

### Tower Position

As outlined in Section 5 of this report, a number of massing options with an alternate southern location for the tower were tested in response to the issue raised in submissions that a more southern siting of the tower should be investigated to improve private view impacts and relationship to context. A maximum feasible envelope shift of up to 15m south was identified due to;

- Increased structural complexity. The more southerly position of the tower creates an increase in structural elements outside the existing sea wall, and the zone between sea wall and Harbour St boundary which the core needs to land in is further constrained as its at its smallest point on the site.
- Visibility of commercial access and address from Market St. A key commercial feasibility factor is the visibility of the entry lobby from Market St as well as pedestrian distance between street, entry and core. View and access studies resulted in an unacceptable negative impact when siting the tower further than 15m south relative to the previous reference scheme.
- Private view sharing. Increased movement south provided no net benefit to view sharing when assessed across a range of buildings.

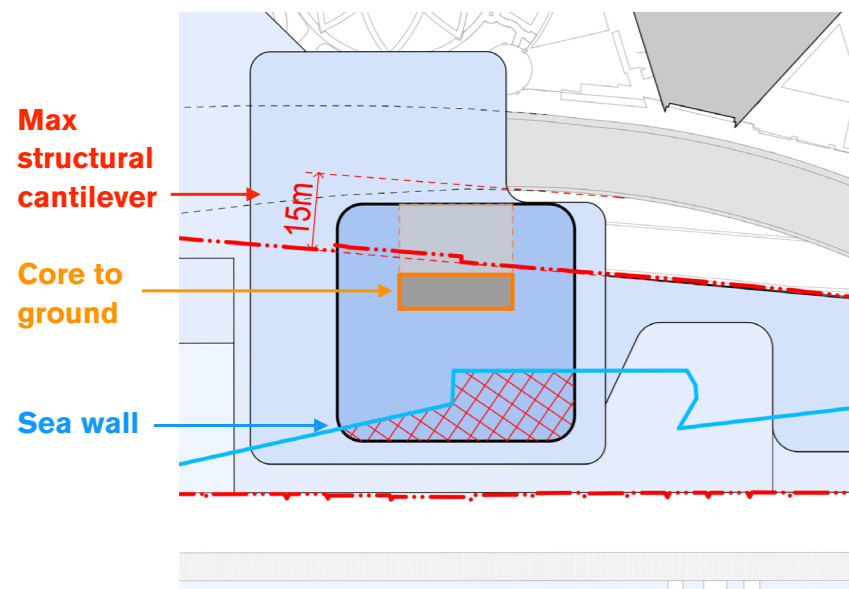


Fig. 11. Structural Constraints

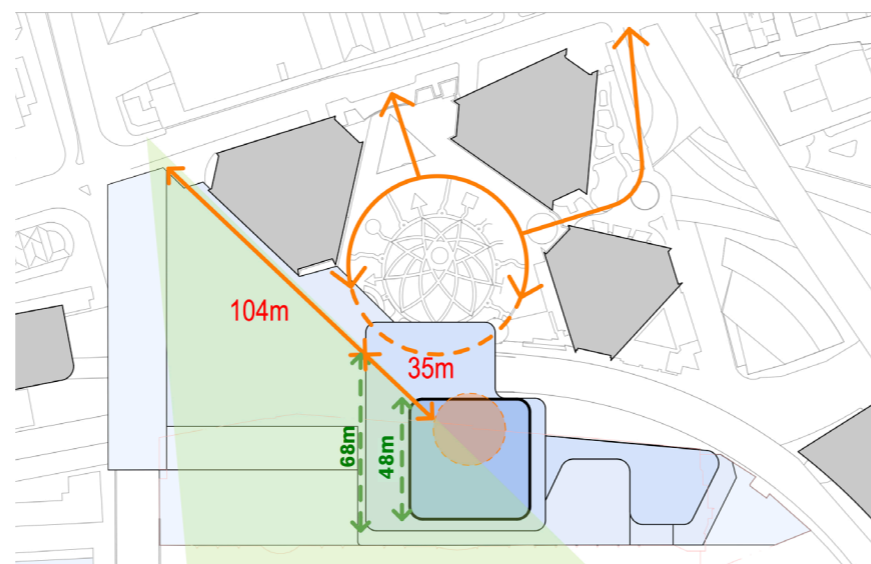


Fig. 12. Commercial Access & Address

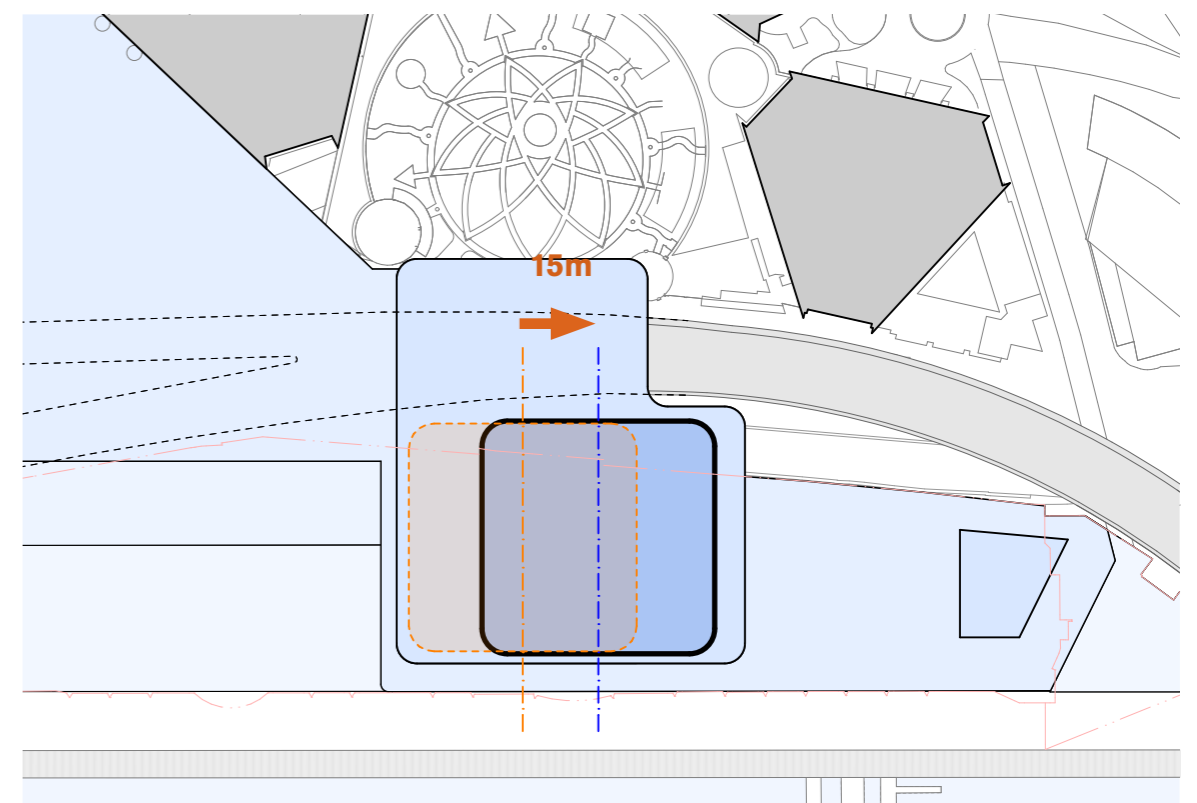


Fig. 13. Tower position 15m south of previous scheme

Key design issue response:

### — Tower Siting

The concept proposal and revised envelope allows for the potential of a more southern tower location of up to 15m towards the south relative to the previously submitted indicative design massing for an improved relationship to context. The final location of the tower siting within the revised envelope is to be developed and refined by design competition architects as part of a holistic urban design and architectural proposal in the design excellence process.

### — View Impacts

Considered private view corridor sharing between the Darling Park Towers, and cognisant of other residential towers.

### Setbacks

The tower setback above podium from the Cockle Bay Promenade has increased from 6m minimum / 8m average, to 8m minimum / 10m average. This increased setback improves the design by increasing the relative strength of the human scale podium structures and reducing the perception of tower forms adjacent to the site, when viewed from the promenade level.

Key design issue response:

#### — View Impacts

Increasing the tower setback from the Promenade reduces the visual presence of the tower when viewed from around Cockle Bay.

#### — Promenade overshadowing

An increased setback from the promenade assists in reducing overshadowing at the southern end. More information on boardwalk overshadowing reduction can be found later in this section.

