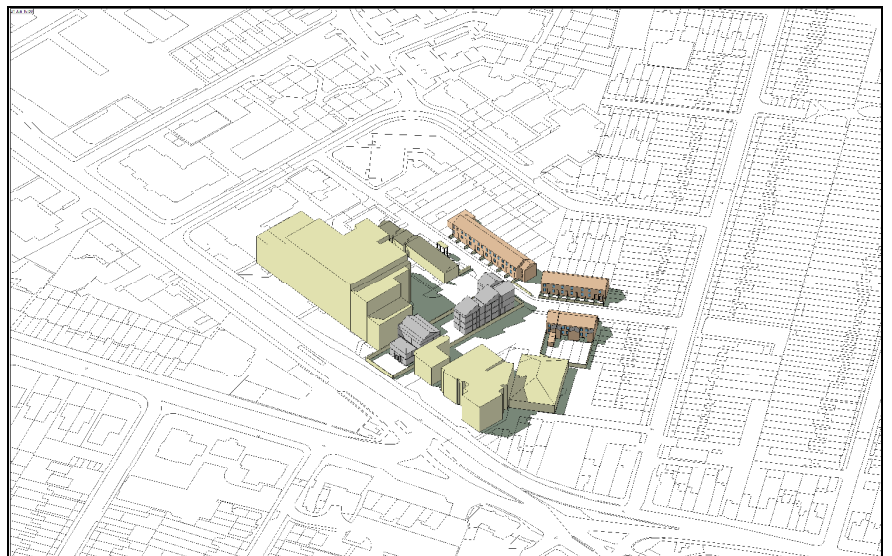




**Building Services
Consulting Engineers**

**PROPOSED RESIDENTIAL DEVELOPMENT
ARTHUR HILL POOL
225 KING'S ROAD, READING**

**FOR
READING BOROUGH COUNCIL**



**DAYLIGHT AND SUNLIGHT
MODELLING REPORT**

DOCUMENT REVISION RECORD**ORIGINAL DOCUMENT**

Compiled by:	Martin Roberts	Date	July 2020
Checked by:	Peter Sheppard	Date	July 2020

ISSUE RECORD

Reason for Issue	Revision	Date	Chkd
Preliminary Issue	P1	27.07.2020	PS
Comments Incorporated	P2	30.07.2020	PS
Report Data Amended	P3	04.08.2020	MB

Executive Summary

The proposed residential development will be located at Arthur Hill Pool, 225 King's Road, Reading. The Application Site is opposite a break in the terraces on Norwood Road where they turn a corner and so is not directly opposite the front of a residential building.

The purpose of this report is to determine if the proposed development complies with the planning recommendations for daylight and sunlight availability levels at the critical adjacent existing residential buildings on Norwood Road.

The study is based on the recommendations set down in the Building Research Establishment (BRE) Report 209, '*Site layout planning for daylight and sunlight, a guide to good practice*', by P J Littlefair (2011).

The RADIANCE lighting simulation package (IESVE, 2020), developed by the Lawrence Berkeley Laboratory in California, in conjunction with IES modelling software and interfaces has been used to perform the daylight simulations.

Sunlight availability calculations were performed using Suncast (IESVE, 2020) to quantify the effect of the proposed development on the adjacent residential building's sunlight availability, both annually and during winter time.

The 3D model of the site was created from drawings supplied by the Client.

Overall, the results show that the proposed development satisfies the BRE requirements and complies with the standard for daylight and sunlight assessment, identified in the document Building Research Establishment (BRE) report 209, '*Site layout planning for daylight and sunlight, a guide to good practice*', by P J Littlefair (2011), and will not adversely affect the light receivable by nearby sensitive windows of the critical adjacent existing residential buildings on Norwood Road.

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1.0 Introduction

1.1 Background

The purpose of this report is to determine if the proposed development complies with the planning recommendations for daylight and sunlight availability levels at the critical adjacent existing residential buildings on Norwood Road. The Application Site is opposite a break in the terraces on Norwood Road where they turn a corner and so is not directly opposite the front of a residential building.

The study is based on the recommendations set down in the Building Research Establishment (BRE) Report 209, '*Site layout planning for daylight and sunlight, a guide to good practice*', by P J Littlefair (2011).

Sunlight availability calculations were performed using SunCast (IESVE, 2020) to quantify the effect of the proposed development on the critical adjacent existing residential buildings sunlight availability, both annually and during winter time.

It is important to also understand the shadowing effects the proposed development will have on the critical adjacent existing residential buildings on Norwood Road. The best way to demonstrate this is with the use of images. Shadowing has been simulated for the proposed development and adjacent buildings on Norwood Road and images have been generated over the course of the day at different times for 21 March (equinox condition) and 21 June (solstice condition).

1.2 Documents Considered

The 3D daylight and sunlight model and this report is based on the design detailed from drawings supplied by the Client.

- CAD drawing of Ordnance Survey map of the area
- 260035cv_01 Topographical Survey of Existing
- 260035cv_03 Survey of Existing Block D
- 260035cv_04 Survey of Existing Residential Buildings on Norwood Road
- 8129_SK101_Proposed Site Plan
- 8129_SK104_Proposed Floor Plans Block A and B Ground and First
- 8129_SK105_Proposed Floor Plans Block A and B Second and Roof
- 8129_SK106_Proposed Floor Plans Block C and D Ground and First
- 8129_SK107_Proposed Floor Plans Block C and D Second and Roof
- 8129_SK109_Proposed Elevations Block A and B North and South
- 8129_SK110_Proposed Elevations Block A and B East and West
- 8129_SK111_Proposed Elevations Block C and D North and South
- 8129_SK113_Proposed Section AA and BB
- 8129_SK22_Proposed Section A-A and B-B
- 8129_SK23_Proposed Section C-C
- 8129_SK24_Proposed Section D-D and E-E

1.3 Planning Conditions

The purpose of this report is to determine if the proposed development complies with the planning recommendations for daylight and sunlight availability levels at the critical adjacent existing residential buildings on Norwood Road under the Planning Policy for Reading Borough Council.

1.4 3D Model Images

Figures 1 - 5 below showing the site plan and the 3D model images for the proposed development.

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Figure 1: Site Plan showing the proposed development and critical adjacent existing residential buildings on Norwood Road.



Figure 2: 3D Model image showing plan view 1 of proposed development (in green) along with critical existing adjacent residential buildings on Norwood Road (in blue) and other existing adjacent buildings (in brown).

