

Television Post-Construction Reception Survey

CityLabs 2.0

September 2020

PLANNING SOLUTIONS FOR:

- Solar
- Telecoms
- Railways
- Defence
- Buildings
- Wind
- Airports
- Radar
- Mitigation

www.pagerpower.com



ADMINISTRATION PAGE

Job Reference:	8916B
Date:	September, 2020
Author:	Kai Frolic
Telephone:	01787 319 001
Email:	kai@pagerpower.com

Reviewer:	Danny Scrivener
Date:	September, 2020
Telephone:	01787 319 001
Email:	danny@pagerpower.com

Issue	Date	Detail of Changes
1	September, 2020	Initial issue

Confidential: The contents of this document may not be disclosed to others without permission.

Copyright © 2020 Pager Power Limited

Pager Power Limited, Stour Valley Business Centre, Sudbury CO10 7GB

T: +44 (0)1787 319001 E: info@pagerpower.com W: www.pagerpower.com

EXECUTIVE SUMMARY

Report Purpose

The CityLabs 2.0 building development in Manchester, UK, has been completed. One of the planning conditions required assessment of the development's impact on terrestrial television reception in the surrounding area. A baseline reception survey was undertaken in 2016 prior to construction of the development. Reception survey measurements have been undertaken at similar locations in September 2020 to evaluate the difference post-construction.

Wider Context

There have been many changes since 2016, numerous buildings have been constructed in the city centre which could affect coverage in general. In addition, the Winter Hill transmitter at the time of the survey provided services on different channels (frequencies) than it did in 2016. Nevertheless, the effect of the new CityLabs 2.0 development has been evaluated based on the survey data.

Conclusions

All television services were received with good picture quality and sound within the development shadow zone – with the exception of one local channel that was not received at two locations. This channel is broadcast at low power and is generally not reliably received in the city centre area.

The received signal strength does appear to have reduced at close range to the development, which may be partially or wholly due to the CityLabs 2.0 development. However, the remaining quality of television services appears to remain high.

It is unlikely that noticeable impacts have occurred for receivers in the development's shadow zone.

Recommendation

In the event that interference to local multiplexes was to be reported in the shadow zone for CityLabs 2.0 within approximately 1 km of the building, the reported effects should be evaluated in the context of the survey results. It would be good practice to arrange for a local aerial installer to visit the reported interference location if the affected channels corresponded to one of the weaker multiplexes with a view to restoring this if possible. It is considered unlikely that this will be a requirement.

LIST OF CONTENTS

Administration Page	2
Executive Summary	3
List of Contents	4
List of Figures	5
List of Tables	5
1 Introduction	7
1.1 Report Purpose	7
1.2 Development	7
2 Terrestrial Television Transmitter Details	8
2.1 Relevant Transmitter	8
2.2 Terrestrial Television Transmitter Location	8
3 Interference Mechanisms	9
3.1 Technical Overview	9
3.2 Interference Mechanisms	9
4 Reception Survey	13
4.1 Locations	13
4.2 Survey Results	14
4.3 Conclusions	16
Appendix A Detailed Survey REsults	18
Location 1	18
Location 2	19
Location 3	20
Location 4	21
Location 5	22
Location 6	23
Location 7	24

Location 8	25
Appendix B Survey Photographs	26
Location 1	26
Location 2	27
Location 3	28
Location 4	29
Location 5	30
Location 6	31
Location 7	32
Location 8	33

LIST OF FIGURES

Figure 1 CityLabs site plan	7
Figure 2 Transmitter and development relative location.....	8
Figure 3 Diffraction loss zones.....	10
Figure 4 Diffraction loss zones.....	11
Figure 5 Survey locations	13
Figure 6 Zone of interest for interference reports.....	17

LIST OF TABLES

Table 1 Survey results	16
------------------------------	----

ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 48 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 INTRODUCTION

1.1 Report Purpose

The CityLabs 2.0 building development in Manchester, UK, has been constructed. One of the planning conditions required assessment of the development's impact on terrestrial television reception in the surrounding area. A baseline reception survey was undertaken in 2016 prior to construction of the development. Reception survey measurements have been undertaken at similar locations in September 2020 to evaluate the difference.

1.2 Development

Figure 1 below¹ shows a site plan of CityLabs 2.0 and 3.0 (the latter has not been considered within this assessment because it has not yet been constructed).

