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Technical Aerodrome Safeguarding Assessment

RGRE Ltd, ID Manchester Ltd, & University of Manchester

Plot H, Sister

December 2025







PLANNING SOLUTIONS FOR:

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4	December 2025	Update following stakeholder engagement

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EXECUTIVE SUMMARY

Report Purpose

Pager Power has been commissioned to investigate the potential impact upon aviation activity and infrastructure associated with Manchester Airport of a proposed development at Plot H, Sister, in Manchester.

The site is located in Manchester City Centre and is bounded by Charles Street (south), the Manchester South Junction and Altrincham Railway Viaduct and Granby Row (north), Sackville Street (east), and Princess Street (west), with a maximum height of 113.25m above ground level.

Overall Conclusions

A technical impact upon the Secondary Surveillance Radar (SSR) at Manchester Airport is unlikely to occur in practice due to: the weaker nature of reflected signals, the façade composition being such that reflections will be scattered, and the advanced built-in capabilities of the radar for increasing its reliability and performance. Mitigation is not expected to be required subject to NATS' formal response.

The proposed development is vertically clear of the Obstacle Limitations Surfaces (OLS) for Manchester Airport and therefore no impact upon the OLS is predicted.

The proposed development is not predicted to impact the Instrument Flight Procedures (IFPs). Relevant clearance distances are predicted to be maintained. Buildings of similar or greater height are located in the vicinity of the development which co-exist with the IFPs It is possible however that a detailed IFP assessment may be requested by Manchester Airport Group (MAG), who safeguard Manchester Airport. If a detailed IFP assessment is required, details of proposed cranes should also be provided.

Considerations of aviation lighting indicate that aviation lighting is not a statutory requirement for the proposed development, based on the proposed height of the buildings.

An aviation lighting scheme for cranes is likely to be required for any cranes measuring 150m above ground level or more. A lighting scheme will need to be agreed with the CAA and MAG.

Technical Summary

Secondary Surveillance Radar

One of the three proposed towers is predicted to be partially visible to the SSR, with consideration of screening due to existing obstructions along the line of sight profile.

The proposed development will be of similar scale to those surrounding it. No significant shadowing effects are anticipated.

The radar has specific features that reduce the radar's susceptibility to interference from buildings. A technical impact is unlikely to occur in practice due to, the weaker nature of reflected signals, the façade composition being such that reflections will be scattered, and the advanced built-in capabilities of the radar for increasing its reliability and performance. The potential for

some adverse effects on the radar cannot be conclusively ruled out. Therefore, mitigation may be requested.

NATS have been contacted with respect to the proposed development and responded that radar mitigation may not be required. Their formal position will be confirmed during the planning application process. Mitigation is therefore not recommended at this time, subject to NATS' formal response.

If mitigation is required, the most likely solution would be a technical fix to the radar and implemented by NATS. The solution would define the building as a known reflector and has been implemented for many developments of this type in the vicinity of SSR.

Obstacle Limitation Surfaces

The proposed development is vertically clear of the OLS and beneath the Outer Horizontal Surface (OHS) for Manchester Airport. The analysis has shown that the proposed development, with a maximum altitude of 148.75m amsl, is vertically clear of the OHS. The minimum margin of clearance is 53m.

Any cranes less than 53m above the maximum height of the development will also be clear of the OHS.

Instrument Flight Procedures – High-Level

A high-level review of the IFPs relative to the proposed development indicates sufficient clearances between the proposed development and aircraft flying procedures. There are also taller existing buildings in the surrounding area that already co-exist with the current IFPs. Therefore, no impact upon the IFP is predicted. It is possible however that a detailed IFP assessment may be requested by MAG. If a detailed IFP assessment is required, details of proposed crane locations, heights, and jib radius should be provided.

MAG have been contacted with respect to the proposed development, however have stated they are unable to provide comment at this time. Their formal position will be confirmed during the planning application process.

Aviation Lighting and Crane Usage – High-Level

The following is true regarding the proposed development:

- The structure itself does not extend above to 150m agl or more;
- The building does not infringe the OLS;
- Cranes are not expected to breach the OHS or to extend to 150m agl or more. Cranes that do breach the OHS, or which exceed to 150m agl or more, will require aviation lighting.

On this basis, aviation lighting is not mandatory for the building structure as per the Air Navigation Order and associated CAA guidance, however crane lighting may be required.

It is recommended that the developer applies for a crane permit from the CAA eight weeks in advance. It is likely that MAG may request a crane operations scheme.

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ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 63 countries within Europe, Africa, America, Asia and Oceania.

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

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

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

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

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

1 BACKGROUND

1.1 Introduction

Pager Power has been commissioned to investigate the potential impact upon aviation activity and infrastructure associated with Manchester Airport of a proposed building development.

The proposed development at Plot H, Sister, is located in Manchester City Centre and is bounded by Charles Street (south), the Manchester South Junction and Altrincham Railway Viaduct and Granby Row (north), Sackville Street (east), and Princess Street (west), with a maximum height of 113.25m above ground level.

Building developments have the potential to affect aviation operations in numerous ways. The most common impacts relate to building developments as physical obstructions both to aircraft and wireless signals used for radar and radio systems. This assessment has identified and assessed all the aviation constraints for the proposed development.

In detail the report includes:

- Proposed development details;
- Radar impact assessment for the Manchester Airport Secondary Surveillance Radar (SSR);
- Obstacle limitation surfaces (OLS) assessment for Manchester Airport;
- High-level assessment of Instrument Flight Procedures (IFPs);
- Commentary on crane usage and lighting requirements;
- Overall conclusions and recommendations.

Following the results of the analysis, conclusions and recommendations are made.

1.2 Proposed Development Site Plan and Location

The proposed development consists of three blocks, referenced as "T1", "T2", and "T3" as labelled in Figure 2. The site layout plan[1] is shown in Figure 1 below.



Figure 1 *Proposed development site layout plan*

The three blocks have the following maximum heights:

- T1 – 8 storeys at 62.25m (amsl);
- T2 – 10 storeys at 67.95m amsl;
- T3 – 38 storeys at 148.75m amsl.

The T3 building is the only building which has been assessed in detail within this report due to its height and potential to cause a significant impact upon aviation activity and infrastructure.

The T1 and T2 buildings are in keeping with other low-rise buildings in the area and are therefore not predicted to have a significant impact upon aviation activity and infrastructure in the vicinity of the proposed development. Section 1.4 shows a 3D representation of the buildings in the context of the existing urban environment. An assessment of the potential impacts upon aviation activity as a result of T3 are predicted to represent a worst-case.

T1 and T2 have therefore not been carried forward for further technical assessment.

[1] Source: 0667-HOD-XX-01-DR-A-(--)201-GA Plan - Level 01.pdf

1.3 Elevation Diagrams

The general elevation plan[2] for the proposed development shown in Figure 2 below, tower blocks are also labelled as described on the previous page.

