Daylight & Sunlight Assessments of a Social Housing Bundle 5 Development at Lambs Cross, Sandyford, Dublin 18.

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1. Introduction

This proposed residential development is on a site located in the townland of Balally, at Lamb's Cross, Dublin 18 situated at the junction of Sandyford Road and Hillcrest Road. The proposed development includes:

- 37 no. apartment units in a 3 - 5 storey building over undercroft area, including 29 no. one bed units; and 8 no. two bed units;
- 1 no. community facility at ground floor of 171sqm;
- Energy Centre at first floor level and external plant area set back at third floor level;
- Undercroft area at lower ground level comprising (a) 2 no. ESB substations (b) car, bicycle and motorcycle parking; (c) bin storage; (d) bulk storage area; and (e) supporting mechanical, electrical and water infrastructure.
- Landscaping works including provision of (a) communal open space; and (b) public realm area fronting onto Sandyford Road and Hillcrest Road
- All associated site development works including (a) vehicular access off Hillcrest Road; (b) public lighting; (c) varied site boundary treatment comprising walls and fencing; and (e) temporary construction signage.

1.1 Executive Summary

This report assesses the impact of the proposed development for Daylight and Sunlight on the neighbouring buildings and the quality of daylight and sunlight within the proposed development. This analysis is carried out based on the drawings of MCORM Architecture & Urban Design.

1.2 Assessment of potential impact to daylight and sunlight availability on adjacent properties.

There will be a minor reduction to the available daylight and sunlight levels to the adjacent dwellings. There will a negligible reduction in sunlight to adjacent private amenity spaces. The results find that any impact on the adjacent residential structures would be imperceivable. All areas assessed continue to meet or exceed the recommendations of the BRE guidelines (2022).

1.3 Assessment of the quality of the proposed development.

The apartments were designed in line with the recommendations of the BRE guidelines. Numerous design iterations were conducted to improve the daylight and sunlight within the proposed development. The guidelines clearly state that the targets are recommendations only and flexibility is required when setting and interpreting the targets.

The BRE Guidelines BR209:2022 recommends assessment methods set out in BS EN 17037 for daylight provision. BS EN 17037 contains a National Annex (NA1) which sets out minimum daylight levels to be achieved in the UK and channel Islands. Ireland has a similar latitude and climate to the UK. The National Annex in BS EN 17037 states that the target values set out in Table A1 may be hard to achieve in the UK and as a result sets alternative minimum values for rooms to dwellings. The minimum illuminance levels set out in BS EN17037:2018+A1:2021 are: Kitchens and living spaces containing a kitchen 200lux (1.3%DF). Living rooms 150lux (1%DF) and bedrooms 100lux (DF0.7%).

The target results set out in BS EN17037:2018+A1:2021 are used in this assessment as the primary results to be achieved because these are referenced in BR209 (as recommended by the local authority) and set out additional room specific targets to be achieved in residential buildings. BR209 deals with daylight and sunlight to adjacent properties and defers to BS EN17037:2018+A1:2021 for daylight and sunlight within the proposed development and allows for a complete assessment of the proposed development and its surroundings. BR209 presents a discussion on aspects of daylight and sunlight and interpreting the results of these assessments.

IS EN17037:2018 does not set out any guidance for assessing the impact to daylight and sunlight from a proposed development on neighbouring buildings nor is there any Irish governmental guidance on interpreting results and percentages of units to achieve the target results in multi unit developments. IS EN17037:2018 does not set out room use specific targets but instead designates a Minimum and Target lux level to be achieved in all rooms regardless of use. The function of a room historically has been the key factor in informing the design of a building and the window sizes to allow adequate daylight levels for the task typical to that room to be achieved. The lack of variance in target levels for the tasks typical to a room can lead to substantially oversized windows in rooms with a lower requirement for daylight levels, for example bedrooms. The aim to achieve the minimum target lux level to all rooms in a multi unit residential building is not practical and could lead to overheating of units that have greater access to the sky and sunlight. This could also lead to higher energy usage due to oversized windows and a balance needs to be met.

The results for the Minimum and Target levels set out in Table A1 in IS EN17037:2018 are presented in the assessment as supplementary for completeness, however, conclusions can not be made due to lack of clear guidance on interpenetration of results.

There are existing mature trees within the vicinity of the proposed development, that have the potential to influence daylight levels in the habitable rooms. The assessments for daylight provision are carried out with the existing retained trees in place.

1.3.1 Assessment of daylight in accordance with BR209:2022 and BS EN 17037:2018+A1:2021.

100% of the Living, Dining, Kitchen and Bedroom spaces within the proposed development achieve the target values set out in BS EN 17037:2018+A1:2021 section NA1. This is the minimum rooms specific values to be achieved in habitable rooms and meets the recommendations of the BRE guidelines.

1.3.2 Sunlight within the proposed development

This scheme is well designed for sunlight, with 94.6% of units meeting the minimum recommended 1.5 direct sunlight hours. This is in line with the BRE guideline example for an apartment layout where 4 in 5 achieves the target sunlight hours.

The proposed communal amenity space has sunlight levels that exceed 2 hours sunlight over 50% of the amenity space on the 21st March.

1.4 Supplementary Information - Assessment of Daylight in Accordance with IS EN 17037:2018

EN 17037:2018 sets out values for target illuminance, minimum target illuminance and fractions of reference plane to be achieved. The target and minimum target levels set out in EN17037:2018 are for any type of building; they do not take into account room use or make allowance for rooms that have a lesser requirement for daylight. The results of this assessment indicate a high level of daylight provision, with 98.8% of rooms achieving Minimum Illuminance and 98.8% achieving Target Illuminance. Appendix B identifies any rooms which do not achieve minimum illuminance or target illuminance levels.

To date there is no guidance from governmental bodies on the use or interpretation of IS EN 17038:2018. Apartment guidelines and local authorities guidelines refer to BR209 2022: “Site layout planning for daylight and sunlight” (Third edition) which in turn references BS EN 17037. BS EN17037:2018+A1:2021 is the same as IS EN 17037:2018 with the addition of a National Annex (NA1) and the annex specifically refers to and sets room specific values for dwellings in the UK and Channel Islands. Therefore the assessment against IS EN 17037:2018 is included as supplementary information only noting there are no room specific recommendations for daylight, and because of this limitation, it is considered the recommendations made in the BRE guidelines are more appropriate.

1.5 Conclusions

Overall the design team worked in response to the context to ensure the proposed development performed with regards to achieving the best possible daylight and sunlight quality. All apartments meet the minimum standard for daylight provision as per BS EN 17037:2018+A1:2021 as referred to in the BRE guidelines BR209:2022 (third edition). The vast majority of habitable rooms achieve daylight provision as set out in IS EN 17038:2018.

With regard to internal daylighting, Section 6.7 of the Sustainable Urban Housing: Design Standards for New Apartments (2023) states the following:

> *“Where an applicant cannot fully meet all of the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, which planning authorities should apply their discretion in accepting taking account of its assessment of specific (sic). This may arise due to design constraints associated with the site or location and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution.”*

Furthermore Section 3.2 of the Urban Development and Building Heights: Guidelines for Planning Authorities (2018) states:

> *“Where a proposal may not be able to fully meet all the requirements of the daylight provisions above, this must be clearly identified and a rationale for any alternative, compensatory design solutions must be set out, in respect of which the planning authority or An Bord Pleanála should apply their discretion, having regard to local factors including specific site constraints and the balancing of that assessment against the desirability of achieving wider planning objectives. Such objectives might include securing comprehensive urban regeneration and or an effective urban design and streetscape solution.”*

It is our opinion that all habitable rooms within the proposed development achieve the minimum target daylight levels set out in BS EN 17037:2018+A1:2021, as referred to in the BRE guidelines BR209:2022 (third edition) and no compensatory measures are required.

2. Methodology

2.1 Standards and Guidelines

Ministerial guidance is provided in Sustainable and Compact Settlements: Guidelines for Planning Authorities (2024) Section 5.3.7(b).

> *"In cases where a technical assessment of daylight performance is considered by the planning authority to be necessary regard should be had to quantitative performance approaches to daylight provision outlined in guides like A New European Standard for Daylighting in Buildings IS EN17037:2018, UK National Annex BS EN17037:2019 and the associated BRE Guide 209 2022 Edition (June 2022), or any relevant future standards or guidance specific to the Irish context."*

This is accordance with Section 6.6 of the Sustainable Urban Housing: Design Standards for New Apartments (2023), and Section 3.2 of the Urban Development and Building Heights Guidelines for Planning Authorities (2018).

The Daylight and Sunlight assessments included in this report demonstrates the level of compliance with these three documents:

- BR209:2022 Site Layout Planning for Daylight and Sunlight (Third edition), also referred to as the BRE guidelines.
- BS EN 17037:2018+A1:2021 Daylight in Buildings, also referred to as the UK Annex.
- IS EN 17037:2018 Daylight in Buildings.

2.2 BRE Guidance Document BR209:2022 - Site Layout Planning for Daylight and Sunlight (3rd edition).

The BRE guidelines (2022) state at the outset that "It is purely advisory and the numerical target values within it may be varied to meet the needs of the development and its location." The recommendations of the BRE guidelines (2022) are not suitable for rigid application to all developments in all contexts and this is of particular importance in the context of national and local policies for the consolidation and densification of urban areas.

BR209 2022 sets out the assessment metrics to be applied when assessing the potential impact of a development on the daylight and sunlight of neighbouring properties. The metrics for assessing impact to adjacent buildings in the areas of Daylight is the Vertical Sky Component (VSC) and Sunlight is the Annual Probable Sunlight Hours (APSH). Sunlight to adjacent amenity space is assessed through the measurement of sunlight availability on the 21st March and the plotting of shadow diagrams.

The BRE guidelines (2022) recommend the use of BS EN 17037:2018 for assessing the quality of interior spaces in proposed developments. BS EN 17037 sets out assessment methods for daylight provision and access to sunlight. It states that "The guidance here is intended for use in the United Kingdom and in the Republic of Ireland, though recommendations in the Irish Standard IS EN 17037 may vary from those in BS EN17037."

EN 17037 is a unified daylighting standard published by the European Committee for Standardization (CEN) in 2018. It is applicable across all countries within the EU including Ireland with the Irish edition IS EN17037:2018. The standard is enacted in Britain under BS EN 17037:2018+A1:2021 with a UK National Annex for regional assessments. The daylight and sunlight assessment methods for internal daylight and sunlight provision are common to both the Irish Standard Version and the UK version.

The UK National Annex (NA) provides further recommendations for daylight provision in the UK and Channel Islands. NA.1 states that the UK committee supports the recommendations for daylight in buildings given in BS EN17037:2018. The annex states that the daylight target levels in Clause A.2 may be hard to achieve in buildings in the UK and in particular dwellings in urban areas with significant obstructions or tall trees outside. NA.2 sets out minimum daylight provision to be achieved in UK dwellings.

The UK National Annex A1 sets out room specific minimum values to be achieved in the UK and Channel Islands. All the rooms achieve the minimum DF factor levels set out in A1 for Bedrooms (DF0.7%), Living Rooms (1%DF) and Kitchens and Living Spaces containing a Kitchen(1.3%). The Daylight Factor percentage values are derived from minimum room specific illiminance levels set out in NA+1 and the Median External Diffuse Illuminance ($E_{v,d,med}$) for Dublin from Table A.3 EN17037:2018. The illuminance levels and corresponding DF% are given in Table 5 below.

2.3 Daylight to Existing Dwellings

BRE guidance document (2022) "Site layout planning for daylight and sunlight" relates to daylight and sunlight to potential impact in neighbouring buildings. As set out above, this is broadly in line with the previous version of the BRE guidelines (2011). The metrics are the same for assessing impact in the areas of Daylight (VSC) and Sunlight (APSH) to adjacent buildings. Sunlight to adjacent amenity space is assessed through the measurement of sunlight availability on the 21st March.

A proposed development could potentially have a negative effect on the level of daylight that a neighbouring property receives, if the obstructing building is large in relation to its distance from the existing dwelling. To ensure a neighbouring property is not adversely affected, the Vertical Sky Component (also referred to as VSC) is calculated and assessed. VSC can be defined as the amount of skylight that falls on a vertical wall or window.

BRE guidelines (2022) recommend that; *"Loss of light to existing windows need not be assessed if the distance of each part of the new development from the existing window is three or more times its height above the centre of the existing window."*

The diffuse light of the existing building may be adversely affected if part of a new building measured in a vertical section perpendicular to the main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25º to the horizontal. If a window falls within a 45° angle both in plan and elevation with a new development in place then the window may be affected and should be assessed.

The guidelines sets out which rooms need to be assessed for daylight in Section 2.2;

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

For loss of daylight the BRE guidelines (2022) recommends calculation of the Vertical Sky Component. This is the ratio of direct sky illuminance falling on the outside window, to the simultaneous horizontal illuminance under an unobstructed sky. The standard CIE Overcast Sky is used and the ratio is usually expressed as a percentage. The maximum value is just under 40% for a completely unobstructed vertical wall. The Vertical Sky Component on a window is a good measure of the amount of daylight entering it.

The BRE guidelines (2022) recommend one of two criteria is met when assessing for the Vertical Sky Component;

a) Where the Vertical Sky Component at the centre of the existing window exceeds 27% with the new development in place then enough sky light should still be reached by the existing window.

b) Where the Vertical Sky Component with the new development in place is both less than 27% and less than 0.8 times its former value, then the area lit by the window is likely to appear more gloomy, and electric light will be needed more of the time.

The BRE guidelines (2022) state that if the VSC is:

- At least 27%, then conventional window design will usually give reasonable results;
- Between 15% and 27%, then special measures (larger windows, changes to room layout) are usually needed to provide adequate daylight;
- Between 5% and 15%, then it is very difficult to prove adequate daylight unless very large windows are used;
- Less than 5%, then it is often impossible to achieve reasonable daylight, even if the whole window wall is glazed

This report assesses the percentage of direct sky illuminance that falls on the centre point of neighbouring windows that could be affected by the proposed development through the Vertical Sky Component (VSC) as per the methodologies contained in the BRE guidelines (2022).

2.4 Sunlight to Existing Buildings

The BRE guidelines (2022) recommend assessing the main living rooms and conservatories if they have a window wall facing within 90° of due south. Kitchens and bedrooms are less important but care should be taken not to block too much sun. If the proposed development is fully north of the existing window then sunlight need not be assessed.

The Annual Probable Sunlight Hours (APSH) is used to assess the quantity of sunlight for a given location. This is the total amount of sunshine for a given location on an unobstructed horizontal surface taking cloud cover into account. Statistical data from the Irish Meteorological Service is used to assess the APSH and the Winter Probable Sunlight Hours (taken to fall between the 21st of September and the 21st of March).
Table 1 below shows the average sunlight hours for each month and the maximum possible without any cloud cover. This gives the factor of possible sunlight hours for each month.

Met Éireann Sunlight Hours Data Set 1991-2020													
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Average Sunlight Hours/ Day	1:54	2:54	3:42	5:24	6:24	6:00	5:17	5:00	4:24	3:24	2:24	1:42	
Average Sunlight Hours/ Month	58:54	81:12	114:42	162:00	198:24	180:00	163:47	155:00	132:00	105:24	72:00	52:42	1449.1
Total Available Sunlight Hours	252	265	358	412	483	485	496	451	375	320	250	236	4383
Probable Sunlight Hours Ratio	23.4%	30.6%	32.9%	39.3%	41.1%	37.1%	33.0%	34.4%	35.2%	32.9%	16.8%	22.3%	33.1%

Table 1: Average monthly sunlight hours recorded at Dublin Airport - Data set 1991-2020

The BRE guidelines (2022) recommend that the centre of a window or 1.6m above ground for a door be assessed and it should receive at least 25% of the APSH and it should receive at least 5% during the period of 21st September to 21st March. If the available APSH is less than this then it should not be reduced below 0.8 times its former value or noticeable loss of sunlight may occur.

2.5 Sunlight to Gardens and Open Spaces

For calculations of sunlight analysis it is general practice to use March 21st. The BRE guidelines (2022) states:

> *"It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March."*

2.6 Calculations of Trees & Hedges

Trees are not usually included in the assessments of impact on neighbouring properties, unless specified otherwise. In relation to the effects of trees and hedges the BRE guidelines (2022) states;

> *"It is generally more difficult to calculate the effects of trees on daylight because of their irregular shape and because some light will generally penetrate through the crown. Where the effects of a new building on existing buildings nearby is being analysed, it is usual to ignore the effects of existing trees. This is because daylight is at its scarcest and most valuable in winter when most trees will not be in leaf."*

BR209:2022 recommends that sometimes trees should be taken into account for the proposed development where the new development is proposed near large existing trees. This needs to be done by modelling a representative of the existing trees. Reflectance and transparency should be taken into account. Table G1 in BR209:2022 gives values for transparencies of tree crowns in summer and winter for deciduous trees, dense evergreen can be assessed as opaque. Table G2 gives general reflectance values for shades of trees.

2.7 BRE Guidelines (2022) Appendix H: Environmental Impact Assessment

The BRE guidelines sets out criteria for classification for assessment of impact where a new development affects a number of existing buildings or open spaces in relation to an Environmental Impact Assessment. The guide does not give a specific range or percentages but sets out parameters as set out below.

> *"Where the loss of skylight or sunlight fully meets the guidelines in this book, the impact is assessed as negligible or minor adverse. Where the loss of light is well within the guidelines, or only a small number of windows or limited area of open space lose light (within the guidelines), a classification of negligible impact is more appropriate. Where the loss of light is only just within the guidelines, and a larger number of windows or open space area are affected, a minor adverse impact would be more appropriate, especially if there is a particularly strong requirement for daylight and sunlight in the affected building or open space.*
>
> *Where the loss of skylight or sunlight does not meet the guidelines in this book, the impact is assessed as minor, moderate or major adverse. Factors tending towards a minor adverse impact include:*
> - *only a small number of windows or limited area of open space are affected*
> - *the loss of light is only marginally outside the guidelines*
> - *an affected room has other sources of skylight or sunlight*
> - *the affected building or open space only has a low level requirement for skylight or sunlight*
> - *there are particular reasons why an alternative, less stringent, guideline should be applied.*
>
> *Factors tending towards a major adverse impact include:*
> - *a large number of windows or large area of open space are affected*
> - *the loss of light is substantially outside the guidelines*
> - *all the windows in a particular property are affected*
> - *the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight, e.g. a living room in a dwelling or a children's playground.*
>
> *Beneficial impacts occur when there is a significant increase in the amount of skylight and sunlight reaching an existing building where it is required, or in the amount of sunlight reaching an open space.*
>
> *Beneficial impacts should be worked out using the same principles as adverse impacts. Thus a tiny increase in light would be classified as a negligible impact, not a minor beneficial impact."*

A flexible approach should be taken when assessing the impact with daylight and sunlight being one of many factors that influence the environment when planning a new development.

The BRE guidelines does not set out a specific value range for the different classification of impact level of Minor, Moderate and Major to each window. For the purpose of this report one of five classification levels will be applied:

1. Imperceptible: There is no reduction in the VSC levels or where the levels are 99% of the existing value.
2. No substantial change: A reduction in the VSC level but it retains a VSC >27% or <27% but >80% of the existing value
3. Minor reduction: A reduction below <27%VSC and <80% of the existing value but greater than 20% VSC.
4. Moderate reduction: A reduction below <20%VSC and <80% of the existing value but greater than 10% VSC.
5. Major reduction: A reduction below <10%VSC and <80% of the existing value.

The evaluation of the impact should be considered in conjunction with other factors when determining the overall impact level to a property.

2.8 Daylight in the Proposed Development.

BR209 (2022) Appendix C sets out interior daylight recommendations. The guideline sets out the that; “BS EN 17037 supersedes BS8206 Part 2 ‘Code of practice for daylighting’ which contained a method of assessment based on Average Daylight Factor, which is now no longer recommended.

BS EN 17037:2018+A1 sets out two methods for assessing daylight provision in proposed buildings. One method is called the **Illuminance method.** This is based on Target illuminances for daylight to be achieved across specified fractions of a reference plane at working plane height (0.85m) for half the daylight hours in a year. The Illuminance Method requires the use of a suitable weather file with local climate conditions and takes into account the orientation of the space.

The alternative method is called the **Daylight Factor Method.** This method is based on calculating the daylight factors achieved over specific fractions of a reference plane. The Daylight factor is the illuminance at a point on a reference plane in a space, divided by the illuminance on an unobstructed horizontal surface outdoors. This method uses an overcast sky for calculation and the assessment of the space is orientation independent. BS EN 17037 gives the Median External Diffuse Illuminance (Ev,d,med) for the capital cities throughout Europe to account for external local illuminance levels.

The UK National Annex (NA) sets out additional minimum room specific Target Daylight Factor values for the UK where the target values in A2 are hard to achieve. NA.2 sets out illuminance values to be exceeded over at least 50% of the points on a reference plane 0.85m above the floor for at least half the daylight hours. The UK committee formed the opinion that the Target Illuminance recommendations in Clause A.2 of BS EN 17037 may not be achievable for some buildings, particularly dwellings. The UK committee believes this could be the case for dwellings with basement rooms or those with significant external obstructions.

BR209 (2022) recommends surface reflectances should represent real conditions and where reflectance values have not been measured or specified default values are set out in Table C4 of the guidance document. The surface reflectances have been specified and are set out in Table 2 below. This table also shows the input values for material used and additional assessment model input parameters.

Input Values for Assessment Model			
Surface Reflectance			
Element	Reflectance	Transmittance	Material Description
Internal walls	80%	0%	White Painted Walls
Internal ceiling	80%	0%	White Painted Ceiling
Floor - light wood	40%	0%	Light wood Flooring
External walls - proposed development	50%	0%	Brick
External walls - outside site	50%	0%	CIBSE
External ground	20%	0%	CIBSE
Glass		68%	Triple glazed clear glass
Maintenance Factor for Glass		Assessment Plane	
Suburban Vertical no overhang	0.96	Sensor Grid spacing	0.3m
Suburban Vertical sheltered by balcony or overhang	0.88	Sensor grid inset	0.35m
Framing Factor: Patio Doors	0.77	Minimum inset	0.3m
		Work plane offset	0.85m

Table 2: Surface reflectance parameters and input values for model calculations

The EN17037:2018 Standard deals exclusively with new developments and does not give guidance or metrics on loss of light or sunlight to existing properties. EN 17037:2018 sets out values for Minimum and Target levels to be achieved with a minimum, medium and high compliance level for each. The guideline recommends that the minimum level should be achieved for both target levels but it does not give guidance on the number of units or fraction within a multiple residential unit development that

should achieve these values. Additionally it does not differentiate between room use and weighted targets for rooms which would have a lesser requirement. The UK National annex sets out factors for UK specific settings where it is difficult to achieve natural daylighting.

The compliance calculation is based on an annual, climate-based simulation of interior illuminance distributions. BR209 refers to this method as the Illuminance Method. For each hour of the year, the percentage of the floor area achieving minimum and target illuminance thresholds are measured on a room-by-room basis. Two target types are set with the following criteria:

- Target Illuminance: 300 lux over 50% of floor area for at least 50% of daylight hours.
- Minimum Illuminance: 100 lux over 95% of floor area for at least 50% of daylight hours.

BS EN 17037 gives three levels of recommendation for daylight provision in an interior space: Minimum, Medium and High. BR209:2022 Section C3 recommends for compliance with the standard, a space should achieve the Minimum level.

Daylight hours are defined as the 4380 hours with the most diffuse horizontal illuminance in the weather file. In addition to this baseline (Minimum) requirement, rooms can achieve Medium and High levels of compliance by meeting higher illuminance thresholds, as outlined in the table below:

Target Illuminance from Daylight over at least half the daylight hours		
Level of recommendation	Target illuminance E_T(lx) for half of the assessment grid	Minimum illuminance E_{TM}(lx) for 95% of the assessment grid
Minimum	300 lux	100 lux
Medium	500 lux	300 lux
High	750 lux	500 lux

Table 3: IS / BS EN 17037:2018 Target Illuminance from Daylight over at least half the daylight hours.

Target Daylight Factor (D) for Dublin*		
Level of recommendation	Target daylight factor D for half of the assessment grid	Minimum daylight factor D for 95% of the assessment grid
Minimum	2%	0.7%
Medium	3.5%	2%
High	5%	3.5%

Table 4: IS / BS EN 17037:2018 Target Daylight Factor (D) for Dublin.

Target Minimum Daylight Factor (D) for Dublin* based UK National Annex		
Room Type	Target illuminance E_T(lx) for half of the assessment grid	Target daylight factor D from Table A.3 EN17037 $E_{v,d,med}$ for Dublin -14,900
Bedroom	100 lux	0.7%
Living Room	150 lux	1%
Kitchen	200 lux	1.3%

* EN17037 uses the latitude of the capital city of each European country to set individual values for daylight and sunlight metrics for use in setting the target levels to be achieved in a particular country.

Table 5: BS EN 17037:2018+A1:2021 Target Illuminance levels and Daylight Factor (D) for Dublin.

2.9 Sunlight within Proposed Developments

The BRE guidelines (2022) recommend that for large residential developments the overall sunlight potential can be initially assessed by counting the number of windows facing south, east and west and the aim should be to minimise the number of living rooms facing solely north, north-east or north-west unless there is some compensating factor such as an appealing view to the north. The guideline acknowledges that it may not be possible to have every living room facing within 90° of south in large developments, however, it recommends maximising the number of units with a southerly aspect.

The BRE guidelines (2022) state that BS EN 17037 should be used to assess for interior access to direct sunlight and that the assessment of APSH should no longer be used. BS EN 17037 sets recommendations for access to sunlight and notes three levels of achievement; Minimum, Medium and High. In dwellings at least one habitable room, preferably a living room, should achieve the Minimum of 1.5 direct hours on a specified date between 1st February and 21st March, with a cloudless sky. This assessment uses the 21st March. The guidelines recommend a time step of 5 minutes or less for the assessment interval. The Minimum level to achieve is 1.5, the Medium level is 3 hours and the High level is 4 hours direct sunlight.

3. Daylight in Neighbouring Buildings

3.1 Site Overview

This site is in the townland of Balally, at Lamb's Cross, Dublin 18, it was a greenfield and has been used as a construction compound in recent years. The site is bounded by Sandyford Road to the west and Hillcrest Road to the south. Opposite the site on the Hillcrest Road are the detached houses, Crossways and Ardcairn. The eastern boundary is along the site of Greenpark, a detached single storey dwelling. To the north of the site is open space in the grounds of Lamb's Brook, and the side boundary of No.12 Lamb's Brook, a detached two storey dwelling.

Figure 1: Indicative view of the site, taken from Google Maps. Please refer to architectural drawings for statutory boundary

3.2 Preliminary assessment of adjoining dwellings

The BRE guidelines BR209:2022 (third edition) recommend that loss of light to existing windows need not be assessed if the distance of each part of the new development from the existing window is three or more times its height above the centre of the existing window. The zone of influence 3 times the height of the proposal is plotted in Figure 2 in yellow.

Section planes perpendicular to the window wall of the adjacent properties facing the proposed development are indicated in blue in Figure 2. The planes at locations A - C extend and if they intersect the proposed development, they are plotted in Figure 3 below.

The guidelines also states that if part of a new building measured in a vertical section perpendicular to the main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25º to the horizontal, then the diffuse light of the existing building may be adversely affected. If a window falls within a 45° angle both in plan and elevation with a new development in place then the window may be affected and should be assessed.

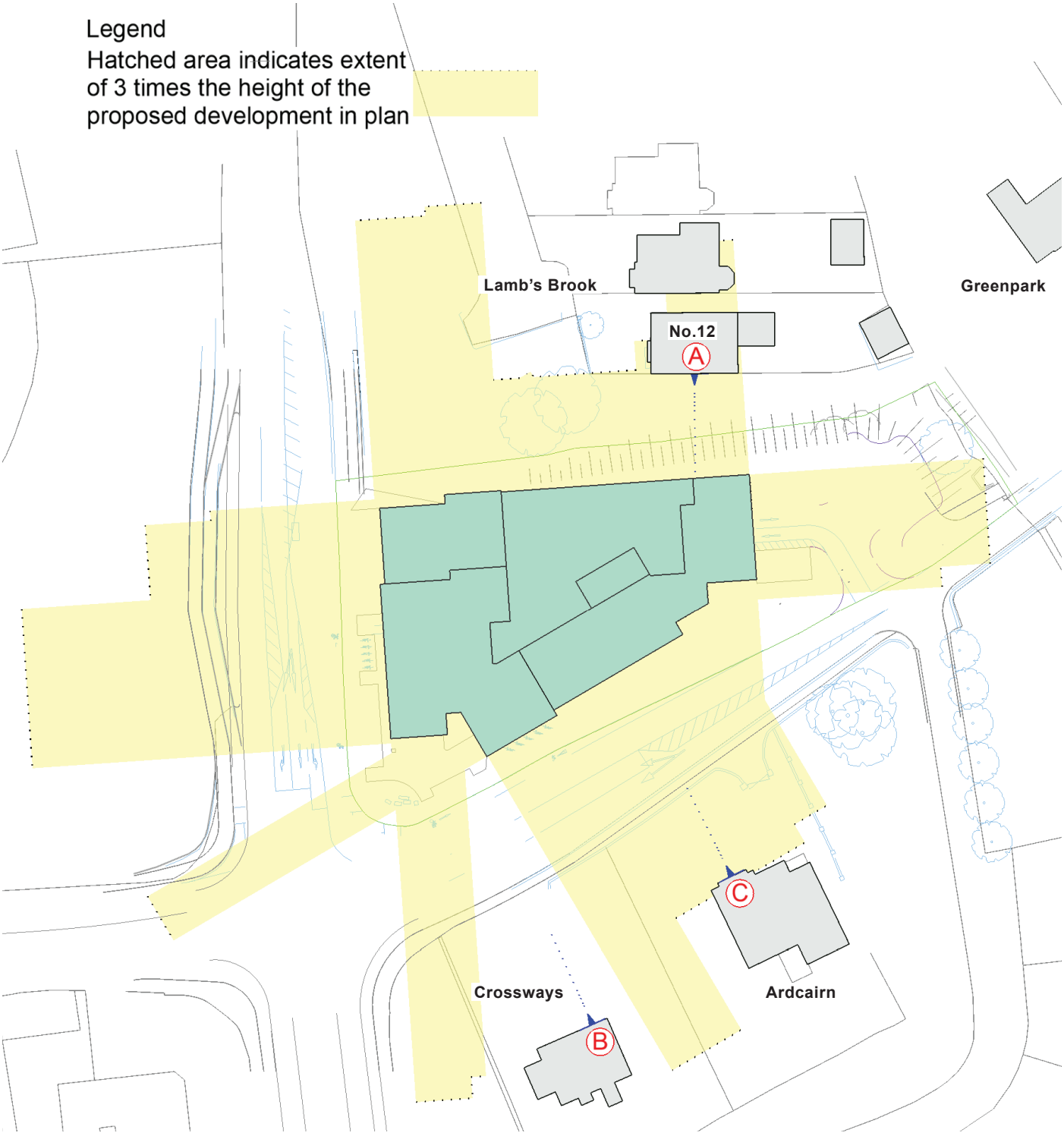


Figure 2: Proposed site plan showing the zone of influence (3 times the height of the proposed building) and direction of the window wall of adjacent residential properties.

