# 17 Telecommunication Interference

## 17.1 Introduction

This Chapter of the ES assesses the potential impacts and likely effects of the Proposed Development on local television (TV) broadcast reception during the demolition, construction and operational stages.

The Chapter describes the relevant policy context; the methods used to assess the potential impacts; the baseline broadcast TV reception conditions at and surrounding the Site; the potential direct, indirect, secondary and wider telecommunication impacts; mitigation measures integral to the development proposals; and the significance of residual effects.

It is noted that since the complete switch to digital only TV services that occurred in Birmingham during April 2012, analogue services are no longer in operation. Accordingly, an assessment of potential impacts on analogue television reception has not been undertaken.

This assessment does not consider the potential for impacts on other wireless radio services, such as emergency services radio communications, private Very High Frequency (VHF) radio users (typically taxis and minicab usage) and other VHF radio use. Their operational frequencies are much lower than that of broadcast television services and combined with an ability to make constructive use of reflected signals, radio handsets and units are able to operate successfully in cluttered urban environments. Accordingly, it is considered that there would be no significant risk to such radio use from the construction or operation of the Proposed Development.

## 17.2 Legislation and Policy Context

### 17.2.1 National Policy

**National Planning Policy Framework, 2012**

Paragraph 44 of the NPPF states that “Local planning authorities … should ensure that: they have considered the possibility of the construction of new buildings or other structures interfering with broadcast and telecommunications services.”

**Planning Policy Guidance, 2014**

The recently introduced Planning Practice Guidance web-based resource does not introduce anything new specific to telecommunications that has not already been covered within the NPPF.

### 17.2.2 Regional Policy

There are no regional telecommunication related policies.

### 17.2.3 Local Policy

There are no local telecommunication related policies.

## 17.3 Assessment Methodology and Significance Criteria

### 17.3.1 Baseline Characterisation

To characterise the existing baseline reception conditions at and surrounding the Site, a desktop study was first undertaken, based on broadcast transmission information, plans of the Proposed Development and maps of the area. This was followed by a site visit to establish the existing television reception conditions in line with Ofcom Reception Advice. The desktop study reviewed publicly available information and information on the Proposed Development relating to the following:

- main serving digital TV transmitter services and locations (Ofcom and Arqiva);
- details of the Proposed Development's form and height.

A Site visit was undertaken on 17 November 2014 to obtain information on the following:

- adjacent building uses;
- approximate heights of neighbouring buildings;
- presence and orientation of existing TV receiving equipment (aerials and face mounted dishes on buildings);
- current availability of potential mitigation options; and
- baseline terrestrial digital TV reception conditions (including strength and quality of transmissions).

To understand existing reception conditions, standard practice is to undertake baseline surveys at the pre-construction stage. A similar survey is sometimes undertaken post-construction to confirm whether the introduction of the Proposed Development has actually significantly affected TV reception and to assist in determining the level of any mitigation to be provided in the event of significant adverse effects occurring.

Due to the complex nature of telecommunication interference in high-density/built up environments, the Site visit also comprised a survey in the general area and in particular to the southwest of the Site, as this would likely be an area most affected by shadow paths created by the Proposed Development, to fully determine existing reception levels. Signal measurements were taken at 12 locations up to 2 km away from the Site (the 'Study Area'). In a typically cluttered urban environment, such as the surrounding of the Proposed Development, 2 km is considered to be a suitable investigation area and has been derived from an understanding of the existing and expected reception conditions and the mechanisms of signal interference as discussed in preceding sections of this Chapter. These TV transmission measurements were carried out using a log-periodic receive antenna, mounted on a broadcast survey vehicle, at a receive height of 10 m above ground level (AGL). No assessment was made of reception conditions within residents' homes.

The telecommunications assessment within this Chapter considers the likely direct effects of the Proposed Development in relation to the reception of digital terrestrial TV and satellite TV broadcast services (sensitive receptors) and the resulting secondary effect at properties in the surrounding areas that make use of these services.

Based on the Site visit survey data and visual findings, broadcast transmission information gathered, plans of the Proposed Development and maps of the area reviewed, the potential impacts on sensitive receptors were quantitatively assessed. Information on the Proposed Development was derived from the following:

- Area Schedule for the Proposed Development; and
- Planning Drawings

The following provided a basis for determining potential impacts:

- Differences in massing, form and height with respect to the physical properties of the existing buildings on the Site; and
- Signal propagation theory and the mechanisms of radio interference.

These techniques and field assessment of those transmitters providing signal to viewers were used to calculate the potential impacts upon sensitive receptors in the area. Outcomes were analysed, and together with various mitigation options, conclusions drawn on the overall effect of the Proposed Development on the reception of broadcast services for local residents.

The principles of radio signal transmission from the transmitting to receiving antenna were used to assess the effects of the Proposed Development on TV reception in the areas surrounding the Site. These are described in more detail in the following paragraphs.