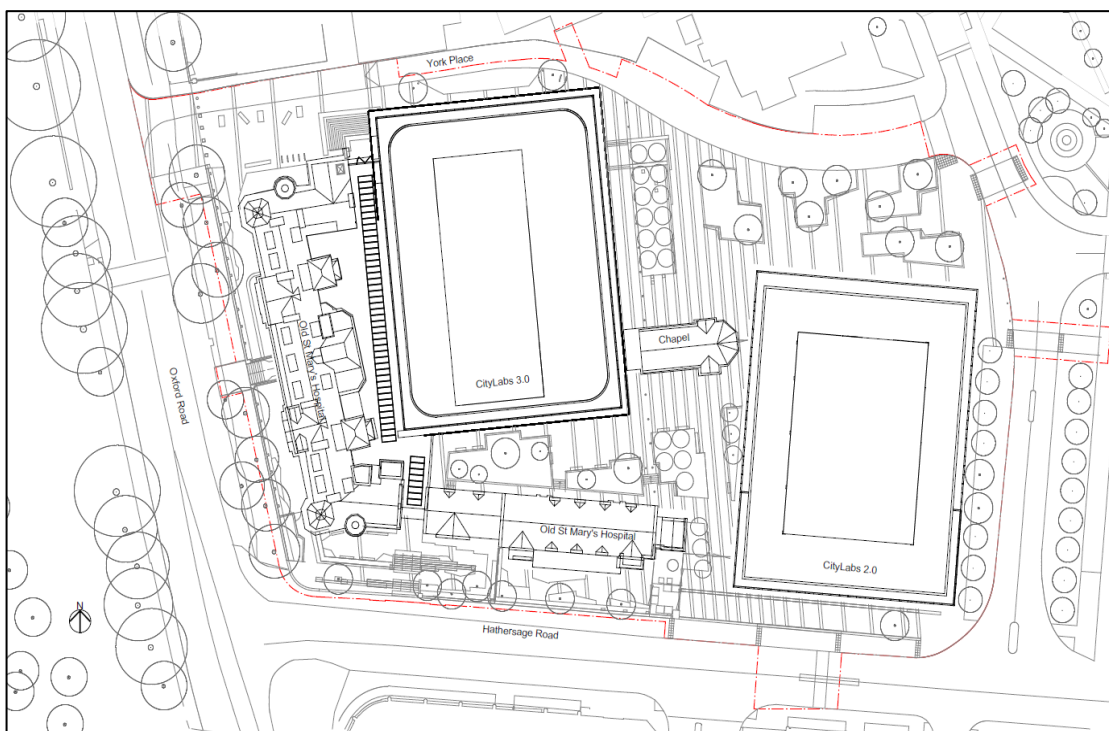


Figure 1 CityLabs site plan

¹ Provided ahead of the original baseline survey, sourced from Shephard Robson (cropped).

2 TERRESTRIAL TELEVISION TRANSMITTER DETAILS

2.1 Relevant Transmitter

The television transmitter serving the area around the development is Winter Hill. This is based on its coverage area and the results of both surveys (which confirmed that the vast majority of household aerials are directed towards this transmitter).

During the baseline survey in 2016, Winter Hill broadcast main multiplexes on channels 50, 59, 54-, 58, 49 and 55. Local multiplexes were broadcast on channels 31, 37, 56 and 57.

More recently, there have been works on the Winter Hill transmitter and services have moved to different channels. At the time of the post-construction survey (7 September 2020), services were available on channels 21, 24, 27, 29, 31, 32, 34, 35, 37 and 55.

2.2 Terrestrial Television Transmitter Location

Figure 2 below shows the location of the development relative to the transmitter.

