

# Development at Northwick Park: Aviation-related Constraints

## 1 Background

Network Homes is proposing a new housing development adjacent to the Northwick Park Hospital site. The site is approximately 6 km from Northolt Aerodrome, in an area subject to aerodrome safeguarding, the process by which airspace required for safe and efficient take-off and landing at airports is maintained free of new development. Specific height limits apply at the site, according to international standards and recommended practices. To support the scheme design process and to assist in securing planning permission, an airport safeguarding assessment of the proposal is required to ensure that the development complies with all relevant aviation-related constraints. In addition to determining the acceptable height of permanent buildings at the site, some consideration of the acceptability of the use of cranes above the finished building heights during construction will also be appropriate.

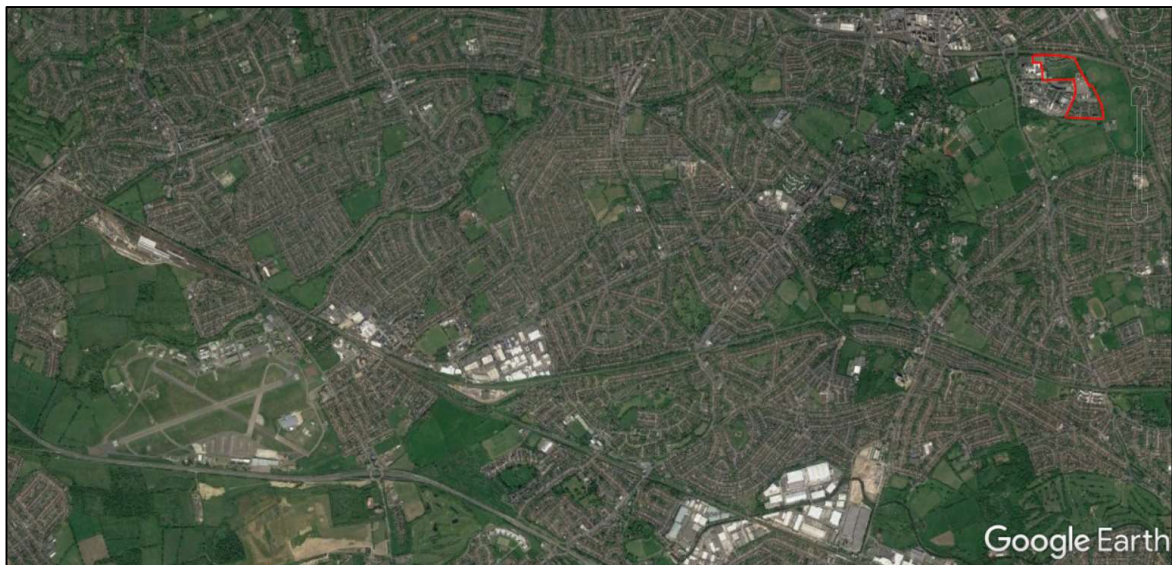
Other airport safeguarding considerations, relating to potential impacts on navigational aids and bird hazard management may also need to be addressed to support the planning application for the proposed development.

This briefing memo defines the relevant aviation-related constraints on development at the site to support the scheme design and associated planning application.

## 2 Site Location and Development Outline

The site is located adjacent to Northwick Park Hospital, beneath the north-easterly take-off and south-westerly approach flight paths to the north-east of Northolt Aerodrome, approximately 6.5 km from the runway end, as shown in Figure 1. The site is also located at the extreme limit of the safeguarding zone for Heathrow Airport at nearly 15 km from the aerodrome reference point (mid-point of the northern runway) that serves as the reference point for defining the relevant height limit.

**Figure 1: Site location in relation to Northolt Aerodrome**



From the perspective of aviation safeguarding, building heights will generally be the primary consideration. In that respect, the general concept for the development, as set out in the GLA pre-application presentation [1], is for building heights to increase from the periphery of the site towards the existing buildings of the Northwick Park Hospital and not to exceed the heights of those existing buildings. Building heights ranging from 3 storeys to 15 storeys are provisionally being proposed.

