Aval Consulting Group.

Sunlight & Daylight Assessment

52 Avenue Road, St Johns Wood, London, NW8 6HS

DOMVS London

10th May 2022

Project Information

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Revision History

Revision	Date	Author	Reviewer	Approver	Status
A	10th May 2022	JP	AC	AC	Draft

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1 Executive Summary

1.1. Overview

1.1.1. DOMVS London Limited (hereafter referred to as the 'client') is seeking planning consent for construction of 12 x townhouse scheme including communal Health and Wellness Spa, totalling 55-60k sq ft. The 'indicative' townhouse scheme is to be 'best in class' with symmetrical facades of stucco white render, contemporary interiors and 3m plus ceiling heights throughout. The development is to provide exemplar eco/zero carbon credentials, private and communal landscaped gardens, concierge, 24 hr gated security etc at 52 Avenue Road, St Johns Wood, London, NW8 6HS (hereafter referred to as the 'proposed development'), which is within the London Borough of Camden.

1.1.2. AVAL Consulting Group Limited (ACGL) was instructed by the client to produce a Sunlight and Daylight Report to accompany the planning application to the London Borough of Camden for consent to undertake the proposed development work.

1.1.3. The purpose of this report is to demonstrate whether the proposed development and its neighbouring properties receive satisfactory levels of daylight and sunlight to windows, habitable rooms, and amenity space.

1.1.4. The study is based on criteria set out in the Building Research Establishment (BRE) guide 'Site Layout Planning for Daylight and Sunlight: a good practice guide, 2nd Edition' by P J Littlefair 2011. The tests prescribed by the BRE Guide are approved by the Department of the Environment and provide a clear methodology for comprehensive testing.

1.1.5. Compliance with the BRE Guide is not a planning criterion and the introduction to the Guide is careful to make this point. There are therefore no minimum mandatory requirements for Sunlight & Daylight in Building Regulations for England & Wales but the guidance set out in BRE Guide is widely accepted as the approved methodology when calculating Sunlight & Daylight.

1.1.6. Appendix 1 identifies the windows analysed in this study. Detailed assessment results containing numerical values and or graphical representation is provided in the appendices.

1.1.7. The proposed development performs well against the BRE recommendations. In our opinion, as the proposed development achieves an overall high level of compliance, the minor transgressions of the BRE recommendations should not warrant refusal of the application.

2 Information Sources

2.1. The baseline conditions are based on

- View of the site in 2D & 3D form from Google earth and Google maps;
- Topographical survey maps of the location and blocks; and
- Site survey and photographs in some cases.

2.2. The proposed conditions are based on the following drawings

- 208-252B PROPOSED SITE PLAN - 12 UNIT SCHEME
- 208-272A WEST BUILDING PROPOSED ELEVATIONS - 12 UNIT SCHEME
- 208-273A EAST BUILDING PROPOSED ELEVATIONS - 12 UNIT SCHEME
- 208-274A NORTH BUILDING PROPOSED ELEVATIONS - 12 UNIT SCHEME
- 208-290A PROPOSED SECTION A - A - 12 UNIT SCHEME
- 208-291A PROPOSED SECTION B - B - 12 UNIT SCHEME
- 208-304A PROPOSED LOWER GROUND FLOOR UNIT PLANS - 12 UNIT SCHEME
- 208-305A PROPOSED GROUND FLOOR UNIT PLANS - 12 UNIT SCHEMES
- 208-306A PROPOSED FIRST FLOOR UNIT PLANS - 12 UNIT SCHEMES
- 208-307A PROPOSED SECOND FLOOR UNIT PLANS - 12 UNIT SCHEMES

3 Relevant policies and guidelines

3.1. National Legislation

3.1.1. There is no current, specific national planning policy or legislation relating to developments and their potential effects on Daylight, Sunlight and Overshadowing.

3.2. National Planning Policy Framework NPPF (2021)

3.2.1. The BRE numerical guidelines should be considered in the context of the National Planning Policy Framework (NPPF), which stipulates that local planning authorities should take a flexible approach to daylight and sunlight to ensure the efficient use of land. The NPPF states:

"Where there is an existing or anticipated shortage of land for meeting identified housing needs, it is especially important that planning policies and decisions avoid homes being built at low densities and ensure that developments make optimal use of the potential of each site. In these circumstances:

c) Local planning authorities should refuse applications which they consider fail to make efficient use of land, taking into account the policies in this Framework. In this context, when considering applications for housing, authorities should take a flexible approach in applying policies or guidance relating to daylight and sunlight, where they would otherwise inhibit making efficient use of a site (as long as the resulting scheme would provide acceptable living standards)."

3.3. National Planning Practice Guidance NPPG (2014)

3.3.1. There is no specific policy and or guidance relating to developments and their potential effects on Sunlight, Daylight and Overshadowing within the Planning Practice Guidance.

3.4. Regional Planning Policy

3.4.1. There is no current, specific regional planning policy or legislation relating to developments and their potential effects on Daylight, Sunlight and Overshadowing.

3.5. Local Planning Policy

3.5.1. We understand that the Local Authority take the conventional approach of considering daylight and sunlight amenity with reference to the various numerical tests laid down in the Building Research Establishment (BRE) guide 'Site Layout Planning for Daylight and Sunlight: a guide to good practice, 2nd Edition' by P J Littlefair 2011.

3.6. Other relevant Policies, Standards and Guidance

3.6.1. Building Research Establishment (BRE)

3.6.1.1. Detailed guidance on Daylight, Sunlight and Overshadowing was published by the BRE in 2011. The Daylight, Sunlight and Overshadowing assessments have been undertaken in accordance with the methodologies and numerical guidelines recommended in BRE Report 209 'Site layout planning for daylight and sunlight: A guide to good practice'.

3.6.1.2. The BRE document gives guidance on-site layout to retain good daylight and sunlight in existing surrounding buildings. It enables an assessment to be made as to whether the proposals will adversely affect the daylight and sunlight reaching existing habitable rooms and relevant external amenity spaces.

