

Television and Radio Baseline Survey Report

St John's Campus

St Johns Manchester Limited

September 2023

PLANNING SOLUTIONS FOR:

- Solar
- Telecoms
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ADMINISTRATION PAGE

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1	March 2023	Initial issue
2	April 2023	Administrative revisions
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EXECUTIVE SUMMARY

Report Purpose

This Television and Radio Baseline Survey Report has been prepared by Pager Power on behalf of St Johns Manchester Ltd, a subsidiary of HBD, and is submitted in support of an application for full planning permission at land bound by New College Street, New Quay Street, NCP car park and Gartside Street, otherwise known as “St John’s Campus”. The description of development is as follows:

“Demolition of the existing buildings and structures and the erection of a 16-storey office building (Use Class E(g)), with flexible ground floor uses (Use Class E), rooftop amenity space and works to facilitate public realm improvements”.

The proposals seek to demolish the existing on-site buildings and structures to deliver a 16 storey office building plus rooftop amenity space of sustainable construction and high quality design. The building will offer flexible office accommodation which will meet the needs of a range of tenants and also provide ground floor commercial uses which will activate the ground floor frontage creating a unique arrival experience.

The proposed development is described fully in the Design and Access Statement prepared by EPR Architects and presented on the application drawings. The application proposals have been developed in consultation with Manchester City Council (“MCC”) Officers and other key stakeholders.

Results

Television

- A site survey was undertaken on 14th March 2023 to confirm the relevant transmitter and record the signal quality;
- The proposed development is within the coverage area for the Winter Hill television transmitter. The baseline survey confirmed it is the main transmitter serving the area;
- Any interference would be due to shadowing effects i.e. the weakening of the transmitted signal due to the physical presence of the buildings;
- The average terrestrial signal strength is moderate in the shadow zone of the proposed development for the main multiplexes, and low on average for the local (lower power) multiplexes;
- Negative effects upon signal strength are most likely at locations close to the proposed development i.e. within 1km of the proposed development and within its shadow zone. The average recorded signal within 1km of the proposed development was moderate and low for main and local TV multiplexes respectively. Buildings in the surrounding environment within 1km of the proposed development were mainly commercial and high-rise residential properties;

- At locations beyond 1km and within the shadow zone, no significant impacts are predicted and interference is predicted to be unlikely.

Radio

- The area surrounding the proposed development receives radio services from the Winter Hill transmitter. The strength and quality of the signal from Winter Hill near the proposed development is consistent, however, not all frequencies decoded;
- Degradation of the radio signal at close range to the proposed development is likely. The effects are unlikely to be noticeable in practice due to the variability of services in an urban environment.

Recommendations and Mitigation

No requirement for pre-emptive mitigation has been identified.

It is recommended any reports of interference are investigated to determine whether these are attributable to the proposed development. Comparisons between a post-construction survey and this baseline survey should be made, if undertaken.

If interference is found to be attributable to the proposed development, mitigation measures should be installed. Solutions are likely to be readily available if required, the most common options are presented in Section 6.

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ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 56 countries within Europe, Africa, America, Asia and Australasia.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems. Over the years, the company has expanded into numerous fields including:

- Renewable energy projects;
- Building developments;
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

1 BACKGROUND

1.1 Introduction

This Television and Radio Baseline Survey Report has been prepared by Pager Power on behalf of St Johns Manchester Ltd, a subsidiary of HBD, and is submitted in support of an application for full planning permission at land bound by New College Street, New Quay Street, NCP car park and Gartside Street, otherwise known as “St John’s Campus”. The description of development is as follows:

“Demolition of the existing buildings and structures and the erection of a 16-storey office building (Use Class E(g)), with flexible ground floor uses (Use Class E), rooftop amenity space and works to facilitate public realm improvements”.

The proposals seek to demolish the existing on-site buildings and structures to deliver a 16 storey office building plus rooftop amenity space of sustainable construction and high quality design. The building will offer flexible office accommodation which will meet the needs of a range of tenants and also provide ground floor commercial uses which will activate the ground floor frontage creating a unique arrival experience.

The proposed development is described fully in the Design and Access Statement prepared by EPR Architects and presented on the application drawings. The application proposals have been developed in consultation with Manchester City Council (“MCC”) Officers and other key stakeholders.

1.1.1 Description of Development

The site comprises a 4-storey building formerly occupied by The Manchester College. The building is of red brick construction with areas of glazing and panelling. The building is bound by Gartside Street to the southeast, New College Street to the north east, New Quay Street to the south west and an existing NCP car park to the north west. Vacant possession of the building is anticipated in December 2022.

The site is surrounded by predominantly commercial buildings including the NCP car park, 1 Hardman Boulevard, 3 Hardman Square, buildings at Enterprise City and the new St John’s neighbourhood which comprises a mix of cultural, commercial and residential accommodation.

1.1.2 Site Area

The proposed total building areas are as follows:

- GIA: 25,852.21sqm 278,271sqft.

The site area for the full application is 0.16 ha. A site location plan has been prepared by EPR Architects.

The existing building areas to be demolished are as follows:

- GIA: 4,344 sqm (46,758 sqft).

1.1.3 Proposed Development Redline Boundary

The proposed development redline boundary¹ is shown in Figure 1 on the following page.

