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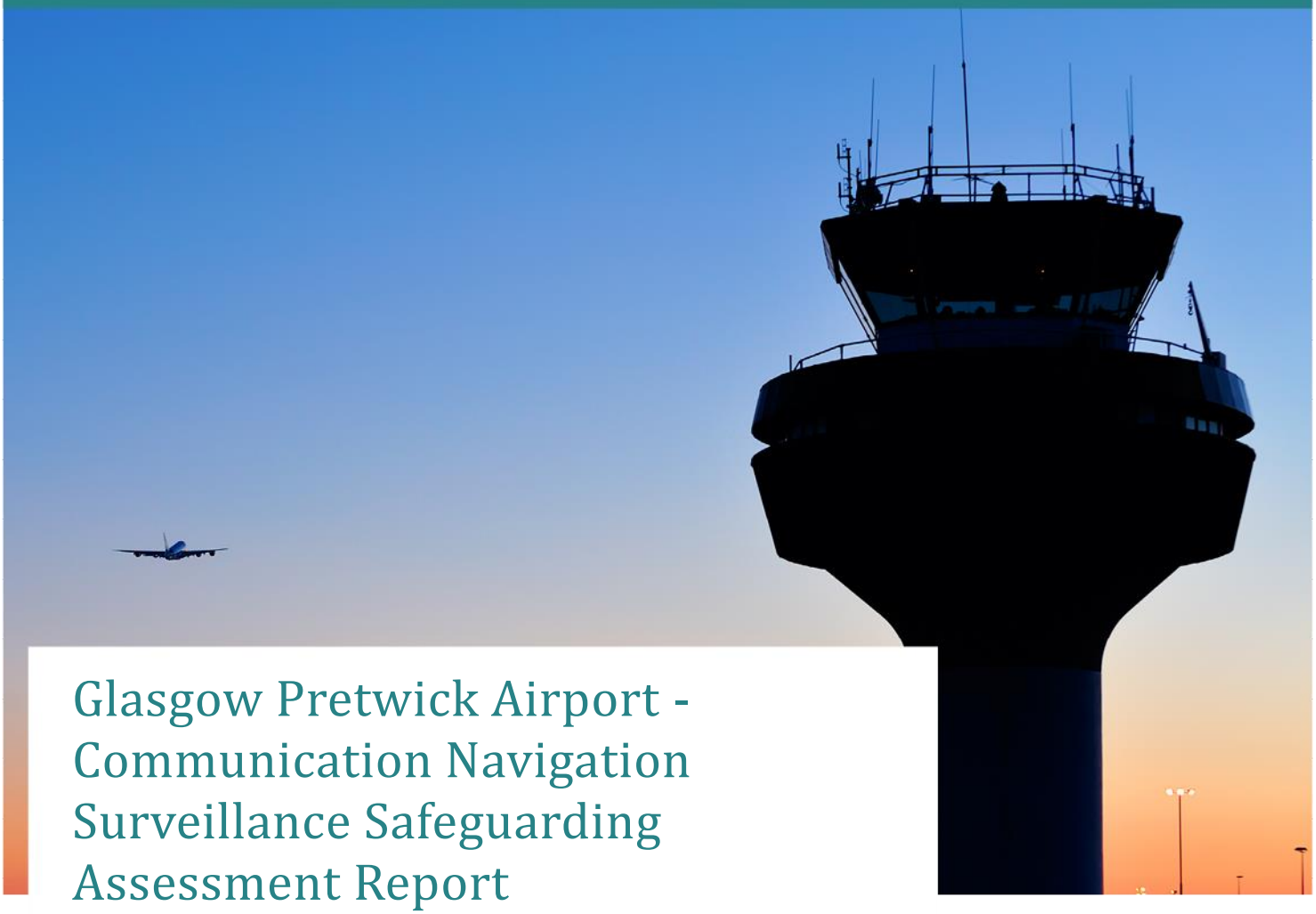
Report



Glasgow Pretwick Airport - Communication Navigation Surveillance Safeguarding Assessment Report

Brockwell Energy - Breezy Hill Wind Farm

Linda Worley

21st March 2025

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Revision History

Revision	Issue Date	Prepared by	Authorized by	Reason/Description
Issue 1.0	21st March 2025	Linda Worley	Foz Binning	Initial Issue

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Executive summary

Introduction

Glasgow Prestwick Airport ("the Airport") is responsible for the technical safeguarding of their Communications Navigation and Surveillance (CNS) systems in accordance with the Civil Aviation Authority (CAA) Publications (CAP).

Brockwell Energy Limited ("the Client") are proposing the development of Breezy Hill Wind Farm (WF) ("the Development").

The Client has commissioned Sagentia Aviation (Sagentia) to conduct Technical Safeguarding Assessments ("the Assessments") to determine potential impacts from the Development upon the Airport's In-Scope CNS systems.

Purpose

This report details the approach and presents the results of the Assessments commissioned and identifies any potential impacts to the Airport's In-Scope CNS systems.

Sagentia undertook the following specific technical assessments. Each are detailed in respective sections of this document, with summary conclusions and recommendations provided below:

- CNS Coverage Assessment
- CAP 670 Carrier Interference (C/I) Ratio Predication Assessment

CNS Coverage Assessment

- Overview

  CNS Coverage Assessment (Intervisibility) uses composite optical line of site software modelling to create coverage maps highlighting potential shadow regions impacting the In-Scope CNS systems coverage which are caused by physical obstruction from the Wind Turbine Generators (WTG) of the Development.

- Conclusions

  The results indicate that the development could cause localised areas of CNS shadowing at all altitudes except 500ft ASL for both the VHF Comms TX Site and VHF Comms RX Site Sites. The extent of shadowing increases by approximately 2 Nautical Miles (NM) as the altitude increases.

  The sector width has been modelled in the worst-case profile and in real world operations, the profile of the WTG being presented to the CNS will vary in relation to their orientation at any point in time and as such it is reasonable to assume that the real affected sector width will be reduced compared to that presented in the results of this modelling.

  Additionally, the Airport should recognise that RF waves do not propagate only in direct 'straight lines', and that the impact is likely to be more distinct shadowing areas of degraded coverage directly behind the individual wind turbines rather than swathes of blank coverage.

- Recommendations

  GPA should consider the nature of the indicated degradation being intermittent and changeable. The WTGs have been modelled in the worst-case profile, in real world operations, the profile of the WTG being presented to the CNS will vary in relation to their orientation at any point in time.

  Sagentia recommends GPA review the results of this assessment against the Air Traffic Services (ATS) they provide in the affected areas, specifically considering that shadow regions are localised behind the Development.

CAP 670 C/I Ratio Predication Assessment

- Overview

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C/I refers to the phenomenon where an unwanted RF signal can cause degradation to a wanted RF signal in the same (or adjacent sub carrier) frequency band.

In the case of Wind Farms, WTGs can reflect the CNS RF signal such that it appears to have originated from an unwanted source. C/I ratio is the assessment of the level of that unwanted signal against the field strength of the wanted signal.

Where the modelling presents areas of C/I falling below the CAP 670 threshold, it is anticipated that the quality of radio communications will be lower than the optimal reading of 5 on the 'readability scale'.

C/I can also occur in areas where the signal strength of the wanted RF signal is weak or heavily attenuated through terrain etc and where other unwanted signals overwhelm the much weaker field strength of the wanted signal. In such areas where the original field strength is weak in the first place, it is likely that the CNS signal quality will be unreliable even without the presence of Wind Farms.

- Conclusions

  The results indicate that the Development could cause localised areas of C/I ratio falling below the CAP 670 Acceptance Criteria for both the VHF Comms TX Site and VHF Comms RX Site at 1,000 feet (ft) Above Ground Level (AGL). However, the regions affected are very small in size and localised to the Development.

- Recommendations

  The Airport should also consider that the nature of the indicated interference being intermittent and changeable as the WTGs have been modelled in the worst-case profile and in real world operations, the profile of the WTG being presented to the CNS will vary in relation to their orientation at any point in time.

  The CAP 670 GEN 02 states that:

  'Technical impact (interference levels) and operational impacts are assessed separately. The type of operational usage and the geographic location and volume of affected airspace (Volume of Interest) will affect the level of operational impact and hence sensitivity to a particular development proposal'

  This document presents the Technical Impact, Sagentia recommends that the Airport conduct an Operational Assessment of the results of this assessment against the ATS they provide in the affected areas, specifically considering that C/I is localised to the Development and only present at low altitudes and that the impact to the ATS provided is likely to be negligible.

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1 Introduction

1.1 Introduction

Glasgow Prestwick Airport ("the Airport") is responsible for the technical safeguarding of their Communications Navigation and Surveillance (CNS) systems in accordance with the Civil Aviation Authority (CAA) Publications (CAP's).

Brockwell Energy Limited ("the Client") are proposing the development of Breezy Hill Wind Farm (WF) ("the Development"). The Client has commissioned Sagentia Aviation (Sagentia) to conduct Technical Safeguarding Assessments ("the Assessments") to determine potential impacts from the Development upon the Airport's In-Scope CNS systems.

1.2 Purpose

This report details the approach and presents the results of the Assessments commissioned and identifies any potential impacts to the Airport's In-Scope CNS systems.

1.3 Scope

1.3.1 The Development

For the purposes of this report and the scope of work undertaken in the Assessments contained within, the Development is defined as Breezy Hill WF.

Figure 1 below depicts the Development's location in relation to the Airport. The WF lies approximately 10 Nautical Miles (NM) from the Airport's Aerodrome Reference Point (ARP).

Figure 1 - The Development

The technical parameters used for the Development's Wind Turbine Generators (WTG's) are detailed in Table 1 below.

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WTG	Eastings	Northings	Max Tip height (m AGL)	Blade Length (m)	Blade Chord (m)	Hub Height (m AGL)	Tower Diameter (m)
BHT01	247271	614508	149.9	68	4.1	81.9	3.7
BHT02	247620	614131	149.9	68	4.1	81.9	3.7
BHT03	247194	613858	149.9	68	4.1	81.9	3.7
BHT04	247573	613707	149.9	68	4.1	81.9	3.7
BHT05	248136	613735	149.9	68	4.1	81.9	3.7
BHT06	248414	613503	149.9	68	4.1	81.9	3.7
BHT07	248756	613253	149.9	68	4.1	81.9	3.7
BHT08	248959	612926	149.9	68	4.1	81.9	3.7
BHT09	247210	613183	149.9	68	4.1	81.9	3.7
BHT10	247555	612926	149.9	68	4.1	81.9	3.7
BHT11	248064	612898	149.9	68	4.1	81.9	3.7
BHT12	248490	612661	149.9	68	4.1	81.9	3.7
BHT13	246865	612263	149.9	68	4.1	81.9	3.7
BHT14	247493	612386	149.9	68	4.1	81.9	3.7
BHT15	247756	612079	149.9	68	4.1	81.9	3.7
BHT16	246449	611969	149.9	68	4.1	81.9	3.7
BHT17	246677	611639	149.9	68	4.1	81.9	3.7
BHT18	247459	610783	149.9	68	4.1	81.9	3.7
BHT19	247556	611130	149.9	68	4.1	81.9	3.7
BHT20	247338	611513	149.9	68	4.1	81.9	3.7

Table 1 - Development WTG Parameters

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Figure 2 - Development Layout

1.3.2 The Requirement

The Airport is responsible for the technical safeguarding of their CNS systems in accordance with the CAP 670 and has requested that the Client provides the Assessments. The Client has requested Sagentia to undertake the following Assessments to determine the level of impact caused by the presence of wind farms located within the Airport's Very High Frequency Communications (Comms) Designated Operational Coverage (DOC):

- CAP 670 Compliant VHF Carrier Interference (C/I) Ratio Assessment
- CNS Coverage Assessment (Intervisibility)

Note: The CAP 670 GEN02.7 prescribes that every aeronautical radio station (CNS) requires a technical area to be safeguarded against the possibility that buildings or other structures erected within the safeguarded area cause interference to the signal radiated by that station. This is achieved by assessing a physical safeguarding frame (zone) which is sized and shaped for the respective CNS system. Sagentia has conducted a course appraisal in the production of the proposal for this report and concluded that the distance of the closest WTG of the Development is outside any prescribed physical safeguarding zone for the Airports CNS and as such, Sagentia have not included a CAP 670 GEN02.7 physical safeguarding assessment within the scope of work undertaken in the Assessments.

1.3.3 The Assessments

Table 2 below details the Airport's CNS systems and the respective assessments that have been undertaken.

In Scope GPA CNS	Section 2 CNS Coverage Assessment (Intervisibility)	Section 3 CAP 670 Compliant VHF C/I Ratio Assessment
VHF Comms Transmitter (TX) Site	✓	✓

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VHF Comms Receiver (RX) Site	✓	✓

Table 2 - In Scope CNS Systems and Relevant Assessments

1.4 Abbreviations

The following abbreviations are used within this document:

Abbreviation	Meaning
‘the Airport'	Glasgow Prestwick Airport
‘the Assessments'	Technical Safeguarding Assessments
‘the Client'	Brockwell Energy Limited
‘the Development '	Breezy Hill Wind Farm
‘Sagentia'	Sagentia Aviation
ARP	Aerodrome Reference Point
ASL	Above Sea Level
ATS	Air Traffic Services
C/I	Carrier Interference
CAA	Civil Aviation Authority
CAP	CAA Publication
CNS	Communications Navigation and Surveillance
Comms	Communications Navigation and Surveillance
dB	decibels
DOC	Declared Operational Coverage
DTM	Digital Terrain Models
HTZ Comms	ATDI HTZ Communications
NM	Nautical Miles
RCS	Radar Cross Section
RF	Radio Frequency
RX	Receiver

Table 3 - Abbreviations

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2 Coverage Assessment (Intervisibility)

2.1 Introduction

This section presents the CNS Coverage Assessment (Intervisibility), using composite optical line of site functions in ATDI HTZ Communications (HTZ Comms) to create coverage maps highlighting potential shadowing on the In-Scope CNS systems coverage caused by physical obstruction from the Development.