3.6.1.3. Whilst the guide is intended for use by designers, consultants and planning officers and gives numerical guidelines, the advice given is not mandatory and should not be used as an instrument of planning policy, as it states:

"...its aim is to help rather than constrain the designer. Although it gives numerical guidelines these should be interpreted flexibly since natural lighting is only one of many factors in the Site layout design. In special circumstances the developer or planning authority may wish to use different target values. For example in a historic city centre, or in an area with modern high rise buildings, a higher degree of obstruction may be unavoidable if new developments are to match the height and proportions of existing buildings" (Section 1, Paragraph 6).

3.6.1.4. When considering the BRE Guide's requirements, it is important to remember that the Guide is not a set of planning rules, and used as an aid to planning officers and designers by giving objective means of making assessments. The target values in the BRE Guide may not be obtainable in dense urban areas where the grain of development is tight, while higher values might well be desirable in suburban or rural areas where the grain is contrastingly open. This is recognised by the BRE and made clear in the BRE Guide.

3.6.1.5. The need to apply daylight and sunlight advice flexibly was reinforced in the recent National Planning Policy Framework (NPPF) draft revisions (March 2018, at para 123 [c]) and reiterated in the NPPG 'Effective Use of Land' guidance (July 2019). This is particularly relevant in London, and acknowledged in the Greater London Authority's Housing Supplementary Planning Guidance (SPG), March 2016 (para 1.3.46), which states:

"The degree of harm on adjacent properties and the daylight targets within a proposed scheme should be assessed drawing on broadly comparable residential typologies within the area and of a similar nature across London."

3.6.2. British Standards (BS)

3.6.2.1. BS are intended to set a standard of quality for goods and services. BS documents applicable to both commercial and residential development include the following:

The British Standard 8206-2:2008 'Lighting for buildings – Part 2: Code of practice for daylighting' (British Standards Institution, 2008) (Ref. 15-11) cites BRE Guidelines as being a source of "guidance regarding the loss of light to existing buildings following construction of a proposed new development".

4 Assessment Methodology

4.1. Existing or baseline condition

The existing or baseline condition includes the current condition of the site with its neighbouring properties and the amount of sunlight and daylight received by them.

Fig.1: Google Satellite image showing existing site along with its neighbouring properties.

4.2. Proposed development condition

The proposed condition includes the site with the proposed development along with its neighbouring properties.

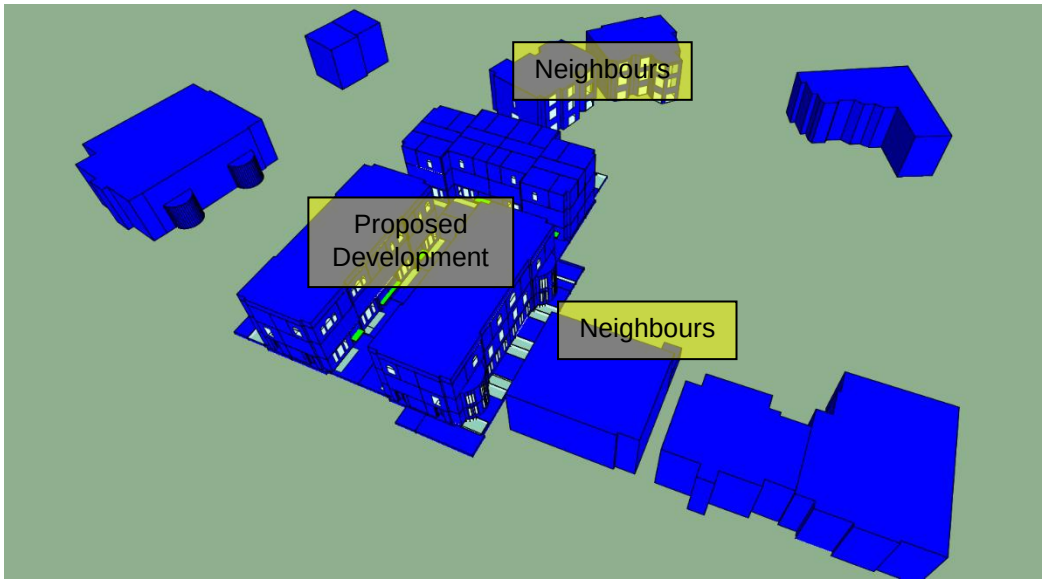


Fig.2: Computer Model showing the proposed development along with its neighbouring properties.

4.3. Extent of the study area

4.3.1. The BRE guidelines state in paragraph 2.2.2:

"The guidelines given here are intended for use for rooms in adjoining dwellings where daylight is required, including living rooms, kitchens and bedrooms. Windows to bathrooms, toilets, storerooms, circulation areas and garages need not be analysed. The guidelines may also be applied to any existing non-domestic building where the occupants have a reasonable expectation of daylight; this would normally include schools, hospitals, hotels and hostels, small workshops and some offices."

4.3.2. In general, most commercial properties are not treated as having a reasonable expectation of daylight or sunlight. This is because they are generally designed to rely on electric lighting to provide sufficient light by which people can work, rather than natural daylight or sunlight, and have therefore been scoped out of this assessment.

4.4. Study parameters

4.4.1. Introduction

4.4.1.1. The BRE Guide (SLPDS) describes various parameters to be assessed to measure the amount of Daylight and Sunlight availability in a building or open space. They are as follows:

#	Study Parameter		New Development	Existing Building	Adjoining Land	Amenity Space
1.	Daylight	Vertical Sky Component	✓	✓	✓	×
2.	Sunlight	Annual Probable Sunlight Hours	✓	✓	✓	×
3.		Overshadowing	×	×	✓	✓

Table.1: List of parameters to be tested

4.4.2. Daylight - Vertical Sky Component (VSC)

4.4.2.1. Daylight is the light received from the sun which is diffused through the sky's clouds. Even on a cloudy day when the sun is not visible a room will continue to be lit with light from the sky. This is also known as diffuse light. Any reduction in the total amount of daylight can be calculated by finding the Vertical Sky Component.

4.4.2.2. The Vertical Sky Component (VSC) is the ratio of the direct skylight illuminance falling on a vertical face at a reference point (usually the centre of a window), to the simultaneous horizontal illuminance under an unobstructed sky.

4.4.2.3. Whilst the VSC test is a useful guide to predict the potential impact of a proposed neighbouring development; the test only measures the light falling on a single point, and therefore does not consider the size of a window or the benefit of other windows serving the same room. The test also does not consider the size of the room any window serves.

