Daylight & Sunlight Report

RESIDENTIAL DEVELOPMENT at BELGARD SQUARE NORTH, TALLAGHT, DUBLIN 24

ASSESSMENT OF DAYLIGHT AND SUNLIGHT

SUSTAINABLE DESIGN ENGINEERS

The Tannery
53-56 Cork Street
Dublin D08 P92R
Ireland
Tel: +353 1 421 4900
E-Mail: mail@jvtierney.ie
Website: www.jvtierney.ie

RESIDENTIAL DEVELOPMENT

at

BELGARD SQUARE NORTH

TALLAGHT

DUBLIN 24

DAYLIGHT AND SUNLIGHT REPORT

Rev:	Issue Date:	Prepared By:	Checked By:
DRAFT	06/08/2020	MS	RB

Directors: R. J. Burke, F. Ahern, J. Lee
Part of the J.V. Tierney Group
Company Registration No. 422555

Contents

Figures

Tables

1 Executive Summary

J.V. Tierney & Co. have been commissioned to undertake a daylight and sunlight study for the proposed residential development at Belgard Square North, Tallaght, Dublin 24. In general, the design meets with the principles of the BRE guide - '*Site Layout Planning for Daylight and Sunlight*' (Littlefair, 2011), and the latest guidelines for new apartments as issued by the Department of Housing with good quality daylight available across a substantial portion of the development. Good levels of sunlight will also be available in the development's amenity areas.

To assess the daylight and sunlight quality of the proposed development:

- The communal amenity area has been tested under the Gardens and Open Spaces methodology; it meets the targets on March 21.
- Kitchen/living rooms and bedrooms have been tested under the Average Daylight Factor methodology; 88.9% of all habitable rooms will have adequate access to daylight. The below table estimates the number of rooms which will meet target ADF values based on representative sample daylight analysis.

Table 1: Estimated ADF Compliance for Proposed Development.

Reference	No. of Kitchen/Living rooms	Estimated to Meet BRE Target	No. of Bedrooms	Estimated to Meet BRE Target	Overall Percentage of Rooms Estimated to Meet BRE Targets (%)
Total	133	114	200	182	88.9

J.V. Tierney & Co's analysis indicates that the proposed development will have significant access to daylight and sunlight across the site based on representative samples.

2 Introduction

J.V. Tierney & Co. have been commissioned to undertake a daylight and sunlight study for the proposed residential development at Belgard Square North, Tallaght, Dublin 24.

The analysis has been carried out in line with '*Site Layout Planning for Daylight and Sunlight'* (Littlefair, 2011). This guide is a comprehensive revision of the 1991 edition of '*Site Layout Planning for Daylight and Sunlight: A guide to good practice'* (Littlefair, 1991).

A 3D geometric model of the site was created using software IES-VE 2019 and using drawings issued by Coady Architects. The analysis procedure considers the following daylighting and sun lighting calculation methodologies; Gardens and Open Spaces and Average Daylight Factor (ADF).

It should be noted that the guidance in this document should be seen as advice only and it should not constrain the design, "*The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; 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 site layout design*" (Littlefair, 2011).

The guidance from '*Site Layout Planning for Daylight and Sunlight'*, should be seen as not being suitable for rigid application to all developments in the context of national and local policies for the consolidation and densification of urban areas.

The '*Urban Design Manual, A Best Practice Guide'* (Environment, Heritage and Local Government, 2009) states that it may not always be possible to meet the criteria within '*Site Layout Planning for Daylight and Sunlight'* for urban areas. "*Where design standards are to be used (such as the UK document Site Layout Planning for Daylight and Sunlight, published by the BRE), it should be acknowledged that for higher density proposals in urban areas it may not be possible to achieve the specified criteria, and standards may need to be adjusted locally to recognise the need for appropriate heights or street widths*" (Environment, Heritage and Local Government, 2009).

The '*Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities'* (Department of Housing, Planning and Local Government, 2018), also reiterates the point mentioned above and states that, "*High density apartment schemes in urban locations should include shadow analysis diagrams at application stage. While overshadowing is clearly not generally desirable, it must be accepted that there may inevitably be some element of overshadowing at certain times of the day and/or year, subject to orientation, layout etc., in order to achieve urban development. In*

assessing development proposals, planning authorities must weigh up the overall quality of the design and layout of the scheme and measures undertaken to avoid overshadowing, with the location of the site and the need to ensure an appropriate scale or urban residential development" (Department of Housing, Planning and Local Government, 2018). (See appendix A).