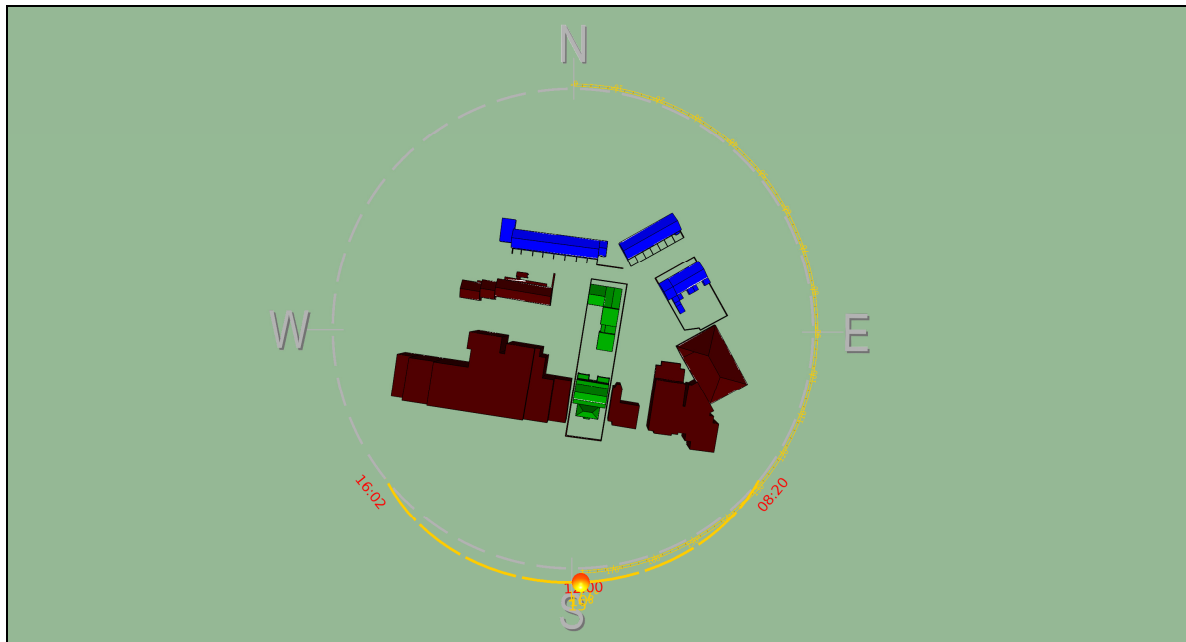


Figure 3: 3D Model image showing view 2 of proposed development (in green) along with critical existing adjacent residential buildings on Norwood Road (in blue) and other existing adjacent buildings (in brown).

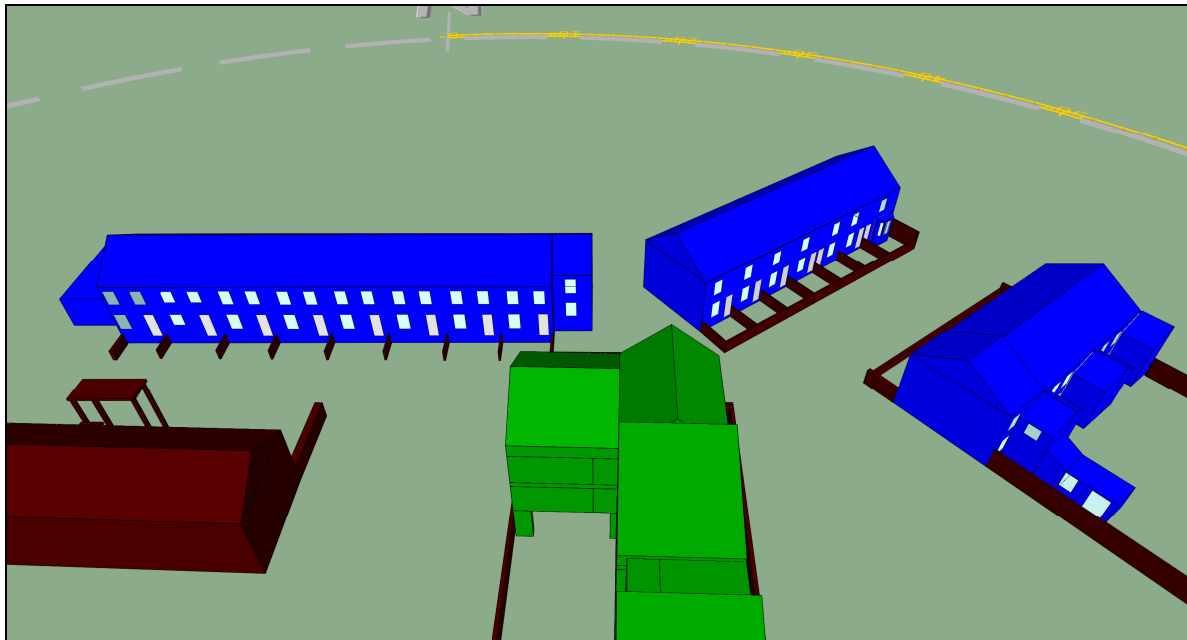


Figure 4: 3D Model image showing North elevation view Scene 1 of proposed development (in green) along with critical existing adjacent residential buildings on Norwood Road (in blue).