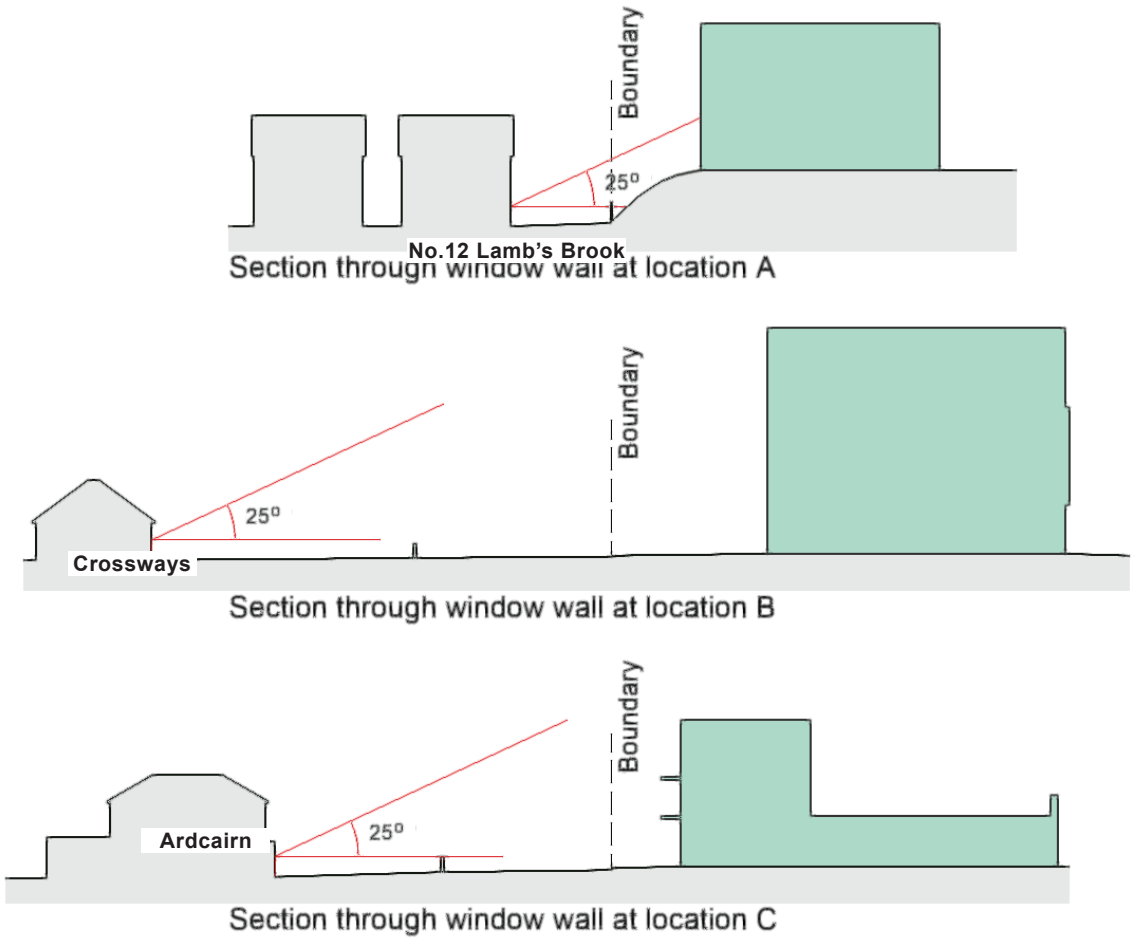


Figure 3: Section perpendicular to window wall at locations indicated in Figure 2.

3.3 Comment on Preliminary Assessment

Location A through the side elevation of No.12 Lamb's Brook: The 25º line would be subtended by the proposed development, this house was selected for further assessment.

Location B through the front elevation of Crossways: The 25º line would not be subtended by the proposed development, indicating any reduction in available daylight is likely to be negligible. No further assessment is required

Location C through the front elevation of Ardcairn: The 25º line would not be subtended by the proposed development, indicating any reduction in available daylight is likely to be negligible. No further assessment is required

3.4 Detailed Assessment to Adjoining Dwellings

The BRE guidelines BR209:2022 (third edition) recommend assessing the Vertical Sky Component (VSC) to adjacent properties, where the layouts are not known. Annual Probable Sunlight Hours (APSH) will also be assessed, where that is relevant.

The guideline recommends that if a window retains a VSC in excess of 27% with the proposed development in place then it will still receive enough daylight. If the existing VSC is below 27% or is reduced below 27% and below 0.8 times its former value then the diffuse light maybe adversely affected.

Test points representing windows in the adjacent dwellings at locations identified in the preliminary analysis are indicated in Figure 4. The results are shown in Table 6 below.

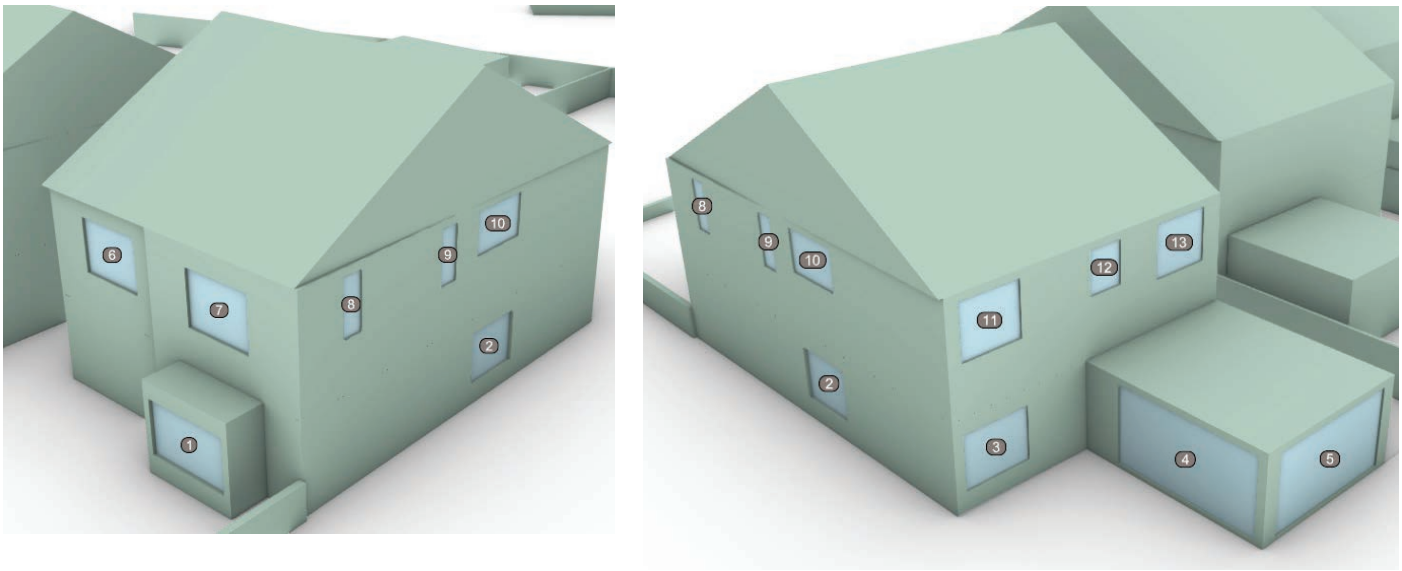


Figure 4: No.12 Lamb's Brook: View of model locating VSC & APSH test points.

Vertical Sky Component						
Location	Vertical Sky Component Recommended Value > 27%		Ratio: Proposal to Existing Recommended > 80%		Meets criteria if >27% VSC or <27% but >80% Existing Value	
	Existing %	Proposed %				
1	37.3	34.2	91.6%	Weighted Avg. 81.5%	Y	Y
2	33.9	23.1	68.1%		N	
3	34.8	34.7	99.5%		Y	Y
4	30.3	25.3	83.6%	Weighted Avg. 91.4%	Y	Y
5	37.4	37.4	100.0%		Y	
6	36.7	34.2	93.4%		Y	Y
7	38.4	35.4	92.0%	Weighted Avg. 82.6%	Y	Y
8	37.8	26.4	69.7%		N	
9	37.8	26.6	70.5%		N	
10	38.1	27.4	72.0%		Y	Y
11	38.8	38.7	99.7%		Y	Y
12	38.7	38.7	99.9%		Y	Y
13	38.9	38.9	100.0%		Y	Y

Table 6: Vertical sky component for windows in No. 12 Lamb's Brook

3.5 Conclusion of potential impact to existing houses

There is a reduction to available daylight to some of the windows on the gable elevation of 12 Lamb's Brook. These windows are secondary to the room and they have other windows on a perpendicular wall. The BRE guidelines recommends using the weighted average where there are multiple windows to a room. When the area weighted average of the potential impact of these windows are considered the ratio of the average is not below 80% of the existing value and any potential loss of light will be minor will be minimal. Any reduction in available daylight from the proposed development will be minor and meets the recommendations of the BRE guidelines BR209:2022 (third edition).

4. Sunlight in Neighbouring Buildings

4.1 Sunlight the Neighbouring Dwellings APSH (Annual Probable Sunlight Hours)

The BRE guidelines BR209:2022 (third edition) recommends assessing window walls for the APSH that face within 90º of due south. The guidelines state that;

> *" In housing the main requirement for sunlight is living rooms, where it is valued at any time of day, but especially in the afternoon. Sunlight is also required in conservatories. It is viewed as less important in bedrooms and in kitchens, where people prefer it in the morning rather than the afternoon."*

For a proposed development to have a noticeable impact on the annual Probable Sunlight Hours the value need to be reduced below the recommended 25% annual or 5% in the winter period from September to March. If the value is either below this to begin with or is reduced below this then it should not be reduced below 0.8 times its former value.

The windows identified in the preliminary assessment and indicated in Figure 4 that face within 90° of due south are assessed regardless of use. The results are set out in the table below.

Annual Probable Sunlight Hours								
	APSH >25% Target			Sept 21 - Mar 21 WPSH >5% Target			Meets criteria of >25% APSH and >5% PSH Or <25% or <5% PSH but >80% Existing Value	
Location ID	Existing	Proposed	Ratio	Existing	Proposed	Ratio		
	% of APSH	% of APSH	If less than 25% APSH Target >80%	% WPSH	% WPSH	If less than 5% WPSH Target >80%		
1	47.3%	36.2%	76.5%	13.0%	3.8%	28.9%	Y	N
2	75.7%	54.3%	71.7%	25.2%	8.5%	33.6%	Y	Y
3	45.5%	41.7%	91.5%	13.4%	10.3%	76.7%	Y	Y
4	58.1%	49.0%	84.4%	22.1%	14.6%	66.2%	Y	Y
5	48.0%	48.0%	100.0%	14.4%	14.4%	100.0%	Y	Y
6	47.7%	38.2%	80.0%	14.5%	6.6%	45.3%	Y	Y
7	50.6%	39.1%	77.3%	15.7%	6.2%	39.2%	Y	Y
8	84.7%	61.4%	72.6%	32.6%	13.3%	40.9%	Y	Y
9	84.7%	62.8%	74.2%	32.6%	14.5%	44.5%	Y	Y
10	84.6%	63.9%	75.5%	32.7%	15.5%	47.3%	Y	Y
11	52.3%	49.0%	93.7%	16.9%	14.1%	83.8%	Y	Y
12	52.4%	50.0%	95.4%	16.9%	14.9%	88.1%	Y	Y
13	52.4%	50.5%	96.4%	16.9%	15.3%	90.7%	Y	Y

Table 7: Annual Probable Sunlight hours to adjoining properties

4.2 Conclusion

All the windows to No.12 Lamb's Brook were assessed. Window ID 1 has a reduction in winter sunlight hours below the recommended level, however, window ID 2 to the same room achieves the target winter sunlight hours and meets the recommendations of the BRE guidelines. The remainder of the windows at ground and first floor level achieve the target APSH and WPSH.

It should be noted that there is dense tree growth along the southern boundary to No.12 Lamb's Brook which is not included in the assessment of sunlight to the existing windows as recommended in the BRE guidelines due to the difficulty in accurately representing trees. The effect of the trees would result in lower levels of sunlight availability in the existing condition results and the effective reduction would be less. Any potential impact would be less than indicated in the table.

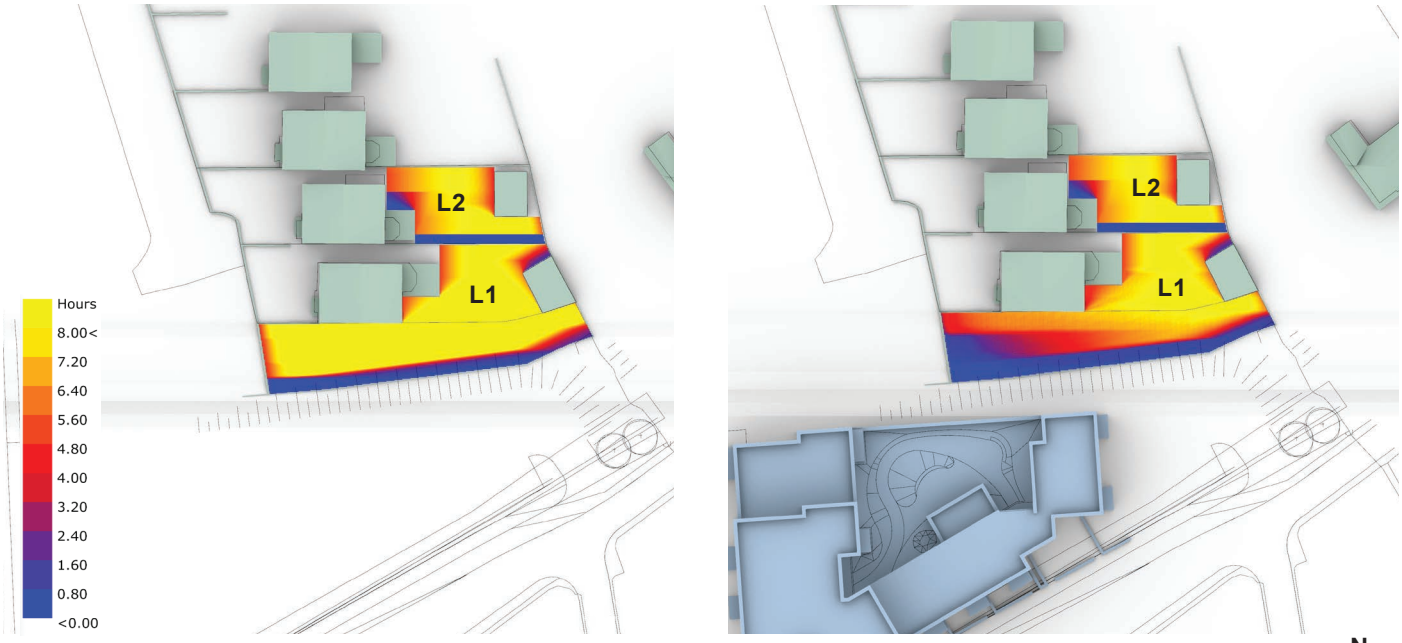
There will be a reduction in sunlight hours to the surrounding houses and any impact will be minor.

5. Sunlight to Amenity in Neighbouring Properties

The BRE guidelines BR209:2022 (third edition) indicates that for an amenity area to have good quality sunlight throughout the year, 50% should receive in excess of 2 hours sunlight on the 21st March. It also states that front gardens need not be assessed for sunlight. Amenity spaces which are entirely south of the proposed development would not perceive an impact from it.

5.1 Amenity space to neighbouring properties.

The private amenity spaces of the neighbouring houses to the north are assessed for a potential impact on their sun of the ground. The existing and proposed generated analysis are shown in Figure 5, the results are shown in Table 8 below.



Existing **Proposed**

Figure 5: Existing & Proposed Radiation map of amenity areas, showing available sunlight on 21st March. The scale represents the percentage of daylight received from 0 - 8 hrs.

Sunlight on the ground - Adjacent properties					
No.	Location	% Area receiving 2 hours sunlight on 21st March		Ratio	Meets criteria of >50% area Or if <50% then target >80% Existing Value
		Existing	Proposed	Proposed: Existing	
L1	12 Lamb's Brook	86.4	73.9	85.5%	Meets criteria
L2	11 Lamb's Brook	83.0	83.0	100.0%	Meets criteria

Table 8: Calculation of Sun on the Ground to adjacent amenity areas

5.2 Conclusion

All the private amenity space to the surrounding properties were assessed for sunlight in accordance with the recommendations set out in BR209:2022. On the 21st March, all the amenity spaces will retain 2 hours sunlight over 50% of the area or will not be reduced below 80% of the existing levels. The proposed development meets the recommendations of the BRE guidelines.

6. Daylight within the Proposed Development

All habitable rooms within the units were assessed for daylight provision by illuminance method. The Illuminance method assesses the daylight levels over at least 50% daylight hours in the year and uses a weather file data set. These methods take into account the orientation of the space. They provide an accurate representation of the daylight provision to a specific room in the context of the proposed environment.

Compliance is demonstrated by a calculation of Daylight Provision with the illuminance method under BS EN 17037:2018+A1:2021. A summary of the results are presented in Table 9 below and a complete set of room results are shown in Appendix A.

Compliance is also demonstrated with a calculation of Daylight Provision with the illuminance method under IS /BS EN 17037:2018. A summary of the results are presented in Table 10 below and a complete set of room results are shown in Appendix B.

6.1 Assessment for Daylight Provision BS EN 17037:2018+A1:2021

The UK National Annex (A1) contains minimum room specific target values for dwellings in the UK. The UK committee fully supports the recommendations of EN17037:2018 but considers the target daylight levels may be hard to achieve in UK dwellings, in particular in urban areas and areas with mature trees. The Target and Minimum levels set out in IS / BS EN17037:2018 do not take into account room use or make allowance for room that have a lesser requirement for daylight. The UK National Annex A1 in BS EN17037:2018+A1:2021 sets out room specific minimum values to be achieved in the UK and Channel Islands. These target values are set to achieve similar minimum daylight levels as the superseded Average Daylight Factor method (ADF) in BS8206-2 2008.

Minimum daylight provision UK NA.1 - BS EN 17037:2018+A1:2021					
	Room Use	Number of rooms	Target illuminance E_T(lx) for half of the assessment grid	Number of rooms to achieve target Lux over 50% of the assessment grid	Percentage of rooms achieving Target
Apartments	LKD	37	200	37	100.0%
	Bedrooms	45	100	45	100.0%
Total		82		82	100.0%

Table 9: Summary of room for Target Illuminance compliance with BS EN 17037:2018+A1:2021. Individual room results can be viewed in Appendix A.

6.2 Conclusion

BR209:2022 recommends assessment methods set out in BS EN 17037 for daylight provision. 100% of the Living, Dining, Kitchen and Bedroom spaces achieve the target values set out in BS EN 17037:2018+A1:2021 section NA1. The is the minimum rooms specific values to be achieved in habitable rooms.

6.3 Supplementary Information - Assessment for Daylight Provision IS / BS EN 17037:2018

A summary of Minimum and Target Illuminance level compliance under IS EN 17037:2018 Annex A Table A1 are set out in the table below.

Daylight provision Illuminance Method IS EN 17037:2018						
		Below Target	Minimum	Medium	High	Percentage of rooms achieving Target
Apartments	Target Illuminance	1.2%	12.2%	50.0%	36.6%	98.8%
	Minimum Illuminance	1.2%	29.3%	24.4%	45.1%	98.8%

Table 10: Summary of room for Target Illuminance compliance with IS/BS EN 17037:2018. Percentage of rooms at each compliance level. Individual room results can be viewed in Appendix B.

The results indicate a high level of compliance for Minimum level of 98.8% and Target level of 98.8% of the spaces achieving the minimum target for each metric. The results indicate that the rooms will achieve high levels of daylight and they will be bright and pleasant.

The recommendations for Daylight provision in Table A1 are not specific for dwellings and do not make allowance for room use. BS EN 17037:2018+A1:2021 address this with the National Annex NA.1 which sets out room specific targets for dwellings and compliance for this is presented in Section 6.1.

7. Sunlight within the Proposed Development

7.1 Sunlight Hours

The BRE guidelines BR209:2022 (third edition) and BS EN 17037:2018+A1:2021 set out recommendations for sunlight hours to be achieved. It states that; *"For dwellings, at least one habitable room, preferably a main living room, should meet at least the minimum criterion."* The guidelines recommend the sunlight hours should be assessed preferably on the 21st March over the course of the day. The guidelines set three levels of achievement. Minimum 1.5h, Medium 3h and High 4h. The guideline does not set the percentage of units that need the achieve the recommendations but they do give an example of a well designed floor layout in Figure 6 below where 4 out of 5 units in an apartment building would achieve the target sunlight.

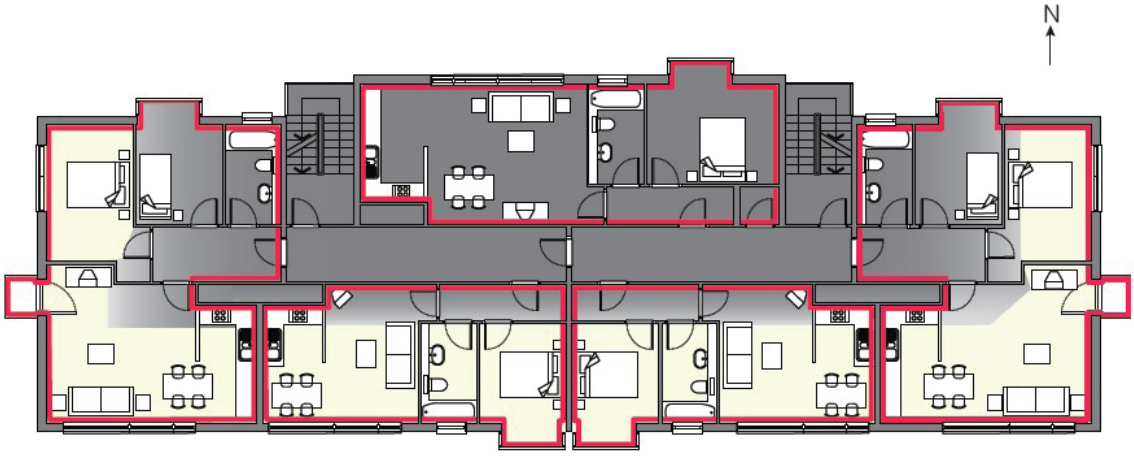


Figure 26: Careful layout design means that four out of the five flats shown have a south-facing living room

Figure 6: Extract from BR209:2022 Section 3 Sun-lighting: Diagram indicating sample floor plan to maximise units with a main living space facing south.

Appendix C details the results per habitable room, indicating if this room has a relevant South facing window. A summary of these results are displayed in the table below.

Sunlight Hours Summary Table									
	Total Units	Rooms with a window within 90° South		Below recommendation <1.5 hours	Minimum >1.5 hours	Medium >3 Hours	High >4 Hours	Number meets criteria	Ratio meets criteria
		No.	Ratio						
Overall Total	37	29	78.4%	2	1	2	32	35	94.6%

Table 11: Summary of results of assessment of Sunlight Hours

7.2 Comment on EN 17037 Sunlight Hours

The BRE Guidelines recommend maximising the amount of units that have a window within 90° due South but does not have set targets. The guidelines acknowledges that for large developments with site constraints its not possible to achieve south facing windows to all main living spaces. 29no. of the 37no. (80.8%) units have window to a Living room or Kitchen/ Dining room which face within 90° South.

Often windows with an aspect of greater than 90° due South, to the North West or North East, will still receive sunlight, but it is likely to be lesser amounts especially in the winter period. 35no. of the 37no. units (94.6%) have a living spaces that achieves the minimum recommended 1.5 direct sunlight hours. Additionally units with dual aspect will receive sunlight to a bedroom space.

7.3 Conclusion

This scheme is well designed for sunlight, with 80.8% of units meeting the minimum recommended 1.5 direct sunlight hours. This is in line with the BRE guideline example for an apartment layout where 4 in 5 achieves the target sunlight hours.

8. Sunlight to Amenity Spaces within the Proposed Development

The BRE guidelines BR209:2022 (third edition) indicates that for an amenity area to have good quality sunlight throughout the year, 50% should receive in excess of 2 hours sunlight on the 21st March.

8.1 Sunlight to amenity within the proposed development

The amenity area within this proposal have been assessed with a calculation of Sun on the Ground on the 21st March. Generated analysis is shown in Figure 7 and the results are set out in Table 12 below.

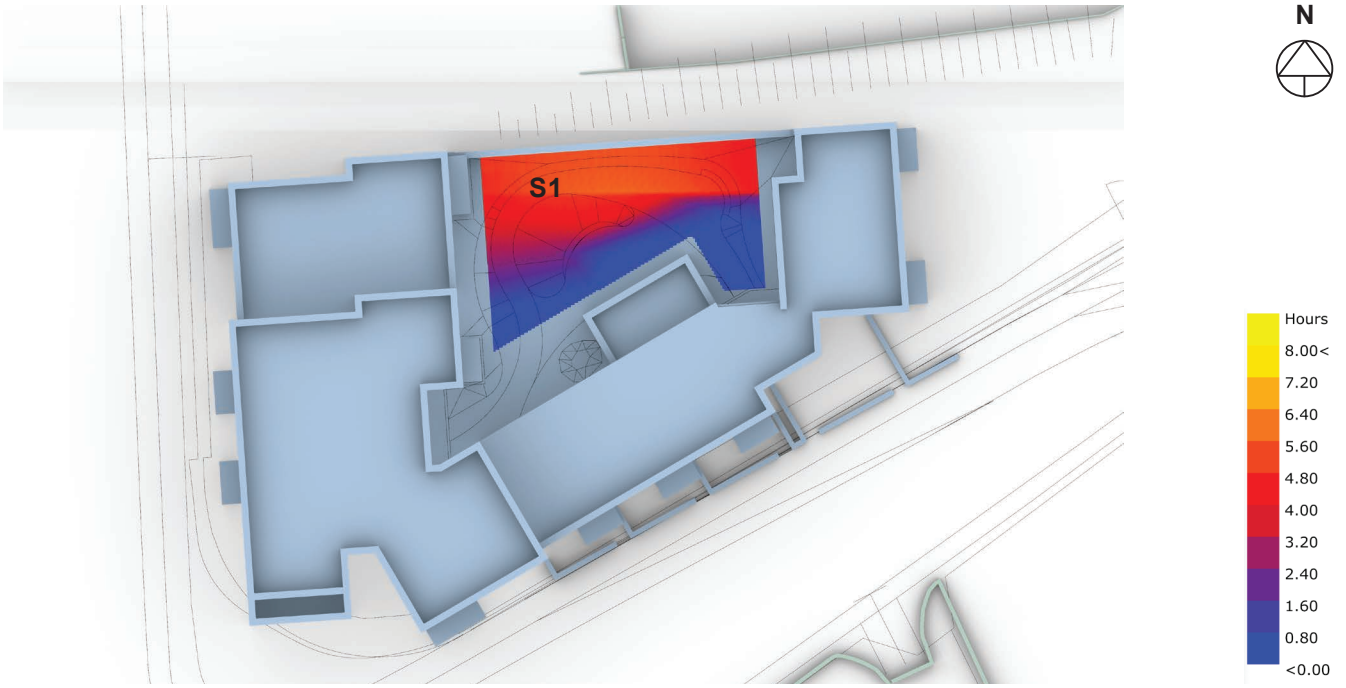


Figure 7: Radiation map of amenity within the Proposed Development, showing available sunlight on 21st March. The scale represents the percentage of daylight received from 0 - 8 hrs.

Sunlight on the Ground - Communal Amenity					
		Proposed: % Area receiving 2 hours sunlight on 21st March	Area Meeting criteria m2	Area Min. required m2	Meets criteria of >50% of area required
S1	Communal Open Space	57.2%	260	217	Y

Table 12: Calculation of Sun on the Ground to amenity area within the proposed development.

8.2 Conclusion

The proposed private amenity space exceeds the BRE recommendation and the amenity space will exceed in excess of 2 hours sunlight over 50% of the amenity space on the 21st March. It should also be noted that the area of assessment is 260m2 which is greater than the minimum required area (217m2).

9. Shadow Study

9.1 BRE Guidance on Shadow Studies

The BRE guidelines recommend using the March Equinox due the equal length of the day and night time. It states:

> *"If a space is used all year round, the equinox (21 March) is the best date for which to prepare shadow plots as it gives an average level of shadowing. Lengths of shadows at the autumn equinox (21 September) will be the same as those for 21 March, so a separate set of plots for September is not required."*

June 21st and December 21st are provided below for information but it should be noted that the summer solstice is the best case scenario with shadows at their shortest. The summer solstice diagrams are included here with the Daylight Saving Time (UTC+1) applied. In Winter even low buildings will cast long shadows and it is common for large areas of the ground to be in shadow throughout the day especially in a built up area and sun barely rises above an altitude of 10° during the course of the day. The guidelines recommends that Sunlight at an altitude of 10° or less does not count. Below are the times for the Equinox and Solstice that the sun is above 10° altitude rounded to the nearest half hour.