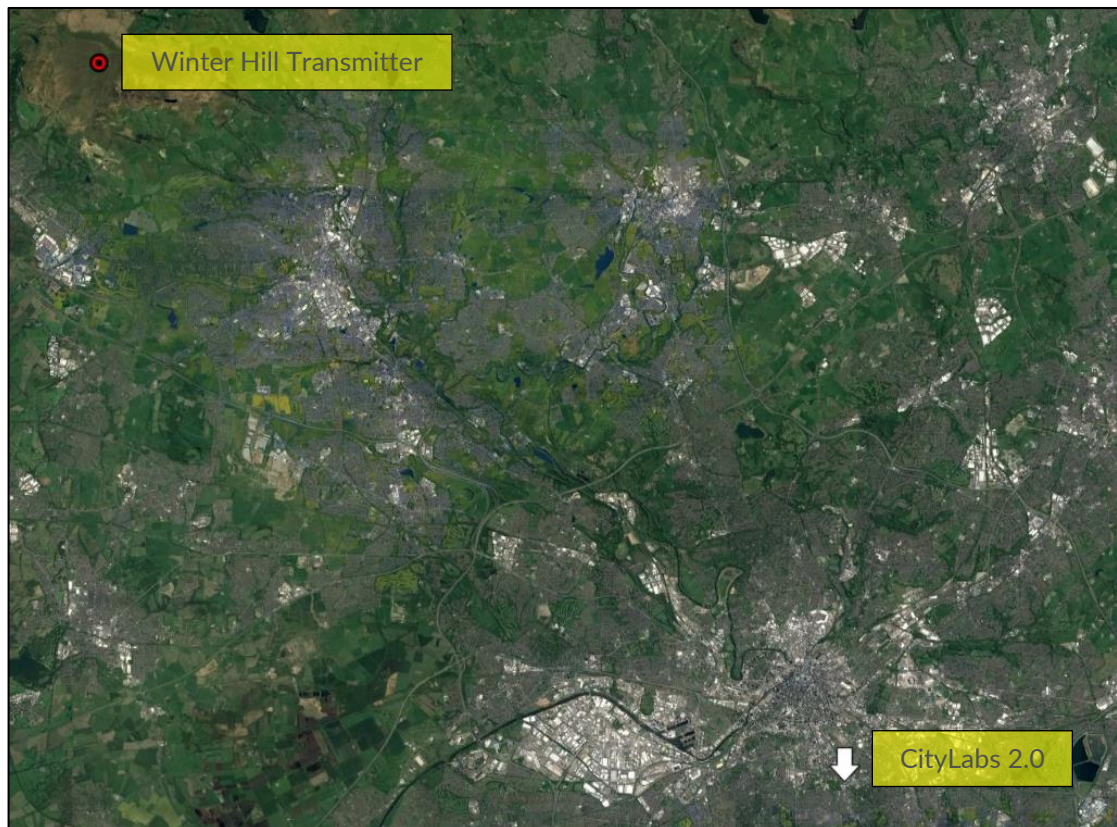


Figure 2 Transmitter and development relative location

3 INTERFERENCE MECHANISMS

3.1 Technical Overview

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.

3.2 Interference Mechanisms

3.2.1 Obstruction of the signal

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 Proposed Development. The following is true for television signals:

- The highest losses (greatest interference) will be located immediately behind the development 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).

Ofcom has produced a document offering guidance on this issue. Relevant extracts from the documents 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

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 3 on the following page, taken from Section 3.2 of the Ofcom guidance regarding the effect of buildings on broadcast signals.