HTZ Comms is an industry standard Radio Frequency (RF) network planning toolset with extensive RF Propagation analysis and modelling capabilities.

2.2 Overview

An Intervisibility calculation fundamentally ascertains whether a point in space can be directly seen from a source point, or whether the path to the point in space is blocked by an obstruction.

HTZ Comms incorporates extensive Digital Terrain Models (DTM) which feature not only terrain elevation at high resolution but also includes clutter layers (building and vegetation height).

2.3 Scope

The scope of the CNS Coverage Assessment (Intervisibility) undertaken, is against the following of the Airport's In-Scope CNS systems:

- VHF Comms TX Site
- VHF Comms RX Site

2.4 Methodology

Test points along an azimuth are tested at the same altitude path, either until the direct visibility is blocked by terrain, clutter, or the development or until the maximum test range as been reached. This process is repeated for every azimuth step from the Source Point with a full 360 intervisibility coverage chart being produced.

Readers of this report should note: All assessments have been conducted to a range respective to the DOC of each respective CNS system.

Figure 3 below depicts this process for a single azimuth step on a defined azimuth/ altitude path.

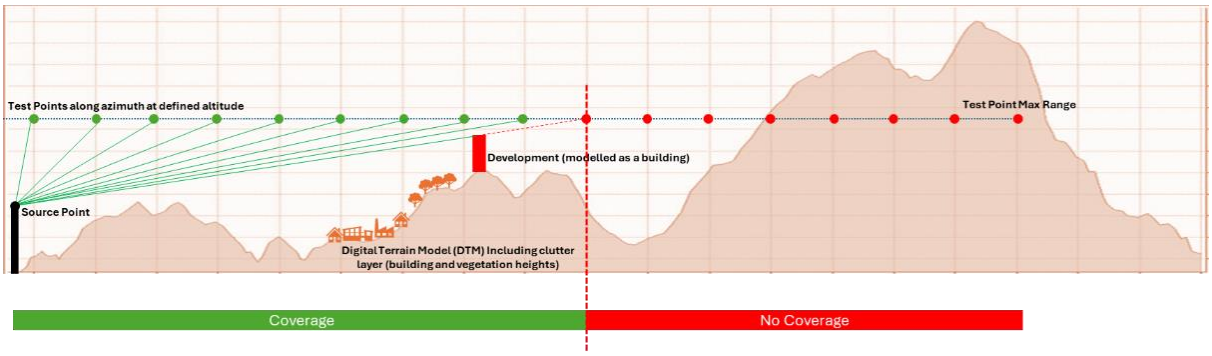

Figure 3 - Intervisibility Coverage Assessment along Azimuth/ Altitude Path

Important Note: Modelling the WTGs as buildings presents the 'worst case' profile to the Airport's CNS (see Figure 4 below); in real-world operation the profile will be variable dependent on number, position, size and orientation of the WTG with respect to the CNS. Additionally, RF waves do not propagate only in direct 'straight lines', as such the actual impact upon coverage is likely to be less than depicted by the Intervisibility Coverage Charts in this report.

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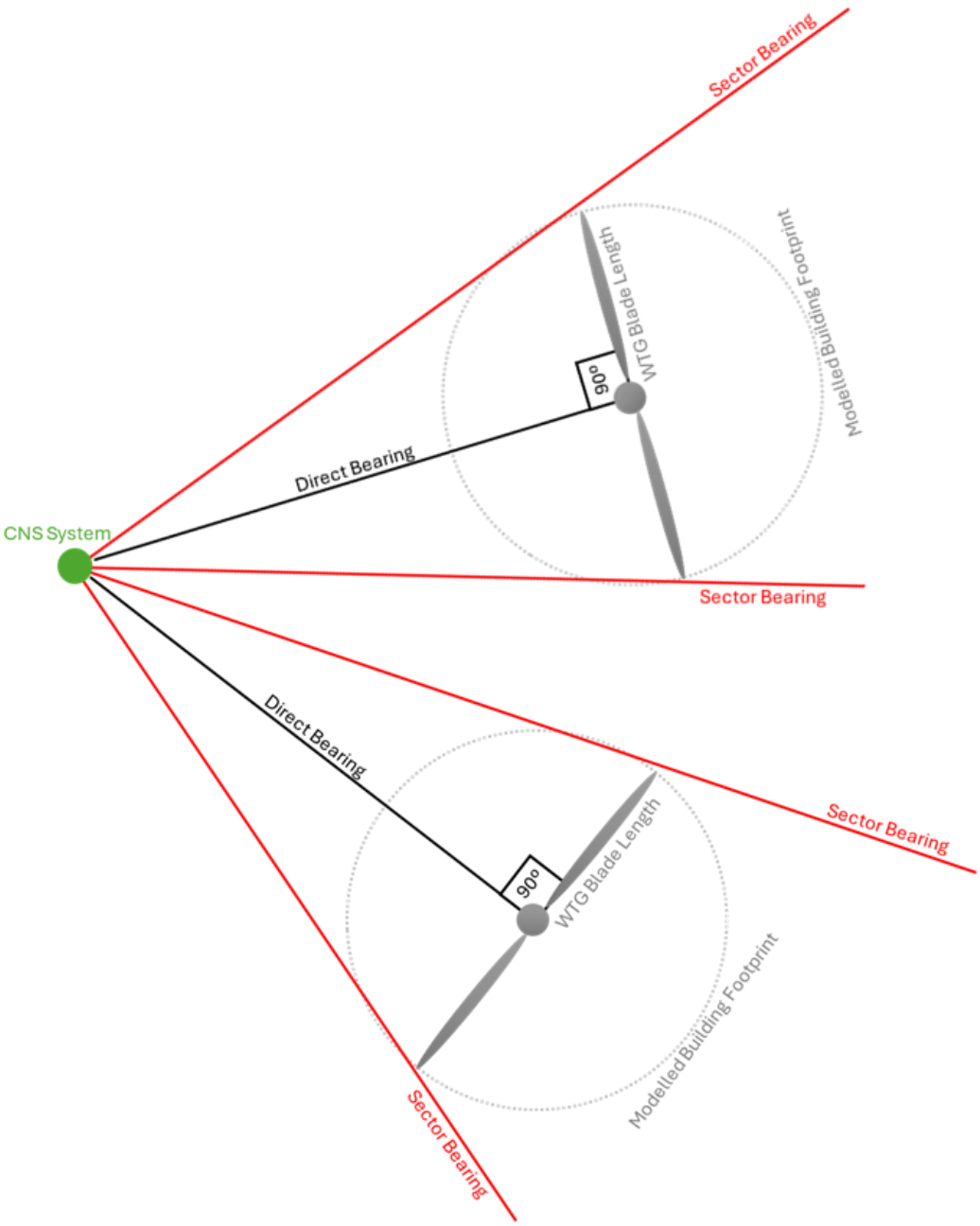

Figure 4 - WTG Modelled as Buildings (Worst Case Scenario)

Intervisibility coverage maps were produced for the in-scope CNS for the following three use cases:

2.4.1 Baseline Intervisibility Coverage Map

Baseline intervisibility coverage map without the Development. This displays the modelled coverage of the CNS without any WTGs modelled, Figure 5 below depicts an example of a Baseline Intervisibility Coverage Map.

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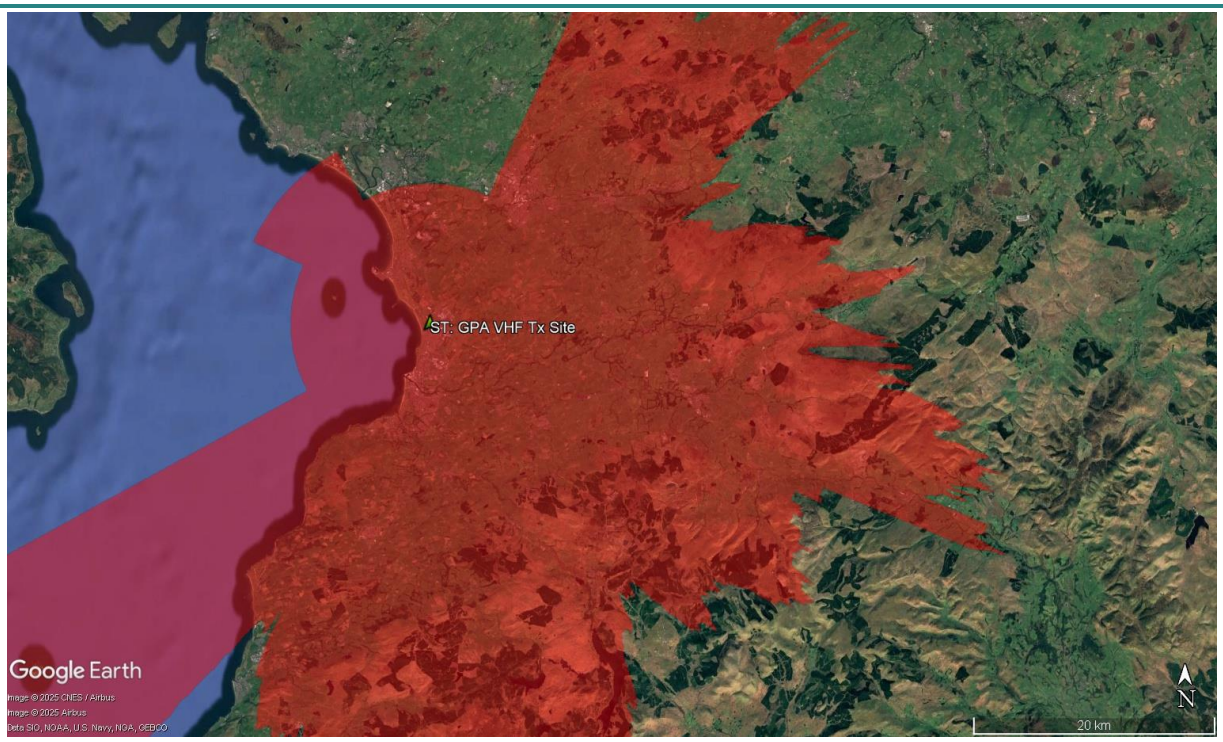

Figure 5 - Example Baseline Intervisibility Coverage Map

2.4.2 Development Intervisibility Coverage Map:

An Intervisibility Coverage map with the WTGs of the Development modelled as buildings with respective footprint which equates to the maximum tip height of the WTGs in question. This displays the coverage of the CNS with potential loss of coverage from the WTGs blocking the RF signal. Figure 6 below depicts an example of a Development Intervisibility Coverage Map.

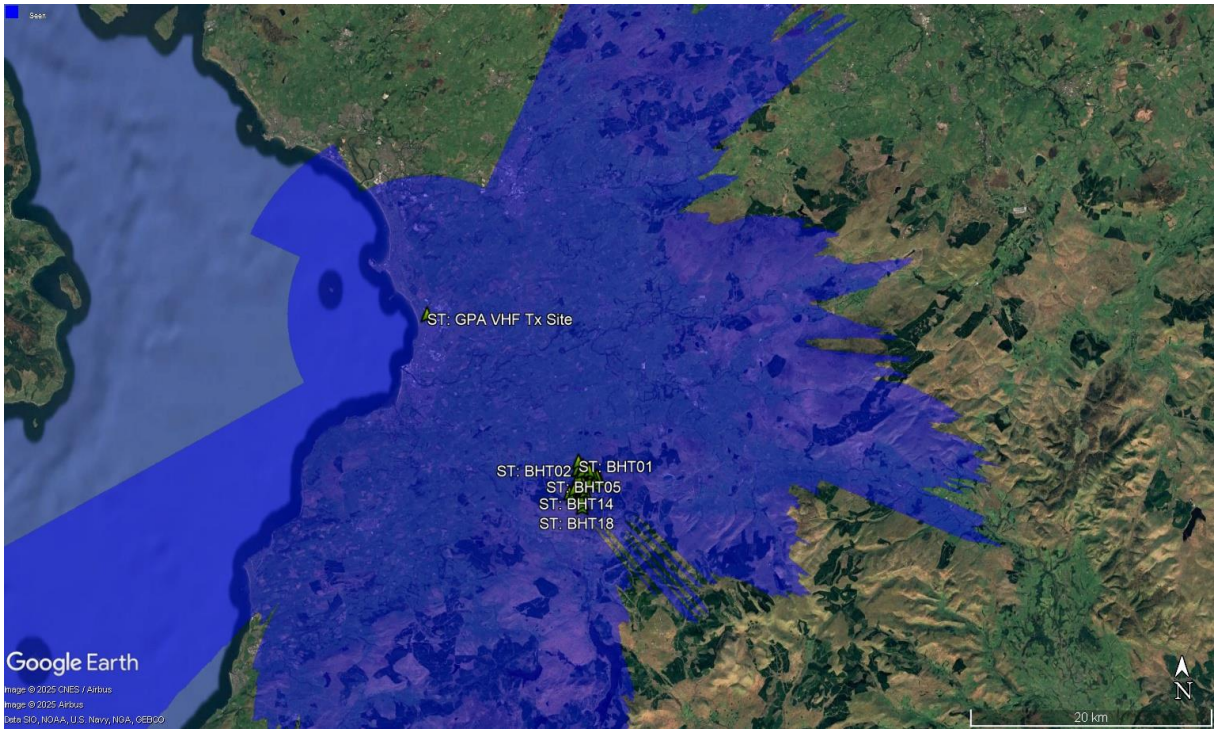

Figure 6 - Example Development Intervisibility Coverage Map

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2.4.3 Composite Intervisibility Coverage Map

Composite intervisibility coverage map where the Development Intervisibility Coverage Map (Blue) is overlaid on a Baseline Intervisibility Coverage Map (Red). Red areas on this type of map illustrate the extent of potential CNS shadow regions. These areas are further highlighted to the reader by Sector Bearings being illustrated originating from the CNS system. Figure 7 below depicts an example of a Composite Intervisibility Coverage Map.

