Potato Wharf

Sunlight, Daylight and Overshadowing Assessment

April 2015

Hulley & Kirkwood Consulting Engineers Ltd
The Stack
Papermill Wynd
McDonald Road
Edinburgh
EH7 4QL

(**t**): 0131 558 4888
(**f**): 0131 558 4889
(**e**): hk.edinburgh@hulley.co.uk
(**w**): www.hulley.co.uk

.....Making Buildings Work

Prepared By: Jonathan McMillan
Checked By: Rowan Palmer
Date: 24/04/2015

Potato Wharf
Sunlight, Daylight and Overshadowing Assessment

April 2015

REV	DESCRIPTION	PREPARED BY	DATE
Issue No. 1	First issue	Jonathan McMillan	April 2015

Index:

1.0 Introduction 5

1.1 Executive Summary 5

2.0 Background and Scope of Appraisal 7

2.1 Site Location 7
2.2 The Development 8

3.0 Relevant Policy and Guidance 9

3.1 Vertical Sky Component (VSC) 9
3.2 Annual Probable Sunlight Hours 10
3.3 Overshadowing 10

4.0 Simulation Modelling 11

4.1 Building Geometry 12
4.2 Identification of Key Sensitive Receptors 16

5.0 Assessment Results 17

5.1 Sunlight and Daylight Assessment Results – Pre Development 19
5.2 Sunlight and Daylight Assessment Results – Post Development 22
5.3 Assessment Results – Comparison of Pre / Post Development Daylight and Sunlight Levels 25

6.0 Overshadowing images 27

7.0 Observations 32

7.1 Daylight Observations 32
7.2 Sunlight Observations 34

8.0 Conclusions 35

9.0 Concluding Remarks 37

1.0 Introduction

This report has been prepared by Jonathan McMillan for Hulley Eco, a sustainable building design and simulation division within Hulley & Kirkwood LTD, in order to summarise the findings of a computer simulation of anticipated daylight levels, sunlight levels and overshadowing at key locations within a residential building, Potato Wharf Block 2 at the Potato Wharf development in Manchester.

The main objective of the exercise was to establish if the proposed Block 3 & Block 4 buildings will result in any noticeable detriment to sunlight, daylight or degree of overshadowing at key window receptors within Block 2.

1.1 Executive Summary

All window receptors analysed within Block 2 will receive less sunlight and less daylight as a result of the construction of Blocks 3 & 4.

The reduction to daylight and sunlight levels will for many areas not result in sunlight or daylight levels dropping below the best practice design thresholds set out in BRE guidelines.

A number of areas will however be subject to a noticeable reduction in current daylight and sunlight levels, with levels dropping by more than 20% of current values and dropping below the best practice design thresholds set out in BRE guidelines. These are detailed in Figure 1 below.

However, within the context of this analysis it should be understood and accepted that the development of Potato Wharf has always envisaged the construction of Blocks 3 & 4 adjacent to Block 2. Blocks 1 to 4 have been designed by the same developer and are of the same proportions and massing.

Block 2 has been recently completed, and prior to purchase, owners were made aware that the potential existed for future phased developments of similar size and massing. As such, the transition from pre-development to post-development measures will have been anticipated by owners.

It is anticipated that the construction of Block 3 will have the same relative impact on Block 2 as Block 2 has had on Block 1. To date no complaints have been received from residents of Block 1 regarding the levels of daylight or sunlight received.

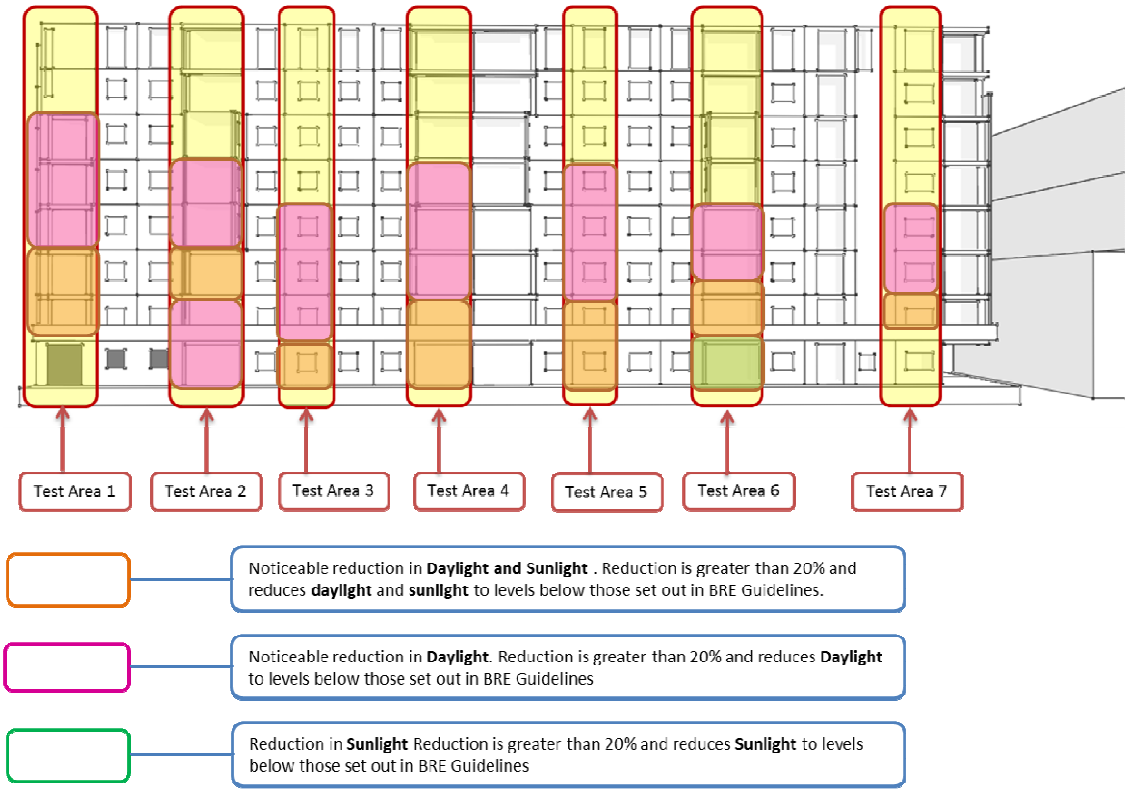


Figure 1 – Areas subject to a noticeable reduction in Daylight and Sunlight

2.0 Background and Scope of Appraisal

The objective of this study is to assess the potential impacts that the proposed Block 3 and 4 at the Potato Wharf development may have on its neighbouring buildings in terms of daylight, sunlight and overshadowing.

The assessment focuses on the adjacent residential building Potato Wharf Block 2. The key elements of this assessment are as follows:

- To summarise the relevant planning policies with respect to daylight, sunlight and overshadowing;
- To assess the baseline sunlight, daylight and overshadowing conditions at the site, in particular at selected, representative window receptors at Potato Wharf Block 2
- To analyse the potential direct and indirect impacts of the proposed Blocks 3 & 4 a number of representative window receptors were selected for analysis using 3D computer modelling techniques.

2.1 Site Location

The Potato Wharf site is located in central Manchester

The existing development is designed across two eight-storey blocks and rests around a landscaped courtyard overlooking the Castlefield waterways

The site has been illustrated by Figure 2.

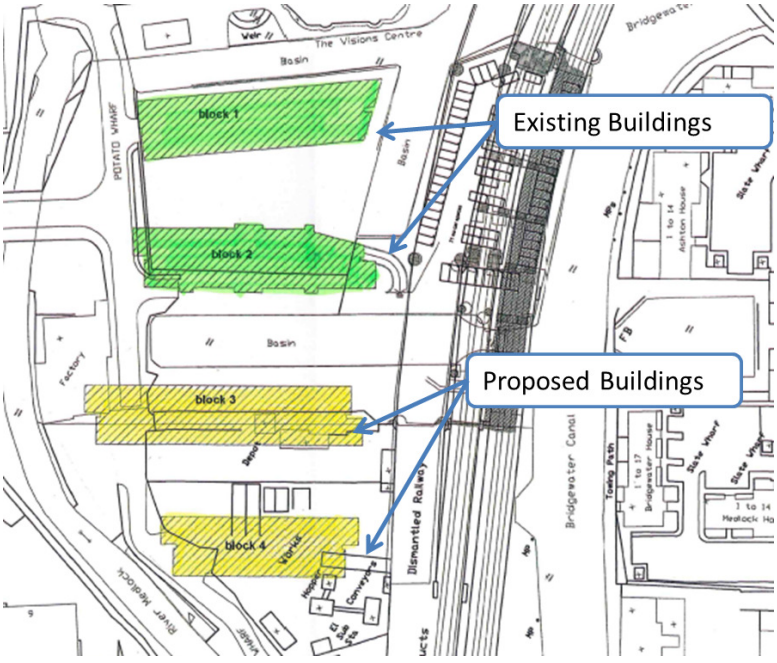


Figure 2 - Site Plan – Architect

2.2 The Development

The proposed development is designed across two seven storey blocks and rests around a landscaped courtyard overlooking the Castlefield waterways, proposed buildings are intended to match the character of the existing Blocks 1 and 2. The current massing proposal is detailed in Figure 3



Figure 3 - Development Massing Proposal

3.0 Relevant Policy and Guidance

The Guide to Development in Manchester, Supplementary Planning Document and Planning Guidance states that proposed developments should consider the following in relation to their location, orientation and massing;

- *Should consider issues such as overshadowing*
- *Microclimate, including overshadowing and air turbulence effects, created by the relationship of the building to those adjacent; and the quality and usability of the spaces surrounding the building.*

The most recognised guidance document relative to the above requirement is published by the Building Research Establishment (BRE) '*Site Layout Planning for Daylight and Sunlight – A Guide to Good Practice', Second Edition, 2011; herein referred to as the 'BRE Guidelines'*.

