



An approach to DAB coverage planning

A consultation for the Government's
Digital Radio Action Plan

Consultation

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¹ There are also technical Annexes A to J, separate to this document, which are listed at 2.15.

Section 1

Executive summary

- 1.1 The Government has published a Digital Radio Action Plan (DRAP) the purpose of which is *‘to provide the information to allow for a well-informed decision by Government on whether to proceed with a radio switchover’*. Ofcom has been asked to chair a DAB coverage and spectrum planning group to *‘determine the current level of FM coverage and develop a range of options to increase DAB coverage to match FM’*.
- 1.2 This consultation sets out our proposed approach to that task. In particular:
- Defining the areas within which we aim to replicate on DAB, as far as practicable, the editorial coverage of existing FM radio services (we call these ‘editorial areas’);
 - The underlying technical assumptions used to predict acceptable levels of FM and DAB coverage for indoor portable and in-vehicle radio reception;
 - The extent of existing FM coverage within each editorial area, for indoor portable radios and for in-vehicle radios on major roads; and
 - A study investigating the feasibility of different radio switchover scenarios illustrating, from a broadcast network perspective, how increasing levels of coverage can be achieved using increasing numbers of transmitters.
- 1.3 This document is not a policy consultation on a regulatory decision by Ofcom. The decisions that may follow this work are primarily to be taken by multiplex operators and by Government. Rather, we are consulting to give a wider public and stakeholder audience the opportunity to express any views on the issues in this document, before we submit a final report to Government.
- 1.4 As we explain, broadcast radio coverage varies depending upon on a range of factors, such as weather conditions, receiver sensitivity or the exact location of the receiver. Whilst we can make assumptions about these factors they will always be judgements and estimates; and there are differences between the technologies of FM and DAB. For these reasons, it is appropriate to propose a range of options.
- 1.5 These options do not constitute a definitive or final view on any post-switchover DAB network but will inform the Government’s decision about whether to proceed with digital radio switchover. Further technical work on network planning, and public policy decisions by Government on the issues raised, will be necessary.

Defining editorial areas

- 1.6 National FM radio services seek to target the whole of the UK. Each local FM service has its own unique editorial area, determined roughly by its transmitter location and power. In each local area covered by DAB there is a single ‘multiplex’ which carries a number of local services, all of which have identical coverage.
- 1.7 Because of this, we have defined a set of local editorial areas, based on discussions with broadcasters about the areas that stations aim to serve. They take into account both the largest local commercial service and the relevant BBC local or nations’ service, to provide a composite editorial area, within which listeners could reasonably

expect to be served by one or both of these services. We have not sought to replicate coverage outside these editorial areas (e.g. BBC Radio Manchester can be heard clearly in parts of Liverpool but the service is not intended for those listeners).

- 1.8 Such editorial areas already form the basis of some of the existing local DAB multiplex areas, which are fixed in licences that confer a right to operate. For multiplexes already broadcasting, transmission infrastructure is in place, and the limited number of DAB frequencies available restricts the opportunities for change.
- 1.9 However, these areas do not cover the whole of the UK and so for planning purposes, we have either extended existing areas or created new ones where necessary, based on discussions we have held with the BBC and the larger commercial operators, taking into account existing FM editorial areas as far as possible.
- 1.10 Every part of the UK is included in at least one local editorial area. In some places there are deliberate overlaps, for example where a particular town may reasonably expect services from two adjacent areas (e.g. Warrington is included in both the Liverpool and Manchester areas).
- 1.11 The BBC's nations' services are expected to be carried on all of the local multiplexes in each nation, together covering the whole of the relevant nation.
- 1.12 This consultation is about the principles of DAB planning and not about the boundaries of editorial areas. Any changes to existing areas can only be made at the request of multiplex operators, and we must publicly consult on each one.

Defining FM coverage

- 1.13 Defining FM coverage is not simple. FM radio signals degrade over distance such that it is still possible to receive some kind of signal that some listeners may regard as acceptable over longer distances.
- 1.14 The current internationally-agreed method of predicting FM service coverage dates from the 1950s, and is based on an assumption that listeners receive their radio services using a directional rooftop aerial pointing towards the transmitter (like television aerials). These aerials have the effect of boosting the reception of the wanted signal, whilst rejecting unwanted signals (interference) received from other directions.
- 1.15 Today the vast majority of listeners instead receive their radio services on portable indoor and in-vehicle receivers. Receiver performance has also evolved and some modern FM receivers are more sensitive than receivers were 50 years ago. They also usually include techniques which conceal reception problems, enabling listeners to listen to weaker signals than used to be the case.
- 1.16 In developing a DAB coverage plan that reflects the level of FM coverage actually experienced, we need to know whether our computer predictions are representative of the FM coverage actually achieved on modern receivers.
- 1.17 We commissioned a review of the factors affecting portable reception of FM services. This produced what is known as a link budget, modelling every stage in the journey from the signal leaving the transmitter to the sound coming out of the speaker.
- 1.18 It concluded that the current assumed level of rooftop field strength (54 dB μ V/m) provides a good way of predicting good, indoor mono FM reception on modern portable receivers. However, many receivers will produce what some listeners might

regard as an acceptable service at a field strength of 48 dB μ V/m, and so this could be used to define variable, indoor portable FM reception. It also supported the view that variable in-vehicle mono reception can be achieved using a lower field strength of 42 dB μ V/m. We welcome views as to which of these levels we should use to define the FM coverage that DAB should match.

- 1.19 Within each local editorial area we then predicted FM coverage of the existing BBC local station (e.g. BBC Radio Manchester); the largest commercial station (e.g. Key 103 in Manchester); and the composite coverage. For UK-wide services, we have calculated the BBC and commercial coverage separately. For all, we have produced FM coverage maps and household and road coverage figures.

Defining existing DAB coverage

- 1.20 Defining the coverage of DAB radio services raises similar technical questions to FM. Here however the challenge has been that either a good digital signal is received or none at all. We commissioned research to establish the planned field strength necessary to provide reliable indoor and in-vehicle reception.
- 1.21 In undertaking our research our aim was to make the most cautious assumptions possible as a starting position for our analysis. This was based on an assumed level of receiver performance, and so a key part of the work was the testing of existing DAB receivers in the market to determine their sensitivity. These tests found a very wide range of receiver performance but many receivers met the standard assumed in the coverage planning model and so this represents a practically achievable target.
- 1.22 We anticipate that the level of receiver sensitivity performance assumed in the planning model will form part of the receiver specifications being developed by the DRAP's Technology and Equipment Group (TEG). We note the importance of these specifications having an associated product logo or kite mark to enable consumers to identify receivers that come with an assurance that they will reliably operate in their planned DAB coverage area.
- 1.23 Given our cautious approach, the field strengths we propose using to predict indoor reception of DAB are significantly higher than previously used for DAB planning. (The previous value was 58dB μ V/m; we used 69dB μ V/m for robust indoor reception in most areas, rising to 77dB μ V/m in dense urban areas, but to retain 58dB μ V/m for in-vehicle reception.) We believe planning to these field strengths will provide consumers with a better, more robust listening experience than that available at present.
- 1.24 In addition to planning for higher field strength, for in-vehicle listening we have planned for reception in 99% of locations for 99% of the time. This is a deliberately cautious approach at this stage which, in practice, means we are planning coverage so that a listener would only lose reception in marginal coverage locations if they happened to be sat in stationary traffic during certain atmospheric conditions.
- 1.25 The robustness of our DAB planning criteria carries a cost in terms of the number of transmitters that need to be built. We will need to do further work to determine if this is necessary or appropriate.
- 1.26 We have produced DAB existing coverage maps and household and road coverage figures both for national coverage and for every editorial area within the UK.

Our proposed approach to increasing DAB coverage

- 1.27 For the BBC UK national multiplex, the BBC has carried out its own planning, based on the same criteria as we are using for local coverage. This planning so far consists of three phases: existing coverage, coverage by the end of 2011, and 97% population as required by the current licence fee settlement. Further transmitters may be required to match fully existing FM coverage, both variable indoor and in-vehicle.
- 1.28 The operator of the national commercial multiplex, Digital One, has provided a plan to match the coverage of Classic FM.
- 1.29 For the local multiplexes we have planned for increasing DAB coverage within each editorial area in four stages for both indoor and road coverage:
- Existing coverage;
 - Modifying existing transmitters to improve coverage (Scenario 1);
 - Adding transmitters in diminishing order of coverage benefit, to a point which approximates existing FM coverage (Scenario 2); and
 - Continuing to a point where additional transmitters add negligible amounts of coverage and become potentially uneconomic to build (Scenario 3).
- 1.30 In aggregate, the set of area plans will present Government and service providers with a range of options for extending coverage, and will enable a cost-benefit analysis to inform the political decision of how much coverage to provide.
- 1.31 The limited number of frequencies available for DAB means that they must be re-used in different local areas around the UK. Interference can be caused by the use of the same frequency in other distant areas. Our plans assume some limited frequency re-allocation, to reduce interference by increasing the distance between the re-use of each frequency, but we have tried to minimise the cost and disruption to services. Any frequency change is subject to international agreement, which can only be negotiated following specific requests. It is likely that interference considerations and frequency availability will constrain the extent of local DAB build-out.

Interim conclusions

- 1.32 While we have tried to match the consumer experience, FM and DAB are different in kind. We consider both good and variable FM coverage but only good DAB coverage. However, the levels are not directly comparable between FM and DAB. Because of the way FM reception fades gradually compared to DAB, the standard we have set for DAB coverage is far higher than for existing FM. For example, the criterion we have used for road coverage for FM is that any 100m square is regarded as served if reception is available at 50% of locations within that square for 95% of the time. For DAB we have used 99% of locations for 99% of the time.
- 1.33 Our plans suggest that good DAB indoor coverage can be built to match good FM coverage, even using our very cautious DAB planning assumptions. For roads, our strict measure of good DAB coverage shows lower coverage than good FM, but there are indications that successful in-vehicle DAB reception may not require coverage planned for such a high percentage of locations. Our estimates suggest that even a minor relaxation in the assumptions (to 95% of locations for 99% of the time) would increase coverage by up to ten percentage points. This, together with other possible

changes we suggest below, such as further frequency changes, give us confidence that DAB road coverage can be built to match FM.

- 1.34 This consultation marks only the end of the first stage in the planning process. Ofcom will conduct further research and planning and engage with industry, to more fully explore these issues in our final report, including an examination of the implications for DAB coverage and the consumer experience of:
- Varying our technical assumptions, in particular whether road coverage needs to be planned for 99% of the time and for 99% of locations, other technical characteristics of the DAB broadcast, and the differences between FM and DAB as technologies;
 - The trade-off between adding more transmitters and the increase in interference within the DAB network that brings;
 - The possibility of merging together some areas to make better use of frequencies (this does not mean merging the radio services, just carrying the same local stations over a wider area); and
 - Frequency changes further to those we have already proposed.
- 1.35 We anticipate both the BBC and Digital One will develop their national build-out plans further, as these issues are examined; their plans presented here are not final.

Next steps

- 1.36 We welcome responses on the consultation questions in Annex 4, particularly from a technical perspective, or focusing on the consumer experience. Following this consultation, we will provide a final report to Government in Q4 2011.

Section 2

Introduction

Context to this report

- 2.1 In July 2010 the Government published its Digital Radio Action Plan [DRAP], subsequently updated². Its stated purpose is *'not to implement a transition to digital radio, but to provide the information to allow for a well-informed decision by Government on whether to proceed with a radio switchover'*.³
- 2.2 The DRAP states that *'a decision on a Digital Radio Switchover can only be made once: 50 per cent of all listening is to digital; and National DAB coverage is comparable to FM, and local DAB reaches 90 per cent of the population and all major roads.'*⁴
- 2.3 As part of the DRAP, Government set up four working groups to report via a Steering Board to Ministers. One of these groups is a Coverage and Spectrum Planning Group [CSPG], which is chaired by Ofcom, and includes advisory and working groups comprising transmission providers, multiplex operators and broadcasters.
- 2.4 A key task of the CSPG is to advise Government on DAB coverage post-switchover. The group is specifically asked to *'Determine the current level of FM; including defining what listeners determine is an appropriate signal quality on FM'* and *'Make recommendations on the build-out of DAB coverage so that it is equivalent to existing FM coverage'*.⁵
- 2.5 The DRAP sets out specific objectives for the CSPG in relation to this task:
- Determine the current level of FM; including defining what listeners determine is an appropriate signal quality on FM;
 - For national and large local services define usable coverage of households and roads and publish the results for consultation;
 - Define appropriate field strengths and other parameters necessary to deliver robust DAB coverage;
 - Identify the achievable coverage from selected sites for DAB services using the latest agreed coverage prediction model, including specifying the geographical and terrain constraints which must be considered in DAB planning;
 - For BBC network services and Classic FM develop options for transmitter plans to match existing FM coverage of households and roads as far as practicable;
 - For large local services (BBC and commercial) develop options for transmitter plans to match existing FM coverage of households and roads within agreed editorial areas as far as practicable.
- 2.6 The report to Government that will follow this consultation will address these objectives, and this consultation outlines our approach to doing so.

² Version 3 was published in March 2011, see <http://www.culture.gov.uk/publications/7876.aspx>

³ http://www.culture.gov.uk/images/publications/Digital_Radio_Action_Plan_V3.pdf - p3

⁴ http://www.culture.gov.uk/images/publications/Digital_Radio_Action_Plan_V3.pdf - p2

⁵ http://www.culture.gov.uk/images/publications/Digital_Radio_Action_Plan_V3.pdf - p23

- 2.7 The consultation questions in this report are primarily technical ones, and the report will be a technical one: in effect a feasibility study looking at the tasks Government will face in terms of coverage, in the event of pursuing a policy of radio switchover.