4.4.3. Sunlight - Annual Probable Sunlight Hours (APSH)

4.4.3.1. Annual Probable Sunlight Hours (APSH) means the total number of hours in the year that the sun is expected to shine on unobstructed ground, allowing for average levels of cloudiness for the location in question. Criterion applies to all rooms of all orientations, although if a room faces significantly north of due east or west it is unlikely to be met.

4.4.3.2. In accordance with the BRE guidelines, windows that face within 90 degrees of due south need to be checked for Annual Probable Sunlight Hours (APSH). Further, it is not necessary to assess the effect of obstructions within 90 degrees of due north of the existing windows. North facing windows and/or properties to the south of the site have therefore not been tested for APSH.

4.4.4. Sunlight - Overshadowing in amenity space

4.4.4.1. The availability of sunlight should be checked for all open spaces where it will be required. This would normally include

- Residential gardens, usually the main back garden of a house
- Parks and playing fields
- Children's playgrounds
- Outdoor swimming pools
- Sitting out areas such as those between non-domestic buildings and in public squares
- Focal points for views such as a group of monuments or fountains

4.4.4.2. Sunlight at an altitude of 10 degrees or less does not count because it is likely to be blocked by low level planting anyway. In working out the total area to be considered, driveways and hard standings for cars should be left out. Around, housing, front gardens which are relatively small and visible from public footpaths should be omitted; only main back garden should be analysed.

4.5. Significance criteria

4.5.1. If the VSC is more than 27% then enough light would still reach the window of the neighbouring building. However, if the VSC is less than 27% as well as less than 0.8 times (one fifth) its former value the occupants will notice the reduction in the amount of skylight.

4.5.2. The recommendations are that applicable windows should receive a minimum of 25 percent of the total annual probable sunshine hours, to include a minimum of 5 percent of that which is available during the winter months between 21st September to the 21st March (the approximate dates of the autumn and spring equinoxes).

4.5.3. The BRE guidance suggests that at least 50 percent of any garden or open space should receive no less than 2 hours of direct sun on the spring equinox (approximately March 21st).

4.5.4. The BRE Guide Appendix I states that "the assessment of the impact will depend on a combination of factors, and there is no simple rule of thumb that can be applied."

4.5.5. Based on sections 4.5.1 to 4.5.5 the numerical criteria applied in this report to classify the magnitude of the daylight, sunlight and overshadowing impacts are as follows.

Vertical Sky Component (VSC)			Impact Classification
New Building	**Existing Building**	**Adjoining Development Land**	
≥27%	≥0.8 times former value	≥27%	**Meets BRE**
≥15%	≥0.6 times former value	≥15%	**Minor**
≥5%	≥0.4 times former value	≥5%	**Moderate**
≤5%	≤0.4 times former value	≤5%	**Major**

Table.2: Vertical Sky Component (VSC) impact classification table

Annual Probable Sunlight Hous (APSH)						Impact Classification
New Buildings			Existing Buildings			
Summer	**Winter**	**Whole Year**	**Summer**	**Winter**	**Whole Year**	
≥25%	≥5%	≥4%	≥0.8 times former value			**Meets BRE**
≥18%	≥4%	≥3%	≥0.6 times former value			**Minor**
≥13%	≥2%	≥2%	≥0.4 times former value			**Moderate**
≤13%	≤2%	≤2%	≤0.4 times former value			**Major**

Table.3: Annual Probable Sunlight Hours (APSH) impact classification table

Sun on Ground (Overshadowing)		Impact Classification
New Open Space	**Existing Open Space**	
≥50% receives 2 hours of sunlight	≥0.8 times former value	**Meets BRE**
≥37% receives 2 hours of sunlight	≥0.6 times former value	**Minor**
≥25% receives 2 hours of sunlight	≥0.4 times former value	**Moderate**
≤25% receives 2 hours of sunlight	≤0.4 times former value	**Major**

Table.4: Sun on Ground (Overshadowing) impact classification table

4.5.6. The impact assessment was undertaken using detailed computer modelling and simulation.

5. Assessment Results – Proposed Development

A drawing representing the windows analysed in this study along with their position and reference number is presented in Figure.3 in Appendix 1.

5.1. Vertical Sky Component (VSC)

5.1.1. The test shows that out of 100 tested windows as shown in Table.5 in Appendix 2

5.1.1.1. 87 (87%) windows meet the BRE requirement of ≥27% VSC value and therefore is considered that the proposed development should allow enough or reasonable amount of skylight to reach the window.

5.1.1.2. 13 (13%) windows meet the BRE requirement of ≥15% VSC value and therefore is considered that the proposed development may have minor impact on the amount of skylight reaching the window. However, all of the 13 affected windows serve the arrival room which is a space not used by the resident of the house often and therefore is to be considered that the impact is not significant.

5.2. Annual Probable Sunlight Hours (APSH)

5.2.1. The test shows that out of 100 tested windows as shown in Table.5 in Appendix 2

5.2.1.1. All 100 (100%) windows meet the BRE requirement of ≥25% APSH value in Summertime between 21st March to 21st September and therefore is considered that the proposed development should allow enough or reasonable amount of sunlight to reach the window.

5.2.1.2. All 100 (100%) windows meet the BRE requirement of ≥5% APSH value in Wintertime between 21st September to 21st March and therefore is considered that the proposed development should allow enough or reasonable amount of sunlight to reach the window.

5.2.1.3. All 100 (100%) windows meet the BRE requirement of ≥4% APSH value in a whole year between 1st January to 1st December and therefore is considered that the proposed development should allow enough or reasonable amount of sunlight to reach the window.

5.3. Overshadowing

5.3.1. The test shows that out of 12 tested amenity spaces

5.3.1.1. All 12 (100%) of amenity spaces meet BRE requirement of receiving two hours of sunlight in ≥50% of their space and therefore is considered that the proposed development should allow enough or reasonable amount of sunlight to reach the amenity space.

6. Assessment Results – Neighbouring Properties

A drawing representing the windows analysed in this study along with their position and reference number is presented in Figure.4 in Appendix 1.

6.1. Vertical Sky Component (VSC)

6.1.1. The test shows that out of 30 tested windows as shown in Table.6 in Appendix 2

6.1.1.1. 26 (87%) windows meet the BRE requirement of ≥27% and or ≥0.8 times of its former VSC value and therefore is considered that the proposed development should allow enough or reasonable amount of skylight to reach the window.