### 17.3.2 Mechanisms of Signal Interference – Electromagnetic Interference

Electromagnetic interference affects the operation of an electrical circuit or system as a result of electromagnetic radiation emitted from an external source. The disturbance may interrupt, degrade or limit the effective performance of the circuit or system. These effects can range from a simple degradation of signal or data to a total loss of data, or equipment malfunction. The magnitude of the effect is dependent upon the sensitivity of the circuit or system to any unwanted electromagnetic radiation and the level of unwanted interference present.

When considered on its own, a building or structure will not generate any interfering electromagnetic interference. Electromagnetic interference is generally caused by an unregulated emission or an unwanted, unlicensed transmission of radio frequency energy, which can interfere with another electrical circuit or system through various coupling means.

### 17.3.3 Mechanisms of Signal Interference - Signal Shadowing and Signal Reflections

Any physical object (*e.g.* a building or other structure) will produce two zones of potential disruption to TV reception. One zone is where the development creates a 'shadow' and the other is where it gives rise to a 'reflection'. Both signal shadowing and signal reflections can be considered to be a physically generated signal interference mechanism, as a physical object (natural or man-made) is the cause of the interference.

At the frequencies used for broadcasting, the processes of creating a 'shadow' or a 'reflection' are somewhat more complicated than with visible light. However the principles of transmission and disruption are similar and are a useful comparison.

With 'shadowing' effects, the TV transmitter is effectively screened from the viewer in the area behind the structure, and the strength of the signal would therefore correspondingly be reduced. This is illustrated in *Figure 17.1* and *Figure 17.2*.

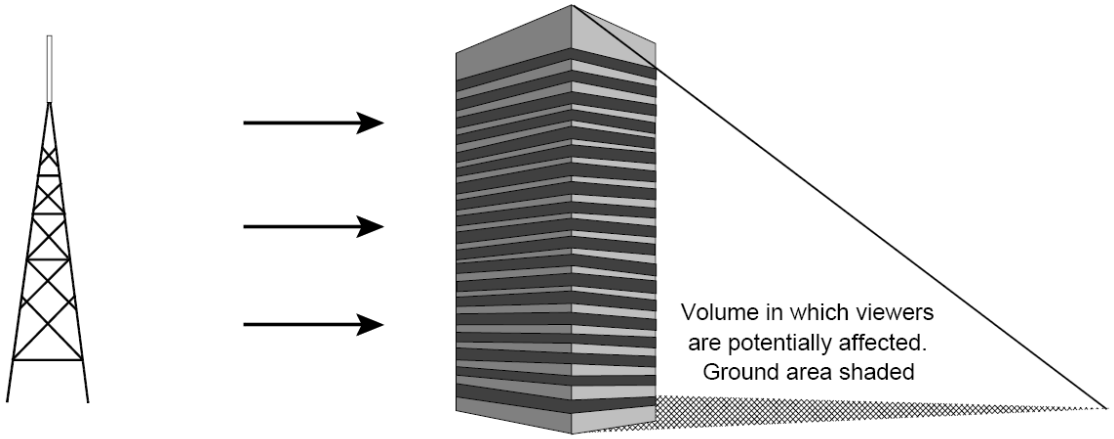


**Figure 17.1:** *Affected Area in the 'Shadow' Zone*

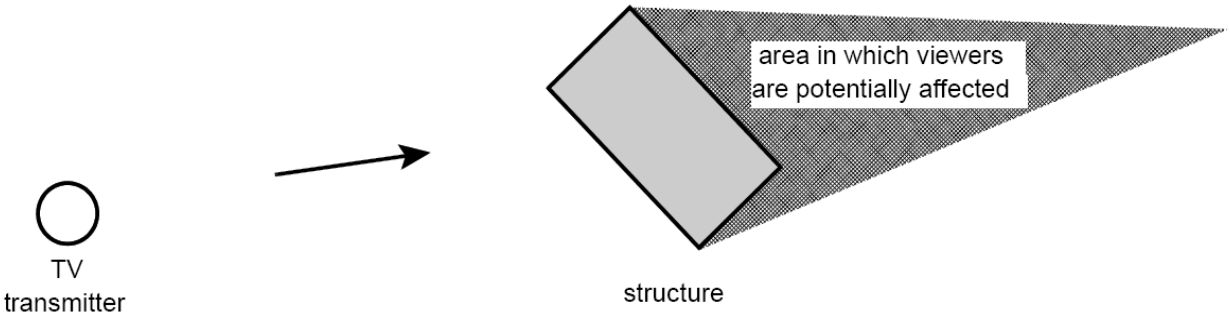


**Figure 17.2:** *Plan View of the 'Shadow' Zone*

TV signals do not create a 'hard' shadow as visible light would do, and therefore a 'shadow' zone must be considered as 'divided' into three sub-zones.

