

**Supporting Operational and Technical Justification**

**for**

***Electronic Communications Base Station***

***Existing Arqiva Site***

***Arqiva Transmitting Station, The Howe, Danby Low Moor,  
Castleton, North Yorkshire YO21 2NF***

***Site Reference 188035***

***CTIL & EE***



**Arqiva Ltd**  
**CTIL & EE**

## Introduction

- 1.1. This document has been prepared to support the planning application to develop an electronic communications base station, as outlined in the accompanying Description of the Proposal.
- 1.2. The document provides supporting technical information and justification on the following matters:
  - The operation of the base station
  - The special operational and technical requirements
  - Health and Safety information, including compliance with the guidelines of the International Commission on Non-Ionising Radiation Protection (commonly referred to as the ICNIRP guidelines)

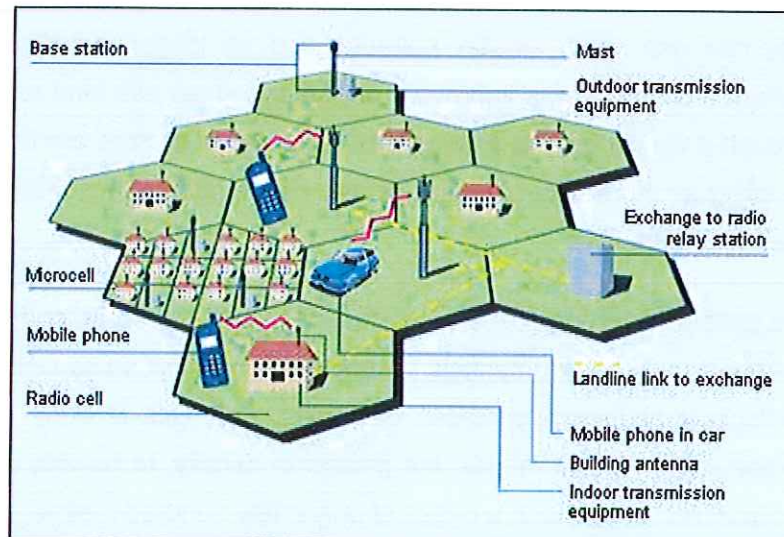
## 2. How the Base Station Operates

- 2.1. Section 6 of the Code of Best Practice on Mobile Network Development in England, published June 2016, explains how mobile networks function and such guidance is relevant to Scotland, Wales and Northern Ireland.
- 2.2. The base station is required as part of a cellular network that provides public communications services in the form of mobile connectivity. These and the associated benefits are described in more detail in the accompanying document the Benefits of Mobile Connectivity.
- 2.3. Cellular networks require base stations at intervals that provide localised areas of coverage, which are linked together like a patchwork quilt to provide nationwide coverage. Base stations typically require a supporting structure, like a mast or high building to support an array of antennas. Macro base stations are used to provide wide area coverage, but in urban areas it is sometimes possible to deploy micro base stations, especially where the requirement is to complete a very small gap in



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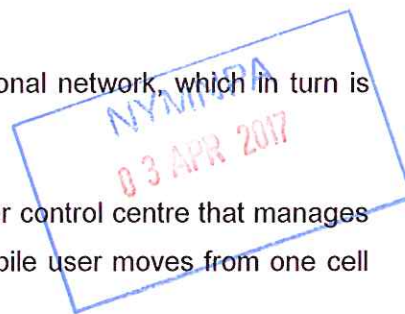
coverage and /or to provide additional network capacity in areas of high demand. This basic network architecture is illustrated below.



