NEW CITY COURT

Television and Radio Reception Impact Assessment

G Tech

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Author: G Phillips		Reviewer: O Lloyd

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GTech Surveys Limited

GTech Surveys Limited is a Midlands based broadcast and telecommunications consultancy conducting projects throughout the entire UK. We undertake mobile phone network, television and radio reception surveys (pre- and post-construction signal surveys), conduct broadcast interference and reception investigations, and support telecommunications planning work for wind energy developers, construction companies, architects, broadcasters and Local Planning Authorities.

In addition to radio interference modelling services and television reception surveys, we produce EIA and ES Telecommunications Chapters (also known as an 'Electronic Interference Chapter'); satisfying the requirements of Part 5, Regulation 18 (Parts 5a and 5b) of The Town and Country Planning EIA Regulations 2017. We peer review ES and EIA work, liaising with telecommunications providers (Arqiva, BT etc.) and advise developers with respect to associated Section 106 (Town and Country Planning Act 1990) and Section 75 (Town and Country Planning (Scotland) Act 1997) agreements.

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GTech Surveys Ltd.
Accountancy House,
4 Priory Road,
Kenilworth,
Warwickshire,
CV8 1LL.

T: +44(0) 1926 744771

Executive Summary

A baseline (pre-construction) signal survey and reception impact assessment has been undertaken to determine the potential effects on the local reception of television and radio broadcast services from the proposed redevelopment of New City Court, 4-26 St Thomas Street, London, SE1 9RS '('the Site'). This report has been produced to support the planning application submission and to provide the baseline reception data to assist with any further studies. Accordingly, impacts to the reception of VHF (FM) radio, digital terrestrial television (DTT, also known as Freeview) and digital satellite television services (such as Freesat and Sky), have been assessed. Impacts to the reception of analogue television services have not been assessed in this study because analogue terrestrial television services were switched off in London during 2012.

Whilst widespread interference to DTT service reception is not expected, the proposed development and use of tower cranes may cause interference to reception for properties located to the immediate north of the site on St. Thomas Street. Antenna betterment or relocation is an easy-to-employ mitigation solution and should restore reception. If any antenna work is required, it is advised that a registered antenna installer undertakes all required work.

The proposed development and use of tower cranes may cause interference to satellite television users adjacent to the site (within 214m to the immediate northwest of the Site). During the survey, no satellite dishes were seen in this area, but may have been positioned on rooftops, not visible from street level. Whilst unlikely, should interference occur, simple and cost-effective mitigation exists; satellite dish repositioning to new locations or the use of DTT receiving equipment, should restore all services. These are standard and easy to adopt mitigation solutions, normally suggested when digital satellite television reception interference has been predicted. If any antenna work is required, it is advised that a registered CAI antenna installer undertakes all required work.

The proposed development is unlikely to adversely impact the reception of VHF(FM) radio broadcasts due to the existing good coverage in the Survey Area and the technology used to encode and decode radio signals.

Overall, the proposed development may cause minor interference to terrestrial and digital satellite television reception to localised areas to the immediate north and northwest of the Site. Mitigation solutions exist that will quickly restore the reception of television services, leaving no long-term adverse effects for any viewer. This report provides the existing level and quality of broadcast signal reception in the study area.

1 - Introduction

This report outlines the findings of a comprehensive study and pre-construction signal reception survey to determine the viewing preference of residents located around the proposed redevelopment of New City Court, 4-26 St Thomas Street, London, SE1 9RS '('the Site'), and identifies what effects the Proposed Development may have on the reception of television and radio broadcast services. National requirements under The National Planning Policy Framework (NPPF), February 2019 (Ministry of Housing, Communities & Local Government) states at paragraph 114, that local planning authorities should ensure that;

> *b) they have considered the possibility of the construction of new buildings or other structures interfering with broadcast and electronic communications services*

Additionally, The London Plan, March 2021, requires that developers should assess possible impacts on broadcast and telecommunications systems and investigate possible interference from development proposals (including impacts arising during the construction phase), see Appendix - *Planning Policies - Regional Planning Policies*.

The Proposed Development comprises of redevelopment to include demolition of the 1980s office buildings and erection of a 26-storey building (plus mezzanine and two basement levels), restoration and refurbishment of the listed terrace (nos. 4-16 St Thomas Street), and redevelopment of Keats House (nos. 24-26 St Thomas Street) with removal, relocation and reinstatement of the historic façade on a proposed building, to provide office floorspace, flexible office/retail floorspace, restaurant/café floorspace and a public rooftop garden, associated public realm and highways improvements, provision for a new access to the Borough High Street entrance to the Underground Station, cycling parking, car parking, service, refuse and plant areas, and all ancillary or associated works.

A desktop study was first undertaken, based on broadcast transmission information, plans of the Proposed Development and maps of the area. The relevant TV and radio signal survey area for the Proposed Development was identified and a site visit was then subsequently conducted to establish the baseline television reception conditions. Modelling techniques and field assessments of viewers' choice of television and radio transmitter were then used to predict the potential effects upon television and radio broadcast reception in the area.

The impacts from the Proposed Development are consequently analysed, and together with various mitigation options, conclusions are drawn on the overall effects of the Proposed Development on television and radio broadcast service reception for local residents. Figure 1 shows the location of the site.

This study was undertaken during March and April 2021 to investigate whether the Proposed Development could cause interference to local television and radio broadcast reception. Consequently, the effects on VHF (FM) radio, digital terrestrial television and digital satellite television service reception are discussed. The report also details the baseline reception conditions for future reference.

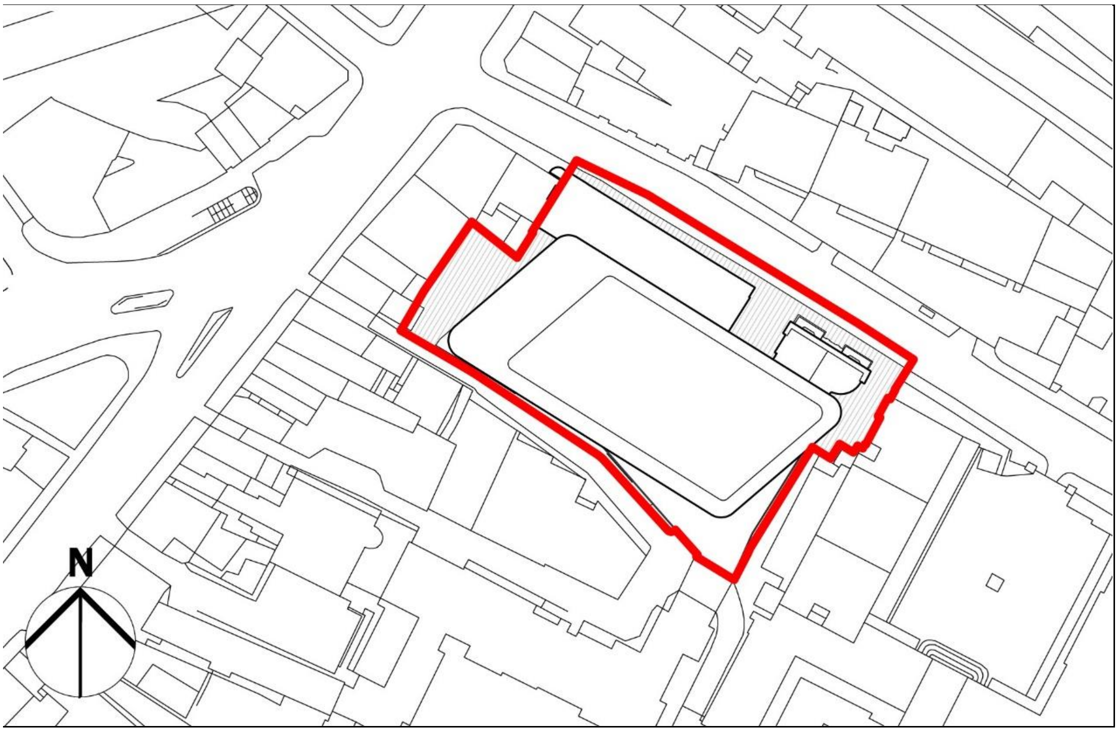

Figure 1 - The Title Boundary of the Site

This report follows the following structure:

- Chapter 1 introduces the work
- Chapter 2 discusses the different forms of structure generated television and radio interference and how these can impact the reception of different television and radio broadcast platforms
- Chapter 3 describes the available television and radio services in the survey area
- Chapter 4 describes the pre-construction television and radio reception conditions around the application site
- Chapter 5 describes the predicted impacts of the Proposed Development upon television and radio broadcast reception before any mitigation measures are applied
- Chapter 6 describes any suitable mitigation measures for any affected TV viewer or radio listener
- Chapter 7 presents the conclusion

2 - The Mechanisms of Interference to Television and Radio Broadcast Services

Terrestrial Television Services

Any structure will produce two zones of potential disruption to television reception. One zone is where the development creates a ‘shadow’ (affects all television broadcast platforms) and the other where it gives rise to a ‘reflection’. At the frequencies used for broadcasting, the processes of creating a ‘shadow’ or a ‘reflection’ are somewhat more complicated than with visible light but thinking of the problem in these terms is still a helpful way of approaching the matter.

Signal ‘Shadowing’ Effects

In the area behind the structure, the television transmitter is effectively screened from the viewer and the strength of the signal is reduced - Figures 2 and 3.

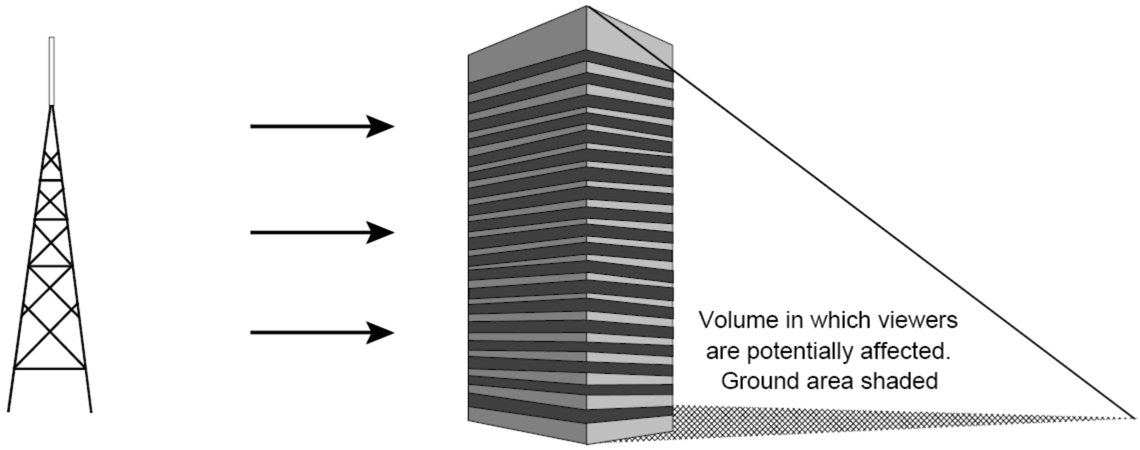

Figure 2 - Affected area in the ‘shadow’ zone behind the structure

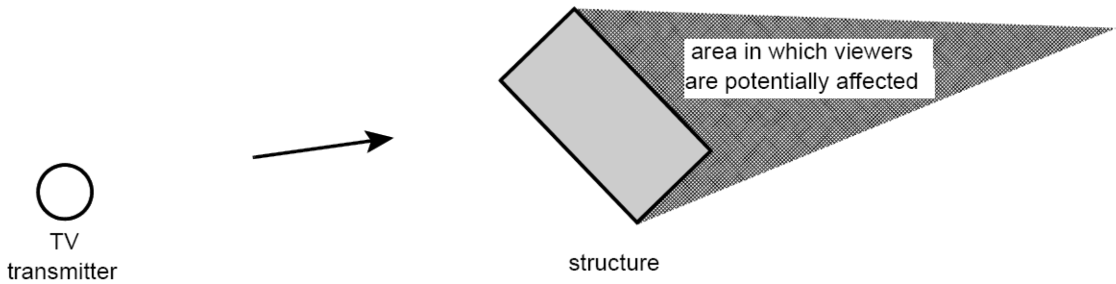

Figure 3 - Plan view of the ‘shadow’ zone

Television signals do not create such a ‘hard’ shadow as visible light, and for the purposes of explanation, a ‘shadow’ zone must be considered which is divided into three sub-zones.

i. Within a few tens of metres from a solid structure, over the region where 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 can be severe and, in some cases, almost total if existing reception conditions are poor.

ii. Further away from the structure (e.g. beyond 25 to 50 metres, but this varies depending on its size) 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.

iii. Even further away from the structure (e.g. 250m) complex multiple reflections and diffraction, caused by structures in the locality, may result in the ‘shadow’ zone becoming almost non-existent, 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 television receiver.

Signal ‘Reflection’ Effects

The second zone of potential interference is produced by ‘reflection’ or ‘scattering’ of the incident signal, see Figure 4.

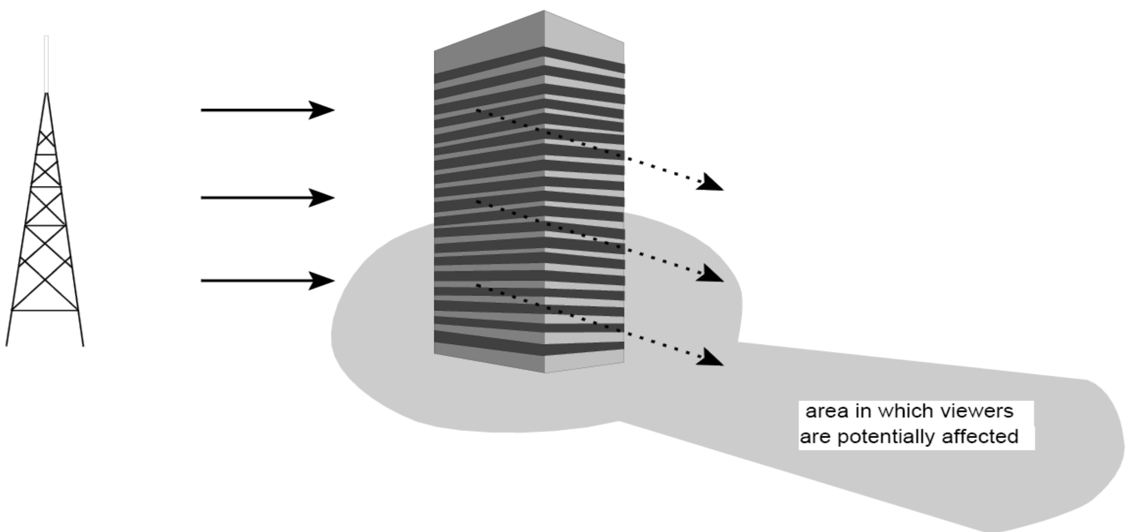

Figure 4 - Affected areas in the ‘reflected’ zone of the structure

Consider Figure 5, the direct signal travels a distance P1 to the viewer, whilst the signal reflected from the structure travels slightly further, distance (P2 + P3). Although travelling at the speed of light, the different path lengths can mean that one signal arrives with a significant delay relative to the other. This results in a degradation in signal quality.