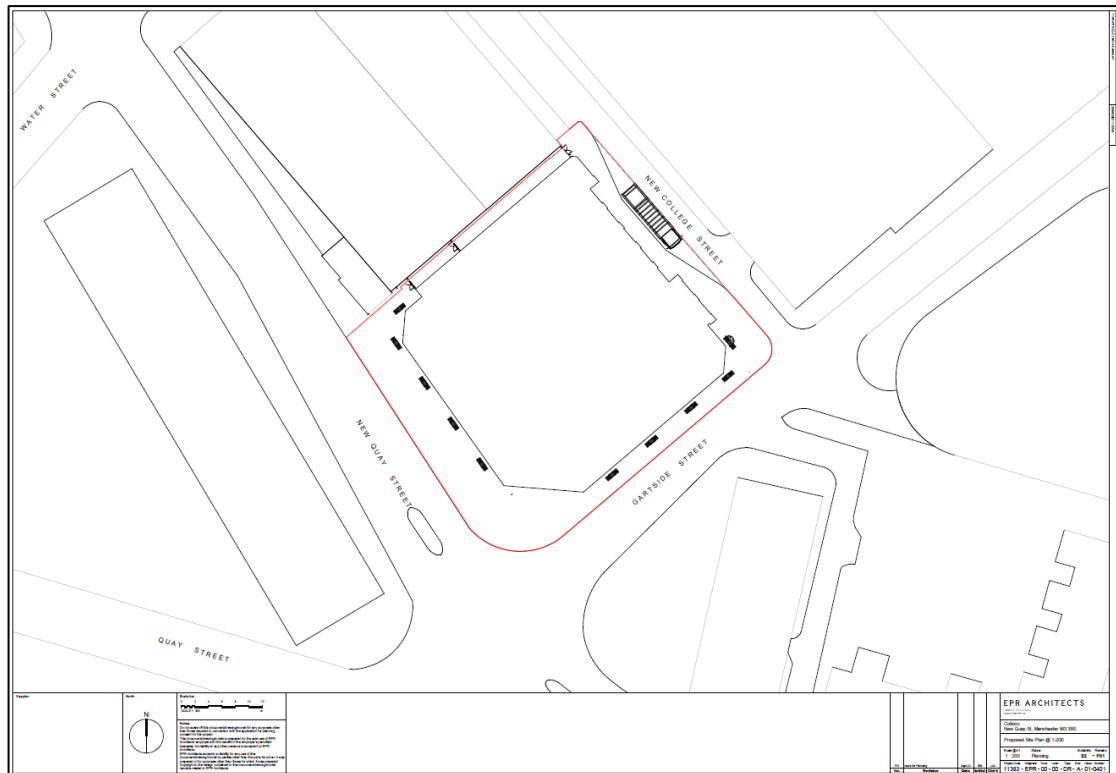


Figure 1 Proposed development redline boundary

¹ Source: Asteer Planning, September 2023, '11383-EPR-00-00-DR-A-01-0401' PDF (cropped)

2 TELEVISION TRANSMITTER DETAILS

2.1 Relevant Transmitter

The Winter Hill transmitter predominantly serves the area around the development². Digital television services are broadcast via Ultra High Frequency (UHF) signals.

2.2 Winter Hill Main Transmitter

Winter Hill is one of the UK's main television transmitters located approximately 24km northwest of the proposed development.

Digital television services are broadcast, details are presented in Tables 1 and 2 below.

	Public (PSB)			Commercial (COM)		
Service	BBC A	Digital 3&4	BBC B	SDN	Arqiva A	Arqiva B
Channel	32	34	35	29	31	37
Power	100 kilo-Watts (kW)					

Table 1 Winter Hill main transmissions (main multiplexes)

Service	LTVmux (Manchester)	Glmux	COM 7
Channel	24	27	55
Power	2 kW	1 kW	25.7 kW

Table 2 Winter Hill transmissions (local multiplexes)

² Based on coverage maps and Digital UK information.

Radio transmission details are presented in Table 3 below.

	Digital Audio Broadcasting (DAB)				FM
Service	CE Manchester	Digital One	Bauer Central Lancashire	BBC National DAB	Various Services
Frequency	220.352 MHz	222.064 MHz	223.936 MHz	225.648 MHz	88.6 – 105.4 MHz
Power	0.25 kW	10 kW	1.5 kW	10 kW	Max 5 kW

Table 3 Winter Hill radio transmissions

3 BUILDINGS AND TELEVISION INTERFERENCE

3.1 Technical Overview

3.1.1 Television

Terrestrial television services are provided by means of electromagnetic waves in the Ultra High Frequency (UHF) range which propagate from land-based transmitters to receiving aerials. The quality of the image and sound on a television set is dependent on both the strength of the signal received directly from the transmitter (carrier signal) and the strength of any interference signals from other sources.

To achieve good quality reception an aerial must receive a strong carrier signal but weak interference signals.

3.1.2 Radio

Radio services are also received from fixed transmitters, much like terrestrial television signals. However, radio services are typically available from numerous transmitters, particularly in a dense urban environment. Services can be digital or analogue.

The quality of the received signal is dependent on its strength and the level of interference, although radio services are typically more robust to interference than television signals.

3.2 Interference Mechanisms – Television

Buildings can cause interference to terrestrial television reception by way of obstruction and reflection, outlined in the following subsections.

3.2.1 Obstruction

This is caused by the building physically blocking the transmitted signal, reducing the strength of the carrier signal in the shadow of the building. In the case of Winter Hill transmissions, this would affect residences to the southeast of the development. Specifically:

- The highest losses (greatest interference) will be located immediately behind the building relative to the transmitter i.e. in the shadow zone;
- Losses near the edge of the shadow zone will be less significant due to diffraction effects (bending of the signal).

Relevant extracts from OFCOM relating to guidance³ on this issue are presented below:

“In general, there will be three ‘zones’ behind the structure:

Zone A - close behind the structure (typically a few tens of metres) there may be a large reduction in signal level with a possible complete loss of reception

³ OFCOM (2009): Tall Structures and their impact on broadcast and other wireless services

Zone B - further away (typically a few hundred metres) the signal reduction is less severe and the shadow will be smaller as diffraction effects partially fill in the shadow. Depending on the size of the structure, some locations could still lose reception completely;

Zone C - some distance away (1-5km) the shadow will effectively have disappeared.”

The zones mentioned are illustrated in Figure 2⁴ below, taken from Section 3.2 of the OFCOM guidance regarding the impact of buildings on broadcast signals.