The BRE Guidelines are not mandatory and themselves state that they should not be used as an instrument of planning policy, however in practice they are heavily relied upon as they provide a good guide to approach, methodology and evaluation of daylight and sunlight impacts.

In conjunction with the BRE Guidelines further guidance is given within the British Standard (BS) 8206-2:2008: 'Lighting for buildings - Part 2: Code of practice for daylighting'.

In this assessment the BRE Guidelines have been used to establish the extent to which the Proposed Development influences daylight and sunlight in Potato Wharf Block 2.

Whilst the BRE Guidelines provide numerical guidance for daylight, sunlight and overshadowing, these criteria should not be seen as absolute targets since, as the document states, the intention of the guide is to help rather than constrain the designer.

The Guide is not an instrument of planning policy, therefore whilst the methods given are technically robust, it is acknowledged that some level of flexibility should be applied where appropriate.

3.1 Vertical Sky Component (VSC)

The Vertical Sky Component (VSC) calculation is the ratio of the direct sky illuminance falling on the outside of a window, to the simultaneous horizontal illuminance under an unobstructed sky.

The standard CIE Overcast Sky is used and the ratio is expressed as a percentage. For example, a window that has an unobstructed view over open fields would benefit from the maximum VSC, which would be close to 39.6%.

For a window to be considered as having a reasonable amount of skylight reaching it, the BRE Guidelines suggests that a minimum VSC value of 27% should be achieved. When assessing the impact of a new development on an existing building the BRE Guidelines sets out the following specific requirement:

If the VSC with the new development in place is both less than 27% and less than 0.8 times its former value, then the reduction in light to the window is likely to be noticeable.

This means that a reduction in the VSC value of up to 20% its former value would be acceptable and thus the impact would be considered negligible. It is important to note that the VSC is a simple geometrical calculation, which provides an early indication of the potential for daylight entering the space. It does not, however, assess or quantify the actual daylight levels inside the rooms.

3.2 Annual Probable Sunlight Hours

Annual probable sunlight hours (APSH) are a measure of sunlight that a given window may expect over a year period. The BRE guidance recognises that sunlight is less important than daylight in the amenity of a room and is heavily influenced by orientation. North facing windows may receive sunlight on only a handful of occasions in a year, and windows facing eastwards or westwards will only receive sunlight for some of the day

BRE guidance recommends that the APSH received at a given window receptor should be at least 25% of the total available, including at least 5% in winter. Winter is defined as the 21st September to 21st March

Where the proposed values fall short of these then the proposed values should not be less than 0.8 times their previous value in each period

3.3 Overshadowing

The BRE Guidance suggests that where a large building is proposed, which may affect a number of gardens or an area of open space, then analysis can be undertaken to quantify the loss of sunlight resulting from overshadowing. The Guidance suggests that at least half of the amenity area should receive at least two hours of sunlight on the 21st March. Potato Wharf Block 2 does have a central landscaped amenity area however this is located on the other side (East) of Block 2 and as such will not be affected by the construction of Blocks 3 & 4.

4.0 Simulation Modelling

The software package IES Virtual Environment has been used to perform daylight analysis calculations on a 3D representation of the proposed site, including the railway bridge and other adjacent buildings surrounding the site.

The accuracy of the model, and hence the validity of any findings, are governed by the assumptions made, and the resolution of the model's geometry.

The model's geometry was accurately drawn from information supplied by the Architect. Assumptions on the reflectance and transmittance of internal surfaces and partitions were based on typical values for specific operational areas.

Daylight has been analysed using IES VE tools Flucs DL and Radiance

Sunlight and Overshadowing have been analysed using IES VE Suncast

The latest version of IES Virtual Environment modelling software has been used (IES version 7.0.2.0). The details of which are given in Table 1.1.

Calculation Engine:	• Flucs DL • Radiance • Suncast
Interface to Calculation Engine:	IES Virtual Environment

Table 1 - Calculation Tool Details

4.1 Building Geometry

A geometrically accurate representation of the proposed site was constructed from the historic architectural layouts and elevations using the Model IT package within the IES Virtual Environment.

Two parallel simulation models were created to represent the site and adjacent buildings pre and post development.