Equinox: between 8:30 and 17:30
Summer Solstice: Between 6:30 and 20:00
Winter Solstice: Between 10:30 and 14:00

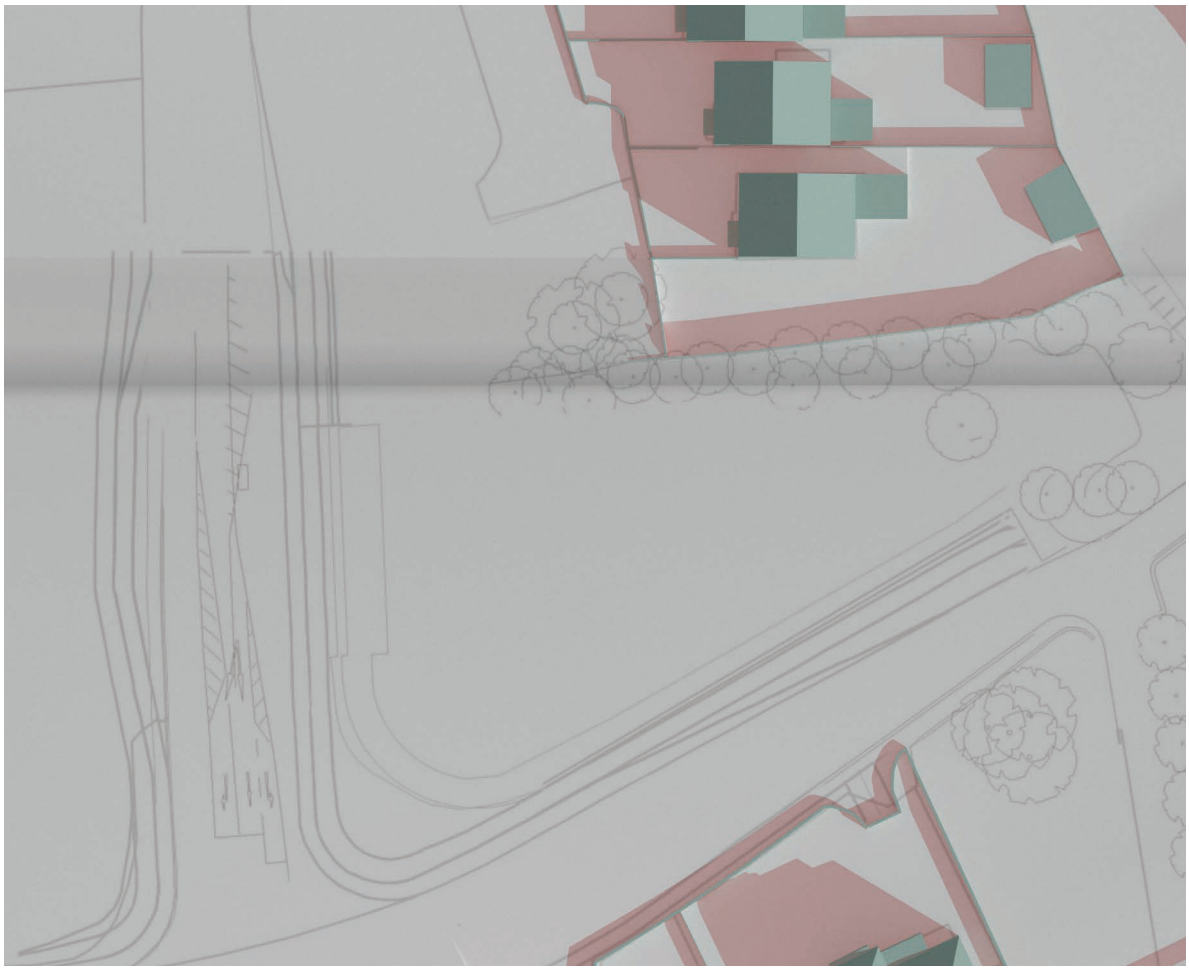
Section 9.2 shows the existing and proposed shadow diagrams for the Equinox on the 21st March at 2 hourly intervals during the day between 09:00 and 17:00.
Section 9.3 shows the existing and proposed shadow diagrams for the Summer Solstice on the 21st June at 2 hourly intervals during the day between 09:00 and 19:00.
Section 9.4 shows the existing and proposed shadow diagrams for the Equinox on the 21st September at 2 hourly intervals during the day between 09:00 and 17:00.
Section 9.5 shows the existing and proposed shadow diagrams for the Winter Solstice on the 21st December at 2 hourly intervals during the day between 09:00 and 15:00.

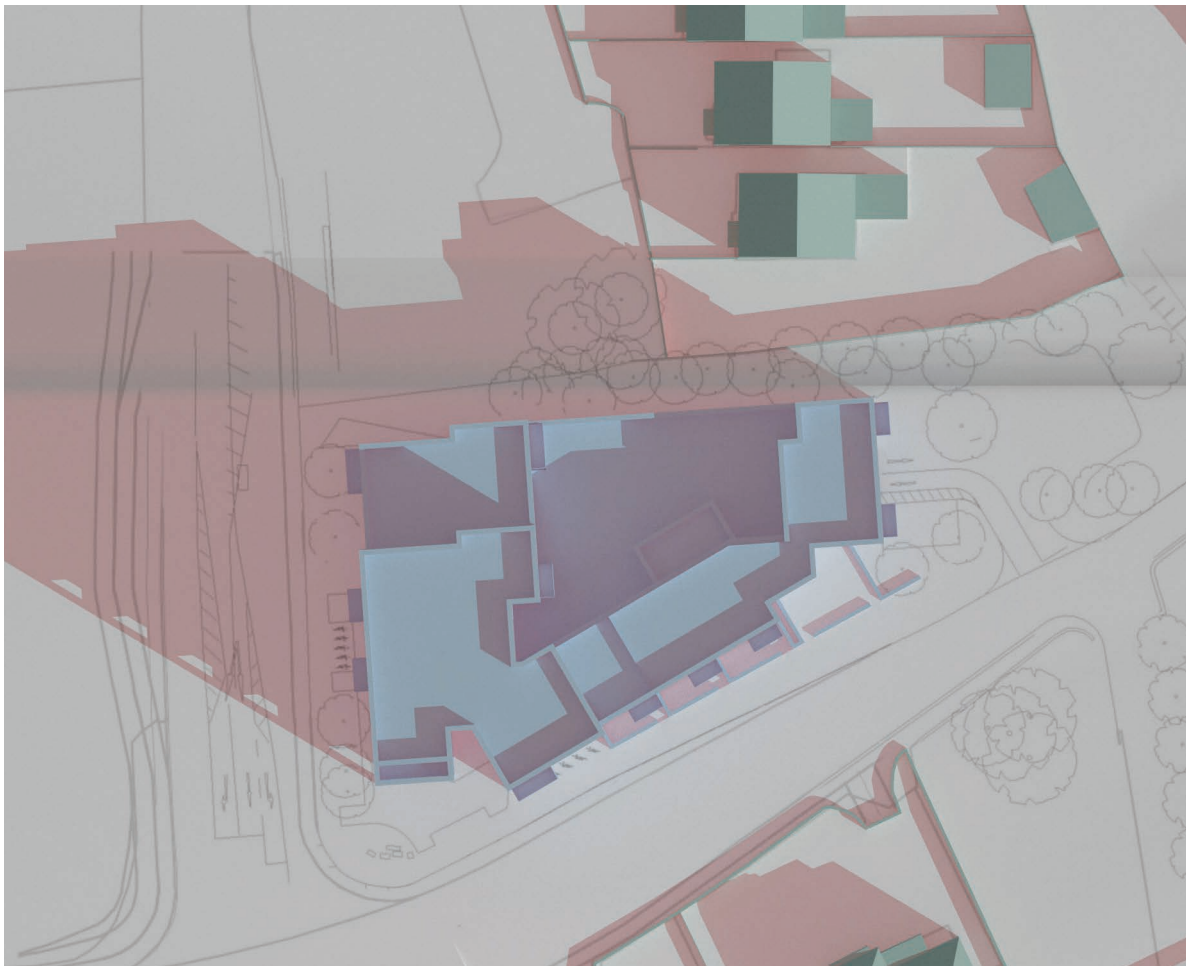
The site is vacant, so there are no shadow cast from any structures in the existing condition. Shadow diagrams are a visual aid to understand where possible shading may occur. The use of shadow diagrams as an assessment method should be taken over the course of the day and not a specific time due to the transient nature of the sun and the shade caused by obstructions.