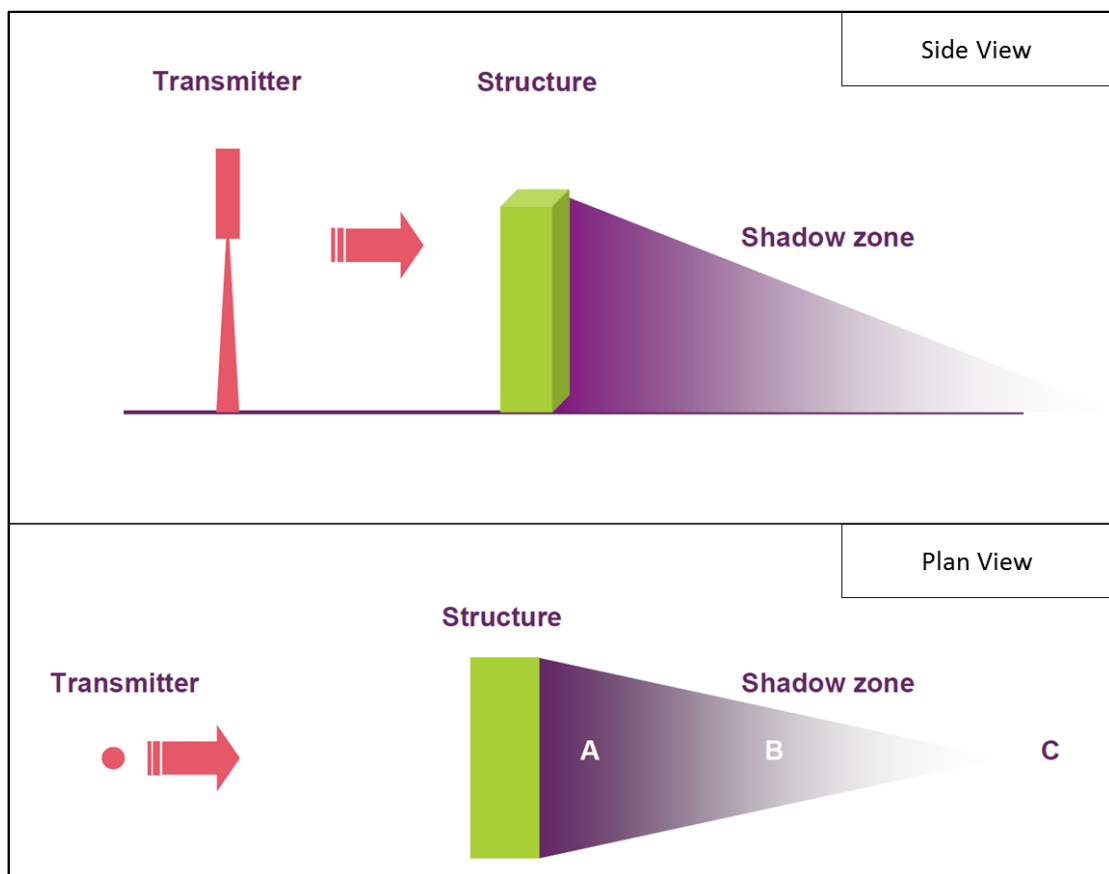


Figure 2 Diffraction Loss Zones

3.2.2 Reflection

For large developments with straight edges, the transmitted signal can be reflected by the building itself. This causes an effect known as ‘multipath interference’ whereby the signal is received twice by an aerial at different times. The direct signal arrives first because it has a shorter distance to travel.

Figure 3⁵ on the following page (taken from Section 3.3 of the OFCOM guidance referenced previously) illustrates this effect.

⁴ Source: OFCOM publication

⁵ Source: OFCOM publication

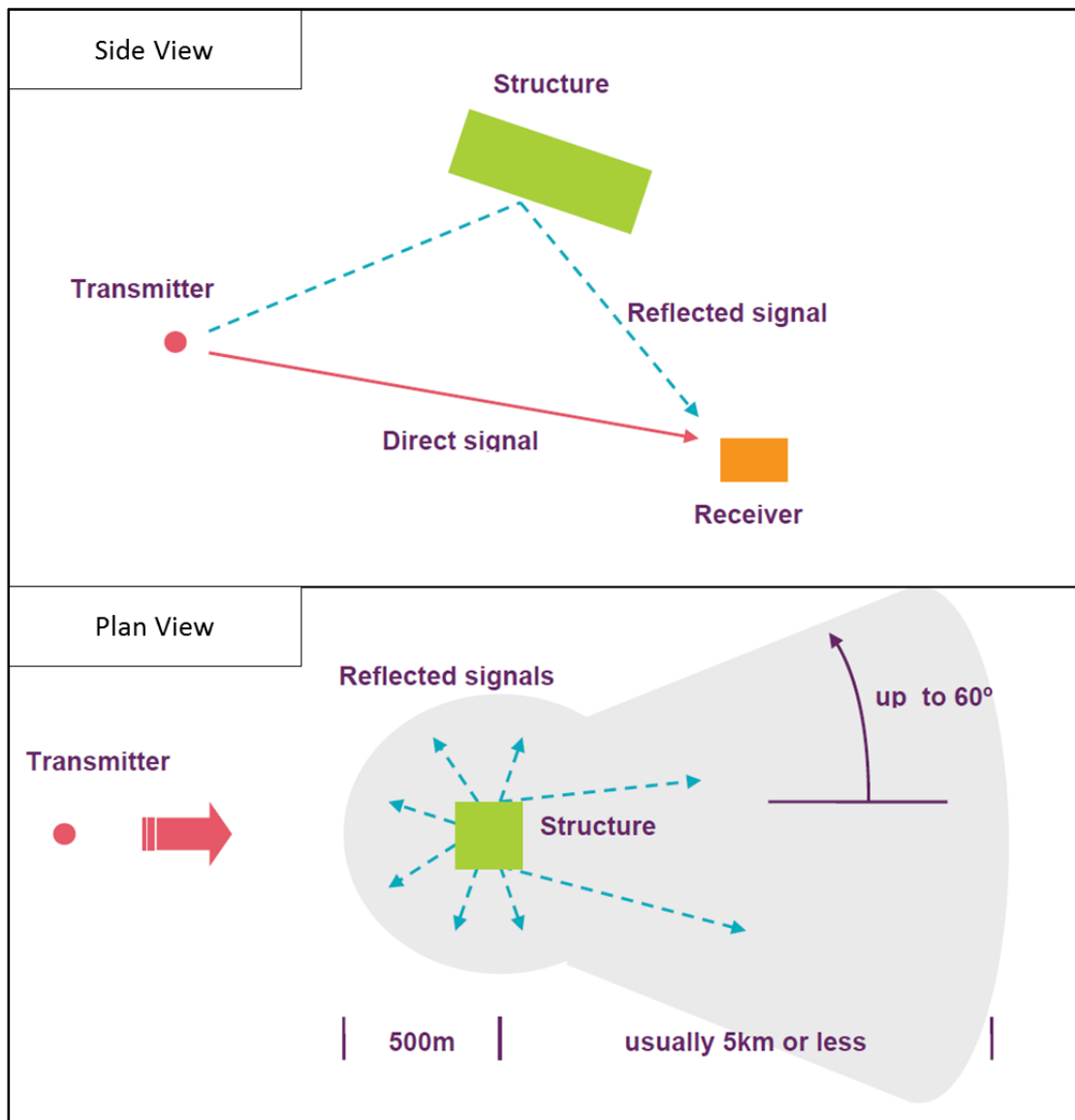


Figure 3 Reflection Zones

In practice, it is considered highly unlikely that reflections will have an effect for receivers in front of the building or on either side when viewed from the location of the transmitter. For digital transmissions in particular, it is unlikely that issues will occur if the angle between the direct signal and the reflected signal is more than 30 degrees⁶.

⁶ This is known to be the angle that Arqiva considers when safeguarding its Television Re-Broadcast Links with regard to reflections from wind turbines – whilst wind turbines cause issues that are different to buildings this particular issue is similar for the two.

The reflection zone has been constructed in accordance with the OFCOM approach, however the angle considered is 30 degrees rather than 60 degrees. This is in order to represent a more realistic scenario for digital transmissions.

Reflection issues are most likely to cause a noticeable impact if:

- The direct signal from transmitter to receiver is weak (e.g. obstructed by terrain or buildings);
- The reflected signal from the development site is strong (e.g. clear radio line of sight from the transmitter to the building and the building to the receiver).

