Appendix: Daylight, Sunlight, Overshadowing, Light Pollution and Solar Glare

Annex 1: Policy and Guidance

Legislation and Policy Context

National Legislation and Policy

National Planning Policy Framework, 2019

11.1 In regard to Daylight and Sunlight the paragraph 123 of the National Planning Policy Framework1 (NPPF) states:

11.2 "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…"

Planning Practice Guidance

11.3 With respect to daylight and sunlight the Planning Practice Guide (PPG): Design[2], paragraph 026 states:

"Account should be taken of local climatic conditions, including daylight and sunlight…"

Local Policy

Woking Local Development Plan, 2012

11.4 The Woking Local Development Document Core Strategy[3] refers to the requirements for the design of new developments in relation on daylight and sunlight, overshadowing or solar glare. Policy CS21: Design states:

"Proposals for new development should…:

Achieve a satisfactory relationship to adjoining properties avoiding significant harmful impacts in terms of loss of… daylight or sunlight…" and;

"Be designed to avoid significant harm to the environment and general amenity, resulting from… light…"

Draft Outlook, Amenity, Privacy and Daylight Supplementary Planning Document, 2019

11.5 This draft Local Development Document; Outlook, Amenity, Privacy and Daylight Supplementary Planning Document (SPD)[4] was produced as part of the wider Woking 2027 process. This draft updates the previous 2008 SPD of the same title. Section 5 of the document refers to daylight, sunlight, overshadowing and solar glare. This document reiterates and enforces the guidance set out by the Building Research Establishment – Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice document, published in 2011.

Draft Site Allocations Development Plan Document, 2019

11.6 Policy UA44 of the draft Site Allocations Development Plan Document[5] sets out the Site as an area fit for potential redevelopment. In order for this redevelopment to be considered must address the following requirements:

"Building heights should consider the local context whilst ensuring there are no adverse environmental effects in terms of… overshadowing and glare;"

"…the development would need to consider the impacts on noise and light pollution and ensure mitigation measures are implemented to protect residential amenity;"

Draft Supplementary Planning Document Light Pollution, 1999

11.7 Woking Borough Council produced a Supplementary Planning Guidance (SPG)[6] document relating to Light Pollution, to feed into the 1999 Local Plan. This document provides the standards and guidance to reduce the impact of Light Pollution caused by new development. This document mirrors advice and policy which is set out in the more recent ILP Guidelines and Woking Local Development Plan.

Guidance

CABE / English Heritage Guidance on Tall Buildings, 2007

11.8 Paragraph 4.1.9 of the English Heritage (EH) / Commission for Architecture and the Built Environment (CABE) Guidance on Tall Buildings[7] recommends that the following criteria should be addressed in relation to new developments:

"The effect on the local environment, including microclimate, overshadowing, night-time appearance, vehicle movements and the environment and amenity of those in the vicinity of the building."

Historic England Guidance on Tall Buildings – Historic England Advice Note 4, 2015

11.9 Paragraph 4.10 of Historic England's Guidance on Tall Buildings Advice Note 4[8] states:

"Consideration of the impact on the local environment is also important, including microclimate, overshadowing, night-time appearance, light pollution, vehicle movements, the environment and amenity of those in the vicinity of the building, and the impact on the pedestrian experience. Well-designed tall buildings provide an inclusive environment, both internally and externally, taking opportunities to offer improved permeability, accessibility and, where appropriate, the opening up or effective closure of views to improve the legibility of the wider townscape."

Building Research Establishment Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice, 2011

11.10 The BRE 'Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice'[9] document provides advice on site layout planning to achieve good sunlighting and daylighting within buildings, and in the open spaces between them (hereafter referred to as the 'BRE guidelines'). It is intended to be used in conjunction with the interior daylight recommendations in the BS 8206 Part 2 and the Applications Manual Window Design of the Chartered Institute of Building Services Engineers (CIBSE)[10].

11.11 The BRE guidelines are intended for building designers, developers, consultants and planning officials. The guidance is not mandatory and should not be used as an instrument of planning policy. In this regard the guidelines state the following:

"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 application 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

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1 Department for Communities and Local Government, 2019. National Planning Policy Framework. London HMSO.

2 Department for Communities and Local Government (Live Document) Planning Practice Guidance [online] Available: http://www.gov.uk/guidance/design

3 Woking Borough Council, 2012. Local Development Document – Woking Core Strategy. Available:www.woking2027.co.uk/developmentplan

4 Woking Borough Council, 2019. Local Development Document - Outlook, Amenity, Privacy and Daylight Supplementary Planning Document

5 Woking Borough Council, 2019. Draft Site Allocations DPD.

6 Woking Borough Council, 1999.

7 English Heritage (EH) / Commission for Architecture and the Built Environment (CABE), 2007. 'Guidance on Tall Buildings'. London. English Heritage and CABE

8 Historic England, 2015. Historic England Advice Note 4 – Tall Buildings. HistoricEngland.org.uk

9 Building Research Establishment (BRE), 2011. Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice.

10 British Standards Institution, 2008. British Standard (BS) 8206 Part 2; Lighting for buildings. Code of Practice for Daylighting, 2008.

higher degree of obstruction may be unavoidable if new Developments are to match the heights and proportions of existing buildings."

British Standard 8206 Part 2; Lighting for buildings. Code of Practice for Daylighting, 2008

11.12 British Standard (BS) 8206-2[13] gives recommendations relating to the design of buildings and its effect on daylight. IT also includes advice on the design of electric lighting when used in alongside natural light.

"BS 8206-2 describes good practice in daylighting design and presents criteria intended to enhance the well-being and satisfaction of people in buildings, recognizing that the aims of good lighting go beyond achieving minimum illumination for task performance."

CIBSE Lighting Guide LG10 - Daylighting - A Guide for Designers, 2014

11.13 The CIBSE Lighting Guide LG10[11] provides advice on the process for designing for daylighting. It provides instruction and advice on a variety of architectural issues that can arise. The guide walks the reader through the design process, primarily intended for design work on new developments but can be applied to refurbishment projects.

Commission Internationale de L'Eclairage 146:2002 and 147:2002 Collection on Glare, 2002

11.14 The Commission Internationale de L'Eclairage (CIE) provide a collection of reports providing information and recommendations.

11.15 146:2002 'CIE Equations for Disability Glare'[12] states the following:

"Disability glare is glare that impairs vision (CIE, 1987). It is caused by scatterings of light inside the eye {…}. The veiling luminance of scattered light will have a significant effect on visibility when intense light sources are present in the peripheral visual field and the contrast of objects to be seen is low".

"Disability glare is most often of importance at night when contrast sensitivities is low and there may well be one or more bright light sources near to the line of sight, such as car headlights, streetlights or floodlights. But even in daylight conditions disability glare may be of practical significance: think of traffic lights when the sun is close to them, or the difficulty viewing paintings hanging next to a window".

11.16 147:2002 'Glare from Small, Large and Complex Sources'[13] states:

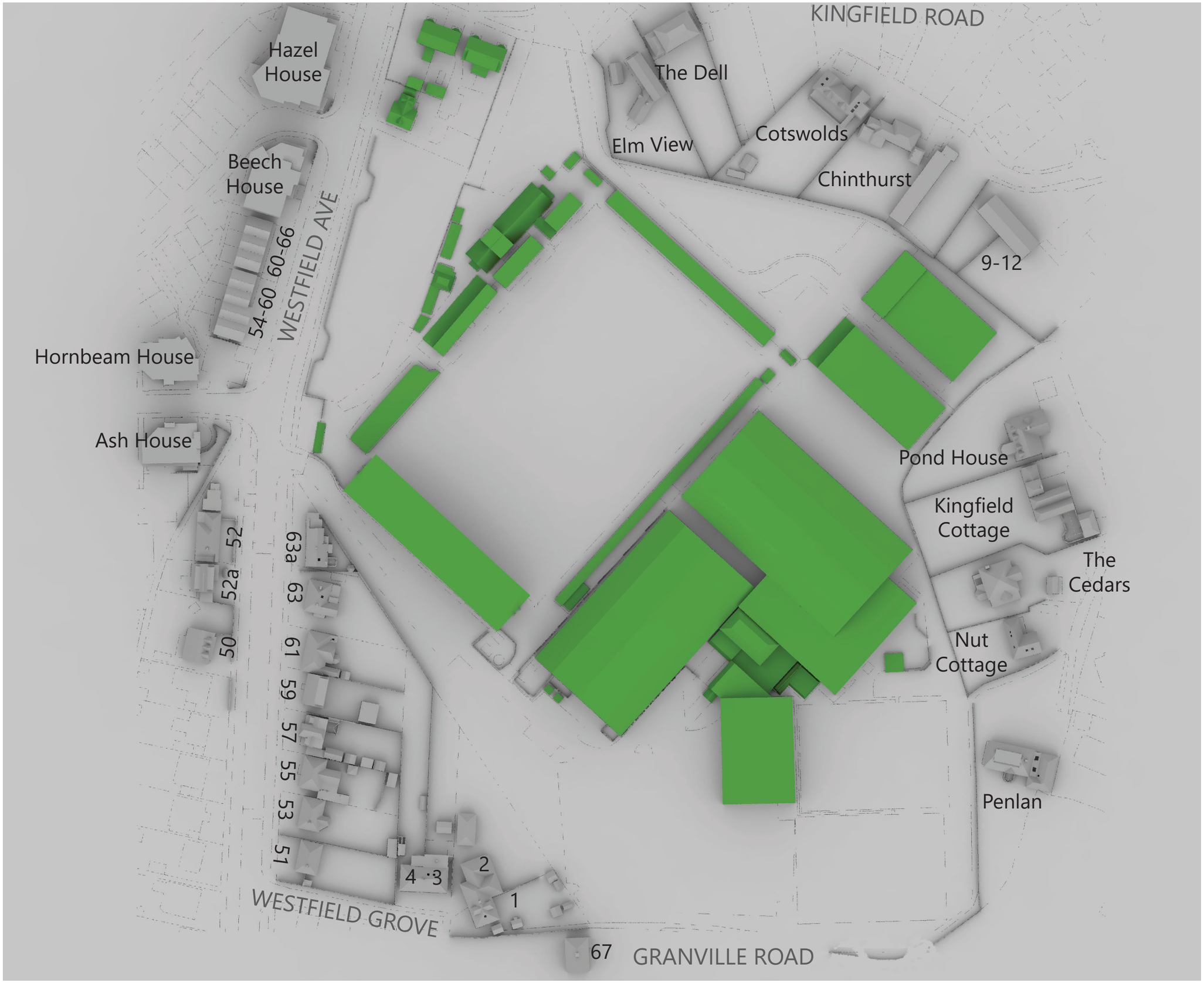
"This Technical Report gives formulations and recommendations for small and large sources of glare which agree with research results and practical experience"

[11] CIBSE, 2014. Lighting Guide LG10 – Daylighting – a Guide for Designers

[12] CIE, 2002. 146:2002 Equations for Disability Glare

[13] CIE, 2002. 147:2002 Glare from Small, Large and Complex Sources

Annex 2: Drawings of the Baseline Conditions and Proposed Development Scenario



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Sources of information

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Key:

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Project: Woking Football Club
GU22 9AA

Title: Existing Condition
Plan View

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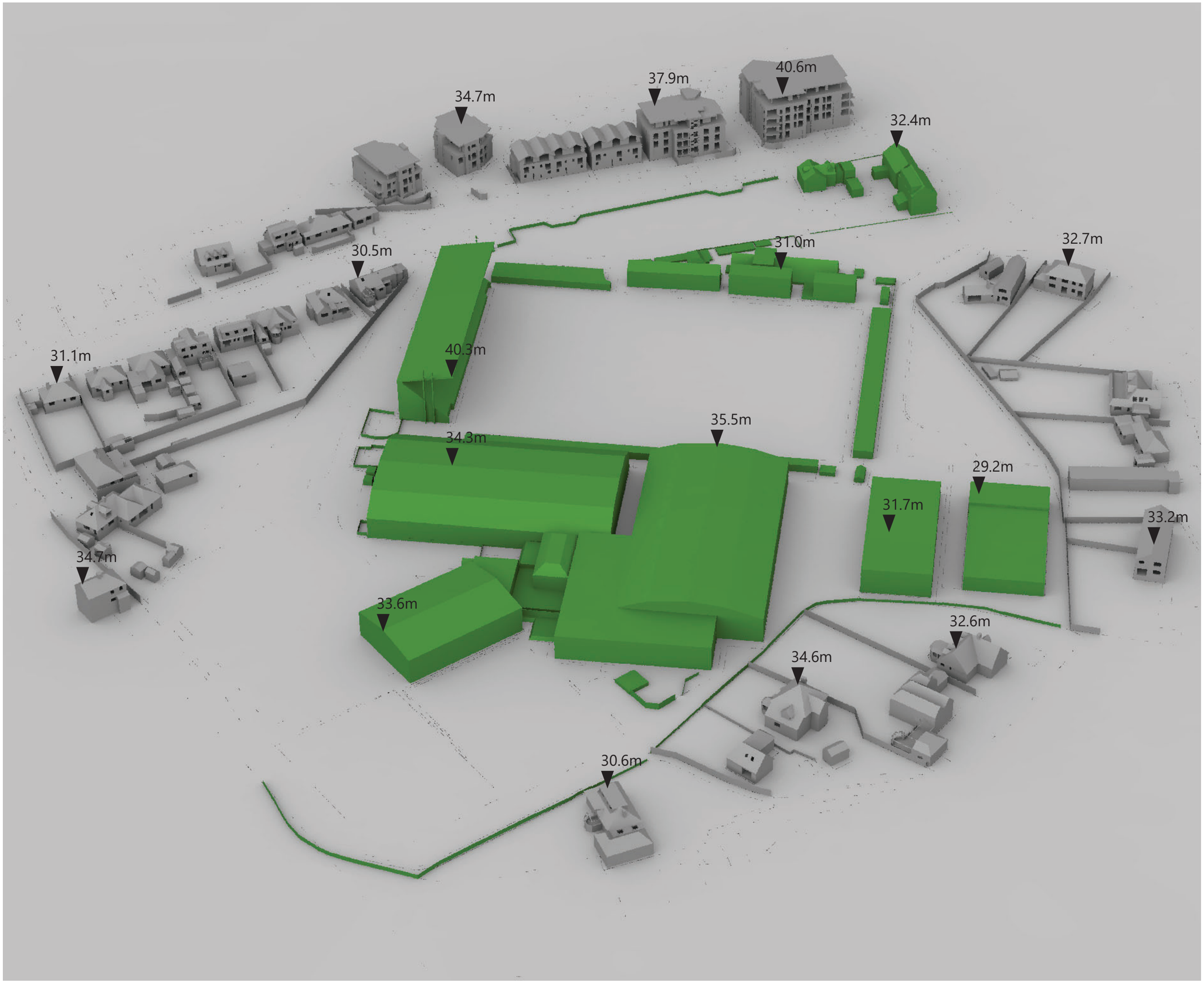

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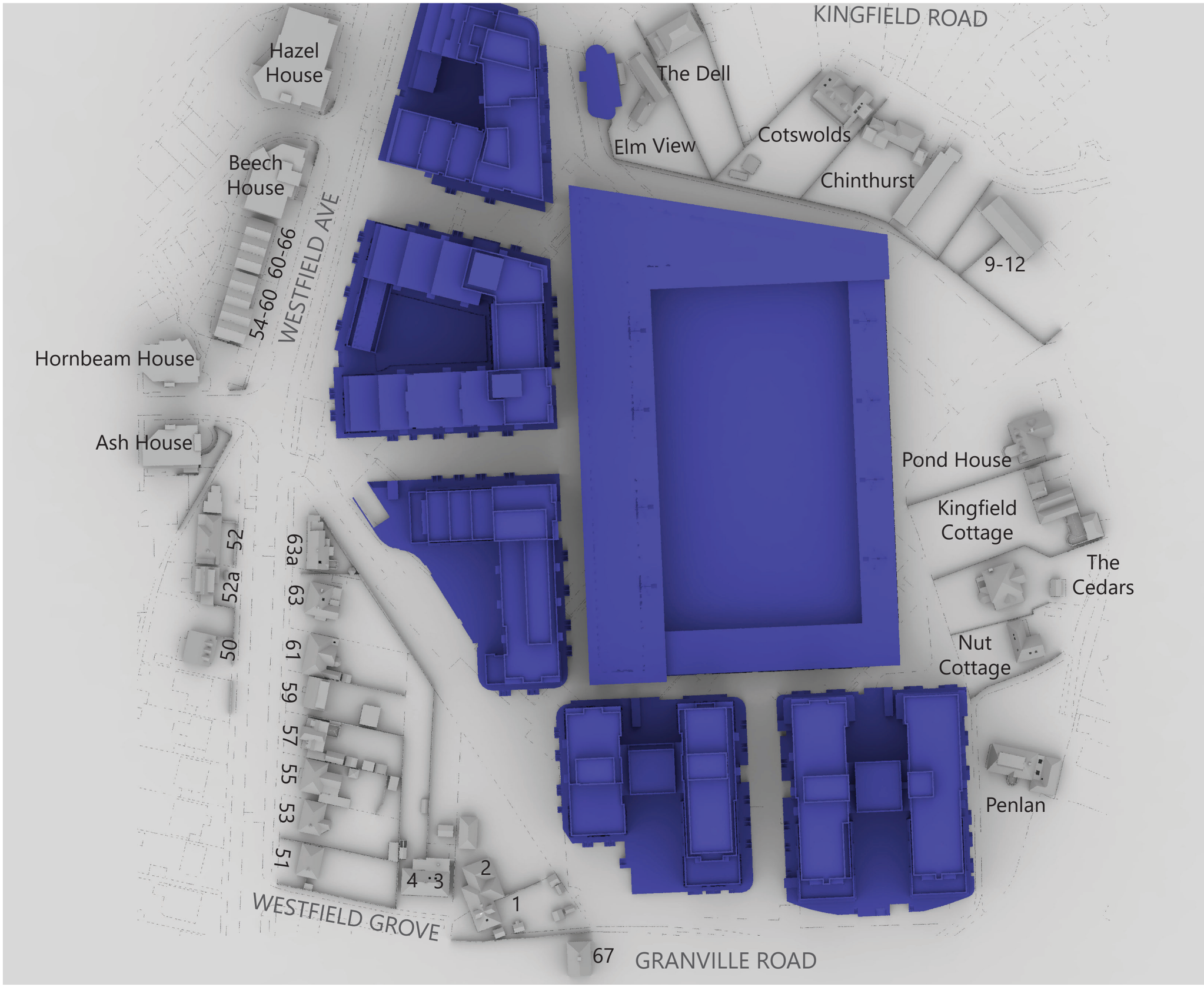

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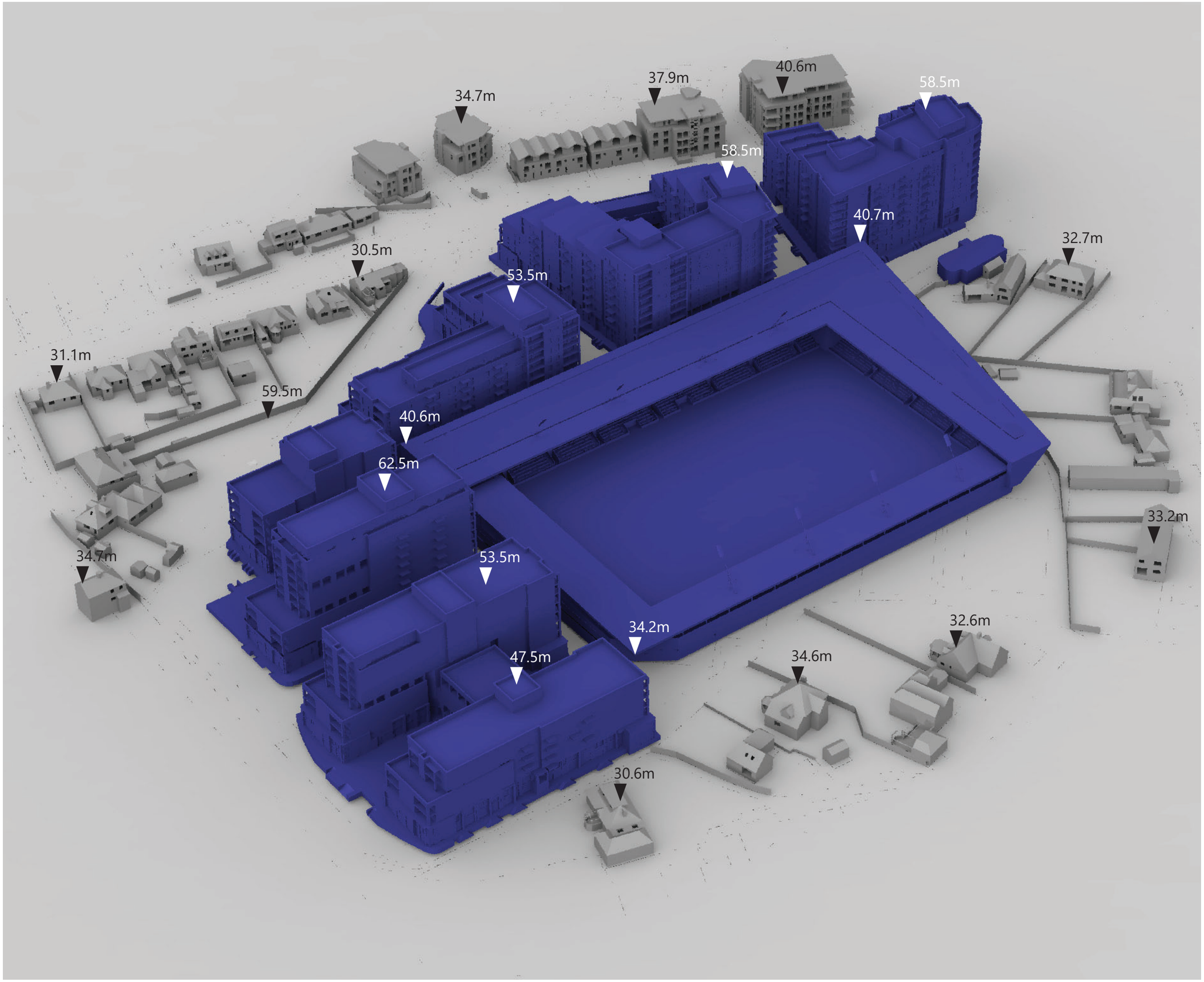

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3D View

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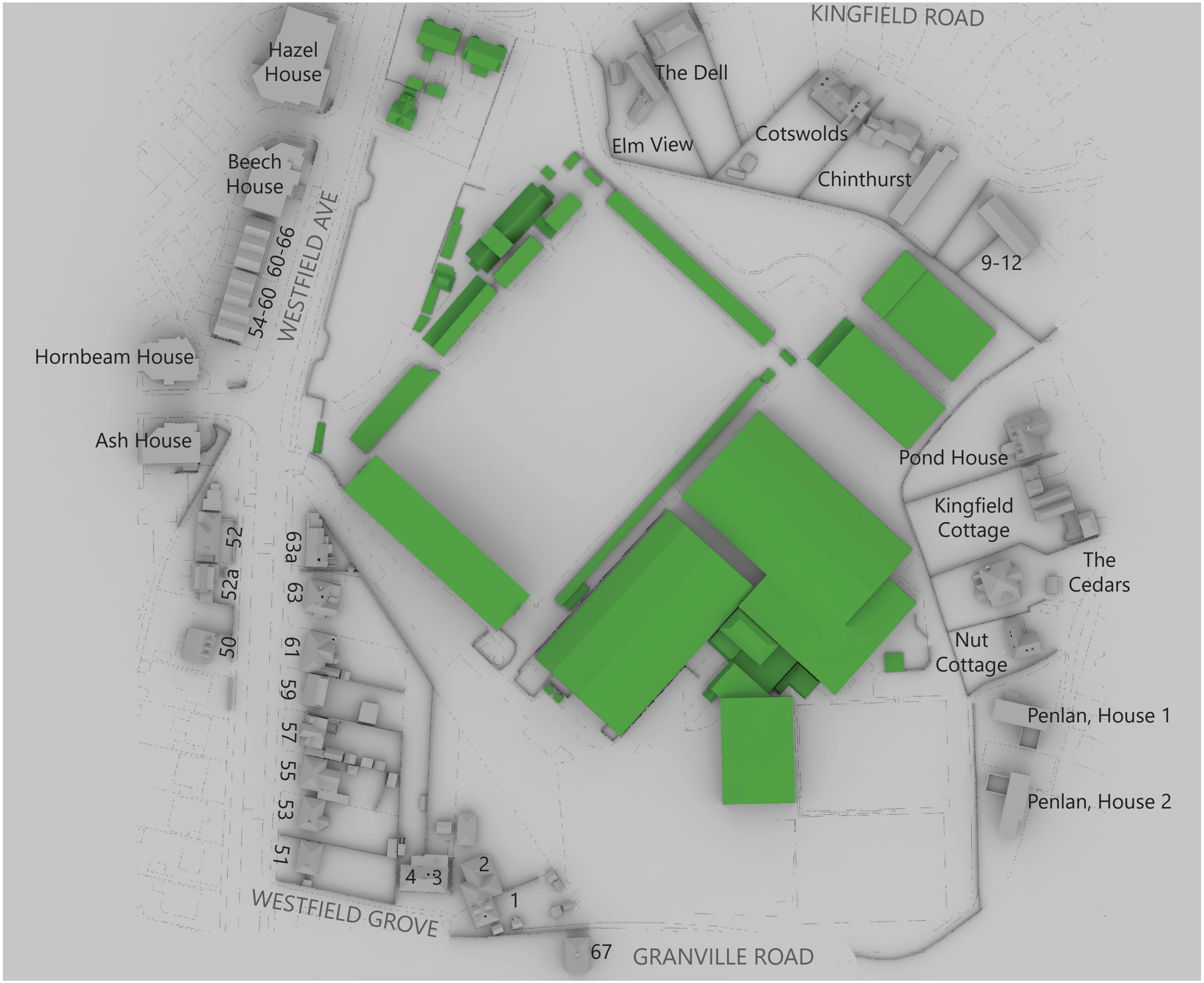
Drawings of the Proposed Development at Penlan, Kingfield Green



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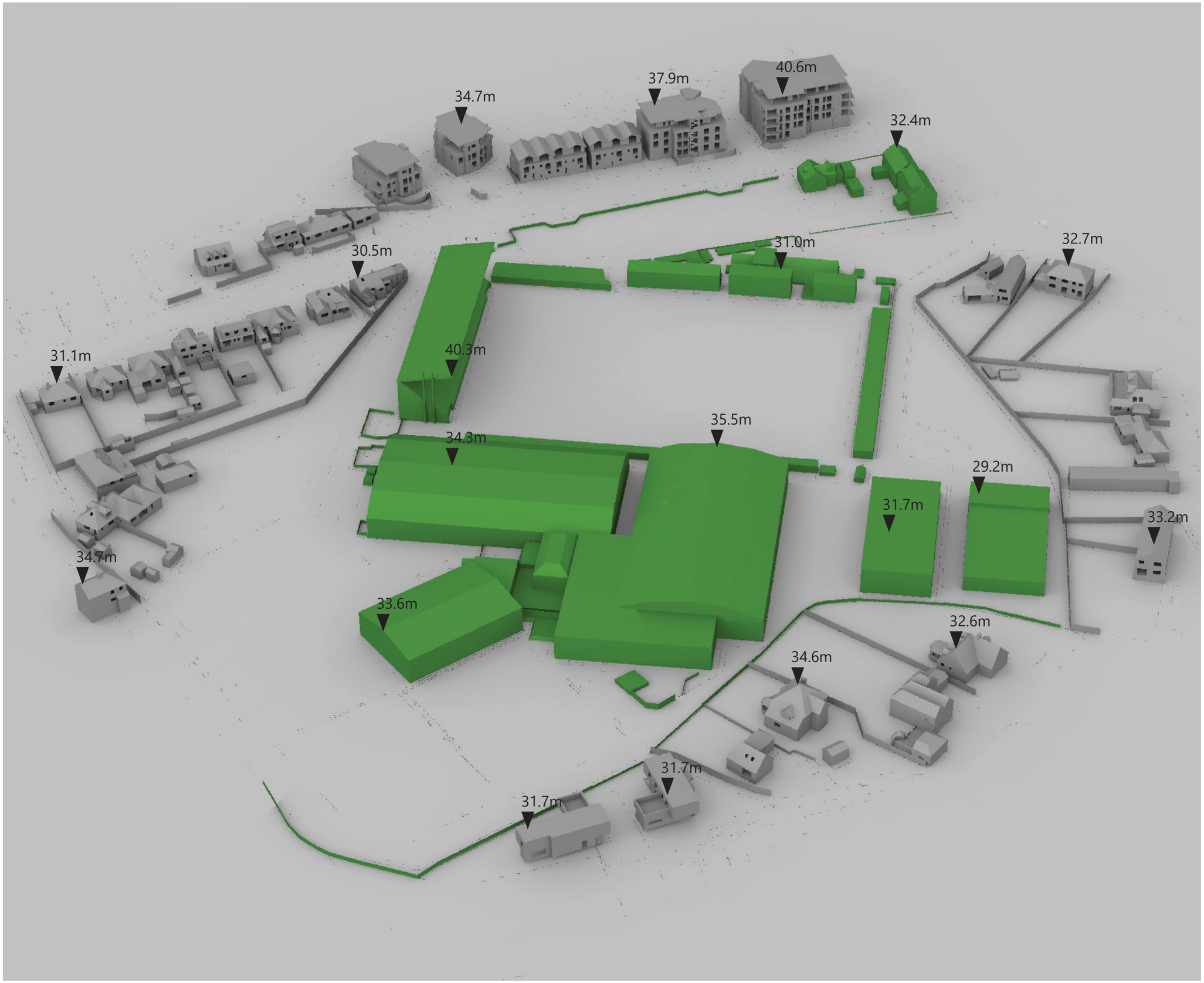

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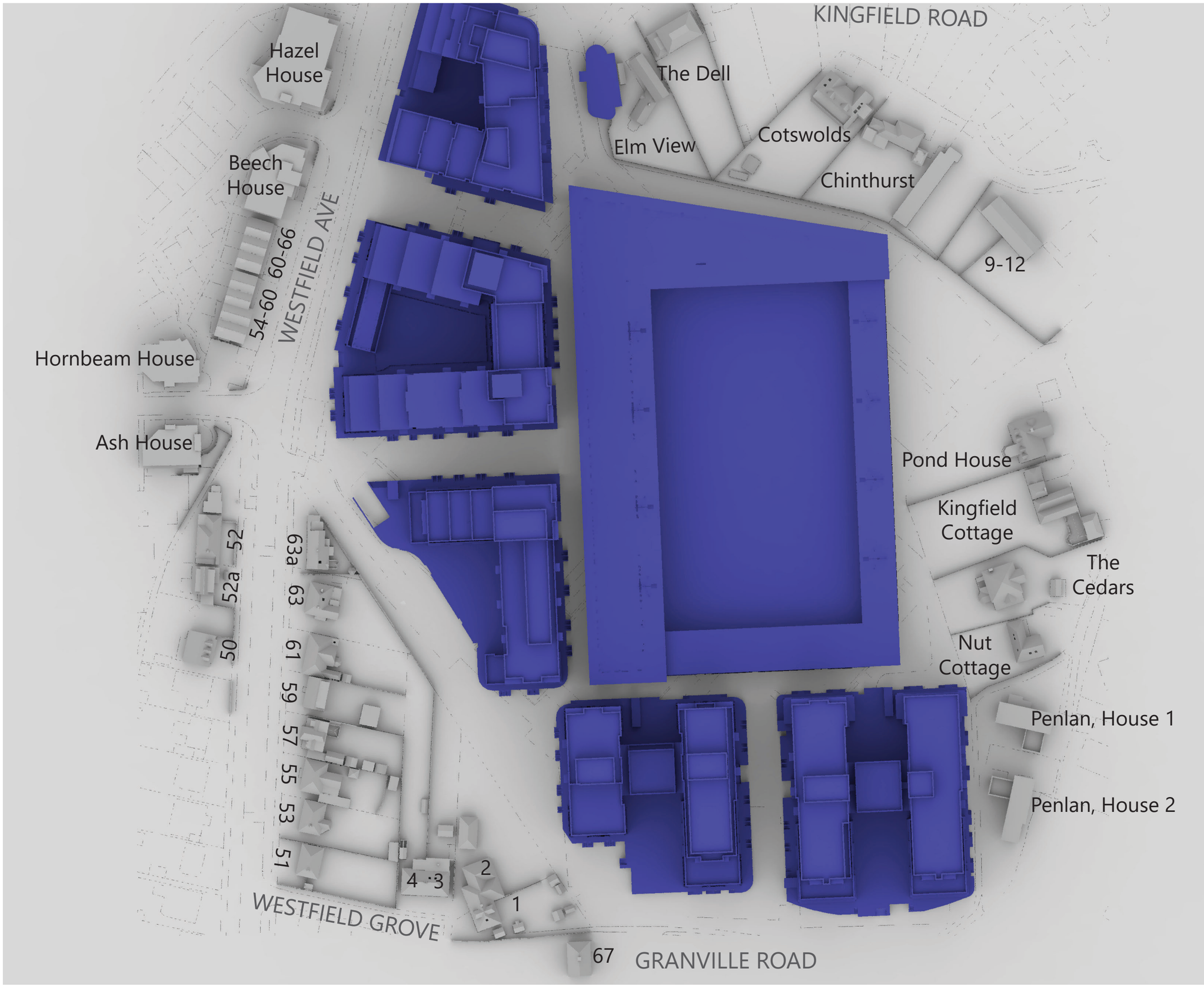

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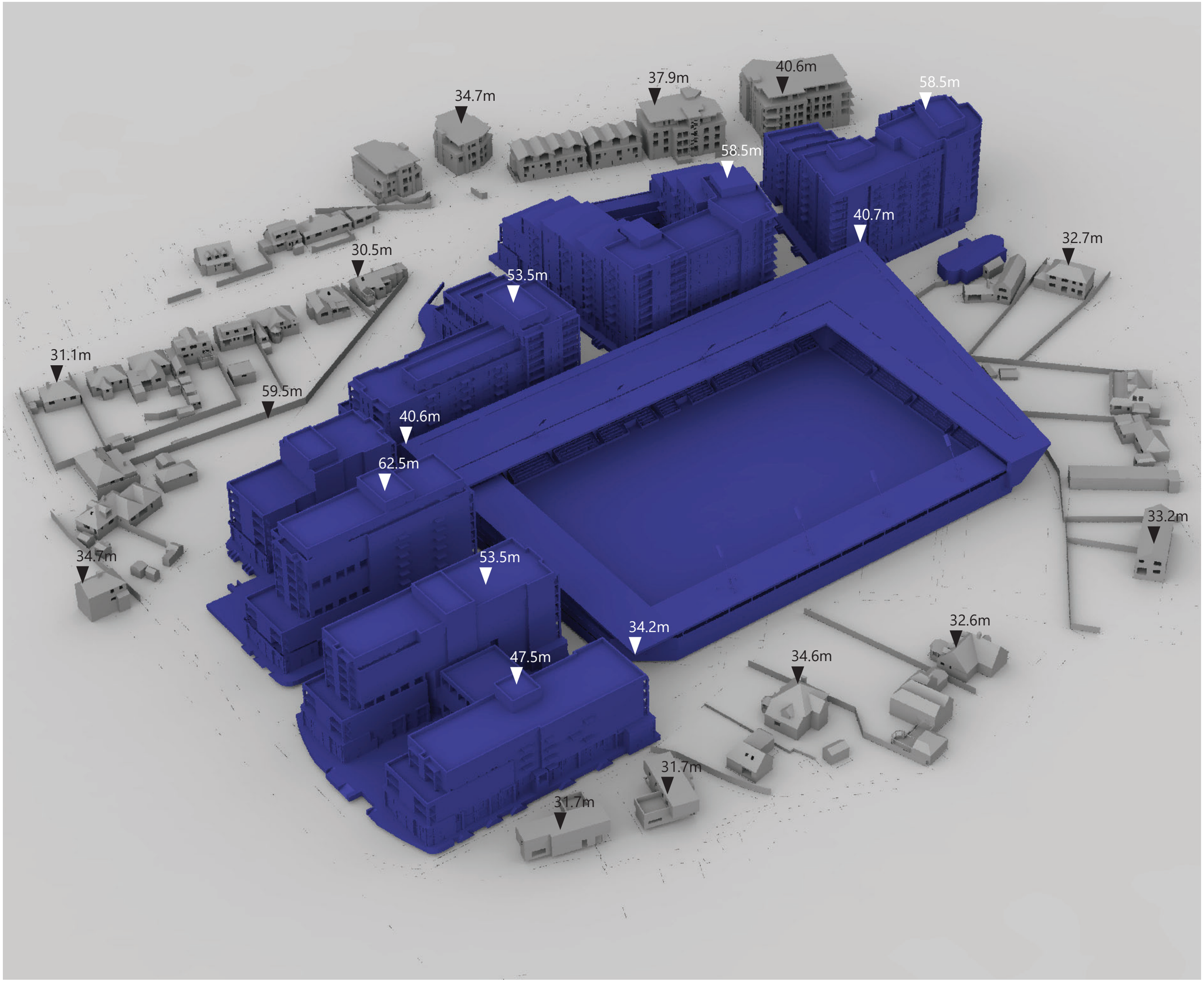

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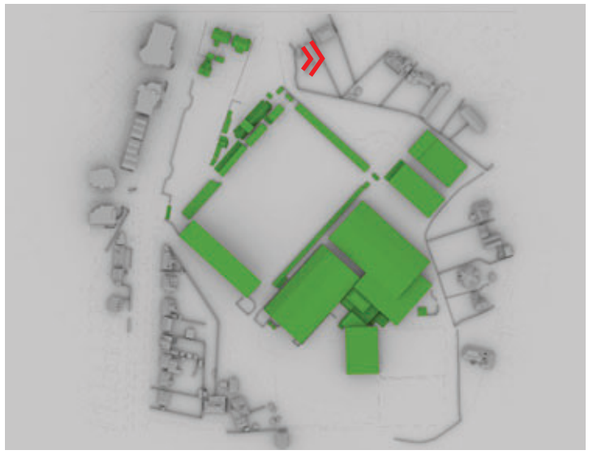
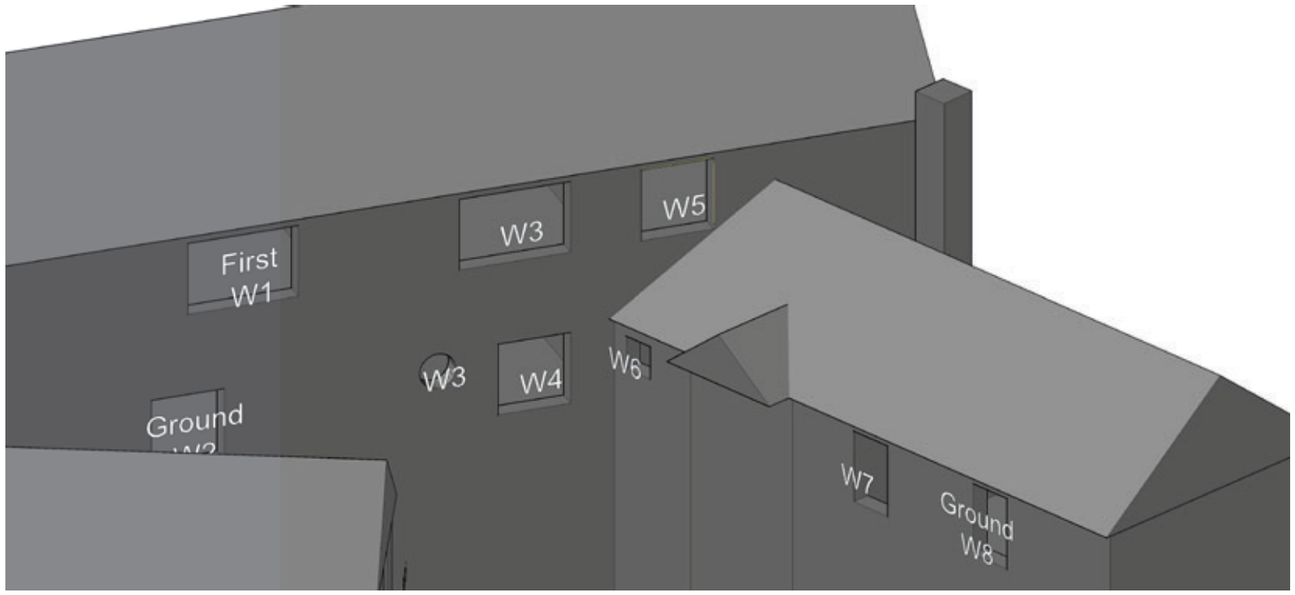
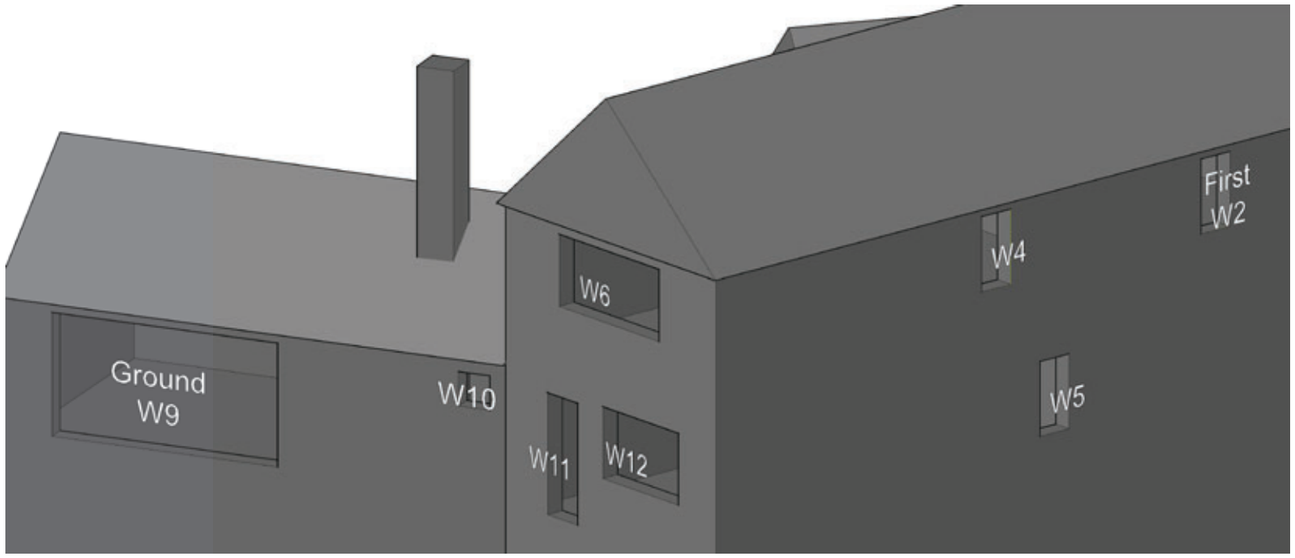
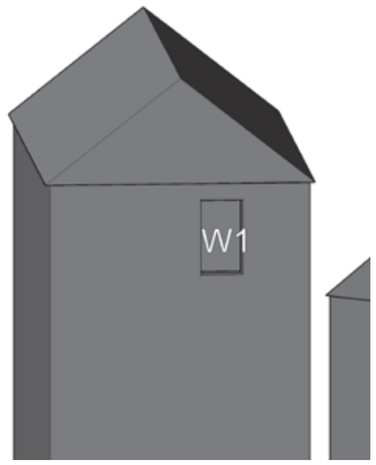
Window maps









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LRW_7884_L(00) drawings
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Project	Woking Football Club GU22 9AA		
Title	Elm View, Kingfield Road, Woking, GU22 9AA		
Drawn	VS	Checked	--
Date	03/07/2019	Project	3499
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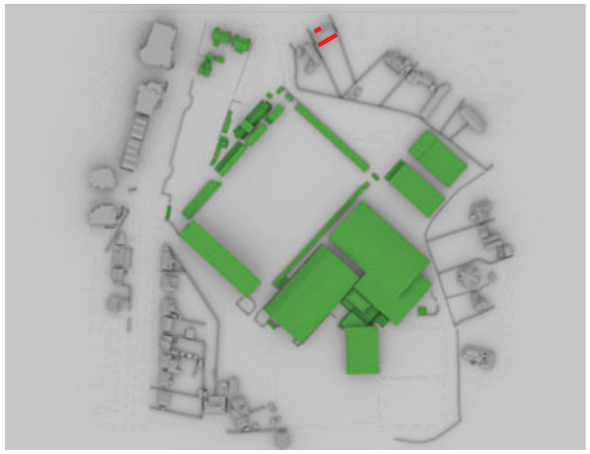
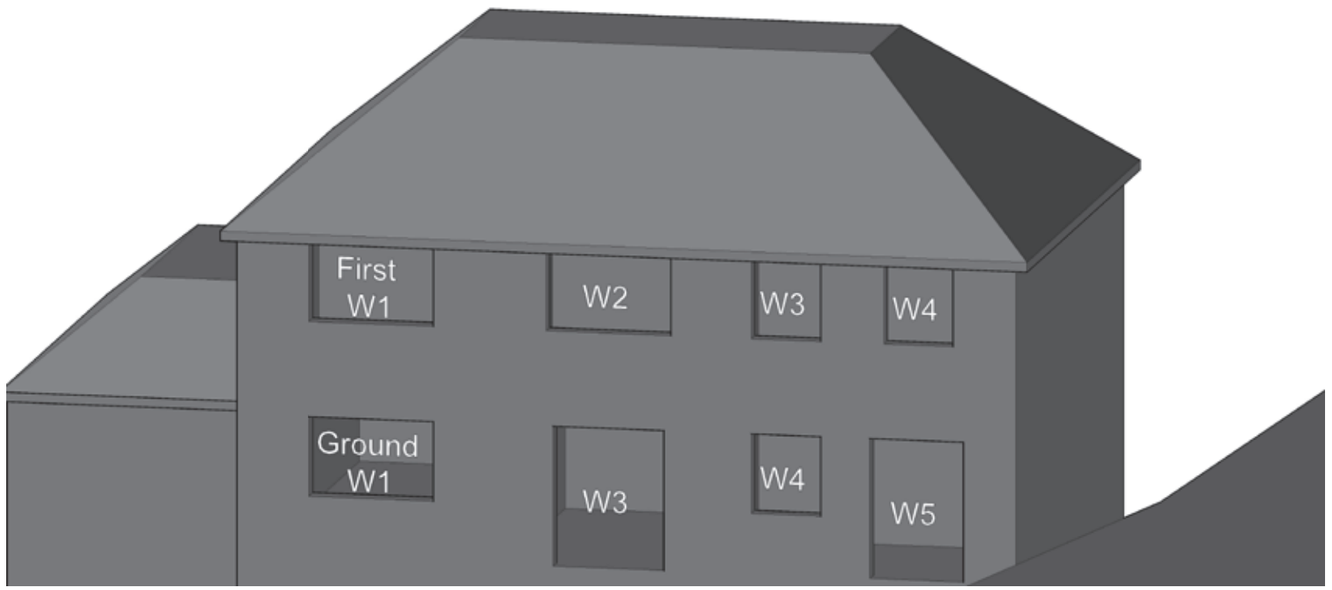
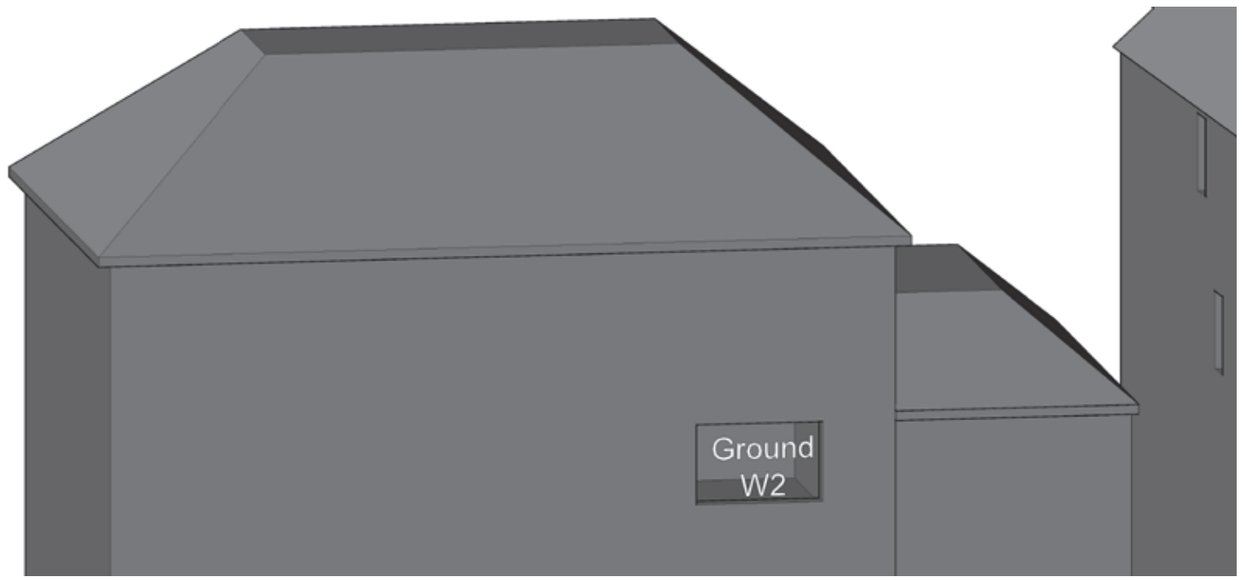
Page no.	WM01		







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Project	Woking Football Club GU22 9AA
Title	The Dell, Kingfield road, Woking, GU22 9AA
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Date	03/07/2019
Project	3499
Rel no.	01
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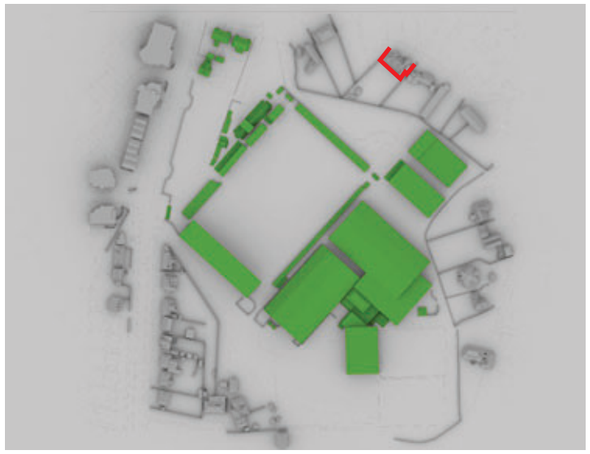

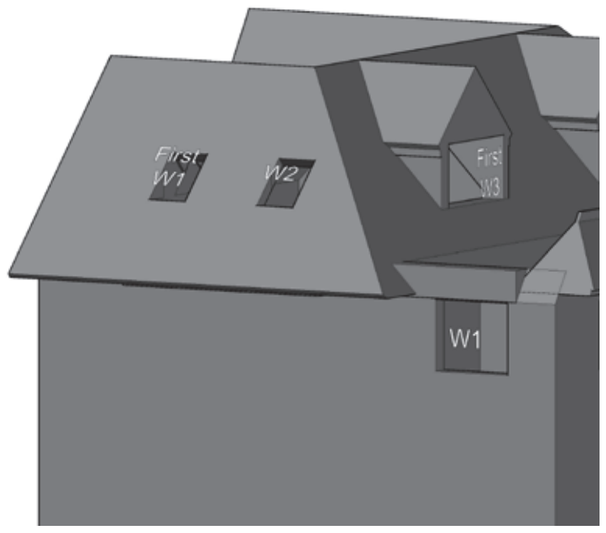

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Project	Woking Football Club GU22 9AA
Title	Cotswolds, Kingfield Road, Woking, GU22 9AA
Drawn	VS
Checked	--
Date	03/07/2019
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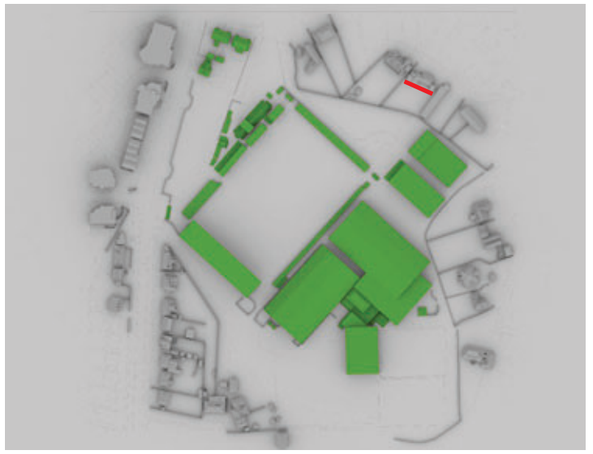

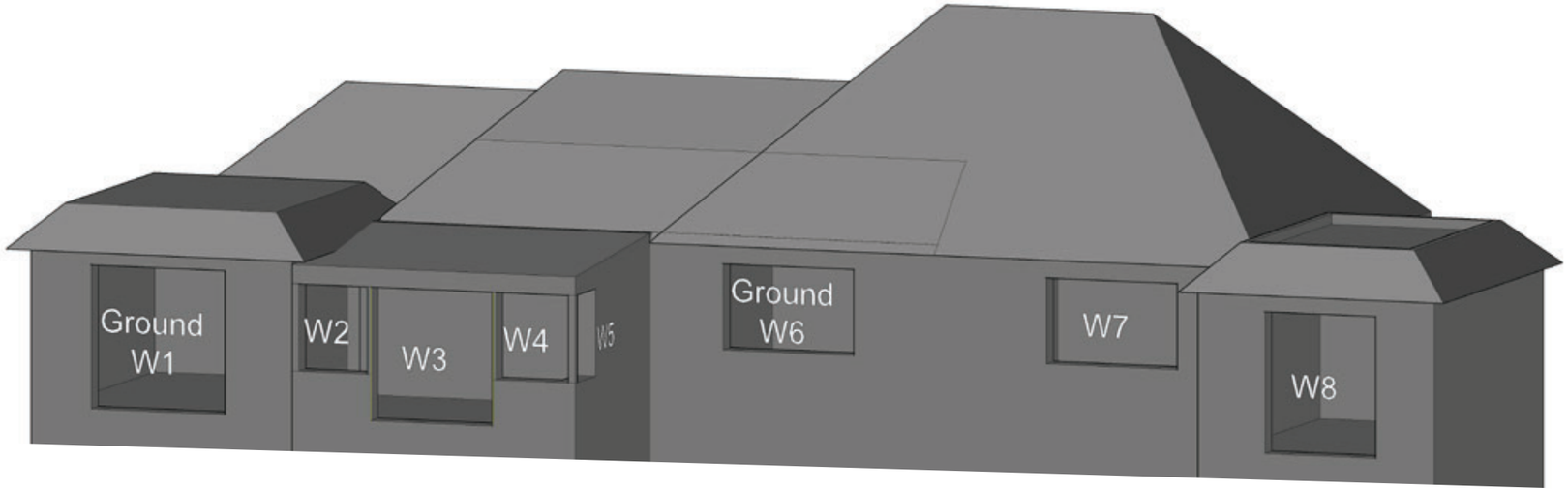

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Project	Woking Football Club GU22 9AA
Title	Chinthurst, Kingfield Road, Woking, GU22 9AA

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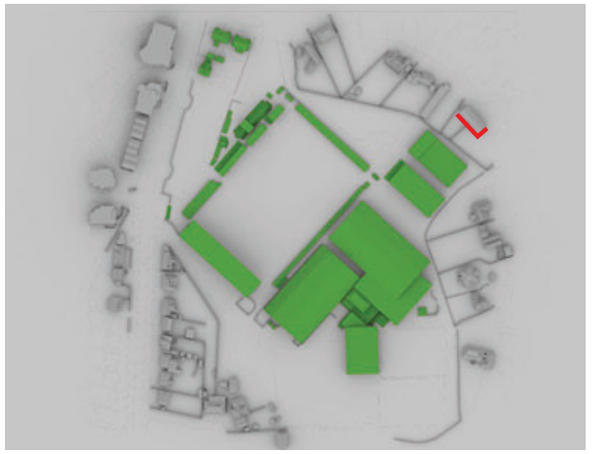

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Project	Woking Football Club GU22 9AA		
Title	9-12 Kingfield Street, GU22 9AD		
Drawn	VS	Checked	--
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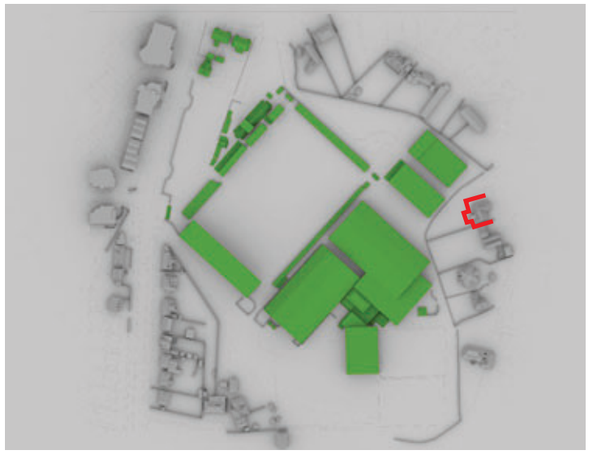

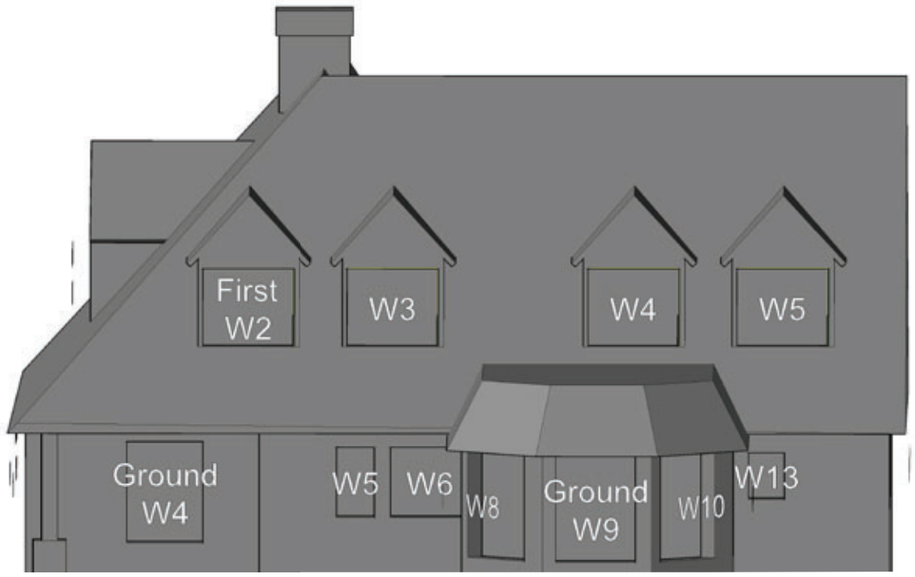

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Project	Woking Football Club GU22 9AA
Title	Pond House, Kingfield Green, GU22 9BD
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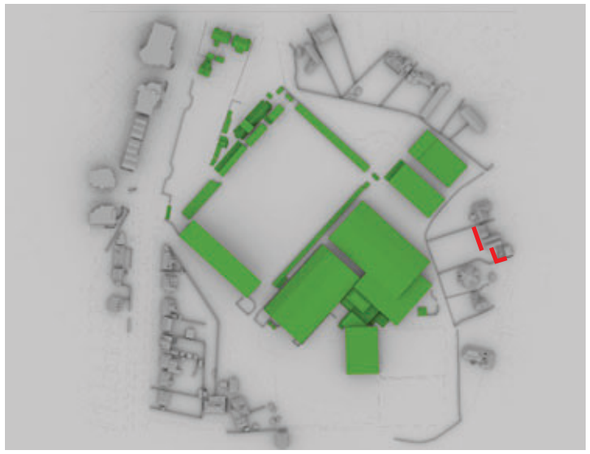

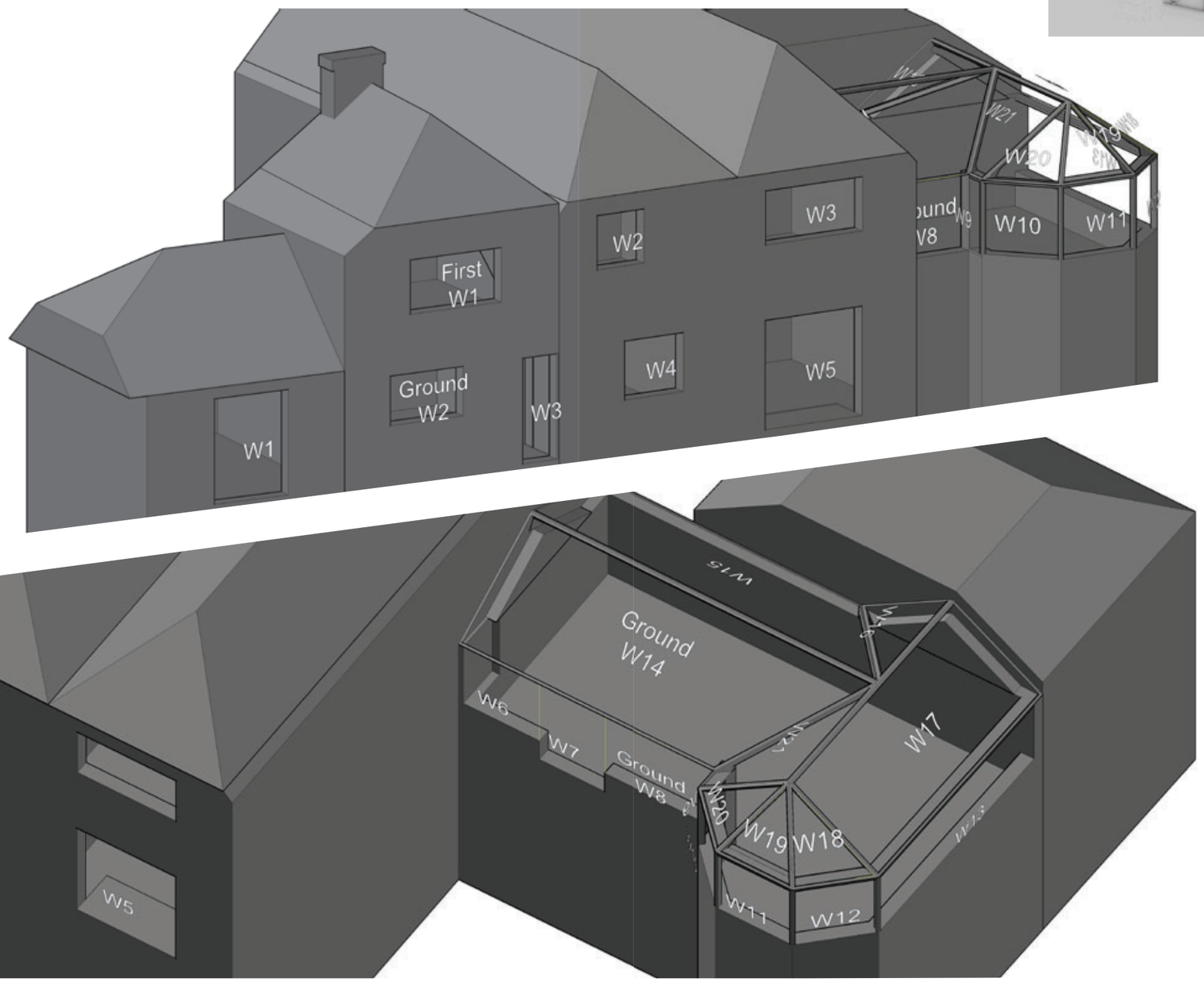

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Project	Woking Football Club GU22 9AA
Title	Kingfield Cottage, Kingfield Green, GU22 9BD
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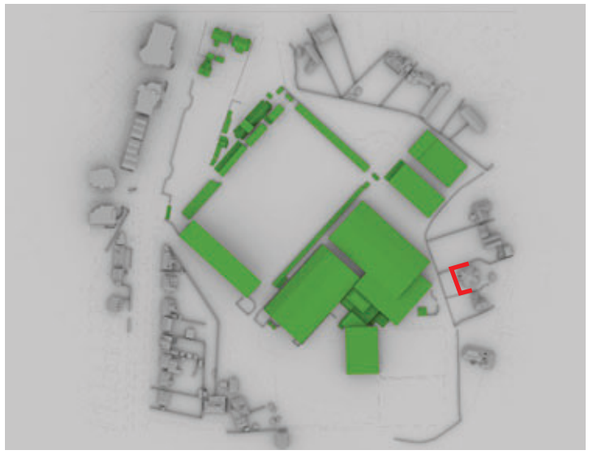

