



## UNIVERSAL DESTINATIONS & EXPERIENCES UK PROJECT

Former Kempston Hardwick Brickworks  
and adjoining land, Bedford

### Appendix 2.7 Daylight Assessment Results

Report reference: 4.2.7.0

Revision number: 00

Date: June 2025





# **Environmental Statement Volume 3 Universal Destinations & Experiences UK Project**

**APPENDIX 2.7 - DAYLIGHT  
ASSESSMENT RESULTS**  
June 2025





# Introduction

WSP has been instructed by Universal Destinations & Experiences (UDX) to undertake a Building Research Establishment (BRE) daylight and sunlight assessment of the Proposed Development to support the planning proposal.

As the project is in the initial stages of design, the purpose of the assessment is twofold:

1. To assess the effects of the Proposed Development based on the proposed maximum building heights.
2. To identify how the Proposed Development could be optimised at the detailed design stage to avoid any significant effects on identified receptors.

The assessment aims to advise the optimum maximum parameter design in order to have no or negligible impact on the surrounding sensitive receptors, which are located on Manor Road and Broadmead Road.

The 268 hectare Site (see **Zonal Plan (Document Reference 1.8.0)**) is located south of Bedford near Kempston Hardwick and is in a relatively vacant area surrounded by a few residential and some commercial/industrial buildings. A detailed description of the Site is available in **Chapter 1: Introduction and Site Description (Volume 1)** of the Environmental Statement (ES) Details regarding the Proposed Development are available in **Chapter 2: Description of the Proposed Development (Volume 1)** of the ES.



# Guidance

The BRE Guide: Site Layout Planning for Daylight and Sunlight, A Guide to Good Practice (BRE 2022)(Ref. 1) is recognised as the most appropriate method for daylight, sunlight and overshadowing assessments. These guidelines were first published in 1991 and superseded the 1971 Department of the Environment Document Sunlight and Daylight. The latest edition was published in 2011 and updated in 2022.

Whilst the BRE Guide provides numerical guidelines for daylight, sunlight and overshadowing, the Guide is not an instrument of planning policy, therefore some level of flexibility should be applied where appropriate.

Ref. 1: Littlefair, P.J. (2022). Site Layout and Planning for Daylight and Sunlight: a guide to good practice, Building Research Establishment, UK, BR 209 2022 Edition. Referred to herein as the "BRE Guide (2022)".



# Methodology

## Obstruction Angle

This is an initial check to identify any potential impacts. If any part of a new building or extension, measured in a vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal, then the diffuse daylighting of the existing building may be adversely affected, and further detailed studies may need to be carried out (see **Annex 1** for details of when detailed studies may be required). This 2D based method applies to windows directly opposite a continuous obstruction and does not consider effects by obstructions either side of the obstruction.

## Vertical Sky Component (VSC)

When the obstruction angle and the visible sky angle ( $\theta$ ) vary significantly because multiple windows are involved, then the Vertical Sky Component (VSC) should be used instead. The calculation of VSC usually requires specialist computer software. The VSC, in simple terms, measures the amount of sky that can be viewed from the centre of a window accounting for all external obstructions, (40% being the maximum value for an unobstructed window). The minimum recommended figure for VSC is 27% to maintain good levels of daylight. For existing surrounding windows if the VSC is below 27%, then a comparison of existing and proposed VSC levels with the new development in place is calculated and impacts are assessed.

The BRE Guide (2022) uses a set of metrics to quantify the potential effect on daylight and sunlight levels including:

- Obstruction Angle (25°);
- Probable Sunlight Hours (PSH); and,
- Vertical Sky Component (VSC); .
- Overshadowing of Open Amenity Spaces

Table 1: Significance Criteria - VSC

VSC Values	Ratio of Change from Baseline	Magnitude of Impact	Meet / below BRE Criteria
VSC ≥ 27%	n/a	Negligible	Meets Criteria
VSC < 27%	> 0.8	Negligible	Meets Criteria
VSC < 27%	0.7 – 0.8	Low	Below
VSC < 27%	0.6 – 0.7	Medium	Below
VSC < 27%	< 0.6	High	Below



# Methodology

## Sunlight: Probable Sunlight Hours (PSH)

Access to sunlight is measured from the windows of habitable rooms, facing within 90° of due south. The Probable Sunlight Hours (PSH) calculation method measures the proportion of the window assessed that is sunlit for a period of time. The BRE Guide recommends that the PSH is calculated for the annum (APSH) and for the winter months (WPSH) (21<sup>st</sup> September to 21<sup>st</sup> March). The recommended sunlight criteria for existing buildings are as follows:

- The window reference point should receive at least than 25% of APSH, including at least 5% of WPSH;
- If the available sunlight hours are both less than the amount given above and less than 0.8 times their former value, either over the whole year or during the winter, then the occupants of the existing building will notice some loss of sunlight;
- The overall loss of sunlight should be maintained below 4%; and
- For the affected receptors, the level of impact has been classified depending on the ratio of impact between the 'Baseline Scenario' and the 'Proposed Scenario', The criteria used for determining the magnitude of change for the APSH and WPSH results are detailed in tables 2 and 3.

**Table 2: Significance Criteria - APSH**

APSH Values	Ratio of Change from Baseline	Absolute Reduction APSH	Meet / Below BRE Criteria	Magnitude of Impact
APSH $\geq$ 25%	>0.8	n/a	Meets Criteria	Negligible
APSH < 25%	>0.8	$\leq$ 4%	Meets Criteria	Negligible
APSH < 25%	>0.7	>4%	Below	Low
APSH < 25%	0.6 – 0.7	>4%	Below	Medium
APSH < 25%	< 0.6	>4%	Below	High

**Table 3: Significance Criteria - WPSH**

WPSH Values	Ratio of Change from Baseline	Meet / Below BRE Criteria	Magnitude of Impact
WPSH $\geq$ 5%	n/a	Meets Criteria	Negligible
WPSH < 5%	>0.8	Meets Criteria	Negligible
WPSH < 5%	0.7 – 0.8	Below	Low
WPSH < 5%	0.6 – 0.7	Below	Medium
WPSH < 5%	< 0.6	Below	High



# Methodology

## Overshadowing of Open Amenity Spaces

For gardens or amenity areas, the BRE Guide suggests that at least half the area (50%) should receive at least two hours of sunlight on 21<sup>st</sup> March (sunlight at an altitude of 10° or less is excluded). If, as a result of a new development, an existing garden (usually the main back garden of a house) or amenity area does not meet the above criteria and the area which can receive two hours of sunlight on 21<sup>st</sup> March is less than 0.8 times its former value, then the loss of sunlight is likely to be significant. The above guidance applies both to gardens and open amenity areas.



# Sensitive Receptors

## VSC and PSH

For the Vertical Sky Component (VSC) and the Probable Sunlight Hours (PSH), the receptors for the assessment are selected on the basis of their location relative to the Site, anticipating the receptors whose level of daylight and sunlight are likely to change as a result of the Proposed Development and also depending on their sensitivity to natural light.

To ensure a robust assessment, all receptors with the potential to be significantly affected by the Proposed Development were identified and included. This process considered the proximity of receptors to the Site and the potential for the Proposed Development to impact their access to daylight and sunlight.

There are 17 residential dwellings located within the Site, 16 of them are located along Manor Road, and one is on Broadmead Road. Although the dwellings are located within the Site boundary, and, under certain circumstances their use could be converted to non-residential, for the purposes of identifying a cautious worst case scenario for the EIA, it has been assumed that these dwellings will continue in residential use. Note, however, that despite this cautious worst case assumption, Universal already owns IDs 1, 2, 3, 4 and 5 and, should a planning permission be granted, will not be using these units for residential use.

Two additional residential dwellings lie within the Site, known as 1 & 2 Vine Cottages, Manor Road, Kempston Hardwick, Bedford, Bedfordshire MK43 9NS. A land use limitation has been imposed for these two dwellings that they shall not be occupied for residential use from the date of commencement of any construction work on Manor Road, therefore, they have not been considered as sensitive receptors in this assessment.

All other adjacent buildings to the Site, categorised as commercial/industrial, were determined to be unlikely to experience significant effects on their daylight or sunlight levels. Therefore, they were not considered as sensitive receptors in this assessment.

Residential buildings require suitable levels of daylight and sunlight, adequate to their function. Windows to such building types are classified as having high sensitivity to daylight and sunlight.

In total, 155 windows were identified among the sensitive receptors. The receptors assessed in the VSC and PSH assessments are detailed in **Table 4** and illustrated in **Figure 2**.

**Table 4: Sensitive Receptors – VSC and PSH**

ID	Receptor	Windows
	Name	Count
1	1 Manor Rd	9
2	2 Manor Rd	7
3	3 Manor Rd	6
4	4 Manor Rd	9
5	5 Manor Rd	7
6	6 Manor Rd	6
7	7 Manor Rd	8
8	8 Manor Rd	11
9	9 Manor Rd	8
10	10 Manor Rd	7
11	11 Manor Rd	9
12	12 Manor Rd	7
13	Eden Lodge	3
14	Moat House A	22
15	Moat House B	9
16	Askern House	21
17	Broadmead Rd	6
Total		155





# Sensitive Receptors

VSC and PSH

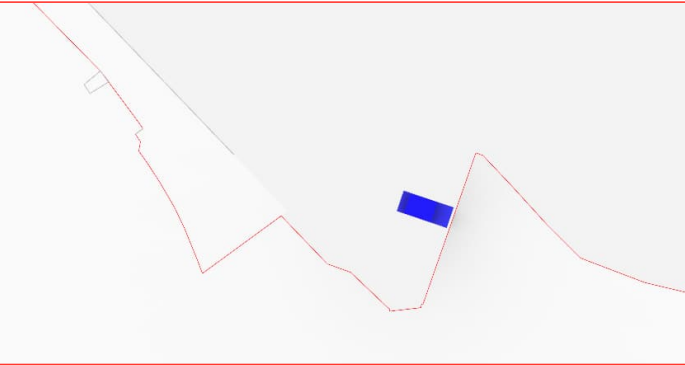
Figure 2: Sensitive Receptors – VSC and PSH



Manor Rd – Daylight Receptors 1-16



Broadmead Rd – Daylight Receptor 17





# Sensitive Receptors

## Overshadowing of Open Amenity Spaces

For the Overshadowing assessment, the sensitive receptors are selected following the BRE 2022 Guide. The BRE considers the following open amenity spaces as sensitive receptors:

- **Gardens:** Includes main back gardens of houses, communal gardens, courtyards, and roof terraces.
- **Parks and Playing Fields:** Public green spaces used for recreation.
- **Children's Playgrounds:** Areas designated for children's play.
- **Outdoor Swimming Pools and Paddling Pools:** Recreational water areas, including marinas and boating lakes.
- **Sitting Out Areas:** Spaces between non-domestic buildings and public squares.

The study identified several private and communal gardens which can potentially be affected by the Proposed Development. The assessment identified 16 open amenity space sensitive receptors: 15 located on Manor Road and one on Broadmead Road. The list of receptors is shown in **Table 5** and **Figure 3**.

**Table 5: Sensitive Receptors – Open Amenity Spaces:**

ID	Receptor
1	1 Manor Rd
2	2 Manor Rd
3	3 Manor Rd
4	4 Manor Rd
5	5 Manor Rd
6	6 Manor Rd
7	7 Manor Rd
8	8 Manor Rd
9	9 Manor Rd
10	10 Manor Rd
11	11 Manor Rd
12	12 Manor Rd
13	Eden Lodge North
14	Eden Lodge South
15	Askern House
16	Broadmead Rd

# Sensitive Receptors

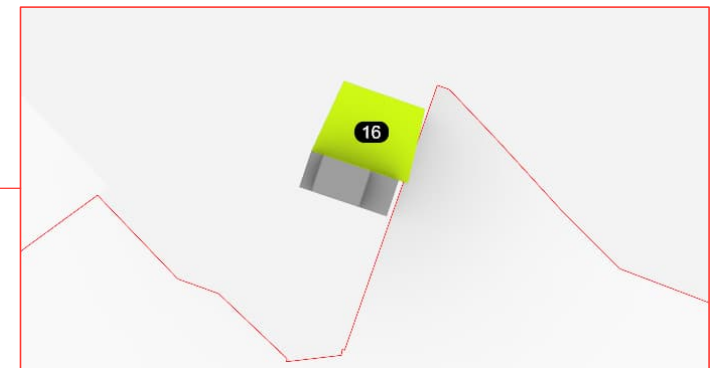
Figure 3: Sensitive Receptors – Open Amenity Spaces:



Manor Rd - Open Amenity Receptors 1-15



Broadmead Rd – Open Amenity Receptor 16





# Assessment Model

## Baseline Scenario

The baseline scenario represents the existing conditions of the Site which is mostly empty, with the exception of the buildings on Manor Road and Broadmead Road. The modelling of the existing context is based on satellite mapping and OpenStreetMap information. The street levels on Manor Road range from approximately 32 above ordnance datum (AOD) at the far west end of the road and in front of the Manor Road receptors, to 26 AOD at the east end at the junction with Amphill Road. The street level of Broadmead Road is around 34-35 AOD.