Within a few tens of metres of a solid structure, over the region where the optical view of the transmitter is lost, the reduction in signal strength is critically dependent on the specific design and composition of the structure. For most brick and concrete buildings the reduction is severe and in some cases almost total.

Further away from the structure (*e.g.* beyond 250 m, although this varies depending on the size of the structure) the limit of the 'shadow' zone and signal reduction are determined by diffraction at the edges of the structure and reflection off surrounding structures. The simple condition of whether or not a location has an optical view of the transmitter is not enough to classify the potential interference zone adequately. In general, the effect is that the signal

appears to bend around the sides of the structure; the shadow zone reduces in size and the signal strength is reduced by much less than simple ray optics would suggest.

Even further away from the structure (*e.g.* 5 km) complex multiple reflections and diffraction, caused by structures in the locality, may result in the 'shadow' zone becoming almost non-existent.

With 'reflection' effects, the second zone of potential interference is produced by 'reflection' or 'scattering' of the incident signal, as shown in *Figure 17.3*.

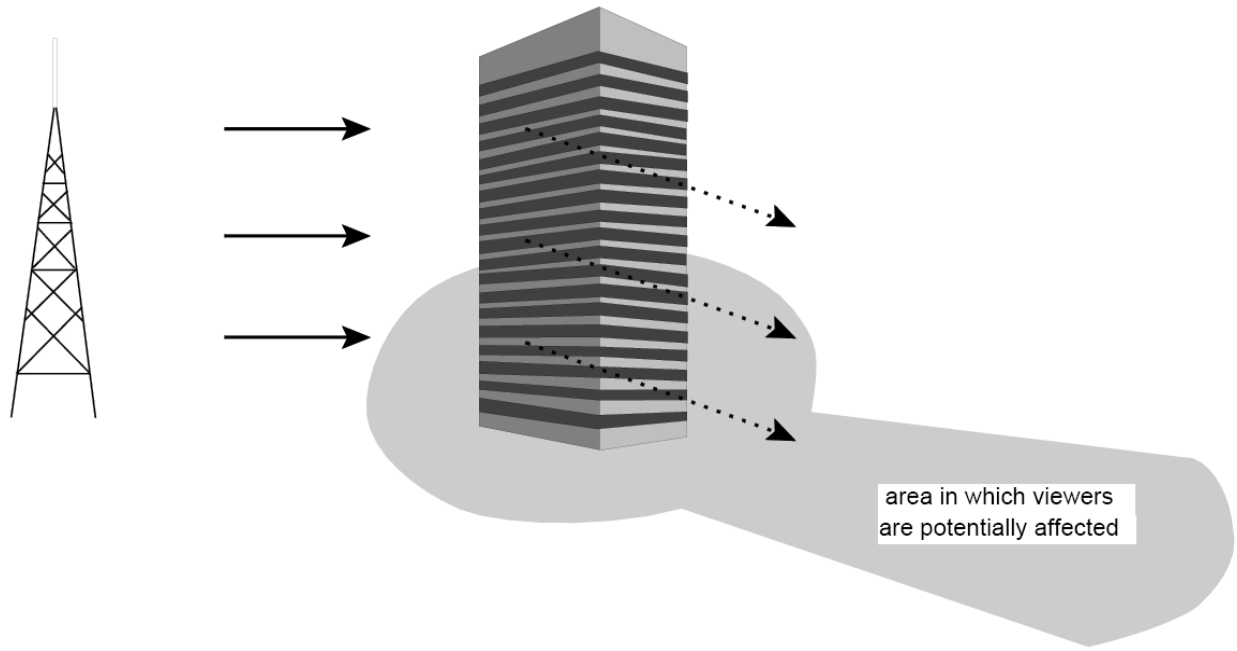


**Figure 17.3:** *Affected Areas in the 'Reflected' Zone of the Structure*

Reflection' type signal interference can cause two signals to arrive at the receiving point at different times relative to the other. This results in a second image appearing on the viewer's screen, displaced from the first. This type of interference is known as 'ghosting'. If the reflecting signal is complex, several 'ghost' images can result.

To help avoid this interference, domestic TV receiving antennas generally have a significant directional response to incoming signals, which means that the antenna may discriminate against interfering signals that arrive on significantly different bearings. This can result in an increase in the ratio of wanted to unwanted signal, as presented to the TV receiver.

### 17.3.4 Digital Terrestrial TV - Freeview

The Digital Terrestrial TV (DTT) broadcast platform offers many advantages over older analogue broadcast technologies. Due to the way picture signals are encoded and broadcast, digital TV offers a much more resilient platform against the types of interference encountered by analogue TV broadcast networks. The construction of digital signals ensures that they are much more impervious to the effects of interference from indirect secondary reflections, which consequently ensures good quality and coherent data stream integrity at the receiver, resulting in an interference free picture.

