APPENDIX B
SHADOW STUDY

Shadow Study Methodology and Analysis
Douglas Avenue Multi-Family Residential Development Project

Methodology

Panorama evaluated for accuracy the building foot print data provided by the City of Burlingame[1] against structures visible in aerial imagery available through Google™ earth that was captured in 2014. The building footprint data was based on imagery captured between approximately 2005 and 2008. The building footprints were not aligned with structures visible in more current imagery, and did not reflect recent development surrounding the proposed project parcels. To ensure a more accurate shadow model, existing structure footprints were re-digitized in SketchUp Pro using imagery available through Google™ earth taken February 23, 2014 and compared to the data layer provided by the City. The models were georeferenced using the same Google™ earth imagery. Parcel data from the City was draped over the imagery.

Representative structure heights were obtained for existing structures using terrain data included with Google™ earth Pro for elevation. The approximate maximum height of each structure was used for the entire structure height. Small extensions of the structures such as chimneys, stair cases, and other facilities were not considered when selecting the representative heights. The elevation of the surrounding street level on Primrose Road and Douglas Avenue (25 feet) was subtracted from the selected structure elevation to determine each structure's relative aboveground height used in the shadow model. Each structure was shown with a flat roof to simplify the model and represent a "worst case" scenario for shadow evaluation.

Shadow cast from trees and other vegetation was not considered.

The longest shadows are cast in the early mornings and late afternoons when the sun is at the horizon or slightly above the horizon. The shortest shadow is cast at noon, when the sun is directly above. During the summer and fall equinox (on or about March 21 and September 21) the sun passes directly over the earth's equator and the length of the daylight and evening hours are equal. The summer solstice (on or about June 21) creates the longest day and the shortest night, and the winter solstice (on or about December 21) creates the shortest day and the longest night. Because these times give us the extremes of cast shadow, representative shadows for existing structures and the proposed project were modeled for 9am, 12pm, and 3pm on March 21st, June 21st, September 21st, and December 21st.

The area of shadows cast between the existing and proposed structures were determined using exported shadow images on a two-dimensional surface and did not incorporate vegetation or

[1] Building footprint data was provided by Lisha Mai, Assistant Engineer, and Ruben Hurin, Senior Planner, for the City of Burlingame on May 7, 2015.

surrounding buildings. The total number of pixels of each two-dimensional shadow image for the times selected were determined using Adobe Photoshop. The values and percent difference were then determined in Microsoft Excel and averaged.

Shadow Analysis for the Proposed Project

The City of Burlingame has not established a community standard for shadow impacts, and does not have criteria for significance. The Downtown Specific Plan provides guidance for assessing potential shadow impacts for projects in Downtown Burlingame, specifying that as part of the design review process, development in the Specific Plan Area that is proposed to be taller than existing surrounding structures (such as the proposed project) should be evaluated for potential to create new shadows/shade on public and/or quasi-public open spaces and major pedestrian routes. The plan suggests at a minimum shadow diagrams should be prepared for 9am, 12pm, and 3pm on March 21st, June 21st, September 21st, and December 21st (approximately corresponding to the solstices and equinoxes) to identify extreme conditions and trends.

Figures 1 and 2 illustrate the difference in shadow cast on the area around the proposed project site in existing conditions and with the proposed project for 9am, 12pm, and 3pm on March 21st, June 21st, September 21st, and December 21st. Overall, the proposed 5-story building would shade an approximately 80 percent greater area[2] than existing structures on the properties; however, there are no public or quasi-public open spaces adjacent to the proposed project site, and the adjacent pedestrian sidewalk on Douglas Avenue would only experience new shading during the later afternoon and evening hours. Shade from the proposed building on the Douglas Avenue sidewalk would be comparable to surrounding buildings. Based on the established criteria in the Downtown Specific Plan, the proposed 5-story building would not create significant new shadows/shade on public and/or quasi-public open spaces and major pedestrian routes. Therefore the proposed project would not be considered to have significant shadow impacts.