The '*Urban Development and Building Heights: Guidelines for Planning Authorities'* (Department of Housing, Planning and Local Government, 2019) have been prepared in response to the publication of '*Project Ireland 2040*' and the '*National Planning Framework'*. The '*Building Heights'* guidelines state "*that appropriate and reasonable regard should be taken of quantitative performance approaches to daylight provision outlined in guides like the Building Research Establishment's 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'* "(Department of Housing, Planning and Local Government, 2019).

In line with the provisions of the '*Apartment Guidelines'* as discussed above, the '*Building Heights'* guidelines make allowances for where a proposal may not fully meet all requirements of daylight provisions. With this report discretion should be applied where it is desired that a scheme meets wider planning objectives such as comprehensive urban regeneration. This is applicable to the subject scheme whereby the requirement to provide for a sustainable level of development results in a need for some discretion to be applied in terms of completely meeting performance standards.

Comments in relation to overshadowing from the 'Site Layout Planning for Daylight and Sunlight', guide also state that some degree of overshadowing is to be expected. The guide states that, "*It must be borne in mind that nearly all structures will create areas of new shadow, and some degree of transient overshadowing of a space is to be expected*" (Littlefair, 2011).

In general, the design meets with the principles of the *BRE guide* and *BS 8206-2 2008* (British Standard Institution, 2008) and the latest guidelines for new apartments as issued by the Department of Housing with good quality daylight available across a substantial portion of the development. Good levels of sunlight will also be available in the development's amenity areas.

2.1 BRE Guidelines

The purpose of this guide is to provide advice on a buildings site plan and layout to achieve good levels of daylighting and sun lighting. The guide provides calculation methodologies which aims to assist clients, consultants and planning officials make informed decisions on site layout to ensure no significant loss of light occurs. It should be noted that the guidance in this document should be seen as advice only and it should not constrain the design.

If this guidance is followed the end result is a site which is positioned and laid out in such a way which will provide adequate levels of sun lighting and daylighting while creating an ambience that will appeal to any building occupant.

2.2 Glossary

CIE - The standard CIE (Commission Internationale de L'Eclairage – International Commission on Illumination) overcast sky. The CIE Overcast sky is intended for two purposes; to be a universal basis for the classification of measured sky luminance distributions and to give a method for calculating sky luminance in daylighting design procedures.

ADF – Average Daylight Factor. This is the ratio of total daylight flux incident on the working plane to the area of the working plane, expressed as a percentage of the outdoor illuminance on a horizontal plane due to an unobstructed CIE Standard Overcast Sky.

3 Assessment Methodology

BRE Guidelines – 'Site Layout Planning for Daylight and Sunlight' puts forth assessment methodologies which consider daylight and sunlight for new developments.

3.1 Gardens and Open Spaces

While providing good levels of daylight and sunlight in living spaces is important, it is also essential to apply the same approach to outside spaces and amenity areas. An adequately lit garden or open space creates a rich ambience that any occupant would find appealing. A well-lit garden or open space will add value to a property, so it is essential that careful consideration is taken when assessing these spaces.

The basis of this calculation is to assess if 50% of the garden area or open space will achieve more than two hours' worth of sunlight on 21 March (Equinox). If the garden or open space can meet this criterion then no further analysis needs to be carried out.

If the above thresholds cannot be met, then a comparison is made between the sunlight received in the gardens/ open space as the existing site currently stands and the sunlight received in the gardens/ open space with the proposed development in place. If the reduction is greater than 20% then the occupants will notice the reduction in sunlight.

3.2 Average Daylight Factor

In order to assess the quality of daylight enjoyed within the proposed development an Average Daylight Factor (ADF) calculation was used. The Average Daylight Factor (ADF) is a ratio between indoor illuminance and outdoor illuminance expressed as a percentage. In dwellings, the following figures should be used to assess if there is a good level of natural light in a space.

- Bedrooms = 1% ADF
- Living Spaces = 1.5% ADF

4 Site Information

The site plan for the proposed development site located at Belgard Square North, Tallaght, Dublin 24 is shown in Figure 1 below.

Figure 1: Proposed development site.