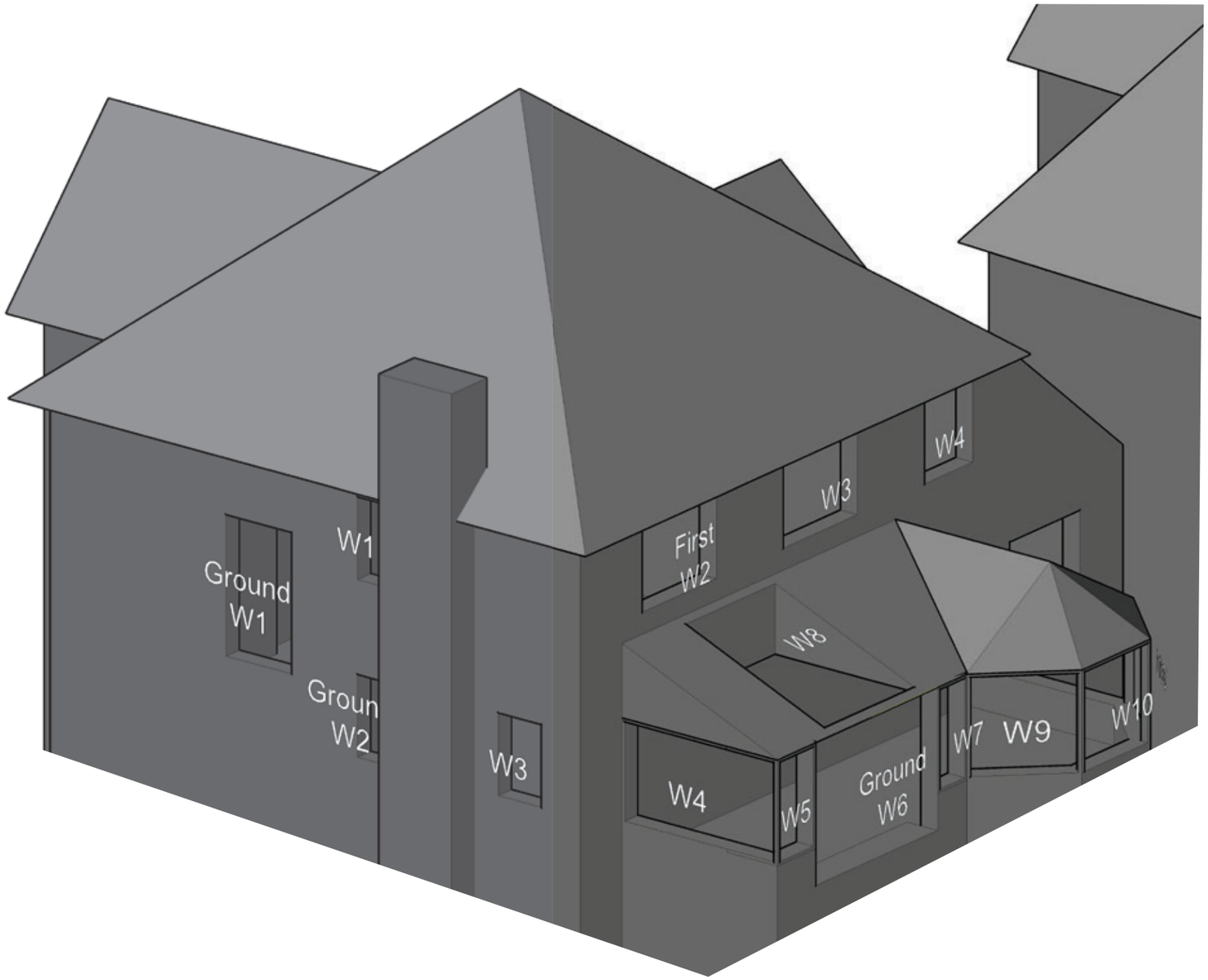

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Project	Woking Football Club GU22 9AA
Title	The Cedars, Kingfield Green, GU22 9BD

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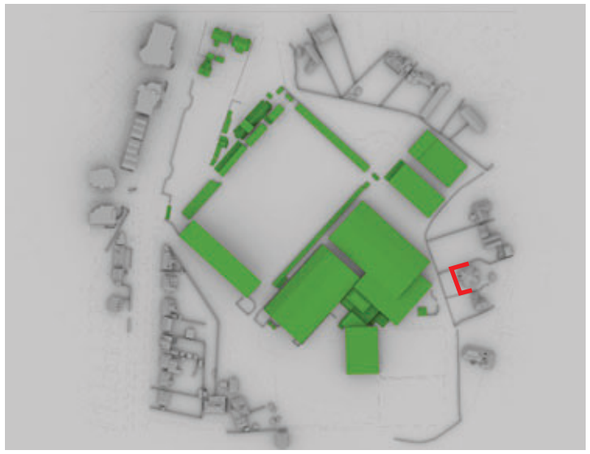

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GU22 9AA

Title: The Cedars, Kingfield Green,
GU22 9BD

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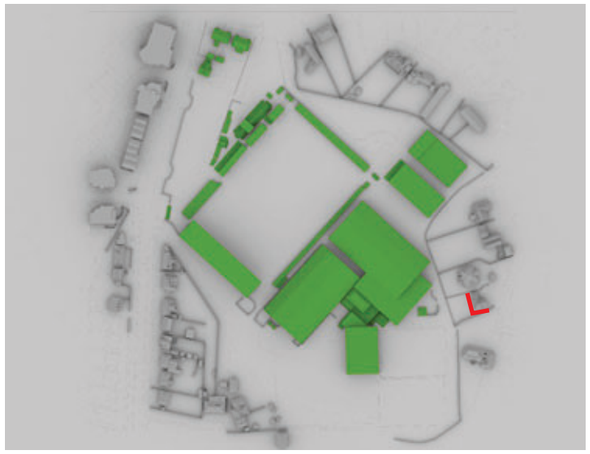

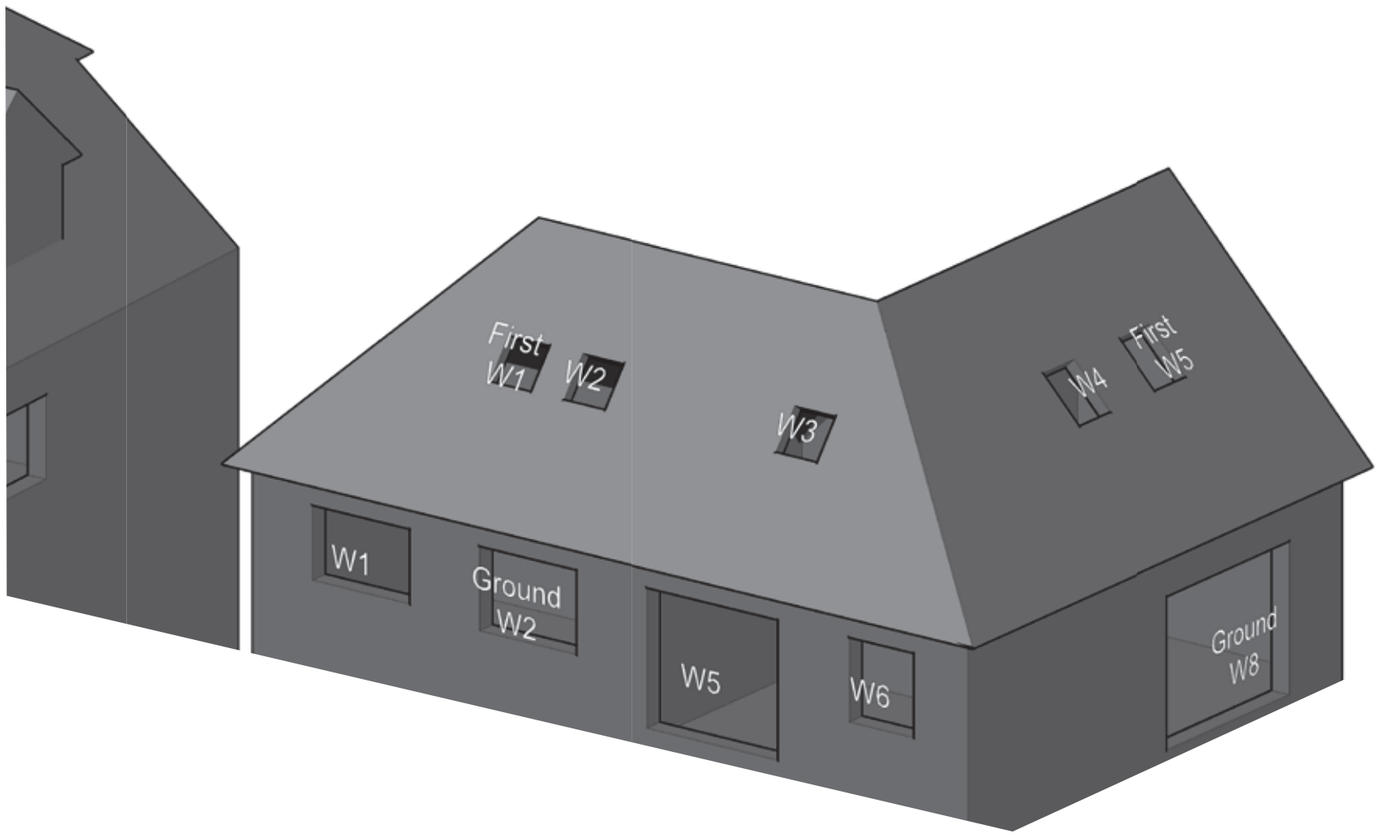

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Project	Woking Football Club GU22 9AA
Title	Nut Cottage, Kingfield Green, GU22 9BD
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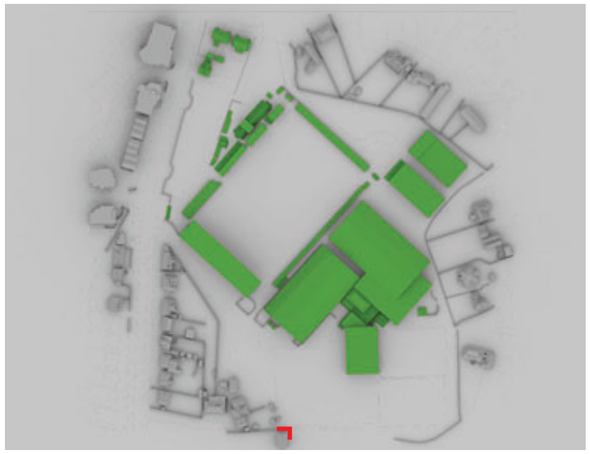

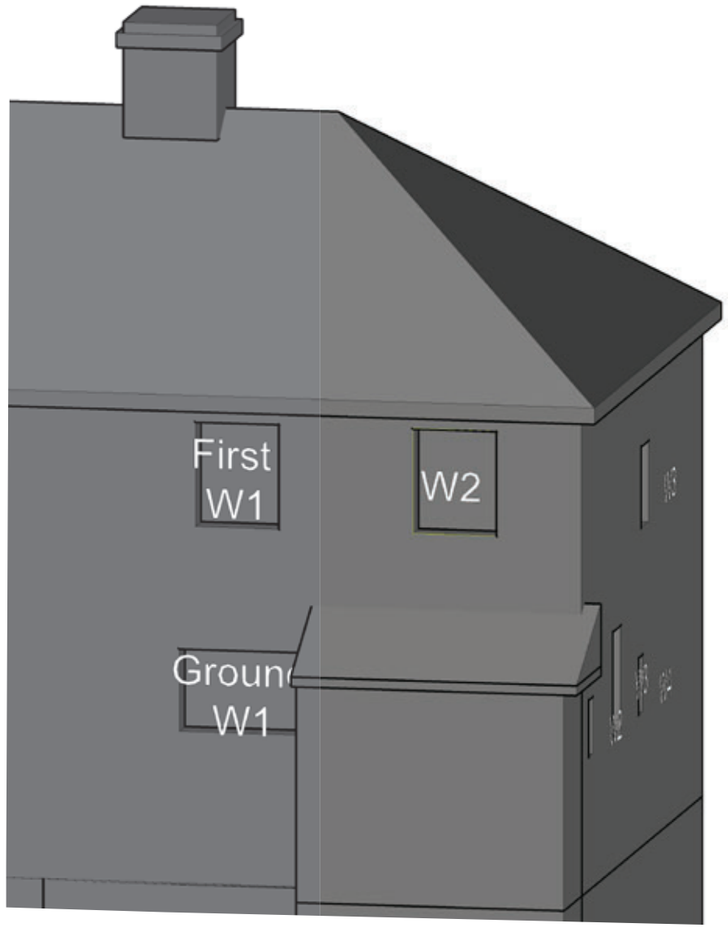

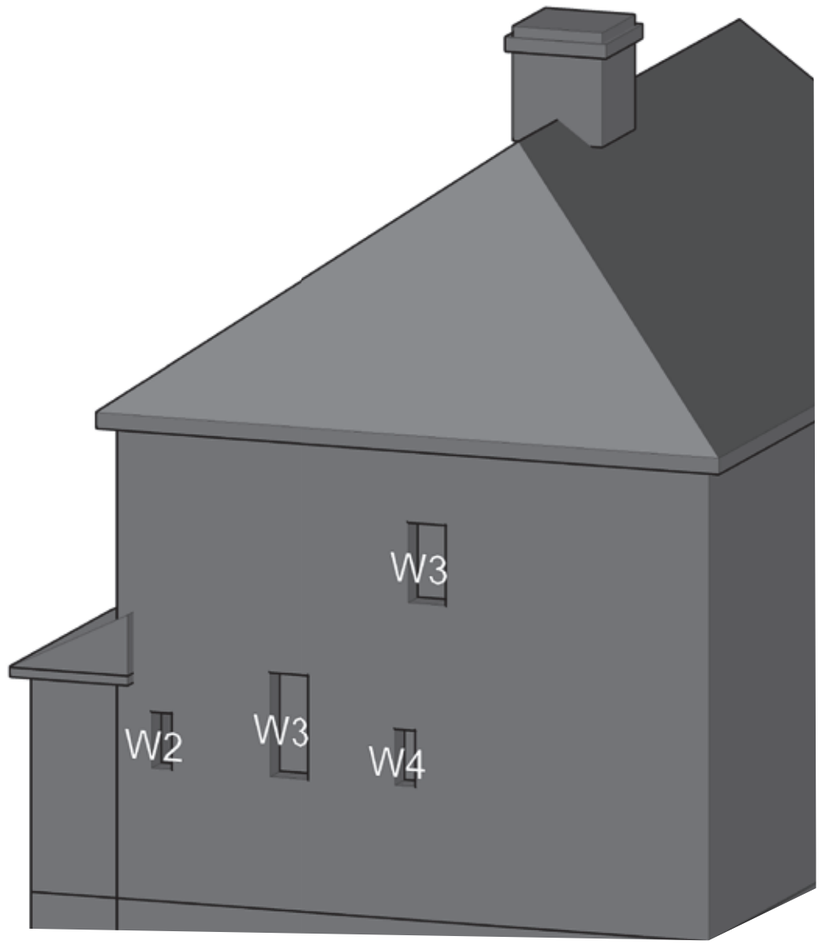

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Project	Woking Football Club GU22 9AA		
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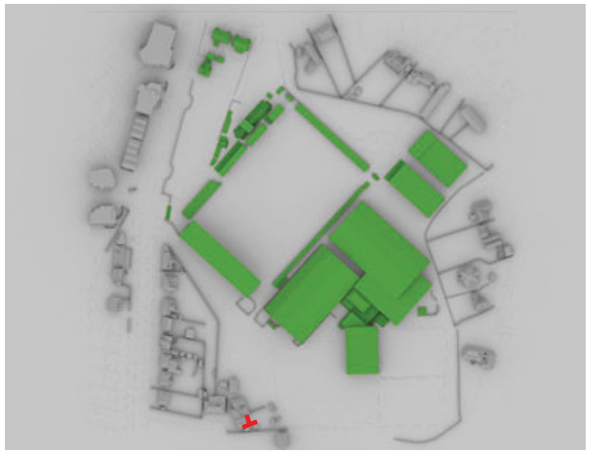

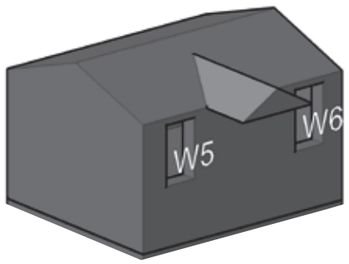

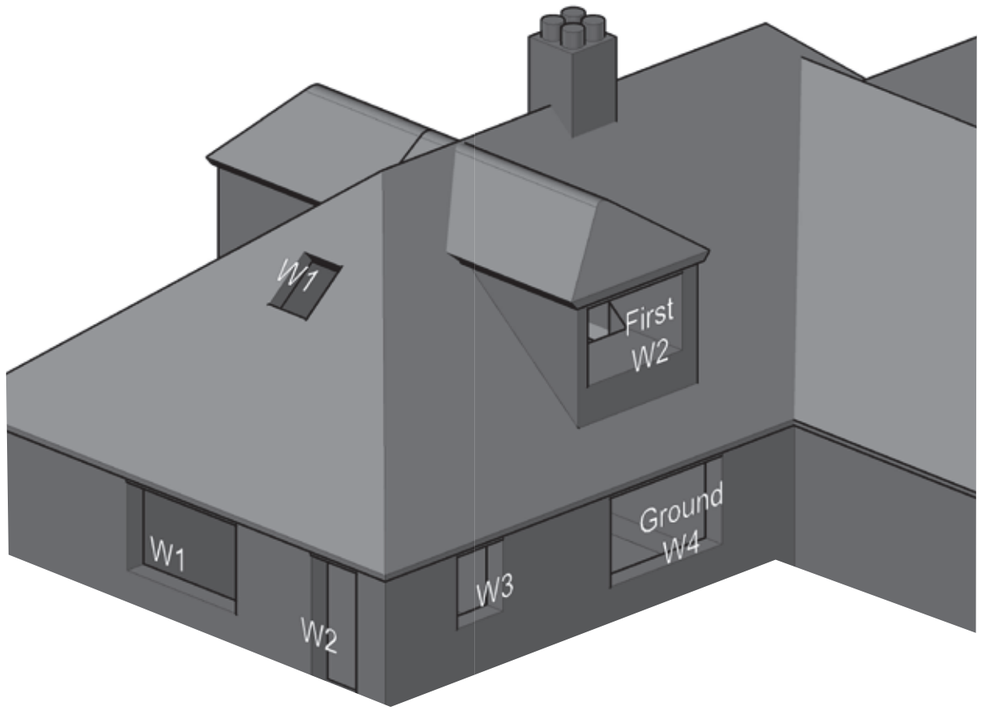

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Title	1 Westfield Grove, GU22 9PQ		
Drawn	VS	Checked	--
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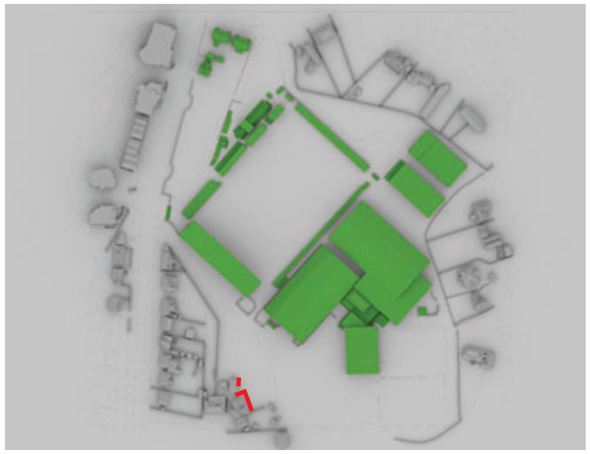

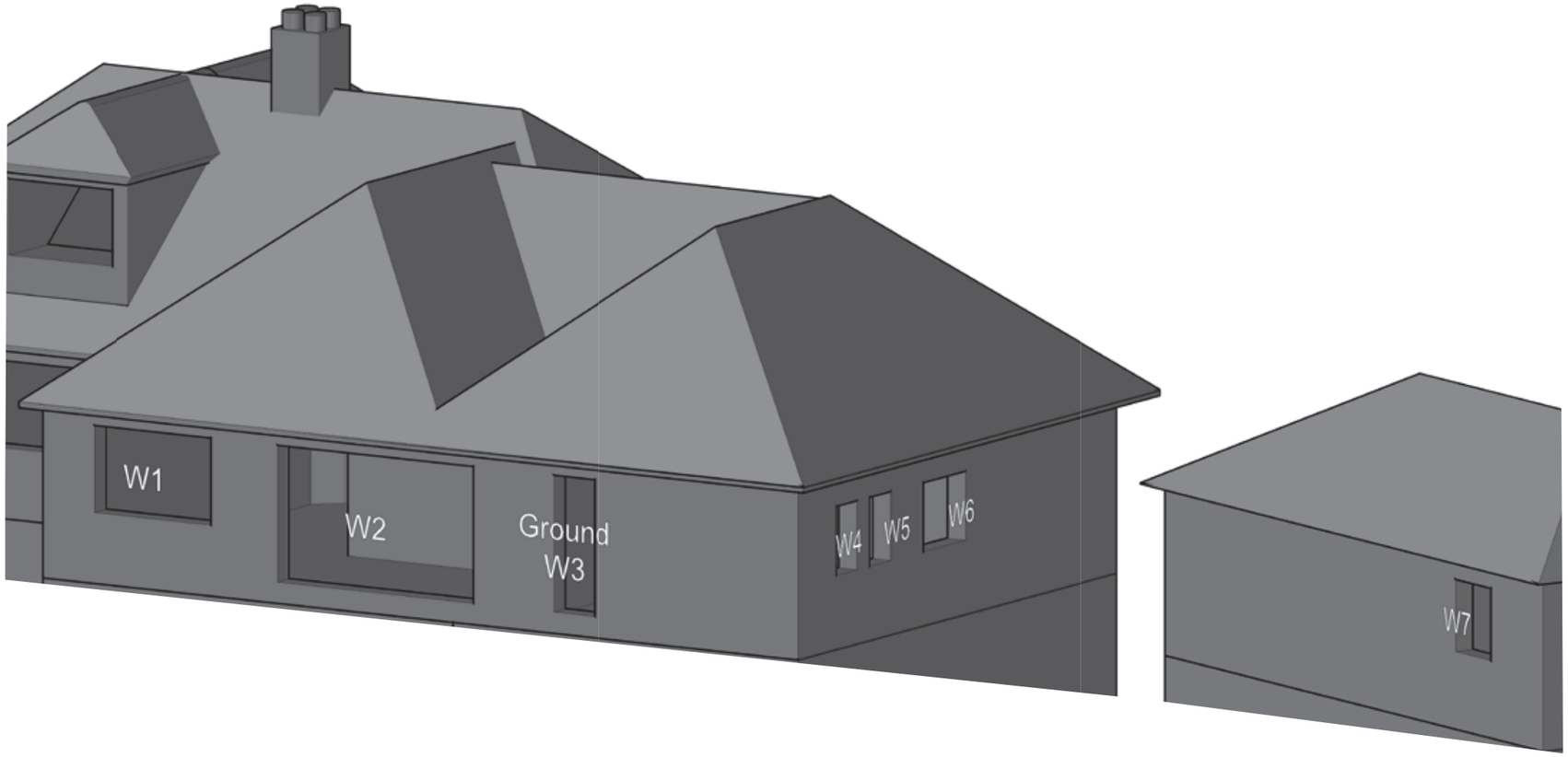

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Project	Woking Football Club GU22 9AA		
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Drawn	VS	Checked	--
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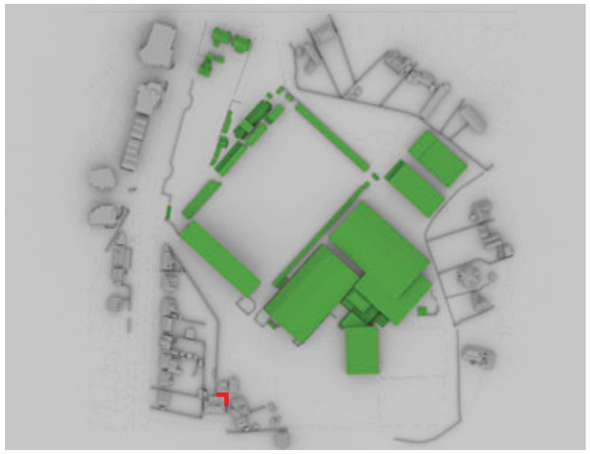

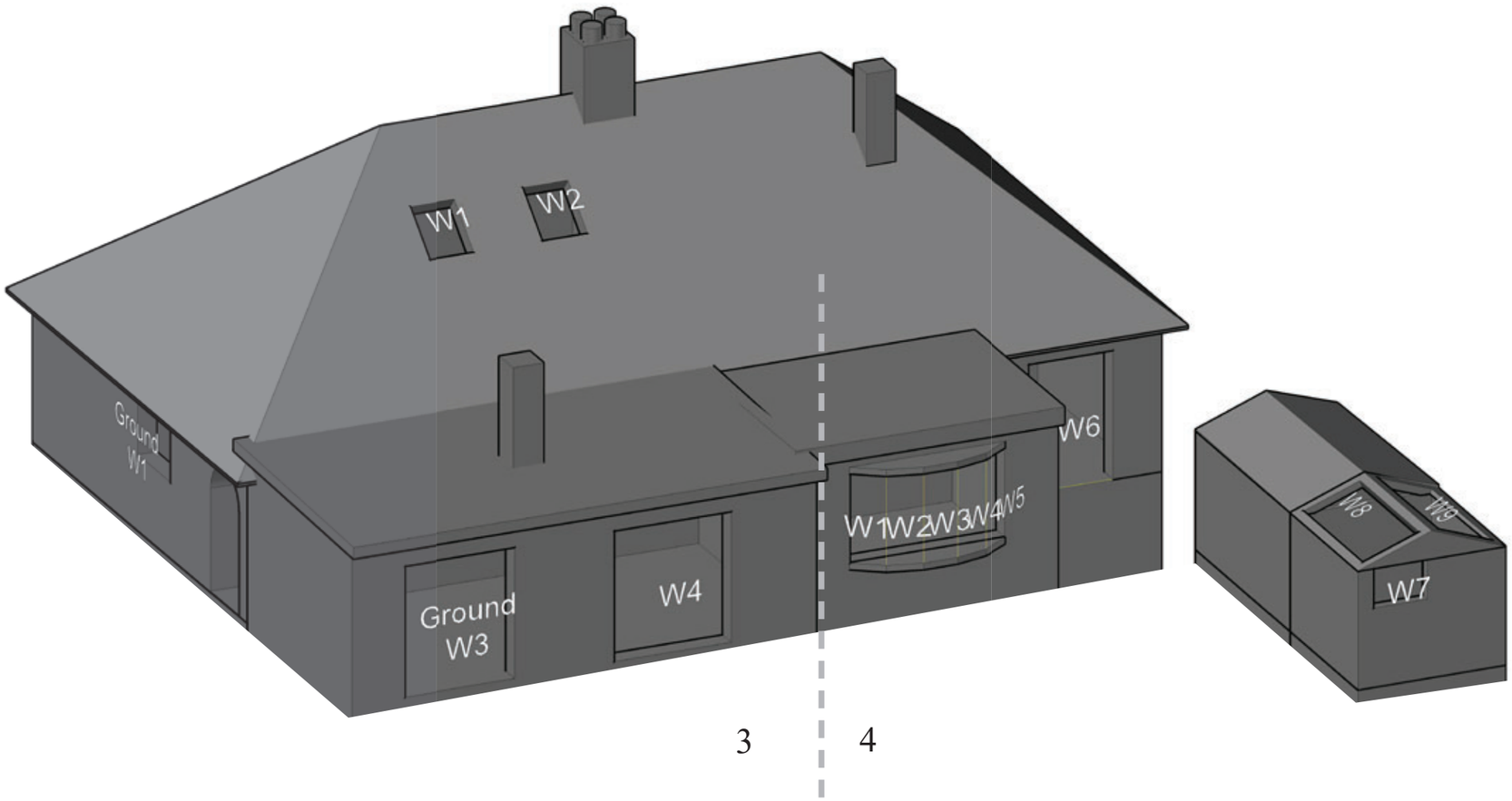

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Project	Woking Football Club GU22 9AA
Title	3 & 4 Westfield Grove, GU22 9PQ
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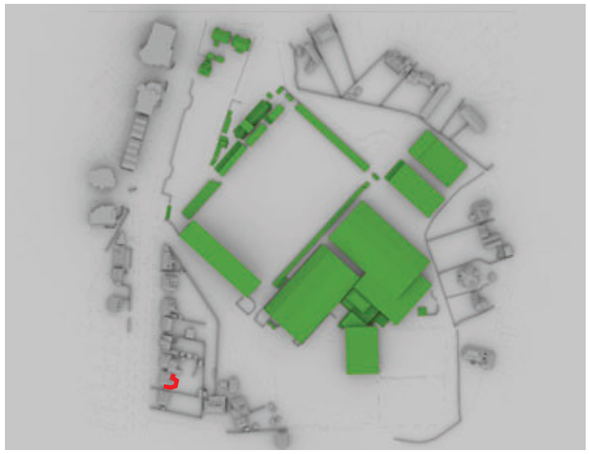

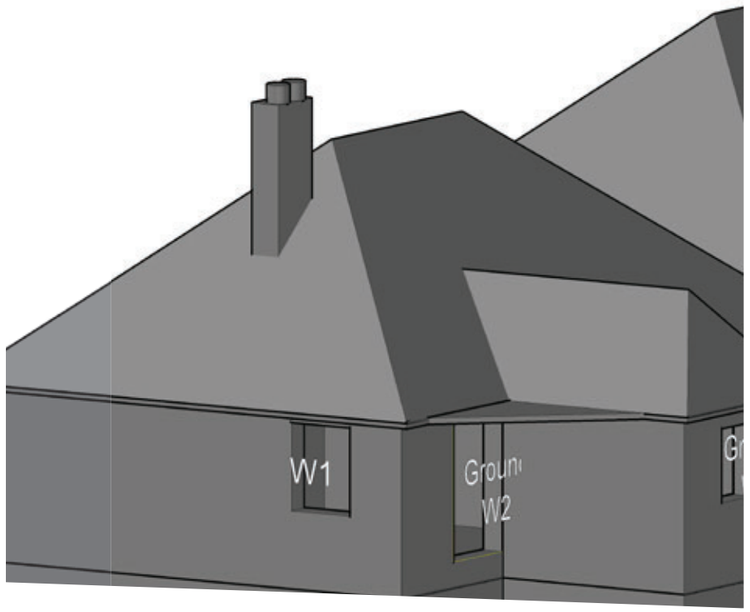

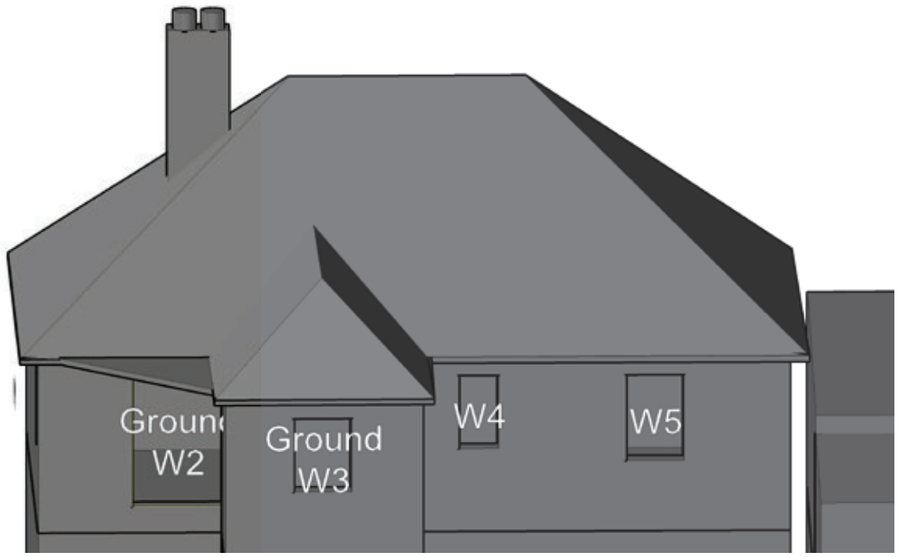

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Project	Woking Football Club GU22 9AA
Title	53 Westfield Avenue, GU22 9PG

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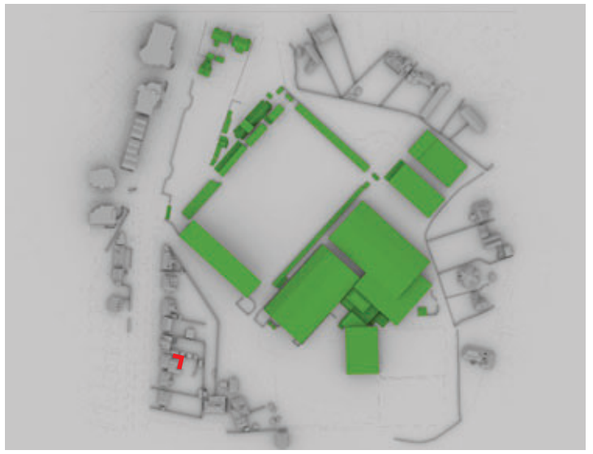

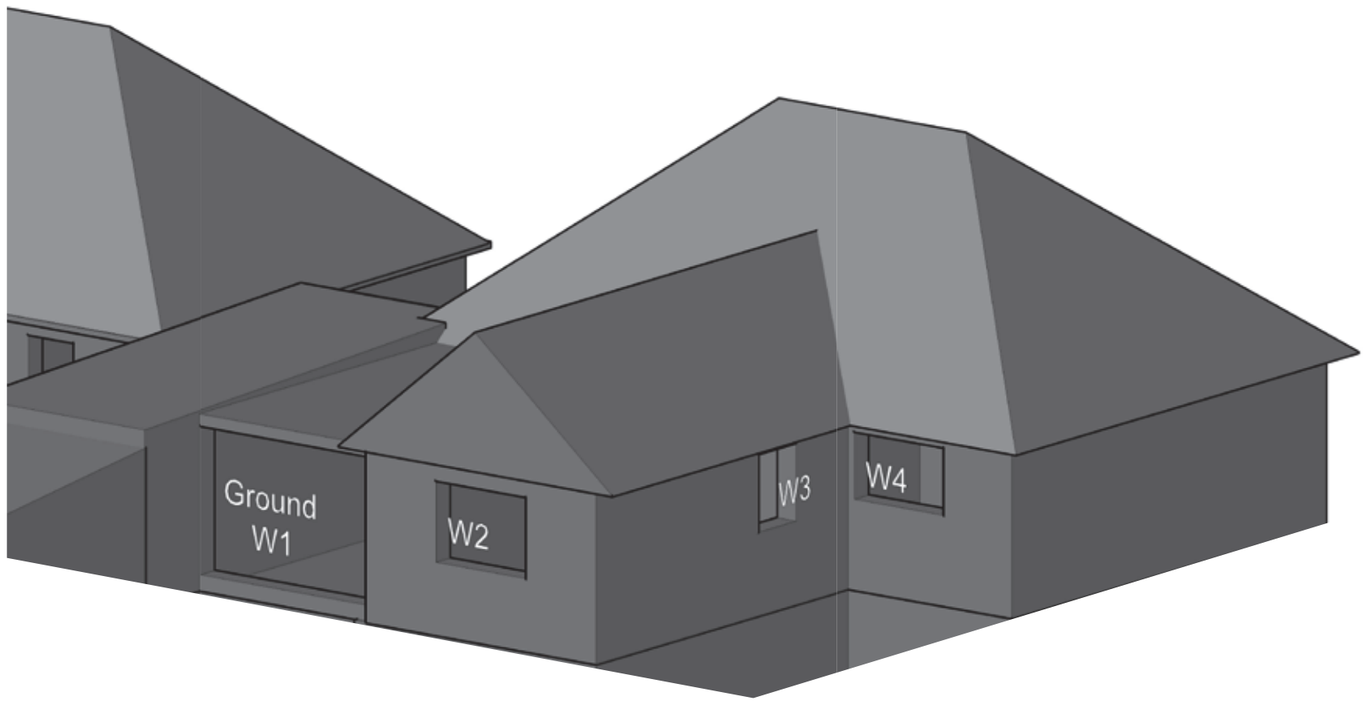

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Sources of information

Woods Hardwick
0189-7-859-869.dwg
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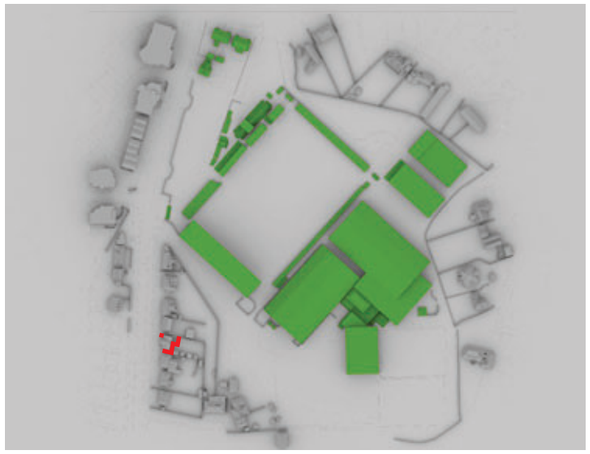

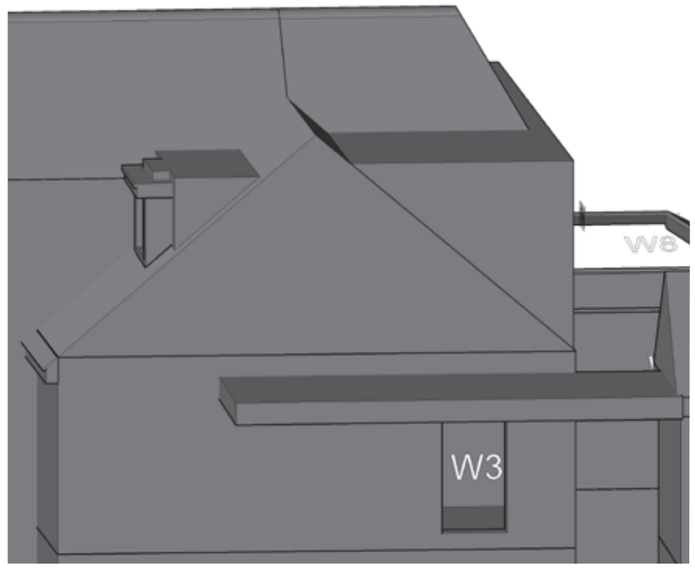

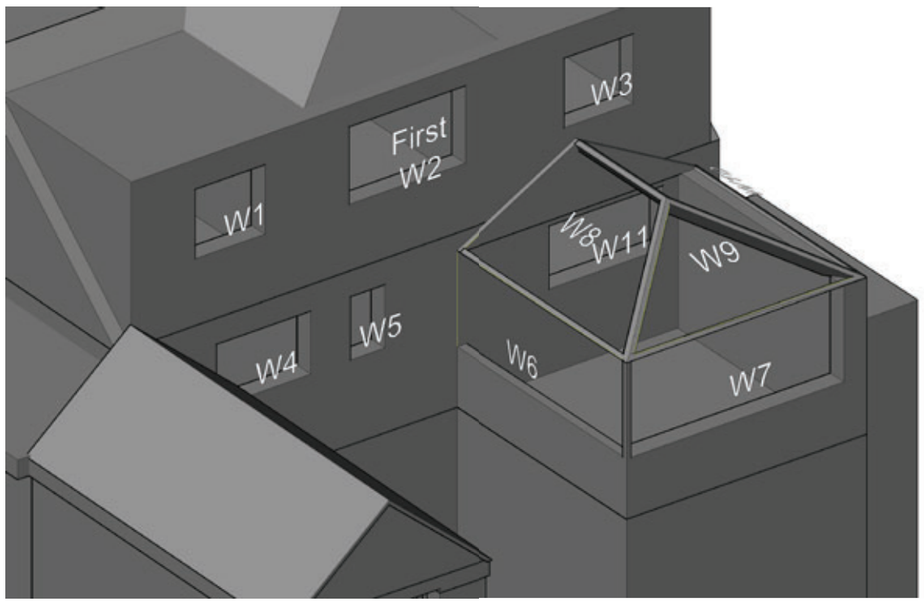

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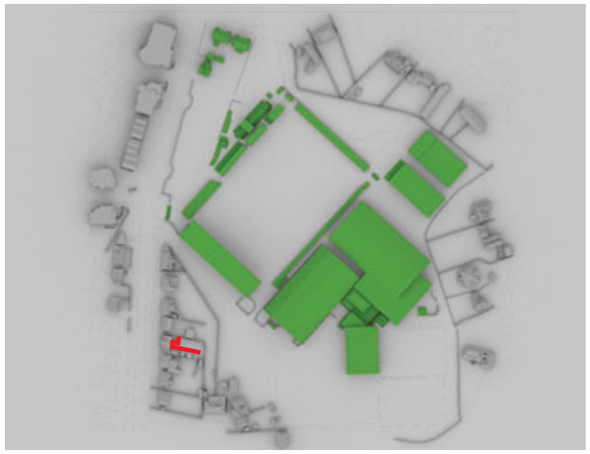

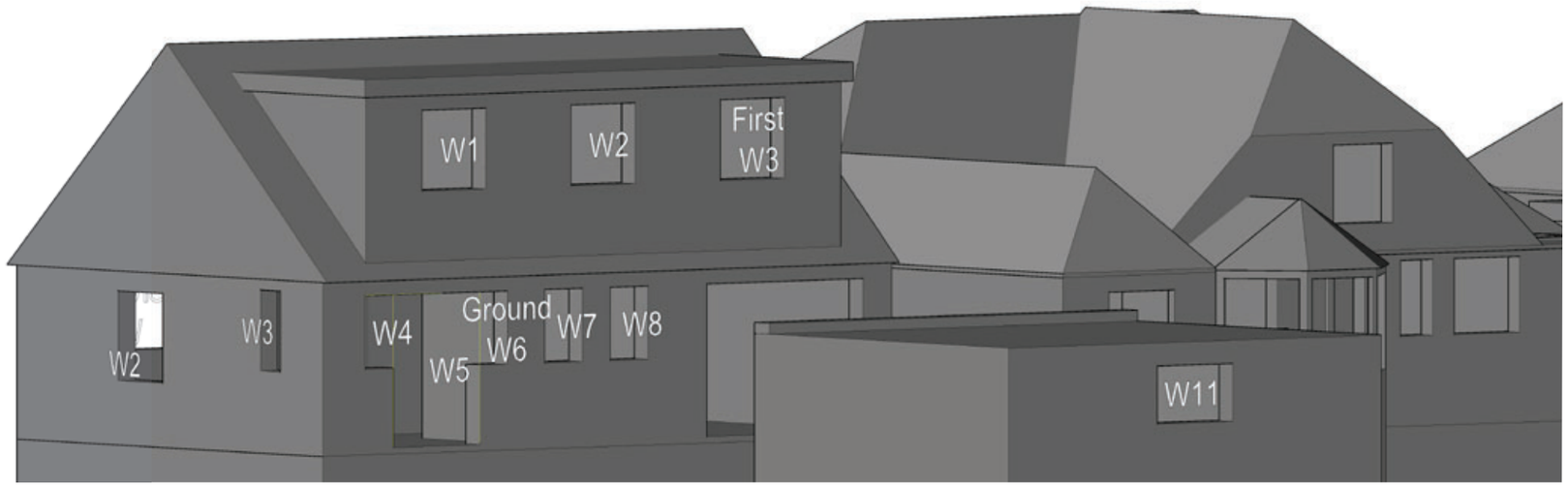

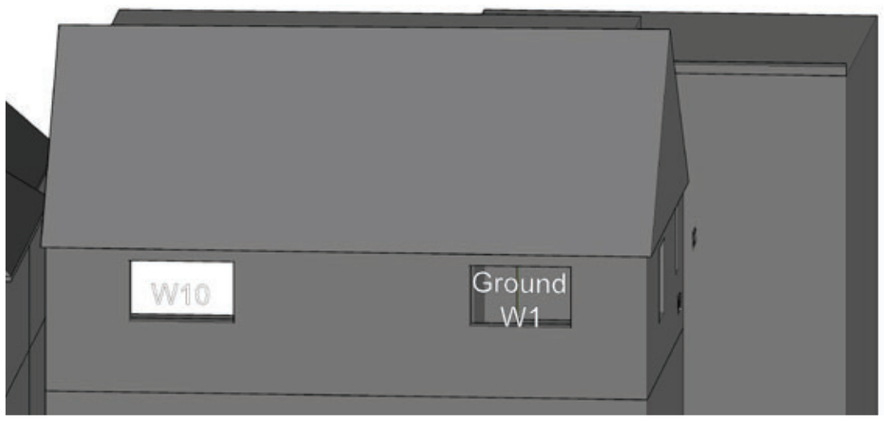

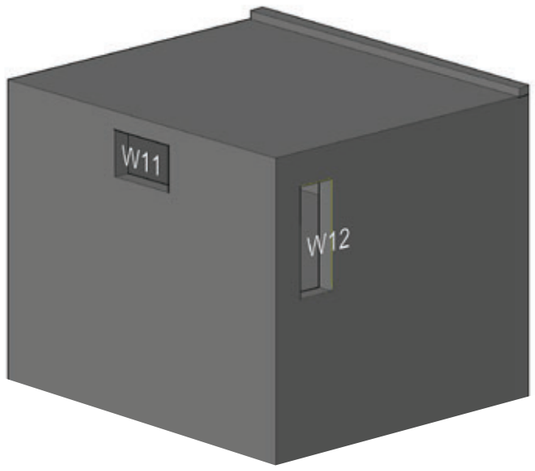

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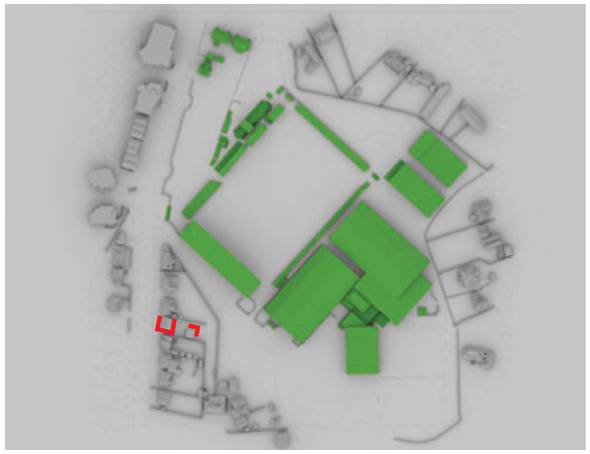

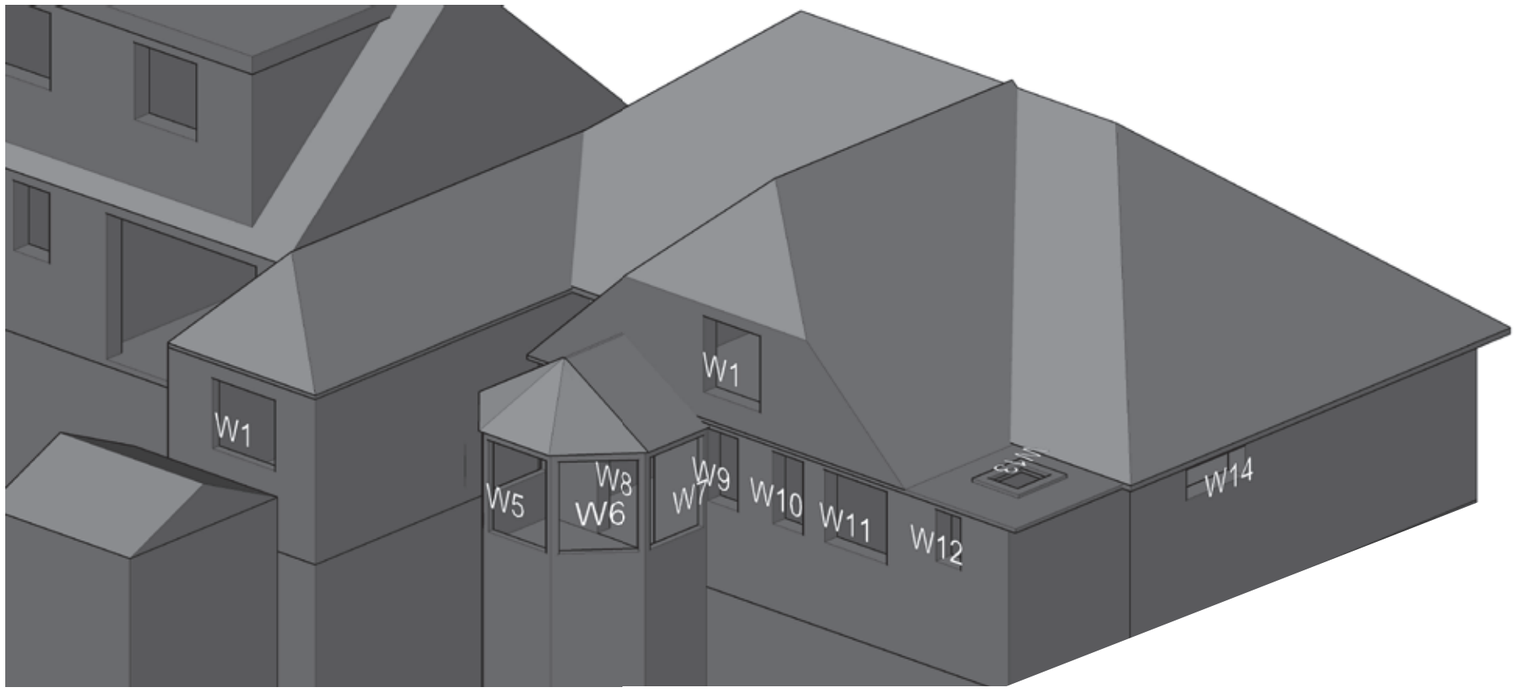

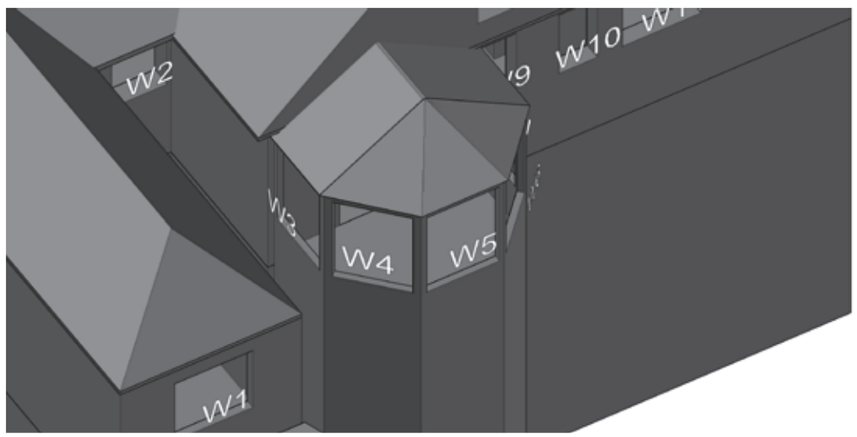

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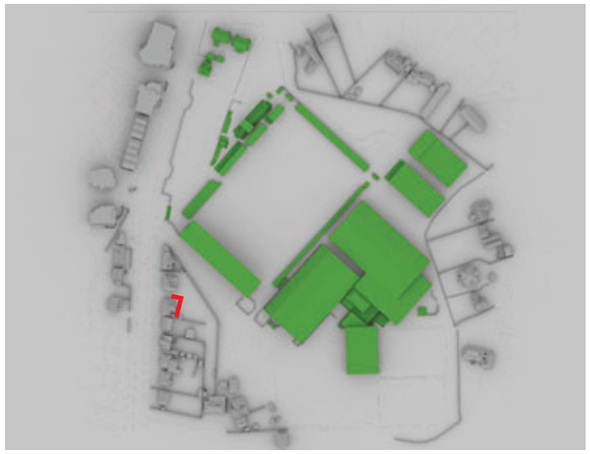

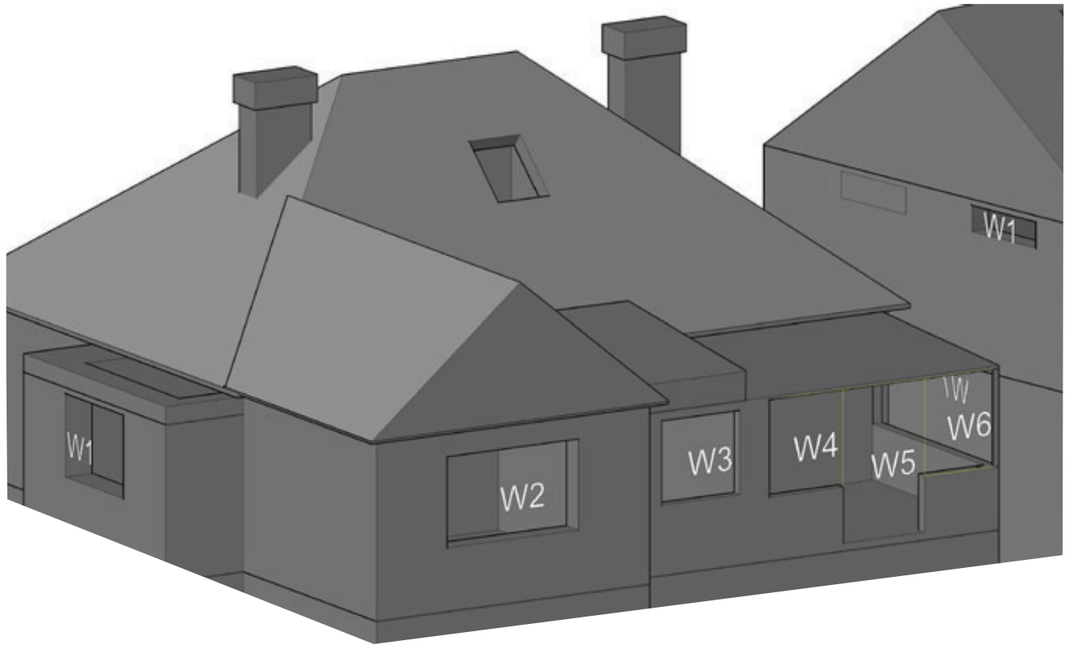

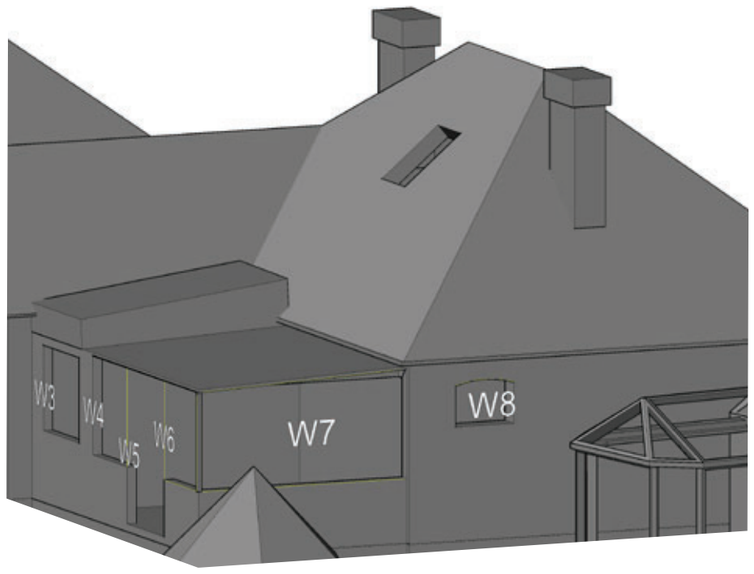

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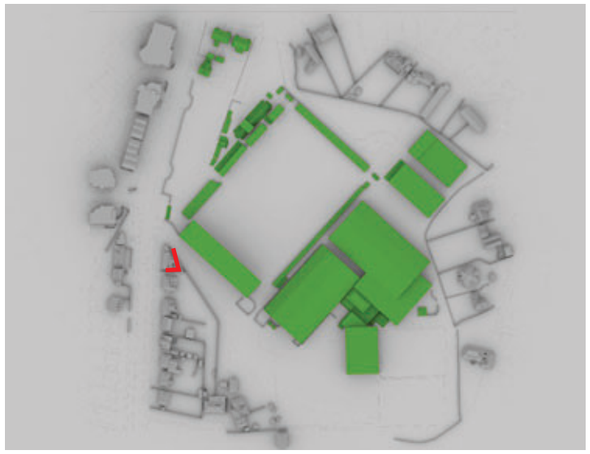

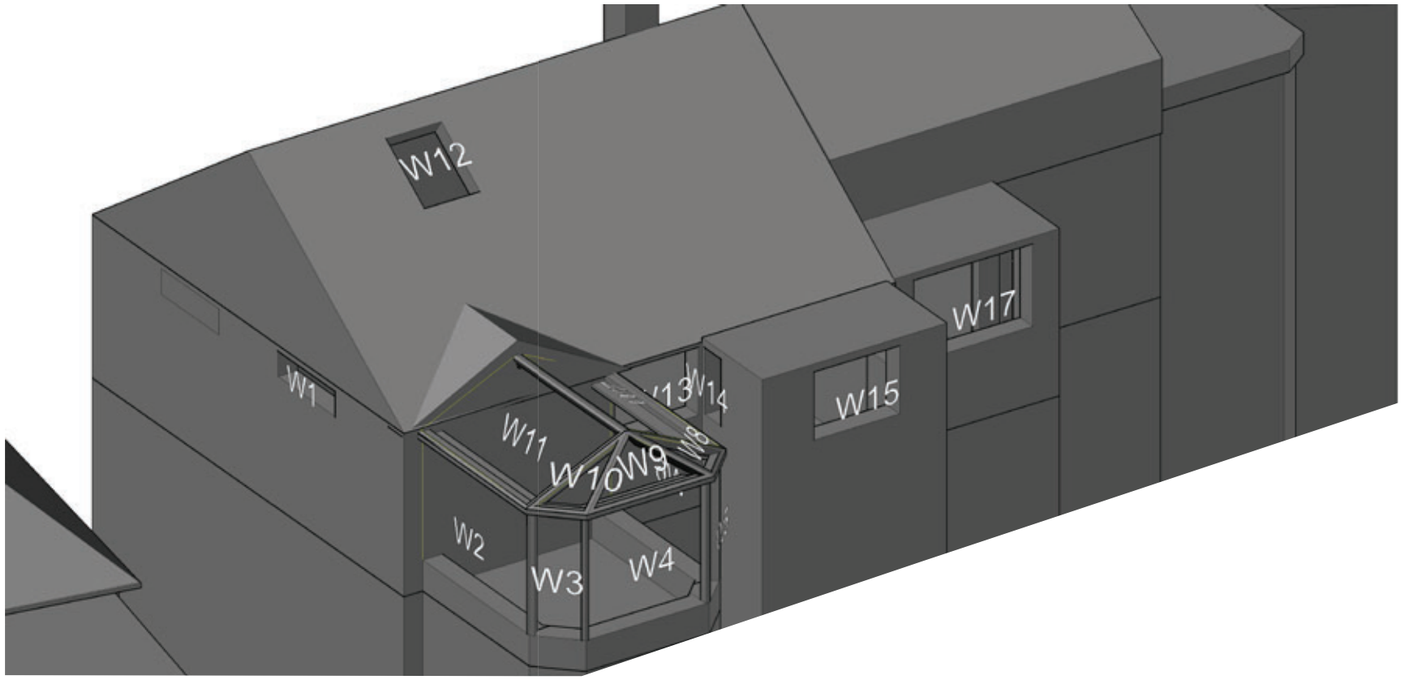

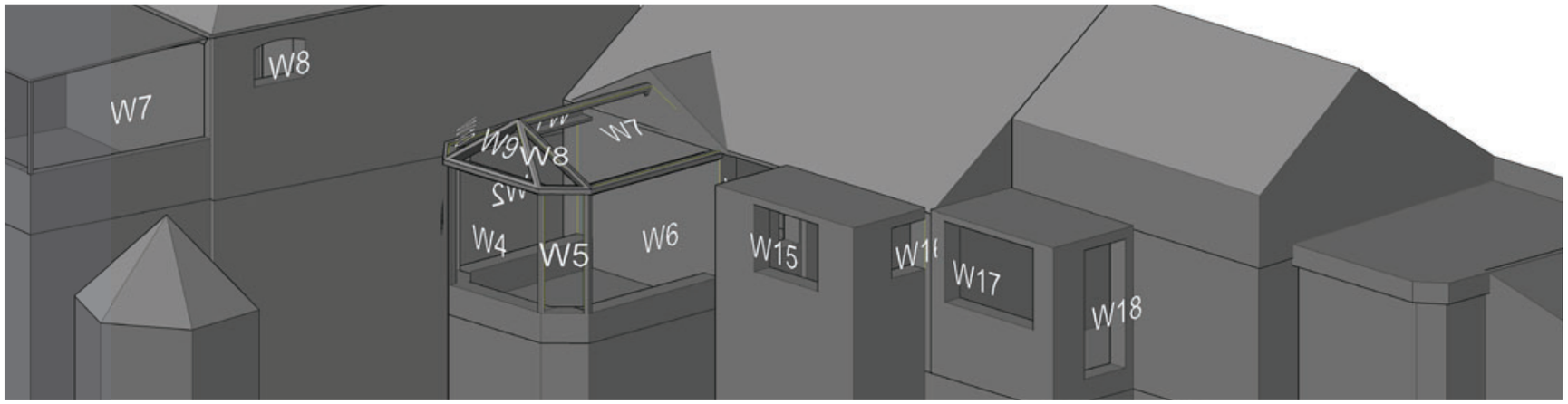

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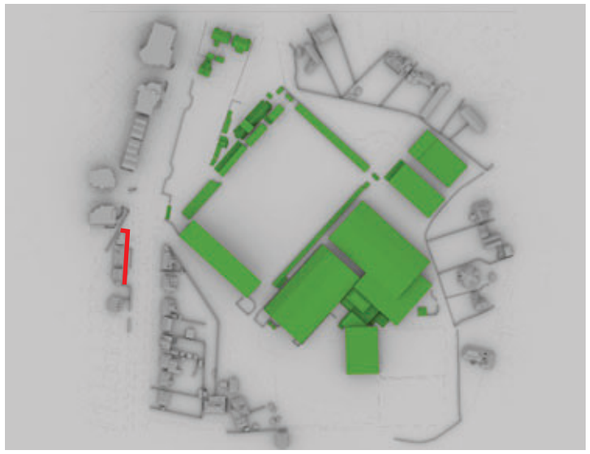

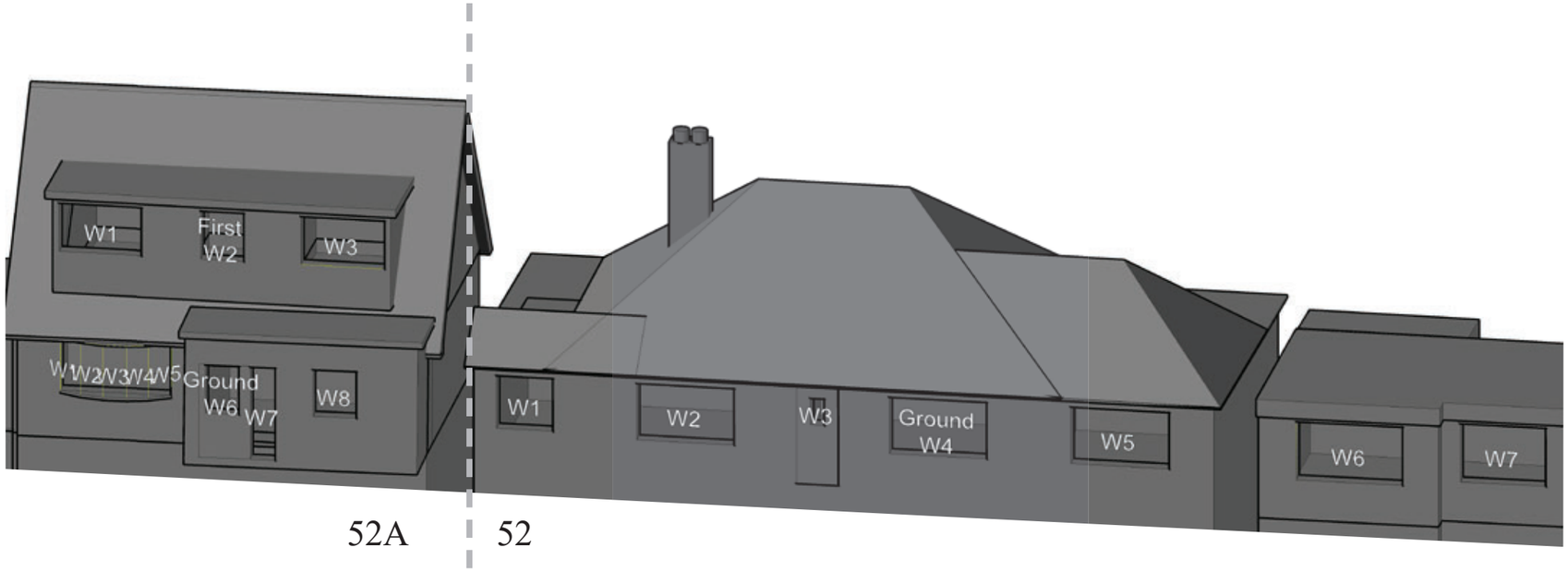

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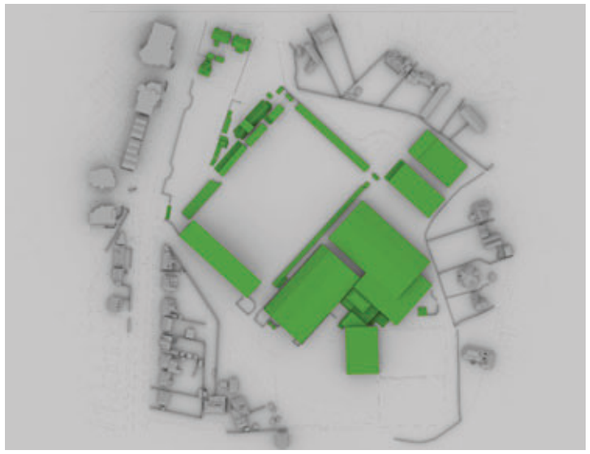