6.1.1.2. 2 (6.5%) windows meet the BRE requirement of ≥5% and or ≥0.4 times of its former VSC value and therefore is considered that the proposed development may have moderate impact on the amount of skylight reaching the window. However, these windows serve washrooms which is unhabitable room and therefore is not considered for assessment based on BRE Guideline. The results are mentioned for completeness and for information only.

6.1.1.3. 2 (6.5%) windows meet the BRE requirement of ≤5% and or <0.4 times of its former VSC value and therefore is considered that the proposed development may have major impact on the amount of skylight reaching the window. However, these windows are in a room which is served by another unobstructed window and therefore it is considered that the proposed development should allow enough or reasonable amount of skylight to reach the room.

6.2. Annual Probable Sunlight Hours (APSH)

6.2.1. The test shows that out of 30 tested windows as shown in Table.6 in Appendix 2

6.2.1.1. 27 (90%) windows meet the BRE requirement of ≥25% and or ≥0.8 times of its former APSH value in Summertime between 21st March to 21st September and therefore is considered that the proposed development should allow enough or reasonable amount of sunlight to reach the window.

6.2.1.2. 3 (10%) window meet would receive sunlight ≥13% and or ≥0.4 times of its former APSH value in Summertime between 21st March to 21st September and therefore is considered that the proposed development may have moderate impact on the amount of skylight reaching the window. However, these windows serve washrooms which is unhabitable room and therefore is not considered for assessment based on BRE Guideline. The results are mentioned for completeness and for information only.

6.2.1.3. All 30 (100%) windows meet the BRE requirement of ≥5% and or ≥0.8 times of its former APSH value in Wintertime between 21st September to 21st March and therefore is considered that the proposed development should allow enough or reasonable amount of sunlight to reach the window.

6.2.1.4. All 30 (100%) windows meet the BRE requirement of ≥4% and or ≥0.8 times of its former APSH value in whole year between 1st January to 1st December and therefore is considered that the proposed development should allow enough or reasonable amount of sunlight to reach the window.

6.3. Overshadowing

6.3.1. The test shows that out of 3 tested amenity spaces

6.3.1.1. All 3 (100%) of amenity spaces meet BRE requirement of receiving two hours of sunlight in ≥50% of their space and or ≥0.8 times space from its former space value and therefore is considered that the proposed development should allow enough or reasonable amount of sunlight to reach the amenity space.

7. Mitigation Measures

7.1. Proposed development

7.1.1. Mitigation measures are not necessary as the proposed development meet the BRE guideline criteria.

7.2. Neighbouring properties

7.2.1. Mitigation measures are not necessary as the proposed development meet the BRE guideline criteria.

8. Conclusion

8.1. Proposed development

8.1.1. This report provides an outline assessment for the daylight and sunlight analysis that should be carried out as part of the detailed planning submission.

8.1.2. In our opinion, the proposed development, achieves an overall high level of compliance with the BRE requirements. Therefore, the minor transgressions should not warrant refusal of the application.

8.1.3. Therefore, it can be considered that the development will not conflict with any national, regional, or local planning policy in relation to the loss of daylight and sunlight because of the proposed development.

8.2. Neighbouring properties

8.2.1. This report provides an outline assessment for the daylight and sunlight analysis that should be carried out as part of the detailed planning submission.

8.2.2. In our opinion, the proposed development, achieves an overall high level of compliance with the BRE requirements. Therefore, it should not warrant refusal of the application.

8.2.3. Therefore, it can be considered that the development will not conflict with any national, regional, or local planning policy in relation to the loss of daylight and sunlight because of the proposed development.

9. Clarifications

9.1. General

9.1.1. The report provided is solely for the use of the client and no liability to anyone else is accepted.

9.1.2. The study is limited to assessing daylight, sunlight of the proposed development as set out in sections 2.1, 3.1 and 3.3 of the BRE Guide.

9.1.3. The study has been undertaken following access to the proposed development site. We have not had access to neighbouring properties. The study is based on the information listed in section 2 of this report.

9.1.4. Where plans or access were not available, the internal layouts have been based on assumptions (where possible from external observation). Where the layouts have been estimated, this has no bearing on the sunlight analysis or the assessment of the vertical sky component daylight test, both of which are considered at the centre of the window.