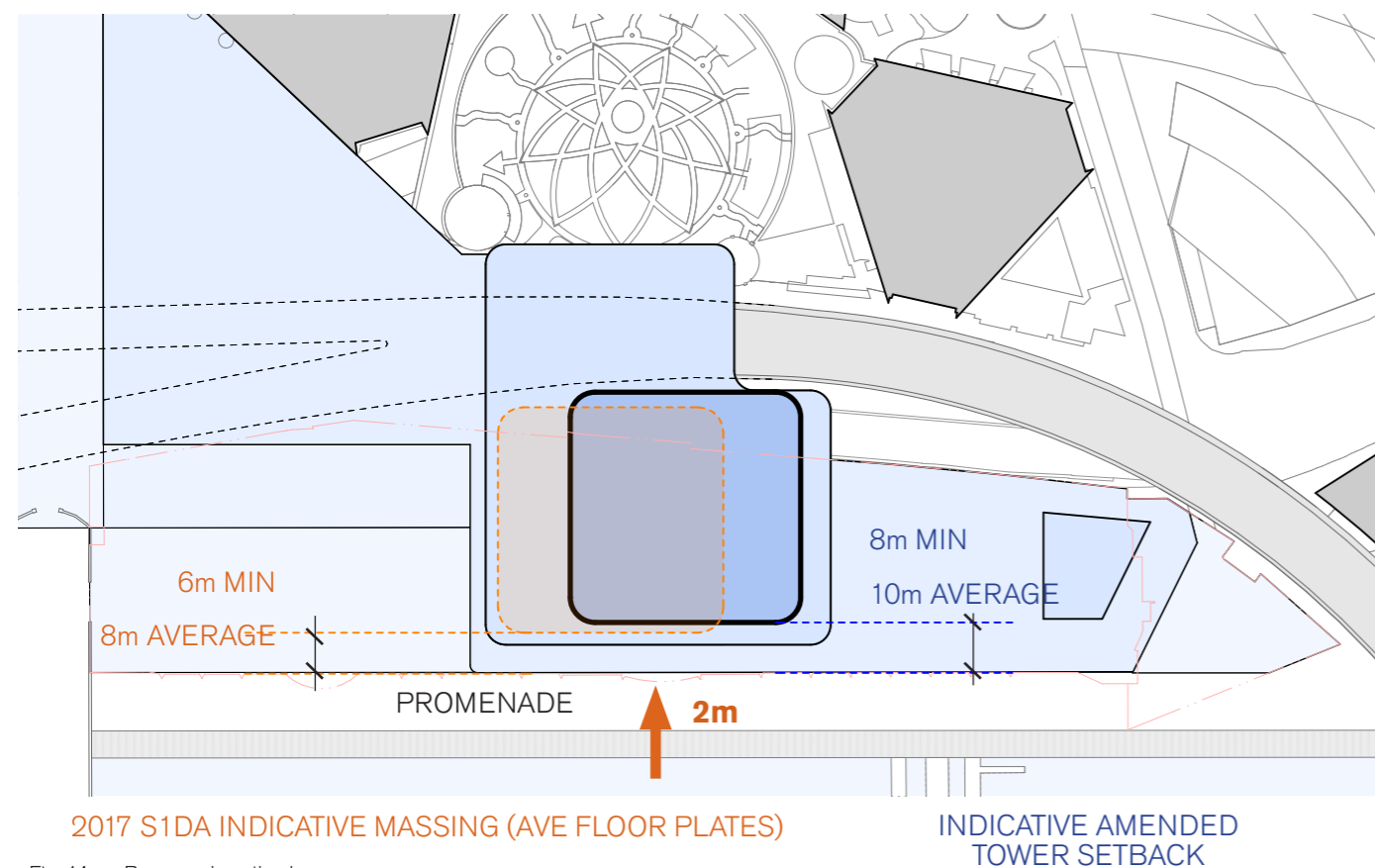


Fig. 14. Promenade setback

### Separation of Southern Public Space from Freeway

A result of the design review process is the provision of an additional single storey built form envelope along the eastern edge of the level 3 terrace. This massing may improve the amenity of the southern public space by providing a physical separation to the adjacent Western Distributor. It also allows for additional activation such as retail opening into the southern public space.

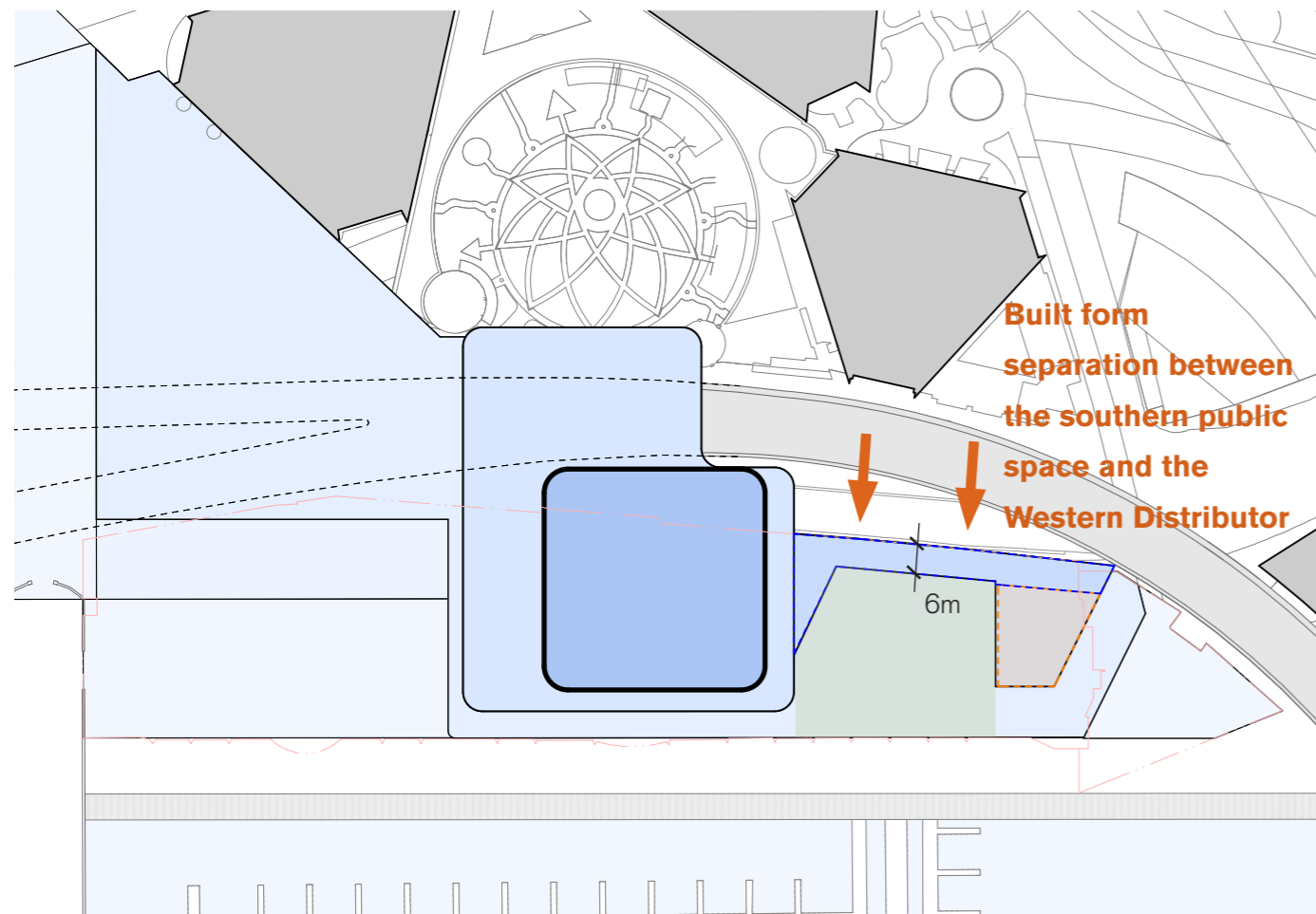


Fig. 15. Separation of the southern public space from the Western Distributor



Fig. 16. Artists Impression of the southern public space with additional built form separation to the Western Distributor by Doug & Wolf and Aspect Studio (indicative render - subject to design competition)

### Southern Podium Envelope Flexibility

In addition to the increase in promenade tower setback, the visual presence of the tower from the southern end of the promenade can be further reduced by increasing the height of the podium massing at the eastern edge of the promenade. Extending the level 3 massing to the western edge of the podium at the southern end allows for the flexibility of an architectural treatment to shield the tower view and create a human scale perception at the podium.