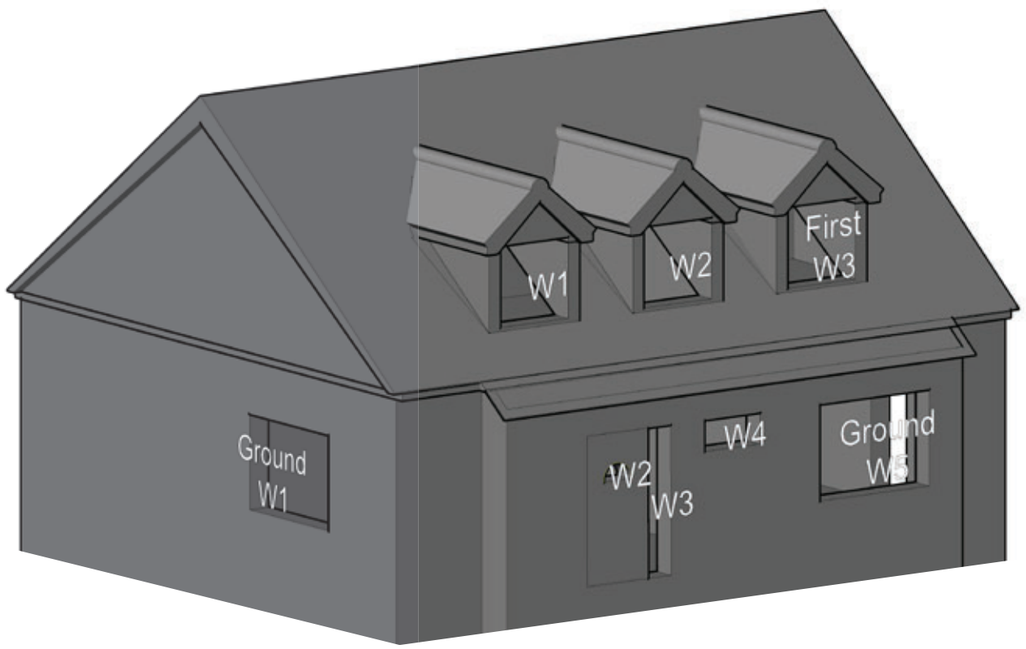

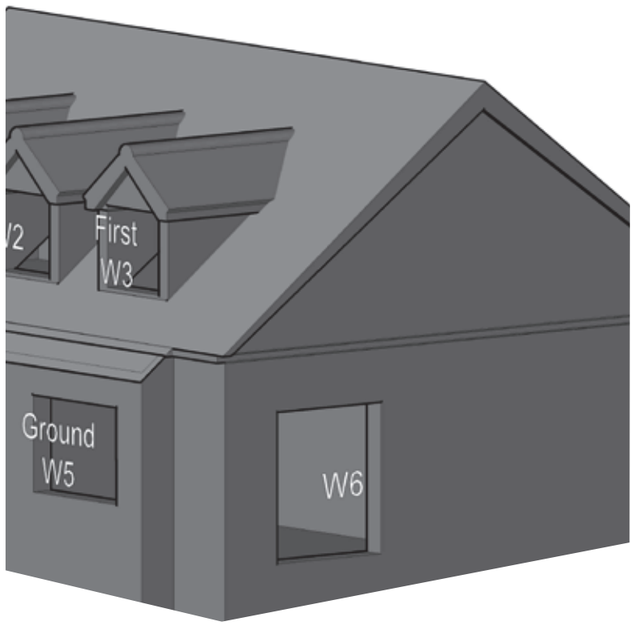

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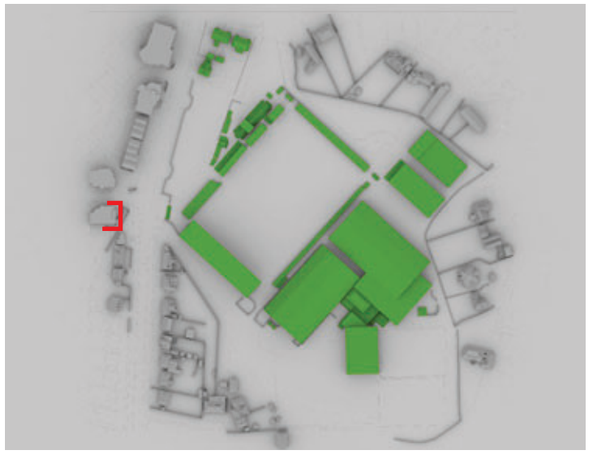

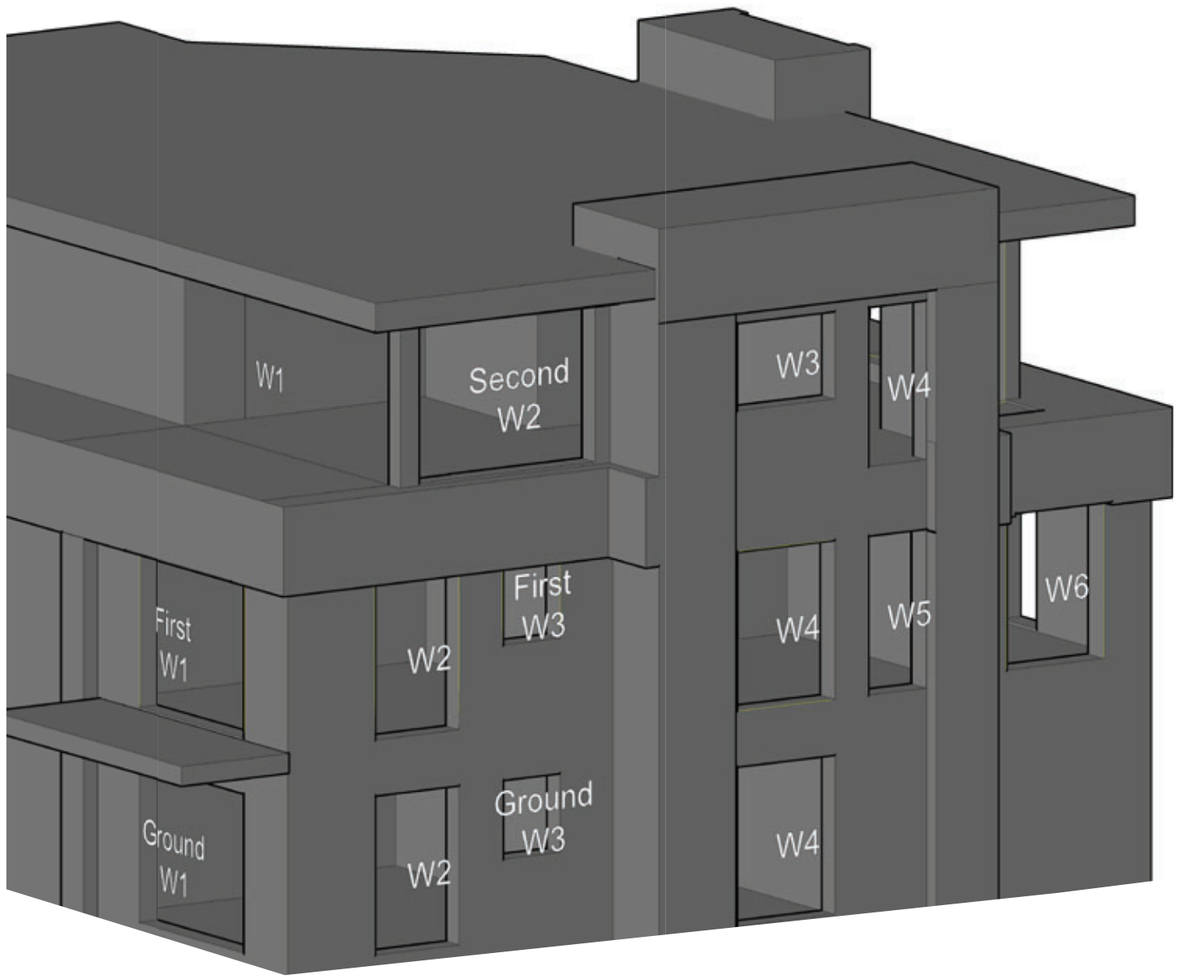

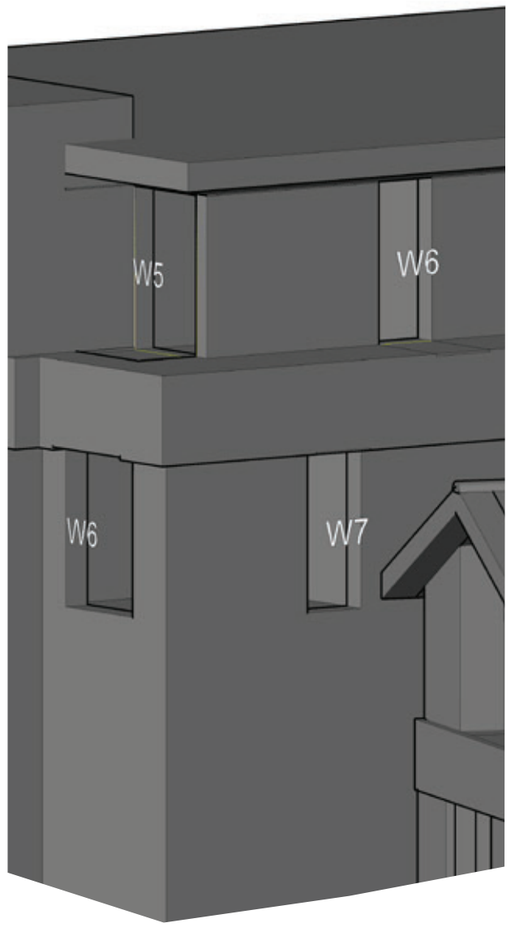

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Project	Woking Football Club GU22 9AA
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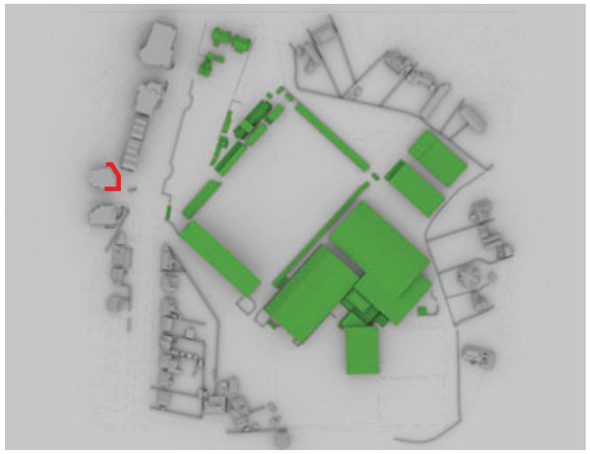

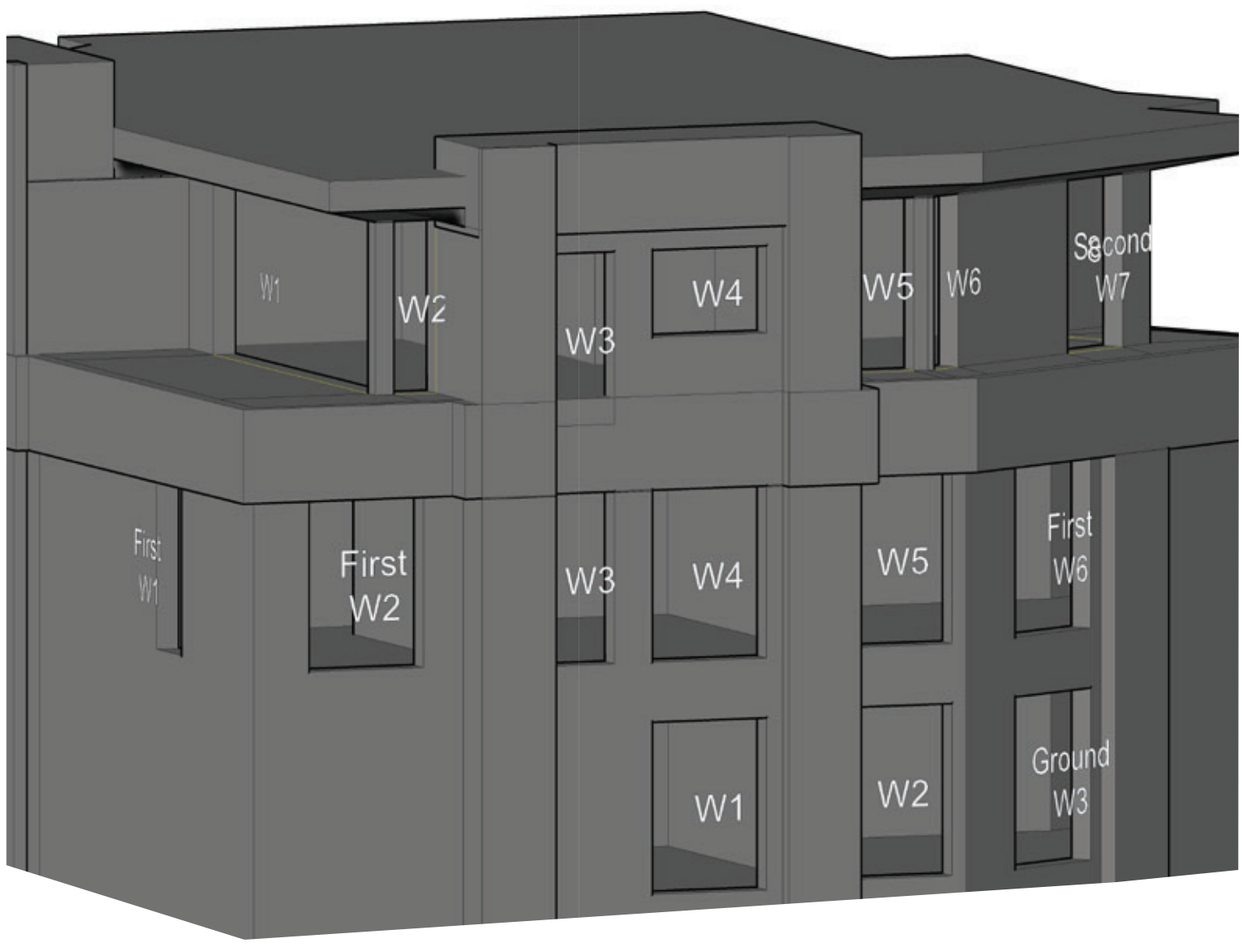

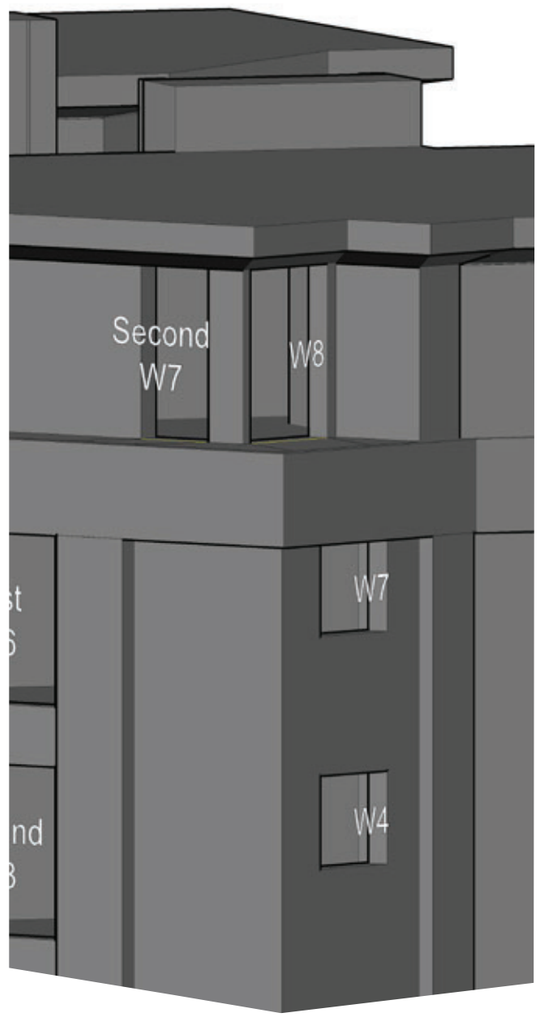

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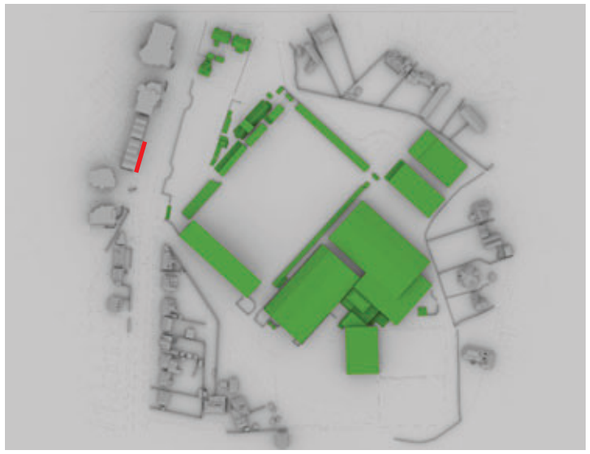

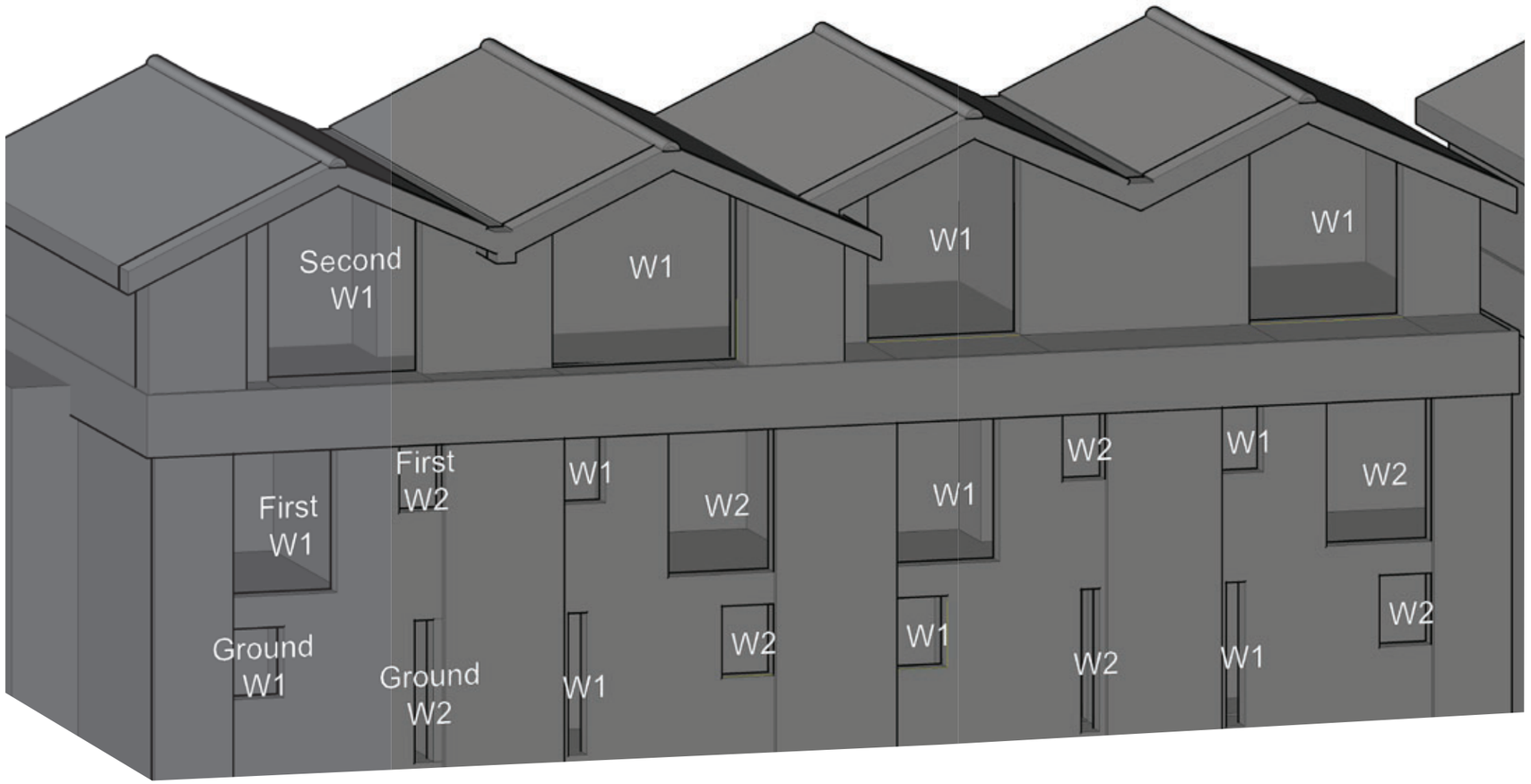

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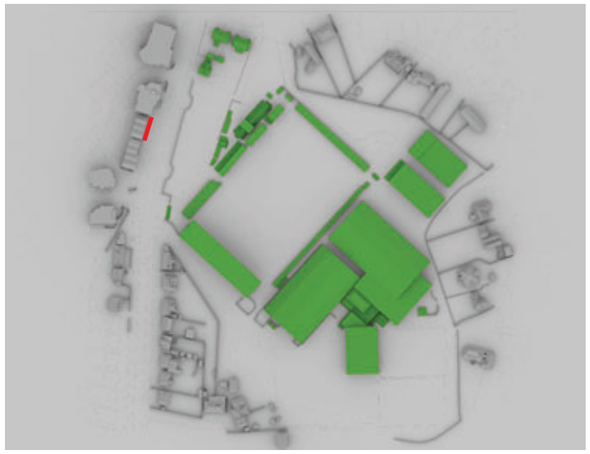

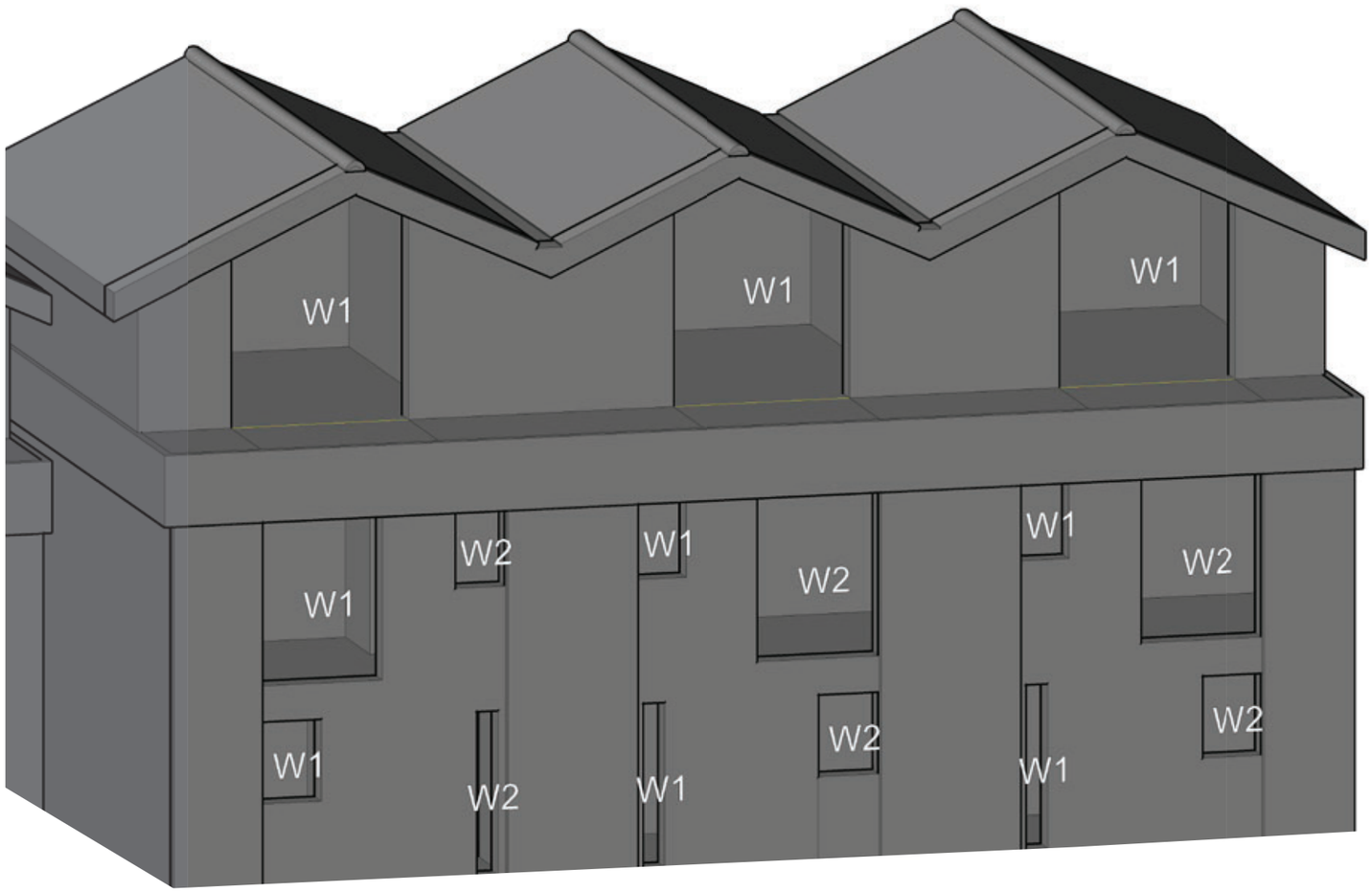

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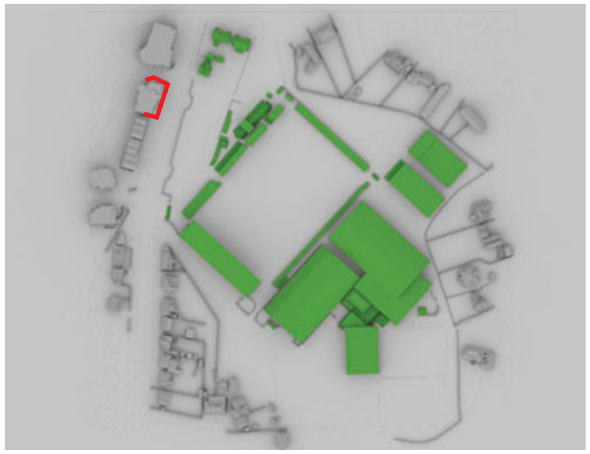

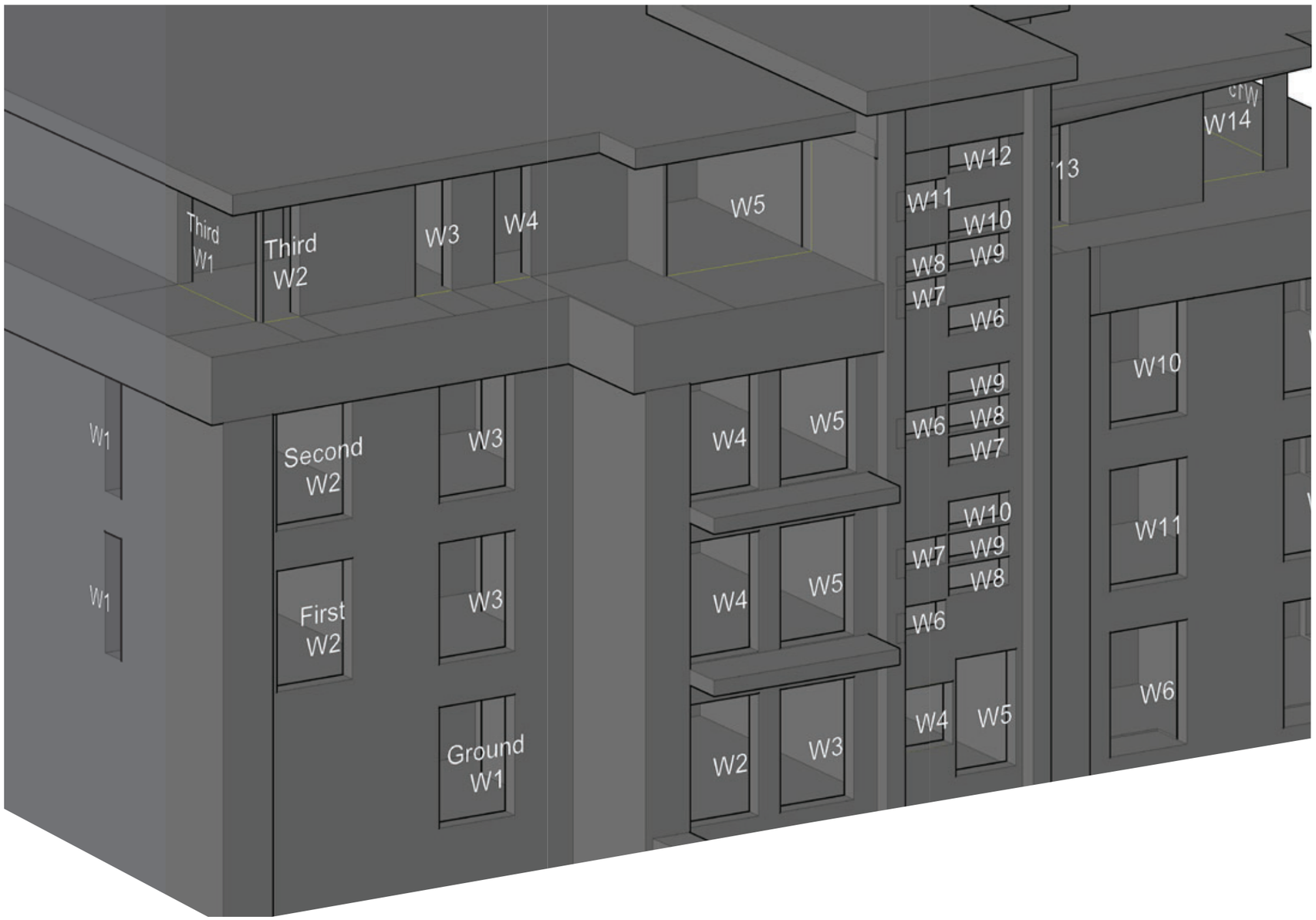

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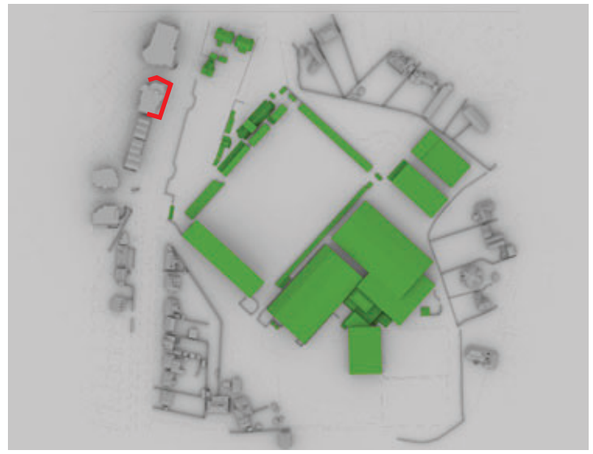

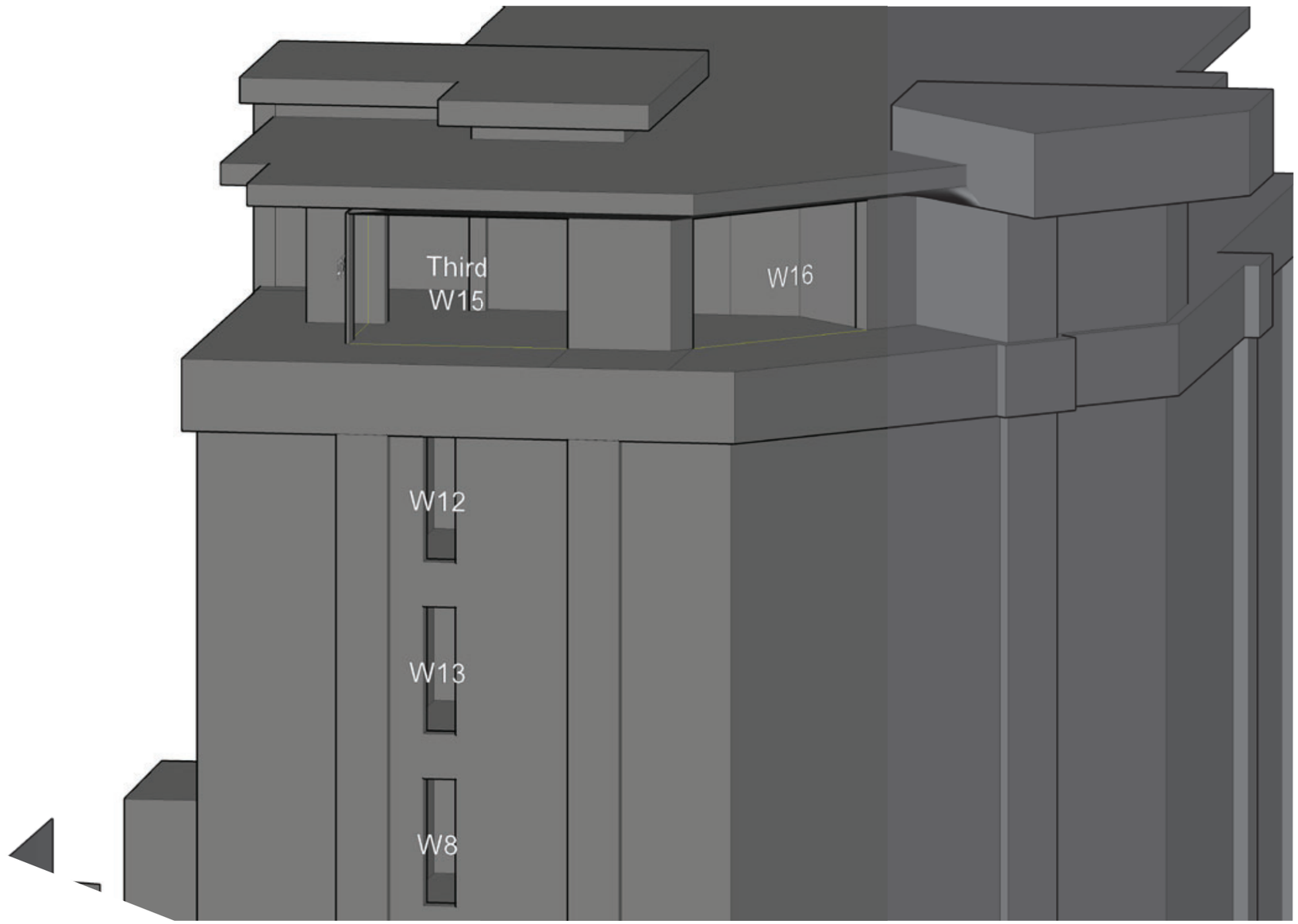

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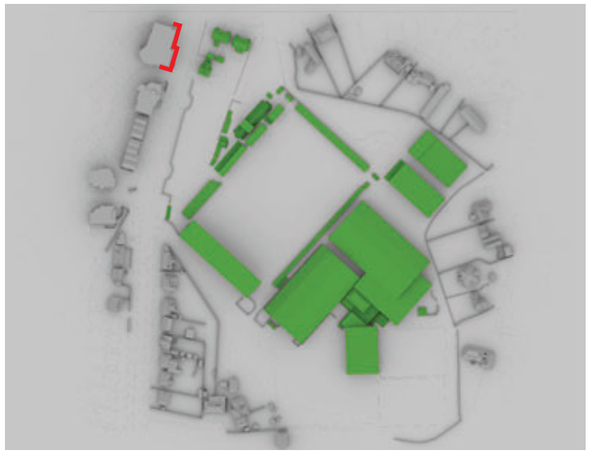

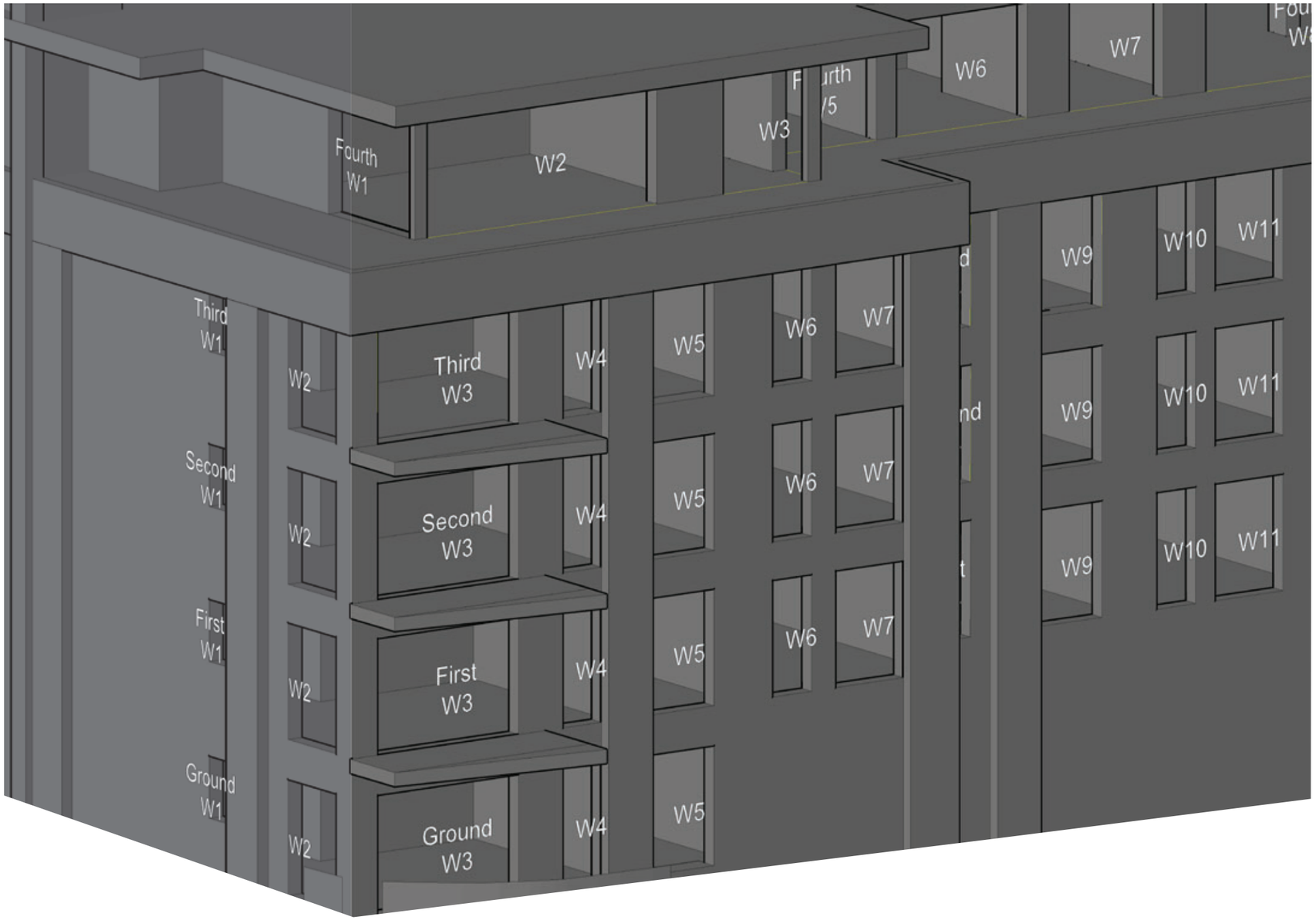

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Woods Hardwick
0189-7-859-869.dwg
0189-7-851A-853A.dwg
Received 04/05/2019

Architect
7884 - Proposed Context - No Views-190607.skp
LRW_7884_L(00) drawings
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Project	Woking Football Club GU22 9AA
Title	Hazel House, Sycamore Avenue, GU22 9FG Part 1
Drawn	VS
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Date	03/07/2019
Project	3499
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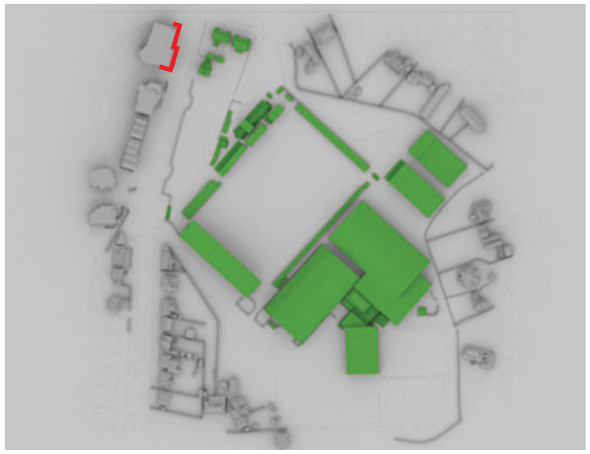
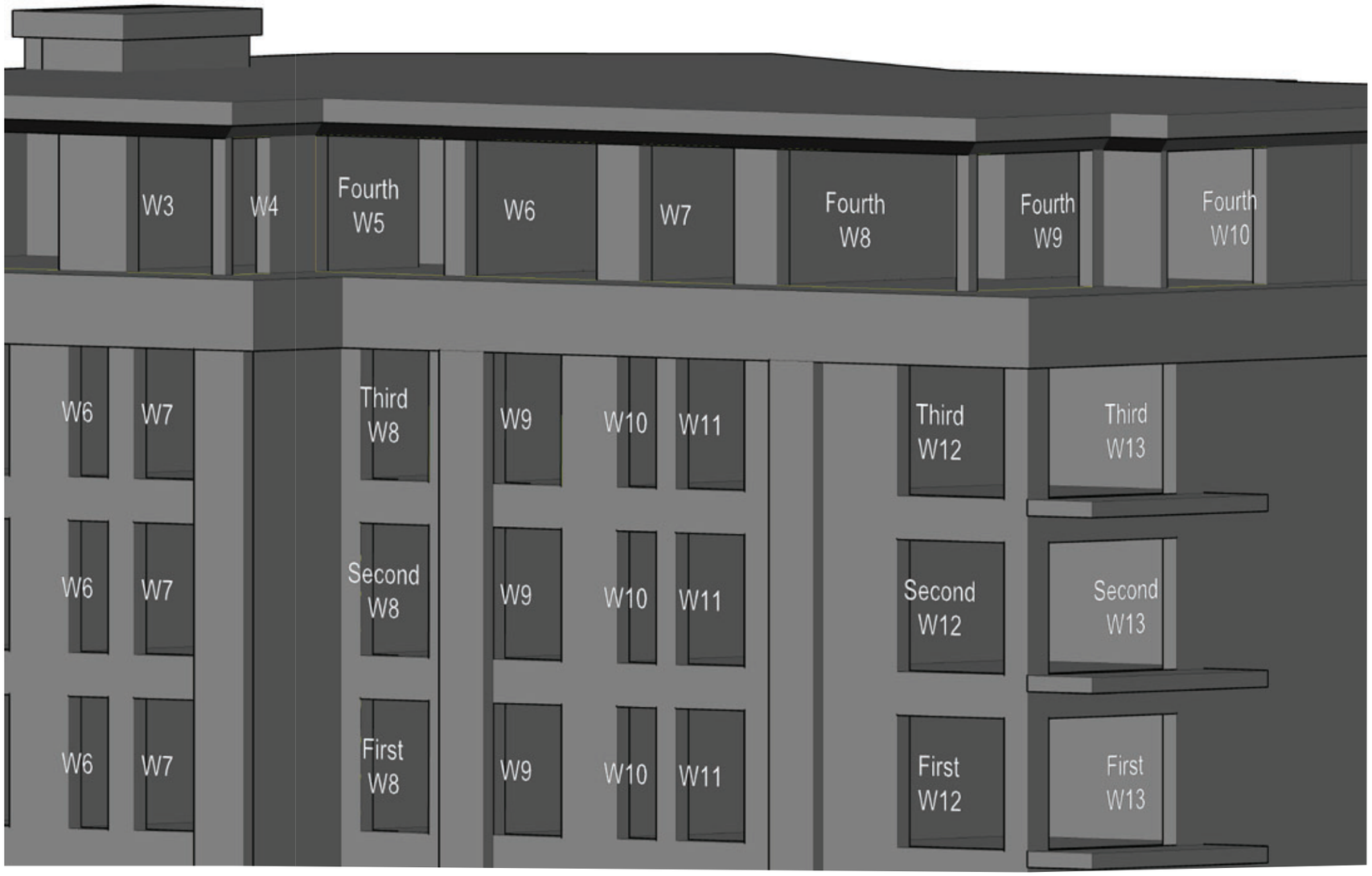
Prefix	DS01
Page no.	WM32





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Project	Woking Football Club GU22 9AA
Title	Hazel House, Sycamore Avenue, GU22 9FG Part 2
Drawn	VS
Checked	--
Date	03/07/2019
Project	3499
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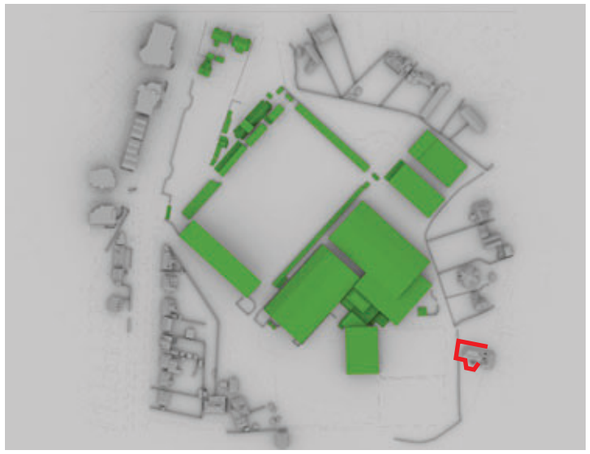
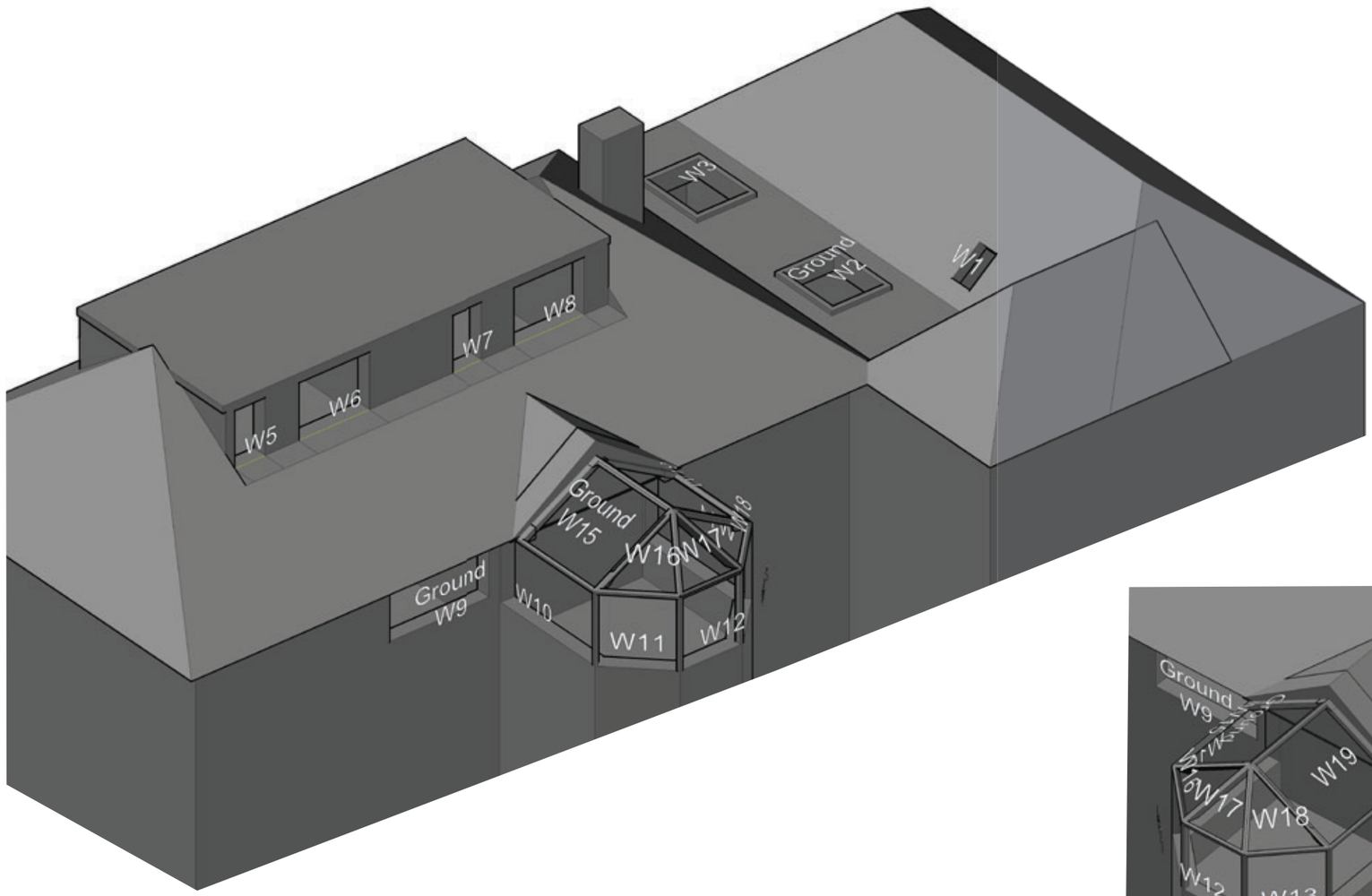
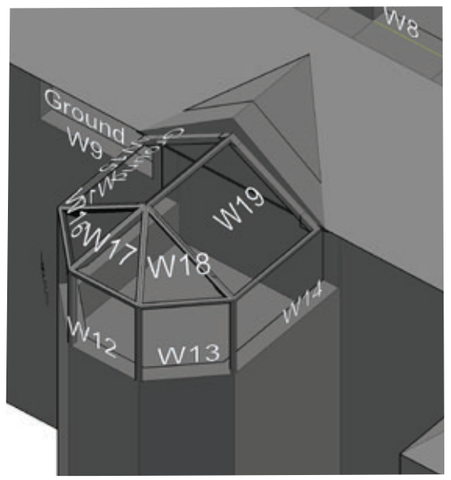
Prefix	DS01
Page no.	







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Title	Penlan, Kingfield Green, GU22 9BD Part 1
Drawn	VS
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Date	03/07/2019
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Prefix	DS01
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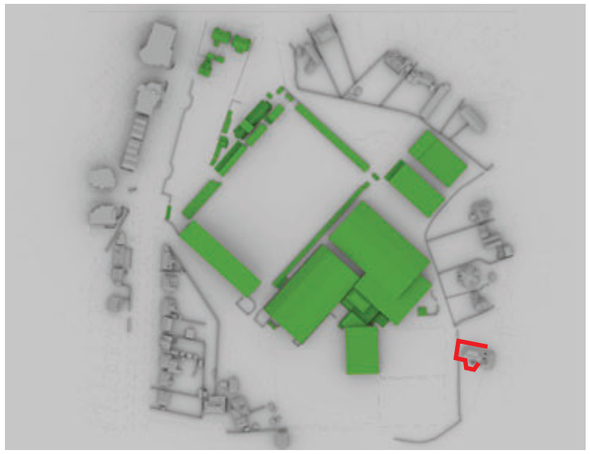

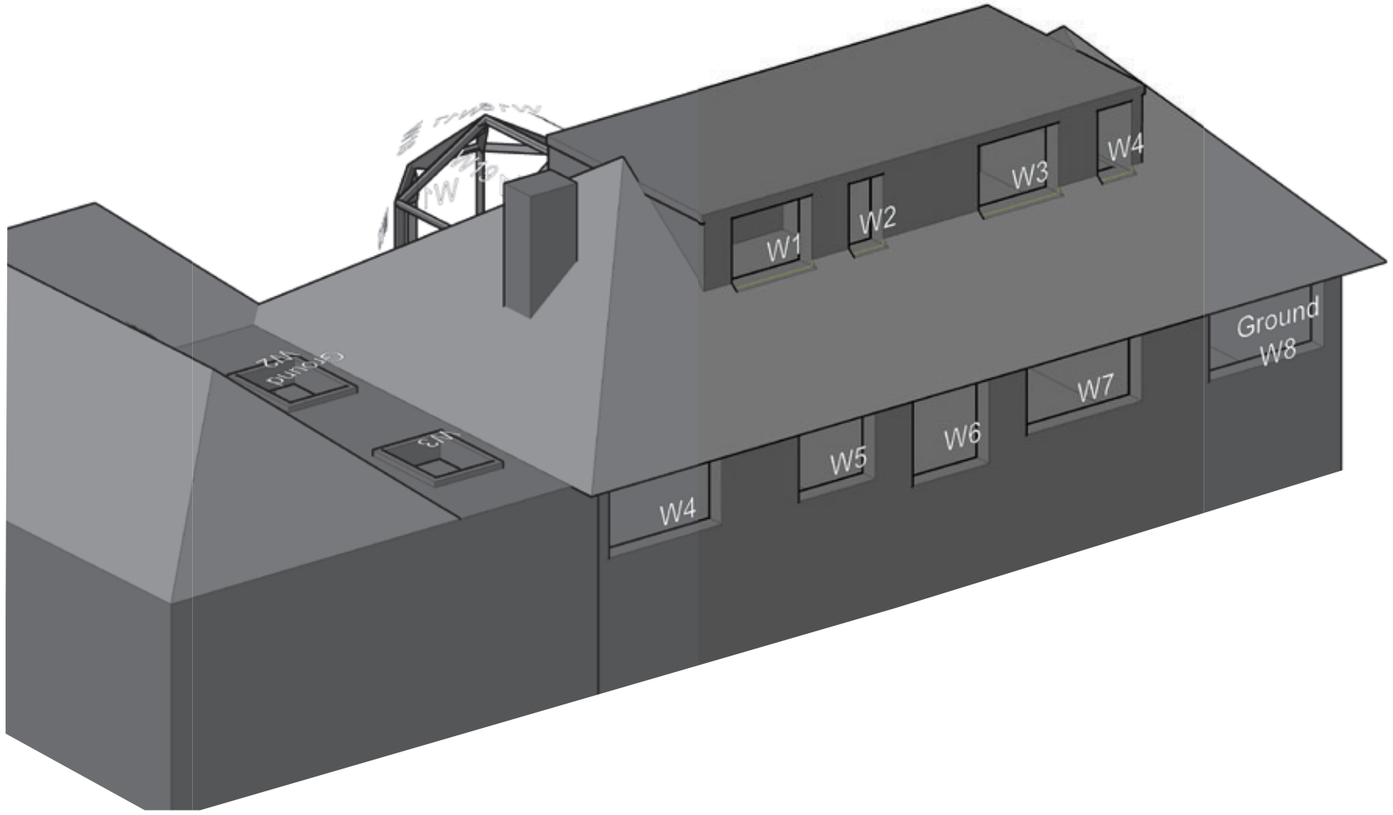

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Title	Penlan, Kingfield Green, GU22 9BD Part 2
Drawn	VS
Checked	--
Date	03/07/2019
Project	3499
Rel no.	01
Prefix	DS01
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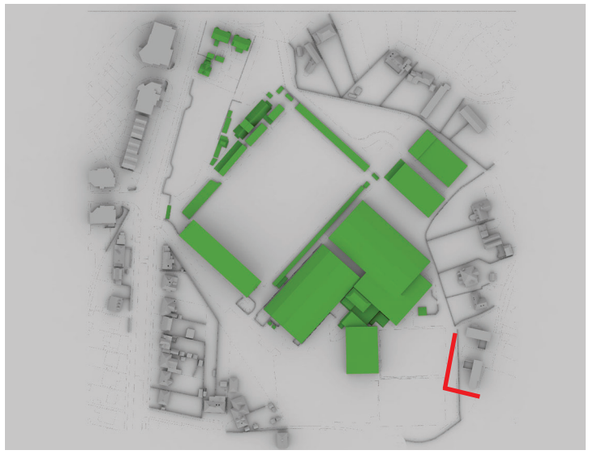

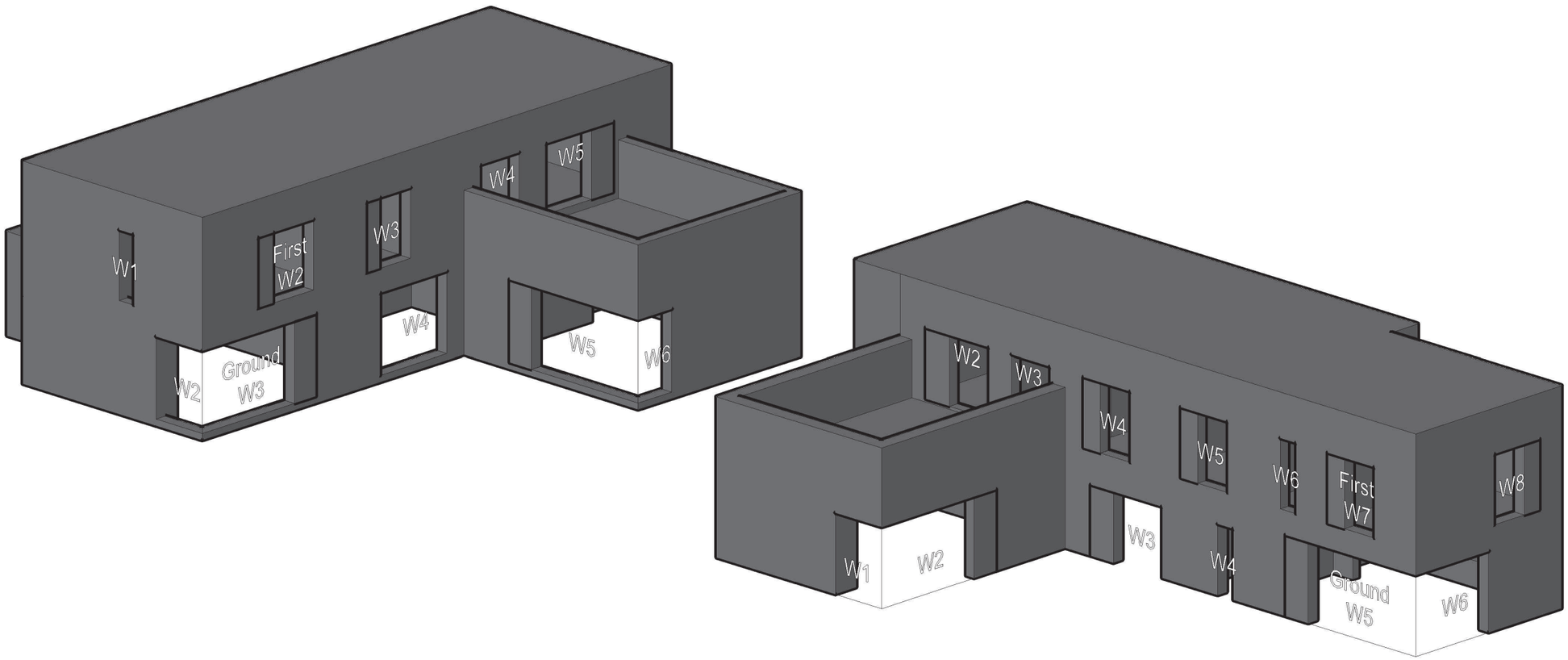

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Leach Rhodes Walker Architects
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Received 05/09/2019
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LRW_7884_L(00)66P Proposed Lower Ground Floor Plan.dwg
LRW_7884_L(00)67U Proposed Ground Floor Plan.dwg
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LRW_7884_L(00)69S Proposed Second Floor Plan.dwg
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LRW_7884_L(00)76U Proposed Ninth Floor Plan.dwg
LRW_7884_L(00)77T Proposed Tenth-Roof Plan.dwg
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Project	Woking Football Club GU22 9AA
Title	Penlan -Consented, Kingfield Green
Drawn	AD
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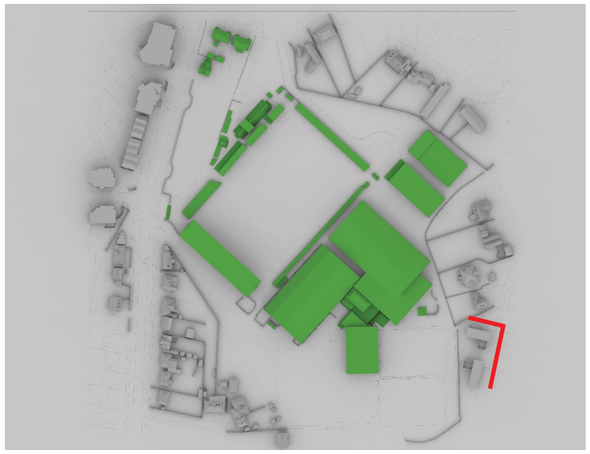
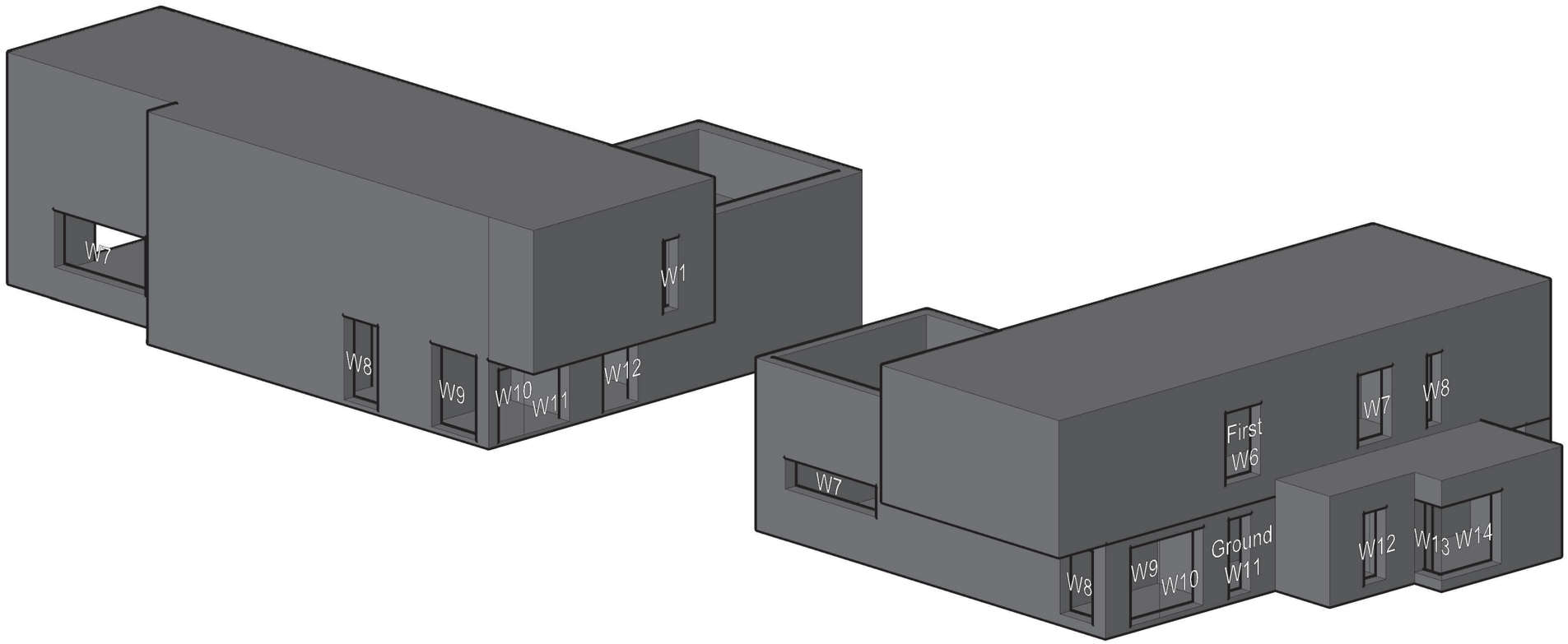
Date	01/10/2019
Project	3499
Rel no.	03
Prefix	DS02
Page no.	WM34





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Project	Woking Football Club GU22 9AA
Title	Penlan -Consented, Kingfield Green

Drawn	AD	Checked	--
Date	01/10/2019	Project	3499

Rel no.	Prefix	Page no.
03	DS02	WM35

Annex 3: Detailed Results of the Daylight (VSC, NSC and ADF) and Sunlight (APSH) Analysis

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Elm View																		
Ground	R2	W2	Residential	30.6	22.5	8.1	26.6	204.9	173.6	87.1	86.5	49.8	56	21	40	12	0.7	0.6
Ground	R3	W3	Residential	34.8	22.8	12.0	34.5	78.1	70.6	31.7	38.9	55.1	60	21	40	11	0.7	0.5
Ground	R4	W4	Residential	33.2	22.0	11.2	33.8											
		W5		34.5	34.4	0.1	0.3	120.8	120.2	108.5	11.6	9.7	86	20	67	11	0.8	0.6
Ground	R5	W11-L	Residential	37.4	30.8	6.7	17.8											
		W11-U																
		W12		38.0	31.7	6.3	16.6	216.8	214.5	211.1	3.4	1.6	81	27	70	16	0.9	0.6
Ground	R6	W6	Residential	26.5	19.0	7.5	28.3											
		W10		36.5	32.0	4.5	12.4	184.3	143.0	138.9	4.2	2.9	90	25	66	13	0.7	0.5
Ground	R7	W7	Residential	34.6	24.3	10.2	29.6											
		W8		35.8	24.4	11.4	31.7											
		W9-L		37.9	31.8	6.0	15.9											
		W9-U						242.5	242.5	242.5	0.0	0.0	97	30	65	11	0.7	0.4
First	R1	W1	Residential	37.9	24.6	13.3	35.0											
		W2		36.1	36.0	0.1	0.2	204.9	204.9	179.5	25.4	12.4	98	30	79	22	0.8	0.7
First	R2	W3	Residential	37.6	24.7	12.9	34.4											
		W4		37.0	36.8	0.1	0.3	203.6	203.6	176.6	27.1	13.3	96	29	76	20	0.8	0.7
First	R3	W5	Residential	36.8	24.3	12.5	33.9											
		W6		38.2	32.8	5.4	14.1	216.8	216.4	211.6	4.8	2.2	100	30	78	19	0.8	0.6
The Dell																		
Ground	R1	W1	Living Room	36.1	33.7	2.4	6.6											
		W2		39.1	37.7	1.3	3.4	297.7	297.7	297.0	0.8	0.3	94	24	87	22	0.9	0.9
Ground	R2	W3-L	Dining Room	36.9	34.2	2.8	7.4											