Disruption to DTT services can sometimes be caused by an obstruction on the line-of-sight from the transmitter to the receive antenna, for example, a tall building or large hill.

To ensure interference free reception of digital terrestrial TV services, signal receive antennas must be positioned on the highest point of a structure. At the Site, all antennas must be directed towards the Sutton Coldfield transmitter to receive the maximum amount of available signal.

### 17.3.5 Digital Satellite TV - Freesat and Sky

Digital satellite services are provided by geo-stationary earth orbiting satellites positioned above the equator. To ensure good reception of satellite services, satellite receive antennas (satellite dishes) are normally positioned away from trees and other clutter and are orientated to face the southern skies.

Disruption to satellite TV services is normally caused by an obstruction on the line-of-sight from the satellite to the receive antenna, for example, a tall building or tall trees. Typical clearance heights of objects to the southeast of signal receive dishes are shown in *Figure 17.4.*

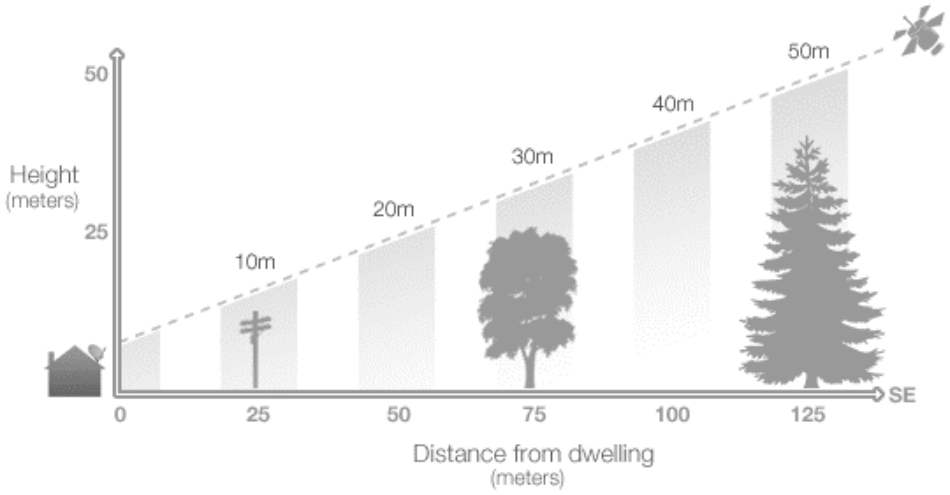


**Figure 17.4:** *Typical Clearance Distances and Obstruction Heights for Interference Free Satellite TV Reception*

### 17.3.6 Cable Services

Cable TV services and services provided over the internet by Asymmetric Digital Subscription (ADSL) are received via cables connected directly into a receiver. These cables normally enter a building alongside the fixed land telephone line and are not affected in the same way as the transmission platforms described above.

### 17.3.7 Significance Criteria

There are no published or recognised significance criteria for the assessment of telecommunication interference. Accordingly, prudent professional judgement has been used to determine significance.

The significance of residual effects has been established through consideration of the use of areas/buildings likely to be affected by the Proposed Development (*e.g.* commercial or residential use), together with the type of telecommunication service likely to be in use in such buildings (*e.g.* terrestrial, cable or satellite).

Where the affected areas/buildings are mainly in residential use, the effects due to the Proposed Development are likely to be more significant as there is a greater potential that terrestrial services would be in use. The predominant impact from the Proposed Development would be from interference to digital TV services in those areas and the number of residential buildings likely to be affected determines the scale/magnitude of the impact.

The criteria that have been applied to determine the significance of likely effects arising from interference caused by the Proposed Development are as follows:

- **High Adverse:** The Proposed Development is likely to result in a complete loss of a signal for a wide area of receiving aerials. This would arise from severe radio shadowing as a result of a very tall or very wide building, which would be significantly greater in form than other buildings surrounding it. More than 500 receptors would be affected.

- **Moderate Adverse:** The Proposed Development is likely to result in a noticeable deterioration in signal quality over a moderate area of receiving aerials. With respect to digital services, the reliability of the service would be reduced due to decreased received signal levels. In the order of 50 to 500 receptors would be affected.

- **Low Adverse:** The Proposed Development is likely to result in a slight deterioration in signal quality over a small area of receiving aerials. The effects on digital services would be less severe, only resulting in the intermittent reduction of service reliability. Less than 50 receptors would be affected.

- **Neutral:** Neither beneficial nor adverse effects of operations on receptors.

- **No effect:** No effect of operations on receptors. Signal qualities and levels would not change by any noticeable amount.