Structure of this consultation

- 2.8 In the following section, 3—*An editorial approach to defining coverage*, we describe the rationale for basing a planning approach on editorial areas, and go on to describe the national and local editorial areas for the purposes of this planning exercise. This frame of editorial areas then becomes the basis for the rest of our approach that follows.
- 2.9 In 4—*Defining FM coverage* we discuss the challenges in predicting FM coverage based on technical planning standards. The resulting technical assumptions that we make, plus the editorial areas, lead to a series of maps defining coverage of current FM services. (The first two tasks in the above list.)
- 2.10 In 5—*Defining DAB coverage* we discuss analogous challenges in predicting DAB coverage. (The third and fourth tasks in the above list.)
- 2.11 In 6—*DAB planning, national and local* we apply the DAB parameters and the national editorial area to present a range of options for transmitter plans to build out coverage of BBC and commercial national DAB services. (The fifth task above.) We do likewise for the local editorial areas, in which BBC and commercial services are carried on the same transmission networks. (The sixth task above.)
- 2.12 In 7—*DAB planning: a local case study* we present a worked example for the Manchester area, to demonstrate the approach.
- 2.13 Finally, in 8—*Interim conclusions* we present the emerging findings from this work, in terms of the likely task ahead in matching DAB to FM.
- 2.14 Four annexes at the end of this document explain how to respond to this consultation, and Ofcom's approach to consultations generally.
- 2.15 Then there is a series of technical annexes which include more detail than the main body of this document.
- A. **FM current coverage maps and tables.** Comprising national BBC (and Nations), national commercial, local (BBC, commercial, composite). These describe current coverage of FM services based on our planning assumptions.
 - B. **Local DAB build-out plans.** These set out current or currently planned coverage according to our planning assumptions, and then describe progressively increased coverage in three build-out stages for both indoor and in-vehicle (mobile) listening.
 - C. **BBC national DAB network coverage & indicative expansion plans.** This annex is supplied by the BBC as an input to this consultation. It calculates current BBC national DAB coverage using our new planning parameters, and describes the plans to expand it.
 - D. **Radio DSO Digital One.** This annex is supplied by Arqiva as an input to this consultation. It calculates current Digital One national DAB coverage using our new planning parameters, and describes the current plans to expand it.

- E. **Radio DSO initial investigations into optimisation of the frequency plan.** This paper discusses options for multiplex mergers as a way of improving coverage in some areas.
- F. **Prediction of the ‘useable’ coverage of FM radio services.** A research report by Ægis Systems Limited that examines the basis for the FM planning assumptions, an FM link budget and a summary of some FM receiver testing.
- G. **DAB coverage planning.** A research report by Ægis Systems Limited that examines the basis for the DAB planning assumptions used in defining DAB coverage. This report also includes an examination of the DAB link budget and some example receiver testing.
- H. **FM coverage prediction definitions.** A report summarising the planning parameters and assumptions made in predicting FM coverage.
- I. **Technical parameters and planning algorithms for T-DAB coverage calculations.** A report summarising the planning parameters and algorithms that are being used by the BBC, Arqiva and Ofcom in the joint frequency planning work for terrestrial digital radio.
- J. **Digital radio receiver sensitivity testing.** This is a summary of DAB receiver testing by ERA technology, commissioned by DCMS and Ofcom.

Next steps

- 2.16 The final report that follows this consultation will be published and presented to Government in Q4 2011.
- 2.17 The DRAP points to further projects that will take forward any digital radio switchover: *‘Following a decision to proceed, this Action Plan would enable Government to decide when and how to deliver a Digital Radio Switchover and set the foundations for a successor project to implement it.’*⁶
- 2.18 The DRAP provides two routes for stakeholders and consumers to participate in a public debate around DAB switchover more generally.
 - The Stakeholder Group, chaired by the DCMS, is open to a wide range of industry and related stakeholders. The principle purpose of this Group will be to inform external stakeholders of progress against the Action Plan and gather views on emerging findings.
 - The Consumer Expert Group, established to inform the Digital Television Switchover Programme – and including a wide range of consumer representatives including RNIB, British Wireless for the Blind Fund, the Voice of the Listener and Viewer and Citizens’ Advice – has formally agreed to extend its role to consider the Digital Radio Switchover through a revision to its Terms of Reference.

⁶ http://www.culture.gov.uk/images/publications/Digital_Radio_Action_Plan_V3.pdf - p3

Section 3

An editorial approach to defining coverage

The relationship between services and areas

- 3.1 The UK radio sector consists of services of many different sizes in many different locations. On FM there are four BBC UK-wide services (BBC Radios 1 to 4) and one national commercial station (Classic FM). On AM there are two national commercial stations (TalkSport and Absolute Radio) and BBC Radio Five Live. There are over 300 local commercial stations on FM or AM, ranging in size of population coverage from Capital Radio in London (4.1m households) to Lochbroom FM in Scotland (fewer than 1,000 households). The BBC operates 40 local stations in England as well as national stations for Scotland, Wales and Northern Ireland. There are over 200 community radio stations, each operating with a coverage area radius of around 5km.
- 3.2 The Government's proposed policy for radio switchover is to migrate both national and larger local services currently broadcasting on AM and FM to digital-only broadcasting. Many large stations are already broadcasting on DAB, but their coverage is not always the same on DAB as on FM or AM. However, the Government has not yet defined what it means by large local stations and so for the purposes of this plan we have used the largest local commercial station plus the relevant local BBC service in each area. In Scotland, Wales and Northern Ireland the relevant BBC station is the nation's service (BBC Radio Scotland & nan Gaidheal, BBC Radio Wales & Radio Cymru and BBC Radio Ulster). We have planned these in individual local areas which together cover the whole of each relevant nation.
- 3.3 Every radio station has a target editorial area - i.e. the area within which it targets its listeners and for which it tailors its content.
- 3.4 The editorial areas of all UK-wide services, both BBC and commercial, are by definition the same.
- 3.5 At a local level, each service tends to have a unique local editorial area. This is not the same as its actual coverage. There may be holes in coverage within the area the station would like to serve. On the other hand, stations can often be heard beyond their editorial area – for example it is possible to hear BBC Radio Manchester in parts of Liverpool – but the station's content is not aimed at listeners in Liverpool, and so we do not intend to plan to replicate this 'overspill'.
- 3.6 For the BBC local services in England, the editorial area is often a county or major conurbation and there are very few overlaps between editorial areas. In Scotland, Wales and Northern Ireland the editorial area for the BBC services is the whole nation (although there are opt-out programmes in parts of Scotland and in Northern Ireland Radio Foyle is targeted at the Londonderry/Derry area).
- 3.7 For commercial radio, the editorial area is often different from station to station, even where two or more stations nominally cover the same area, such as Greater Manchester. This is because each station may use a different transmitter site or broadcast at a different power. Because there is often more than one FM local commercial service in a local area, we have selected the one with the largest coverage in each area for this planning exercise.

- 3.8 The assumptions we have made about stations should not be taken as an indication that any individual station will become digital-only at switchover or that stations not listed here will remain on FM. The decision as to the criteria regarding which stations would switch is a matter for the Secretary of State at the appropriate time.
- 3.9 On FM, because each station has its own transmission network, it is possible for each station to have its own unique editorial area. But on DAB, the signals of all stations are combined into what is known as a 'multiplex'. All of the stations that are carried on a single DAB multiplex therefore have the same coverage area.
- 3.10 Because of this we need to define a set of editorial areas for DAB which take account of the different stations' existing editorial areas. So in discussion with broadcasters and multiplex operators, we have defined a set of editorial areas which aim to cater for the needs of both the BBC and commercial radio.
- 3.11 Such editorial areas already form the basis of some of the existing local DAB multiplex areas. These DAB licences are already broadcasting and confer a right to operate: transmission infrastructure for these services is already in place, and the limited number of DAB frequencies available restricts the opportunities for change.
- 3.12 However, these existing areas do not cover the whole of the UK and so for this exercise, we have either extended existing areas or created new ones where necessary, based on discussions we have held with the BBC and the large commercial operators, taking into account existing FM editorial areas as far as possible.
- 3.13 Every part of the UK is included in at least one local editorial area. Scotland, Wales and Northern Ireland are divided into local areas. The BBC's nations' services are expected to be carried on all of the local multiplexes in each nation, together covering the whole of the relevant nation. In some places there are deliberate overlaps, for example where a particular town may reasonably expect services from two adjacent areas. For example, Warrington is included in both the Liverpool and Manchester editorial areas.
- 3.14 We are not consulting here on the boundaries of editorial areas. Any changes to existing licensed boundaries can only be made, following separate consultation, at the request of multiplex operators. We are, however, as part of this consultation asking a more general question about the merits of trade-offs between exactly matching existing editorial areas and providing improvements in overall service coverage (Annex 4).
- 3.15 The local areas are shown here in Figure 3.1 and the areas are shown in detail in the FM and DAB maps (Annexes A and B).
- 3.16 It should be noted that in this planning exercise we have excluded regional services as these generally represent an additional layer on top of local services. BBC services are not carried on regional multiplexes (with one exception) and so there is no universal service commitment; the further build-out of coverage of regional multiplexes is purely a commercial decision for their operators. Regional FM commercial services may choose to be carried on either regional multiplexes, local multiplexes or on a national multiplex.

Section 4

Defining FM coverage

FM coverage within each area

- 4.1 Having defined the editorial areas, the next task is to define the FM coverage within each editorial area that we are trying to match.

National coverage

- 4.2 At a national level, we have distinguished between the BBC and commercial services. This is partly because the BBC has a universal service requirement while commercial services do not, but also because the BBC and commercial DAB multiplexes are separate and so their coverage can be designed independently.
- 4.3 For the BBC, the task is to match its national digital multiplex coverage to a level equivalent to its national FM services (for which we are using BBC Radio 2 coverage as a proxy). For commercial national DAB, how to match the coverage of the national digital multiplex, Digital One, to a level equivalent to the single national commercial FM service, Classic FM.
- 4.4 Classic FM has lower coverage than the BBC's national networks as it uses fewer transmitters. Classic FM is currently carried throughout Great Britain on DAB by Digital One and in Northern Ireland by the local DAB multiplex. Following the passing of the Digital Economy Act, it is open to Digital One to request to extend its licence to cover Northern Ireland. Digital One also carries the AM national services Absolute Radio and TalkSport. We will aim to match the current FM coverage of Classic FM in both Great Britain and Northern Ireland.

Local coverage

- 4.5 Just as the local editorial areas of BBC and individual commercial services differ, so does their existing FM coverage. For the purposes of this planning exercise we have defined the FM coverage of the BBC service and the largest commercial service within each editorial area, and taken the composite of the two coverage areas as the basis on which to match DAB. This means that a particular location is regarded as being covered by local FM radio if it can receive either the local BBC service or the local commercial service or both. However, we have only considered this coverage within the editorial areas we have defined. It would not be sensible or practicable to plan for DAB coverage to match existing FM overspill, although inevitably there will be some DAB overspill beyond the editorial areas.
- 4.6 We are not planning to match the coverage of any AM stations, either BBC or commercial, as this is outside the remit of the Coverage and Spectrum Planning Working Group. However, the Government is planning to switch-off AM services at the same time as FM and there are some areas, such as eastern Gloucestershire, where local services are only available on AM. In planning DAB we need to be aware of this, although we have not been asked specifically to plan for it. In practice almost all AM stations are also carried on DAB and so the majority of their listeners would remain served at any future digital radio switchover.
- 4.7 Before we can say exactly what the coverage within each editorial area is, we need to define how we measure it and what constitutes an acceptable level of service.

Modelling FM coverage

- 4.8 FM radio reception coverage is usually modelled rather than measured: the technology is sufficiently well understood to enable accurate computer simulations of coverage. Coverage predictions have been checked with field measurements of received signal strength over a number of years, giving a high degree of confidence in their accuracy.
- 4.9 The internationally-agreed method of predicting FM service coverage is based on an assumption that listeners receive their radio services using a directional rooftop aerial pointed at transmitter site (in the same way that television aerials do). These directional aerials have the effect of boosting the reception of wanted signal, whilst rejecting unwanted signals (interference) received from other directions. The assumption that listeners use a directional roof top aerial dates back to the 1950s, when this type of reception was common.
- 4.10 Today the vast majority of listeners do not use a directional roof top aerial connected by cable to an indoor receiver to listen to radio services, and instead receive their radio services on portable indoor and in-vehicle receivers. There have also been a number of other significant changes, including a major reduction in the amount of impulsive noise (ignition interference) generated by motor vehicles.
- 4.11 Receiver performance has also evolved. Some modern receivers are more sensitive than in the past and have improved adjacent channel rejection performance (i.e. they are better at ignoring interference from adjacent frequencies). They also usually include techniques which conceal reception problems, enabling listeners to listen to weaker signals than had been the case.
- 4.12 In order to develop a post switchover digital coverage plan that appropriately accounts for the current level of FM service coverage actually experienced by listeners, it is important to determine the extent to which computer simulations of FM coverage, based on the rooftop reception assumption, are representative of the coverage actually achieved on modern portable indoor and in-vehicle receivers.
- 4.13 To achieve this Ofcom commissioned an independent review of the assumptions made in predicting FM coverage. These include propagation and receiver factors impacting on the portable reception of FM services, losses in signal strength resulting from in-building penetration loss and reduced aerial height, as well as modern FM receiver sensitivity and co- and adjacent channel rejection performance (i.e. interference from distant transmitters using the same or adjacent frequencies). This produced what is known as a 'link budget', which takes an end-to-end approach to planning, taking into account every stage from the signal leaving the transmitter to the sound coming out of the radio speaker (Annex F).
- 4.14 This study concluded that the current assumed level of roof top FM field strength, 54 dB μ V/m, does provide a good proxy for predicting robust mono indoor FM coverage on modern portable indoor receivers.
- 4.15 However, some receivers can work indoors with 48 dB μ V/m field strength, possibly with some level of background hiss or distortion or where the listener has to try different receiver or aerial positions to obtain a listenable signal, and so we use this as a typical, variable indoor indication.
- 4.16 In-vehicle reception is possible with lower field strengths. In order to properly evaluate the extent of coverage two lower field strengths were considered. These were 48 dB μ V/m, providing good, robust in-vehicle coverage, and 42 dB μ V/m, providing variable mono in-vehicle reception. The study supported using the lower

figure, which results in a larger area covered, to represent listener perceptions of coverage better.