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W3-U						160.1	159.4	159.4	0.0	0.0	78	25	76	23	1.0	0.9
Ground	R3	W4	Living Room	37.5	34.7	2.8	7.4											
		W5-L		37.6	34.8	2.8	7.5											
		W5-U						120.1	119.5	119.5	0.0	0.0	79	26	78	25	1.0	1.0
First	R1	W1	Bedroom	34.9	32.4	2.5	7.2	175.2	172.4	172.3	0.1	0.1	71	26	70	25	1.0	1.0
First	R2	W2	Bedroom	35.4	32.7	2.7	7.5	126.0	124.0	123.9	0.0	0.0	72	27	70	25	1.0	0.9
First	R3	W3	Bedroom	35.5	32.9	2.6	7.3											
		W4		35.6	33.1	2.5	7.1	120.0	117.5	117.5	0.0	0.0	72	27	71	26	1.0	1.0
Cotswolds																		
Ground	R1	W1	Residential	37.3	35.4	1.9	5.0											
		W2		27.1	20.4	6.7	24.6	218.3	218.0	217.6	0.4	0.2	54	23	45	17	0.8	0.7
Ground	R2	W3-L	Residential	29.9	24.3	5.6	18.7											
		W3-U																
		W4-L		37.4	30.3	7.1	19.0											
		W4-U																
		W5-L		30.8	24.6	6.2	20.2											
		W5-U						219.6	217.4	211.7	5.7	2.6	73	26	62	17	0.8	0.7
Ground	R3	W6-L	Residential	30.7	23.5	7.2	23.4											
		W6-U																
		W7-L		31.6	24.3	7.3	23.1											
		W7-U																
		W8-L		30.9	23.6	7.3	23.6											
		W8-U																
		W9		33.5	31.5	2.0	6.0											
		W10-L		25.3	23.7	1.7	6.5											
		W10-U						288.3	288.2	288.1	0.1	0.0	95	27	84	18	0.9	0.7
Ground	R4	W11-L	Residential	24.6	21.3	3.3	13.4											

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W11-U						75.0	73.3	73.3	0.0	0.0	49	18	45	14	0.9	0.8
First	R1	W1	Residential	79.7	78.2	1.5	1.8											
		W2		79.7	78.1	1.5	1.9											
		W3-L		38.6	33.5	5.1	13.3											
		W3-U						256.3	248.0	246.2	1.8	0.7	77	27	71	23	0.9	0.9
First	R2	W4-L	Residential	38.6	33.4	5.2	13.4											
		W4-U						169.1	166.4	165.8	0.6	0.4	76	27	71	24	0.9	0.9
First	R3	W5-L	Residential	77.0	75.8	1.2	1.5											
		W5-U																
		W6-L		77.0	75.9	1.1	1.4											
		W6-U																
		W7		77.0	76.1	0.9	1.2	124.6	119.9	119.9	0.0	0.0	86	27	85	26	1.0	1.0
Chinthurst																		
Ground	R1	W1-L	Residential	36.3	29.1	7.2	19.8											
		W1-U						160.2	159.0	131.6	27.3	17.2	78	28	67	19	0.9	0.7
Ground	R2	W2-L	Residential	37.2	30.3	6.9	18.6											
		W2-U																
		W3-L		37.5	30.5	7.0	18.7											
		W3-U																
		W4-L		37.7	30.9	6.8	17.9											
		W4-U																
		W5-L		32.7	32.1	0.6	1.9											
		W5-U						125.6	125.6	125.6	0.0	0.0	94	30	84	22	0.9	0.7
Ground	R3	W6	Residential	35.5	31.1	4.4	12.3	200.9	198.5	183.8	14.7	7.4	73	25	67	19	0.9	0.8
Ground	R4	W7	Residential	35.3	30.1	5.2	14.7	208.9	205.8	193.9	11.9	5.8	73	21	66	15	0.9	0.7
Ground	R5	W8-L	Residential	33.4	28.0	5.4	16.2											
		W8-U						140.1	139.6	126.9	12.7	9.1	73	22	64	14	0.9	0.6

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
9-12 Kingfield Road																		
Ground	R1	W1	Residential	37.9	34.6	3.3	8.6	176.8	173.3	173.3	0.0	0.0	69	25	65	22	0.9	0.9
Ground	R2	W2	Residential	37.7	34.7	3.0	8.0											
		W3-L		37.5	34.6	2.9	7.8											
		W3-U																
		W4		37.7	34.8	2.9	7.7	137.7	136.8	136.8	0.0	0.0	69	25	65	22	0.9	0.9
Ground	R3	W5	Residential	37.7	34.9	2.8	7.3	138.4	137.2	137.2	0.0	0.0	69	25	66	23	1.0	0.9
Ground	R4	W6	Residential	37.8	35.2	2.6	7.0	176.8	173.8	173.8	0.0	0.0	69	25	65	22	0.9	0.9
Ground	R5	W7-L	Residential	39.1	38.8	0.4	0.9											
		W7-U						133.7	133.3	133.3	0.0	0.0	76	26	75	25	1.0	1.0
Ground	R6	W8	Residential	39.2	38.9	0.4	0.9	130.1	128.2	128.2	0.0	0.0	76	26	75	25	1.0	1.0
First	R1	W1	Residential	38.0	35.2	2.8	7.5	176.8	173.4	173.4	0.0	0.0	67	25	65	23	1.0	0.9
First	R2	W2	Residential	38.2	35.5	2.7	7.2	137.7	137.2	137.2	0.0	0.0	68	25	67	24	1.0	1.0
First	R3	W3	Residential	38.2	35.5	2.6	6.9	138.4	138.0	138.0	0.0	0.0	68	25	66	24	1.0	1.0
First	R4	W4	Residential	38.0	35.5	2.6	6.7	176.8	173.9	173.9	0.0	0.0	67	25	65	24	1.0	1.0
First	R5	W5	Residential	39.4	39.0	0.4	0.9	133.7	127.7	127.7	0.0	0.0	76	26	76	26	1.0	1.0
First	R6	W6	Residential	39.4	39.1	0.4	0.9	130.1	128.2	128.2	0.0	0.0	76	26	76	26	1.0	1.0
Pond House																		
Ground	R1	W1-L	Residential	36.0	35.6	0.3	0.9											
		W1-U						180.3	173.7	173.7	0.0	0.0	N/F	N/F	N/F	N/F	N/F	N/F

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Ground	R2	W2-L	Residential	36.4	36.2	0.1	0.3											
		W2-U						124.9	123.3	123.3	0.0	0.0	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R3	W3-L	Residential	35.5	35.4	0.1	0.4											
		W3-U																
		W4-L		13.5	12.0	1.4	10.7											
		W4-U						159.9	155.4	155.4	0.0	0.0	19	6	18	5	0.9	0.8
Ground	R4	W5	Residential	28.1	27.2	0.9	3.4											
		W6		21.6	20.9	0.7	3.4	141.0	137.6	137.6	0.0	0.0	34	3	34	3	1.0	1.0
Ground	R5	W7-L	Residential	27.0	26.8	0.2	0.9											
		W7-U																
		W8-L		33.6	32.6	1.0	3.0											
		W8-U																
		W9-L		33.8	31.2	2.5	7.5											
		W9-U																
		W10-L		34.1	31.5	2.7	7.8											
		W10-U																
		W11-L		29.7	28.4	1.3	4.5											
		W11-U																
		W12-L		23.8	22.5	1.3	5.3											
		W12-U						145.0	145.0	145.0	0.0	0.0	81	25	80	24	1.0	1.0
Ground	R6	W13	Residential	21.9	20.1	1.8	8.3											
		W14		28.4	27.2	1.1	3.9											
		W15		27.6	27.0	0.6	2.2	102.1	97.8	97.8	0.0	0.0	84	25	83	24	1.0	1.0
First	R1	W1	Residential	39.0	38.1	0.9	2.4	100.0	97.2	96.7	0.5	0.5	N/F	N/F	N/F	N/F	N/F	N/F
First	R2	W2	Residential	37.8	35.1	2.7	7.2											
		W3		37.8	35.0	2.8	7.3	199.4	195.8	195.5	0.3	0.2	59	20	55	17	0.9	0.9
First	R3	W4	Residential	37.8	35.0	2.8	7.4											
		W5		37.8	35.0	2.8	7.5	179.8	179.2	179.2	0.0	0.0	59	20	55	17	0.9	0.9

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Kingfield Cottage																		
Ground	R1	W1-L	Residential	35.0	32.7	2.3	6.5											
		W1-U						201.9	199.9	199.9	0.0	0.0	53	17	51	16	1.0	0.9
Ground	R2	W2	Residential	35.7	33.4	2.4	6.6											
		W3-L		35.2	32.9	2.2	6.4											
		W3-U						231.2	228.1	228.1	0.0	0.0	54	17	52	16	1.0	0.9
Ground	R3	W4	Residential	35.4	33.3	2.1	5.9	177.0	173.1	173.1	0.0	0.0	55	16	54	16	1.0	1.0
Ground	R4	W5-L	Residential	34.5	32.7	1.8	5.1											
		W5-U						181.6	180.8	180.8	0.0	0.0	55	16	53	15	1.0	0.9
Ground	R5	W6-L	Residential	21.2	20.5	0.7	3.4											
		W6-U																
		W7-L		26.0	25.3	0.7	2.8											
		W7-U																
		W8-L		29.1	28.2	0.8	2.9											
		W8-U																
		W9-L		14.5	14.3	0.2	1.3											
		W9-U																
		W10-L		26.7	26.0	0.6	2.4											
		W10-U																
		W11-L		33.2	32.0	1.2	3.5											
		W11-U																
		W12-L		35.5	34.5	1.0	2.7											
		W12-U																
		W13-L		37.4	36.9	0.5	1.5											
		W13-U																
		W14		81.5	80.8	0.8	1.0											
		W15		78.9	78.9	0.0	0.0											
		W16		68.4	68.4	0.0	0.0											
		W17		86.8	86.2	0.6	0.7											
		W18		78.5	77.4	1.1	1.4											
		W19		71.5	70.2	1.3	1.8											

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W20		71.9	71.2	0.7	1.0											
		W21		76.5	76.3	0.2	0.2	523.8	523.8	523.8	0.0	0.0	98	29	96	27	1.0	0.9
First	R1	W1-L	Residential	37.2	34.6	2.7	7.2											
		W1-U						231.2	228.8	228.5	0.3	0.1	56	18	54	16	1.0	0.9
First	R2	W2	Residential	37.3	34.7	2.6	6.9	177.0	169.1	169.1	0.0	0.0	58	19	56	17	1.0	0.9
First	R3	W3	Residential	37.0	34.7	2.3	6.3	181.6	178.5	178.5	0.0	0.0	57	18	56	17	1.0	0.9
The Cedars																		
Ground	R2	W2	Living Room	29.4	28.8	0.6	2.0											
		W3		33.3	32.1	1.2	3.5	300.5	290.4	286.4	4.1	1.4	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R3	W4-L	Conservatory	32.7	31.6	1.2	3.6											
		W4-U																
		W5-L		34.6	29.3	5.3	15.3											
		W5-U																
		W6-L		34.2	28.7	5.5	16.1											
		W6-U																
		W7-L		31.9	27.0	4.9	15.4											
		W7-U																
		W8		78.2	75.0	3.2	4.1											
		W9-L		33.0	30.5	2.6	7.8											
		W9-U																
		W10-L		35.0	28.9	6.1	17.4											
		W10-U																
		W11-L		36.8	30.1	6.7	18.3											
		W11-U																
		W12-L		28.1	24.4	3.6	12.9											
		W12-U						256.7	256.7	256.7	0.0	0.0	79	26	72	20	0.9	0.8
Ground	R4	W13-L	Kitchen	32.8	27.1	5.7	17.5											
		W13-U																
		W14		33.2	30.2	3.0	9.1	448.1	446.8	393.4	53.4	12.0	91	25	84	19	0.9	0.8

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
First	R2	W2	Bedroom	31.7	26.9	4.8	15.3	160.0	156.1	156.1	0.0	0.0	45	17	39	11	0.9	0.6
First	R3	W3	Bedroom	31.9	26.8	5.1	16.0	122.4	120.1	120.1	0.0	0.0	45	17	38	10	0.8	0.6
First	R4	W4	Bedroom	32.1	26.8	5.4	16.7	147.2	143.4	142.4	0.9	0.6	47	19	41	13	0.9	0.7
Nut Cottage																		
Ground	R1	W1	Residential	34.0	27.5	6.5	19.0											
		W2		34.5	27.7	6.9	19.9											
		W2		70.1	64.4	5.7	8.2	269.4	269.4	269.4	0.0	0.0	73	24	67	18	0.9	0.8
Ground	R2	W5-L	Residential	35.6	28.3	7.3	20.6											
		W5-U																
		W6		34.9	27.4	7.5	21.5	278.6	274.3	273.8	0.5	0.2	53	19	43	12	0.8	0.6
Ground	R3	W8-L	Residential	36.8	34.3	2.5	6.7											
		W8-U																
		W5		78.8	76.5	2.3	2.9	194.0	194.0	194.0	0.0	0.0	93	30	87	24	0.9	0.8
First	R1	W1	Residential	70.0	64.4	5.6	8.0											
		W2		70.1	64.4	5.7	8.2	269.4	202.0	201.1	0.9	0.4	73	24	67	18	0.9	0.8
First	R2	W3	Residential	70.2	64.2	6.0	8.6	265.6	210.4	205.7	4.8	2.3	73	24	65	17	0.9	0.7
First	R3	W4	Residential	78.8	76.3	2.5	3.1											
		W5		78.8	76.5	2.3	2.9	203.2	178.3	178.3	0.0	0.0	93	30	87	24	0.9	0.8
Penlan																		
Ground	R1	W1	Residential	76.8	70.3	6.5	8.5	46.9	46.9	46.9	0.0	0.0	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R2	W2	Residential	90.4	89.0	1.5	1.6											
		W3		92.2	91.7	0.5	0.5	193.1	193.1	193.1	0.0	0.0	75	19	67	16	0.9	0.8

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Ground	R3	W4	Residential	29.8	29.5	0.3	1.0											
		W5		29.6	29.3	0.3	1.1	264.6	260.4	260.4	0.1	0.0	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R4	W6-L	Residential	31.4	31.0	0.4	1.3											
		W6-U																
		W7		29.4	28.9	0.4	1.5	257.9	254.6	254.6	0.0	0.0	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R5	W8	Residential	29.3	28.6	0.7	2.4	122.8	121.1	120.8	0.3	0.3	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R6	W9	Residential	27.4	19.1	8.2	30.1	125.7	121.3	121.3	0.0	0.0	56	22	39	15	0.7	0.7
Ground	R7	W10-L	Residential	31.0	15.0	15.9	51.5											
		W10-U																
		W11-L		38.7	21.6	17.1	44.2											
		W11-U																
		W12-L		39.5	31.8	7.7	19.5											
		W12-U																
		W13-L		37.7	36.7	1.0	2.7											
		W13-U																
		W14-L		28.0	28.0	0.0	0.0											
		W14-U																
		W15		84.9	70.5	14.4	17.0											
		W16		83.4	67.4	16.0	19.2											
		W17		80.5	71.3	9.2	11.5											
		W18		83.4	81.0	2.4	2.9											
		W19		85.4	85.1	0.4	0.4	97.1	97.1	97.1	0.0	0.0	100	30	80	23	0.8	0.8
First	R1	W1	Residential	39.0	38.3	0.7	1.8											
		W2		38.9	38.2	0.8	2.0											
		W7		39.5	32.9	6.7	16.8											
		W8		39.5	33.5	6.0	15.3	149.0	149.0	149.0	0.0	0.0	100	30	81	23	0.8	0.8
First	R2	W3	Residential	38.9	37.9	1.0	2.5											
		W4		38.8	37.7	1.1	2.9											
		W5		39.5	30.8	8.7	22.1											
		W6		39.5	31.7	7.9	19.9	137.6	137.6	137.6	0.0	0.0	100	30	79	23	0.8	0.8

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
67 Granville Road																		
Ground	R1	W1	Residential	34.7	30.9	3.8	10.9	148.7	142.3	126.8	15.5	10.9	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R2	W2	Residential	37.3	25.6	11.7	31.3											
		W3		37.8	26.6	11.2	29.6											
		W4		37.8	26.8	11.0	29.0	118.7	108.0	93.5	14.5	13.4	N/F	N/F	N/F	N/F	N/F	N/F
First	R1	W1	Residential	37.8	31.2	6.6	17.4	148.7	143.2	125.8	17.4	12.2	N/F	N/F	N/F	N/F	N/F	N/F
First	R2	W2	Residential	37.7	30.6	7.2	19.0											
		W3-L		38.0	27.9	10.2	26.8											
		W3-U						118.7	116.3	114.3	2.0	1.7	N/F	N/F	N/F	N/F	N/F	N/F
1 Westfield Grove																		
Ground	R1	W1	Residential	35.8	35.6	0.2	0.6											
		W2-L		34.0	33.7	0.2	0.7											
		W2-U																
		W3		33.8	24.7	9.1	27.0	188.7	188.6	186.2	2.4	1.3	82	27	78	27	1.0	1.0
Ground	R2	W4	Residential	32.3	24.0	8.3	25.7	157.2	154.5	135.8	18.7	12.1	N/F	N/F	N/F	N/F	N/F	N/F
First	R1	W1	Residential	82.7	82.0	0.7	0.8	108.7	89.8	89.8	0.0	0.0	93	30	90	30	1.0	1.0
First	R2	W2	Residential	37.6	28.5	9.1	24.2	130.9	103.4	90.1	13.3	12.9	N/F	N/F	N/F	N/F	N/F	N/F
2 Westfield Grove																		
Ground	R1	W1	LKD	35.1	22.9	12.2	34.6											
		W2-L		36.1	23.1	13.1	36.2											
		W2-U						462.0	442.9	329.4	113.5	25.6	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R4	W6	Bedroom	32.4	28.6	3.8	11.8	76.8	74.6	74.3	0.3	0.5	N/F	N/F	N/F	N/F	N/F	N/F

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
3 Westfield Grove																		
Ground	R1	W1	Residential	22.7	21.1	1.7	7.3											
		W2		4.1	3.5	0.6	14.5	140.2	128.2	121.7	6.6	5.1	31	9	31	9	1.0	1.0
Ground	R2	W3-L	Residential	35.0	30.9	4.1	11.7											
		W3-U						121.6	121.0	120.9	0.2	0.1	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R3	W4-L	Residential	35.5	31.4	4.1	11.5											
		W4-U						148.1	147.0	146.5	0.5	0.3	N/F	N/F	N/F	N/F	N/F	N/F
First	R1	W1	Residential	83.0	78.9	4.1	5.0											
		W2		82.4	78.5	3.9	4.7	170.0	145.5	145.5	0.0	0.0	N/F	N/F	N/F	N/F	N/F	N/F
4 Westfield Grove																		
Ground	R1	W1-L	Residential	29.2	24.4	4.8	16.6											
		W1-U																
		W2-L		35.7	30.6	5.1	14.3											
		W2-U																
		W3-L		36.6	32.5	4.0	11.1											
		W3-U																
		W4-L		36.3	33.5	2.8	7.7											
		W4-U																
		W5-L		33.9	32.5	1.4	4.2											
		W5-U						115.5	115.0	115.0	0.0	0.0	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R2	W6-L	Residential	27.2	26.0	1.2	4.4											
		W6-U						112.7	111.3	111.3	0.0	0.0	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R3	W7	Residential	36.9	33.1	3.8	10.3											
		W8		93.6	90.0	3.5	3.8											
		W9		94.7	94.5	0.2	0.2	53.0	53.0	53.0	0.0	0.0	98	28	93	28	0.9	1.0
50 Westfield Avenue																		

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Ground	R1	W1	Residential	39.0	39.0	0.1	0.2											
		W2		35.9	33.6	2.3	6.5											
		W3-L		35.8	33.7	2.2	6.1											
		W3-U																
		W4		35.4	33.0	2.4	6.8	253.9	251.9	251.7	0.2	0.1	97	30	97	30	1.0	1.0
Ground	R2	W5	Residential	35.8	33.5	2.4	6.6											
		W6-L		35.7	33.8	1.9	5.3											
		W6-U						167.8	167.5	167.5	0.0	0.0	56	18	54	17	1.0	0.9
First	R1	W1-L	Residential	37.0	34.4	2.7	7.2											
		W1-U																
		W2-L		37.0	34.3	2.7	7.4											
		W2-U						263.1	210.8	196.9	13.9	6.6	51	17	50	16	1.0	0.9
First	R2	W3-L	Residential	37.0	34.2	2.8	7.5											
		W3-U						174.4	136.9	135.5	1.4	1.0	51	17	50	16	1.0	0.9
51 Westfield Avenue																		
Ground	R1	W1	Residential	37.6	37.6	0.0	0.0											
		W2		36.1	33.3	2.7	7.6	162.6	162.5	162.5	0.0	0.0	96	30	93	30	1.0	1.0
Ground	R2	W3	Residential	35.3	32.3	2.9	8.3											
		W4		35.8	32.8	3.1	8.5											
		W5		30.5	28.3	2.2	7.3	217.8	217.7	217.7	0.0	0.0	51	15	48	15	0.9	1.0
52 Westfield Avenue																		
Ground	R1	W1-L	Residential	34.2	30.9	3.3	9.6											
		W1-U																
		W2-L		34.7	31.3	3.4	9.7											
		W2-U						283.3	281.3	281.3	0.0	0.0	49	15	45	13	0.9	0.9
Ground	R2	W3	Residential	34.0	30.5	3.5	10.2											
		W4-L		34.8	31.3	3.5	10.0											

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W4-U						246.0	241.3	230.8	10.5	4.4	49	15	46	13	0.9	0.9
Ground	R3	W5-L	Residential	34.9	31.2	3.6	10.4											
		W5-U						160.2	159.2	159.2	0.0	0.0	47	14	46	13	1.0	0.9
Ground	R4	W6	Residential	36.0	32.1	3.9	10.9											
		W7		35.5	31.3	4.2	11.8	255.4	255.0	255.0	0.0	0.0	50	15	46	13	0.9	0.9
52a Westfield Avenue																		
Ground	R1	W1	Residential	30.8	28.8	2.0	6.4											
		W2		34.8	32.5	2.3	6.6											
		W3		33.7	31.3	2.4	7.1											
		W4		28.5	26.4	2.1	7.3											
		W5		18.0	16.5	1.5	8.5	165.9	162.8	162.8	0.0	0.0	49	15	46	14	0.9	0.9
Ground	R2	W6	Residential	33.0	31.6	1.5	4.4											
		W7-L		27.3	26.7	0.7	2.5											
		W7-U																
		W8		31.5	29.9	1.6	5.0	198.4	194.7	194.7	0.0	0.0	44	14	43	13	1.0	0.9
First	R1	W1	Residential	37.2	33.8	3.4	9.1	107.1	104.8	104.8	0.0	0.0	48	15	45	13	0.9	0.9
First	R2	W2	Residential	37.1	33.7	3.4	9.2	100.3	98.0	98.0	0.0	0.0	48	15	45	13	0.9	0.9
First	R3	W3	Residential	37.2	33.7	3.5	9.4	104.9	103.0	103.0	0.0	0.0	48	15	45	13	0.9	0.9
53 Westfield Avenue																		
Ground	R1	W1-L	Residential	27.9	27.9	0.0	0.0											
		W1-U																
		W2-L		12.2	11.6	0.6	4.6											
		W2-U						217.5	209.5	198.5	10.9	5.2	77	23	77	23	1.0	1.0
Ground	R2	W3	Residential	36.8	33.3	3.5	9.5	60.2	58.9	58.9	0.0	0.0	49	15	45	15	0.9	1.0

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Ground	R3	W4	Residential	26.7	23.7	3.1	11.5	90.7	86.8	82.1	4.8	5.5	31	2	27	2	0.9	1.0
Ground	R4	W5-L	Residential	31.3	29.2	2.1	6.6											
		W5-U						128.4	124.6	115.3	9.3	7.4	43	10	40	10	0.9	1.0
54 Westfield Avenue																		
First	R1	W1-L	Bedroom	37.8	29.6	8.2	21.7											
		W1-U						112.8	112.0	109.1	2.9	2.6	55	18	46	15	0.8	0.8
Second	R1	W1-L	Bedroom	24.0	17.0	7.0	29.1											
		W1-U						134.9	130.9	130.8	0.1	0.1	36	11	27	8	0.8	0.7
55 Westfield Avenue																		
Ground	R1	W1-L	Residential	33.1	29.1	4.0	12.2											
		W1-U						155.3	155.3	154.8	0.5	0.3	44	5	40	5	0.9	1.0
Ground	R2	W2	Residential	37.1	33.2	3.9	10.6											
		W3		22.9	21.7	1.2	5.2	207.9	205.8	205.8	0.0	0.0	58	18	55	18	0.9	1.0
Ground	R3	W4	Residential	22.9	20.4	2.5	10.9	222.0	201.2	198.6	2.6	1.3	28	1	26	1	0.9	1.0
56 Westfield Avenue																		
First	R2	W2-L	Bedroom	37.8	29.1	8.7	22.9											
		W2-U						112.5	112.0	108.5	3.5	3.1	56	18	47	15	0.8	0.8
Second	R1	W1-L	Bedroom	24.7	17.5	7.3	29.3											
		W1-U						131.6	129.2	129.0	0.2	0.1	34	10	25	7	0.7	0.7
57 Westfield Avenue																		
Ground	R1	W1	Residential	35.7	32.0	3.7	10.4											
		W2		32.0	28.9	3.0	9.5	160.6	160.4	145.8	14.6	9.1	56	16	52	16	0.9	1.0

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Ground	R2	W3-L	Kitchen	1.1	1.1	0.0	0.0											
		W3-U																
		W4		32.9	29.1	3.7	11.4	100.8	99.0	99.0	0.0	0.0	53	12	51	11	1.0	0.9
Ground	R4	W6	Conservatory	23.7	23.5	0.1	0.6											
		W7		37.1	32.3	4.8	13.0											
		W8		74.9	74.5	0.4	0.5											
		W9		88.9	85.6	3.4	3.8											
		W10		80.3	77.9	2.3	2.9											
		W11		31.3	28.7	2.7	8.5	142.4	142.4	142.4	0.0	0.0	82	24	78	23	1.0	1.0
Ground	R5	W11	Living Room	31.3	28.7	2.7	8.5											
		W12		29.6	29.6	0.0	0.0	255.4	213.6	213.6	0.0	0.0	64	17	61	17	1.0	1.0
First	R1	W1	Residential	38.5	34.6	3.9	10.2	99.1	97.1	97.1	0.0	0.0	58	18	57	18	1.0	1.0
First	R2	W2	Residential	38.5	34.4	4.1	10.6	120.9	120.2	120.2	0.0	0.0	57	18	56	17	1.0	0.9
First	R3	W3	Residential	38.4	34.1	4.2	11.1	110.4	108.1	108.1	0.0	0.0	57	18	54	17	0.9	0.9
58 Westfield Avenue																		
First	R1	W1-L	Bedroom	37.8	28.9	8.9	23.6											
		W1-U																
		W2		36.3	27.5	8.9	24.4	118.6	115.5	115.5	0.0	0.0	55	18	46	15	0.8	0.8
Second	R1	W1-L	Bedroom	33.2	25.6	7.5	22.7											
		W1-U						199.5	198.5	198.5	0.0	0.0	44	12	37	9	0.8	0.8
59 Westfield Avenue																		
Ground	R1	W1	LKD	37.9	37.9	0.0	0.0											
		W2-L		25.7	25.5	0.2	0.7											
		W2-U																
		W3		19.7	19.5	0.2	1.1											
		W4		33.6	29.0	4.7	13.9											

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W5-L		34.3	29.9	4.4	12.9											
		W5-U																
		W6		34.9	30.1	4.8	13.7	232.0	231.9	231.1	0.8	0.3	95	26	90	25	0.9	1.0
Ground	R4	W9-L	Living Room	34.1	29.8	4.3	12.6											
		W9-U																
		W10		36.8	36.8	0.0	0.0	239.0	239.0	235.1	3.9	1.6	89	25	81	22	0.9	0.9
First	R1	W1	Residential	37.1	32.4	4.7	12.6	93.1	91.2	91.2	0.0	0.0	50	16	47	15	0.9	0.9
First	R2	W2	Residential	37.1	32.2	4.9	13.2	79.6	78.5	78.5	0.0	0.0	50	16	46	14	0.9	0.9
First	R3	W3	Residential	37.0	31.9	5.1	13.7	75.4	74.7	74.7	0.0	0.0	50	16	46	14	0.9	0.9
60 Westfield Avenue																		
First	R1	W1	Bedroom	36.3	27.3	9.1	25.0											
		W2-L		37.8	28.4	9.4	24.8											
		W2-U						121.9	118.4	118.4	0.0	0.0	57	18	47	14	0.8	0.8
Second	R1	W1-L	Bedroom	34.5	26.6	7.9	23.0											
		W1-U						205.6	204.3	204.3	0.0	0.0	49	15	42	12	0.9	0.8
61 Westfield Avenue																		
Ground	R2	W2	Dining Room	14.8	13.1	1.7	11.3	125.0	69.3	69.3	0.0	0.0	25	1	23	0	0.9	0.0
Ground	R4	W3-L	Conservatory	18.0	17.5	0.5	2.7											
		W3-U																
		W4-L		29.6	26.4	3.2	10.8											
		W4-U																
		W5-L		35.9	29.8	6.1	16.9											
		W5-U																
		W6-L		33.1	27.4	5.7	17.2											
		W6-U																
		W7-L		20.0	17.3	2.6	13.2											

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W7-U						56.2	56.2	56.2	0.0	0.0	77	17	68	14	0.9	0.8
Ground	R8	W14	Bedroom	21.1	19.2	1.9	8.8	104.4	83.3	82.8	0.5	0.6	N/F	N/F	N/F	N/F	N/F	N/F
First	R1	W1-L	Study	37.0	31.3	5.6	15.3											
		W1-U						73.9	68.7	36.2	32.4	47.2	57	18	50	15	0.9	0.8
62 Westfield Avenue																		
First	R1	W1-L	Bedroom	37.8	28.0	9.8	25.9											
		W1-U																
		W2		36.4	26.6	9.8	26.8	123.5	119.9	119.9	0.0	0.0	55	18	44	14	0.8	0.8
Second	R1	W1-L	Bedroom	35.6	27.3	8.3	23.3											
		W1-U						212.0	211.0	211.0	0.0	0.0	48	15	41	12	0.9	0.8
63 Westfield Avenue																		
Ground	R1	W1-L	Bedroom	33.2	32.6	0.6	1.9											
		W1-U						109.7	106.8	106.8	0.0	0.0	81	24	77	21	1.0	0.9
Ground	R2	W2-L	Bedroom	33.5	28.0	5.5	16.4											
		W2-U						130.2	129.2	124.8	4.5	3.5	49	16	41	13	0.8	0.8
Ground	R4	W4-L	Kitchen	33.6	28.3	5.2	15.6											
		W4-U																
		W5-L		33.1	27.9	5.1	15.5											
		W5-U																
		W6-L		33.1	28.0	5.1	15.3											
		W6-U																
		W7-L		29.6	27.9	1.7	5.7											
		W7-U						115.6	115.6	115.6	0.0	0.0	55	17	48	14	0.9	0.8
Ground	R5	W8	Kitchen	26.6	24.7	1.9	7.0	99.6	76.6	71.6	5.0	6.5	N/F	N/F	N/F	N/F	N/F	N/F
First	R1	W1	Bedroom	80.5	76.3	4.3	5.3	179.0	173.1	168.1	4.9	2.8	79	23	74	21	0.9	0.9

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
63A Westfield Avenue																		
Ground	R1	W1	Residential	33.2	32.0	1.2	3.5											
		W12		83.1	79.5	3.5	4.2											
		W13		23.3	21.8	1.5	6.6	212.1	212.1	212.1	0.0	0.0	92	30	86	27	0.9	0.9
Ground	R2	W2-L	Residential	31.9	30.5	1.4	4.3											
		W2-U																
		W3-L		33.7	30.3	3.4	10.2											
		W3-U																
		W4-L		28.9	25.7	3.2	11.0											
		W4-U																
		W5-L		25.2	23.9	1.3	5.2											
		W5-U																
		W6-L		18.7	18.9	-0.2	-1.1											
		W6-U																
		W7		84.7	83.4	1.3	1.5											
		W8		79.2	77.2	2.1	2.6											
		W9		64.8	61.1	3.7	5.6											
		W10		84.3	81.4	2.9	3.4											
		W11		90.1	88.7	1.4	1.6	67.9	67.9	67.9	0.0	0.0	89	29	84	26	0.9	0.9
Ground	R3	W14	Residential	20.2	19.7	0.5	2.6											
		W15		28.1	25.8	2.3	8.2											
		W16		20.6	19.8	0.8	4.0	100.5	92.5	79.9	12.5	13.6	53	15	48	13	0.9	0.9
Ground	R4	W17	Residential	25.5	24.2	1.3	5.1											
		W18-L		17.4	16.2	1.2	6.9											
		W18-U						103.1	94.2	88.9	5.3	5.6	37	8	32	6	0.9	0.8
64 Westfield Avenue																		
First	R1	W1	Bedroom	36.4	26.4	10.0	27.5											
		W2-L		37.9	27.6	10.3	27.1											
		W2-U						118.3	114.9	114.9	0.0	0.0	57	18	46	14	0.8	0.8

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Second	R1	W1-L W1-U	Bedroom	35.5	27.0	8.5	23.9	204.2	203.5	203.5	0.0	0.0	49	15	41	12	0.8	0.8
66 Westfield Avenue																		
First	R1	W1	Bedroom	36.3	26.3	10.0	27.5											
		W2-L		37.8	27.7	10.1	26.8											
		W2-U						122.2	118.4	118.4	0.0	0.0	57	18	45	14	0.8	0.8
Second	R1	W1-L W1-U	Bedroom	35.2	26.9	8.3	23.7	208.8	207.7	207.7	0.0	0.0	49	15	40	12	0.8	0.8
Ash House																		
Ground	R1	W1-L	LKD	22.3	21.9	0.5	2.1											
		W1-U																
		W2-L		36.0	31.2	4.7	13.2											
		W2-U																
		W3		32.6	28.1	4.5	13.8	245.0	244.6	244.6	0.0	0.0	73	30	67	28	0.9	0.9
Ground	R2	W4-L	Bedroom	36.8	31.6	5.2	14.2											
		W4-U						129.7	128.6	112.0	16.7	12.9	N/F	N/F	N/F	N/F	N/F	N/F
First	R1	W1-L	LKD	37.9	37.3	0.6	1.5											
		W1-U																
		W2-L		36.2	31.6	4.6	12.8											
		W2-U																
		W3		30.5	26.2	4.4	14.4	233.9	233.6	233.6	0.0	0.0	92	30	87	28	0.9	0.9
First	R2	W4-L	LKD	37.7	32.7	5.0	13.3											
		W4-U																
		W5-L		36.5	31.3	5.2	14.2											
		W5-U						271.3	269.1	260.8	8.3	3.1	N/F	N/F	N/F	N/F	N/F	N/F
First	R3	W6-L	Bedroom	35.6	30.3	5.3	15.0											

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W6-U																
		W7-L		32.3	30.7	1.6	4.9											
		W7-U						130.1	126.4	121.0	5.4	4.3	N/F	N/F	N/F	N/F	N/F	N/F
Second	R1	W1-L	LKD	26.9	26.3	0.6	2.3											
		W1-U																
		W2-L		25.0	20.8	4.2	16.7											
		W2-U																
		W3-L		36.8	32.2	4.6	12.4											
		W3-U						275.8	274.8	274.8	0.0	0.0	71	30	68	29	1.0	1.0
Second	R2	W4-L	Bedroom	36.6	31.8	4.8	13.0											
		W4-U																
		W5-L		19.3	15.4	3.9	20.2											
		W5-U																
		W6-L		24.3	22.9	1.4	5.8											
		W6-U						168.1	167.4	167.4	0.0	0.0	N/F	N/F	N/F	N/F	N/F	N/F
Hornbeam House																		
Ground	R1	W1-L	Bedroom	34.0	28.8	5.3	15.5											
		W1-U						139.4	138.7	114.5	24.1	17.4	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R2	W2-L	LKD	25.7	21.6	4.1	16.0											
		W2-U																
		W3-L		29.2	26.7	2.5	8.6											
		W3-U																
		W4		36.7	36.7	0.0	0.0	274.8	274.3	264.2	10.1	3.7	N/F	N/F	N/F	N/F	N/F	N/F
First	R1	W1-L	Bedroom	32.2	31.4	0.9	2.7											
		W1-U																
		W2-L		34.9	29.4	5.4	15.6											
		W2-U						148.5	147.5	142.1	5.4	3.7	87	25	84	24	1.0	1.0
First	R2	W3-L	LKD	35.0	29.8	5.2	14.9											
		W3-U																

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W4-L		36.2	31.3	4.9	13.6											
		W4-U						274.6	273.1	247.2	25.9	9.5	N/F	N/F	N/F	N/F	N/F	N/F
First	R3	W5-L	LKD	27.3	23.4	3.9	14.4											
		W5-U																
		W6-L		32.7	30.1	2.6	8.0											
		W6-U																
		W7		34.0	34.0	0.0	0.1	262.7	262.1	262.0	0.1	0.0	N/F	N/F	N/F	N/F	N/F	N/F
Second	R1	W1-L	LKD	25.7	24.8	0.9	3.3											
		W1-U																
		W2-L		17.8	14.8	3.0	16.9											
		W2-U																
		W3-L		36.4	31.2	5.2	14.4											
		W3-U																
		W4		37.9	32.7	5.2	13.7	378.9	378.2	378.2	0.0	0.0	72	28	69	26	1.0	0.9
Second	R2	W5-L	Bedroom	21.9	17.7	4.2	19.1											
		W5-U																
		W6-L		28.3	24.2	4.0	14.3											
		W6-U																
		W7-L		27.6	23.7	3.9	14.1											
		W7-U																
		W8-L		19.2	19.0	0.1	0.8											
		W8-U						162.3	162.3	162.3	0.0	0.0	N/F	N/F	N/F	N/F	N/F	N/F
Beech House																		
Ground	R1	W1-L	Bedroom	30.9	22.1	8.9	28.6											
		W1-U						115.9	113.1	106.1	7.0	6.2	57	18	47	12	0.8	0.7
Ground	R2	W2-L	LKD	29.9	17.6	12.2	41.0											
		W2-U																
		W3-L		29.5	17.1	12.5	42.2											
		W3-U						277.7	277.2	275.9	1.3	0.5	51	17	37	9	0.7	0.5

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Ground	R4	W6-L	Bedroom	37.4	24.0	13.5	36.0											
		W6-U						152.7	148.9	119.9	28.9	19.4	51	15	37	10	0.7	0.7
Ground	R5	W7-L	Bedroom	37.6	23.3	14.3	38.0											
		W7-U																
		W8-L		22.0	18.1	3.9	17.6											
		W8-U						162.3	154.8	146.8	7.9	5.1	59	18	40	12	0.7	0.7
First	R1	W1-L	Bedroom	14.9	13.8	1.1	7.1											
		W1-U																
		W2-L		36.7	27.2	9.5	26.0											
		W2-U						171.2	168.0	136.8	31.3	18.6	62	15	53	12	0.9	0.8
First	R2	W3-L	Bedroom	31.7	23.7	8.0	25.3											
		W3-U						115.9	113.3	111.9	1.3	1.2	57	18	50	15	0.9	0.8
First	R3	W4-L	LKD	30.5	19.5	11.0	36.1											
		W4-U																
		W5-L		30.2	18.9	11.3	37.3											
		W5-U						277.7	277.2	276.9	0.3	0.1	50	16	40	11	0.8	0.7
First	R5	W11-L	Bedroom	38.3	26.1	12.2	31.9											
		W11-U						152.7	148.9	126.5	22.4	15.0	52	15	39	12	0.8	0.8
First	R6	W12-L	Bedroom	38.5	25.5	13.1	33.9											
		W12-U																
		W13-L		24.9	21.2	3.7	14.8											
		W13-U						162.3	154.8	149.1	5.7	3.7	59	18	45	15	0.8	0.8
Second	R1	W1-L	Bedroom	32.8	31.4	1.4	4.2											
		W1-U																
		W2-L		36.9	28.5	8.3	22.6											
		W2-U						171.2	170.1	141.9	28.2	16.6	94	26	85	23	0.9	0.9
Second	R2	W3-L	Bedroom	32.2	25.3	6.9	21.4											
		W3-U						115.9	113.5	113.2	0.2	0.2	53	18	46	15	0.9	0.8

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Second	R3	W4-L	LKD	37.4	27.9	9.5	25.4											
		W4-U																
		W5-L		37.5	27.8	9.7	25.9											
		W5-U						277.7	277.2	277.2	0.0	0.0	54	18	46	15	0.9	0.8
Second	R5	W10-L	Bedroom	37.9	27.4	10.5	27.8											
		W10-U						152.7	148.8	132.9	15.9	10.7	52	16	43	15	0.8	0.9
Second	R6	W11-L	Bedroom	38.0	26.7	11.3	29.7											
		W11-U																
		W12-L		27.7	24.3	3.3	12.1											
		W12-U						162.3	154.7	150.2	4.5	2.9	55	18	44	16	0.8	0.9
Third	R1	W1-L	Bedroom	24.1	22.8	1.2	5.1											
		W1-U																
		W2-L		24.4	17.6	6.8	27.8											
		W2-U																
		W3-L		22.6	15.8	6.8	29.9											
		W3-U						137.9	137.9	137.9	0.0	0.0	64	30	58	27	0.9	0.9
Third	R3	W5-L	Bedroom	19.1	13.8	5.3	27.7											
		W5-U						124.8	121.9	121.4	0.5	0.4	35	14	29	11	0.8	0.8
Third	R5	W13-L	LKD	19.0	12.4	6.7	35.1											
		W13-U																
		W14-L		17.4	9.7	7.6	43.9											
		W14-U																
		W15-L		19.8	16.8	3.0	14.9											
		W15-U																
		W16-L		18.2	18.0	0.1	0.7											
		W16-U						379.5	378.6	378.6	0.0	0.0	27	6	22	5	0.8	0.8
Hazel House																		
Ground	R1	W1	LKD	26.7	24.7	2.1	7.7											

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W2-L		29.9	26.1	3.9	12.9											
		W2-U																
		W3-L		22.3	6.1	16.1	72.4											
		W3-U																
		W4-L		29.2	13.5	15.7	53.9											
		W4-U						288.6	288.5	282.1	6.4	2.2	88	23	68	16	0.8	0.7
Ground	R2	W5-L	Bedroom	34.9	19.2	15.7	45.0											
		W5-U						150.1	149.4	63.6	85.7	57.4	44	11	23	4	0.5	0.4
First	R1	W1	LKD	29.2	27.4	1.8	6.2											
		W2-L		32.0	28.6	3.4	10.6											
		W2-U																
		W3-L		23.2	7.7	15.5	66.7											
		W3-U																
		W4-L		30.8	15.5	15.4	49.8											
		W4-U						288.6	288.5	283.5	5.0	1.7	92	25	75	19	0.8	0.8
First	R2	W5-L	Bedroom	36.8	21.5	15.3	41.5											
		W5-U						150.1	149.4	70.7	78.7	52.7	48	13	28	5	0.6	0.4
First	R3	W6-L	LKD	37.9	22.9	15.0	39.7											
		W6-U																
		W7-L		37.4	22.5	14.9	39.9											
		W7-U						284.1	283.2	115.1	168.1	59.4	57	17	36	9	0.6	0.5
First	R4	W8-L	Bedroom	27.4	16.9	10.5	38.3											
		W8-U						122.8	120.8	69.3	51.5	42.6	27	4	13	0	0.5	0.0
First	R5	W9-L	Bedroom	35.9	22.6	13.3	37.1											
		W9-U						147.1	146.2	71.9	74.3	50.8	43	10	25	2	0.6	0.2
First	R6	W10-L	LKD	37.4	24.2	13.2	35.2											
		W10-U																
		W11-L		37.7	24.6	13.0	34.6											
		W11-U						264.0	262.9	132.9	130.0	49.5	52	15	34	7	0.7	0.5

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
First	R7	W12-L	LKD	38.5	26.4	12.1	31.4											
		W12-U																
		W13-L		26.9	26.1	0.8	3.0											
		W13-U						294.7	294.7	288.0	6.7	2.3	58	17	40	9	0.7	0.5
Second	R1	W1	LKD	32.1	30.6	1.6	4.9											
		W2-L		34.5	31.6	2.9	8.4											
		W2-U																
		W3-L		24.1	10.1	13.9	57.9											
		W3-U																
		W4-L		32.4	18.5	13.9	42.9											
		W4-U						288.6	288.5	283.9	4.6	1.6	94	27	80	21	0.9	0.8
Second	R2	W5-L	Bedroom	38.0	24.1	13.9	36.6											
		W5-U						150.1	149.4	81.9	67.4	45.1	48	13	32	6	0.7	0.5
Second	R3	W6-L	LKD	39.0	25.1	13.8	35.5											
		W6-U																
		W7-L		38.3	24.6	13.7	35.8											
		W7-U						284.1	283.2	133.5	149.7	52.9	58	18	42	11	0.7	0.6
Second	R4	W8-L	Bedroom	28.1	18.2	9.8	35.1											
		W8-U						122.8	120.8	80.2	40.6	33.6	27	4	14	1	0.5	0.3
Second	R5	W9-L	Bedroom	36.8	24.6	12.2	33.2											
		W9-U						147.1	146.3	82.1	64.3	43.9	44	10	27	3	0.6	0.3
Second	R6	W10-L	LKD	38.2	26.2	12.0	31.5											
		W10-U																
		W11-L		38.4	26.5	11.9	31.0											
		W11-U						264.0	263.0	144.2	118.8	45.2	54	15	37	8	0.7	0.5
Second	R7	W12-L	LKD	39.1	28.1	11.0	28.1											
		W12-U																
		W13-L		27.0	26.3	0.7	2.7											

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W13-U						294.7	294.7	288.0	6.7	2.3	58	17	47	10	0.8	0.6
Third	R1	W1	LKD	32.5	31.2	1.3	4.0											
		W2-L		36.2	33.9	2.3	6.4											
		W2-U																
		W3-L		38.3	26.7	11.6	30.3											
		W3-U																
		W4-L		36.5	24.8	11.7	31.9											
		W4-U						288.6	288.5	284.3	4.2	1.5	97	30	87	27	0.9	0.9
Third	R2	W5-L	Bedroom	37.8	26.1	11.7	30.9											
		W5-U						150.1	149.3	88.5	60.8	40.7	50	15	37	10	0.7	0.7
Third	R3	W6-L	LKD	38.3	26.6	11.7	30.5											
		W6-U																
		W7-L		37.8	26.1	11.7	30.8											
		W7-U						284.1	283.2	145.3	137.9	48.7	54	18	41	13	0.8	0.7
Third	R4	W8-L	Bedroom	28.0	19.4	8.6	30.7											
		W8-U						122.8	121.5	85.3	36.2	29.8	25	3	14	0	0.6	0.0
Third	R5	W9-L	Bedroom	36.7	26.3	10.4	28.3											
		W9-U						147.1	146.3	88.1	58.2	39.8	47	12	35	8	0.7	0.7
Third	R6	W10-L	LKD	37.8	27.5	10.3	27.3											
		W10-U																
		W11-L		37.9	27.7	10.2	26.9											
		W11-U						264.0	263.1	156.6	106.5	40.5	53	17	42	14	0.8	0.8
Third	R7	W12-L	LKD	38.3	28.8	9.5	24.7											
		W12-U																
		W13-L		38.4	37.8	0.6	1.5											
		W13-U						294.7	294.7	290.0	4.7	1.6	55	18	49	15	0.9	0.8
Fourth	R1	W1-L	LKD	23.3	21.7	1.6	7.0											
		W1-U																

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W2-L		24.0	15.5	8.5	35.6											
		W2-U						303.7	303.7	300.7	3.0	1.0	62	30	52	27	0.8	0.9
Fourth	R2	W3-L	Bedroom	24.3	15.6	8.6	35.6											
		W3-U																
		W4-L		13.5	11.5	2.0	14.9											
		W4-U						139.7	139.7	114.5	25.2	18.0	34	12	24	9	0.7	0.8
Fourth	R3	W5-L	Bedroom	15.2	8.2	7.0	45.9											
		W5-U						146.8	137.6	122.5	15.0	10.9	15	3	5	0	0.3	0.0
Fourth	R4	W6-L	Bedroom	22.7	14.7	7.9	35.0											
		W6-U						150.9	148.5	145.8	2.6	1.8	30	8	22	5	0.7	0.6
Fourth	R5	W7-L	Bedroom	23.7	15.9	7.8	32.9											
		W7-U						142.2	141.9	117.6	24.3	17.1	34	12	26	9	0.8	0.8
Fourth	R6	W8-L	LKD	24.0	16.5	7.5	31.3											
		W8-U																
		W9-L		19.0	18.4	0.6	3.2											
		W9-U																
		W10-L		24.2	23.9	0.4	1.6											
		W10-U						346.1	346.1	345.0	1.1	0.3	34	12	29	9	0.9	0.8

Detailed Results of the Daylight (VSC, NSC and ADF) and Sunlight (APSH) Analysis
for the Proposed Development at Penlan, Kingfield Green

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing ADF Window	Existing ADF Total	Proposed ADF Window	Proposed ADF Total	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Penlan House01																								
Ground	R1	W1-L	Living Room	25.7	25.5	0.2	0.9						0.0		0.0									
		W1-U											0.9		0.9									
		W2-L		37.1	23.2	14.0	37.7						0.1		0.0									
		W2-U											1.3		0.9									
		W3-L		35.7	25.6	10.1	28.3						0.1		0.1									
		W3-U						398.5	397.6	383.4	14.3	3.6	2.5	5.0	2.0	3.9	1.0	20.7	84	26	59	18	0.7	0.7
Ground	R2	W4-L	Dining Room	26.8	19.8	7.0	26.1						0.1		0.1									
		W4-U						232.8	226.6	184.1	42.5	18.7	2.2	2.3	1.8	1.9	0.4	17.9	55	16	37	9	0.7	0.6
Ground	R3	W5-L	Kitchen	30.8	19.5	11.4	36.9						0.1		0.1									
		W5-U											2.7		1.9									
		W6-L		30.8	25.7	5.1	16.6						0.0		0.0									
		W6-U											0.9		0.7									
		W7		38.4	38.4	0.0	0.0	376.9	376.9	370.7	6.2	1.6	0.7	4.4	0.7	3.5	0.9	19.9	97	27	79	21	0.8	0.8
First	R2	W2-L	Bedroom	38.4	30.3	8.1	21.1						0.1		0.1									
		W2-U						156.7	154.1	143.5	10.6	6.9	2.2	2.3	1.8	1.9	0.4	18.4	87	30	69	23	0.8	0.8
First	R3	W3-L	Bedroom	37.6	31.0	6.6	17.6						0.1		0.1									
		W3-U						130.5	127.9	127.9	0.0	0.0	1.9	2.0	1.6	1.7	0.3	15.0	85	28	68	21	0.8	0.8
First	R4	W4-L	Bedroom	34.7	32.3	2.3	6.7						0.1		0.1									
		W4-U						130.5	128.6	128.6	0.0	0.0	2.3	2.4	2.1	2.2	0.2	9.7	79	27	73	24	0.9	0.9
First	R5	W5-L	Bedroom	36.1	32.1	4.0	11.1						0.1		0.1									
		W5-U						162.6	157.2	149.0	8.1	5.2	2.3	2.4	2.1	2.2	0.3	10.6	85	28	73	22	0.9	0.8
Penlan House02																								
Ground	R1	W1-L	Living Room	37.8	12.8	24.9	66.0						0.1		0.0									
		W1-U											1.1		0.5									
		W2-L		32.8	22.1	10.7	32.7						0.2		0.1									
		W2-U						425.1	420.7	247.0	173.7	41.3	2.0	3.4	1.5	2.2	1.2	34.5	67	19	39	11	0.6	0.6
Ground	R2	W12-L	Living Room	15.7	14.3	1.4	9.0						0.1		0.1									
		W12-U						115.5	113.6	112.2	1.3	1.2	0.4	0.4	0.3	0.4	0.0	5.5	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R5	W3-L	Dining Room	30.3	13.8	16.5	54.3						0.1		0.1									
		W3-U						241.1	224.5	54.8	169.7	75.6	1.1	1.2	0.6	0.7	0.5	40.1	N/F	N/F	N/F	N/F	N/F	N/F
Ground	R7	W5-L	LKD	37.6	16.6	21.0	55.9						0.2		0.1									
		W5-U											2.9		1.6									
		W6-L		39.6	33.0	6.6	16.6						0.2		0.2									
		W6-U											2.1		1.8									
		W7-L		38.6	38.6	0.0	0.0						0.0		0.0									

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing ADF Window	Existing ADF Total	Proposed ADF Window	Proposed ADF Total	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W7-U						343.5	343.5	340.4	3.0	0.9	1.3	6.9	1.3	5.1	1.8	25.8	100	30	78	24	0.8	0.8
First	R2	W2-L	Bedroom	35.8	21.9	13.9	38.9						0.1		0.1									
		W2-U						152.1	150.0	60.1	89.9	59.9	1.8	1.9	1.2	1.3	0.6	32.6	N/F	N/F	N/F	N/F	N/F	N/F
First	R3	W4-L	Bedroom	37.0	20.6	16.4	44.4						0.1		0.1									
		W4-U						135.7	131.3	55.3	76.0	57.9	1.4	1.5	0.9	1.0	0.6	36.2	N/F	N/F	N/F	N/F	N/F	N/F
First	R4	W5-L	Bedroom	38.5	20.7	17.9	46.3						0.1		0.1									
		W5-U						154.6	150.5	53.2	97.2	64.6	1.4	1.5	0.8	0.9	0.6	38.1	N/F	N/F	N/F	N/F	N/F	N/F
First	R6	W7-L	Bedroom	38.7	19.8	19.0	48.9						0.1		0.1									
		W7-U											1.2		0.7									
		W8-L		39.6	34.9	4.7	11.7						0.1		0.1									
		W8-U						179.6	177.2	173.0	4.2	2.4	1.3	2.7	1.1	2.0	0.7	24.9	89	30	74	27	0.8	0.9

Detailed Results of the ‘Balconies Removed’ Assessment

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Beech House																		
Ground	R1	W1-L	Bedroom	31.8	22.6	9.2	29.0											
		W1-U						115.9	113.1	106.1	7.0	6.2	57	18	47	12	0.8	0.7
Ground	R2	W2-L	LKD	37.9	25.7	12.2	32.3											
		W2-U																
		W3-L		37.3	24.8	12.5	33.5											
		W3-U						277.7	277.3	276.3	0.9	0.3	60	20	46	12	0.8	0.6
Ground	R3	W4-L	Hallway	35.0	22.4	12.6	36.0											
		W4-U																
		W5-L		35.7	23.0	12.7	35.6											
		W5-U						164.7	164.7	164.7	0.0	0.0	52	15	41	10	0.8	0.7
Ground	R4	W6-L	Bedroom	37.5	24.1	13.5	35.9											
		W6-U						152.7	148.9	119.9	28.9	19.4	52	16	38	11	0.7	0.7
Ground	R5	W7-L	Bedroom	37.7	23.4	14.3	37.9											
		W7-U																
		W8-L		22.0	18.2	3.9	17.5											
		W8-U						162.3	154.8	146.8	7.9	5.1	59	18	40	12	0.7	0.7
First	R1	W1-L	Bedroom	15.1	14.0	1.1	7.0											
		W1-U																
		W2-L		37.2	27.6	9.6	25.9											
		W2-U						171.2	168.1	136.9	31.3	18.6	62	15	53	12	0.9	0.8
First	R2	W3-L	Bedroom	32.7	24.4	8.3	25.5											
		W3-U						115.9	113.4	112.0	1.3	1.2	57	18	50	15	0.9	0.8
First	R3	W4-L	LKD	38.7	27.7	11.0	28.5											
		W4-U																
		W5-L		38.1	26.8	11.3	29.6											
		W5-U						277.7	277.3	277.0	0.3	0.1	60	20	50	15	0.8	0.8

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
First	R4	W6-L	Stairwell	35.1	23.3	11.9	33.8											
		W6-U																
		W7		35.4	24.1	11.3	32.0											
		W8		36.9	25.1	11.8	32.0											
		W9		37.1	25.5	11.6	31.1											
		W10		37.2	26.0	11.3	30.3	164.7	163.8	161.4	2.4	1.5	52	15	44	12	0.8	0.8
First	R5	W11-L	Bedroom	38.5	26.2	12.2	31.8											
		W11-U						152.7	148.9	126.5	22.4	15.0	53	16	40	13	0.8	0.8
First	R6	W12-L	Bedroom	38.7	25.6	13.1	33.8											
		W12-U																
		W13-L		25.0	21.3	3.7	14.7											
		W13-U						162.3	154.8	149.1	5.7	3.7	59	18	45	15	0.8	0.8
Second	R1	W1-L	Bedroom	34.0	32.6	1.4	4.1											
		W1-U																
		W2-L		38.1	29.7	8.4	22.1											
		W2-U						171.2	170.4	144.0	26.4	15.5	94	26	85	23	0.9	0.9
Second	R2	W3-L	Bedroom	34.6	27.4	7.2	20.8											
		W3-U						115.9	113.6	113.5	0.1	0.1	57	18	50	15	0.9	0.8
Second	R3	W4-L	LKD	39.2	29.7	9.5	24.2											
		W4-U																
		W5-L		38.5	28.8	9.7	25.2											
		W5-U						277.7	277.3	277.3	0.0	0.0	60	20	52	17	0.9	0.9
Second	R4	W6	Stairwell	35.8	25.7	10.1	28.2											
		W7-L		37.4	26.8	10.6	28.4											
		W7-U																
		W8		37.5	27.2	10.3	27.4											
		W9		37.6	27.7	9.9	26.4	164.7	164.0	163.2	0.8	0.5	52	15	46	14	0.9	0.9
Second	R5	W10-L	Bedroom	39.0	28.4	10.5	27.0											
		W10-U						152.7	148.9	137.5	11.3	7.6	53	16	44	15	0.8	0.9

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
Second	R6	W11-L	Bedroom	39.3	28.0	11.3	28.8											
		W11-U																
		W12-L		28.6	25.2	3.3	11.7											
		W12-U						162.3	154.8	150.7	4.0	2.6	59	18	48	16	0.8	0.9
Third	R1	W1-L	Bedroom	39.5	38.3	1.2	3.1											
		W1-U																
		W2-L		39.3	32.5	6.8	17.3											
		W2-U																
		W3-L		38.8	32.1	6.8	17.4											
		W3-U						137.9	137.9	137.9	0.0	0.0	98	30	92	27	0.9	0.9
Third	R2	W4-L	Storage	37.8	31.3	6.6	17.4											
		W4-U						37.6	32.2	32.2	0.0	0.0	60	20	53	17	0.9	0.9
Third	R3	W5-L	Bedroom	31.9	26.6	5.3	16.6											
		W5-U						124.8	122.1	122.1	0.0	0.0	59	20	53	17	0.9	0.9
Third	R4	W6-L	Stairwell	37.7	28.5	9.2	24.4											
		W6-U																
		W7-L		36.0	27.3	8.7	24.1											
		W7-U																
		W8		36.0	27.7	8.3	23.1											
		W9		37.8	29.3	8.4	22.4											
		W10		37.8	29.7	8.1	21.4											
		W11		36.1	28.5	7.6	21.1											
		W12		38.0	30.6	7.4	19.5	164.7	162.2	162.2	0.0	0.0	54	15	49	14	0.9	0.9
Third	R5	W13-L	LKD	30.1	23.4	6.7	22.2											
		W13-U																
		W14-L		33.9	26.2	7.6	22.5											
		W14-U																
		W15-L		35.2	32.3	3.0	8.4											
		W15-U																
		W16-L		32.4	32.3	0.1	0.4											

Address	Room	Window	Room Use	Existing VSC	Proposed VSC	Loss	Loss %	Room Area	Existing NSC	Proposed NSC	Loss	Loss %	Existing APSH Total	Existing APSH Winter	Proposed APSH Total	Proposed APSH Winter	Total Retained	Winter Retained
		W16-U						379.5	378.6	378.6	0.0	0.0	37	6	32	5	0.9	0.8

Annex 4: Results of the Overshadowing (Sunlight Amenity) Analysis

Fig. 1: Existing Scenario

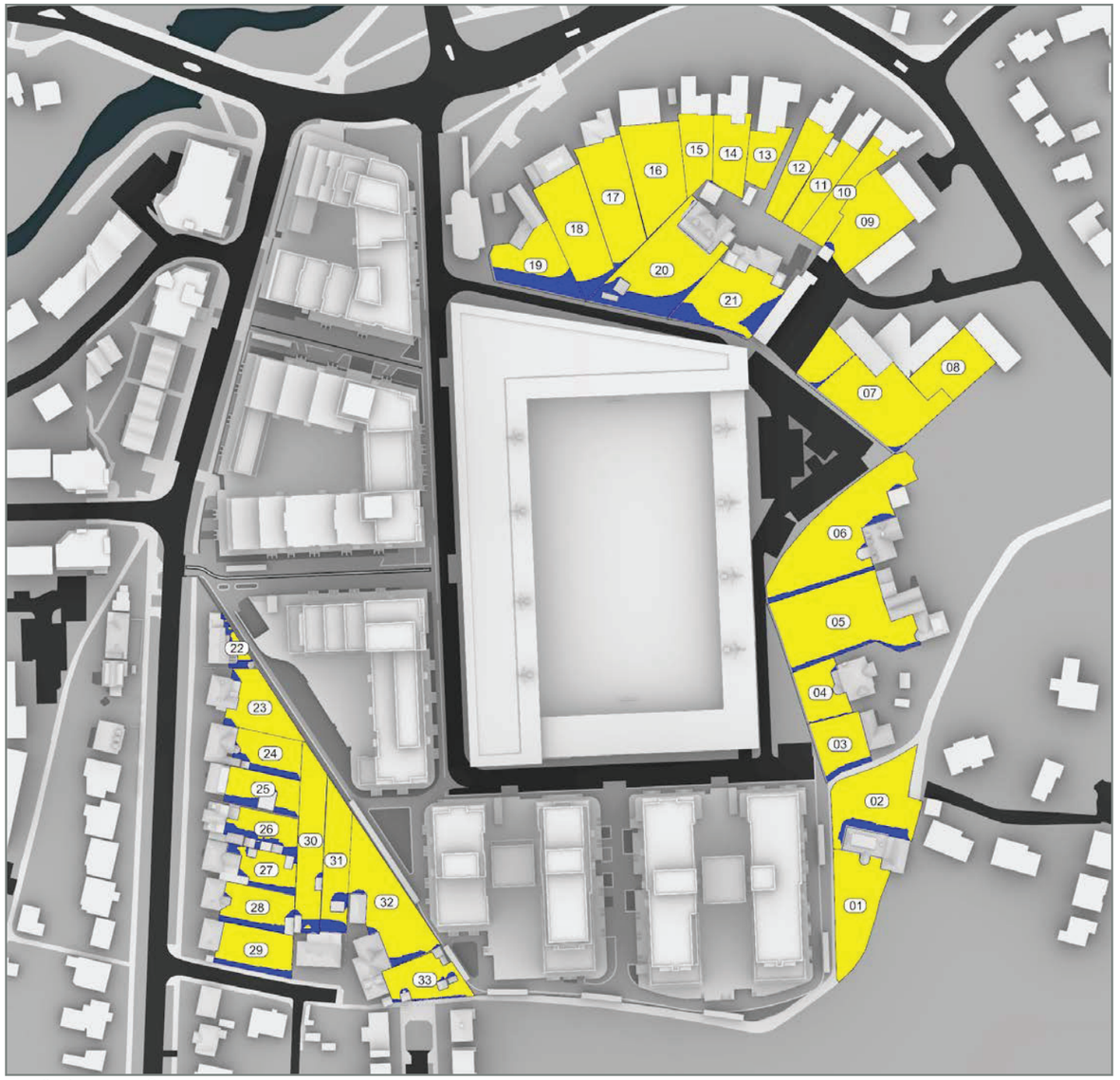


Fig. 2: Proposed Scenario

YES

NO

BRE's Sun On Ground
Area seing at least two hours of sunlight

Day: 21st March
Latitude: 51.4°N
Effective day length: 10 hours
*Min solar angle 10°
(BR209 3.3.8)

NORTH

Zone Name	Area (m2)	Sunlit Area* Existing [%]	Proposed [%]	Loss [%]
01	586.4	100.0	99.9	0.1
02	712.3	90.4	87.2	3.6
03	355.1	94.9	87.1	8.3
04	297.7	94.5	91.9	2.7
05	1,081.0	92.9	92.4	0.5
06	1,107.0	91.8	90.9	1.0
07	1,037.9	94.7	94.2	0.5
08	409.8	99.9	99.9	0.0
09	583.3	99.0	99.0	0.0
10	323.1	100.0	100.0	0.0
11	306.7	100.0	100.0	0.0