### **3 Physical Safeguarding Assessment**

Two distinct height constraints associated with operations at Northolt Aerodrome and London Heathrow Airport apply in the area of the development site:

- Aerodrome licensing requirements, prescribed in terms of the obstacle limitation surfaces (OLS) for the Airport;
- Operational requirements, for example as prescribed by PANS-OPS criteria for instrument procedure design, employed for the design of operational procedures for take-off and approach that take account of the existing obstacle environment in the vicinity of the Airport and which generally lie above the OLS.

Typically, maximum permanent building heights are defined by the OLS. Temporary infringements of the OLS by construction cranes may be permitted, provided that this is not in conflict with operational requirements, in accordance with PANS-OPS criteria.

The focus of this assessment has been on the OLS since it is expected that this will adequately address the relevant practical constraints for the heights of the development that it is understood are likely to be proposed.

An assessment against the OLS criteria, set out in more detail in the appendix to this note, indicates that the site is located within the areas covered by the Runway 25 approach surface, the Runway 07 take-off climb surface and outer horizontal surface of the OLS for Northolt Aerodrome and the area covered by the Heathrow Airport outer horizontal surface. Of the three Northolt Aerodrome surfaces, the take-off climb surface gives rise to the most limiting height constraints. The take-off climb surface slopes upwards from the runway end with a 2% slope, leading to an estimated height limit of 165.7 m AOD at locations towards the south-west of the site, closer to the runway, and an estimated height limit of 173.7 m AOD at locations towards the north-east of the site, further from the runway. The height limit associated with the Heathrow Airport outer horizontal surface is identified as 167.95 m AOD across the whole of the site. This surface is therefore slightly more limiting than the Northolt Aerodrome Runway 07 take-off climb surface across the more north-easterly parts of the site.

The ground level across the site is understood to vary between around 48 to 60 m AOD such that development at up to slightly over 100 m above local ground level would be possible without infringing the OLS. This limit is well above the anticipated maximum height of 15 storeys currently being considered.

The most effective use of cranes to support the construction of the development can be expected to require cranes at heights above the finished building heights. On the basis of previous experience of crane plan development, it is expected that a minimum of 10 m of headroom above finished building height is normally required to accommodate a single saddle jib crane. For effective overall coverage of construction sites, the use of several cranes with overlapping jib arcs may be required with a minimum headroom of 10 m for

each overlapping jib being required. The use of luffing jib cranes, which may be preferred in some situations, will typically require more headroom than the use of saddle jib cranes and perhaps of the order of 40 to 50 m. On that basis, it is expected that cranes to support the construction of buildings up to slightly more than 80 m above ground level could be accommodated without any infringements of the OLS.

#### **4 Technical Safeguarding**

Technical safeguarding is the process employed to protect radio signals that support aircraft operations from being adversely affected by physical or electromagnetic changes in their transmission environment. Most physical objects act as potential reflectors or diffractors of radio signals. A combination of object size, material, proximity and incident radio wavelength determine the extent to which objects act as reflectors or diffractors.

The technical safeguarding of navigational aids such as instrument landing systems and other equipment providing guidance directly to aircraft is achieved by reference to defined geometrical frames, representing the volumes of space around any given navigational aid that may need to be kept free of obstacles to avoid potential interference with effective operation. Guidance [2] on the dimensions of geometrical frames associated with specific types of equipment is provided by the CAA. The geometrical frames identified in CAA guidance are understood to be cautious and represent the volumes of space in which there may be some potential for adverse impacts from new objects but where, in practice, according to the details of the object and equipment concerned, no significant impact may arise. These frames are initially applied as screening criteria to identify those circumstances where some further assessment may be required to determine whether or not any impacts will occur in practice.

In general, it is expected that developments that comply with the limits defined by the OLS will not conflict with the requirements for the technical safeguarding of the relevant navigational aids located at Northolt Aerodrome.

In addition, consideration needs to be given to the safeguarding of radar equipment employed for the support of air traffic control. In that context, impacts of tall buildings on the operation of the H10 radar located on the south side of London Heathrow Airport are a recognised potential concern. New tall buildings can give rise to two adverse impacts: interruption of radar coverage behind the buildings where airspace is shielded by them; reflections of signals from aircraft that lead to the generation of “false targets” along the line of the buildings. The extent to which any new development may adversely impact on the radar will be dependent upon the height of the structure relative to the radar and its distance from the radar, having regard to the curvature of the earth and the associated influence on sight lines, together with the presence of terrain and existing development along sight lines. These parameters determine the extent to which a new structure may stand above its general surroundings and lead to additional restrictions on radar coverage.