Figure 4: Baseline Scenario – Broadmead Road – South View



Figure 5: Baseline Scenario – SE View

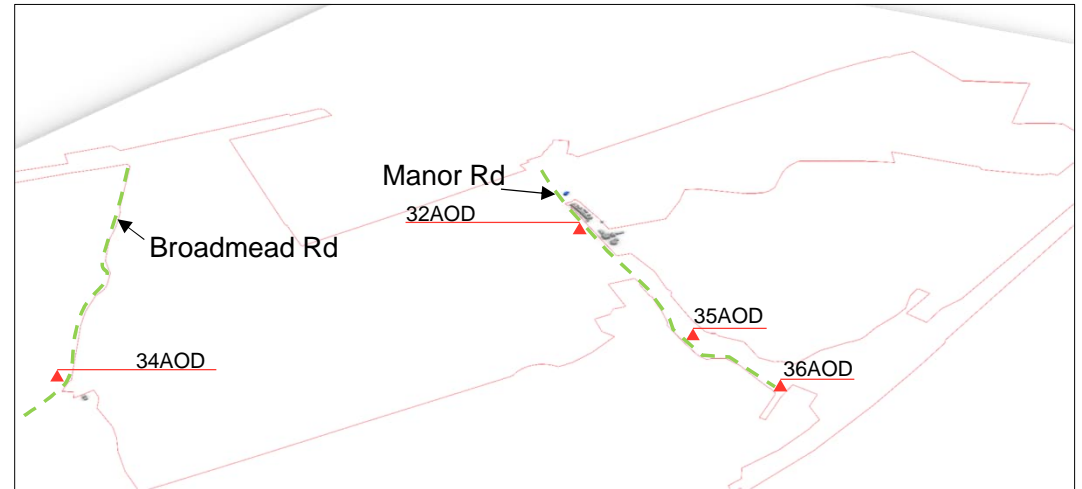
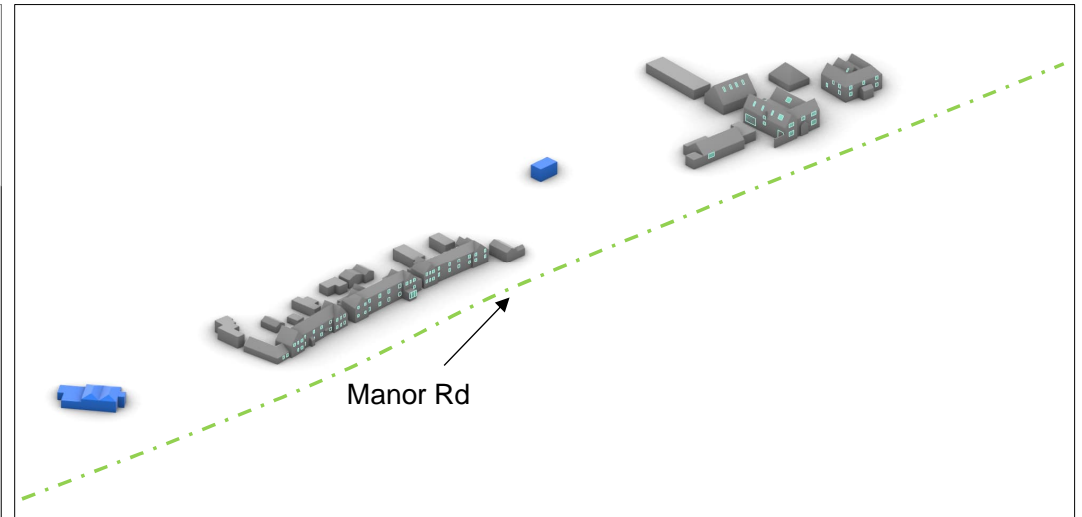


Figure 6: Baseline Scenario – Manor Road – West View





# Assessment Model

## Proposed Scenario

The proposed Maximum Height Parameters consist of a variety of maximum heights (as set out in detail in **Chapter 2: Description of the Proposed Development (Volume 1)** of the ES).

As detailed in the **Design Standards (Document Reference 6.3.0)**, a development envelope for above ground physical structures has been set across the Site based on maximum height parameters. The maximum height above ground level and AOD, and corresponding Zones for each key element of the Proposed Development are set out in **Table 2-1 of Chapter 2: Description of the Proposed Development (Volume 1)** of the ES. Maximum height limits are also proposed across the Site by specific location, to recognise those areas of the Site that are adjacent to sensitive receptors or form important roadway corridors. These are controlled by **Table 2-2 of Chapter 2: Description of the Proposed Development (Volume 1)** of the ES. Both **Table 2-1** and **Table 2-2** were used when setting the maximum allowable height for development. The lowest applicable height for any specified component in any given land area applies in each case.

The Attraction Overlay Zone (see **Design Standards (Document Reference 6.3.0)**), provides that the overall height of a structure may increase by up to a further 40m above the relevant maximum height for any non-occupiable or non-habitable features, such as architectural or ornamental features of buildings.

The final component of the overall height strategy is the Open Sky Concept Articulated Skyline standard as described in **Chapter 2: Description of the Proposed Development (Volume 1)** of the ES.

On the basis of the maximum height parameters referenced above, two proposed scenarios have been considered in this assessment. Both are highly conservative, assuming for Scenario A the full build out of the Maximum Height Parameters plus Attraction Overlay Zone, while Scenario B assumes full build out of the Maximum Height Parameters but excludes the Attraction Overlay Zone.

The reason for including Scenario B in the assessment is because the Attraction Overlay Zone is for structures only, not buildings, however the only way to assess the maximum height is as a solid massing at the full height of the Attraction Overlay Zone. Therefore, Scenario B is likely to be a more realistic assessment than Scenario A of the final detailed design.

However, even Scenario B is still highly conservative and exceeds the cautious worst-case scenario that has otherwise been assessed in the ES, as it is still unable to account for the Open Sky Concept Articulated Skyline standard. For example, the Open Sky Concept Articulated Skyline standard limits maximum height structures to 3% of the Core Zone, while the assessment has assumed that 100% of the Core Zone would be developed to the maximum height.

## Assessment Scenarios:

### 1. Baseline Scenario

- Includes the existing receptors, with the existing buildings on site.

### 2. Proposed Scenario A – Maximum Height Parameters plus Attraction Overlay Zone

- Considers the maximum height of the development, including the Attraction Overlay Zone.

### 3. Proposed Scenario B – Maximum Height Parameters

- Excludes the Attraction Overlay Zone





# Assessment Model

## Proposed Scenario A – Maximum Height Parameters plus Attraction Overlay Zone

Core Zone	Lake Zone	East Gateway Zone
44m AOD	44m AOD	47.5m AOD
66.3m AOD	55.5m AOD	67.5m AOD
106.3m AOD (Attraction)	65.5m AOD	<b>West Gateway Zone</b>
117m AOD	110.5m AOD	47.5m AOD
157m AOD (Attraction)		67m AOD
		111m AOD

Figure 7: Proposed Scenario A – Broadmead Road – South View

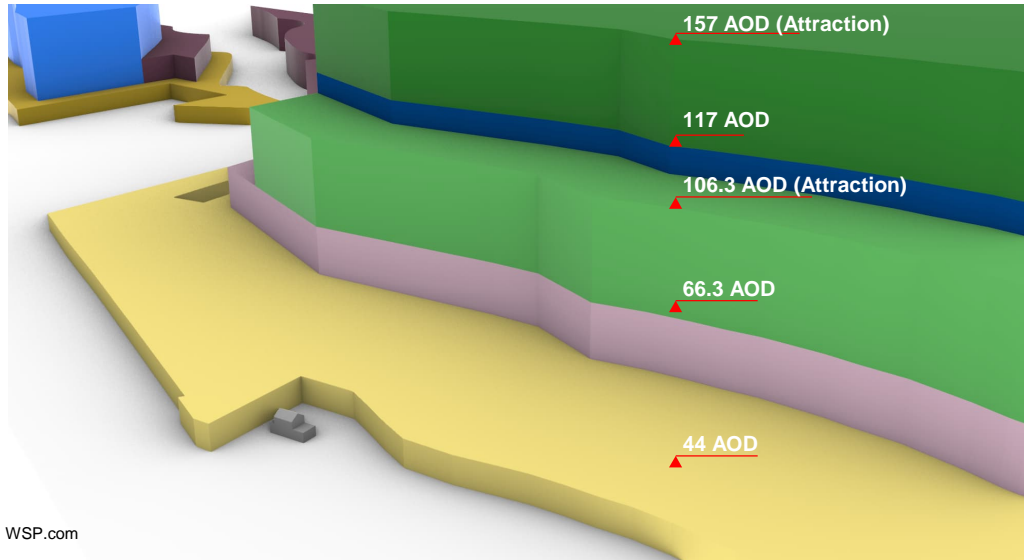


Figure 8: Proposed Scenario A– SE View

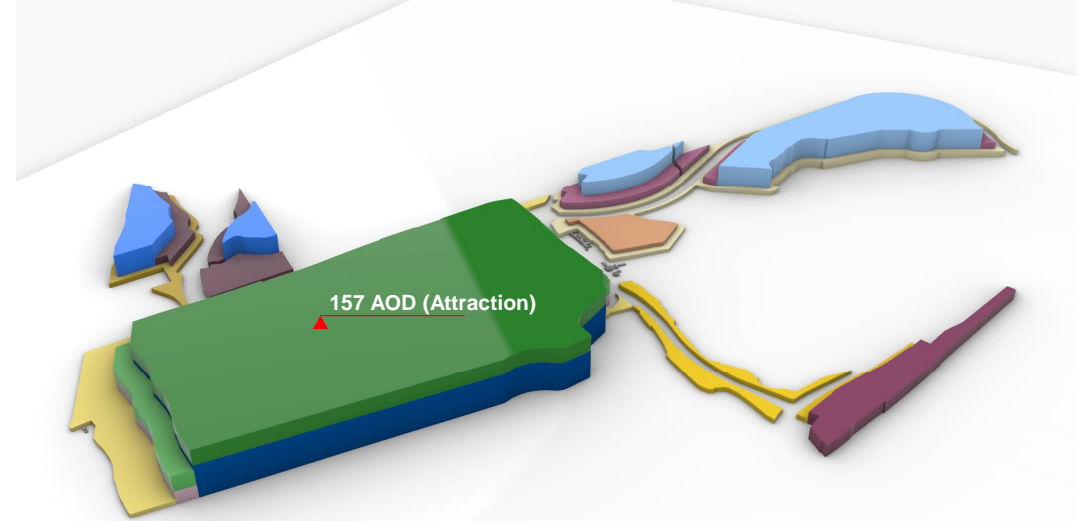
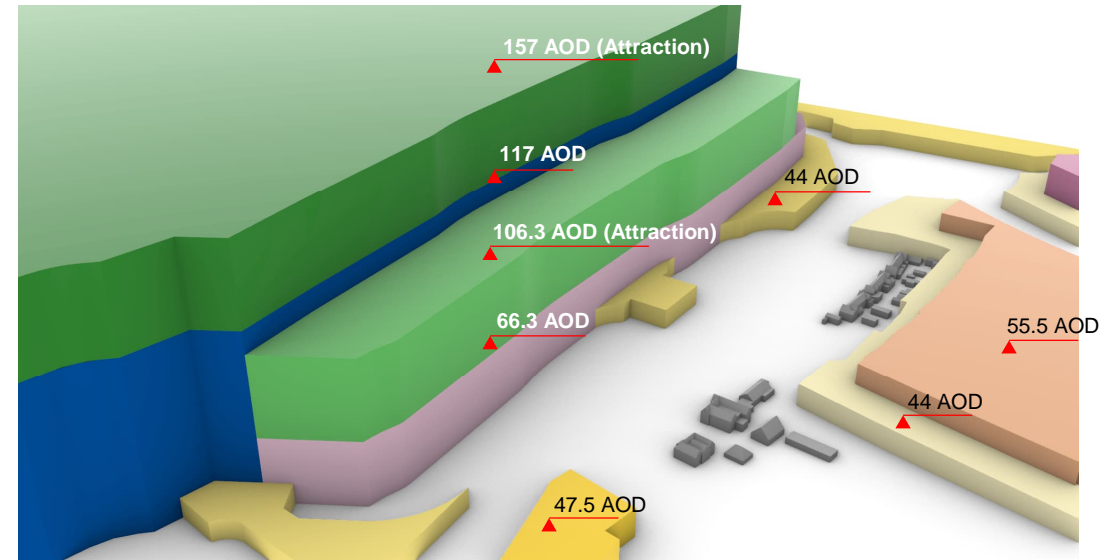


Figure 9: Proposed Scenario A – Manor Road – East View





# Assessment Model

**Proposed Scenario B – Maximum Height Parameters (without Attraction Overlay Zone)**

Core Zone	Lake Zone	East Gateway Zone
44m AOD	44m AOD	47.5m AOD
66.3m AOD	55.5m AOD	67.5m AOD
117m AOD	65.5m AOD	West Gateway Zone
	110.5m AOD	47.5m AOD
		67m AOD
		111m AOD