- **Low Beneficial:** Not applicable to this Site. The effect of interference on any communications system cannot be graded as minor beneficial. The emanation of interference from any source degrades the signal in many ways *e.g.* by varying the amplitude and phase of the transmitted signal, temporary or permanent loss of signal, *etc.*

- **Moderate Beneficial:** Not applicable to this Site. The effect of interference on any communications system cannot be graded as moderate beneficial. The emanation of interference from any source degrades the signal in many ways *e.g.* by varying the amplitude and phase of the transmitted signal, temporary or permanent loss of signal, *etc.*

- **High Beneficial:** Not applicable to this Site. The effect of interference on any communications system cannot be graded as major beneficial. The emanation of interference from any source degrades the signal in many ways *e.g.* by varying the amplitude and phase of the transmitted signal, temporary or permanent loss of signal, *etc.*

### 17.3.8 Assumptions and Limitations

The assessment identifies only the area where the Proposed Development could potentially cause signal shadows. However radio waves are reflected and refracted off buildings and other structures and therefore it is unlikely all users in the area could be affected. This is especially relevant for DTT services.

Only a comparison between pre-construction TV reception survey data and post-construction signal reception survey data, can fully determine actual effects.

The UK's terrestrial TV network is a highly complex engineering system and is constantly being modified, re-designed, upgraded and maintained. The reception conditions detailed in this Chapter were those prevailing at the time of the survey (17 November 2014) in the Study Area. Engineering work at transmitter sites, weather conditions and the time of the year will influence the quality and coverage of terrestrial services and their susceptibility to interference. Whilst every effort was made to accurately measure and assess the available TV transmissions and services at the time of the survey, it cannot be assumed that any part of the TV broadcast network or transmission from any transmitter was operating in required specification or correctly to any design criteria. The signal measurements undertaken during the survey work were used to define the possible impacts to TV reception for this assessment.

Modelling parameters assume that all installed UHF antenna systems are mounted at least 10 m AGL and installed to a modern standard, with all components meeting Confederation of Aerial Industries (CAI) quality standards. Antennas mounted at lower heights and poor quality installations will be more prone to the effects of interference from external sources and as such, reception conditions to installations with the aforementioned characteristics have not been accounted for in any impact modelling. Consequently properties with such installations may be prone to interference effects that have not been identified. Such installations are commonly found on bungalows and properties where it is not possible to attach an antenna to the exterior roof.

Antennas mounted in lofts are also more prone to interference effects arising from the signal attenuation caused by roofing materials. Reception conditions to properties with the aforementioned antenna installation characteristics have not been accounted for in any impact modelling and as such, properties with these installations may be prone to interference effects that have not been identified.

Antennas can be mounted on flat rooftops and as such may not be visible from street level. Consequently, antennas may be positioned in areas where impacts may occur; however their presence is not known.

The installation of a signal receiving antenna does not indicate that a TV viewer is present or that the antenna system is in good working order.

## 17.4 Baseline Conditions

### 17.4.1 Available Broadcast Services

**Digital Terrestrial TV - Freeview**

The Study Area is served from the transmitting site at Sutton Coldfield (NGR SK1135000350). Technical information regarding the services from this transmitter is provided in *Table 17.1.*

**Table 17.1:** *Sutton Coldfield TV Services*

| Digital Multiplex and Owner | UHF Channel Number * | Channel Frequency Fc (MHz) ** |
|---|---|---|
| BBC A / BBC (PSB) | 43 | 650.000 |
| D 3&4 / D 3&4 (PSB) | 46 | 674.000 |
| BBC B (HD) / BBC (PSB) | 40+ | 626.167 |
| SDN / SDN (COM) | 42 | 642.000 |
| Arqiva A / Arqiva (COM) | 45 | 666.000 |
| Arqiva B / Arqiva (COM) | 39+ | 618.167 |
| COM7 (HD) / Arqiva (COM) | 33 | 570.000 |
| L-BRM / Comux (COM) | 51 | 714.000 |

**Notes:**

Public Service Broadcaster (PSB) Digital Multiplexes

Commercial (COM) Digital Multiplexes

* - Digital multiplexes with a "+" or "-" sign operate with a frequency offset making the centre frequency + or - 167 kHz

** - Nominal centre frequency, Fc (in Megahertz) of the multiplex can be calculated using Fc=8n+306, where 'n' is UHF channel number

No digital self-help installations (very low powered TV transmitters to cover very small areas of population) were identified in the Study Area.

### Digital Satellite TV - Freesat and Sky

Digital satellite TV services, within the Study Area, are provided by geo-stationary earth orbiting satellites positioned above the equator. Digital satellite TV broadcast services (Freesat and Sky) are provided by the ASTRA 2A, ASTRA 2B and ASTRA 2D satellite cluster, located at an orbital location of 28.2 degrees east.

Optimum reception is obtained by aligning satellite dishes to the southeast on a compass bearing of 143.9 degrees and an elevation to the horizontal of 23.8 degrees.