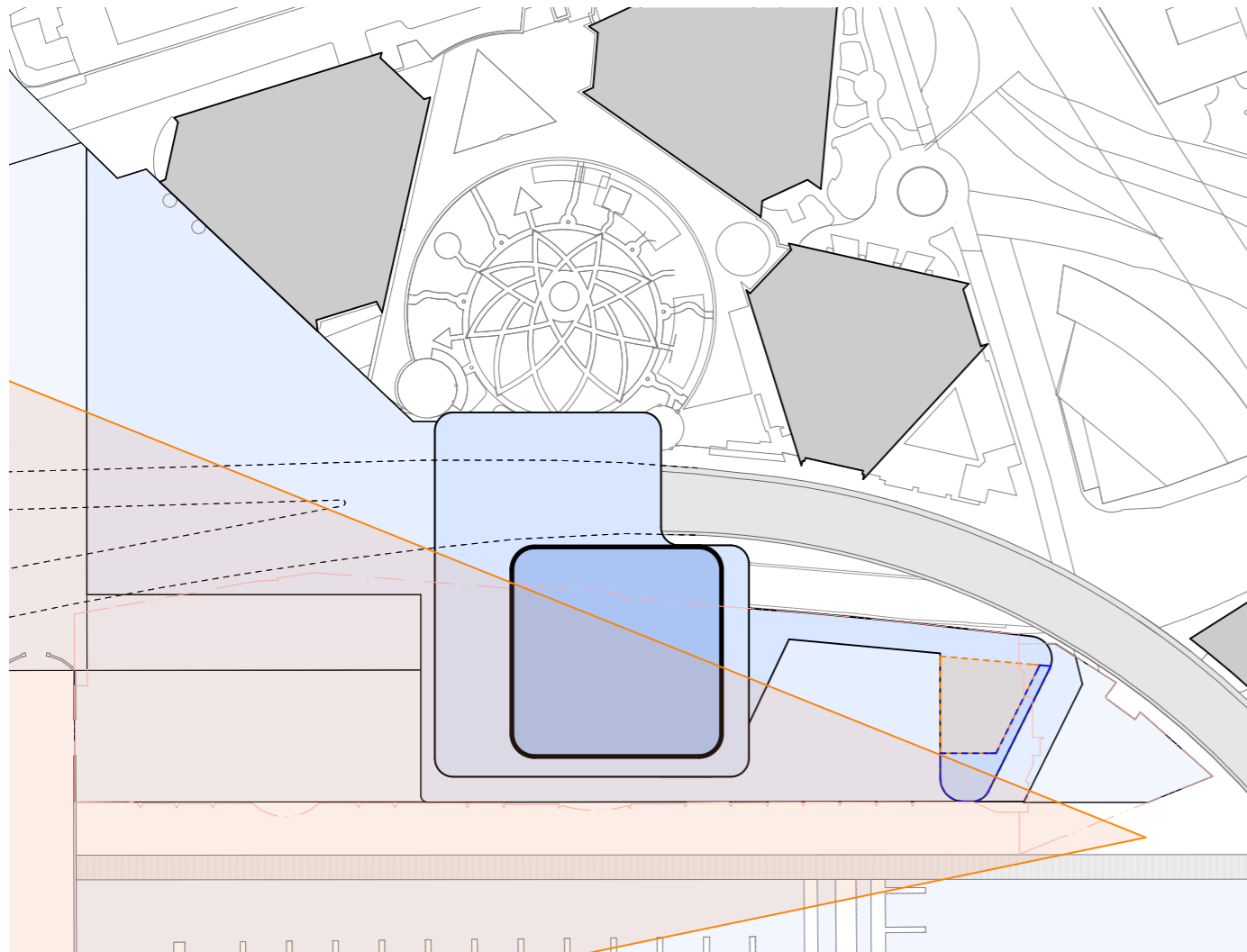


Fig. 17. View along the promenade location

Key design issue response:

### — View Impacts

Potential extension of built form at the south west corner of level 3 reduces the presence of the tower from the southern end of the Promenade, strengthening the human scale of the podium relative to the tower.

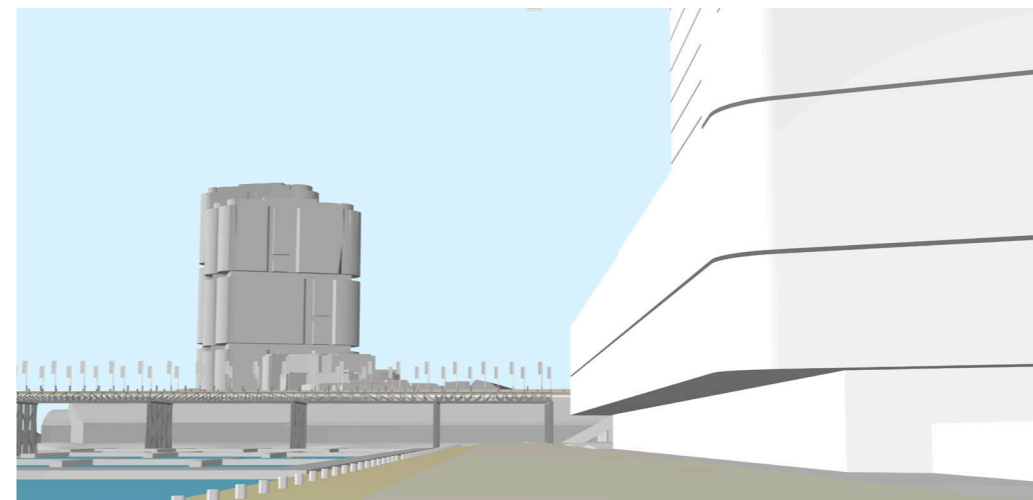
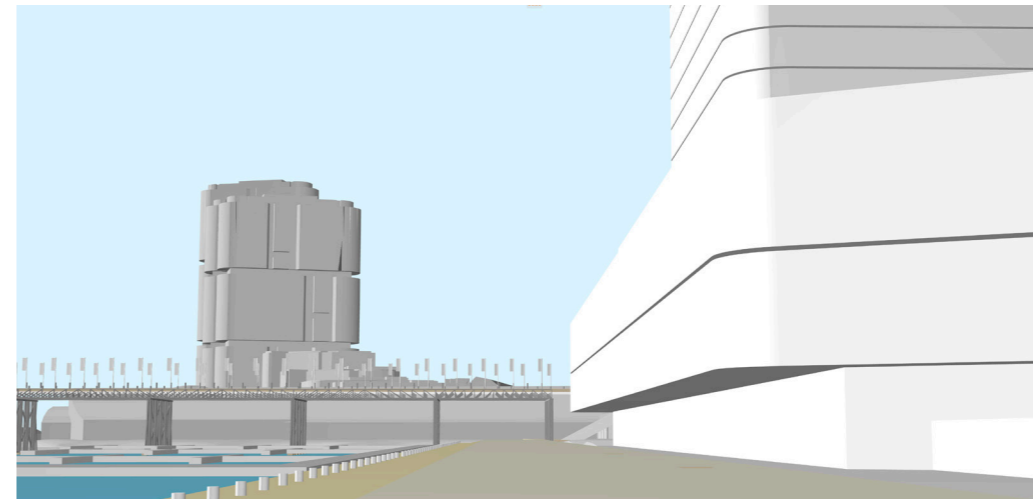


Fig. 18. View from the promenade looking north - with and without additional podium flexibility at level 3

### Promenade Overshadowing

The combination of reduction in height and increased setback from the promenade results in no additional tower overshadowing to the 11.6m promenade zone at the draft Central Sydney Planning Strategy (CSPS) control time of 11 am - 3pm on 21 June (mid winter).

These shadow diagrams indicate the shadow cast by the full envelope at the above control time. Metric built form controls within the design brief of the next stage will mean the resulting building solution will not fill the envelope (refer to Section 7.2 for Key Design Criteria), so the Stage 2 design will only ever improve on the below shadow conditions.