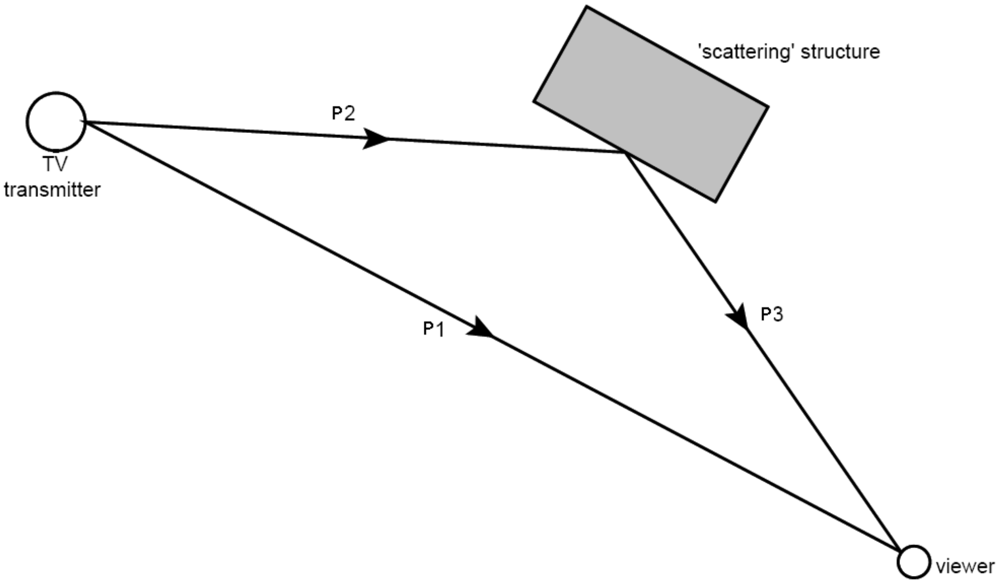

Figure 5 - Direct and Indirect Signal Paths

To avoid interference, it is necessary to ensure that the ratio of wanted signal along the direct path (P1) to the unwanted signal along indirect paths (P2+P3) is sufficiently high. 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 television receiver.

Digital Terrestrial Television (DTT) - Freeview

The digital television broadcast platform offers many advantages over older analogue broadcast technologies. Due to the way picture signals are encoded and broadcast, digital television offers a much more resilient platform against interference. 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 is normally caused by a poor-quality receiving antenna system or locally generated wideband electrical noise. Signal blocking caused by buildings can also degrade received signal quality.

Digital Satellite Television Services - Freesat & Sky

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

Disruption to digital satellite television services is normally caused by an obstruction on the line of sight from the satellite to the receive antenna e.g. a tall building or tall trees. Adverse weather can also influence reception. In the United Kingdom, Freesat and Sky services come from the 28.2 degrees east ASTRA satellite cluster.

Figure 6 below shows typical clearance distances and obstruction heights for interference free satellite television reception.

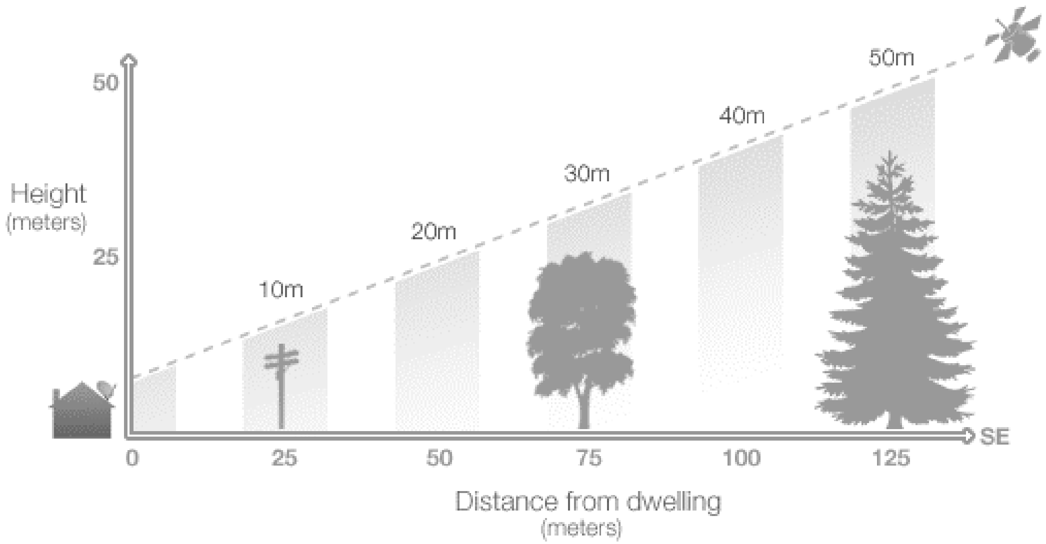

Figure 6 - Typical Clearance Distances and Obstruction Heights for Interference Free Satellite Television Reception

VHF (FM) Radio

VHF (FM) radio services are broadcast from similar structures as terrestrial television services. Many things can cause radio interference, however simple remedies exist that can quickly reduce the effects. Most reception problems on FM radio are caused either by a weak signal or by some kind of interference.

Radio transmission signals will reflect into ‘shadow’ areas and also reflect from structures to cause ‘multi-path’ effects. The effect of multiple signals is to create zones of signal cancellation and signal enhancement. This is often demonstrated by the need to carefully position portable radio receivers for good reception or the fluctuation in signal quality whilst listening to VHF (FM) broadcasts in a vehicle. Due to the wavelength of the VHF (FM) signal (at 100 MHz, the wavelength is 3 metres), zones of interference can quickly and easily physically move around, as the interference is generated from the sum interaction of all incoming signals. Consequently, prediction of VHF (FM) interference is not practically possible due to the complex interaction of reflected signals with wanted signals, the design of radio receivers and radio signal propagation characteristics.

Buildings rarely cause radio interference but there is little that can be done during the design stage to reduce any adverse effects. Due to the lower frequencies in use for radio transmission (with respect to television services) and the methods by which the radio signals are encoded, it is very unlikely that a new structure in an already cluttered urban environment will disrupt the reception of radio services.

3 - Available Television and Radio Broadcast Services

Terrestrial Television Services

The area around the Site is no longer served by analogue television transmissions due to the completed Digital Television Switchover. All analogue services were switched off in the London television region during 2012.

Digital Terrestrial Television (DTT) - Freeview

The study area is served by DTT services (London TV region) from the Crystal Palace transmitter (grid reference TQ 33940 71220), on a bearing of 171° (with respect to true north) and 9km away.

The transmitter is shown with respect to the Site in Figure 7. Technical transmission information for each service at the aforementioned transmitter site is detailed in Table A, found in the Appendix - *Television Transmission Frequencies*.

Up to date technical information regarding the London TV region and Crystal Palace transmitter can be found on the Digital UK website - http://www.digitaluk.co.uk

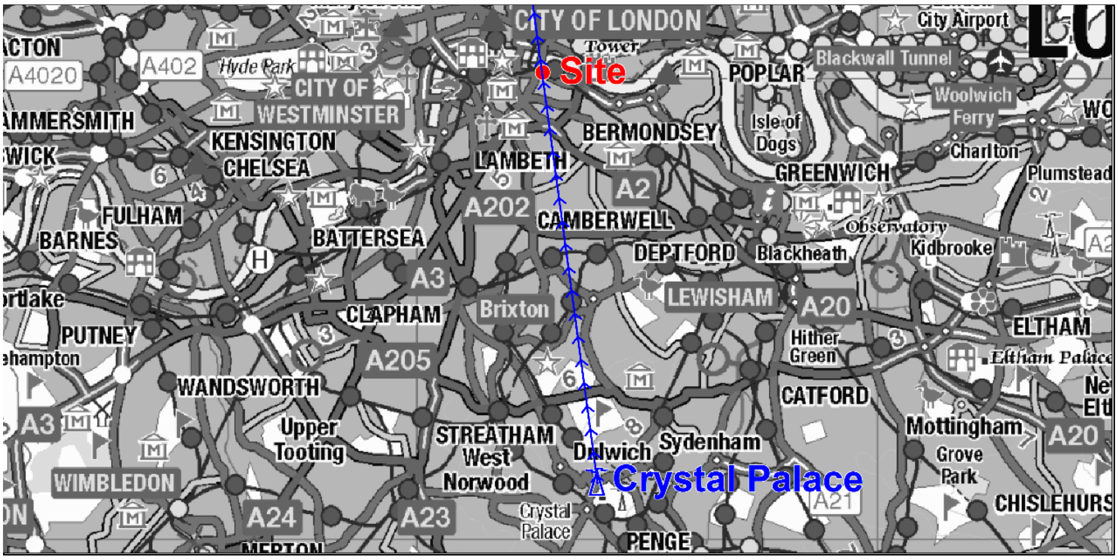

Figure 7 - The Location of the Crystal Palace Transmitter, the Site and the direction of the incoming DTT signals at the Site