The worst-case scenario is for both of the above conditions to be satisfied. The best-case scenario is for neither of the above conditions to be satisfied.

3.3 Interference Mechanisms – Radio

There is less specific guidance for radio interference within the OFCOM guidance though the interference mechanisms presented for television transmissions do generally apply. The following information is specifically given:

“Although reports of new structures causing problems to radio reception are rare, the possibility of difficulties cannot be ruled out entirely. Broadcast radio (FM, AM and DAB digital radio) are transmitted on lower frequencies than those used by terrestrial TV signals. Lower frequency signals tend to pass through obstructions more easily than the higher frequency TV signals, and diffraction effects also become more significant at lower frequencies. Both these factors will tend to lessen the impact of new structures on radio reception.

Strong signal reflections will reduce the quality of FM reception leading to fluttering noises or sound distortion. In contrast, the signal format used for DAB digital radio is designed to offer high levels of robustness in difficult conditions and it is not materially affected by reflections. FM and DAB reception can be affected where a structure blocks signals and both may cease to function if signals are reduced below a certain threshold.”

It is Pager Power’s experience that reported interference to radio services is significantly less common than reported interference to television services. Potential impacts on radio have nevertheless been considered within the analysis to satisfy the planning condition.

4 TECHNICAL ASSESSMENT

4.1 Potential Interference Areas

The shadow and reflection zones have been defined based on the geometry as set out in the previous section. Both zones extend to a distance of 5km beyond the proposed development location in accordance with the OFCOM guidance.

In the case of the shadow zone, this has been modelled as having straight sides in order to be conservative. In actuality, due to diffraction effects, the zone would have a more triangular shape as shown in Figure 3 in the previous section.

Figure 4 below shows reflection and shadow areas, or interference zones, associated with the proposed development.

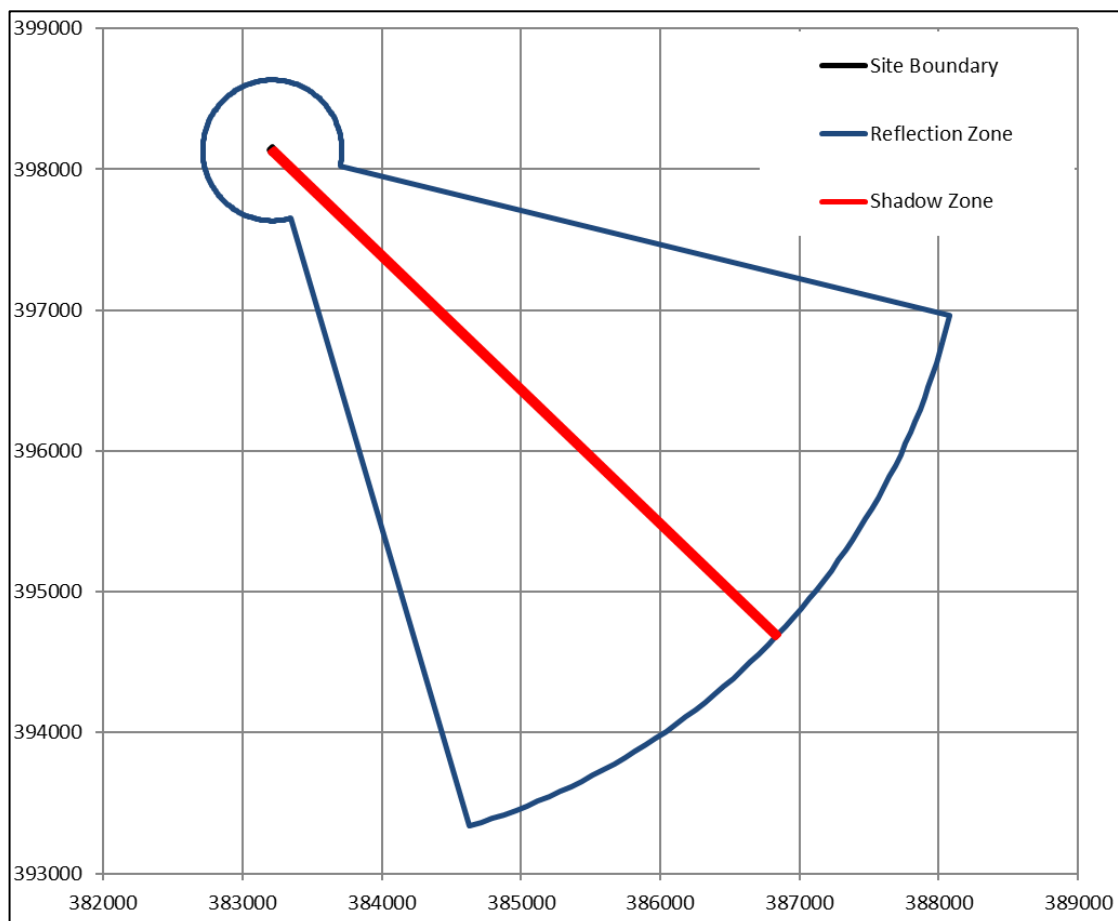


Figure 4 Reflection and Shadow Zones

Figure 5 below shows the interference zones overlaid onto an aerial image.