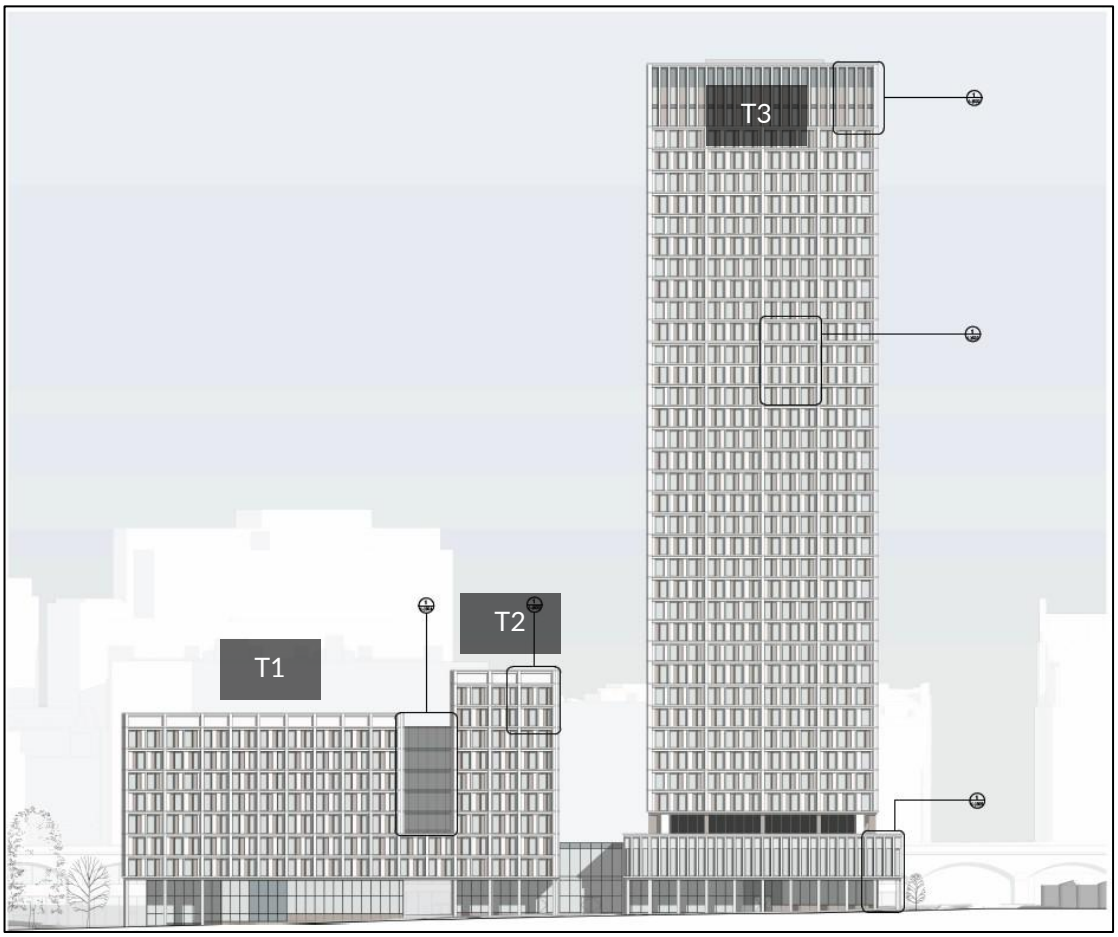


Figure 2 *Proposed development general elevation plan*

1.4 3D Building Visualisation

The corner coordinates for the tower blocks have been extrapolated from the site drawing and are presented in Appendix A.

A representative 3D visualisation of the proposed development is shown in Figure 3 on the following page.

[2] Source: 0667-HOD-XX-ZZ-DR-A-(--)302-South Elevation.pdf

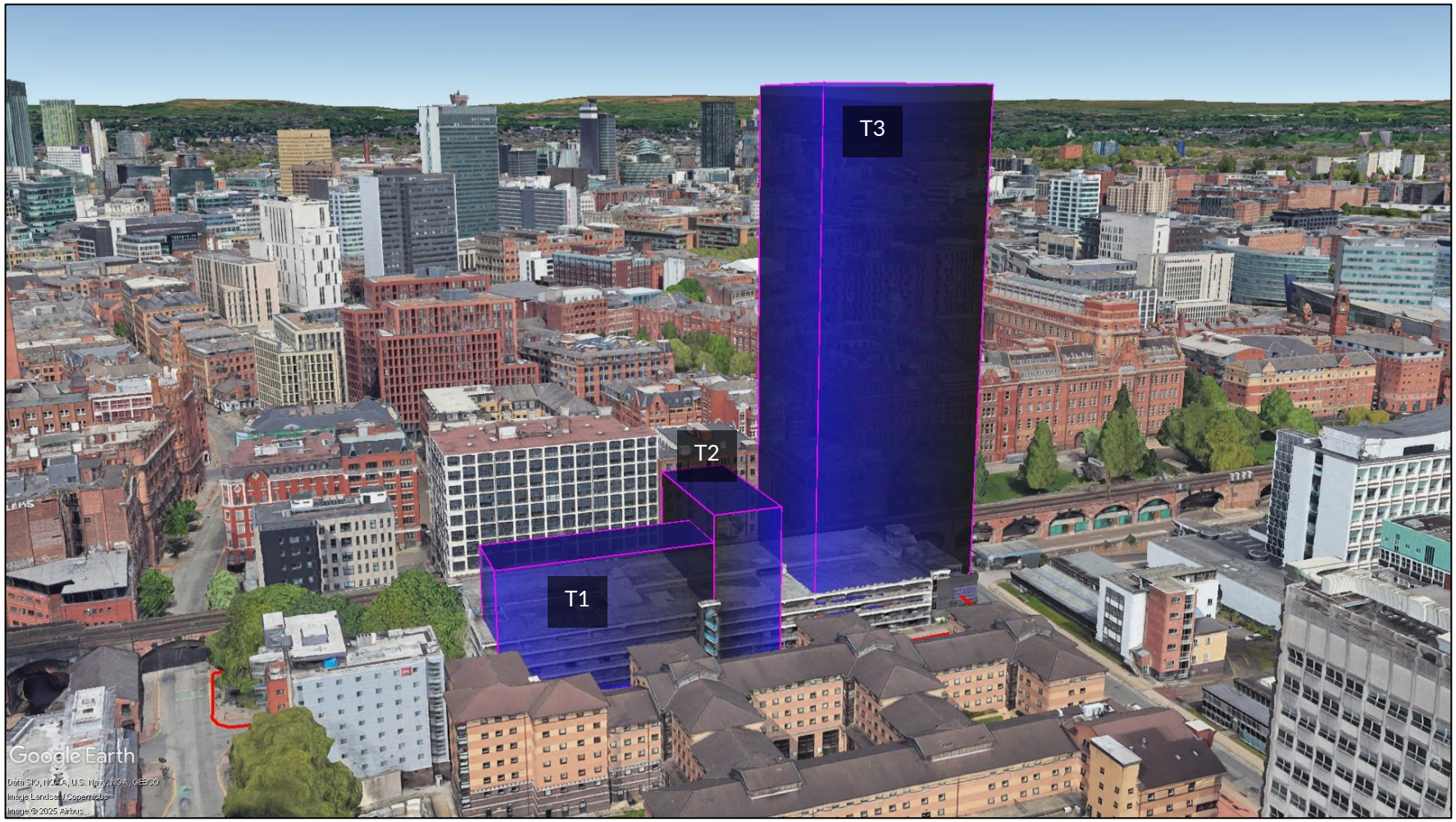


Figure 3 *3D building visualisation*

2 MANCHESTER AIRPORT DETAILS

2.1 Aerodrome Details

Manchester Airport is a CAA certificated airport and is approximately 12.5km south south-west of the proposed development. The location relative to the proposed development is shown in Figure 4 below.



Figure 4 *Location of Manchester Airport relative to the proposed development*

The aerodrome chart for Manchester Airport is shown in Figure 5 on the following page.