- 4.17 We seek views on which of these field strengths is appropriate for predicting FM coverage in order to build-out DAB networks to equivalent levels (see consultation question in Annex 4). Because this question is ultimately informed by subjective experience, and because of the variability of other parameters that affect FM coverage, our approach in this document is not to take any FM field strength as providing the ‘correct answer’; but rather to use the alternative approach of maximising DAB coverage within editorial areas.
- 4.18 Annex A shows detailed maps of existing FM coverage for national and local services.

Figure 4.1: Field strength definitions for FM

Minimum field strength ^[1]	Environment	FM coverage type	Assumptions
54 dBµV/m	Rooftop aerial	Stereo	Receiver antenna directivity (as per ITU Rec. BS 599) Protected from interference for both 50% and 5% time conditions
	Indoor portable	Robust mono	No antenna directivity Protected from interference for both 50% and 5% time conditions
48 dBµV/m	Indoor portable	Variable mono	No antenna directivity Protected from interference for both 50% and 5% time conditions
	In-vehicle	Robust mono	No antenna directivity Protected from interference for both 50% and 5% time conditions
42 dBµV/m	In-vehicle	Variable mono	No antenna directivity Protected from interference for both 50% and 5% time conditions

^[1] At 10m agl in the absence of interference and calculated for 50% time propagation conditions.

Section 5

Defining DAB coverage

Principles of DAB operation

- 5.1 DAB operates differently to FM. On FM each frequency can only carry a single service. Each new transmitter added to a network needs to operate on a different frequency from other transmitters in the same region to prevent co-channel interference. To achieve near-universal coverage, 2.2 MHz of spectrum is needed for each national FM radio service: a total of 11 MHz is currently used to deliver just five stations.
- 5.2 On DAB a number of services can be carried on a single frequency using a technology known as multiplexing. For any given multiplex the DAB transmitters operate in a network in which all share a common frequency (what is known as a Single Frequency Network, or SFN). This enables the efficient extension of network coverage, by just adding more transmitters on the same frequency.
- 5.3 A national DAB multiplex operating with an SFN occupies just over 1.5 MHz of spectrum and can deliver over ten radio stations and additional data services. So DAB makes more efficient use of the spectrum than FM to deliver a large number of services.
- 5.4 DAB receivers add together signals arriving from different transmitters operating within the same SFN, rather than treating them as interference as an FM network would do. This provides improved reception as a DAB transmitter signal which is obscured at a particular location can be compensated for by a stronger signal arriving from another transmitter. However, signals arriving from distant transmitters within the same SFN, can cause interference if they arrive with a sufficiently long time delay that they fall outside what is known as the 'guard interval' which cannot be compensated for in the receiver. This can be a particular problem across sea paths such as between north east England and Norfolk.
- 5.5 All of the transmitters on an SFN must carry exactly the same services if they are not to cause interference to one another. For example if the BBC were to add BBC Radio Scotland to its national DAB multiplex it could only do so across the whole of the UK.

UK DAB frequency allocations

- 5.6 To deliver different local radio services in different parts of the UK a different DAB frequency block needs to be allocated to each adjacent local DAB multiplex to prevent co-channel interference (the interference between two different SFNs using the same DAB channel). Co-channel interference causes an effective reduction in the DAB service coverage area, in the same way as it does with other radio and TV services. So a number of different DAB frequency blocks are required across the UK.
- 5.7 In the UK, DAB currently operates using numbered frequency blocks (see Figure 5.1) which have been allocated for this use. (DAB blocks 10B to 12D, and block 5A, which is not currently used, but is proposed as part of this plan.)
- 5.8 The Digital One multiplex uses the block 11D in England and Wales and block 12A in Scotland, and does not currently broadcast in Northern Ireland. The BBC's national services are delivered across the United Kingdom using the block 12B. The 11A block frequency is currently unused and could be used to provide an additional

national DAB multiplex. To maintain an opportunity to expand the national DAB service offer in the future, this frequency block has not been included in the proposed post switchover DAB plan. The remaining blocks are allocated to local and regional multiplexes.

- 5.9 Because there are a limited number of DAB frequency blocks available, for local services the blocks must be re-used around the UK. The aim is to make the distance between blocks using the same frequency sufficiently far apart so as to minimise the interference between the areas.
- 5.10 In this plan we have proposed changing some frequencies to reduce further the level of interference suffered but due to the large number of local DAB multiplex areas, the limited number of DAB block frequencies available and practical limitations imposed by the sitting of existing transmitters, it has not been possible to completely remove the impact of co-channel interference on the reception of local DAB services in the whole of their editorial areas.
- 5.11 This re-planning of local DAB frequency allocations to reduce the impact of co-channel interference has, wherever possible, been carried out so minimise the need to change the frequency of existing DAB services, which requires re-engineering of transmission equipment.
- 5.12 Figure 5.1 shows our proposal for how local DAB services might be re-planned so as to improve coverage, and forms the basis of the network planning in this document.
- 5.13 The use of the previously unallocated frequency block, 5A, means it is likely that new antenna systems will be required at the transmitter sites, as there is a large frequency separation between this block and others. To minimise the cost of this, we have proposed to restrict the use of 5A to areas where local DAB services have not yet launched (Suffolk, Oxfordshire and Derbyshire).
- 5.14 Although it is allocated to DAB use, non-broadcast services currently operate within 5A. An assessment of the impact of new DAB use of 5A is currently being made. In addition, at some locations the use of the 5A frequency block is likely to require additional international clearance with other countries.
- 5.15 The internationally-agreed DAB blocks were planned to avoid international interference as much as possible, but we have not specifically sought to take international interference into account, as few DAB networks have been built abroad.
- 5.16 The plans to re-allocate frequencies are subject to international agreement, and can only be done upon requests from multiplex operators. It is likely that ultimately, interference considerations and frequency availability will constrain the extent of local DAB build-out.
- 5.17 It may be that we should consider further frequency changes to increase the level of coverage that may be achieved, although this is likely to be more expensive and require much greater international re-negotiation.

- 5.19 Another possibility which would improve coverage for the same number of transmitters is the merging of local multiplexes in some areas to create a larger area using a single frequency rather than smaller areas using two separate frequencies. This would free-up the pressure on the re-use of frequencies. It would not mean merging services, merely carrying a larger number of local services over a greater area. There would be commercial implications for stations (e.g. possibly increased transmission costs, and loss of local granularity for advertising sales). We therefore welcome views as to whether we should explore such options further.

DAB planning parameters

Field strength

- 5.20 DAB networks were originally planned to provide mobile reception in vehicles⁷. In practice a large amount of DAB listening is to portable radios used in the home. To deliver services to these receivers a higher signal strength is generally required to overcome the loss of signal inside buildings, so in 2006 planning assumptions for 'indoor portable' receivers were agreed⁸ (Annex G).
- 5.21 For both in-vehicle and indoor coverage planning the required field strength is defined in a standardised way, as for FM planning. This is specified as field strength required at 10m above ground level (with an adjustment made to reduce the height to 1.5m for in-vehicle listening). Different levels of field strength are required to provide reliable in-vehicle and indoor reception.
- 5.22 As for FM planning, based on research, we have created a link budget for DAB. This is an end-to end process which takes into account every stage from the signal leaving the transmitter to the sound coming out of the radio speaker.
- 5.23 To determine the levels of required field strength that need to be planned for, we first need to know what field strength a receiver's aerial needs for it to work effectively. Adjustments are then made to compensate for height loss, building loss (for indoor reception only) and how the signal varies across different locations to calculate the field strengths that, if delivered at 10m above ground level, will deliver the appropriate signal levels for in-vehicle and indoor reception.
- 5.24 If listeners are to achieve good reception over the whole planned coverage area it is important that the sensitivity performance of their receivers at least matches that assumed in the coverage planning model.
- 5.25 Working with the Technology and Equipment Group (TEG), DCMS and Ofcom jointly commissioned independent research on the performance of DAB receivers currently available in the market. The results of these tests are attached in Annex J. These show that whilst there is a large spread in the level of receiver sensitivity performance achieved by receivers, the performance level assumed in the planning model is met by many of the receivers, and so represents a realistic target.
- 5.26 It is anticipated that a minimum requirement to meet the level of receiver sensitivity performance assumed in the planning model will form part of the receiver specifications being developed by TEG. We expect that these specifications will have an associated product logo, enabling consumers to identify receiver equipment that provides them with a greater level of assurance that it will reliably operate in their planned DAB coverage area.

⁷ In this document and annexes, 'in-vehicle' and 'mobile' are interchangeable; we are considering mobile reception specifically because of DAB listening in vehicles.

⁸ 2006 ITU Digital Broadcasting Conference, Geneva

- 5.27 When the received DAB signal falls below the level required for robust (audibly error-free) reception the receiver will typically emit a burbling, scrambled audio sound for a short period before muting entirely. This may give listeners the impression that DAB reception is more ‘critical’ than FM which tends to degrade more gracefully, including the switching from stereo to mono reception. We understand that DAB receiver manufacturers are now exploring ways to minimise this effect.
- 5.28 Because of this difference in the way FM and DAB receivers behave, when planning DAB services, we have required a higher DAB signal strength so that audibly error-free reception is possible in a greater percentage of locations and for a greater percentage of time than for FM⁹.
- 5.29 Ofcom commissioned an independent assessment of the appropriateness of using these field strength values for predicting DAB coverage. The study concluded that these field strengths are valid for DAB service planning (Annexes G and I). Because of the different ways in which DAB services are listened to on indoor portable receivers and in-vehicle receivers, and in different building types, a number of different field strength targets are used to predict service coverage:

Figure 5.2: Minimum field strength definitions for DAB

Environment	Coverage type	Equivalent field strength dB(µV/m) measured at 10m	
		Rural & suburban	Dense urban
Indoor portable	Robust service	69	77
	Useable service	64	71
In-vehicle	Robust Service	58	

Percentage of locations

- 5.30 Like FM, DAB coverage is predicted using a software planning model. This uses a detailed terrain database so that the impact of hills, valleys and buildings on coverage can be taken into account. In producing this plan, Ofcom, the BBC and Arqiva have agreed a model for predicting coverage.
- 5.31 Location availability is a measure, generally given as a percentage, of how much of an area will receive a service. For example if a 100 by 100 metre square (a ‘prediction pixel’) is predicted to have 50% location availability a listener’s receiver should provide a good service in 50 out of 100 randomly chosen places in that pixel.
- 5.32 The reason for this measure is that the signal over each pixel of a prediction will always vary to some extent due to:
 - changes in ground height over the prediction area;
 - fixed physical objects such as buildings and trees (also called ground cover or clutter) and terrain that obstructs the direct signal from the wanted transmitter;
 - moving objects such as vehicles and people;

⁹ FM coverage is normally predicted to deliver an adequate signal level over a minimum of 50% of locations within a 100m square. That is to say that if a radio were to be placed in 100 random points over the 100 metre square area it would operate to the required standard in at least 50 of them.

- multipath effects (reflections) that can lead to a cancellation of the wanted signal.
- 5.33 All FM computer predictions are carried out on the basis that a standard receiver will provide a service in 50% of the actual locations within the prediction pixel. For FM radio, 50% location availability is sufficient to provide a service although at lower levels reception will be degraded, but this may be considered an acceptable service.
- 5.34 However, due to the way a DAB receiver either provides a service or not depending on its exact location (unlike FM which produces more hiss and distortion as the signal level decreases), a level of 50% would not be acceptable for DAB. In order to overcome this, a higher level of location availability is required. In practical terms, this can be achieved by increasing the required signal level at the given location.
- 5.35 Within an SFN there is also a possibility of reducing the signal variation across a pixel, and hence increasing the location availability, by using additional transmitters on the same frequency. This helps in two ways. Firstly the signals of all of the contributing transmitters can be combined to increase the overall signal and, secondly, if the path from one transmitter to a receiver is blocked by an obstruction, such as a building, it is possible that another transmitter might have a clear path.
- 5.36 For DAB we have used three different location availability figures:
- 99% is used for mobile services. A high requirement is necessary due to the need to deliver coverage to vehicles which can only follow a set route. At traffic lights, in congestion and at road works the vehicle might be stationary so locations where the receiver will not work need to be minimised.
 - 95% is used to indicate robust indoor coverage. This slightly lower value is considered acceptable on the basis that a portable receiver will be useable in the majority of locations within a property.
 - 80% is used to indicate a useful service. The previous two figures comply with international agreed figures while this, lower, threshold indicates that a service should be available to most receivers if well positioned.
- 5.37 It may be that for in-vehicle reception, completely robust coverage to 99% of locations is not required. This is because the way that the moving receiver decodes the signal means that a constant audio signal can be heard by the listener. So in practice, it would require three conditions to apply simultaneously for audio to be lost:
- The receiver would be in the 1% of locations;
 - The receiver would be static (e.g. stationary in traffic);
 - There would be a high-pressure lift 1% of time – this weather condition may occur for a couple of days a year.
- 5.38 This level of robustness may not be appropriate and may result in under-prediction of coverage. We will consider robustness further before publishing our final report.
- 5.39 The impact of using different levels of location availability is illustrated below in a local DAB multiplex area. This shows around 10 percentage point increase in coverage based on using the same transmitter network, if a slightly reduced percentage location target is used (see Figures 5.3 and 5.4).