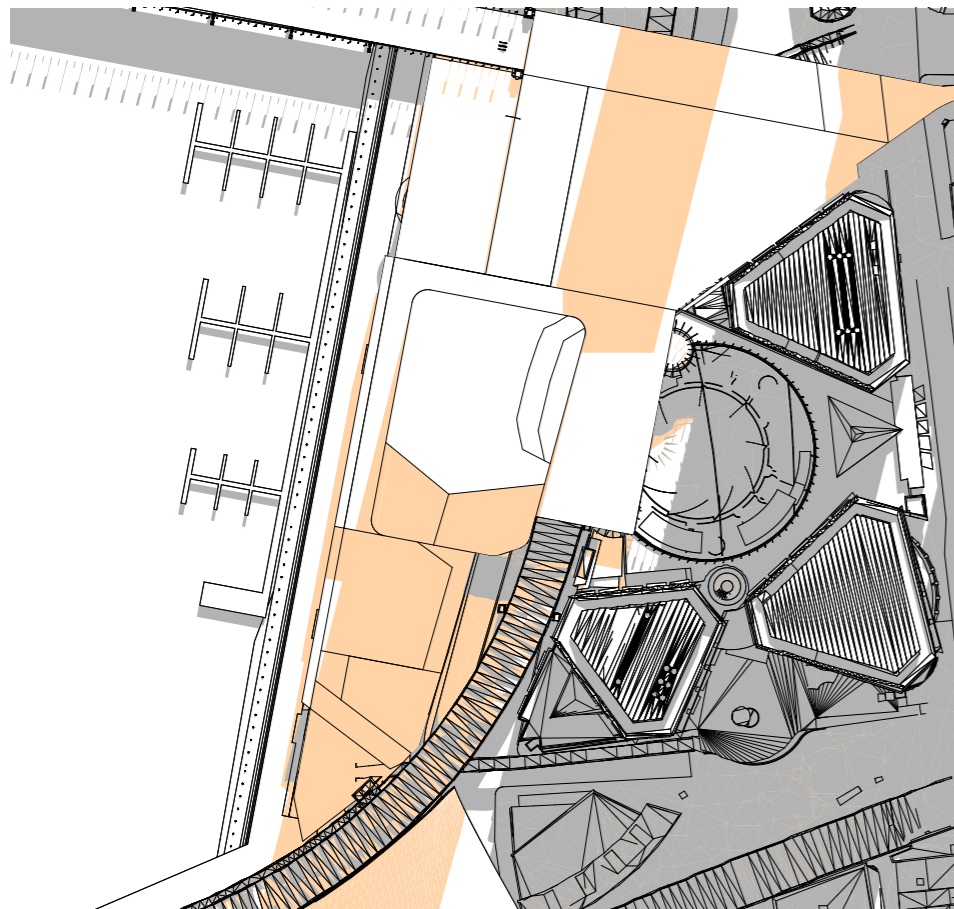


Fig. 19. Shadow diagram - revised envelope on 21 June at 11am

Key design issue response:

### —Promenade Overshadowing

Tower overshadowing on the promenade zone has been eliminated at the control time.

Additionally, no additional overshadowing by the tower during the draft CSPS control time of 11 am - 3pm on 21 June (mid winter) will become a design requirement of the Stage 2 design excellence process.

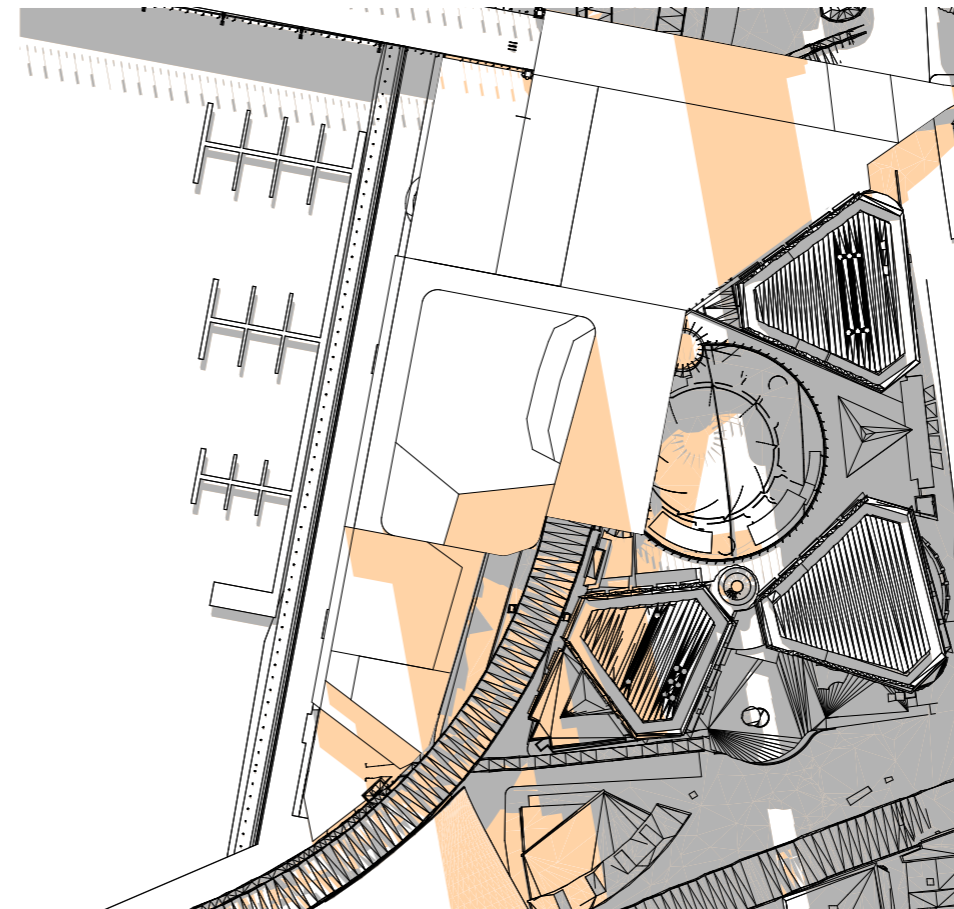


Fig. 20. Shadow diagram - revised envelope on 21 June at 12.30pm

### Town Hall Square Overshadowing

An assessment of overshadowing impact caused by an indicative building mass in both a northern and southern position (refer Figure 21) within the revised Concept Envelope has been carried out, demonstrating significantly improved shadow impact on this area of future open space when compared to the previously proposed (EIS 2016 and EIS 2017) Concept Envelope.

The analysis indicates that during the Council's proposed period of protection (12:00 midday - sunset all year), the worst case out of the two locations tested has minor additional overshadowing;

- occurring for a period of 3 weeks around each equinox in March and September (46 days in total)
- has a presence of less than half an hour in the late afternoon from 4:00pm to 4:30pm (AEST) on the peak days (1 April and 9 September). When daylight savings occurs this time is occurs even later in the day between 5.00pm and 5.30pm.
- results in maximum additional overshadowing of any point in the proposed square of only 14 minutes on the peak day.
- results in an overall additional annual overshadowing of 0.06% averaged across the square (refer to overshadowing definitions on page 41).

The overshadowing will not significantly impact on pedestrian amenity and use of the space, as it is occurring:

- for a brief period, for a restricted time of year when the climate is temperate, and;
- late in the afternoon when outdoor dining and cafes etc are usually closed between lunchtime and evening service.

At the times of year overshadowing occurs on the future Town Hall Square, the proposed new public park to the north of the new tower is within a 7 minute walk and receives full sun over several thousand square metres of public open space. The benefits of this new sun filled public open space with sun access all year round far outweigh the relatively minor Future Town Hall Square additional overshadowing which occurs at the very end of the day for a very short period of time.

Key design issue response:

### —Town Hall Square Overshadowing

These studies indicate building massing in either the original tower location or 15m south produce a reduction in Town Hall Square overshadowing compared to the November 2107 EIS envelope. Impact will be limited by including measurable Town Hall Square overshadowing controls in the key design criteria for the design competition and Stage 2 DA.