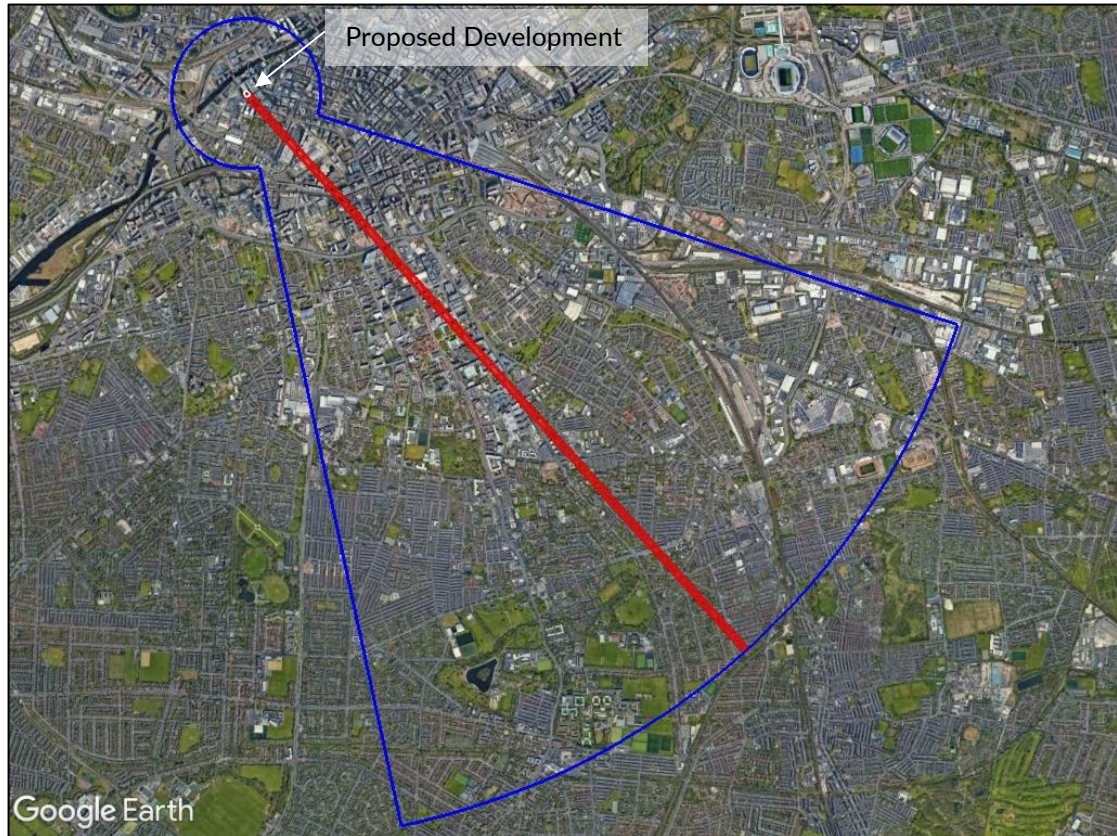


Figure 5 Interference zones onto aerial imagery

4.2 Potential Diffraction Issues – Terrestrial Television

The shadow zone passes over urban areas that contain commercial and residential buildings. Areas closest to the proposed development are at the highest risk of experiencing television interference. This is typically limited to 1km based on Pager Power's assessment experience.

The 1km assessment area predominantly features commercial and high-rise residential properties, therefore, interference is unlikely due to the lack of airds present or their heights. Beyond 1km, commercial and low-rise properties exist. Interference is unlikely to be experienced at this range.

4.3 Potential Reflection Issues

Reflection effects are most likely if the transmitter does not have direct line-of-sight to the receiving aerial.

The predicted coverage of the Winter Hill transmitter is generally good in the surrounding area. Interference due to reflections are most likely when:

- The receiving aerial is unobstructed by existing obstacles;
- The reflected signal path via the proposed development is unobstructed;
- The angle between the reflected signal via the proposed development and the direct signal would is small.

Interference is most likely if all of the above criteria are met. Interference is least likely if none of the above criteria are met.

In practice it is unlikely that all of the above criteria would be met for the proposed development. In particular, locations that are below radio line of sight from the transmitter are unlikely to have an unobstructed path to the proposed development, due to their relative heights. Impacts due to reflections are considered unlikely.

5 TELEVISION BASELINE SURVEY

5.1 Overview – Television Services

The purpose of a baseline survey is to establish current signal strength and quality in the area. The baseline survey serves three purposes these are:

1. It confirms which transmitter is serving most homes in the areas surveyed (for television);
2. It provides an indicator regarding the likelihood of interference. If current signals are of good quality, minor degradation is less likely to have a noticeable effect;
3. It allows a 'before and after' comparison to be made in the event that a complaint is received.

A baseline television reception survey was undertaken for the proposed development on 14th March 2023.

Survey measurements were taken using Pager Power's custom survey vehicle with a wideband UHF aerial extended to a height of 10 metres above ground level. This was connected to television analyser to record the signal strength and stability.

The strength of the recorded signals is categorised in accordance with Table 4 below.

Average Signal Strength (dB)	Subjective Signal Strength Definition
< 35	Low
35-45	Moderate
45-55	Good
> 55	Very Good

Table 4 Television signal strength categories

5.2 Survey Locations

Figures 6 and 7 below and on the following page show the survey locations overlaid onto aerial photography. Survey locations were chosen pre-survey (within the shadow zone) however safe and available access influenced the specific position on the day. The locations below show the actual survey locations. Radial white icons represent both television and radio survey locations.



Figure 6 Radio reception survey locations

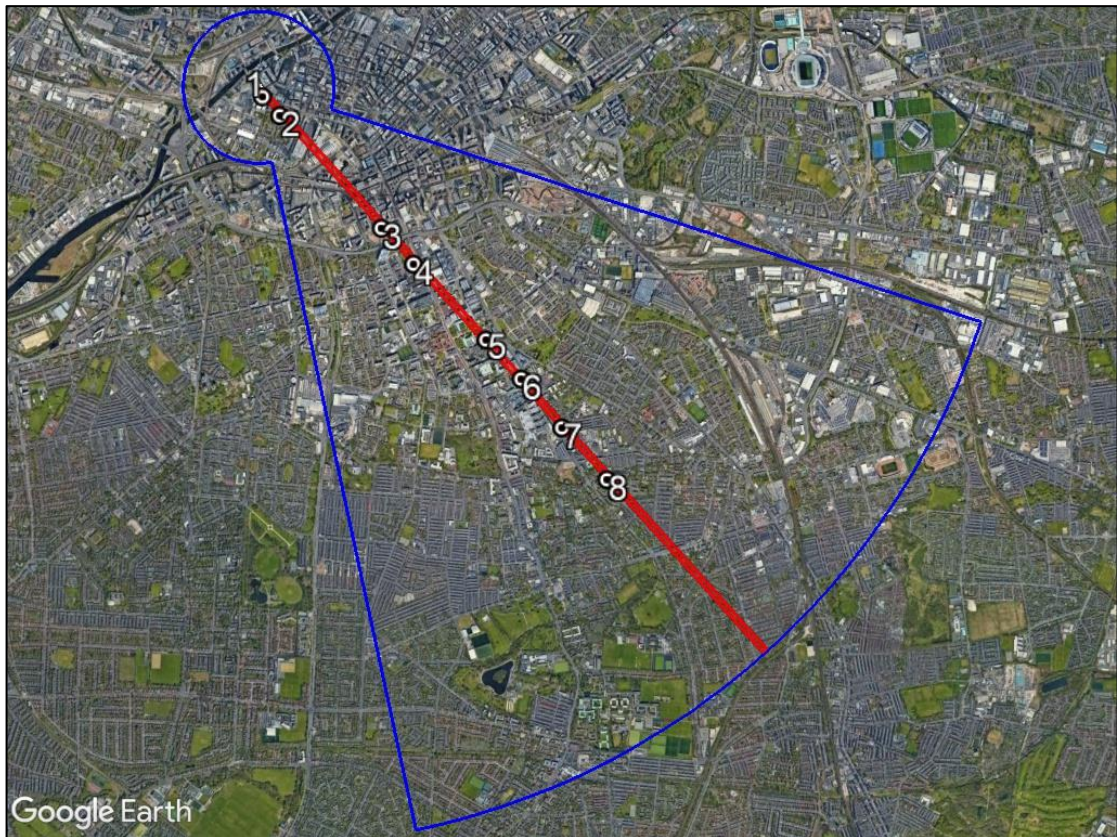


Figure 7 Television reception survey locations

5.3 Survey Results

Full survey results are shown in Appendix A. Survey photographs are shown in Appendix B.