A preliminary review indicates that sight lines from the H10 to the Northwick Park site may be interrupted to some extent by terrain up to 118 m AOD at Harrow on the Hill but it seems that potential sight lines to all parts of the site may not be effectively blocked. NATS, the operators of the H10 radar will be consulted as part of any planning application associated with the proposed development. If potential adverse impacts were identified, NATS would be expected to request that a condition be attached to any permission arising from an application for the proposed development requiring that a radar mitigation scheme is agreed by the developer with NATS prior to commencement of construction and subsequently

implemented according to an agreed timetable. This is an established approach which has previously been adopted to address the impacts of other tall building developments.

Overall, it may be concluded that, subject to the implementation of an agreed radar mitigation scheme, there will be no technical safeguarding objection to the proposed development.

## **4 Bird Hazard Management**

Bird hazard management is a further element of aerodrome safeguarding that may require consideration. ICAO guidance [3] identifies a requirement for safeguarding of aerodromes in respect of bird hazards out to a distance of 13 km from the aerodrome reference point. The Northwick Park site is therefore identified to be outside the standard safeguarding zone for London Heathrow Airport but within the zone for Northolt Aerodrome.

ICAO guidance identifies bird attractants falling within three general categories that should be minimised in development at or near airports, as follows:

- Food
- Water
- Shelter

Guidance provided by the UK CAA [4] identifies the same broad issues as primary considerations in bird hazard management near airports.

ICAO guidance states the following in respect of bird attraction associated with buildings:

Structures. Architects should consult biologists during the design phase of buildings, hangars, bridges and other structures at airports to minimize exposed areas that birds can use for perching and nesting. When perching sites are present in older structures (such as rafter and girded areas in hangars, warehouses and under bridges) access to these sites can often be eliminated with netting. Anti-perching devices, such as spikes, can be installed on ledges, roof peaks, rafters, signs, posts and other roosting and perching areas to keep certain birds from using them. Changing the angle of building ledges to 45 degrees or more will deter birds. However, it is emphasized that incorporating bird exclusion or deterrence into the design of structures is the most effective, long-term solution.

The CAA provide the following general guidance on building design:

When new buildings are being designed they should:

- prevent wildlife gaining access to the interior and roof spaces
- use self-closing doors or plastic strip curtains or other mechanisms to prevent access by wildlife
- be without roof attractions - consider implications of green, flat and shallow pitched structures
- have minimal roof overhangs and be without ledges beneath overhangs or external protrusions
- allow easy access to rooftops in case it becomes necessary to take action against nesting gulls or waders that colonise large flat or shallow-pitched roofs.

Gulls will also use steeply sloping roofs where the nests can be lodged behind vents, skylights, and in gullies etc.

The CAA note further that sheltered ledges, access holes and crevices within and underneath structures can prove ideal nesting locations for feral pigeons, stock doves, pied wagtails and starling whilst rooftops themselves, including green roofs, may be attractive to gulls or wading birds such as oystercatchers, for nesting, loafing and roosting.

Water acts as a bird attractant and water features should be avoided in landscaping plans for development near airports. Management of water accumulations that may otherwise attract birds may be required during site preparation and construction activities.

Potential food attractants include food waste as well as landscaping features. Standard guidance recommends the avoidance of berry bearing plants that may attract birds and the avoidance of the creation of areas of dense cover for roosting by flocking species of birds. Careful attention to the management of wastes that might give rise to food sources is also recommended.

Modern aircraft are designed to be resilient to bird strike. Civil aircraft design and certification requirements specify the necessary tolerance of aircraft to defined bird strike events. Key elements of these standards include the ability of an engine to withstand ingestion of birds without catching fire, suffering uncontained failure or becoming impossible to shut down, whilst retaining some partial thrust for a specified period after the strike. These standards should ensure that any multi-engine civil aircraft will be able to withstand engine ingestion of a single "large" bird without endangering the aircraft, even if the engine is destroyed beyond economic repair, and similarly to withstand ingestion of a certain number of "small" and "medium" sized birds without endangering the aircraft.