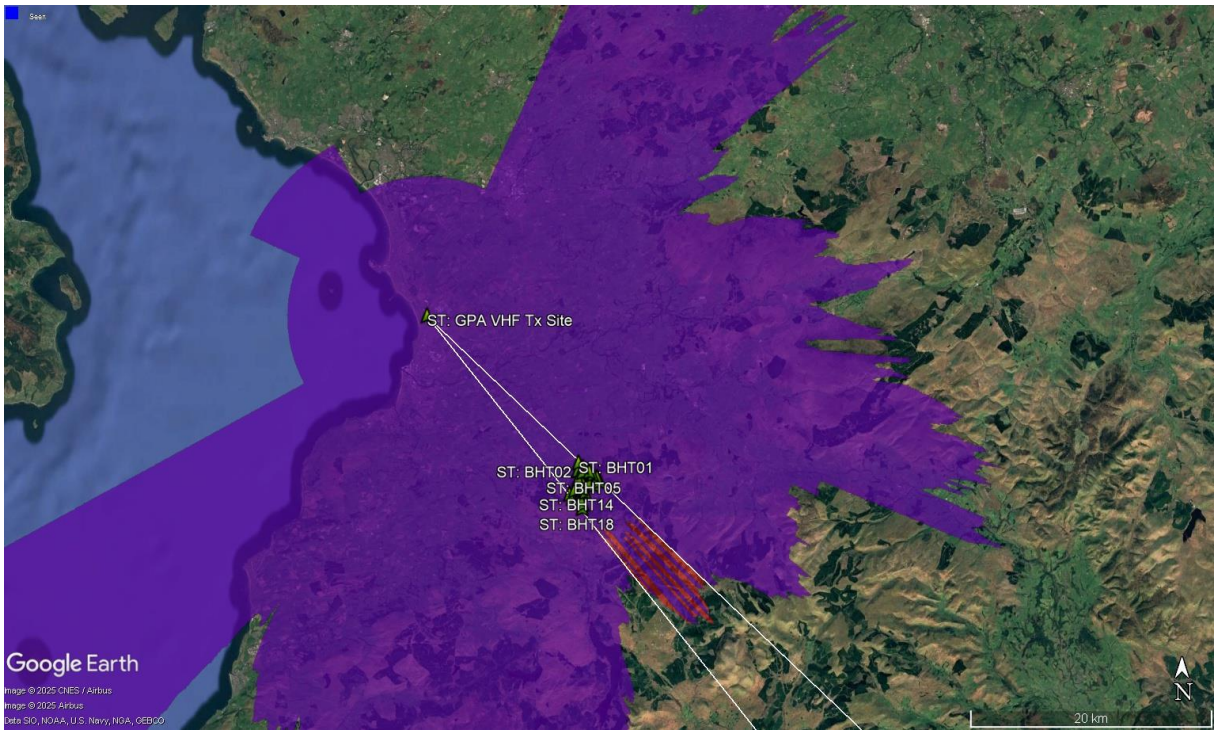

Figure 7 - Example Composite Intervisibility Coverage Map

To assess potential impacts at key altitudes, Intervisibility coverage maps for each CNS and each use-case stated above were produced at the following heights:

- 500 feet (ft) Above Sea Level (ASL)
- 1,000ft ASL
- 1,500ft ASL
- 2,000ft ASL
- 3,000ft ASL
- 4,000ft ASL
- 5,000ft ASL

2.5 Results

Composite Intervisibility Coverage maps (Appendix A) have been produced and assessed for the following of the Airport's CNS:

- 2.5.1 - VHF Comms TX Site
- 2.5.2 - VHF Comms RX Site

2.5.1 VHF Comms TX Site

Potential shadowing on the VHF Comms TX Site coverage caused by physical obstruction from the Development is presented in Table 4 below:

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Altitude	CNS System	WTG Sector	Impacted Range Window (circa NM)	Appendix A Reference
500ft ASL	TX	133.35º to 141.28º	Nil	Figure 8
1,000ft ASL	TX	133.35º to 141.28º	9.31 to 10.19	Figure 9
1,500ft ASL	TX	133.35º to 141.28º	9.81 to 14.17	Figure 10
2,000ft ASL	TX	133.35º to 141.28º	11.75 to 18.66	Figure 11
3,000ft ASL	TX	133.35º to 141.28º	17.55 to 27.01	Figure 12
4,000ft ASL	TX	133.35º to 141.28º	23.04 to 34.65	Figure 13
5,000ft ASL	TX	133.35º to 141.28º	28.34 to 41.77	Figure 14

Table 4 - VHF Comms TX Site Coverage Impact Summary

2.5.2 VHF Comms RX Site

Potential shadowing on the VHF Comms RX Site coverage caused by physical obstruction from the Development is presented in Table 5 below:

Altitude	CNS System	WTG Sector	Impacted Range Window (circa NM)	Appendix A Reference
500ft ASL	RX	135.49º to 144.40º	Nil	Figure 15
1,000ft ASL	RX	135.49º to 144.40º	9.32 to 10.18	Figure 16
1,500ft ASL	RX	135.49º to 144.40º	9.8 to 14.02	Figure 17
2,000ft ASL	RX	135.49º to 144.40º	11.7 to 18.34	Figure 18
3,000ft ASL	RX	135.49º to 144.40º	17.10 to 25.92	Figure 19
4,000ft ASL	RX	135.49º to 144.40º	22.31 to 33.20	Figure 20
5,000ft ASL	RX	135.49º to 144.40º	27.32 to 40.14	Figure 21

Table 5 - VHF Comms RX Site Coverage Impact Summary

2.6 Conclusions

The results indicate that the development could cause localised areas of CNS shadowing at all altitudes except 500ft ASL for both the VHF Comms TX Site and VHF Comms RX Site. The extent of shadowing increases by approximately 2 NM as the altitude increases.

In all cases, the shadow regions are always directly behind the individual WTGs and restricted to a combined sector width of approximately 9º for the VHF Comms TX Site and 8º for the VHF Comms RX Site. Again, the sector width has been modelled in the worst-case profile and in real world operations, the profile of the WTG being presented to the CNS will vary in relation to their orientation at any point in time and as such it is reasonable to assume that the real affected sector width will be reduced compared to that presented in the results of this modelling.

Additionally, the Airport should recognise that RF waves do not propagate only in direct ‘straight lines’, and that the impact is likely to be more distinct shadowing areas of degraded coverage directly behind the individual wind turbines rather than swathes of blank coverage.

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2.7 Recommendations

The Airport should consider the nature of the indicated degradation being intermittent and changeable. The WTGs have been modelled in the worst-case profile, in real world operations, the profile of the WTG being presented to the CNS will vary in relation to their orientation at any point in time.

Sagentia recommends GPA review the results of this assessment against the Air Traffic Services (ATS) they provide in the affected areas, specifically considering that shadow regions are localised behind the Development.

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3 CAP 670 Compliant VHF C/I Ratio Assessment

3.1 Introduction

This section presents the CAP 670 C/I Ratio Prediction Assessment, using the Network Interference functions in HTZ Comms to create C/I Sum maps following the methodology prescribed in the CAP 670 GEN 02[1].

3.2 Overview

C/I refers to the phenomenon where an unwanted RF signal can cause degradation to a wanted RF signal in the same (or adjacent sub carrier) frequency band.

In the case of Wind Farms, WTGs can reflect the CNS RF signal such that it appears to have originated from an unwanted source. C/I ratio is the assessment of the level of that unwanted signal against the field strength of the wanted signal.

C/I can also occur in areas where the signal strength of the wanted RF signal is weak or heavily attenuated through terrain etc. and where other unwanted signals overwhelm the much weaker field strength of the wanted signal. In such areas where the original field strength is weak in the first place, it is likely that the CNS signal quality will be unreliable even without the presence of Wind Farms.

3.3 Scope

The scope of the CAP 670 Compliant VHF C/I Ratio Assessments undertaken, is against the following of the Airport's In-Scope CNS systems:

- GPA VHF Comms TX Site
- GPA VHF Comms RX Site

3.4 Methodology

C/I ratio maps are produced for In-Scope CNS at each altitude being assessed following the CAP 670 methodology, which considers interference from terrain and interference generated from the Development. C/I below the CAP 670 threshold of 14 decibels (dB) is presented in the volume of interest.

3.5 Results

A summary of the results of the CAP 670 C/I Ratio predication assessment is presented in Table 6 below:

Altitude	CNS	CI Present below <14dB Threshold[2]	Appendix B Reference
1,000ft AGL	TX	**Yes**	Figure 22
1,000ft AGL	RX	**Yes**	Figure 26
2,000ft AGL	TX	**No**	Figure 23
2,000ft AGL	RX	**No**	Figure 27

[1] Part B, Section 4: Appendix A to GEN 02: Methodology for the Prediction of Wind Turbine Interference Impact on Aeronautical Radio Station Infrastructure.
[2] 'YES' indicates C/I that has been generated by the Development.

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3,000ft AGL	TX	**No**	Figure 24
3,000ft AGL	RX	**No**	Figure 28
5,000ft ASL	TX	**No**	Figure 25
5,000ft ASL	RX	**No**	Figure 28

Table 6 - GPA CAP 670 C/I Ratio Prediction Summary

3.6 Conclusions

3.6.1 VHF Comms TX Site:

- At 1,000ft AGL, C/I ratio below the CAP 670 criteria of <14dB which is generated from the Development may be present, but it is very localised as indicated by the white region on Figure 22.

  Field Strength patterns for the VHF Comms TX Site at 1,000ft AGL indicate that in the region of the proposed development, the signal strength is attenuated by the challenging high terrain intertwined with steep drop offs into valleys. As such the quality of VHF coverage in this area may already be degraded before the Development is constructed.

  C/I Ratio is the comparison of the strength of one RF signal against another, in this case between the strength of the VHF Comms TX Site and the signal strength modelled for the Development (the turbine related interference).

  The results modelled for 1,000ft AGL, indicate C/I ratio below the CAP670 criteria of <14dB. However, on examining the field strength patterns, it can clearly be seen that the underlaying terrain profiles significantly contribute to the results presented in the volume of interest; whereas the contribution to the C/I results from the Development is constrained to the immediate and localised area of the Development, as indicated by the white region on Figure 22.
- No C/I is predicted at 2,000ft AGL.
- No C/I is predicted at 3,000ft AGL.
- No C/I is predicted at 5,000ft ASL.

3.6.2 VHF Comms RX Site:

At 1,000ft AGL, C/I ratio below the CAP 670 criteria of <14dB which is generated from the Development may be present, but it is very localised as indicated by the white region on Figure 26.

Field Strength patterns for the VHF Comms RX Site at 1,000ft AGL indicate that in the region of the proposed development, the signal strength is attenuated by the challenging high terrain intertwined with steep drop offs into valleys. As such the quality of VHF coverage in this area may already be degraded before the Development is constructed.

C/I Ratio is the comparison of the strength of one RF signal against another, in this case between the strength of the VHF Comms RX Site and the signal strength modelled for the Development (the turbine related interference).

The results modelled for 1,000 ft AGL, indicate C/I ratio below the CAP670 criteria of <14dB. However, on examining the field strength patterns, it can clearly be seen that the underlaying terrain profiles significantly contribute to the results presented in the volume of interest; whereas the contribution to the C/I results from the Development is constrained to the immediate and localised area of the Development, as indicated by the white region on Figure 26.

- No C/I is predicted at 2,000ft AGL.
- No C/I is predicted at 3,000ft AGL.
- No C/I is predicted at 5,000ft ASL.

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3.7 Recommendations

The CAP 670 threshold value of <14dB has been determined from laboratory-based susceptibility testing of a wide range of ground based and airborne radio receiver types. It includes a modest safety margin to allow for signal fading, effects of weather, multipath reflection etc., which will all potentially degrade the C/I ratio further.

Areas where C/I ratio <14dB is depicted indicate that audio quality of radio communications as perceived by either Air Traffic Controller or Pilot may be impaired.

The results indicate that the Development could cause localised areas of C/I ratio falling below the CAP 670 Acceptance Criteria for both the VHF Comms TX Site and VHF Comms RX Site at 1,000ft AGL. However, the regions affected are very small in size and localised to the Development.

The Airport should also consider that the nature of the indicated interference being intermittent and changeable as the WTGs have been modelled in the worst-case profile and in real world operations, the profile of the WTG being presented to the CNS will vary in relation to their orientation at any point in time.