5.3.1 Television Baseline Survey

A summary of the survey results for television reception is presented in Table 4 on the following page.

Location	Average Measured Signal Strength (dB)	Remarks	High Level Conclusion
1	Average: 39.7 (Moderate) Main TV MUX: 44.2 (Moderate) Local TV MUX: 30.7 (Low)	No HP ⁷ UHF ⁸ aerials or satellite dishes were observed. All main multiplexes decoded with fine picture and audio quality. An average of moderate signal strength and signal fluctuations of less than or equal to 1dB. Two out of three local multiplexes decoded with fine picture and audio quality. An average of low signal strength and signal fluctuations of less than or equal to 1dB.	The survey location was within 50m of the proposed development and within its shadow zone. Signal losses at this range are likely to be small, considering the attenuation from existing buildings. Noticeable effects are not predicted in practice due to the lack of residential properties or height of any aerials in the area.

⁷ Horizontally Polarised.

⁸ Ultra-High Frequency

Location	Average Measured Signal Strength (dB)	Remarks	High Level Conclusion
2	Average: 39.7 (Moderate) Main TV MUX: 42.2 (Moderate) Local TV MUX: 34.8 (Low)	One HP UHF aerial directed towards the Winter Hill transmitter was observed. No satellite dishes were observed. All main multiplexes decoded with fine picture and audio quality. An average of moderate signal strength and signal fluctuations of less than or equal to 1dB. Two out of three local multiplexes decoded with fine picture and audio quality. An average of low signal strength and signal fluctuations of less than or equal to 1dB.	The survey location was within 250m of the proposed development and within its shadow zone. Signal losses at this range are likely to be small, considering the attenuation from existing buildings. Noticeable effects are not predicted in practice due to the lack of residential properties or height of any aerials in the area.
3	Average: 37.3 (Moderate) Main TV MUX: 42.1 (Moderate) Local TV MUX: 27.8 (Low)	No HP UHF aerials or satellite dishes were observed. All main multiplexes decoded with fine picture and audio quality. An average of moderate signal strength and signal fluctuations of less than or equal to 1dB. Two out of three local multiplexes decoded with fine picture and audio quality. An average of low signal strength and signal fluctuations of less than or equal to 1dB.	This location is approximately 1.25km from the proposed development. Effects at this range are likely to be relatively small based on previous experience. Based on the current signal quality, effects are unlikely to be noticeable.

Location	Average Measured Signal Strength (dB)	Remarks	High Level Conclusion
4	Average: 29.8 (Low) Main TV MUX: 35.1 (Moderate) Local TV MUX: 19.1 (Low)	Multiple HP UHF aerials directed towards the Winter Hill transmitter was observed. Multiple satellite dishes were observed. All main multiplexes decoded with fine picture and audio quality. An average of moderate signal strength and signal fluctuations of less than or equal to 1dB. Two out of three local multiplexes decoded with fine picture and audio quality. An average of low signal strength and signal fluctuations of less than or equal to 1dB.	This location is approximately 1.55km from the proposed development. Effects at this range are likely to be relatively small based on previous experience. Based on the current signal quality, effects are unlikely to be noticeable.
5	Average: 35.1 (Moderate) Main TV MUX: 38.6 (Moderate) Local TV MUX: 28.1 (Low)	Few HP UHF aerials directed towards the Winter Hill transmitter were observed. Few satellite dishes were observed. All main multiplexes decoded with fine picture and audio quality. An average of moderate signal strength and signal fluctuations of less than or equal to 1dB. Two out of three local multiplexes decoded with fine picture and audio quality. An average of low signal strength and signal fluctuations of less than or equal to 1dB.	This location is approximately 2.25km from the proposed development. Effects at this range are likely to be relatively small based on previous experience. Based on the current signal quality, effects are unlikely to be noticeable.

Location	Average Measured Signal Strength (dB)	Remarks	High Level Conclusion
6	Average: 49.6 (Good) Main TV MUX: 59.4 (Very Good) Local TV MUX: 30.1 (Low)	No HP UHF aerials or satellite dishes were observed. All main multiplexes decoded with fine picture and audio quality]. An average of very good signal strength and signal fluctuations of less than or equal to 1dB. Two out of three local multiplexes decoded with fine picture and audio quality. An average of low signal strength and signal fluctuations of less than or equal to 1dB.	This location is approximately 2.6km from the proposed development. Effects at this range are likely to be relatively small based on previous experience. Based on the current signal quality, effects are unlikely to be noticeable.
7	Average: 40.7 (Moderate) Main TV MUX: 44.5 (Moderate) Local TV MUX: 33.1 (Low)	Multiple HP UHF aerials directed towards the Winter Hill transmitter were observed. Multiple satellite dishes were observed. All main multiplexes decoded with fine picture and audio quality]. An average of moderate signal strength and signal fluctuations of less than or equal to 1dB. Two out of three local multiplexes decoded with fine picture and audio quality. An average of low signal strength and signal fluctuations of less than or equal to 1dB.	This location is approximately 3km from the proposed development. Effects at this range are likely to be relatively small based on previous experience. Based on the current signal quality, effects are unlikely to be noticeable.

Location	Average Measured Signal Strength (dB)	Remarks	High Level Conclusion
8	Average: 37.7 (Moderate) Main TV MUX: 43.7 (Moderate) Local TV MUX: 25.7 (Low)	Multiple HP UHF aerials directed towards the Winter Hill transmitter were observed. Multiple satellite dishes were observed. All main multiplexes decoded with fine picture and audio quality. An average of moderate signal strength and signal fluctuations of less than or equal to 1dB. Two out of three local multiplexes decoded with fine picture and audio quality. An average of low signal strength and signal fluctuations of less than or equal to 1dB.	This location is approximately 3.45km from the proposed development. Effects at this range are likely to be relatively small based on previous experience. Based on the current signal quality, effects are unlikely to be noticeable.

Table 5 Television baseline survey results

5.3.2 Radio Baseline Survey

Two out of four digital, and FM radio services decoded with good signal strength and fine audio quality at close range to the proposed development. Detailed results are shown in Appendix A.

Overall, some degradation of the radio signal at close range to the proposed development is likely. The effects are unlikely to be noticeable in practice due to the variability of services in an urban environment.

