Cherrywood Town Centre Building Height Review

Skylight, Sunlight and Shadow Analysis

January 2021

CSC Chris Shackleton Consulting
www.shackleton.ie info@shackleton.ie

Chris Shackleton Consulting Ltd.
19 Waterside Crescent, Swords Road, Malahide, Co Dublin, K36 DF74
email: info@shackleton.ie
Tel: +353-1-5653239
Mob: +353-86-8206374

Contents

1. Introduction & Scope

Chris Shackleton Consulting Ltd (CSC) were commissioned by Cherrywood Development Agency Project Team (DAPT) of Dún Laoghaire-Rathdown County Council for the initial review of the Cherrywood Town Centre development which helped frame the Urban Form Development Framework (UFDF) as it related to daylight and shadow.

In response to the Urban Development and Building Height: Planning Guidelines for Planning Authorities, issued in December 2018, in particular SPPR 3, we have been asked, now to examine the granted design (DZ17A/0862) and comment on what the impact of increased height to the residential units might be in relation to Skylight, Sunlight and Shadow analysis. This report references the BRE guidelines ""Site layout planning for daylight and sunlight: a guide to good practice, (2011, BRE Document BR 209)" which were identified in the UFDF.

The modelling and analysis in this report focuses on the residential blocks within the Town Centre, having regard to the sensitivity of this use and also the significant residential component in the permitted Town Centre Application (TC1, TC2, & TC4) and in the revised Masterplan and proposed development for the remaining Quadrant of the Town Centre (TC3). Other uses have not been modelled in this analysis. It is acknowledged, that other uses such as office blocks or hotels may be less sensitive for internal users, but equally have the potential to impact on the public realm. Further, the DAPT have advised that any significant increase in quantum floorspace of High Intensity Employment (HIE) would potentially impact significantly on trip generation patterns and as such significant changes to the land use patterns would be outside the scope of the building height review.

2. Policy Context

There are numerous policy documents, guidelines and statutory provisions, etc, relating to the availability of light in new developments this assessment is cognisant of the following:

- **The Cherrywood Planning Scheme:**
  - Objectives PD12: To ensure a sustainable built form with best practice design
  - Objective GI 5: layout and orientation of amenity spaces and adequate sunlight
- **Cherrywood Town Centre UFDF**
  - Section 3.3 The design of buildings, in terms of their height, scale and typology shall ensure quality accommodation and levels of amenity, in terms of acceptable levels of daylight and sunlight provision.
  - Objective PD 12 best practice sustainable design
  - Objective GI.5 Layout and orientation of residential areas ensures adequate levels of sunlight and good accessibility
  - The design of amenity spaces shall seek to ensure adequate levels of sunlight penetration and as such avoid extensive areas of prolonged shade which often result in uninviting and unusable spaces
- **Design Standards for New Apartments, Guidelines for Planning Authorities, Mar 2018**
  - 3.35 Private Amenity Space should be located to optimise solar orientation minimise overshadowing and overlooking
  - 4.11 Designers must ensure that the heights and orientation of adjoining blocks permit adequate levels of sunlight to reach communal amenity space throughout the year. Roof gardens may also be provided.
  - A perimeter block with a central communal open space is particularly appropriate for children's play, especially if access from the street is controlled.
  - 6.5 The provision of reasonable levels of natural light in new apartment developments is an important planning consideration but planning authorities must weigh up overall quality of the design and layout of the scheme with the location of the site and the need for appropriate scale of urban residential development.
  - 6.6 Planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'
  - 6.7 allows for compensatory design solutions, which planning authorities may apply their discretion in accepting taking account of its assessment of specific design constraints or objectives such as securing comprehensive urban regeneration or an effective urban design and streetscape design.

- **Urban Development and Building Heights, Guidelines for Planning Authorities, Dec 2018**
    - Section 3.2 Development Management Criteria (P. 13)
    - The form, massing and height of proposed developments should maximise access to natural daylight, ventilation and views and minimise overshadowing and loss of light.
    - Quantitative performance shall use the BRE guidelines and BS 8206
    - Alternative, compensatory design solutions may be considered by the planning authority or An Bord Pleanála at their discretion, balanced against achieving wider planning objectives such as securing comprehensive urban regeneration and or an effective urban design and streetscape solution.
- **BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition)**
    - This guide gives advice on site layout planning to achieve good daylighting and sun lighting and provides a numeric guidelines and analysis methods which provide a quantitative method of assessing designs.
    - The advice is not mandatory and the introduction notes that natural lighting is only one of many factors in site layout design
    - It notes that, in special circumstances, a planning authority may wish to use different target values where competing objectives apply.