Figure 10: Proposed Scenario B – Broadmead Road – South View

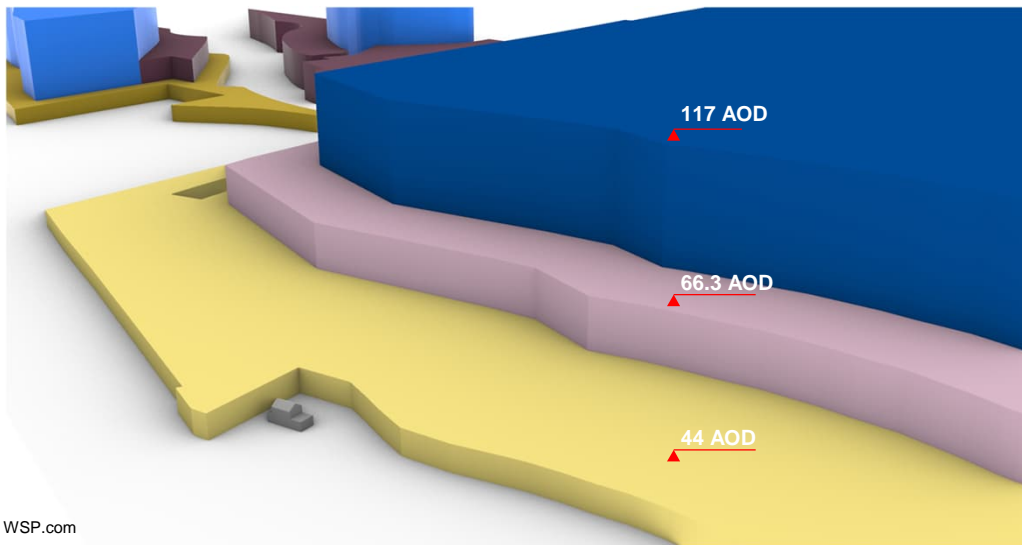


Figure 11: Proposed Scenario B – SE View

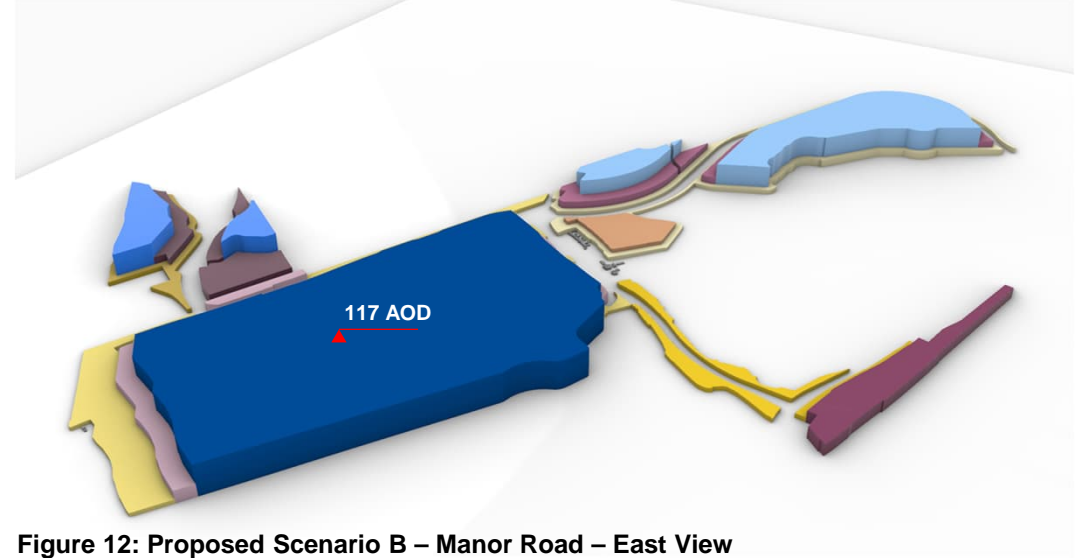
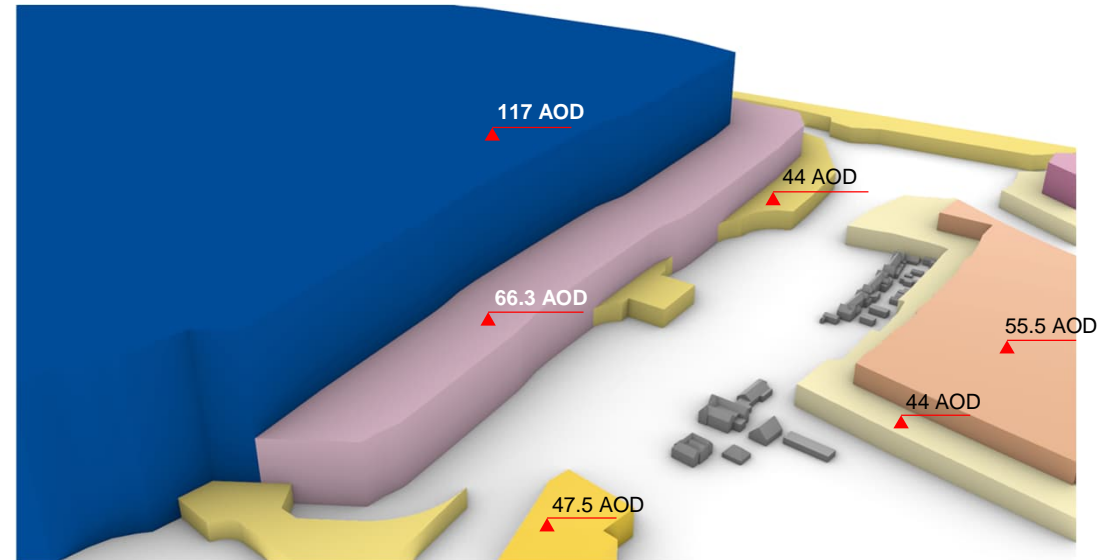


Figure 12: Proposed Scenario B – Manor Road – East View





# **DAYLIGHT, SUNLIGHT AND OVERSHADOWING (DSO)**

## **ASSESSMENT RESULTS**





# Assessment Results

## Proposed Scenario A: Daylight Impact – VSC

Table 6 presents the Vertical Sky Component (VSC) assessment results for the Proposed Scenario A – Maximum Height Parameters plus Full Attraction Overlay Zone. The VSC measures the amount of sky visible from the centre of a window, accounting for external obstructions. The table categorises the impact on daylight levels for windows as (Low), (Medium), and (High) as previously illustrated in Table 1.

### Daylight Impact Summary:

- **Meet BRE Criteria:** 29.7% of the assessed windows meet the BRE criteria, either by achieving a VSC of 27% or greater or by maintaining the reduction of the VSC within 0.8.
- **Below BRE Criteria:** 70.3% of the assessed windows have VSC levels below the BRE criteria, with 19.4% experiencing a **Medium** adverse impact and 49% experiencing a **High** adverse impact.
- The majority of windows do not meet the BRE criteria for daylight levels, indicating **Major Adverse** impact on daylight.

Table 6: VSC Results – Proposed Scenario A

Receptor	Windows	Meet BRE Criteria		Below BRE (Low)		Below BRE (Medium)		Below BRE (High)	
Name	Num	Num	%	Num	%	Num	%	Num	%
1 Manor Rd	9	0	0	0	0	0	0	9	100
2 Manor Rd	7	0	0	0	0	1	14.3	6	85.7
3 Manor Rd	6	0	0	0	0	2	33.3	4	66.7
4 Manor Rd	9	0	0	0	0	3	33.3	6	66.7
5 Manor Rd	7	0	0	0	0	3	42.9	4	57.1
6 Manor Rd	6	0	0	0	0	2	33.3	4	66.7
7 Manor Rd	8	0	0	0	0	4	50	4	50
8 Manor Rd	11	0	0	2	18.2	2	18.2	7	63.6
9 Manor Rd	8	0	0	1	12.5	1	12.5	6	75
10 Manor Rd	7	0	0	0	0	3	42.9	4	57.1
11 Manor Rd	9	0	0	0	0	5	55.6	4	44.4
12 Manor Rd	7	0	0	0	0	3	42.9	4	57.1
Eden Lodge	3	2	66.7	0	0	0	0	1	33.3
Moat House A	22	17	77.3	0	0	0	0	5	22.7
Moat House B	9	9	100	0	0	0	0	0	0
Askern House	21	16	76.2	0	0	0	0	5	23.8
Broadmead Rd	6	2	33.3	0	0	1	16.7	3	50
<b>Total</b>	<b>155</b>	<b>46</b>	<b>29.7</b>	<b>3</b>	<b>1.9</b>	<b>30</b>	<b>19.4</b>	<b>76</b>	<b>49</b>

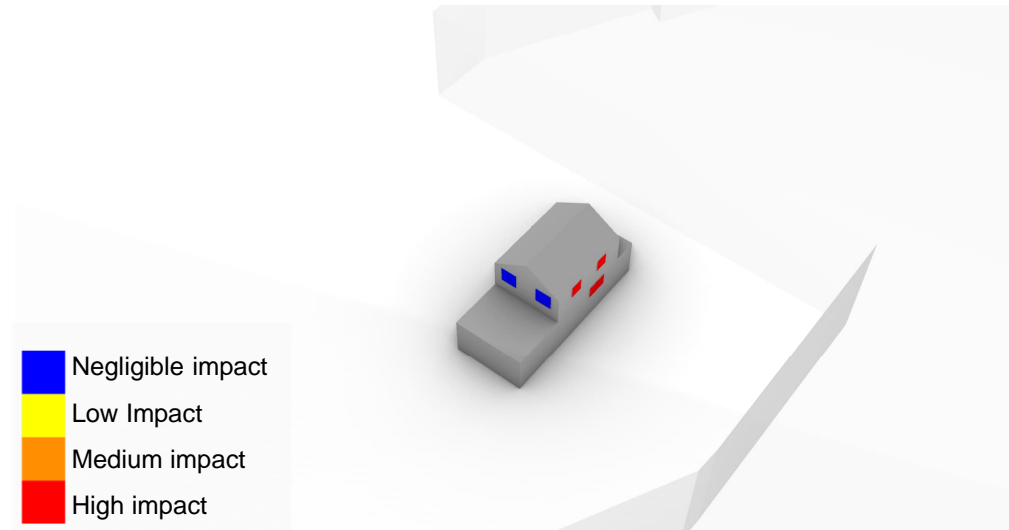


# Assessment Results

## Proposed Scenario A: Daylight Impact – VSC

Figures 13 to 15 provide visual representations of the VSC results for the assessed windows.

Figure 13: VSC Results for Broadmead Road Receptors – Rear Windows



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Figure 14: VSC Results for Manor Road Receptors – Rear Windows

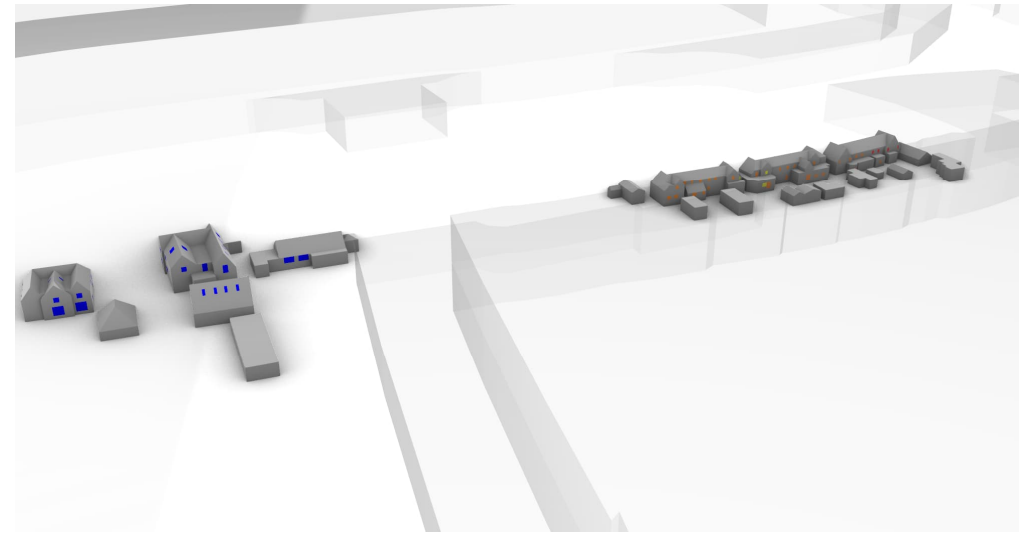
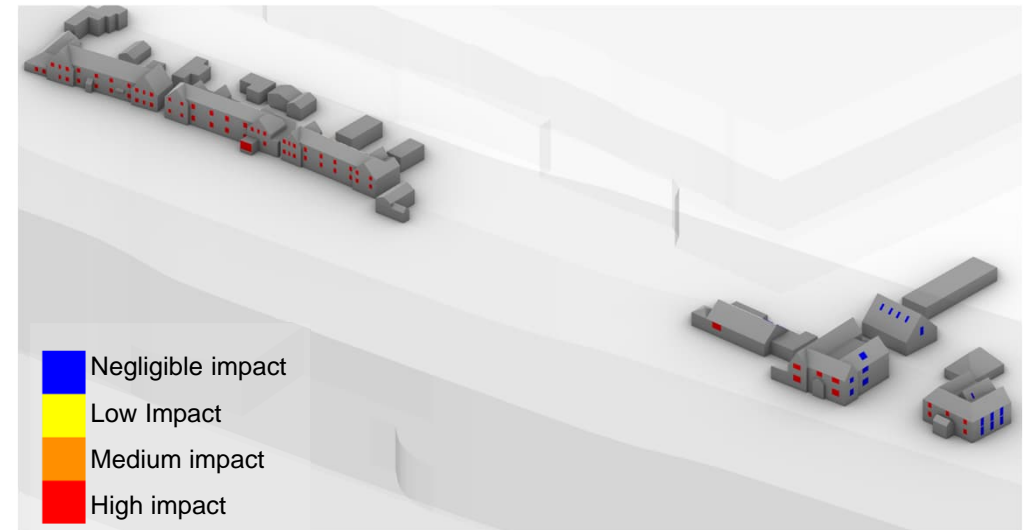


Figure 15: VSC Results for Manor Road Receptors – Front Windows





# Assessment Results

## Proposed Scenario A: Sunlight Impact – PSH (APSH + WPSH)

Table 7 shows the Probable Sunlight Hours (PSH) assessment results for windows facing within 90° due south. The PSH measures the proportion of the window that is sunlit for a period of time, and the table categorises the impact on sunlight levels for windows as (Low), (Medium), and (High) as previously illustrated in Table 2 and Table 3.

### Sunlight Impact Summary:

- **Meet BRE Criteria:** 78.4% of the assessed windows meet the BRE criteria, either by achieving an Annual Probable Sunlight Hours (APSH) of 25% or greater or by maintaining the reduction of the APSH within 0.8. Additionally, these windows also meet the Winter Probable Sunlight Hours (WPSH) criteria of at least 5%.
- **Below BRE Criteria:** 21.6% of the assessed windows have APSH levels below the BRE criteria, with all the affected windows experiencing a **High** adverse impact.
- The majority of windows meet the BRE criteria for sunlight levels, however, a significant portion of the windows experience a High adverse impact. Therefore, the overall impacts on sunlight is **Moderate Adverse**.