Sagnetia recommends the Airport review the results of this assessment against the ATS they provide in the affected areas, specifically considering that C/I is localised to the Development and only present at low altitudes and that the impact to the ATS provided is likely to be negligible.

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Appendix A CNS Intervisibility Coverage Maps

A.1 Introduction

In conducting the Intervisibility Coverage Assessment, many technical artifacts are generated. Map images are produced for three different use cases at every altitude being assessed for each CNS being considered.

To improve readability of this document, only the key Composite Intervisibility Coverage Maps have been included for reference in this Appendix.

The Baseline Intervisibility Coverage Maps and Development Intervisibility Coverage Maps are available for audit/ inspection by the Client.

A.2 Contents

The contents of this Appendix are as follows:

- A.1

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- VHF Comms TX Site - Composite Intervisibility Coverage Maps
- A.1

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- VHF Comms RX Site - Composite Intervisibility Coverage Maps

Note: [Images are displayed from the next page onwards]

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A.3 VHF Comms TX Site - Composite Intervisibility Coverage Maps

A.3.1 500ft ASL

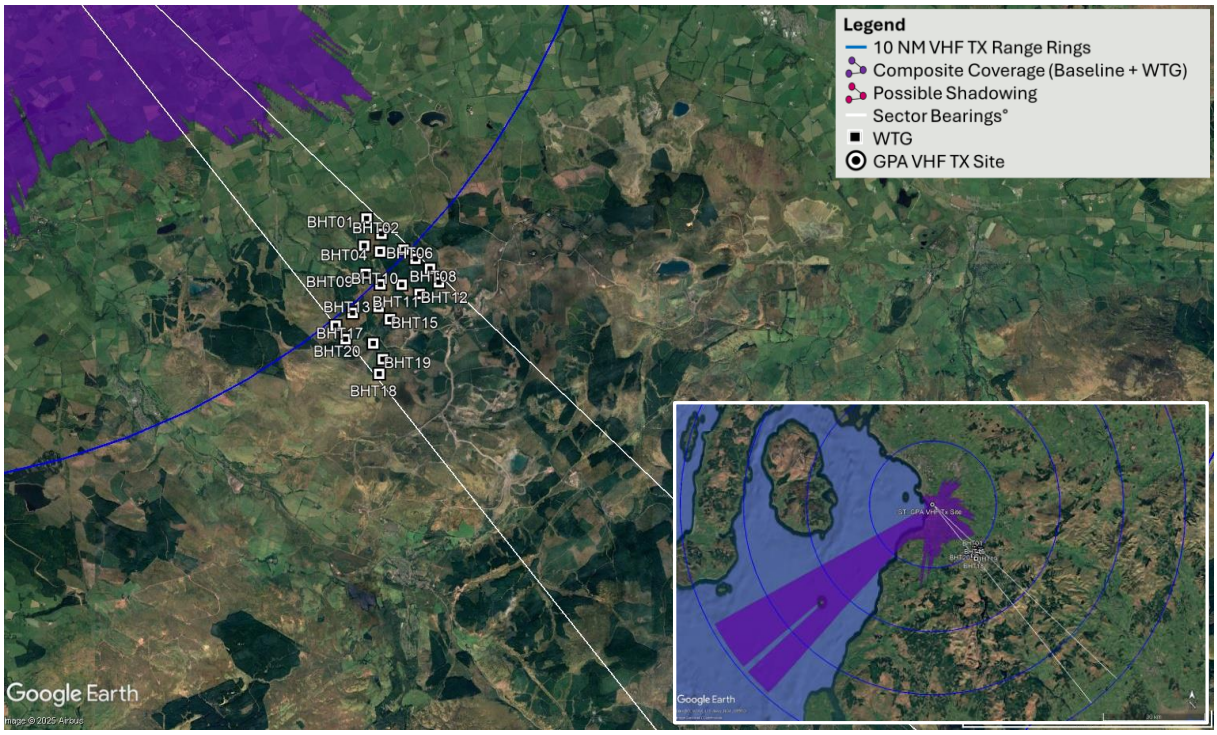

Figure 8 - GPA VHF Comms TX Site 500ft ASL Composite Intervisibility Coverage Map

A.3.2 1,000ft ASL

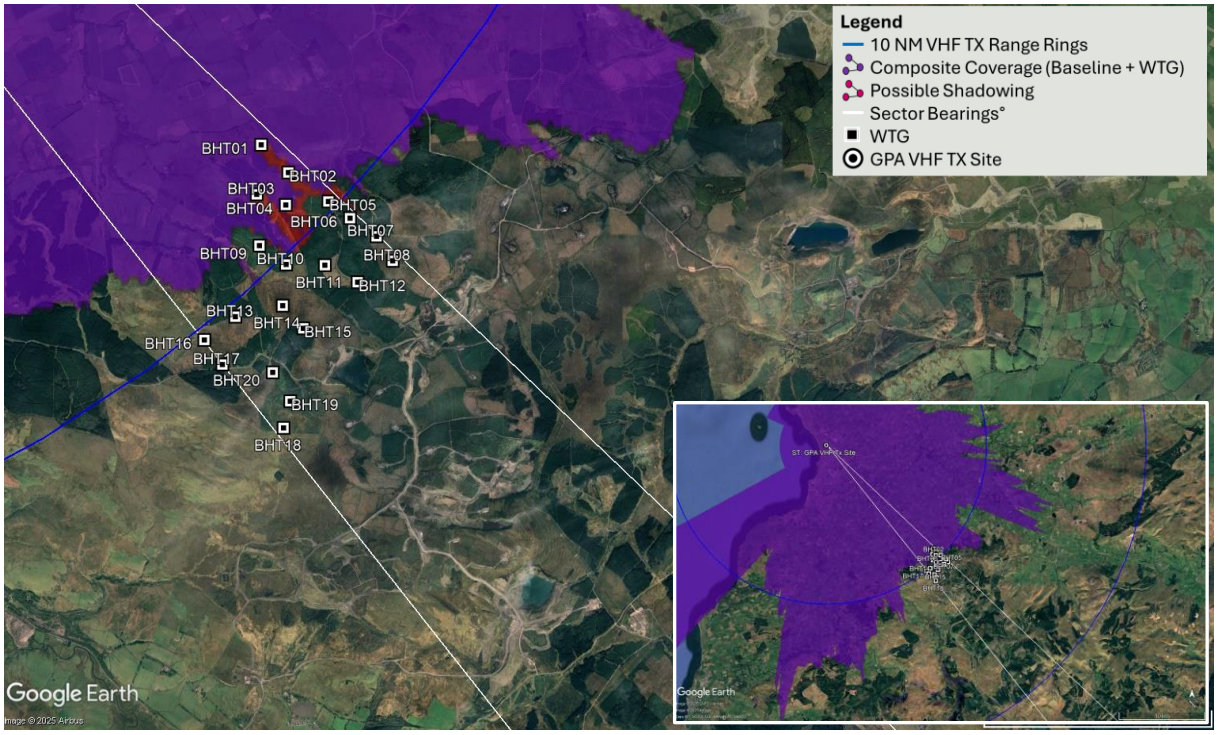

Figure 9 - GPA VHF Comms TX Site 1,000ft ASL Composite Intervisibility Coverage Map

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A.3.3 1,500ft ASL

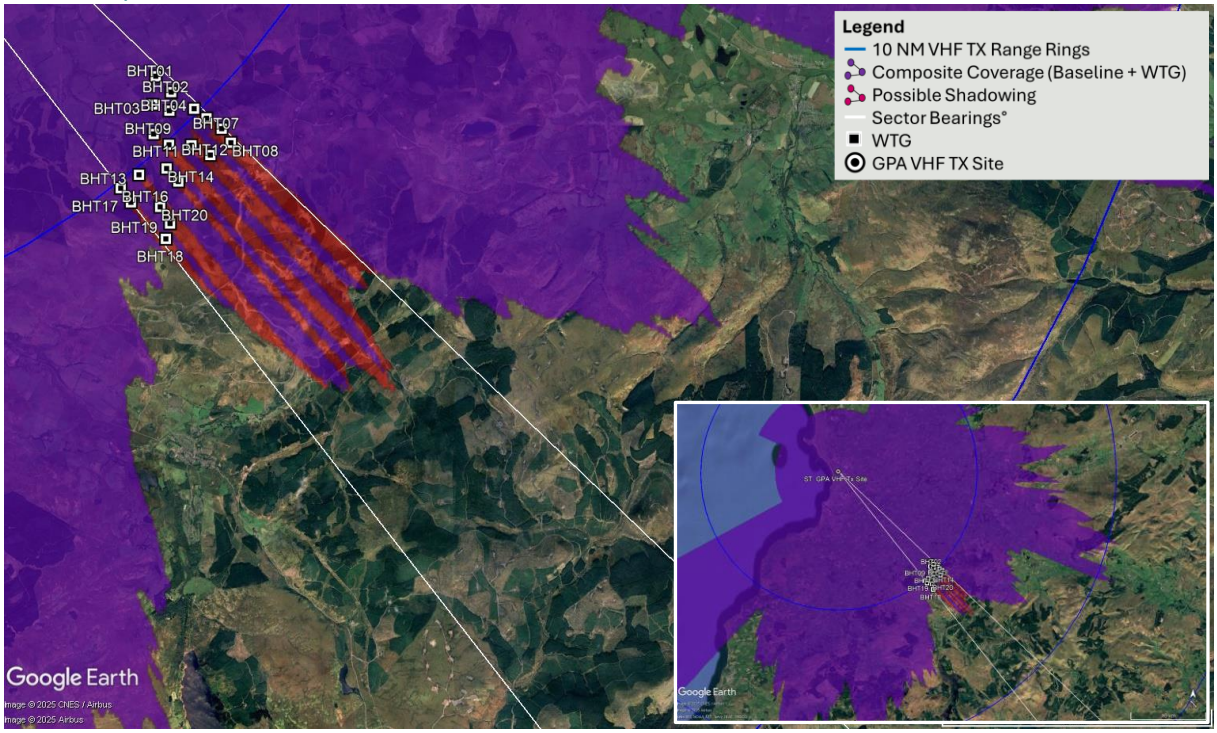

Figure 10 - GPA VHF Comms TX Site 1,500ft ASL Composite Intervisibility Coverage Map

A.3.4 2,000ft ASL

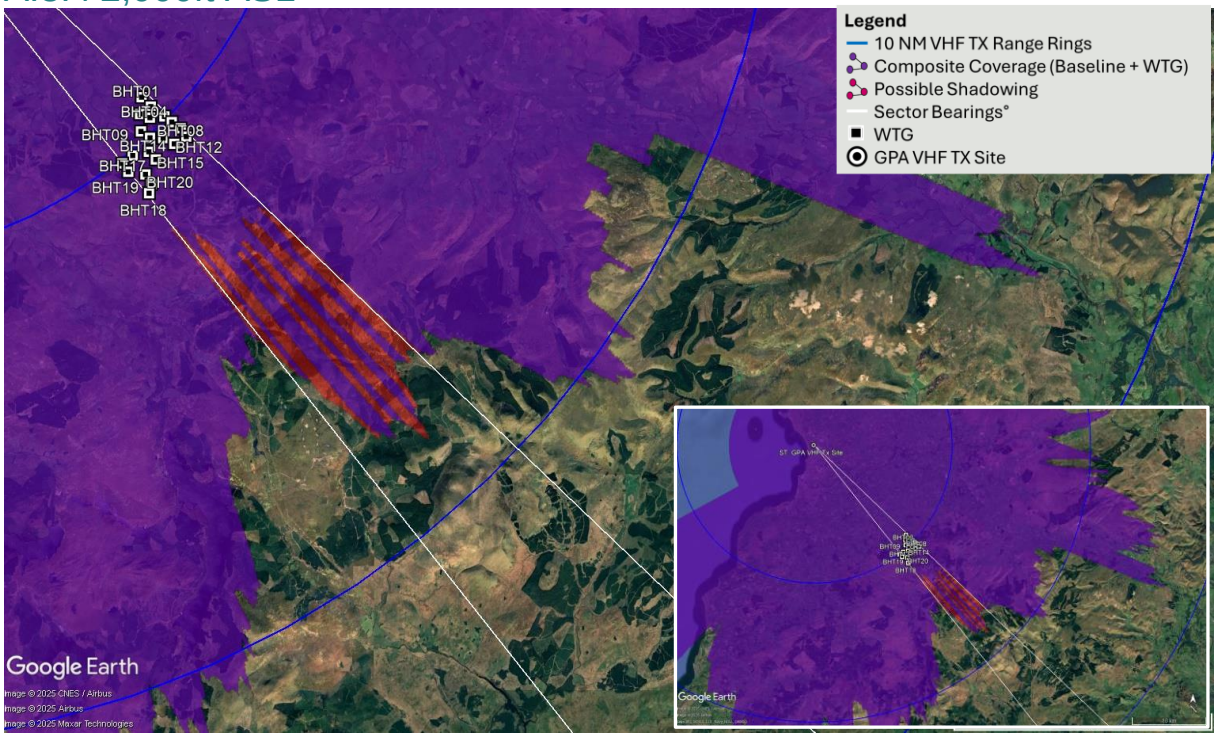

Figure 11 - GPA VHF Comms TX Site 2,000ft ASL Composite Intervisibility Coverage Map