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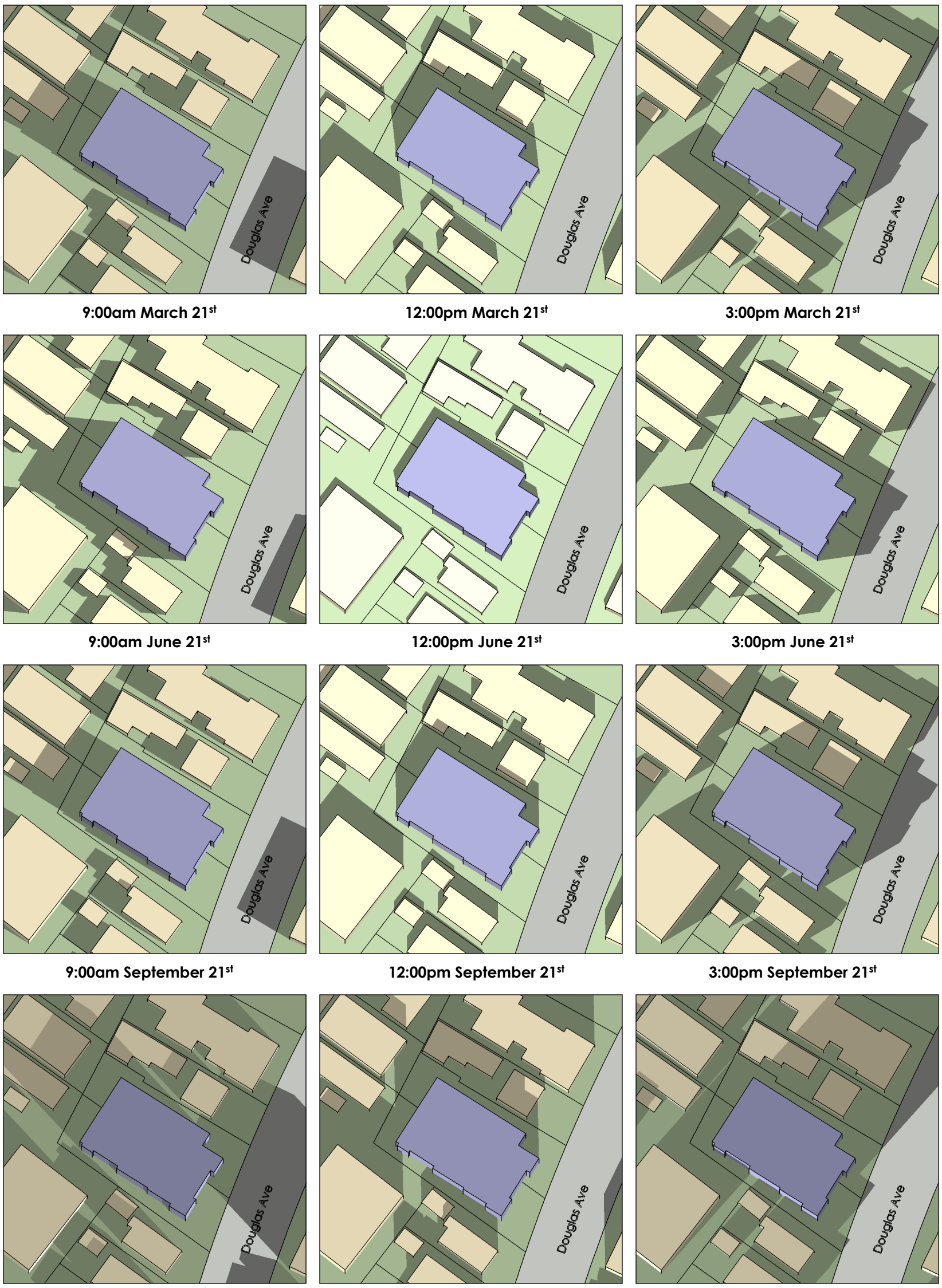
[2] Values for shadow area were generated using representative modeling for the existing and proposed structures on the project site, and averaged from each of the times shown on Figures 1 and 2. Shadows from surrounding buildings and vegetation were not included.