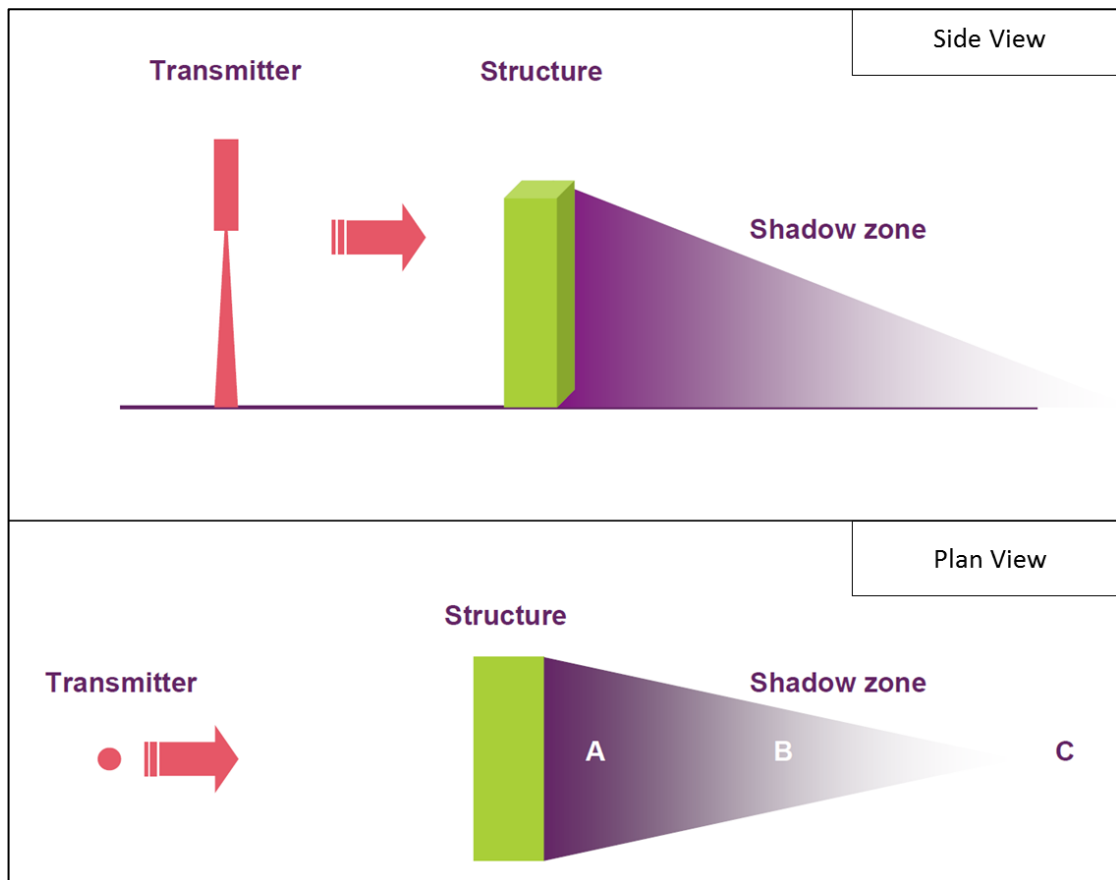


Figure 3 Diffraction loss zones

3.2.2 Reflection of the Signal

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 4 on the following page (taken from Section 3.3 of the Ofcom guidance referenced above) illustrates this effect.