Table 7: PSH Results – Proposed Scenario A

Receptor	Windows	Meet BRE Criteria		Below BRE (Low)		Below BRE (Medium)		Below BRE (High)	
Name	Num	Num	%	Num	%	Num	%	Num	%
1 Manor Rd	7	5	71.4	0	0	0	0	2	28.6
2 Manor Rd	4	3	75	0	0	0	0	1	25
3 Manor Rd	4	1	25	0	0	0	0	3	75
4 Manor Rd	6	5	83.3	0	0	0	0	1	16.7
5 Manor Rd	4	4	100	0	0	0	0	0	0
6 Manor Rd	4	3	75	0	0	0	0	1	25
7 Manor Rd	4	1	25	0	0	0	0	3	75
8 Manor Rd	7	7	100	0	0	0	0	0	0
9 Manor Rd	6	6	100	0	0	0	0	0	0
10 Manor Rd	4	4	100	0	0	0	0	0	0
11 Manor Rd	4	2	50	0	0	0	0	2	50
12 Manor Rd	4	4	100	0	0	0	0	0	0
Eden Lodge	1	0	0	0	0	0	0	1	100
Moat House A	10	7	70	0	0	0	0	3	30
Moat House B	5	5	100	0	0	0	0	0	0
Askern House	12	10	83.3	0	0	0	0	2	16.7
Broadmead Rd	2	2	100	0	0	0	0	0	0
<b>Total</b>	<b>88</b>	<b>69</b>	<b>78.4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>19</b>	<b>21.6</b>

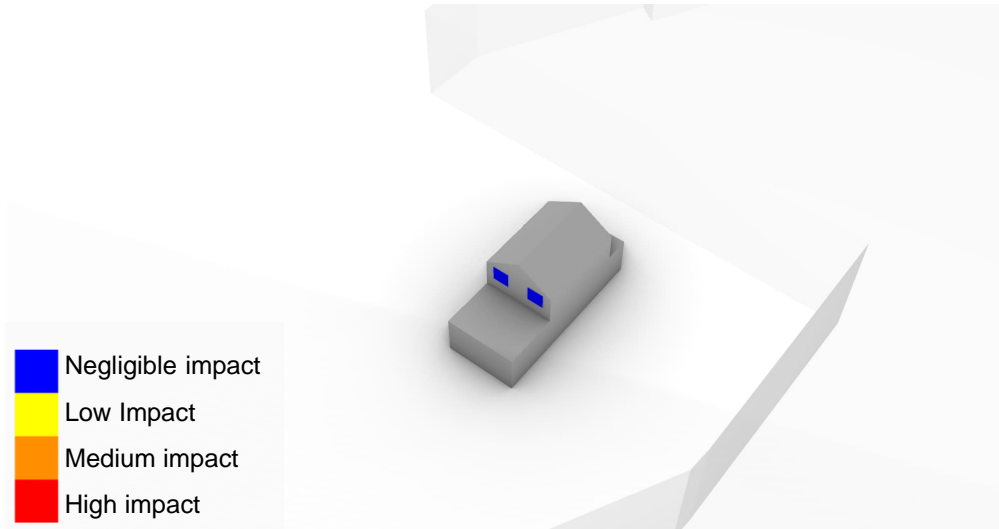


# Assessment Results

## Proposed Scenario A: Sunlight Impact – PSH (APSH + WPSH)

Figures 16 to 18 provide visual representations of the PSH results for the assessed south facing windows.

Figure 16: PSH Results for Broadmead Road Receptors – Rear Windows



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Figure 17: PSH Results for Manor Road Receptors – Rear Windows

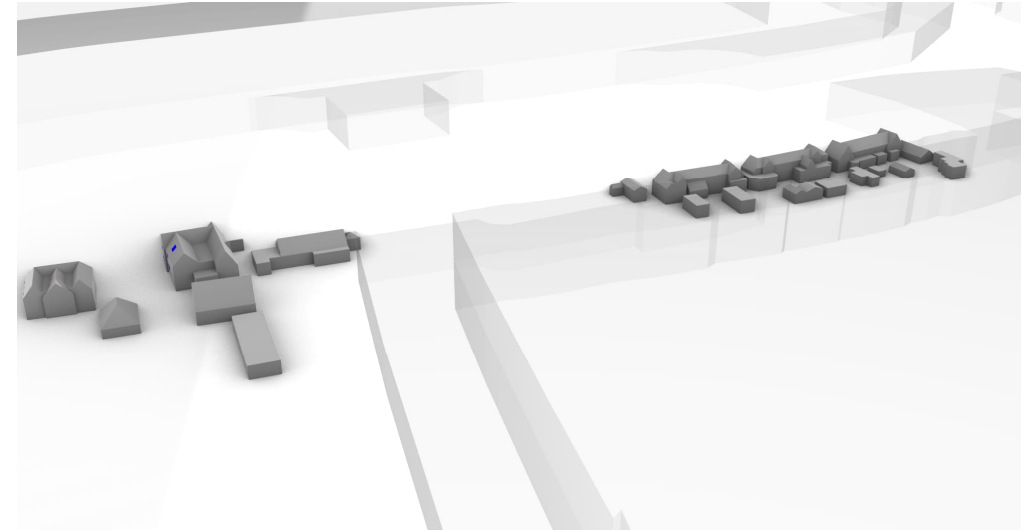
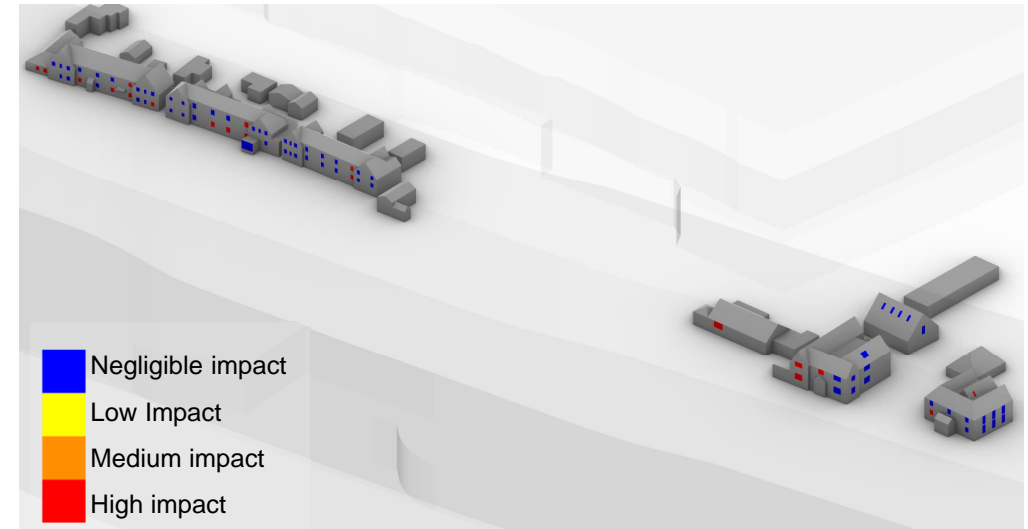


Figure 18: PSH Results for Manor Road Receptors – Front Windows





# Assessment Results

## Proposed Scenario A: Overshadowing of Open Spaces

Table 8 presents the overshadowing assessment results for gardens and open amenity spaces. The assessment indicates that the majority of the assessed gardens receive sufficient sunlight, meeting the BRE criteria either by having at least 50% of their area receive at least 2 hours of sunlight on the 21st of March or by maintaining a ratio of impact greater than 0.8.

### Overshadowing Impact Summary:

- **Meet BRE Criteria:** The majority of the assessed gardens and open amenity spaces meet the BRE criteria.
- **Below BRE Criteria:** Only 2 gardens fall below the BRE criteria i.e., 4 Manor Road, and 11 Manor Road.
- Overall, the overshadowing impact from the Proposed Scenario A is considered **Minor Adverse**.

Table 8: Overshadowing Impact Results – Proposed Scenario A

ID	Receptor	Baseline (%)	Proposed (%)	Ratio of Impact	BRE Compliance
1	1 Manor Rd	90.48	80.3	0.89	Above
2	2 Manor Rd	64.68	64.35	0.99	Above
3	3 Manor Rd	63.41	59.82	0.94	Above
4	4 Manor Rd	66.56	40.87	0.61	Below
5	5 Manor Rd	91.82	78.44	0.85	Above
6	6 Manor Rd	92.61	87.26	0.94	Above
7	7 Manor Rd	58.03	56.09	0.97	Above
8	8 Manor Rd	87.93	87.93	1	Above
9	9 Manor Rd	81.35	61.87	0.76	Above
10	10 Manor Rd	58.9	58.9	1	Above
11	11 Manor Rd	68.57	49.27	0.72	Below
12	12 Manor Rd	99.76	96.32	0.97	Above
13	Eden Lodge North	94.68	91.5	0.97	Above
14	Eden Lodge South	100	100	1	Above
15	Askern House	99.07	62	0.63	Above
16	Broadmead Rd	88.66	81.11	0.91	Above

# Assessment Results

## Proposed Scenario A: Overshadowing of Open Spaces

Figures 19 and 20 provide visual representations of the overshadowing impact results for the assessed gardens and open amenity spaces.

Figure 19: Overshadowing Impact Results - Manor Road

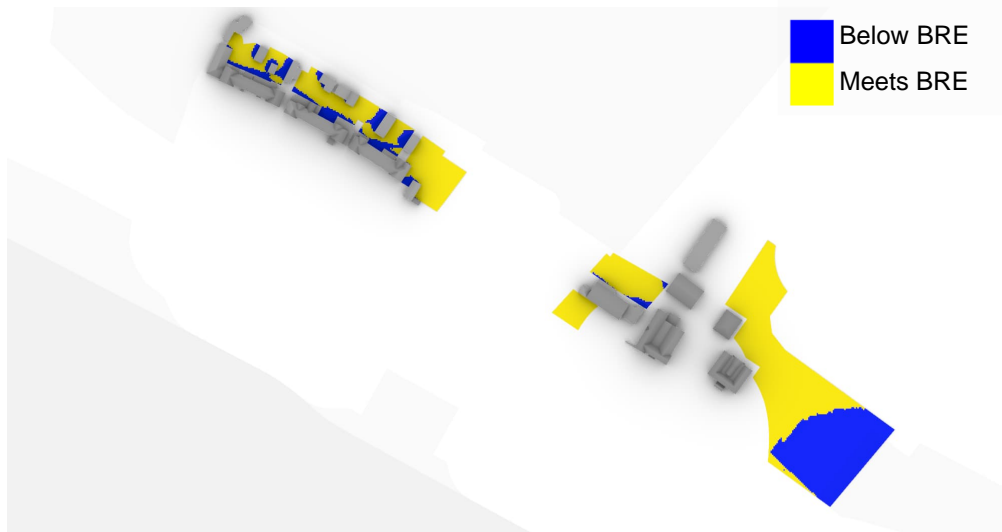
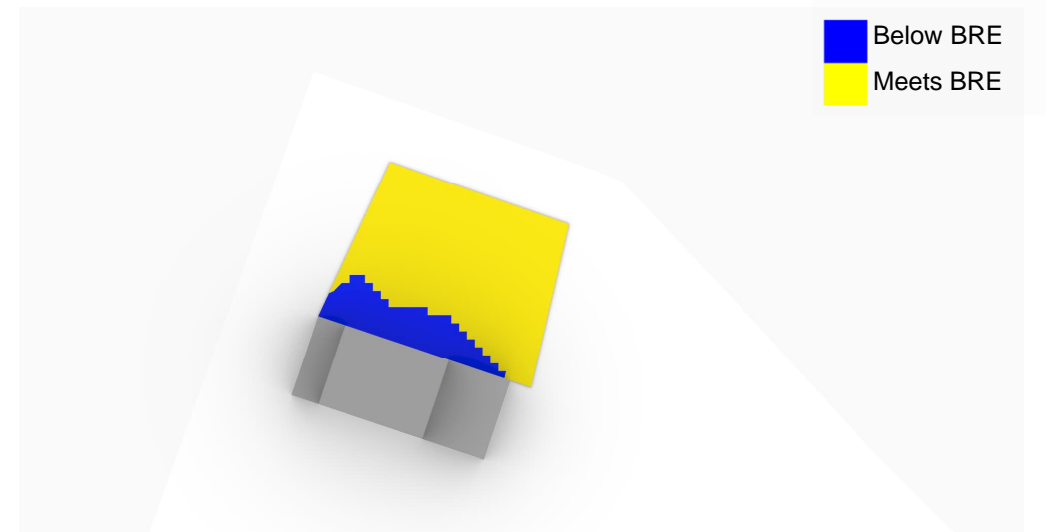


Figure 20: Overshadowing Impact Results - Broadmead Road





# Assessment Results

## Proposed Scenario A: Overview

The DSO evaluation of sensitive receptors for Proposed Scenario A – Maximum Height Parameters plus Full Attraction Overlay Zone showed a notable effect on daylight and sunlight at sensitive receptors.

**Daylight:** The findings highlight **Major Adverse** impact on daylight availability, as only 29.7% of windows comply with the BRE standards.

**Sunlight:** The sunlight evaluation indicates that 78.4% of windows satisfy the BRE criteria for Annual Probable Sunlight Hours (APSH) and Winter Probable Sunlight Hours (WPSH). However, a significant portion of the windows experience a High adverse impact. Therefore, the overall impacts on sunlight is **Moderate Adverse**.

**Overshadowing of Open Spaces:** Additionally, the overshadowing analysis shows that only two out of 16 assessed open amenity spaces experience a significant reduction in their access to sunlight. However, the remaining 14 spaces meet the BRE criteria. Overall, the overshadowing impact from the Proposed Scenario A is considered to be **Minor Adverse**.



# Assessment Results

## Proposed Scenario B: Daylight Impact – VSC

Table 9 presents the Vertical Sky Component (VSC) assessment results for the Proposed Scenario B – Maximum Height Parameters (without the Attraction Overlay Zone). The VSC measures the amount of sky visible from the centre of a window, accounting for external obstructions. The table categorises the impact on daylight levels for windows as (Low), (Medium), and (High) as previously illustrated in Table 1.

### Daylight Impact Summary:

- **Meet BRE Criteria:** 30.3% of the assessed windows meet the BRE criteria, either by achieving a VSC of at least 27% or by maintaining the reduction of the VSC within 0.8.
- **Below BRE Criteria:** 69.7% of the assessed windows have VSC levels below the BRE criteria, with 58.7% experiencing a **Medium** adverse impact and 9.7% experiencing a **High** adverse impact.
- The majority of windows do not meet the BRE criteria for daylight, indicating **Major Adverse** impacts on daylight levels of the sensitive receptors.