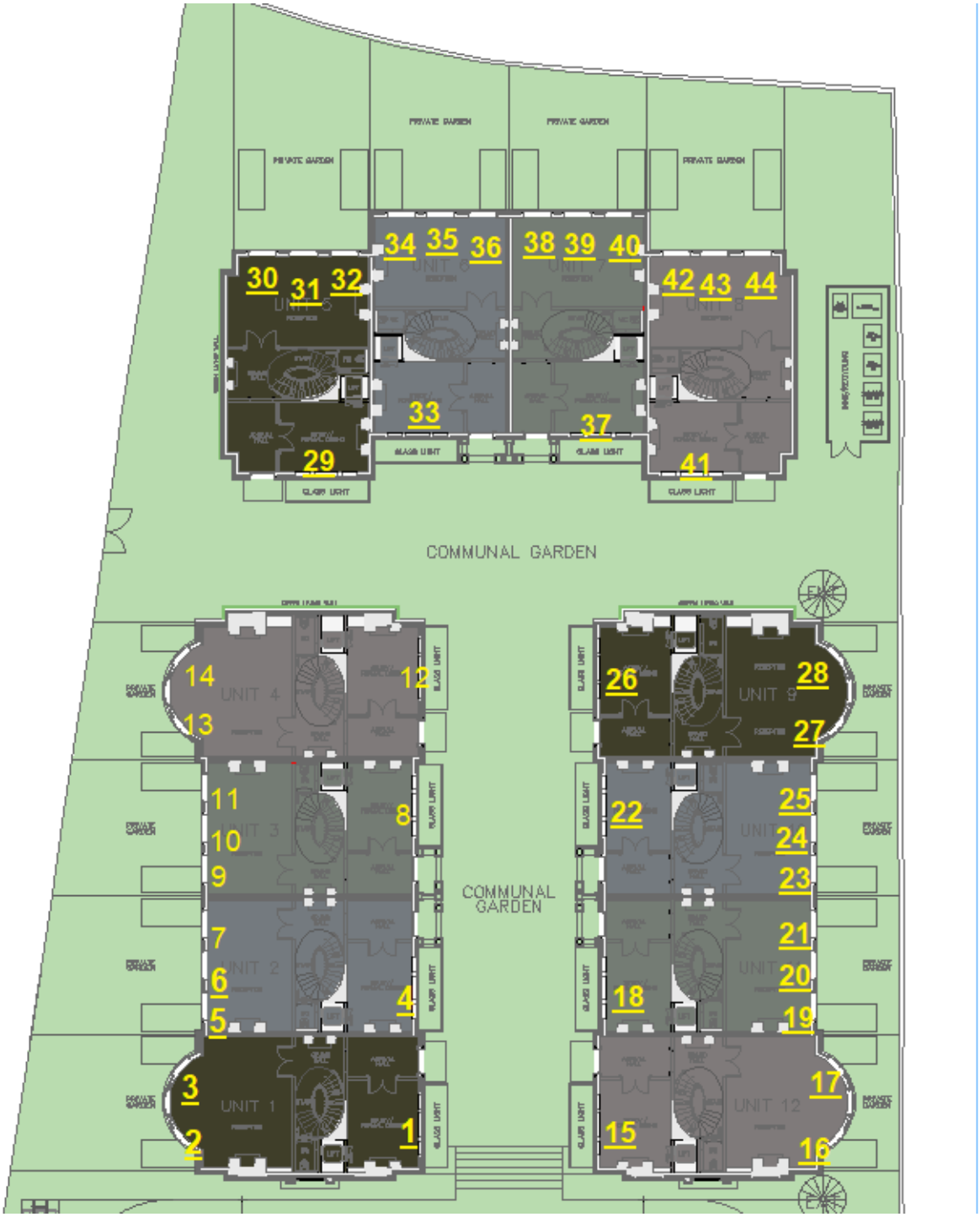
9.1.5. This study does not calculate the effects of trees and hedges on daylight, sunlight and overshadowing to gardens. The BRE guide states that trees should sometimes be taken into account, e.g. where there is concern that future occupants of the dwelling may want the trees to be cutdown if they block too much skylight or sunlight. We are not aware of any such circumstances, in this instance.

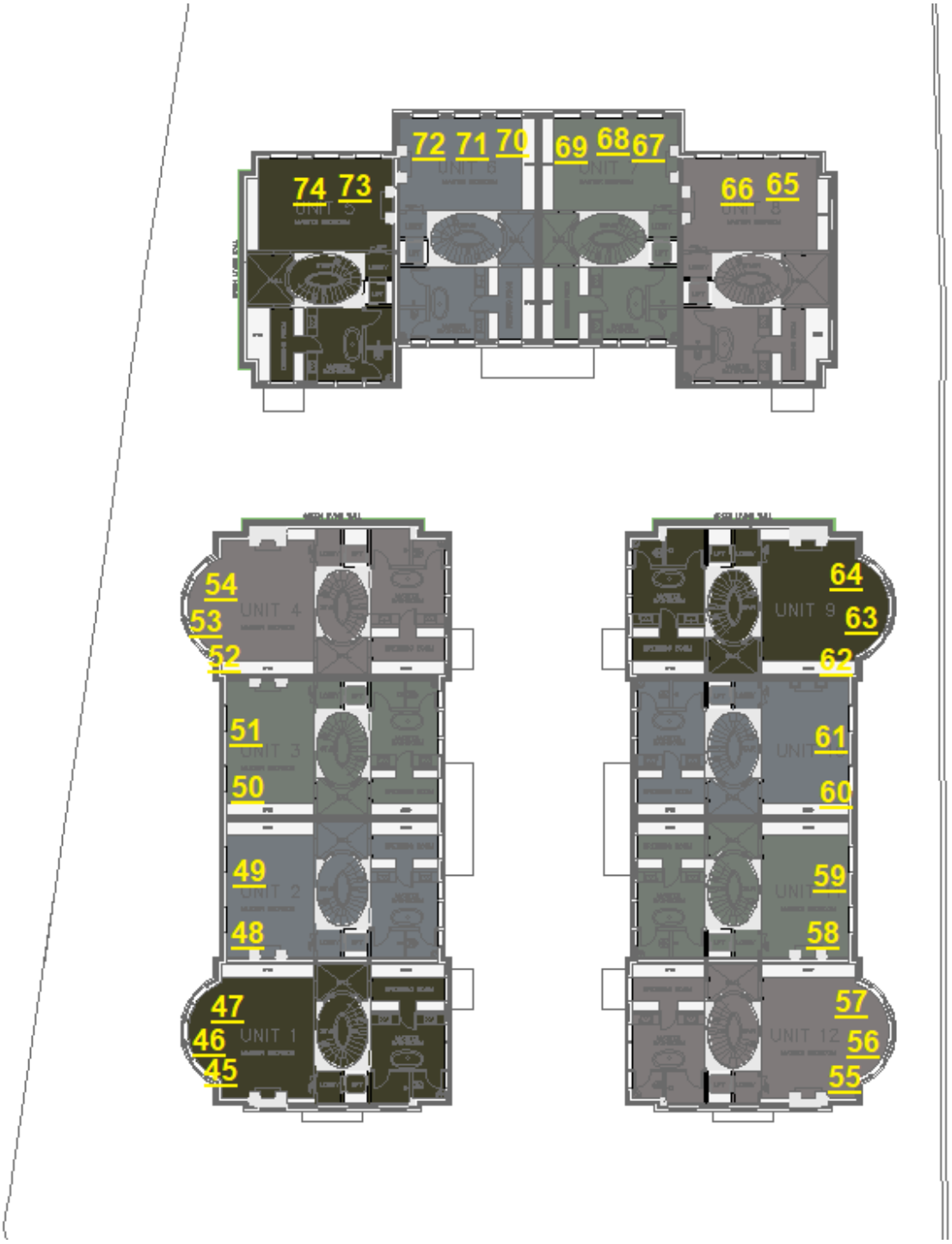
9.1.6. We have undertaken the survey following the guidelines of the RICS publication “Surveying Safely”. Where limited access is available, assumptions will have been made.

9.1.7. This report is based upon and subject to the scope of work set out in AVAL Consulting Group’s quotation and standard terms and conditions.