4.1.1 Pre-Development Model Geometry

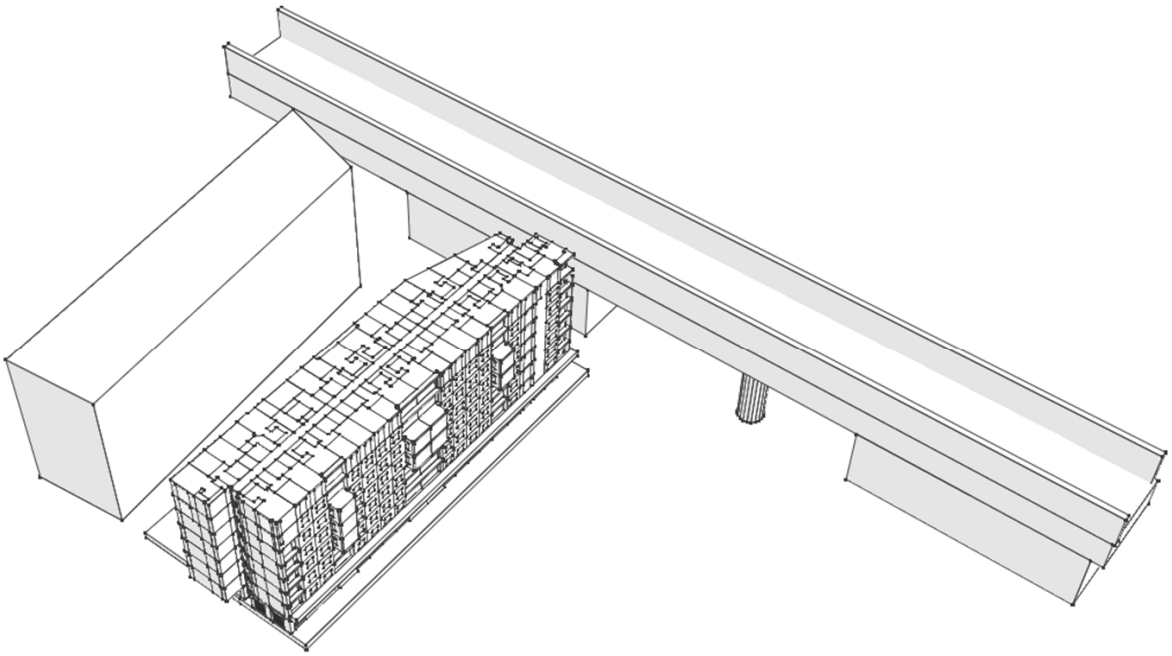


Figure 4 - Pre-Development 1 - Simulation Geometry

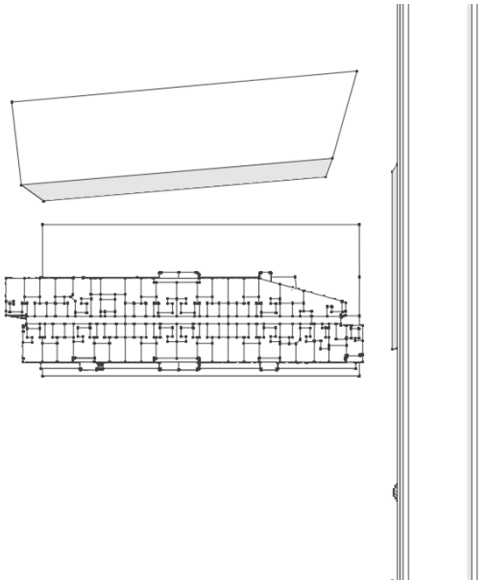


Figure 5 - Pre-Development 2 - Simulation Geometry

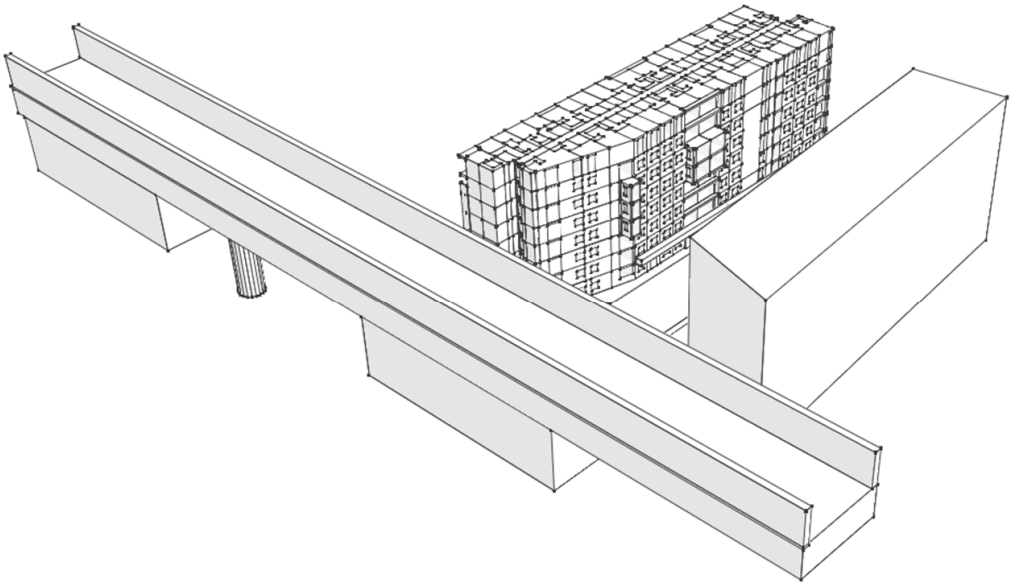


Figure 6 - Pre-Development 3 - Simulation Geometry

4.1.2 Post Development Geometry

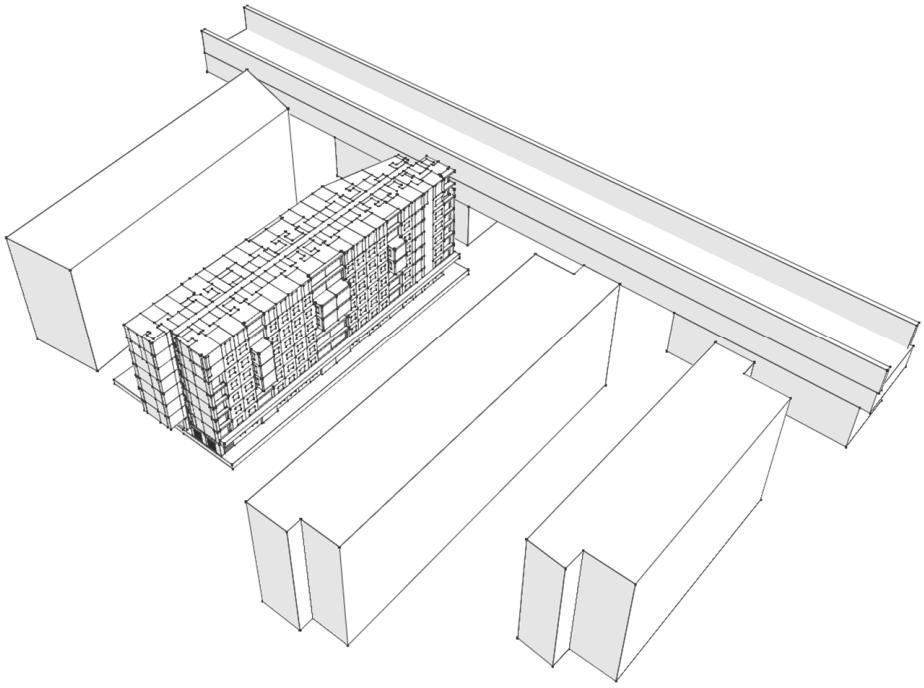


Figure 7- Post-Development 1 - Simulation Geometry

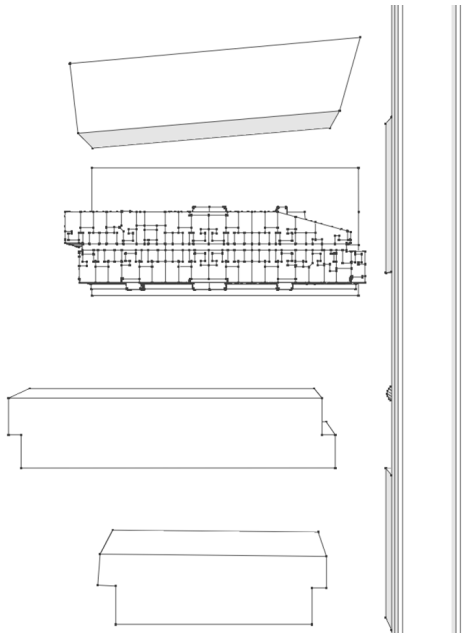


Figure 8 - Post-Development 2 - Simulation Geometry

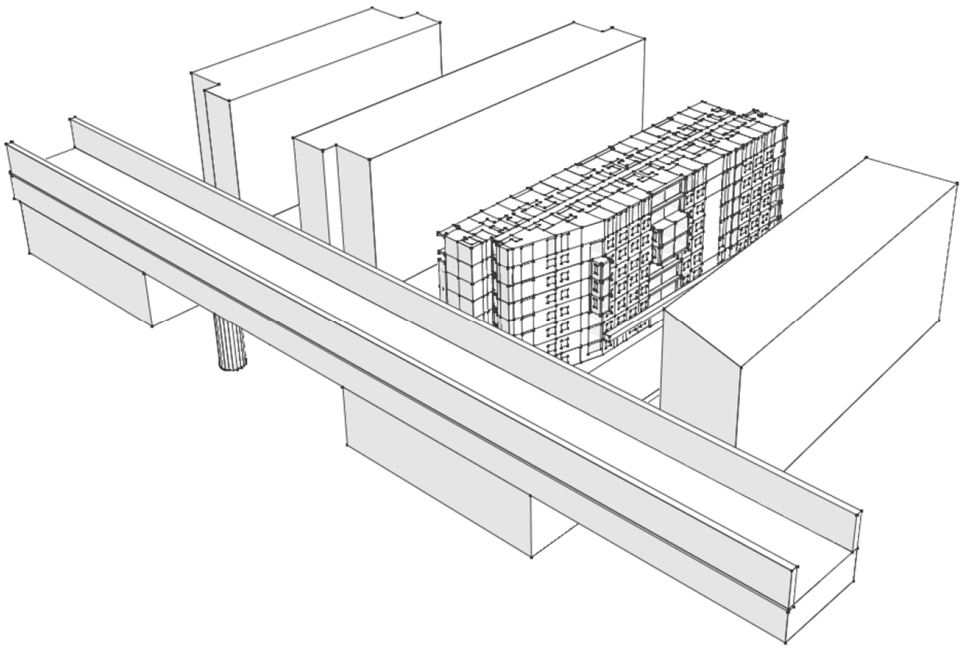


Figure 9 - Post-Development 3 - Simulation Geometry

4.2 Identification of Key Sensitive Receptors

In order to determine if the proposed Potato Wharf Blocks 3 and 4 will have a negative impact on sunlight, daylight and overshadowing within the adjacent existing Block 2, a number of key receptors have been identified.

Due to the dynamic, whole building nature, daylight and sunlight results have been collated for all window receptors. However, for the purposes of this assessment results are presented for a number of key test areas, as identified below.