Zone Name	Area (m2)	Sunlit Area* Existing [%]	Proposed [%]	Loss [%]
12	328.0	100.0	100.0	0.0
13	224.3	100.0	100.0	0.0
14	312.7	99.9	99.9	0.0
15	285.3	99.8	99.8	0.0
16	649.0	100.0	99.2	0.8
17	640.7	98.8	98.6	0.3
18	671.6	98.8	91.8	7.0
19	511.9	89.8	61.4	31.6
20	883.5	93.5	74.3	20.6
21	652.3	95.4	77.1	19.1
22	66.2	52.2	51.8	0.8

Zone Name	Area (m2)	Sunlit Area* Existing [%]	Proposed [%]	Loss [%]
23	371.3	97.5	95.6	1.9
24	303.3	85.8	82.0	4.4
25	293.5	81.9	78.9	3.6
26	261.4	78.9	75.2	4.6
27	251.4	76.4	76.1	0.3
28	328.7	81.8	81.8	0.0
29	392.2	85.6	85.6	0.0
30	548.1	93.5	93.5	0.0
31	456.6	85.6	85.5	0.1
32	720.6	94.4	94.1	0.3
33	356.7	93.4	93.2	0.2

*Sunlit Area = Area receiving at least 2hrs. of sunlight on 21st March

Neighbouring Areas - BRE's Sun-on-Ground
BRE Overshadowing

Fig. 3: Existing Scenario

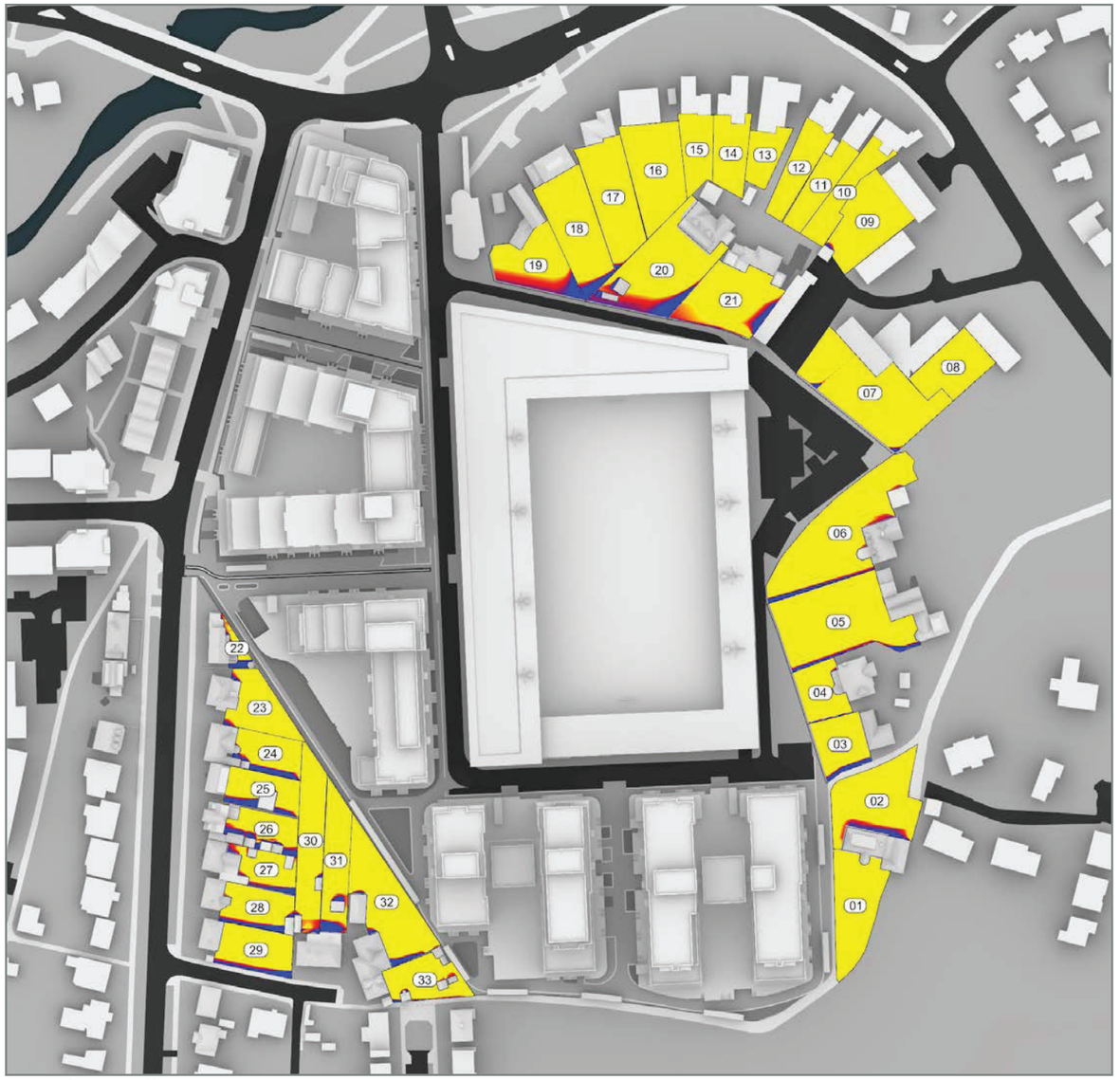
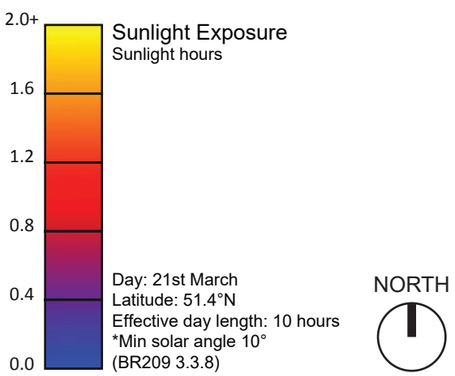


Fig. 4: Proposed Scenario

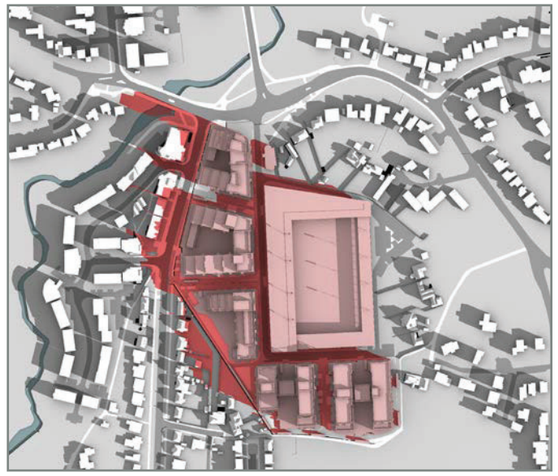


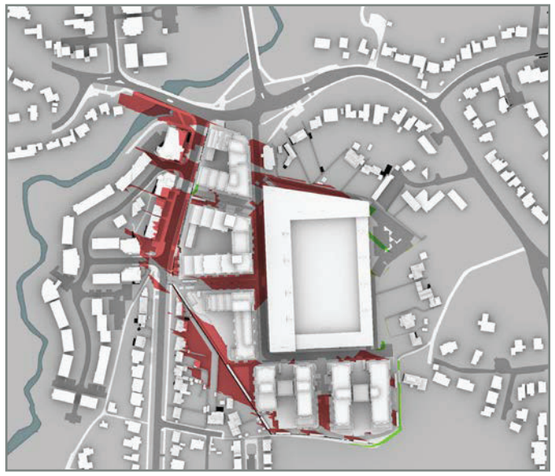
Annex 5:Transient Overshadowing Images

Existing Scenario

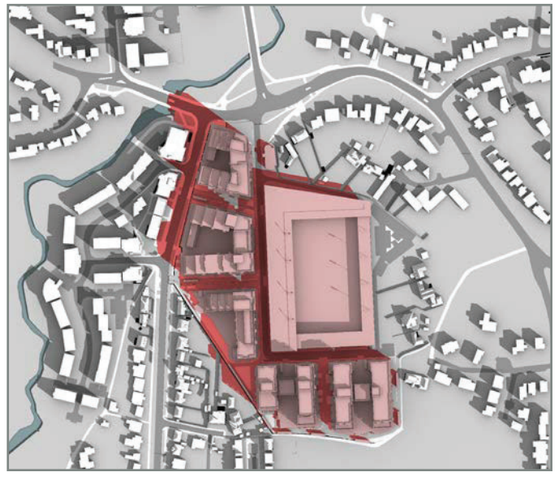
Proposed Scenario

Difference

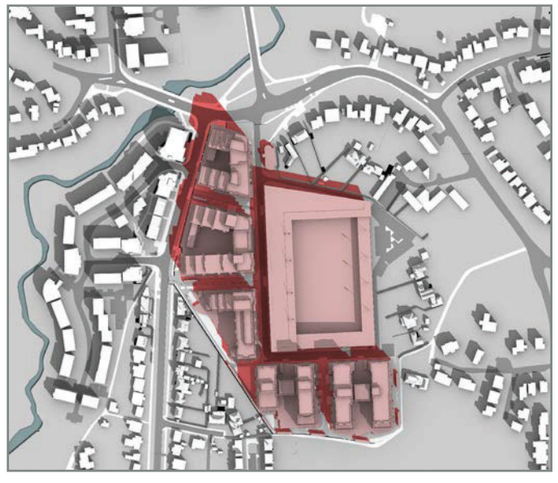


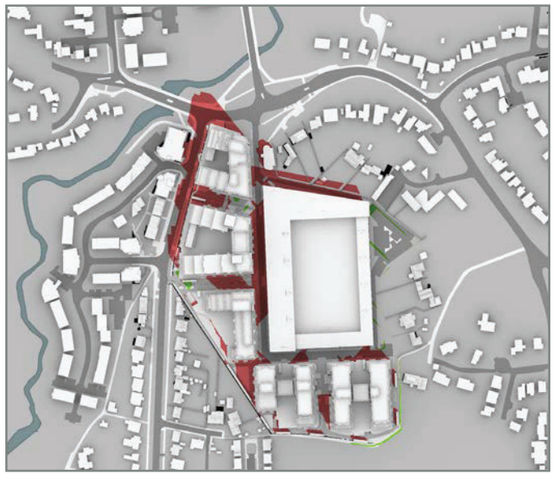


8:00



9:00





10:00

Existing

Proposed

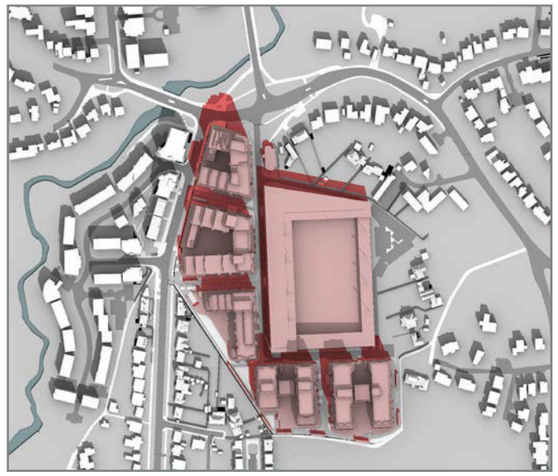
NORTH

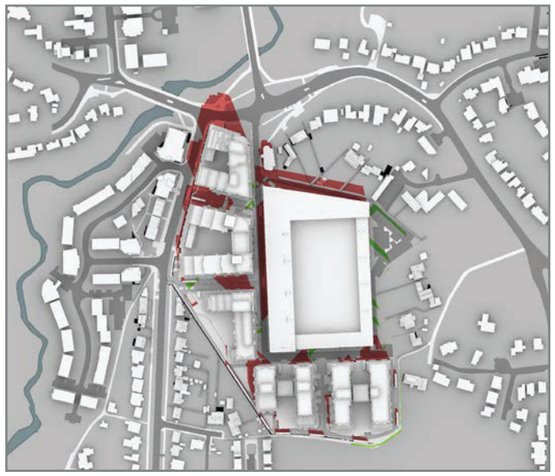
Latitude: 51.4N
Min. solar altitude 10 degrees
(BR209 3.3.8)

Existing Scenario

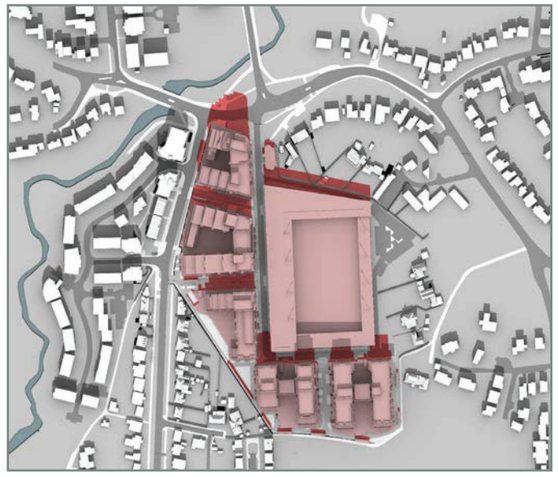
Proposed Scenario

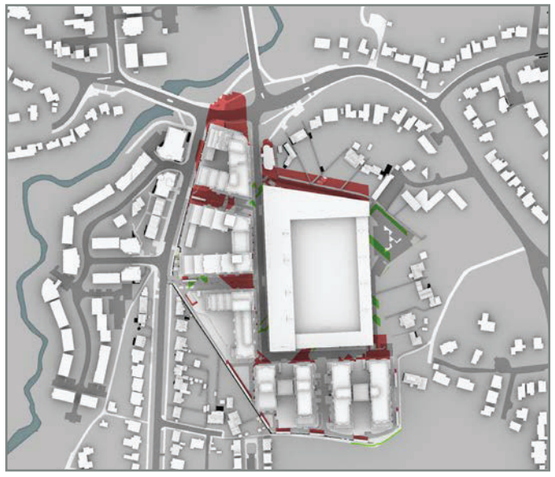
Difference



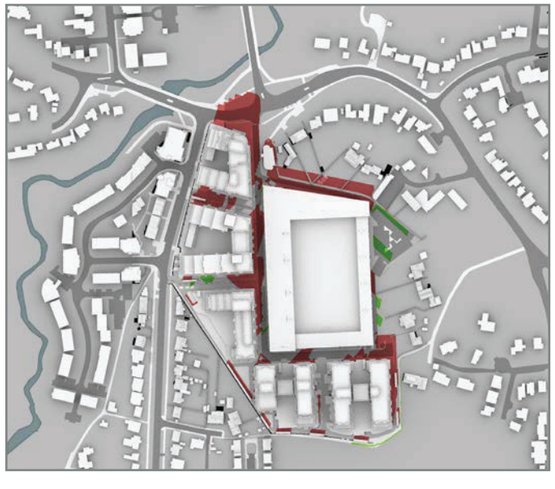


11:00





12:00



13:00

Existing

Proposed

NORTH

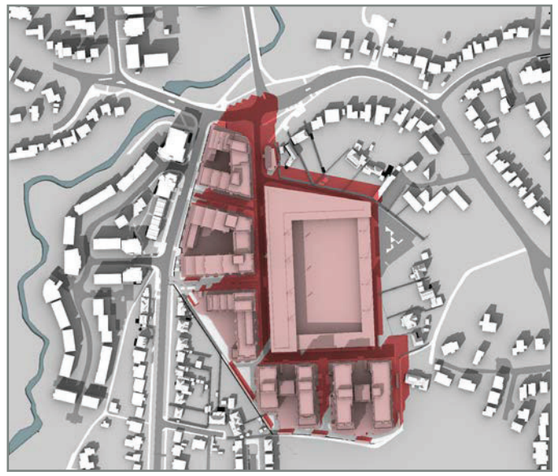
Latitude: 51.4N
Min. solar altitude 10 degrees
(BR209 3.3.8)

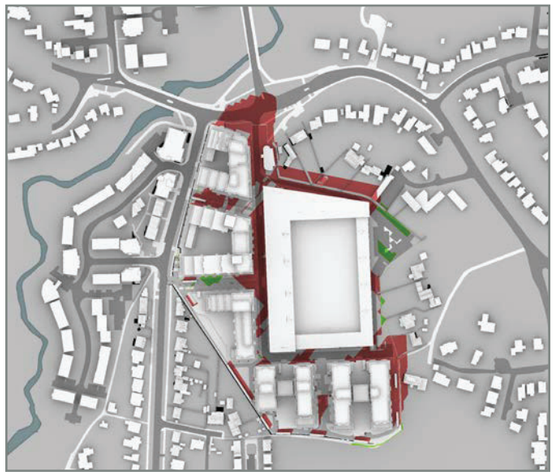
21st March (equinox)
Hourly Shadows

Existing Scenario

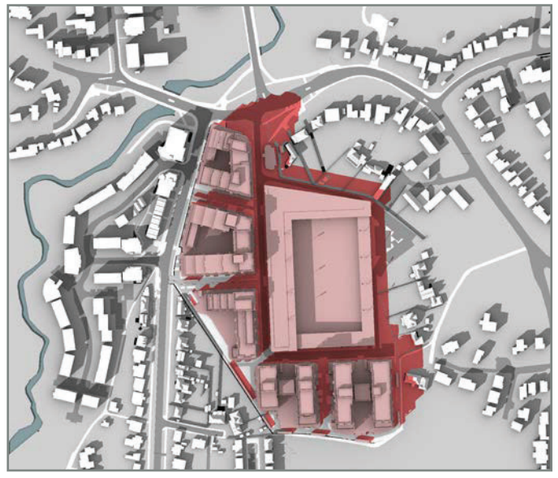
Proposed Scenario

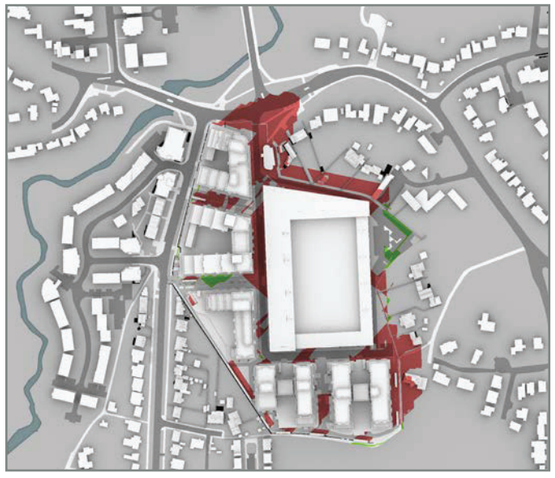
Difference



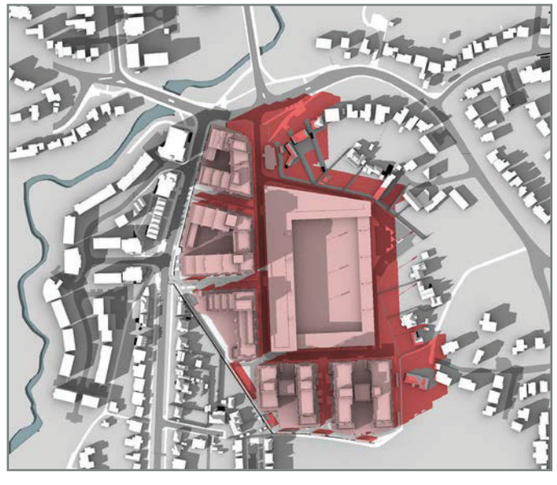


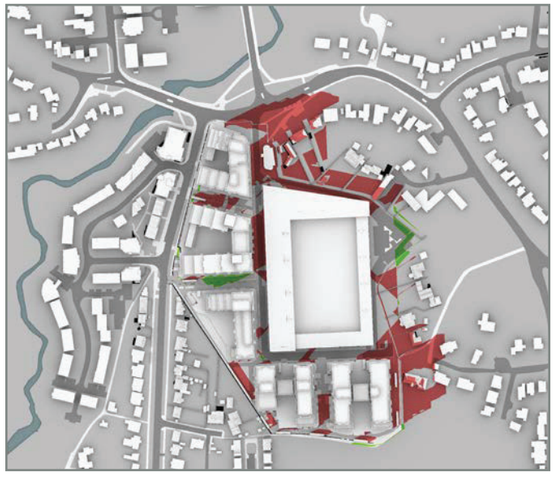
14:00





15:00





16:00

Existing

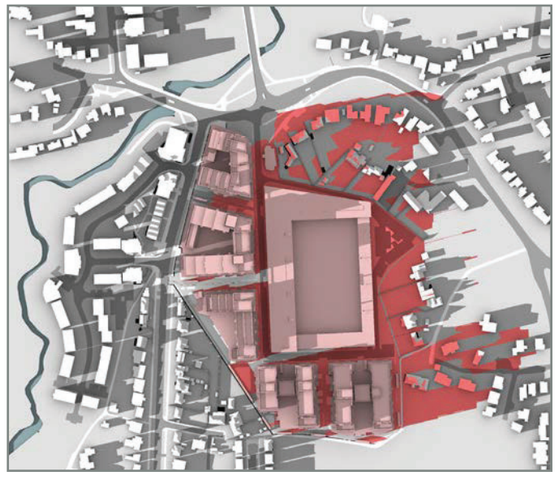
Proposed

NORTH

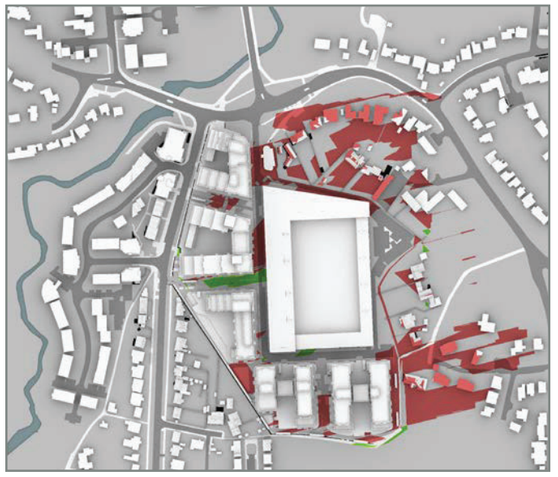
Latitude: 51.4N
Min. solar altitude 10 degrees
(BR209 3.3.8)

Existing Scenario

Proposed Scenario



Difference



17:00

Existing

Proposed

NORTH

Latitude: 51.4N
Min. solar altitude 10 degrees
(BR209 3.3.8)

21st March (equinox)
Hourly Shadows

Existing Scenario

Proposed Scenario

Difference

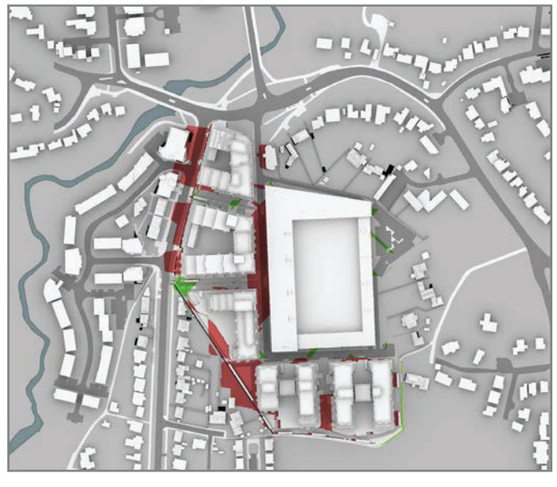


6:00



7:00





8:00

Existing

Proposed

NORTH

Latitude: 51.4N
Min. solar altitude 10 degrees
(BR209 3.3.8)

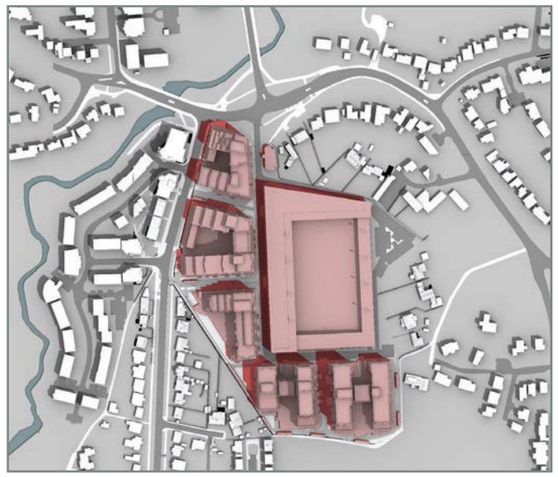
21st June (summer solstice)
Hourly Shadows

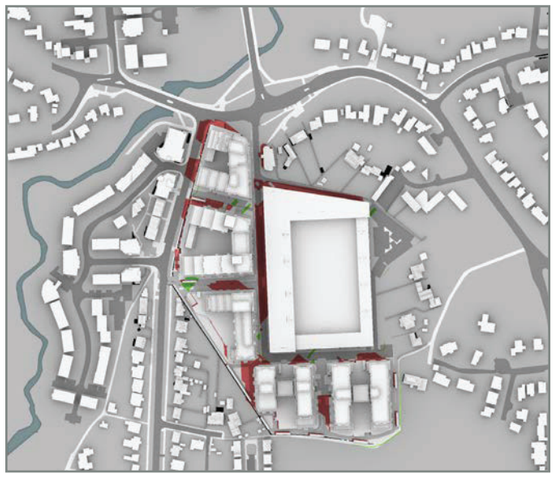
Existing Scenario

Proposed Scenario

Difference

9:00





10:00

11:00

Existing

Proposed

NORTH

Latitude: 51.4N
Min. solar altitude 10 degrees
(BR209 3.3.8)

21st June (summer solstice)
Hourly Shadows

Existing Scenario

Proposed Scenario

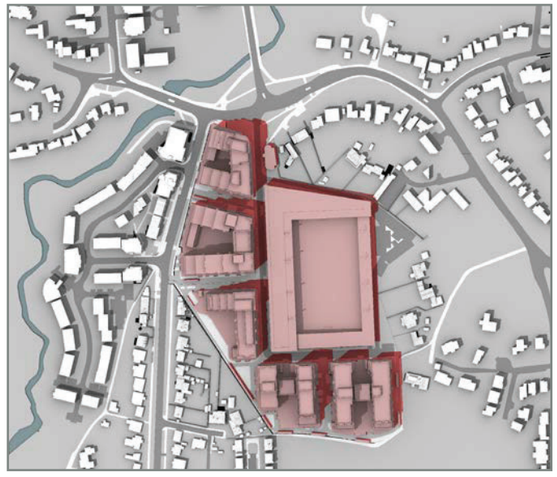
Difference



12:00



13:00


14:00

Existing

Proposed

NORTH

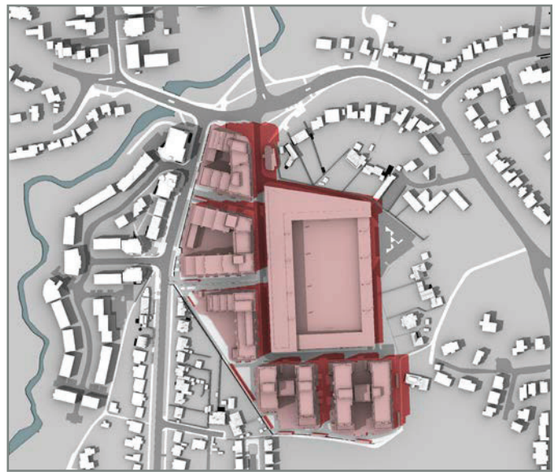
Latitude: 51.4N
Min. solar altitude 10 degrees
(BR209 3.3.8)

21st June (summer solstice)

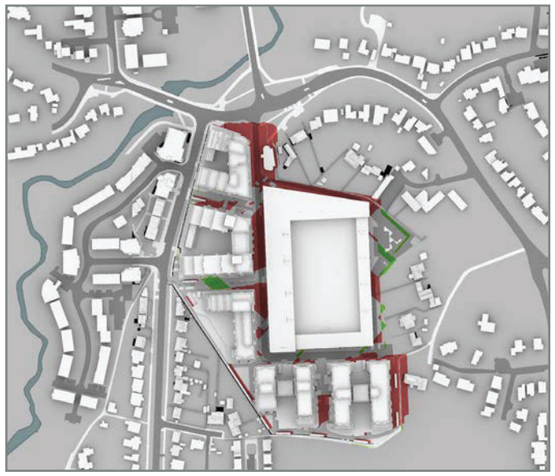
Hourly Shadows

Existing Scenario

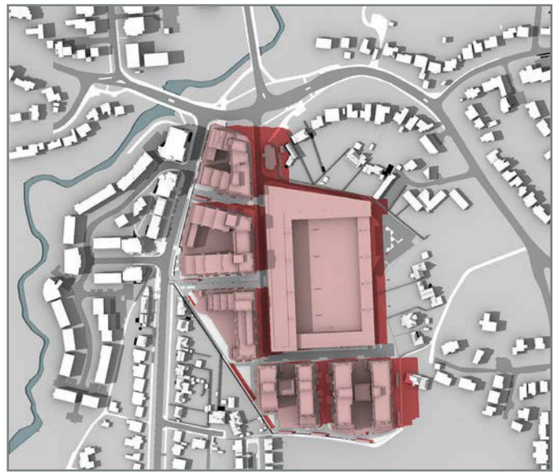
Proposed Scenario

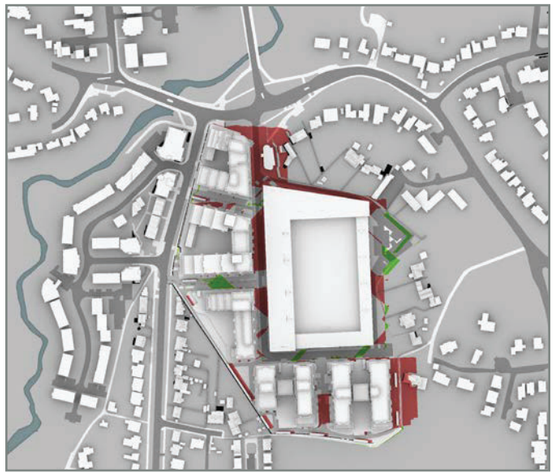


Difference

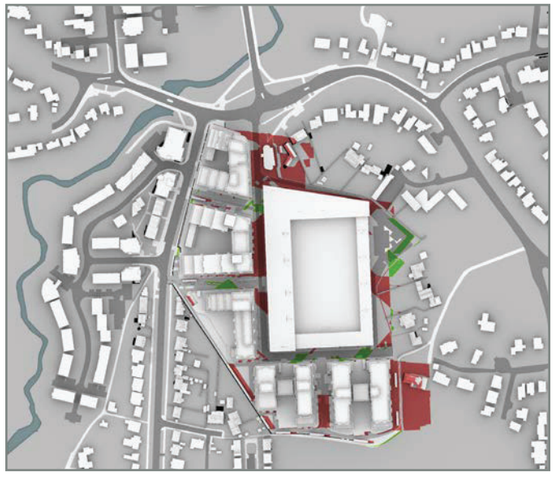


15:00





16:00



17:00

Existing

Proposed

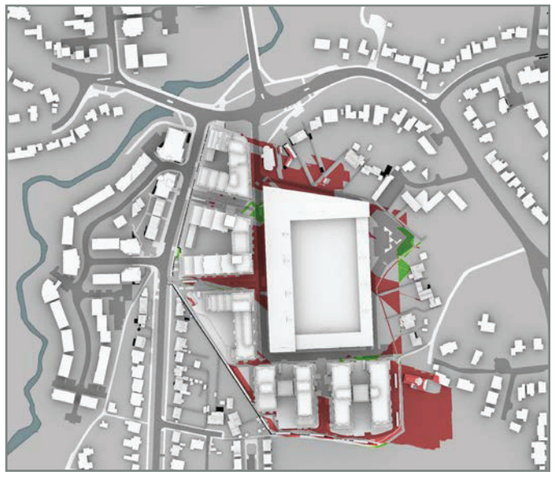
NORTH

Latitude: 51.4N
Min. solar altitude 10 degrees
(BR209 3.3.8)

Existing Scenario

Proposed Scenario

Difference



18:00

Existing

Proposed

NORTH

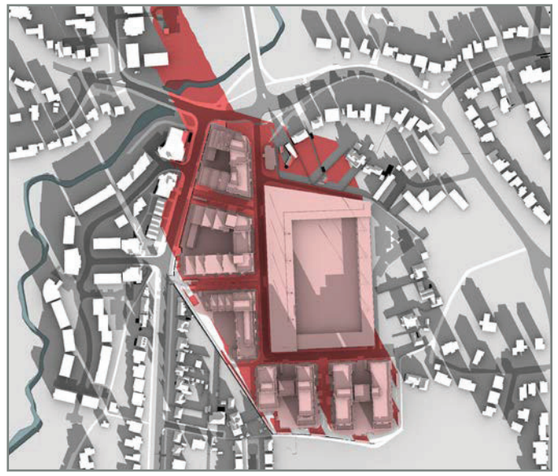
Latitude: 51.4N
Min. solar altitude 10 degrees
(BR209 3.3.8)

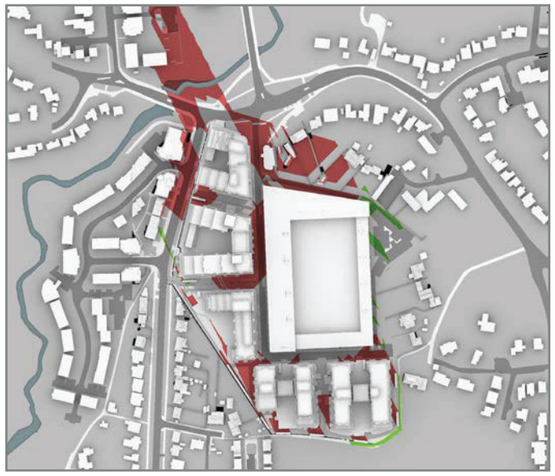
21st June (summer solstice)
Hourly Shadows

Existing Scenario

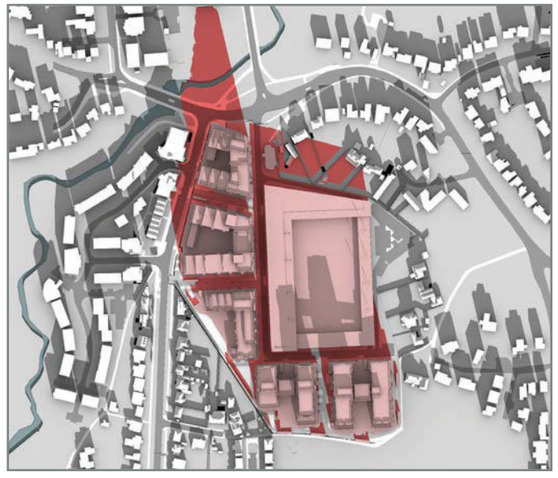
Proposed Scenario

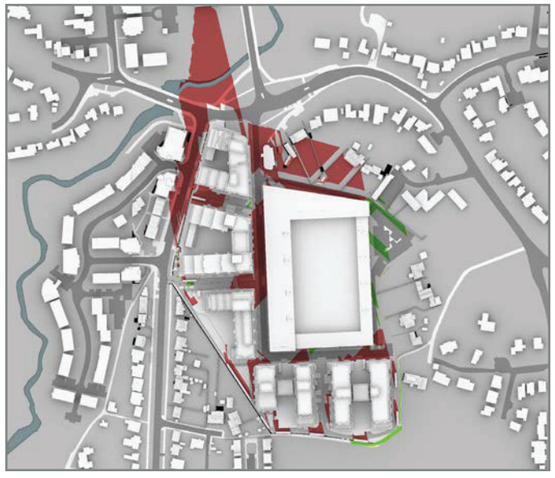
Difference



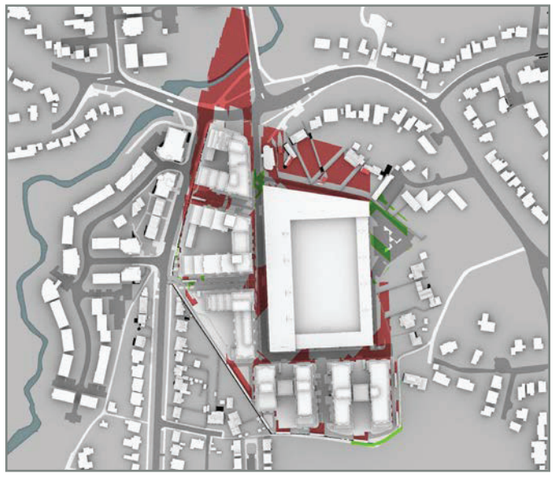


10:00





11:00



12:00

Existing

Proposed

NORTH

Latitude: 51.4N
Min. solar altitude 10 degrees
(BR209 3.3.8)

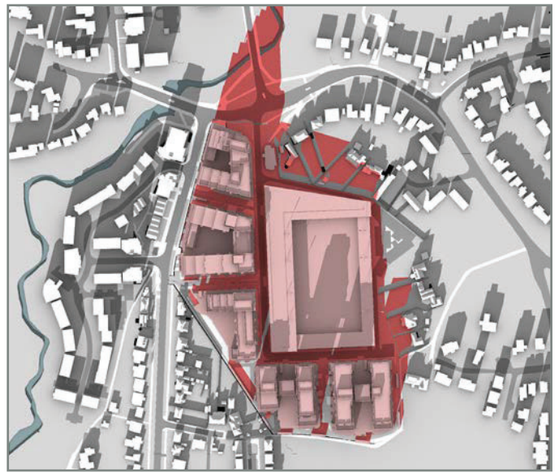
21st December (winter solstice)

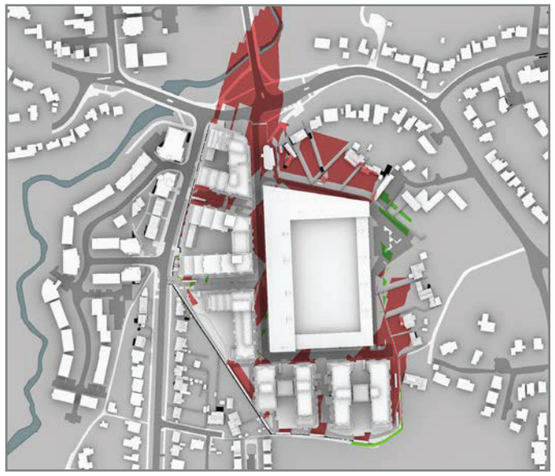
Hourly Shadows

Existing Scenario

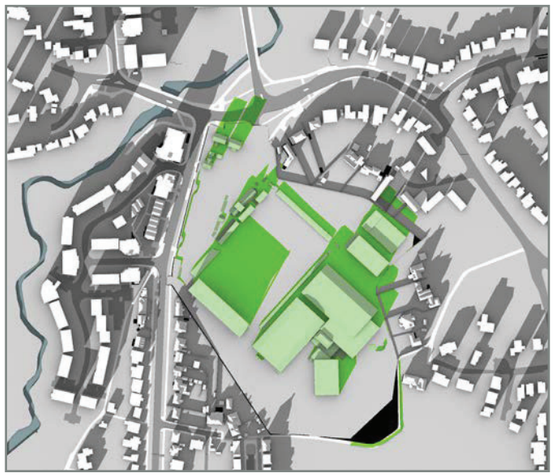
Proposed Scenario

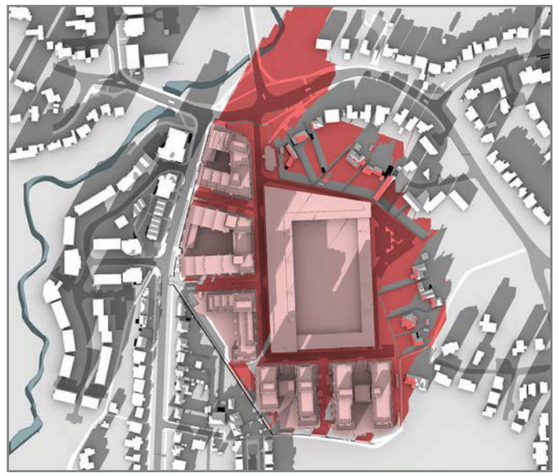
Difference

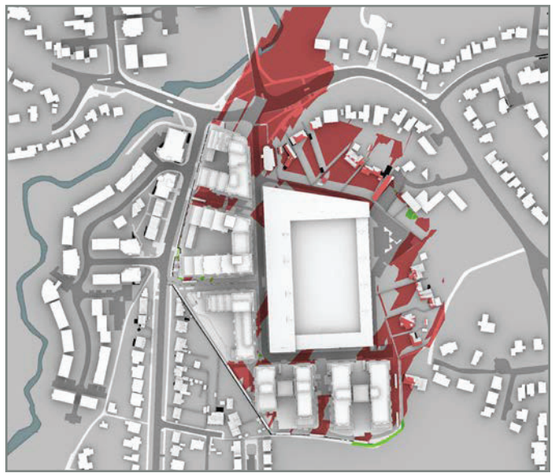




13:00







14:00

Existing

Proposed

NORTH

Latitude: 51.4N
Min. solar altitude 10 degrees
(BR209 3.3.8)

21st December (winter solstice)

Hourly Shadows

Annex 6: Details of the Baseline Light Pollution Assessment


18
12
25
25
20
6
25
0
25
0
27
26
5
21
1
45
9
16
29
1
2
1
39
7
5
2
3

Details of the Proposed Lighting Strategy

Woking Football Club

Lighting Strategy

18th November 2019

dpa lighting consultants

"RIGHT LIGHT, RIGHT PLACE, RIGHT TIME"™

TABLE OF CONTENTS

Extract from www.wokingcommunitystadium.co.uk (190712-Our-Plans-v1.pdf)

1.0 - INTRODUCTION

1.1 - About dpa lighting consultants

dpa lighting consultants were established in 1958 pioneering the discipline in the United Kingdom. The practice now has three offices in the UK and two offices overseas.

We are at the forefront of encouraging the development of high quality and environmentally sensitive lighting solutions.

dpa are independent consultants working across all aspects of lighting design from planning and environmental assessments, to lighting scheme design for residential, commercial and industrial projects.

We have been involved in numerous environmental impact lighting assessments for planning submissions, lighting strategies and lighting master planning.

We have stood as Expert Witnesses for both planning authorities and applicants, hence we are knowledgeable in this type of work and can provide advice accordingly.

1.2 - The Brief

dpa lighting consultants were instructed by Woking Football Club on 28th August 2019 to produce a lighting strategy for the proposed new Woking Football Club stadium and surrounding development, which is to form part of an environmental impact assessment.

The study area includes exterior artificial illumination to the following areas:

- New football stadium – playing surface (pitch) and spectator areas
- Circulation lighting around the outer perimeter of the stadium
- On site car parking
- Associated hard and soft landscaping

Basic objectives of floodlighting the pitch area:

- To facilitate a high level of performance by the players
- To enable spectators, both present and remote, to clearly see the action on pitch
- To enable sport to be played after dark
- To create a safe environment for both players and spectators
- To create a comfortable visual environment for both players and spectators

Extract from www.wokingcommunitystadium.co.uk (190712-Our-Plans-v1.pdf)

1.3 - Survey

Please refer to the surveys of the existing baseline condition carried out by others.

1.4 - Baseline Data

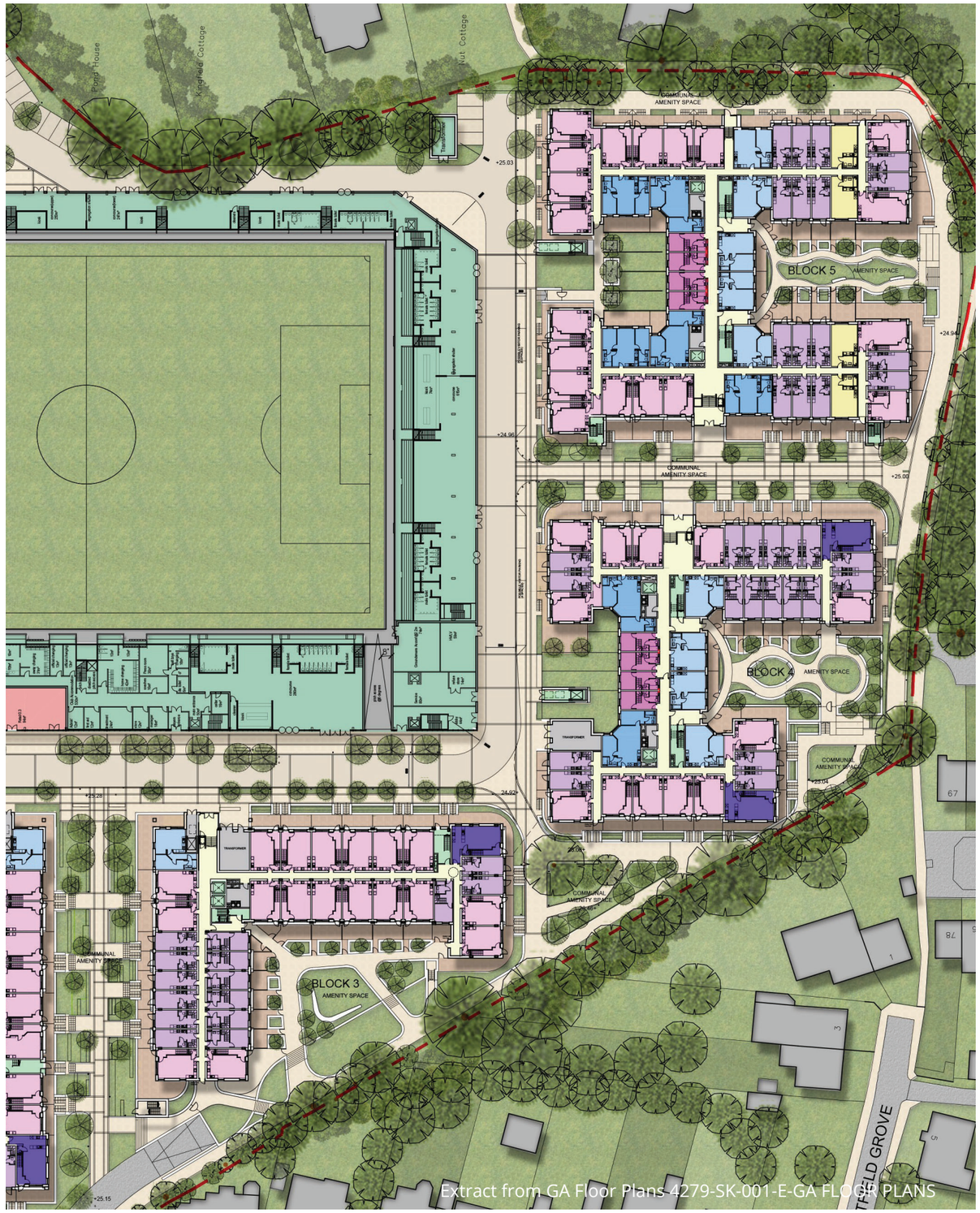
The scope of the proposed stadium development and surrounding buildings has been taken from the drawings provided and data provided by Woking Football Club. We have reviewed the site plans issued to us along with freely available maps and aerial photography so as to inform our lighting strategy.

CAD Drawings Package Ref. 4279 Provided by Holms Miller:
- GA Floor Plans 4279-SK-001-E-GA FLOOR PLANS A1@1:500
- Cross Sections 4279-SK-010-A-CROSS SECTIONS A1@1:200
- West Stand Sections 4279-SK-011-#-WEST STAND SECTIONS A1@1:100

CAD Drawings Package Ref. LRW_7884 Provided by Leach Rhodes Walker:
- Proposed Ground Level PlanLRW_7884_L(00)079H Proposed Ground Level (Colour) A1@1:500
- Block Elevations LRW_7884_L(00)Block Elevations-190801 A1@1:200
- Masterplan Elevations LRW_7884_L(00)Masterplan Elevations-190731 A1@1:500
- Sketchup 3D Model Proposed Context

In addition to these documents we have assessed a number of resources and guidance from regulatory bodies and standards agencies to ensure our proposals conform to best practice:

- Institute of Lighting Professionals (ILP) - Guidance Notes for the Reduction of Obtrusive Light GN01:2011
- The Society of Light & Lighting (CIBSE) – Lighting Guide 4: Sports Lighting 2006
- English Football League - Membership Criteria (Regulation 8)
- The FA - The FA Guide to Floodlighting 2013
- Sport England – Artificial Sports Lighting 2012
- UEFA - UEFA Stadium Lighting Guide 2016
- FIFA Resources (FIFA) - Lighting & Power Supply



Extract from GA Floor Plans 4279-SK-001-E-GA FLOOR PLANS

2.0 - PROPOSED LIGHTING TO THE DEVELOPMENT

The documentation listed in Section 1.0 details the proposals for the various elements of the development. We point out what we believe to be the appropriate lighting standard to follow for each part of the proposed development, together with our comments on the effects of the particular lighting approaches suggested.

2.1 - Floodlighting to Main Pitch

Woking Football Club estimates the usage of the main pitch to be approximately 23 days per year and 3.5 hours per session.

The lighting would be operational no later than 22.30 hours from Monday to Saturday and 21.00 hours on Sundays. This means that lighting could be required all year round as required depending on prevailing ambient lighting conditions.

From our proposed lighting strategy, we suggest that the lighting is required to conform to the CIBSE, LG4:2006 recommendations for 'Class I' Play (Maintained Average Illuminance: 500lux, Min/Average Uniformity: 0.7, Unified Glare Rating: 55, Colour Rendering Index: 70). This would satisfy the demands of Category B of the Football Associations National Ground Grading document, which are at or above the requirements associated with Woking FC's current position within the league system and therefore represent a reasonable assumed level of lighting provision for future needs.

Areas to be considered as part of the playing area for the purpose of floodlighting:

- The principal pitch playing area
- The volume of the playing area up to 7 metres above the pitch surface
- The safety and runoff zones

The integration of approximately 32no. high quality artificial lighting projectors with good optical control using cut-off lanterns from a 22.5 metre mounting height above pitch level, can satisfy the guidelines. The projectors would be mounted on a total of 8no. structural gantries, 4no. gantries located above the roof line on both the east and west stands at the same height above pitch level. The design proposed requires the lighting not to be directed above horizontal and therefore producing a minimum level of light pollution or light spill to adjacent areas. Therefore, the artificial lighting can be designed so as to satisfy the functional criteria for the playing area and also provide good mitigation against unwanted environmental effects.

To ensure obtrusive light is kept to a minimum we recommend that the CIBSE recommendations for obtrusive light limitations for Environmental Zone E3 (suburban / medium district brightness) to be followed. Particular care should be taken to minimize light trespass through windows of the nearby residential developments to the south and west of the stadium and the existing residential area to the north and east. If the installation is designed to comply with CIBSE guidelines for obtrusive light for Zone E3, we believe good mitigation against unwanted environmental effects will have been addressed.

Whilst the pitch playing area is proposed to be lit for competition 'Class I' Play (SLL/CIBSE) we recommend the use of luminaires that provide sufficient quality of light and specification for basic television recording and broadcast. This includes specifications for high CRI (Colour Rendering Index), colour consistency and flicker free lighting, compliant with international sport federation regulations (SLL 2006). Infrastructure for mounting the proposed floodlighting fixtures should be designed to also accommodate any additional luminaires to meet TV broadcasting lighting levels. Whilst not proposed to be installed as part of the development, any future inclusion of additional broadcast lighting would be infrequently used for one off outside broadcasts, whilst typical matches would require only 'Class I' illumination. All lighting installed including any additional broadcast luminaires will also need to meet the same CIBSE recommendations for obtrusive light limitations for Environmental Zone E3.

KEY ADVANTAGES of OmniBlast Gen2:

- Cost-effective and efficient solution to maximise energy and maintenance savings
- Compliant with international sport federation regulations
- Flexibility: modular approach for high-power applications
- Compliant with UHD/HD/4K broadcast and super slow motion replays (flicker-free)
- High Colour Rendering Index (90 CRI) and Television Colour Consistency (TLCI >85+)
- Instant on/off and entertainment mode (optional to create dramatic/theatrical effects)
- Optimised glare control
- Sport optics based on BlastFlexTM technology offering a wide range of beams: very narrow to asymmetric beams
- Inclination angle adjustable on-site for each LED and/or the complete bracket

Recommended Flood Lighting Solution:

Urbis Schreder OmniBlast Gen2

LED Floodlighting Solution Designed for Stadium Floodlighting with high lighting quality suitable for TV broadcast.

See 'Omniblast Gen2.pdf' for technical details.

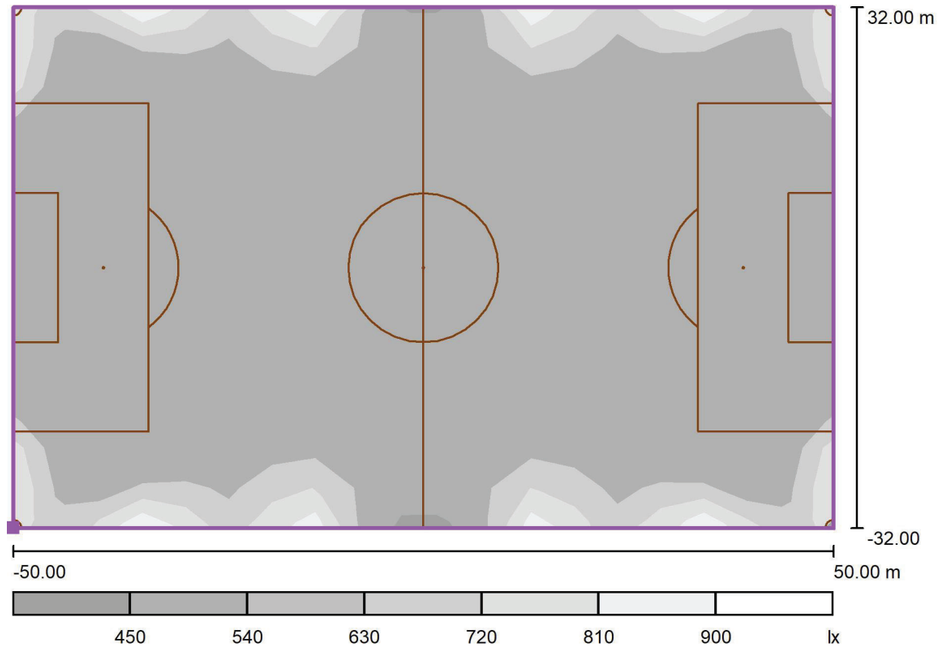
Detailed design and product specifications to be confirmed within the detailed design process, at a later date.

Available from:
Urbis Schreder Ltd
Tel. 01256 354446
Email. mark.searle@schreder.com

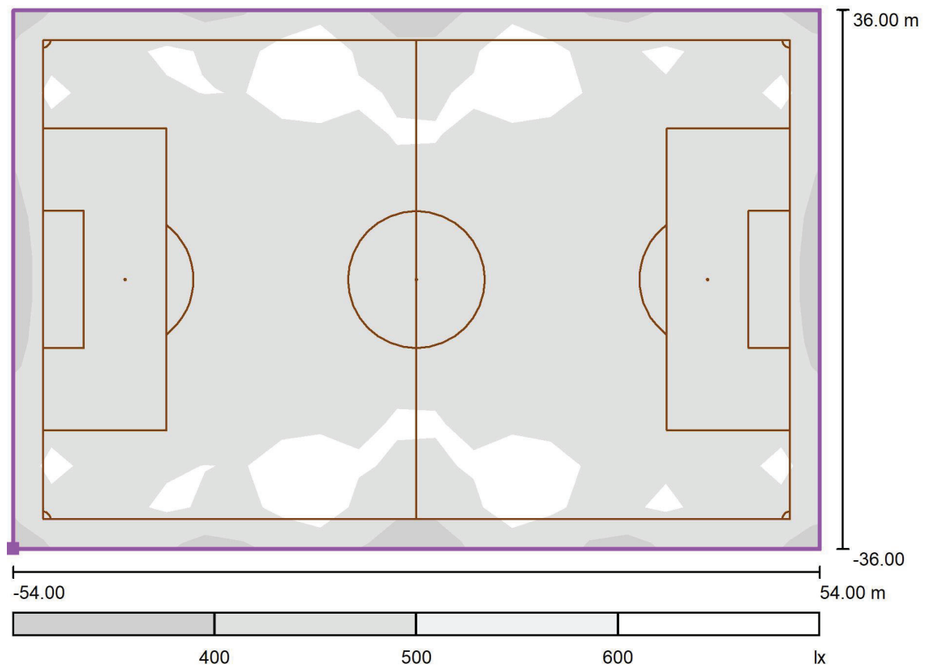
Example Urbis Schreder OmniBlast Gen2 Projector

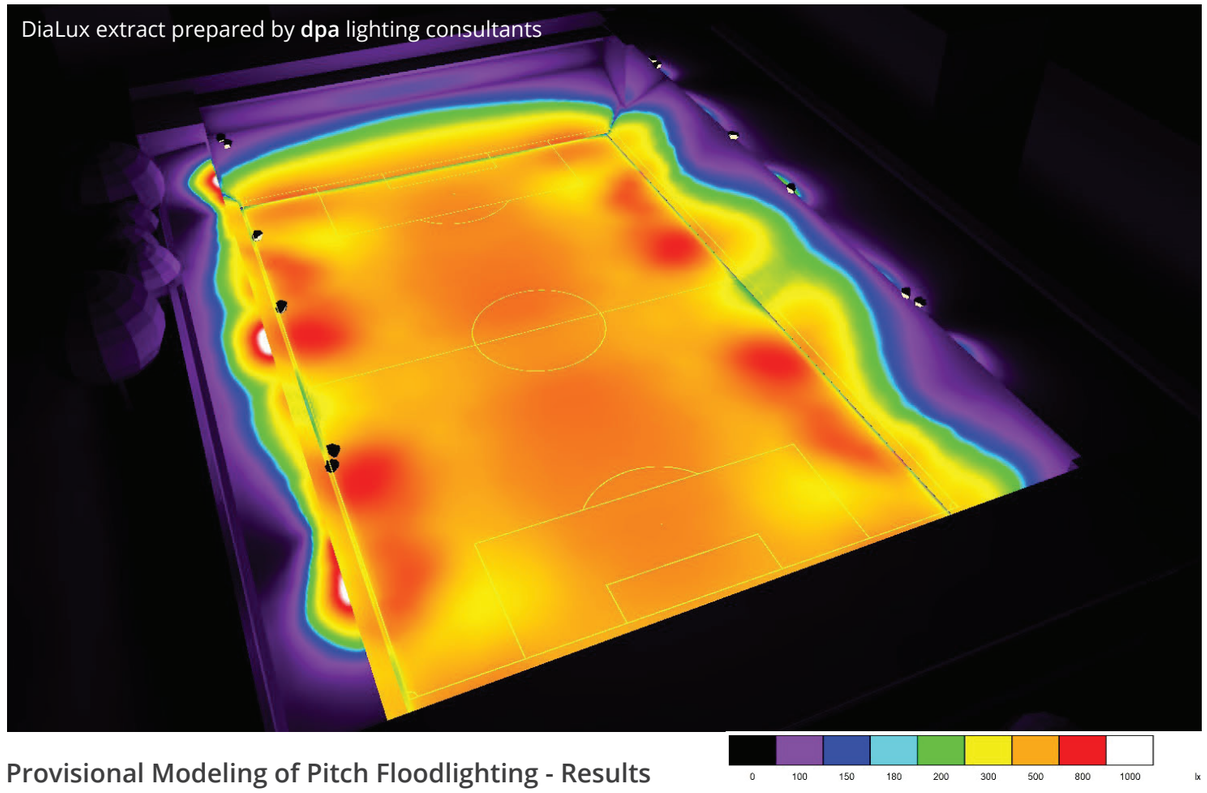
2.0 - PROPOSED LIGHTING TO THE DEVELOPMENT

Pitch Illumination Playing Pitch Area (PA)



Pitch Illumination Total Area (TA)





Provisional Modeling of Pitch Floodlighting - Results

dpa has worked directly with the manufacturer Urbis Schreder to define a suitable provisional specification and **dpa** has provided provisional light modeling to assess the requirements for floodlighting and ensure the provisional design meets sporting illumination standards. The detailed lighting design can reflect any additional lighting required for full broadcast lighting, if requested.

The extract to the left is from the document 'Woking Football Club Stadium Report.pdf', Appendix A.

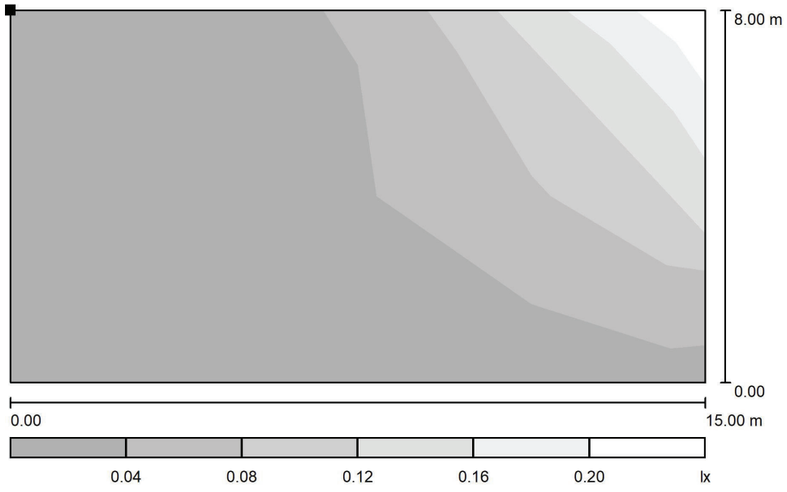
The following table summarises the results against the standards set out in the CIBSE, LG4:2006 recommendations for 'Class I' Play and the English Football League recommendations for floodlighting in 'Membership Criteria (Regulation 8)':

	Horizontal Average Illuminance (Lux)	Illuminance Average Uniformity	Colour Rendering Index (CRI)	Glare Rating	Broadcasting Ready
CIBSE Class I	500	0.7	70	55	No
Proposed Design – Total Area	545	0.6	90	<50	Yes
Proposed Design – Principal Pitch Area	565	0.7	90	<50	Yes
Pass / Fail	Pass	Pass	Pass	Pass	Pass

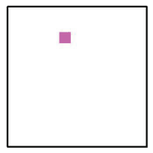
2.0 - PROPOSED LIGHTING TO THE DEVELOPMENT

Residential Receptor 1 - Elm View

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.