6 MITIGATION

6.1 Mitigation Requirement

If an adverse effect on television services occurs and is attributable to the proposed development, mitigation may be required. The most effective form of mitigation is dependent on the specific impact. Common options are shown below.

Mitigation options for television include:

- Replacement of receiving aerial with a more directional or higher gain aerial;
- Repositioning the receiving aerial so that the received signal is stronger;
- Directing the receiving aerial to an alternative transmitter that covers the area and retuning the television accordingly;
- Upgrading antenna cabling and connections;
- Installation of signal amplifiers;
- Development of a bespoke local solution using a receiving aerial some distance from the dwelling;
- A combination of the above;
- Replacing terrestrial reception equipment with satellite reception equipment or cable.

6.2 Recommended Options

If interference were to occur for a small number of dwellings it is likely that installation of satellite television receiver would be the most suitable option.

If effects are experienced for dwellings with poor quality or low receiving aerials, the best option may be to upgrade and/or elevate the existing aerial.

It is also possible that the television services could be supplied by an alternate transmitter in the surrounding area.

6.3 Recommended Process

The result of the baseline survey suggests there is no reason to install pre-emptive mitigation. Mitigation and recommendations have only been included for completeness.

It is possible that no adverse effects will occur due to the current reception quality in the surrounding area and the scarcity of residential receptors at a low height in the immediate shadow zone.

It is therefore recommended to investigate any reports of interference in order to determine whether these are attributable to the proposed development. If this is found to be the case, mitigation can be applied.

7 CONCLUSIONS

7.1 Results

7.1.1 Television

- A site survey was undertaken on 14th March 2023 to confirm the relevant transmitter and record the signal quality;
- The proposed development is within the coverage area for the Winter Hill television transmitter. The baseline survey confirmed it is the main transmitter serving the area;
- Any interference would be due to shadowing effects i.e. the weakening of the transmitted signal due to the physical presence of the buildings;
- The average terrestrial signal strength is moderate in the shadow zone of the proposed development for the main multiplexes, and low on average for the local (lower power) multiplexes;
- Negative effects upon signal strength are most likely at locations close to the proposed development i.e. within 1km of the proposed development and within its shadow zone. The average recorded signal within 1km of the proposed development was moderate and low for main and local TV multiplexes respectively. Buildings in the surrounding environment within 1km of the proposed development were mainly commercial and high-rise residential properties;
- At locations beyond 1km and within the shadow zone, no significant impacts are predicted and interference is predicted to be unlikely.

7.1.2 Radio

- The area surrounding the proposed development receives radio services from the Winter Hill transmitter. The strength and quality of the signal from Winter Hill near the proposed development is consistent, however, not all frequencies decoded;
- Degradation of the radio signal at close range to the proposed development is likely. The effects are unlikely to be noticeable in practice due to the variability of services in an urban environment.

7.2 Recommendations and Mitigation

No requirement for pre-emptive mitigation has been identified.

It is recommended any reports of interference are investigated to determine whether these are attributable to the proposed development. Comparisons between a post-construction survey and this baseline survey should be made, if undertaken.

If interference is found to be attributable to the proposed development, mitigation measures should be installed. Solutions are likely to be readily available if required, the most common options are presented in Section 6.

APPENDIX A – DETAILED SURVEY RESULTS

Radio Location 1

Coordinates: Lon -2.255002 °, Lat 53.480191°			
Frequency (MHz)	Service	Signal Strength (dBμV)	Audio
220.352	CE Manchester	17.2 ± 0.1	DND
222.064	Digital One	53.0 ± 0.5	Fine
223.936	Bauer Central Lancashire	17.7 ± 0.1	DND
225.648	BBC National DAB	52.0 ± 0.2	Fine
88-106	Various FM	35.4 ± 1.0	Fine

Radio Location 2

Coordinates: Lon -2.252567°, Lat 53.480480°			
Frequency (MHz)	Service	Signal Strength (dBμV)	Audio
220.352	CE Manchester	20.2 ± 0.1	DND
222.064	Digital One	49.0 ± 0.3	Fine
223.936	Bauer Central Lancashire	12.7 ± 0.6	DND
225.648	BBC National DAB	51.0 ± 0.4	Fine
88-106	Various FM	44.4 ± 0.4	Fine

Radio Location 3

Coordinates: Lon -2.254837°, Lat 53.479504°			
Frequency (MHz)	Service	Signal Strength (dBμV)	Audio
220.352	CE Manchester	22.2 ± 0.4	DND
222.064	Digital One	45.7 ± 0.2	Fine
223.936	Bauer Central Lancashire	13.8 ± 0.1	DND
225.648	BBC National DAB	47.5 ± 0.5	Fine
88-106	Various FM	39.4 ± 0.3	Fine

Radio Location 4

Coordinates: Lon -2.253853°, Lat 53.479203°			
Frequency (MHz)	Service	Signal Strength (dBμV)	Audio
220.352	CE Manchester	20.0 ± 0.3	DND
222.064	Digital One	57.2 ± 0.2	Fine
223.936	Bauer Central Lancashire	17.9 ± 0.8	DND
225.648	BBC National DAB	58.8 ± 0.6	Fine
88-106	Various FM	51.4 ± 0.3	Fine

Location 1

Coordinates: Lon -2.253853°, Lat 53.479203°					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	31.4 ± 0.1	1×10 ⁻⁸	Fine	Fine
27	GImax	38.5 ± 0.1	1×10 ⁻⁸	Fine	Fine
29	SDN	42.7 ± 0.2	1×10 ⁻⁸	Fine	Fine
31	Arq A	40.5 ± 0.3	1×10 ⁻⁸	Fine	Fine
32	BBC A	45.2 ± 0.2	1×10 ⁻⁸	Fine	Fine
34	D3+4	46.9 ± 0.3	1×10 ⁻⁸	Fine	Fine
35	BBC B	45.2 ± 0.1	1×10 ⁻⁸	Fine	Fine
37	Arq B	45.0 ± 0.1	1×10 ⁻⁸	Fine	Fine
55	COM7	22.4 ± 0.2	DND ⁹		

Notes: No HP¹⁰ UHF¹¹ aerials or satellite dishes were observed.

⁹ Did not decode

¹⁰ Horizontally Polarised.