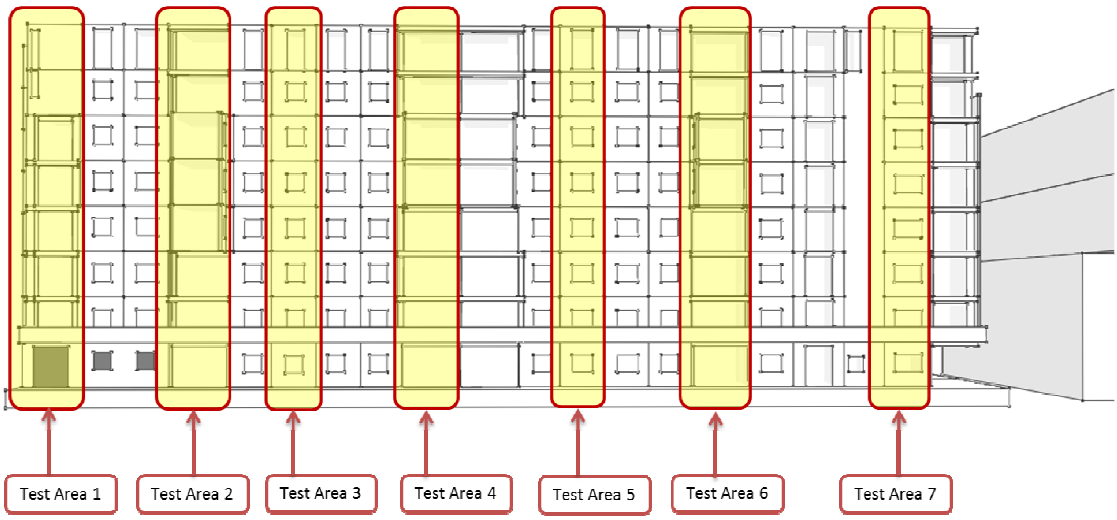


Figure 10 - Key Representative Test Receptors – Pre-Development

5.0 Assessment Results

Section 5.1 and 5.2 present the following results for pre-development and post-development scenarios respectively.

- Daylight – Vertical Sky Component (VSC)
- Sunlight – Annual Probable Sunlight Hours (APSH) and Winter Probable Sunlight Hours (WPSH)

  Results have been formatted conditionally.
- For Daylight Where the VSC is below the BRE guideline figure of 27% the results are coloured red. Where the VSC approaches 39.67% (maximum) results are coloured Green.
- For Sunlight, where the APSH is below the BRE guideline figure of 25% the results are coloured red. Where APSH approaches 50% results are coloured Green.
- For Sunlight, where the WPSH is below the BRE guideline figure of 5% the results are coloured red. Where WPSH approaches 10% results are coloured Green.

A simple key to results tables is presented below.

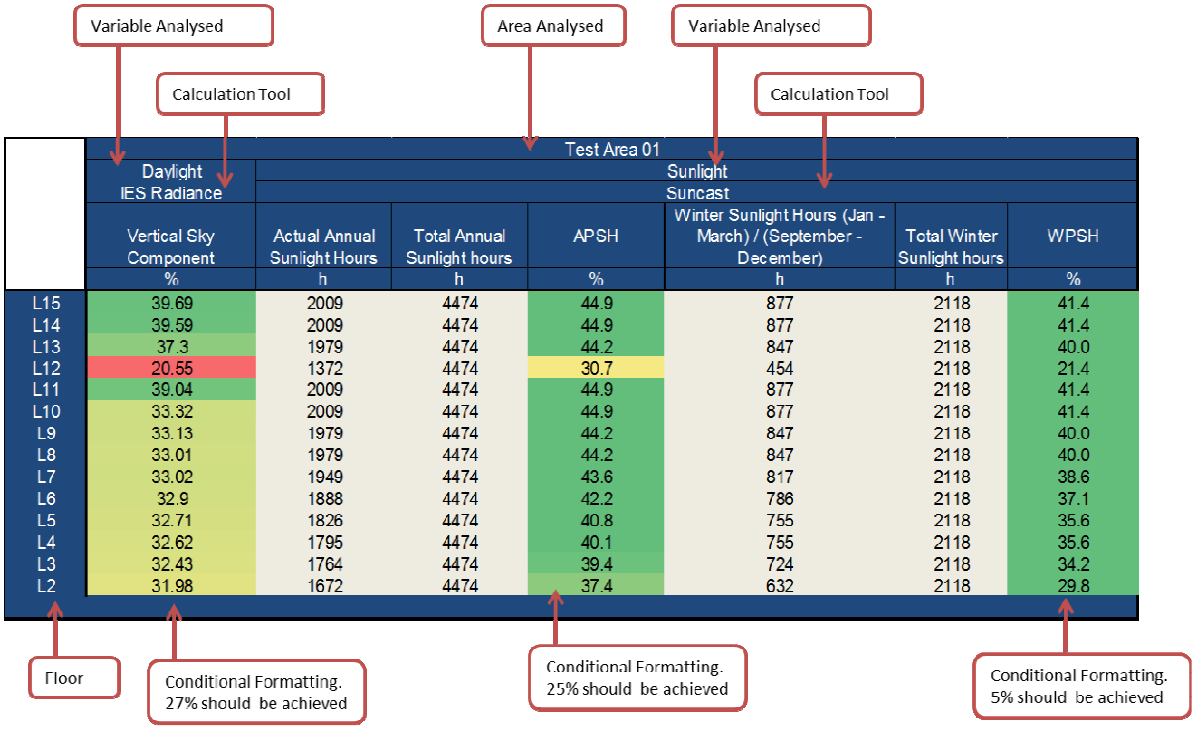


Figure 11 – Sunlight and Daylight Assessment Result Table – Key

Section 5.3 presents a comparison of results and examines the following;

- Are Sunlight and/or Daylight levels greater than design threshold levels set out in BRE Guidelines pre-development
- Are Sunlight and/or Daylight levels greater than design threshold levels set out in BRE Guidelines post-development
- Have daylight and/or Sunlight levels reduced by more than 20% as a result of the development of Blocks 3 and 4.

A simple key to results tables is presented below.

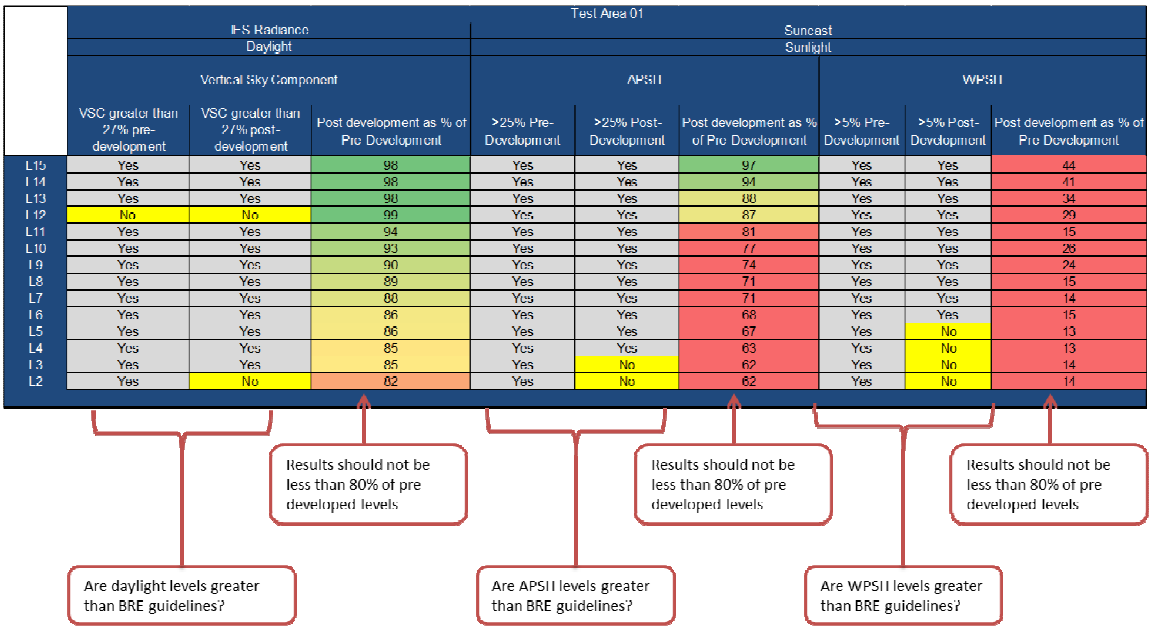


Figure 12 – Sunlight and Daylight Assessment Comparison Table – Key

5.1 Sunlight and Daylight Assessment Results – Pre Development

	Test Area 01						
	Daylight IES Radiance	Sunlight Suncast					
	Vertical Sky Component	Actual Annual Sunlight Hours	Total Annual Sunlight hours	APSH	Winter Sunlight Hours (Jan - March) / (September - December)	Total Winter Sunlight hours	WPSH
	%	h	h	%	h	h	%
L07	40.19	2829	4474	63.2	1483	2118	70.0
L06	40.19	2860	4474	63.9	1483	2118	70.0
L05	32.34	2587	4474	57.8	1302	2118	61.5
L04	30.51	2556	4474	57.1	1302	2118	61.5
L03	30.23	2464	4474	55.1	1271	2118	60.0
L02	30.25	2526	4474	56.5	1302	2118	61.5
L01	29.71	2526	4474	56.5	1302	2118	61.5
L00							