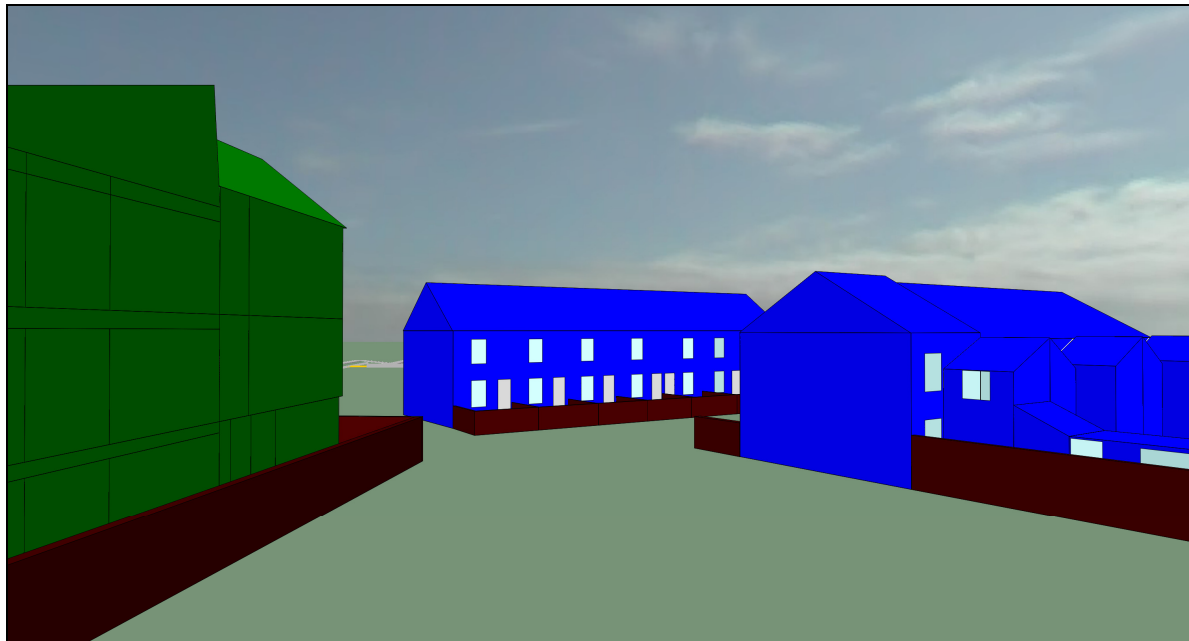
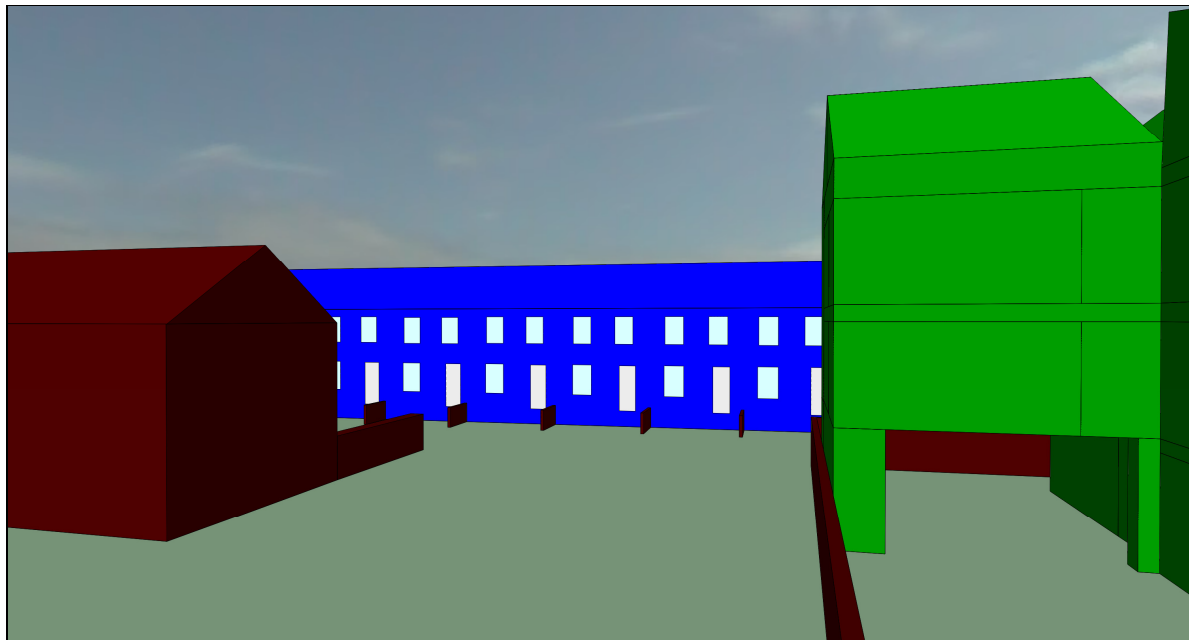


Figure 5: 3D Model image showing North elevation view Scene 2 of proposed development (in green) along with critical existing adjacent residential buildings on Norwood Road (in blue).



2.0 Daylight Modelling

The percentage of the sky visible from the centre of a window is known as the Vertical Sky Component. The Vertical Sky Component on a window can be related to the average daylight factor in a room. The Vertical Sky Component is usually expressed as a percentage and the maximum value for a completely unobstructed wall is slightly less than 40%.

The recommendations set down in the BRE Report 209, '*Site layout planning for daylight and sunlight, a guide to good practice*', would indicate, for residential properties, that a Vertical Sky Component (VSC) value of greater than 27% is acceptable, or if less then cannot be less than 0.8 times the existing value.

The RADIANCE lighting simulation package, developed by the Lawrence Berkeley Laboratory in California, in conjunction with IES modelling software and interfaces has been used to perform the daylight simulations. The 3D model of the site was created from drawings supplied by the Client. The daylighting simulation used the sky condition for 21st September at 12:00 noon with the CIE Standard Overcast Sky.

Table 1 shows the results for Vertical Sky Component for each window for the critical adjacent existing residential buildings on Norwood Road with the proposed development. Figures 6 - 14 below show the raw data images with VSC value for the centre of each window for the critical adjacent existing residential buildings on Norwood Road.

Table 1: Results for Vertical Sky Component Calculations for each window for the critical adjacent existing residential buildings on Norwood Road with the proposed development.

Window Reference	Vertical Sky Component (%) with Proposed Development	Meets BRE Report 209 Criteria? (Target Vertical Sky Component value $\geq$ 27%)
1	30.8	Yes
2	27.0	Yes
3	32.3	Yes
4	31.9	Yes
5	32.6	Yes
6	32.8	Yes
7	29.5	Yes
8	31.0	Yes
9	32.6	Yes
10	33.4	Yes
11	33.2	Yes
12	33.2	Yes
13	31.1	Yes
14	31.3	Yes
15	33.2	Yes
16	31.8	Yes
17	33.6	Yes
18	33.0	Yes
19	32.9	Yes
20	32.7	Yes
21	31.2	Yes
22	30.8	Yes
23	30.5	Yes
24	32.8	Yes
25	34.1	Yes
26	31.1	Yes

27	35.2	Yes
28	35.7	Yes
29	35.9	Yes
30	33.9	Yes
31	34.5	Yes
32	33.9	Yes
33	35.5	Yes
34	37.8	Yes
35	36.5	Yes
36	34.5	Yes
37	35.1	Yes
38	35.1	Yes
39	38.9	Yes
40	34.8	Yes
41	27.8	Yes

Conclusions

From Table 1 and Figures 6 - 14, it can be seen that all the windows for the critical adjacent existing residential buildings on Norwood Road with the proposed development meet the BRE criteria for Vertical Sky Component (Target from BRE 209 $\geq 27\%$) and are significantly higher with VSC values ranging from 27.0% – 38.9%.

Figure 6: Raw data image showing VSC value for centre of each window for the critical adjacent existing residential buildings on Norwood Road.