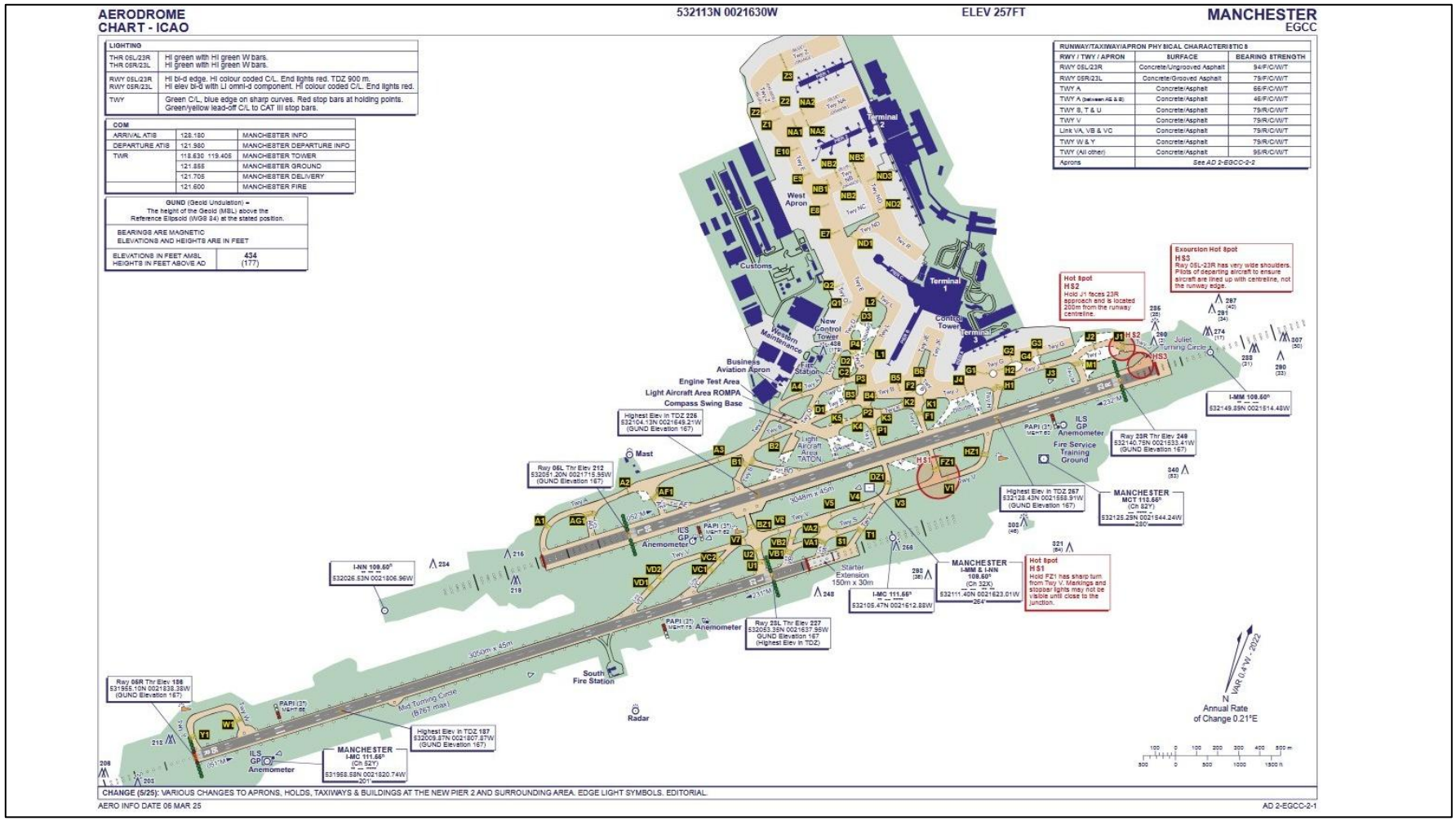


Figure 5 *Aerodrome Chart for Manchester Airport*

3 RADAR INFORMATION

3.1 Radar Data

Table 1 below provides the details for the assessed Manchester Airport SSR radar. Radar data has been provided by NATS.

Radar	Secondary Surveillance Radar (SSR)
Overall radar altitude above mean sea level	97m
Distance between the proposed development and radar	15.24km
Average grid bearing from radar to proposed development	11.8°

Table 1 *Manchester Airport SSR radar location details*

3.2 Radar Types and Usage

There are two radar situated upon the metal lattice tower. The lower radar is a non-cooperative PSR, the taller is the co-operative SSR which has been assessed within this report.

SSR broadcast interrogating radio signals that are detected by aircraft with on-board transponders. The transponder responds by broadcasting a radio reply which normally contains identification and altitude information. The SSR determines the aircraft's horizontal position from the direction the antenna is orientated and the time taken to receive a response from the interrogation.

Both radar will be used by air traffic controllers to provide approach services to aircraft landing at and departing Manchester Airport. Both radar will also be used by air traffic controllers at national air traffic control centres to provide services to en-route aircraft.

The radar of significance with respect to the predicted impact is the SSR. The PSR is not expected to be significantly affected.

4 RADAR INTERFERENCE

4.1 Overview

An overview of the various possible interference mechanisms is presented in the following subsections.

4.2 Interference

Buildings, structures and terrain can interfere with SSR. The level of interference normally depends on the size of the interfering structure and its distance from the radar. A larger structure closer to the radar is more likely to interfere than a smaller structure which is further away. The two predominant forms of interference are considered. These are listed in the following sub-sections.

4.2.1 Reflections

Reflections from a structure can potentially result in genuine aircraft returns being plotted in the wrong place as a result of the structure reflecting signals in a specular (mirror-like) way. This means that an air traffic controller could mis-manage aircraft, leading to safety implications.

Both in-bound and out-bound signals are weakened due to reflections because they are reflected by a structure in both directions.

4.2.2 Shadowing

Radar signals are weakened by physical obstacles. The most significant signal blocking is often caused by terrain. Large obstructions within a radar's area of coverage can have a 'shadowing' effect, reducing the signal strength immediately behind them.

This effect is most pronounced immediately behind the structure and becomes less pronounced with distance. This is important because it means a structure's 'shadow' does not block radar coverage indefinitely, and the areas with the highest losses should be considered in an operational context.

Both in-bound and out-bound signals are weakened by shadowing because signals are attenuated by a structure in both directions.

4.3 SSR Capabilities

The radar is a Secondary Surveillance Radar (SSR) fitted with a Large Vertical Aperture (LVA) antenna. The radar is located to the south of Manchester Airport. It is a Mode S monopulse SSR supplied by Raytheon Systems Limited as part of a nationwide contract to upgrade NATS' national network of twenty sites.

The radar is understood to be a Condor 300 dual channel system with Mode S capabilities. This radar has a range of advanced built-in capabilities for increasing its reliability and performance. Specific features that reduce the radar's susceptibility to interference from buildings are listed in Table 2 on the following pages.

Feature	Form of interference	How feature reduces interference	Additional Information
Integral Tracking Function	Reflections	More likely to determine return is genuine if it moves as an aircraft return is expected to.	Ensures good false target suppression.
Refined Algorithms	Reflections and Shadowing	Experience on many sites used to enhance performance.	Ensures good performance in complex environments.
Identification and rejection of false replies	Reflections	False returns are rejected	If two or more replies are identified from the same source all but the first is rejected.
Side Lobe Suppression	Reflections	False returns arising from antenna sidelobes are rejected	P1 and P2 pulses are used. This is an encoding system which enables sidelobe signals to be detected by comparing pulse sizes.
Sensitivity Time Control (STC)	Reflections	Removes reflections	Removes relatively low amplitude replies
Minimum Detection Signal Level (MDS)	Shadowing	Maximises radar coverage whilst minimising noise detections	-
Dynamic Threshold	Shadowing	Weak signals stronger than any interference signals are detected.	-
Reply to Reply Correlation	Reflections	Multiple replies required for target processing	Single reply reports are rejected.
FRUIT[3] Rejection	Reflections	Track initiation only allowed if report contains two or more correlating replies in the same SSR mode	e.g. two or more Mode A replies

[3] FRUIT – False Replies Unsynchronized in Time

Feature	Form of interference	How feature reduces interference	Additional Information
Track Processing	Reflections and Shadowing	Improvements are made in target location using history of target position.	Improvements made when confidence in location information is low
False Target Processing	Reflections	Advanced processing that applies a series of tests to identify and reject false returns	Techniques include: 1: Check whether Mode A code is unique 2: Check "known" reflection zones 3: Use geometric analysis for checking reflection zones 4: Self adaptive processing

Table 2 *Radar features for reducing interference*

5 RADAR LINE OF SIGHT ANALYSIS

5.1 Methodology

The approach taken within this report is presented in the following section.

5.1.1 Technical Assessment

- Radar line of sight assessment based on the tower coordinates assessed at their relative height above ground level;
- Screening assessment to determine whether existing buildings and/or landscape features would hide/shield the proposed development from the SSR;
- Consideration of the distance from the SSR.

5.1.2 Cumulative Assessment

- Assessment of the predicted impact in the context of the existing environment has been undertaken.

5.2 Radar Line of Sight Analysis

Figure 6 on the following page shows the line-of-sight chart for the southernmost vertex of T3 (the point with the greatest visibility to the SSR). Information regarding the methodology or the additional line of sight charts can be provided upon request. The tower height above ground level has been adjusted to account for the terrain height based on OSGB36 terrain data at that particular location.

The box labelled 'certainty' in Figure 6 provides the distance (in metres) by which the proposed development is or is not within line of sight to the assessed radar.

In this case the proposed development would be fully visible considering bare earth terrain.