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A.3.5 3,000ft ASL

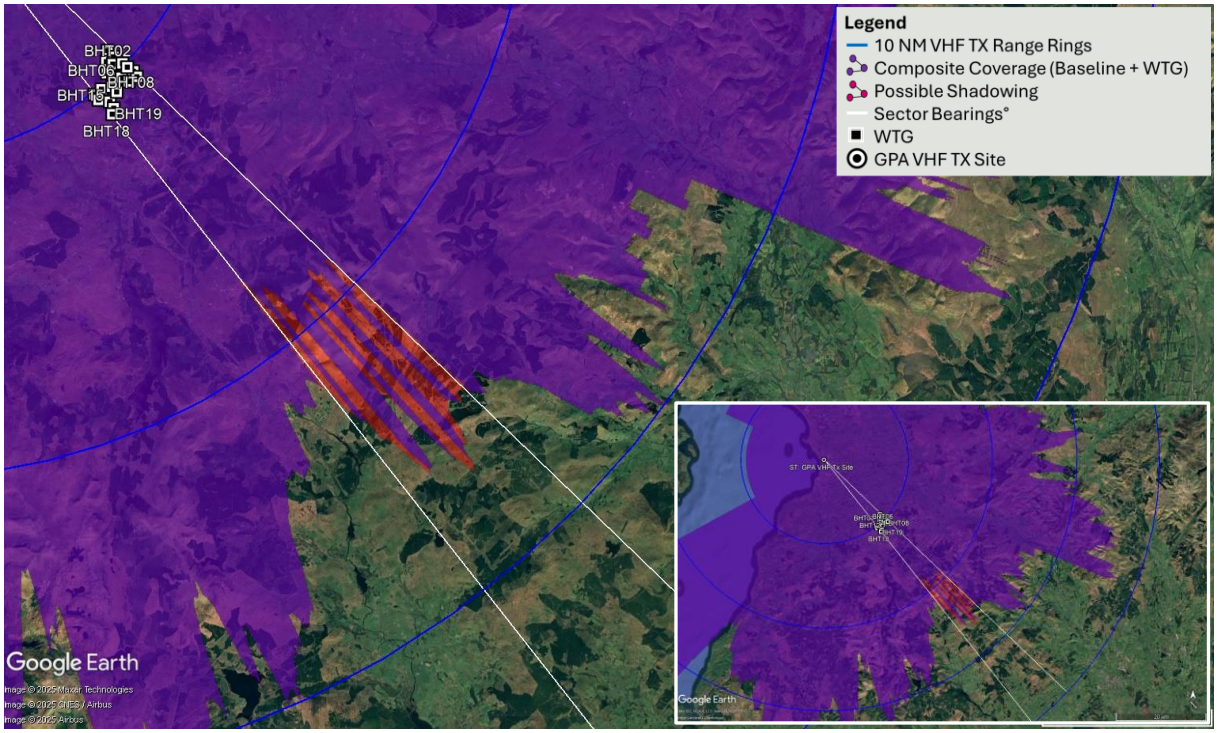

Figure 12 - GPA VHF Comms TX Site 3,000ft ASL Composite Intervisibility Coverage Map

A.3.6 4,000ft ASL

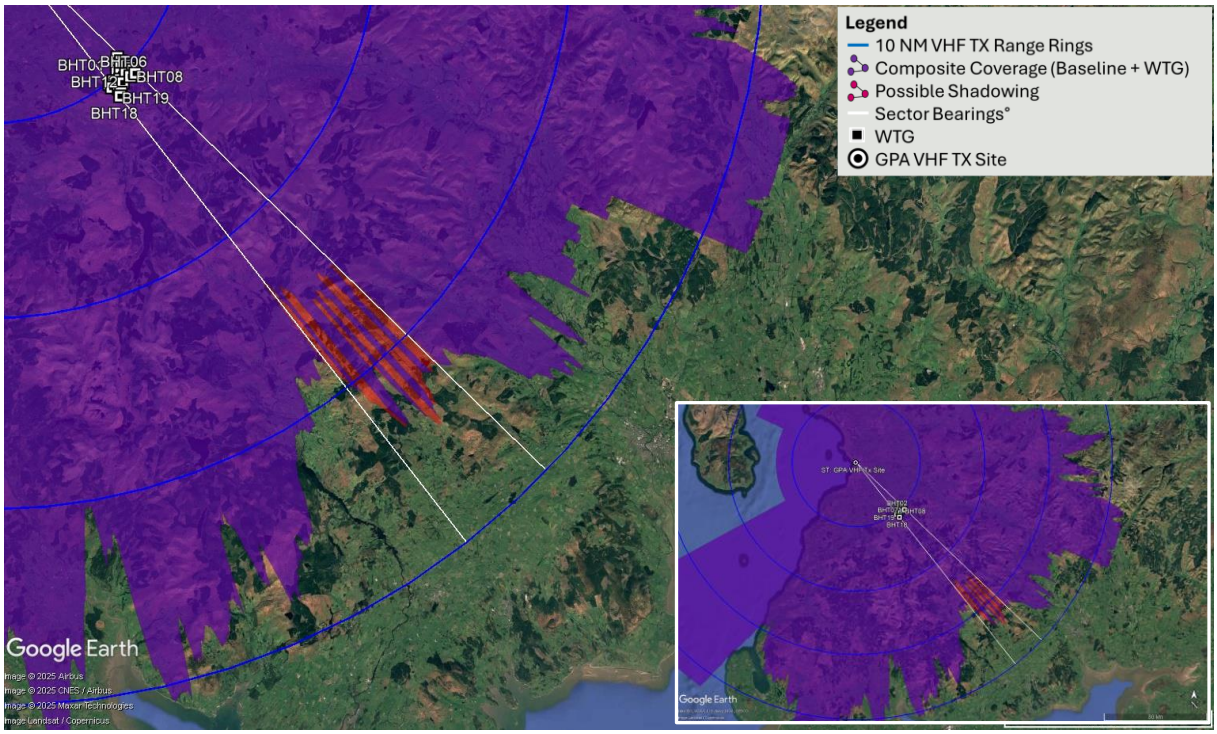

Figure 13 - GPA VHF Comms TX Site 4,000ft ASL Composite Intervisibility Coverage Map

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A.3.7 5,000ft ASL

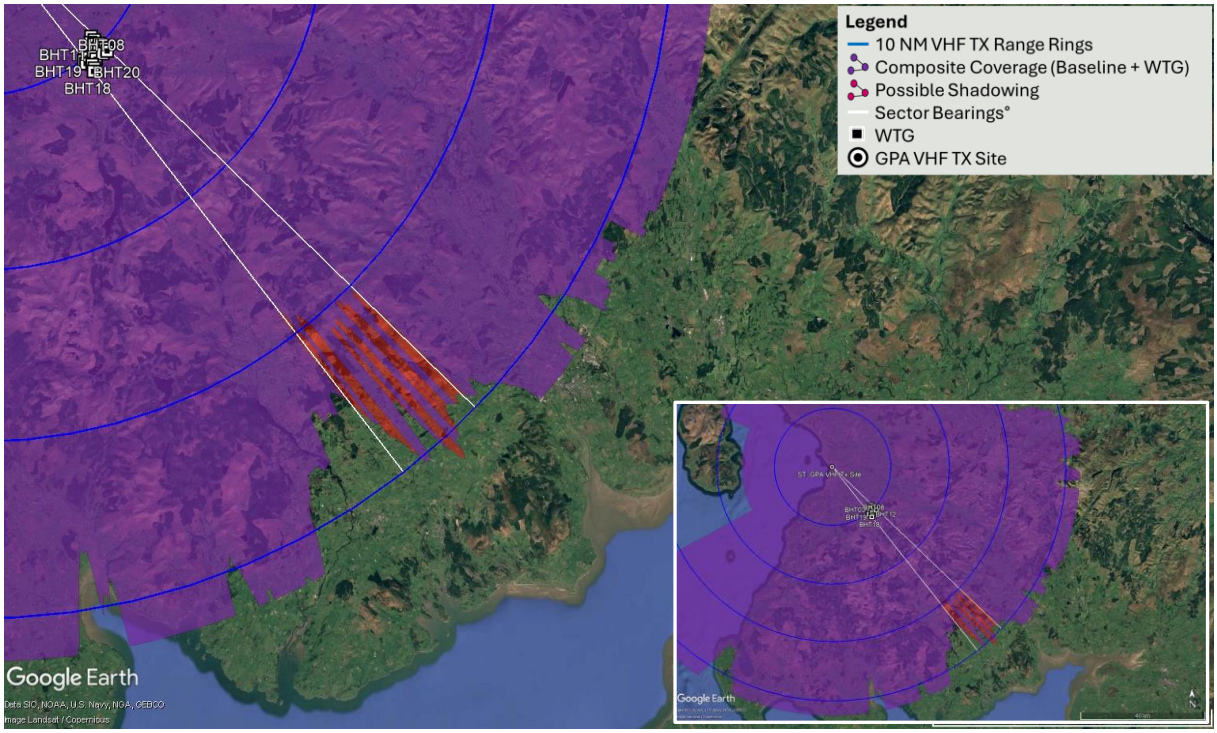

Figure 14 - GPA VHF Comms TX Site 5,000ft ASL Composite Intervisibility Coverage Map

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A.4 VHF Comms RX Site - Composite Intervisibility Coverage Maps

A.4.1 500ft ASL

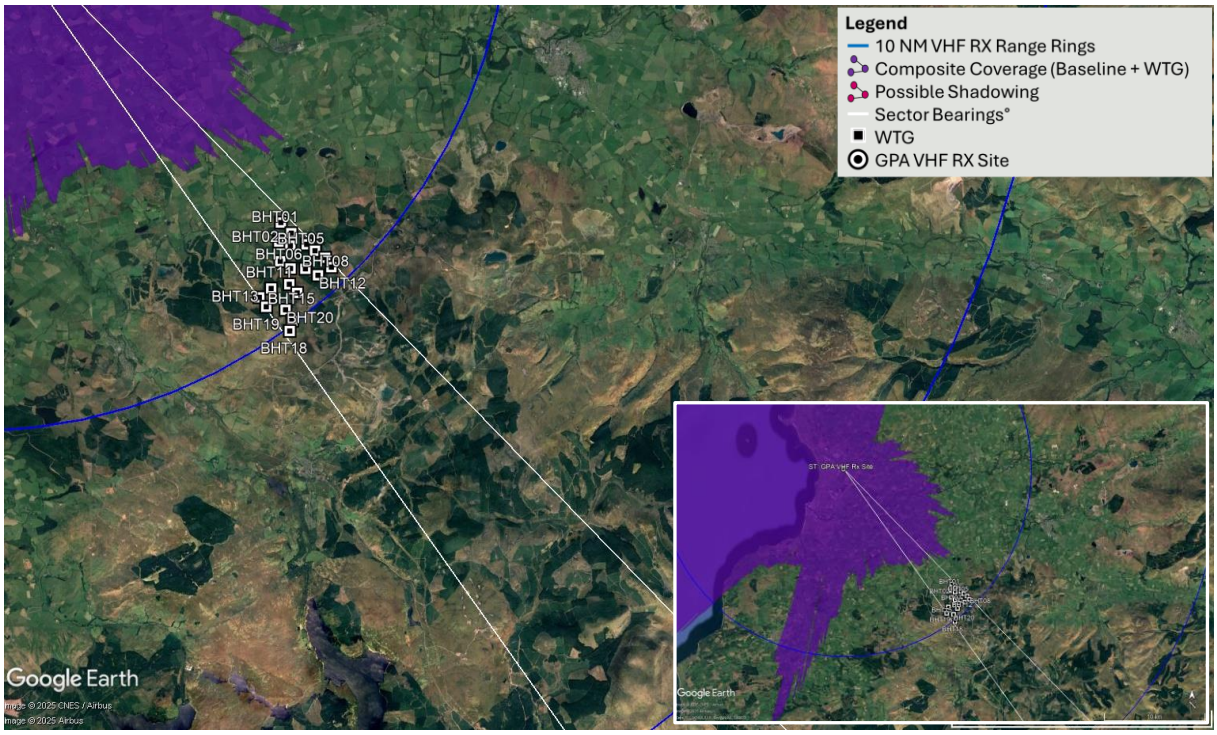

Figure 15 - GPA VHF Comms RX Site 500ft ASL Composite Intervisibility Coverage Map