9.2 Shadow Casting diagrams March Equinox

Existing

N



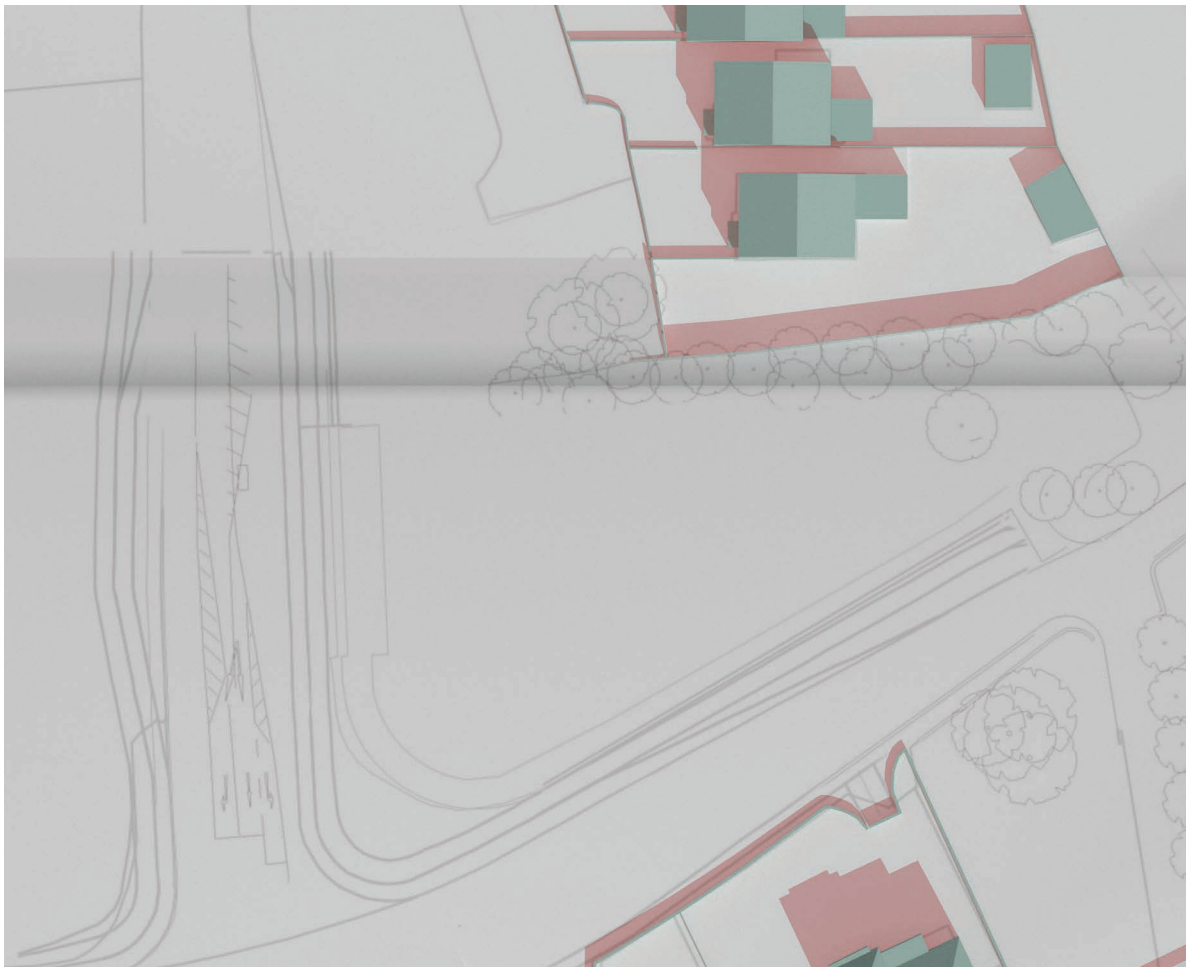


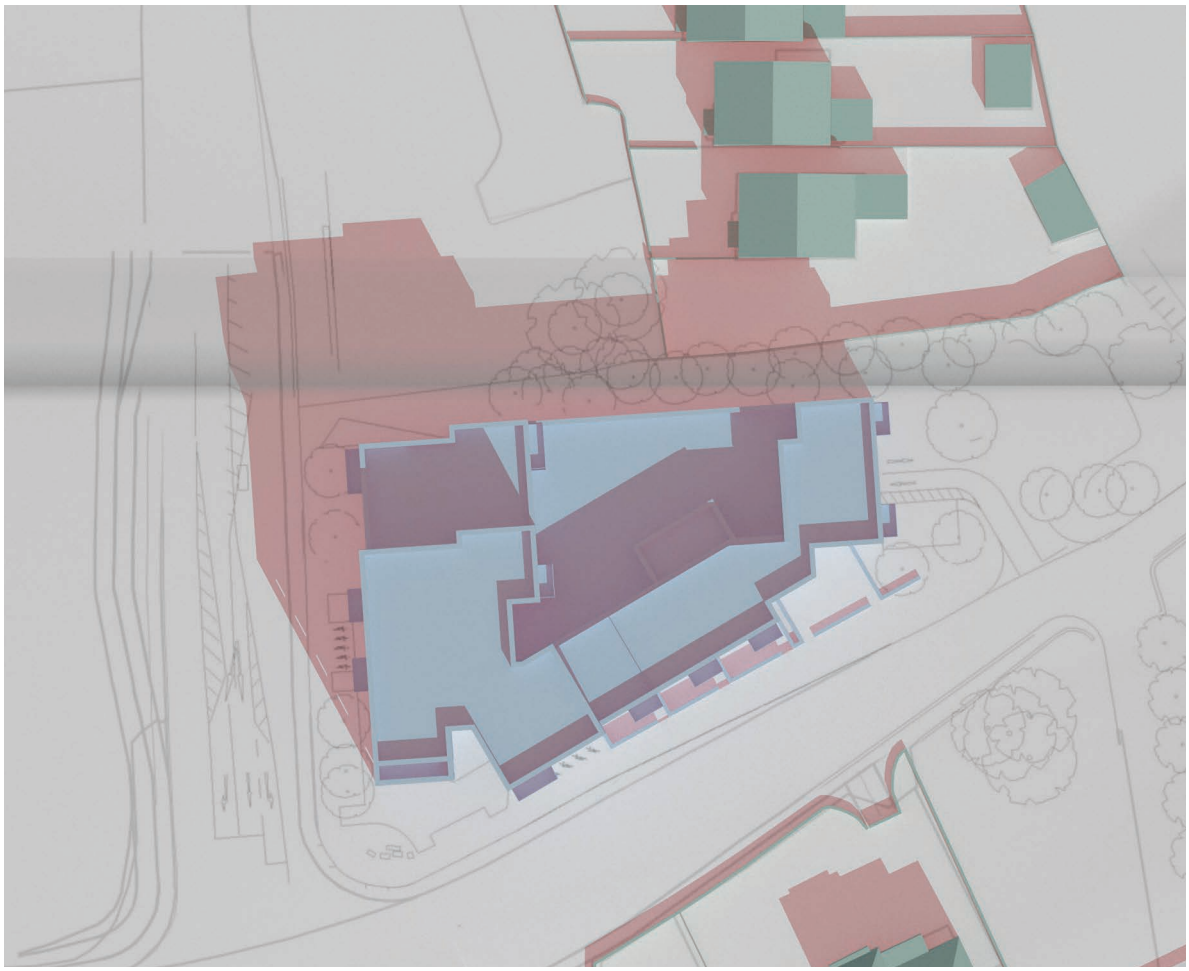
Proposed

Figure 8: Shadow diagrams 21 March 09:00 UTC

Existing

N



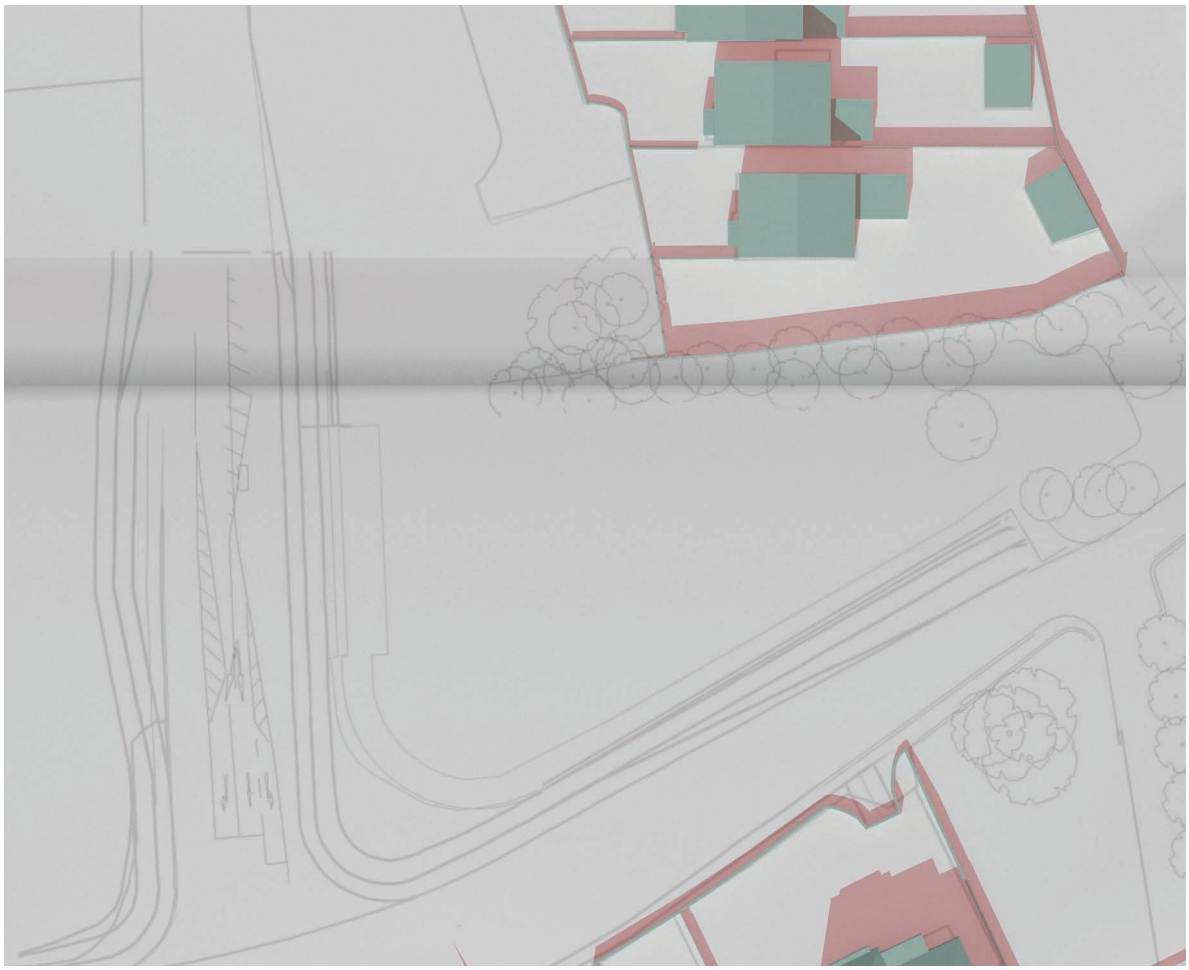


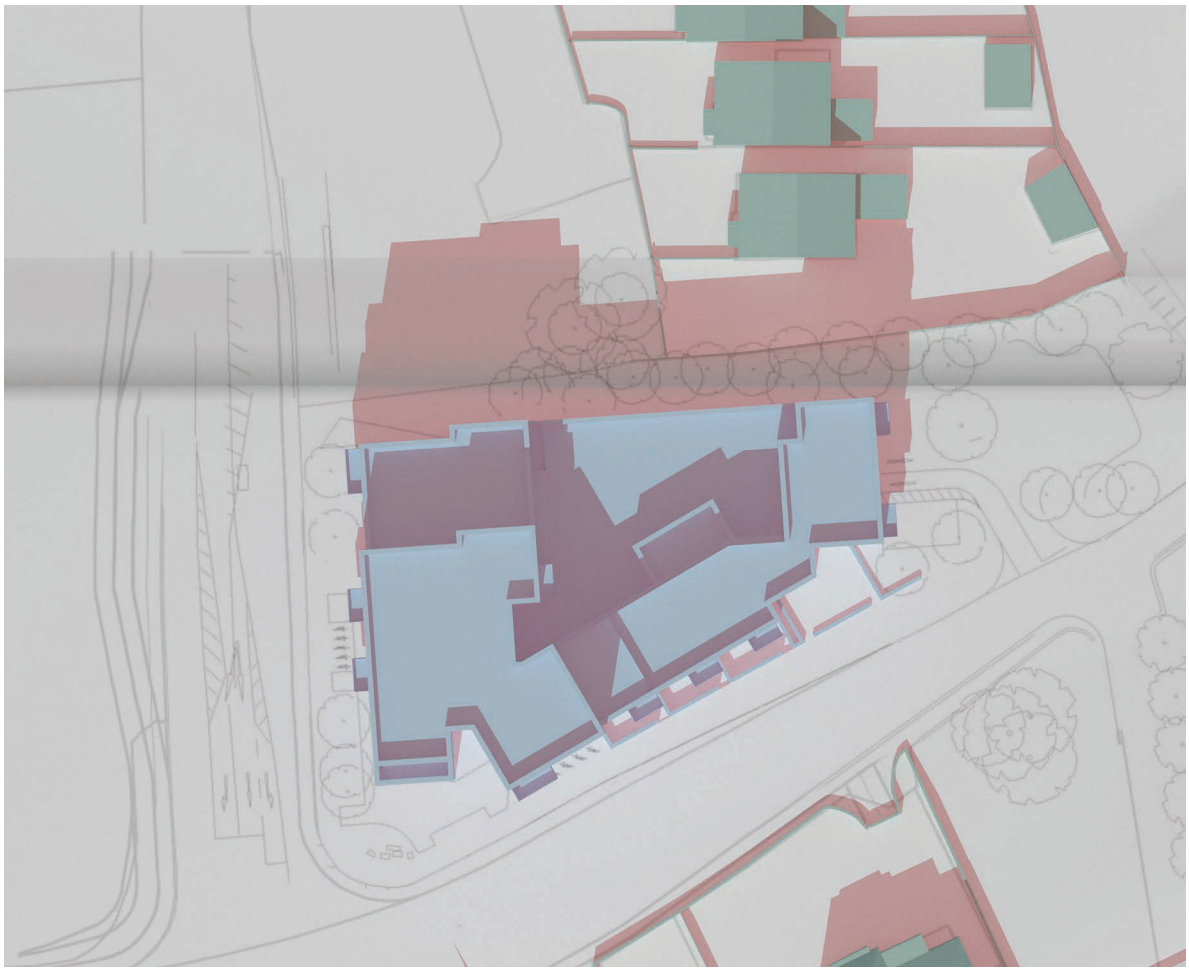
Proposed

Figure 9: Shadow diagrams 21 March 11:00 UTC

Existing

N



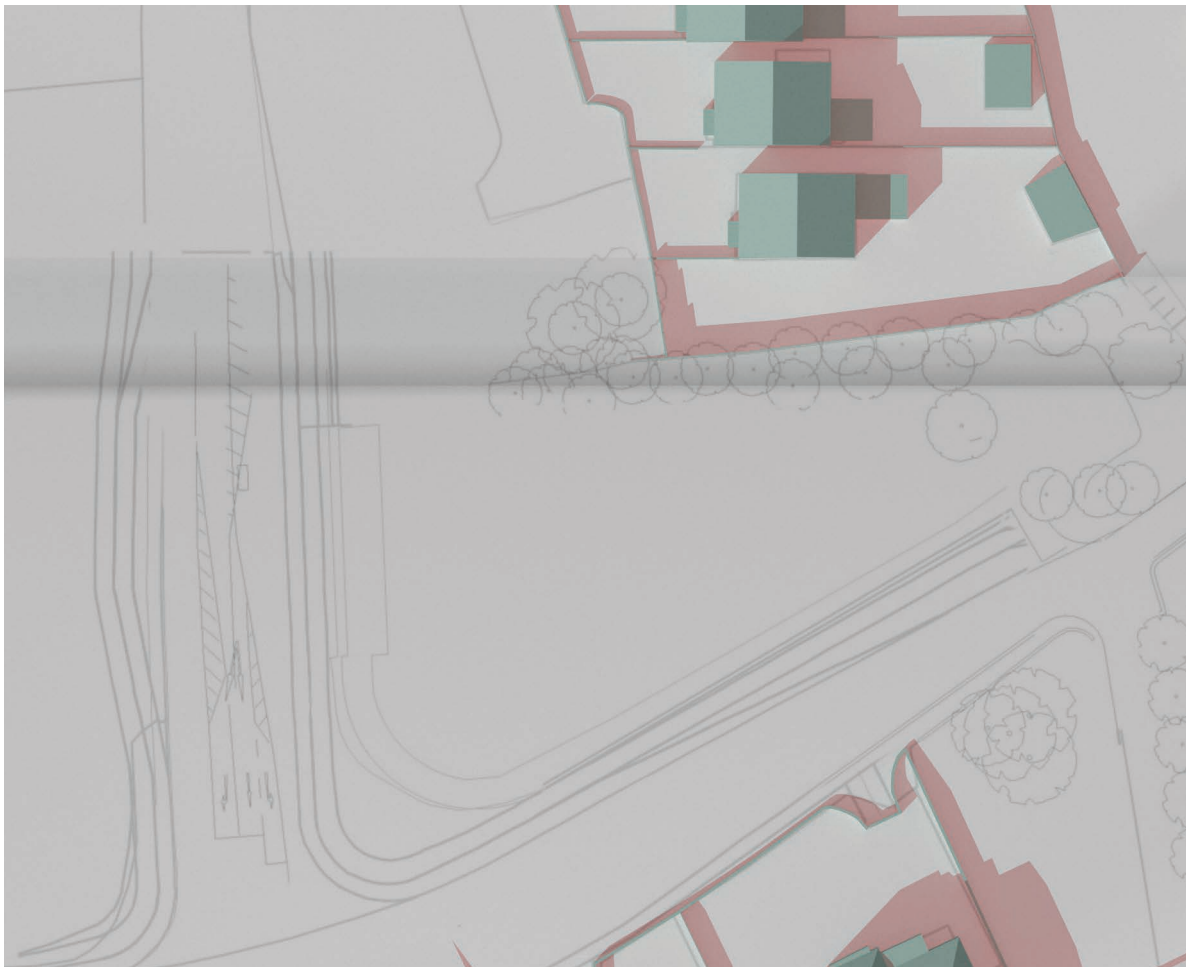


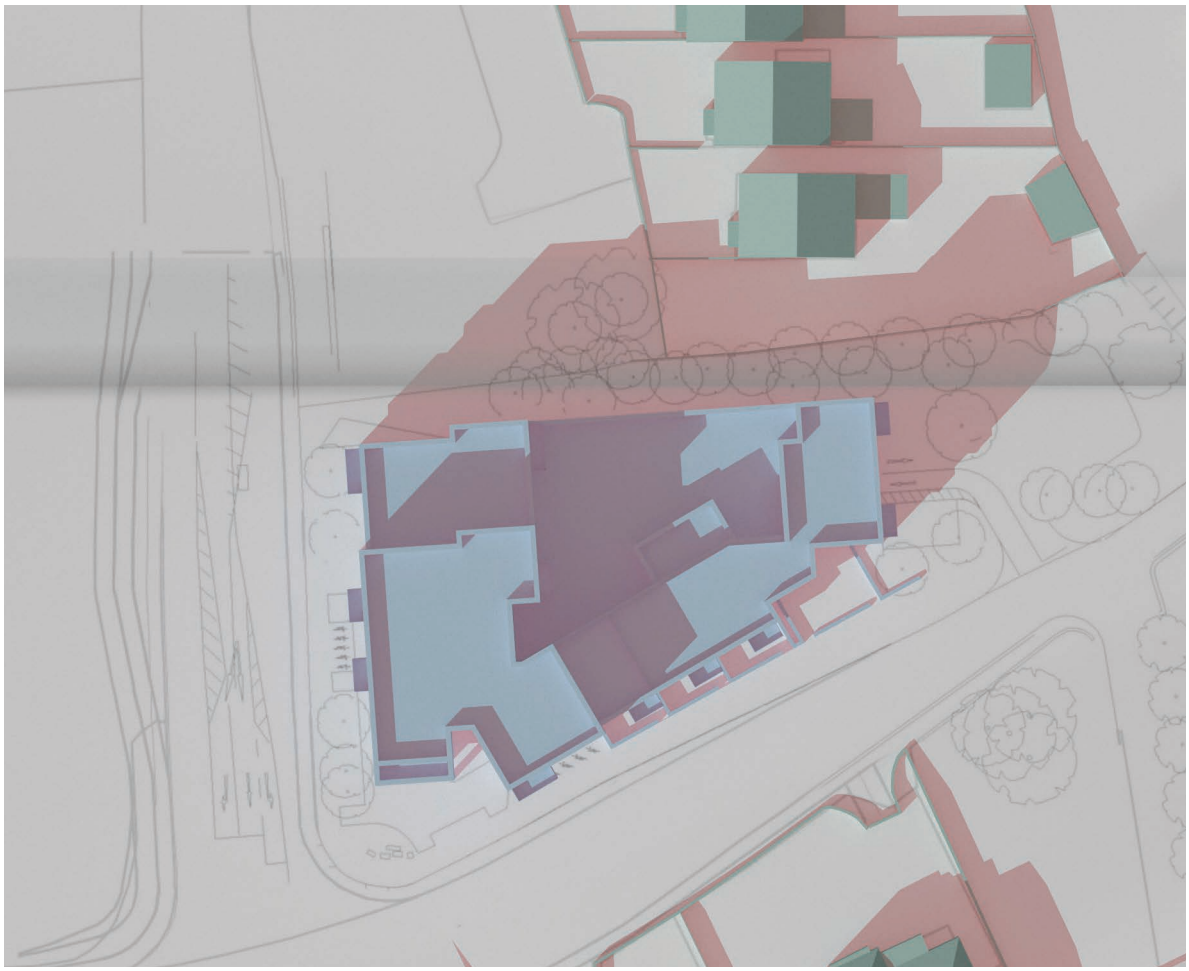
Proposed

Figure 10: Shadow diagrams 21 March 13:00 UTC

Existing

N



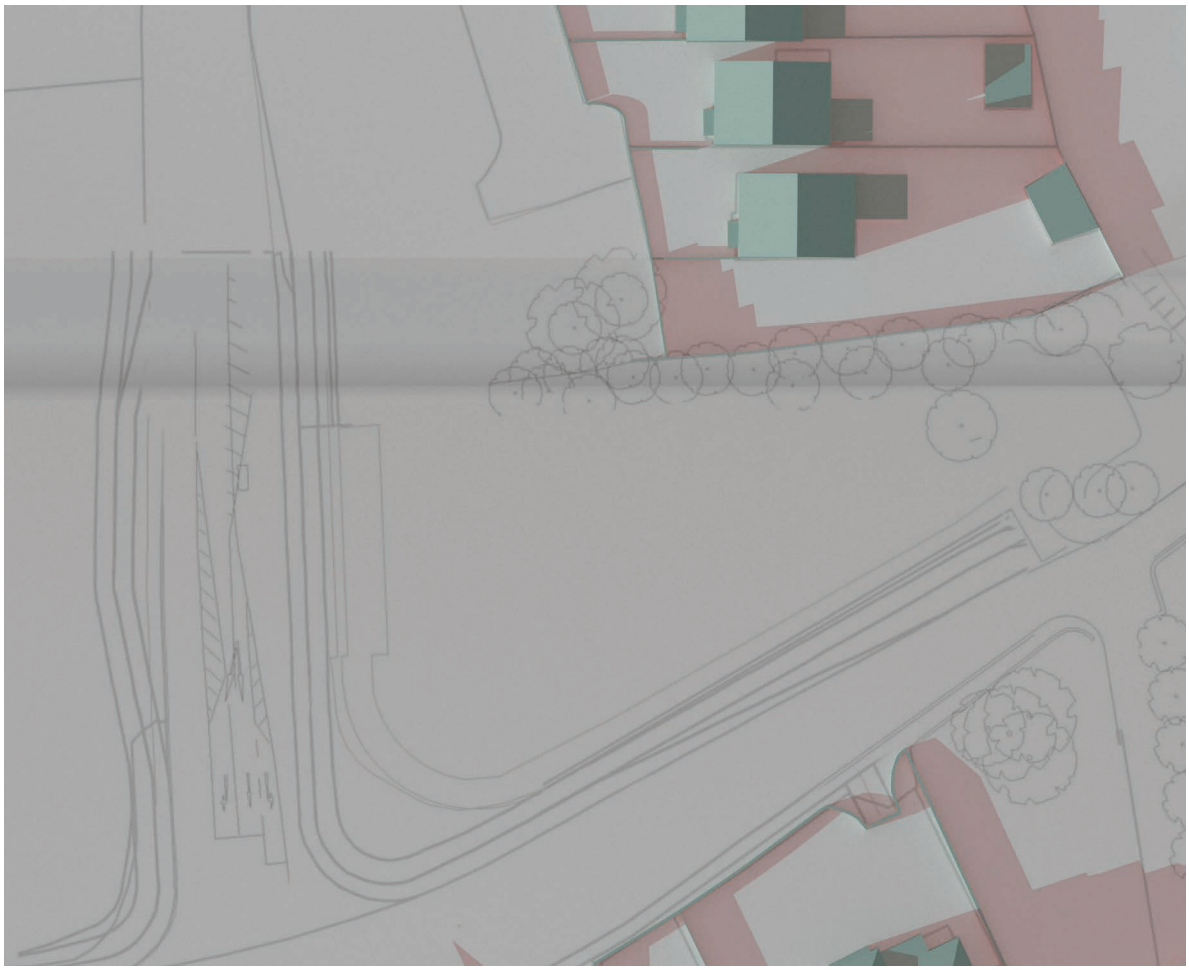


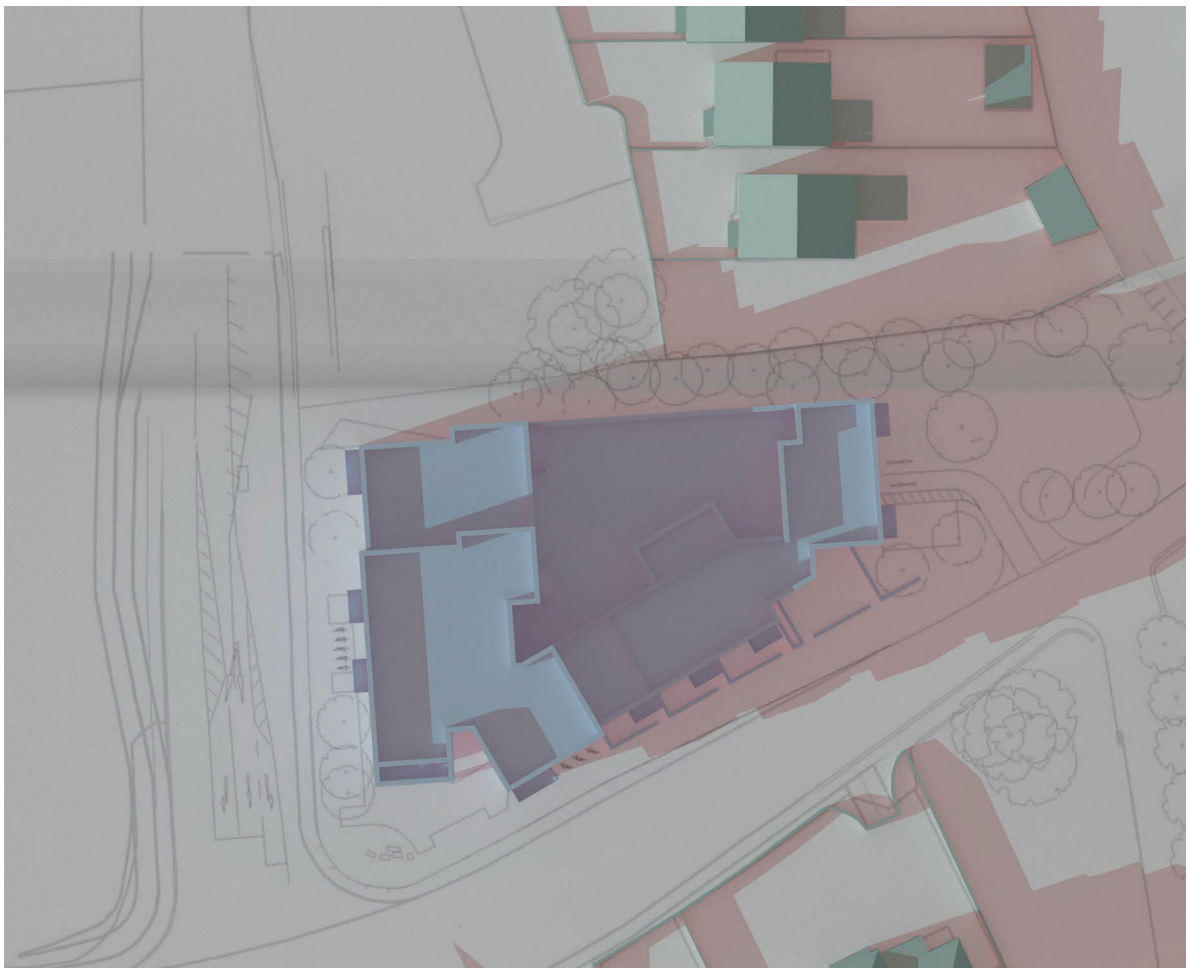
Proposed

Figure 11: Shadow diagrams 21 March 15:00 UTC

Existing

N





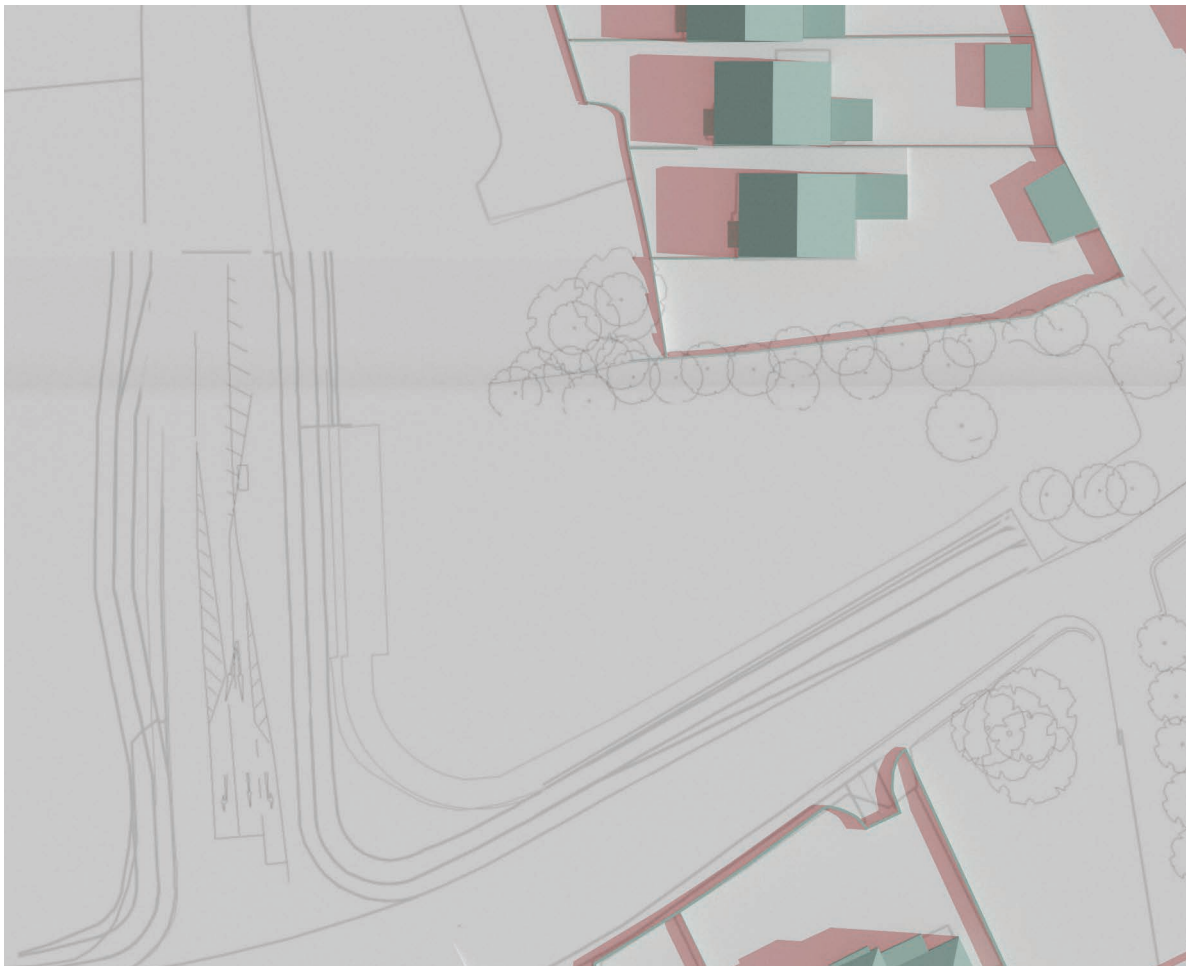
Proposed

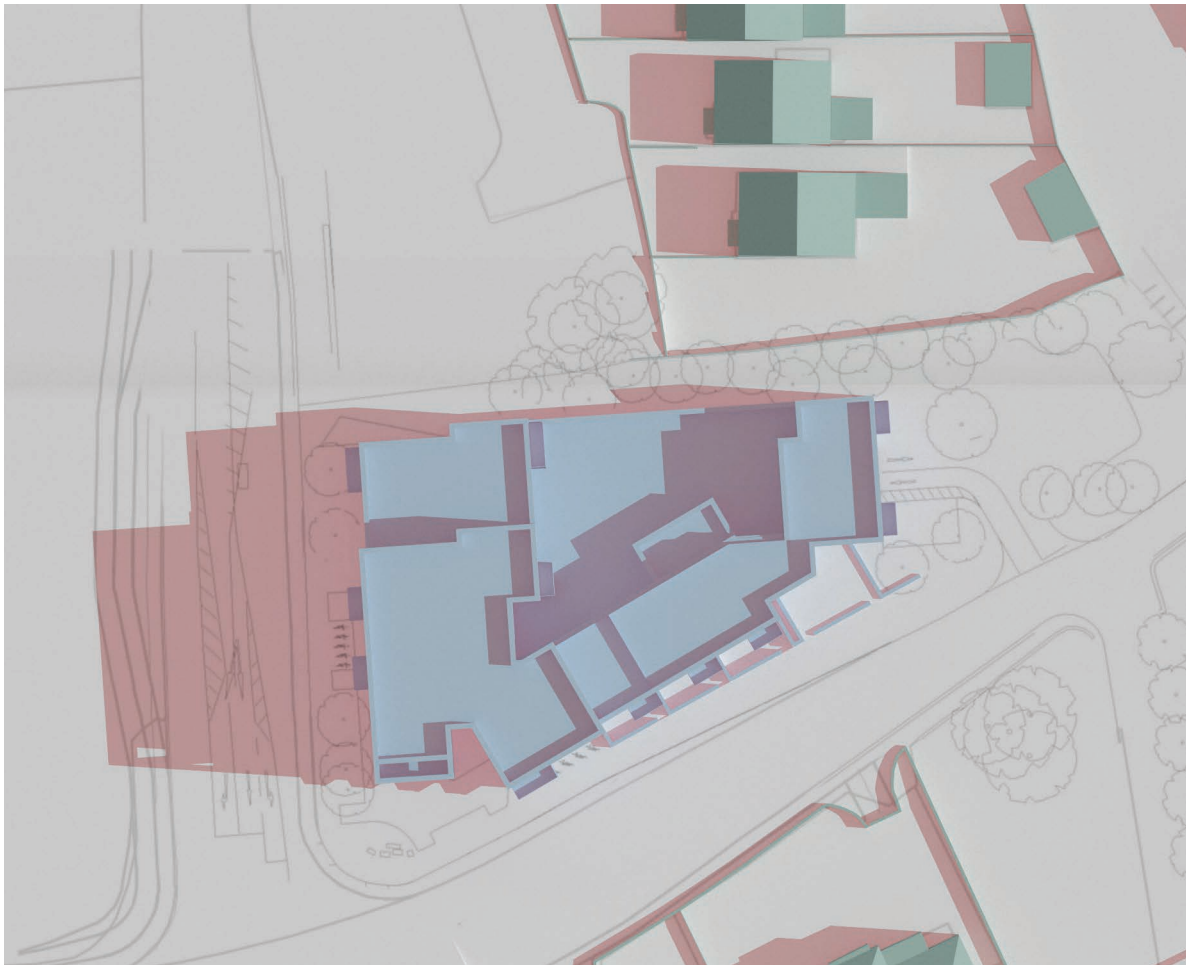
Figure 12: Shadow diagrams 21 March 17:00 UTC