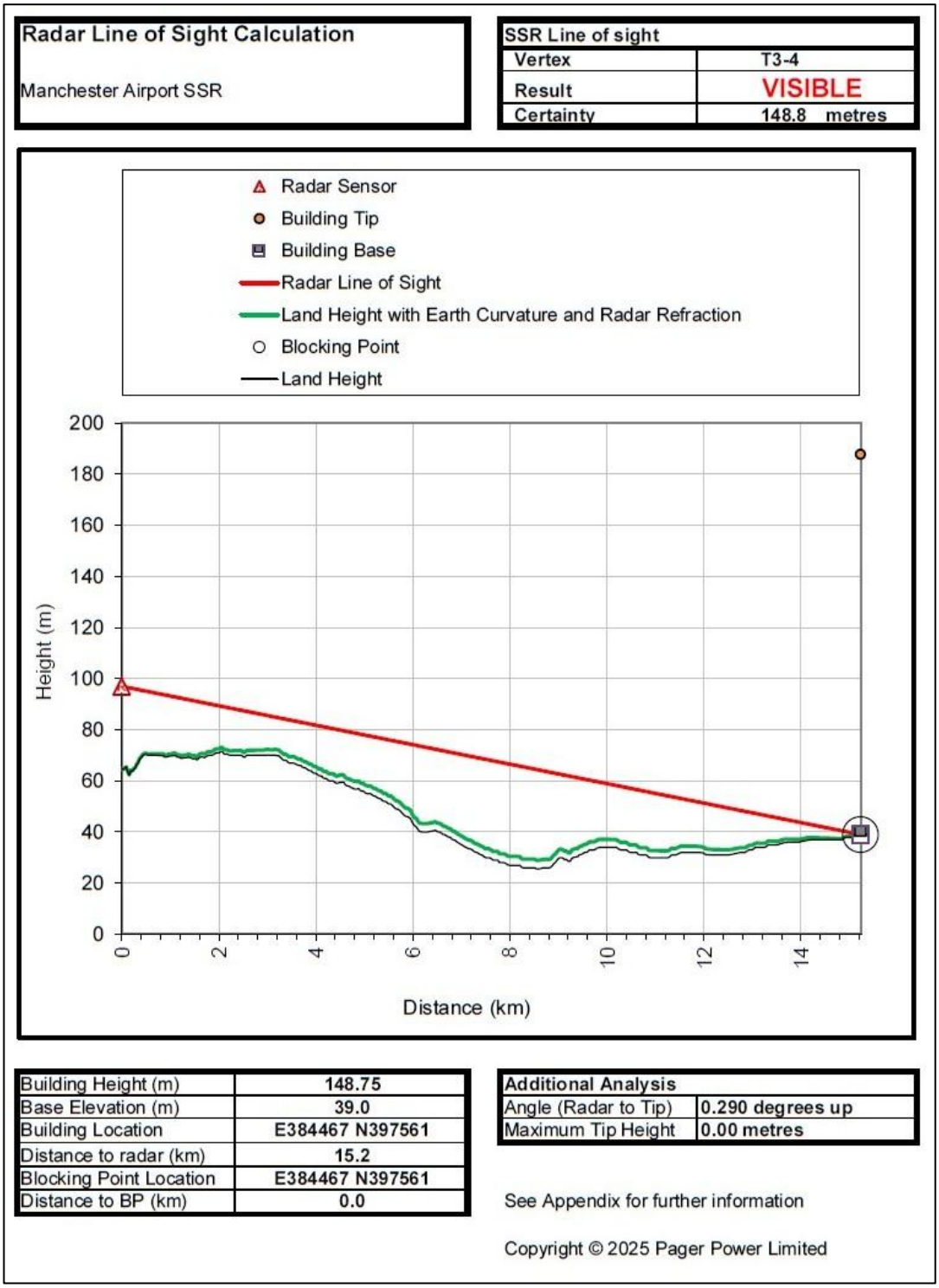


Figure 6 *Radar line of sight chart*

5.3 Line of Sight Results – Bare Earth Terrain

A summary of the line of sight assessments for each building is presented in Table 3 below. The results are shown for the four vertices of the building.

Building / Vertex	Result (Bare earth terrain)
T3 / West	The building is visible by a margin of 148.7m
T3 / North	The building is visible by a margin of 148.7m
T3 / East	The building is visible by a margin of 148.7m
T3 / South	The building is visible by a margin of 148.8m

Table 3 *Line of sight results for each assessed building point – bare earth terrain*

5.4 Additional Screening Analysis

The modelling described in the sections above accounts for the intervening terrain. It does not account for additional obstructions within the radar line of sight e.g. buildings or vegetation. A review of additional screening has therefore been undertaken.

Figure 7 on the following page shows the line of sight towards the proposed development from the SSR. Figure 8 on page 23 shows a closer view of the existing building (Voyager Office Building) near the airport, which has the potential to partially obscure visibility from the SSR to the proposed development. Figure 9 on page 24 shows the additional obstructions effect on visibility from the radar. The top of the proposed development is not predicted to be screened by the identified screening and therefore visibility is considered possible.

The proposed development is predicted to be visible from the SSR with consideration of additional screening. A technical impact upon the radar is considered possible.



Figure 7 *Point-of-view from the SSR at Manchester Airport*

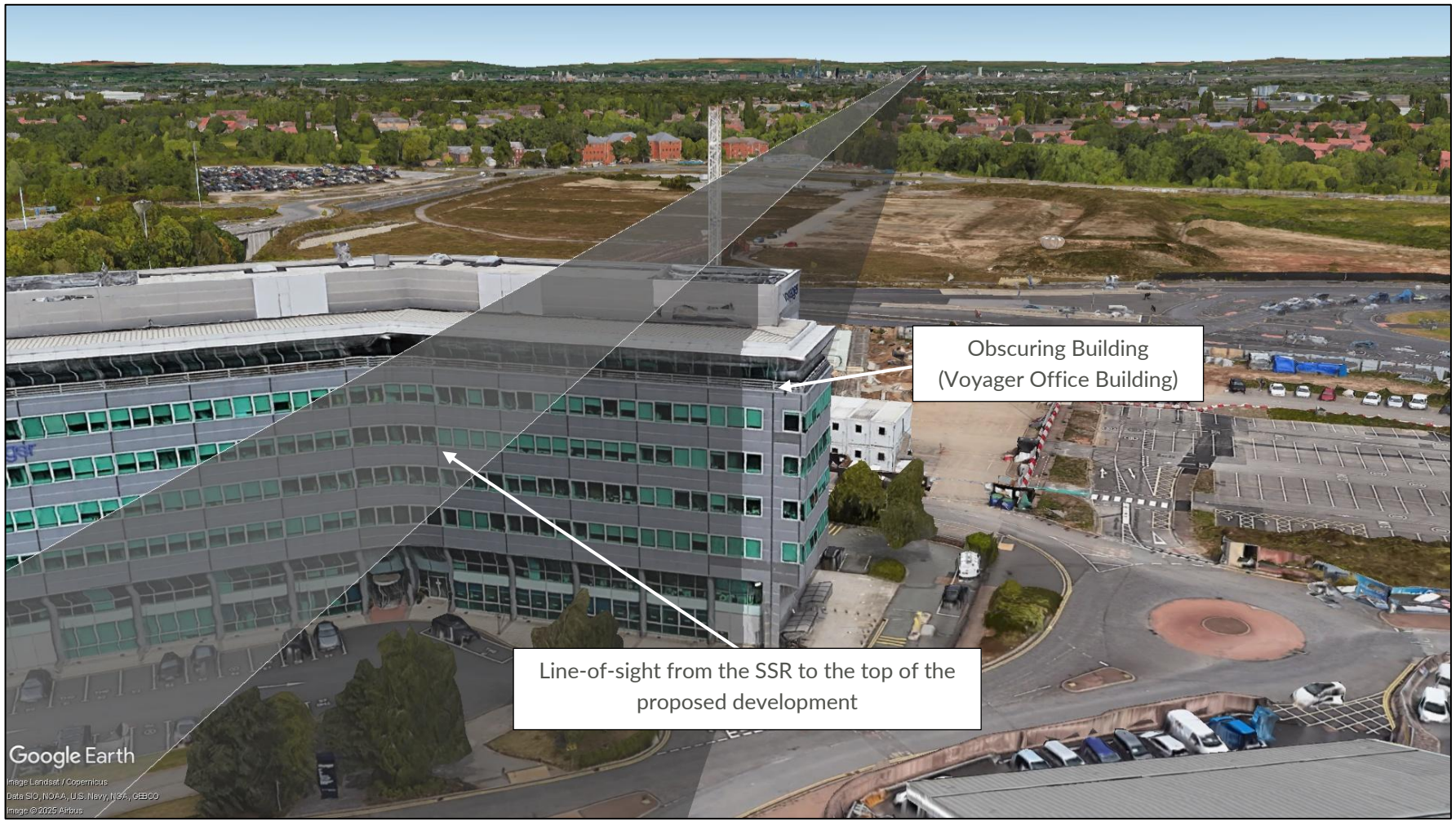


Figure 8 *Close view of the existing building development partially obscuring line-of-sight from the SSR – 3D view*