Non-Terrestrial Television Services (Digital Satellite Television)

For the reception of the 28.2 degrees east ASTRA satellite cluster (Freesat and Sky services), dish elevations of 25.4 degrees are required at this latitude. Optimal receive dish azimuths are 145.5 degrees with respect to true north.

VHF (FM) Radio

The areas around the Proposed Development are served by VHF (FM) radio services of

BBC Radio 1, 2, 3, and 4 from the Crystal Palace transmitter (NGR TQ 33940 71220)

Technical transmission information for each radio service at the aforementioned transmitter site is detailed in Table B in the Appendix - *VHF (FM) Radio Transmission Frequencies.*

4 - Survey Methodology & Description of Baseline

Due to the complex nature of television interference in cluttered urban environments, field investigations must be undertaken in the general area around a site to fully evaluate any potential effects. In this study, field measurements were undertaken up to two kilometres from the Site, however, the study mainly focused around the application site and areas to the immediate north and northwest. Additionally, investigations are carried out in all areas where predicted (modelled) interference may occur. These are identified in Figure 8, and the measurements are detailed in Tables C and D, found in the Appendix - *Signal Measurements*. In particular, the following data was recorded:

- Field strength and technical signal measurements of DTT transmissions from the main serving transmitter

- Viewing preference (choice of television transmitter) of residents in all areas visited

- Field strengths of VHF (FM) radio transmissions from the serving transmitter

All television measurements were carried out using a UHF log-periodic receive antenna, mounted on GTech Surveys's broadcast survey vehicle, at a receive height of 10 metres above ground level (AGL), industry standard height for such work.

VHF (FM) radio field strength measurements were taken with a resonant half wavelength folded dipole antenna at 2 metres AGL, industry standard height for such work.

During the survey, no assessment was made of reception conditions within viewers' homes. Equipment details are detailed in the Appendix - *Survey Equipment*.

Survey Results and Observations

In general, building use around the proposed development is mainly commercial. When visible during the survey, all signal receive antenna systems are mounted on rooftops, ensuring optimal reception conditions. Terrestrial television antennas are directed towards the Crystal Palace transmitter. No communal antenna systems were noted to be in the survey area.

Analogue Terrestrial Television

Due to the completed Digital Television Switchover, analogue television signals are no longer available in the study area.

Digital Terrestrial Television - Freeview

DTT services were available at all surveyed locations from the Crystal Palace transmitter. At all locations, received signal levels were in excess of recommended minimum amounts and the technical quality of received signals was found to be good[1]. DTT services currently provide good coverage and service throughout the study area. **Antennas may have been located on rooftops, not visible from street level, especially on St. Thomas Street.**

Digital Satellite Television - Freesat & Sky

During the survey, no satellite dishes could be seen from street level. **Dishes may be placed on rooftops, which are not visible from street level**. No existing interference has been identified for any satellite television platform.

VHF (FM) Radio

VHF (FM) radio reception conditions were deemed to be good[2] throughout the study area. In-car reception was deemed to be good at all locations. This is due to the proximity of the serving radio transmitter with respect to the study area.

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1 - Signal levels as specified by the *Code of Practice Confederation of Aerial Industries (CAI) COP 01 - Installation of Terrestrial and Satellite TV Reception Systems (MDU & Commercial), CAI, January 2021*

Additional technical information regarding the Freeview signal can be found in the Appendix - *An Overview of Signal Measurements*

2 - Minimum Recommended Field Strengths for Acceptable Levels of VHF (FM) Radio Service

Monophonic audio - 40 dBµV/m
Stereophonic audio (excellent quality) - 54 dBµV/m

Source - https://www.ofcom.org.uk/__data/assets/pdf_file/0013/54310/annex-f.pdf

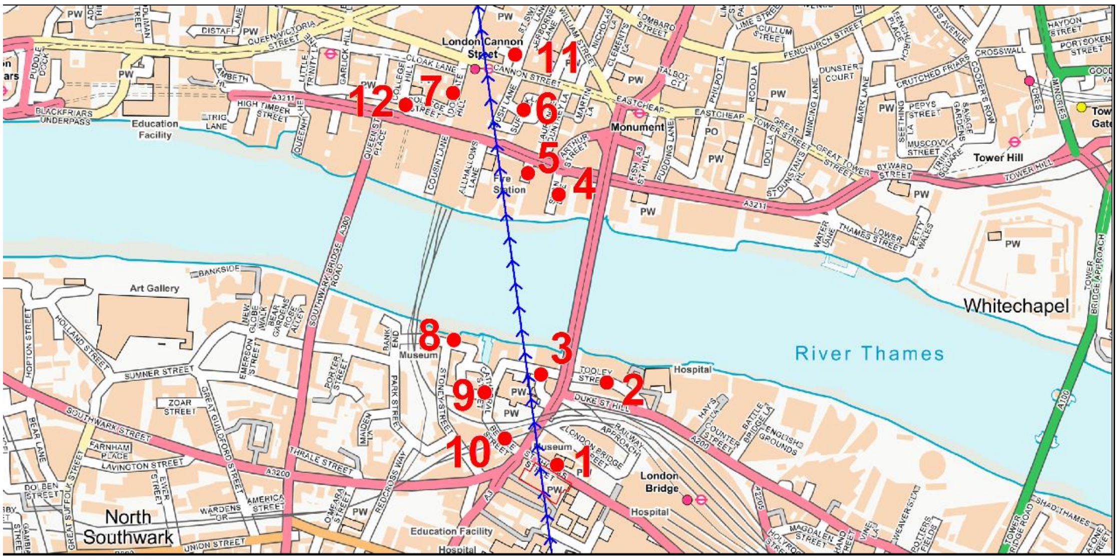

Figure 8 - Surveyed Locations. The blue arrows indicate the direction of the incoming DTT signals from Crystal Palace transmitter at the Site. The Site is delineated in red

5 - Predicted Impacts and Effects

Methodology

To assess the effects of the Proposed Development upon television and radio broadcast service reception, the structures were considered to create interference to services in the immediate areas around the Site, in signal reflection areas and in the signal shadow zones. These methods, used in conjunction with broadcast transmission information, development plans, maps of the study area and modelling techniques, contribute towards predicting the potential effects upon television and radio broadcast reception in the study area.

The field survey then investigated the areas identified as being at risk of interference and assessed all available services and the transmitter viewing preferences of residents in order to determine if the computed risk is practically valid. The collected data was finally used to determine what actual risks exist and what viable solutions are available to minimise any adverse effects. The predicted effects are discussed below and summarised in Table 1.

Digital Terrestrial Television - Freeview

Widespread interference is not expected to occur due to the existing good coverage in the study area. However, the proposed development and the use of tower cranes may cause signal disruption to a small number of properties adjacent to the site, located to the immediate north on St. Thomas Street, where signal levels from the Crystal Palace transmitter could be reduced by the proposed structures. Easy to implement mitigation as discussed in Chapter 6 is likely to restore the reception of services for any affected viewer.