### Baseline Reception Conditions

During the 19 November 2014 Site visit, 12 representative locations within the Study Area, as outlined above in Baseline Characterisation Section, were investigated. These locations are shown in *Figure 17.5* with the corresponding measurements taken provided in *Table 17.2.*

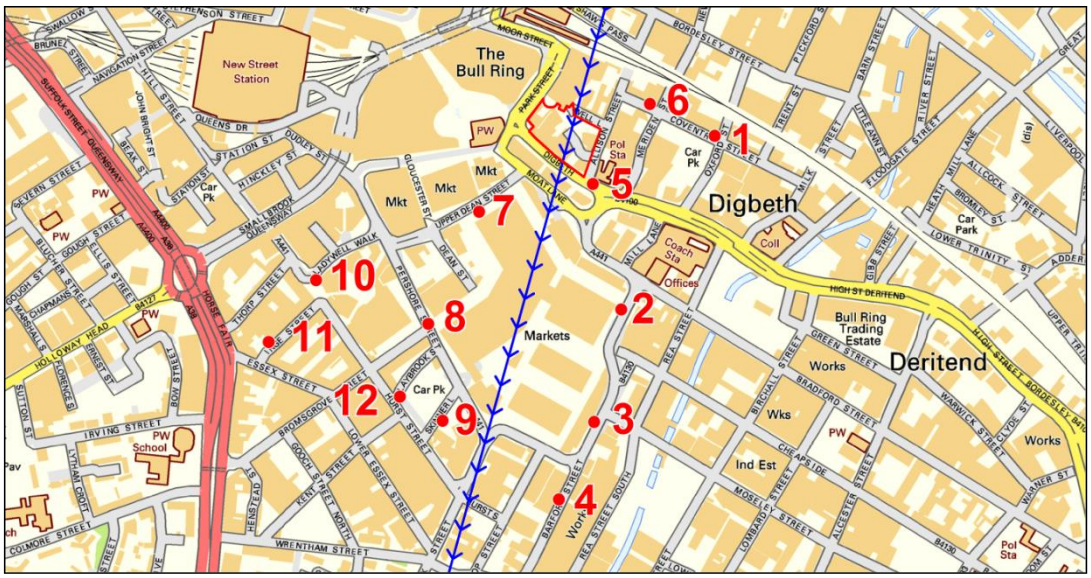


**Figure 17.5:** *Location of Site, Surveyed Points and Direction of incoming Signals from Sutton Coldfield*

The following data was recorded:

- signal qualities and field strengths (signal strengths) of DTT transmissions from the Sutton Coldfield transmitter; and
- viewing preference (choice of TV transmitter) of residents, (visually assessed by inspecting the orientation of roof mounted receive aerials).