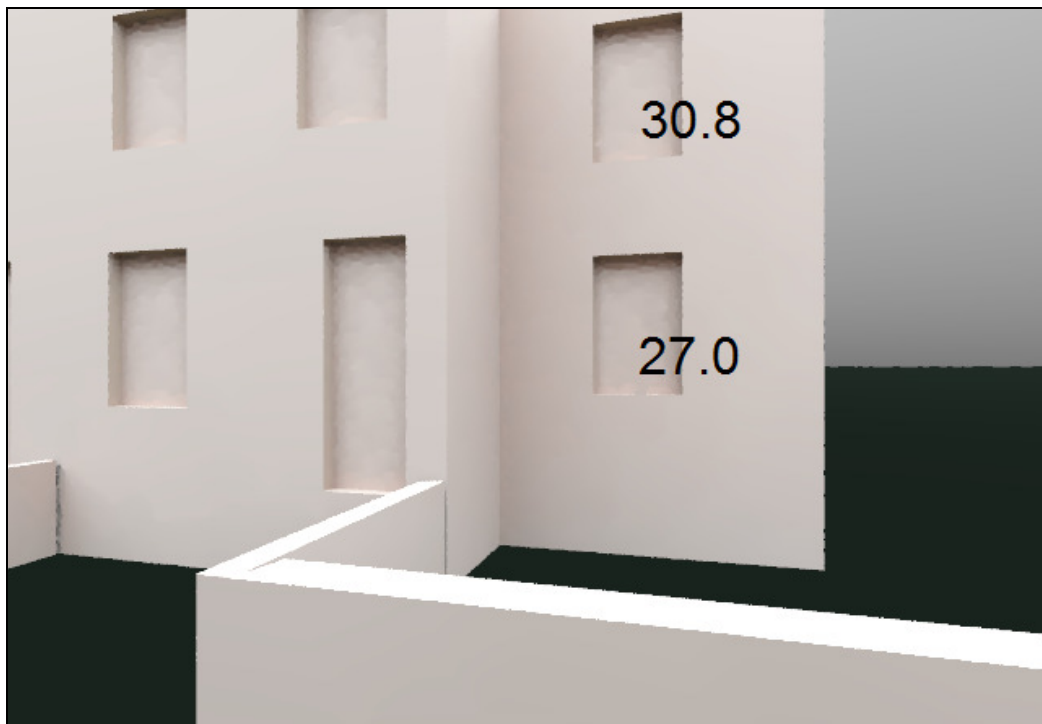


Figure 7: Raw data image showing VSC value for centre of each window for the critical adjacent existing residential buildings on Norwood Road.

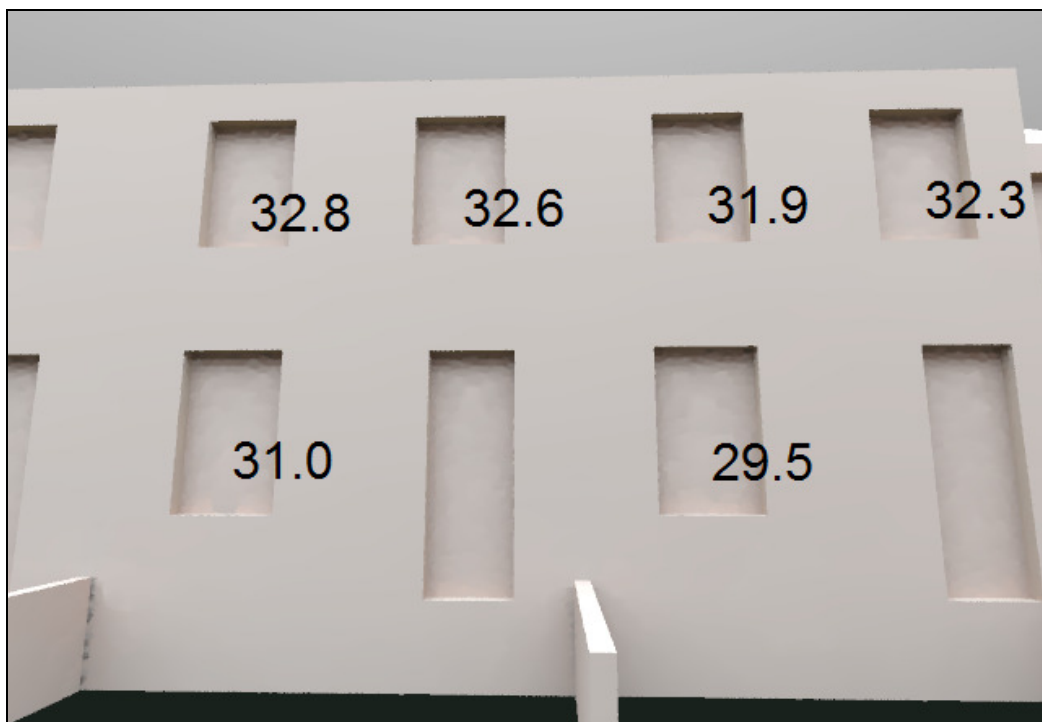


Figure 8: Raw data image showing VSC value for centre of each window for the critical adjacent existing residential buildings on Norwood Road.



Figure 9: Raw data image showing VSC value for centre of each window for the critical adjacent existing residential buildings on Norwood Road.

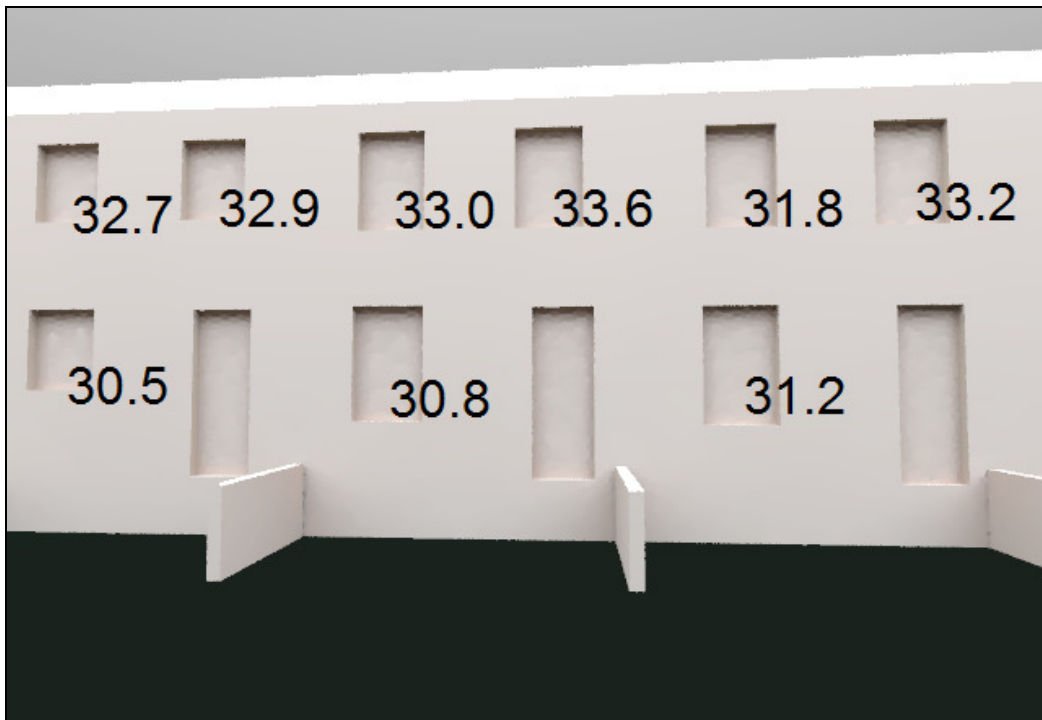


Figure 10: Raw data image showing VSC value for centre of each window for the critical adjacent existing residential buildings on Norwood Road.