Figure 5.3: Map of different percentage location parameters, Derbyshire

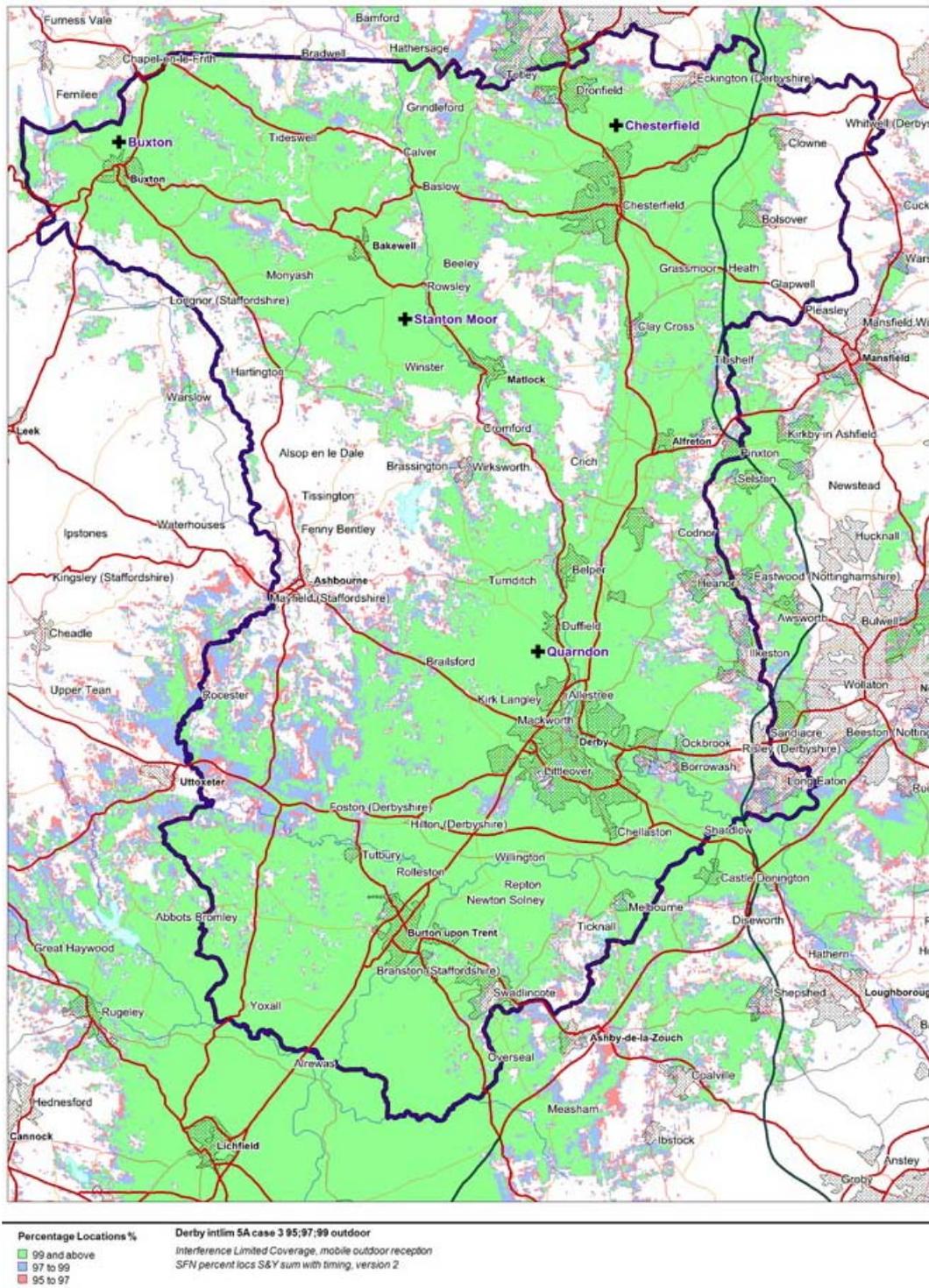


Figure 5.4: Table of different percentage location parameters, Derbyshire

In-vehicle coverage	99% time interference		
	95% locations	97% locations	99% locations
Case 1 (launch coverage)	74.3%	71.3%	63.0%
Case 3	82.3%	79.4%	71.0%

5.40 There is a similar issue with indoor coverage, although less significant, which is also only an issue for a few percent of time; this too needs to be investigated.

Percentage time availability

5.41 The level of co-channel interference between areas is not constant. During limited periods of the year atmospheric conditions can be such that signals from distant transmitters cause more interference than normal. Because of this, the target percentage amount of time that the services should be reliably receivable in the coverage area is another important consideration in the coverage planning process.

5.42 Local DAB (and DTT) services in some areas of the country, in particular those with flat terrain or a coastal location, such as Lincolnshire and Norfolk, are particularly susceptible to these problems, and residents of these areas may be familiar with similar problems occurring with TV and FM radio reception.

5.43 In planning DAB coverage, we have taken a very cautious view, planning for 99% time availability. This is the same availability target used for planning the BBC's national FM services but is more stringent than that used for planning commercial national and local FM stations, where a 95% availability target is used.

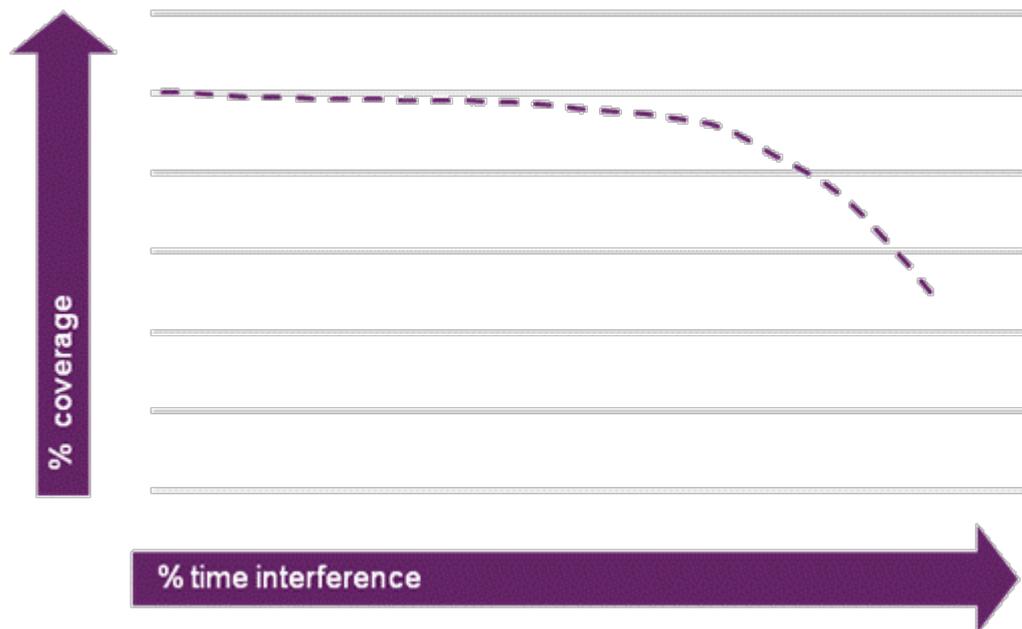
5.44 A consequence of using this cautious approach, if adopted, is either to reduce the effective coverage area or potentially to need to add significant numbers of additional transmitter sites.

5.45 However, adopting such cautious planning criteria causes problems for the planning of both local and national DAB networks. For local DAB networks adding further transmitters increases the interference experienced between re-used DAB block frequencies in different areas, whilst for national networks it increases interference between distant transmitters operating within the same SFN whose signals arrive with a delay that falls outside of the guard interval. So, in practice using additional transmitters to compensate for the effects of time varying interference can provide diminishing returns: whilst each new transmitter enhances coverage in its immediate area it can also increase the overall level of co-channel interference, reducing coverage in more distant areas.

5.46 An alternative approach might be to plan in the future for lower percentage time availability, such as 95% in areas that are particular susceptible to this type of interference.

5.47 Short term additional incoming interference from other transmissions using the same block of DAB frequencies does not typically occur to any great degree for more than a few days a year. It follows that the difference between DAB coverage predicted to be available for 50% of the time and, say, 95% of time, is likely to be minimal as the following diagram (Figure 5.3) illustrates.

Figure 5.3: Illustrative diagram showing the relationship between coverage and interference



- 5.48 See Section 7 for maps comparing 99% time availability with 50% time availability (Figures 7.9 and 7.10) which give a specific illustrative example of the effect of varying this parameter on the coverage achieved with a given transmitter network.
- 5.49 It is proposed to explore these options in greater detail in the next development phase of the post switch transmitter/coverage scenarios, including their impact on the consumer experience. However, due to the short percentage of time these propagation conditions occur it may take some time to research and analyse the issue fully.

Comparing FM and DAB coverage prediction

- 5.50 It is difficult to compare FM and DAB coverage on a like-for-like basis, because of the differences between the two technologies, as previously described.
- 5.51 One particular difference from the listener's point of view is the property of graceful degradation of FM: reception deteriorates gradually as the listener moves out of a coverage area, whereas DAB is either receivable at high quality or not at all.
- 5.52 These differences underlie but are compounded by differences in the planning and prediction models we use for FM and DAB. With DAB we have to plan for perfect reception; with FM we can plan for acceptable reception. FM is not planned to the same level of coverage as DAB is.
- 5.53 From the listener's point of view, our approaches to DAB and FM planning should result in a superior experience when substituting DAB for FM, particularly at the margins of FM coverage prediction. Some listeners who presently get a poor level of FM service will get perfect DAB reception.
- 5.54 This has consequences for the cost and feasibility of DAB build-out; this theme is returned to in our concluding chapter, and our research during the next phase will explore what the trade-offs might be in terms of coverage and cost.

- 5.55 We need to better understand whether the different failure characteristics of FM and DAB justify different percentage targets or not, and will be taking forward research to explore this.

Section 6

DAB planning, national and local

Planning the build-out of DAB coverage

- 6.1 Having previously outlined the steps taken to establish an approach to DAB planning, this section takes that model and uses it first to predict existing DAB coverage, and then to examine the task of building out DAB to FM equivalence, within the editorial areas proposed in Section 3.
- 6.2 This approach results in a range of options for building out DAB for a number of reasons:
- The difficulties (discussed in section 4) in establishing a single standard of FM coverage, due to the wide range of devices and circumstances in which FM listening takes place.
 - The commercial and operational decisions that will need to follow this theoretical exercise, when the actual service and transmission providers make plans in the light of their businesses and local realities. It is likely to be more useful to have a theoretical model which includes a range of options in terms of transmitter sites, and specific details for each, than to have a single answer at this stage of the DAB switchover process.
 - The different coverage objectives of commercial operators, who seek a commercially viable transmission infrastructure, and the BBC, which has a mandate for universal provision of its services; it is not within the scope of this planning exercise to broker a deal between those different parties.
 - The decision to build out DAB coverage to a certain level before switching off FM services requires an evaluation of costs and benefits that can only be made as a matter of public policy. The DRAP outlines the process that will lead to these further decisions being taken, and DCMS will take this process forwards.
- 6.3 So to enable future decisions to be made by Government on DAB switchover, we propose an approach of planning up to near-universal DAB coverage within the agreed editorial areas. This technical exercise will create a set of options for decision makers.

A staged approach to local coverage build-out

- 6.4 Coverage build-out is an inherently incremental process. From the baseline of current multiplex coverage (planned coverage, in the case of multiplexes licensed but yet to launch), the obvious way to increase coverage is the addition of further transmitters to the single frequency network.
- 6.5 However, before making any such additions, it may be economically more effective to upgrade the capabilities of individual transmitters already operating within the SFN.
- 6.6 A typical local DAB SFN consists of a small number of high-power transmitters to which various smaller transmitters are added to serve those areas not already covered by signals from the larger transmitters that form the core of the network.

- 6.7 As the coverage of a broadcast transmission network is rolled-out to cover a greater percentage of the desired service area, there is a case of diminishing returns. The first transmitters built into the network will tend to achieve the greatest coverage in terms of both area and population. As additional transmitters are added to the SFN, each will tend to increase the total network coverage achieved by a lesser amount than each of those which are already broadcasting.
- 6.8 It follows from the above that the marginal cost of providing coverage for additional listeners increases as total coverage expands. A table can be drawn, with transmitters in diminishing order of coverage added. For commercial broadcasters there would be a cut-off point on this table below which increasing coverage ceases to be economically viable (the cost of the additional transmitter is greater than the incremental income which would be generated by that addition). For the BBC, there would be a lower cut-off point on this table, at which the competing demands of universal service and value for money were reconciled. Therefore in creating tables, the approach taken here is to keep adding transmitters until the final transmitter adds a magnitude of incremental coverage benefit that is unlikely ever to be viewed as providing value for money.
- 6.9 Because economic modelling and discussions of value for money are beyond the scope of this consultation document, the planning process used for local multiplexes has deliberately over-planned the proposed DAB network on the assumption that not every one of the proposed transmitters would be built in practice. Furthermore it is not possible to guarantee that specific sites identified will be available.
- 6.10 Because the process of modelling road coverage (outdoor) is different to the process of modelling population coverage (indoor; households), separate tables of incremental coverage added by transmitters need to be created for both.
- 6.11 Drawing up incremental transmitter coverage tables for roads and indoor coverage, up to near universal coverage, provides an effective continuum along which a build-out point can be selected. However, it is possible to identify discrete stages along this continuum, and for the purposes of informing a Government decision about the viability of DAB switchover, we consider that it would be helpful to identify build-out scenarios associated with these stages, to simplify the information that this modelling will provide.
- 6.12 The baseline is either current coverage provided (for launched multiplexes), or current coverage assumed from the technical plans in licence awards (for un-launched multiplexes).
- 6.13 It should be noted that in this document and accompanying annexes we calculate current coverage with the new coverage prediction parameters that this document introduces. Effectively these are tougher criteria than were used before, which means that further planning done from this point onwards can result in a greater consumer confidence around the reception of DAB services. This does mean, however, that existing coverage predictions will be not be comparable with the new ones. In particular, until it is updated, the current post code database used by Digital Radio UK for consumers to predict DAB coverage may not be comparable. Digital Radio UK is working to update this.
- 6.14 **Scenario 1.** The logical first step of any upgrade is various improvements to existing transmission infrastructure. Existing DAB transmission facilities can be upgraded in various ways. For example, the power of transmissions can be increased, effective antenna height can be increased (thereby improving coverage) and, in some cases, existing directional restrictions on the performance of the antenna's radiation pattern can be modified or removed.