Digital Satellite Television - Freesat and Sky

Tall structures can disrupt digital satellite television reception by causing obstructions on the line of sight to the signal receive dish from the serving satellite. This is discussed further in Chapter 2.

Using the mathematical tangent function and based on the height of the proposed development, the angle and orientation of the incoming satellite signals, theoretical signal shadow zones for the 28.2E ASTRA satellite cluster are up to 214m. This area extends in a northwesterly direction (325.5 degrees with respect to north) from the base of the building's base. The theoretical signal shadow area is shown in Figure 9. Tower cranes are likely to cause unwanted interference in similar areas. Satellite dishes may be located on existing rooftops in this area.

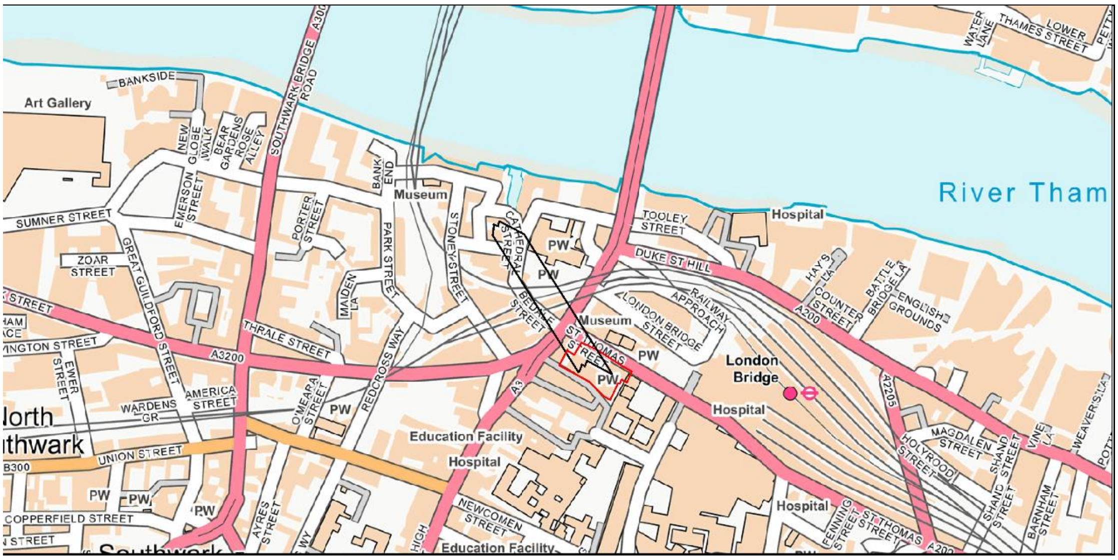

Figure 9 - Approximate Location and orientation of the theoretical Digital Satellite Television Signal Shadow

VHF (FM) Radio

Modelling VHF (FM) radio interference in a cluttered urban environment is not possible due to the number of constantly changing variables. VHF(FM) broadcast radio reception is robust throughout this part of the country; evident by the survey results and signal availability with a typical car radio. Whilst any structure will change local signal propagation characteristics, due to the technical methods involved with encoding and receiving the transmissions, reception remains possible. Overall, the Proposed Development is not expected to impact the reception of VHF (FM) radio broadcasts.

Broadcast platform	Area(s) of predicted interference	Risk of interference & reasoning	Mitigation
DTT (Freeview)	In localised areas to the immediate north of the site on St Thomas Road	Possible, but only if antennas are located in this area	Antenna betterment
Digital Satellite TV (Freesat & Sky)	Within 214m to the immediate northwest from the base of the proposed development	Possible, but only if satellite dishes are located in this area	Initially, satellite dish relocation to less obscured areas. Secondly, use of DTT receiving equipment
VHF(FM) Radio	Non-identified	No because coverage is robust	N/A

Table 1 - Summary of Predicted Interference

Predicted Effects - Conclusions

Whilst widespread interference to DTT service reception is not expected, the development and use of tower cranes could cause interference to adjacent properties on St Thomas Street receiving Crystal Palace transmissions. Antenna betterment / repositioning should restore all services and is most simple and most cost-effective mitigation solution. If this is required, it is advised that a registered antenna installer undertakes all required work. This is detailed further in Chapter 6

The proposed development and use of tower cranes could cause interference to digital satellite reception up to 214m to the immediate northwest from the base of the tallest element of the scheme. Whilst it was not possible to locate satellite dishes during the survey (as they may have been positioned on non-visible locations and rooftops), dish relocations to positions where views to the serving satellite remain unobscured should restore all television services and is the most simple and cost-effective mitigation solution. If this is required, it is advised that a registered antenna installer undertakes all required work. Should dish moving not be possible, or does not restore services for any other reason, the use of DTT receiving equipment will offer an alternative source of broadcasts. This is detailed further in Chapter 6

The proposed development is not expected to affect VHF(FM) radio reception.

6 - Identifying Television Interference and Mitigation Measures

Identifying interference

The identification of television interference is a straightforward and simple undertaking for a qualified television / signal engineer with suitable and calibrated signal receiving and testing equipment. As discussed in Chapter 2, a building or obstruction between the transmitter or satellite and receiving antenna (i.e. a domestic Sky / Freeview dish or TV antenna, mounted on a rooftop or the side of the building), can cause a reduction in both the received signal strength and signal quality. These reductions can result in the received transmissions becoming more prone to other external interference sources and in very severe cases, this reduction can result in a total loss of service for the viewer.

For a qualified television / signal engineer to verify that a building has caused interference, it is advised that initially a short questionnaire (in the Appendix - *Television Signal Interference Questionnaire*) is completed by the complainee. Upon validation of the case (e.g. in this situation it would not be a valid complaint if interference was occurring to cabled television services), and the engineer has visually confirmed that the satellite dish / antenna on the property in question point directly 'through' the development, signal measurements with the appropriate equipment taken at the cable termination point should indicate a reduction in both level and quality. Naturally, a poor quality or faulty antenna installation would also indicate poor signal levels and qualities, and if that was the case and the engineer deems the installation 'not fit for purpose', then no further developer remediation is required. However, if the cause of interference has been identified as a result of the development, the mitigation solution as detailed below, should be sufficient to restore the good reception of television services.

Mitigation Measures

For any affected Sky or Freesat television user to the immediate northwest of the site, the repositioning of antennas to new locations is likely to restore services. This is a common and simple mitigation solution for similar situations where reception conditions have been affected by construction work. If it is not possible to relocate the satellite dish, then the use of DTT receiving equipment would offer an alternative source of television transmissions. For any terrestrial television interference, antenna betterment should restore reception.

It is recommended that all antenna work (dish moving, relocating, betterment etc.) is undertaken by a registered installer (Confederation of Aerial Industries (CAI) Accredited) and that all system components used must be CAI Certified. More information regarding the CAI & Registered Installers can be found on the CAI's website - http://www.cai.org.uk/index.php

The CAI's Certification scheme ensures that the cables and antennas have passed minimum requirements for the use of DTT and digital satellite television reception. The use of non-certified products in an antenna system would degrade overall performance and effectiveness of the system, increasing the risk from interference. More information on CAI Certified Products can be found on the CAI's website -

https://www.cai.org.uk/index.php/services/product-certification-scheme

7 - Conclusions

A desktop-based study and baseline reception survey have been performed to assess the possible effects and impacts on the reception of television and radio broadcast services from the proposed redevelopment of New City Court. The study has focused on the reception of VHF (FM) radio and the two television broadcast platforms that could possibly be impacted by the Proposed Development; digital terrestrial television and digital satellite television services.