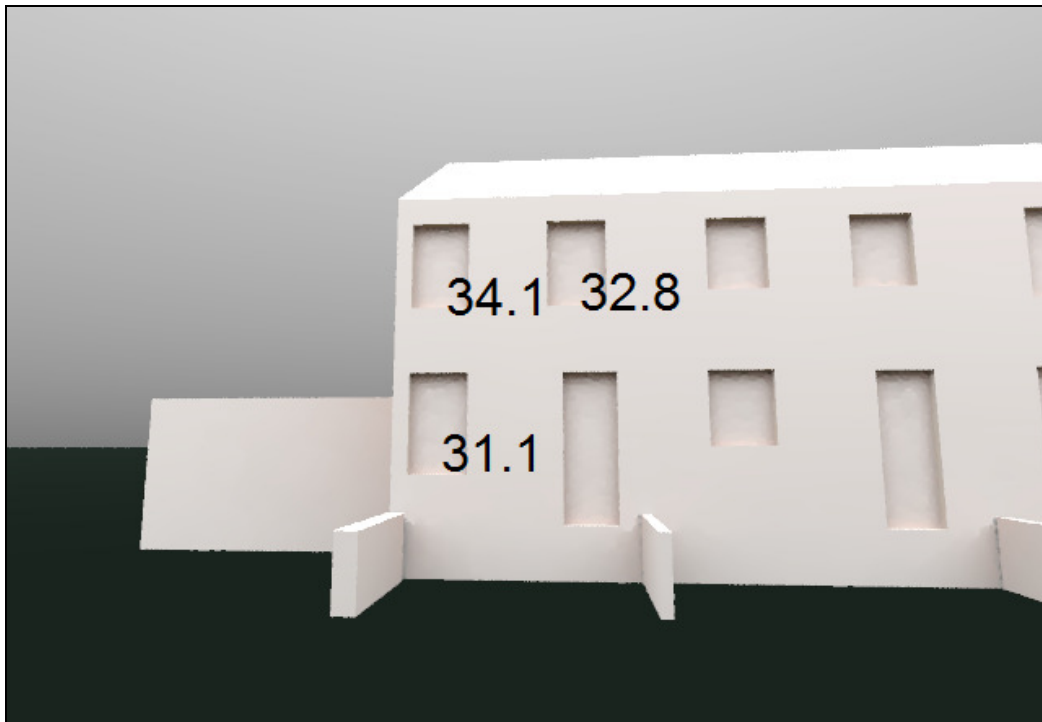


Figure 11: Raw data image showing VSC value for centre of each window for the critical adjacent existing residential buildings on Norwood Road.



Figure 12: Raw data image showing VSC value for centre of each window for the critical adjacent existing residential buildings on Norwood Road.

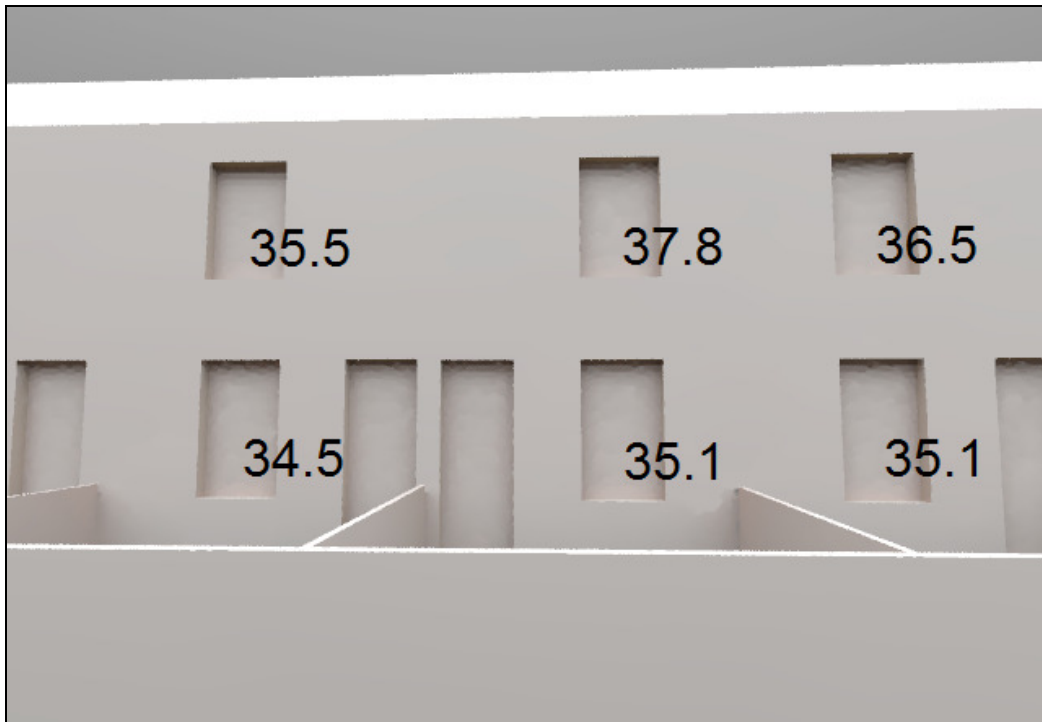


Figure 13: Raw data image showing VSC value for centre of each window for the critical adjacent existing residential buildings on Norwood Road.



Figure 14: Raw data image showing VSC value for centre of each window for the critical adjacent existing residential buildings on Norwood Road.



3.0 Sunlight Availability Calculations

For existing buildings, the recommendations set down in the BRE Report 209, 'Site layout planning for daylight and sunlight, a guide to good practice', and British Standard (BS 8206-2) states "that interiors where the occupants expect sunlight should receive at least one quarter of annual probable sunlight hours (APSH), including at least 5% of annual probable sunlight hours during the winter months (WPSH), between 21 September and 21 March".

BRE Report 209 states that if these conditions can be met, 'then the room should still receive enough sunlight'. Where these conditions are not met, the BRE Report 209 states that 'if the available sunlight hours are less than the amount recommended above and also less than 0.8 times the existing value, it is likely that the occupants of the existing building will notice the loss of sunlight'.