The common thread of the various documents is that modern apartment design should:

- Provide quality amenity space with adequate levels of sunlight and good accessibility.
- A perimeter block with a central communal open space is particularly appropriate for children's play, especially if access from the street is controlled.
- Roof space may be provided but extensive areas of prolonged shade should be avoided.
- Accommodation shall ensure that it provides both daylight (ADF), sunlight (APSH/WPSH) availability and the private amenity is also served by sunlight.
- The form, massing and height of proposed developments should maximise access to natural daylight, ventilation and views and minimise overshadowing and loss of light.
- Quantitative performance approaches to daylight provision reference the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'
- Planning authorities at their discretion may consider compensatory design solutions, where there are constraints or objectives especially in relation to urban residential development/regeneration.

3. The primary UFDF References are:

The availability of light for residential housing was considered and the best practice guidelines from the BRE applied.

UFDF 3.3 Building Height, Scale and Massing

….. The design of buildings, in terms of their height, scale and typology shall ensure quality accommodation and levels of amenity, in terms of acceptable levels of daylight and sunlight provision. In this regard, the development shall be guided by the principles of "Site layout planning for daylight and sunlight: a guide to good practice, (2011, BRE Document BR 209) in conjunction with ‘‘Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities’, DECLG, 2015 and “Guidelines for Planning Authorities on Sustainable Residential Development in Urban Areas (Cities, Towns and Villages)”, DEHLG, 2009. A shadow, daylight and sunlight assessment will be required at planning application stage. Any development shall also be assessed having regard to Section 4.7 of the UFDF which relates to micro climate for amenity space.

In addition, the UFDF sought to ensure that the urban civic and shared amenity spaces were orientated to optimise for sunlight penetration.

UFDF 4.7 Micro Climate

…..Amenity spaces, both as civic spaces and pedestrian and cycle streets within the public realm and communal residential areas, shall be designed to take advantage of positive microclimates and create attractive vibrant spaces. The design of amenity spaces shall seek to ensure adequate levels of sunlight penetration and as such avoid extensive areas of prolonged shade which often result in uninviting and unusable spaces……

---

4. Town Centre Application DZ17A/0862 (TC1, TC2, TC4) & Design

CSC was appointed by the DAPT to assess the daylight and sunlight aspects of the Town Centre Application – and prior to that assessment undertook to inform on the block massing and layout of the UFDF. This iterative process formed the basis of the application now granted.

4.1.Impact on neighbours

As part of the parent application for the Town Centre DZ17A/0862 (sites TC1, TC2 and TC3, a full impact on neighbours was performed for the existing residential properties. This analysis followed the recommendations of the BRE Best Practice Guidelines.

The analysis looked at the following:

- Impact habitable windows Skylight – Vertical Sky Component - VSC test
- Impact living room windows Sunlight – Annual and Winter Annual Probable Sunlight Hours APSH & WPSH tests
- Impact on Residential Amenity, gardens, balconies, shared/Public space to the 2hr or the 21st March test

In each case the results were tested against the minimum requirement or the 0.80 change ratio (i.e. a 20% reduction). All existing tested neighbours passed the requirements.

All tests met the required standards.

4.2.Shared & Public Amenity & Civic Spaces.

4.2.1. Design & Iteration

A process of analysis was also undertaken on the Shared, Public and Civic Spaces. The BRE guidelines were again used as the standard with a desirability of 50% of the space receiving sunlight for 2 hours on the 21st March.

Specific attention was given to the quality of light as a new Town Centre it was important to the DAPT to ensure that such a new build would provide a bright and light vibrant ground and shared spaces and as the UFDF states *"avoid extensive areas of prolonged shade which often result in uninviting and unusable spaces".* Given that this is a greenfield site this was not expected to constrain the design unduly.

Most spaces achieved the requirements of the BRE Guidelines although some spaces had limited light. However, it was also noted that a number of spaces provided fell below the requirements of the BRE Guidelines.

4.2.2. DAPT Application of 'Flexibility Factor – Amenity

Shared Amenity

The DAPT in discussions with the developer noted the provision of amenity space in places was well in excess of that required for the number of residents and as such the applicant might be penalised for the extra space provided. It was considered appropriate that the applicant should show results for the full area provided but base their pass/fail ratio on the statutory space required.