Digital Terrestrial Television (DTT) - Freeview

Whilst widespread interference to Freeview reception is not expected, the proposed development and use of tower cranes may cause reception degradation to properties adjacent to the site on St. Thomas Street. Simple and cost-effective antenna betterment should restore all services. This is a standard and easy to adopt mitigation solution. If any antenna work is required, it is advised that a registered antenna installer undertakes all required work.

Digital Satellite Television - Freesat & Sky

The use of tower cranes and the proposed development could cause disruption to the reception of digital satellite television services within 292m to the north-northwest from the base of the tallest element of the scheme. There may be satellite dishes located on rooftops in this area. Should interference occur, initially, a simple and cost-effective mitigation solution is to relocate the satellite dish to a new location where the view to the serving satellite is not obscured by the obstruction. If dish moving is not possible, the use of DTT receiving equipment would offer any affected viewer an alternative source of transmissions. A qualified television signal engineer would be able to implement the optimal solution once scheme generated interference has been verified.

VHF(FM) Radio

Due to the existing good coverage and robust technical nature of the broadcast radio network with respect to building-generated signal interference, the proposed development is not expected to affect the reception of VHF(FM) radio services.

Overall, the Proposed Development may cause some highly localised disruption to the reception of digital terrestrial television and digital satellite television services to the immediate northwest of the site. Should interference occur, antenna betterment or moving satellite dishes to new locations out of any signal shadows should restore good reception conditions. No other interference is expected, so no mitigation measures are required to restore the reception of any other broadcast platform. This report provides the existing level and quality of radio and television signal reception in the survey area and can be used to support the planning application submission.

APPENDIX

Television Transmission Frequencies

VHF (FM) Radio Transmission Frequencies

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Television Transmission Frequencies

Digital TV Multiplex	Multiplex Operator	UHF Channel Number *	Channel Frequency Fc (MHz) **	Transmitter Power (kW)
BBC A	BBC	23	490.000	200.00
D3&4	Digital 3 & 4	26	514.000	200.00
BBC B - HD	BBC	30-	545.833	200.00
SDN	SDN	25	506.000	200.00
Arqiva A	Arqiva	22	482.000	200.00
Arqiva B	Arqiva	28-	529.833	200.00
COM7 - HD	Arqiva	55	746.000	84.42

Table A - Crystal Palace Digital Terrestrial Television Services

Public Service Broadcaster (PSB) Digital Multiplexes
Commercial (COM) Digital Multiplexes

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

** - The nominal channel frequency, Fc (in Megahertz) of the multiplex can be calculated using Fc = 8n+306, where ‘n’ is the UHF channel number

VHF (FM) Radio Transmission Frequencies

Service	Frequency (MHz)	Transmitter Power (kW)
BBC Radio 1	98.5	4.0
BBC Radio 2	88.0	4.0
BBC Radio 3	91.0	4.0
BBC Radio 4	93.2	4.0

Table B - VHF (FM) Radio Services

Information correct at time of writing. Information provided by DigitalUK and Arqiva

Signal Measurements

Measurement Point Number	Channel	23	26	30	25	22	28	55
	Frequency	490.00	514.00	545.83	506.00	482.00	529.83	746.00
	Service	BBC A	D3&4	BBC B -	SDN	Arqiva A	Arqiva B -	COM7
1	FS	89.6	86.8	83.0	90.4	94.8	93.3	83.7
	CSI	24.8	24.9	-	20.6	18.7	27.1	-
	MER	31.6	31.1	-	29.7	31.4	31.1	-
2	FS	85.5	82.6	87.3	97.8	96.6	91.0	83.5
	CSI	20.9	21.1	-	25.7	23.5	18.2	-
	MER	32.5	32.0	-	32.3	31.4	31.7	-
3	FS	95.2	87.8	81.6	91.4	86.0	92.5	82.9
	CSI	21.5	21.7	-	21.7	23.2	23.4	-
	MER	31.8	31.1	-	32.1	31.7	32.0	-
4	FS	90.1	85.0	88.9	93.4	94.3	88.8	85.7
	CSI	26.4	26.0	-	21.0	20.9	23.5	-
	MER	32.2	31.7	-	31.2	31.8	32.3	-
5	FS	93.5	90.9	93.2	88.6	95.1	90.9	87.5
	CSI	21.6	23.6	-	23.0	20.9	23.8	-
	MER	30.7	29.8	-	30.1	30.5	29.5	-
6	FS	84.1	89.1	92.0	87.8	95.8	92.8	78.5
	CSI	22.8	21.8	-	21.0	23.9	22.1	-
	MER	29.9	32.2	-	31.8	31.7	30.9	-
7	FS	91.8	83.7	85.0	83.6	84.5	89.9	83.6
	CSI	26.1	20.5	-	19.6	20.0	21.1	-
	MER	32.5	31.5	-	30.6	31.5	30.9	-
8	FS	90.1	89.4	90.1	91.7	99.5	94.7	89.9
	CSI	21.4	21.4	-	26.4	23.5	21.3	-
	MER	32.5	31.4	-	31.4	30.9	30.6	-
9	FS	93.1	93.7	85.9	94.2	90.9	86.3	77.1
	CSI	18.0	19.9	-	17.8	22.5	17.9	-
	MER	31.8	30.0	-	31.6	31.5	30.6	-
10	FS	90.3	87.3	94.1	88.4	90.7	93.9	82.3
	CSI	20.7	22.8	-	22.2	24.7	22.6	-
	MER	30.4	31.0	-	31.4	28.5	30.7	-
11	FS	88.1	88.9	84.7	91.3	94.2	90.2	83.1
	CSI	20.6	19.7	-	22.9	23.1	18.5	-
	MER	31.6	31.1	-	31.9	32.5	29.6	-
12	FS	96.0	88.8	92.9	96.2	88.7	95.9	78.1
	CSI	21.9	23.0	-	23.8	22.3	21.8	-
	MER	30.9	31.2	-	31.2	31.7	32.0	-

Table C - Field Strength Measurements of Crystal Palace Digital Television Services

Frequency - MHz
Field strength (FS) - dBμV/m
Channel Status Information (CSI) - %
Modulation Error Ratio (MER) - dB

Location	Service	Radio 1	Radio 2	Radio 3	Radio 4
1		65.4	69.6	67.6	61.5
2		67.0	62.2	71.4	69.8
3		61.7	73.4	60.6	63.0
4		64.2	68.2	70.7	69.1
5		64.6	66.3	68.1	69.4
6		62.7	61.5	64.9	62.6
7		66.4	71.8	69.0	65.4
8		70.6	62.3	69.1	67.4
9		74.2	68.4	64.8	68.8
10		64.9	65.9	65.5	73.1
11		68.1	69.8	68.1	72.2
12		64.9	65.7	71.9	67.2

Table D - Field Strength Measurements of Crystal Palace VHF(FM) Radio Services

Field strength (FS) - dBμV/m

An Overview of Signal Measurements

The first and easiest parameter to check is signal level (also referred to as amplitude or terminated signal strength). In many cases this gives a good indication of the available decoding margin, or the extent of any shortfall.

At the receiver input, the terminated level of a DTT signal is measured in the usual units of dBµV (a maximum signal level of 70 dBµV and a minimum signal level of 50 dBµV). It is helpful to understand that the level of a DTT signal represents the total power of all the carriers in the Coded Orthogonal Frequency Division Multiplexing (COFDM) signal and not the level of each individual COFDM carrier. For satisfactory reception of digital signals, it is important the signals applied to the receiver are within these ranges. These maximum and minimum levels define a so-called window of operation for the receiver.

Common practice dictates that in order to measure the quality of a received DTT signal we have to look at one or more of the following parameters: Bit-Error Rate (BER), Channel BER (CBER), Carrier-to-Noise Ratio (CNR) and Modulation Error Ratio (MER). The Channel State Information (CSI) feature available in DTT measurement equipment is a very valuable tool providing additional insight into the quality of reception in a typical domestic or professional DTT installation.