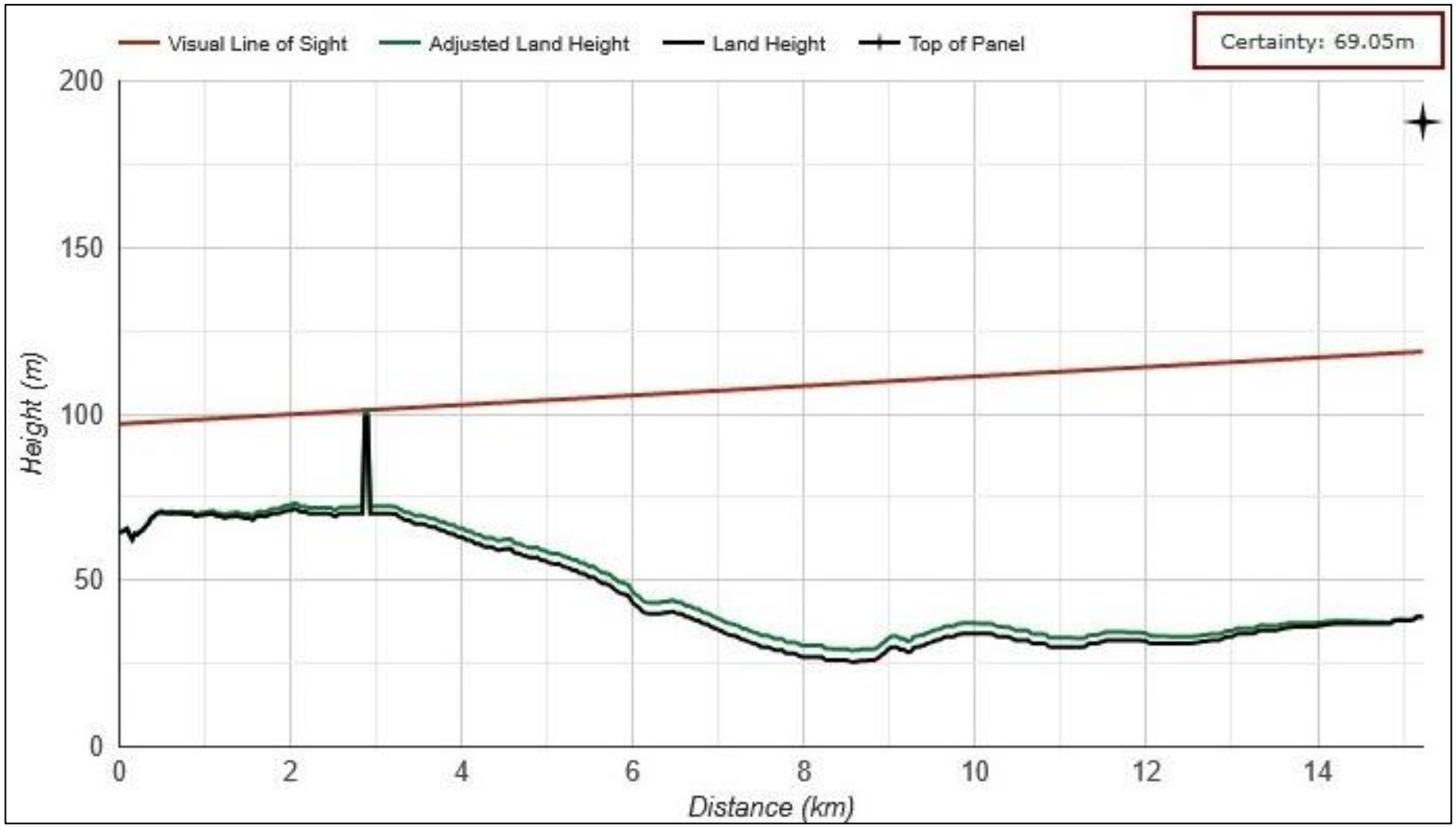


Figure 9 *Line of sight from the SSR with consideration of identified screening*

5.5 Radar Line of Sight Conclusions

The results show that T3 will be at least partially visible to the SSR at Manchester Airport. Existing screening in the form of existing buildings is not predicted to fully obstruct line of sight between the radar and building. Therefore, the potential for a technical impact is discussed in the following subsections.

5.6 Interference Assessment

Secondary surveillance radar broadcast interrogating radio signals that are detected by aircraft with on-board transponders. The transponder responds by broadcasting a radio reply which normally contains identification and altitude information. The SSR determines the aircraft's horizontal position from the orientation of the antenna and the time taken to receive a response from the interrogation.

Buildings, structures and terrain can interfere with SSR. The level of interference normally depends on the size of the interfering structure and its distance from the radar. A larger structure closer to the radar is more likely to interfere than a smaller structure which is further away. Two forms of interference have been considered. These are:

1. Reflections – Either in-bound or out-bound signals are reflected off a structure;
2. Shadowing – Either in-bound or out-bound signals are weakened because they are attenuated by a structure.

The proposed development's location, height, and orientation have been reviewed and the reflection and shadow zones considered at a high level.

5.6.1 Reflection Effects

The proposed development can be considered a flat façade acting as a uniform reflector. Reflection effects caused by static structures have the potential to create false targets, azimuth errors and target fading issues. These could occur when an obstruction reflects the outgoing and/or incoming radar signals between the SSR and an aircraft. To be received by the radar the signals also have to be strong enough to be detected. A radar return that is reflected via a building will be significantly weaker than a return received directly from an aircraft. Furthermore, a radar antenna is also designed to have reduced gain at very low angles to reduce ground clutter returns. Overall, radar returns that are reflected via buildings are significantly weaker than those that are received directly from aircraft.

A section of the façades of the T3 building is predicted to be visible to the radar, where reflections would be geometrically possible, and therefore concerns due to reflections are possible.

In practice, the effects from the proposed development are likely to be small due to the following considerations. Reflected signals are weaker than direct signals. The composition of the façade, made up of windows and beams, is not understood to be smooth. Therefore, any reflections are predicted to be scattered, leading to a weakened reflected signal. The radar is understood to be a Condor 300 dual channel system with Mode S capabilities. This radar has a range of specific features that reduce the radar's susceptibility to interference from buildings as shown in Section 4.3.

While a technical impact is not predicted, the potential for some adverse effects on the radar cannot be conclusively ruled out. It is therefore recommended that details of the façades, including the materials proposed and the composition (whether smooth or broken up) are provided to NATS during consultation to confirm any predicted impact.

The most common mitigation solution for building developments at this range from modern SSR is a software-based solution whereby the building information, specifically coordinates and altitudes of each building corner, are programmed into the radar system such that reflection effects can be ameliorated.

This agreement would be funded by the developer and commercially agreed with NATS via a contract ahead of starting development. Deployment of the solution is typically within six months of the final agreement between the developer and NATS, therefore it is recommended that engagement regarding the mitigation process is progressed with this timescale in mind.

It is possible that NATS would seek to limit any construction at the site to five metres above ground prior to installation of the mitigation solution (i.e. within six months of signing the mitigation agreement).

5.6.2 Shadowing Effects

Shadowing effects are predicted to be extremely limited. This is because the development is already within a built-up area of Manchester city centre, including Vita Living north tower, Artisan Heights, and Bridgewater Heights, which are of a similar height and located nearby. These towers have a similar bearing as the proposed development relative to the SSR.

5.7 Assessment Conclusions

The modelling has concluded that at least part of T3 is predicted to be visible to the SSR at Manchester Airport.

A technical impact is unlikely to occur in practice due to, the weaker nature of reflected signals, the composition of the façade is not understood to be smooth leading to scattered reflections, and the advanced built-in capabilities of the radar for increasing its reliability and performance (see Section 4.3), the potential for some adverse effects on the radar cannot be conclusively ruled out.

NATS have been contacted with respect to the proposed development and responded that radar mitigation may not be required. Their formal position will be confirmed during the planning application process. Mitigation is therefore not recommended at this time, subject to NATS' formal position.

6 OBSTACLE LIMITATION SURFACES ASSESSMENT

6.1 Overview

The Obstacle Limitation Surfaces (OLS) for Manchester Airport have been modelled with respect to the building plot coordinates. The aim is to identify whether the proposed development would infringe the OLS at Manchester Airport.

6.2 Manchester Airport Obstacle Limitation Surfaces

Obstacle Limitation Surfaces are imaginary planes defined in three dimensions for physical safeguarding purposes (i.e. ensuring that physical structures do not present a safety hazard at an airfield) and are defined around licensed airfields. The dimensions and geometry of the surfaces are constructed based on detailed rules defined in:

- For licensed aerodromes: UK Civil Aviation Authority's Civil Aviation Publication 168 for licensed aerodromes;
- For certificated aerodromes: Assimilated Regulation (EU) No. 139/2014; and,
- For military aerodromes: UK Military Aviation Authority (MAA): Regulatory Article (RA) 3512: Permanent Fixed Wing Aerodrome - Obstacle Environment for military aerodromes.