This allows the qualifying space, to be evaluated against both the minimum requirement and the full extent of what was provided.

In two cases the BRE requirements could not be achieved at ground level. There was always enough space at ground level for children's play areas. As an alternative the developer suggested overproviding additional space at roof level. When considered this excess additional space provided close 100% compliant minimum area requirements.

It should be noted that the ground and roof spaces are not contiguous. The BRE 21st March analysis would expect that additional ground space on such an amenity space would improve as we moved further into the year and the sun rose higher.

The overprovision on the roof spaces bringing the 21st March results to 112% and 71% ameliorated that concern.

This flexibility factor is in accordance with the BRE Guidelines, Urban Development and Building Height Guidelines 2018 and Design Standards for New Apartments 2018 of which Section 6.7 states the following.

> **6.7 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. 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.**

Civic Amenity

The provision of civic amenity space in this new Town Centre is considered as essential and included in the UFDF as a primary requirement.

The Civic spaces were also tested and consideration to proposed usage and where sunlight/shadow was prevalent.

4.3.Light Distribution to Residential Rooms (ADF)

4.3.1. Design & Iteration

The initial check for the performance of residential rooms was undertaken, on instruction from the DAPT and DLR, on a block-by-block basis. Analysis for two full floor plates for each block were undertaken. These tests occurred at both 1st and the penultimate[1] floors. The analysis of the two full floors was to allow the developer to show the improvement in light at higher levels and make a case for percentage passes.

Full floor plates at each of these levels ensured that the layout was adequately tested and so that a sub-set of passing rooms could not be presented.

It was important to the DAPT to ensure that the quality of the residential amenity in the rooms provided met with current standards as much as possible given the other constraints placed upon the design.

After numerous iterations of design, it became clear, that the density and height being proposed for the Town Centre would make achieving the standard BRE room requirements difficult/impossible. However, the BRE guidelines are not prescriptive in this regard:

> **BRE 1.6 The guide is intended for building designers and their clients, consultants, and planning officials. The advice given here is not mandatory and the guide should not be seen as an instrument of planning policy; its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design (see Section 5). In special circumstances the developer or planning authority may wish to use different target values…..**

4.3.2. Application of Flexibility Factor – Residential Rooms

In consideration of conflicting objectives DLR/DAPT considered it acceptable to apply a flexibility factor for ADF for both bedrooms and living spaces so that the density of development could be achieved in the Town Centre.

DLR/DAPT provided, as part of the planning process, a relaxation of **20%** on the minimum ADF values normally associated with specific room usage as defined in recommendations of *"Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice (BRE 2011)"* and *"BS 8206 Lighting for Buildings, Part 2: Code of Practice for Daylighting"* and other updated relevant documents.

This relaxation- flexibility factor was an acknowledgement of the competing objectives relating specifically to the Town Centre density and height development. The relaxations afforded related solely to the Town Centre.

[1] Penultimate in this case represented main floor plan layouts and specifically excluded penthouse or offset floor levels.

The guidelines note that they should be applied with a level of flexibility and should be used to help rather than constrain which complies with the "special circumstances" where a "planning authority may wish to use different target values".

The relaxed minimum values for the Town Centre developments are therefore:

- Guideline and BS Standard Living rooms 1.5% bedroom 1.0%
- DAPT/DLR relaxation for TC Living rooms 1.2% bedroom 0.8%

These relaxations were considered appropriate having regard to the need to balance competing objectives to allow the applicant to achieve a compliant and passing design for difficult rooms and were not to be considered as a new overall target. The number of rooms which needed to lean on this relaxation was small, as was the case in the permitted Town Centre.

Nonetheless, it is recommended that a further relaxation or flexibility factor should not be afforded or considered based on the need to ensure adequate levels of daylight and sunlight penetration into the residential units.

4.4.Summary - Town Centre Application

The project design and development of the UFDF incorporated several considerations and relaxations / flexibility factor by the DAPT to balance light availability with other constraints related to the development of a new Town Centre such as streetscape frontage and a sustainable intensity of development for a Town Centre.

5. Building Height Assessment TC1, TC2 & TC4

DAPT have now asked us to examine the potential impact of increased height over the residential blocks in the permitted Town Centre development, part of which is under construction, and to comment on whether this additional height should be considered.