Table 9: VSC Results – Proposed Scenario B

Receptor	Windows	Meet BRE Criteria		Below BRE (Low)		Below BRE (Medium)		Below BRE (High)	
Name	Num	Num	%	Num	%	Num	%	Num	%
1 Manor Rd	9	0	0	0	0	0	0	9	100
2 Manor Rd	7	0	0	0	0	4	57.1	3	42.9
3 Manor Rd	6	0	0	0	0	6	100	0	0
4 Manor Rd	9	0	0	0	0	9	100	0	0
5 Manor Rd	7	0	0	0	0	7	100	0	0
6 Manor Rd	6	0	0	0	0	6	100	0	0
7 Manor Rd	8	0	0	0	0	7	87.5	1	12.5
8 Manor Rd	11	0	0	1	9.1	10	90.9	0	0
9 Manor Rd	8	1	12.5	1	12.5	6	75	0	0
10 Manor Rd	7	0	0	0	0	7	100	0	0
11 Manor Rd	9	0	0	0	0	9	100	0	0
12 Manor Rd	7	0	0	0	0	7	100	0	0
Eden Lodge	3	2	66.7	0	0	1	33.3	0	0
Moat House A	22	17	77.3	0	0	3	13.6	2	9.1
Moat House B	9	9	100	0	0	0	0	0	0
Askern House	21	16	76.2	0	0	5	23.8	0	0
Broadmead Rd	6	2	33.3	0	0	4	66.7	0	0
<b>Total</b>	<b>155</b>	<b>47</b>	<b>30.3</b>	<b>2</b>	<b>1.3</b>	<b>91</b>	<b>58.7</b>	<b>15</b>	<b>9.7</b>



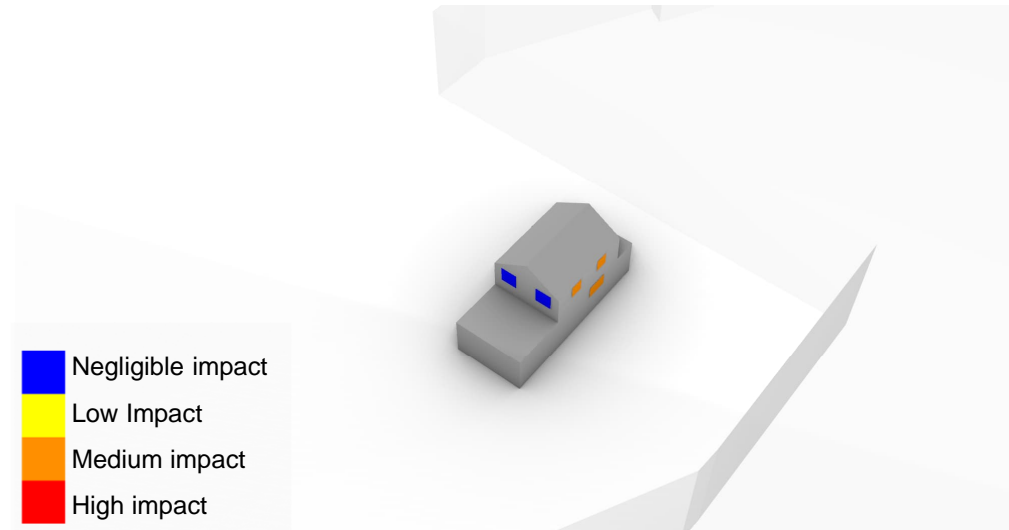


# Assessment Results

## Proposed Scenario B: Daylight Impact – VSC

Figures 21 to 23 provide visual representations of the VSC results for the assessed windows.

Figure 21: VSC Results for Broadmead Road Receptors – Rear Windows



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Figure 22: VSC Results for Manor Road Receptors – Rear Windows

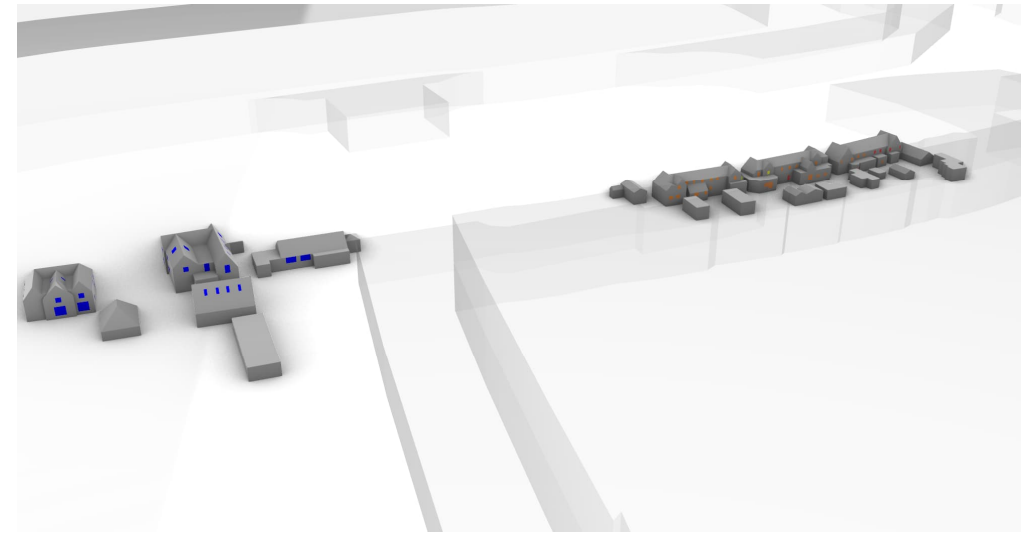
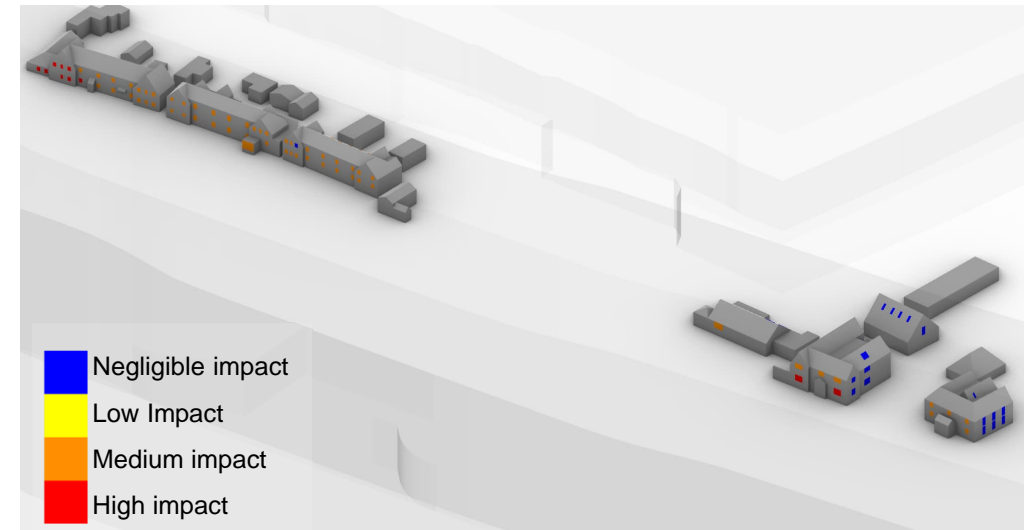


Figure 23: VSC Results for Manor Road Receptors – Front Windows





# Assessment Results

## Proposed Scenario B: Sunlight Impact – PSH (APSH + WPSH)

Table 10 presents the Probable Sunlight Hours (PSH) assessment results for the Proposed Scenario B – Maximum Height Parameters. The PSH measures the proportion of the window that is sunlit for a period of time, and the table categorises the impact on sunlight levels for windows as (Low), (Medium), and (High) as previously illustrated in Table 2 and Table 3.

### Sunlight Impact Summary:

- **Meet BRE Criteria:** 98.9% of the assessed windows meet the BRE criteria, either by achieving an Annual Probable Sunlight Hours (APSH) of at least 25% or by maintaining the reduction of the APSH within 0.8. Additionally, these windows also meet the Winter Probable Sunlight Hours (WPSH) criteria of at least 5%.
- **Below BRE Criteria:** 1.1% of the assessed windows have PSH levels below the BRE criteria and is considered to have a **High** adverse impact from the Proposed Development.
- The vast majority of windows meet the BRE criteria for sunlight levels, indicating an overall **Minor Adverse** impact on sunlight for the dwellings on Manor Road and Broadmead Road.

Table 10: PSH Results – Proposed Scenario B

Receptor	Windows	Meet BRE Criteria		Below BRE (Low)		Below BRE (Medium)		Below BRE (High)	
Name	Num	Num	%	Num	%	Num	%	Num	%
1 Manor Rd	7	7	100	0	0	0	0	0	0
2 Manor Rd	4	4	100	0	0	0	0	0	0
3 Manor Rd	4	4	100	0	0	0	0	0	0
4 Manor Rd	6	6	100	0	0	0	0	0	0
5 Manor Rd	4	4	100	0	0	0	0	0	0
6 Manor Rd	4	4	100	0	0	0	0	0	0
7 Manor Rd	4	3	75	0	0	0	0	1	25
8 Manor Rd	7	7	100	0	0	0	0	0	0
9 Manor Rd	6	6	100	0	0	0	0	0	0
10 Manor Rd	4	4	100	0	0	0	0	0	0
11 Manor Rd	4	4	100	0	0	0	0	0	0
12 Manor Rd	4	4	100	0	0	0	0	0	0
Eden Lodge	1	1	100	0	0	0	0	0	0
Moat House A	10	10	100	0	0	0	0	0	0
Moat House B	5	5	100	0	0	0	0	0	0
Askern House	12	12	100	0	0	0	0	0	0
Broadmead Rd	2	2	100	0	0	0	0	0	0
<b>Total</b>	<b>88</b>	<b>87</b>	<b>98.9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1.1</b>

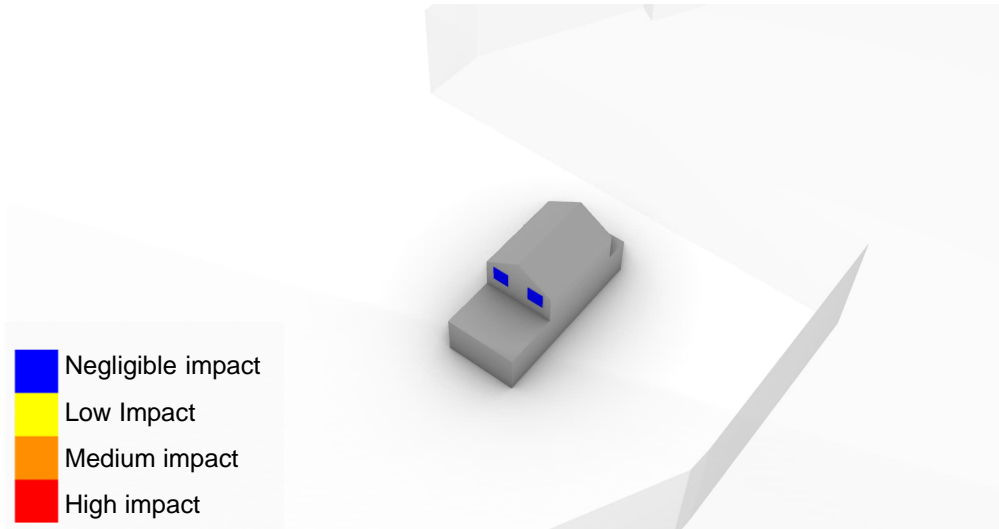


# Assessment Results

**Proposed Scenario B: Sunlight Impact – PSH (APSH + WPSH)**

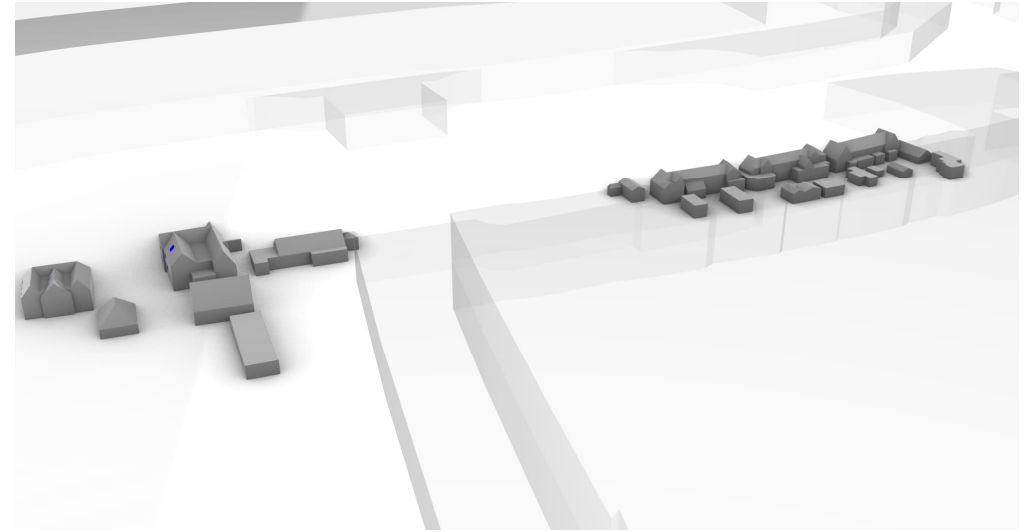
**Figures 24 to 26** provide visual representations of the PSH results for the assessed south facing windows.

**Figure 24: PSH Results for Broadmead Road Receptors – Rear Windows**

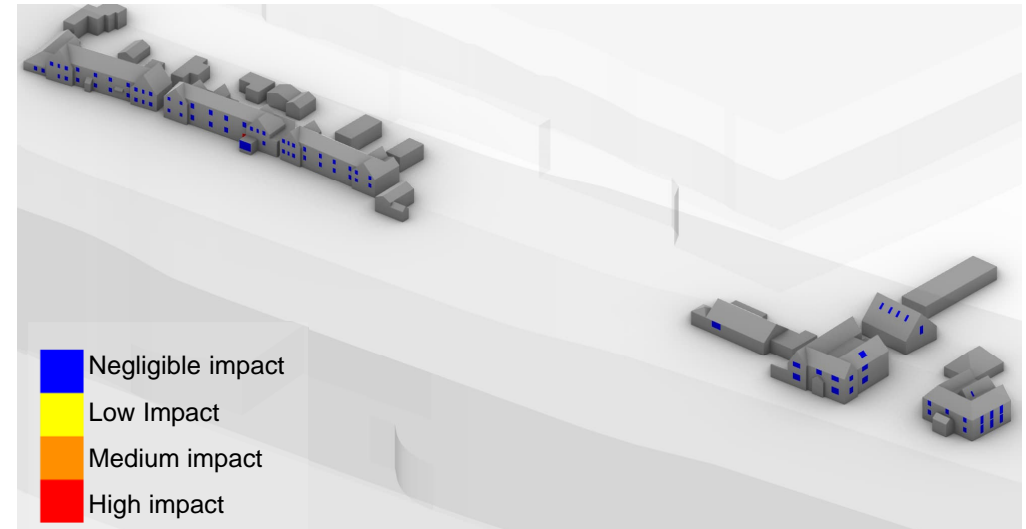


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**Figure 25: PSH Results for Manor Road Receptors – Rear Windows**



**Figure 26: PSH Results for Manor Road Receptors – Front Windows**





# Assessment Results

## Proposed Scenario B: Overshadowing of Open Spaces

Table 11 shows the overshadowing assessment results for gardens and open amenity spaces. The assessment indicates that all the assessed gardens receive sufficient sunlight, meeting the BRE criteria by either having at least 50% of their area receive at least 2 hours of sunlight on the 21st of March or by maintaining a ratio of impact greater than 0.8.