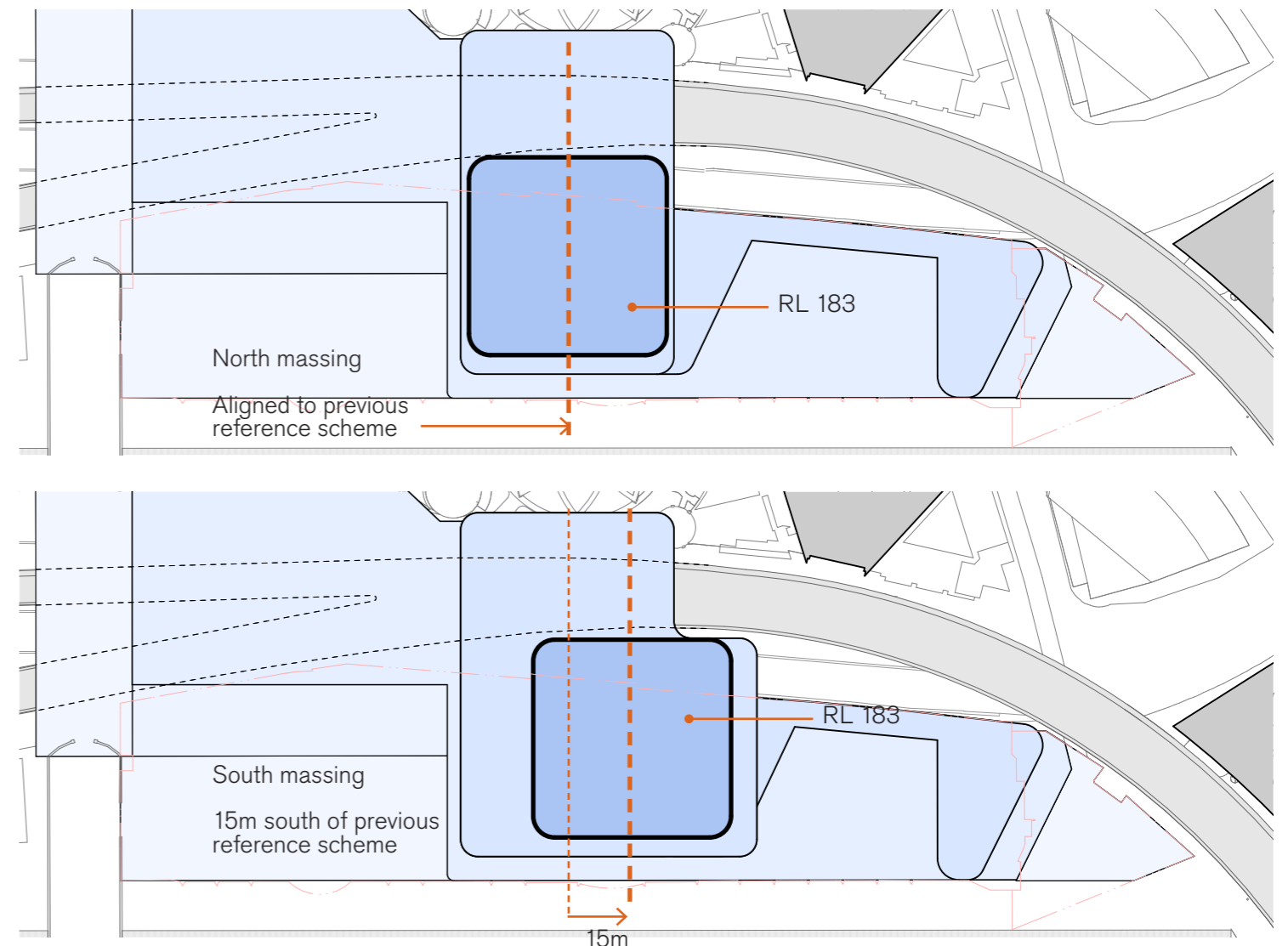


Fig. 21. Massing locations analysed for Town Hall Square overshadowing impacts

Annual Overshadowing

Figure 22 below represents the marginal impact on annual sun access hours achieved by the existing condition (studies account for the approved development under construction at 230 Sussex St).

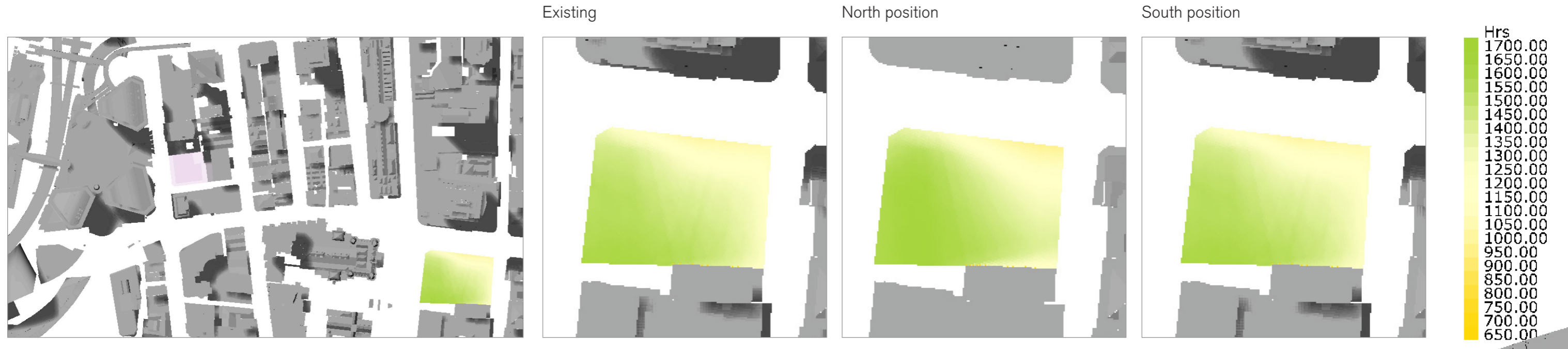


Fig. 22. Annual sun access hours from 12 midday to sunset on the Future Town Hall Square

Figure 23 represented the annual hours of sun reduction. This indicates that in the worst case north position, a large amount of the site to the south west corner is affected by less than 2 hours over the whole year. The maximum annual reduction at any one point on the square is 6.8 hours out of a total 2173 possible sun hours over the whole year.

Spot levels shown are approx cumulative annual hours of sun reduction at these points (over the whole year).

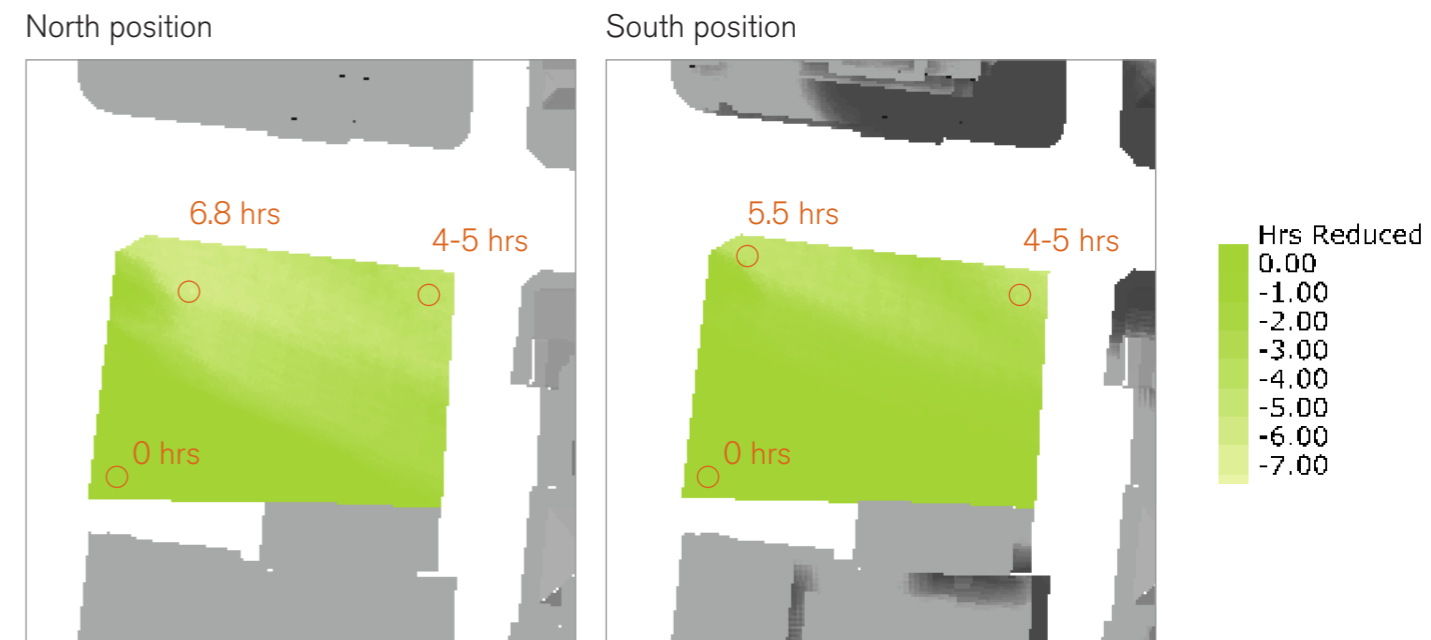
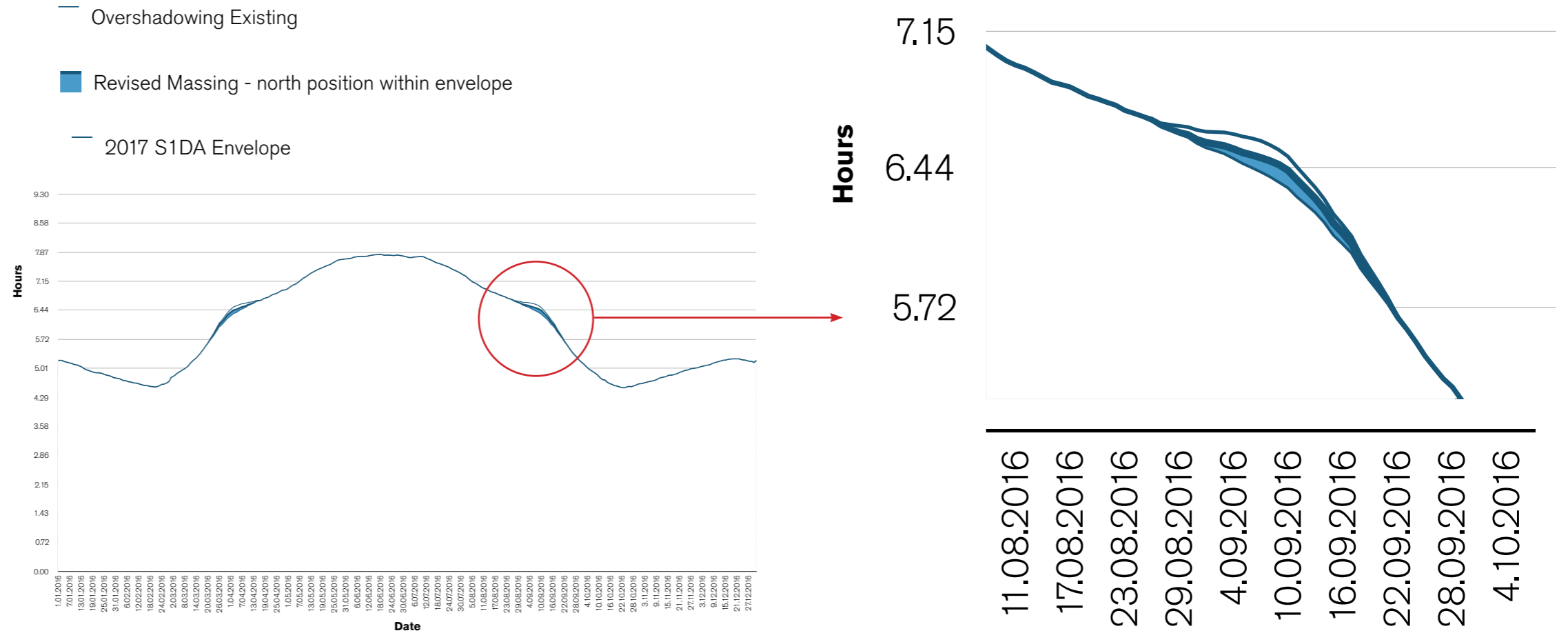