- 6.15 **Scenario 2.** The next step is to add additional transmitters targeted at geographical areas where FM coverage is robust, but which are not well served by DAB yet. In this second stage of DAB network upgrading it makes sense where possible to add other transmitter sites which are already used for broadcasting (especially other DAB networks) and which therefore have much of the required background technical infrastructure (power supplies, data links etc.) already in place. This stage of network expansion could include one or more additional high-power transmitters as well as further smaller-fill-in transmitters.
- 6.16 **Scenario 3.** The third and final stage of DAB network expansion involves providing coverage to any remaining centres of population which have not been reached as a result of measures taken in the preceding two stages of expansion. At this point it is likely that many of the sites involved may not previously have been used for broadcasting and that infrastructure costs will climb as a result. Furthermore, the number of additional listeners served and additional road mileage covered per each new transmitter will begin to decline sharply. It is probable that at some point during this third stage of network expansion the point of value-for-money universal build-out would be passed, as the majority of the sites identified will need to be built from scratch and at possible high cost per additional listener.
- 6.17 These stages are not so easily applicable to the national multiplexes, where coverage is already at a higher level than most local multiplexes, but for the bulk of the planning exercise – the local layer – they provide a helpful way of understanding the magnitude of the build-out tasks.

National DAB planning

The BBC national multiplex

- 6.18 The BBC has given a commitment as part of last year's licence fee settlement to 'enhance its national DAB coverage in the period of this agreement, and to match its national FM coverage as a switchover date draws near'¹⁰.
- 6.19 The first stage is establishing the base-case, our current coverage scenario, but calculated using our new planning parameters. At the date of publication, this contains 196 transmitters, with 230 expected to be operational by the end of 2011. The base-case is described in full at Annex C.
- 6.20 The BBC plans to improve its DAB coverage to reach around 97% of the UK population. This involves a process of looking at transmitter sites used in the local DAB planning, and assessing whether there is merit in using them to extend the national network; a process that is underway but not concluded. The latest - but not the definitive - version of this plan is also in Annex C.
- 6.21 At this point in the BBC's process it has shared two build-out scenarios, through the Planning Advisory Group under the Coverage DRAP group. These are analogous to our scenarios 1 and 2 at the local level.
- A list of transmitters that are already being planned for build-out within this year, up to a total of 230;
 - A list of transmitters that may be options for national DAB build-out, but about which operational and prioritisation decisions have yet to be taken.

¹⁰ http://www.bbc.co.uk/bbctrust/assets/files/pdf/news/2010/sos_letter.pdf

The national commercial multiplex

- 6.22 Digital One has provided a possible scenario which sets out a series of improvements and additional sites. It aims to identify what developments of the existing Digital One network are needed to deliver reception which is comparable to Classic FM's analogue transmitter network.
- 6.23 Wherever possible Digital One have sought to deliver contiguous digital radio coverage for both mobile and in building reception. The work has not been commercially driven – either by Arqiva as a transmission provider nor by the commercial criteria of Digital One's customers. Digital One says that several of its customers believe the current main network of 133 transmitters includes sites which, according to the radio station's business criteria, are already non-economic. However, Digital One believes that the improvements proposed should be economically sustainable as the route and timetable to switch over continues to be clarified.
- 6.24 In its planning work Digital One has not sought to ensure that each and every house or road which the model suggests has FM reception will also receive DAB reception, as they believe this would have been wasteful and simply uneconomic for Digital One's customers. By way of example, in some cases the nature of FM propagation means that in order to deliver robust coverage in a densely populated area a particular site is used at a particular power and as an unintended consequence the FM signal also reaches very sparsely populated hillsides which Classic FM was never seeking to cover. At the same time, the limited FM spectrum available to Classic FM means that some towns have poor coverage, or no coverage. In this process Digital One has not sought to bring DAB coverage to every sparsely populated hillside but has sought, where possible, to reach towns and major roads where Classic FM does have coverage and in addition to some areas where Classic FM's analogue coverage is poor or inadequate.
- 6.25 The proposed improvements and additional sites include several sites in Northern Ireland. As yet, Digital One has not applied to extend its licence to Northern Ireland or discussed the detail of the sites in Northern Ireland with service providers (i.e. the owners of stations and services on Digital One).

Section 7

DAB planning: a local case-study

7.1 This chapter provides an example of how DAB coverage could be built to match existing FM coverage for the Manchester local editorial area.

Current FM coverage of Manchester

7.2 Analogue FM local radio services for the Manchester area are currently delivered using high-power transmitters on high ground to the north-east of the city. BBC Radio Manchester is broadcast from two transmitters (Holme Moss and Saddleworth) with the largest local commercial service, Key103, using one (Saddleworth).

7.3 The following table sets out the population and road coverage achieved by each of these two FM local radio services. It then sets out the composite coverage achieved both services taken together; that is to say taking into account all locations served by one, other or both stations.

Figure 7.1: Current Manchester local FM coverage

Manchester	Households		Major roads	
	No.	%	Km	%
Total in editorial area	1,422,055		1,591	
BBC				
54dBµV/m	1,221,650	85.9%	1,286	80.8%
48dBµV/m	1,355,349	95.3%	1,462	91.9%
42dBµV/m			1,505	94.6%
Key 103				
54dBµV/m	1,020,625	71.8%	897	56.4%
48dBµV/m	1,259,325	88.6%	1,228	77.2%
42dBµV/m			1,273	80.0%
Composite				
54dBµV/m	1,272,889	89.5%	1,335	83.9%
48dBµV/m	1,367,556	96.2%	1,477	92.9%
42dBµV/m			1,518	95.4%

See figure 4.1 for definitions of coverage

7.4 The following three maps show the FM coverage of each service, then the composite coverage¹¹.

- FM coverage at signal strengths equal or greater than 54dBµV/m is shown in green;
- coverage at between 48dBµV/m and 54dBµV/m is in blue;
- coverage at between 42dBµV/m and 48dBµV/m is shown in yellow.

¹¹ Larger versions of these maps, and more detail about the Manchester plan, can be found in Annexes A and B

Figure 7.2: BBC Radio Manchester FM coverage

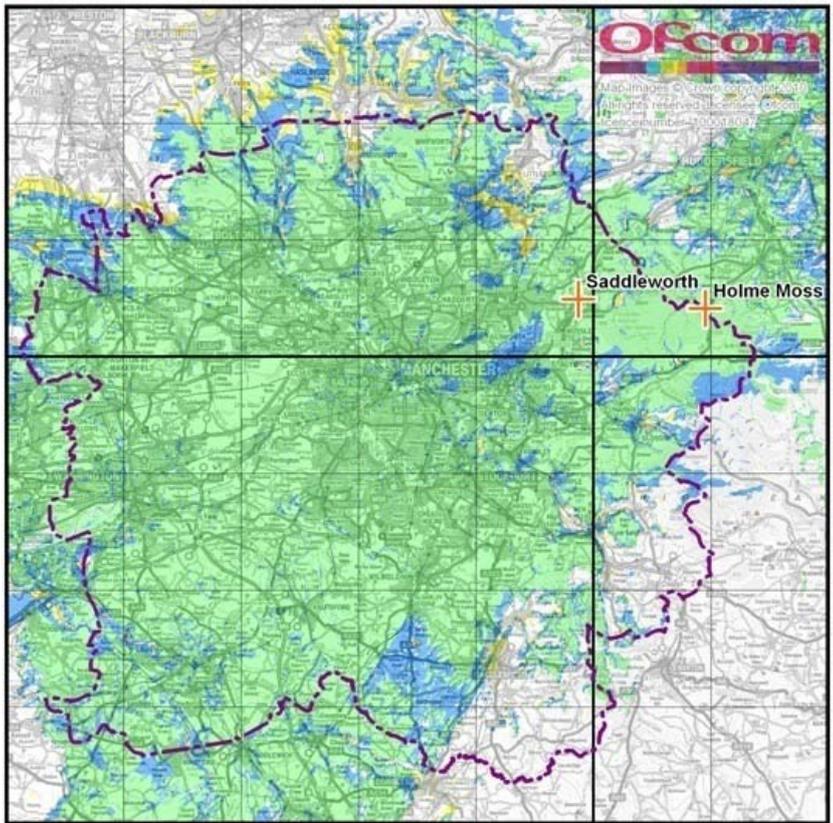


Figure 7.3: Key 103 FM coverage

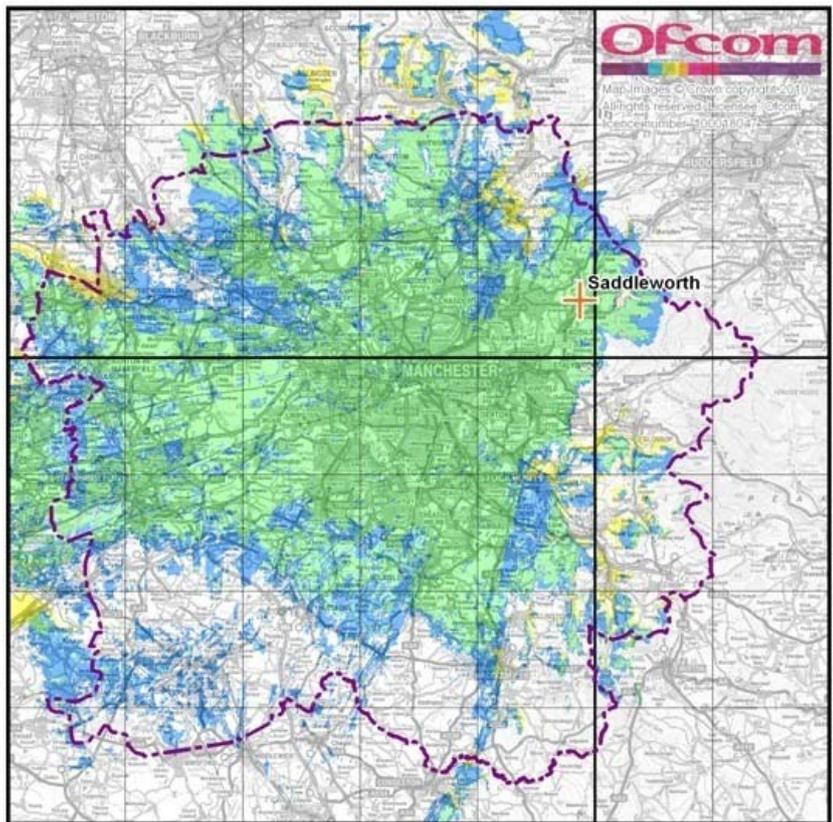
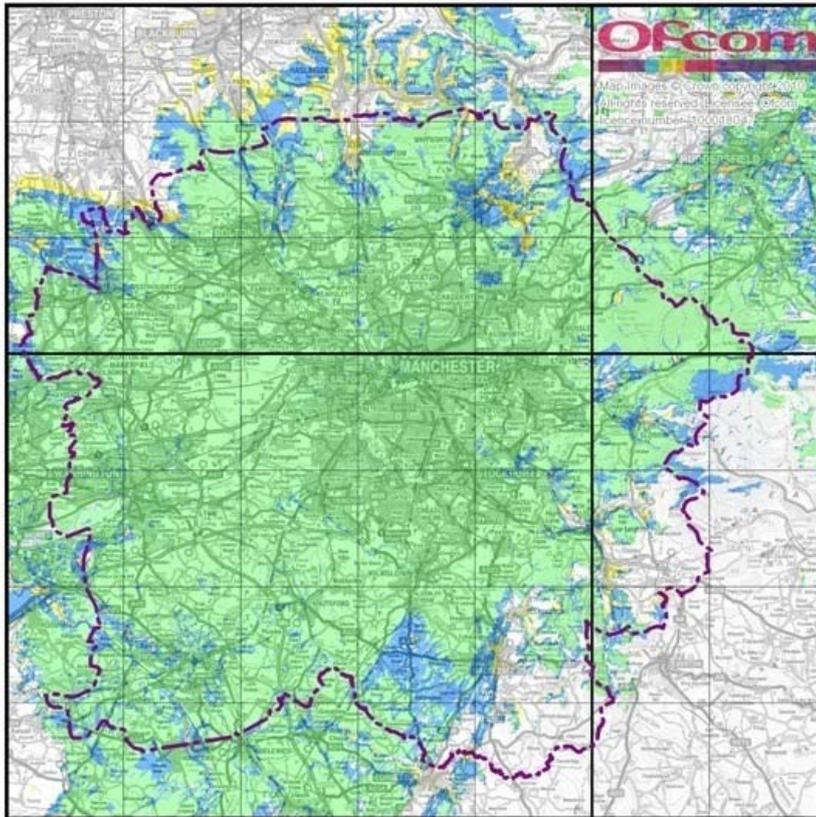


Figure 7.4: BBC Manchester plus Key 103, composite FM coverage



- 7.5 These maps represent coverage for 95% time, taking into account the occasional effects of short-term interference from distant stations which can occur under particular weather conditions for a few days each year.
- 7.6 As can be seen from the preceding table and maps, existing FM local radio coverage in the Manchester area is better for the BBC than for Key 103. Composite coverage is good, focused on serving populated areas well and only substantially absent from sparsely populated areas, particularly in the foothills of the Pennine Range to the south-east of the city.
- 7.7 The absence of substantial areas of coverage at signal strengths of between 42dB μ V/m and 48dB μ V/m (shown in yellow) is due to the presence of incoming interference on the frequencies involved which, in many instances, is sufficiently strong to prevent adequate reception of wanted signals at these levels.