Table 02 – Test Area 01

	Test Area 02						
	Daylight IES Radiance	Sunlight Suncast					
	Vertical Sky Component	Actual Annual Sunlight Hours	Total Annual Sunlight hours	APSH	Winter Sunlight Hours (Jan - March) / (September - December)	Total Winter Sunlight hours	WPSH
	%	h	h	%	h	h	%
L07	32.33	2557	4474	57.2	1333	2118	62.9
L06	32.5	2557	4474	57.2	1333	2118	62.9
L05	39.77	2860	4474	63.9	1483	2118	70.0
L04	39.98	2921	4474	65.3	1544	2118	72.9
L03	39.71	2921	4474	65.3	1544	2118	72.9
L02	21.39	2707	4474	60.5	1361	2118	64.3
L01	30.96	2526	4474	56.5	1302	2118	61.5
L00	29.43	2369	4474	53.0	1268	2118	59.9

Table 03– Test Area 02

	Test Area 03						
	Daylight IES Radiance	Sunlight Suncast					
	Vertical Sky Component	Actual Annual Sunlight Hours	Total Annual Sunlight hours	APSH	Winter Sunlight Hours (Jan - March) / (September - December)	Total Winter Sunlight hours	WPSH
	%	h	h	%	h	h	%
L07	40.39	2860	4474	63.9	1483	2118	70.0
L06	40.13	2860	4474	63.9	1483	2118	70.0
L05	40.06	2799	4474	62.6	1453	2118	68.6
L04	39.31	2771	4474	61.9	1394	2118	65.8
L03	37.77	2710	4474	60.6	1333	2118	62.9
L02	37.62	2677	4474	59.8	1361	2118	64.3
L01	37.58	2614	4474	58.4	1329	2118	62.7
L00	23.88	2034	4474	45.5	1025	2118	48.4

Table 04 – Test Area 03

	Test Area 04						
	Daylight	Sunlight					
	IES Radiance	Suncast					
	Vertical Sky Component	Actual Annual Sunlight Hours	Total Annual Sunlight hours	APSH	Winter Sunlight Hours (Jan - March) / (September - December)	Total Winter Sunlight hours	WPSH
	%	h	h	%	h	h	%
L07	33.08	2585	4474	57.8	1361	2118	64.3
L06	39.92	2585	4474	57.8	1361	2118	64.3
L05	39.88	2860	4474	63.9	1483	2118	70.0
L04	39.46	2799	4474	62.6	1453	2118	68.6
L03	19.82	2309	4474	51.6	1361	2118	64.3
L02	31.25	2492	4474	55.7	1299	2118	61.3
L01	30.38	2369	4474	53.0	1145	2118	54.1
L00	28.28	2218	4474	49.6	1056	2118	49.9

Table 05– Test Area 04

	Test Area 05						
	Daylight	Sunlight					
	IES Radiance	Suncast					
	Vertical Sky Component	Actual Annual Sunlight Hours	Total Annual Sunlight hours	APSH	Winter Sunlight Hours (Jan - March) / (September - December)	Total Winter Sunlight hours	WPSH
	%	h	h	%	h	h	%
L07	39.91	2860	4474	63.9	1422	2118	67.1
L06	40.05	2799	4474	62.6	1422	2118	67.1
L05	39.34	2860	4474	63.9	1483	2118	70.0
L04	38.26	2771	4474	61.9	1394	2118	65.8
L03	37.47	2709	4474	60.5	1362	2118	64.3
L02	37.49	2491	4474	55.7	1175	2118	55.5
L01	36.43	2341	4474	52.3	1056	2118	49.9
L00	22.2	1884	4474	42.1	845	2118	39.9

Table 06– Test Area 05

	Test Area 06						
	Daylight	Sunlight					
	IES Radiance	Suncast					
	Vertical Sky Component	Actual Annual Sunlight Hours	Total Annual Sunlight hours	APSH	Winter Sunlight Hours (Jan - March) / (September - December)	Total Winter Sunlight hours	WPSH
	%	h	h	%	h	h	%
L07	31.85	2557	4474	57.2	1302	2118	61.5
L06	31.95	2526	4474	56.5	1302	2118	61.5
L05	39.31	2860	4474	63.9	1483	2118	70.0
L04	38.37	2829	4474	63.2	1452	2118	68.6
L03	19.72	2402	4474	53.7	1117	2118	52.7
L02	28.87	2095	4474	46.8	902	2118	42.6
L01	27.54	2068	4474	46.2	844	2118	39.8
L00	23.36	2009	4474	44.9	785	2118	37.1

Table 07– Test Area 06

	Test Area 07						
	Daylight	Sunlight					
	IES Radiance	Suncast					
	Vertical Sky Component	Actual Annual Sunlight Hours	Total Annual Sunlight hours	APSH	Winter Sunlight Hours (Jan - March) / (September - December)	Total Winter Sunlight hours	WPSH
	%	h	h	%	h	h	%
L07	41.29	2860	4474	63.9	2860	2118	135.0
L06	39.97	2860	4474	63.9	2860	2118	135.0
L05	38.67	2798	4474	62.5	2798	2118	132.1
L04	36.39	2401	4474	53.7	2401	2118	113.4
L03	34.62	2375	4474	53.1	2375	2118	112.1
L02	32.84	1983	4474	44.3	1983	2118	93.6
L01	31.44	1861	4474	41.6	1861	2118	87.9
L00	18.57	1770	4474	39.6	1770	2118	83.6

Table 08– Test Area 07

5.2 Sunlight and Daylight Assessment Results – Post Development

	Test Area 01						
	Daylight IES Radiance	Sunlight Suncast					
	Vertical Sky Component	Actual Annual Sunlight Hours	Total Annual Sunlight hours	APSH	Winter Sunlight Hours (Jan - March) / (September December)	Total Annual Sunlight hours	WPSH
	%	h	h	%	h	h	%
L07	38.64	2769	4474	61.9	1423	4474	31.8
L06	37	2679	4474	59.9	1333	4474	29.8
L05	26.47	1764	4474	39.4	969	4474	21.7
L04	22.5	1981	4474	44.3	696	4474	15.6
L03	19.42	1740	4474	38.9	546	4474	12.2
L02	17.34	883	4474	19.7	424	4474	9.5
L01	14.86	763	4474	17.1	334	4474	7.5
L00							

Table 09 - Test Area 01

	Test Area 02						
	Daylight IES Radiance	Sunlight Suncast					
	Vertical Sky Component	Actual Annual Sunlight Hours	Total Annual Sunlight hours	APSH	Winter Sunlight Hours (Jan March) / (September December)	Total Annual Sunlight hours	WPSH
	%	h	h	%	h	h	%
L07	31.1	2496	4474	55.8	1272	4474	28.4
L06	28.17	2345	4474	52.4	1121	4474	25.1
L05	32.67	2376	4474	53.1	1059	4474	23.7
L04	29.4	2103	4474	47.0	847	4474	18.9
L03	26.47	1798	4474	40.2	696	4474	15.6
L02	6.75	1160	4474	25.9	395	4474	8.8
L01	15.11	1003	4474	22.4	331	4474	7.4
L00	10.55	2769	4474	61.9	1422	4474	31.8

Table 10- Test Area 02

	Test Area 03						
	Daylight IES Radiance	Sunlight Suncast					
	Vertical Sky Component	Actual Annual Sunlight Hours	Total Annual Sunlight hours	APSH	Winter Sunlight Hours (Jan - March) / (September - December)	Total Annual Sunlight hours	WPSH
	%	h	h	%	h	h	%
L07	38.52	2738	4474	61.2	1391	4474	31.1
L06	36.16	2495	4474	55.8	1179	4474	26.4
L05	33.11	2282	4474	51.0	1029	4474	23.0
L04	29.73	1921	4474	42.9	758	4474	16.9
L03	25.83	1739	4474	38.9	607	4474	13.6
L02	23.55	1585	4474	35.4	574	4474	12.8
L01	21.09	1157	4474	25.9	392	4474	8.8
L00	5.63	578	4474	12.9	181	4474	4.0

Table 11- Test Area 03

	Test Area 04						
	Daylight IES Radiance	Sunlight Suncast					
	Vertical Sky Component %	Actual Annual Sunlight Hours h	Total Annual Sunlight hours h	APSH %	Winter Sunlight Hours (Jan - March) / (September - December) h	Total Annual Sunlight hours h	WPSH %
L07	31.27	2555	4474	57.1	1422	4474	31.8
L06	29.52	2312	4474	51.7	1149	4474	25.7
L05	32.36	2284	4474	51.1	1029	4474	23.0
L04	29.34	2192	4474	49.0	999	4474	22.3
L03	7.05	1980	4474	44.3	878	4474	19.6
L02	17.17	1339	4474	29.9	574	4474	12.8
L01	14.37	1063	4474	23.8	420	4474	9.4
L00	9.85	729	4474	16.3	240	4474	5.4