- 2.4. The base station operates by receiving and transmitting to mobile devices, such as smartphones or tablets using radio waves. This is similar to television and radio reception, except the communication is two way. This is achieved by the antennas, dishes and other electronic communications apparatus, the main function of the supporting structure is to elevate this apparatus above intervening features such as tall trees, buildings, or valley sides that would otherwise cause interference.
- 2.5 Base stations use two forms of antenna systems. The first system uses sector antennas that look like vertically orientated strips. These look over the target coverage area and transmit and receive the signals to and from mobile devices. Base stations are typically split into three 120 degree sectors that combined provide 360 degree coverage and which requires three pairs of transmit and receive sector antennas.
- 2.6 With the First Generation networks the cell areas in rural areas had a radius of between 30 and 50 kilometres. This required masts of between 30 – 45 metres in height. The phones also needed to have very large batteries and external antennas, in order to supply the power necessary to communicate over such distances. The

Third and Fourth Generation cells tend to be no more than 3 or 4 kilometres in diameter, which means the mast heights tend to be lower (but not always depending on local factors). This is one reason why mobile devices are much smaller, because they can use much smaller batteries and no longer include external antennas. Battery technology has improved, but smartphones still tend to use a lot of power through a variety of data applications. The mobile devices are therefore a constraint on siting as the sector antennas on the base stations must now be much closer to the user than before.

- 2.7 It is anticipated that for additional capacity to 4G networks and future 5G services, there will be greater emphasis on the deployment of small cell antennas systems, particularly at the early stages of deployment. This is likely to entail network infrastructure smaller in size, but greater in density, to provide coverage to smaller geographical areas, with a radius of only a few hundred metres, typically attached to building elevations or public infrastructure such as street furniture.
- 2.8 The second system requires the use of dish antennas and these operate on a direct line of sight basis, a bit like a search light beam, to other dishes on corresponding installations on the network. These dish links to the wider network are critical for the following three main reasons:
- The dishes link the base station to the wider national network, which in turn is linked to other national and international networks.
  - The dish links also link the base station to a master control centre that manages the call handover process that occurs when a mobile user moves from one cell area to another.
  - The dishes also provide telemetric monitoring to ensure the site is working properly, with some faults able to be fixed remotely.
- 2.9 Base stations also require cabinets to house the electronic communications radio equipment and an electricity meter cabinet for the necessary power connection.

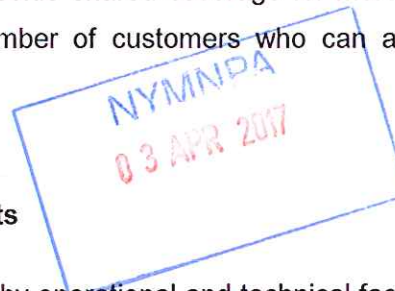




### 3. Technical Information

- 3.1. All mobile network operators are licensed by Ofcom, the independent regulator and competition authority for the UK's communication industries, to use allocated radio spectrum to provide publicly available electronic communications services. .
- 3.2. There are now four mobile network operators and they receive and transmit calls within the following radio frequency bands:
- Vodafone Ltd: 900MHz or 1800MHz for 2G services, 900MHz or 2100MHz for 3G services, and 800MHz for 4G services
  - Telefónica UK Ltd: 900MHz or 1800MHz for 2G services, 900MHz or 2100MHz for 3G services, and 800MHz for 4G services
  - EE: 900MHz or 1800MHz for 2G services, 2100MHz for 3G services and 1800MHz for 4G services
  - Hutchison 3G Ltd: 2100MHz for 3G services and 1800MHz for 4G services
- 3.3. All four operators are under a legal obligation to comply with the conditions of their licences granted by Ofcom. These conditions ensure compliance with legal obligations in respect of avoiding interference between themselves, with other radio systems, other electrical equipment, instrumentation and air traffic systems. The conditions of the licence are mandated by Ofcom who are responsible for the regulation of the civilian radio spectrum. Ofcom also has powers to investigate and remedy any reported significant interference.
- 3.4 The four operators have now consolidated their network infrastructure under two operations, i.e.:
- Vodafone and Telefónica networks have formed Cornerstone Telecommunications Infrastructure Ltd (CTIL)
  - Everything Everywhere or EE (in itself a merger between Orange and T-Mobile) and Hutchison 3G networks have formed Mobile Broadband Network Ltd (MBNL)

3.5 There are differences in the way in which these two companies have been formed and operate, but the net effect has increased the use of shared infrastructure and reduced network duplication between operators. In some cases, historic sites have been decommissioned and new sites planned are done so on a consolidated basis. This does mean that any new site will provide shared coverage for more than one operator and so widen the potential number of customers who can access the mobile services available.