### Overshadowing Impact Summary:

- **Meet BRE Criteria:** All the assessed gardens and open amenity spaces meet the BRE criteria.
- **Ratio of Impact:** The ratio of impact ranges from 0.91 to 1, indicating that the Proposed Development has a **Negligible** impact on the overshadowing of these spaces.

Table 11: Overshadowing Impact Results – Proposed Scenario B

ID	Receptor	Baseline (%)	Proposed (%)	Ratio of Impact	BRE Compliance
1	1 Manor Rd	90.48	87.94	0.97	Above
2	2 Manor Rd	64.68	64.35	0.99	Above
3	3 Manor Rd	63.41	63.41	1	Above
4	4 Manor Rd	66.56	65.66	0.99	Above
5	5 Manor Rd	91.82	89.39	0.97	Above
6	6 Manor Rd	92.61	89.65	0.97	Above
7	7 Manor Rd	58.03	56.6	0.98	Above
8	8 Manor Rd	87.93	87.93	1	Above
9	9 Manor Rd	81.35	76.22	0.94	Above
10	10 Manor Rd	58.9	58.9	1	Above
11	11 Manor Rd	68.57	65.56	0.96	Above
12	12 Manor Rd	99.76	98.52	0.99	Above
13	Eden Lodge North	94.68	94.68	1	Above
14	Eden Lodge South	100	100	1	Above
15	Askern House	99.07	79.48	0.8	Above
16	Broadmead Rd	88.66	81.11	0.91	Above



# Assessment Results

## Proposed Scenario B: Overshadowing of Open Spaces

Figures 27 and 28 provide visual representations of the overshadowing impact results for the assessed gardens and open amenity spaces.

Figure 27: Overshadowing Impact Results - Manor Road

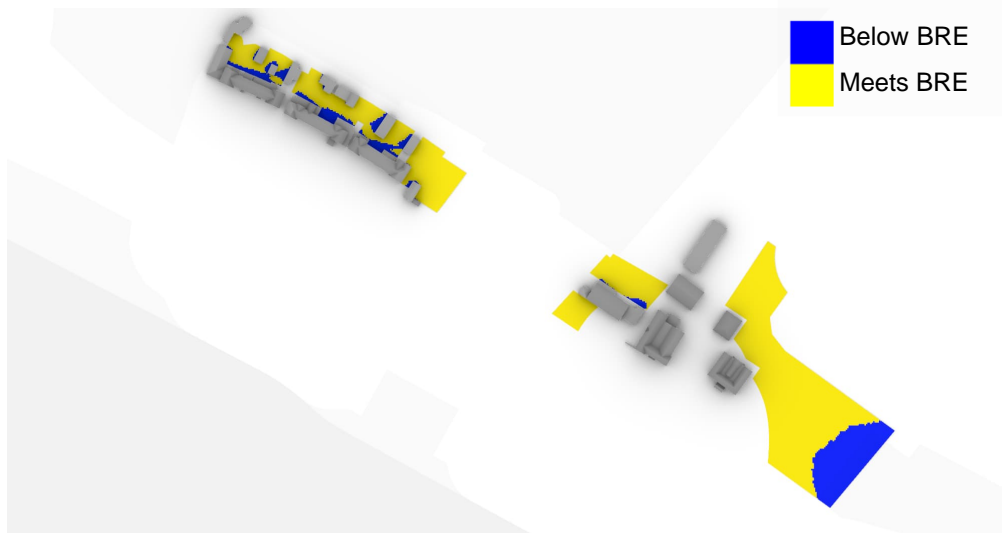
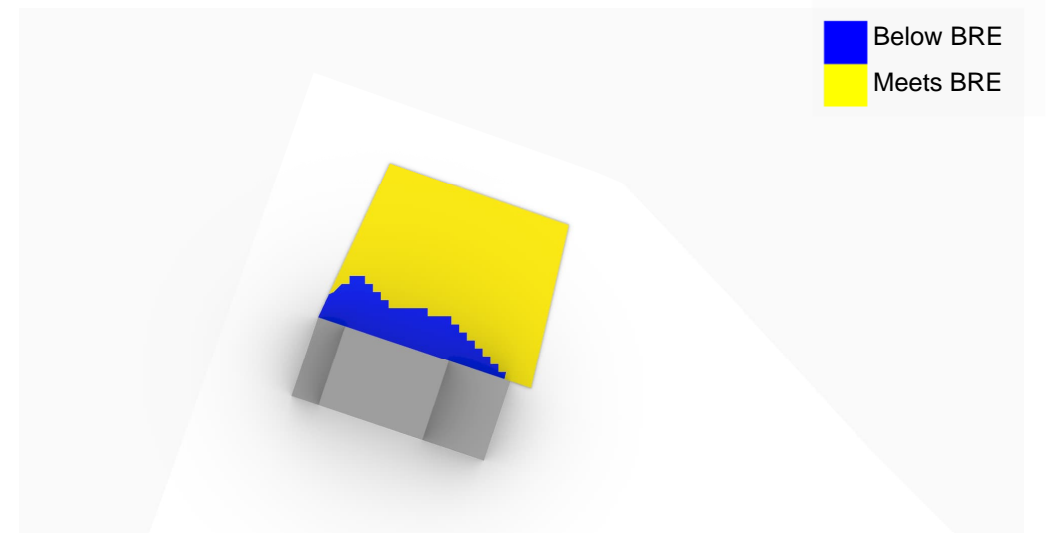


Figure 28: Overshadowing Impact Results - Broadmead Road





# Assessment Results

## Proposed Scenario B: Overview

The DSO evaluation of sensitive receptors for Proposed Scenario B – Maximum Height Parameters showed an improvement over Proposed Scenario A, particularly in relation to the sunlight and overshadowing results.

**Daylight:** The findings identify **Major Adverse** impacts on daylight availability, as only 30.3% of windows comply with the BRE standards.

**Sunlight:** Conversely, the sunlight evaluation indicates that 98.9% of windows satisfy the BRE criteria for Annual Probable Sunlight Hours (APSH) and Winter Probable Sunlight Hours (WPSH), indicating a **Minor Adverse** impact on sunlight access for the windows.

**Overshadowing of Open Spaces:** Additionally, the overshadowing analysis indicate that all assessed gardens and open amenity spaces meet the BRE standards, resulting in a **Negligible** impact on overshadowing.



# Assessment Results

## Assessment Insights and Discussion

The DSO assessment of sensitive receptors for Proposed Scenario A – Maximum Height Parameters plus Attraction Overlay Zone, and Proposed Scenario B –Maximum Height Parameters (without Attraction Overlay Zone) show some differences on the level of impact on daylight and sunlight between the two scenarios, particularly in relation to sunlight and overshadowing.

### Comparison of Proposed Scenario A and Proposed Scenario B Results:

**Daylight Impact:** In Proposed Scenario A, only 29.7% of the assessed windows meet the BRE criteria for daylight levels, indicating **Major Adverse** impacts on daylight for the dwellings on Manor Road and Broadmead Road. Proposed Scenario B showed a slight improvement, with 30.3% of the assessed windows meeting the BRE criteria, however the overall impact of this Scenario remain **Major Adverse**. It should be noted however that the level of impact does reduce between the scenarios with 49% of windows in Proposed Scenario A experiencing a high impact, while only 9.7% experience a high impact in Proposed Scenario B.

**Sunlight Impact:** Proposed Scenario A indicates that 78.4% of the assessed windows meet the BRE criteria for Annual Probable Sunlight Hours (APSH) and Winter Probable Sunlight Hours (WPSH), indicating **Moderate Adverse** impacts on sunlight levels. Proposed Scenario B shows a notable improvement, with 98.9% of the assessed windows meeting the BRE criteria and indicating a **Minor Adverse** impact. This demonstrates that Proposed Scenario B has a much lower impact on sunlight levels compared to Proposed Scenario A.

**Overshadowing Impact:** In Proposed Scenario A, most of the assessed gardens and open amenity spaces meet the BRE criteria, but two properties experience significant overshadowing, indicating an overall **Minor Adverse** impact. Proposed Scenario B, on the other hand, shows that all the assessed gardens and open amenity spaces meet the BRE criteria, indicating **Negligible** impact on overshadowing.

### Open Sky Concept Articulated Skyline Standard

As noted in the Methodology section above, it is important to recognise that the Open Sky Concept Articulated Skyline standard is not able to be applied in either assessment scenario. The Open Sky Concept Articulated Skyline standard requires variety in building and structure heights; incorporating diverse architectural elements including varied forms, spacing and setbacks; and ensuring that the skyline design responds to the surrounding context.

The Open Sky standard limits the extent of the Site that can be developed by Low, Medium, Tall and Maximum Height (see Paragraph 2.2.10 of **Chapter 2: Description of the Proposed Development (Volume 1)**). For example, only 3% of the Core Zone may have Maximum Height structures, with no more than 0.2 hectares of any structure extending beyond 75m and each Maximum Height structure being a minimum 20 metres from any other Maximum Height structure. As such the scenarios considered in this assessment are highly conservative, meaning that the effects identified are also likely to be highly conservative.

This is particularly the case for Proposed Scenario A which assumes that the area covered by the Attraction Overlay Zone is covered in one structure of uniform height at the highest possible level (i.e. 115m AGL/157m AOD). When, in reality, the Attraction Overlay Zone only allows for an additional 40m of development height for non-occupiable or non-habitable components such as ride tracks and architectural or ornamental features. Such components would therefore be highly limited in extent and would therefore only have a limited effect on daylight and sunlight.



# DSO

## ASSESSMENT CONCLUSION





# Summary and Conclusions

A DSO assessment was conducted to evaluate the potential impacts of the Proposed Development on the surrounding sensitive receptors. The assessment considered 3 scenarios: Baseline Scenario, Proposed Scenario A – Maximum Height Parameters plus Full Attraction Overlay Zone, and Proposed Scenario B – Maximum Height Parameters.

The scenarios are highly conservative and exceed the cautious worst-case scenario that has otherwise been assessed in the ES, as they do not allow for the Open Sky Concept Articulated Skyline standard. For example, the Open Sky Concept Articulated Skyline standard limits maximum height structures to 3% of the Core Zone, while the assessment has assumed that 100% of the Core Zone would be developed to the maximum height. It is further noted that Universal already owns IDs 1, 2, 3, 4 and 5 and, should a planning permission be granted, will not be using these units for residential use.

## Daylight Impact:

The assessment showed **Major Adverse** impacts on daylight availability for both proposed scenarios when assessed against the Baseline Scenario. In Proposed Scenario A, only 29.7% of the assessed windows met the BRE criteria, indicating a decrease in daylight levels for many windows. Proposed Scenario B showed a slight improvement, with 30.3% of the assessed windows meeting the BRE criteria. While it is recognised that the scenarios are highly conservative, an optimisation study has been undertaken (see **Annex 1**) to identify how effects can be reduced through detailed design.

## Sunlight Impact:

The sunlight assessment indicated that Proposed Scenario A had **Moderate Adverse** impacts on sunlight levels, with 78.4% of the assessed windows meeting the BRE criteria for Annual Probable Sunlight Hours (APSH) and Winter Probable Sunlight Hours (WPSH). Proposed Scenario B showed a **Minor Adverse** impact with 98.9% of the assessed windows meeting the BRE criteria, suggesting that Proposed Scenario B has a much lower impact on sunlight levels compared to Proposed Scenario A.

## Overshadowing Impact:

The overshadowing assessment demonstrated that while most gardens and open amenity spaces in Proposed Scenario A met the BRE criteria, two properties experienced significant overshadowing indicating an overall **Minor Adverse** impact. In Proposed Scenario B, all the assessed gardens and open amenity spaces met the BRE criteria, indicating **Negligible** impact on overshadowing.

## Conclusions:

The assessment concludes that both proposed scenarios would have a **Major Adverse** impact on daylight on the existing neighbouring windows.

The impact on sunlight is **Moderate Adverse** in Proposed Scenario A, and **Minor Adverse** in Scenario B.

The impact on overshadowing is **Minor Adverse** in Proposed Scenario A, and **Negligible** in Scenario B.

It is important to note that these findings are based on highly conservative scenarios that do not allow for the Open Sky Concept Articulated Skyline standard and overly conservative approach to the Attraction Overlay Zone.

However, an optimisation study has been undertaken (see **Annex 1**) to identify how effects can be reduced through the detailed design process should the receptors still be in residential use at the time of development.



# **ANNEX 1**

## **OPTIMISATION**



# Optimisation

As highlighted in the report, the suggested scenarios are highly conservative, showing potential significant effects on the daylight at nearby sensitive receptors.

The optimisation process is applied using Proposed Scenario A, as a cautious worst case scenario. As with the Proposed Scenario A assessment above, the optimisation study does not take the Open Sky Concept Articulated Skyline standard into account. Therefore, this optimisation study remains highly conservative but provides an indication of the potential absolute maximum optimisation.

The study intends to determine the minimum advisable distance between the windows of these receptors and the massing of the Proposed Development so long as they remain in residential use. This analysis employs the Obstruction Angle (25°) method as outlined in the Methodology section of this report.

The window with the lowest VSC results from the Manor Road receptors has been selected for this exercise (ID 1), along with one window located at the rear of these receptors (also on ID 1). However, it should be noted that Universal already owns IDs 1, 2, 3, 4 and 5 and, should a planning permission be granted, will not be using these units for residential use.

Additionally, the rear window for the receptor on Broadmead Road has been tested.

This study is a simple 2D exercise and does not account for obstructions either side of the obstruction facing the window. The study has been used to identify when a full 3D VSC assessment should be undertaken.