Appendices

Appendix 1: Window reference numbers

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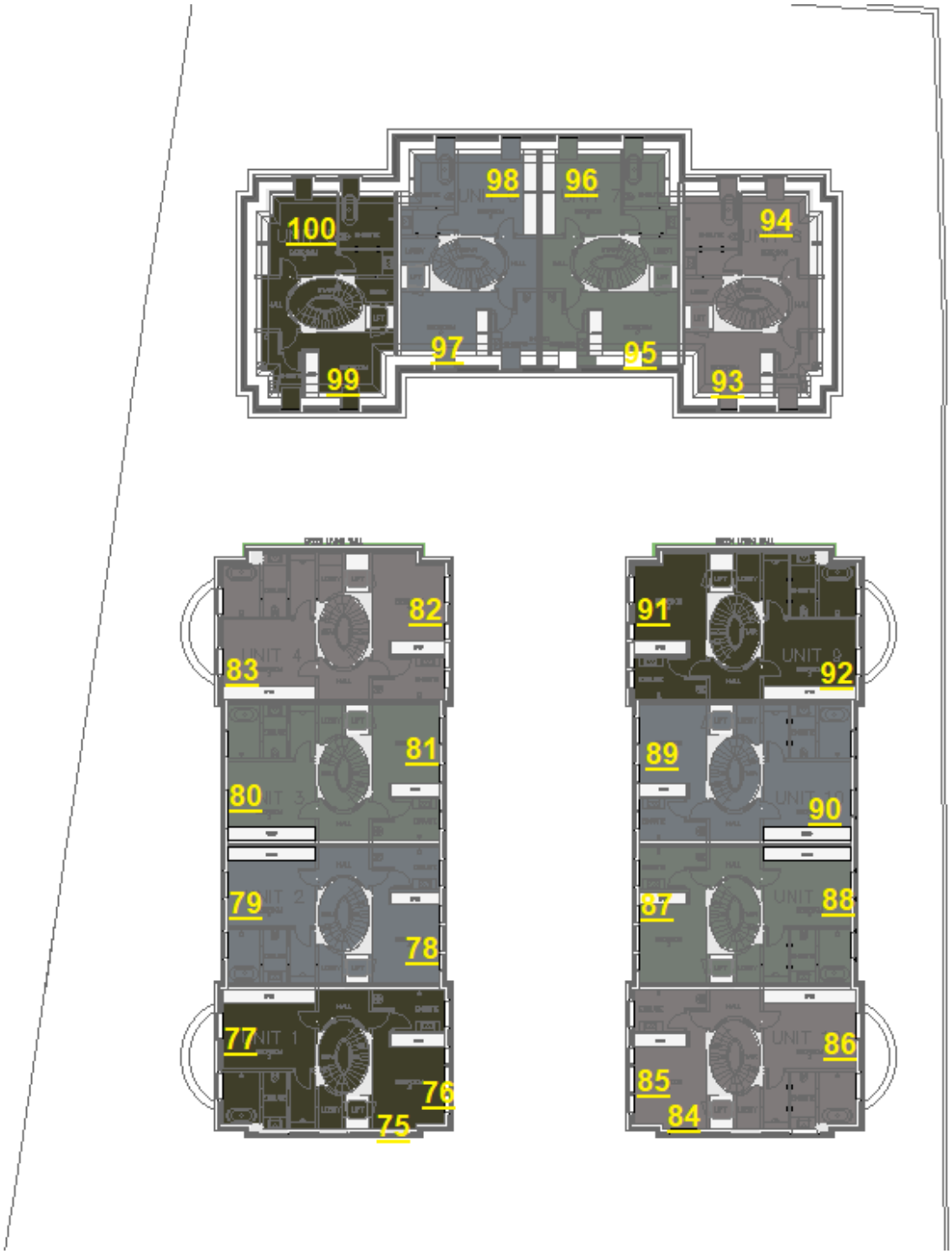
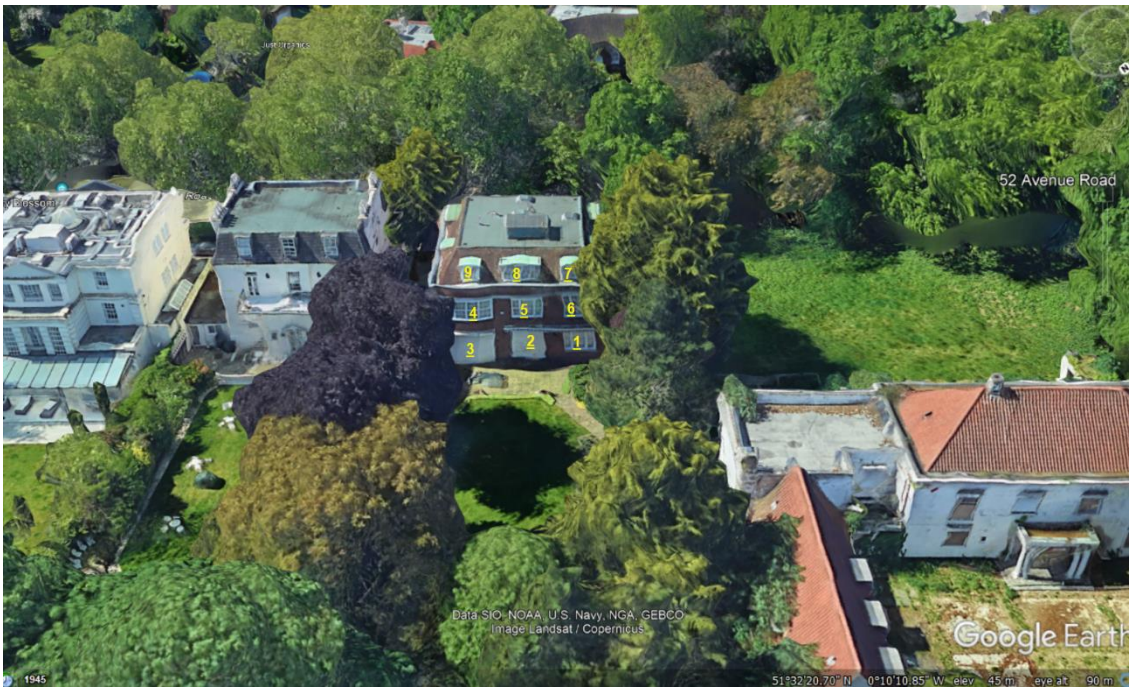