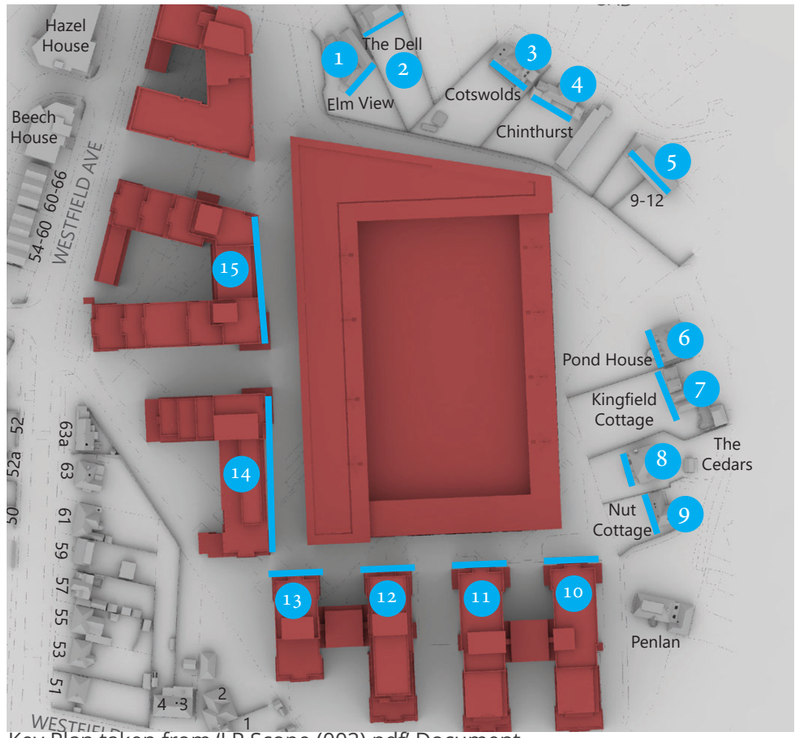


Position of surface in external scene:
Marked point:
(-243.004 m, 213.049 m, 8.151 m)

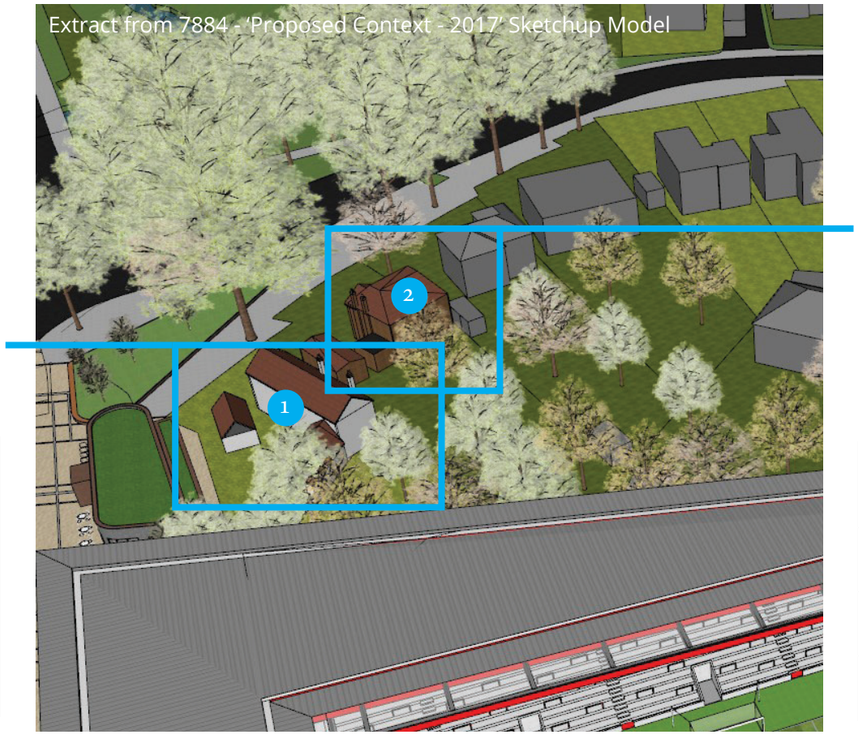


Grid: 4 x 2 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
0.05	0.03	0.21	0.540



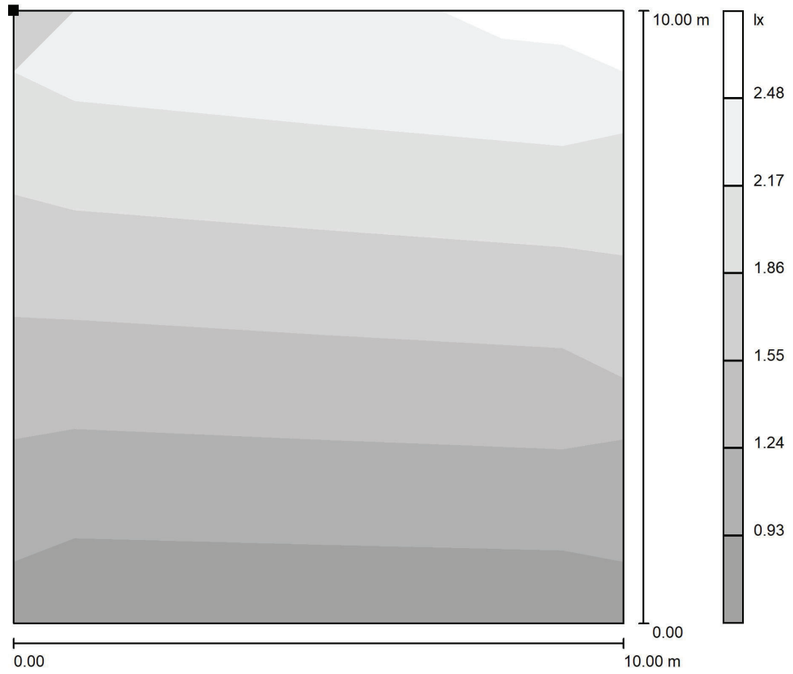
Key Plan taken from 'LP Scope (002).pdf' Document



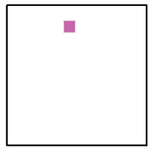
Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	0.05	0
Pass / Fail	Pass	Pass

Residential Receptor 2 - The Dell

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



Position of surface in external scene:
Marked point:
(-229.179 m, 238.838 m, 10.020 m)



Grid: 2 x 2 Points

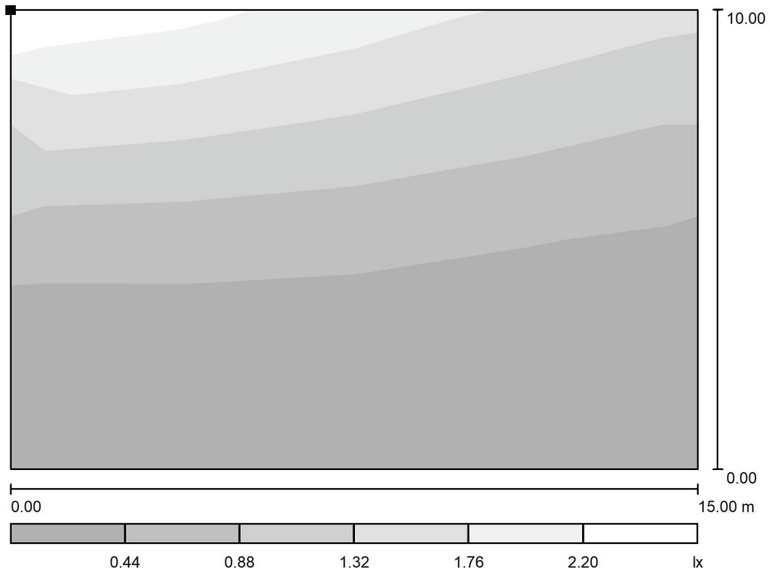
E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
1.60	0.88	2.41	0.549

Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	1.6	0
Pass / Fail	Pass	Pass

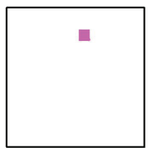
2.0 - PROPOSED LIGHTING TO THE DEVELOPMENT

Residential Receptor 3 - Cotswolds

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.

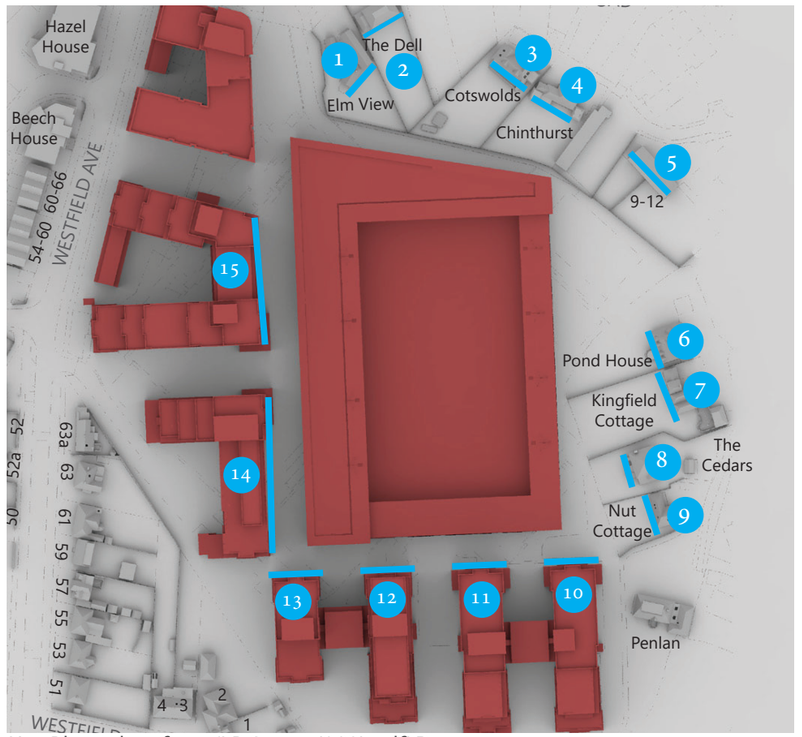


Position of surface in external scene:
Marked point:
(-185.379 m, 221.297 m, 10.302 m)

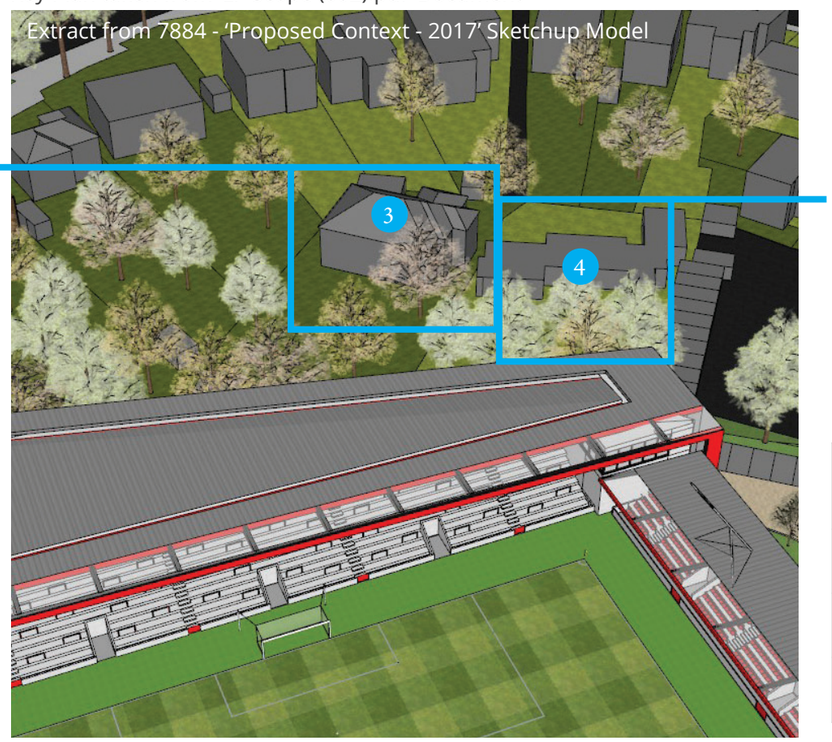


Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
0.70	0.09	2.28	0.126



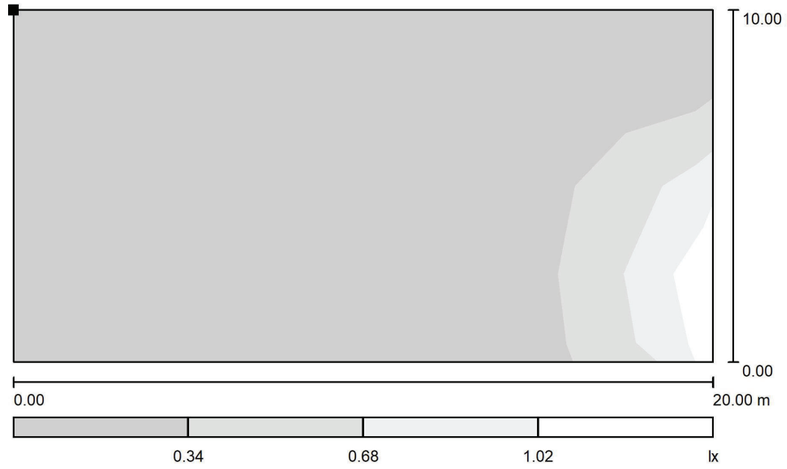
Key Plan taken from 'LP Scope (002).pdf' Document



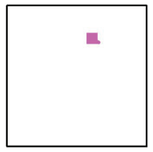
Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	0.7	0
Pass / Fail	Pass	Pass

Residential Receptor 4 - Chinthurst

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



Position of surface in external scene:
Marked point:
(-168.452 m, 207.935 m, 9.808 m)



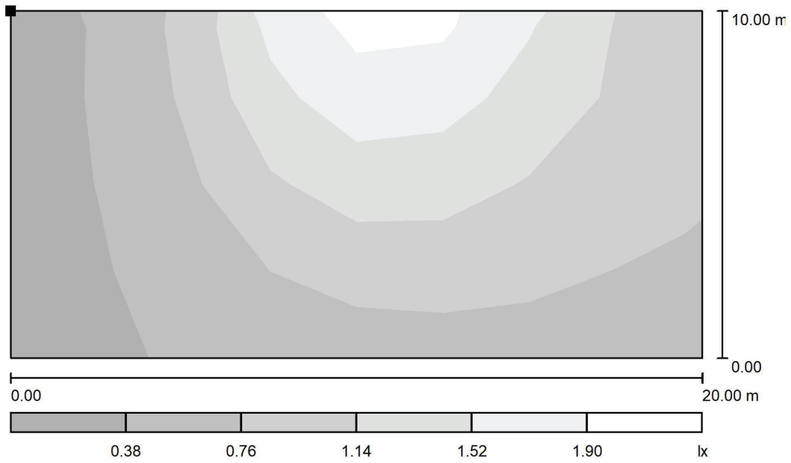
Grid: 8 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
0.16	0.05	1.73	0.321

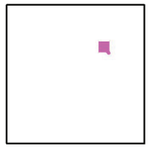
Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	0.16	0
Pass / Fail	Pass	Pass

Residential Receptor 5 - 9-12

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.

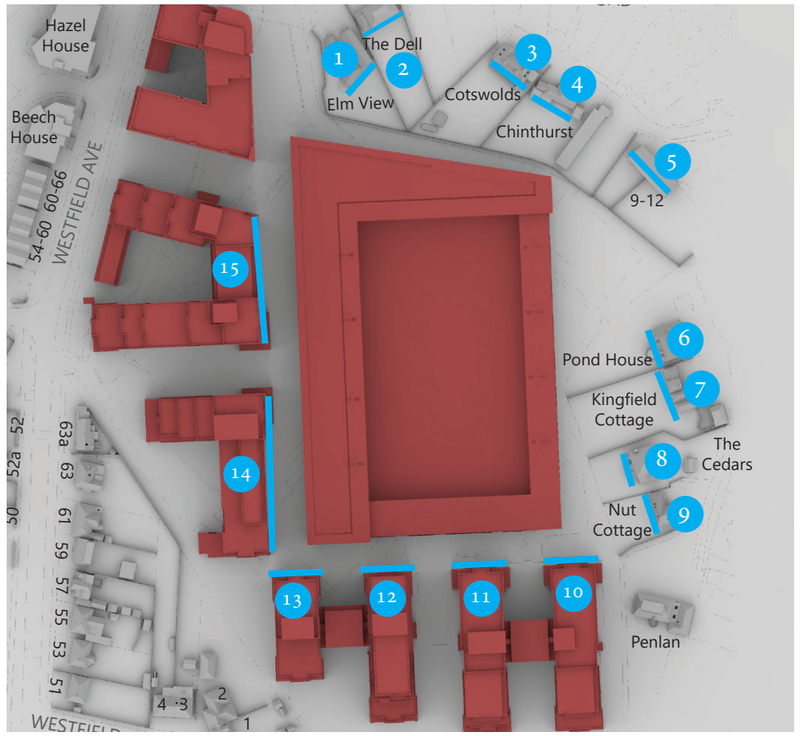


Position of surface in external scene:
Marked point:
(-131.178 m, 181.297 m, 10.302 m)

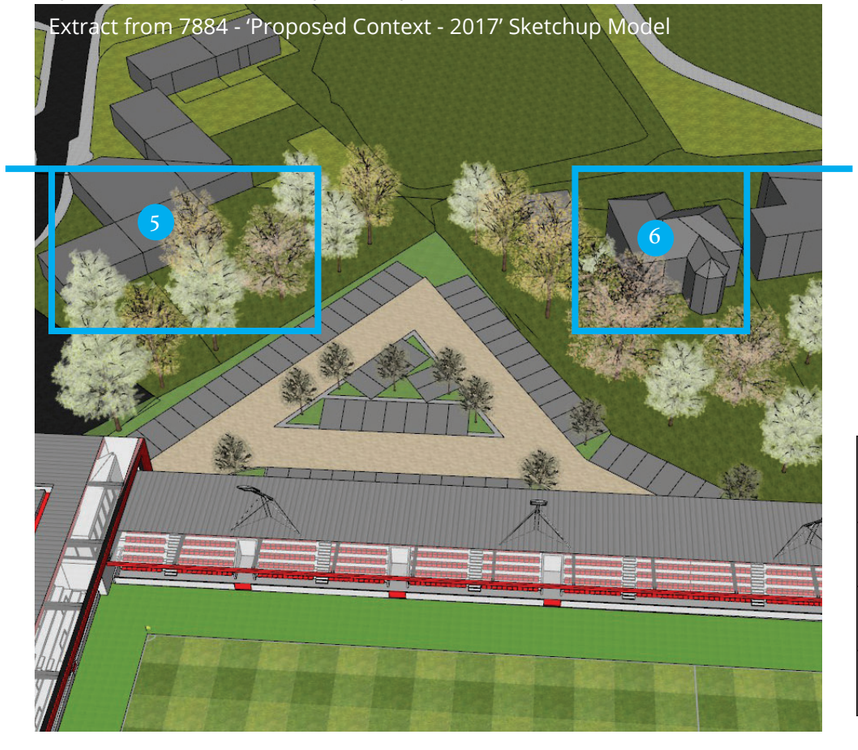


Grid: 8 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
0.95	0.30	2.21	0.312



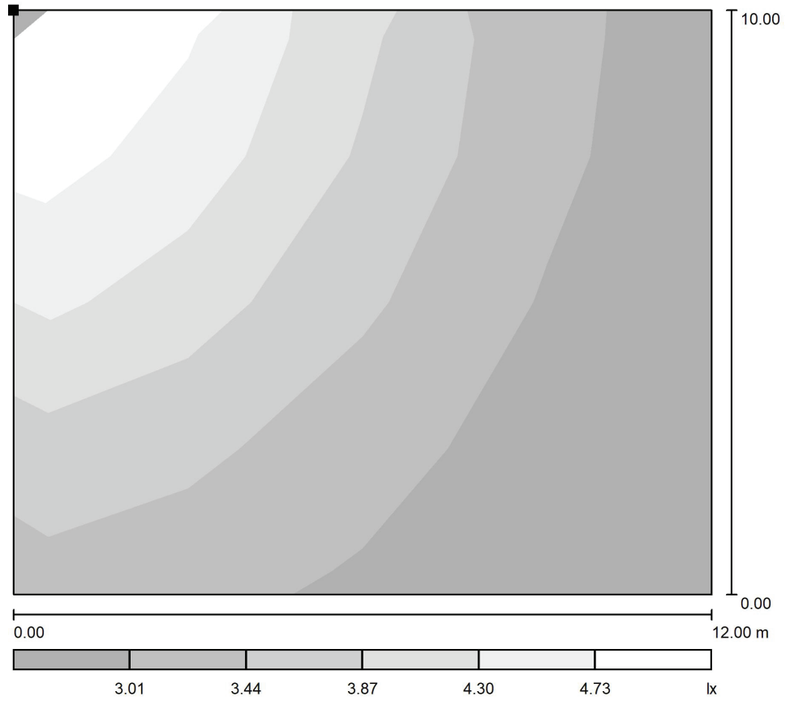
Key Plan taken from 'LP Scope (002).pdf' Document



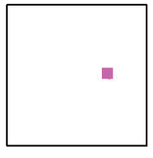
Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	0.95	0
Pass / Fail	Pass	Pass

Residential Receptor 6 - Pond House

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



Position of surface in external scene:
Marked point:
(-126.233 m, 111.658 m, 10.302 m)



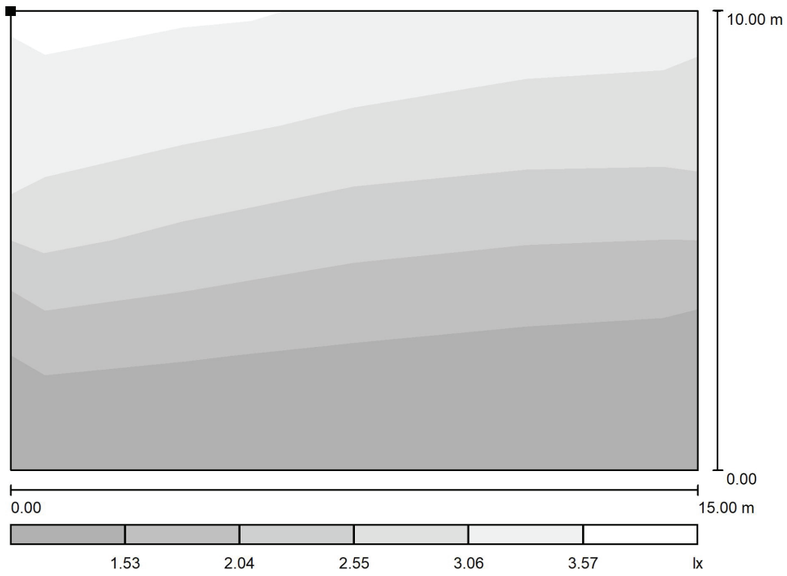
Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
3.51	2.70	4.86	0.769

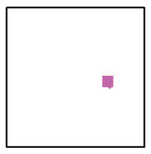
Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	3.51	0
Pass / Fail	Pass	Pass

Residential Receptor 7 - Kingfield Cottage

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



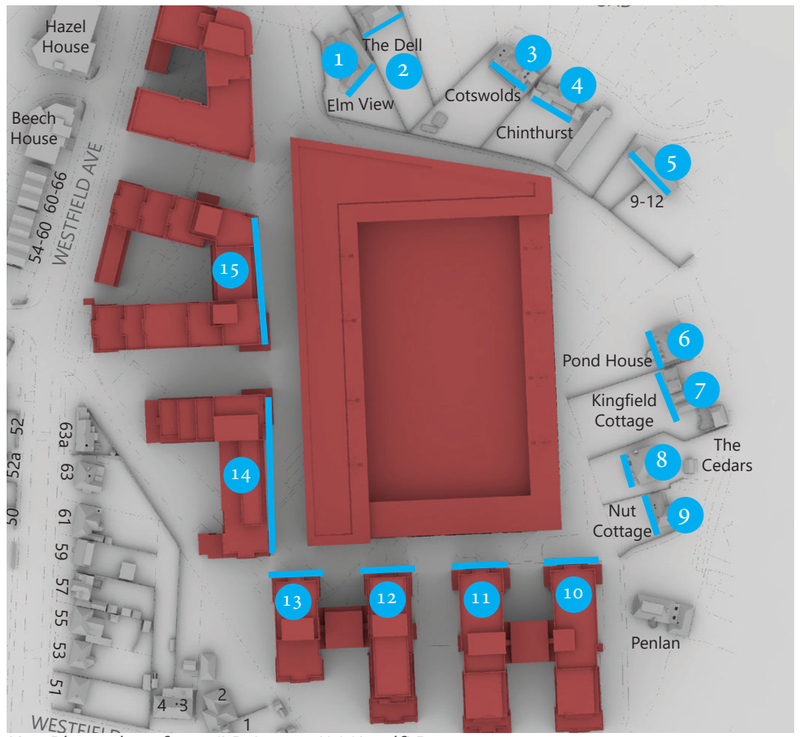
Position of surface in external scene:
Marked point:
(-120.568 m, 95.185 m, 10.302 m)



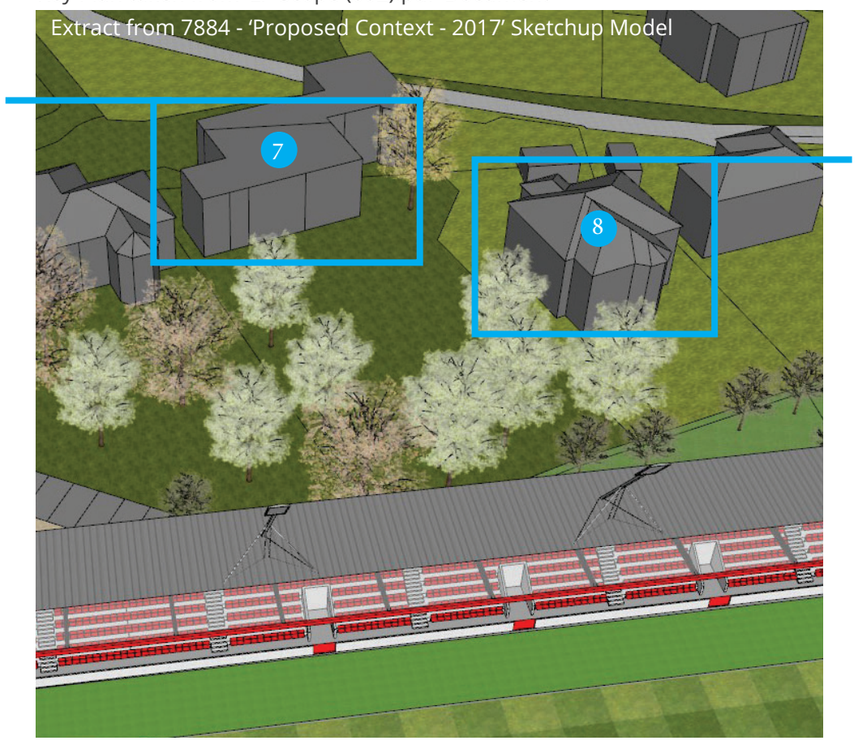
Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
2.24	1.15	3.68	0.512

Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	2.24	0
Pass / Fail	Pass	Pass

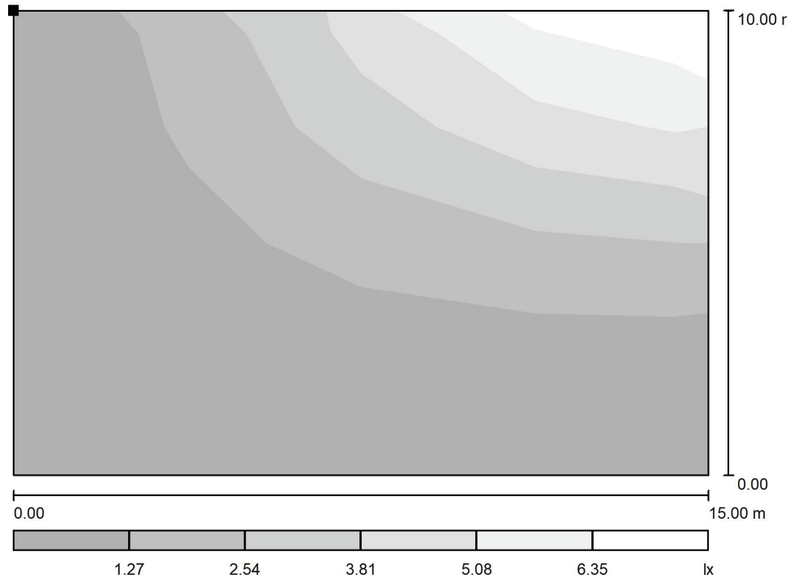


Key Plan taken from 'LP Scope (002).pdf' Document



Residential Receptor 8 - The Cedars

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



Position of surface in external scene:
Marked point:
(-139.123 m, 65.347 m, 10.302 m)

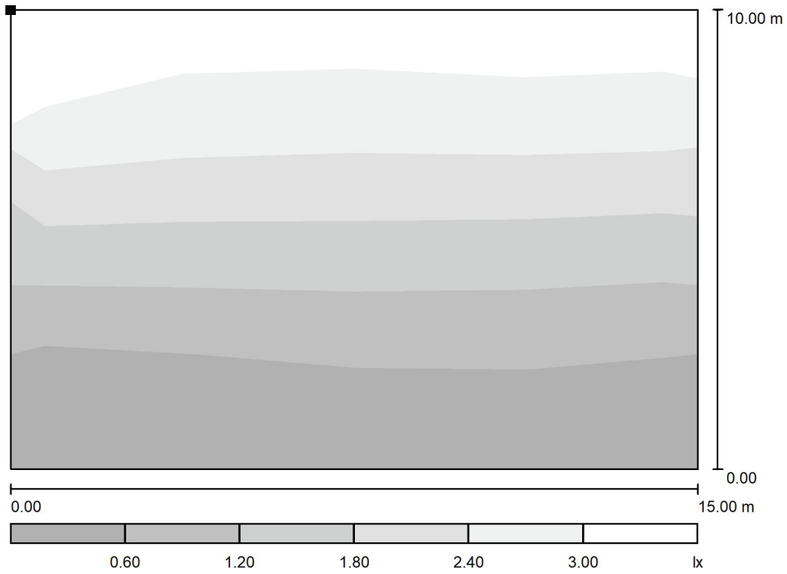
Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
1.76	0.19	6.53	0.108

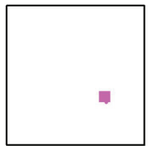
Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	1.76	0
Pass / Fail	Pass	Pass

Residential Receptor 9 - Nut Cottage

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



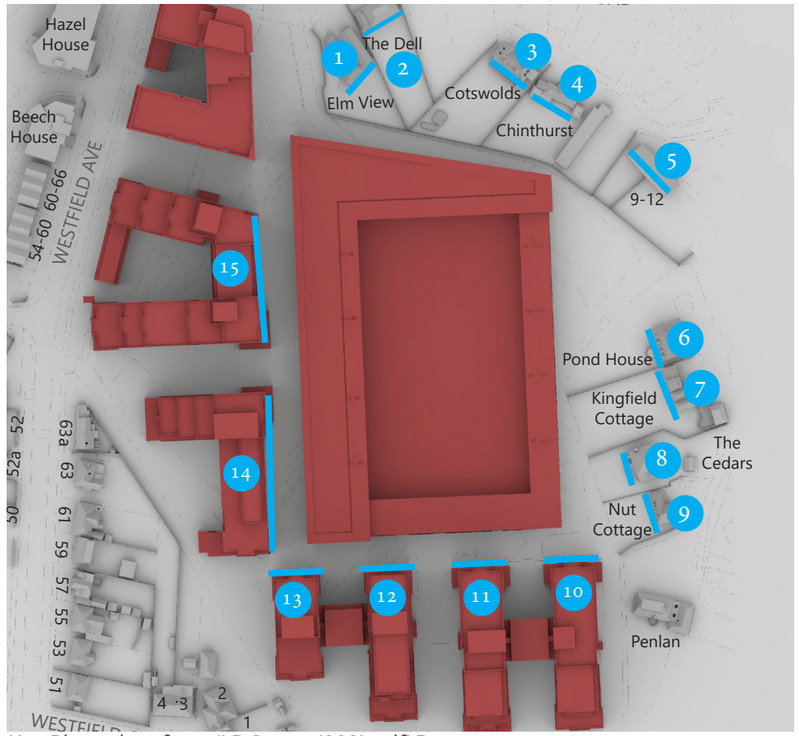
Position of surface in external scene:
Marked point:
(-129.283 m, 47.969 m, 10.302 m)



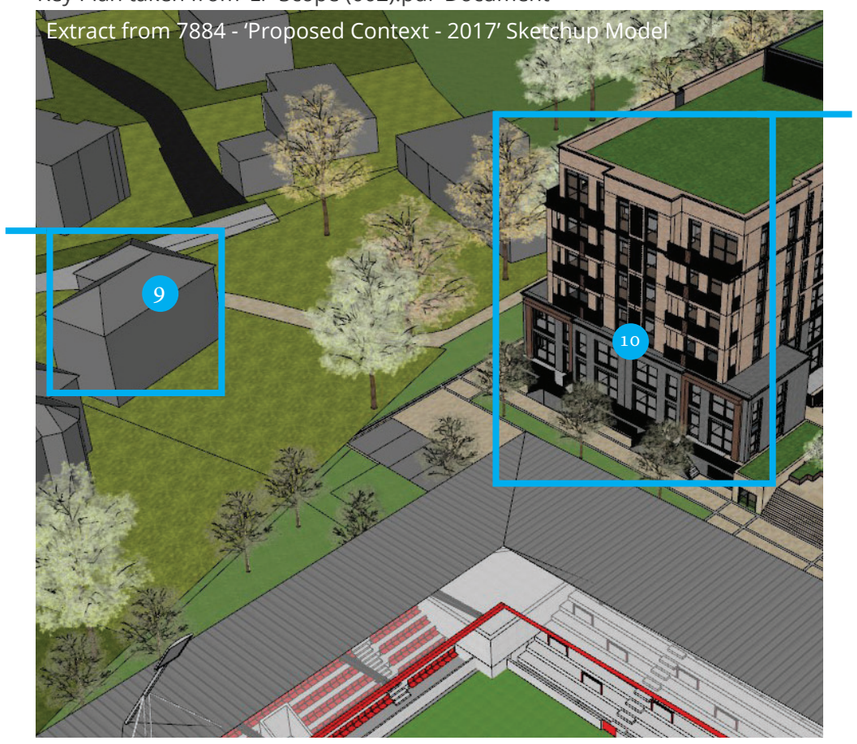
Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
1.67	0.30	3.31	0.179

Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	1.67	0
Pass / Fail	Pass	Pass

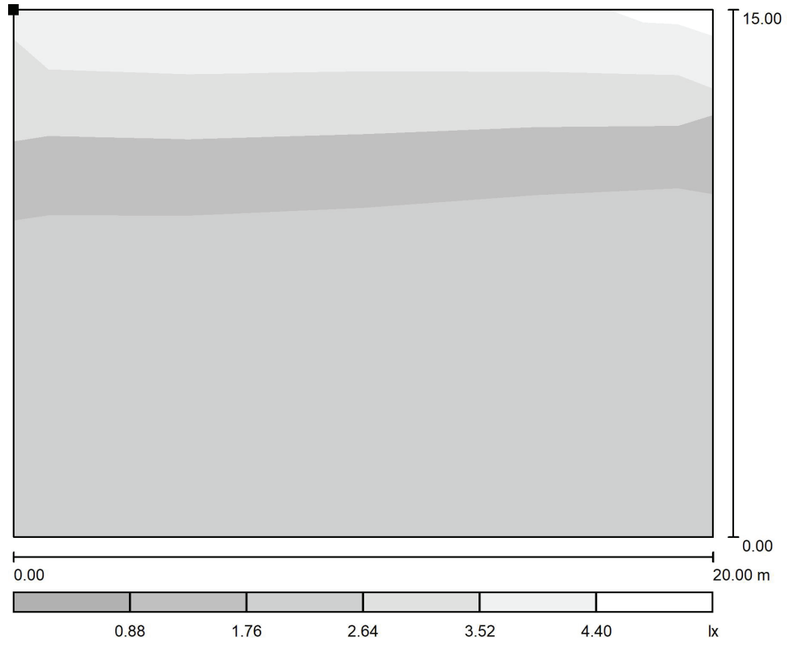


Key Plan taken from 'LP Scope (002).pdf' Document

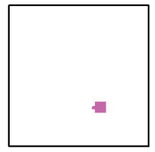


Residential Receptor 10 - Block 5 (East)

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



Position of surface in external scene:
Marked point:
(-150.520 m, 21.346 m, 16.156 m)



Grid: 4 x 4 Points

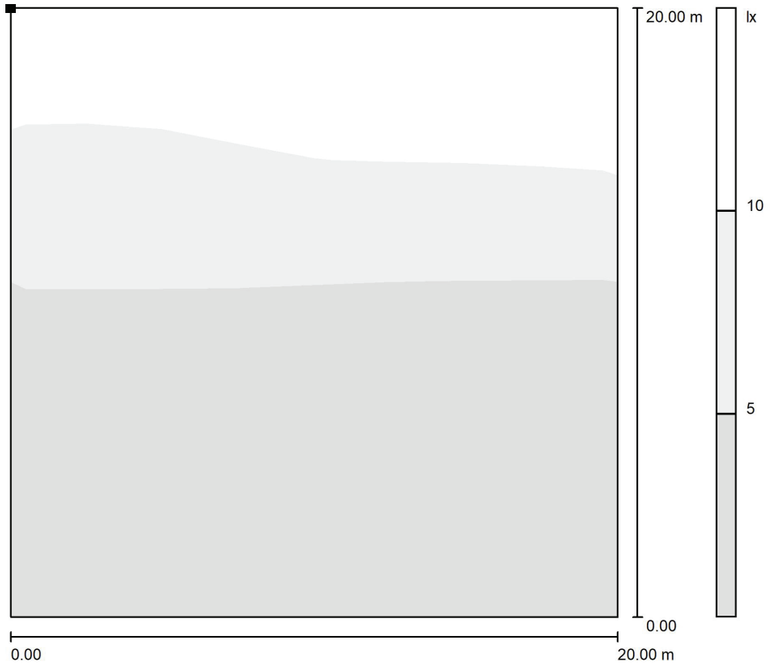
E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
1.38	0.10	4.52	0.075

Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	1.38	0
Pass / Fail	Pass	Pass

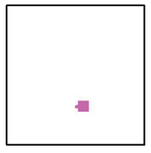
2.0 - PROPOSED LIGHTING TO THE DEVELOPMENT

Residential Receptor 11 - Block 5 (West)

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



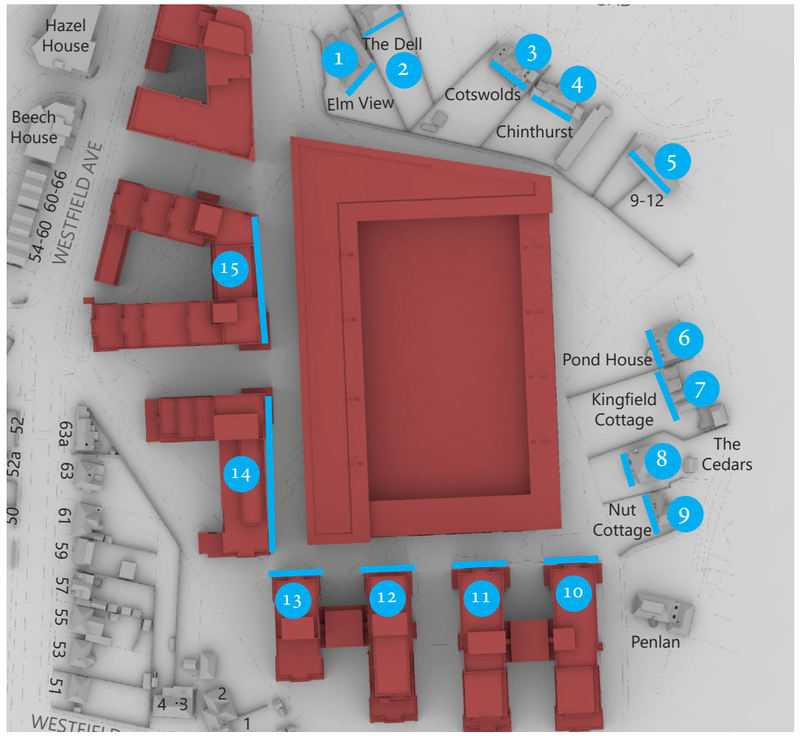
Position of surface in external scene:
Marked point:
(-188.047 m, 21.404 m, 21.789 m)



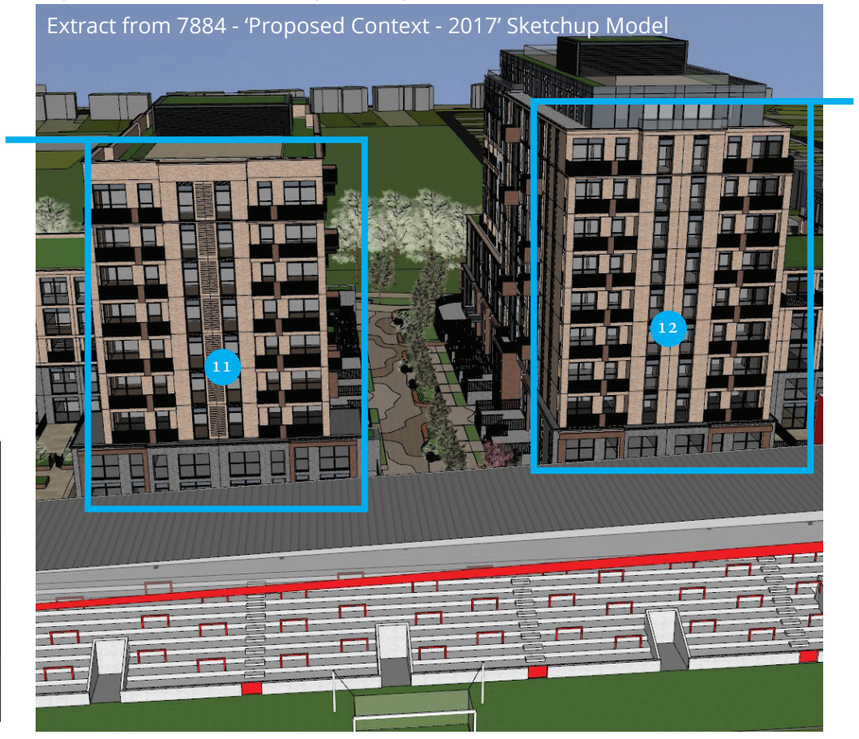
Grid: 8 x 8 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
4.82	0.11	11	0.024

Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	4.82	0
Pass / Fail	Pass	Pass

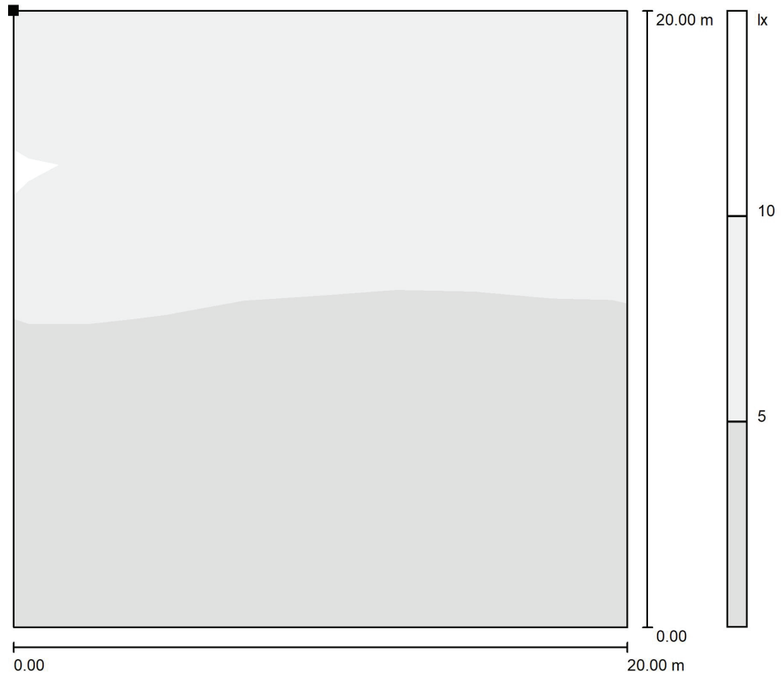


Key Plan taken from 'LP Scope (002).pdf' Document

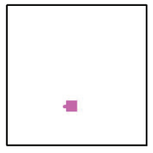


Residential Receptor 12 - Block 4 (East)

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



Position of surface in external scene:
Marked point:
(-223.561 m, 22.366 m, 23.717 m)



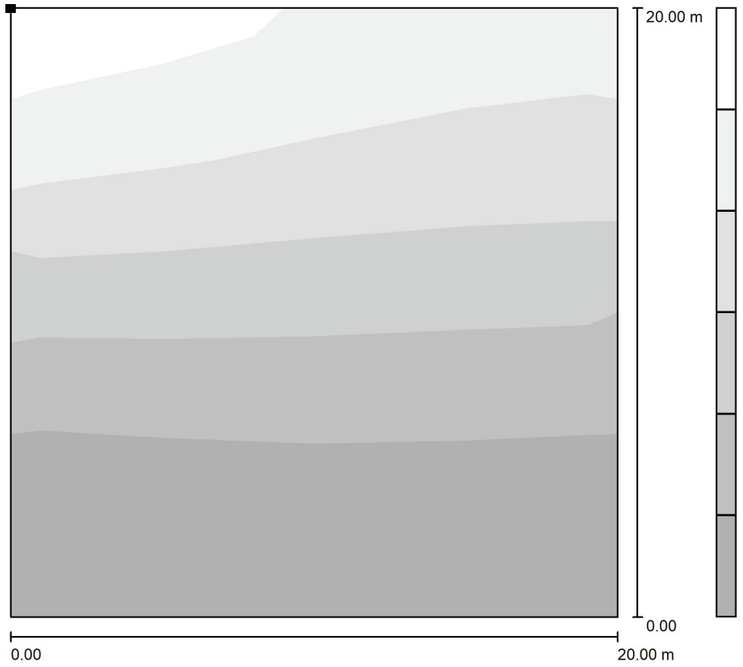
Grid: 8 x 8 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
4.56	0.15	11	0.033

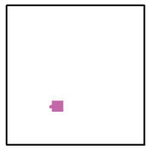
Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	4.56	0
Pass / Fail	Pass	Pass

Residential Receptor 13 - Block 4 (West)

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



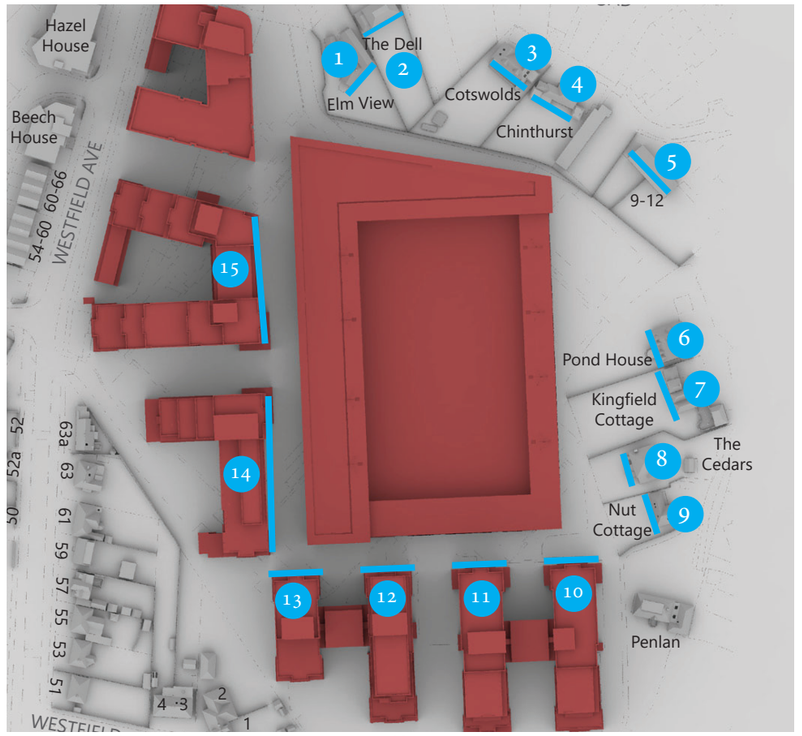
Position of surface in external scene:
Marked point:
(-259.230 m, 21.164 m, 21.428 m)



Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
2.73	0.32	6.22	0.116

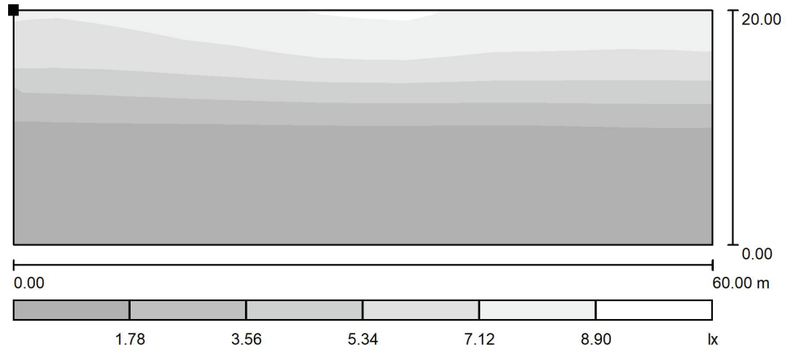
Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	2.73	0
Pass / Fail	Pass	Pass



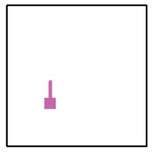
Key Plan taken from 'LP Scope (002).pdf' Document

Residential Receptor 14 - Block 3

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



Position of surface in external scene:
Marked point:
(-282.102 m, 31.887 m, 19.473 m)



Grid: 16 x 8 Points

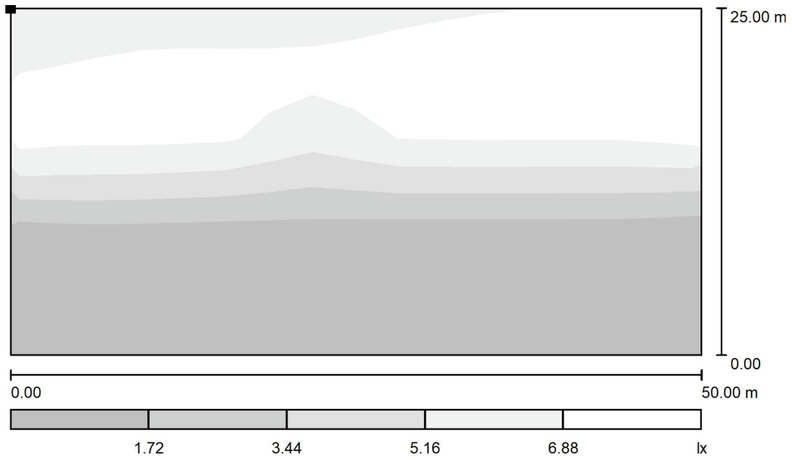
E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
3.03	0.07	8.97	0.024

Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	3.03	0
Pass / Fail	Pass	Pass

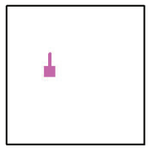
2.0 - PROPOSED LIGHTING TO THE DEVELOPMENT

Residential Receptor 15 - Block 2

Light modelling data shows that the provisional specification for pitch floodlighting does not adversely effect this residential receptor.



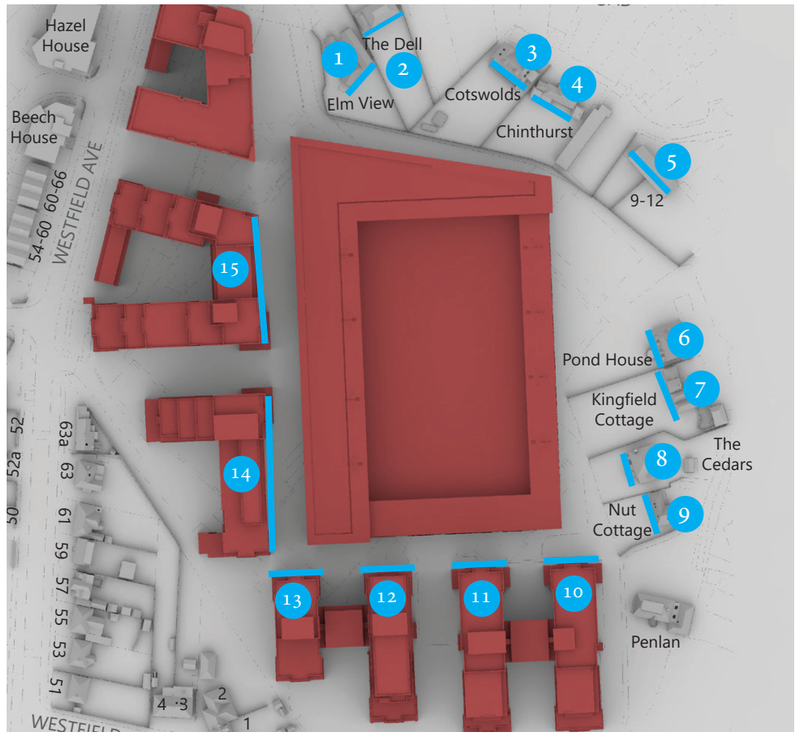
Position of surface in external scene:
Marked point:
(-281.167 m, 116.237 m, 24.101 m)



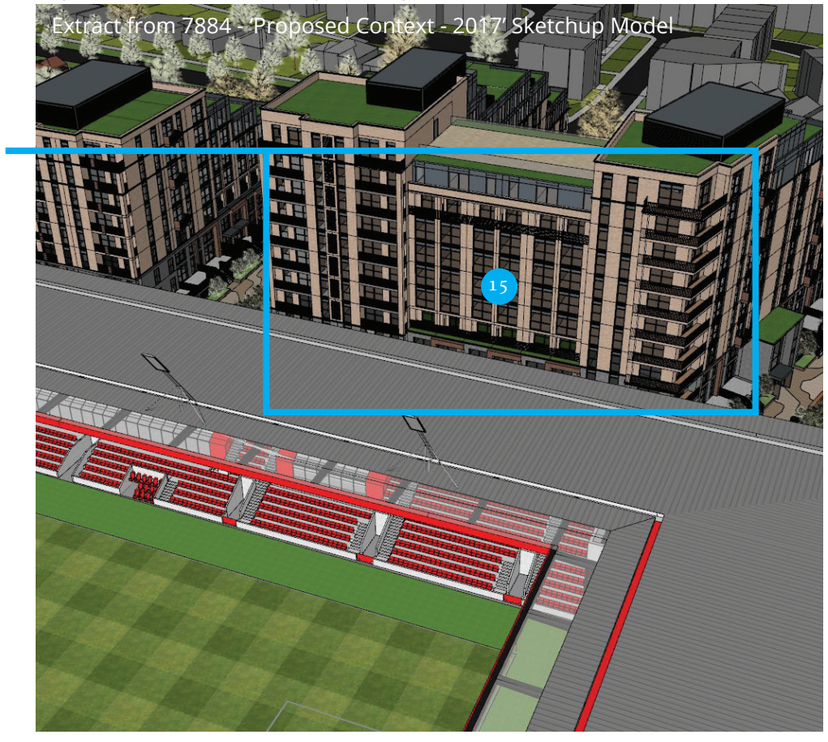
Grid: 16 x 8 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0
3.88	0.12	8.69	0.030

Assumed Curfew 22:30hrs (Mon-Sat) 21:00hrs (Sun)	Light Intrusion **Pre Curfew** Average (Lux)	Light Intrusion **Post Curfew** Average (Lux)
ILP / CIBSE Target (Zone E3)	10	2
Proposed Design (Average)	3.88	0
Pass / Fail	Pass	Pass



Key Plan taken from 'LP Scope (002).pdf' Document



Extract from 7884 - 'Proposed Context - 2017' Sketchup Model

Extract from www.wokingcommunitystadium.co.uk (190712-Our-Plans-v1.pdf)

2.2 Lighting to Car Park

It is proposed that the car park areas be illuminated to provide a safe and secure environment for users of the development.

In our opinion, the lighting levels should reflect those presented in the British Standards for lighting of car parks with Medium Traffic (BS 12464-2:2007 table 5.9) and obtrusive light controlled by the levels controlled by Environmental Zone E3 (suburban / medium district brightness) (BS 12464-2:2007 chapter 4.5). Apart from the use of horizontal cut-off (HCO) luminaires with good optical control, as stipulated by Environmental Zone E3, we would recommend consideration to be given to the mounting heights of the car park lighting. Mounting this lighting at a height of no more than 4-6 metres would minimize the day-time visual impact.

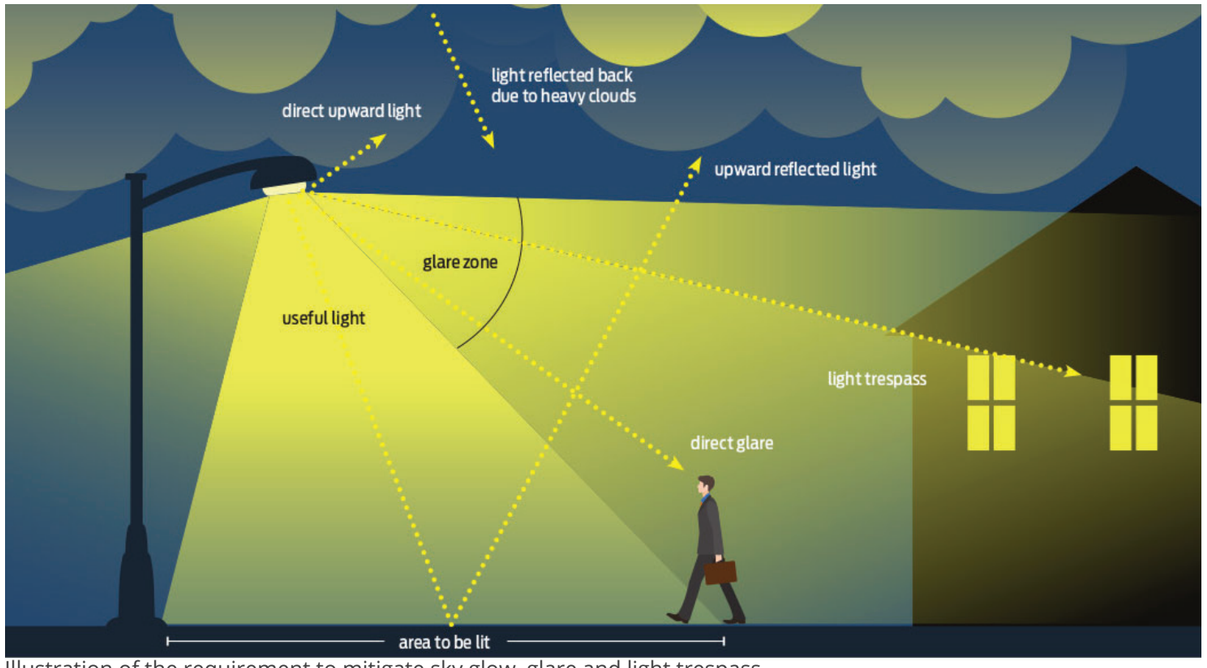
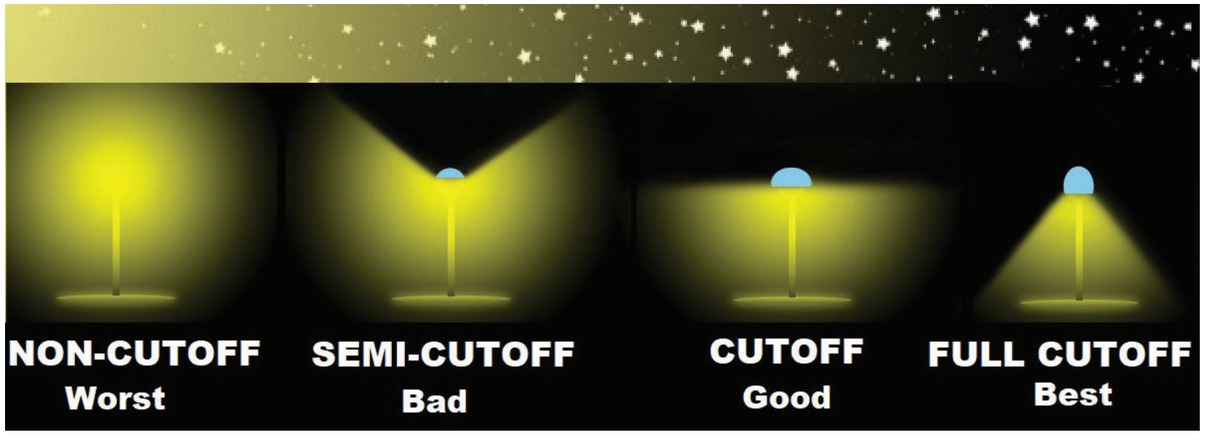
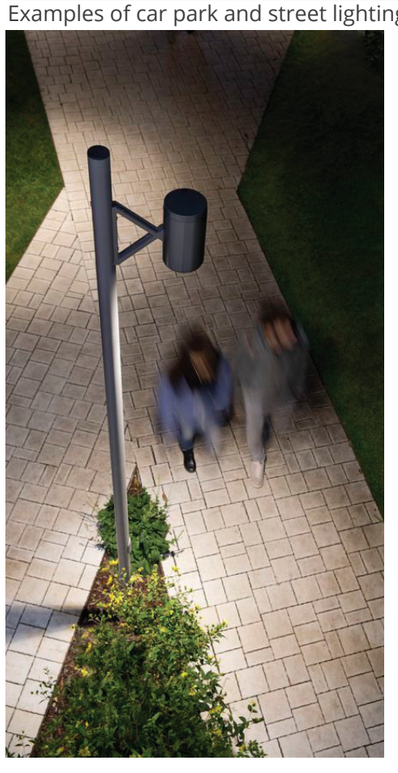
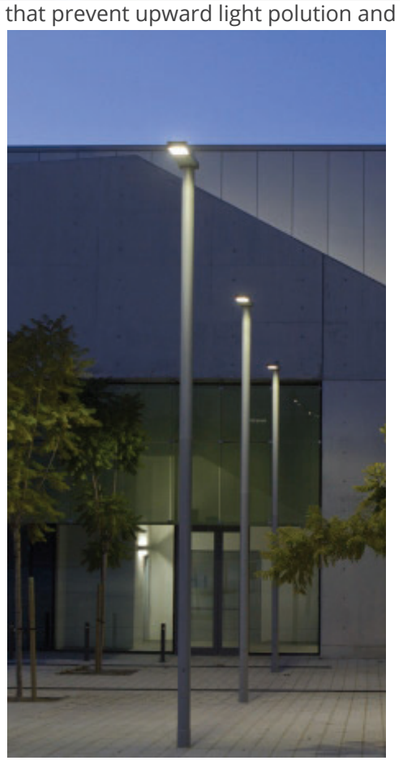


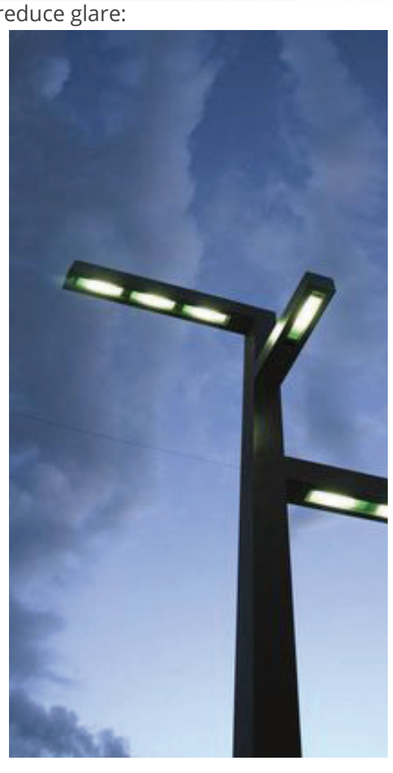
Illustration of the requirement to mitigate sky glow, glare and light trespass



Examples of car park and street lighting that prevent upward light polution and reduce glare:







2.3 Building Façade, Pathway, Circulation, Signage and Security Lighting

Applying a common sense approach is required to ensure that any lighting does not use higher brightness light sources than necessary, is not spilling in to areas where it serves no function or is operational at times when it serves no purpose.

Lighting to the façade of the main stadium building, pathways, car parks or exterior of the surrounding residential development must be designed in such a way so as to avoid any uncontrolled light that will contribute to light pollution, glare or sky glow.

Façade lighting should not be directed upwards, instead a suitable design for façade illumination should include concealed light sources and the direction of the emitted light should not exceed 90° or be excessively bright so as to prevent glare or sky glow.

Street lighting should comprise of street lamps that direct the lighting efficiently downwards to the specific area to be illuminated. Careful choice of optics and full cut-off designs should be used to prevent any light being directed upwards or close to horizontal.

No up lighting should be used to facades, trees or street furniture to prevent unnecessary glare or reduce sky glow, unless there is an adjacent built surface to terminate the path of light. Lighting for bollards, benches or wall lighting should all be directed downwards and where possible the light source should be of a concealed type. Overleaf - images of low glare street lighting effects.

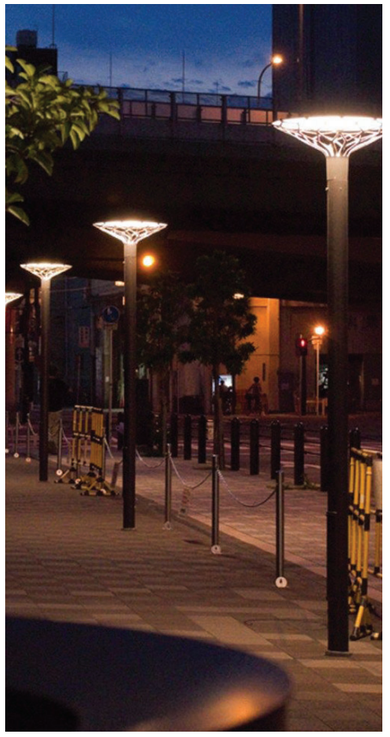
The type and position of any proposed illuminated signage, displays, screens or illuminated hoardings must be carefully considered for their individual impact on the local environment. This includes conformity to any relevant regulations and consideration to residents that may be affected by the extra light. It is recommended that any illuminated signage be significantly dimmed or switched off automatically after 23:00 hours. Any signage that causes sudden changes of light intensity such as digital signage displays can be a nuisance to residents.

Motion activated security lighting should be avoided as sudden changes in brightness can cause a nuisance to residents and users of the area. Instead a suitable lighting design for the circulation and curtilage should provide a suitable background level of illumination for safety and security around the site. Any additional lighting required should be controlled according to the control advice in Section 2.5 ‘Lighting Control’.

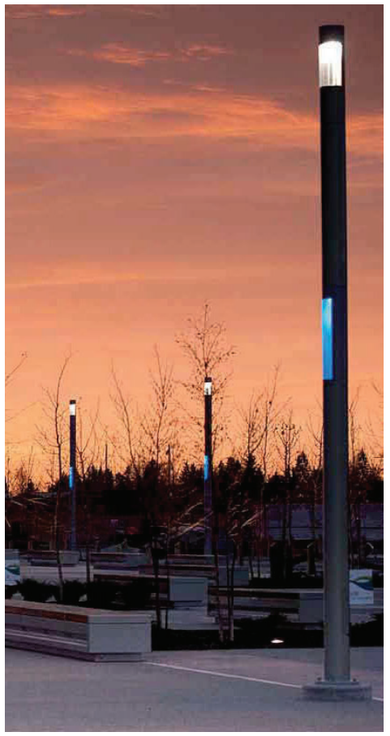
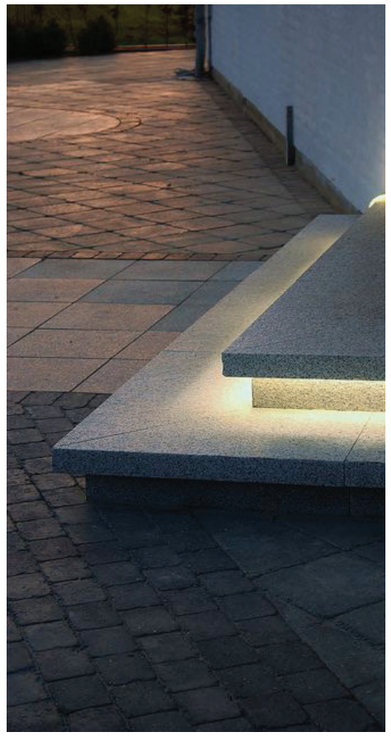
All of the above measures are required to prevent excessive or unnecessary lighting which would otherwise contribute to light pollution, annoyance or energy inefficiency. A carefully designed lighting solution including careful choice of luminaires, positioning and control strategy will improve the experience of users and residents, reduce energy consumption and prevent adverse environmental impacts.