Fig. 23. Annual hours of sun reduction on the Future Town Hall Square

### Average hours of overshadowing - north

The average impact on Town Hall Square in the north position is;

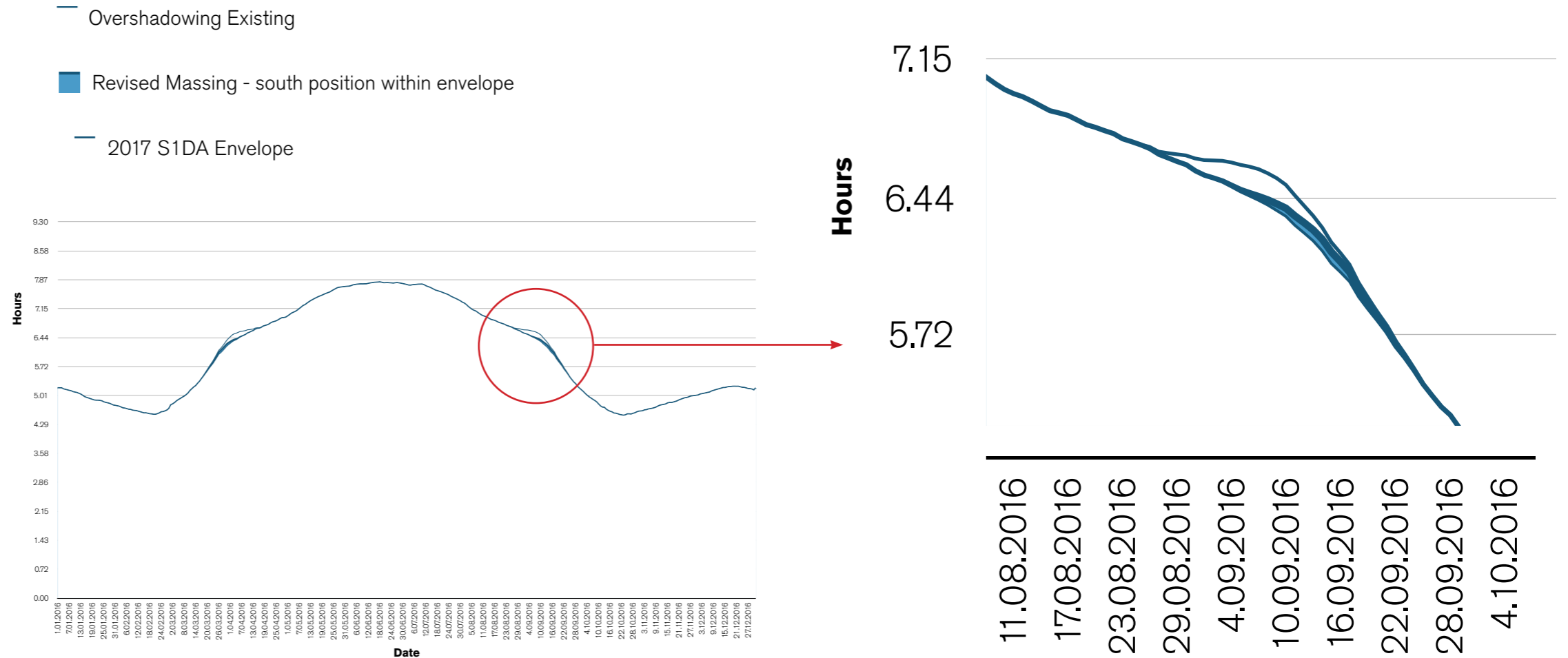
- a 0.8% increase in overshadowing hours on the most affected day of the year 9 September, with the degree of overshadowing tapering off on either side of that day for a 12 day period (24 total affected days around the September peak day)
- a 0.79% increase on the 1st April, with the degree of overshadowing tapering off on either side of that day for a 12 day period (24 days total around the April peak day).



### Average hours of overshadowing - south

The average impact on Town Hall Square in the north position is;

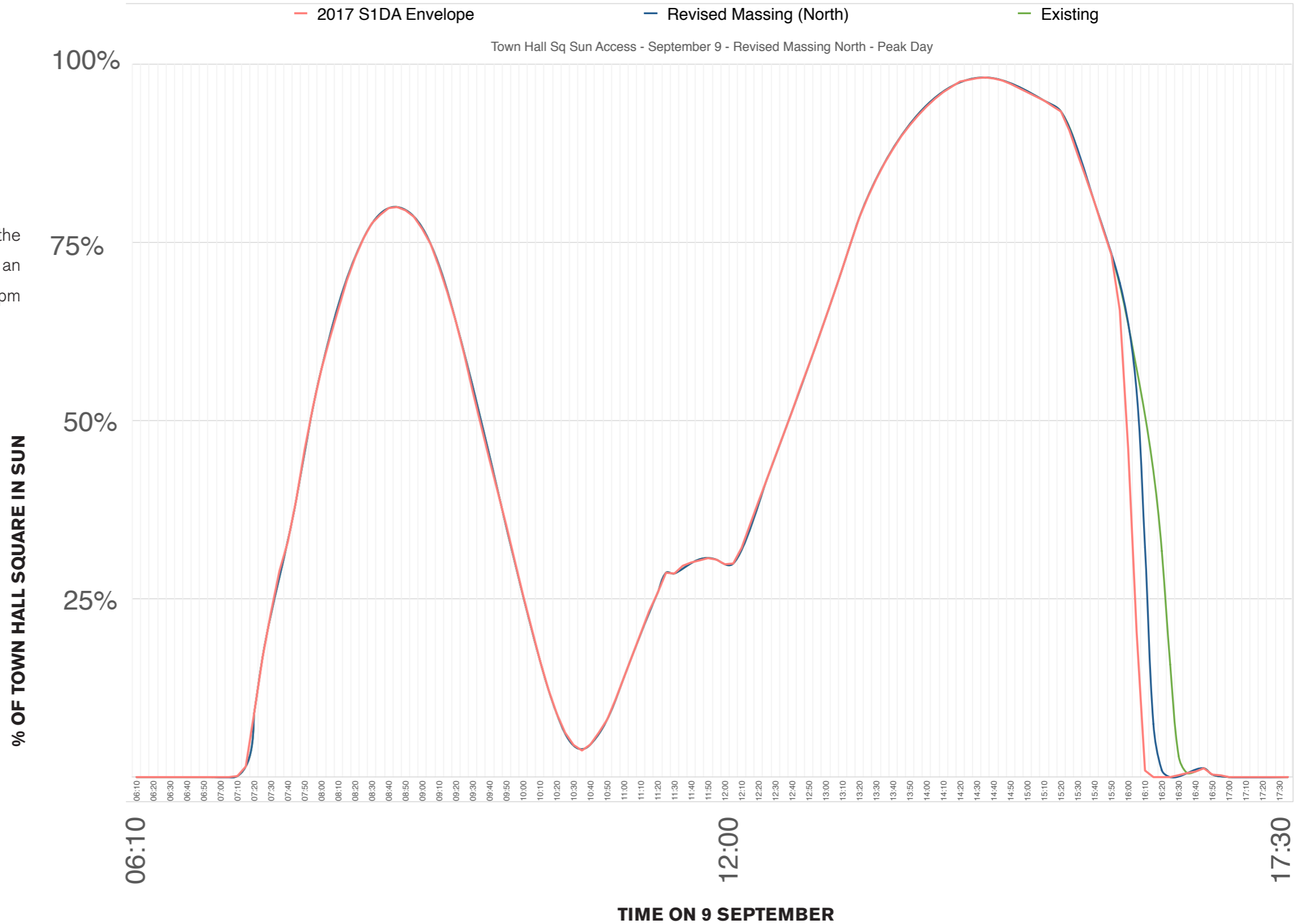
- a 0.52% increase in overshadowing hours on the most affected day of the year 14 September, with the degree of overshadowing tapering off on either side of that day for a 12 day period (24 total affected days around the September peak day)
- a 0.51% increase on the 27th March, with the degree of overshadowing tapering off on either side of that day for a 12 day period (24 days total around the March peak day).