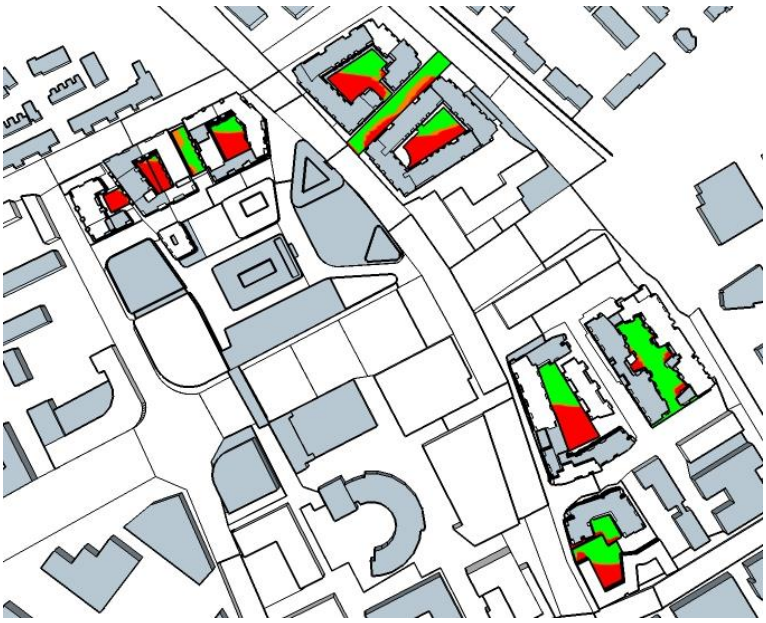
5.1.Sunlight/Shadow

During the course of the Town Centre Application DZ17A/0862 application for TC1, TC2 and TC4, we were provided with initial analysis model. CSC have used this model for the examination of 1 & 2 additional floors[2] . While the design was fine-tuned, the basic plan and form are unchanged. The amenity spaces for the residential blocks at ground level were evaluated and these are tested on the full provided areas[3]. The additional roof spaces at roof level for TC1 – A3 & TC1 A1, A2 are excluded from the analysis. The results here relate to the full provided (not minimum required) areas.

Key to reading the BRE 2-hour Shadow Plots detailed below.

The graphic below indicates the areas which receive 2 hours of sunlight on the 21st March in accordance with the BRE guidelines.

- **Green** represents areas which exceed the 2-hour requirement - pass
- **Red** is less than the 2-hour requirement - fail
- **Orange** are marginal or borderline - just below the 2-hour requirement

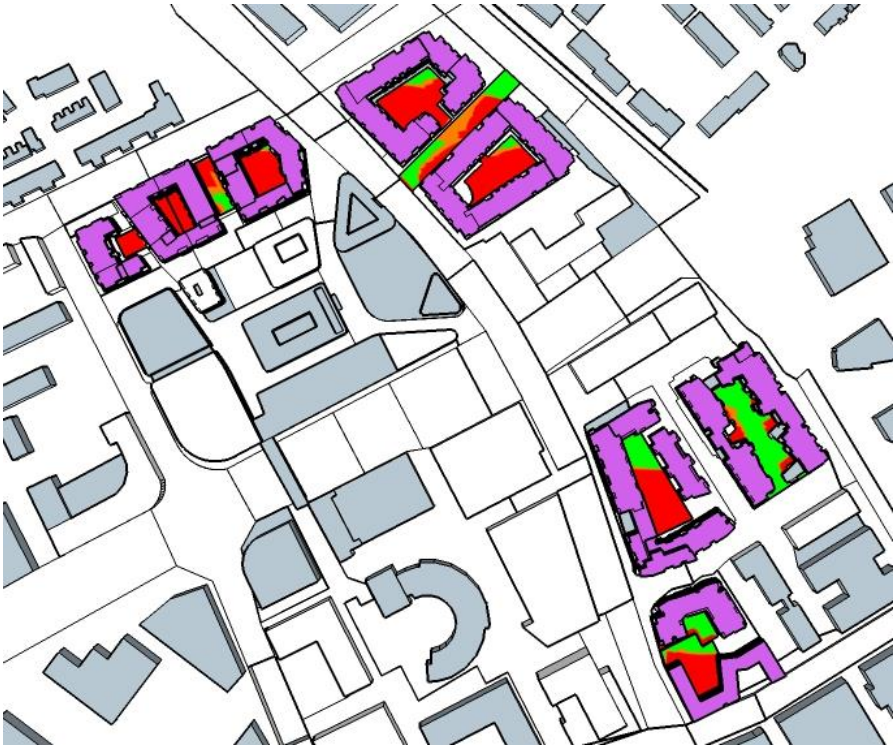


Existing

[2] It was agreed with DLR/DAPT that the analysis would simply look at full additional floor plates rather than to pre-empt or pre-determine a series of possible site-specific design iterations which may result in a more nuanced design response. This approach has been applied to all of the Town Centre Quadrants and is considered a robust and evidenced based approach.

