



31 January 2017

SHADING ASSESSMENT PROPOSED MORAY PLACE DUNEDIN HOTEL

These notes accompany the shade diagram plans that form part of the resource consent application for the proposed Dunedin Moray Place Hotel. The purpose of these notes is to describe the methodology used to determine the shading effects and any other relevant matters.

1.0 Methodology

The critical heights of the proposed building have been determined from the architectural concept plans, with a correction applied to convert these levels to Otago Datum.

The critical levels are-

1. Top of main building. This is shown on the architectural plans as having a level of 59.600m (this is the level at the top of the garret/roof terrace). The conversion to Otago Datum is a static +112.500m, which gives a resulting Reduced Level (RL) of 172.100m.
2. Top of ring feature. This has been scaled from the architectural plans as having a level of 64.350. The conversion to Otago Datum is a static +112.500m, which gives a resulting Reduced Level (RL) of 176.850m.

I note that there is a 0.200m difference in the elevation levels between the architectural concept plans and the unit title subdivision plans. This appears to be a rounding difference resulting from independent design processes. While this difference exists, it is not of a size that is considered to either i) materially affect the various assessments that have been undertaken, or ii) materially affect the accurate interpretation of the proposed activity.

The shading assessment has taken into account four principal forms of the proposed Hotel structure, these being-

- The service shaft and ring feature at the top of the building.
- The extent of the structure at its upper level floor (at RL 172.100). Note that this shape ignores the small bite that is shown on Section AA of the architectural plans removed for the left-hand-side of the structure.
- The extent of the structure at its widest 'bulge' point (Level 8).
- The extent of the structure at its various ground level elevations (Levels 1 to 4) as it retracts from the bulge point at Level 8.

The combination of these four principal forms, at their respective elevations, provides the 3-dimensional block that has been used as the basis of the shading assessment.

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Ground levels of the surrounding landscape have been adopted from Dunedin City Council LiDAR information (sourced as contour lines at 0.500m intervals). This LiDAR information has been corrected by +100.000m to convert from Mean Sea Level to Otago Datum.

The elevation and orientation of the sun has been interpreted in the conventional manner using the diagram titled 'Elevation and Bearing to Sun in Dunedin (45°53'S 170°30'E) – FIG. A', a copy of which is attached.

Using the above information, an assessment has been carried out for each of the three significant annual occurrences – Summer Solstice (at Daylight Savings Time), Winter Solstice and at the Equinox.

The earliest time of the day assessed for each of the above instances has been determined as being the earliest hour at which the sun has risen above the eastern horizon. The latest time of the day assessed for each of the above instances has been determined as being the latest hour at which the sun is still visible above the western horizon (prior to setting). Various hours have then been assessed between the rise and set times to provide a suitable range of shading scenarios.

The extent of the shadows has been determined as being the intersection of the line from the sun's position (centre of the sun) in the sky across the top of the proposed building to where this intersects with the existing ground surface.

The assessment has also identified a number of nearby existing structures that will influence the extent of the anticipated shading from the proposed Hotel structure. In these instances the existing structures are expected to interrupt the new shadow, preventing it from extending beyond the existing structure (i.e. the new shadow will terminate on the wall or roof of the interrupting structure). The instances where this occurs have been marked on the assessment diagrams as a yellow line on the periphery of the shading areas. I note that not all existing structures have been included in this part of the assessment. There are many small existing structures, and other features such as established trees, that are likely to interrupt the anticipated Hotel shading, which have not been assessed. It is considered that the influences of these elements on the shading assessment will be relatively minor. The structures that have been taken into account are those that I expect will have a moderate to substantial effect on the shading assessment, these generally being large structures located near to the Hotel site and medium-large structures located near to the limits of the projected shading effect.

2.0 Other Relevant Matters

It is relevant to note that the shading assessments undertaken at this time do not take into account the following influences-

1. No transitional shading has been illustrated on the assessment diagrams.

Transitional shading occurs along the inside and outside edges of the shading areas, where the sun is partially obscured by the edge to the structure. This creates a 'fade' between full sunlight to full shadow, with a transition range between. The

average apparent diameter of the sun is $0^{\circ}32'02''$, which creates a transitional shading wedge that widens at a rate of 0.932m for every 100m that the full shadow extends away from the subject structure. The 'hard' lines shown on the assessment plan at the edges of the shading areas illustrate the centre of the transitional fade wedges (due to these lines having a bearing to the centre of the sun). Thus the transitional wedges, if depicted on the assessment diagrams, would project on both the inside and the outside of the illustrated lines at a rate of 0.466m per 100m. As an example, if we consider the longest of the assessed shadows, occurring at 4pm on the Winter Solstice diagram and having a shadow that extends a distance of close to 710m, we can determine that the total width of the transitional shading width at its maximum is 6.617m. This wedge would extend to a maximum distance of 3.309m on either side of the shadow edge illustrated, this width equating to a diagram distance of 1.3mm when plotted at the 1:2500 scale of the Winter Solstice assessment diagram.

2. No assessment has been made to-date of the shading that might be expected to be created by the establishment of a non-fanciful permitted baseline structure within the development site.
3. No assessment has been made to-date of the shading that is presently generated across the application land (and beyond the application land) by existing structures and environment.

Assessment report prepared by:

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Registered Professional Surveyor

Paterson Pitts Group



Notes:

1. Shading is based on Lidar ground levels, except where shadows are interrupted by existing buildings. These interruptions are indicated by a yellow line around the outside of the applicable shadow.
2. RL's (Otogo Datum): Top of Ring, RL: 176.85m; Top of Building, RL: 172.10m
3. Shading created by existing buildings or environment has not been illustrated on this diagram
4. Transitional shading, where the proposed structure partially obscures sunlight (i.e. at the edges of the full shading areas illustrated) is not shown on this diagram.

SUMMER SOLSTICE (DLS TIME)

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Client/Location:

Dunedin Moray Place Hotel

Purpose/Drawing Title:

Shade Diagram
Using Lidar Ground Contours

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