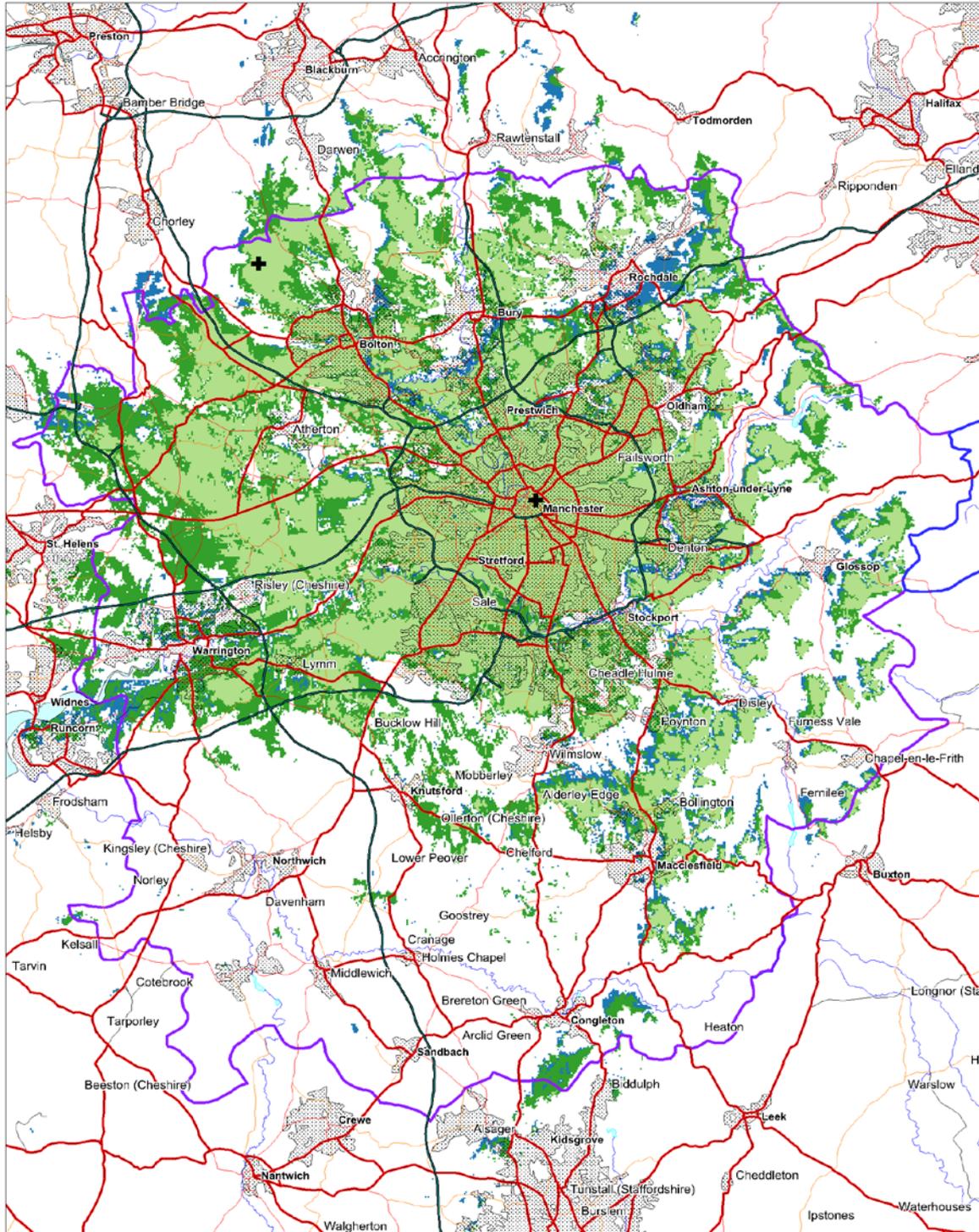
Current DAB coverage of Manchester

- 7.8 Local DAB services in the Manchester area are currently delivered using frequency block 11C, by two transmitters, one at Winter Hill and one at City Tower.
- 7.9 The current network achieves a lower level of coverage than the composite existing FM coverage. Figure 7.6 below shows the existing coverage of Manchester DAB services operating on the 11C DAB frequency block. Although the centre of Manchester is already well-served by the transmitter broadcasting from City Tower, the map clearly shows considerable gaps in coverage of the wider Greater Manchester area.

Figure 7.5: Current Manchester local DAB coverage

Type	DAB Coverage (households)	
Indoor	1,092,506	76.8%

Figure 7.6: Current block 11C Manchester coverage

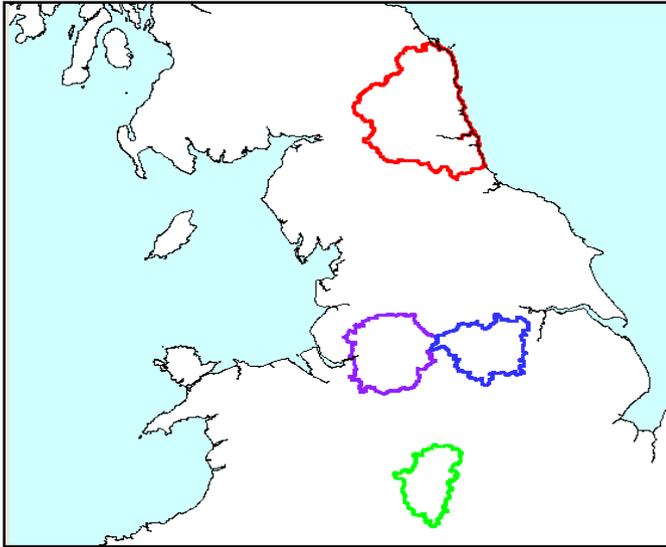


Percentage Locations % CE Manchester current interference limited coverage 11C
 Robust indoor Interference Limited Coverage
 Indoor SFN percent locs S&Y sum with timing, version 2
 Mobile outdoor

Changing the Manchester local DAB frequency

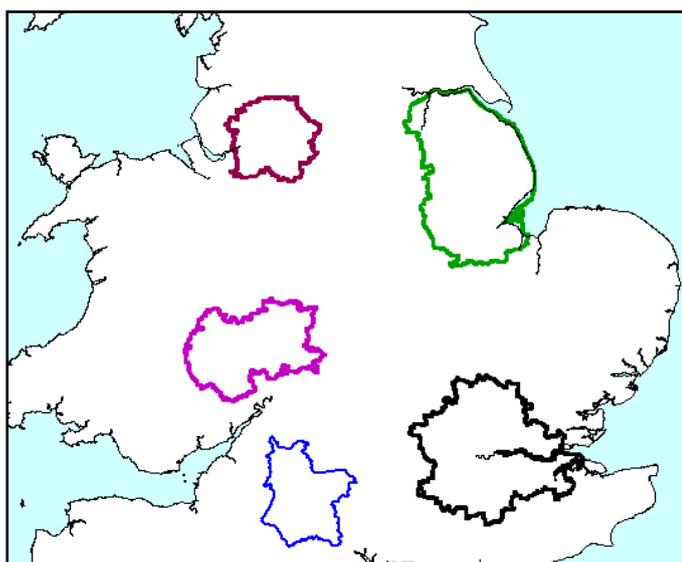
7.10 The 11C DAB frequency block is also currently used in the North East of England (Tyne & Wear), in Birmingham and, critically, in the adjacent South Yorkshire area. It is also internationally allocated for use on the Isle of Man.

Figure 7.7: Current block 11C allocations



- 7.11 The geography of the Pennine Ridge helps minimise unwanted co-block interference between the Manchester and South Yorkshire local DAB areas. However, despite taking advantage of this terrain blocking, the current DAB transmissions from Winter Hill still have to be constrained, both in terms of antenna height and transmitter radiated power. Without such constraints, signals from Winter Hill would cause interference to local DAB coverage in both South Yorkshire and Birmingham.
- 7.12 Our first stage of improving local DAB coverage is to look at options for improving the performance of existing transmitters. However in Manchester (and for some other local DAB editorial areas), because of outgoing interference issues it is not possible to improve the performance of existing transmission infrastructure without first changing the frequency of the network.
- 7.13 It is therefore necessary to find an alternative DAB frequency block for this service, to ensure that co-block interference between it and other areas operating on the same frequency block are minimised.
- 7.14 Our proposed frequency re-plan allocates block 10B for future use in Manchester, Lincolnshire, Herefordshire & Worcestershire, West Wiltshire, and Greater London.

Figure 7.8: Proposed block 10B allocations

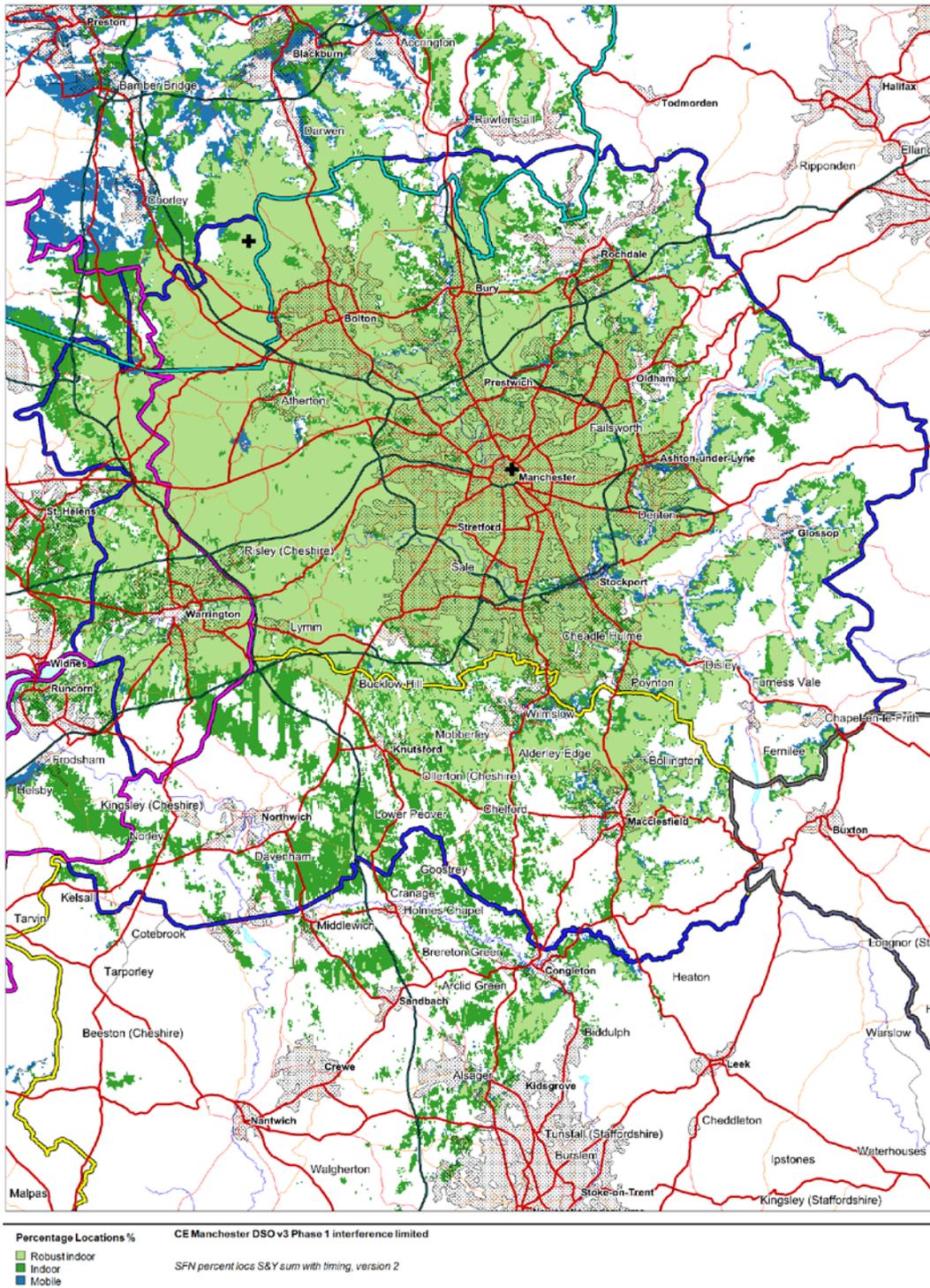


- 7.15 Predictions indicate that if they all use the same 10B block, Greater London and West Wiltshire would be largely unaffected by Manchester, and that there would be only minor adverse impacts to parts of Hereford & Worcestershire.
- 7.16 The coverage of local DAB services in the Lincolnshire area would suffer interference from Manchester, but most of the interference would be in the north of the Lincolnshire area, which is also served by the local DAB multiplex for Humberside.