9.3 Shadow Casting diagrams June Solstice

Existing

N



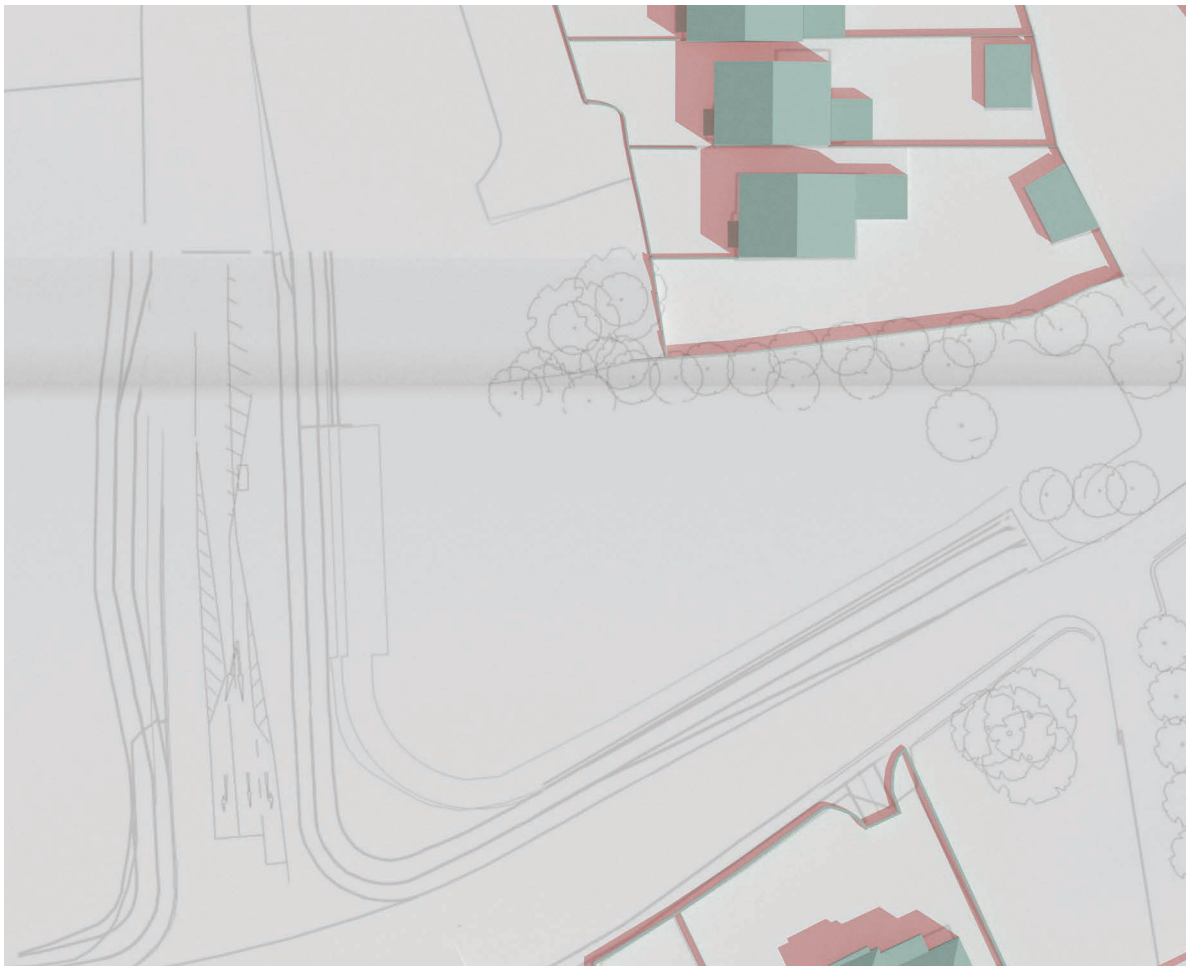


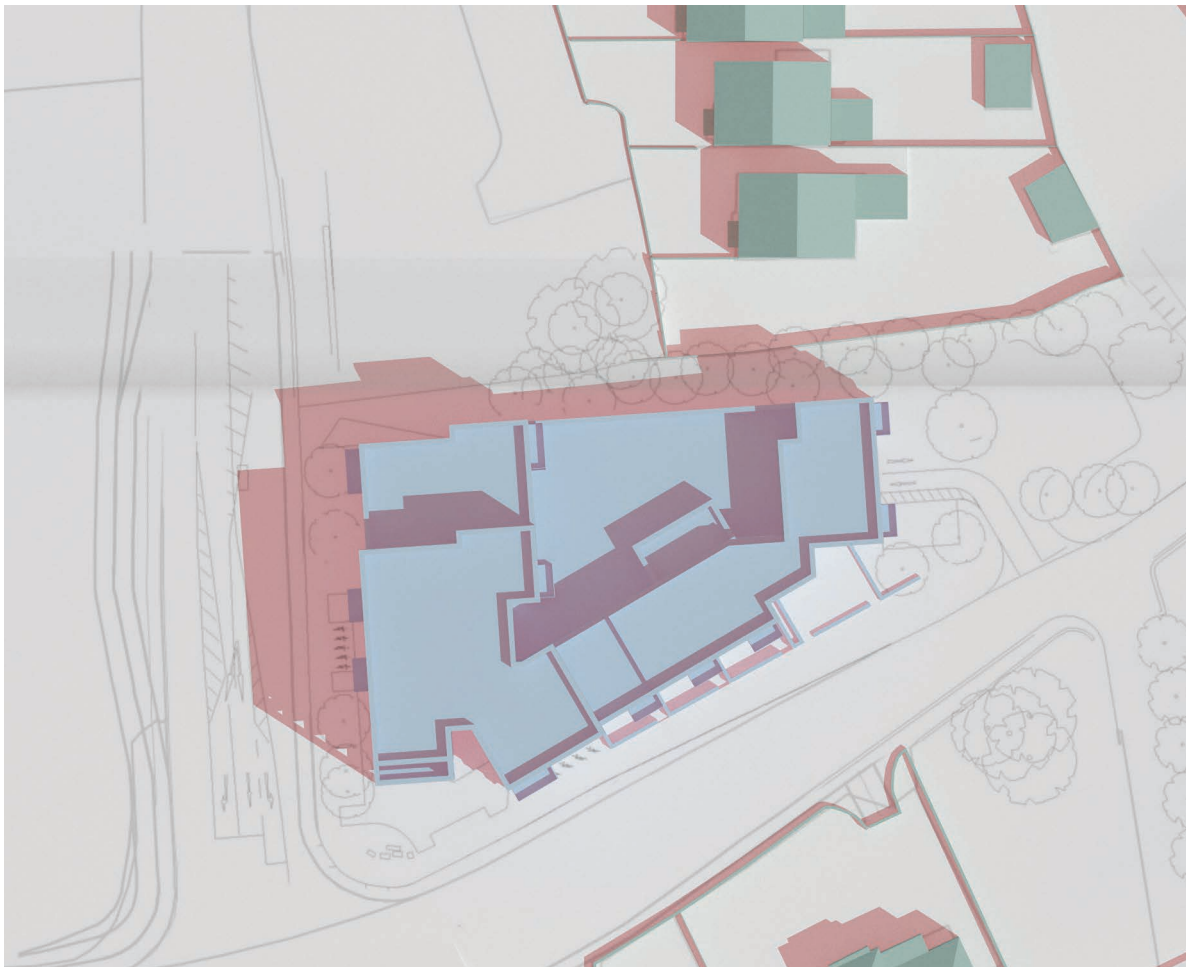
Proposed

Figure 13: Shadow diagrams 21 June 09.00 UTC +1

Existing

N



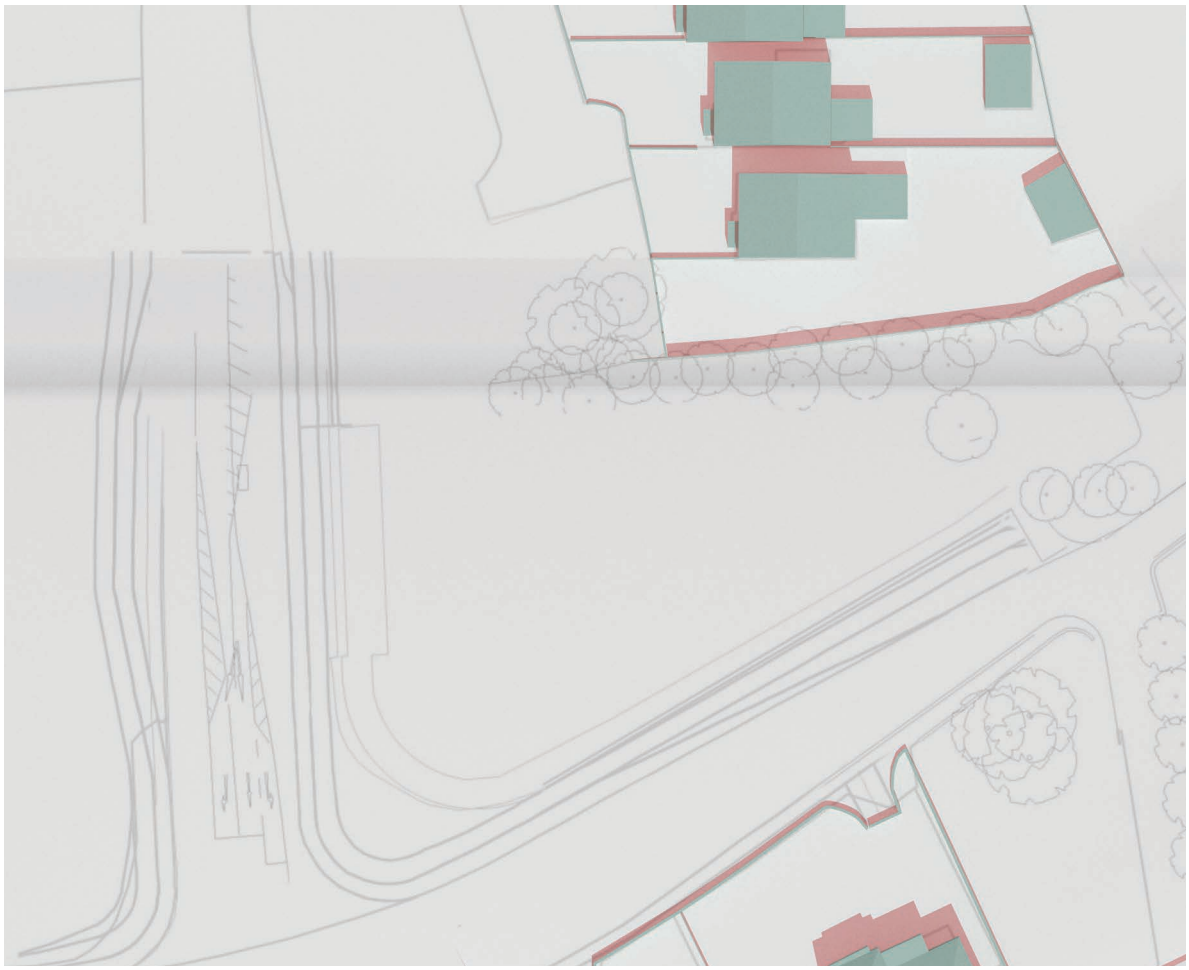


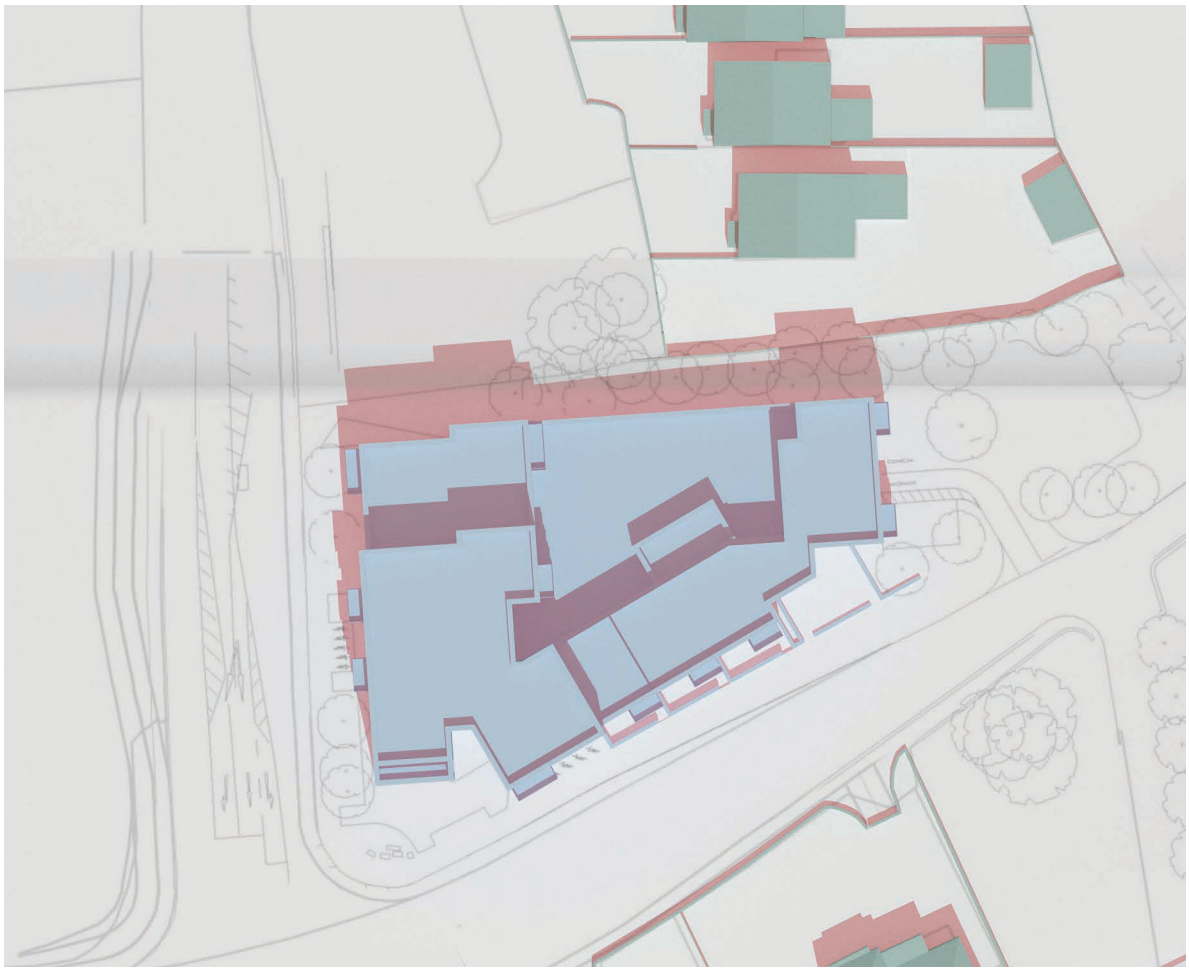
Proposed

Figure 14: Shadow diagrams 21 June 11:00 UTC +1

Existing

N



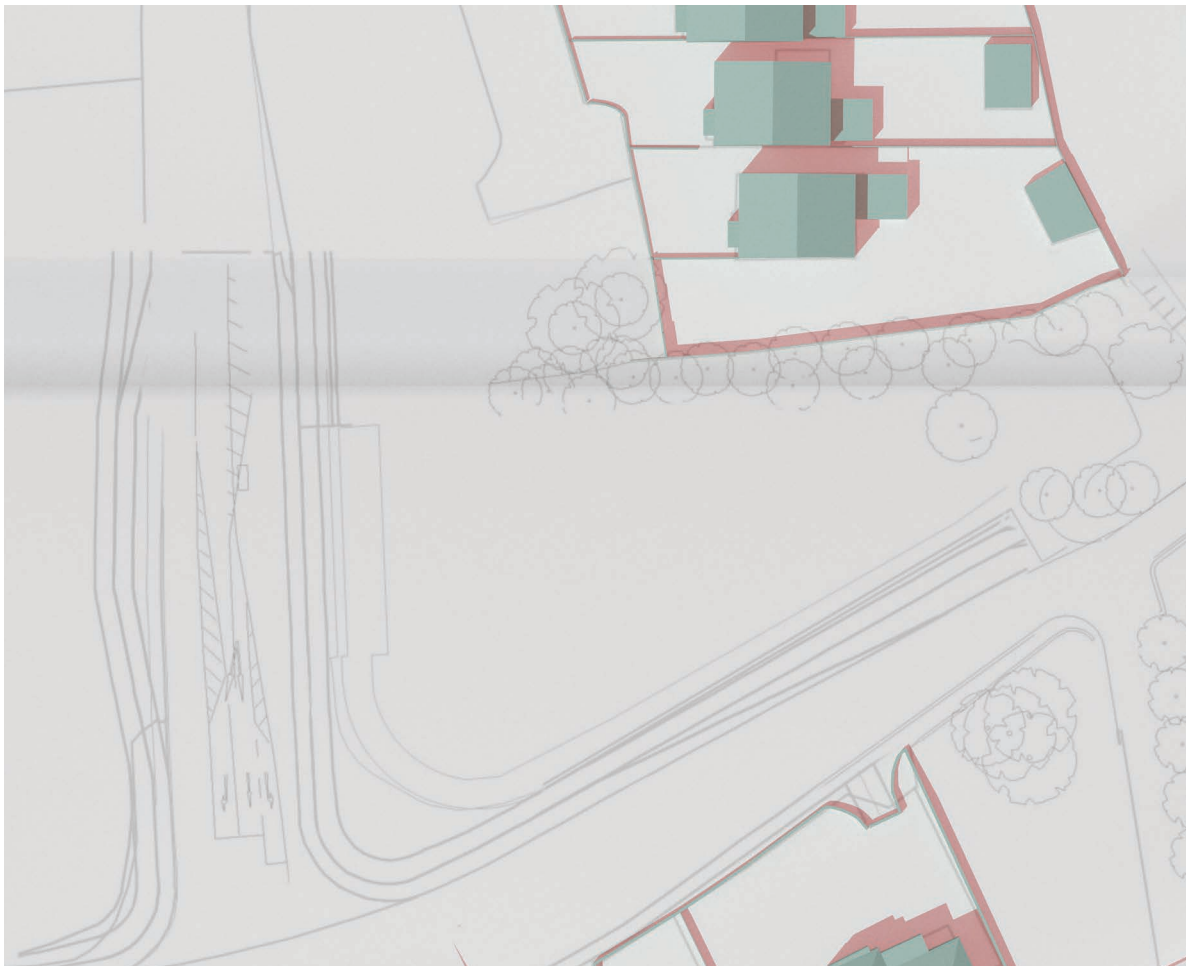


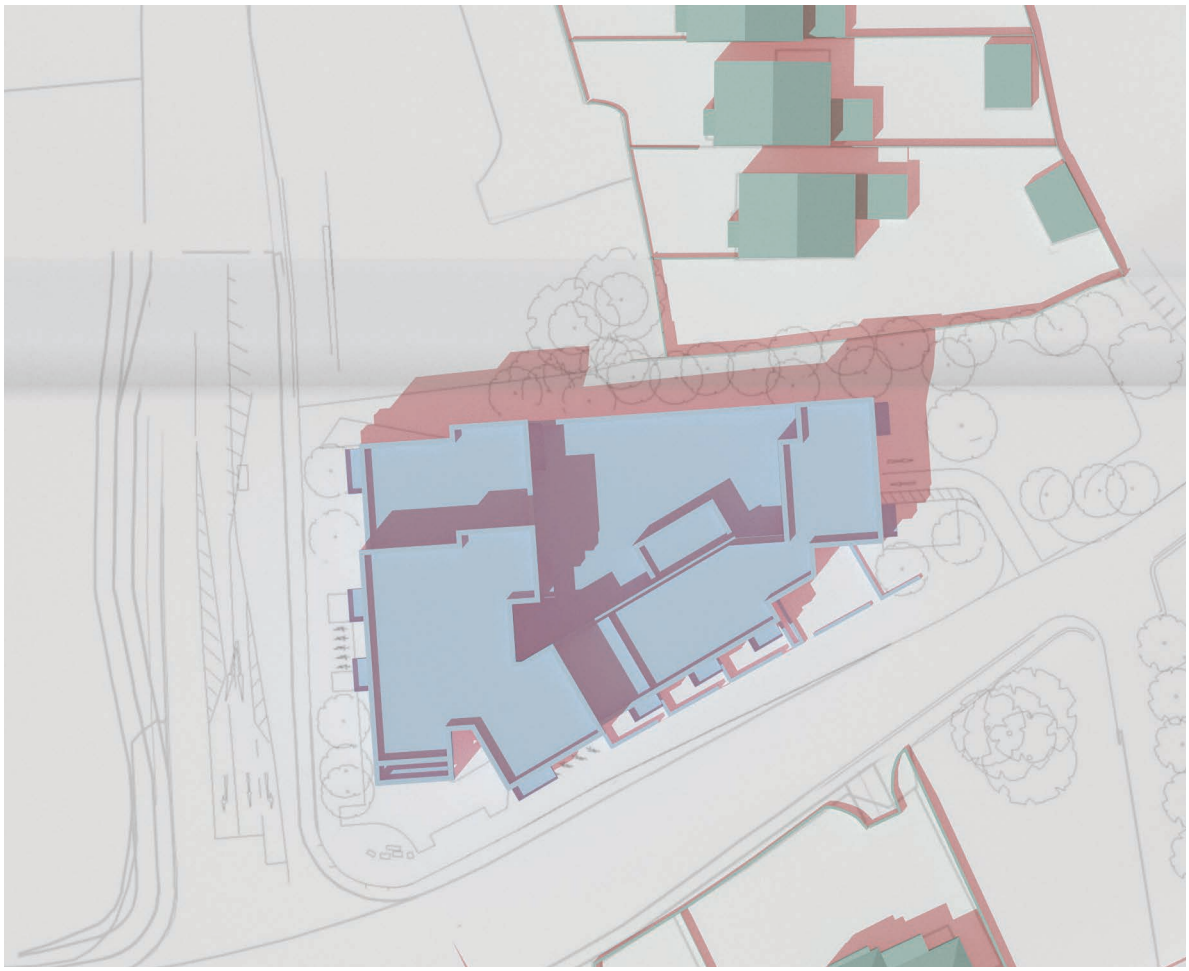
Proposed

Figure 15: Shadow diagrams 21 June 13:00 UTC +1

Existing

N



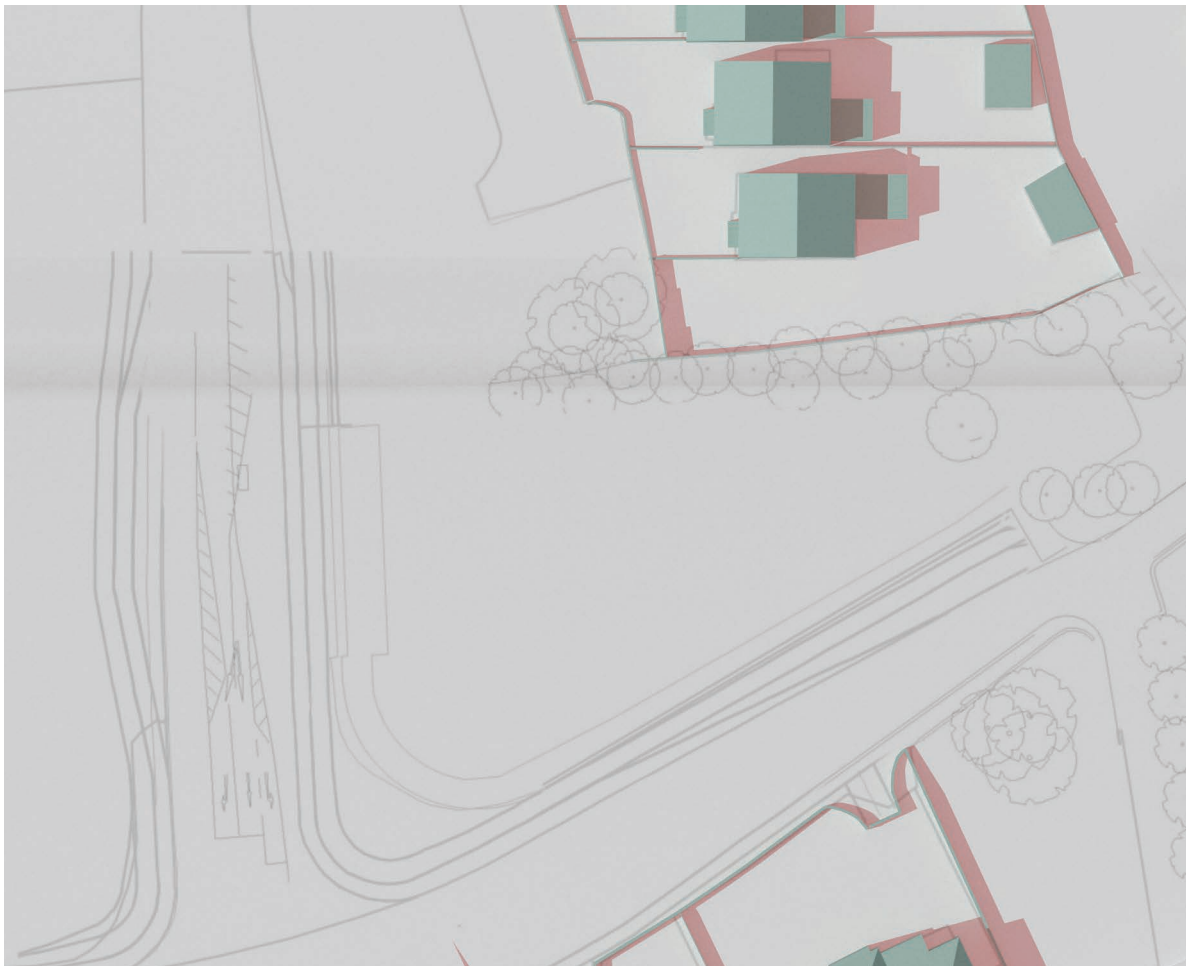


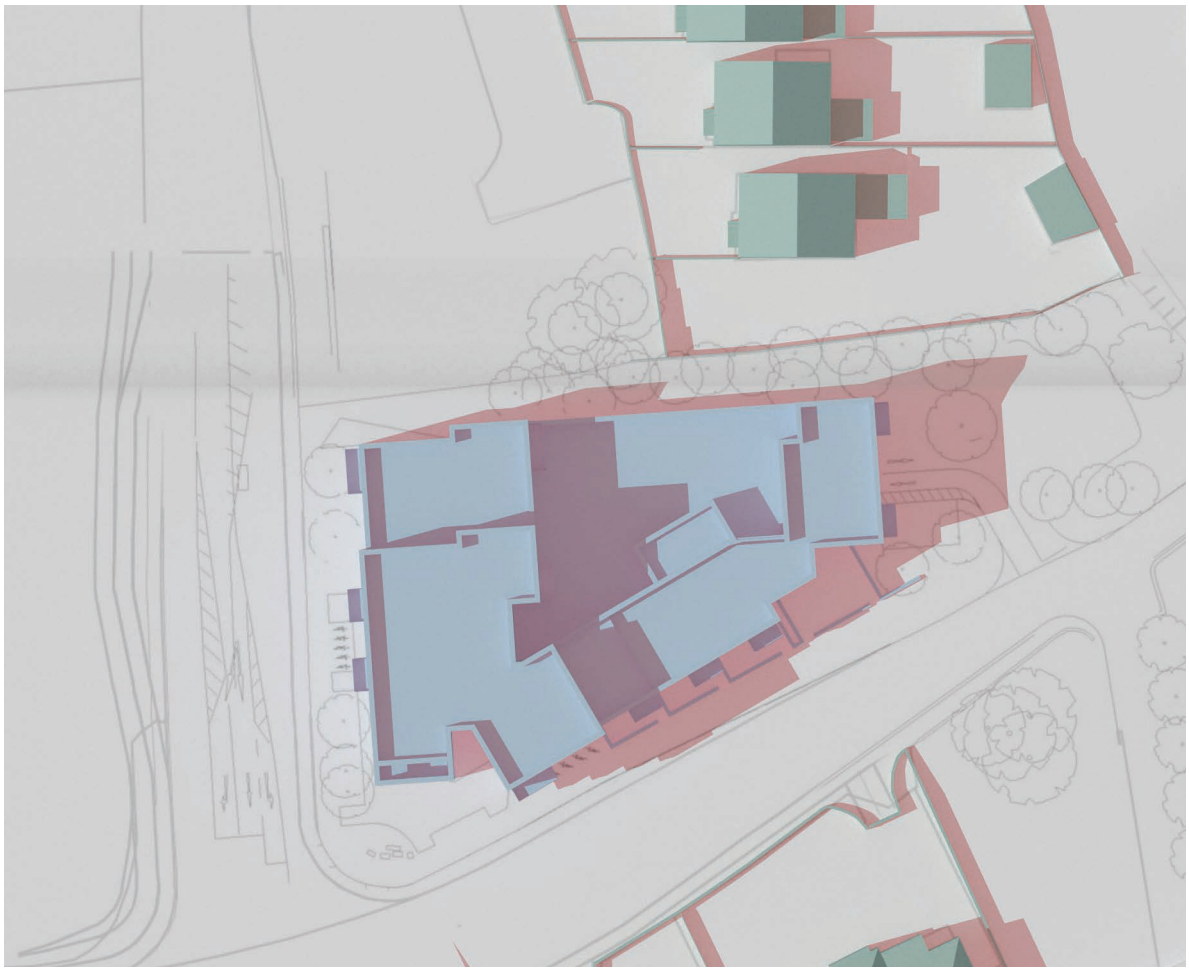
Proposed

Figure 16: Shadow diagrams 21 June 15:00 UTC +1

Existing

N



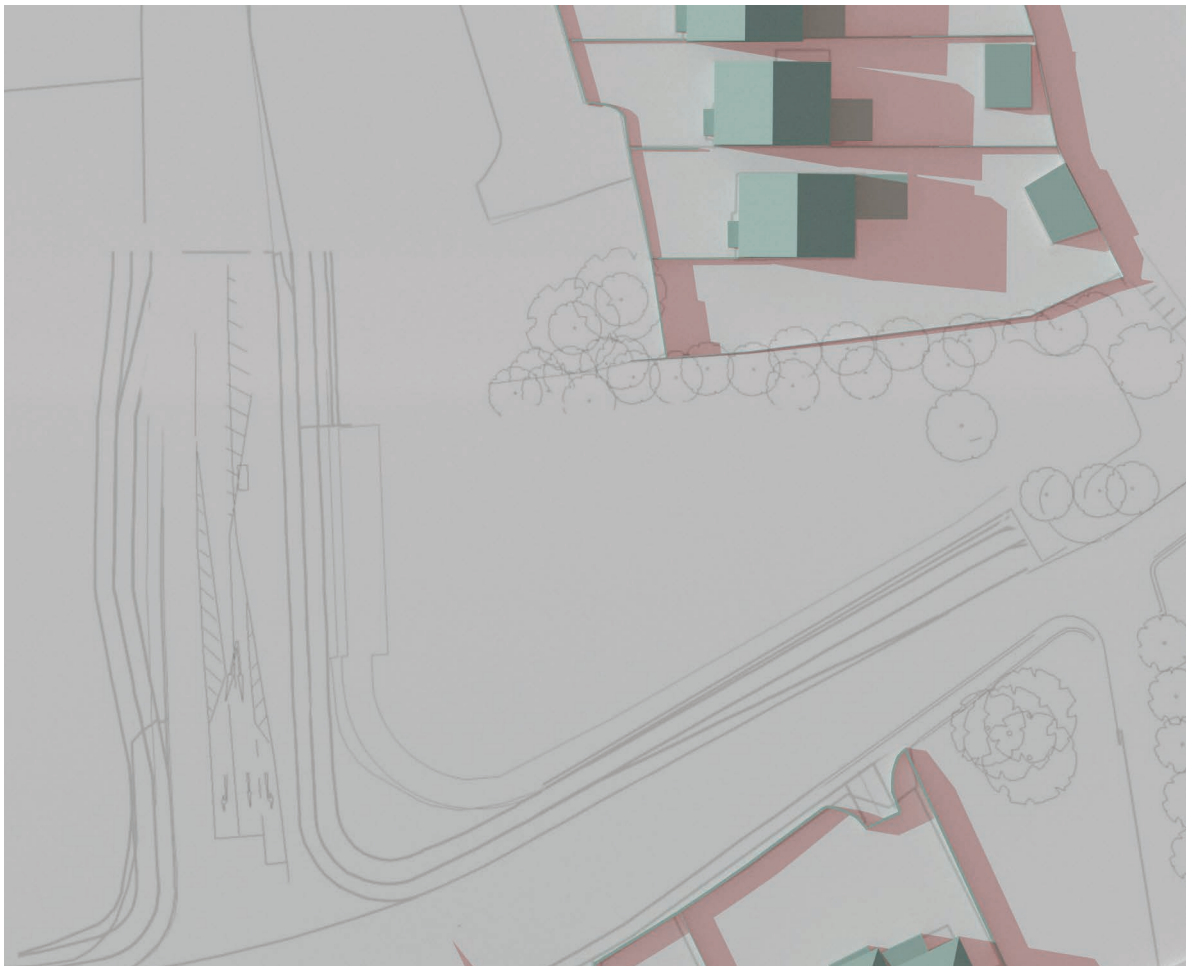


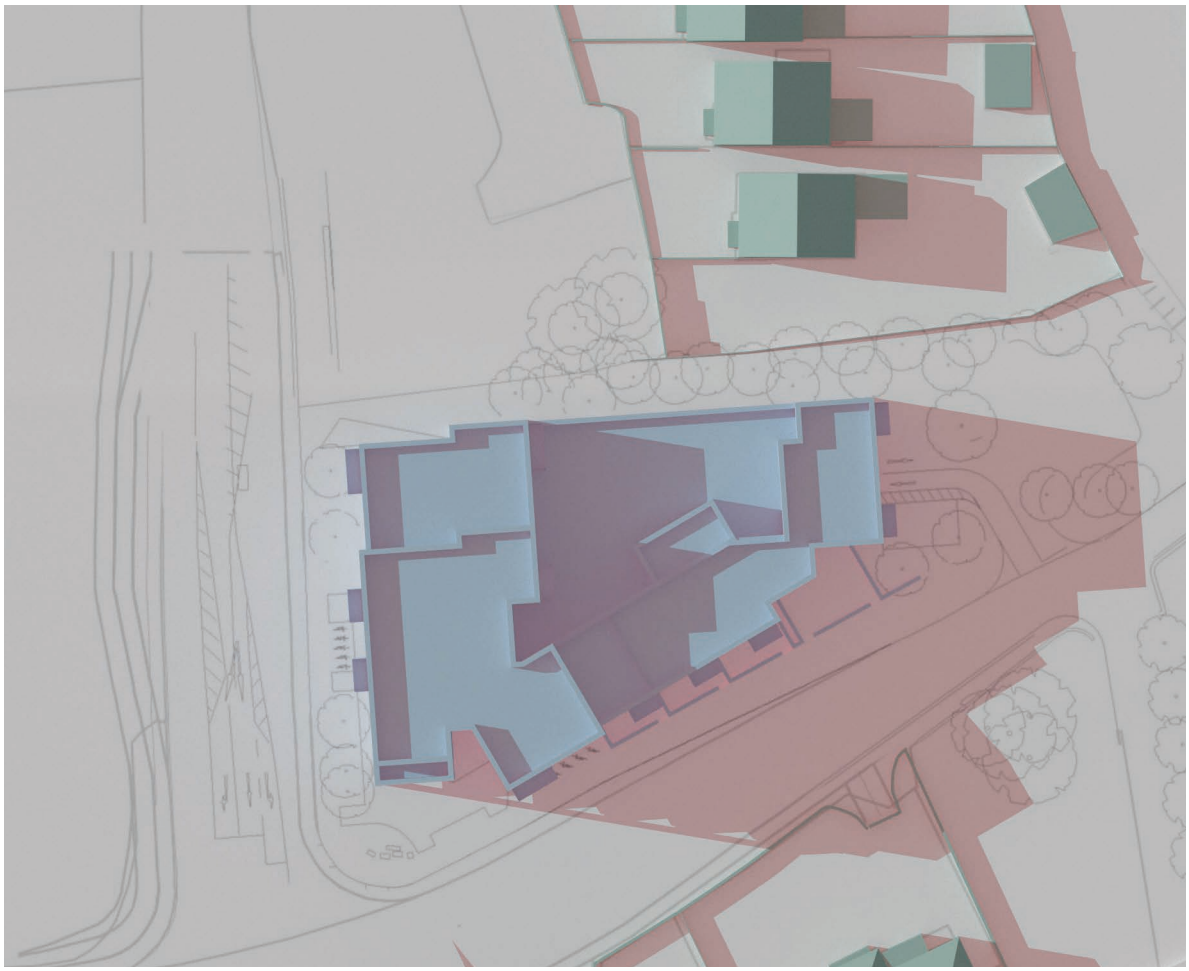
Proposed

Figure 17: Shadow diagrams 21 June 17:00 UTC +1

Existing

N





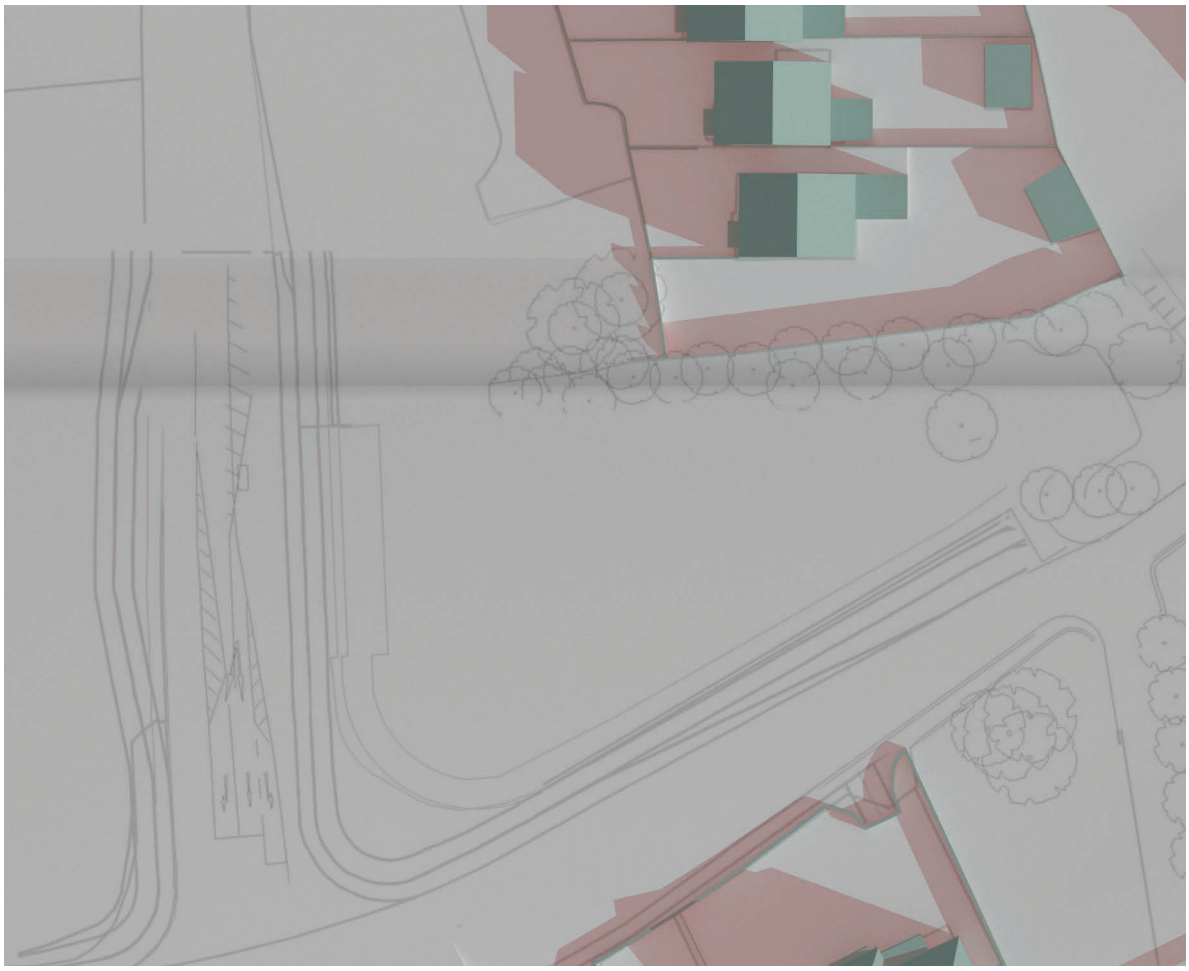
Proposed

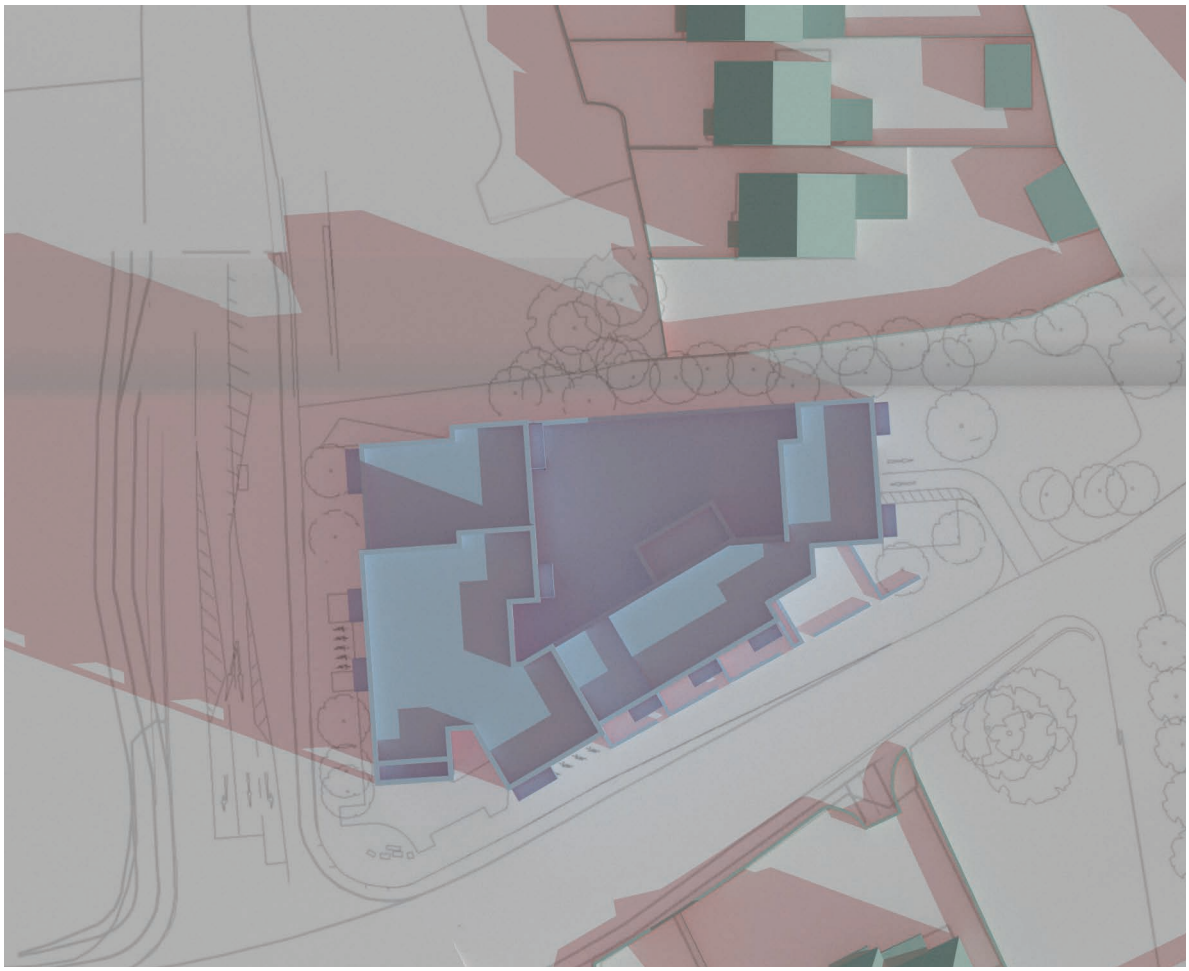
Figure 18: Shadow diagrams 21 June 19:00 UTC +1