4.1 Proposed Development

The proposed development which consists of an apartment building of one, two- and three-bedrooms and studios. This study addresses access to daylight and sunlight within the proposed development, therefore two methodologies will be used. Habitable rooms of apartment buildings will be assessed for Average Daylight Factor as this methodology is used for assessing the daylight quality. Amenity areas will be assessed with BRE's Gardens and Open Spaces methodology as this test's sunlight provision within the amenity areas.

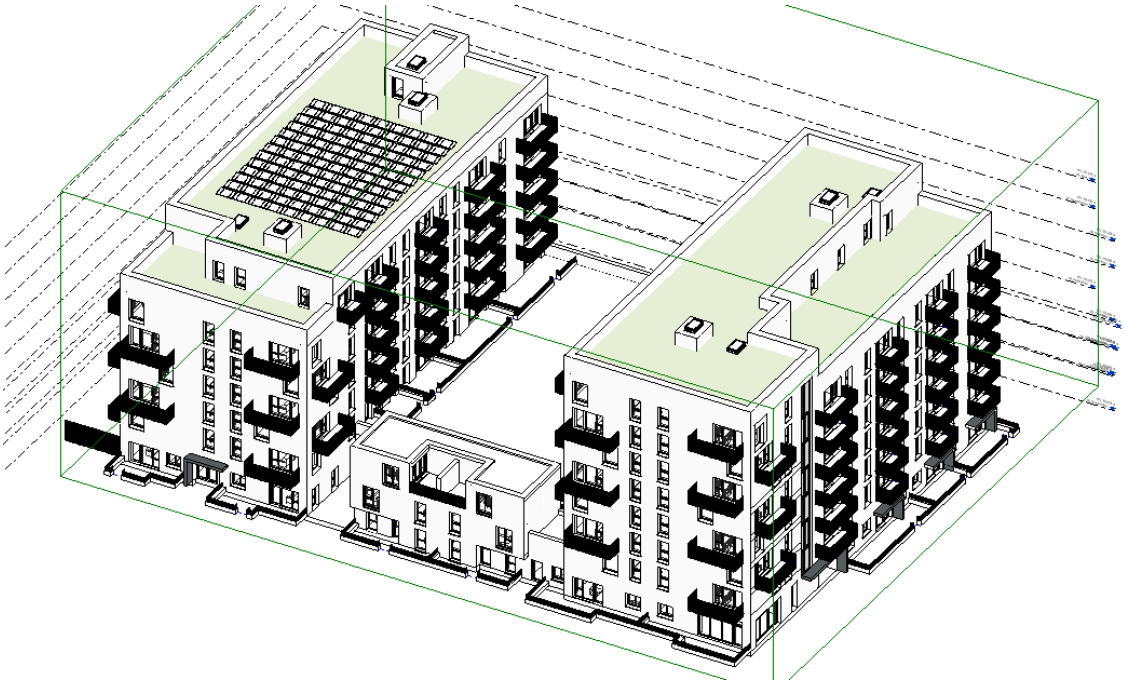

Figure 2: Architectural model of the proposed development.

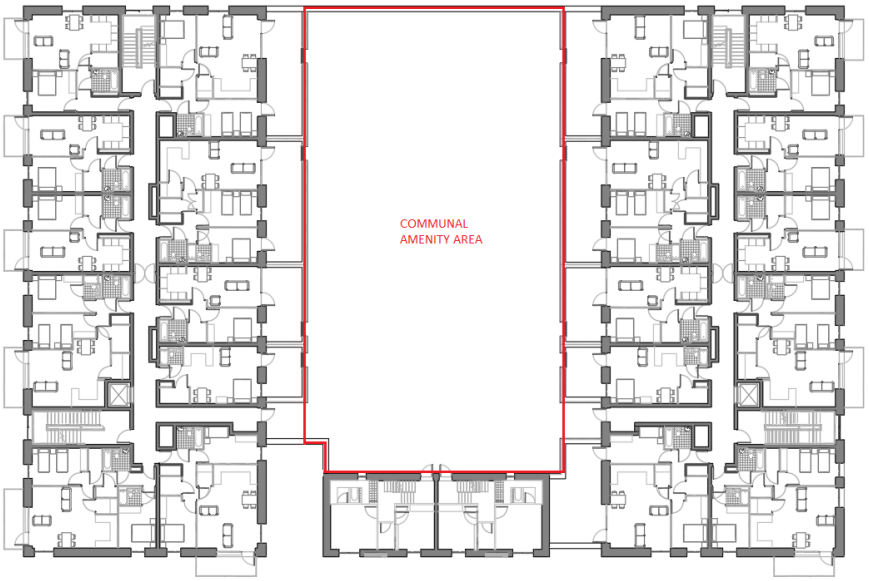

Figure 3: Architectural floor layout highlighting communal amenity area.