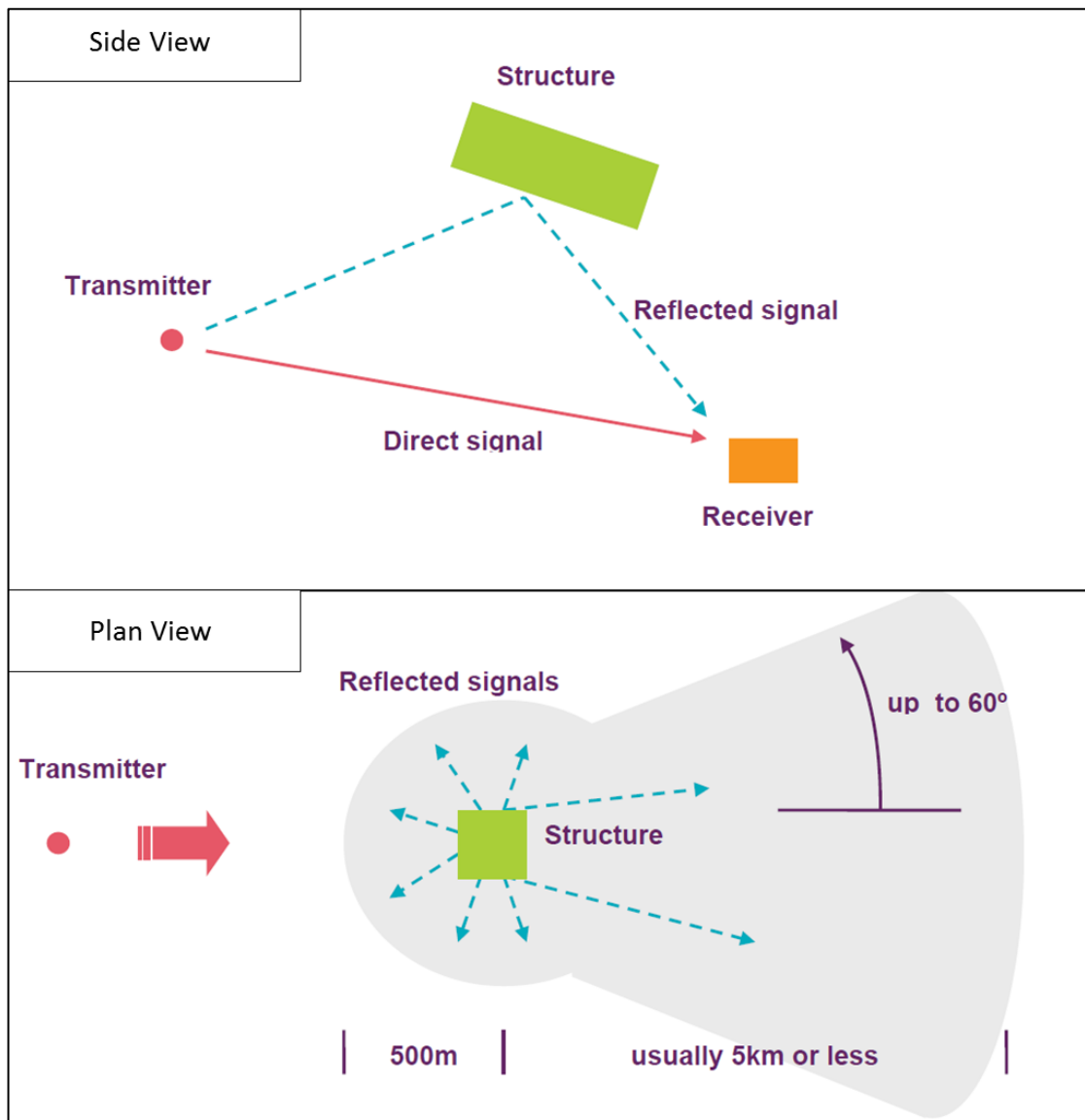


Figure 4 Diffraction loss zones

In practice, it is considered highly unlikely that reflections will have an effect for receivers in front of the Proposed Development 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 degrees .

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 effect if:

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

4 RECEPTION SURVEY

4.1 Locations

Figure 5 below² shows the surveyed locations as numbered pink icons. The figure also shows the locations surveyed in 2016 as radial icons for reference purposes. The development shadow zone is also shown by the red lines – this includes CityLabs 3.0 which was assessed in 2016. The 2020 locations, where possible, were adjusted to be located firmly in the CityLabs 2.0 shadow zone. It can be seen that Location 8 is located outside the zone, this was due to safe access limitations at the time of the survey³.



Figure 5 Survey locations

² Copyright ©2020 Google, Landsat/Copernicus, CNES/Airbus.

³ Survey locations must be safe, publicly accessible and clear of any overhead obstructions such as trees or phone lines.

4.2 Survey Results

Table 1 below summarises the survey results. Detailed measurements are presented in Appendix A. Survey photographs are shown in Appendix B.

Location	Approximate distance from development (km)	Results summary	Conclusions
1	0.4	All multiplexes were received with good picture and audio quality, with the exception of one local channel. The main multiplexes in 2016 showed a slightly higher received strength than the current multiplexes.	The one local channel that was not received shows variable reliability in the city centre. The development is unlikely to be having a noticeable effect on receivers in the area.
2	0.6	All multiplexes were received with good picture and audio quality. The main multiplexes in 2016 showed a slightly higher received strength than the current multiplexes.	The development was not found to be having a noticeable effect on receivers in the area.
3	1.0	All multiplexes were received with good picture and audio quality. The main multiplexes in 2016 showed a slightly higher received strength than the current multiplexes.	The development was not found to be having a noticeable effect on receivers in the area.

Location	Approximate distance from development (km)	Results summary	Conclusions
4	1.6	All multiplexes were received with good picture and audio quality, with the exception of one local channel. The main multiplexes in 2016 showed a significantly higher received strength than the current multiplexes.	The development was not found to be having a noticeable effect on receivers in the area. The high differences in received signal strength are unlikely to be solely due to the CityLabs 2.0 development based on the smaller differences recorded at closer ranges to the development.
5	2.3	All multiplexes were received with good picture and audio quality. The received signal strength is comparable in 2020 to the levels measured in 2016.	The development was not found to be having a noticeable effect on receivers in the area.
6	3.0	All multiplexes were received with good picture and audio quality. The received signal strength is comparable in 2020 to the levels measured in 2016.	The development was not found to be having a noticeable effect on receivers in the area.
7	3.6	All multiplexes were received with good picture and audio quality. The received signal strength is comparable in 2020 to the levels measured in 2016.	The development was not found to be having a noticeable effect on receivers in the area.