**Table 17.2:** *Field strength technical quality measurements of Sutton Coldfield Digital TV Services*

| Measurement Point Number | Channel | 43 | 46 | 40 | 42 | 45 | 39 | 33 | 51 |
|---|---|---|---|---|---|---|---|---|---|
| | Frequency | 650.00 | 674.00 | 626.00 | 642.00 | 666.00 | 618.00 | 570.00 | 714.00 |
| | Service | BBC A | D3&4 | BBC B (HD) | SDN | Arqiva A | Arqiva B | COM7 (HD) | L-BRM |
| 1 | FS | 89.1 | 79.7 | 67.8 | 86.9 | 83.8 | 89.0 | 67.9 | 58.1 |
| | CSI | 19.0 | 21.4 | | 19.5 | 23.9 | 23.5 | | 23.3 |
| | MER | 31.1 | 31.0 | | 32.1 | 27.2 | 28.5 | | 27.7 |
| 2 | FS | 85.8 | 83.6 | 74.7 | 81.1 | 82.7 | 77.1 | 83.5 | 73.9 |
| | CSI | 26.7 | 21.3 | | 25.9 | 20.1 | 22.0 | | 23.3 |
| | MER | 27.7 | 29.3 | | 33.4 | 29.7 | 29.2 | | 27.6 |
| 3 | FS | 79.9 | 94.7 | 85.0 | 78.5 | 84.8 | 88.1 | 73.1 | 60.4 |
| | CSI | 20.5 | 25.0 | | 21.3 | 21.8 | 23.5 | | 20.7 |
| | MER | 30.3 | 31.0 | | 29.9 | 34.5 | 28.7 | | 32.2 |
| 4 | FS | 84.0 | 87.1 | 86.2 | 88.7 | 93.5 | 85.4 | 88.2 | 71.8 |
| | CSI | 27.0 | 20.8 | | 24.2 | 24.5 | 19.0 | | 19.3 |
| | MER | 30.4 | 29.1 | | 31.3 | 29.4 | 33.4 | | 31.4 |
| 5 | FS | 78.7 | 74.9 | 80.2 | 80.1 | 70.1 | 78.5 | 76.8 | 65.4 |
| | CSI | 23.7 | 19.8 | | 20.7 | 19.8 | 27.2 | | 24.9 |
| | MER | 29.6 | 28.7 | | 28.5 | 32.0 | 32.0 | | 29.1 |
| 6 | FS | 78.5 | 90.8 | 77.7 | 69.9 | 72.7 | 85.2 | 77.4 | 63.3 |
| | CSI | 21.2 | 17.5 | | 18.5 | 29.1 | 18.0 | | 21.9 |
| | MER | 31.1 | 30.1 | | 29.6 | 30.3 | 30.1 | | 30.3 |
| 7 | FS | 85.3 | 81.7 | 80.6 | 77.7 | 78.2 | 75.7 | 80.2 | 63.8 |
| | CSI | 23.0 | 19.3 | | 24.1 | 21.5 | 23.6 | | 24.3 |
| | MER | 27.2 | 28.7 | | 28.5 | 29.2 | 32.1 | | 29.5 |
| 8 | FS | 83.3 | 93.1 | 80.0 | 65.8 | 75.4 | 84.4 | 73.4 | 58.8 |
| | CSI | 23.7 | 19.9 | | 20.4 | 25.3 | 18.7 | | 20.6 |
| | MER | 30.6 | 30.9 | | 29.6 | 30.5 | 32.0 | | 30.2 |
| 9 | FS | 79.6 | 93.4 | 84.8 | 74.0 | 86.2 | 84.0 | 84.3 | 65.0 |
| | CSI | 22.5 | 20.3 | | 22.9 | 20.4 | 20.3 | | 19.1 |
| | MER | 31.0 | 29.2 | | 28.8 | 32.3 | 28.3 | | 31.7 |
| 10 | FS | 90.4 | 73.4 | 63.8 | 76.0 | 86.9 | 87.6 | 72.2 | 65.8 |
| | CSI | 22.3 | 22.7 | | 20.2 | 23.0 | 22.6 | | 21.9 |
| | MER | 28.1 | 30.3 | | 29.7 | 29.0 | 25.9 | | 25.7 |
| 11 | FS | 92.8 | 76.7 | 76.6 | 85.1 | 92.5 | 87.5 | 70.3 | 63.1 |
| | CSI | 25.7 | 23.7 | | 23.6 | 19.5 | 20.1 | | 22.7 |
| | MER | 27.0 | 32.9 | | 32.4 | 32.2 | 29.2 | | 30.8 |
| 12 | FS | 83.1 | 85.9 | 74.9 | 86.7 | 78.1 | 75.9 | 68.0 | 61.7 |
| | CSI | 23.4 | 24.5 | | 24.9 | 20.0 | 20.4 | | 22.7 |
| | MER | 31.6 | 30.2 | | 32.0 | 29.6 | 31.0 | | 29.0 |

**Notes:**

Channel Status Information (CSI) Values are expressed in %

Modulation Error Ratios (MER) values are expressed in dB (Decibels)

Frequencies listed are in MHz

Field strength (FS) values are indicated in dBμV/m

The buildings and structures currently on the Site have an influence on terrestrial TV reception conditions in areas to the immediate southwest, as incoming signals propagate from the northeast from the Sutton Coldfield transmitter. This influence is evident by slightly reduced signal strengths into these areas. However, as is the case throughout central Birmingham, reception of terrestrial services is still optimal in this location due to the inherent ability of Freeview signals to diffract around obstructions and the forward error correction technology used in Freeview transmissions.

**Existing Sensitive Receptors**

There are no existing sensitive receptors to the immediate east, south, north or west of the Site. Commercial use sites are located all around the site.

## 17.5 Assessment of Project Impacts

### 17.5.1 Potential Impacts

**Potential Demolition and Construction Impacts**

During the demolition and construction works, large temporary structures such as cranes may cause highly localised disruption to reception services in the vicinity of the Site. As the phased construction of the Proposed Development progresses, potential impacts would increasingly resemble that of the completed development. Potential impacts during this stage of the Proposed Development are discussed in relation to each sensitive receptor in the following paragraphs.

**Digital Terrestrial TV - Freeview**

Due to the existing good availability of DTT signals and lack of interference caused by the existing buildings in the Study Area, DTT reception is unlikely to be affected during the demolition and construction works, which would see a gradual increase in development across the Site towards the final built form over the development programme. Consequently, there would be no impact on DTT signals.

**Digital Satellite TV - Freesat and Sky**

Due to lack of interference caused by the height and form of the existing buildings in the Study Area, and the locations of any receiving dishes, digital satellite TV reception is unlikely to be affected during the demolition and construction works. Consequently, there would be no impact on DST services.

**Cable Services and TV over ADSL**

There are not believed to be any important arterial communication routes crossing the Site. Accordingly cabled services would not be impacted by the demolition and construction works of the Proposed Development.