Sunlight availability calculations were performed using SunCast (IESVE, 2020) to quantify the effect of the proposed development on the critical adjacent existing residential buildings sunlight availability, both annually and during winter time.

Table 2 and Table 3 show the results for the annual (APSH) and winter (WPSH) probable sunlight hours (stated as a percentage) for each window for the critical adjacent existing residential buildings on Norwood Road with the proposed development.

Table 2: Results for Annual Sunlight Availability Calculations for each window for the critical adjacent existing residential buildings on Norwood Road with the proposed development.

Window Reference	APSH (%) with Proposed Development	Meets BRE Report 209 Criteria? (Target Annual Sunlight Availability $\geq$ 25%)
1	49.23	Yes
2	40.58	Yes
3	64.26	Yes
4	63.46	Yes
5	63.09	Yes
6	62.04	Yes
7	57.02	Yes
8	56.35	Yes
9	63.08	Yes
10	63.58	Yes
11	64.05	Yes
12	65.28	Yes
13	60.25	Yes
14	59.10	Yes
15	64.93	Yes
16	64.45	Yes
17	64.95	Yes
18	65.97	Yes
19	67.92	Yes
20	67.90	Yes
21	62.63	Yes
22	60.70	Yes
23	59.82	Yes
24	66.71	Yes
25	67.45	Yes
26	61.87	Yes
27	64.07	Yes

28	65.61	Yes
29	65.92	Yes
30	58.87	Yes
31	61.52	Yes
32	61.40	Yes
33	68.66	Yes
34	68.66	Yes
35	71.55	Yes
36	61.36	Yes
37	62.14	Yes
38	64.54	Yes
39	73.12	Yes
40	64.38	Yes
41	44.19	Yes

Table 3: Results for Winter Sunlight Availability Calculations for each window for the critical adjacent existing residential buildings on Norwood Road with the proposed development.

Window Reference	WPSH (%) with Proposed Development	Meets BRE Report 209 Criteria? (Target Winter Sunlight Availability $\geq$ 5%)
1	18.05	Yes
2	12.37	Yes
3	21.79	Yes
4	20.99	Yes
5	20.62	Yes
6	19.57	Yes
7	14.55	Yes
8	13.88	Yes
9	20.61	Yes
10	21.12	Yes
11	21.58	Yes
12	22.82	Yes
13	17.79	Yes
14	16.64	Yes
15	22.47	Yes
16	21.99	Yes
17	22.49	Yes
18	23.50	Yes
19	25.46	Yes
20	25.43	Yes
21	20.17	Yes
22	18.24	Yes
23	17.36	Yes
24	24.24	Yes
25	24.98	Yes
26	19.41	Yes
27	22.29	Yes
28	23.83	Yes
29	24.14	Yes
30	17.76	Yes

31	20.19	Yes
32	20.15	Yes
33	26.88	Yes
34	26.88	Yes
35	29.77	Yes
36	20.38	Yes
37	22.20	Yes
38	25.59	Yes
39	31.34	Yes
40	26.82	Yes
41	18.80	Yes

Conclusions

From Table 2, it can be seen that all the windows for the critical adjacent existing residential buildings on Norwood Road Street with the proposed development meet the BRE criteria for Annual Sunlight Availability (Target from BRE 209 $\geq 25\%$) and are significantly higher with APSH values ranging from 40.58% – 73.12%.

From Table 3, it can be seen that all the windows for the critical adjacent existing residential buildings on Norwood Road Street with the proposed development meet the BRE criteria for Winter Sunlight Availability (Target from BRE 209 $\geq 5\%$) and are significantly higher with WPSH values ranging from 12.37% – 31.34%.

4.0 Overshadowing Study

It is important to understand the shadowing effects the proposed Arthur Hill Residential Development will have on the critical adjacent existing residential buildings on Norwood Road. The best way to demonstrate this is with the use of images.

Shadowing has been simulated for the proposed development and adjacent buildings on Norwood Road and images have been generated over the course of the day at different times for 21 March (equinox condition) and 21 June (solstice condition). The following images have been generated by SUNCAST, part of the IESVE modelling software suite (2020), for 21 March and 21 June.

Conclusions

1. The images show that partial overshadowing from the proposed development on to the front gardens of the existing residential buildings, which are located opposite the proposed on Norwood Road, occurs during the late afternoon in March between the hours of 3pm – 5pm. The same conditions will occur during the September 21st equinox.

We expect that this is acceptable in this instance as:

- It is the front gardens only, which face onto Norwood Road.
 - It occurs in the late afternoon at a time of year where darkness falls relatively early and cooler external temperatures prevail and thus, the front gardens would not generally be used by residents for leisure time.
 - The calculation results for the daylight and sunlight levels with the proposed are excellent and show that the proposed development is not negatively impacting the light levels to the existing residential properties.
2. The images show that partial overshadowing from the proposed development on to the back garden of the existing residential building adjacent to the proposed on Norwood Road occurs during the early evening in June and only between the hours of 6pm and 7pm.

We expect that this is acceptable in this instance as:

- It is only partially overshadowing the back garden of the existing residential building adjacent to the proposed on Norwood Road.
- The overshadowing only lasts for 1 hour.
- At the same time, the existing residential building is casting its own shadow on its own garden.
- The calculation results for the daylight and sunlight levels with the proposed are excellent and show that the proposed development is not negatively impacting the light levels to the existing residential properties.

The images show that due to the orientation of the site the existing block of flats which are located adjacent to the proposed development on Norwood Road are not overshadowed.