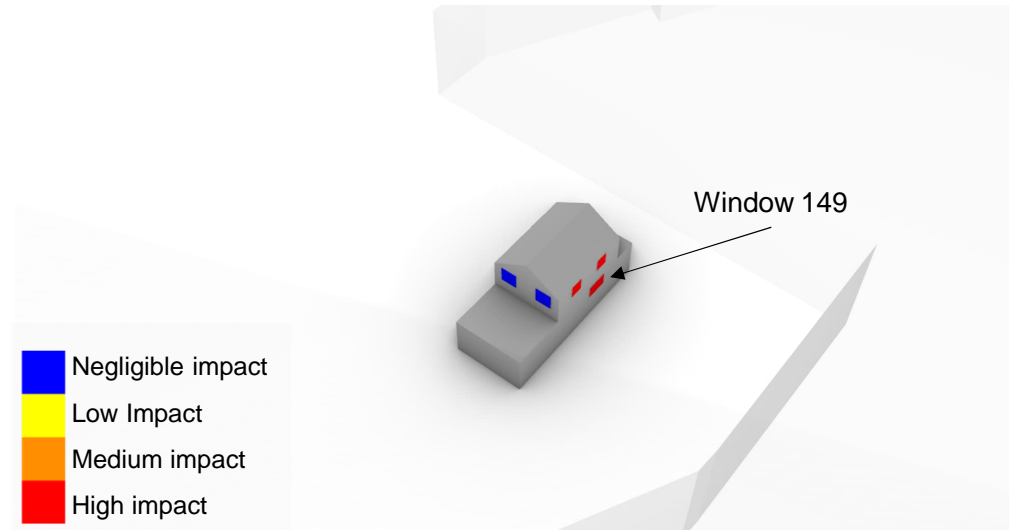
# Optimisation

## Proposed Scenario A (before optimisation) : Daylight Impact – VSC

The images highlight the windows with the worst VSC results in Proposed Scenario A, which are used in this optimisation exercise. They are:

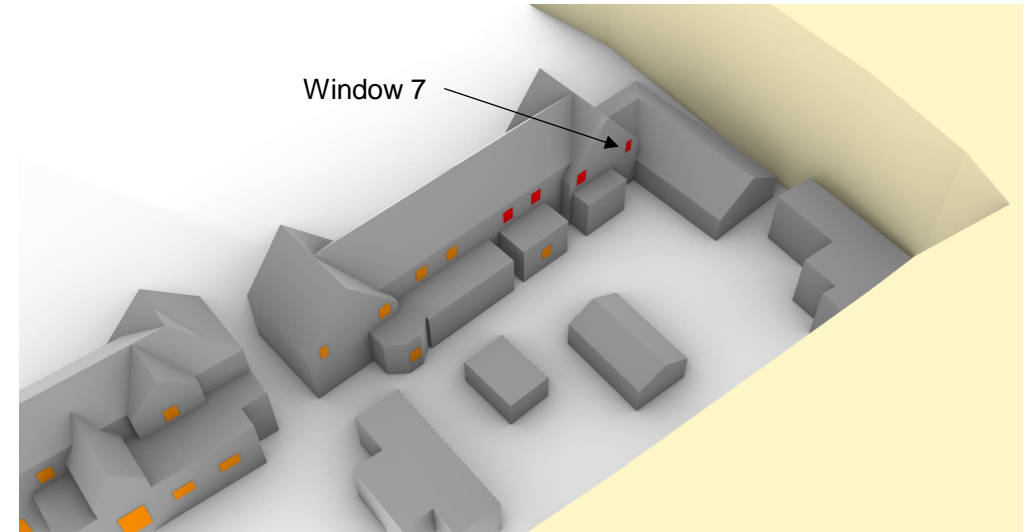
- Window no. 1 – located in 1 Manor Road (owned by Universal)
- Window no. 7 – located in 1 Manor Road (owned by Universal)
- Window no. 149 – located in Broadmead Road

### VSC Results for Broadmead Road Receptors – Rear Windows

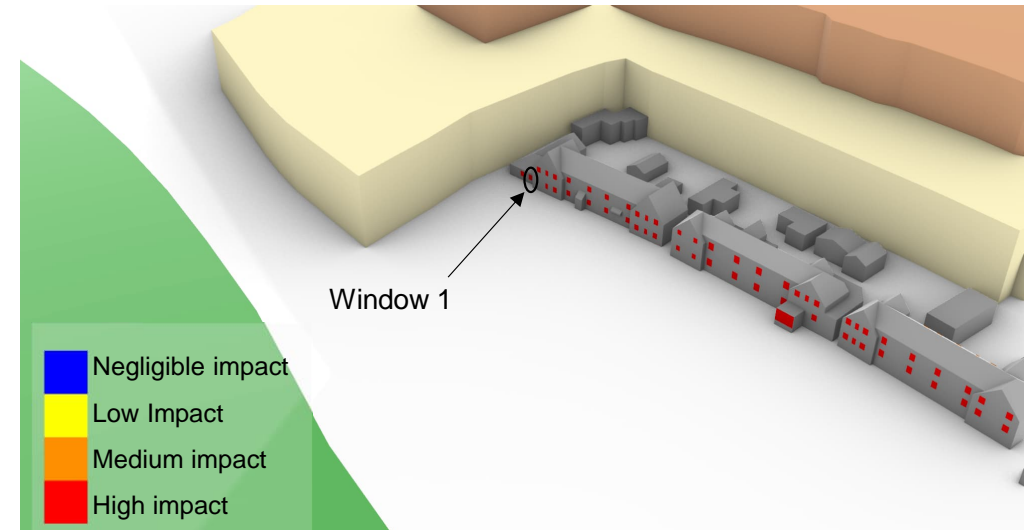


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### VSC Results for Manor Road Receptors – Rear Windows



### VSC Results for Manor Road Receptors – Front Windows








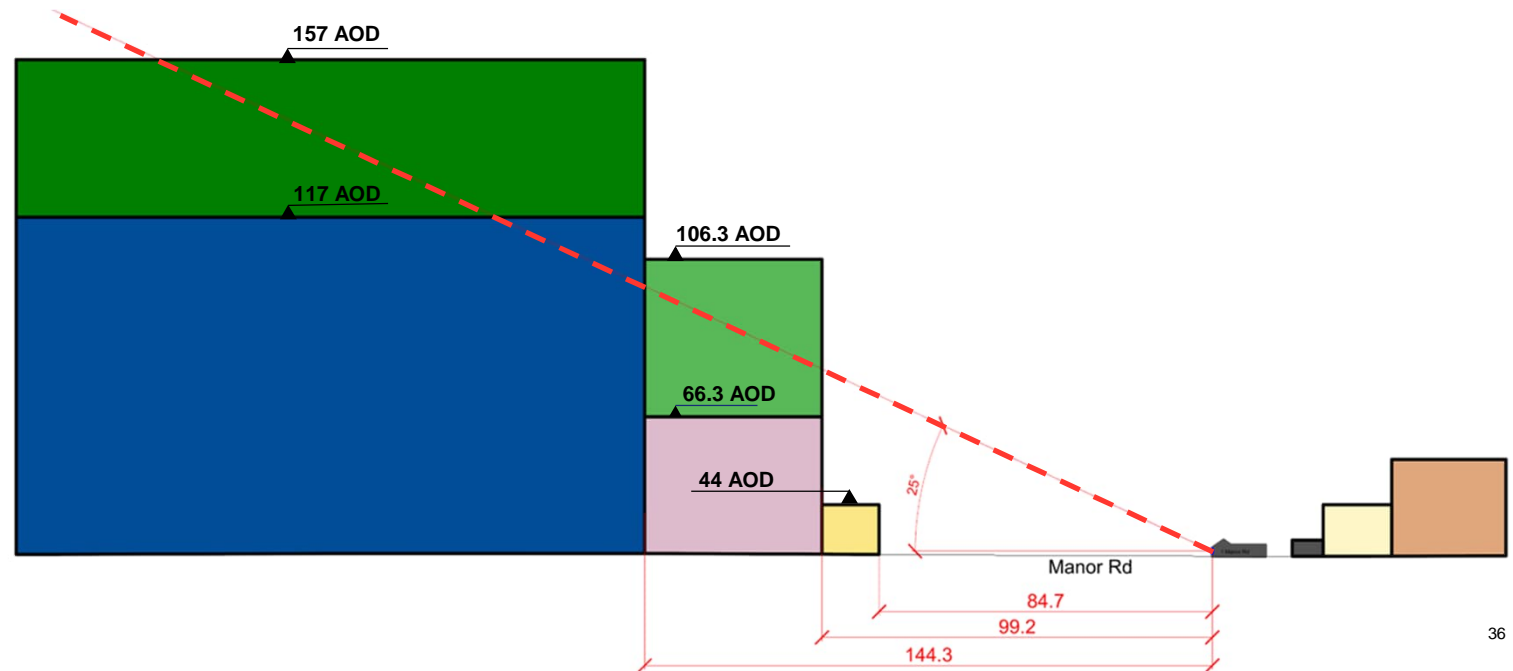


# Optimisation

## Proposed Scenario A (before optimisation) - Window No. 1 – located at 1 Manor Road (owned by Universal)

The following section illustrates the 25° angle from Window No. 1, which is situated at 1 Manor Road. This serves as a reference to cutback the Proposed Development Proposed Scenario A, or to change the heights accordingly.

Core Zone	Proposed max. Height	Distance From Receptor (m)
	44m AOD	84.7
	66.3m AOD	99.2
	106.3m AOD (Attraction)	99.2
	117m AOD	144.3
	157m AOD (Attraction)	144.3





# Optimisation

## Optimised Proposed Scenario A - Window No. 1 – located at 1 Manor Road (owned by Universal)

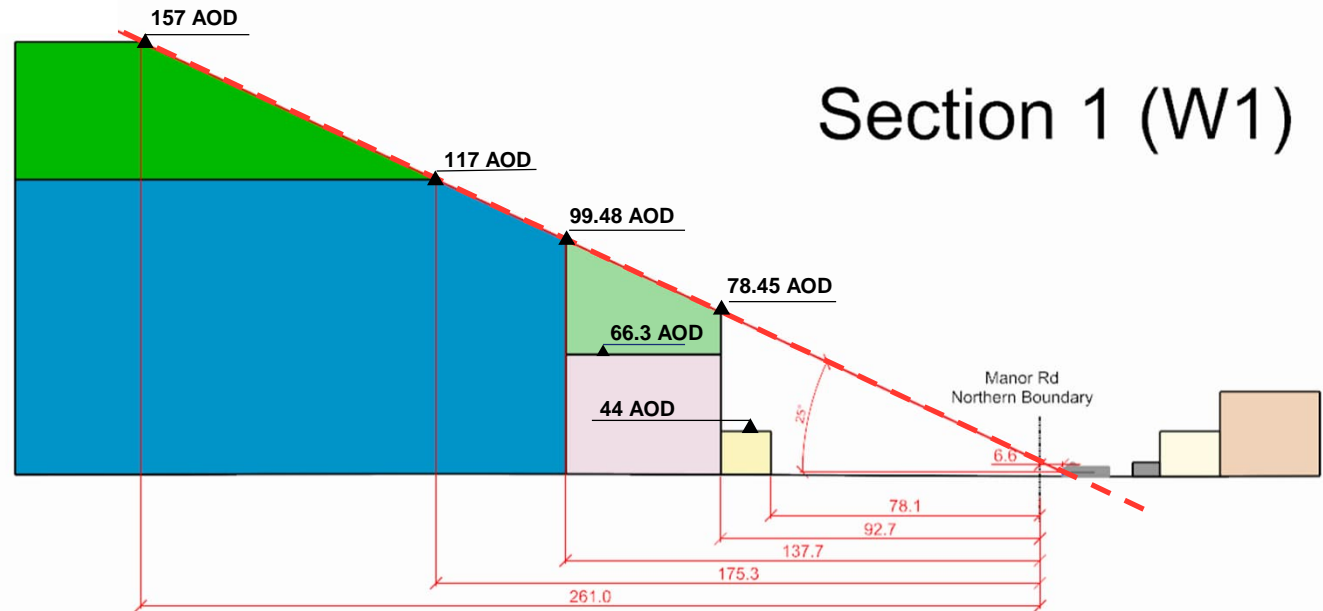
Following the obstruction angle simplified method the massing heights would need to be reduced to become within the 25° angle line as shown in the diagram below to achieve suitable daylight levels. The distances shown below are based on the northern edge of the existing adopted boundary of Manor Road, to provide a fixed reference point to determine the requirement for when and where a further detailed assessment is needed. The following land use limitation is therefore proposed in relation to development of the Core Zone and the residential properties on Manor Road:

*A Vertical Sky Component Assessment shall be undertaken and submitted as part of the Compliance Statement for the Core Zone during the post-consent design approval process for the relevant part of the development where: (a) a building or structure, as applicable, comes forth within the column B distance from any dwelling on Manor Road within ERC Expansion Area A, B or C, (b) the dwelling is not owned by Universal and is still being occupied or otherwise still available for residential use, and (c) the building or structure in the Core Zone will exceed the height in column A of the table below.*

The assessment should demonstrate that suitable daylight and sunlight levels will be maintained within such dwelling in accordance with the most recent BRE guidance, to the extent that suitable levels can be achieved and factoring in the dwelling's baseline conditions.

Note: No limitation is required between the existing adopted northern boundary of Manor Road and 92.7m due to the maximum height limitation parameter in this area (44m AOD) being under the 25° angle line.