Location	Approximate distance from development (km)	Results summary	Conclusions
8	4.9	All multiplexes were received with good picture and audio quality. The received signal strength is comparable in 2020 to the levels measured in 2016.	The development was not found to be having a noticeable effect on receivers in the area.

Table 1 Survey results

4.3 Conclusions

The signal strength has decreased noticeably since 2016 within the shadow zone, particularly at close range to the development. This may be attributable to the development itself, or to other developments in the city centre between the transmitter and the survey locations.

Overall, it is judged that the effects of the CityLabs 2.0 development are unlikely to be noticeable for receivers, because the vast majority of multiplexes showed good picture and audio quality at all survey locations.

If interference to local multiplexes was to be reported in the shadow zone for CityLabs 2.0 within approximately 1 km of the building, the reported effects should be evaluated in the context of the survey results. It would be good practice to arrange for a local aerial installer to visit the reported interference location if the affected channels corresponded to one of the weaker multiplexes. The zone in which interference reports should be considered the most carefully is illustrated in Figure 6 on the following page⁴.

⁴ Copyright © 2020 Google.

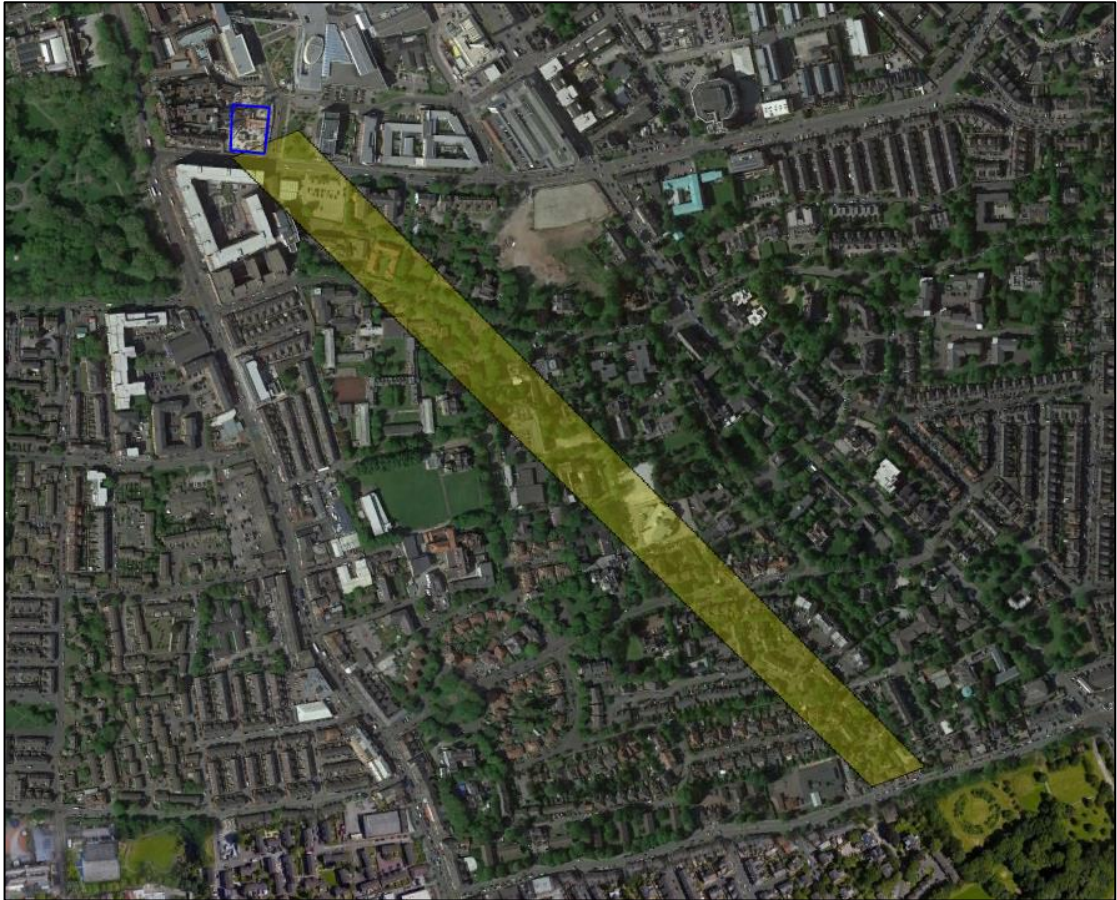


Figure 6 Zone of interest for interference reports

It is considered unlikely that such reports will be raised because noticeable effects are not predicted.