9.4 Shadow Casting diagrams September Equinox

Existing

N



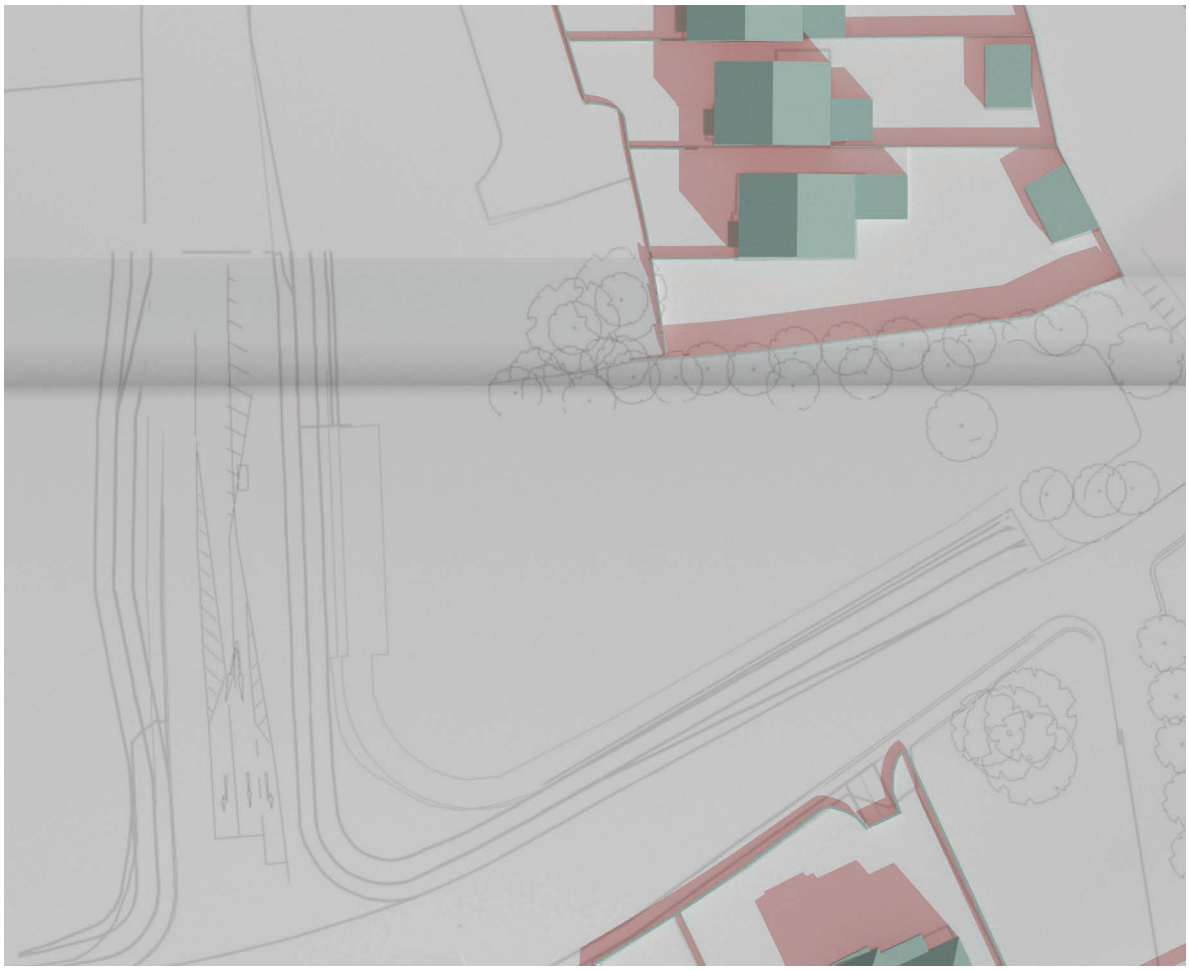


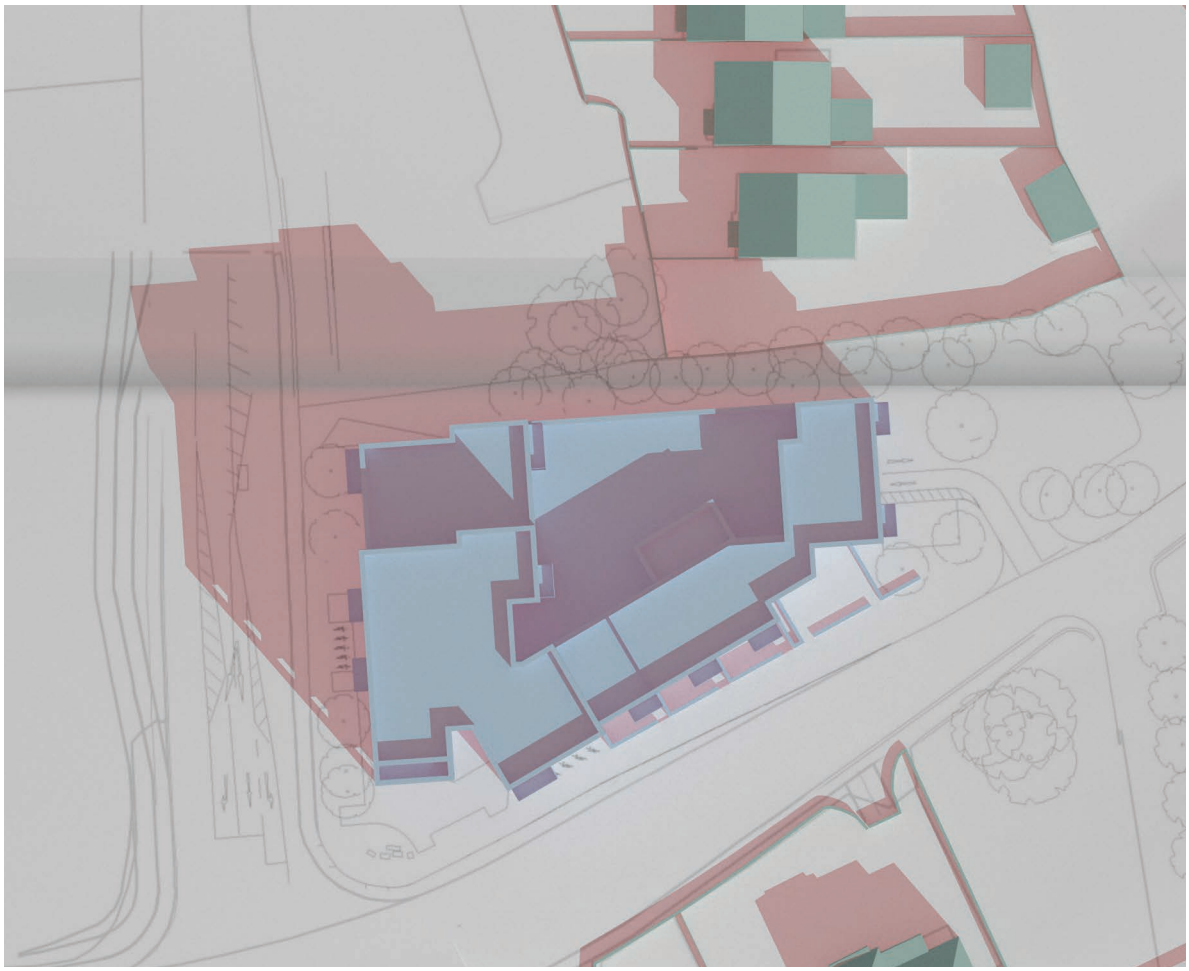
Proposed

Figure 19: Shadow diagrams 21 September 09:00 UTC +1

Existing

N



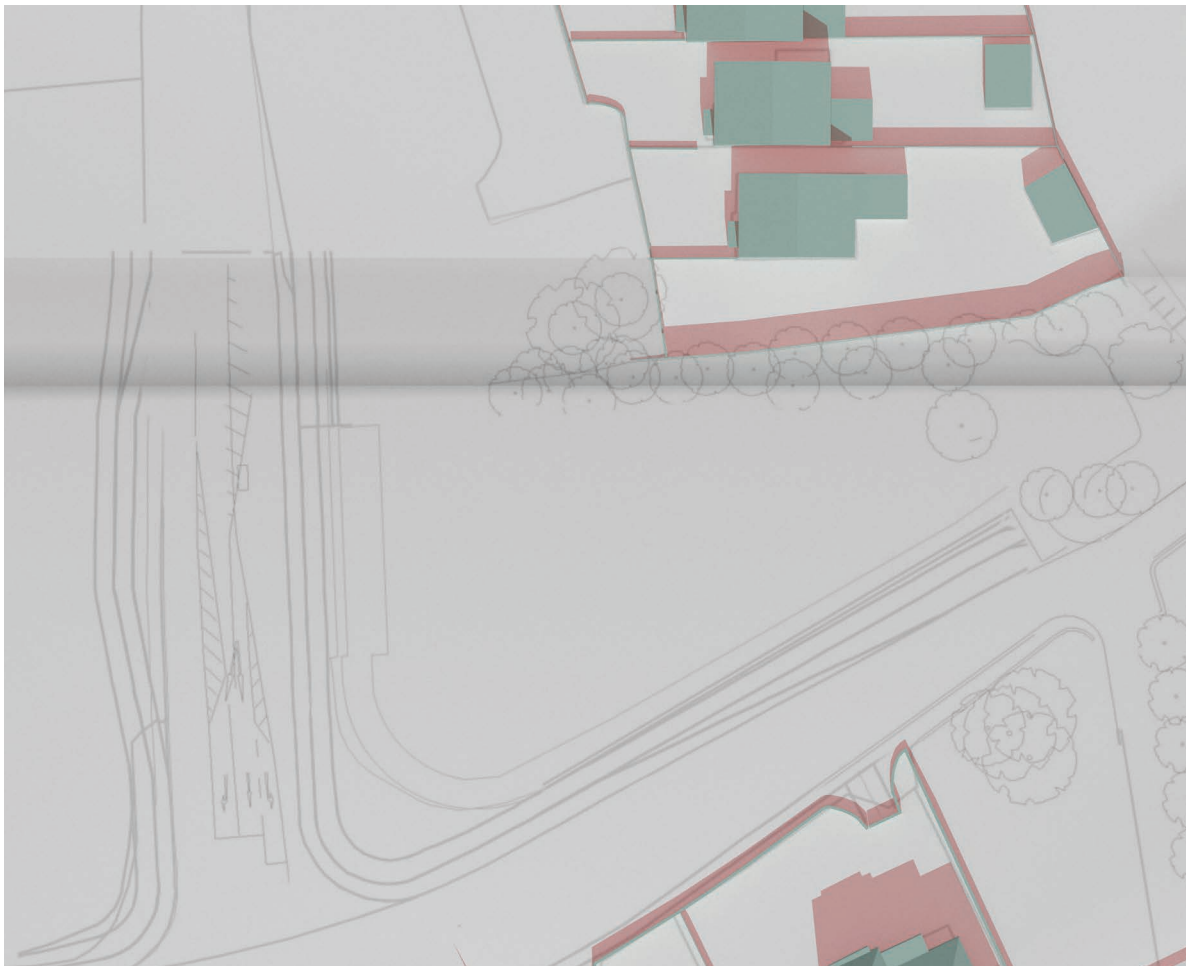


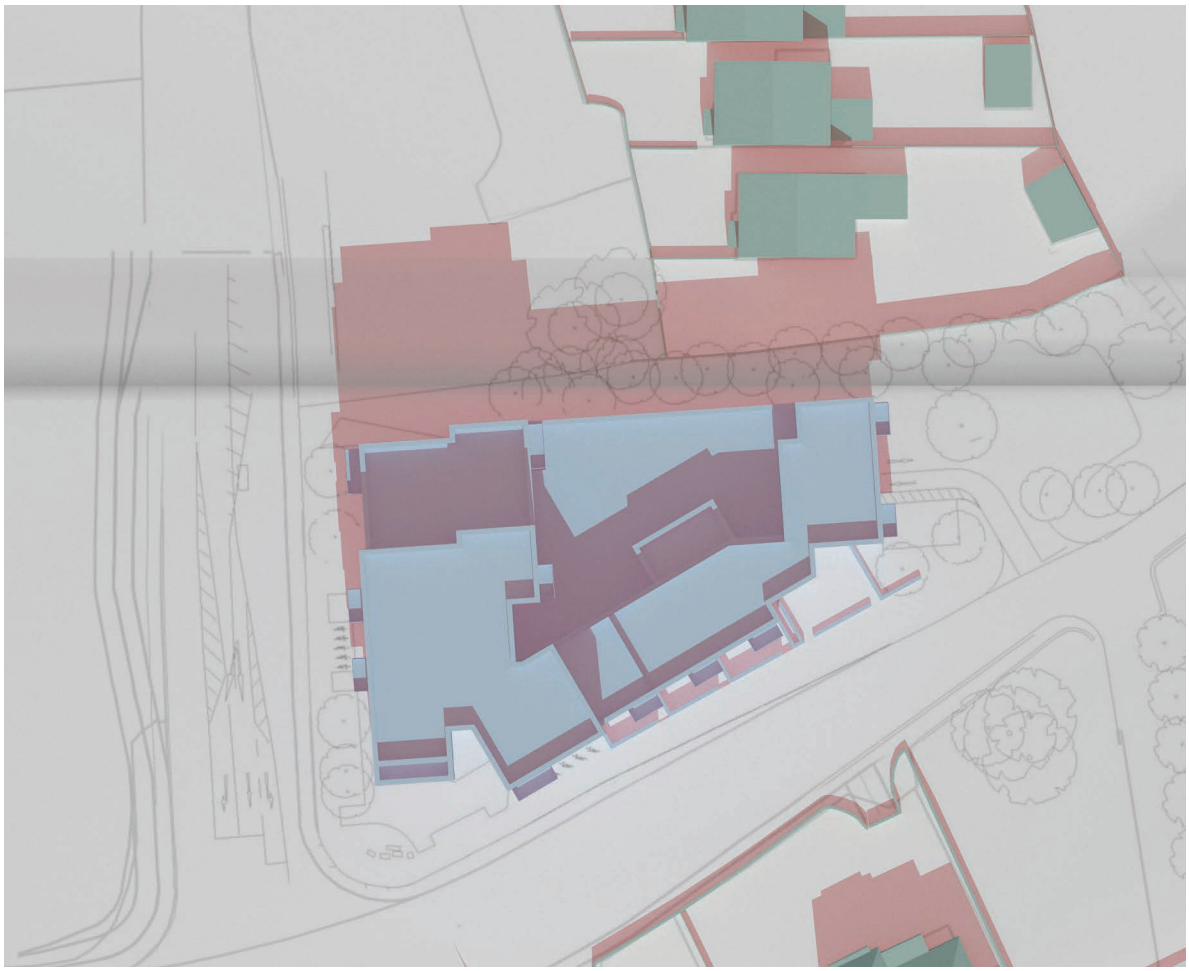
Proposed

Figure 20: Shadow diagrams 21 September 11:00 UTC +1

Existing

N



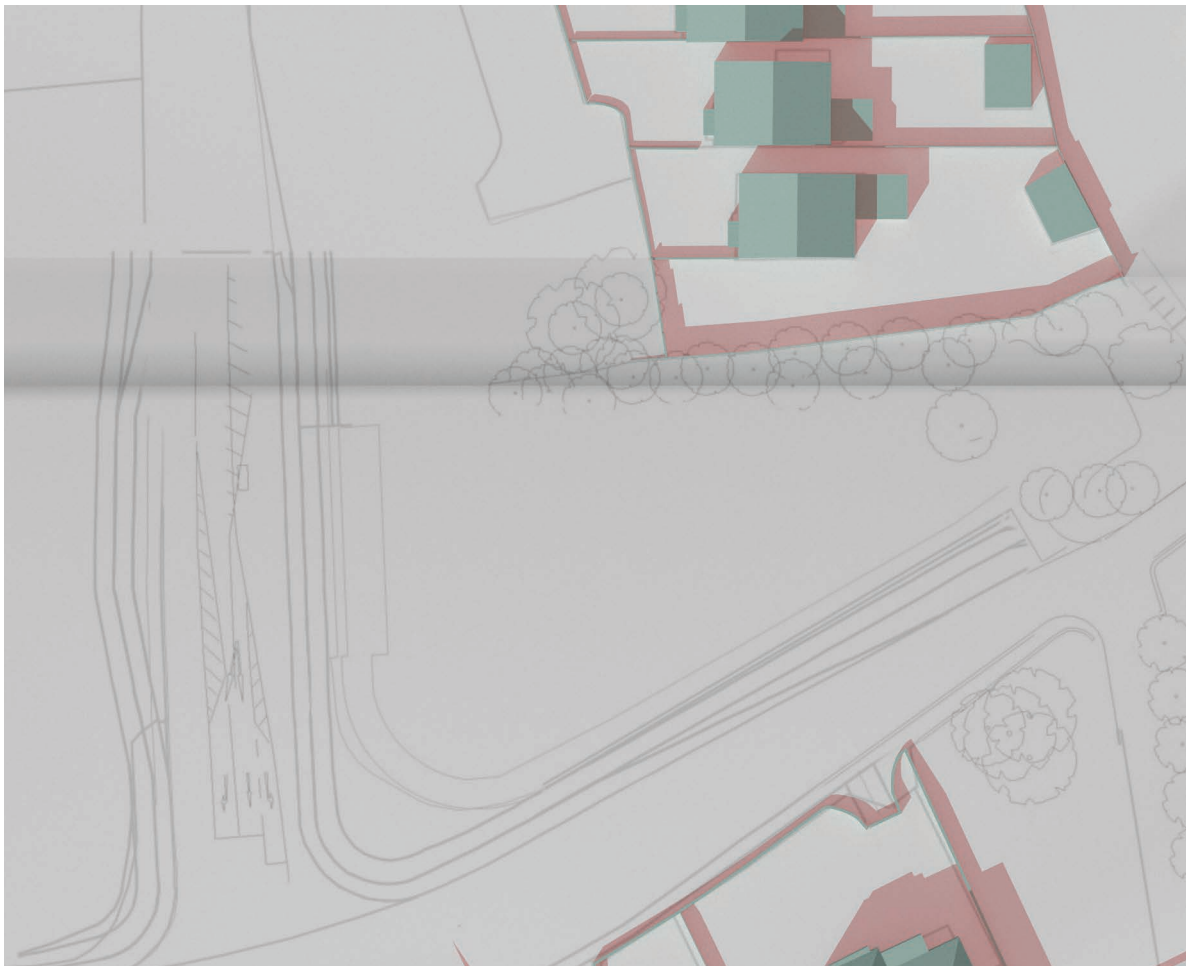


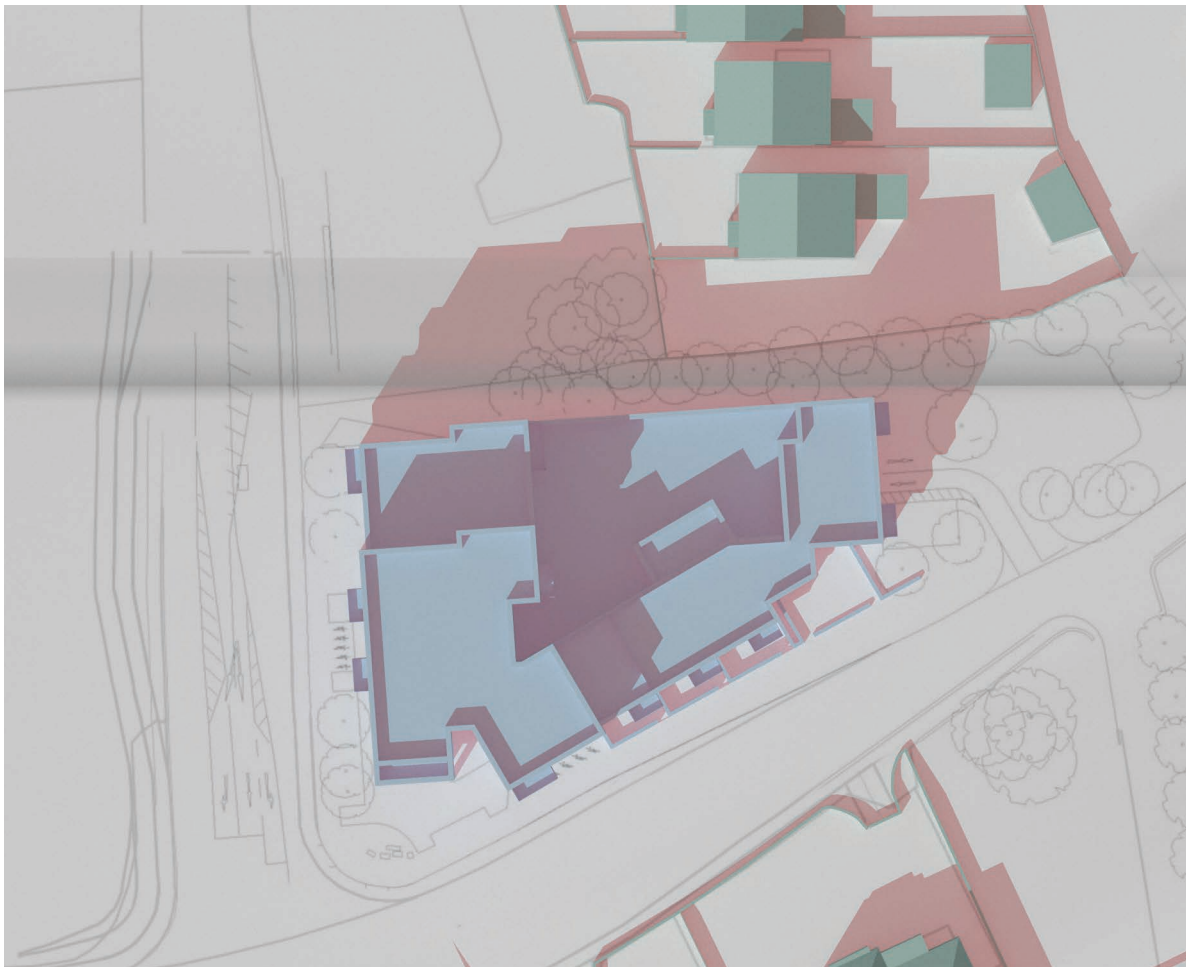
Proposed

Figure 21: Shadow diagrams 21 September 13:00 UTC +1

Existing

N



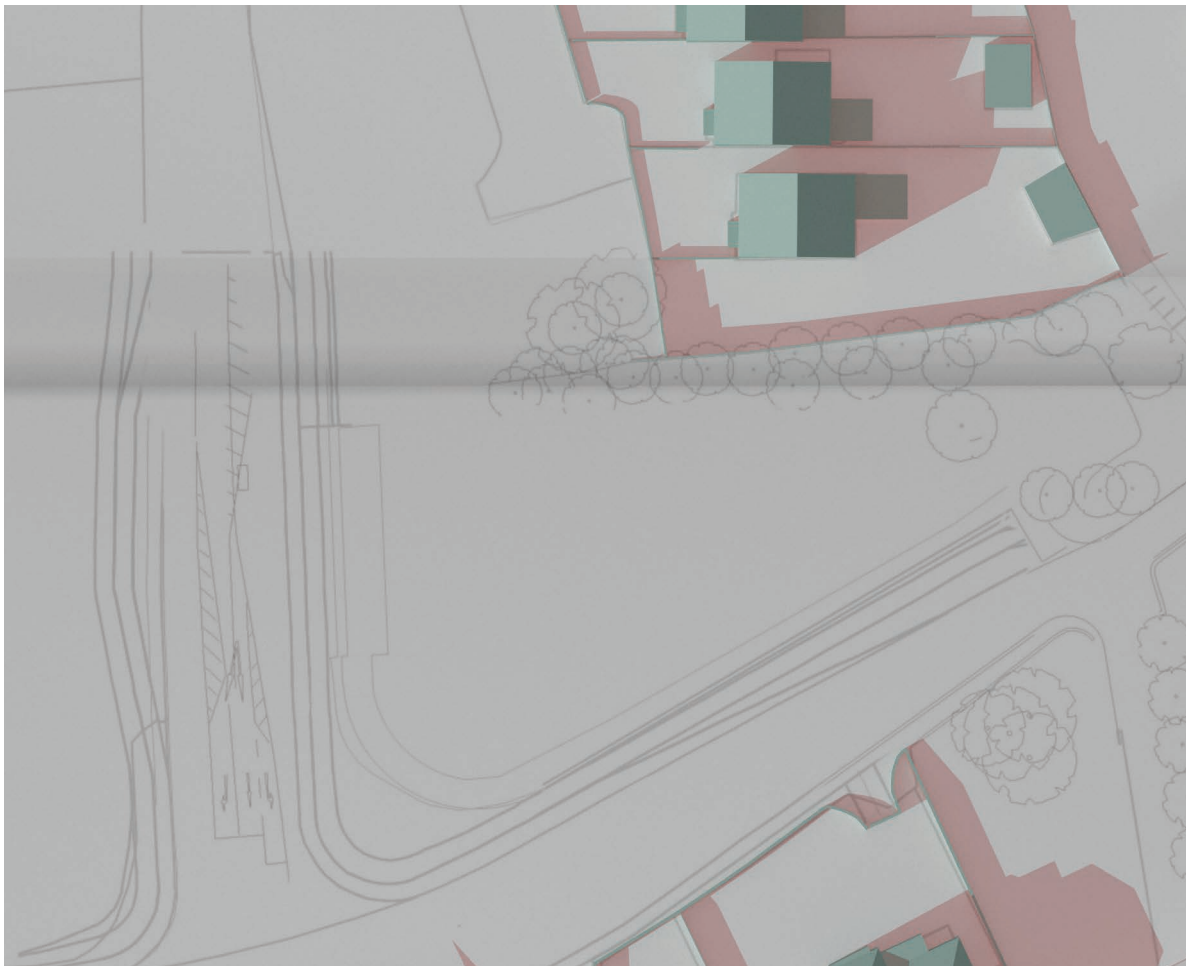


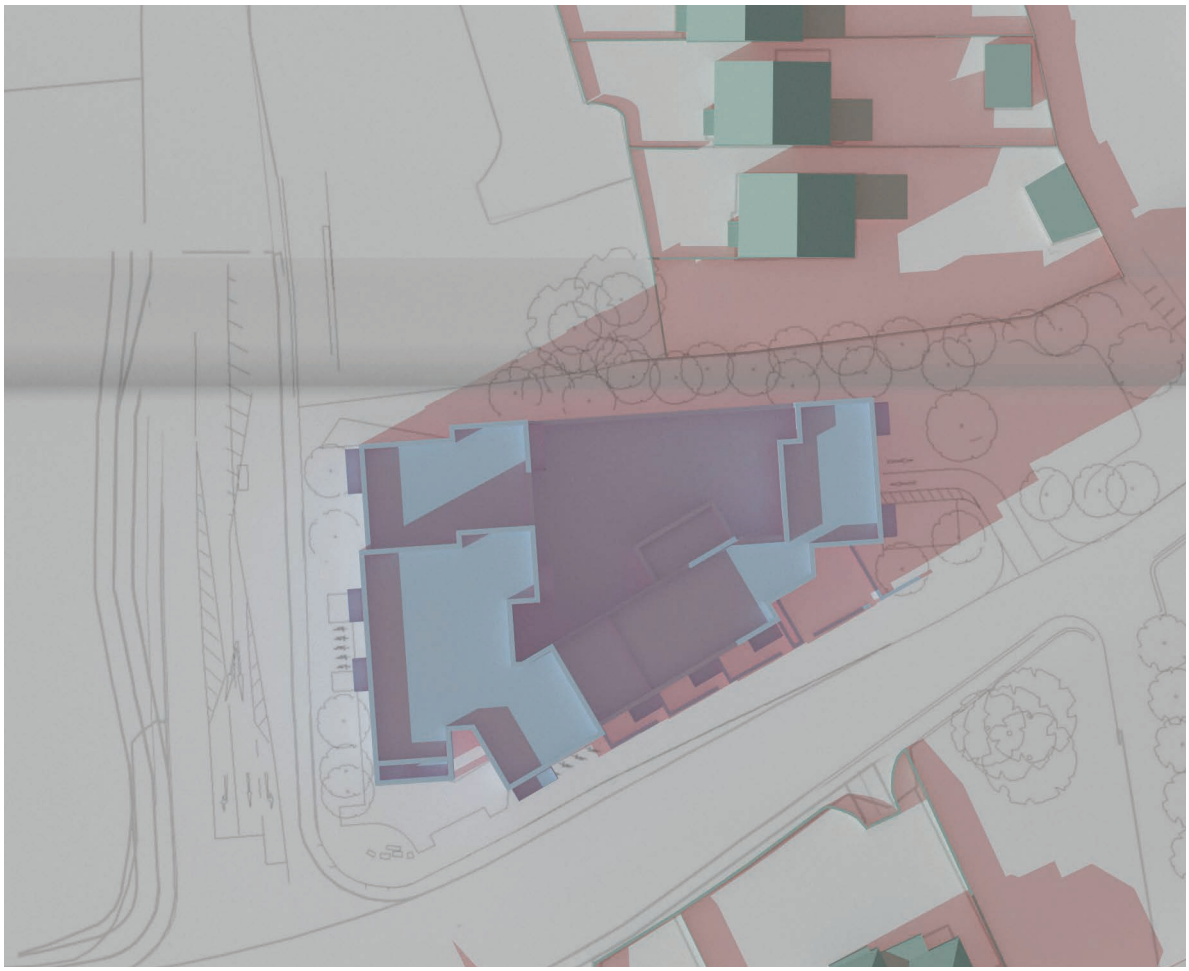
Proposed

Figure 22: Shadow diagrams 21 September 15:00 UTC +1

Existing

N





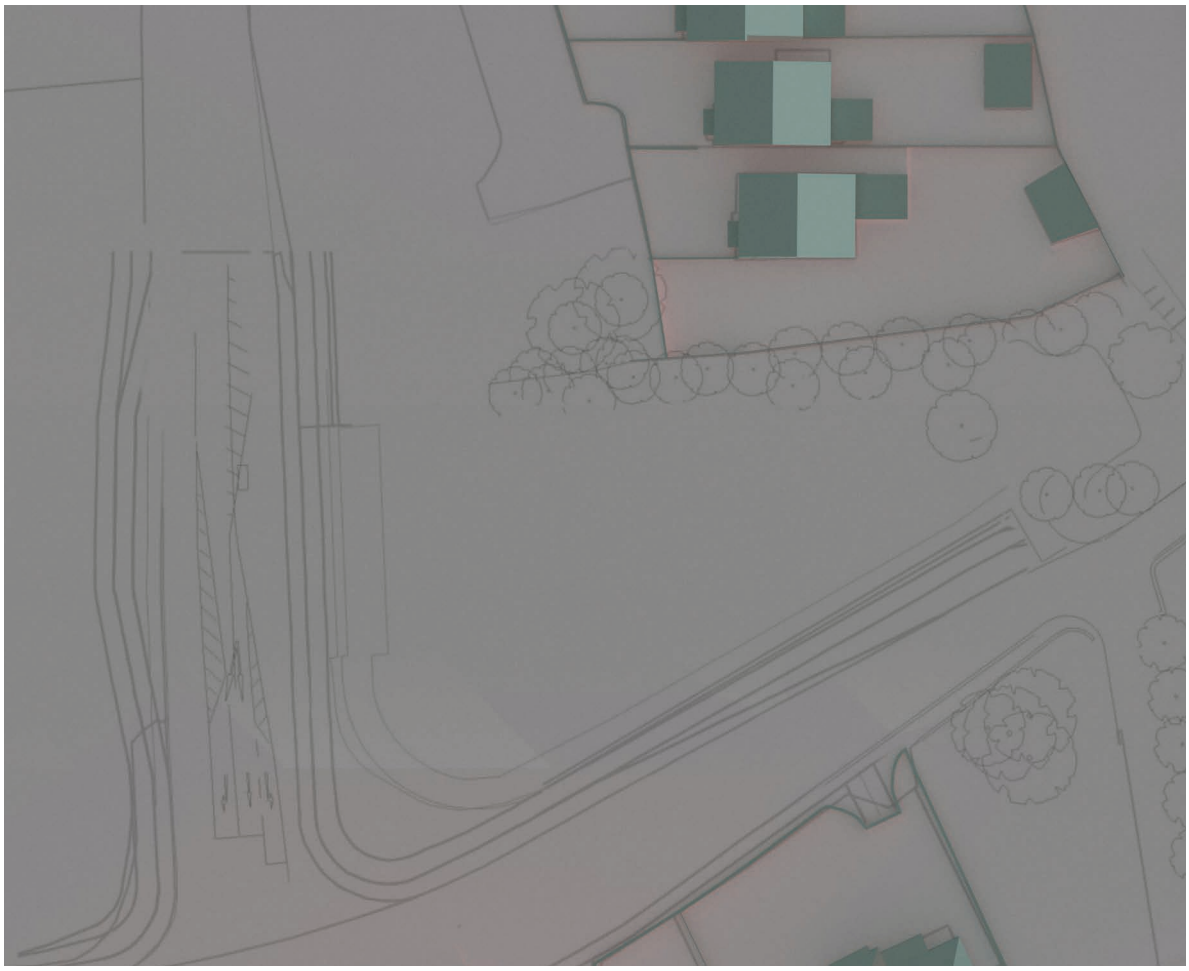
Proposed

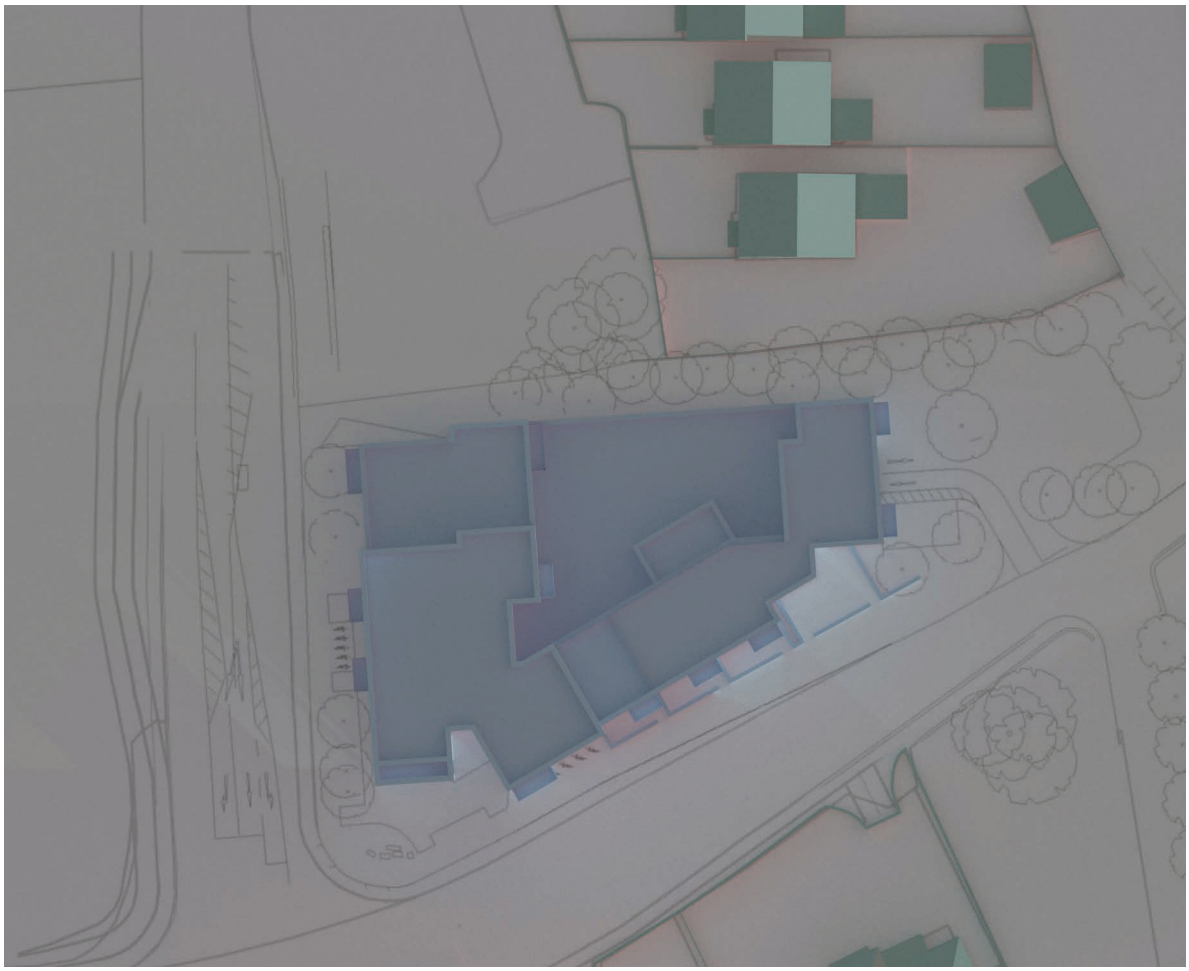