The size of the surfaces is dependent on the number of runways, their dimensions and the procedures carried out at the airfield.

Table 4 below presents a summary of the OLS assessment results.

Building / Vertex	Distance	Surface
T3 / West	Clear by 53.03 metres	Outer Horizontal Surface
T3 / North		
T3 / East		
T3 / South		

Table 4 *OLS assessment results*

The OLS for Manchester Airport are presented in Figure 10 on the following page. The proposed development building plot coordinates are shown as red crosses. Due to the scale these icons overlap and appear as a single cross.

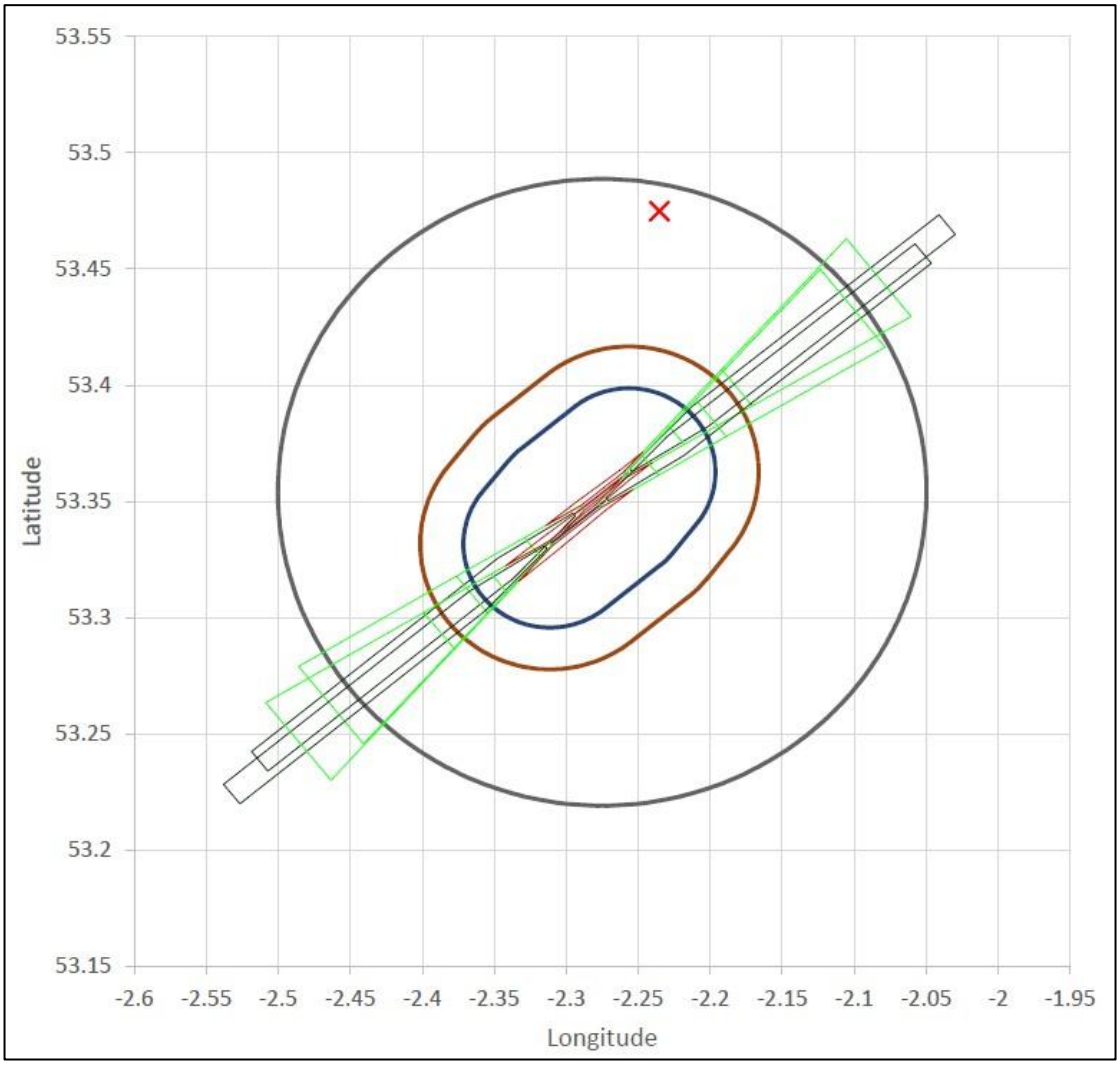


Figure 10 *Manchester Airport Obstacle Limitation Surfaces chart*

6.3 Obstacle Limitation Surfaces Conclusions

The analysis has shown that the proposed development does not infringe the OLS at Manchester Airport. The building is clear of the relevant surface, the Outer Horizontal Surface (OHS), by 53 metres.

Despite the proposed development's clearance of the OHS, cranes could breach the OLS during construction if they are not planned appropriately. It is possible that a crane operation scheme will need to be agreed with Manchester Airport and aviation lighting for cranes and the proposed development (discussed further in Section 8).

7 HIGH-LEVEL INSTRUMENT FLIGHT ANALYSIS

7.1 Overview

Instrument Flight Procedures (IFPs) are published documents that consist of defined three dimensional routes for aircraft arriving and departing airports.

In practice, aircraft do not necessarily fly these routes exactly due to limitations on the performance of aeronautical instruments, pilots and variations in wind and pressure conditions. This means that an area around and beneath these three-dimensional routes must be kept clear of obstacles to ensure that there is no significant collision risk to aircraft flying these procedures, as shown in Figure 11 below.

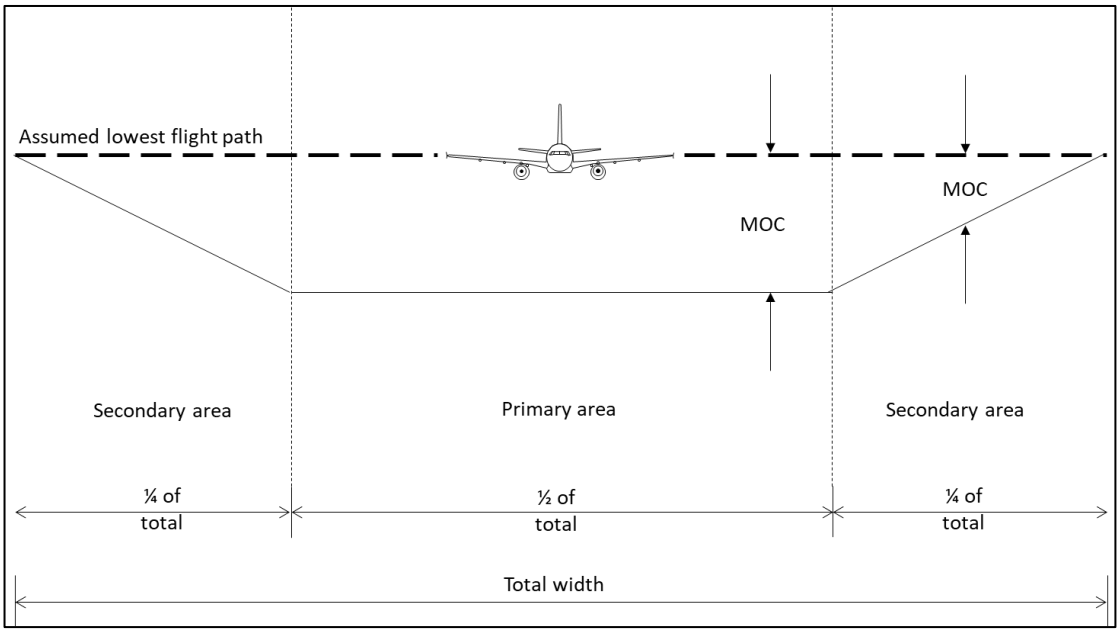


Figure 11 *Instrument Flight Procedure Minimum Obstacle Clearances*

As a general rule, IFPs are designed so that there are vertical and horizontal safety margins between the specified trajectory and surrounding terrain and obstacles. These margins vary depending on the phase of flight and whether UK, European or International rules are being considered. Nevertheless, the vertical margins are typically 300m (984 feet)[4] except in particularly mountainous regions, which Manchester is not. This means that if the vertical

[4] 300m (984ft). Procedures for Air Navigation Services, Aircraft Operations (PANS OPS) guidance states 1,000ft. It is open to interpretation whether to apply 984ft or 1000ft. In this report the former has been applied. Procedures for Air Navigation Services, Aircraft Operations, Volume II Construction of Visual and Instrument Flight Procedures. Fifth edition (2006). International Civil Aviation Organization (ICAO). Section 1-1-1-5. Part I — Section I, Chapter I. *'Minimum sector altitude (MSA). The lowest altitude which may be used which will provide a minimum clearance of 300 m (1 000 ft) above all objects located in an area contained within a sector of a circle of 46 km (25 NM) radius centred on a radio aid to navigation.'*

clearance between an IFP route and the top of the proposed development exceeds 300m (984 feet) then it will not have a significant safety impact on aircraft flying the route.