Figure 2 Existing Shadows Plus Project



Legend

N Scale: 1"=100'(1:1,200)

100 ft

Proposed Project Building

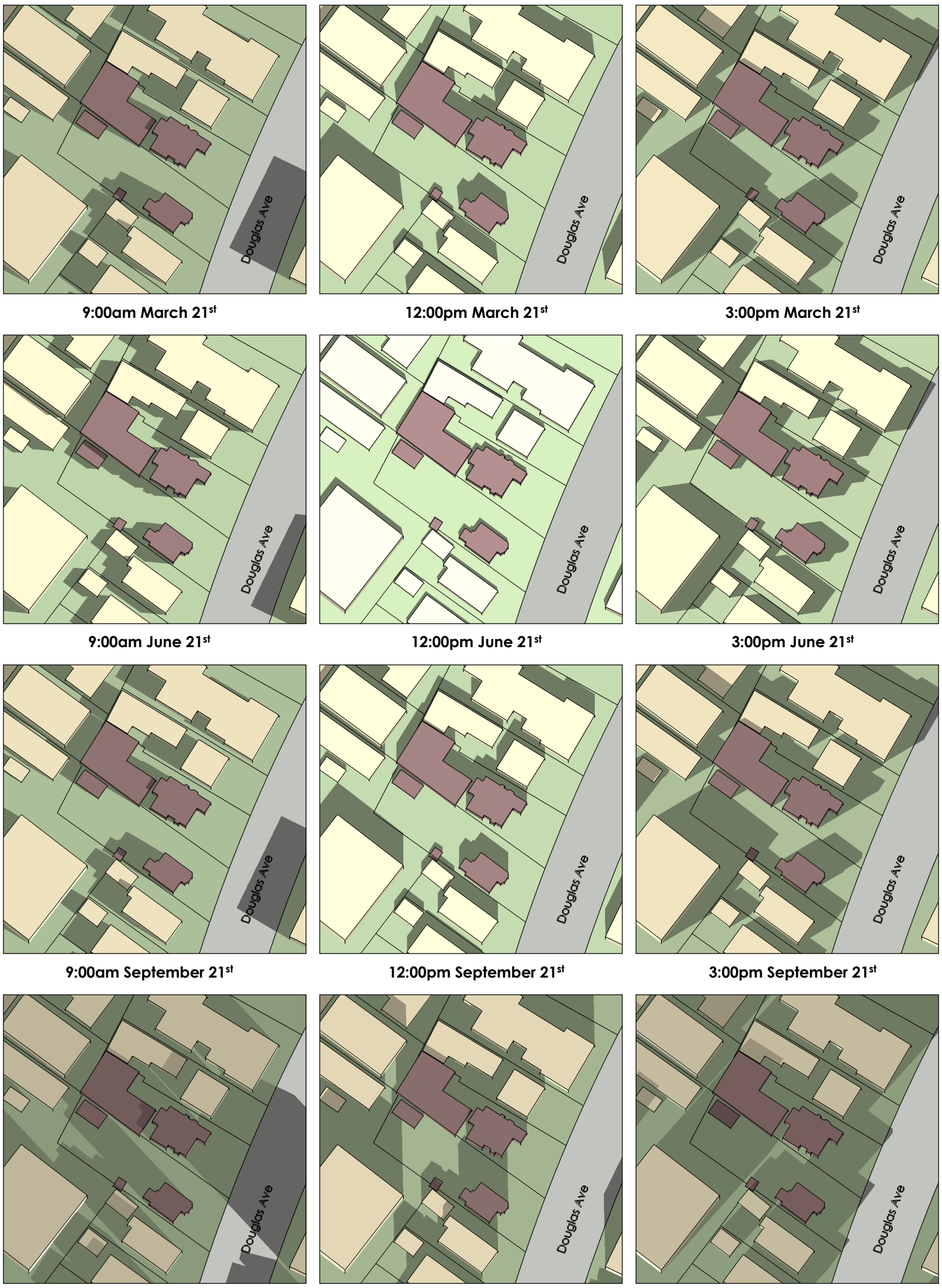
Parcels

Surrounding Buildings

Street

PANORAMA

Figure 1 Existing Shadows



9:00am March 21st | 12:00pm March 21st | 3:00pm March 21st

9:00am June 21st | 12:00pm June 21st | 3:00pm June 21st

9:00am September 21st | 12:00pm September 21st | 3:00pm September 21st

9:00am December 21st | 12:00pm December 21st | 3:00pm December 21st

Legend

N Scale: 1"=100'(1:1,200)

100 ft

Existing Buildings on Project Site

Parcels

Surrounding Buildings

Street

PANORAMA