[3] These results will differ from the percentage pass provided in the application analysis since only the minimum amenity area requirement was reported on in terms of percentage.
These tests, however, provide clarity on the quality of sunlight that can penetrate to ground level to the amenity and logically to other civic spaces.

Plus 1 Floor



Plus 2 Floors

Tabulated this shows

Shadow / Sunlight Amenity			
Receives 2 hours of sunlight on 21st March			
	Granted Application	Plus 1 Floor	Plus 2 Floor
Ref	% 2hr Sunlight	% 2hr Sunlight	% 2hr Sunlight
A3	10	0	0
A1A2-Shared	35	11	5
C1C2-Shared	48	28	19
F1	42	27	27
F2	81	70	70
F3	60	38	38
Note: The percentages shown here are compliant % on the basis of the total areas not the minimum			

We can see that even 1 additional floor shows a large reduction in the penetration of sunlight to the pedestrian and play levels at ground floor level. It would appear from these results that the granted application design had already been maximised in terms of height.

These results show that, based on the original footprint, which was locked in by the applicant at an early stage, that additional height will greatly reduce the availability of sunlight at ground level. This will impact on:

- The availability of sunlight at ground levels and the use of the same as amenity.
- Difficulty in providing suitable sunlit children's play areas
- Penetration of sunlight to the living rooms and to the private balconies at ground and lower floor level apartments will be significantly impacted.

The mitigation option of moving the amenity spaces to roof levels to provide sunlit amenity space would not offset the fact that the ground level would be predominately in shade.

Any attempt to split a passing 50% amenity space onto the roof should be resisted as it is against the guideline premise that more of the amenity will received sunlight as the year progresses.

Cherrywood DAPT have expressed concerns regarding daylight and sunlight penetration and want to safeguard against ground level amenity spaces of been generally devoid of sunlight and in shade.

The UFDF seeks to ***"avoid extensive areas of prolonged shade which often result in uninviting and unusable spaces"***. Unfortunately, the analysis here shows that this will be the case for many of the ground level amenity spaces provided if height is increased and the logical conclusion is that this will have similar negative impact on the Civic spaces as well.

5.2.Light Distribution to Residential Rooms (ADF)

In the Town Centre Application DZ17A/0862 the evaluation of the light distribution for the proposed development ADF was tested against the requirement of the BRE guidelines considering the accepted relaxations already provided by the DAPT and DLR. Even with this easing of targets the development still did not fully comply although it did achieve a good % pass rate. Increased height will inevitably reduce skylight available to lower-level windows and more fails would therefore be expected.

6. Building Height Assessment TC3

6.1.Original TC3 Design

DAPT also requested that we examine the potential for additional height on the residential units of TC3. The layout of this block had undergone some changes from the original design in the UFDF which was open to the south.