A.4.2 1,000ft ASL

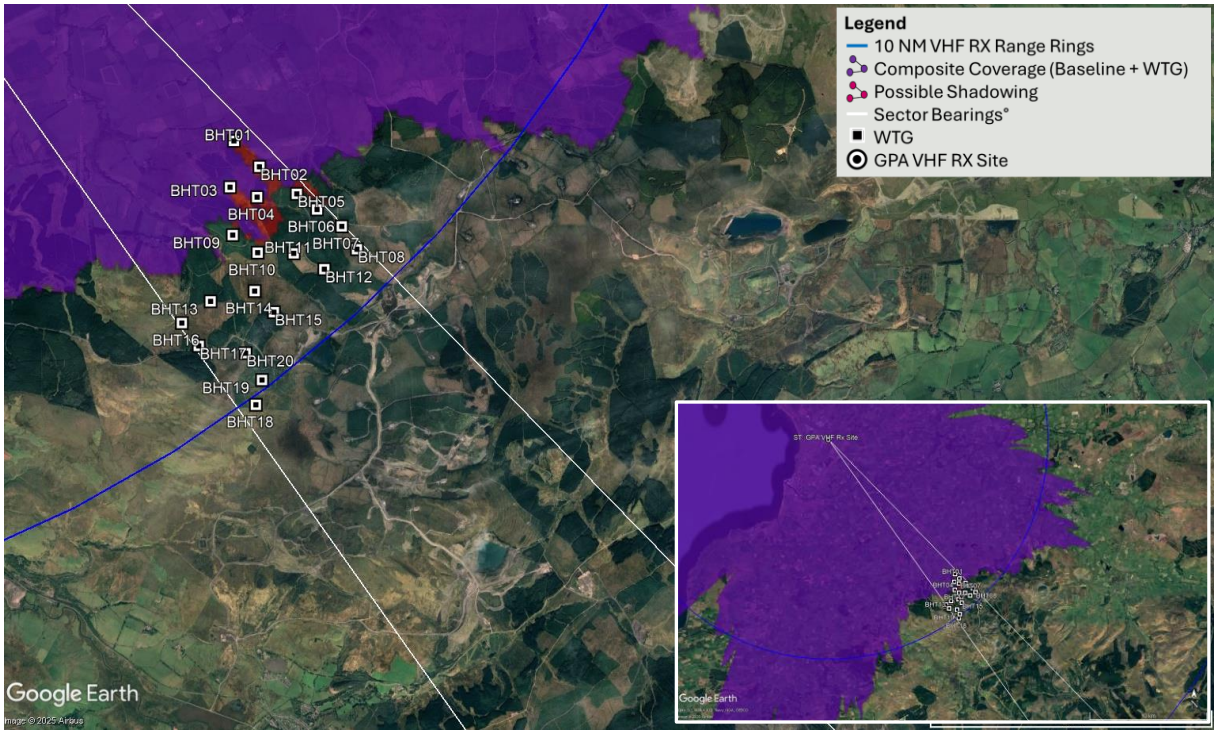

Figure 16 - GPA VHF Comms RX Site 1,000ft ASL Composite Intervisibility Coverage Map

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A.4.3 1,500ft ASL

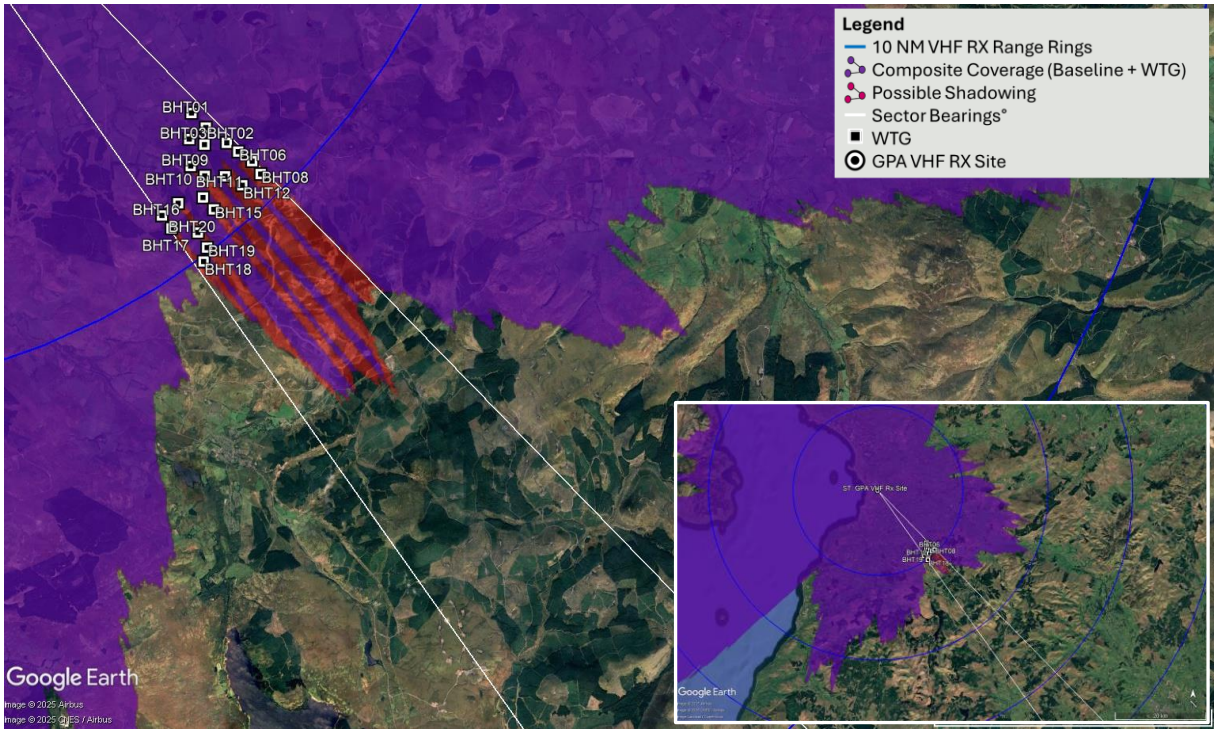

Figure 17 - GPA VHF Comms RX Site 1,500ft ASL Composite Intervisibility Coverage Map

A.4.4 2,000ft ASL

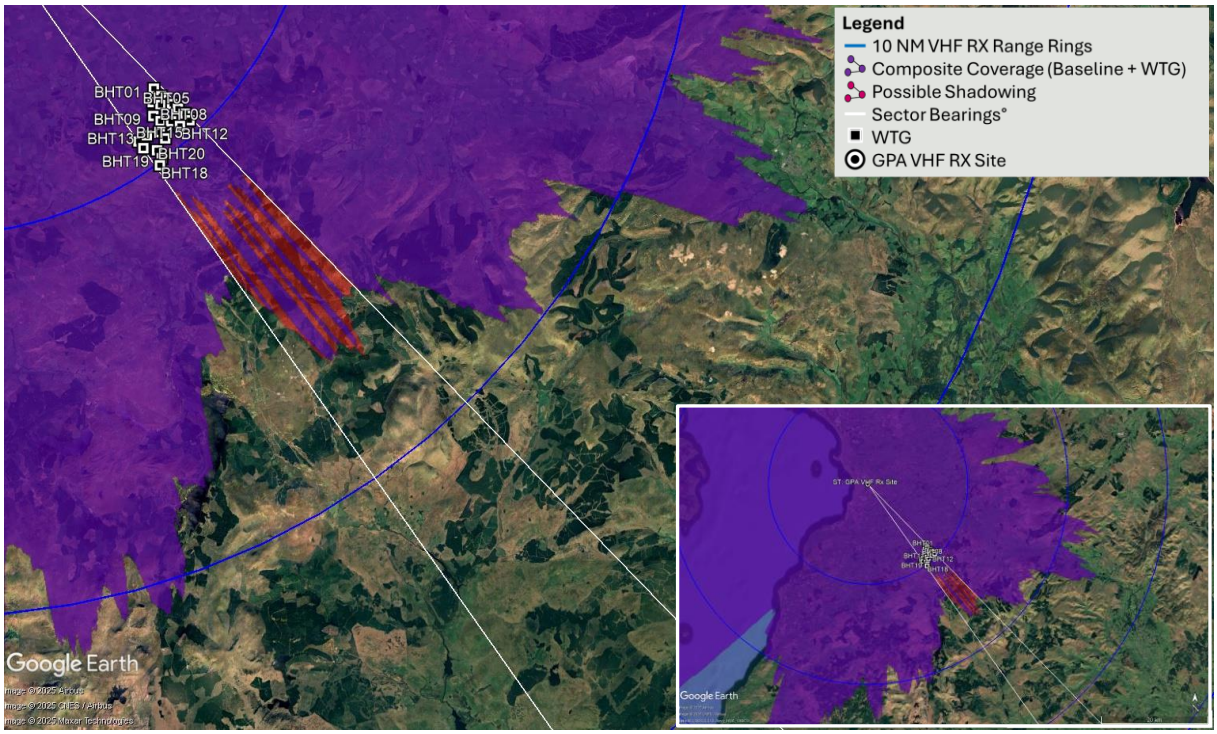

Figure 18 - GPA VHF Comms RX Site 2,000ft ASL Composite Intervisibility Coverage Map

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A.4.5 3,000ft ASL

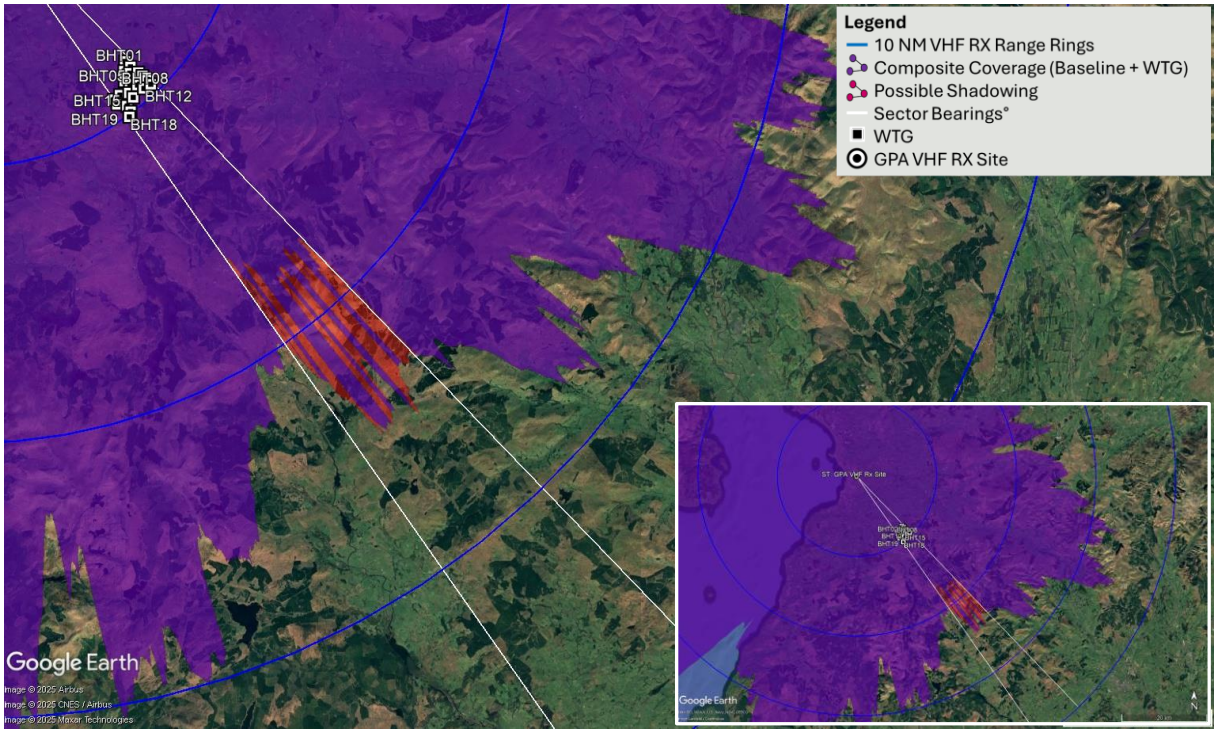

Figure 19 - GPA VHF Comms RX Site 3,000ft ASL Composite Intervisibility Coverage Map

A.4.6 4,000ft ASL

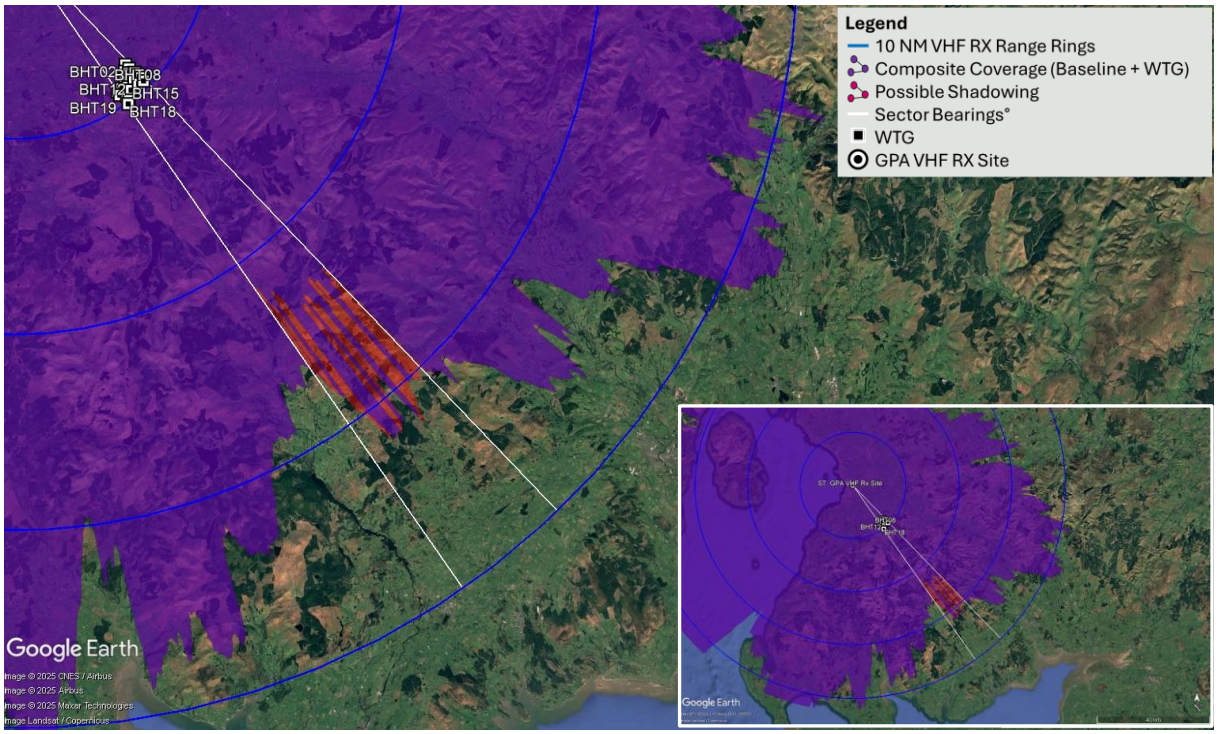

Figure 20 - GPA VHF Comms RX Site 4,000ft ASL Composite Intervisibility Coverage Map

