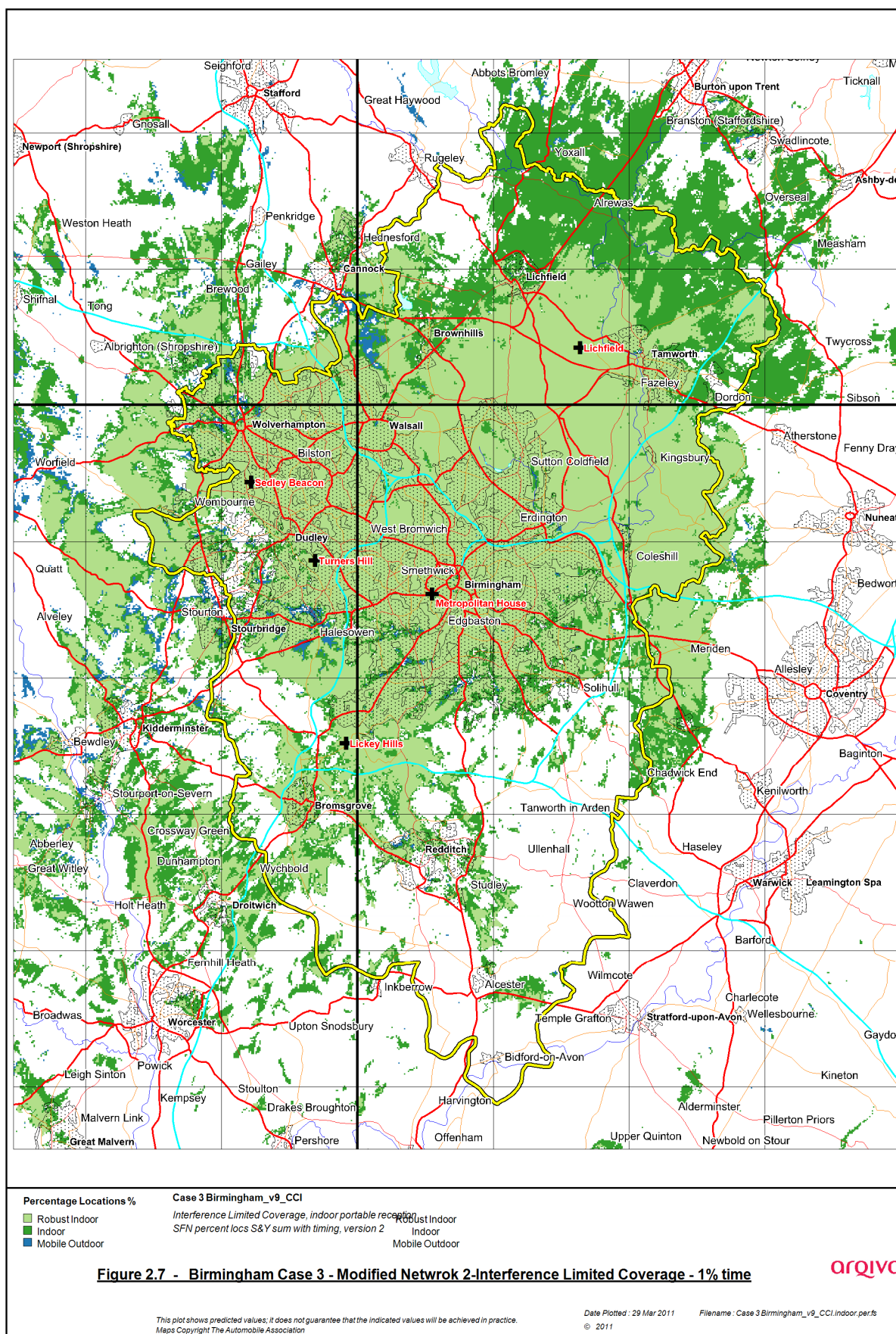


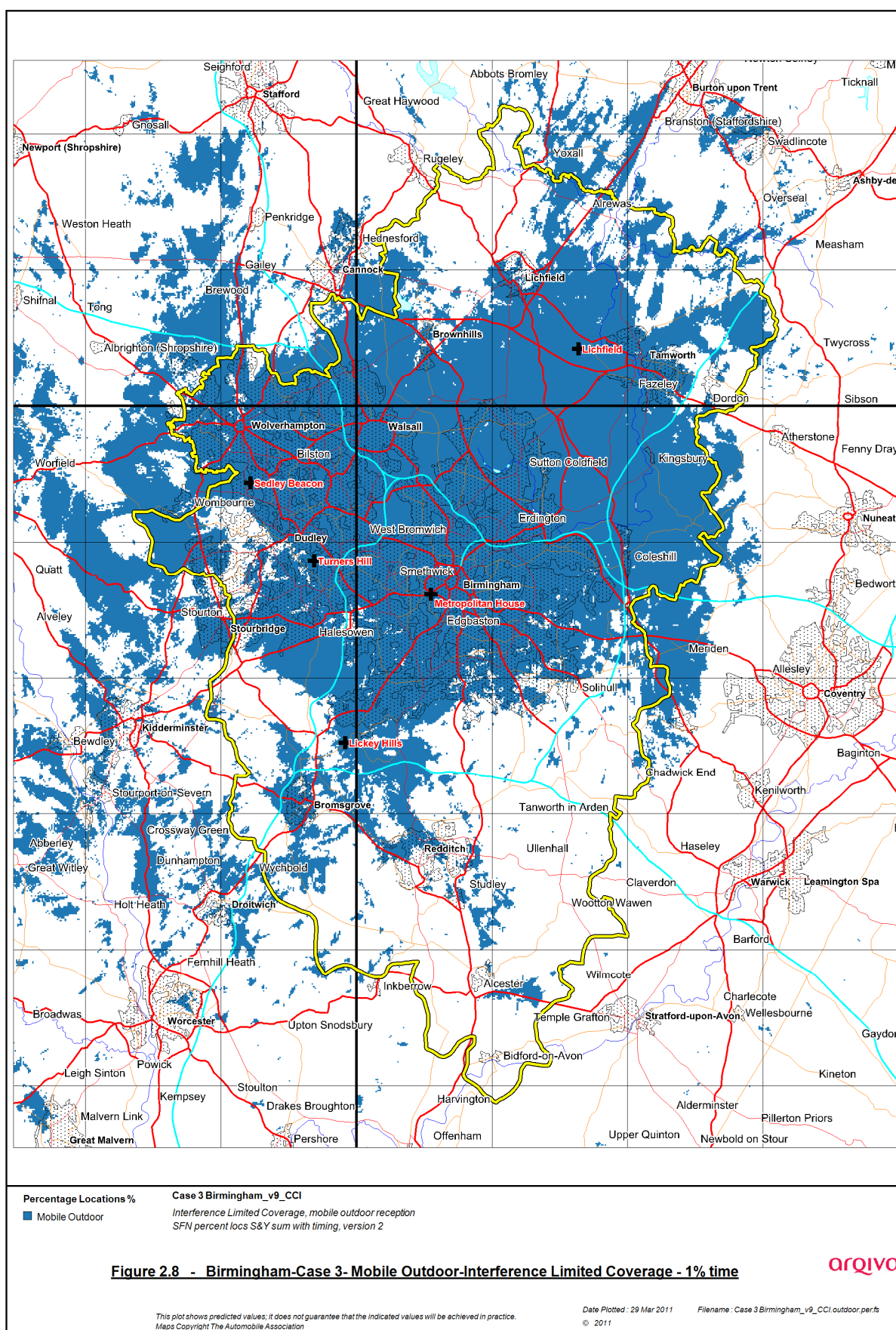


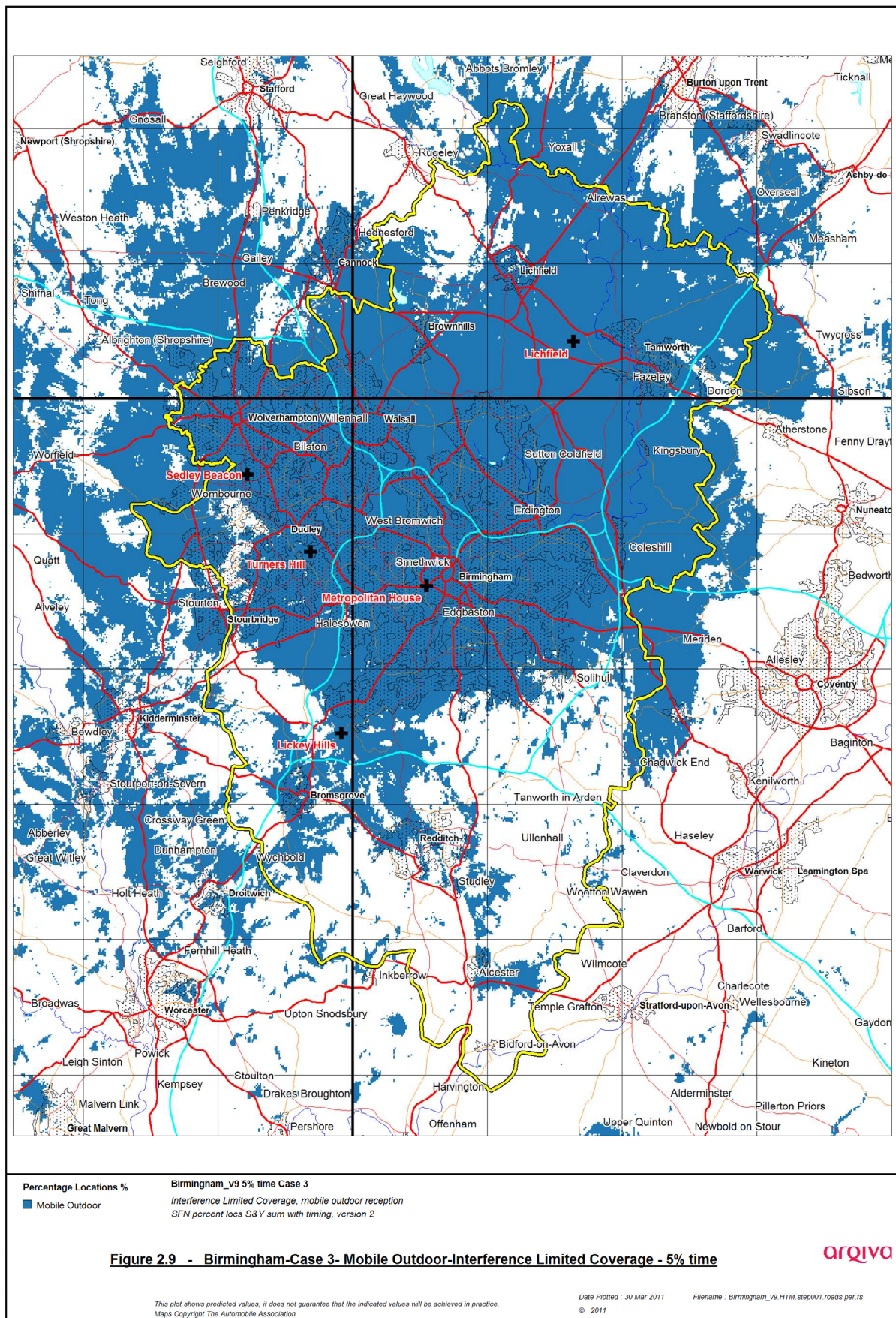