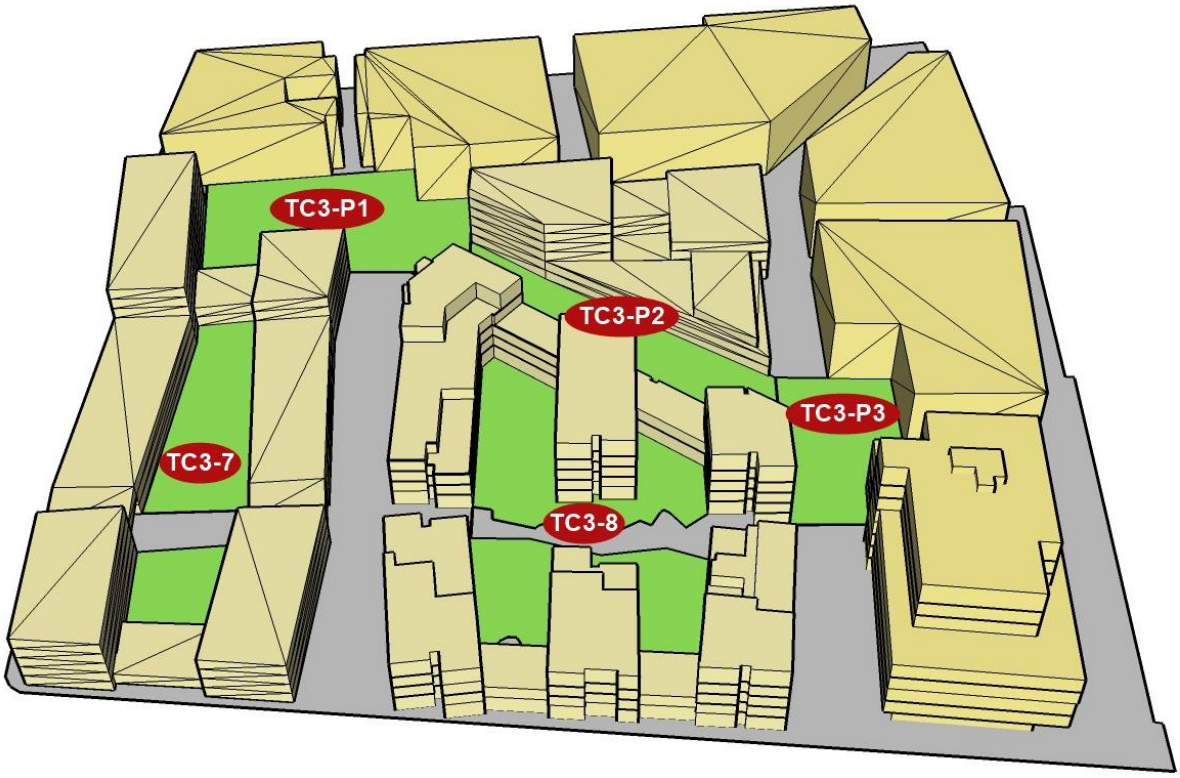
Analysis of these spaces open to the South showed that additional height would have little impact on sunlight/Shadow.

	Shadow / Sunlight Amenity			
	Receives 2 hours of sunlight on 21st March			
		Granted Application	Plus 1 Floor	Plus 2 Floor
	Ref	% 2hr Sunlight	% 2hr Sunlight	% 2hr Sunlight
	TC3-7	98	98	98
	TC3-8	100	100	100
	TC3-9	100	100	100

6.2. Revised TC3 Masterplan

A higher density more enclosed masterplan design was then proposed and the submitted application **DZ20A/0052** develops on this masterplan with more detailed design for blocks TC3-8 and TC3-1. We were asked to examine the potential impact of increased height over the residential blocks and comment on the same.

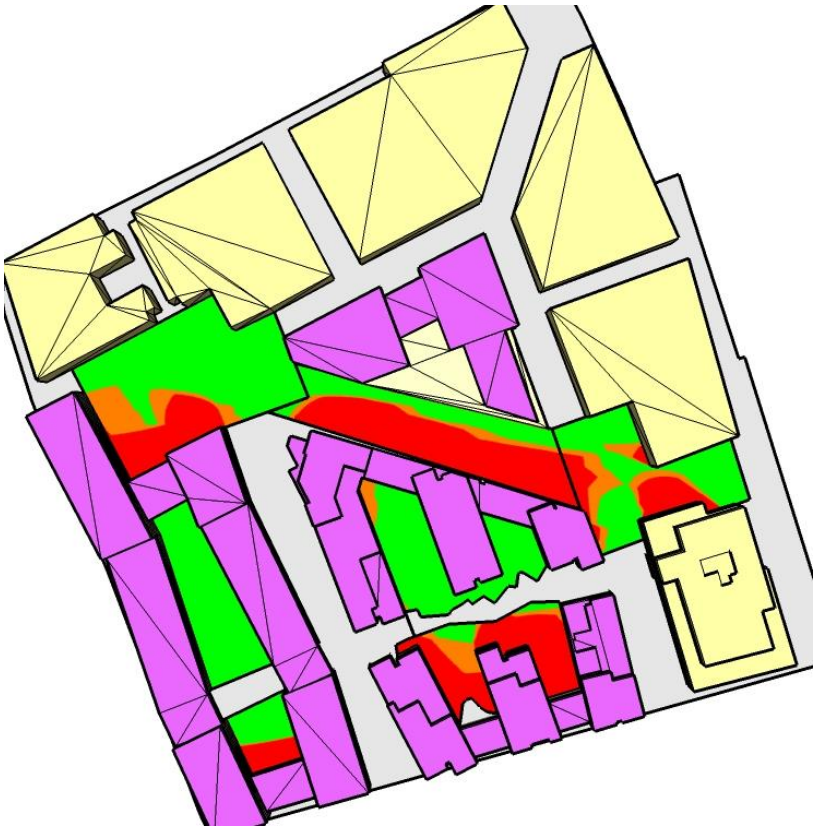
Part of the design philosophy of the new masterplan was the provision of a key public amenity space running as a diagonal through the site with large public spaces to either end. These are reported as 3 elements TC3-P1, P2 & P3. Finally, we note that the gap in the middle of the shared amenity spaces of TC3-8 and TC3-7 are because they are bisected by Public Space (an east-west street).