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A.4.7 5,000ft ASL

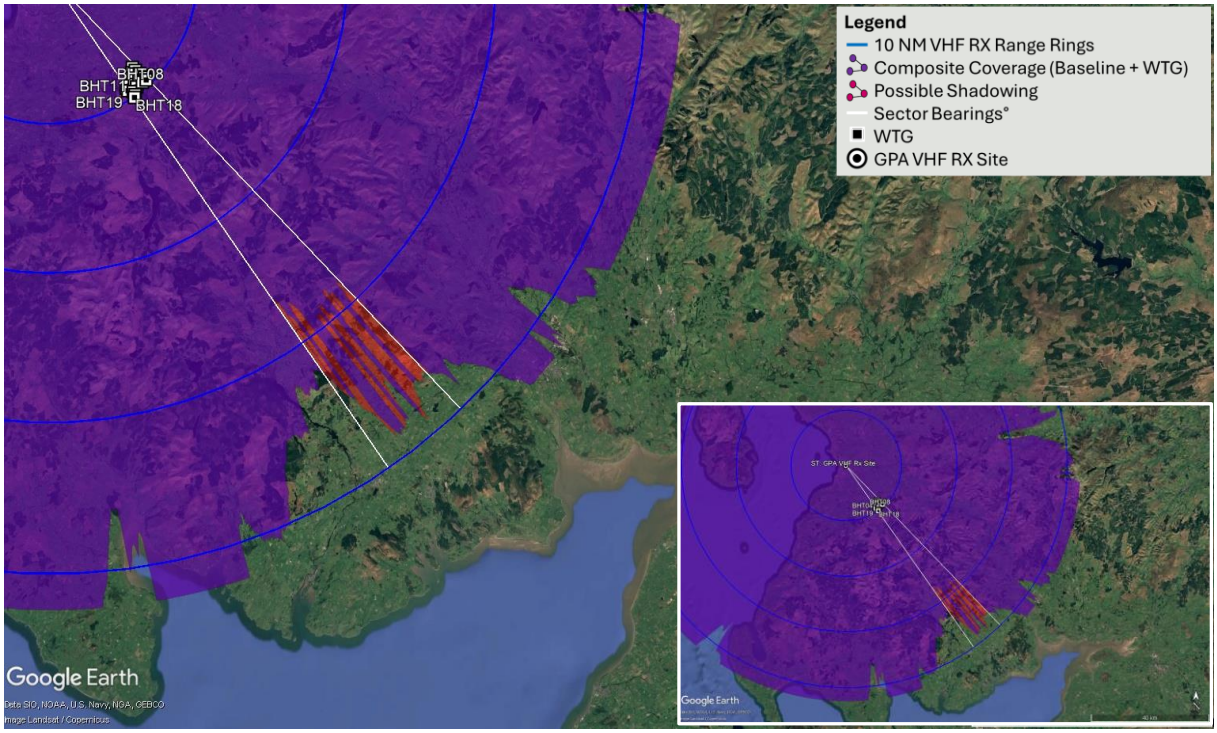

Figure 21 - GPA VHF Comms RX Site 5,000ft ASL Composite Intervisibility Coverage Map

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Appendix B CAP 670 C/I Ratio Maps

B.1 Introduction

In conducting the CAP 670 C/I Ratio Prediction Assessment for the Development, many technical artifacts are generated. Map images are produced for Post Development at every altitude being assessed for each CNS system being considered. For ease of readability of the main report, these images are contained within this Appendix.

B.2 Contents

The contents of this Appendix are as follows:

- A.1 VHF Comms TX Site - CAP 670 C/I Ratio Maps
- B.4 VHF Comms RX Site - CAP 670 C/I Ratio Maps

Note: [Images are displayed from the next page onwards]

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B.3 VHF Comms TX Site - CAP 670 C/I Ratio Maps