Using the BER alone is an ill-advised “hit-or-miss” strategy because of the 'cliff-edge effect' characteristic of any digital TV system. A BER reading below the reference quasi error free (QEF) value of 2×10-4 might wrongly lead us to conclude that the receiving conditions are satisfactory.

However, the BER provides a very narrow signal measurement range. Even for vanishingly small BER readings, a small drop in the level of received DTT signal can push the DTT receiver over the digital cliff edge beyond the point of system failure. The CBER is closely related to the BER providing a wider signal measurement range. Depending on the type(s) of unknown disturbance(s) affecting our DTT installation (noise, co-channel or adjacent PAL, co-channel DTT, etc.), the CBER corresponding to the reference QEF BER of 2×10-4 varies between 4 and 7 in 100 [[1]]. Unfortunately, the CBER is not a reliable indicator of how far the digital cliff edge is.

DTT engineers need a tool with a wide measurement range that solves the shortcomings of the BER and CBER. This measurement tool should provide some estimate of the noise margin of the DTT installation. A first candidate comes to mind: CNR or, alternatively, its sibling the MER.

The CNR is defined as the ratio of the average RF power of the DTT signal to the power of the noise present in the UHF channel. Similarly, the MER is defined as the ratio of the average power of the DTT signal to the average power of the constellation errors. It can therefore be used to give a more direct indication of decoding margin when, as is often the case, there is co-channel interference as well as noise in the channel. The higher the MER value, the **better** the reception conditions. Our measurement equipment provides a maximum MER measurement value of up to 35 dB.

In situations where there is no multipath propagation so that the channel frequency response remains reasonably flat, CNR and MER are in principle the same thing. In practice, the accuracy of the measured CNR is limited by the noise floor of the measurement equipment and by the presence of other disturbances on adjacent UHF channels. Likewise, both the receiver's noise floor and other issues resulting from its practical implementation degrade the MER estimate.

Channel State Information (CSI)

Some flavour of CSI is used internally by all commercial DTT receivers to achieve the recommended target system performance[3]. The CSI counts the effect of both the noise present in the channel and the shape of the transmission channel itself. In other words, the CSI gives a measure of the reliability of the received DTT signal. We measure the average of the CSI across the UHF channel occupied by the DTT signal. <u>The higher the percentage value of CSI, the **less** reliable DTT reception is</u>.

As explained, the CSI can be used as a means to measure the noise margin in a DTT installation. Let us call CSI_{QEF} the percentage CSI measured at the point where the measurement equipment displays the reference QEF BER. The noise margin in dB is then approximately given by –

$$NM\ (dB) = \frac{CSI_{QEF} - CSI}{2.6}$$

This empirical approximation represents a good estimate for NM below 8dB. The CSI alone, on the other hand, has a wider measurement range, providing meaningful results for NM of up to 15dB.

3 J. Lago-Fernández, "Using Channel State Information (CSI) to Characterize DVB-T Reception", IBC, Amsterdam, 12-17 September 2002

Survey Equipment

1 x Promax Prolink 4C Premium – Serial Number PK4COPAB11B / 060419030005 Running firmware version 2.47

1 x Sony Wide screen CRT Reference Receiver KV–16TIU – Serial Number 4014480

1 x Professional Broadcast Wideband Log Periodic 8 element antenna – Amphenol Jaybeam (details below)

Amphenol JAYBEAM 468-860 MHz

A Log Periodic antenna designed for UHF Broadcast, TETRA and Cellular communications applications. This antenna is often used in a stacked array to form a rugged, high power, extended range antenna. Produced to the highest quality standards, these robust antenna designs will insure reliable operation in harsh environmental conditions.

Replace "x" with desired model number option.

LPU/Rx

V-Pol or H-Pol | Log Periodic | 70° | 7.9 dBd

Electrical Characteristics		
Frequency band	468-860 MHz	
Model number options (x)	Model Number LPU/R-N LPU/R-7/16	Connector type N-Female 7/16-DIN Female
Polarization	Vertical or Horizontal	
Horizontal beamwidth	70°	
Gain	7.9 dBd	
Impedance	50Ω	
VSWR	<1.3:1	
Maximum power	250 W	
Connector type	see model number options above	
Lightning protection	DC grounded	
Mechanical Characteristics		
Materials	Aluminium Alloy	
Dimensions (Length x Width)	1210 x 320 mm	47.6 x 12.6 in
Weight without bracket	3.5 kg	7.7 lbs
Mounting Options		
Mounting	Mounting bracket included to fit 38-50 mm dia. pipe.	

Technical Specification for an Amphenol Jaybeam Professional Broadcast Wideband Log Periodic 8-Element Antenna

All RF cables, interconnects and systems of professional quality and calibrated to determine feeder losses and antenna gains. These are factored into the results, providing accurate descriptions of actual field strength values at 10m AGL for each surveyed location – see *Calculation of Received Field Strength*

Calculation of Received Field Strength

The Field Strength (dBµV/m) is derived from the Terminated Level (dBµV) as measured at the input of the Promax measurement receiver in the survey vehicle.

Field Strength (dBµV/m) = Terminated Level (dBµV) – Aerial Gain (a) + Dipole Factor (b) + Feeder Loss (c)

where -

Dipole Factor (to matched load)	(b)	$20Log(\frac{2\pi}{\lambda})$ *Where λ = Transmission Wavelength (m)*
Feeder Loss	(c)	3 dB
Aerial Gain (dB_{dipole})	(a)	10 dB

References

The building information found in Chapter 2 was sourced from the following Ofcom document –

http://licensing.ofcom.org.uk/binaries/spectrum/fixed-terrestrial-links/wind-farms/tall_structures.pdf

Mapping Data

This report includes mapping and mapping data provided by Ordnance Survey (OS), under the terms of the Open Government Licence, OS data Crown copyright and database copyright (2021).

Television Signal Interference Questionnaire

Television Signal Survey Questionnaire

Contact details *please highlight (in bold or circle) your required method of contact*

Name:

Address (inc. postcode):

Telephone: Mobile:

Email:

About your TV Signal

What provides the signal to the television set(s) in your home?

☐ Digital Satellite (Sky/Freesat)

☐ Digital Terrestrial (Freeview)

☐ Cable/Broadband (BT/Virgin Media)

Which of these rooms do you have a television set in?

☐ Lounge ☐ Bedroom 2

☐ Dining room ☐ Bedroom 3

☐ Kitchen ☐ Bedroom 4

☐ Bedroom 1 ☐ Bedroom 5

☐ Other
*Please specify*____

____

Which of these television sets have been affected by interference since (or during) the building's construction?

- [ ] Lounge
- [ ] Dining room
- [ ] Kitchen
- [ ] Bedroom 1
- [ ] Bedroom 2
- [ ] Bedroom 3
- [ ] Bedroom 4
- [ ] Bedroom 5
- [ ] Other
  *Please specify*____

What interference have you been experiencing?

When does this happen?

- [ ] Daytime
- [ ] Night time

How often does this happen?

- [ ] Daily
- [ ] Weekly
- [ ] Monthly
- [ ] Yearly

What channels are affected?

When did you first notice the interference?

Please feel free to add any additional comments

Signature:.. Date:..