APPENDIX A DETAILED SURVEY RESULTS

Location 1

GPS Coordinates: SJ 85362 95649				
Channel	Signal Strength (dBμV)	BER	Picture Quality	Audio Quality
21 Tiny pop	25.7 ± 0.2	-	-	-
24 That's TV	31.5 ± 0.3	1e-8	Fine	Fine
27 Pop max	30.6 ± 0.2	6e-3	Fine	Fine
29 CCXTV	48.6 ± 0.2	1e-8	Fine	Fine
31 4Music	50.6 ± 0.2	1e-8	Fine	Fine
32 BBC 2	48.7 ± 0.2	1e-8	Fine	Fine
34 ITV 3	47.5 ± 0.2	1e-8	Fine	Fine
35 BBC 2 HD	48.1 ± 0.2	1e-8	Fine	Fine
37 Yesterday	48.7 ± 0.2	1e-8	Fine	Fine
55 BBC News HD	34.5 ± 0.3	1e-8	Fine	Fine

Notes: Aerials were not visible from the survey location.

Location 2

GPS Coordinates: SJ 85535 95498				
Channel	Signal Strength (dBμV)	BER	Picture Quality	Audio Quality
21 Tiny pop	30.3 ± 0.2	7e-7	Fine	Fine
24 Tiny pop	40.6 ± 0.3	1e-7	Fine	Fine
27 Pop max	33.3 ± 0.2	2e-8	Fine	Fine
29 5 Star	56.2 ± 0.2	1e-8	Fine	Fine
31 4Music	57.8 ± 0.2	1e-8	Fine	Fine
32 BBC 1 NW	57.0 ± 0.2	1e-8	Fine	Fine
34 ITV2	54.0 ± 0.4	1e-8	Fine	Fine
35 BBC 1 HD	51.2 ± 0.3	1e-8	Fine	Fine
37 Ideal World	50.5 ± 0.2	1e-8	Fine	Fine
55 CBeebies HD	40.8 ± 0.2	1e-8	Fine	Fine

Notes: One HP UHF aerial directed towards Winter Hill observed at some distance.

Location 3

GPS Coordinates: SJ 85807 95225				
Channel	Signal Strength (dBμV)	BER	Picture Quality	Audio Quality
21 Tiny pop	31.7 ± 0.3	1e-8	Fine	Fine
24 That's TV	42.0 ± 0.2	1e-8	Fine	Fine
27 Sony +1	33.3 ± 0.2	2e-8	Fine	Fine
29 5 Star	57.7 ± 0.3	1e-8	Fine	Fine
31 Sky News	60.0 ± 0.3	1e-8	Fine	Fine
32 BBC 2	60.6 ± 0.2	1e-8	Fine	Fine
34 ITV 3	59.6 ± 0.2	1e-8	Fine	Fine
35 BBC 2 HD	60.3 ± 0.3	1e-8	Fine	Fine*
37 Yesterday	58.5 ± 0.4	1e-8	Fine	Fine
55 CBeebies HD	54.2 ± 0.2	1e-8	Fine	Fine

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

Location 4

GPS Coordinates: SJ 86204 94764				
Channel	Signal Strength (dBμV)	BER	Picture Quality	Audio Quality
21 Tiny pop	26.0 ± 0.2	-	-	-
24 That's TV	32.3 ± 0.2	1e-8	Fine	Fine
27 Pop max	32.0 ± 0.2	6e-6	Fine	Fine
29 5 USA	48.6 ± 0.1	1e-8	Fine	Fine
31 Challenge	42.2 ± 0.3	1e-8	Fine	Fine
32 BBC 1 NW	45.6 ± 0.2	1e-8	Fine	Fine
34 ITV	43.1 ± 0.2	1e-8	Fine	Fine
35 ITV HD	44.4 ± 0.4	1e-8	Fine	Fine
37 Ideal World	38.8 ± 0.3	2e-3	Fine	Fine
55 BBC News HD	38.0 ± 0.3	1e-8	Fine	Fine