The maximum altitude of the proposed development is 488.03 feet. This means that aircraft subject to any IFP route or limit of more than 1,472.03 feet will not be affected. Key IFPs are discussed in the following subsection.

Aircraft flying IFR have been assessed at a high-level by considering:

- Impact on Manchester Airport Surveillance Minimum Altitude Chart (SMAC);
- Impact on current Manchester Airport Standard Instrument Departures;
- Impact on current Manchester Airport Standard Arrival Charts;
- Impact on current Manchester Airport Instrument Approach Charts.

This has been undertaken to determine whether an impact upon IFPs is likely or whether further, more detailed, analysis is required.

7.2 Minimum Obstacle Clearance

The Minimum Obstacle Clearance provides the minimum obstacle clearance above all obstacles (terrain and structures) in a particular quadrangle of an aeronautical chart. The Area Minimum Altitude shown for the quadrangle in which the development is located is 3,500 feet AMSL. The proposed development has a maximum altitude of 488.03 feet AMSL which is 3,011.97 feet below the Area Minimum Altitude. The proposed development will therefore not affect the current Area Minimum Altitude.

7.3 Surveillance Minimum Altitude Chart (SMAC)

Surveillance Minimum Altitude Charts (SMAC)[5] are published to show the lowest altitude a pilot will be instructed to fly whilst receiving an air traffic control service. The Manchester Airport SMAC shows that the minimum altitude for the Surveillance Minimum Altitude Area (SMAA) is 2,400 feet AMSL and within a buffer of 5NM of the proposed development. The proposed development has a maximum altitude of 488.03 feet. The vertical clearance between aircraft subject to a radar control service and the top of both buildings will be at least 1,911.97 feet. This is greater than the specified clearance of 984 feet stated in the CAA publication (CAP 777) for designing SMACs. This means that aircraft flying IFR and receiving a radar control service will have an acceptably low collision risk.

Figure 12 on the following page shows the ATC SMAC for Manchester Airport. It presents the approximate location of the proposed development (yellow dot) as well as the area of tall buildings present in the surrounding city centre.

[5] NATS AIP, AD 2.EGCC-5-1 (cropped)

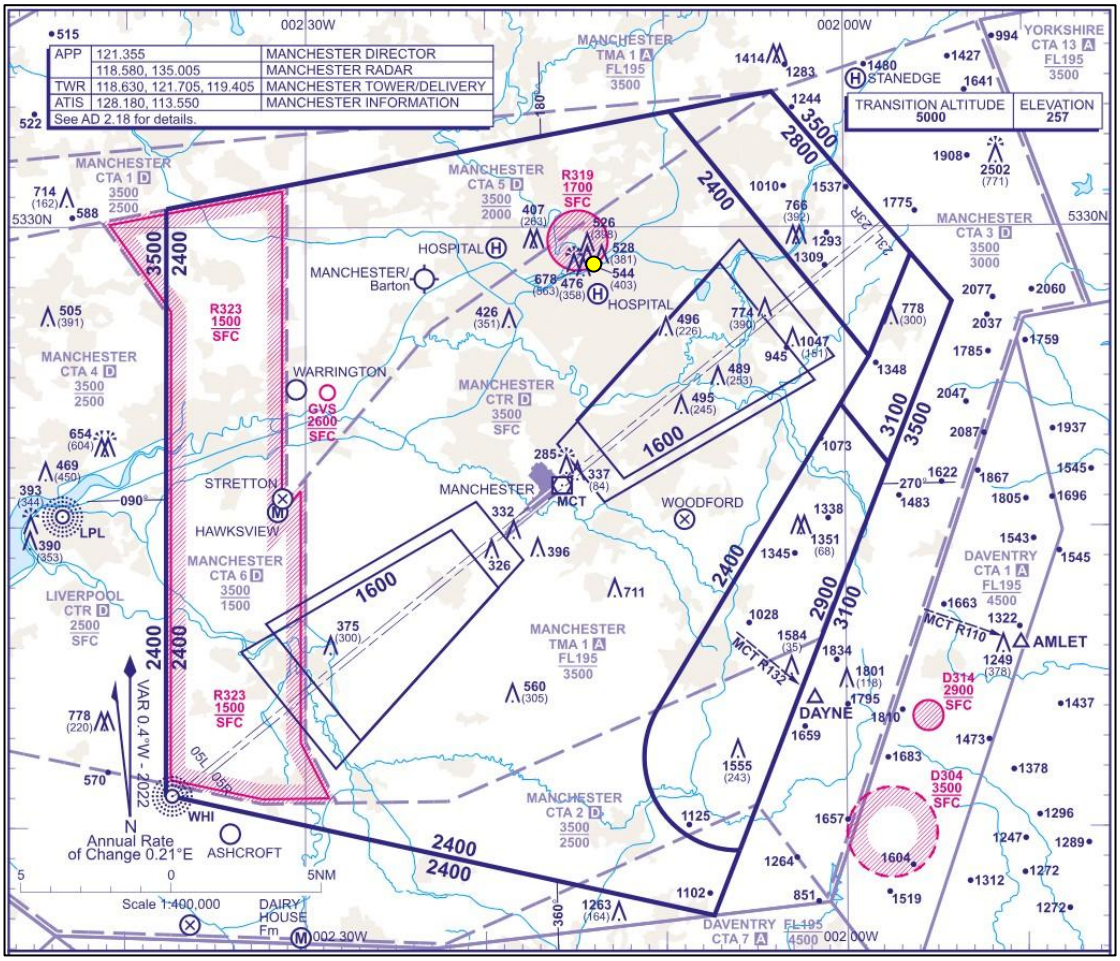


Figure 12 *Manchester Airport ATC Surveillance Minimum Altitude Chart*

7.4 Minimum Sector Altitudes (MSAs)

The procedures also show MSAs for aircraft flying within 25 nautical miles of an airport.

The MSA[6] for the sector in which the proposed development is located is 3,500ft, and is not within 5 nautical miles of another lower sector. Therefore, the proposed development is over 3,011 feet vertically clear and therefore will not impact the MSA.

[6] NATS AIP EGCC AD 2.24 -8

7.5 Omni-Directional Departure Procedures and Standard Instrument Departures (SIDs)

Omni-directional departures are not used in practice at Manchester Airport but have been assessed as part of a conservative and thorough analysis of instrument flight procedures. If a proposed building is not predicted to infringe omni-directional departures, it can be predicted that the proposed building will not impact other departure procedures. If an infringement is predicted, more detailed analysis of specific departure procedures is undertaken.

Departure charts have been examined to identify the appropriate climb profile. The climb profile varies along and between departure procedures, the lowest profile used is 3.43%, which has been assumed throughout for simplicity. If the proposed development does not infringe under a climb profile of 3.43% it will not infringe when a steeper profile is used.

A maximum height of 1371.4ft (418m) AMSL is allowed at the location of the proposed development. The maximum elevation of the proposed development is 488.03ft (148.75m). Thus the proposed development is clear of the omni-directional departures by 883.37ft (269.25m) and is not predicted to infringe this procedure. Cranes with a maximum altitude lower than 1371.4ft (418m) are also not expected to impact this procedure.

As the proposed development is not predicted to infringe the omni-directional departures, the proposed development is also not predicted to infringe specific instrument departures.

The building is predicted to present an acceptably low collision risk to aircraft flying all Standard Instrument Departure routes.

7.6 Standard Arrival Charts (STARs)

Manchester Airport has four published Standard Arrival (STARs) Charts. Each of these has been assessed with respect to the proposed development. Results of the assessment are shown in Table 5 below.

STAR Name	Observations	Assessed Impact	Recommendation
via ROSUN (north)	Minimum Altitude FL70	Aircraft will be 6,512 ft vertically clear of the proposed development	No further action
via ROSUN (east)	Minimum Altitude FL70	Aircraft will be 6,512 ft vertically clear of the proposed development	No further action
via MIRSI	Minimum Altitude FL70	Aircraft will be 6,512 ft vertically clear of the proposed development	No further action
via DAYNE	Minimum Altitude FL70	Aircraft will be 6,512 ft vertically clear of the proposed development	No further action

Table 5 *Standard Arrival Chart (STARs) Assessment Results*

Aircraft flying Manchester Airport's Standard Arrival Routes will be at least 6,512 feet vertically clear of the building. This means that such aircraft will have an acceptably low collision risk.