Table 12 - Test Area 04

	Test Area 05						
	Daylight IES Radiance	Sunlight Suncast					
	Vertical Sky Component %	Actual Annual Sunlight Hours h	Total Annual Sunlight hours h	APSH %	Winter Sunlight Hours (Jan - March) / (September - December) h	Total Annual Sunlight hours h	WPSH %
L07	38.83	2647	4474	59.2	1392	4474	31.1
L06	36.3	2464	4474	55.1	1179	4474	26.4
L05	33.05	2284	4474	51.1	1060	4474	23.7
L04	29.66	1922	4474	43.0	851	4474	19.0
L03	26.43	1676	4474	37.5	697	4474	15.6
L02	24.53	1305	4474	29.2	510	4474	11.4
L01	21.33	1063	4474	23.8	390	4474	8.7
L00	4.59	514	4474	11.5	179	4474	4.0

Table 13 - Test Area 05

	Test Area 06						
	Daylight IES Radiance	Sunlight Suncast					
	Vertical Sky Component %	Actual Annual Sunlight Hours h	Total Annual Sunlight hours h	APSH %	Winter Sunlight Hours (Jan - March) / (September - December) h	Total Annual Sunlight hours h	WPSH %
L07	30.44	2435	4474	54.4	1241	4474	27.7
L06	29.01	2222	4474	49.7	1152	4474	25.7
L05	33.19	2376	4474	53.1	0	4474	0.0
L04	30.06	2069	4474	46.2	1059	4474	23.7
L03	10.75	1275	4474	28.5	540	4474	12.1
L02	17.5	942	4474	21.1	360	4474	8.0
L01	15.01	821	4474	18.4	331	4474	7.4
L00	8.62	821	4474	18.4	331	4474	7.4

Table 14 - Test Area 06

	Test Area 07						
	Daylight IES Radiance	Sunlight Suncast					
	Vertical Sky Component	Actual Annual Sunlight Hours	Total Annual Sunlight hours	APSH	Winter Sunlight Hours (Jan - March) / (September - December)	Total Annual Sunlight hours	WPSH
	%	h	h	%	h	h	%
L07	40.63	2676	4474	59.8	1421	4474	31.8
L06	38	2648	4474	59.2	1363	4474	30.5
L05	34.82	2434	4474	54.4	1240	4474	27.7
L04	31.62	1853	4474	41.4	812	4474	18.1
L03	28.15	1492	4474	33.3	543	4474	12.1
L02	25.36	1282	4474	28.7	395	4474	8.8
L01	22.66	1038	4474	23.2	303	4474	6.8
L00	8.85	886	4474	19.8	0	4474	0.0

Table 15 - Test Area 07

5.3 Assessment Results – Comparison of Pre / Post Development Daylight and Sunlight Levels

	Test Area 01								
	IES Radiance Daylight			Suncast Sunlight					
	Vertical Sky Component			APSH			WPSH		
	VSC greater than 27% pre-development	VSC greater than 27% post-development	Post development as % of Pre-Development	>25% Pre-Development	>25% Post-Development	Post development as % of Pre-Development	>5% Pre-Development	>5% Post-Development	Post development as % of Pre-Development
L07	Yes	Yes	90	Yes	Yes	98	Yes	Yes	45
L06	Yes	Yes	92	Yes	Yes	94	Yes	Yes	40
L05	Yes	No	82	Yes	Yes	88	Yes	Yes	35
L04	Yes	No	74	Yes	Yes	78	Yes	Yes	25
L03	Yes	No	64	Yes	Yes	71	Yes	Yes	20
L02	Yes	No	57	Yes	No	35	Yes	Yes	15
L01	Yes	No	50	Yes	No	30	Yes	Yes	12
L00									

Table 16 – Test Area 01

	Test Area 02								
	IES Radiance Daylight			Suncast Sunlight					
	Vertical Sky Component			APSH			WPSH		
	VSC greater than 27% pre development	VSC greater than 27% post development	Post development as % of Pre-Development	>25% Pre-Development	>25% Post-Development	Post development as % of Pre-Development	>5% Pre-Development	>5% Post-Development	Post development as % of Pre-Development
L07	Yes	Yes	96	Yes	Yes	98	Yes	Yes	45
L06	Yes	Yes	87	Yes	Yes	92	Yes	Yes	40
L05	Yes	Yes	82	Yes	Yes	83	Yes	Yes	34
L04	Yes	Yes	74	Yes	Yes	72	Yes	Yes	26
L03	Yes	No	67	Yes	Yes	62	Yes	Yes	21
L02	No	No	32	Yes	Yes	43	Yes	Yes	14
L01	Yes	No	49	Yes	No	40	Yes	Yes	12
L00	Yes	No	36	Yes	Yes	11	Yes	Yes	53

Table 17 – Test Area 02

	Test Area 03								
	IES Radiance Daylight			Suncast Sunlight					
	Vertical Sky Component			APSH			WPSH		
	VSC greater than 27% pre-development	VSC greater than 27% post-development	Post development as % of Pre Development	>25% Pre-Development	>25% Post-Development	Post development as % of Pre Development	>5% Pre-Development	>5% Post-Development	Post development as % of Pre Development
L07	Yes	Yes	95	Yes	Yes	96	Yes	Yes	44
L06	Yes	Yes	90	Yes	Yes	87	Yes	Yes	38
L05	Yes	Yes	83	Yes	Yes	82	Yes	Yes	34
L04	Yes	Yes	70	Yes	Yes	69	Yes	Yes	26
L03	Yes	No	68	Yes	Yes	64	Yes	Yes	22
L02	Yes	No	63	Yes	Yes	59	Yes	Yes	20
L01	Yes	No	56	Yes	Yes	44	Yes	Yes	14
L00	No	No	24	Yes	No	28	Yes	No	9

Table 18 – Test Area 03

	Test Area 04								
	IES Radiance Daylight			Suncast Sunlight					
	Vertical Sky Component			APSH			WPSH		
	VSC greater than 27% pre-development	VSC greater than 27% post-development	Post development as % of Pre-Development	>25% Pre-Development	>25% Post-Development	Post development as % of Pre-Development	>5% Pre-Development	>5% Post-Development	Post development as % of Pre-Development
L07	Yes	Yes	95	Yes	Yes	99	Yes	Yes	49
L06	Yes	Yes	74	Yes	Yes	89	Yes	Yes	40
L05	Yes	Yes	81	Yes	Yes	80	Yes	Yes	33
L04	Yes	Yes	74	Yes	Yes	78	Yes	Yes	33
L03	No	No	36	Yes	Yes	86	Yes	Yes	31
L02	Yes	No	55	Yes	Yes	54	Yes	Yes	21
L01	Yes	No	47	Yes	No	45	Yes	Yes	17
L00	Yes	No	35	Yes	No	33	Yes	Yes	11

Table 19 – Test Area 04

	Test Area 05								
	IES Radiance Daylight			Suncast Sunlight					
	Vertical Sky Component			APSH			WPSH		
	VSC greater than 27% pre-development	VSC greater than 27% post-development	Post development as % of Pre-Development	>25% Pre-Development	>25% Post-Development	Post development as % of Pre-Development	>5% Pre-Development	>5% Post-Development	Post development as % of Pre-Development
L07	Yes	Yes	97	Yes	Yes	93	Yes	Yes	46
L06	Yes	Yes	91	Yes	Yes	88	Yes	Yes	39
L05	Yes	Yes	84	Yes	Yes	80	Yes	Yes	34
L04	Yes	Yes	78	Yes	Yes	69	Yes	Yes	29
L03	Yes	No	71	Yes	Yes	62	Yes	Yes	24
L02	Yes	No	65	Yes	Yes	52	Yes	Yes	21
L01	Yes	No	59	Yes	No	45	Yes	Yes	17
L00	No	No	21	Yes	No	27	Yes	No	10

Table 20 – Test Area 05

	Test Area 06								
	IES Radiance Daylight			Suncast Sunlight					
	Vertical Sky Component			APSH			WPSH		
	VSC greater than 27% pre-development	VSC greater than 27% post-development	Post development as % of Pre-Development	>25% Pre-Development	>25% Post-Development	Post development as % of Pre-Development	>5% Pre-Development	>5% Post-Development	Post development as % of Pre-Development
L07	Yes	Yes	96	Yes	Yes	95	Yes	Yes	45
L06	Yes	Yes	91	Yes	Yes	88	Yes	Yes	42
L05	Yes	Yes	84	Yes	Yes	83	Yes	No	0
L04	Yes	Yes	78	Yes	Yes	73	Yes	Yes	35
L03	No	No	55	Yes	Yes	53	Yes	Yes	23
L02	Yes	No	61	Yes	No	45	Yes	Yes	19
L01	Yes	No	55	Yes	No	40	Yes	Yes	19
L00	No	No	37	Yes	No	41	Yes	Yes	20