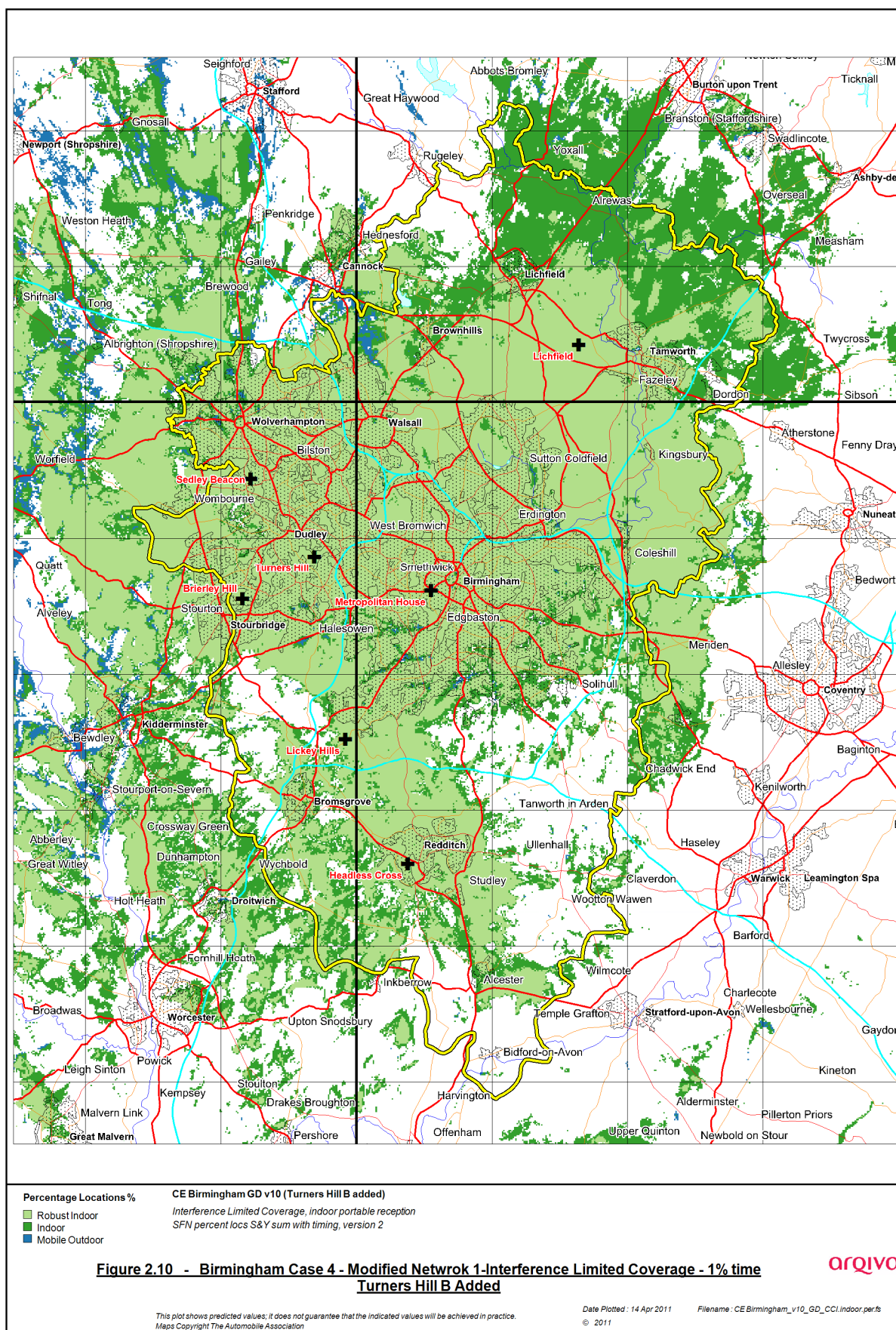


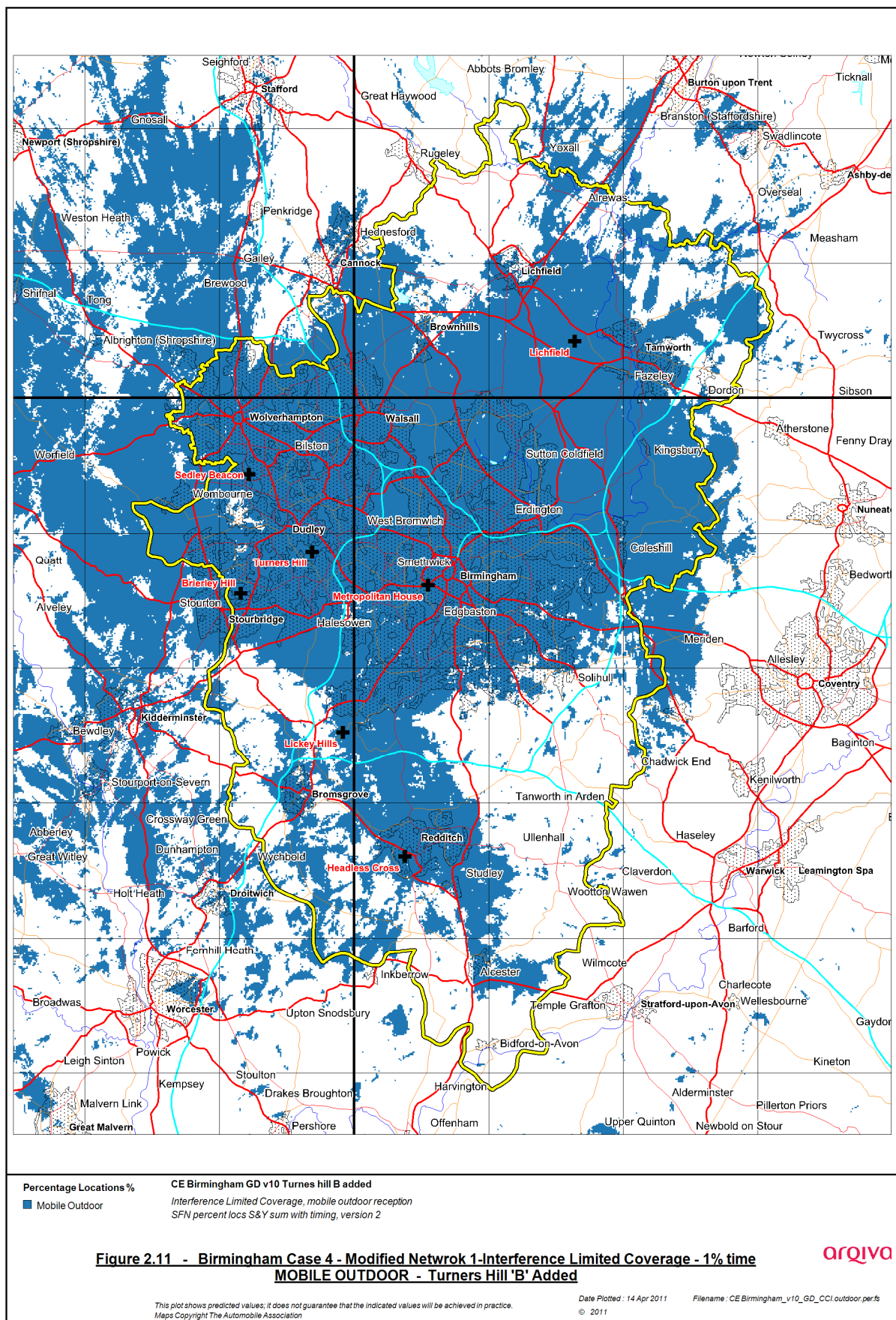


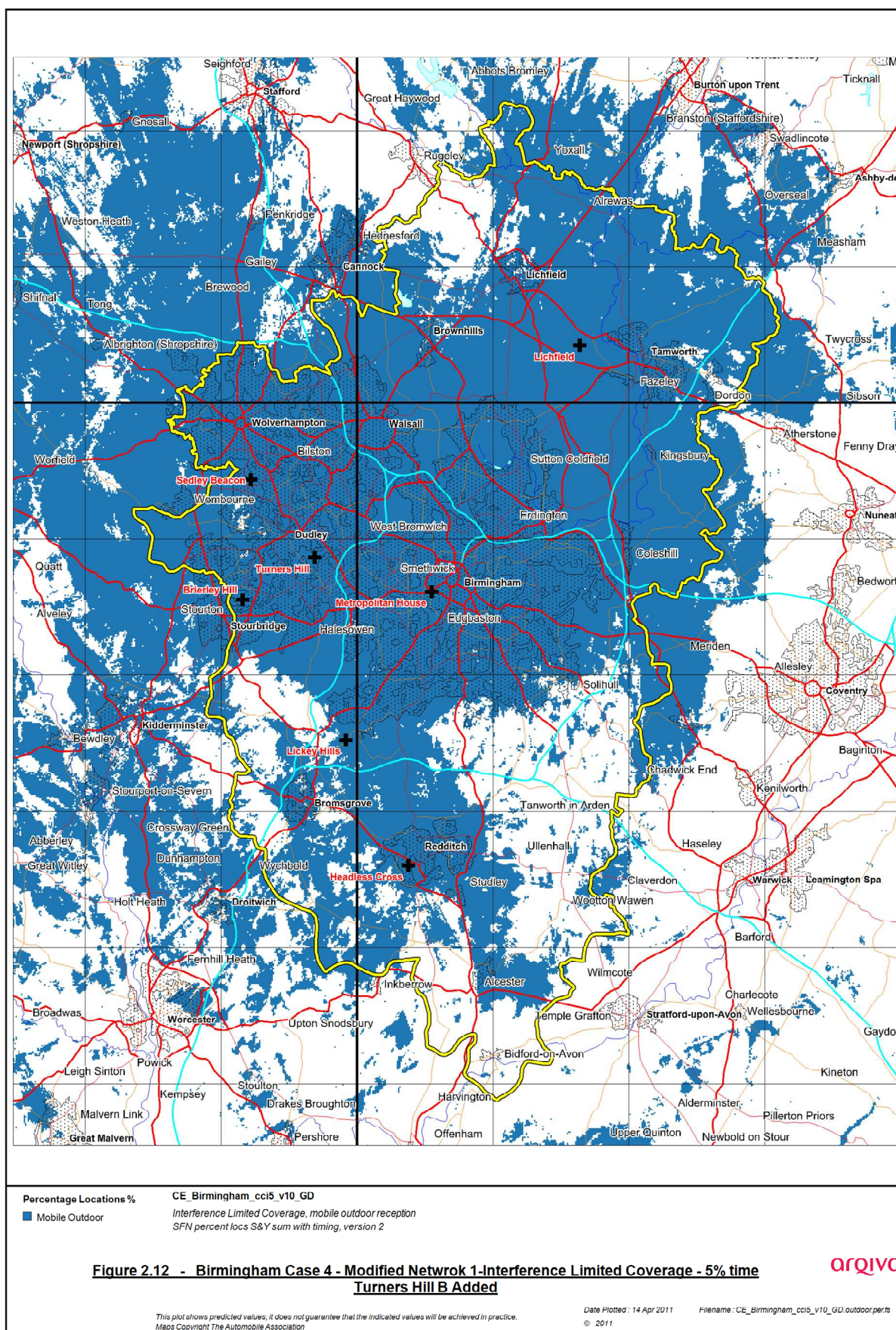












2.2 Population Coverage Tables

The following tables 2.1 and 2.2 and 2.3 show the population figures and the roads coverage for Birmingham. These tables are colour coded thus:-

Existing Birmingham	-	Case 1 (<i>4 transmitters</i>)
	-	Yellow = Existing sites unchanged
Case 2		Modified Network 1
	-	Increase in ERP at Lichfield from 1 kW to 2.5 kW (4 transmitters)
	-	Orange
Case 3		Modified Network 2
	-	Improved Network (<i>5 transmitters</i>)
	-	Orange + Green = modified network 2
Case 4		Modified Network 3 (<i>7 transmitters</i>)
	-	Expanded network
	-	Orange + Green + Blue = modified network 3