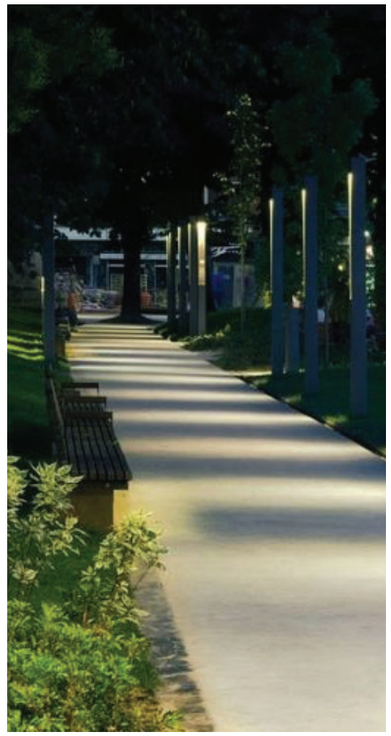
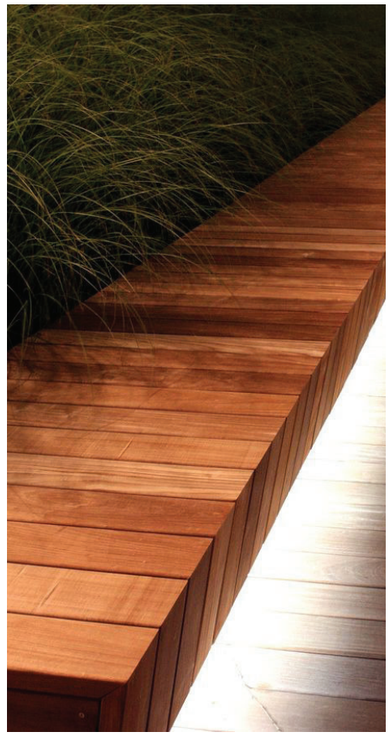
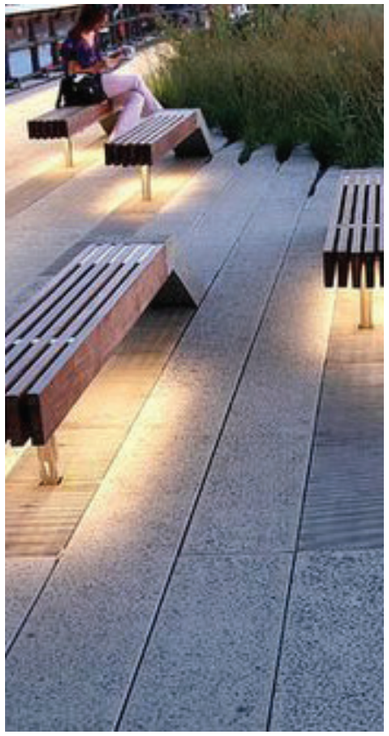
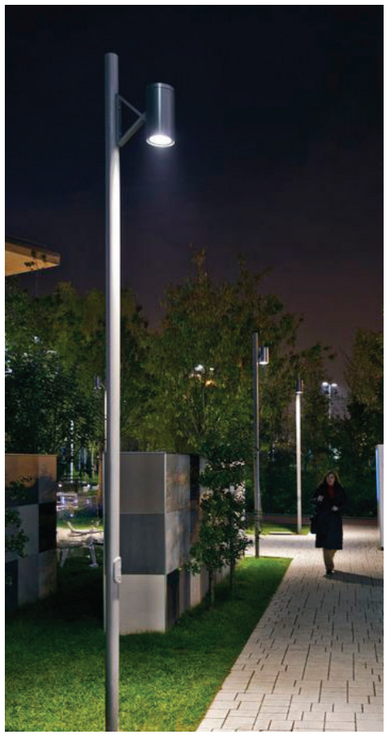
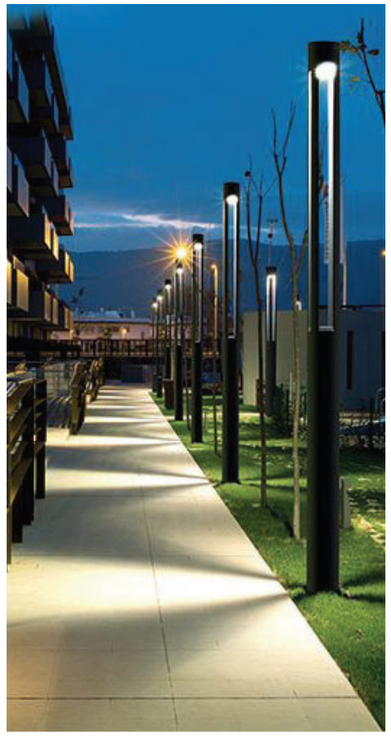
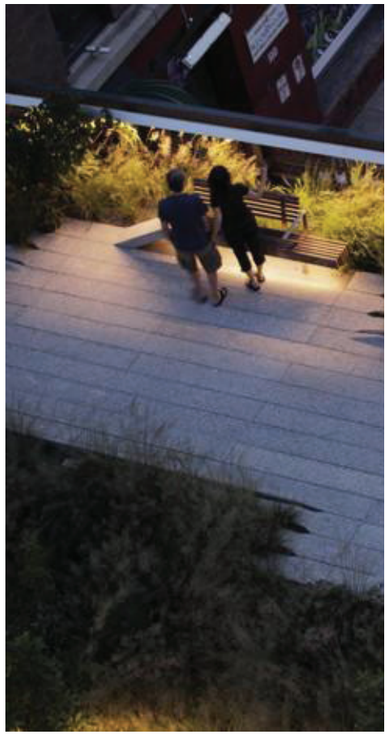
Example of stadium facade lit downwards to prevent excess light polution:

Examples of low glare street lighting that help reduce sky glow:



2.0 - PROPOSED LIGHTING TO THE DEVELOPMENT

2.4 Internal Lighting to Stadium

The internal lighting within the stadium envelope can, if not effectively controlled, provide an unwanted source of light pollution. Bare light sources should not be visible through windows when viewed from the outside and lighting controls arranged so all lighting is easily turned off when not required, automatically turned off or significantly reduced in output when outside of operational hours.

This also applies to any internal signage, displays, screens or hoardings. If internal lighting is to be required after 23:00 hours other methods of lighting control such as blinds should be used to prevent egress of light from internal lighting through window openings. This is especially critical where retail or office space is located directly opposite residential dwellings where light trespass is likely to occur.

2.5 Lighting Control

The lighting to the pitch be switched off or the lit intensity reduced to Mode 4 (see below) no later than 22:30 hours Monday to Saturday and 21:00 hours on Sundays.

The use of Pitch Illuminance Switch Mode (PISM) allows for more suitable levels of lighting depending on the usage of the pitch area. This further reduces any undesirable effects of light spill or sky glow by reducing the output of the floodlighting system depending on the requirements of the activity:

- Mode 1 : Full Match Mode (full 'Class II' illumination for match play)
- Mode 2 : Match Continuity Mode (reduced illumination used in event of power failure)
- Mode 3 : Training Mode (a lower level 'Class III' illumination for non-match use)
- Mode 4 : Maintenance Mode (basic illumination for maintenance)

The surrounding pedestrian plaza, walkways and car parks will need to be lit for convenience, safety and security throughout the hours of darkness. After 23.00 hours Monday to Saturday and 21.00 hours on Sundays, the overall lighting levels to these areas are suggested to be significantly reduced automatically whilst maintaining a safe minimum level of illumination. Additional measures such as motion enhanced lighting can smoothly, subtly and unobtrusively slightly raise the street lighting levels around areas of detected activity. Lighting to circulation areas should automatically respond to ambient light levels to save energy when not required due to variations in natural light levels at dawn and dusk. All exterior lighting should dim smoothly and no motion activated or automated exterior lighting should come on or off abruptly which could cause nuisance or disturbance to nearby residents.

All suggestions above are intended to improve safety and security whilst also reducing overall emissions of light, light trespass or disturbance to residents of nearby housing.

2.6 Mitigation by Landscaping

We believe the proposed landscaping within the site together with the lower height and location of the stadium in relation to the residential developments surrounding to the south and west will help to screen the night time impact of the lighting emitted from the stadium pitch installations. The screening to the north and east will become more apparent overtime as the trees grow and mature. This will also help obscure the daytime prominence of the stadium lighting gantries when viewed from the northern and eastern fringe residential area.

Extract from www.wokingcommunitystadium.co.uk (190712-Our-Plans-v1.pdf)

3.0 - CONCLUSION

dpa lighting consultants were instructed by Woking Football Club on the 28th August 2019 to provide a suitable strategy for lighting the main stadium venue and surrounding curtilage. This strategy is to be made with due consideration for the environmental impact of the lighting associated with the new Woking Football Club stadium and surrounding residential development.

3.1 Sky Glow / Light Pollution

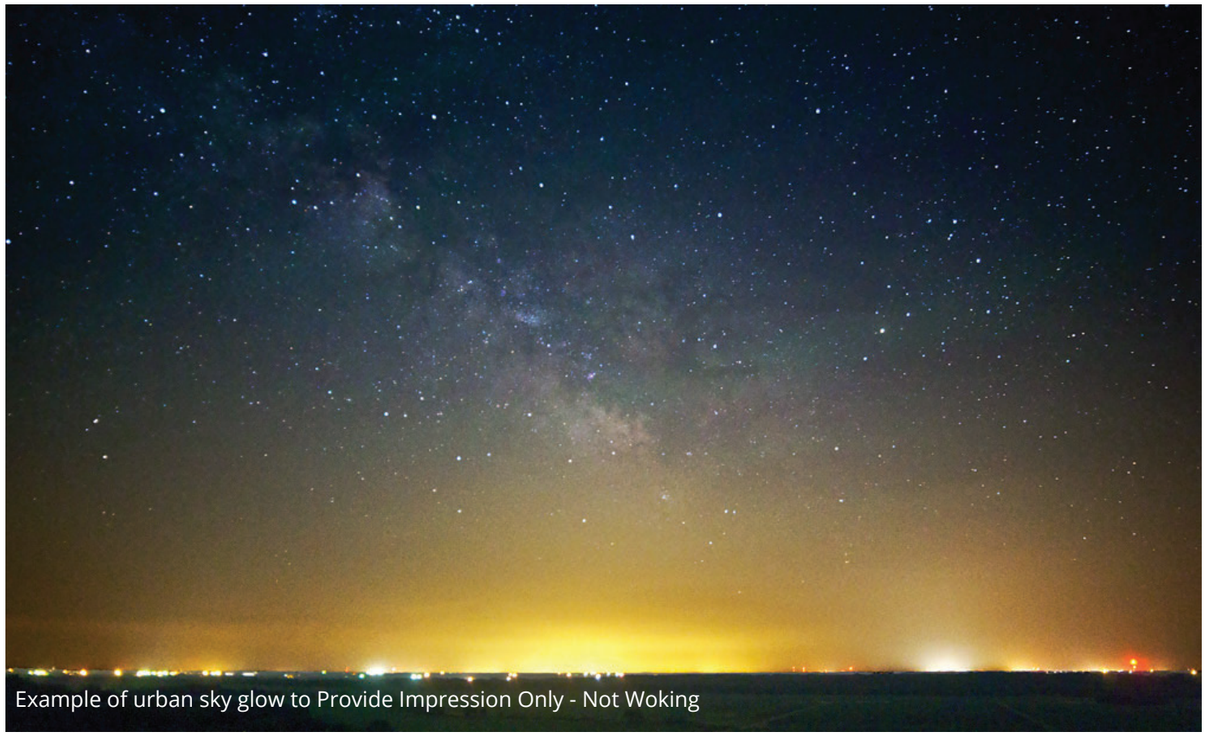
Even when the lighting design adheres to appropriate guidelines with respect to minimising any direct upward light components and spill light there will be upward reflected light due to the reflectance of the area to be illuminated (for example, the pitch surfaces or car park surfaces etc.). This upward reflected light would cause sky glow (i.e. a brightening of the night sky in the vicinity of the development) that will be exacerbated in times of increased humidity in the atmosphere.

The production of sky glow from floodlighting installations is inevitable. Sky glow is a negative environmental effect, although the perceived magnitude of the effect depends on the context. In the case of the new stadium, this is located in an urban environment and therefore the overall perceived magnitude of the effect would be masked to some extent by the existing sky glow produced by the neighbouring conurbation, from light sources associated with streets and building lighting etc.

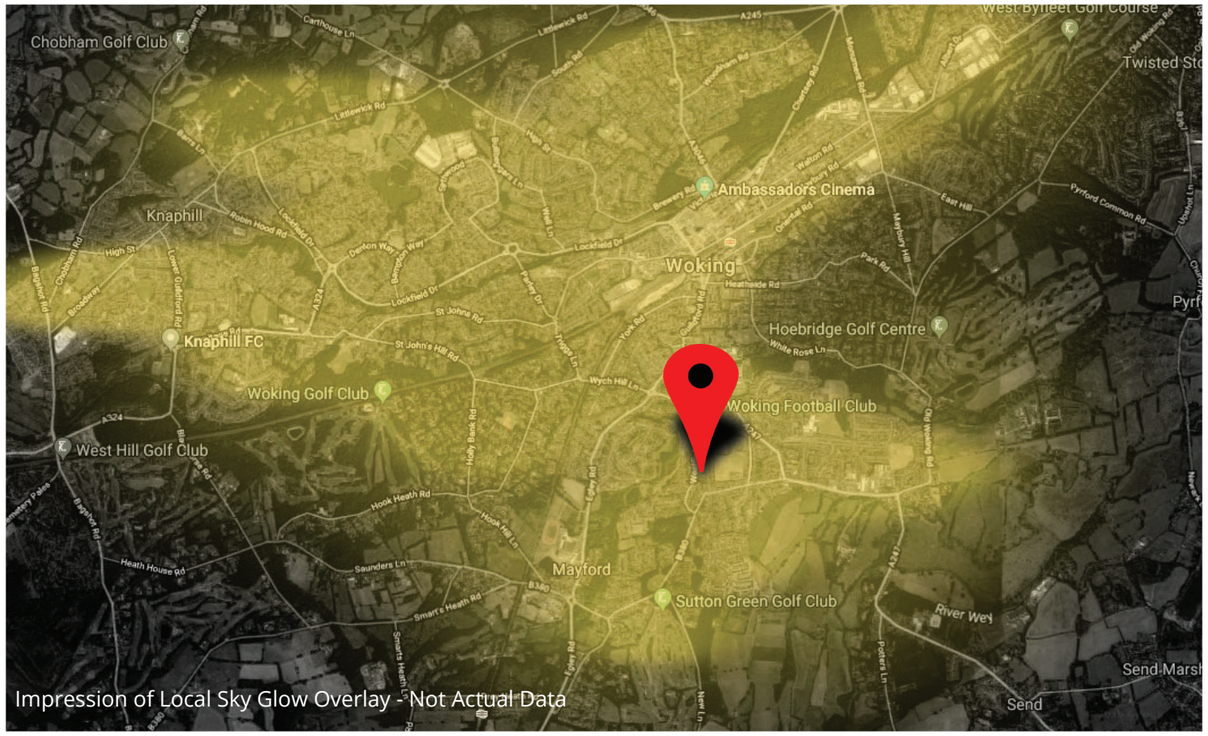
The proposed development is located on the edge of a large urban area with both industrial and residential developments nearby. Our observations suggest that there are medium to high levels of background illumination to the immediate vicinity during the hours of darkness.

The geographical location of the site (i.e. on an area of relatively low elevation) is such that the site is viewable from a limited number of locations and viewing angles. In our opinion, the sites topographical location mitigates the negative environmental impact associated with the proposed lighting as the number of individuals potentially affected by the proposed lighting (and the daytime view of the lighting equipment) is reduced significantly.

Furthermore, the impact of the sky glow will differ between viewing locations, which will mean that other sources of sky glow such as that produced by Woking town will be viewed in proximity on the horizon and will be more apparent. Due to the close proximity to other lit areas and low-lying location within the landscape, the sky glow addition of reflected light when the pitch is lit will not be of a magnitude to be considered detrimental to the landscape.



Example of urban sky glow to Provide Impression Only - Not Woking



Impression of Local Sky Glow Overlay - Not Actual Data

3.2 Residential Development

There are significant proposed multiple dwelling unit residential developments immediately surrounding the south and west sides of the proposed stadium which are the primary receptors for obtrusive light from the stadium floodlighting, façade and circulation street lighting around the site.

All measures suggested are intended to reduce the impact of artificial lighting on these receptors and all aspects of the lighting strategy are to be designed to reduce light intrusion, glare or light trespass. All precautions taken within CIBSE recommendations for obtrusive light limitations for Environmental Zone E3 (suburban / medium district brightness) protect these residential receptors from excess light as a nuisance.

3.3 Flora and Fauna

dpa lighting consultants are not experts on the effect of light on the local ecology including flora, fauna and wildlife. As such, we would advise that professional opinion be sought regarding any potential impact of the lighting proposals in this respect.

3.4 Final Statement

All developments generate environmental impacts, both adverse and beneficial. In our opinion, if the finished lighting installation, in particular the floodlighting to the stadium pitch and circulation street lighting, is implemented in line with the recommended guidelines, taking into consideration the geographical location and environmental context together with mitigation by lighting control and hours of operation, these factors will combine to produce an acceptable negative environmental impact.

Extract from www.wokingcommunitystadium.co.uk (190712-Our-Plans-v1.pdf)

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dpa lighting consultants

Lighting Strategy

Appendix A

Woking Football Club – Pitch Illumination

30th September 2019

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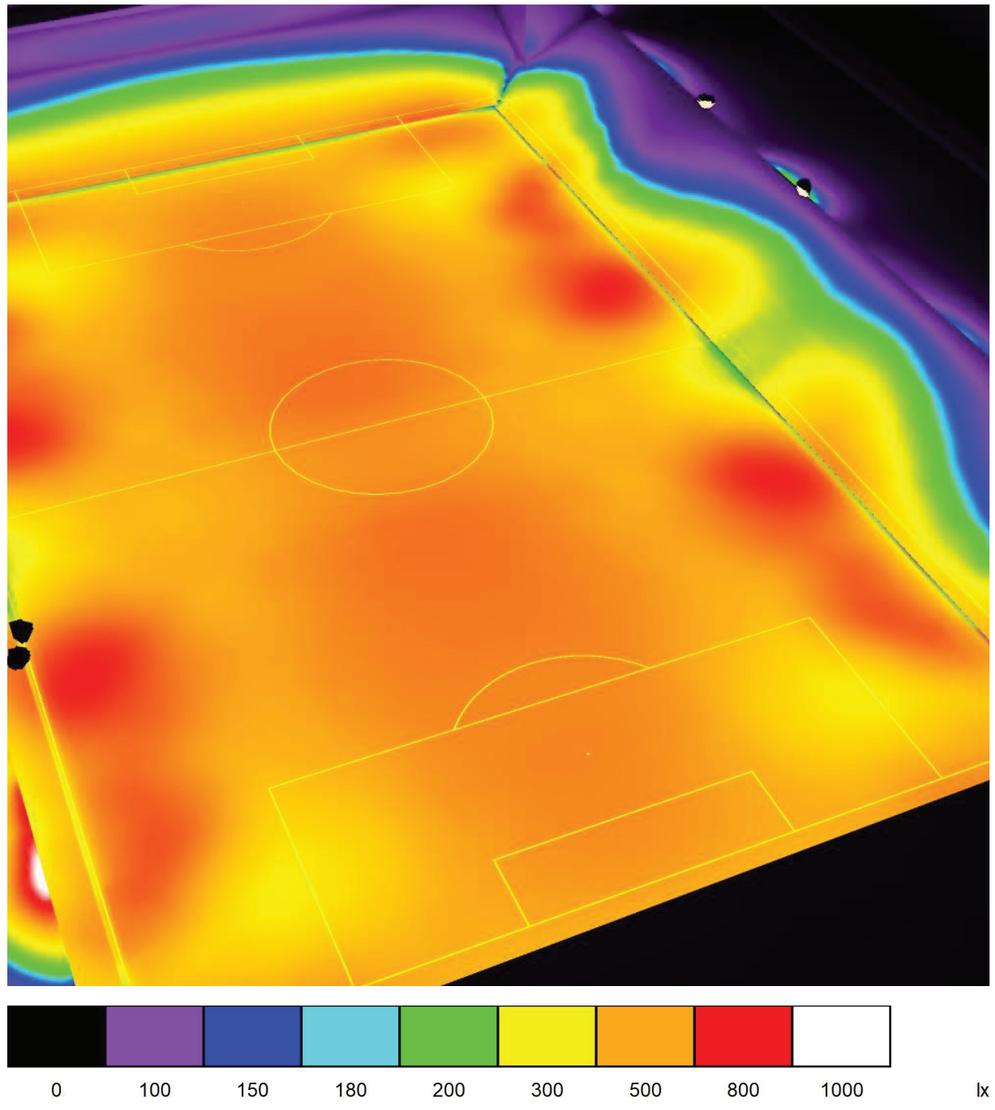
Exterior Scene 1 / False Colour Rendering



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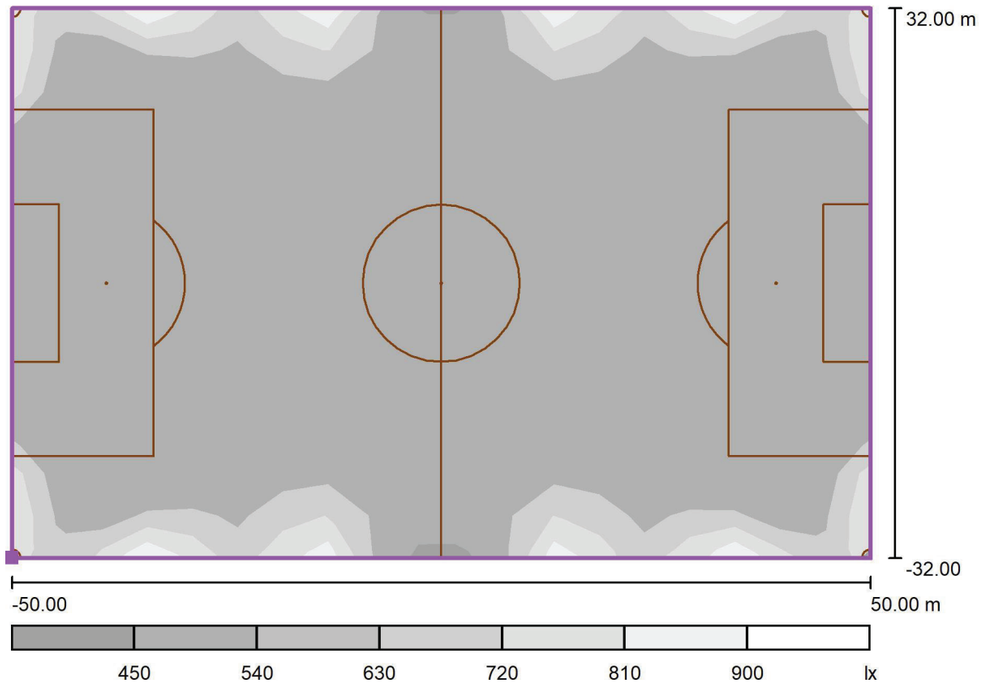
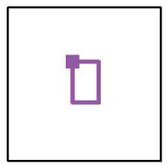
Exterior Scene 1 / Soccer Field 2 Calculation Grid (PA) / Greyscale (E, Horizontal)



Scale 1 : 715

Position of surface in external scene:
Marked point: (-238.625 m,
162.655 m, 1.877 m)



Grid: 19 x 13 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
565	398	845	0.70	0.47

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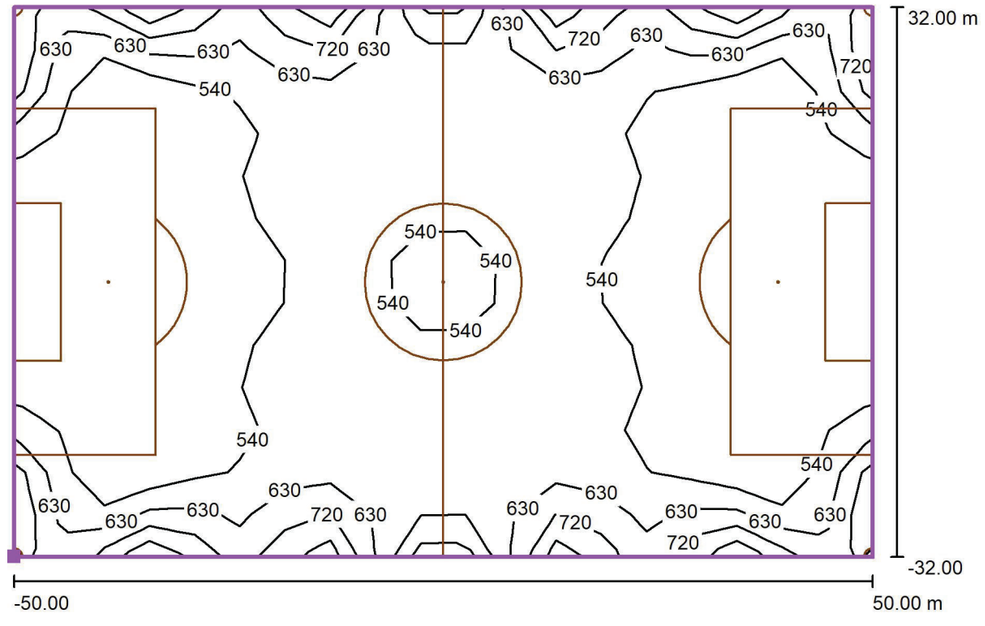
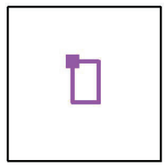
Exterior Scene 1 / Soccer Field 2 Calculation Grid (PA) / Isolines (E, Horizontal)



Values in Lux, Scale 1 : 715

Position of surface in external scene:
Marked point: (-238.625 m, 162.655 m, 1.877 m)



Grid: 19 x 13 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
565	398	845	0.70	0.47

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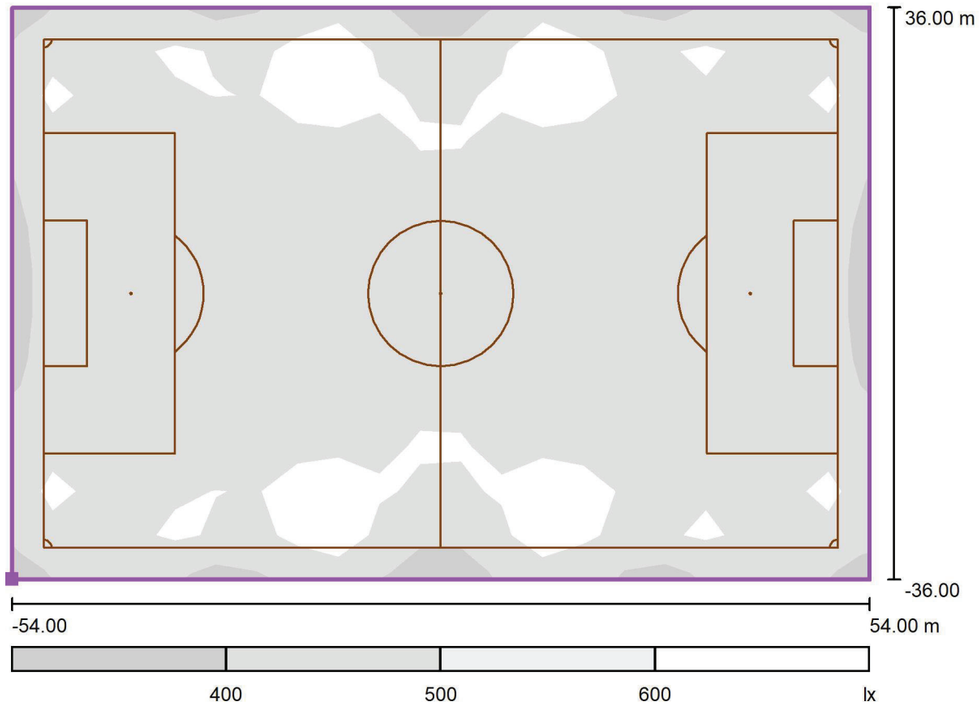
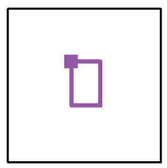
Exterior Scene 1 / Soccer Field 2 Calculation Grid (TA) / Greyscale (E, Horizontal)



Scale 1 : 773

Position of surface in external scene:
Marked point: (-242.625 m,
166.655 m, 1.877 m)



Grid: 21 x 13 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
545	325	823	0.60	0.39

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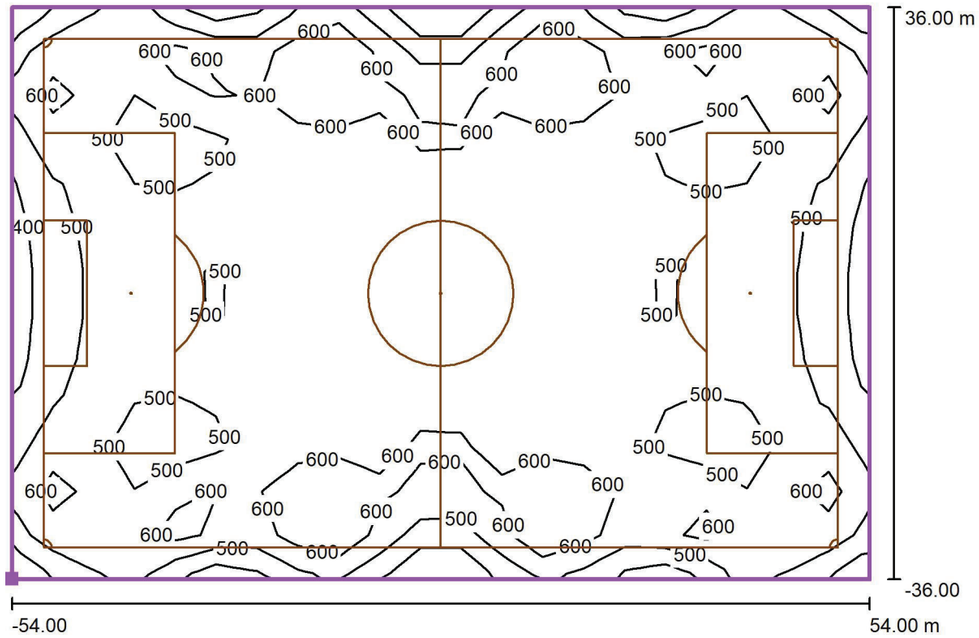
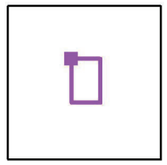
Exterior Scene 1 / Soccer Field 2 Calculation Grid (TA) / Isolines (E, Horizontal)



Values in Lux, Scale 1 : 773

Position of surface in external scene:
Marked point: (-242.625 m,
166.655 m, 1.877 m)



Grid: 21 x 13 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
545	325	823	0.60	0.39

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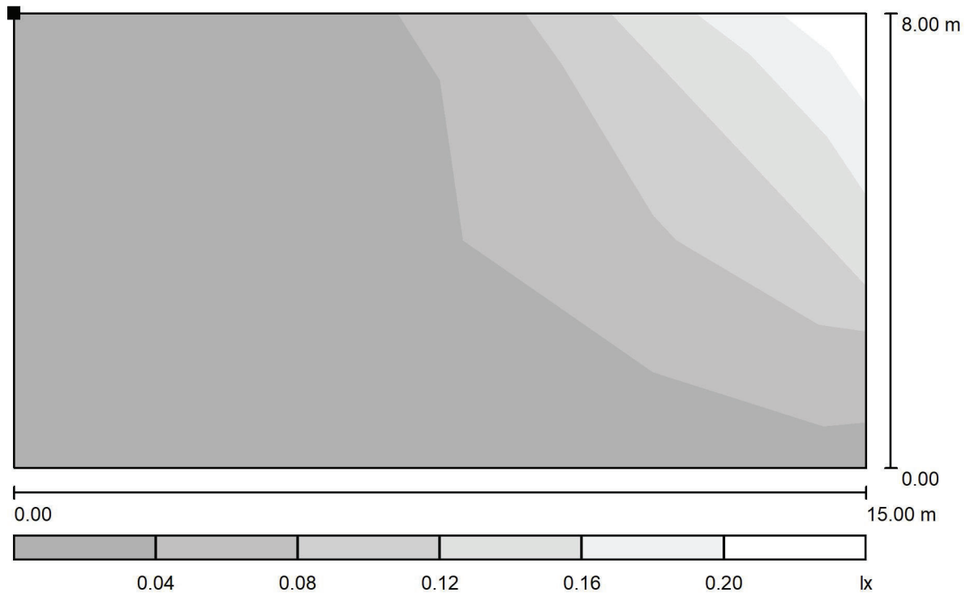
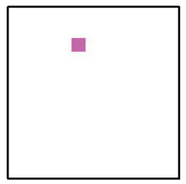
Exterior Scene 1 / Elm View / Greyscale (E, Perpendicular)



Scale 1 : 108

Position of surface in external scene:
Marked point:
(-243.004 m, 213.049 m, 8.151 m)



Grid: 4 x 2 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
0.05	0.03	0.21	0.540	0.128

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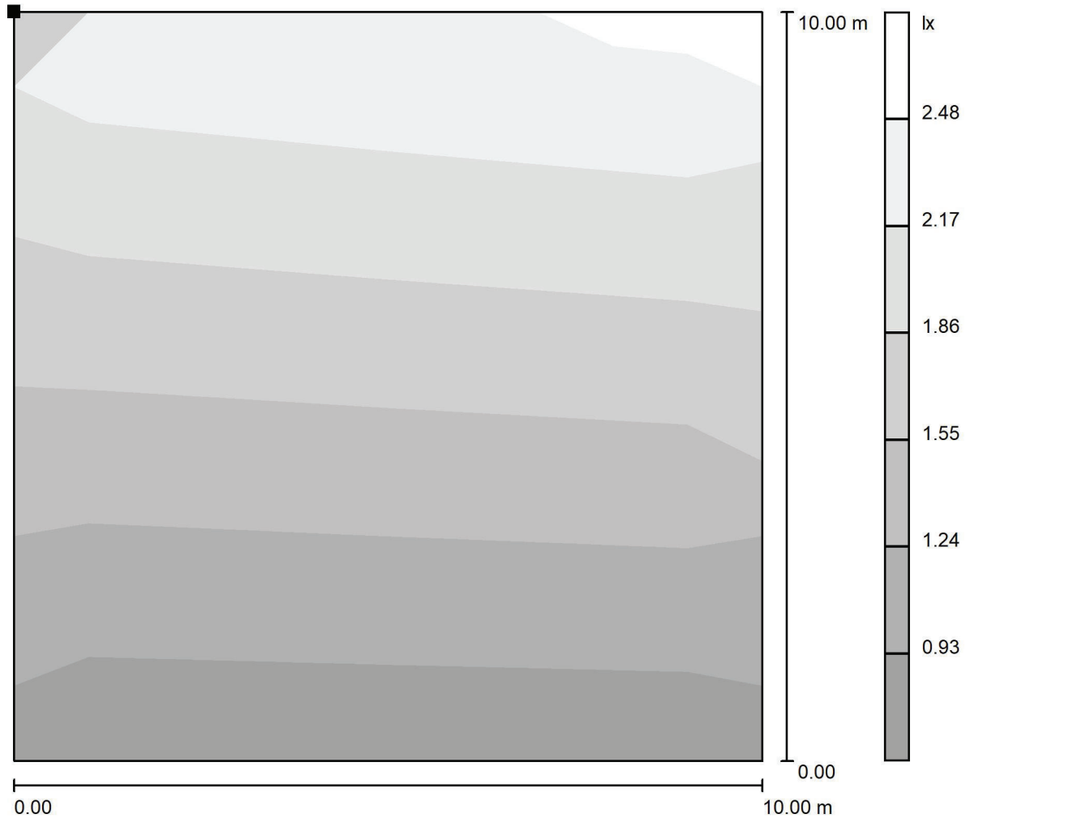
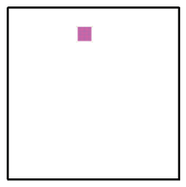
Exterior Scene 1 / The Dell / Greyscale (E, Perpendicular)



Scale 1 : 82

Position of surface in external scene:
Marked point:
(-229.179 m, 238.838 m, 10.020 m)



Grid: 2 x 2 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
1.60	0.88	2.41	0.549	0.364

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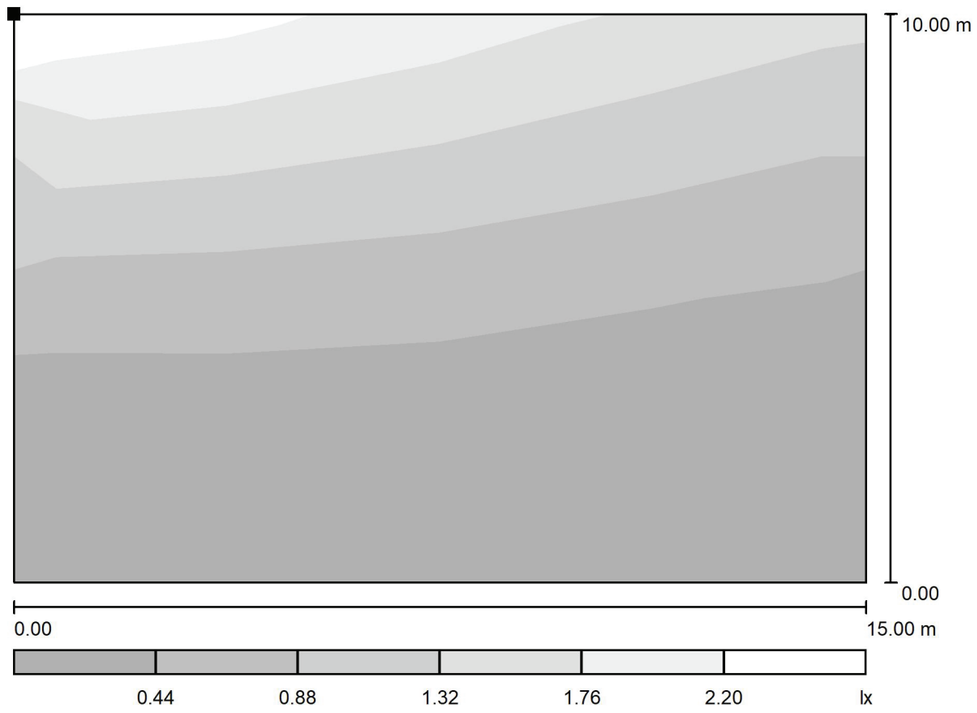
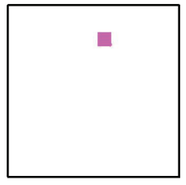
Exterior Scene 1 / Cotswolds / Greyscale (E, Perpendicular)



Scale 1 : 108

Position of surface in external scene:
Marked point:
(-185.379 m, 221.297 m, 10.302 m)



Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
0.70	0.09	2.28	0.126	0.039

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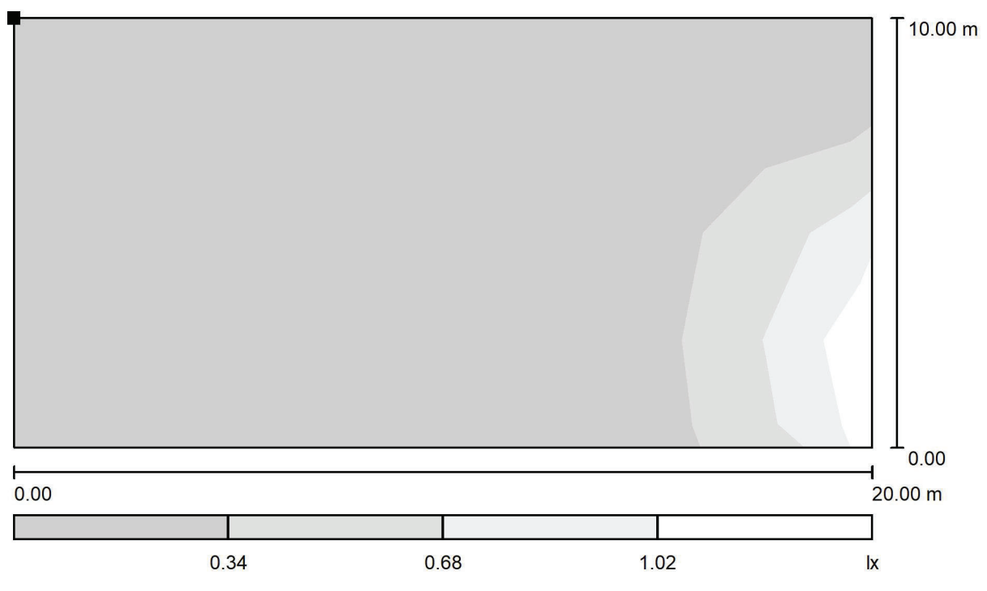
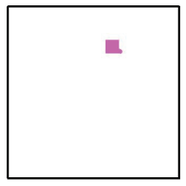
Exterior Scene 1 / Chinthurst / Greyscale (E, Perpendicular)



Scale 1 : 143

Position of surface in external scene:
Marked point:
(-168.452 m, 207.935 m, 9.808 m)



Grid: 8 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
0.16	0.05	1.73	0.321	0.029

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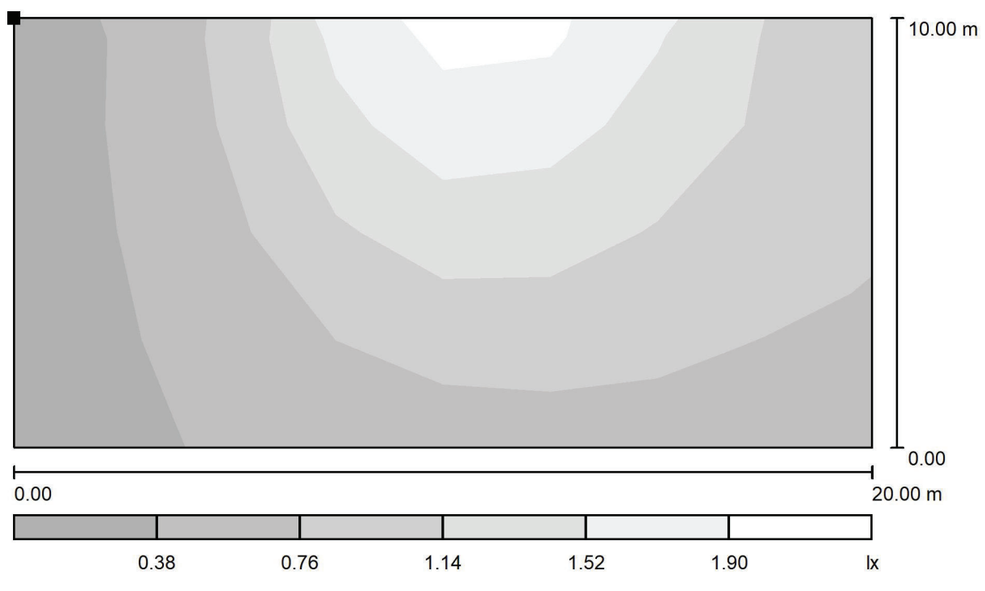
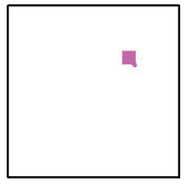
Exterior Scene 1 / 9-12 / Greyscale (E, Perpendicular)



Scale 1 : 143

Position of surface in external scene:
Marked point:
(-131.178 m, 181.297 m, 10.302 m)



Grid: 8 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
0.95	0.30	2.21	0.312	0.133

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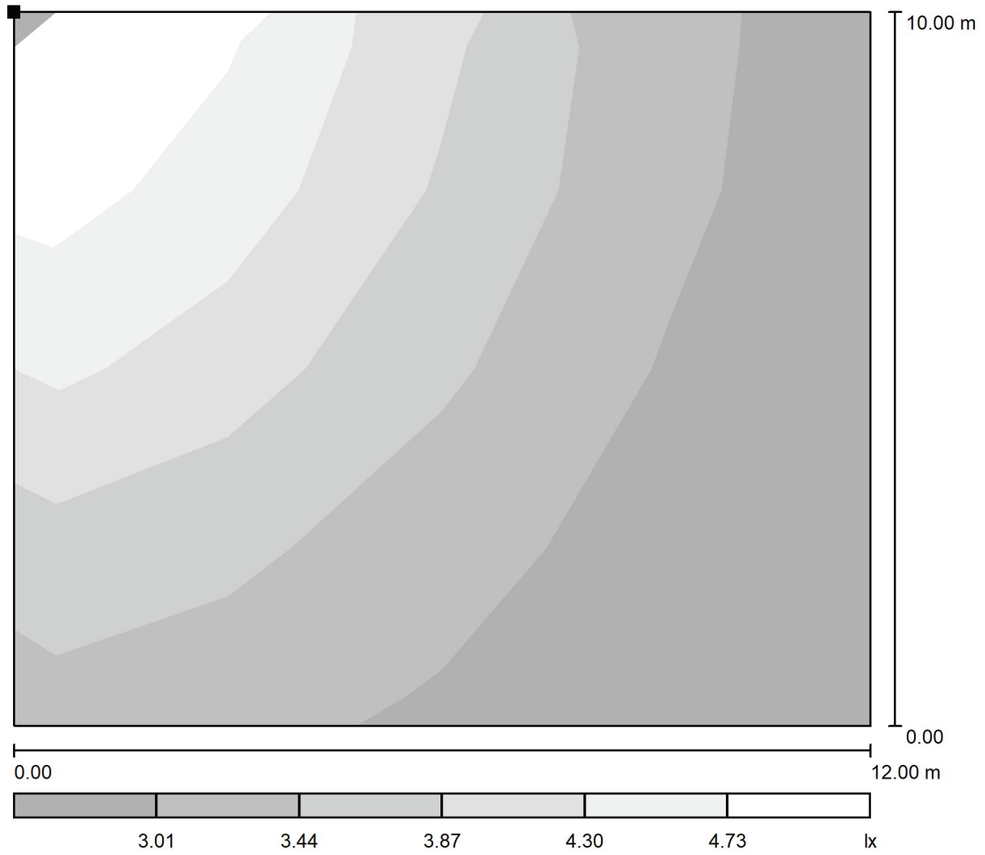
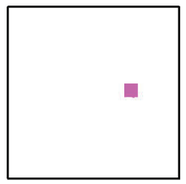
Exterior Scene 1 / Pond House / Greyscale (E, Perpendicular)



Scale 1 : 86

Position of surface in external scene:
Marked point:
(-126.233 m, 111.658 m, 10.302 m)



Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
3.51	2.70	4.86	0.769	0.555

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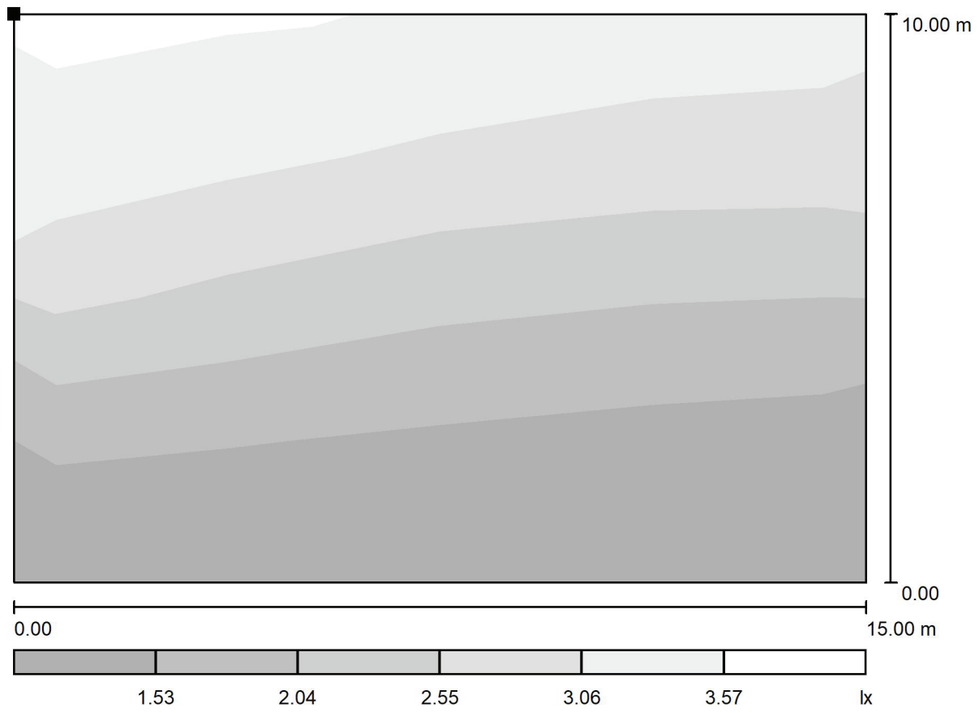
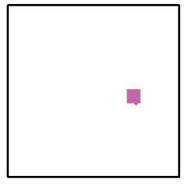
Exterior Scene 1 / Kingfield Cottage / Greyscale (E, Perpendicular)



Scale 1 : 108

Position of surface in external scene:
Marked point:
(-120.568 m, 95.185 m, 10.302 m)



Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
2.24	1.15	3.68	0.512	0.311

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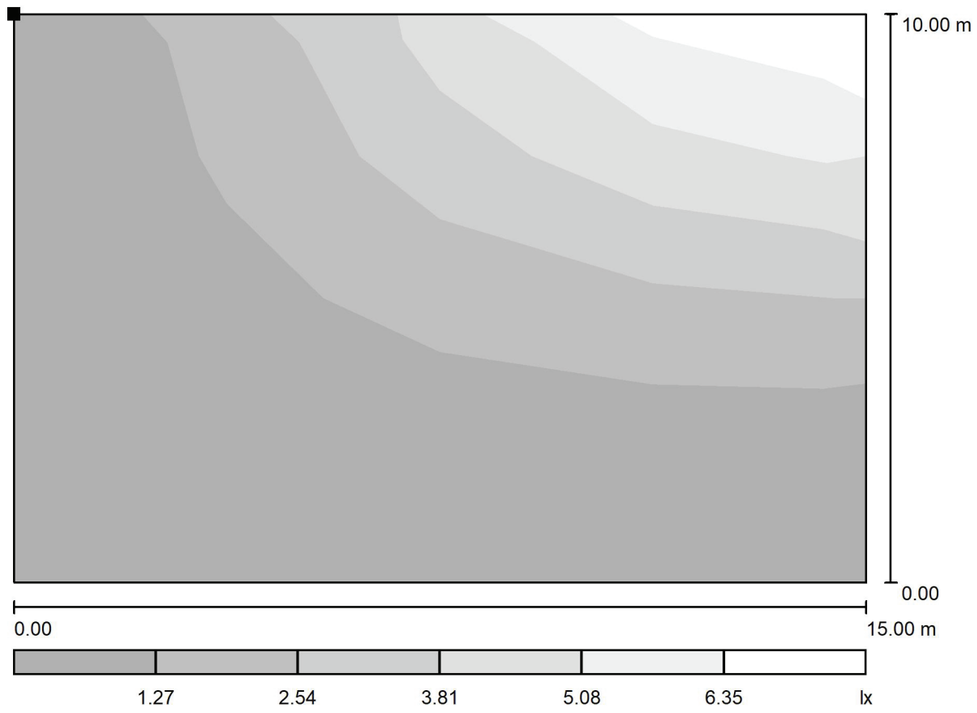
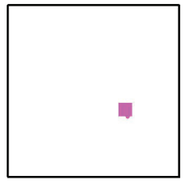
Exterior Scene 1 / The Cedars / Greyscale (E, Perpendicular)



Scale 1 : 108

Position of surface in external scene:
Marked point:
(-139.123 m, 65.347 m, 10.302 m)



Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
1.76	0.19	6.53	0.108	0.029

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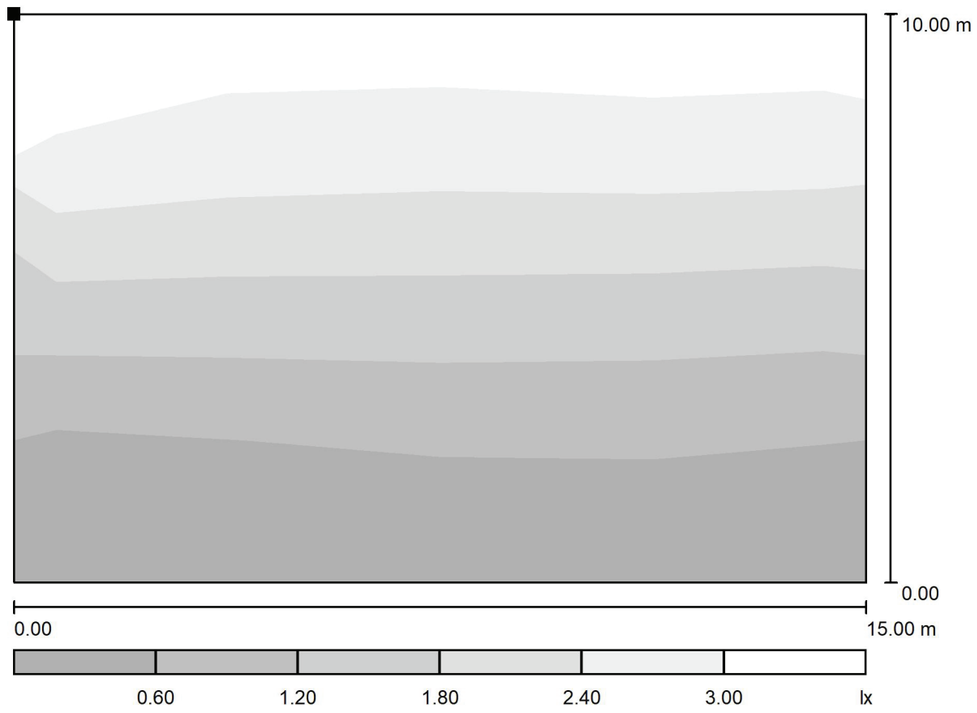
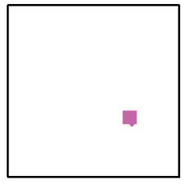
Exterior Scene 1 / Nut Cottage / Greyscale (E, Perpendicular)



Scale 1 : 108

Position of surface in external scene:
Marked point:
(-129.283 m, 47.969 m, 10.302 m)



Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
1.67	0.30	3.31	0.179	0.090

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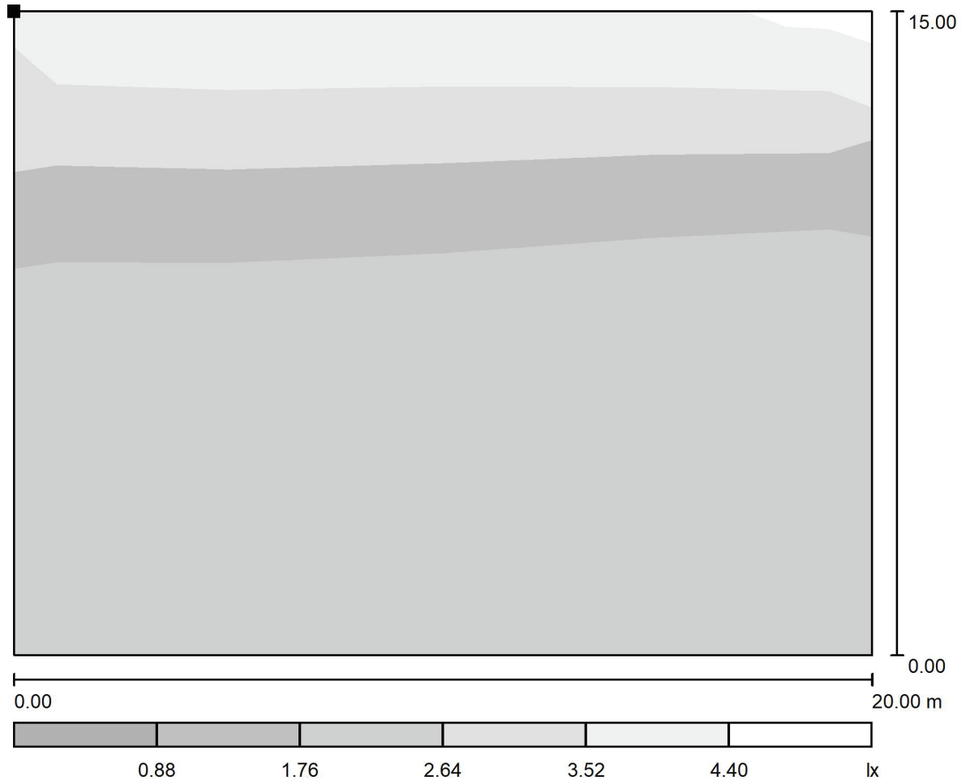
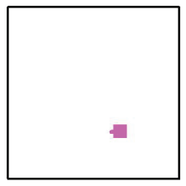
Exterior Scene 1 / Block 5 1 / Greyscale (E, Perpendicular)



Scale 1 : 143

Position of surface in external scene:
Marked point:
(-150.520 m, 21.346 m, 16.156 m)



Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
1.38	0.10	4.52	0.075	0.023

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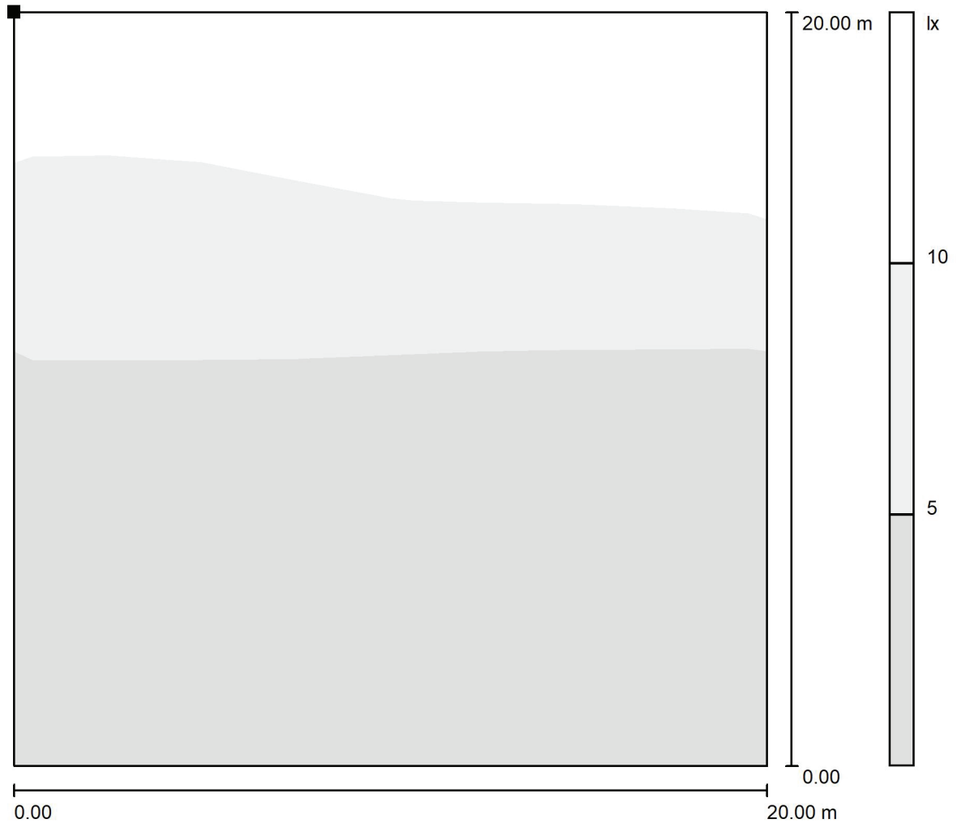
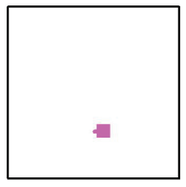
Exterior Scene 1 / Block 5 2 / Greyscale (E, Perpendicular)



Scale 1 : 163

Position of surface in external scene:
Marked point:
(-188.047 m, 21.404 m, 21.789 m)



Grid: 8 x 8 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
4.82	0.11	11	0.024	0.010

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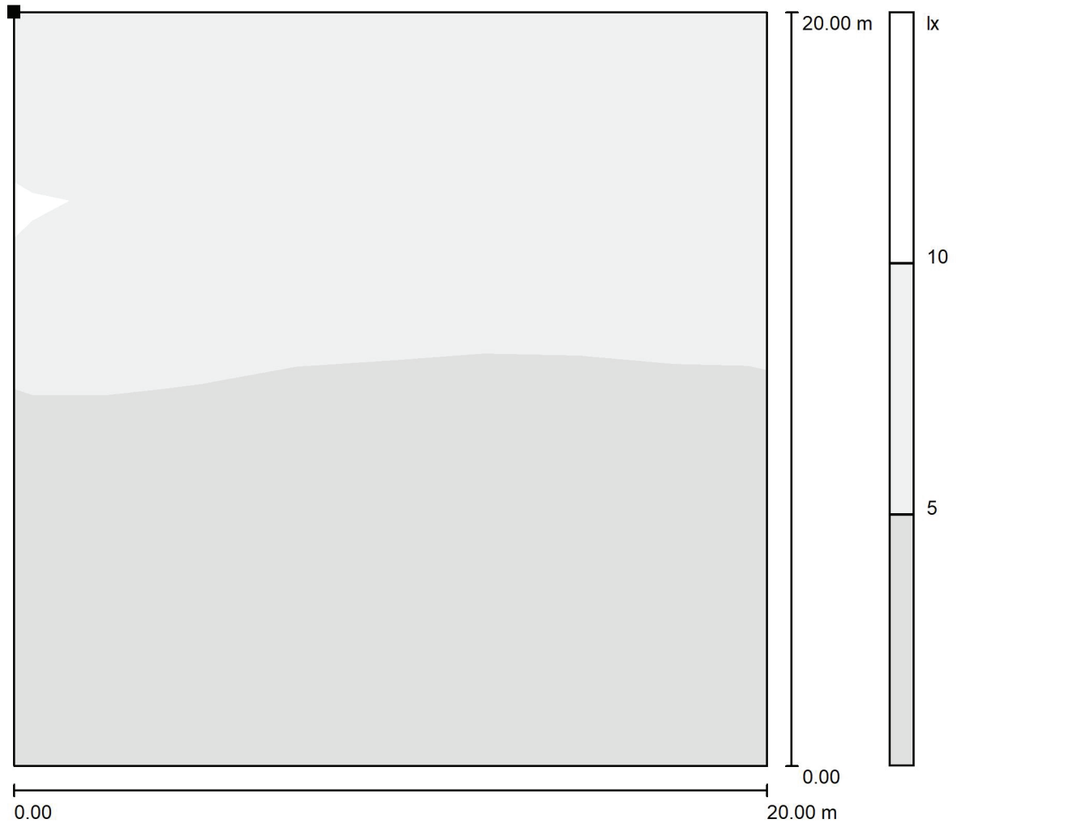
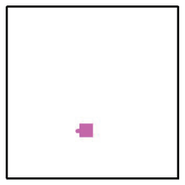
Exterior Scene 1 / Block 4 1 / Greyscale (E, Perpendicular)



Scale 1 : 163

Position of surface in external scene:
Marked point:
(-223.561 m, 22.366 m, 23.717 m)



Grid: 8 x 8 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
4.56	0.15	11	0.033	0.013

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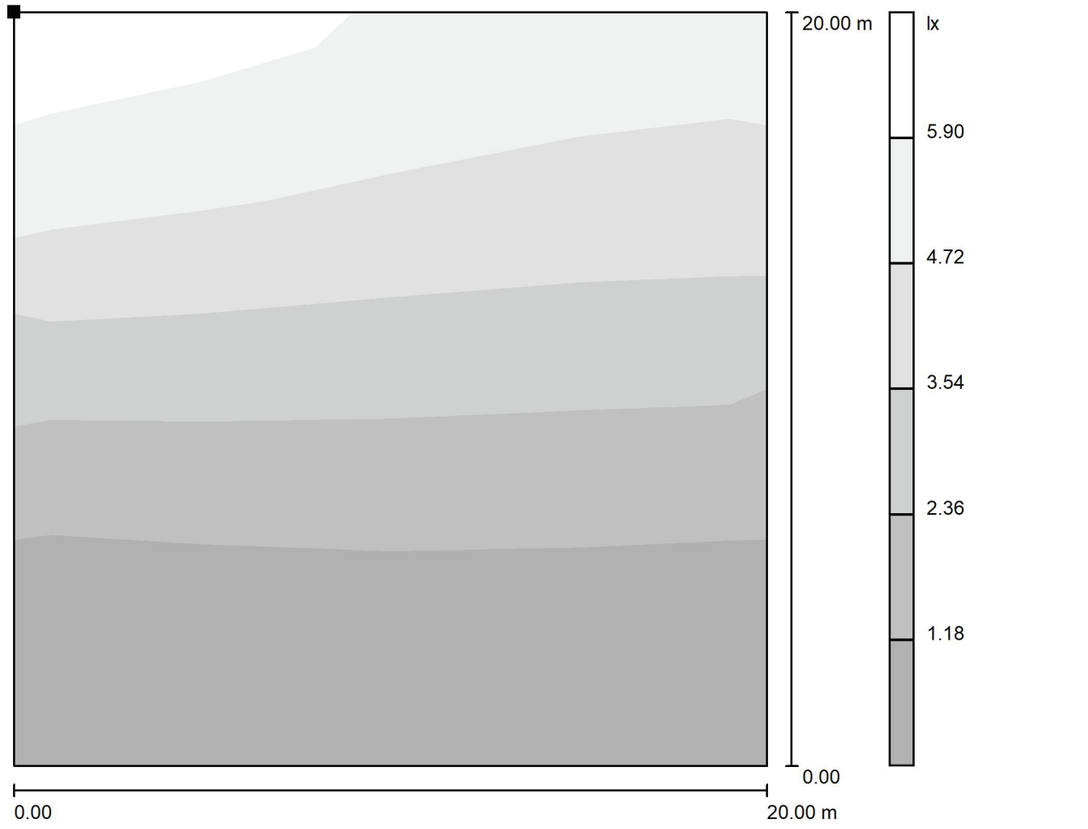
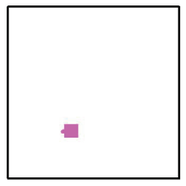
e-Mail