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

Location 5

GPS Coordinates: SJ 86692 94246				
Channel	Signal Strength (dBμV)	BER	Picture Quality	Audio Quality
21 Tiny pop	38.6 ± 0.2	1e-8	Fine	Fine
24 Tiny pop	50.6 ± 0.1	1e-8	Fine	Fine
27 Pop max	49.7 ± 0.2	1e-8	Fine	Fine
29 Create and Craft	61.9 ± 0.1	1e-8	Fine	Fine
31 4Music	64.5 ± 0.2	1e-8	Fine	Fine
32 BBC 1 NW	64.1 ± 0.1	1e-8	Fine	Fine
34 ITV 3	63.0 ± 0.2	1e-8	Fine	Fine
35 BBC 2 HD	64.7 ± 0.2	1e-8	Fine	Fine
37 Ideal World	67.1 ± 2	1e-8	Fine	Fine
55 Quest HD	53.0 ± 0.2	1e-8	Fine	Fine

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

Location 6

GPS Coordinates: SJ 87213 93847				
Channel	Signal Strength (dBμV)	BER	Picture Quality	Audio Quality
21 Tiny pop	37.6 ± 0.1	1e-8	Fine	Fine
24 Tiny pop	49.2 ± 0.2	1e-8	Fine	Fine
27 Pop max	46.4 ± 0.1	1e-8	Fine	Fine
29 CCXTV	67.2 ± 0.2	1e-8	Fine	Fine
31 4Music	68.0 ± 0.2	1e-8	Fine	Fine
32 BBC 2	66.8 ± 0.1	1e-8	Fine	Fine
34 ITV	66.6 ± 0.2	1e-8	Fine	Fine
35 BBC 2 HD	67.6 ± 0.2	1e-8	Fine	Fine
37 Yesterday	68.1 ± 0.2	1e-8	Fine	Fine
55 BBC News HD	55.4 ± 0.1	1e-8	Fine	Fine

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

Location 7

GPS Coordinates: SJ 87665 93429				
Channel	Signal Strength (dBμV)	BER	Picture Quality	Audio Quality
21 Tiny pop	35.3 ± 0.2	1e-8	Fine	Fine
24 Tiny pop	49.1 ± 0.2	1e-8	Fine	Fine
27 Pop max	44.2 ± 0.2	1e-8	Fine	Fine
29 CCXTV (5 Star)	65.0 ± 0.2	1e-8	Fine	Fine
31 (Dave)	66.4 ± 0.1	1e-8	Fine	Fine
32 BBC 2	66.5 ± 0.2	1e-8	Fine	Fine
34 ITV	64.7 ± 0.2	1e-8	Fine	Fine
35 BBC 1 HD	66.1 ± 0.2	1e-8	Fine	Fine
37 Ideal World	66.4 ± 0.2	1e-8	Fine	Fine
55 QVC HD	52.8 ± 0.2	1e-8	Fine	Fine

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

Location 8

GPS Coordinates: SJ 88694 92534				
Channel	Signal Strength (dBμV)	BER	Picture Quality	Audio Quality
21 Tiny pop	44.6 ± 0.2	1e-8	Fine	Fine
24 Tiny pop	58.1 ± 0.1	1e-8	Fine	Fine
27 Pop max	51.0 ± 0.1	1e-8	Fine	Fine
29 CCXTV	70.1 ± 0.2	1e-8	Fine	Fine
31 4Music	72.1 ± 0.2	1e-8	Fine	Fine
32 BBC 2	70.9 ± 0.1	1e-8	Fine	Fine
34 ITV	70.1 ± 0.2	1e-8	Fine	Fine
35 BBC 1 HD	72.0 ± 0.2	1e-8	Fine	Fine
37 Yesterday	71.9 ± 0.2	1e-8	Fine	Fine
55 BBC News HD	60.4 ± 0.2	1e-8	Fine	Fine

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

APPENDIX B SURVEY PHOTOGRAPHS

Location 1



Location 2



Location 3



Location 4



Location 5



Location 6



Location 7



Location 8





Pager Power Limited
Stour Valley Business Centre
Sudbury
Suffolk
CO10 7GB

Tel: +44 1787 319001 **Email:** info@pagerpower.com **Web:** www.pagerpower.com