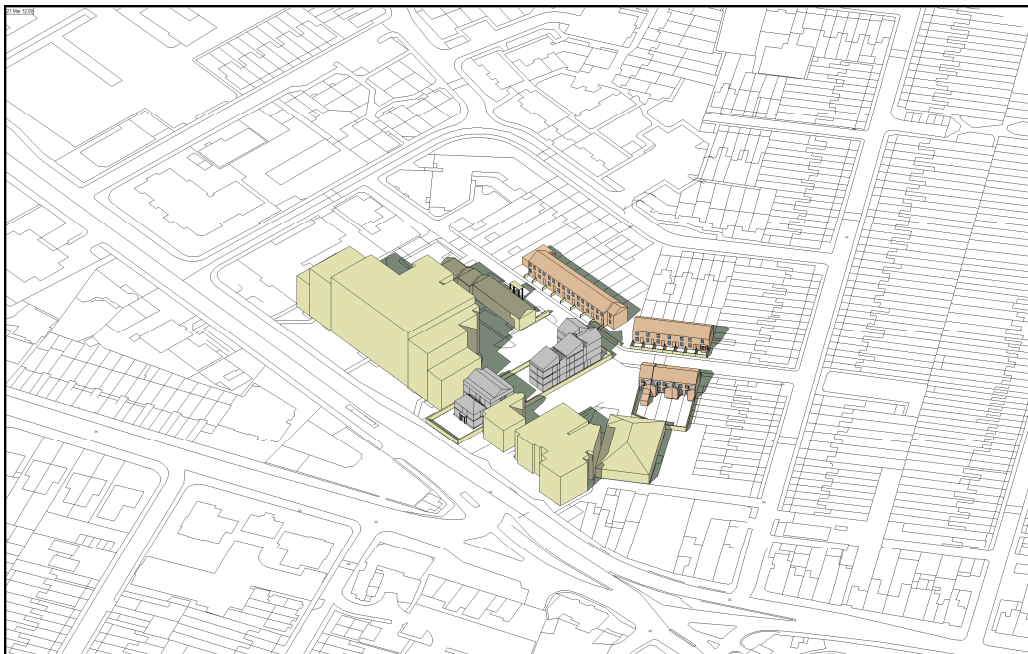
21 March – 0900 hours



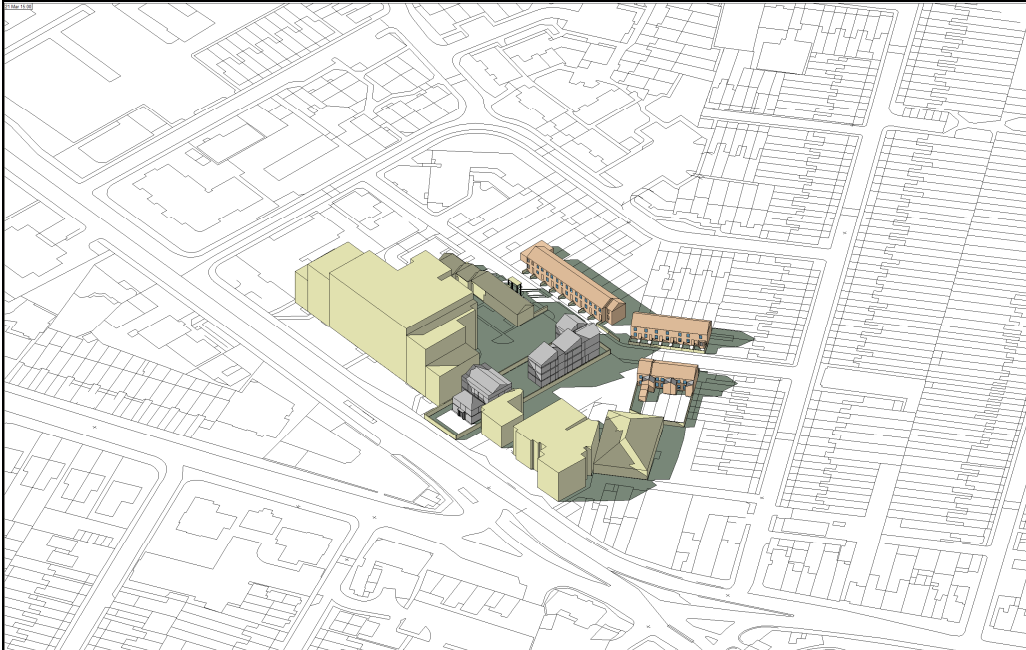
21 March – 1100 hours



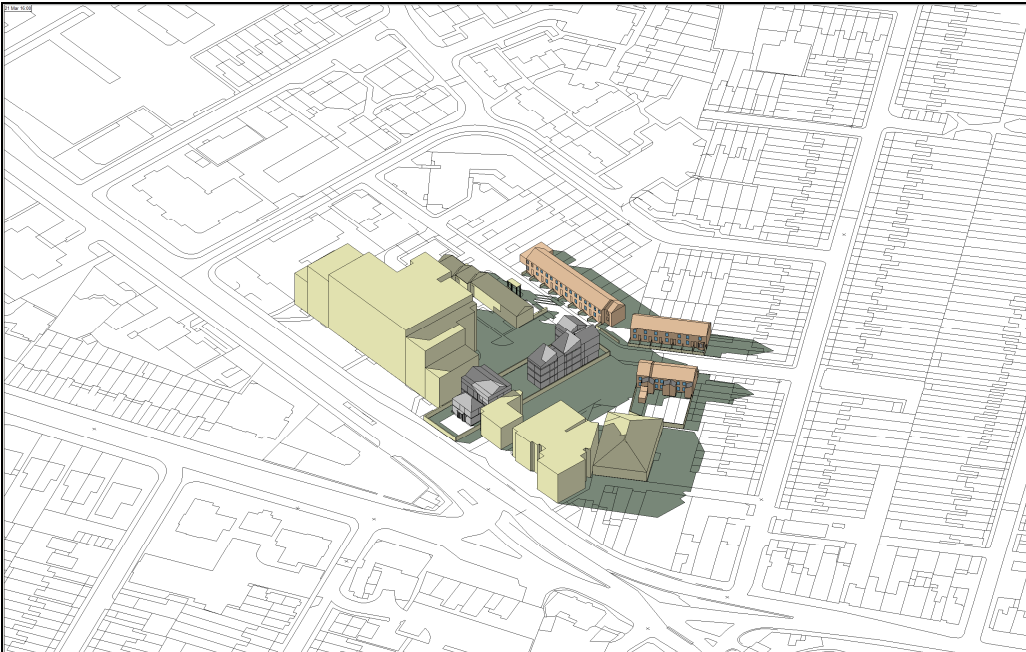
21 March – 1200 hours



21 March – 1500 hours



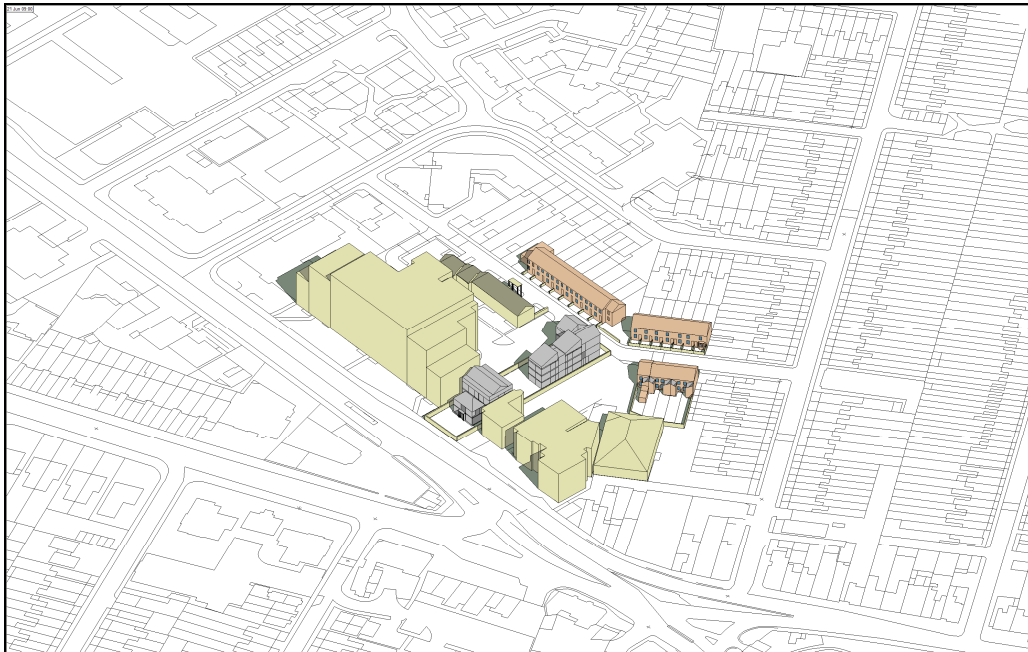
21 March – 1600 hours



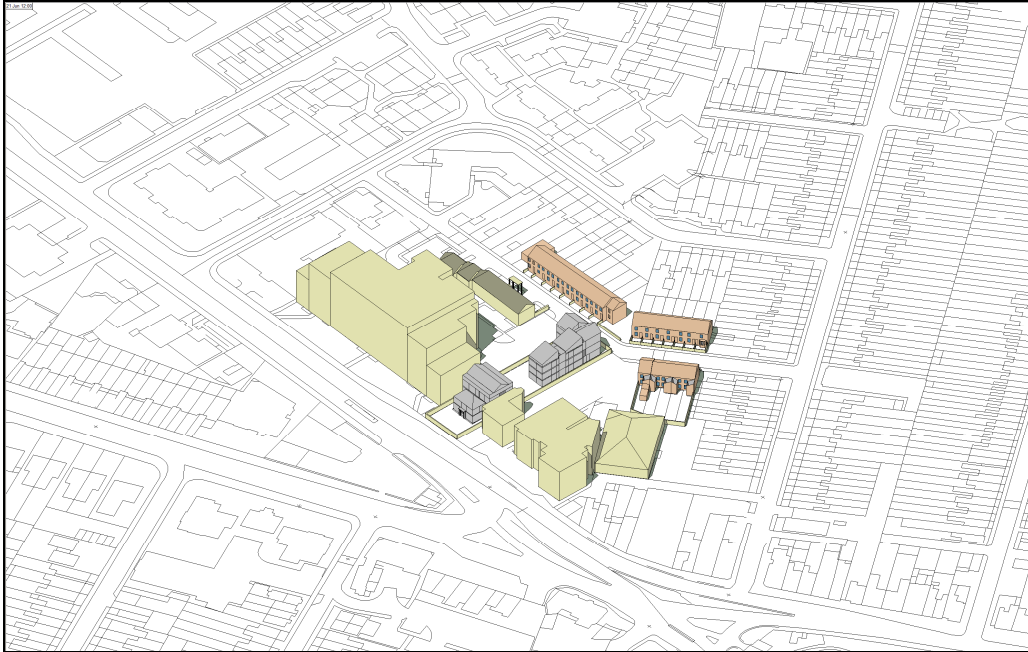
21 March – 1700 hours



21 June – 0900 hours



21 June – 1200 hours



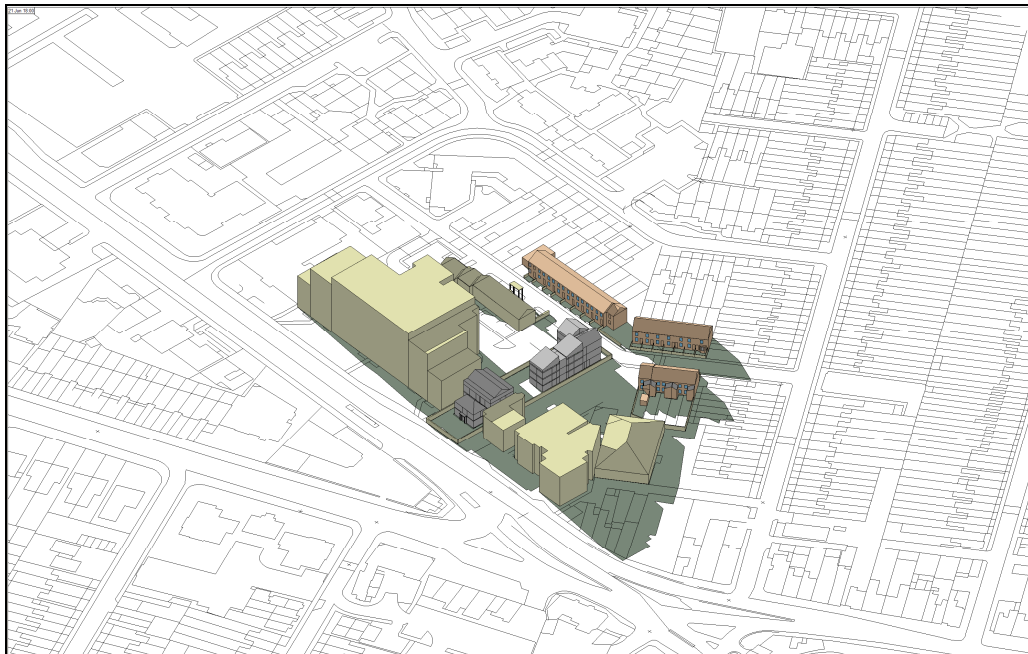
21 June – 1500 hours



21 June – 1700 hours



21 June – 1800 hours



21 June – 1900 hours



Summary

The proposed residential development will be located at Arthur Hill Pool, 225 King's Road, Reading. The purpose of this report is to determine if the proposed development complies with the planning recommendations for daylight and sunlight availability levels at the critical adjacent existing residential buildings on Norwood Road. The Application Site is opposite a break in the terraces on Norwood Road where they turn a corner and so is not directly opposite the front of a residential building.

The study is based on the recommendations set down in the Building Research Establishment (BRE) Report 209, '*Site layout planning for daylight and sunlight, a guide to good practice*', by P J Littlefair (2011).

Overall, the results show that the proposed development satisfies the BRE requirements and complies with the standard for daylight and sunlight assessment, identified in the document Building Research Establishment (BRE) report 209, '*Site layout planning for daylight and sunlight, a guide to good practice*', by P J Littlefair (2011), and will not adversely affect the light receivable by nearby sensitive windows of the critical adjacent existing residential buildings on Norwood Road.

References

BSI. Code of practice for daylighting. BS 8206-2 :2008.
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Littlefair P J et al. Site layout planning for daylight and sunlight, a guide to good practice.
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