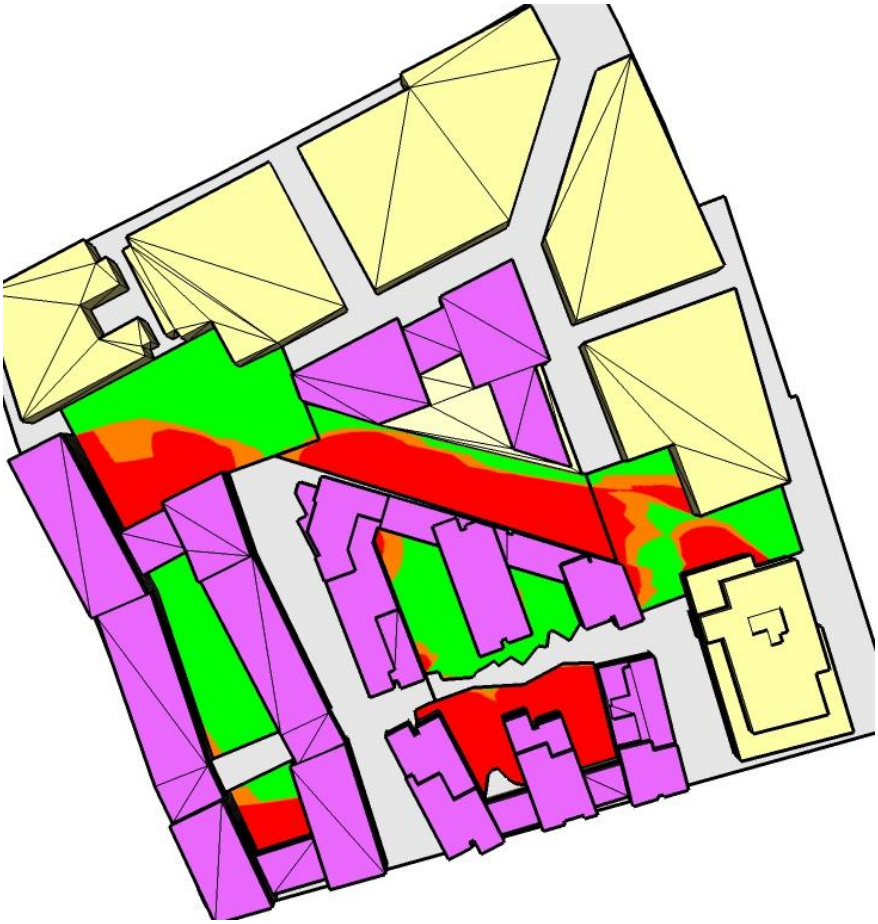
6.3.Sunlight/Shadow

A simplified and localised model for TC3 was created from the Masterplan and the submitted application drawings for TC3-8 & TC3-1, See above. Again, amenity spaces for the residential blocks at ground level only were evaluated on the full provided areas. Roof space amenity was excluded from the analysis.

Existing



Plus 1 Floor



Plus 2 Floors

Overall All Public Space

The relevant Zones are tabulated below:

Shadow / Sunlight Amenity			
Receives 2 hours of sunlight on 21st March			
	Granted Application	Plus 1 Floor	Plus 2 Floor
Ref	% 2hr Sunlight	% 2hr Sunlight	% 2hr Sunlight
Shared Residental			
TC3-7-Amenity	94	88	79
TC3-8-Amenity	66	55	47
Public Diagonal Space			
TC3-P1	81	68	60
TC3-P2	38	26	14
TC3-P3	65	56	44
Note: The percentages shown here are compliant % on the basis of the total areas not the minimum			

TC3-8 with its strong street frontage shows much of the Southern section of the amenity space in shadow and additional floors reduce this further. The extra floors also impact on the proposed diagonal public space reducing the sunlight getting to these spaces. We can see that TC3-7 which is more open to the South fairs somewhat better.