5 Results

5.1 Gardens and Open Spaces

While providing good levels of daylight and sunlight in living spaces is important, it is also essential to apply the same mentality to outside spaces and amenity areas. An adequately lit garden or open space creates a rich ambience that any occupant would find appealing. A well-lit garden/open space will add value to a property, so it is essential that careful consideration is taken when assessing these spaces.

The below table summarises the access to sunlight within the proposed development.

Table 2: BRE Garden & Open Spaces results.

General Information			Proposed		
			21 March		
Reference	BRE Garden & Open Spaces Target (%)	Total Area (m²)	Total Courtyard Area Receiving More Than 2 Hours (m²)	Percentage of Courtyard Area Receiving more than 2 Hours (%)	Status (Meets/Below BRE target)
Communal Amenity Area	50	771.2	650.2	84.3	Meets

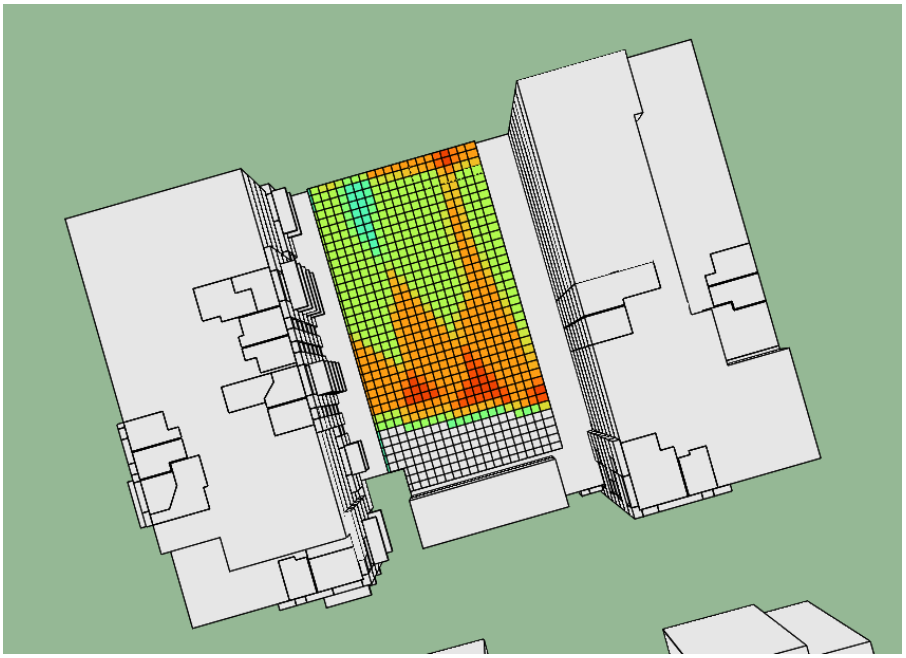

Figure 4: Sun exposure on communal amenity area.

5.2 Average Daylight Factor

In order to assess the quality of daylight enjoyed within the proposed Belgard Square North apartments an Average Daylight Factor (ADF) calculation was carried out on representative sample rooms. The Average Daylight Factor (ADF) is a ratio between indoor illuminance and outdoor illuminance expressed as a percentage. In housing, the following figures should be used to assess if there is a good level of natural light in a space;

- Bedrooms = 1%
- Living Spaces = 1.5%

As can be seen from the results in the tables below, a significant portion of the room's meet the criteria set out in the BRE guidelines and BS-8206-2 2008 and are also in line with the development standards for new apartments as set out by the Department of Housing.

When looked at as a total, the quantum of spaces meeting the daylight factor targets is greater than 80% which exceeds international environmental assessment standards such as BREEAM, which targets a figure of 80% and LEED, which targets a figure of 75% to award a credit under the daylighting criteria and demonstrates that the development has '*maximised the daylight*' for the occupied spaces.