B.3.1 1,000ft AGL

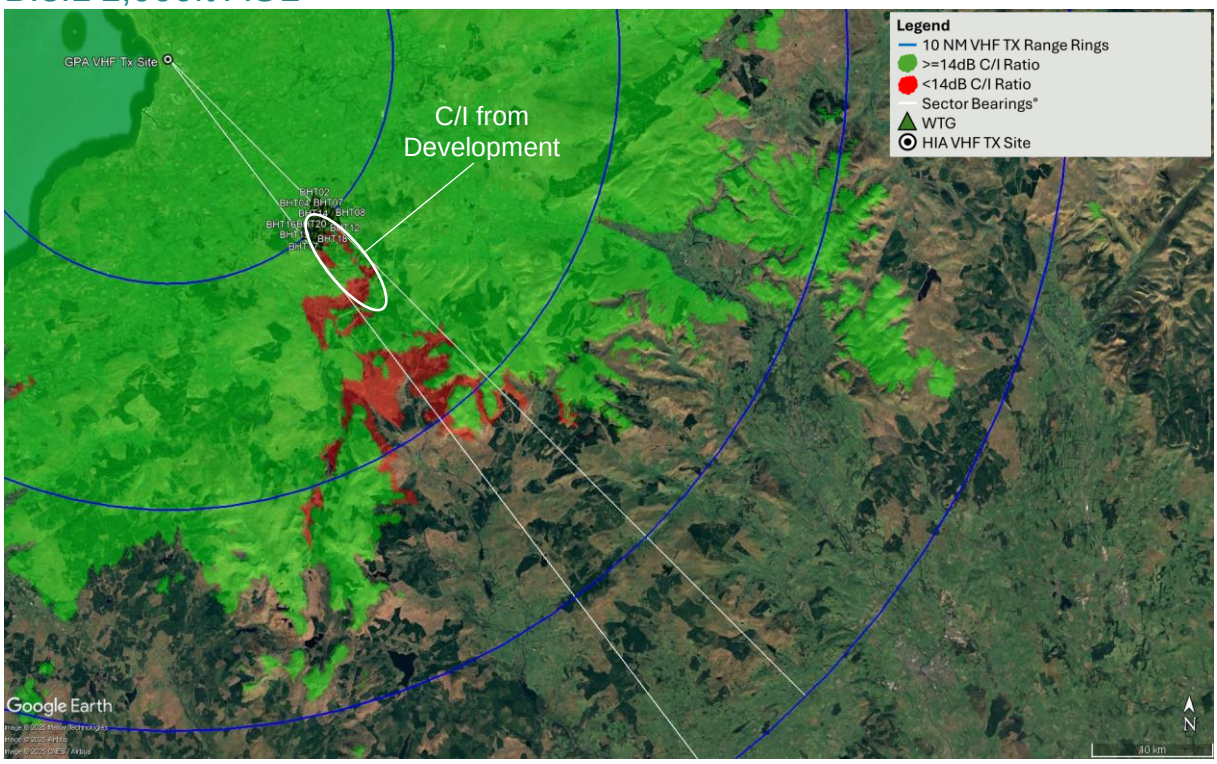

Figure 22 - VHF Comms TX Site 1,000ft AGL Post Development C/I Map

B.3.2 2,000ft AGL

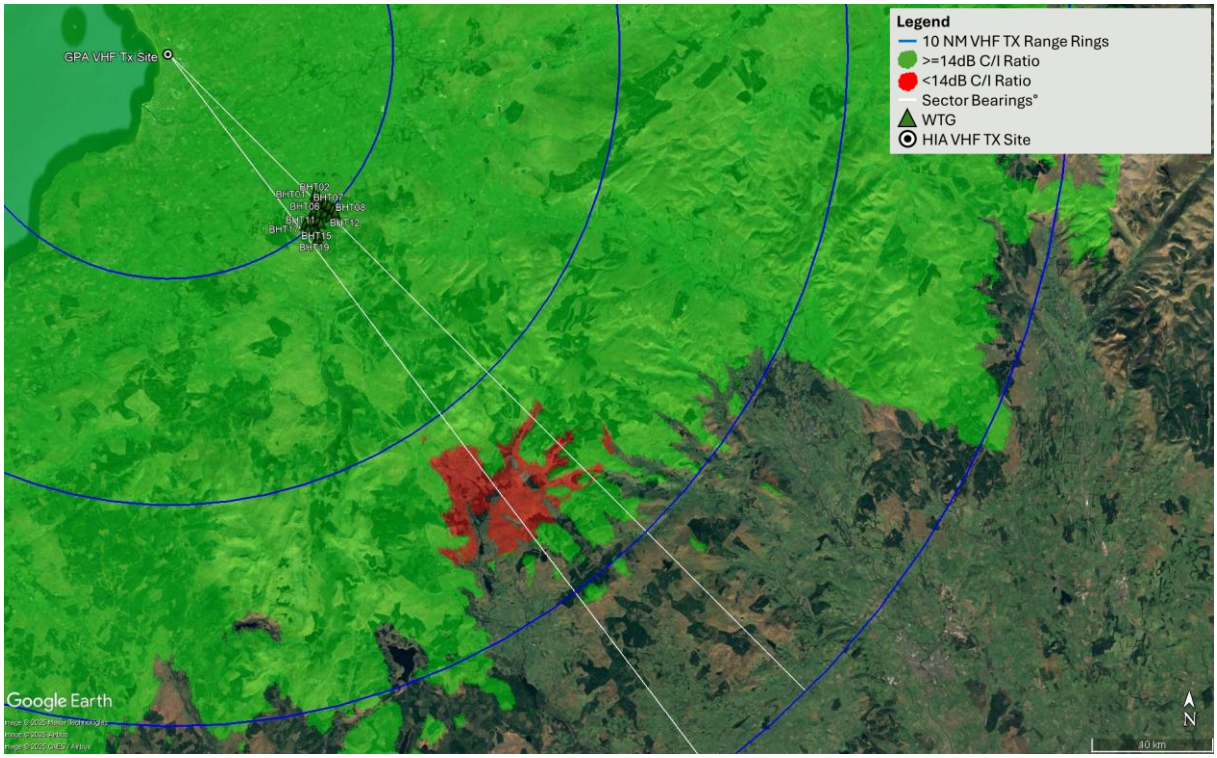

Figure 23 - VHF Comms TX Site 2,000ft AGL Post Development C/I Map

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B.3.3 3,000ft AGL

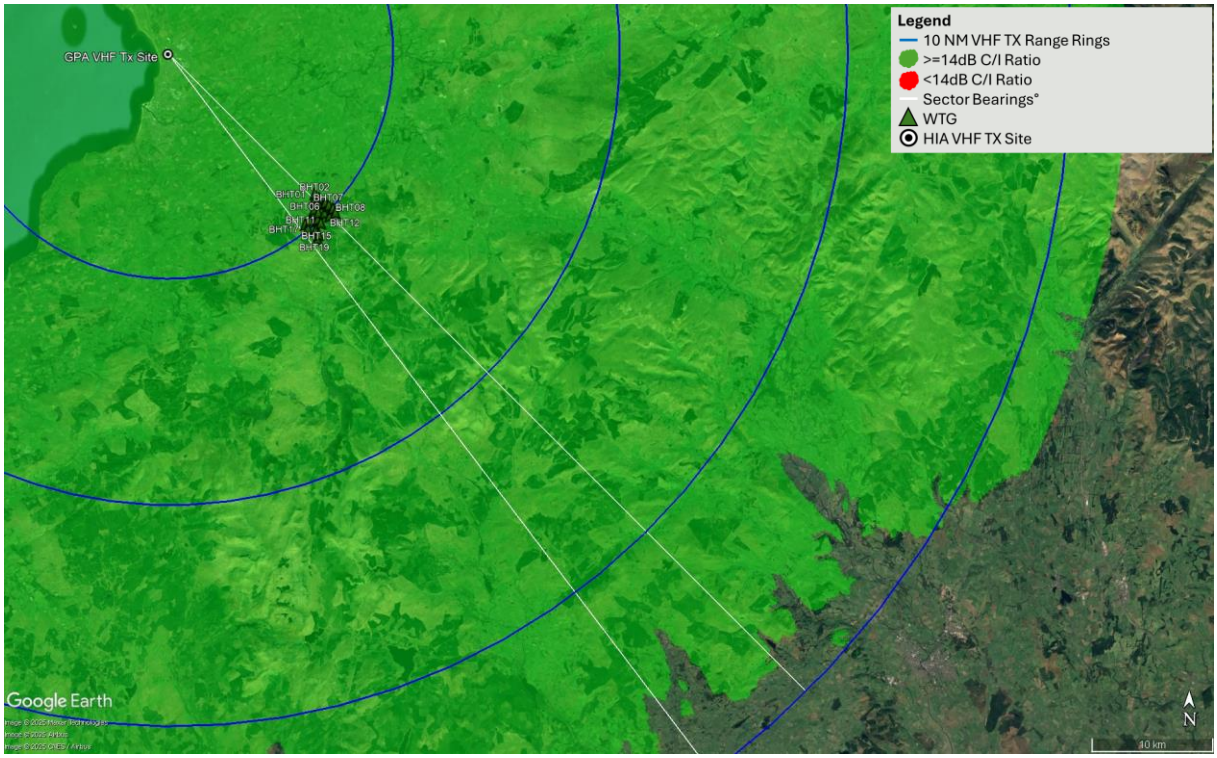

Figure 24 - VHF Comms TX Site 3,000ft AGL Post Development C/I Map

B.3.4 5,000ft ASL

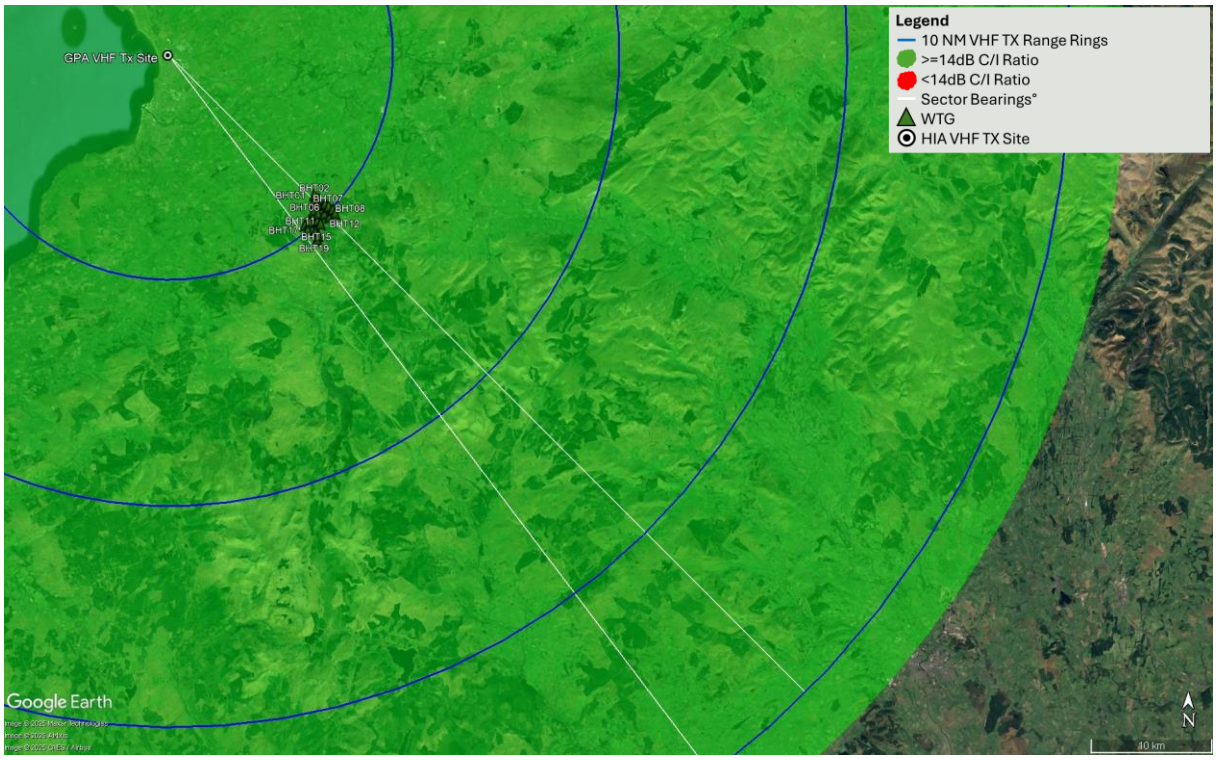

Figure 25 - VHF Comms TX Site 5,000ft ASL Post Development C/I Map

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B.4 VHF Comms RX Site - CAP 670 C/I Ratio Maps

B.4.1 1,000ft AGL

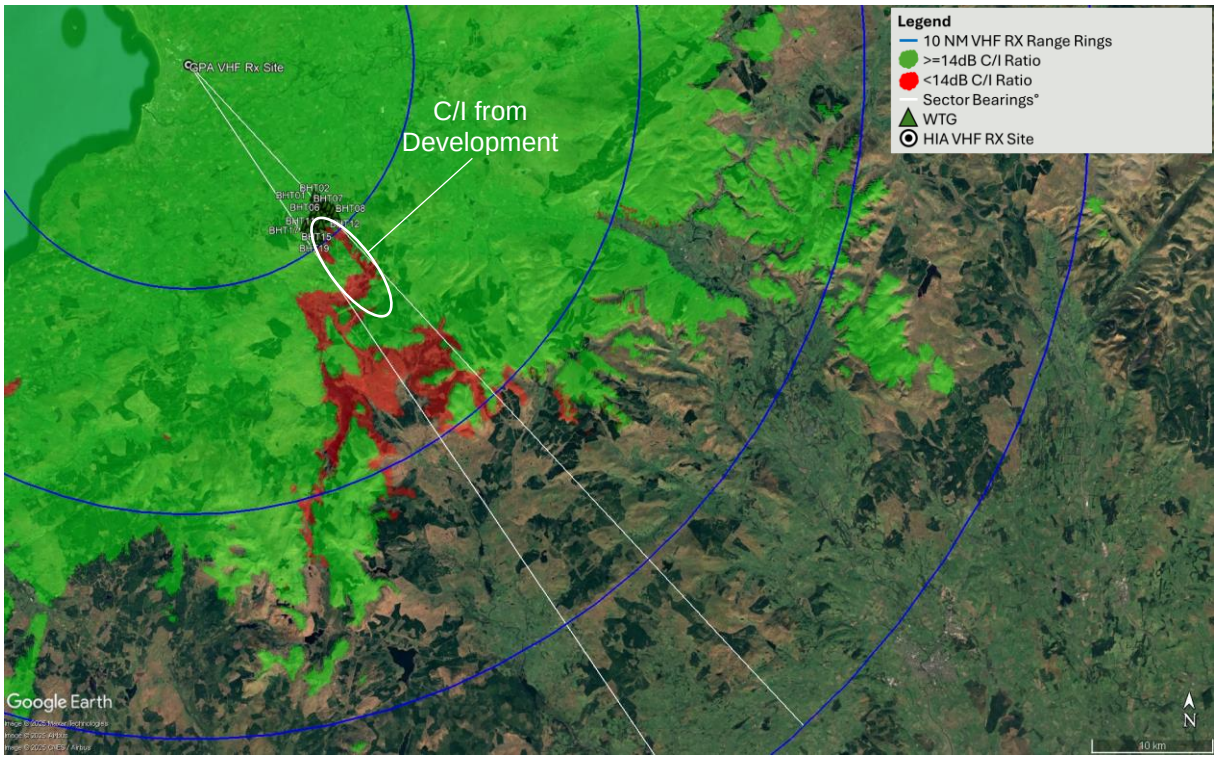

Figure 26 - VHF Comms RX Site 1,000ft AGL Post Development C/I Map

B.4.2 2,000ft AGL

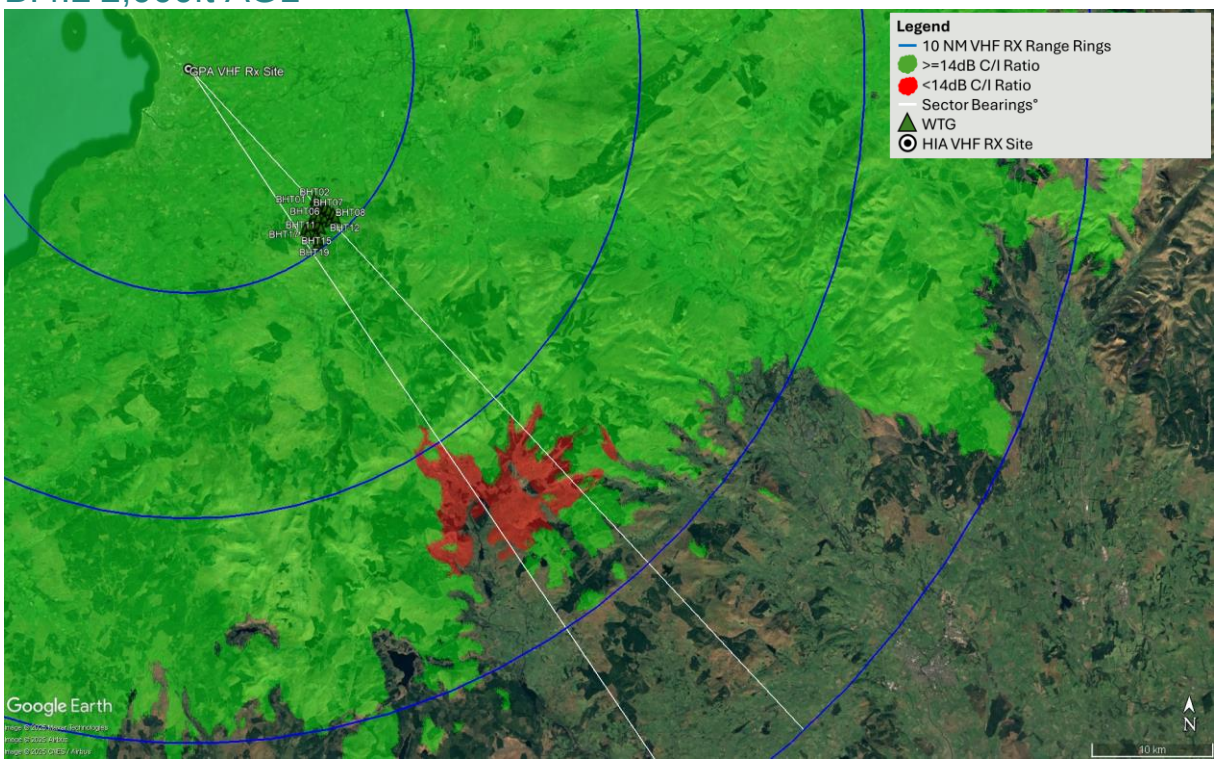

Figure 27 - VHF Comms RX Site 2,000ft AGL Post Development C/I Map

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B.4.3 3,000ft AGL

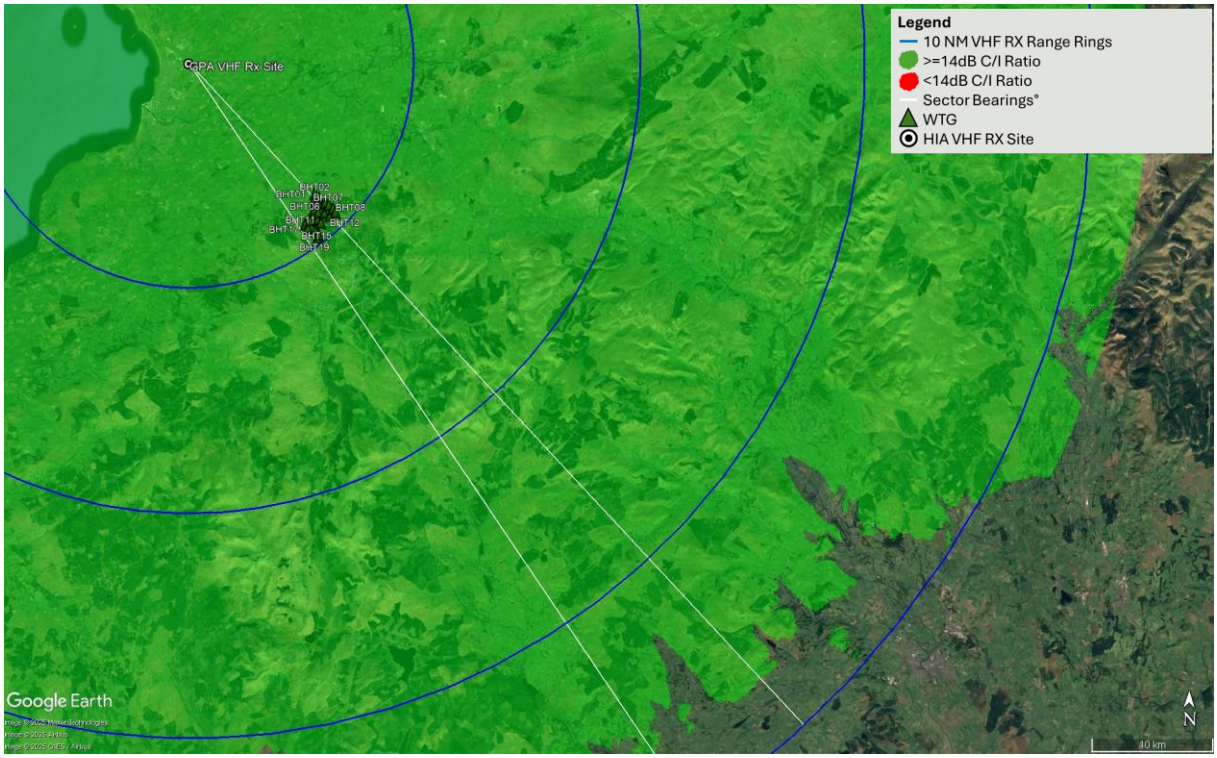

Figure 28 - VHF Comms RX Site 3,000ft AGL Post Development C/I Map

B.4.4 5,000ft ASL

Figure 29 - VHF Comms RX Site 5,000ft ASL Post Development C/I Map

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Osprey Consulting Services Ltd (t/a Sagentia Aviation) specialises in delivering innovative technical and engineering consultancy services in civil and military aviation environments. It serves government agencies, regulatory authorities, equipment providers, and airport and spaceport operators to enable change and solve critical aviation challenges.

info@sagentiaaviation.com
www.sagentia.com/aviation

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info@sciencegroup.com
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