¹¹ Ultra-High Frequency

Location 2

Coordinates: Lon -2.251972°, Lat 53.478162°					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	38.2 ± 0.1	1×10 ⁻⁸	Fine	Fine
27	Glmax	45.9 ± 0.1	1×10 ⁻⁸	Fine	Fine
29	SDN	43.3 ± 0.2	1×10 ⁻⁸	Fine	Fine
31	Arq A	41.0 ± 0.3	1×10 ⁻⁸	Fine	Fine
32	BBC A	46.8 ± 0.2	1×10 ⁻⁸	Fine	Fine
34	D3+4	44.3 ± 0.3	1×10 ⁻⁸	Fine	Fine
35	BBC B	38.7 ± 0.2	1×10 ⁻⁸	Fine	Fine
37	Arq B	39.4 ± 0.1	1×10 ⁻⁸	Fine	Fine
55	COM7	20.3 ± 0.2	DND		

Notes: One HP UHF aerial directed towards the Winter Hill transmitter was observed. No satellite dishes were observed.

Location 3

Coordinates: Lon -2.240996°, Lat 53.471997°					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	30.4 ± 0.2	1×10 ⁻⁸	Fine	Fine
27	Glmax	29.8 ± 0.3	1×10 ⁻⁸	Fine	Fine
29	SDN	49.6 ± 0.2	1×10 ⁻⁸	Fine	Fine
31	Arq A	41.4 ± 0.2	1×10 ⁻⁸	Fine	Fine
32	BBC A	41.8 ± 0.1	1×10 ⁻⁸	Fine	Fine
34	D3+4	39.6 ± 0.1	1×10 ⁻⁸	Fine	Fine
35	BBC B	40.5 ± 0.2	1×10 ⁻⁸	Fine	Fine
37	Arq B	40.0 ± 0.2	1×10 ⁻⁸	Fine	Fine
55	COM7	23.4 ± 0.2	DND		

Notes: No HP UHF aerials or satellite dishes were observed.

Location 4

Coordinates: Lon - 2.206275°, Lat 53.470910°					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	23.7 ± 0.5	1×10 ⁻⁸	Fine	Fine
27	Glmax	18.0 ± 0.4	1×10 ⁻⁸	Fine	Fine
29	SDN	36.9 ± 0.2	1×10 ⁻⁸	Fine	Fine
31	Arq A	36.3 ± 0.2	1×10 ⁻⁸	Fine	Fine
32	BBC A	37.9 ± 0.1	1×10 ⁻⁸	Fine	Fine
34	D3+4	36.8 ± 0.3	1×10 ⁻⁸	Fine	Fine
35	BBC B	36.4 ± 0.3	1×10 ⁻⁸	Fine	Fine
37	Arq B	26.5 ± 0.2	1×10 ⁻⁸	Fine	Fine
55	COM7	15.7 ± 0.1	DND		

Notes: Multiple HP UHF aerials directed towards the Winter Hill transmitter was observed.
Multiple satellite dishes were observed.

Location 5

Coordinates: Lon -2.229743°, Lat 53.465913°					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	30.8 ± 0.1	1×10 ⁻⁸	Fine	Fine
27	Glmax	33.3 ± 0.3	1×10 ⁻⁸	Fine	Fine
29	SDN	37.8 ± 0.2	1×10 ⁻⁸	Fine	Fine
31	Arq A	38.0 ± 0.3	1×10 ⁻⁸	Fine	Fine
32	BBC A	41.9 ± 0.3	1×10 ⁻⁸	Fine	Fine
34	D3+4	36.5 ± 0.2	1×10 ⁻⁸	Fine	Fine
35	BBC B	38.3 ± 0.5	1×10 ⁻⁸	Fine	Fine
37	Arq B	39.5 ± 0.3	1×10 ⁻⁸	Fine	Fine
55	COM7	20.2 ± 0.1	DND		

Notes: Few HP UHF aerials directed towards the Winter Hill transmitter were observed. Few satellite dishes were observed.

Location 6

Coordinates: Lon -2.225955°, Lat: 53.463774°					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	36.0 ± 0.2	1×10 ⁻⁸	Fine	Fine
27	Glmax	29.3 ± 0.3	1×10 ⁻⁸	Fine	Fine
29	SDN	59.3 ± 0.2	1×10 ⁻⁸	Fine	Fine
31	Arq A	59.2 ± 0.1	1×10 ⁻⁸	Fine	Fine
32	BBC A	61.0 ± 0.1	1×10 ⁻⁸	Fine	Fine
34	D3+4	59.2 ± 0.4	1×10 ⁻⁸	Fine	Fine
35	BBC B	58.4 ± 0.2	1×10 ⁻⁸	Fine	Fine
37	Arq B	59.3 ± 0.1	1×10 ⁻⁸	Fine	Fine
55	COM7	25.2 ± 0.1	DND		

Notes: No HP UHF aerials or satellite dishes were observed.

Location 7

Coordinates: Lon -2.221534°, Lat 53.461089°					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	35.6 ± 0.2	1×10 ⁻⁸	Fine	Fine
27	Glmax	39.5 ± 0.1	1×10 ⁻⁸	Fine	Fine
29	SDN	47.0 ± 0.2	1×10 ⁻⁸	Fine	Fine
31	Arq A	49.7 ± 0.2	1×10 ⁻⁸	Fine	Fine
32	BBC A	42.0 ± 0.2	1×10 ⁻⁸	Fine	Fine
34	D3+4	43.7 ± 0.1	1×10 ⁻⁸	Fine	Fine
35	BBC B	41.4 ± 0.3	1×10 ⁻⁸	Fine	Fine
37	Arq B	43.2 ± 0.1	1×10 ⁻⁸	Fine	Fine
55	COM7	24.2 ± 0.1	DND		

Notes: Multiple HP UHF aerials directed towards the Winter Hill transmitter were observed. Multiple satellite dishes were observed.

Location 8

Coordinates: Lon -2.216669°, Lat 53.458250°					
Channel	Service	Signal Strength (dBμV)	BER	Picture	Audio
24	LTVmux	27.2 ± 0.1	1×10 ⁻⁸	Fine	Fine
27	Glmax	25.1 ± 0.3	1×10 ⁻⁸	Fine	Fine
29	SDN	41.7 ± 0.2	1×10 ⁻⁸	Fine	Fine
31	Arq A	42.4 ± 0.1	1×10 ⁻⁸	Fine	Fine
32	BBC A	46.9 ± 0.5	1×10 ⁻⁸	Fine	Fine
34	D3+4	45.5 ± 0.2	1×10 ⁻⁸	Fine	Fine
35	BBC B	48.5 ± 0.1	1×10 ⁻⁸	Fine	Fine
37	Arq B	37.2 ± 0.5	1×10 ⁻⁸	Fine	Fine
55	COM7	25.0 ± 0.3	DND		

Notes: Multiple HP UHF aerials directed towards the Winter Hill transmitter were observed.
Multiple satellite dishes were observed.

APPENDIX B – SURVEY PHOTOGRAPHS

Radio Location 1



Location 1



Location 2



Location 3



Location 4



Location 5



Location 6



Location 7





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