The primary hazard that may give rise to serious consequences is therefore a multiple bird strike involving larger species, including in particular water birds such as gulls, geese and swans which may potentially be encountered in flocks by aircraft during take-off and landing operations. It is therefore recommended that the general guidance in respect of the avoidance of water and potential nest sites that may attract these species is followed during building design, with particular attention to the landscaping design. There is potential concern about the increasing use of urban areas by gulls, in particular the establishment of nesting colonies making use of flat roofs on buildings. If flat roofs form part of the design, some active management to deter nesting of these species may be appropriate during the life of the development.

## **References**

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- 1 Northwick Park GLA Pre-app presentation 01 25th June 2019, PRP
- 2 CAP 670 Air Traffic Services Safety Requirements, UK Civil Aviation Authority, 2014
- 3 Airport Services Manual Part 3: Wildlife Control and Reduction, Fourth Edition, 2012, International Civil Aviation Organization
- 4 Wildlife Hazard Management at Aerodromes CAP 772, Civil Aviation Authority, December 2014

## **Appendix 1: Detailed Physical Safeguarding Assessment**

### **A1.1: Northolt Aerodrome OLS Assessment**

The obstacle limitation surface (OLS) requirements at military airfields such as Northolt Aerodrome are defined in the Manual of Aerodrome Design & Safeguarding (MADS) of the Military Aviation Authority. Based on the runway length and instrument approach aids available at Northolt, the runway is classed as a code 3 instrument runway. Key reference points defining the locations of the relevant OLS are the runway thresholds and the Runway 07 end of declared take-off distance for which specifications are provided in the Aeronautical Information Publication and associated Type A charts. These reference points are summarised in Table A1.1.

**Table A1.1: Northolt Aerodrome reference points defining the locations of the OLS**

Location	OS Easting	OS Northing	Height (m AMSL)
Runway 07 threshold	508971.79	184668.49	37.85
Runway 25 threshold	510452.43	185248.77	34.75
Runway 07 end of TODA	510530.72	185279.52	39.32

The relevant OLS defining height limits across the Northwick Park site are determined to be the Runway 07 take-off climb surface, the Runway 25 approach surface and the outer horizontal surface. The standard specifications for these surfaces at a code 3 instrument runway are as follows:

#### Take-off climb surface

Inner edge length	180 m
Inner edge origin	End of TODA
Side divergence (each side)	12.5%
Final width	1,200 m
Length	15,000 m
Slope	2%

#### Approach surface

Inner edge length	300 m
Runway end distance	60 m
Side divergence (each side)	15%
Length of first section	3,000 m
Slope of first section	2%
Length of second section	3,600 m
Slope of second section	2.50%
Length of horizontal section	8,400 m

#### Outer horizontal surface

Origin: edge of the conical surface (radius of 6,000 m from runway ends)

Height: 145 m above lowest threshold

Outer limit: 15,000 m radius from runway ends

The Northwick Park site approximate boundary was estimated by reference to Google Earth satellite images and coordinates in latitude and longitude were converted to OS eastings and northings using the Grid Inquest coordinate transformation tool. These coordinates were

then converted into rectilinear runway-aligned coordinates referenced against the Runway 25 threshold where X is the distance along the runway extended centreline and Y is the lateral distance from the runway extended centreline. All points were found to be located within the areas covered by the Runway 07 take-off climb surface, the Runway 25 approach surface and the outer horizontal surface. Based on the reference elevation of 34.75 m AMSL and the height of the outer horizontal surface at 145 m above that reference, this surface was determined to be 179.75 m AMSL. The heights of the Runway 07 take-off climb surface (TOCS) and Runway 25 approach surface which slope upwards from the runway end were determined for each point, according to the specifications given earlier. These estimates are summarised in Appendix 2.

The Runway 07 take-off climb surface was determined to be the most limiting constraint across the whole of the site. This surface gives rise to an estimated height limit of 165.7 m AOD at locations towards the south-west of the site, closer to the runway, and an estimated height limit of 173.7 m AOD at locations towards the north-east of the site, further from the runway.

## A1.2: London Heathrow Airport OLS Assessment

The key reference points for the relevant OLS at London Heathrow Airport are summarised in Table A1.2.