Refer to overshadowing definitions on page 41.

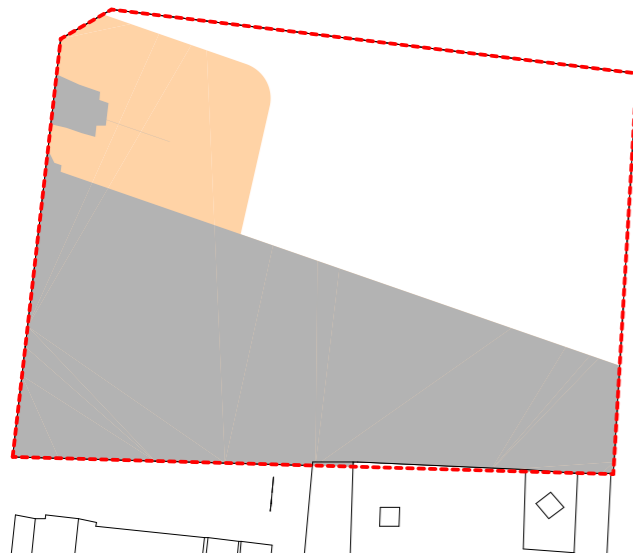
Duration of maximum daily overshadowing  
 - north massing peak day  
 - 9 September

Analysis of the peak day for the massing in the north position indicates this for less than half an hour between 4.00pm and 4.30pm AEST (5.00pm to 5.30pm when daylight savings occurs).



North massing shadow diagrams (worst day 9 September)

The following shadow diagrams represent additional overshadowing on the worst case day for the indicative massing tested in the north position.



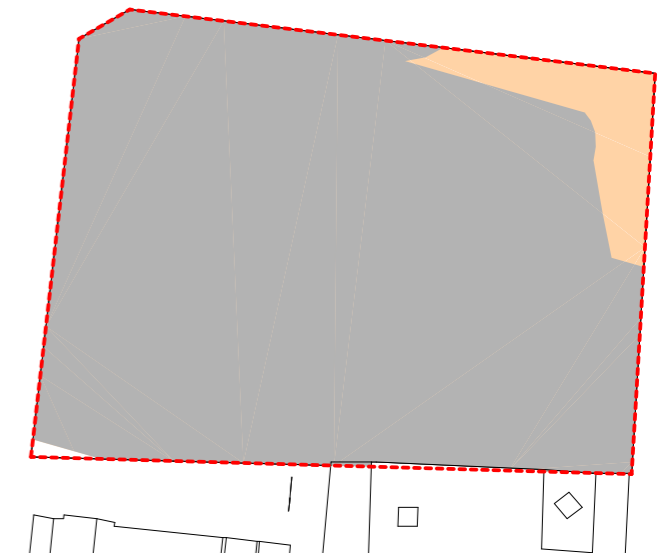
**9th Sep  
4.05pm**

		Area m <sup>2</sup>	% of Site
Sun		2240.44	51.02
Shade	Existing	1876.85	42.74
	Additional	274.30	6.25



**9th Sep  
4.15pm**

		Area m <sup>2</sup>	% of Site
Sun		326.77	7.44
Shade	Existing	2419.01	55.08
	Additional	1645.81	37.48

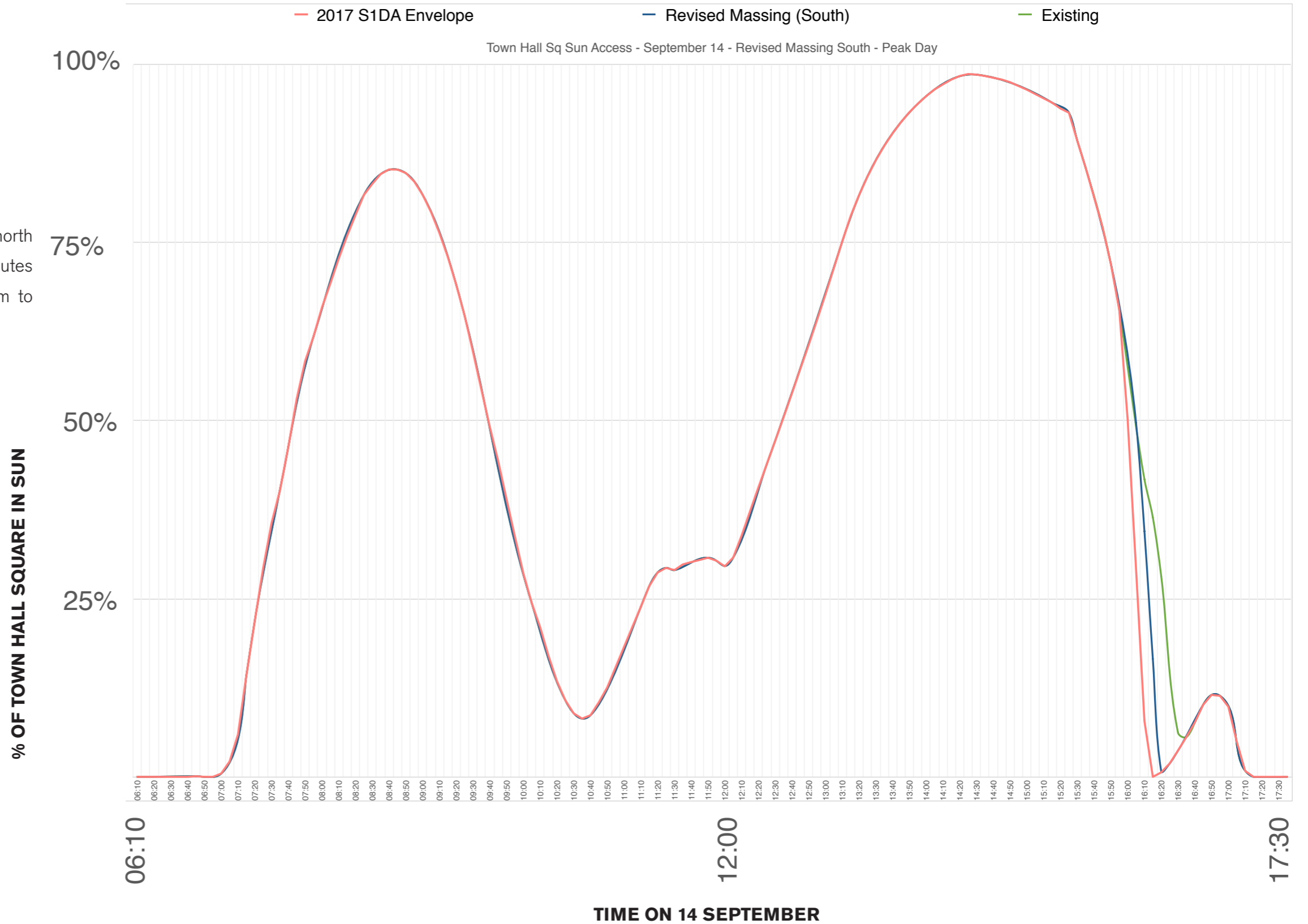


**9th Sep  
4.25pm**

		Area m <sup>2</sup>	% of Site
Sun		0.00	0.00
Shade	Existing	3698.47	84.22
	Additional	693.12	15.78

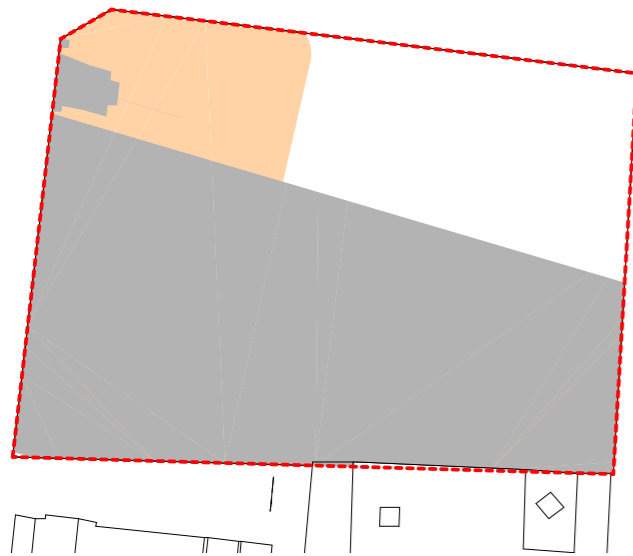
Duration of maximum daily overshadowing  
 - south massing peak day  
 - 14 September

Analysis of the peak day for the massing in the north position indicates this for less than 25 minutes between 4.05pm and 4.30pm AEST (5.05pm to 5.30pm when daylight savings occurs).