To achieve the above targets, the design process considered a number of different iterations in relation to daylight/ sunlight within the proposed development scheme. Preliminary analysis carried out in line with '*Site Layout Planning for Daylight and Sunlight*' (Littlefair, 2011) informed the design team of a baseline performance in relation to the daylight received within the apartments comprising the scheme. Early discussions with the design team concluded that with some minor changes, the amount of natural light penetration into the scheme could be maximized. Following on from these discussions, the following changes were investigated.

- Separation distances
- Overall height
- Massing
- Window size
- Floor to ceiling heights
- Balcony layouts

A final design was agreed which maximised access to daylight as far as reasonably possible by utilising strategic balcony layouts and reducing balcony depth and thickness, this in turn minimised the obstruction from above.

Furthermore, in large scale developments it is common to see ground floor apartments receive lower amounts of daylight when compared to the upper levels. In order to combat this design constraint, the lower level apartments have included for higher floor to ceiling heights which reduces the obstruction from balconies above, therefore ensuring that the development still receives good levels of light penetration. It is also important to note that while the lower level units have less access to daylight generally, this is compensated for in having direct access to courtyards and amenities.

The below tables breakdown Average Daylight Factors based on representative samples within the proposed development.

Table 3: Estimated ADF Compliance for Proposed Development.

Floor	No. of Kitchen/Living rooms	Estimated Meet BRE Target	No. of Bedrooms	Estimated Meet BRE Target
0	6	4	12	8
1	20	12	32	18
2	22	16	30	30
3	20	17	30	30
4	20	20	30	30
5	20	20	30	30
6	19	19	26	26
7	6	6	10	10
Total	133	114	200	182

No. of rooms	333
R meet	296
Percentage above %	88.9

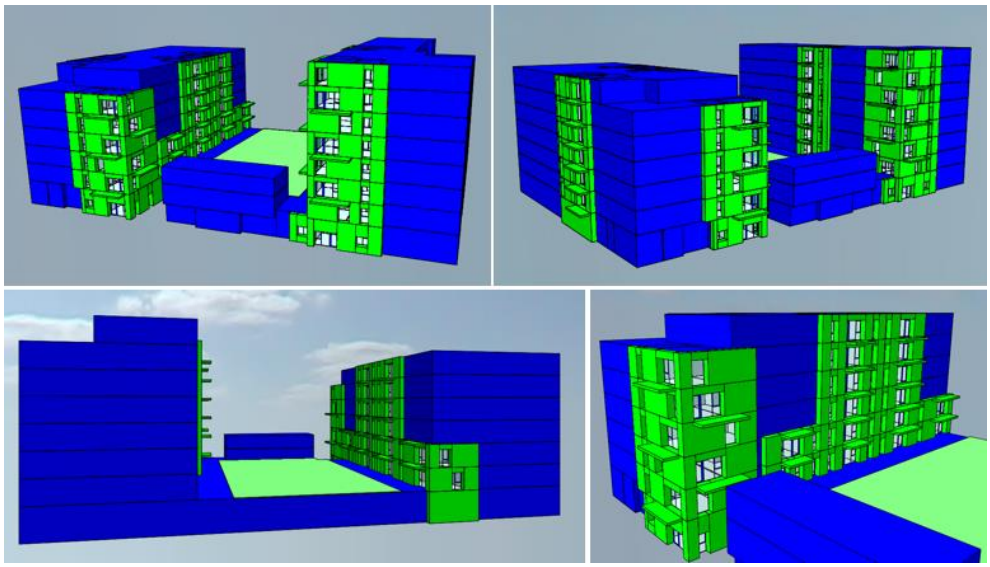

Figure 5: Simulation Model

6 Results Summary

The following summarise the results shown in Section 5.

6.1 Proposed Development

1. The communal amenity area has been tested under the Gardens and Open Spaces methodology; it meets the targets on March 21.

Table 4: BRE Gardens & Open Spaces Results for the Proposed Development on March 21.

General Information			Proposed		
			21 March		
Reference	BRE Garden & Open Spaces Target (%)	Total Area (m²)	Total Courtyard Area Receiving More Than 2 Hours (m²)	Percentage of Courtyard Area Receiving more than 2 Hours (%)	Status (Meets/Below BRE target)
Communal Amenity Area	50	771.2	650.2	84.3	Meets

2. Kitchen/living rooms and bedrooms have been tested under the Average Daylight Factor methodology; 88.9% of all occupiable rooms will have adequate access to daylight. The below table estimates the number of rooms which will meet target ADF values based on representative sample daylight analysis.