Table 21 – Test Area 06

	Test Area 07								
	IES Radiance Daylight			Suncast Sunlight					
	Vertical Sky Component			APSH			WPSH		
	VSC greater than 27% pre-development	VSC greater than 27% post-development	Post development as % of Pre-Development	>25% Pre-Development	>25% Post-Development	Post development as % of Pre-Development	>5% Pre-Development	>5% Post-Development	Post development as % of Pre-Development
L07	Yes	Yes	98	Yes	Yes	94	Yes	Yes	24
L06	Yes	Yes	95	Yes	Yes	93	Yes	Yes	23
L05	Yes	Yes	90	Yes	Yes	87	Yes	Yes	21
L04	Yes	Yes	87	Yes	Yes	77	Yes	Yes	16
L03	Yes	Yes	81	Yes	Yes	63	Yes	Yes	11
L02	Yes	No	77	Yes	Yes	65	Yes	Yes	9
L01	Yes	No	72	Yes	No	56	Yes	Yes	8
L00	No	No	48	Yes	No	50	Yes	No	0

Table 22 – Test Area 07

6.0 Overshadowing images

The following section presents a number of overshadowing images.

The images presented are illustrative only, and are not quantitative ie there is no scale applied to areas of shade.

These images should be considered in conjunction with Annual Probable Sunlight Hours and Winter Probable Sunlight Hours results presented in Section 3.0.

Comparative images are presented for the following Solstice and Equinox dates

- 20th March
- 21st June
- 23rd September
- 21st December

The areas of analysis receive sun for the majority of the afternoon, as such results are presented for 15:00 (3 P.M)

Shadow Image Comparison - March 20th 15:00



Table 23 – Comparative Shading Images - March

Shadow Image Comparison - June 21st 15:00



Table 24 – Comparative Shading Images - June

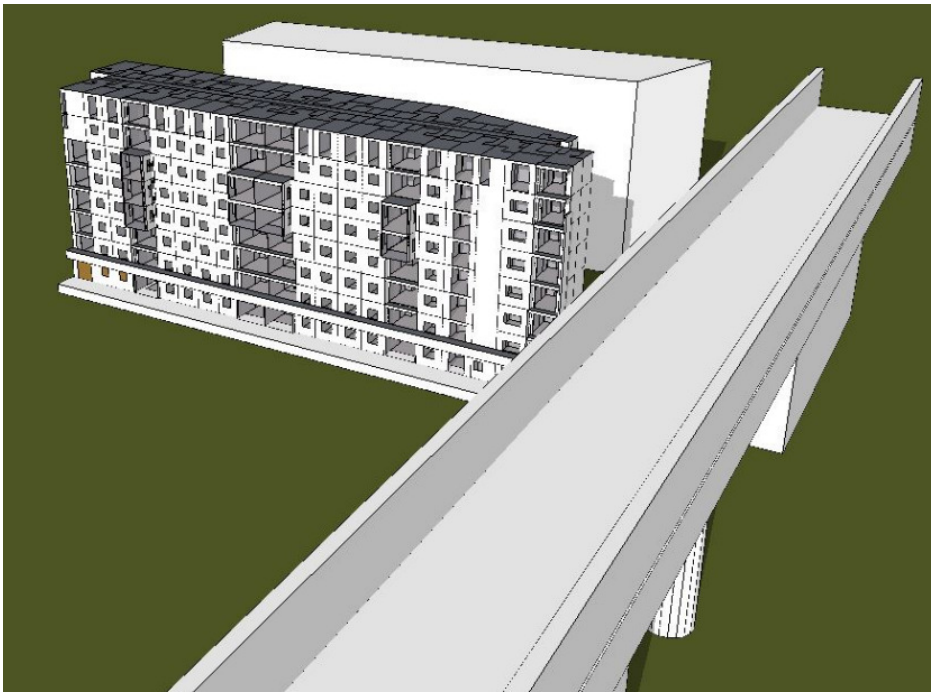
Shadow Image Comparison - September 23rd 15:00



Table 25 – Comparative Shading Images - September

Shadow Image Comparison - December 21st 15:00

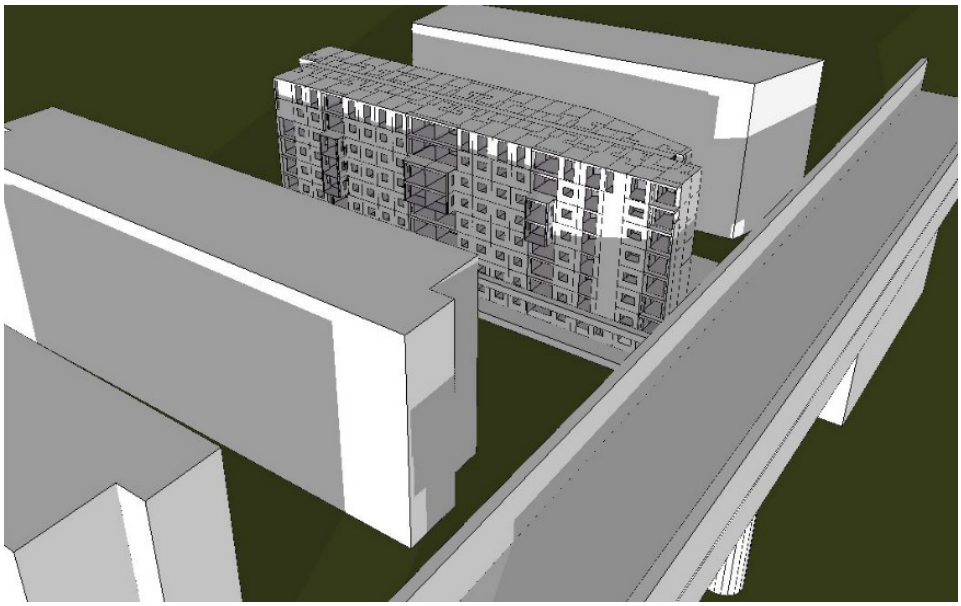


Table 26 – Comparative Shading Images - December

7.0 Observations

Daylight and Sunlight results have been presented for a number of test areas (Test Areas 1 -5), as detailed in Figure 14 below. The following section describes results for these areas.

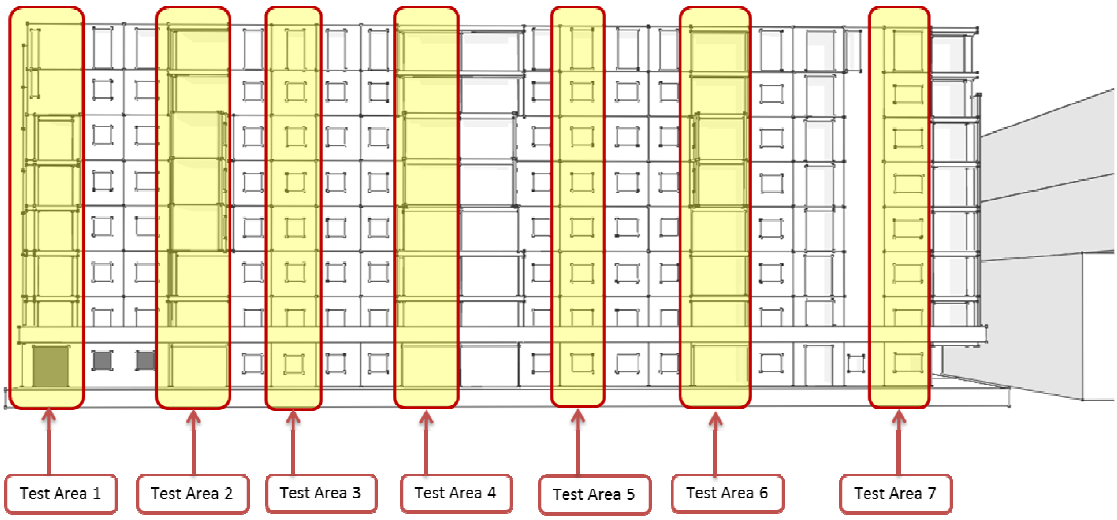


Figure14 - Key Representative Test Receptors

7.1 Daylight Observations

7.1.1 Pre-Development Daylight Levels

- All key window receptors analysed currently experience a high level of daylight, as defined by the respective Vertical Sky Component
- Results suggest that in the current pre-developed state the vast majority of analysed receptors achieve a VSC greater than the 27% threshold level set out in BRE guidance required for adequate daylight
- A number of receptors are shaded by building overhangs and other geometric features, resulting in VSC levels below BRE guideline levels.
- Further, results suggest that in the current pre-developed state the majority of windows analysed achieve a Vertical Sky Component (VSC) above the benchmark guidance value of 27%
- Results suggest that the vast majority of analysed window receptors currently achieve a good level of daylight
- Results suggest that in the proposed post-development state daylight levels are reduced, the degree of reduction can be summarised as follows

7.1.2 Post-Development Daylight Levels

Results have been presented for a total of 48 key representative window receptors on the South West elevation of Potato Wharf block 2. Of these 48 key receptors 27 were noted to experience a noticeable reduction in daylight.