Column A Height (m AOD)	Column B Distance from the Existing Adopted Northern Boundary of Manor Road (m)
78.45	92.7
99.48	137.7
117	175.3
157	261





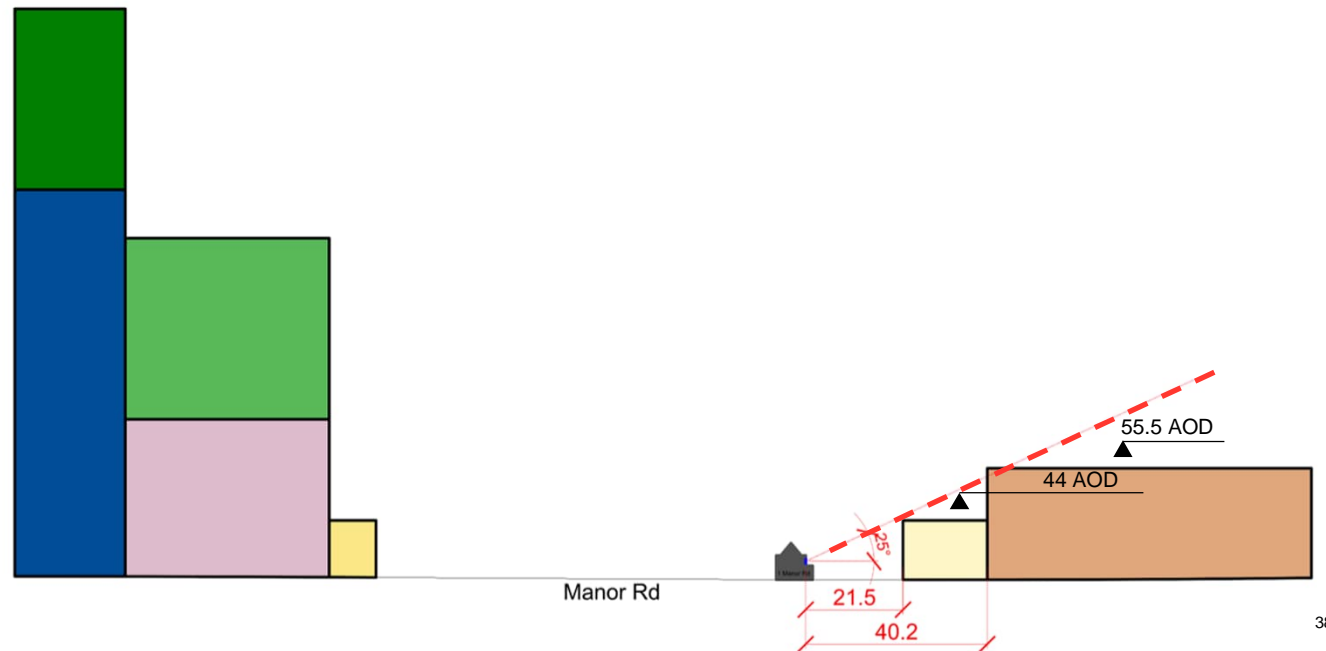


# Optimisation

## Proposed Scenario A (before optimisation) - Window No. 7 – located at 1 Manor Road (owned by Universal)

The following section illustrates the 25° angle from Window No. 7, located in the rear façade of 1 Manor Road. This serves as a guideline to follow and ensure that the heights of the Proposed Development at the Lake Zone, north of Manor Rd remain below this angle.

Lake Zone	Proposed max. Height	Distance From Receptor (m)
	44m AOD	21.5
	55.5m AOD	40.2



# Optimisation

## Optimised Proposed Scenario A - Window No. 7 – located at 1 Manor Road (owned by Universal)

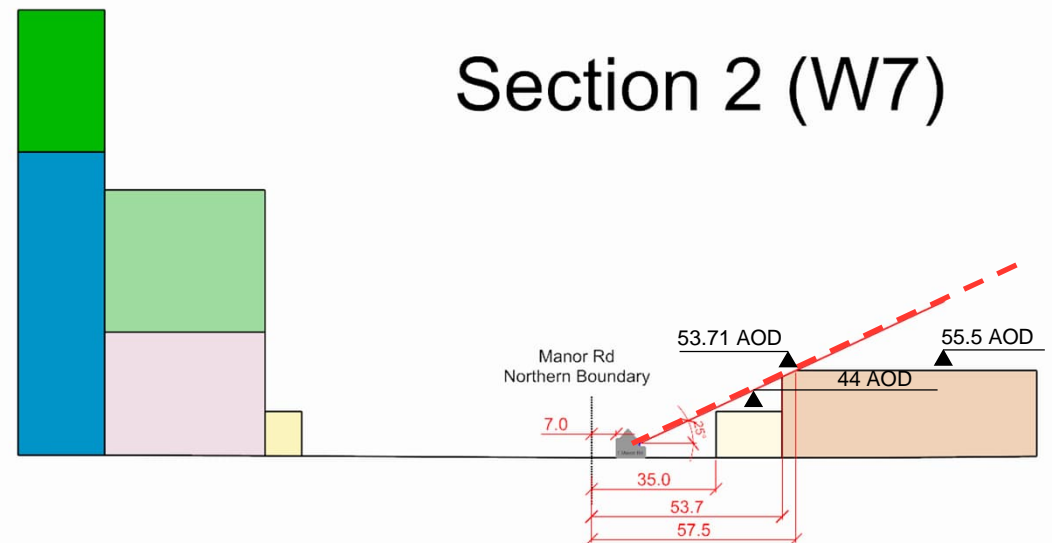
Following the obstruction angle simplified method the massing heights would need to be reduced to become within the 25° angle line as shown in the diagram below to achieve suitable daylight levels. The distances shown below are based on the northern edge of the existing adopted boundary of Manor Road, to provide a fixed reference point to determine the requirement for a further detailed assessment. The following land use limitation is therefore proposed in relation to development of the Lake Zone and the properties on Manor Road:

*A Vertical Sky Component Assessment shall be undertaken and submitted as part of the Compliance Statement for the Lake Zone during the post-consent design approval process for the relevant part of the development where: (a) a building or structure, as applicable, comes forth within the column B distance from any dwelling on Manor Road within ERC Expansion Area A, B or C, (b) the dwelling is not owned by Universal and is still being occupied or otherwise still available for residential use, and (c) the building or structure in the Core Zone will exceed the height in column A of the table below.*

The assessment should demonstrate that suitable daylight and sunlight levels will be maintained within such dwelling in accordance with the most recent BRE guidance, to the extent that suitable levels can be achieved and factoring in the dwelling's baseline conditions.

Column A Height (m AOD)	Column B Distance from the Existing Adopted Northern Boundary of Manor Road (m)
53.71	53.7
55.5	57.5

Note: No limitation is required between the adopted Northern Boundary of Manor Road and 153.7m due to the maximum height limitation parameter in this area (44m AOD) being under the 25° angle line.









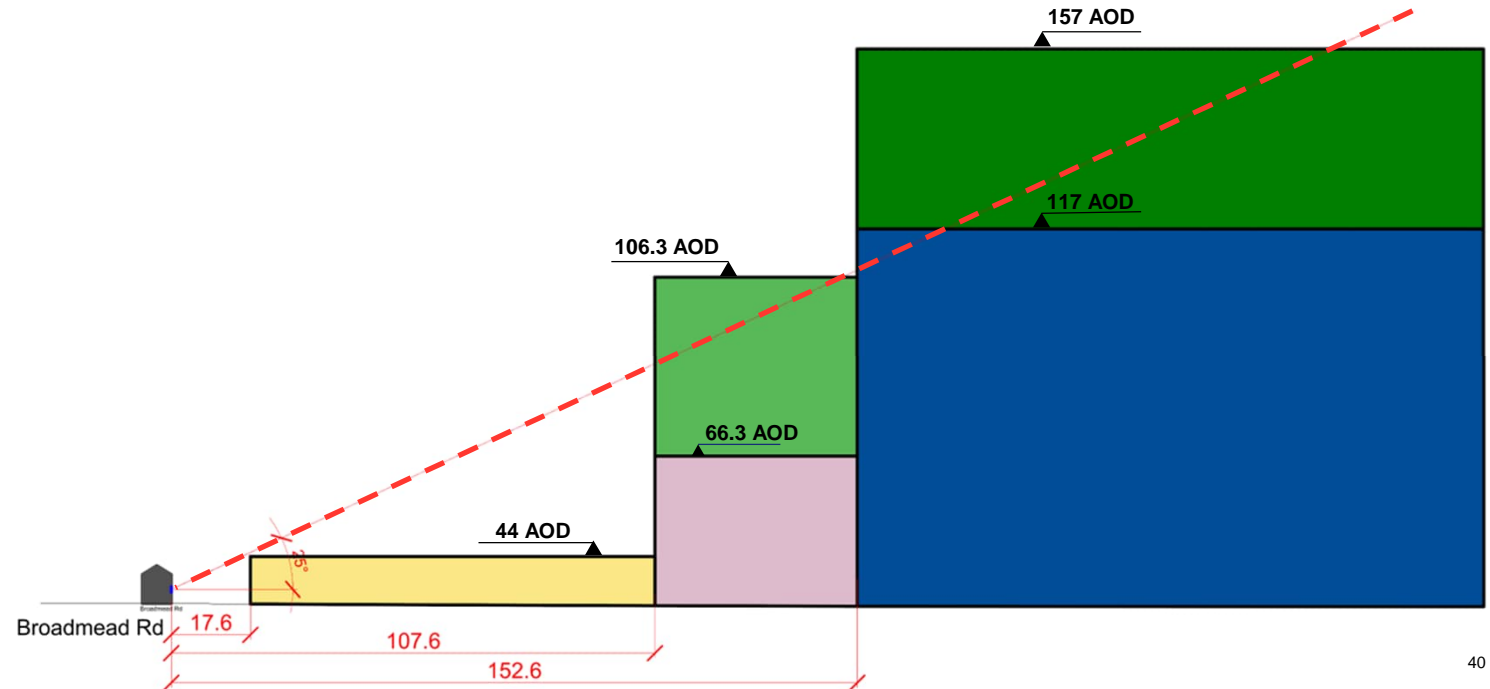


# Optimisation

## Proposed Scenario A (before optimisation) - Window No. 149 – located at Broadmead Road

The following section illustrates the 25° angle from Window No. 149, which is located in the rear façade of Broadmead Road receptor. This serves as a guideline to follow to ensure that the heights of the Proposed Development at the Core Zone north of Broadmead Rd remain below this angle.

Core Zone	Proposed max. Height	Distance From Receptor (m)
	44m AOD	17.6
	66.3m AOD	107.6
	106.3m AOD (Attraction)	107.6
	117m AOD	152.6
	157m AOD (Attraction)	152.6



# Optimisation

## Optimised Proposed Scenario A - Window No. 149 – located at Broadmead Road

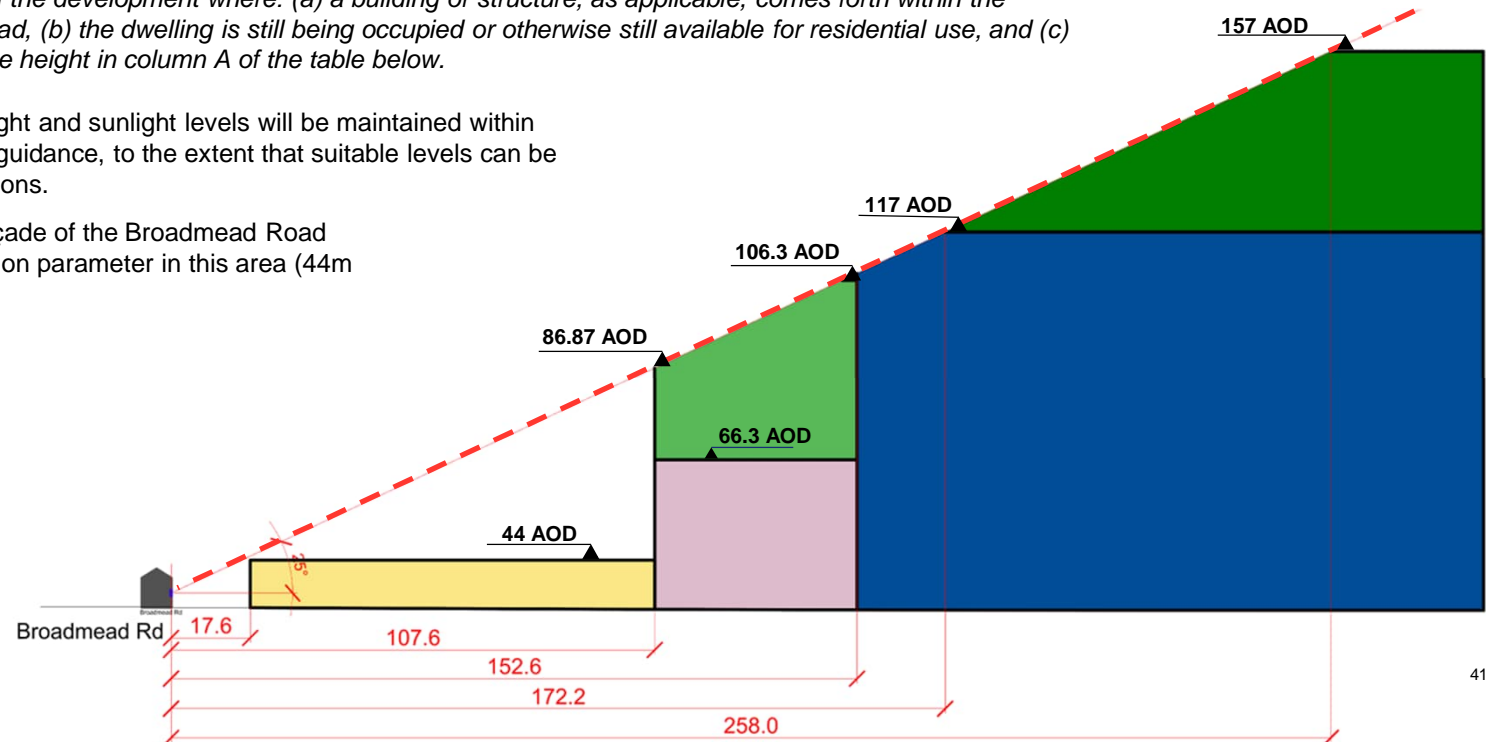
Following the obstruction angle simplified method the massing heights would need to be reduced to become within the 25° angle line as shown in the diagram below to achieve suitable daylight levels. The following land use limitation is therefore proposed in relation to development of the Core Zone and the property on Broadmead Road:

*A Vertical Sky Component Assessment shall be undertaken and submitted as part of the Compliance Statement for the Core Zone during the post-consent design approval process for the relevant part of the development where: (a) a building or structure, as applicable, comes forth within the column B distance from the dwelling on Broadmead Road, (b) the dwelling is still being occupied or otherwise still available for residential use, and (c) the building or structure in the Core Zone will exceed the height in column A of the table below.*

The assessment should demonstrate that suitable daylight and sunlight levels will be maintained within such dwelling in accordance with the most recent BRE guidance, to the extent that suitable levels can be achieved and factoring in the dwelling's baseline conditions.

Note: No limitation is required between the northern façade of the Broadmead Road dwelling and 107.6m due to the maximum height limitation parameter in this area (44m AOD) being under the 25° angle line.

Column A Height (m AOD)	Column B Distance from the Northern Façade of the Broadmead Road Dwelling (m)
86.87	107.6
106.3	152.6
117	172.2
157	258





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