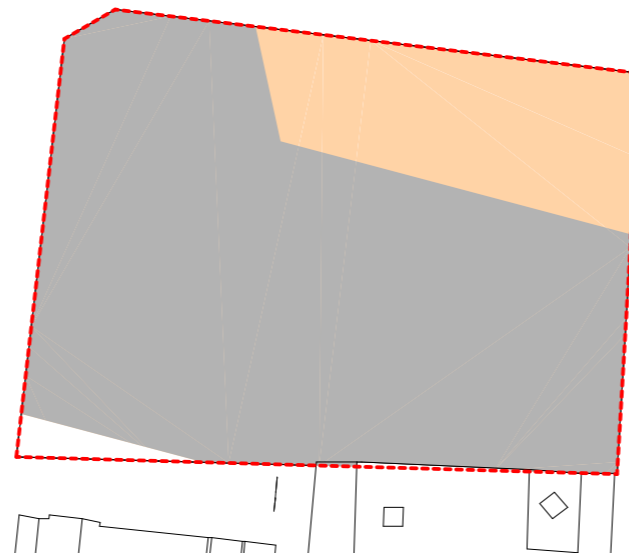
South massing shadow diagrams (worst day 14 September)

The following shadow diagrams represent additional overshadowing on the worst case day for the indicative massing tested in the south position. Analysis indicates that the most affected day can change by a few days depending on the location of the tower within the revised Concept Envelope.



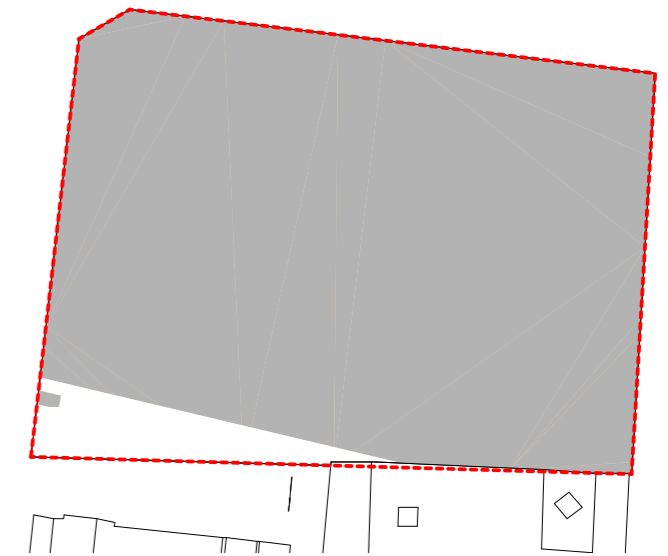
**14th Sep  
4.10pm**

		Area m <sup>2</sup>	% of Site
Sun		1514.18	34.48
Shade	Existing	2557.08	58.23
	Additional	320.33	7.29



**14th Sep  
4.20pm**

		Area m <sup>2</sup>	% of Site
Sun		34.06	0.78
Shade	Existing	3154.47	71.83
	Additional	1203.06	27.39



**14th Sep  
4.30pm**

		Area m <sup>2</sup>	% of Site
Sun		162.00	3.69
Shade	Existing	4119.13	93.80
	Additional	110.46	2.52

### Town Hall Square overshadowing reduction Summary

When considering the appropriateness of the proposed impact on solar access to Future Town Hall Square it should be noted that:

- There is currently no statutory control regarding overshadowing impacts to the Future Town Hall Square area.
- The impact summarised in this assessment is a worst-case assessment; for 342 days of the year there would be no impact at all on solar access to Future Town Hall Square;
- On days where an impact is anticipated, the impact would be limited to a maximum of 30 minutes between 4pm and 4:30pm AEST, which is outside of the times that open spaces are likely to experience peak utilisation such as lunch time hours.
- No impacts in Mid-winter or in lunch time hours occur when solar access planes have traditionally applied.
- The proposed Concept Envelope will deliver a significant new publicly accessible open space adjacent to the Harbour. The new public space, being located at the north of the Site, achieves excellent solar access throughout the day, achieving 4-8 hours of sunlight on June 21 mid winter (refer to November 2107 S1DA). The introduction of this significant public benefit is a balanced environmental planning response for the minor solar access impact that could be anticipated as a result of the proposed development.
- Future Town Hall Square is already overshadowed by a number of buildings located to the west of the Future Town Hall Square site and to the East of the Cockle Bay Park Site (the Site). In order to eliminate any overshadowing impacts to this area of the city, a building within the proposed Concept Envelope would have to be constrained so that any overshadowing impact falls within an existing building shadow. We note that Council has suggested an envelope that achieves this outcome, however we note that strict compliance with this control will not provide the best outcome for the site, the public domain or for future users of the site.
- The actual overshadowing impact of a future building within the revised Concept Envelope would be determined by the Competitive Design Process. Controls would be included within the Competitive Design Process Brief to require competing architect teams to consider, and limit as far as possible, overshadowing impacts to Future Town Hall Square. The controls proposed as a minimum to comply with are described in Section 4.3 of the Response to Submission by Ethos Urban.

	Original Concept	Stage 1 DA	Revised Massing (south within envelope)	Revised Massing (north within envelope)
<b>Annual average additional overshadowing (hours)</b>	12	5.4	<b>1.42</b>	<b>2.46</b>
<b>Maximum annual additional overshadowing at any point (hours)</b>	21	11	<b>5.5</b>	<b>6.8</b>
<b>Annual average overshadowing % change</b>	0.28%	0.12%	<b>0.03%</b>	<b>0.06%</b>
<b>Duration of overshadowing period (days)</b>	70	62	<b>46</b>	<b>48</b>
<b>Dates of maximum overshadowing</b>	11 April	4 April	27 March	1 April
<b>(peak days with largest overshadowing % increase)</b>	5 September	5 September	14 September	9 September
<b>Peak day overshadowing % change</b>	2.9%	1.5%	<b>0.52%</b>	<b>0.8%</b>
<b>Peak day maximum duration of additional overshadowing at any one point (minutes)</b>	20	15	<b>12</b>	<b>14</b>

The analysis as summarised in the table above indicates that during the Council's proposed period of protection (12:00 midday - sunset all year), the worst case out of the two locations tested has minor additional overshadowing;

- occurring for a period of 3 weeks around each equinox in March and September (46 days in total)
- has a presence of less than half an hour in the late afternoon from 4:00pm to 4:30pm (AEST) on the peak days (1 April and 9 September). When daylight savings occurs this time is occurs even later in the day between 5.00pm and 5.30pm.
- results in maximum additional overshadowing of any point in the proposed square of only 14 minutes on the peak day
- results in an overall additional annual overshadowing of the square of 0.06%

## Overshadowing Definitions

### Sun Access Hours Calculation

Sun access and shade hours are the average sunlight and shade hours across the whole of the Future Town Hall Square calculated at 5 minute intervals during sunlight hours for each day of the year. The average is calculated with a sample size of 2.5m x 2.5m.

### Annual Calculations

Annual total additional overshadowing hours =  
(annual total existing sun access hours) - (annual total proposed sun access hours)

### Annual average additional overshadowing hours =

(annual total additional overshadowing hours) / 365

### Annual average overshadowing % change =

(annual average additional overshadowing hours) / (annual total hours of daylight available) x 100

### Peak Day Calculations

Peak day existing overshadowing percentage =  
(peak day total existing overshadowing hours) / (peak day total hours of daylight available) x 100

Peak day proposed overshadowing percentage =  
(peak day total overshadowing hours by proposed building) / (peak day total hours of daylight available) x 100

### Peak day overshadowing % change =

(peak day existing overshadowing %) - (peak day proposed overshadowing %)



Fig. 24. Artists impression by Doug & Wolf (indicative render - subject to design competition)