Scenario 1: improving existing infrastructure

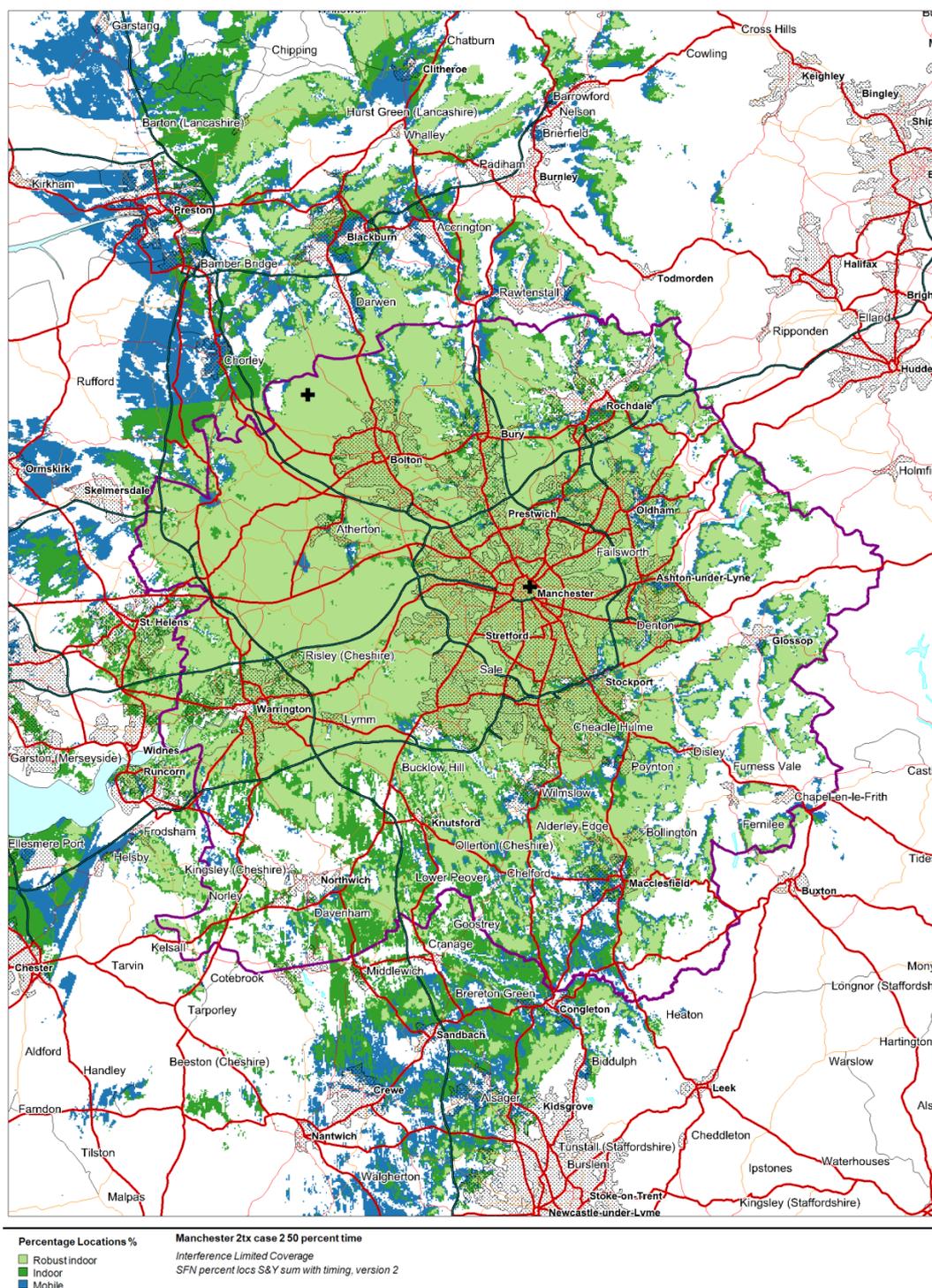
- 7.17 With a DAB block frequency change identified, it is then possible to begin to look at ways in which the existing infrastructure can be enhanced to improve coverage.
- 7.18 Notable improvements to coverage can be achieved by modifying the Winter Hill site. This site can accommodate both a higher antenna, and an increase in radiated power output from 250W to 2kW ERP. (Because it is a city-centre installation already running at 500W ERP, it is not possible to modify City Tower.) The coverage resulting from these technical improvements and the frequency change is shown at Figure 7.9.

Figure 7.9: Predicted block 10B Manchester coverage (modified Winter Hill site)



7.19 In each of the preceding maps, coverage is only shown where it is predicted to be available for 99% of the time. Most of the time, the coverage will be considerably better than this. Figure 7.10 shows the coverage predicted for at least 50% of the time. (See discussion of time availability in section 5)

Figure 7.10: Predicted block 10B Manchester, 50% time (modified Winter Hill site)



7.20 But even when coverage is predicted to be available for at least 50% of the time, rather than for 99% of the time, some gaps in coverage remain at particular locations. Terrain blocking and signal reductions caused by building obstructions are the primary causes of such coverage gaps, which can only be overcome by the installation of additional transmitters at different locations.

Scenario 2: additional transmitters

7.21 The next stage of improving DAB coverage is to add further transmitters to provide in-fill coverage, focused on areas where existing FM coverage is robust.

7.22 In the case of local DAB services for Manchester ten additional sites were added as shown in the table below:

Figure 7.11: Manchester expanded DAB transmitter network (Scenario 2)

Transmitter site	Incremental increase in households	Incremental increase in households (%)	% of Editorial Area
Current two sites			81.6
Crompton Moor	93,440	6.57	88.2
Sutton Common	62,883	4.42	92.6
Saddleworth	23,671	1.66	94.3
Glossop	20,003	1.41	95.7
Beech Hill	11,279	0.79	96.5
Romiley	5,067	0.36	96.9
Warrington	5,582	0.39	97.2
Littleborough	4,149	0.29	97.5
Torhead reservoir	24	0.00	97.5
Woodhead reservoir	5	0.00	97.5

7.23 These sites increase the coverage of the Manchester editorial area to 97.5%. Figure 7.13 shows the coverage map.

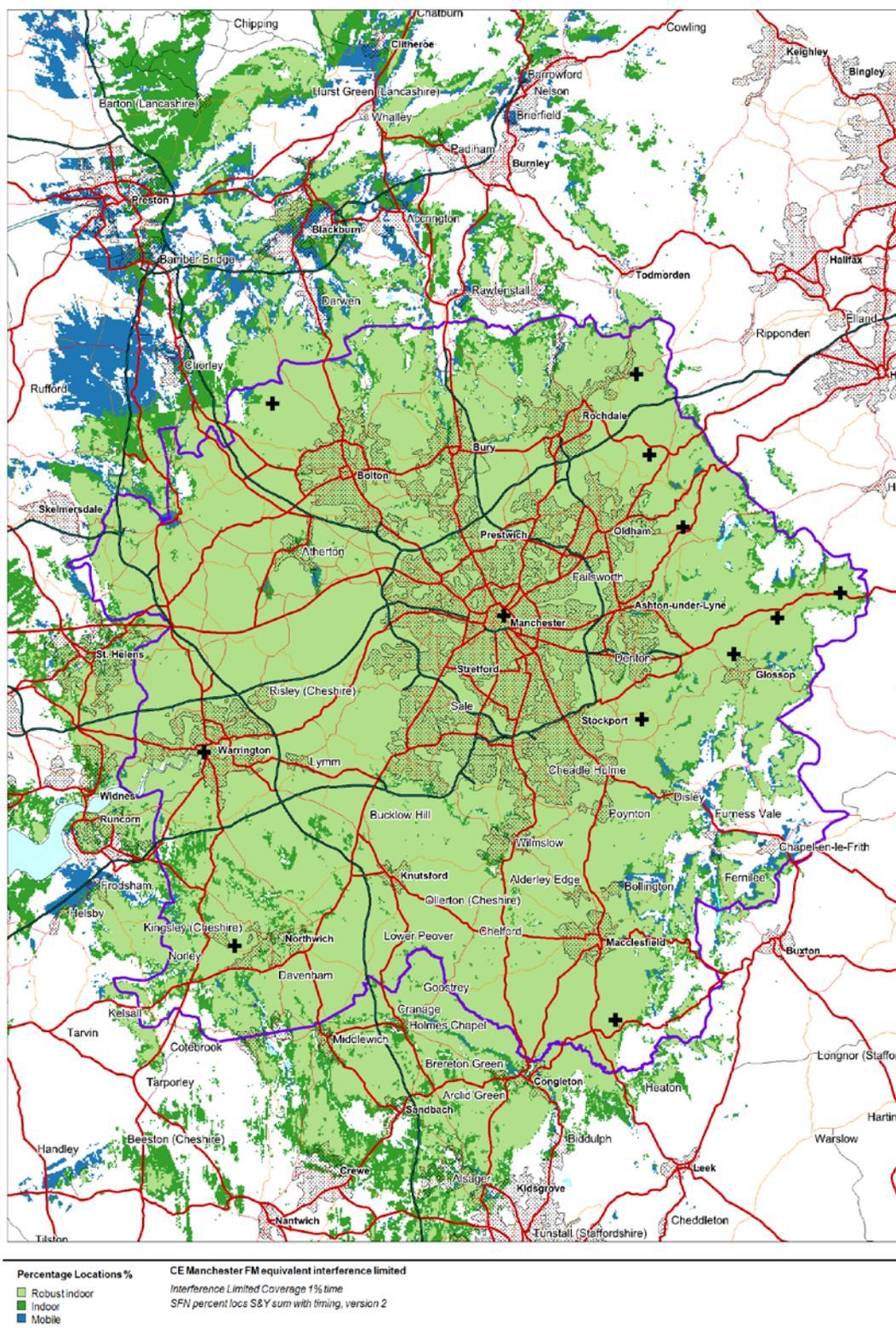
7.24 Because there are various overlaps of signals from the different transmitters, the order in which new sites are added to the network influences the amount of additional coverage each will achieve.

7.25 Two of the new sites – Torhead Reservoir and Woodhead Reservoir – serve an insignificant number of additional households, but were added because of the extra in-vehicle coverage they achieve. The road coverage achieved is as follows:

Figure 7.12: Manchester expanded DAB road coverage (Scenario 2)

Transmitter site	Increase in road length (km)	Incremental % increase in road length	% of roads within Editorial Area
Current two sites			66.0
Crompton Moor	123	7.7	73.7
Sutton Common	152	9.5	83.2
Saddleworth	51	3.2	86.4
Glossop	31	1.9	88.4
Beech Hill	45	2.8	91.2
Romiley	8	0.5	91.7
Warrington	12	0.8	92.4
Littleborough	5	0.3	92.7
Torhead reservoir	4	0.3	93.0
Woodhead reservoir	7	0.5	93.5

Figure 7.13: Predicted block 10B Manchester coverage (Scenario 2)



Scenario 3: near-universal coverage

- 7.26 The final stage of the planning exercise examines what additional transmitters might be required to achieve near-universal coverage.
- 7.27 In the case of the Manchester editorial area, the addition of three further sites, highlighted in the table below, increased coverage by a relatively small amount.

Figure 7.14: Manchester expanded DAB population coverage (Scenario 3)

Transmitter site	Incremental increase in number of households	Incremental percentage increase of population	% of Editorial Area
Current (11C)			66.4
Winter Hill (modified)	232,299	16.3	82.8
Sutton Common	91,189	6.4	89.2
Saddleworth	46,917	3.3	92.5
Glossop	21,434	1.5	94.0
Beech Hill	11,585	0.8	94.8
Crompton Moor	30,217	2.1	96.9
Warrington	4,628	0.3	97.2
Ladder Hill	13,215	0.9	98.2
Romiley	2,805	0.2	98.4
Birch Vale	3,979	0.3	98.7
Littleborough	2,987	0.2	98.9
Whitworth	2,847	0.2	99.1
Torhead reservoir	27	0.0	99.1
Woodhead reservoir	0	0.0	99.1

7.28 Between them, these additional three sites provide coverage for just over an additional 90,000 households (approximately 1.5% of the total population within the Manchester editorial area), taking the total to 99.1% of the editorial area.

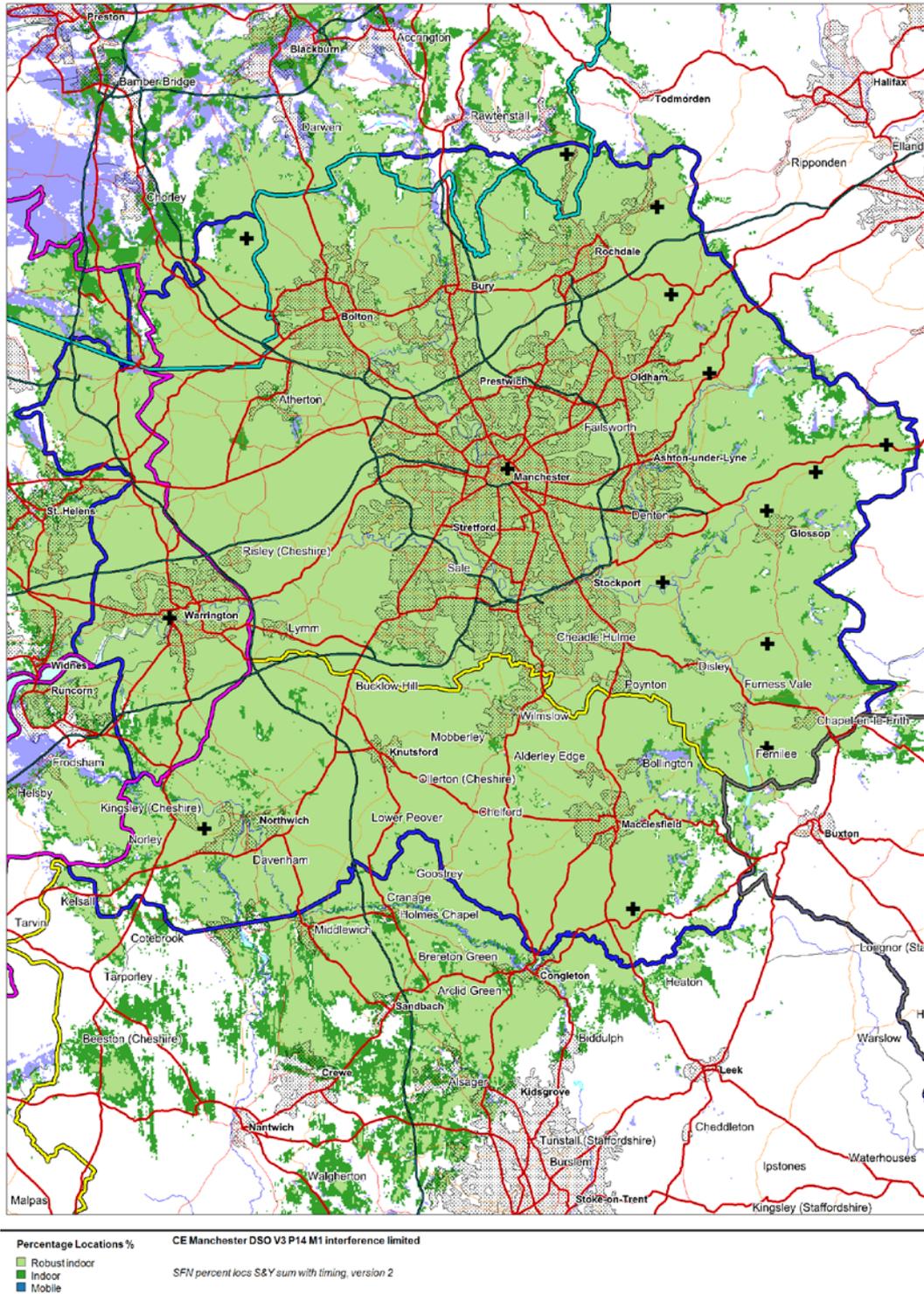
7.29 The road coverage achieved by this complete 15 transmitter network is set out in the table below:

Figure 7.15: Manchester expanded DAB road coverage (Modified Network 3)

Transmitter site	Increase in road length (km)	Incremental % increase in road length	% of roads within Editorial Area
Current (11C)			55.2
Winter Hill (modified)	206	12.19	67.4
Sutton Common	189	11.2	78.6
Saddleworth	80	4.7	83.3
Glossop	35	2.0	85.4
Beech Hill	48	2.8	88.2
Crompton Moor	59	3.5	91.7
Warrington	9	0.5	92.2
Ladder Hill	34	2.01	94.2
Romiley	4	0.26	94.5
Birch Vale	11	0.65	95.1
Littleborough	5	0.28	95.4
Whitworth	4	0.25	95.6
Torhead reservoir	4	0.25	95.9
Woodhead reservoir	6	0.34	96.2

7.30 This coverage achieved by this complete 15 transmitter network is shown in the following map.

Figure 7.16: Predicted clock 10B Manchester coverage (Modified Network 3)



7.31 The following table summarises the coverage achieved in the four cases.

Table 7.17 Summary of coverage within editorial area for each case

Case	Indoor (households)	Indoor (%)	Mobile (km)	Mobile (%)
1	944,951	66.4	935	55.2
2	1,177,251	82.8	1,142	67.4
3	1,389,660	97.7	1,584	93.5
4	1,409,080	99.1	1,630	96.2

7.32 It is beyond the scope of this consultation to consider the costs of network roll-out, but it may be the case that some of the transmitters in this example (and in other local DAB areas) may not be considered by multiplex operators to be economically viable to implement.

7.33 Because of the number of variables involved, when developing coverage proposals for local DAB editorial areas, it is sometimes the case that additional implementation options become apparent during the planning process. The Arqiva local DAB planning document for Manchester (which this section of the consultation is based on) also sets out one such alternative approach (Appendix B). The relative merits of any such options are a matter for multiplex operators.

Section 8

Interim conclusions

- 8.1 This consultation document has proposed an approach to building out DAB coverage to FM equivalence, leading to a range of options for future transmitter deployment. This will allow Government to make a more informed decision about DAB switchover, as described in the Digital Radio Action Plan; and it will allow service and multiplex operators to make more informed decisions about their individual strategies and business plans within the radio policy framework that Government wishes to take forward.
- 8.2 What this approach does not do is provide a single answer to the question, *what does it take to match DAB to FM?* This is for the reasons discussed in previous chapters: there is no single definitive view of what FM coverage is, there are differences between FM and DAB broadcast technologies, and there are different levels of DAB coverage depending on the circumstances of listening and equipment being used. However it does provide some specific predictions in terms of transmitter numbers to achieve difference coverage scenarios.
- 8.3 This final chapter summarises these predictions. These follow from the approach taken, the current structure of FM and DAB transmission services, and the planning assumptions made. The predictions can only be interim conclusions. The assumptions they rest on are the subject of this public consultation. Some of these assumptions are being further examined (see below).
- 8.4 Furthermore, these conclusions are dependent upon a frequency re-plan for DAB transmission. We will need to seek agreement with our international neighbours; specifically Belgium, France, The Netherlands and the Republic of Ireland. There may be some issues where these administrations have not finalised their use of DAB spectrum. So we might need to adjust our proposals accordingly.

Summary data

- 8.5 While we have tried to match the consumer experience, FM and DAB are different in kind. These tables specify both good and variable FM coverage but only good DAB coverage. However, the levels are not directly comparable between FM and DAB. Because of the way FM reception fades gradually compared to DAB, the standard we have set for DAB coverage is far higher than for existing FM. For example, the criteria we have used for road coverage for FM is that any 100m square is regarded as served if reception is available at 50% of locations within that square for 95% of the time. For DAB we have used 99% of locations for 99% of the time.
- 8.6 Our plans suggest that good DAB indoor coverage can be built to match good FM coverage, even using our very cautious DAB planning assumptions. For roads, our strict measure of good DAB coverage shows lower coverage than good FM, but there are indications that successful in-vehicle DAB reception may not require coverage planned for such a high percentage of locations. Our estimates suggest that even a minor relaxation in the assumptions (to 97% of locations for 99% of the time) would increase coverage by up to ten percentage points. This, together with other possible changes we suggest below, such as further frequency changes, give us confidence that DAB road coverage can be built to match FM.

- 8.7 Our planning exercise, using the strictest planning criteria for DAB, gives the following results for DAB build-out in terms of additional transmitters, for our build-out scenarios:

Figure 8.1: Summary coverage data

BBC national (Radio 1 to 4) ¹²	Existing FM coverage	Existing DAB coverage	DAB by end of 2011	97% DAB coverage
Households (robust)	94.9% ¹³	92.2%	93.8%	97.2%
Households (variable)	99.1%			
Roads (robust mono)	93.1%	73.4%	76.6%	82.4%
Roads (variable mono)	95.8%			
No. of transmitters	215 per service	196	230	404

Further transmitters would be required to match variable indoor and road coverage. The figures for individual nations are shown in Annex C.

Commercial national	Existing FM coverage (Classic FM)	Existing DAB coverage	.Further build-out
Households (robust)	90.9%	84.6%	91.5%
Households (variable)	97.4%		
Roads (robust mono)	86.8%	63.5%	69.2%
Roads (variable mono)	90.3%		
No. of transmitters	42	138	168

Note: there is no technical reason why Digital One's coverage could not be similar to the BBC's. The extent of build out here has been determined by matching Classic FM's coverage and Digital One's view of what might be built. The 42 FM transmitters provide only 1 service, while Digital One's DAB network currently carries 13 services.

Local	Existing FM coverage	Existing DAB coverage	Scenario 1	Scenario 2	Scenario 3
Households (robust)	92.6%	66.2%	75.8%	92.7%	95.6%
Households (variable)	97.9%				
Roads (robust mono)	91.5%	42.9%	56.1%	79.8%	83.1%
Roads (variable mono)	95.5%				
No. of transmitters	n/a	145	199	572	699

Ongoing work for the Coverage and Spectrum Planning group

- 8.8 The process of planning DAB build-out within these areas has identified a number of trade-offs between coverage achieved and other factors. We plan to conduct further research and planning so that these issues can be more fully explored in our final report to Government.
- 8.9 The planning of DAB build-out through this process has revealed new information about a number of critical issues. The specific plans in this report can only be a snapshot in time, and the timetable of this project has not allowed for substantial revision. We therefore present the current set of plans at this moment in time, while proposing to take forward new work which will examine these emerging issues.
- 8.10 Our final report to Government on DAB Planning will reflect both the issues discussed in this consultation and further work on the emerging issues. It will not be

¹² BBC nations' radio services are included in the local coverage figures.

¹³ All coverage predictions in this document are rounded to one decimal place

possible, however, to present the further work for public consultation while delivering a report to the timetable in the Digital Radio Action Plan.

- 8.11 The process of planning DAB coverage has identified a number of trade-offs between coverage achieved and other factors. On the basis of the planning work so far, we believe that matching DAB coverage to indoor FM coverage is feasible, but there are potentially issues around road coverage, although these may be due to the cautious planning criteria we have adopted. We will conduct further research and planning to more fully explore these issues in our final report.
- 8.12 Over the next few months, the Planning Working Group will examine the implications for DAB coverage and the consumer experience of:
- Varying our technical assumptions, in particular whether road coverage needs to be planned for 99% of the time and for 99% of locations, other technical characteristics of the DAB broadcast signal, and the differences between FM and DAB as technologies (for example whether the way that FM reception deteriorates gradually as the listener moves out of a coverage area rather than more abruptly with DAB justifies setting more robust percentage location and time availability targets for DAB than FM);
 - The trade-off between adding more transmitters and the increase in self interference within the DAB network that brings;
 - Changing local editorial areas, in particular by merging together some areas to make better use of frequencies (this does not imply merging the radio services, just carrying the same local stations over a wider area); and
 - Frequency changes further to those we have already proposed.
- 8.13 We anticipate that both the BBC and Arqiva will develop their build-out plans further, as these issues are examined; their plans presented here are not final.

Annex 1

Responding to this consultation

How to respond

- A1.1 Ofcom invites written views and comments on the issues raised in this document, to be made **by 5pm on 14 September 2011**.
- A1.2 Ofcom strongly prefers to receive responses using the online web form at <http://stakeholders.ofcom.org.uk/consultations/dab-coverage-planning>, as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see Annex 3), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.
- A1.3 For larger consultation responses - particularly those with supporting charts, tables or other data - please email dab.consult@ofcom.org.uk attaching your response in Microsoft Word format, together with a consultation response coversheet.
- A1.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.
- DAB Planning Consultation
Radio Content and Broadcast Licensing
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA
- Fax: 020 7783 4033
- A1.5 Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.
- A1.6 It would be helpful if your response could include direct answers to the questions asked in this document, which are listed together at Annex 4. It would also help if you can explain why you hold your views and how Ofcom's proposals would impact on you.

Further information

- A1.7 If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please email dab.consult@ofcom.org.uk.

Confidentiality

- A1.8 We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt. If you think your response should be kept confidential, can you please specify what part or whether all of your response should be kept confidential, and specify why. Please also place such parts in a separate annex.

- A1.9 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and will try to respect this. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.
- A1.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at <http://www.ofcom.org.uk/about/accoun/disclaimer/>

Next steps

- A1.11 Following the end of the consultation period, Ofcom intends to publish a statement in Q4 2011.
- A1.12 Please note that you can register to receive free mail Updates alerting you to the publications of relevant Ofcom documents. For more details please see: http://www.ofcom.org.uk/static/subscribe/select_list.htm

Ofcom's consultation processes

- A1.13 Ofcom seeks to ensure that responding to a consultation is easy as possible. For more information please see our consultation principles in Annex 2.
- A1.14 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk . We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.
- A1.15 If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Graham Howell, Secretary to the Corporation, who is Ofcom's consultation champion:

Graham Howell
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA

Tel: 020 7981 3601

Email Graham.Howell@ofcom.org.uk

Annex 2

Ofcom's consultation principles

A2.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

A2.3 We will be clear about who we are consulting, why, on what questions and for how long.

A2.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened Plain English Guide for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A2.5 We will consult for up to 10 weeks depending on the potential impact of our proposals.

A2.6 A person within Ofcom will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organisations interested in the outcome of our decisions. Ofcom's 'Consultation Champion' will also be the main person to contact with views on the way we run our consultations.

A2.7 If we are not able to follow one of these principles, we will explain why.

After the consultation

A2.8 We think it is important for everyone interested in an issue to see the views of others during a consultation. We would usually publish all the responses we have received on our website. In our statement, we will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

- A3.1 In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, www.ofcom.org.uk.
- A3.2 We have produced a coversheet for responses (see below) and would be very grateful if you could send one with your response (this is incorporated into the online web form if you respond in this way). This will speed up our processing of responses, and help to maintain confidentiality where appropriate.
- A3.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to complete their coversheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.
- A3.4 We strongly prefer to receive responses via the online web form which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of this coversheet in Word or RTF format from the 'Consultations' section of our website at www.ofcom.org.uk/consult/.
- A3.5 Please put any parts of your response you consider should be kept confidential in a separate annex to your response and include your reasons why this part of your response should not be published. This can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your cover sheet only, so that we don't have to edit your responses.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing Name/contact details/job title

Whole response Organisation

Part of the response If there is no separate annex, which parts?

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here.

Name

Signed (if hard copy)

Annex 4

Consultation questions

A4.1 We welcome responses on the following questions, particularly from a technical perspective, or focusing on the consumer experience.

- 1. Do you agree with our approach of matching DAB to FM within defined editorial areas?** *We will seek comments on specific editorial boundaries via separate consultations if and when specific changes are proposed.*
- 2. Do you agree with our approach to determining the extent of existing FM coverage, and which of the three field strength levels should be used to define the FM coverage that DAB should match?**
- 3. Do you agree with our approach to determining the extent of existing DAB coverage, and its relation to the approach we take for FM?**

And in particular, as we consider the emerging issues,
- 4. Are the assumptions we make about needing to predict DAB in-vehicle coverage for 99% of the time and for 99% of locations the right ones?**
- 5. Should the principle of merging editorial areas be explored, as a way of improving coverage?**
- 6. Above and beyond the frequency changes proposed in this document, should further changes to frequency allocations be explored, as a way of improving coverage?**

A4.2 The Government's Digital Radio Action Plan sets out the context of this technical report, and the various ways in which the Government is seeking public views on the proposed DAB switchover for radio more generally.

A4.3 It provides two routes for stakeholders and consumers to participate in a public debate around DAB switchover more generally.

- The Stakeholder Group, chaired by the DCMS, is open to a wide range of industry and related stakeholders. The principle purpose of this Group will be to inform external stakeholders of progress against the Action Plan and gather views on emerging findings.
- The Consumer Expert Group, established to inform the Digital Television Switchover Programme – and including a wide range of consumer representatives including RNIB, British Wireless for the Blind Fund, the Voice of the Listener and Viewer and Citizens' Advice – has formally agreed to extend its role to consider the Digital Radio Switchover through a revision to its Terms of Reference.