Table 5: Estimated ADF Compliance for the Proposed Development.

Reference	No. of Kitchen/Living rooms	Estimated to Meet BRE Target	No. of Bedrooms	Estimated to Meet BRE Target	Overall Percentage of Rooms Estimated to Meet BRE Targets (%)
Total	133	114	200	182	88.9

7 Conclusions

When interpreting results, consideration should be given to the notes outlined in the introduction of this report. Collaboration with the design team through preliminary analysis highlighted potential areas for optimisation such as increased window sizes, balcony layouts, building separation distances etc. this ultimately led to minor design changes which maximise the amount of natural light penetration throughout the development.

As can be seen from the results, a significant portion of the room's meet the criteria set out in the BRE guidelines and BS-8206-2 2008 and are also in line with the development standards for new apartments as set out by the Department of Housing.

When looked at as a total, the quantum of spaces meeting the daylight factor targets is greater than 80% which exceeds international environmental assessment standards such as BREEAM, which targets a figure of 80% and LEED, which targets a figure of 75% to award a credit under the daylighting criteria and demonstrates that the development has '*maximised the daylight'* for the occupied spaces.

In conclusion, the design meets with the principles of the BRE guide - '*Site Layout Planning for Daylight and Sunlight*' (Littlefair, 2011), and the latest guidelines for new apartments as issued by the Department of Housing with good quality daylight available across a substantial portion of the development. Good levels of sunlight will also be available in the development's amenity areas.

8 Bibliography

British Standard Institution, 2008. *BS 8206 Part 2: Code of Practice for Daylighting,* London: BSI Publications.

Department of Housing, Planning and Local Government, 2018. *Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities,* Dublin: s.n.

Department of Housing, Planning and Local Government, 2019. *Urban Development and Building Heights: Guidelines for Planning Authorities,* Dublin: s.n.

Environment, Heritage and Local Government, 2009. *Urban Design Manual, A Best Practice Guide,* Dublin: s.n.

Littlefair, P., 1991. *Site Layout Planning for Daylight and Sunlight 1991: A Guide to Good Practice.* Watford: IHS BRE Press.

Littlefair, P., 2011. *Site Layout Planning for Daylight and Sunlight 2011: A Guide to Good Practice.* Watford: IHS BRE Press.

9 Appendices

9.1 Appendix A – Site Shadow Analysis March 21

Figure 6: Site Shadow Analysis on March 21 @07:00 (left) @08:00 (right)

Figure 7: Site Shadow Analysis on March 21 @09:00 (left) @10:00 (right)

Figure 8: Site Shadow Analysis on March 21 @11:00 (left) @12:00 (right)

Figure 9: Site Shadow Analysis on March 21 @13:00 (left) @14:00 (right)

Figure 10: Site Shadow Analysis on March 21 @15:00 (left) @16:00 (right)

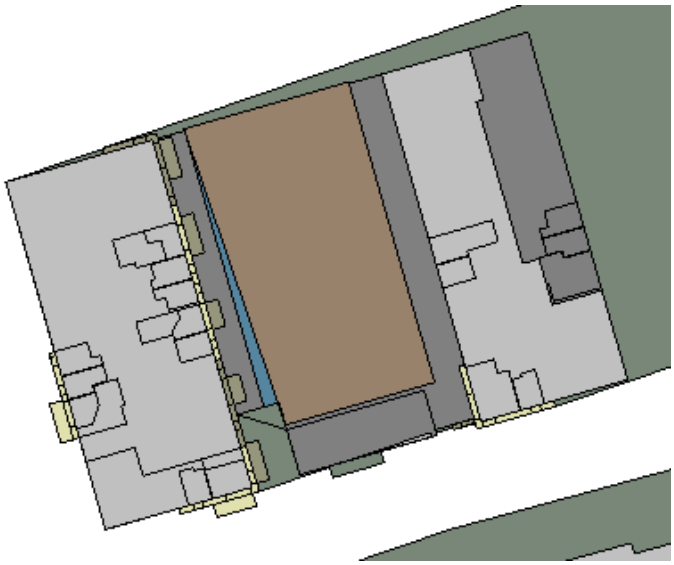

Figure 11: Site Shadow Analysis on March 21 @17:00