Figure 23: Shadow diagrams 21 September 17:00 UTC +1

9.5 Shadow Casting diagrams December Solstice

Existing

N



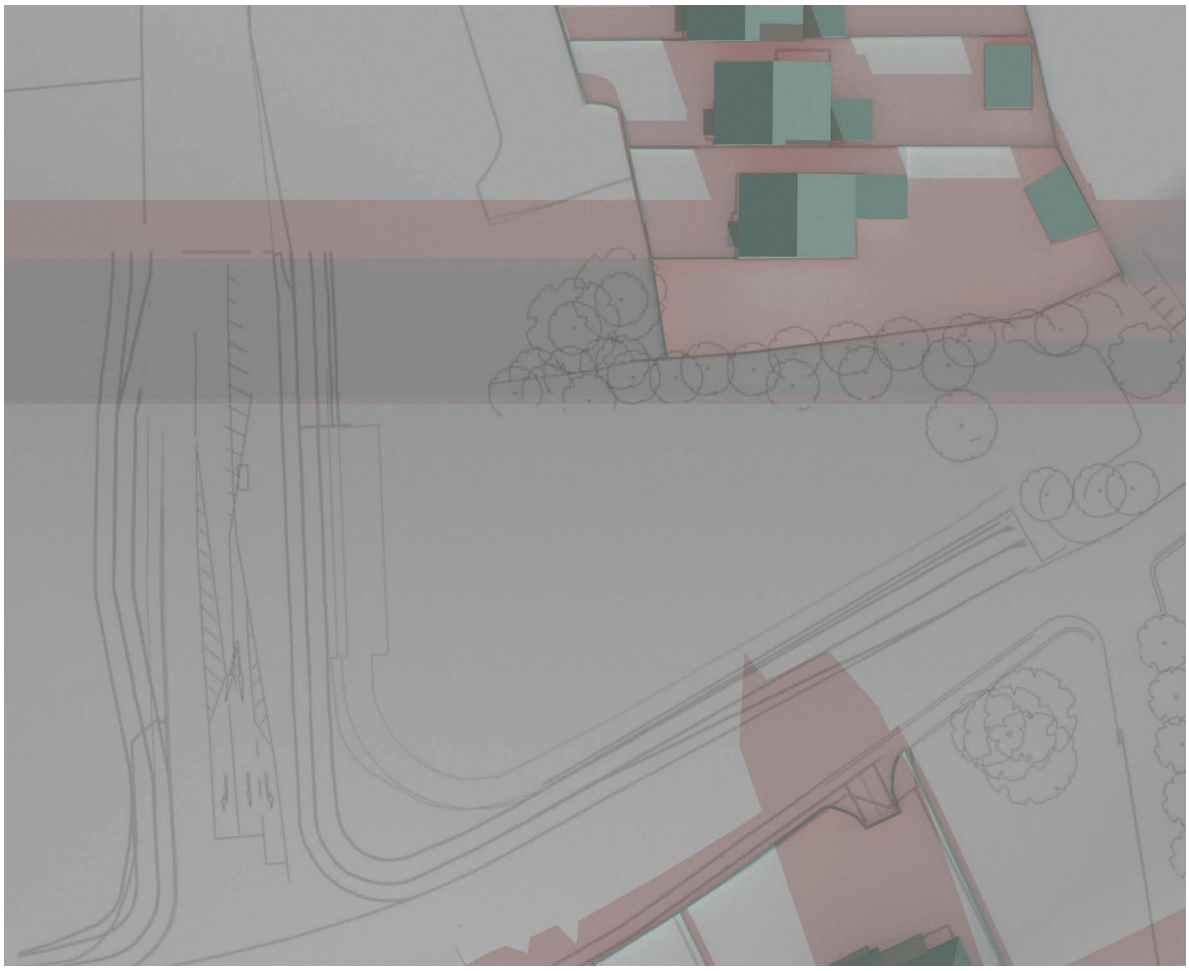


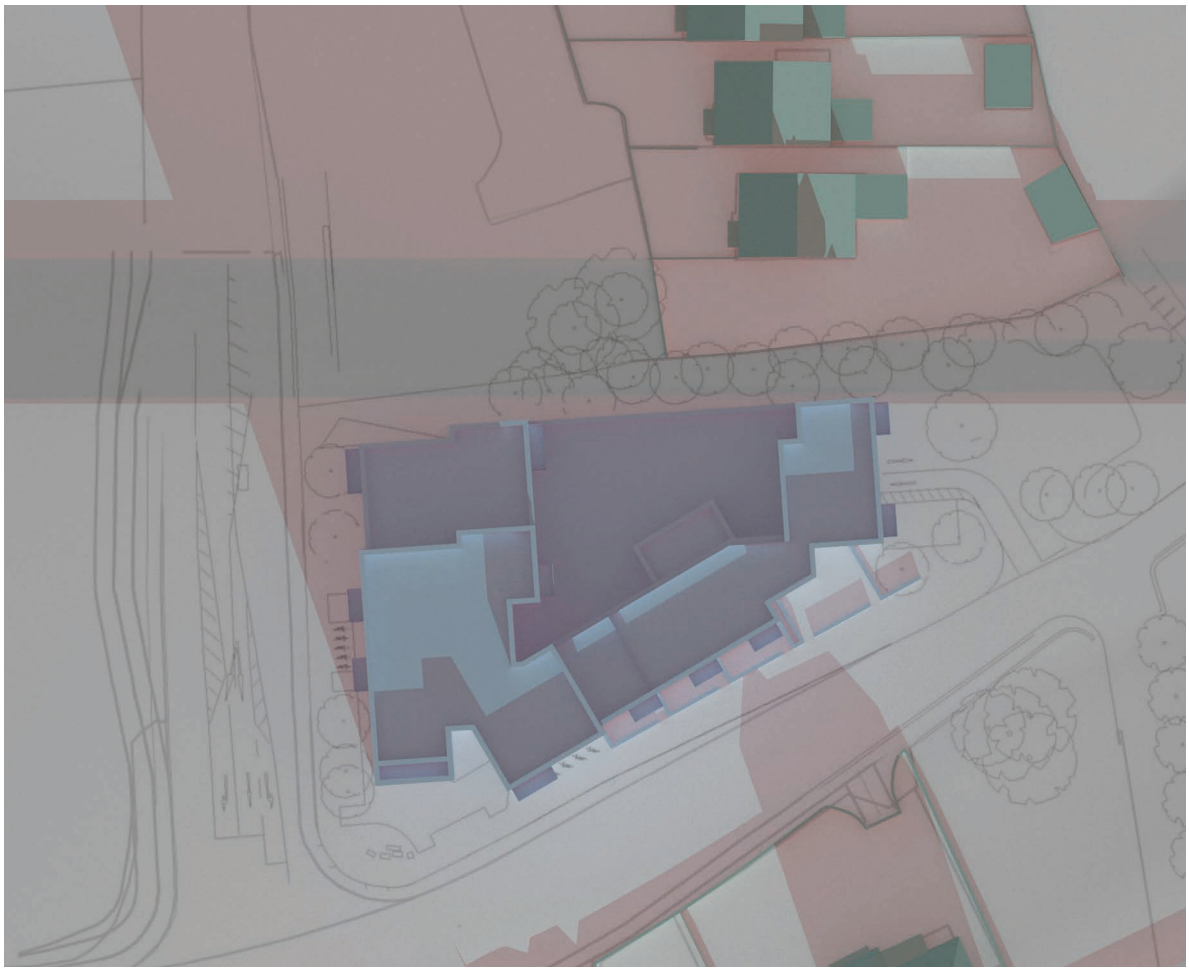
Proposed

Figure 24: Shadow diagrams 21 December 09:00 UTC

Existing

N



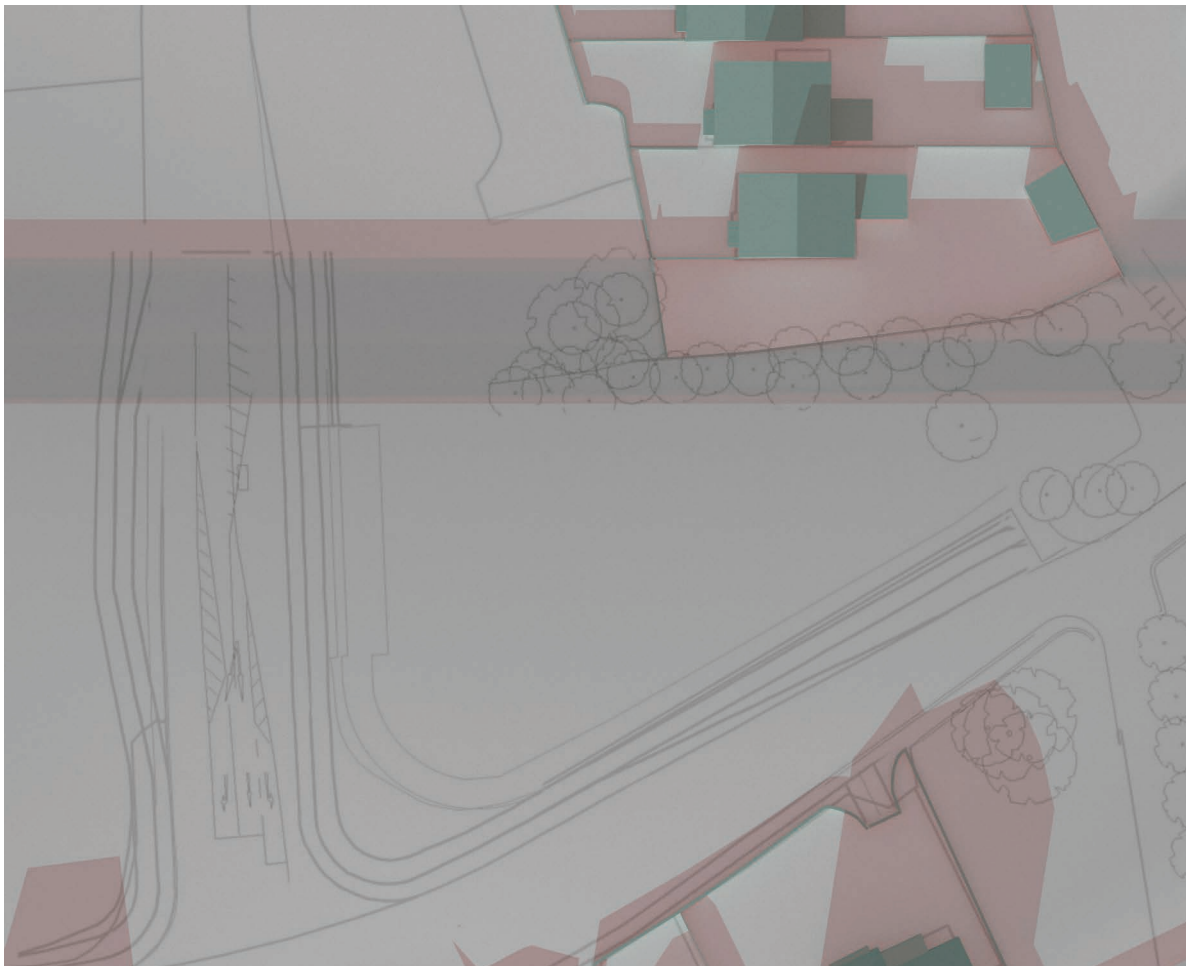


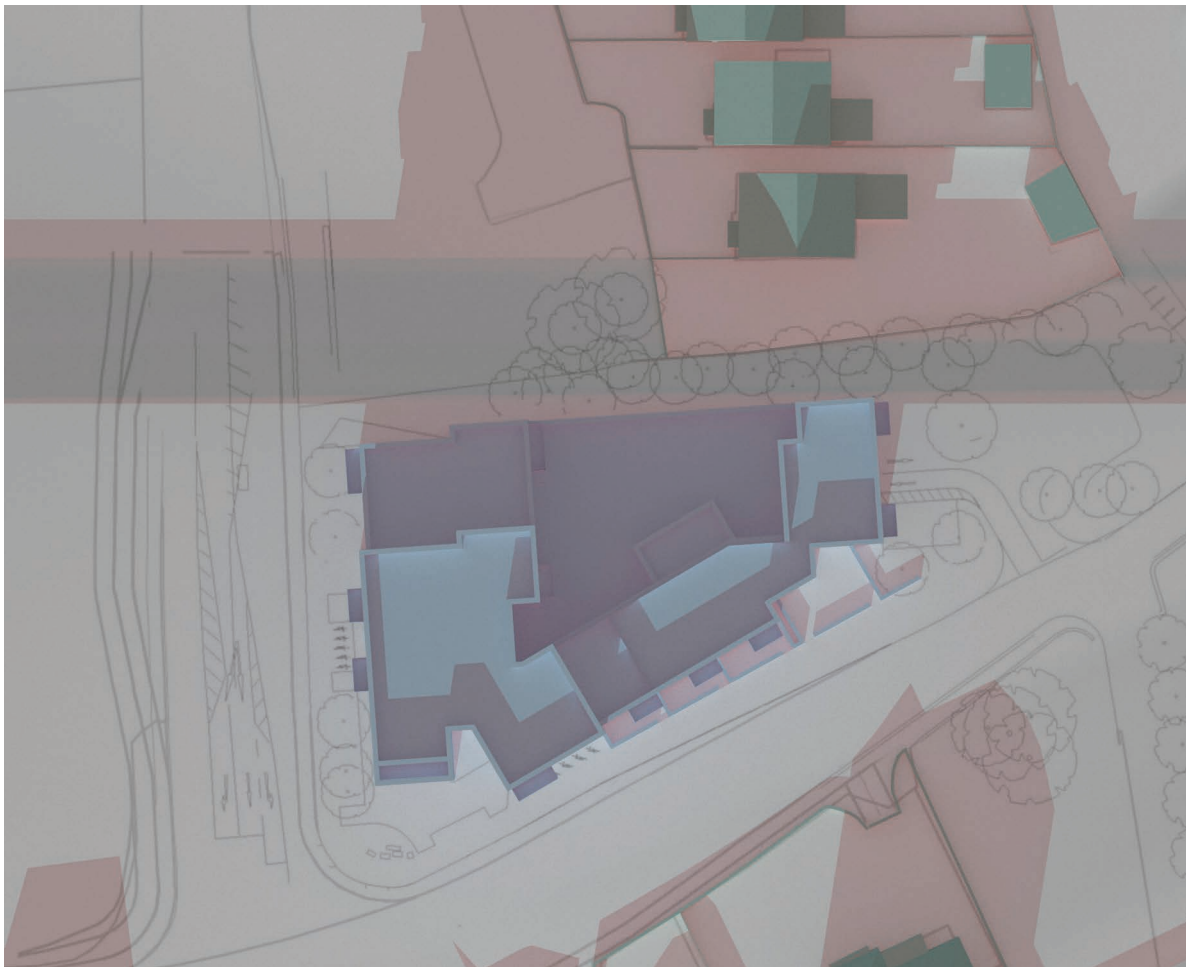
Proposed

Figure 25: Shadow diagrams 21 December 11:00 UTC

Existing

N



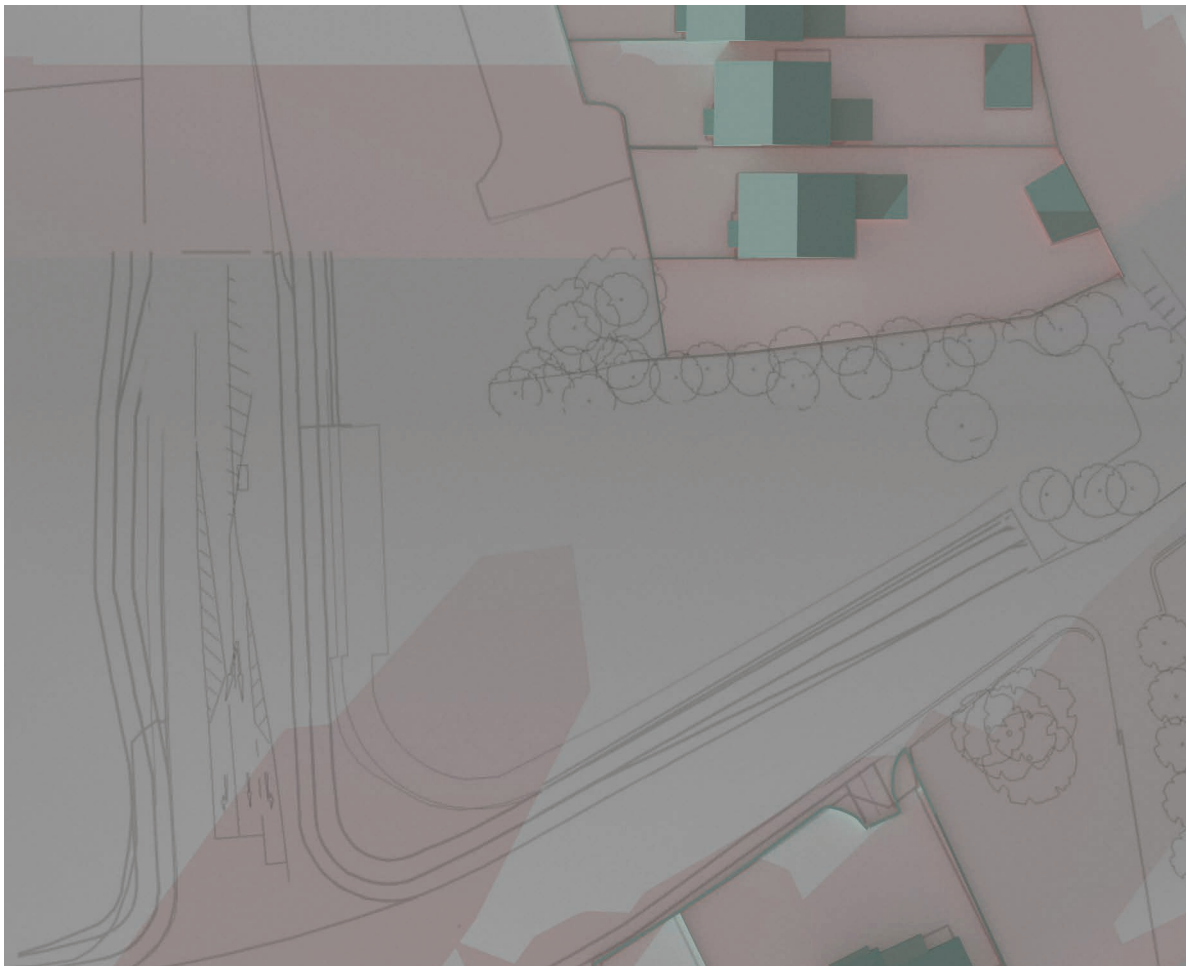


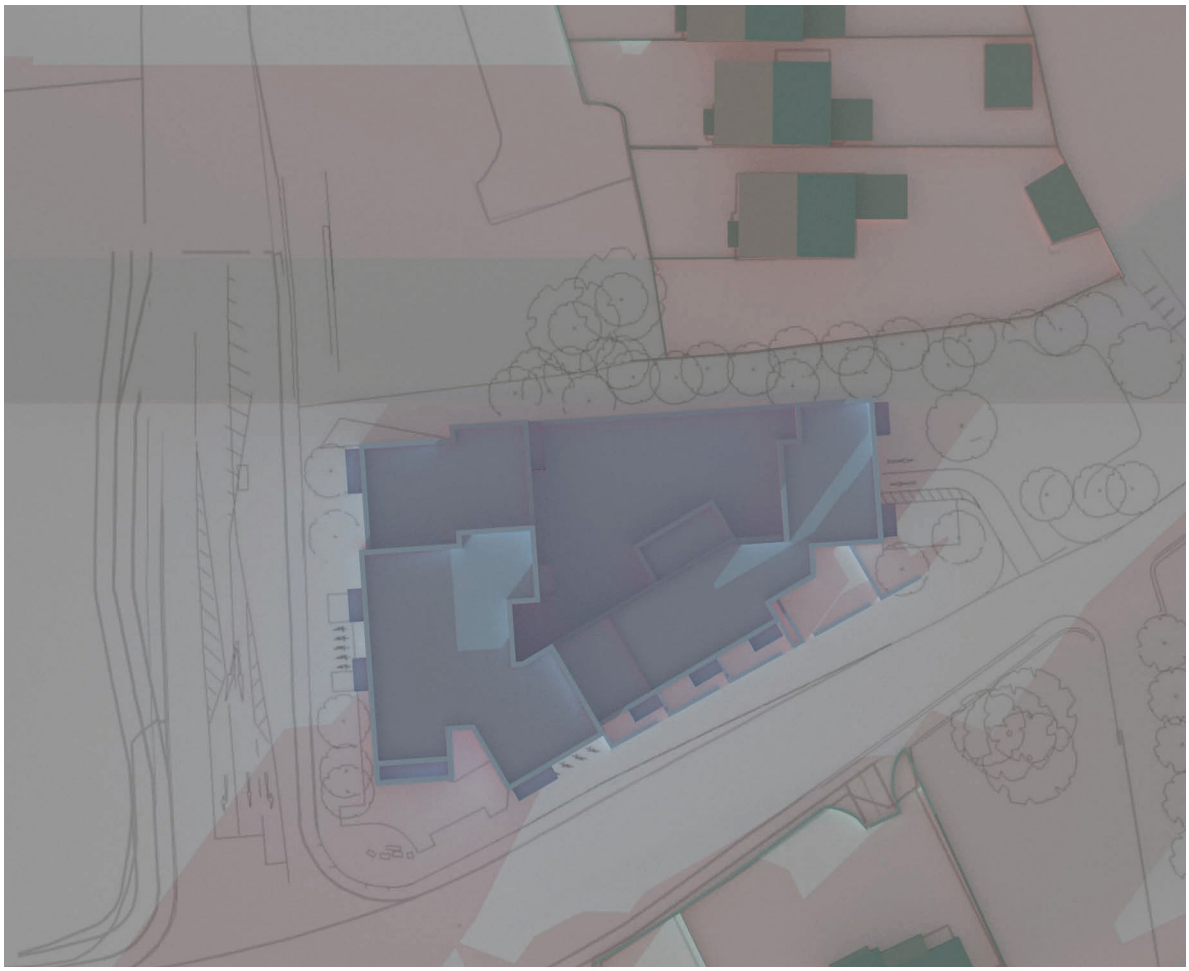
Proposed

Figure 26: Shadow diagrams 21 December 13:00 UTC

Existing

N





Proposed

Figure 27: Shadow diagrams 21 December 15:00 UTC

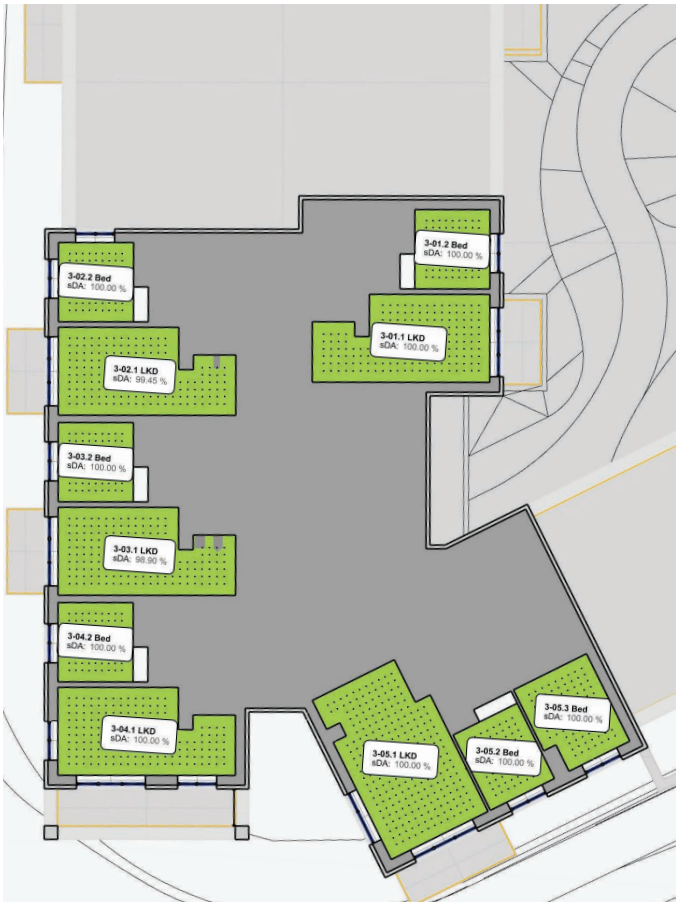
Appendix A -BS EN17037:2021+A1 Minimum room specific Daylight Provision in accordance with UK National Annex Table NA.1.