Fig.3: Windows and its numbers within proposed development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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth
1945
51°32'20.70" N 0°10'10.85" W elev 45 m eye alt 90 m


13
12
11
10
Image Landsat / Copernicus
Google Earth
1945
51°32'20.60" N 0°10'11.20" W elev 47 m eye alt 67 m

Fig.4: Windows and its numbers in surrounding neighbouring properties

Appendix 2: Detailed numerical test results

					VSC in %			APSH Summer in %			APSH Winter in %			APSH Whole Year in %		
House	Floor	Room	Window Reference	Window Direction	Target	Proposed	Opinion	Target	Proposed	Opinion	Target	Proposed	Opinion	Target	Proposed	Opinion
1	G	Study/Formal/Dining	1	SE	≥27	23.41	Minor impact	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
1	G	Reception	2	NW	≥27	39	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
1	G		3	NW	≥27	34		≥25	≥25		≥5	≥5		≥4	≥4	
2	G	Study/Formal/Dining	4	SE	≥27	17.5	Minor impact	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
2	G	Reception	5	NW	≥27	37	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
2	G		6	NW	≥27	37		≥25	≥25		≥5	≥5		≥4	≥4	
2	G		7	NW	≥27	37		≥25	≥25		≥5	≥5		≥4	≥4	
3	G	Study/Formal/Dining	8	SE	≥27	16.9	Minor impact	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
3	G	Reception	9	NW	≥27	37	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
3	G		10	NW	≥27	37		≥25	≥25		≥5	≥5		≥4	≥4	
3	G		11	NW	≥27	37		≥25	≥25		≥5	≥5		≥4	≥4	
4	G	Study/Formal/Dining	12	SE	≥27	19	Minor impact	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
4	G	Reception	13	NW	≥27	35	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
4	G		14	NW	≥27	35		≥25	≥25		≥5	≥5		≥4	≥4	
12	G	Study/Formal/Dining	15	NW	≥27	25.3	Minor impact	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
12	G	Reception	16	SE	≥27	36	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
12	G		17	SE	≥27	17		≥25	≥25		≥5	≥5		≥4	≥4	
11	G	Study/Formal/Dining	18	NW	≥27	17.7	Minor impact	≥25	≥15	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
11	G	Reception	19	SE	≥27	17.8	Minor impact	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
11	G		20	SE	≥27	18.38		≥25	≥25		≥5	≥5		≥4	≥4	
11	G		21	SE	≥27	20.71		≥25	≥25		≥5	≥5		≥4	≥4	
10	G	Study/Formal/Dining	22	NW	≥27	16.4	Minor impact	≥25	≥15	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
10	G	Reception	23	SE	≥27	26.15	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE

10	G		24	SE	≥27	28.72		≥25	≥25		≥5	≥5		≥4	≥4	
10	G		25	SE	≥27	30.32		≥25	≥25		≥5	≥5		≥4	≥4	
9	G	Study/Formal/Dining	26	NW	≥27	19.16	Minor impact	≥25	≥15	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
9	G	Reception	27	SE	≥27	28.6	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
9	G		28	SE	≥27	35.4		≥25	≥25		≥5	≥5		≥4	≥4	
5	G	Study/Formal/Dining	29	SW	≥27	15.48	Minor impact	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
5	G	Reception	30	NE	≥27	32.79	Meets BRE	≥25	≥12	Meets BRE	≥5	≥1	Meets BRE	≥4	≥4	Meets BRE
5	G		31	NE	≥27	30.82		≥25	≥12		≥5	≥1		≥4	≥4	
5	G		32	NE	≥27	24.5		≥25	≥12		≥5	≥1		≥4	≥4	
6	G	Study/Formal/Dining	33	SW	≥27	19.8	Minor impact	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
6	G	Reception	34	NE	≥27	30.45	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
6	G		35	NE	≥27	30.16		≥25	≥25		≥5	≥5		≥4	≥4	
6	G		36	NE	≥27	30.02		≥25	≥25		≥5	≥5		≥4	≥4	
7	G	Study/Formal/Dining	37	SW	≥27	19.74	Minor impact	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
7	G	Reception	38	NE	≥27	31.4	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
7	G		39	NE	≥27	32.22		≥25	≥25		≥5	≥5		≥4	≥4	
7	G		40	NE	≥27	33.67		≥25	≥25		≥5	≥5		≥4	≥4	
8	G	Study/Formal/Dining	41	SW	≥27	15.39	Minor impact	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
8	G	Reception	42	NE	≥27	28.45	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
8	G		43	NE	≥27	32.1		≥25	≥25		≥5	≥5		≥4	≥4	
8	G		44	NE	≥27	34.76		≥25	≥25		≥5	≥5		≥4	≥4	
1	1	Bedroom	45	NW	≥27	39.6	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
1	1		46	NW	≥27	39.9		≥25	≥25		≥5	≥5		≥4	≥4	
1	1		47	NW	≥27	37.35		≥25	≥25		≥5	≥5		≥4	≥4	
2	1	Bedroom	48	NW	≥27	38.37	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
2	1		49	NW	≥27	38.32		≥25	≥25		≥5	≥5		≥4	≥4	
3	1	Bedroom	50	NW	≥27	38.6	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
3	1		51	NW	≥27	38.06		≥25	≥25		≥5	≥5		≥4	≥4	
4	1	Bedroom	52	NW	≥27	37.54	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
4	1		53	NW	≥27	38.3		≥25	≥25		≥5	≥5		≥4	≥4	
4	1		54	NW	≥27	37.88		≥25	≥25		≥5	≥5		≥4	≥4	
12	1	Bedroom	55	NW	≥27	36.29	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
12	1		56	NW	≥27	27.79		≥25	≥25		≥5	≥5		≥4	≥4	
12	1		57	NW	≥27	22.82		≥25	≥25		≥5	≥5		≥4	≥4	
11	1	Bedroom	58	NW	≥27	26	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE

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11	1		59	NW	≥27	27.14		≥25	≥25		≥5	≥5		≥4	≥4	
10	1	Bedroom	60	NW	≥27	32.08	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
10	1		61	NW	≥27	33.95		≥25	≥25		≥5	≥5		≥4	≥4	
9	1	Bedroom	62	NW	≥27	31.09	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
9	1		63	NW	≥27	36.76		≥25	≥25		≥5	≥5		≥4	≥4	
9	1		64	NW	≥27	37.17		≥25	≥25		≥5	≥5		≥4	≥4	
8	1	Bedroom	65	NE	≥27	37.08	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
8	1		66	NE	≥27	34.84		≥25	≥25		≥5	≥5		≥4	≥4	
7	1	Bedroom	67	NE	≥27	36.12	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
7	1		68	NE	≥27	35.8		≥25	≥25		≥5	≥5		≥4	≥4	
7	1		69	NE	≥27	35.08		≥25	≥25		≥5	≥5		≥4	≥4	
6	1	Bedroom	70	NE	≥27	34.56	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
6	1		71	NE	≥27	34.27		≥25	≥25		≥5	≥5		≥4	≥4	
6	1		72	NE	≥27	34.38		≥25	≥25		≥5	≥5		≥4	≥4	
5	1	Bedroom	73	NE	≥27	33.8	Meets BRE	≥25	≥15	Meets BRE	≥5	≥3	Meets BRE	≥4	≥4	Meets BRE
5	1		74	NE	≥27	35.86		≥25	≥15		≥5	≥3		≥4	≥4	
1	2	Bedroom	75	SW	≥27	39.8	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
1	2		76	SE	≥27	33.3		≥25	≥25		≥5	≥5		≥4	≥4	
1	2	Bedroom	77	NW	≥27	39.6	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
2	2	Bedroom	78	SE	≥27	33.77	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
2	2	Bedroom	79	NW	≥27	39.7	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
3	2	Bedroom	80	NW	≥27	39.67	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
3	2	Bedroom	81	SE	≥27	33.22	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
4	2	Bedroom	82	SE	≥27	33.64	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
4	2	Bedroom	83	NW	≥27	39.5	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
12	2	Bedroom	84	SW	≥27	39.97	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
12	2		85	NW	≥27	33.19		≥25	≥25		≥5	≥5		≥4	≥4	
12	2	Bedroom	86	SE	≥27	38.29	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
11	2	Bedroom	87	NW	≥27	31.23	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
11	2	Bedroom	88	SE	≥27	38.53	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
10	2	Bedroom	89	NW	≥27	31.16	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
10	2	Bedroom	90	SE	≥27	39.13	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
9	2	Bedroom	91	NW	≥27	31.31	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
9	2	Bedroom	92	SE	≥27	39.33	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
8	2	Bedroom	93	SW	≥27	28.88	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
8	2	Bedroom	94	NE	≥27	38.91	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
7	2	Bedroom	95	SW	≥27	29.96	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
7	2	Bedroom	96	NE	≥27	39.36	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
6	2	Bedroom	97	SW	≥27	29.93	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE

6	2	Bedroom	98	NE	≥27	39.26	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
5	2	Bedroom	99	SW	≥27	28.93	Meets BRE	≥25	≥25	Meets BRE	≥5	≥5	Meets BRE	≥4	≥4	Meets BRE
5	2	Bedroom	100	NE	≥27	38.85	Meets BRE	≥25	≥25	Meets BRE	≥5	≥4	Meets BRE	≥4	≥4	Meets BRE

Table.5: Detailed numerical test results within the proposed development

					VSC in %					APSH Summer in %					APSH Winter in %					APSH Whole Year in %				
House	Room	Floor	Window Reference	Window Direction	Target	Before	After	Loss Ratio	Opinion	Target	Before	After	Loss Ratio	Opinion	Target	Before	After	Loss Ratio	Opinion	Target	Before	After	Loss Ratio	Opinion
50 Avenue Road		G	1	NE	≥27	35.27	29.91	0.85	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		G	2	NE	≥27	34.76	33.35	0.96	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥4	0.8	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		G	3	NE	≥27	28.51	28.2	0.99	Meets BRE	≥25	≥20	≥13	0.52	Meets BRE	≥5	0	0	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		1	4	NE	≥27	32.45	31.6	0.97	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		1	5	NE	≥27	37.5	36.27	0.97	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		1	6	NE	≥27	37.82	33.13	0.88	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		2	7	NE	≥27	39.53	35.91	0.91	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		2	8	NE	≥27	39.48	38.04	0.96	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		2	9	NE	≥27	37.77	37.4	0.99	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		G	10	NW	≥27	37.58	8.1	0.22	Meets BRE	≥25	≥25	≥13	0.52	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		1	11	NW	≥27	38.72	13.27	0.34	Meets BRE	≥25	≥25	≥13	0.52	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		2	12	NW	≥27	39.6	21.24	0.54	Meets BRE	≥25	≥25	≥20	0.8	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		2	13	NW	≥27	39.49	19.74	0.5	Meets BRE	≥25	≥25	≥20	0.8	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
57 Elsworthy Road		G	14	SW	≥27	31.3	25.07	0.8	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		2	15	SW	≥27	37.48	30.14	0.8	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		G	16	SE	≥27	33.79	31.75	0.94	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		G	17	SE	≥27	35.6	34.49	0.97	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		1	18	SE	≥27	37.76	36.57	0.97	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		1	19	SE	≥27	36.96	34.29	0.93	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		2	20	SE	≥27	38.8	36.91	0.95	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		2	21	SE	≥27	39.37	38.58	0.98	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
55 Elsworthy Road		G	22	E	≥27	34.93	33.36	0.96	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		G	23	E	≥27	27.98	27.41	0.98	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		G	24	E	≥27	30.39	28.63	0.94	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		G	25	E	≥27	37.19	36.21	0.97	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		1	26	E	≥27	38.33	38.08	0.99	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		1	27	E	≥27	29.43	28.84	0.98	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		1	28	E	≥27	36.95	36.05	0.98	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		2	29	E	≥27	32.61	32.22	0.99	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE
		2	30	E	≥27	39.49	39.17	0.99	Meets BRE	≥25	≥25	≥25	1	Meets BRE	≥5	≥5	≥5	1	Meets BRE	≥4	≥4	≥4	1	Meets BRE

Table.6: Detailed numerical test results within neighbouring properties