Planning Policies - National Planning Policies

National Planning Policy Framework (NPPF), Ministry of Housing, Communities & Local Government, February 2019

10. Supporting high quality communications

114. Local planning authorities should not impose a ban on new electronic communications development in certain areas, impose blanket Article 4 directions over a wide area or a wide range of electronic communications development, or insist on minimum distances between new electronic communications development and existing development. They should ensure that:

a) they have evidence to demonstrate that electronic communications infrastructure is not expected to cause significant and irremediable interference with other electrical equipment, air traffic services or instrumentation operated in the national interest; and

b) they have considered the possibility of the construction of new buildings or other structures interfering with broadcast and electronic communications services

Planning Policies - Regional Planning Policies

London - The London Plan - The Spatial Development Strategy for Greater London, March 2021, The Greater London Authority (GLA)

The London Plan 2021 (March 2021) - Spatial Development Strategy for Greater London, discusses at length the need for robust digital connectivity and that new development must not cause interference to telecommunications networks and local connectivity. Two policies and associated text relating to telecommunications, broadcast reception and digital connectivity are presented below;

Policy SI 6 Digital connectivity infrastructure

A) To ensure London's global competitiveness now and in the future, development proposals should:

1) ensure that sufficient ducting space for full fibre connectivity infrastructure is provided to all end users within new developments, unless an affordable alternative 1GB/s-capable connection is made available to all end users

2) meet expected demand for mobile connectivity generated by the development

3) take appropriate measures to avoid reducing mobile connectivity in surrounding areas; where that is not possible, any potential reduction would require mitigation

4) support the effective use of rooftops and the public realm (such as street furniture and bins) to accommodate well-designed and suitably located mobile digital infrastructure.

B) Development Plans should support the delivery of full-fibre or equivalent digital infrastructure, with particular focus on areas with gaps in connectivity and barriers to digital access.

9.6.3 Better digital connectivity with a focus on capability, affordability, security, resilience and the provision of appropriate electrical power supply should be promoted across the capital. The specific requirements of business clusters, such as a symmetrical-capable service with the same upload and download speeds, should also be met.

9.6.4 Given the fast pace at which digital technology is changing, a flexible approach to development is needed that supports innovation and choice. Part R1 of the Building Regulations 2010 requires buildings to be equipped with at least 30 MB/s ready in-building physical infrastructure, however new developments using full fibre to the property or other higher-grade infrastructure can achieve connectivity speeds of 1GB/s. Developers should engage early with a range of network operators, to ensure that development proposals are *designed to be capable of providing this level of connectivity to all end users. Mechanisms should also be put in place to enable further future infrastructure upgrades. Innovation is driving reductions in the size of infrastructure, with marginal additional unit costs, but greater digital connectivity is needed in more locations.*

9.6.5 Development proposals should also demonstrate that mobile connectivity will be available throughout the development and should not have detrimental impacts on the digital connectivity of neighbouring buildings. Early consultation with network operators will help to identify any adverse impact on mobile or wireless connectivity and appropriate measures to avoid/mitigate them.

9.6.6 Access for network operators to rooftops of new developments should be supported where an improvement to the mobile connectivity of the area can be identified. Where possible, other opportunities to secure mobile connectivity improvements should also be sought through new developments, including for example the creative use of the public realm.

9.6.8 The Mayor will work with network operators, developers, councils and Government to develop guidance and share good practice to increase awareness and capability amongst boroughs and developers of the effective provision of digital connectivity and to support the delivery of policy requirements. The Mayor will also help to identify spatial gaps in connectivity and overcome barriers to delivery to address this form of digital exclusion, in particular through his Connected London work. Boroughs should encourage the delivery of high-quality / world-class digital infrastructure as part of their Development Plans.

9.6.9 Digital connectivity supports smart technologies in terms of the collection, analysis and sharing of data on the performance of the built and natural environment, including for example, water and energy consumption, waste, air quality, noise and congestion. Development should be fitted with smart infrastructure, such as sensors, to enable better collection and monitoring of such data. As digital connectivity and the capability of these sensors improves, and their cost falls, more and better data will become available to improve monitoring of planning agreements and impact assessments, for example related to urban design. Further guidance will be developed to make London a smarter city.

Policy D9 Tall buildings

Definition

A) Based on local context, Development Plans should define what is considered a tall building for specific localities, the height of which will vary between and within different parts of London but should not be less than 6 storeys or 18 metres measured from ground to the floor level of the uppermost storey.

2) functional impact

f) buildings, including their construction, should not interfere with aviation, navigation or telecommunication, and should avoid a significant detrimental effect on solar energy generation on adjoining buildings

Local Plans and Frameworks

Draft New Southwark Plan - Southwark Council's Proposed Changes to The Submitted New Southwark Plan 2018 to 2033, August 2020

P43 Broadband and digital infrastructure

Major development must:

1. Enable the delivery of fibre to the premises (FTTP) broadband or equivalent technology for future occupants and users of the proposed development, with superfast speeds being the minimum offered; and

2. Provide FTTP, or equivalent, connections to existing, poorly serviced properties in the vicinity of the development where there is an identified need; and

3. Engage with UK mobile network operators (MNOs) and digital infrastructure providers regarding the installation of wireless broadband and telecommunications aerials.

Digital infrastructure development must:

1. Be designed and sited to avoid harmful impacts on public amenity or unacceptable street clutter in the public realm; and

2. Avoid harm to the significance of heritage assets or their settings and support local distinctiveness; and

3. Demonstrate an absence of alternative sites, including, but not only, the possibility of sharing of existing masts and sites; and

4. Provide self-certification to the effect that a mobile phone base station when operational will meet the International Commission on Non-Ionising Radiation Protection (ICNRP) guidelines; and

5. Provide a statement for each site indicating its location, the height of the antenna, the frequency and modulation characteristics and details of power output and where a mobile phone base station is added to an external mast or site, confirmation that the cumulative exposure will not exceed the ICNRP guidelines.

Reasons

Digital connectivity is an important utility. Effective communications networks are vital in the efficient operation of business and home life, and have benefits for safety and security. Ofcom currently defines superfast broadband as being a minimum download speed of 30 megabits per second (Mbit/s), which is a measure of data transfer speed. The government is prioritising creating and funding demand for full fibre broadband networks which will greatly enhance business opportunities. High speed broadband can help businesses, including SMEs, to increase efficiencies and work in partnership with others, thereby realising their full economic potential and driving jobs and economic growth. They can also help residents to access information, products and services more easily. Southwark has some areas with low or poor digital connectivity: according to Ofcom's 'Connect Nations Update: Summer 2019 7% of Southwark premises are unable to receive a minimum download speed of 30Mbit/s (9923 premises, compared with 5% nationally. We seek to improve these statistics and promote Southwark as a digitally inclusive borough. This is important for social regeneration as it benefits residents and businesses. Applicants should work with the council, MNOs and broadband delivery partners to find an appropriate solution for delivering FTTP broadband or equivalent connections to occupiers of new development and the surrounding existing properties where necessary and feasible. However, poorly sited digital infrastructure installations can be unsightly in particular when situated close to historic buildings or places.

DISCLAIMER

This Report was completed by GTech Surveys Limited on the basis of a defined programme of work and terms and conditions agreed with the Client. We confirm that in preparing this Report we have exercised all reasonable skill and care taking into account the project objectives, the agreed scope of works, prevailing site conditions and the degree of manpower and resources allocated to the project.

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The UK's terrestrial television and radio networks are highly complex engineering systems and are constantly being modified, re-designed, upgraded and maintained. The reception conditions detailed in this report were those prevailing at the time of the survey 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 television and radio transmissions and services at the time of the survey, GTech Surveys Limited cannot assume that any part of the television or radio 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 television and radio reception for this project. Although best practice has been applied in understanding the potential impacts, due to the complex nature of the subject, GTech Surveys Limited is not accountable in anyway whatsoever if unpredicted impacts occur at any location anywhere in the study area.

Modelling parameters assume that all installed UHF antenna systems are mounted at least 10m AGL and installed to a modern standard, with all components meeting 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 in camping and caravan parks, 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. Again, 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.

Digital terrestrial television (Freeview) coverage may vary as a result of engineering works or any frequency changes authorised by Ofcom. We advise that consumers always check future reception predictions (http://www.digitaluk.co.uk/coveragechecker/) before buying TV equipment. GTech Surveys Limited, Ofcom and Digital UK are not responsible for household TV reception arrangements.

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Any questions or matters arising from this Report should be addressed in the first instance to the Project Manager.