Table 2-1. Population coverage proportional indoor 99%T Total 1,182,380

Site scenario and incremental additional sites	Site Type	Individual Gross Interference Limited coverage within Editorial Area	Number of households within Editorial Area	Increase in number of households	Incremental percentage increase of population	Percentage of Editorial Area
Current (4 Tx)	Existing Dab sites		935001			79.08
Case 2	Existing DAB sites		962789	27788	2.35%	81.43
Sedley Beacon	New Site	248480 (21.02%)	1048260	113259	9.58%	88.66
Headless Cross	New Site	39393 (3.33%)	1080163	31903	2.70%	91.35
Brierley Hill	New Site	64394 (5.45%)	1104213	24050	2.03%	93.39
Turners Hill B	New antenna on existing site	240794 (17.45%)	1114719	10506	0.89%	94.28

Table 2-2. Population coverage proportional indoor 95% time Total 1,182,380

Site scenario and incremental additional sites	Site Type	Individual Gross Interference Limited coverage within Editorial Area	Number of households within Editorial Area	Increase in number of households	Incremental percentage increase of population	Percentage of Editorial Area
Current (4 txs)	Existing Dab sites		968328			81.90
Case 2 (4 Tx)	Existing DAB sites		993227	104108	8.81%	84.0
Sedley Beacon	New Site	262898 (22.23%)	1076096	82869	7.1%	91.10
Headless Cross	New Site	41146 (3.48%)	1107507	31411	2.57%	93.67
Brierley Hill	New Site	71847 (6.08%)	1127797	20290	1.71%	95.38
Turners Hill B	New antenna on existing site	268717 (19.42%)	1135687	7890	0.67%	96.05

Table 2-3 Road coverage 99% locations, 99% time Total 1087.5 km

Site scenario and incremental additional sites	Site Type	Total road length in km	Increase in number of road length in km	Incremental percentage increase of road length	Percentage of roads within the editorial area
Current (4 Tx)	Existing DAB sites	748.6			68.83
Case 2 (4 Tx)	Existing DAB sites	776.9	28.3	2.61%	71.44
Sedley Beacon	New Site	828.7	80.1	7.36%	76.2
Headless Cross	New Site	859.8	31.1	2.86%	79.06
Brierley Hill	New Site	876.5	16.8	1.54%	80.60
Turners Hill B	New antenna on existing site	880.7	4.2	0.3%	80.90

Table 2-4 Road coverage 99% locations, 95% time- Total 1087.5 km

Site scenario and incremental additional sites	Site Type	Total road length in km	Increase in number of road length in km	Incremental percentage increase of road length	Percentage of roads within the editorial area
Current (4 Tx)	Existing DAB sites	853.2			78.46
Case 2	Existing DAB sites	868.1	48.6	0.36%	78.82
Sedley Beacon	New Site	911.4	43.3	4.99%	83.81
Headless Cross	New Site	943.8	32.4	2.87%	86.7
Brierley Hill	New Site	954.1	10.3	1.03%	87.73
Turners Hill B	New antenna on existing site	955.2	1.3	0.1%	87.83

Table 2-5. Summary of Coverage within Editorial Area for Each Case (for 1% time)

Case	Indoor Household (& percentage coverage)	Mobile Road Coverage (& percentage coverage) 99% locations
1	935001 (79.08%)	748.6 (68.8%)
2	962789 (81.43%)	776.9 (71.4%)
3	1048260 (88.66%)	828.7 (76.2%)
4	1114719 (94.28%)	880.7 (80.9%)

- Case 1 - Light Yellow = existing sites unchanged
Case 2 - Orange = Modified Network 1
Case 3 - Orange + green = modified network 2
Case 4 - Orange + green + blue = modified network 3

Table 2-6. Summary of Coverage within Editorial Area for Each Case (for 5% time)

Case	Indoor Household (& percentage coverage)	Mobile Road Coverage (& percentage coverage) 99% locations
1	968328 (81.9%)	853.2 (78.5%)
2	993227 (84%)	868.1 (78.8%)
3	1097335 (92.8%)	911.4 (83.3%)
4	1135687 (96.05%)	955.2 (87.8%)

- Case 1 - Light Yellow = existing sites unchanged
Case 2 - Orange = Modified Network 1
Case 3 - Orange + green = modified network 2
Case 4 - Orange + green + blue = modified network 3