7.7 Instrument Approach Charts

Manchester Airport has 14 published Instrument Approach Charts. Each of these has been assessed with respect to the proposed development. For each, the following have been considered:

- The final approach phase;
- Earlier approach phases shown on the chart;
- Missed approach procedure;
- Decision heights and circling minima;
- Minimum Sector Altitude (MSA) within 25 nautical miles.

Results of the assessment are shown in Table 6 on the following pages.

V = vertically and H = horizontally.

The proposed development is not predicted to impact the Instrument Approach Charts. No further action is recommended.

Name	Final Approach	Earlier Approach	Missed Approach	Decision and Circling	MSA	Assessed Impact	Recommended Action
ILS/DME (I-MC) RWY 05R	Clear V,H	Clear V,H	Clear V,H	Clear V,H	Clear V	None	None
ILS/DME (MCT) RWY 05R	Clear V,H	Clear V,H	Clear V,H	Clear V,H	Clear V	None	None
LOC/DME (I-MC) RWY 05R	Clear V,H	Clear V,H	Clear V,H	Clear V,H	Clear V	None	None
VOR/DME RWY 05R	Clear V,H	Clear V,H	Clear V,H	Clear V,H	Clear V	None	None
ILS/DME (I-MM) RWY 05L	Clear V,H	Clear V,H	Clear V	Clear V,H	Clear V	None	None
ILS/DME (MCT) RWY 05L	Clear V,H	Clear V,H	Clear V	Clear V,H	Clear V	None	None
LOC/DME RWY 05L	Clear V,H	Clear V,H	Clear V	Clear V,H	Clear V	None	None
VOR/DME RWY 05L	Clear V,H	Clear V,H	Clear V	Clear V,H	Clear V	None	None
ILS/DME (I-NN) RWY 23R	Clear V,H	Clear V,H	Clear V,H	Clear V,H	Clear V	None	None

Name	Final Approach	Earlier Approach	Missed Approach	Decision and Circling	MSA	Assessed Impact	Recommended Action
ILS/DME (MCT) RWY 23R	Clear V,H	Clear V,H	Clear V,H	Clear V,H	Clear V	None	None
LOC/DME RWY 23R	Clear V,H	Clear V,H	Clear V,H	Clear V,H	Clear V	None	None
VOR/DME RWY 23R	Clear V,H	Clear V,H	Clear V,H	Clear V,H	Clear V	None	None
VOR/DME RWY 23L	Clear V,H	Clear V,H	Clear V,H	Clear V,H	Clear V	None	None
RNP RWY 23L	Clear V,H	Clear V,H	Clear V,H	Clear V,H	Clear V	None	None

Table 6 *Instrument Approach Charts assessment results*

7.8 High-level IFP Assessment – Obstacle Clearance Margins Conclusions

It is likely that if an obstacle does not infringe the OLS it will not adversely affect the IFP. The OLS will not be affected by the proposed development. A high-level review of the IFPs relative to the proposed development indicates sufficient clearances. There are also taller existing buildings in the surrounding area that already co-exist with the current IFPs. Therefore, no impact upon the IFPs is predicted and a detailed IFP assessment is not recommended. It is possible however that this could still be requested by Manchester Airport Group (MAG).

8 HIGH-LEVEL AVIATION LIGHTING AND CRANE USAGE CONSIDERATIONS

8.1 Overview

Aviation lighting is required where an object becomes a collision risk. This is most likely where there is an infringement of the OLS. It also becomes mandatory to have lighting where an object extends to 150m above ground level or more[7]. The following section explores the requirement for aviation lighting at a high-level.

8.2 Lighting Requirements

The following is true regarding the proposed development:

- The structure itself does not extend above to 150m agl or more (the development has a maximum height of 148.75m agl);
- The building does not infringe the OLS;
- Cranes are not expected to breach the OHS but are likely to extend to 150m agl or more. Cranes that do breach or exceed to 150m agl or more, will require aviation lighting.

On this basis, aviation lighting is not mandatory for the building structure as per the associated Air Navigation Order guidance, however crane lighting may be required.

8.3 Crane Operations Scheme

It is possible that Manchester Airport Group may request a crane operations scheme despite cranes being unlikely to breach the OLS.

The Civil Aviation Authority (CAA) should also be notified of the proposed development and any proposed cranes. All cranes and obstacle notifications to the CAA should be made to the Airspace Coordination and Obstacle Management Service (ACOMS). The registration process is via the CAA customer portal to access the ACOMS service to submit notification.

It is recommended that the developer applies for a crane permit from the CAA 8 weeks in advance. It is likely that MAG may request a crane operations scheme.

[7] Air Navigation Order, 2016. There is a requirement unless the CAA allow otherwise. Last accessed 26.10.22.

9 CONCLUSIONS

9.1 Secondary Surveillance Radar

One of the three proposed towers is predicted to be partially visible to the SSR with consideration of screening due to existing obstructions along the line of sight profile.

The proposed development will be of similar scale to those surrounding it. No significant shadowing effects are anticipated.

The radar has specific features that reduce the radar's susceptibility to interference from buildings. A technical impact is unlikely to occur in practice due to, the weaker nature of reflected signals, the façade composition being such that reflections will be scattered, and the advanced built-in capabilities of the radar for increasing its reliability and performance. The potential for some adverse effects on the radar cannot be conclusively ruled out. Therefore, mitigation may be requested.

NATS have been contacted with respect to the proposed development and responded that radar mitigation may not be required. Their formal position will be confirmed during the planning application process. Mitigation is therefore not recommended at this time, subject to NATS' formal response.

If mitigation is required, the most likely solution would be a technical fix to the radar and implemented by NATS. The solution would define the building as a known reflector and has been implemented for many developments of this type in the vicinity of SSR.

9.2 Obstacle Limitation Surfaces

The proposed development is vertically clear of the OLS and beneath the Outer Horizontal Surface (OHS) for Manchester Airport. The analysis has shown that the proposed development, with a maximum altitude of 148.75m amsl, is vertically clear of the OHS. The minimum margin of clearance is 53m.

Any cranes less than 53m above the maximum height of the development will also be clear of the OHS.

9.3 Instrument Flight Procedures at Manchester Airport – High-Level

A high-level review of the IFPs relative to the proposed development indicates sufficient clearances between the proposed development and aircraft flying procedures. There are also taller existing buildings in the surrounding area that already co-exist with the current IFPs. Therefore, no impact upon the IFP is predicted. It is possible however that a detailed IFP assessment may be requested by MAG. If a detailed IFP assessment is required, details of proposed crane locations, heights, and jib radius should be provided.

MAG have been contacted with respect to the proposed development, however have stated they are unable to provide comment at this time. Their formal position will be confirmed during the planning application process.

9.4 Aviation Lighting and Crane Usage – High-Level

The following is true regarding the proposed development:

- The structure itself does not extend above to 150m agl or more;
- The building does not infringe the OLS;
- Cranes are not expected to breach the OHS or to extend to 150m agl or more. Cranes that do breach the OHS, or which exceed to 150m agl or more, will require aviation lighting.

On this basis, aviation lighting is not mandatory for the building structure as per the Air Navigation Order and associated CAA guidance, however crane lighting may be required.

It is recommended that the developer applies for a crane permit from the CAA eight weeks in advance. It is likely that MAG may request a crane operations scheme.

APPENDIX A – COORDINATE DATA

Assessed Building Points

The coordinates outlining the building are given below. Maximum building elevations are presented in Section 1.

Point	Longitude (°)	Latitude (°)	Point	Longitude (°)	Latitude (°)
1	-2.235877	53.474585	3	-2.236412	53.47432
2	-2.235798	53.474461	4	-2.236494	53.474445

Building coordinates – T1

Point	Longitude (°)	Latitude (°)	Point	Longitude (°)	Latitude (°)
1	-2.235798	53.474461	3	-2.235773	53.474783
2	-2.235594	53.474509	4	-2.235977	53.474737

Building coordinates – T2

Point	Longitude (°)	Latitude (°)	Point	Longitude (°)	Latitude (°)
1	-2.235653	53.474811	3	-2.234957	53.474671
2	-2.235129	53.474932	4	-2.235483	53.474552

Building coordinates – T3

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