In common with the analysis for TC1, 2 & 4 additional floors have a negative impact on the penetration of sunlight to the amenity spaces at ground level. Once again it would appear that new application design process had iterated the design to balance height and amenity constraints.

The comments made above relating to the other zones generally also apply here. The UFDF specifically seeks to protect the ground level amenity spaces and looks to ensure that there are cheerful places with good access to sunlight. Additional height will generally conflict with the requirement to ***"avoid extensive areas of prolonged shade which often result in uninviting and unusable spaces"***.

7. Overall Summary and Recommendations

While not adverse to the idea of additional height in the Town Centre, we do not believe that this can be achieved on the permitted fixed site layout (TC1, TC2 & TC4) most of which is under construction, or for the revised masterplan layout for TC3, without impacting very negatively on the ground amenity spaces.

This would be contrary with the UFDF requirement 4.7.

UFDF 4.7 Micro Climate

…..Amenity spaces, both as civic spaces and pedestrian and cycle streets within the public realm and communal residential areas, shall be designed to take advantage of positive microclimates and create attractive vibrant spaces. The design of amenity spaces shall seek to ensure adequate levels of sunlight penetration and as such avoid extensive areas of prolonged shade which often result in uninviting and unusable spaces……

- A revised layout for TC1,TC2 and TC4 would certainly open up options. The current layout, however, was strongly defended by the applicant's design team and locked down at an early stage during the drafting of the UFDF. We understand that a fundamental change to the ground floor plan is not now possible as construction is well underway on TC2 and TC4 with groundworks commencing on TC1.
- TC3 has undergone considerable layout change with the use of a perimeter block format. Since the finalisation of the UFDF for the Town Centre in September 2017 which was prepared in consultation with the landowners at the time, a revised masterplan layout has been subsequently prepared and proposed for TC3. The revised layout generally conforms with the principles of the UFDF in terms of permeability, street network and civic spaces, having regard also to the land use strategy and block layout on Map 2 of the UFDF. However, with the revised masterplan the layout of the individual development blocks differs, notably with the use of the perimeter block format versus open courtyards. The revised masterplan reflects a maximisation of the development quantum on TC3 still within the permissible range under the UFDF & Planning Scheme, whilst the masterplan as proposed in the UFDF reflects a lower quantum of development. As a result, the current masterplan is much more enclosed, and it would appear that the revised design has balanced the sunlight/shadow and height/density constraints to maximise the plot usage. Similar to the other Town Centre quadrants, trying now to add height means that the other constraint, light, must suffer and be adversely impacted upon.
- Additional constraints are now also in play as other granted neighbouring applications will now also need to be evaluated for neighbour impact in accordance with the Guidelines.

- While it might be possible to make a case of some mitigation for the loss of sunlight to residential amenity at ground level by utilising roof space, we would recommend that this is only considered if the full provision open space is made as a contiguous element. The children's play area would still need to be provided in a well-lit ground level area. We do note, however, that there would still be conflict with the UFDF section 4.7 as the ground levels spaces may lack sunlight penetration and end up as extensive areas in prolonged shade, and this would need to be resolved.
- The impact on the proposed diagonal ground level civic area of TC3 shows that additional height would have an extremely negative effect on sunlight availability. The impact on Ground level for the other zones and civic areas has not been tested and may similarly be impacted.
- Finally, increased height will reduce skylight, light distribution, and sunlight penetration (living rooms and balconies) to the lower floors of the granted application. The results to the same were marginal already even with the allowed flexibility factor applied. Increased height will further reduce the same.

The analysis of potential additional floors shows considerable negative impact to sunlight penetration to the ground levels spaces.

8. Recommendation

Thus, CSC believe that the design and building heights as permitted to date under the Town Centre Application DZ17A0862 and currently proposed under DZ20A/0052 have already been well iterated at the design stage to achieve the maximum height and density/plot ratio while maintaining the minimum required light at ground level.

The provision of additional height in the Town Centre is therefore not recommended as it would appear from our preliminary analysis of the permitted and proposed residential blocks that this would impact on the ground level amenity spaces resulting in them been largely in shade for much of the year and therefore resulting in an amenity space serving these apartments which would be substandard and contrary to the UFDF.

Additionally, the lower-level apartments in these blocks already had a number of apartments with low ADF and sunlight (living rooms and balconies) and they would likely be similarly impacted.