As such **56%** of analysed receptors would experience a noticeable reduction in daylight.

A noticeable reduction in daylight would constitute a drop in VSC to below 27%, where a VSC of 27% was experienced pre-development

AND

Daylight levels are reduced to less than 80% of pre-development levels.

Results suggest that generally, across all test areas, lower floors from Level 00 to Level 03 will receive noticeably less daylight as a result of the construction of Blocks 3 & 4

Daylight within these areas, measured by the VSC, will drop below the target value of 27% and will be reduced by more than 20%, relative to pre-development levels.

Results suggest that generally, across all test areas, upper floors L04 to L07 will receive less daylight as a result of the construction of Blocks 3 & 4. However the levels of daylight experienced in these areas, measured by the VSC, will be in excess of the target value of 27%.

7.2 Sunlight Observations

7.2.1 Pre-Development Sunlight Levels

- Due to the South facing aspect, all key window receptors analysed currently experience a high level of sunlight, as defined by the respective Annual Probable Sunlight Hours (APSH) and Winter Probable Sunlight Hours (WPSH)

- Results suggest that in the current pre-developed state the vast majority of analysed receptors achieve an APSH greater than the 25% threshold level set out in BRE guidance required for adequate sunlight and achieve a WPSH greater than the 5% threshold level set out in BRE guidance required for adequate sunlight.

- Results suggest that in the proposed post-development state sunlight levels are reduced, the degree of reduction can be summarised as follows

7.2.2 Post-Development Daylight Levels

Results have been presented for a total of 48 key representative window receptors on the South West elevation of Potato Wharf block 2. Of these 48 key receptors 11 were noted to experience a noticeable reduction in sunlight.

As such **23%** of analysed receptors would experience a noticeable reduction in sunlight.

A noticeable reduction in sunlight would constitute a drop in APSH to **below 25%,** where APSH of greater than 25% was experienced pre-development

AND

A drop in WPSH to **below 5%,** where APSH of greater than 5% was experienced pre-development

Results suggest that generally, across all test areas, lower floors from Level 00 to Level 02 will receive noticeably less sunlight as a result of the construction of Blocks 3 & 4

Sunlight within these areas, measured by the APSH and WPSH, will drop below the target value of 25% and 5% respectively and will be reduced by more than 20%, relative to pre-development levels.

Results suggest that generally, across all test areas, upper floors L04 to L07 will receive less sunlight as a result of the construction of Blocks 3 & 4. However the levels of sunlight experienced in these areas, measured by the APSH and WPSH, will be in excess of the target value of 25% and 5% respectively.

8.0 Conclusions

In this assessment the BRE Guidelines have been used to establish the extent to which the Proposed Development influences daylight and sunlight in Potato Wharf Block 2.

Daylight and Sunlight results have been presented for 48 windows within 7 representative key test areas. All windows are associated with habitable rooms, ie living space or bedrooms. No results have been presented for core circulation space.

Results from these key representative key test areas have been applied to adjacent areas of equal size, shape and configuration, as detailed in Figure 15 below.

All window receptors analysed will receive less sunlight and less daylight as a result of the construction of Blocks 3 & 4.

The reduction to daylight and sunlight levels will for some areas not result in sunlight or daylight levels dropping below the best practice design thresholds set out in BRE Guidelines.

A number of areas will however be subject to a noticeable reduction in current daylight and sunlight levels, with levels dropping by more than 20% of current values and dropping below the best practice design thresholds set out in BRE Guidelines. These are detailed in Figure 15.

However, within the context of this analysis it should be understood and accepted that the development of Potato Wharf has always envisaged the construction of Blocks 3 & 4 adjacent to Block 2. Blocks 1 to 4 have been designed by the same developer and are of the same proportions and massing.

Block 2 has been recently completed, and prior to purchase, owners were made aware that the potential existed for future phased developments of similar size and massing. As such, the transition from pre-development to post-development measures will have been anticipated by owners.

It is anticipated that the construction of Block 3 will have the same relative impact on Block 2 as Block 2 has had on Block 1. To date no complaints have been received from residents of Block 1 regarding the levels of daylight or sunlight received.

Additionally, whilst the BRE Guidelines provide numerical guidance for daylight, sunlight and overshadowing, these criteria should not be seen as absolute targets since, as the document states, the intention of the guide is to help rather than constrain the designer.

The Guide is not an instrument of planning policy, therefore whilst the methods given are technically robust, it is acknowledged that some level of flexibility should be applied where appropriate.

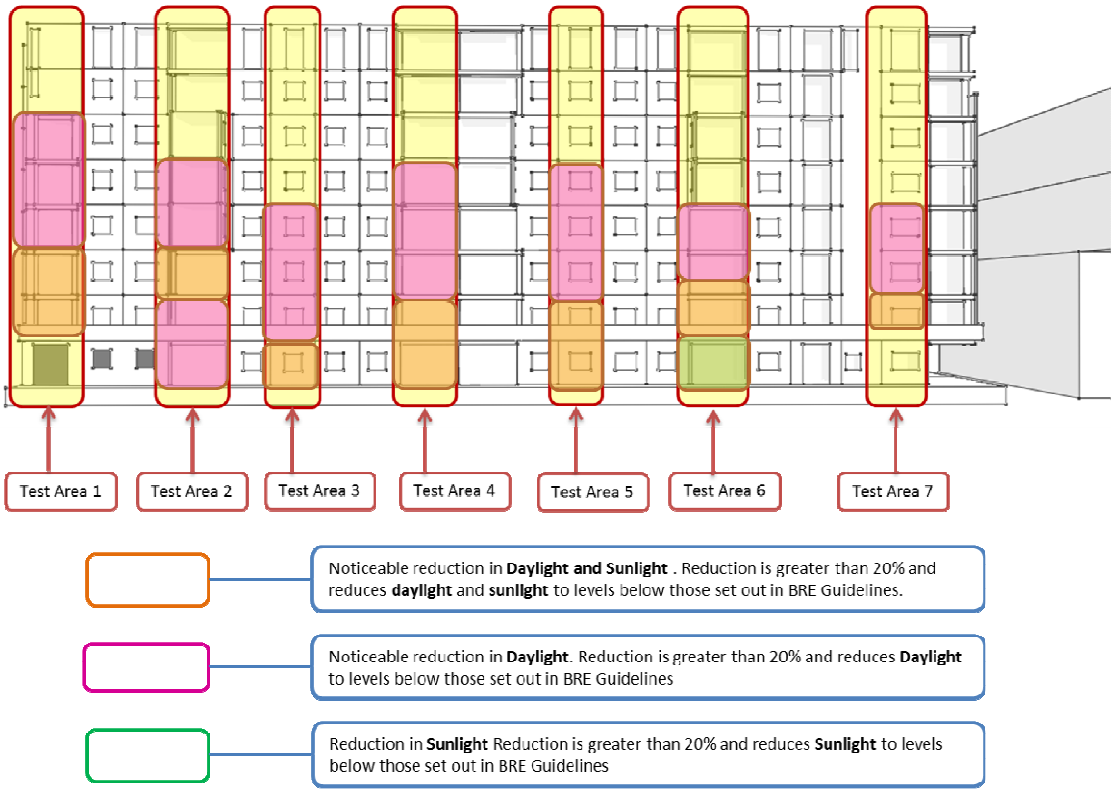


Figure 15 – Areas subject to a noticeable reduction in Daylight and Sunlight

9.0 Concluding Remarks

The simulation results given in this report are based on the output of a complex, dynamic Energy model, which takes account of the following design criteria:

- Architect's drawings
- Weather data
- Simulation Software
- Internal Conditions
- Construction materials
- Space Conditioning system efficiency

Any output from the model is only as accurate as the input of the variables associated with the above criteria.

It is essential that all parties understand and accept the various criteria, as these 'drive' the performance of the building.