**Table A1.2: London Heathrow Runway 09L/27R Threshold and ARP Coordinates**

Threshold	WGS 84		OS grid coordinates		Height AOD	
	Latitude	Longitude	Easting	Northing	ft	m
Runway 09L	51°28'39.00"N	00°29'06.05"W	505306.73	176481.25	79	24.08
Runway 27R	51°28'39.63"N	00°25'59.74"W	508900.14	176576.41	78	23.77
ARP	51°28'39"N	00°27'41"W	506947.31	176515.46	83	25.30

The outer horizontal surface is identified to extend to a distance of 15 km from the aerodrome reference point (ARP). The whole of the Northwick Park site is determined to be located towards the outer limit of this surface at between 14.57 and 14.97 km from the ARP. The operators of London Heathrow Airport identify the height of this surface to be 167.95 m AMSL. Some uncertainty has been identified in the appropriate specification for the outer horizontal surface at London Heathrow Airport following recent changes to the regulatory framework and the value identified by the operators of London Heathrow Airport can be considered the lowest one that might be applied.

**Appendix 2: Site boundary and associated Northolt OLS heights**

OS Easting	OS Northing	X	Y	Range	TOCS (m AOD)	APPS (m AOD)
516556.11	187462.47	6490.59	-166.10	6492.72	167.49	183.61
516866.61	187454.41	6776.74	-286.90	6782.81	173.29	190.77
516865.13	187503.65	6793.33	-240.51	6797.59	173.59	191.18
516853.82	187558.85	6802.94	-184.99	6805.46	173.75	191.42
516833.26	187605.59	6800.85	-133.97	6802.17	173.68	191.37
516799.18	187669.53	6792.45	-62.01	6792.74	173.49	191.16
516765.98	187723.71	6781.31	0.55	6781.31	173.26	190.88
516746.72	187716.39	6760.71	0.77	6760.71	172.85	190.37
516727.76	187746.90	6754.19	36.09	6754.29	172.72	190.20
516686.24	187814.90	6740.35	114.55	6741.32	172.46	189.86
516660.95	187860.01	6733.26	165.78	6735.30	172.34	189.68
516627.26	187927.01	6726.34	240.45	6730.64	172.25	189.51
516630.42	187929.93	6730.35	242.02	6734.70	172.33	189.61
516631.12	187934.45	6732.65	245.97	6737.14	172.38	189.67
516612.49	187935.22	6715.58	253.49	6720.37	172.05	189.24
516611.92	187940.92	6717.13	259.00	6722.12	172.08	189.28
516492.78	187954.04	6611.00	314.69	6618.48	170.01	186.62
516439.02	187957.19	6562.09	337.24	6570.75	169.05	185.40
516387.46	187957.82	6514.32	356.64	6524.07	168.12	184.21
516283.68	187946.94	6413.72	384.38	6425.23	166.14	181.69
516286.85	187890.33	6396.02	330.51	6404.55	165.73	181.25
516351.32	187893.32	6457.13	309.77	6464.56	166.93	182.78
516354.64	187850.08	6444.45	268.30	6450.03	166.64	182.46
516368.09	187848.74	6456.48	262.15	6461.80	166.87	182.76
516365.35	187820.86	6443.76	237.19	6448.12	166.60	182.44
516371.36	187749.32	6423.25	168.39	6425.45	166.15	181.93
516529.00	187762.86	6574.96	123.48	6576.12	169.16	185.72
516630.98	187764.94	6670.67	88.20	6671.25	171.06	188.12
516620.19	187750.68	6655.42	78.86	6655.88	170.76	187.74
516629.37	187740.66	6660.31	66.18	6660.64	170.85	187.86
516632.24	187727.24	6658.08	52.64	6658.29	170.80	187.80
516636.22	187693.94	6649.64	20.18	6649.67	170.63	187.59
516634.96	187651.62	6633.02	-18.76	6633.05	170.30	187.18
516631.51	187629.89	6621.88	-37.73	6621.99	170.08	186.90
516612.24	187583.73	6587.10	-73.68	6587.51	169.39	186.03
516594.68	187545.92	6556.95	-102.47	6557.75	168.79	185.27
516580.88	187513.11	6532.13	-127.99	6533.38	168.31	184.65
516563.21	187477.67	6502.75	-154.53	6504.58	167.73	183.92