Exterior Scene 1 / Block 4 2 / Greyscale (E, Perpendicular)



Scale 1 : 163

Position of surface in external scene:
Marked point:
(-259.230 m, 21.164 m, 21.428 m)



Grid: 4 x 4 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
2.73	0.32	6.22	0.116	0.051

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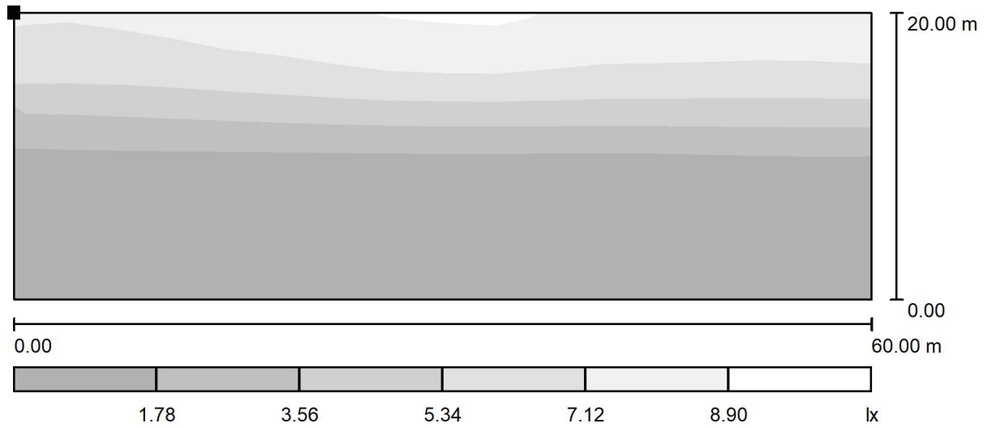
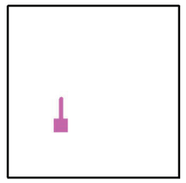
Exterior Scene 1 / Block 3 / Greyscale (E, Perpendicular)



Scale 1 : 429

Position of surface in external scene:
Marked point:
(-282.102 m, 31.887 m, 19.473 m)



Grid: 16 x 8 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
3.03	0.07	8.97	0.024	0.008

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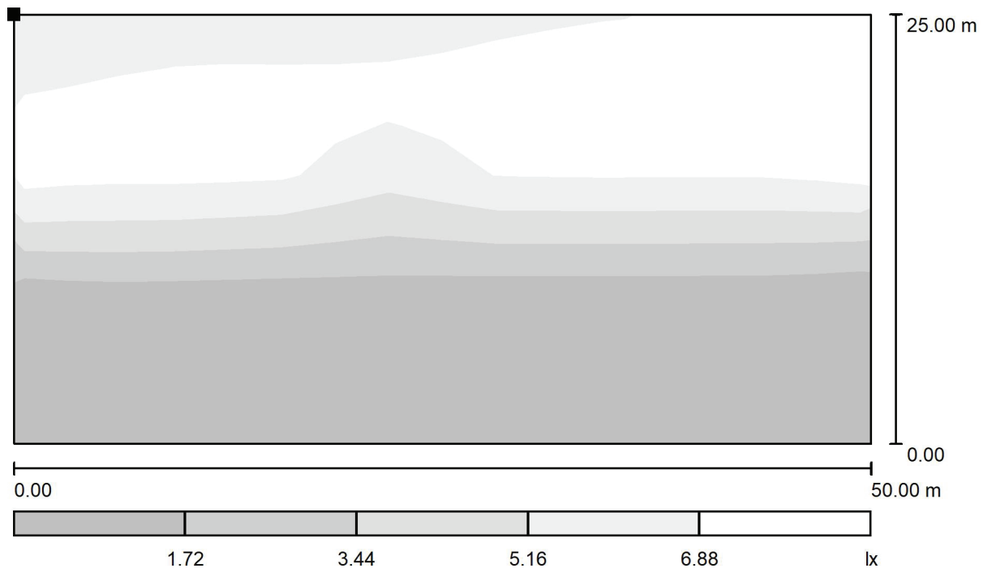
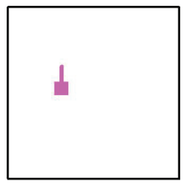
e-Mail

Exterior Scene 1 / Block 2 / Greyscale (E, Perpendicular)



Scale 1 : 358

Position of surface in external scene:
Marked point:
(-281.167 m, 116.237 m, 24.101 m)



Grid: 16 x 8 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
3.88	0.12	8.69	0.030	0.013

Annex 7: Detailed Solar Glare Analysis

Fig. 1: Site Plan

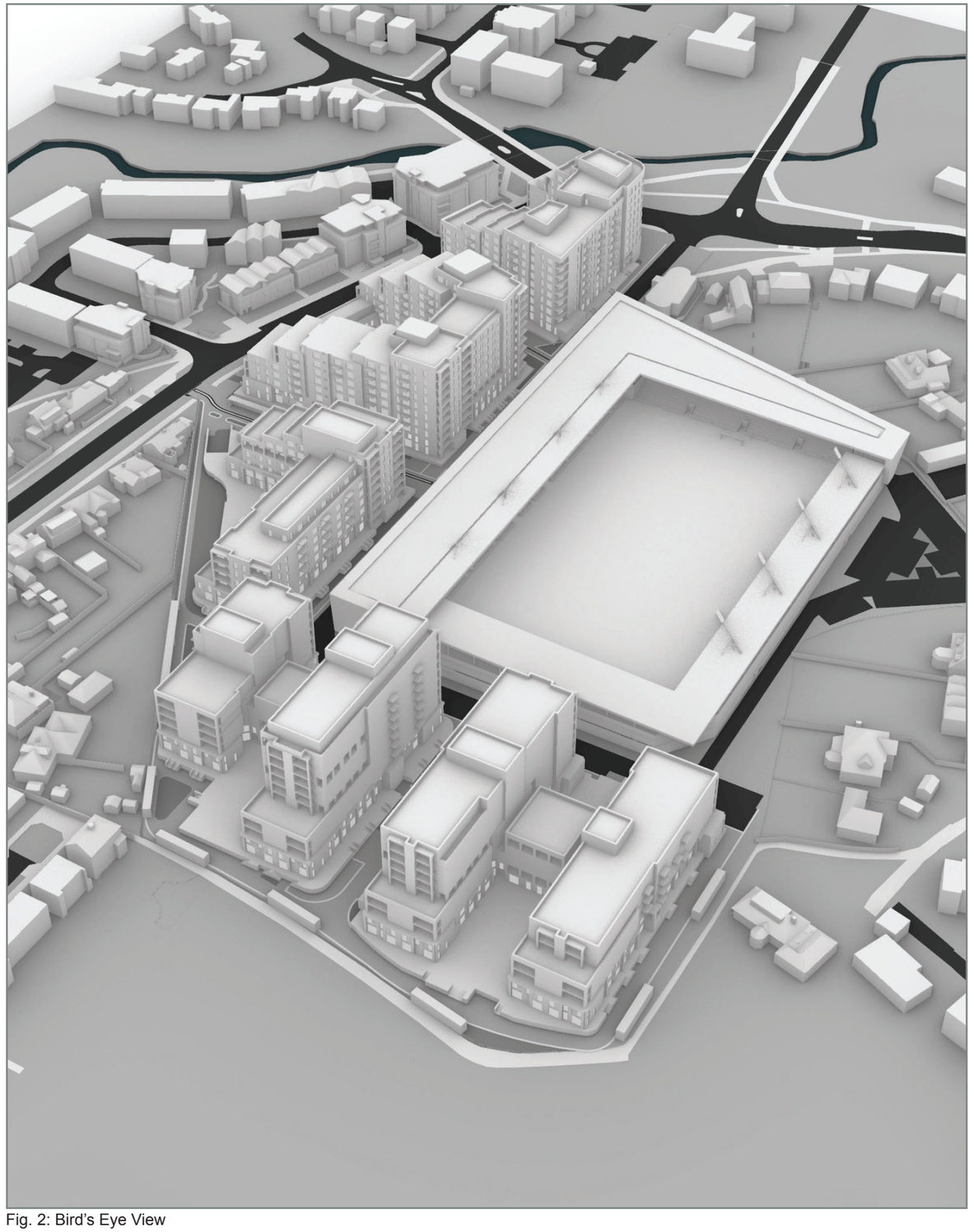


Fig. 2: Bird's Eye View

Site Overview and Viewpoint Location

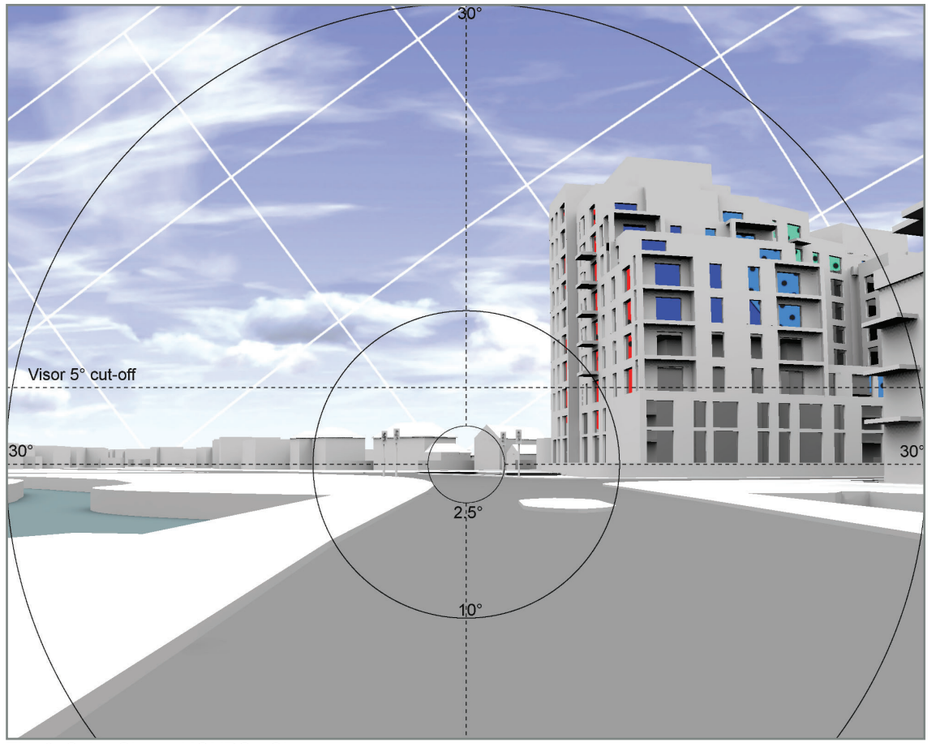


Fig. 3: Solar Glare - HOURS - Close-up

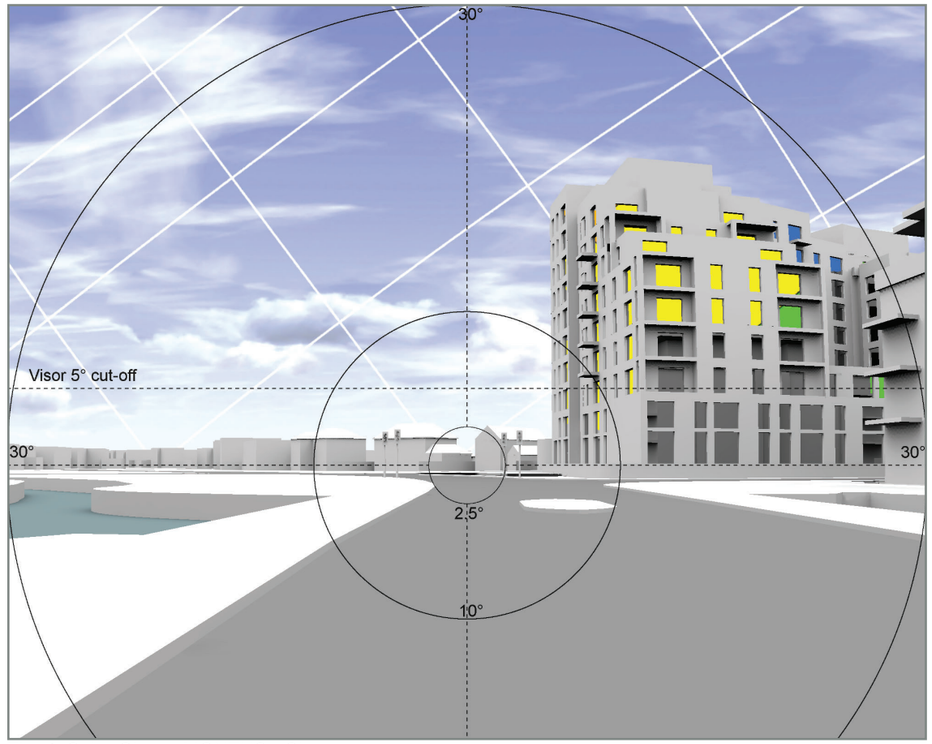


Fig. 4: Solar Glare - MONTHS - Close-up

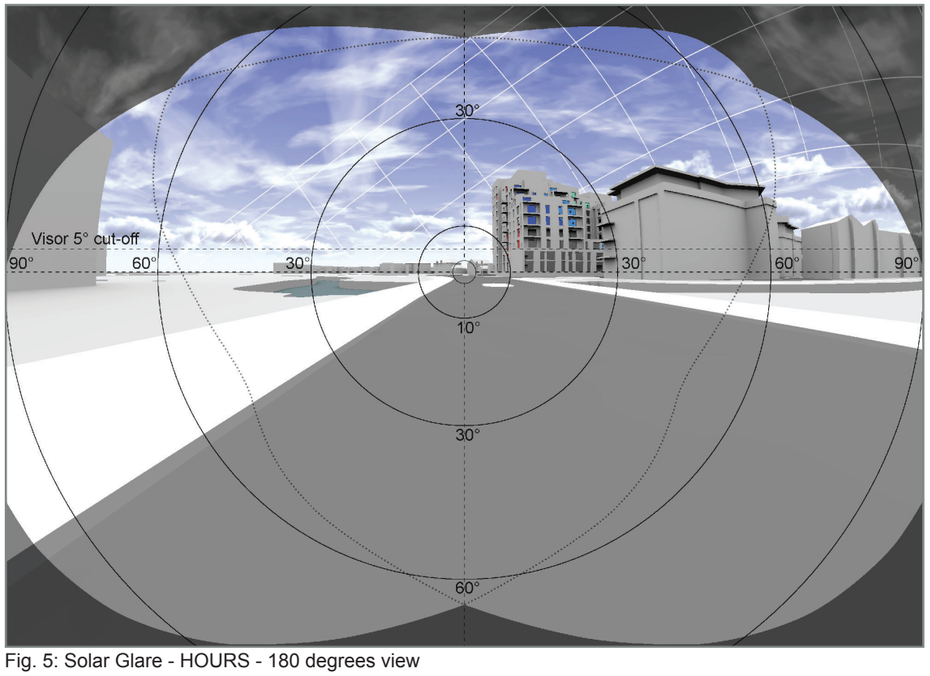
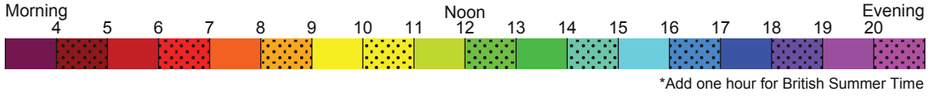


Fig. 5: Solar Glare - HOURS - 180 degrees view



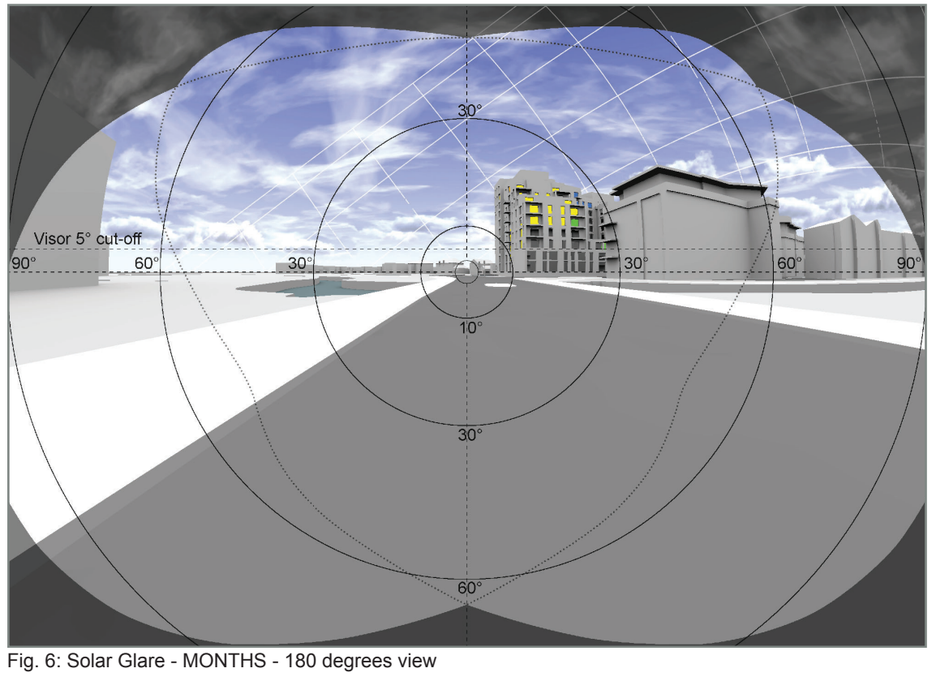
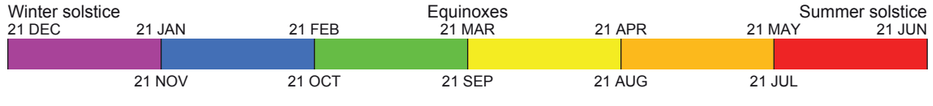


Fig. 6: Solar Glare - MONTHS - 180 degrees view



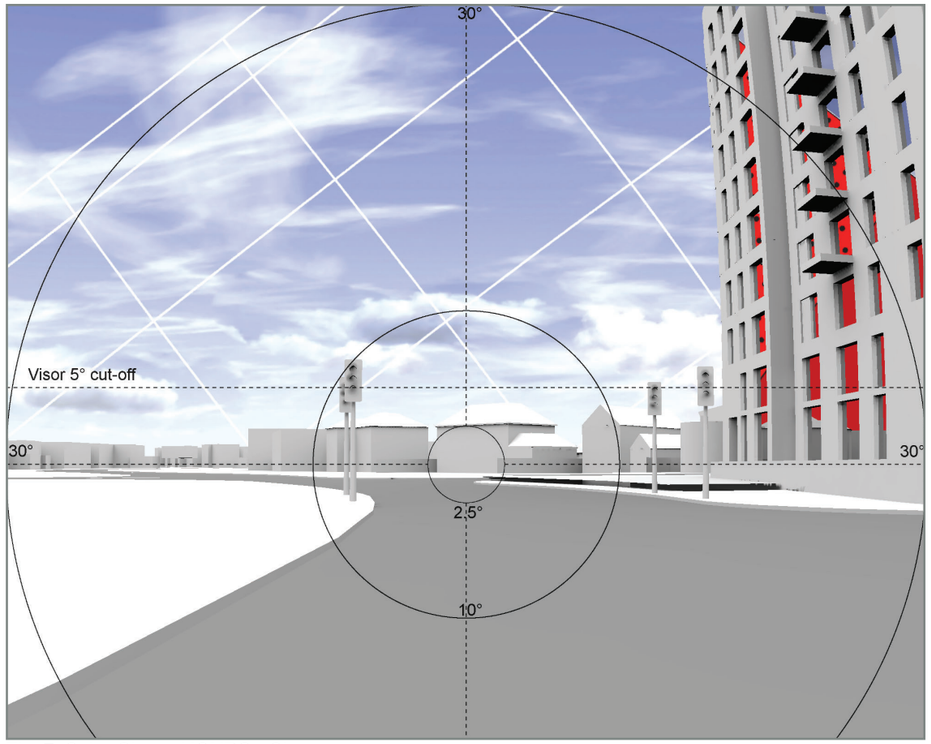


Fig. 7: Solar Glare - HOURS - Close-up

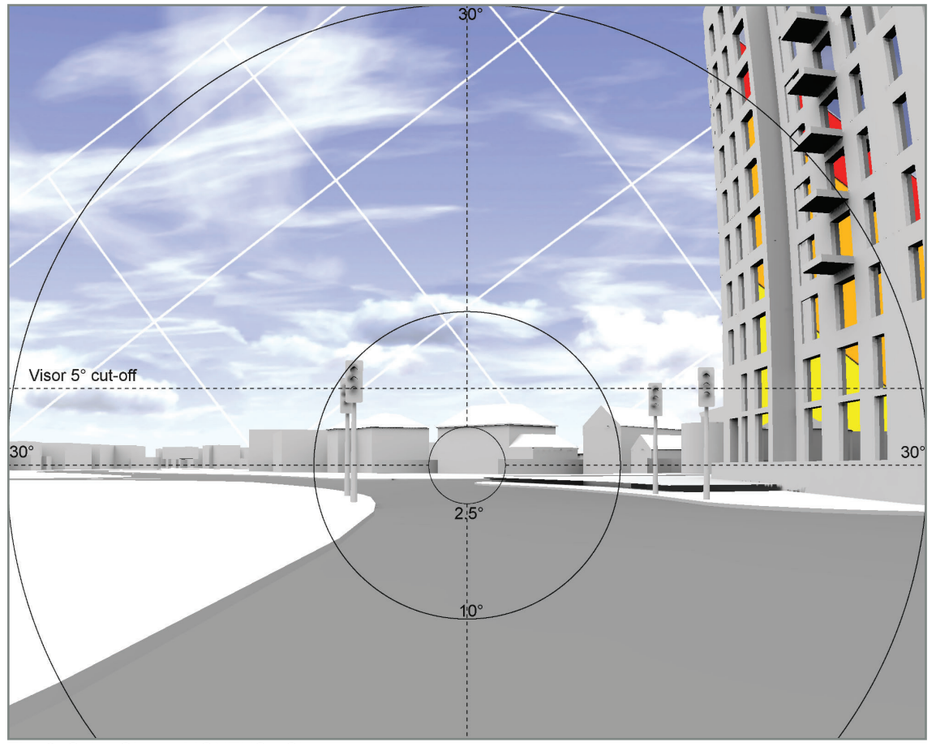


Fig. 8: Solar Glare - MONTHS - Close-up

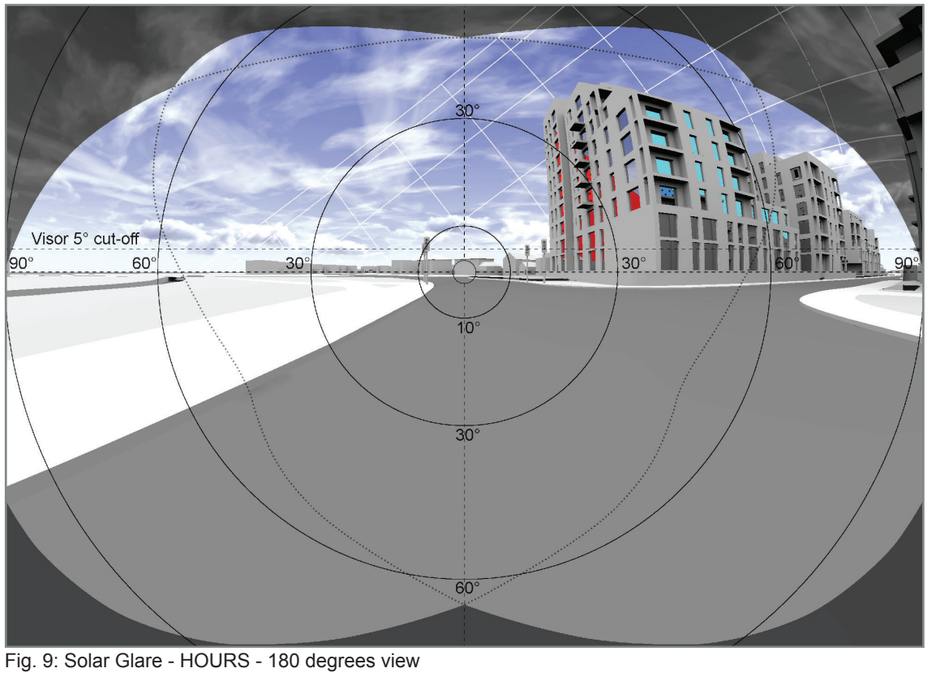
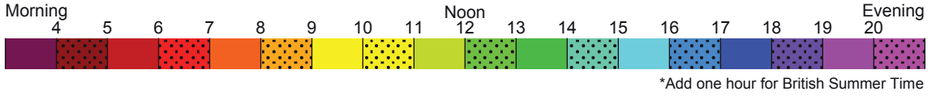


Fig. 9: Solar Glare - HOURS - 180 degrees view



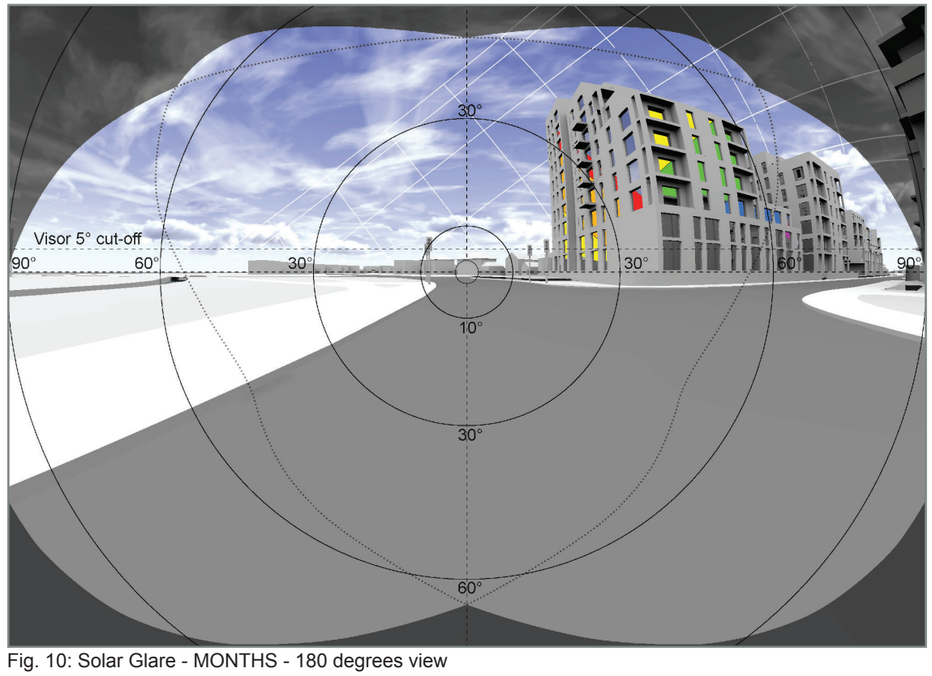
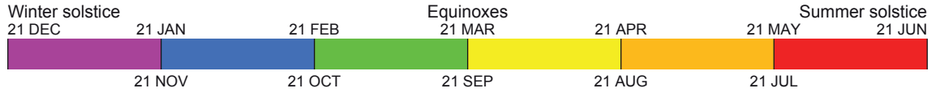


Fig. 10: Solar Glare - MONTHS - 180 degrees view



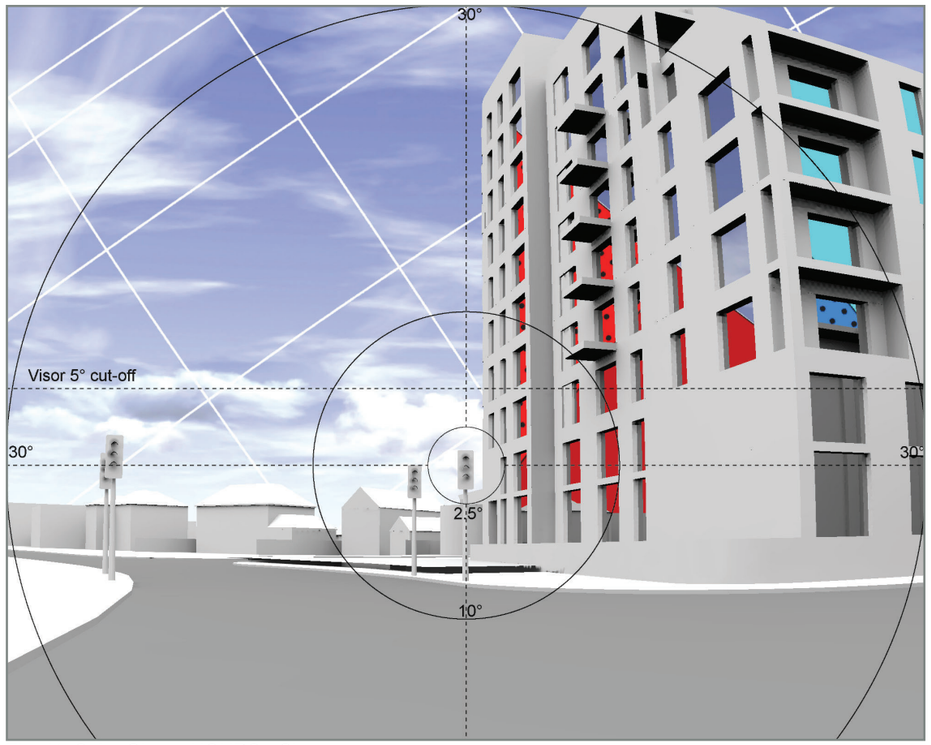


Fig. 11: Solar Glare - HOURS - Close-up

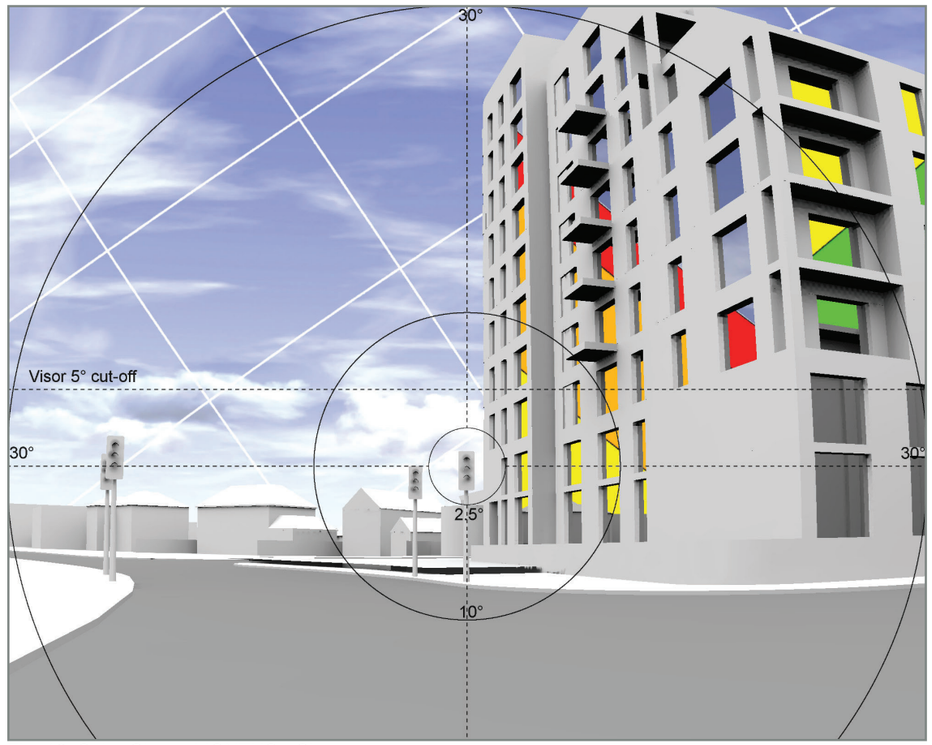


Fig. 12: Solar Glare - MONTHS - Close-up

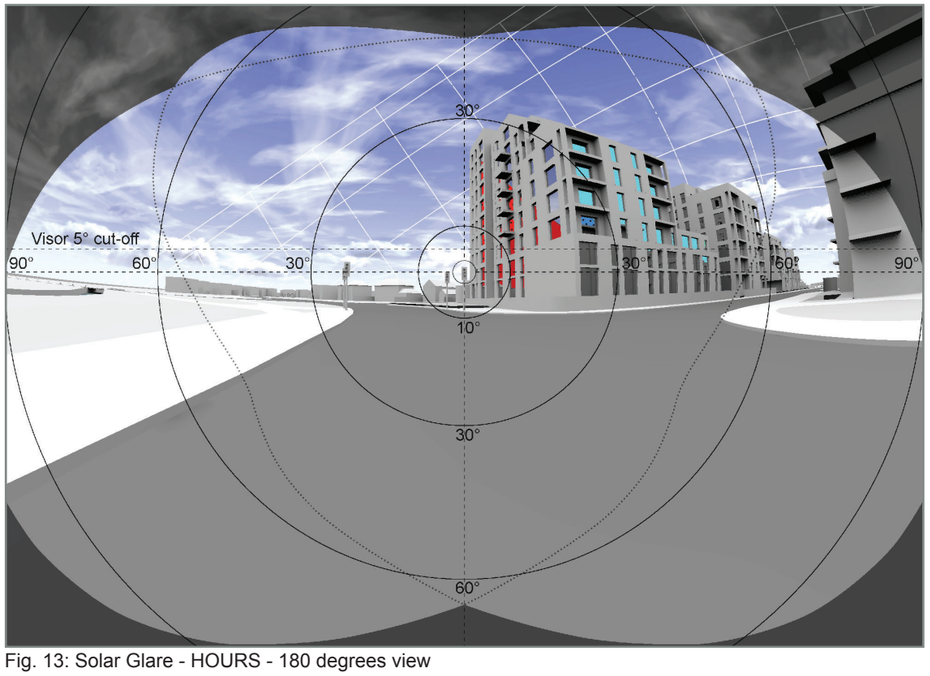
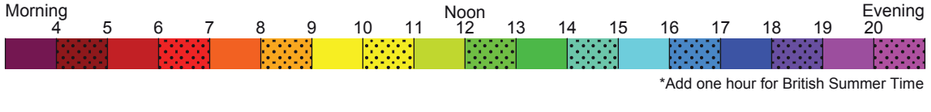


Fig. 13: Solar Glare - HOURS - 180 degrees view



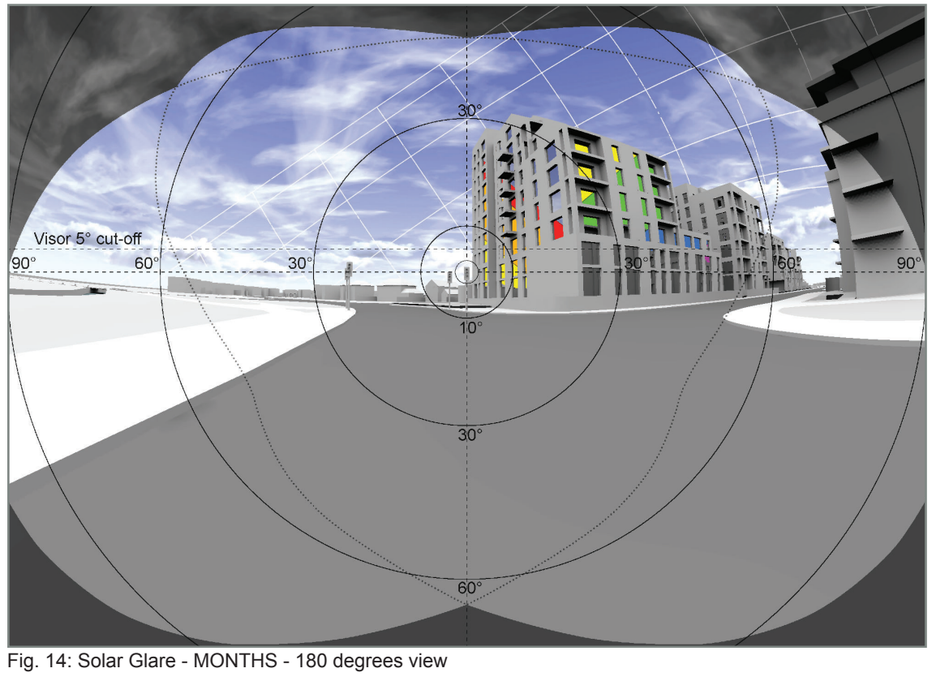
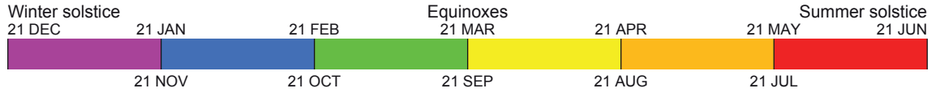


Fig. 14: Solar Glare - MONTHS - 180 degrees view



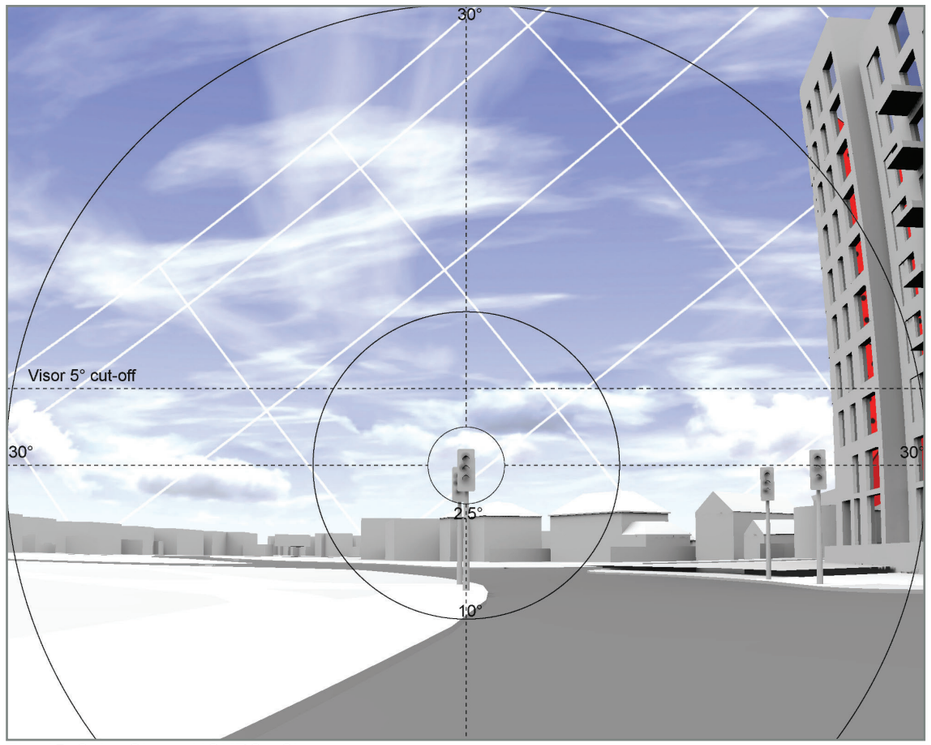


Fig. 15: Solar Glare - HOURS - Close-up

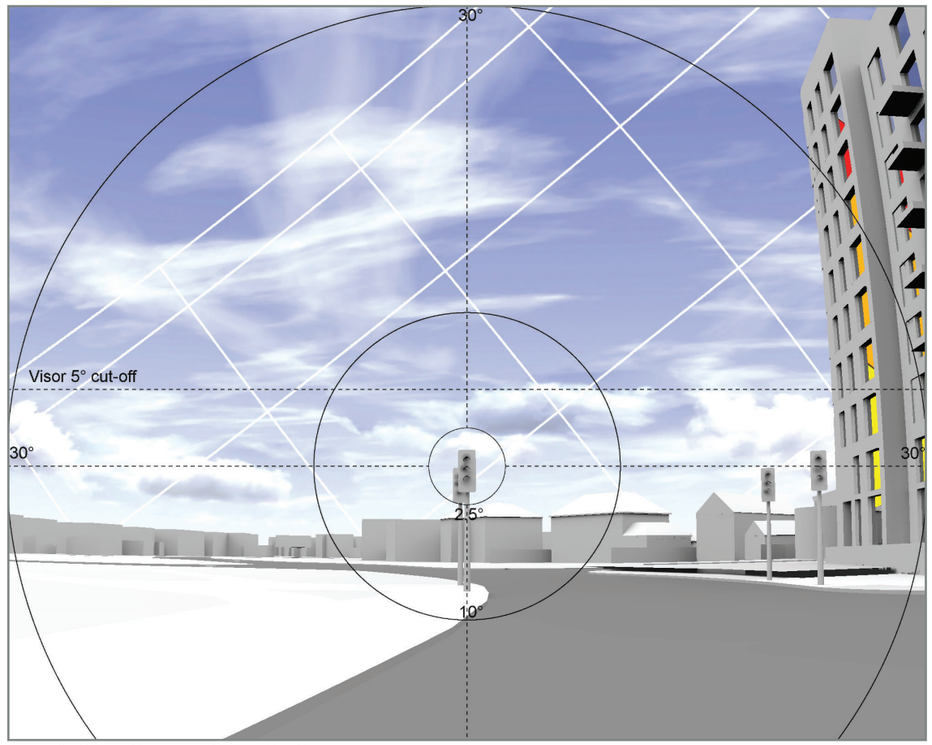


Fig. 16: Solar Glare - MONTHS - Close-up

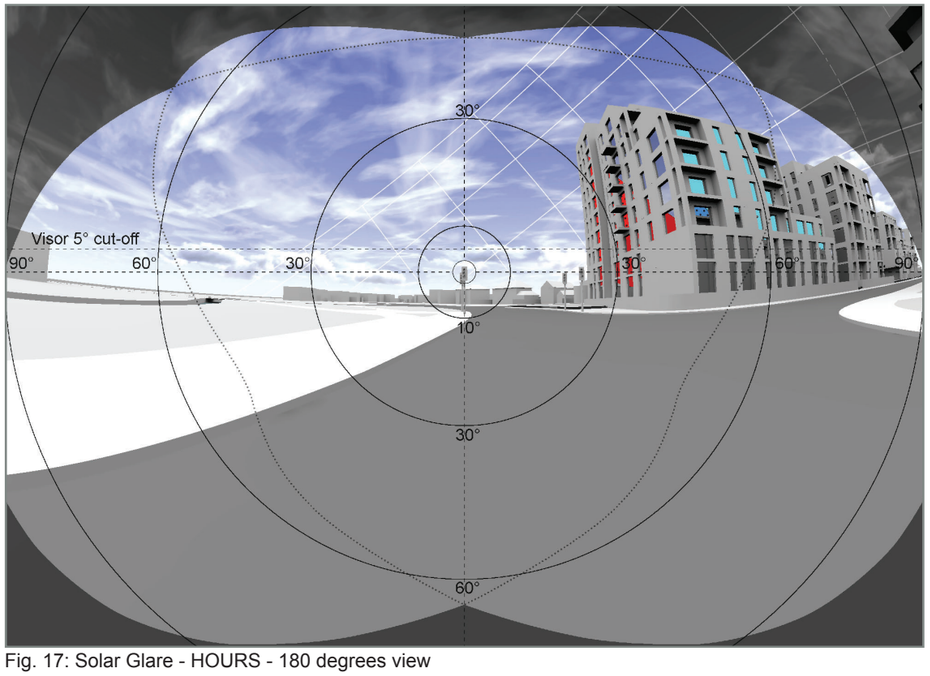
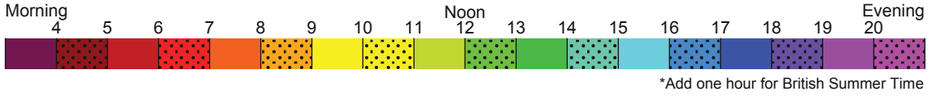


Fig. 17: Solar Glare - HOURS - 180 degrees view



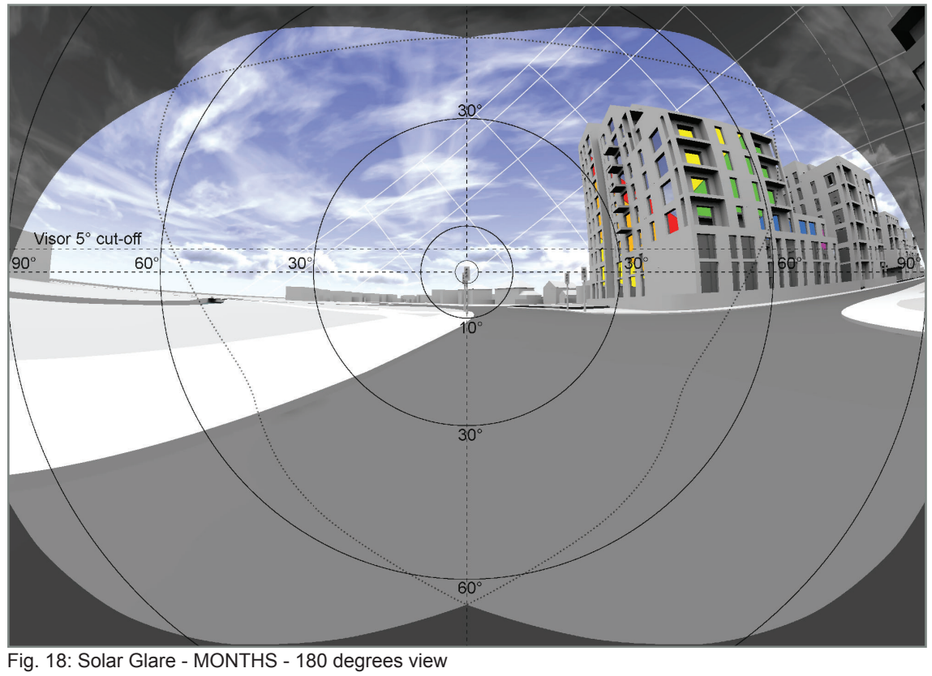
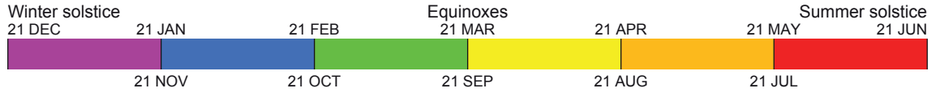


Fig. 18: Solar Glare - MONTHS - 180 degrees view



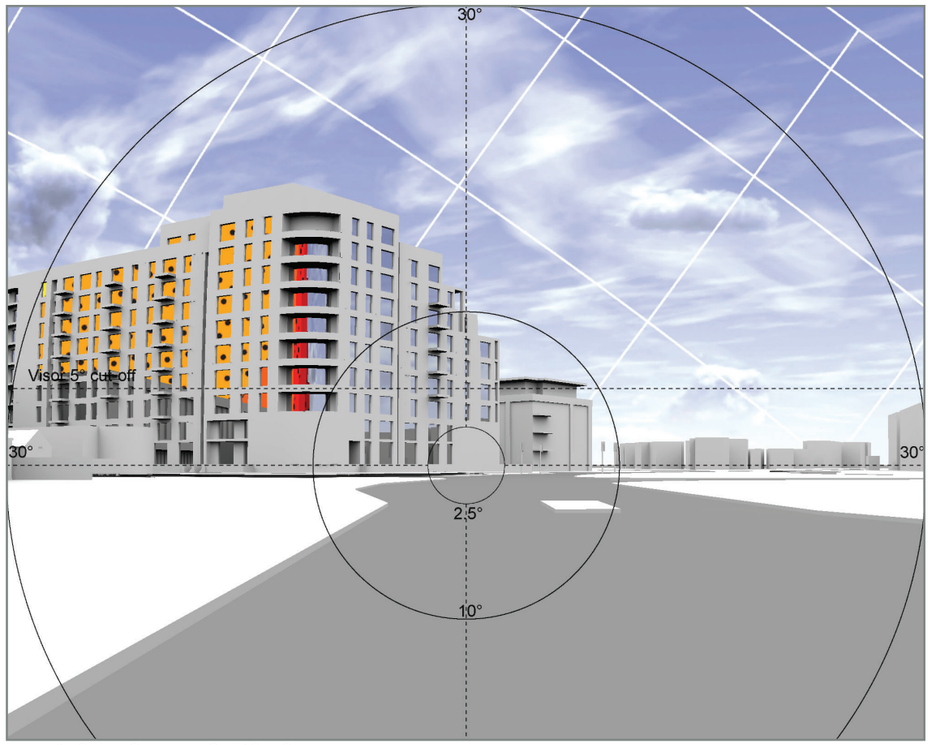


Fig. 19: Solar Glare - HOURS - Close-up

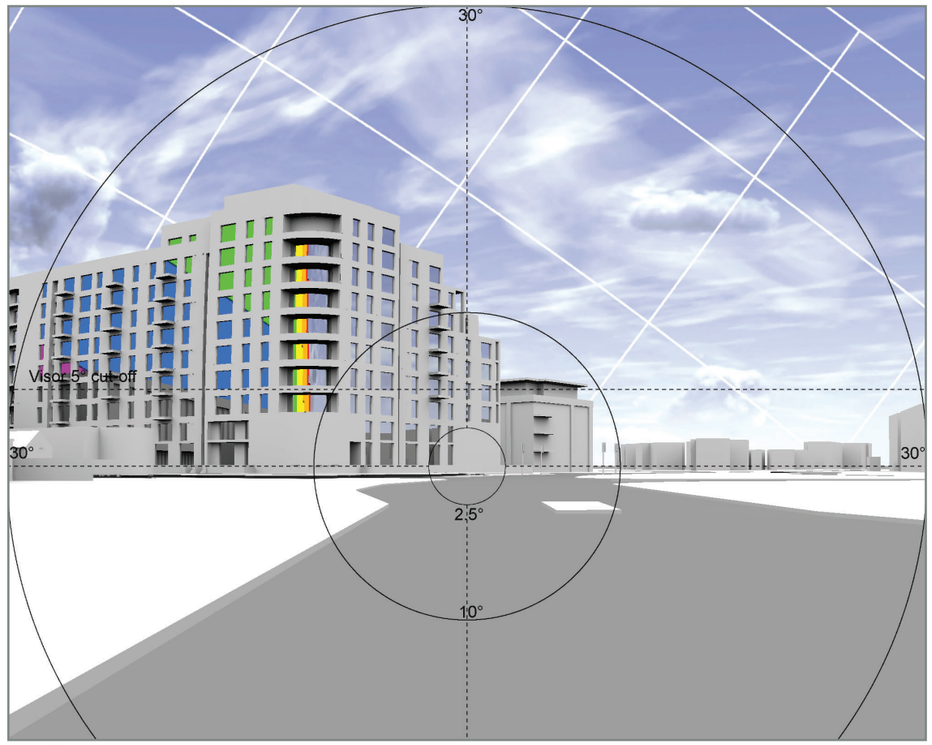


Fig. 20: Solar Glare - MONTHS - Close-up

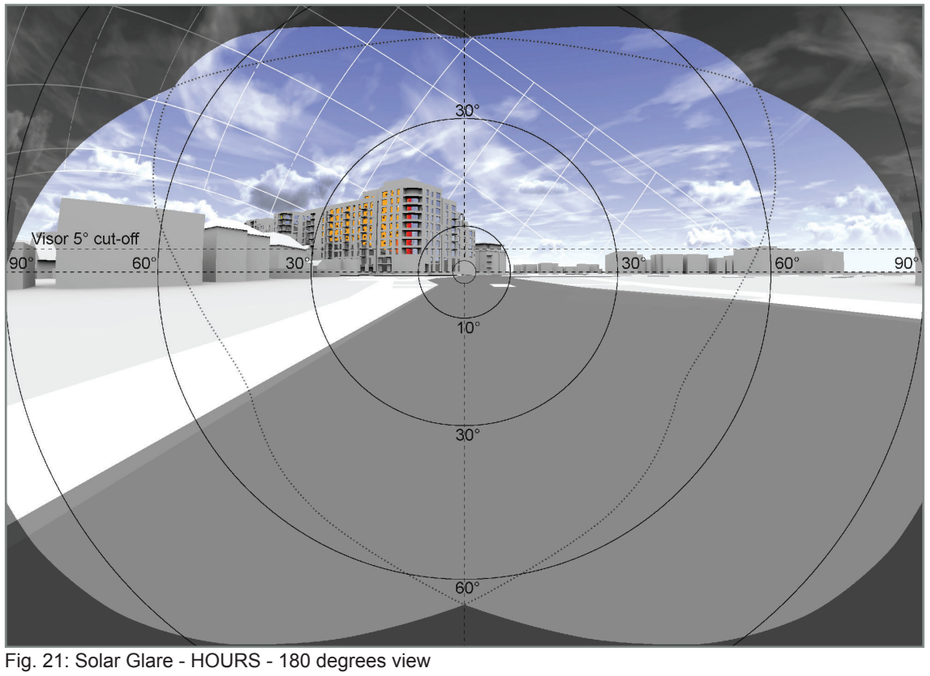
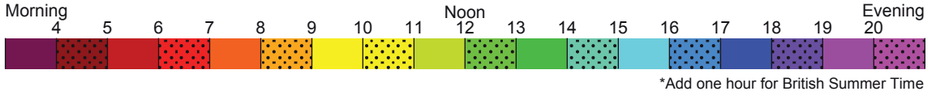


Fig. 21: Solar Glare - HOURS - 180 degrees view



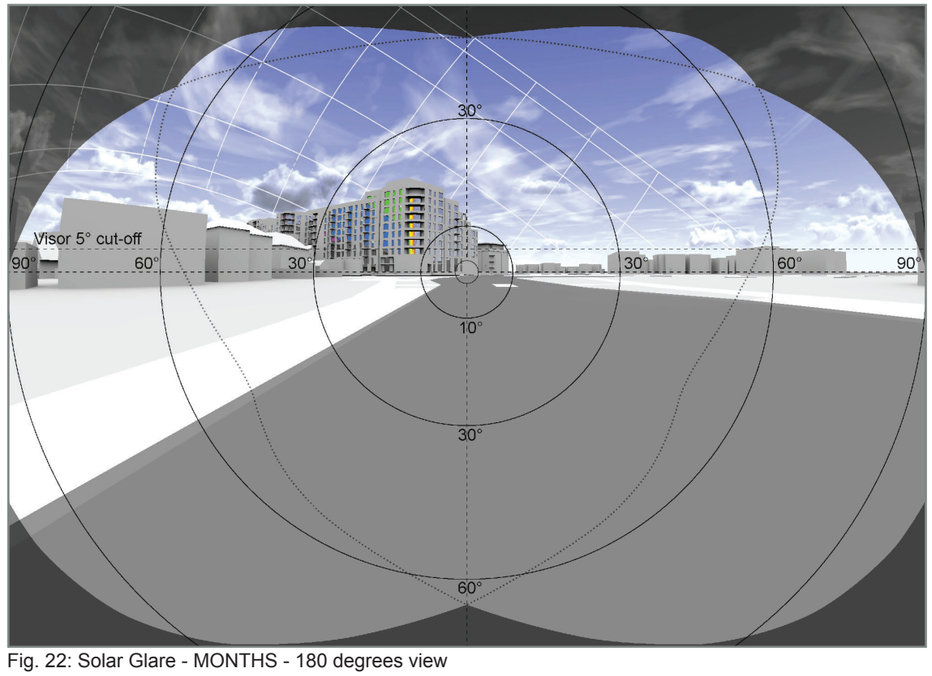
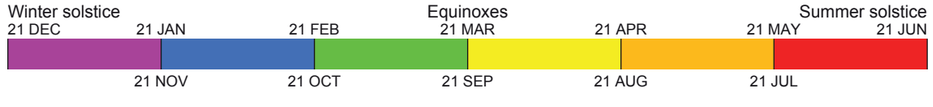


Fig. 22: Solar Glare - MONTHS - 180 degrees view



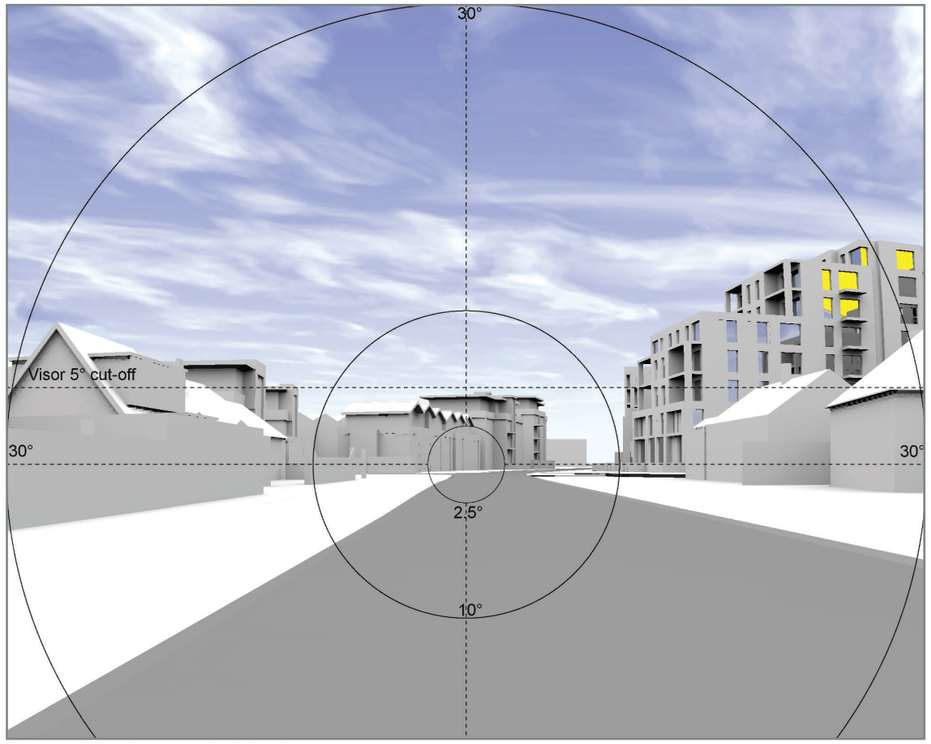


Fig. 23: Solar Glare - HOURS - Close-up

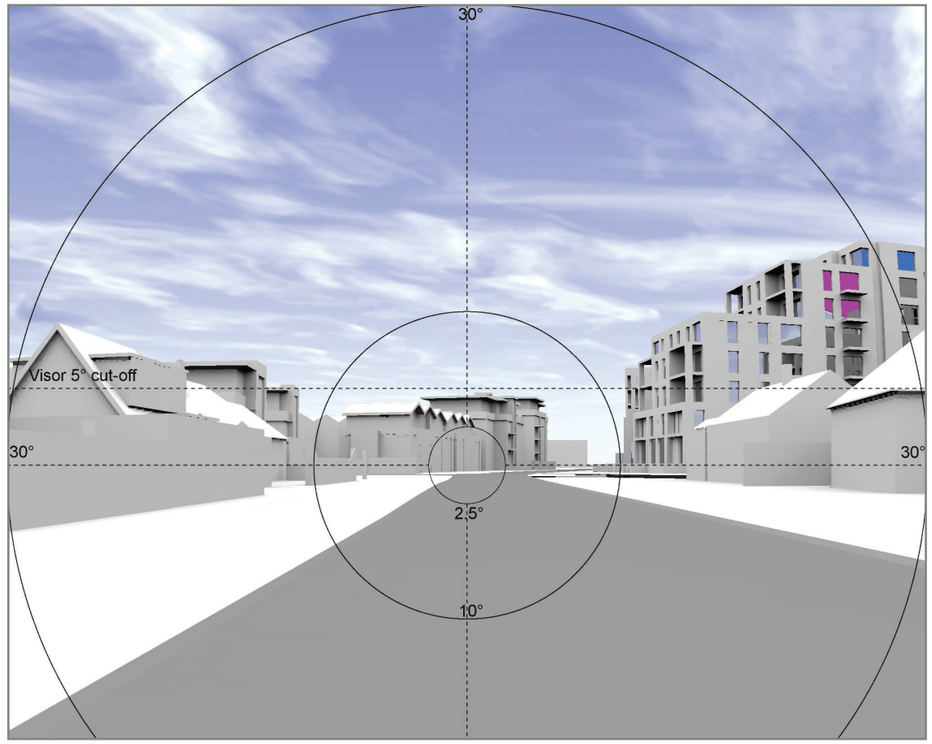


Fig. 24: Solar Glare - MONTHS - Close-up

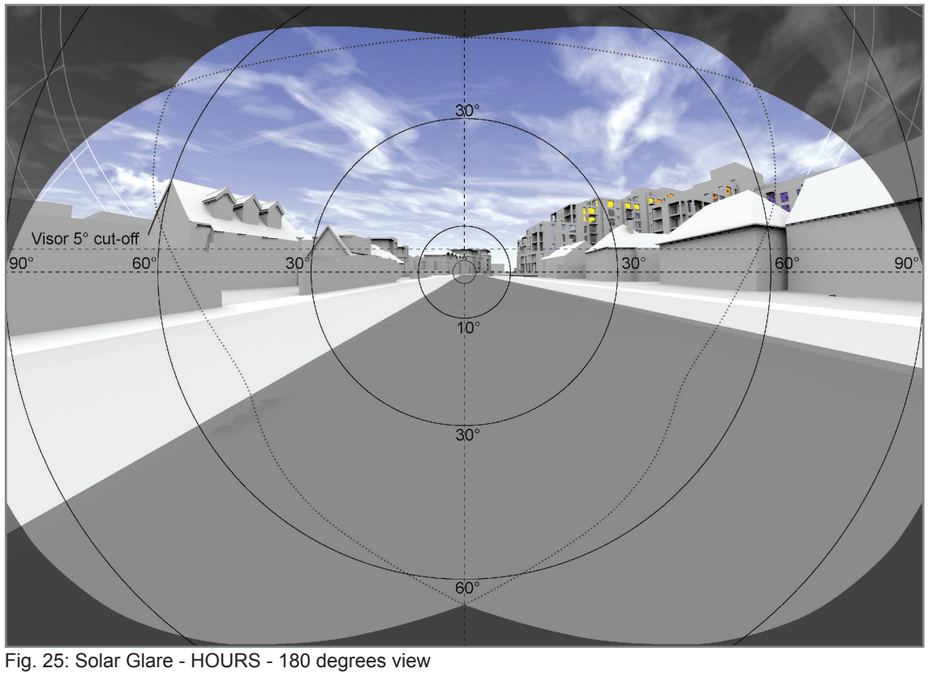
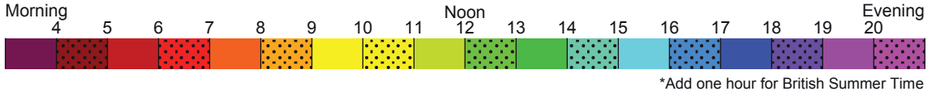


Fig. 25: Solar Glare - HOURS - 180 degrees view



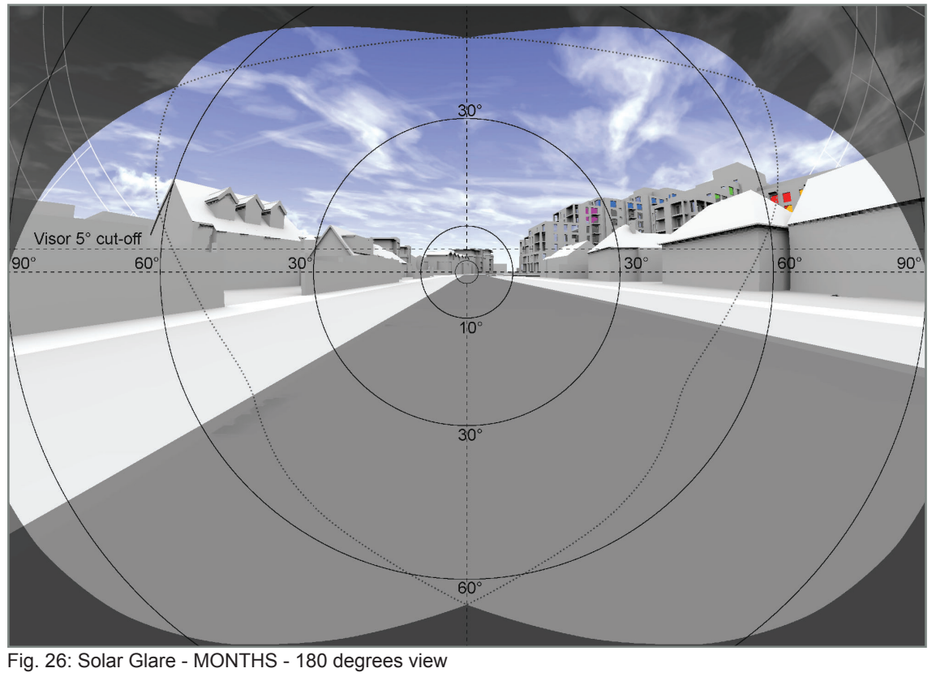


Fig. 26: Solar Glare - MONTHS - 180 degrees view