Ground Floor

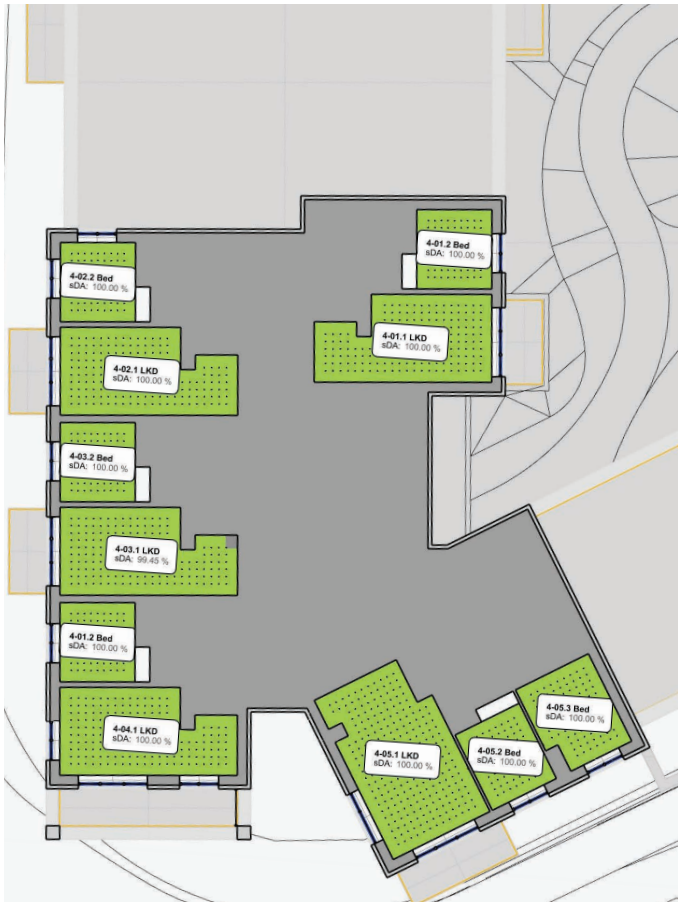
First Floor

Figure 28: Floor plans indicating Daylight Provision to BS EN17037:2021+A1 Table NA.1

Second Floor



Third Floor



Fourth Floor

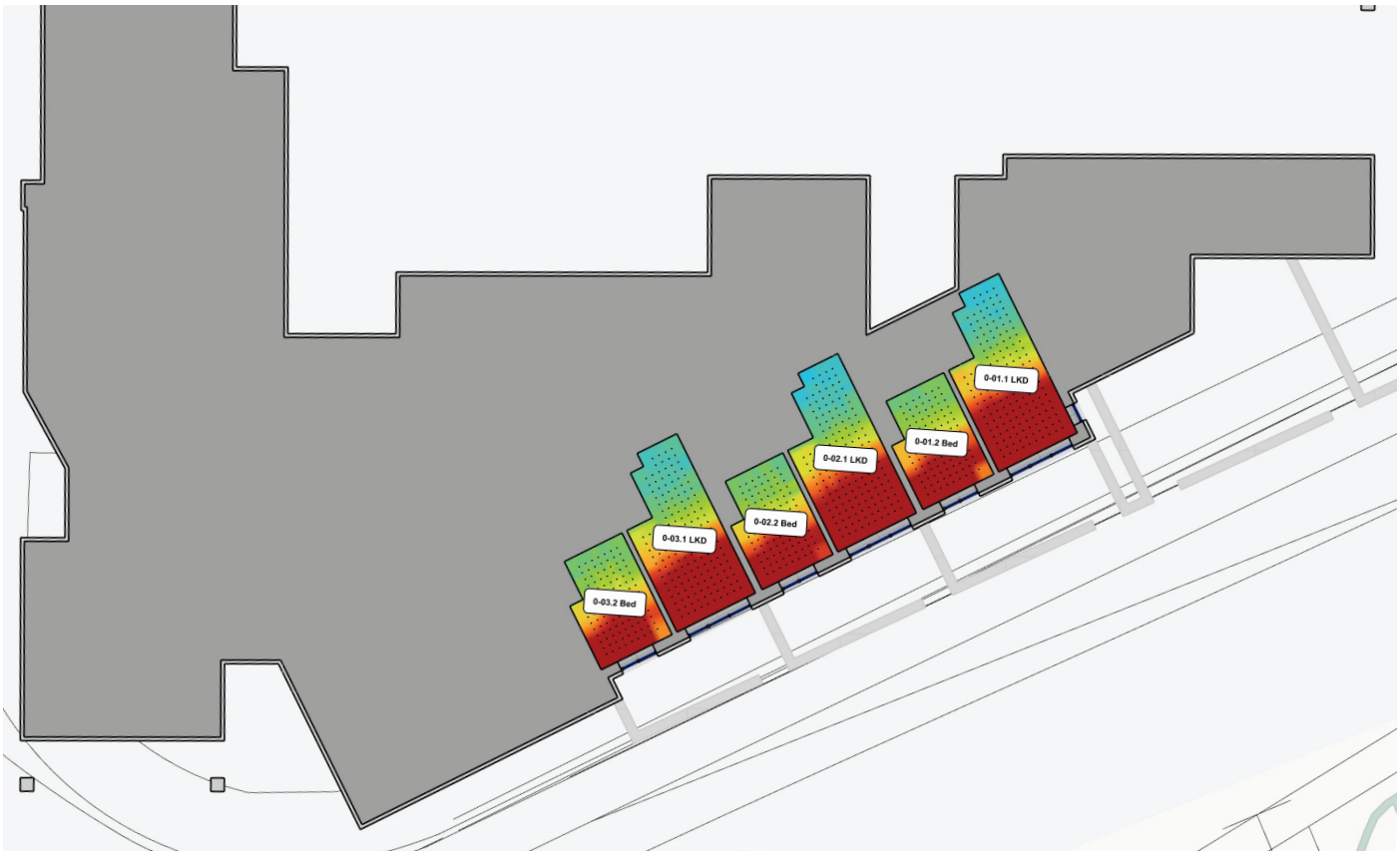
Figure 29: Floor plans indicating Daylight Provision to BS EN17037:2021+A1 Table NA.1

Minimum illuminance levels from BS EN17037:2018+A1:2021 - Table NA.1							
Space ID	Use	Area m2	Sensor Count	Target Lux	Mean Lux	% of grid target exceeded: Minimum 50% of grid	Meets Criteria
0-01.1	LKD	22.3	180	200	1432	100.0%	Y
0-01.2	Bed	13.7	114	100	1109	100.0%	Y
0-02.1	LKD	22.3	180	200	1308	99.4%	Y
0-02.2	Bed	13.7	114	100	1123	100.0%	Y
0-03.1	LKD	22.3	180	200	1292	100.0%	Y
0-03.2	Bed	13.7	114	100	1083	100.0%	Y
1-01.1	LKD	22.7	181	200	488	79.0%	Y
1-01.2	Bed	9.8	81	100	926	100.0%	Y
1-02.1	LKD	29.9	266	200	871	100.0%	Y
1-02.2	Bed	9.9	80	100	1056	100.0%	Y
1-02.3	Bed	12.4	100	100	832	100.0%	Y
1-03.1	LKD	29.9	266	200	1015	100.0%	Y
1-03.2	Bed	9.9	80	100	1167	100.0%	Y
1-03.3	Bed	12.4	100	100	861	100.0%	Y
1-04.1	LKD	22.7	181	200	951	99.4%	Y
1-04.2	Bed	9.8	81	100	1166	100.0%	Y
1-05.1	LKD	22.7	181	200	962	97.8%	Y
1-05.2	Bed	9.8	81	100	1164	100.0%	Y
1-06.1	LKD	22.7	181	200	2440	100.0%	Y
1-06.2	Bed	9.8	81	100	1196	100.0%	Y
1-07.1	LKD	29.9	266	200	1874	100.0%	Y
1-07.2	Bed	9.9	80	100	1701	100.0%	Y
1-07.3	Bed	12.4	100	100	1471	100.0%	Y
1-08.1	LKD	22.7	181	200	1393	100.0%	Y
1-08.2	Bed	9.8	81	100	1712	100.0%	Y
1-09.1	LKD	22.7	181	200	1407	100.0%	Y
1-09.2	Bed	9.8	81	100	1780	100.0%	Y
1-10.1	LKD	22.7	181	200	1512	100.0%	Y
1-10.2	Bed	9.8	81	100	1781	100.0%	Y
1-11.1	LKD	22.7	181	200	1823	100.0%	Y
1-11.2	Bed	9.8	81	100	1166	100.0%	Y
1-12.1	LKD	22.7	181	200	1281	100.0%	Y
1-12.2	Bed	9.8	81	100	1175	100.0%	Y
2-01.1	LKD	22.7	181	200	804	95.6%	Y
2-01.2	Bed	9.8	81	100	1062	100.0%	Y
2-02.1	LKD	29.9	266	200	1159	100.0%	Y
2-02.2	Bed	9.9	80	100	1100	100.0%	Y
2-02.3	Bed	12.4	100	100	883	100.0%	Y
2-03.1	LKD	29.9	266	200	1250	100.0%	Y
2-03.2	Bed	9.9	80	100	1188	100.0%	Y
2-03.3	Bed	12.4	100	100	876	100.0%	Y
2-04.1	LKD	22.7	181	200	966	98.3%	Y
2-04.2	Bed	9.8	81	100	1166	100.0%	Y
2-05.1	LKD	22.7	181	200	980	98.9%	Y
2-05.2	Bed	9.8	81	100	1173	100.0%	Y
2-06.1	LKD	22.7	181	200	2398	100.0%	Y
2-06.2	Bed	9.8	81	100	1213	100.0%	Y
2-07.1	LKD	29.9	266	200	1879	100.0%	Y
2-07.2	Bed	9.9	80	100	1700	100.0%	Y
2-07.3	Bed	12.4	100	100	1472	100.0%	Y
2-08.1	LKD	22.7	181	200	1783	100.0%	Y

Minimum illuminance levels from BS EN17037:2018+A1:2021 - Table NA.1							
Space ID	Use	Area m2	Sensor Count	Target Lux	Mean Lux	% of grid target exceeded: Minimum 50% of grid	Meets Criteria
2-08.2	Bed	9.8	81	100	1731	100.0%	Y
2-09.1	LKD	22.7	181	200	1785	100.0%	Y
2-09.2	Bed	9.8	81	100	1825	100.0%	Y
2-10.1	LKD	22.7	181	200	1885	100.0%	Y
2-10.2	Bed	9.8	81	100	1810	100.0%	Y
2-11.1	LKD	22.7	181	200	2046	100.0%	Y
2-11.2	Bed	9.8	81	100	1190	100.0%	Y
2-12.1	LKD	22.7	181	200	1565	100.0%	Y
2-12.2	Bed	9.8	81	100	1193	100.0%	Y
3-01.1	LKD	22.7	181	200	981	100.0%	Y
3-01.2	Bed	9.8	81	100	1168	100.0%	Y
3-02.1	LKD	22.7	181	200	972	99.4%	Y
3-02.2	Bed	9.8	81	100	1759	100.0%	Y
3-03.1	LKD	22.7	181	200	977	98.9%	Y
3-03.2	Bed	9.8	81	100	1194	100.0%	Y
3-04.1	LKD	22.7	181	200	2443	100.0%	Y
3-04.2	Bed	9.8	81	100	1229	100.0%	Y
3-05.1	LKD	29.9	266	200	1921	100.0%	Y
3-05.2	Bed	9.9	80	100	1739	100.0%	Y
3-05.3	Bed	12.4	100	100	1499	100.0%	Y
4-01.1	LKD	22.7	181	200	1266	100.0%	Y
4-01.2	Bed	9.8	81	100	1229	100.0%	Y
4-02.1	LKD	22.7	181	200	1229	100.0%	Y
4-02.2	Bed	9.8	81	100	1847	100.0%	Y
4-03.1	LKD	22.7	181	200	1229	99.4%	Y
4-03.2	Bed	9.8	81	100	1212	100.0%	Y
4-04.1	LKD	22.7	181	200	2369	100.0%	Y
4-04.2	Bed	9.8	81	100	1229	100.0%	Y
4-05.1	LKD	29.9	266	200	2272	100.0%	Y
4-05.2	Bed	9.9	80	100	1762	100.0%	Y
4-05.3	Bed	12.4	100	100	1492	100.0%	Y

Table 15: Minimum Daylight Provision BS EN17037:2018+A1:2021 Table NA.1 compliance for habitable rooms

Appendix B - Supplementary Information - IS/ BS EN17037:2018 Table A.1 Daylight Provision Room Results

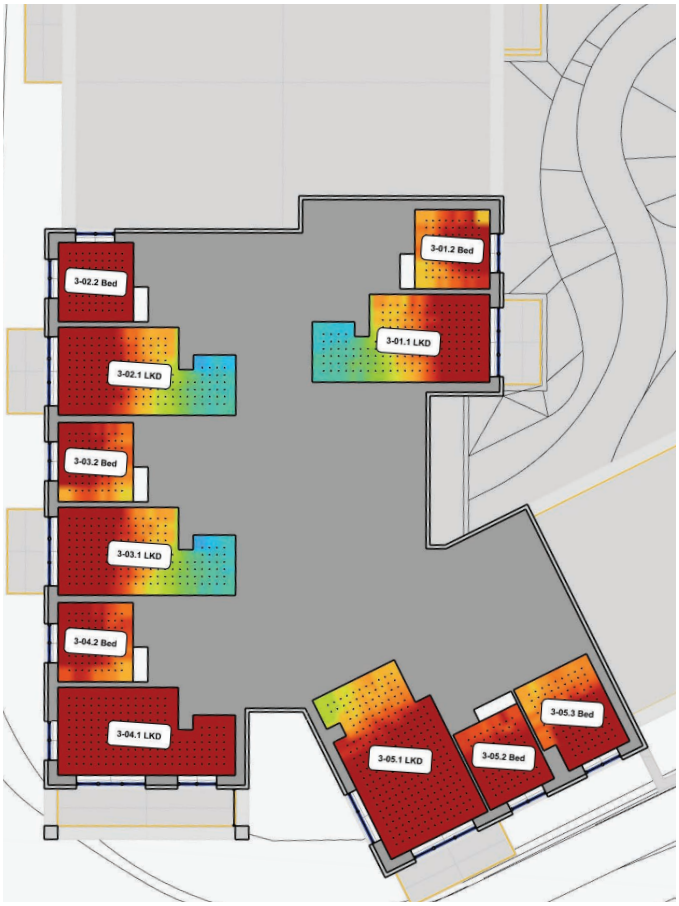


Ground Floor

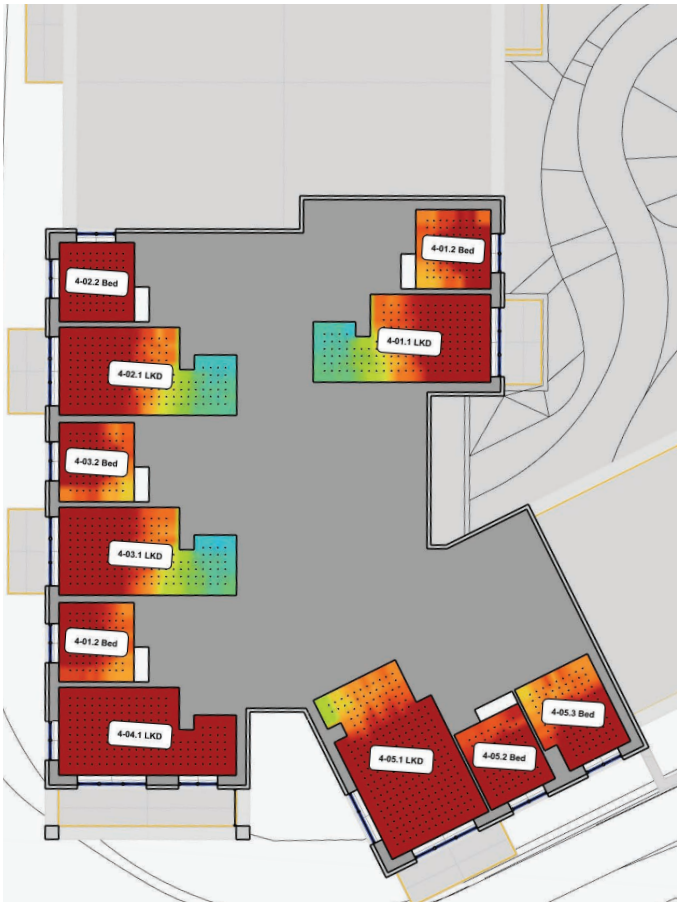
First Floor

Figure 30: Daylight Provision and Annual Average Illuminance to all habitable rooms

Second Floor



Third Floor



Fourth Floor

Figure 31: Daylight Provision and Annual Average Illuminance to all habitable rooms

EN17037:2018 Table A.1 Daylight Provision Room Schedule

Space ID	Description	Area m2	Sensor Count	Target Illuminance	300lux_50	500lux_50	750lux_50	Minimum Target Illuminance	100lux_95	300lux_95	500lux_95
0-01.1	LKD	22.7	181	High	75.3%	63.2%	50.7%	Minimum	76.1%	45.8%	26.6%
0-01.2	Bed	9.8	81	Medium	74.1%	61.6%	48.2%	High	84.5%	65.6%	50.2%
0-02.1	LKD	22.7	181	Medium	69.4%	56.0%	42.4%	Minimum	71.1%	38.4%	19.0%
0-02.2	Bed	9.8	81	Medium	74.2%	62.0%	48.3%	High	84.7%	66.1%	51.2%
0-03.1	LKD	22.7	181	Medium	69.4%	56.1%	42.6%	Minimum	72.2%	40.5%	20.5%
0-03.2	Bed	9.8	81	Medium	74.8%	62.1%	49.3%	High	84.9%	66.7%	52.0%
1-01.1	LKD	22.7	181	Fail	42.9%	13.2%	2.4%	Fail	44.6%	1.7%	0.2%
1-01.2	Bed	9.8	81	Minimum	62.9%	43.2%	22.7%	Minimum	80.7%	47.4%	22.3%
1-02.1	LKD	28.8	266	Minimum	65.4%	48.4%	27.3%	Minimum	73.6%	34.6%	6.8%
1-02.2	Bed	9.9	80	Minimum	66.8%	49.6%	30.8%	Medium	82.0%	54.0%	31.2%
1-02.3	Bed	12.4	100	Minimum	58.5%	37.6%	18.2%	Minimum	78.1%	42.5%	19.3%
1-03.1	LKD	28.8	266	Minimum	65.8%	48.6%	29.6%	Minimum	76.9%	42.6%	18.2%
1-03.2	Bed	9.9	80	Medium	74.0%	59.3%	43.6%	Medium	85.5%	66.0%	47.7%
1-03.3	Bed	12.4	100	Medium	68.1%	51.8%	33.8%	Medium	83.0%	60.3%	39.3%
1-04.1	LKD	22.7	181	Medium	71.0%	56.2%	39.4%	Minimum	73.3%	34.5%	12.4%
1-04.2	Bed	9.8	81	Medium	74.8%	60.9%	45.8%	High	86.7%	68.0%	51.5%
1-05.1	LKD	22.7	181	Medium	71.4%	57.0%	40.4%	Minimum	73.0%	34.4%	12.4%
1-05.2	Bed	9.8	81	Medium	75.2%	61.4%	46.1%	High	86.3%	67.5%	50.5%
1-06.1	LKD	22.7	181	High	82.9%	76.1%	67.2%	High	89.5%	80.1%	69.8%
1-06.2	Bed	9.8	81	Medium	75.0%	61.5%	46.7%	High	86.3%	67.6%	51.3%
1-07.1	LKD	28.8	266	High	81.6%	73.3%	64.2%	High	85.3%	68.5%	55.2%
1-07.2	Bed	9.9	80	High	76.6%	64.6%	52.8%	High	85.2%	68.4%	54.3%
1-07.3	Bed	12.4	100	Medium	71.6%	59.2%	46.1%	Medium	83.9%	64.7%	48.9%
1-08.1	LKD	22.7	181	Medium	74.1%	62.2%	49.2%	Minimum	75.3%	45.4%	25.9%
1-08.2	Bed	9.8	81	High	76.8%	65.0%	54.3%	High	86.2%	71.0%	57.9%
1-09.1	LKD	22.7	181	Medium	74.2%	62.0%	49.2%	Minimum	75.6%	44.9%	24.4%
1-09.2	Bed	9.8	81	High	76.8%	64.9%	53.9%	High	86.1%	70.3%	56.8%
1-10.1	LKD	22.7	181	High	78.3%	68.2%	57.1%	Minimum	77.4%	48.7%	30.4%
1-10.2	Bed	9.8	81	High	76.6%	64.7%	53.6%	High	86.3%	70.8%	57.4%
1-11.1	LKD	22.7	181	High	81.9%	74.9%	65.3%	Medium	80.3%	55.3%	37.6%
1-11.2	Bed	9.8	81	Medium	75.4%	61.4%	46.4%	High	86.1%	68.6%	51.8%
1-12.1	LKD	22.7	181	High	78.5%	66.8%	55.4%	High	86.8%	70.9%	56.4%
1-12.2	Bed	9.8	81	Medium	74.8%	60.5%	45.4%	High	86.1%	68.3%	51.0%
2-01.1	LKD	22.7	181	Minimum	61.1%	40.5%	18.3%	Minimum	62.5%	9.8%	2.5%
2-01.2	Bed	9.8	81	Medium	69.7%	52.7%	34.3%	Medium	84.8%	61.4%	40.7%
2-02.1	LKD	28.8	266	Medium	75.8%	61.6%	47.0%	Medium	80.6%	52.8%	28.7%
2-02.2	Bed	9.9	80	Medium	73.5%	58.4%	42.5%	Medium	84.6%	62.6%	44.4%
2-02.3	Bed	12.4	100	Minimum	64.2%	47.0%	25.7%	Medium	82.3%	55.2%	31.4%
2-03.1	LKD	28.8	266	Medium	77.2%	64.1%	49.6%	Medium	81.5%	56.0%	32.3%
2-03.2	Bed	9.9	80	Medium	74.4%	59.8%	45.2%	Medium	85.9%	66.7%	49.2%
2-03.3	Bed	12.4	100	Medium	68.8%	53.3%	35.5%	Medium	84.0%	62.3%	42.7%
2-04.1	LKD	22.7	181	Medium	72.4%	57.7%	41.7%	Minimum	73.8%	36.8%	12.6%
2-04.2	Bed	9.8	81	Medium	74.8%	61.2%	45.8%	High	86.6%	67.9%	51.3%
2-05.1	LKD	22.7	181	Medium	71.6%	56.9%	41.1%	Minimum	73.4%	35.4%	12.6%
2-05.2	Bed	9.8	81	Medium	74.9%	61.4%	46.7%	High	86.5%	67.9%	51.8%
2-06.1	LKD	22.7	181	High	83.0%	76.3%	67.4%	High	89.6%	80.4%	70.5%
2-06.2	Bed	9.8	81	Medium	75.3%	62.0%	48.0%	High	86.8%	68.9%	53.3%
2-07.1	LKD	28.8	266	High	81.8%	73.8%	64.7%	High	85.0%	68.2%	55.4%
2-07.2	Bed	9.9	80	High	76.8%	65.0%	53.7%	High	85.5%	68.7%	55.0%
2-07.3	Bed	12.4	100	Medium	71.4%	59.2%	46.5%	Medium	84.2%	65.2%	49.9%

EN17037:2018 Table A.1 Daylight Provision Room Schedule											
Space ID	Description	Area m2	Sensor Count	Target Illuminance	300lux_50	500lux_50	750lux_50	Minimum Target Illuminance	100lux_95	300lux_95	500lux_95
2-08.1	LKD	22.7	181	High	76.4%	64.5%	53.5%	Minimum	77.2%	48.7%	31.8%
2-08.2	Bed	9.8	81	High	77.2%	65.8%	55.0%	High	86.3%	71.3%	58.5%
2-09.1	LKD	22.7	181	High	76.7%	64.9%	54.2%	Minimum	78.3%	49.8%	33.5%
2-09.2	Bed	9.8	81	High	77.3%	65.9%	55.1%	High	86.5%	71.5%	58.7%
2-10.1	LKD	22.7	181	High	79.5%	70.3%	59.4%	Medium	79.4%	53.2%	36.3%
2-10.2	Bed	9.8	81	High	77.4%	65.8%	55.1%	High	86.5%	71.3%	58.3%
2-11.1	LKD	22.7	181	High	83.3%	76.5%	67.4%	Medium	80.9%	57.0%	40.2%
2-11.2	Bed	9.8	81	Medium	75.8%	62.4%	48.0%	High	86.4%	69.2%	53.2%
2-12.1	LKD	22.7	181	High	80.5%	71.1%	60.0%	High	88.1%	75.3%	61.6%
2-12.2	Bed	9.8	81	Medium	75.8%	62.4%	47.8%	High	86.5%	69.2%	52.8%
3-01.1	LKD	22.7	181	Medium	68.4%	50.9%	32.4%	Minimum	72.9%	30.1%	6.7%
3-01.2	Bed	9.8	81	Medium	74.9%	59.6%	43.9%	Medium	85.9%	66.8%	48.8%
3-04.1	LKD	22.7	181	Medium	72.2%	57.7%	42.2%	Minimum	75.0%	38.6%	14.1%
3-04.2	Bed	9.8	81	High	84.5%	77.4%	67.4%	High	90.0%	79.2%	68.4%
3-05.1	LKD	22.7	181	Medium	72.4%	58.2%	42.4%	Minimum	74.7%	38.6%	13.1%
3-05.2	Bed	9.8	81	Medium	75.8%	62.5%	48.0%	High	86.6%	68.2%	52.1%
3-06.1	LKD	22.7	181	High	82.9%	76.2%	67.3%	High	89.6%	80.3%	70.5%
3-06.2	Bed	9.8	81	Medium	75.5%	62.3%	48.4%	High	86.9%	69.5%	53.8%
3-07.1	LKD	28.8	266	High	81.9%	74.1%	64.8%	High	85.0%	68.5%	55.6%
3-07.2	Bed	9.9	80	High	76.9%	65.3%	54.4%	High	85.9%	69.6%	55.9%
3-07.3	Bed	12.4	100	Medium	71.8%	59.4%	46.8%	Medium	84.2%	65.1%	49.7%
4-01.1	LKD	22.7	181	Medium	75.7%	62.1%	47.7%	Minimum	77.3%	44.5%	16.0%
4-01.2	Bed	9.8	81	High	84.6%	78.0%	67.6%	High	90.0%	79.1%	68.1%
4-04.1	LKD	22.7	181	Medium	75.0%	61.5%	47.5%	Minimum	76.5%	41.7%	18.6%
4-04.2	Bed	9.8	81	High	84.3%	77.3%	67.4%	High	89.6%	78.6%	67.1%
4-05.1	LKD	22.7	181	Medium	75.6%	62.0%	48.2%	Minimum	77.0%	43.7%	20.1%
4-05.2	Bed	9.8	81	Medium	76.1%	62.9%	49.0%	High	86.9%	69.5%	53.9%
4-06.1	LKD	22.7	181	High	82.8%	76.0%	67.0%	High	89.3%	79.8%	69.3%
4-06.2	Bed	9.8	81	Medium	75.5%	62.4%	48.2%	High	86.9%	69.8%	54.2%
4-07.1	LKD	28.8	266	High	82.9%	76.1%	66.7%	High	86.2%	70.8%	58.7%
4-07.2	Bed	9.9	80	High	77.0%	65.2%	54.3%	High	86.0%	69.9%	56.5%
4-07.3	Bed	12.4	100	Medium	71.6%	59.4%	47.0%	High	84.7%	66.0%	51.3%

Table 16: Daylight Provision individual values for all habitable rooms to EN 17037 Table A.1.

Appendix C - Sunlight Hours for Living Spaces

Sunlight Hours			
Unit ID	LKD window within 90° South	No. sunlight hours on 21st March	Compliance
A0-01	Yes	8.3	High
A0-02	Yes	8.3	High
A0-03	Yes	8.3	High
A1-01	No	0.0	Below criteria
A1-02	No	1.9	Minimum
A1-03	Yes	3.8	Medium
A1-04	Yes	5.3	High
A1-05	Yes	5.3	High
A1-06	Yes	7.6	High
A1-07	Yes	6.5	High
A1-08	Yes	7.4	High
A1-09	Yes	7.4	High
A1-10	Yes	7.4	High
A1-11	Yes	4.8	High
A1-12	No	4.8	High
A2-01	No	0.0	Below criteria
A2-02	No	4.1	High
A2-03	Yes	5.3	High
A2-04	Yes	5.3	High
A2-05	Yes	5.3	High
A2-06	Yes	7.6	High
A2-07	Yes	6.5	High
A2-08	Yes	8.3	High
A2-09	Yes	8.3	High
A2-10	Yes	8.3	High
A2-11	Yes	5.8	High
A2-12	No	4.8	High
A3-01	No	3.7	Medium
A3-02	Yes	5.3	High
A3-03	Yes	5.3	High
A3-04	Yes	7.6	High
A3-05	Yes	6.5	High
A4-01	No	4.8	High
A4-02	Yes	5.3	High
A4-03	Yes	5.3	High
A4-04	Yes	5.3	High
A4-05	Yes	8.3	High

Table 17: Sunlight hours to living spaces