#### 4. Technical and Operational Requirements

4.1. The location of the base station is guided by operational and technical factors in the first instance. Consistent with the statutory and planning policy requirements to share existing infrastructure, the start point has been to explore using such sites first, including those owned or managed by radio site management companies like Arqiva. More information on site selection is summarised in the Planning Statement provided with the planning application. From the technical and operational perspectives, the location of the base station is determined by the following factors:

- The need to provide an acceptable level of coverage over the target coverage area by the sector antennas
- The need to be able to obtain the required direct lines of sight for the dish antennas
- Proximity to a power source
- An accessible route for construction and future maintenance access
- A reasonable degree of security
- A sympathetic and willing site provider

5.



## 7. Compliance with Health and Safety Guidelines

- 7.1. The proposed base station has been designed, and will be constructed and operated, in accordance with all relevant health and safety requirements, including the precautionary ICNIRP guidelines as adopted in the EU Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0Hz to 300GHz).
- 7.2. The radio frequency public exposure limits for electromagnetic fields were developed by the International Commission on Non-Ionising Radiation Protection following reviews of all the peer-reviewed scientific literature, including thermal and non-thermal effects. The International Commission is a non-governmental organisation formally recognised by the World Health Organisation, which has adopted its guidelines.
- 7.3. These guidelines have also been adopted by the UK Government, along with other EU Members and many other Governments. The health and safety regulations that require compliance with the ICNIRP Guidelines are there to protect all members of the public 24 hours-a-day and incorporate a precautionary safety factor of 50. It is important to appreciate that they run across the top of the town planning system, i.e. it does not matter what may be granted planning permission, compliance is still required and if the Guidelines were to change for whatever reason any permitted sites would have to be brought into compliance.
- 7.4 Mobile base stations use low powered transmitters and typically operate at no more than 50 watts, which is similar to an old domestic light bulb. In urban areas, base stations typically comply with the ICNIRP Guidelines by a factor in the hundreds and in rural areas that increases to a factor in the thousands. There are many other means by which people are regularly exposed to radio emissions on a daily basis that are much higher, although still well within these safety Guidelines, for example, watching the television or sitting in front of a computer.

7.5. The certificate submitted with the planning application certifies that the base station, when operational, will meet the precautionary ICNIRP guidelines. For the avoidance of doubt, the certification relates to the individual and cumulative emissions from all operators on the site.

## 8. ICNIRP Certification - National Planning Policy Guidance

8.1. Section 5 'Supporting high quality communications infrastructure' of the National Planning Policy Framework for England provides the following guidance to local planning authorities on health safeguards and base station development:

*"46. Local Planning authorities must determine applications on planning grounds. They should not seek to prevent competition between different operators, question the need for the telecommunications system, or determine health safeguards if the proposal meets International Commission guidelines for public exposure."*

8.2 The application is clearly conforms with this and as set out in the accompanying document the Evolving Benefits of Mobile Connectivity will help provide a vital public service that makes a major contribution to public safety.

## 9. Further Information

9.1. Further information on health and safety guidelines can be found from the following sources:

ICNIRP: <http://www.icnirp.org/>

World Health Organization: [http://www.who.int/topics/electromagnetic\\_fields/en/](http://www.who.int/topics/electromagnetic_fields/en/)

Public Health England: <http://www.hpa.org.uk/HPAwebHome/>

Mobile UK: <http://www.mobileuk.org/index.html>