### 17.5.2 Potential Completed Development Impacts

**Digital Terrestrial TV - Freeview**

When considering the influence of the existing buildings in the Study Area, the good coverage already provided by existing DTT transmissions and the inherent resilience of the DTT signal with respect to interference, plus the absence of any residential receptors utilising low mounted receiving antennas to the immediate north-north-west of the taller elements of the Proposed Development (where any significant signal shadow could be created) it is unlikely that the Proposed Development would impact the reception of DTT services. Furthermore, since the Digital TV Switchover that occurred during April 2012, DTT transmission modes also changed, ensuring better coverage within cluttered urban areas.

**Digital Satellite TV – Freesat and Sky**

Due to the optimal positions of existing satellite signal receiving dishes on nearby buildings (ensuring clear line of sight to the serving satellite), especially in relation to those on residential properties, it is unlikely that the Proposed Development would impact on Digital Satellite service reception as any signal shadow zones created by the taller elements of the Proposed Development, will not obscure the line of sight from these receiving dishes to the serving satellites. Consequently, the Proposed Development would have no impact on the reception of DST services.

**Cable Services and TV over ADSL**

The Proposed Development would not impact cabled TV services. Consequently, interference is not a concern.

## 17.6 Assessment of Cumulative Impacts

When taking into consideration the cumulative effects that may arise from the Proposed Development in combination with other cumulative schemes in the vicinity, and considering the complex nature of television interference in cluttered environments, the timelines and other factors affecting potential different mitigation options, quantifiable impacts cannot be readily derived.

However, based on professional judgement and considering the locations of the cumulative schemes relative to the Proposed Development, as well as the direction of incoming signals and the nature of signal interference, no in-combination cumulative effects are considered likely to occur either during the demolition and construction stage or the completed development stage.

## 17.7 Impact Mitigation and Residual Effects

### 17.7.1 Mitigation

As no adverse impacts have been identified during any work stage, no pre-construction or post-construction mitigation measures are required.

**Mitigation by Design**

With regards to design mitigation with the exception of changing building heights and mass, options to reduce any potential interference risks are limited. Solutions exist (not design based) for interference caused by reflections, but offer no help to those in the radio shadow of a new development or existing development.

**Mitigation during Demolition and Construction**

As no adverse impacts have been identified during the demolition and construction stage, no mitigation measures are required.

**Mitigation during Completed Development**

As no adverse impacts have been identified arising from the completed development, no post-construction mitigation measures are required.

### 17.7.2 Assessment of Residual Effects

**Demolition and Construction Effects**

It is anticipated that demolition and construction works of the Proposed Development would have No effect on the reception of broadcast services.

**Completed Development Effects**

It is anticipated that the Proposed Development, once complete, would have No effect on the reception of broadcast services.

## 17.8 Summary

Planning policy requires that the potential impact of Proposed Development on TV reception is adequately assessed and mitigation offered where appropriate.

From the technical analysis carried out, it is considered unlikely that the Proposed Development would cause any interference to digital terrestrial TV services (Freeview), based on the current good reception conditions and the lack of sensitive receptors utilising low mounted antenna systems in areas where signal shadowing could occur. During the Digital TV Switchover, DTT transmission powers increased and transmission modes changed to ensure better coverage in urban areas.

From the detailed analysis carried out, it is considered that the Proposed Development would have the following effects:

- No effect on the reception of digital terrestrial TV services such as Freeview during either the demolition and construction stage or operational stage;
- No effect on the reception of digital satellite TV services such as Freesat and Sky during either the demolition and construction stage or operational stage;
- No effect upon the reception of cabled TV services due to the delivery nature of these services.

*Table* 17.3 summarises the outcomes of the assessment.

**Table 17.3:** *Summary of potential impacts of the proposed development, mitigation and residual effects*

| Potential Impact/Issue | Mitigation Proposed | Means of Implementation | Outcome/Residual Effects |
|---|---|---|---|
| **Demolition and Construction** | | | |
| Interference to digital terrestrial TV services - Freeview | N/A | N/A | No effect |
| Interference to digital satellite services – Freesat & Sky | N/A | N/A | No effect |
| Interference to cable TV services | N/A | N/A | No effect |
| **Completed Development** | | | |

| Potential Impact/Issue | Mitigation Proposed | Means of Implementation | Outcome/Residual Effects |
|---|---|---|---|
| Interference to digital terrestrial TV services - Freeview | N/A | N/A | No effect |
| Interference to digital satellite services – Freesat & Sky | N/A | N/A | No effect |
| Interference to cable TV services | N/A | N/A | No effect |

Based upon the appraisal of telecommunications impacts discussed above, the residual impacts associated with the **Construction Phase** are `deemed to be **INSIGNIFICANT**. The residual impacts associated with the **Operational Phase** are deemed to be **INSIGNIFICANT**.