

Appendix L

Shadow Analysis

Shadow Analysis

Impact on Major Open Spaces



INTRODUCTION

Sunlight Access

The benefits of access to sunlight are well known, with increased daylight access linked to mental and physical health-promoting benefits. Daylight access is a key element associated with the enjoyment of public spaces, and also increases the site's security and safety.

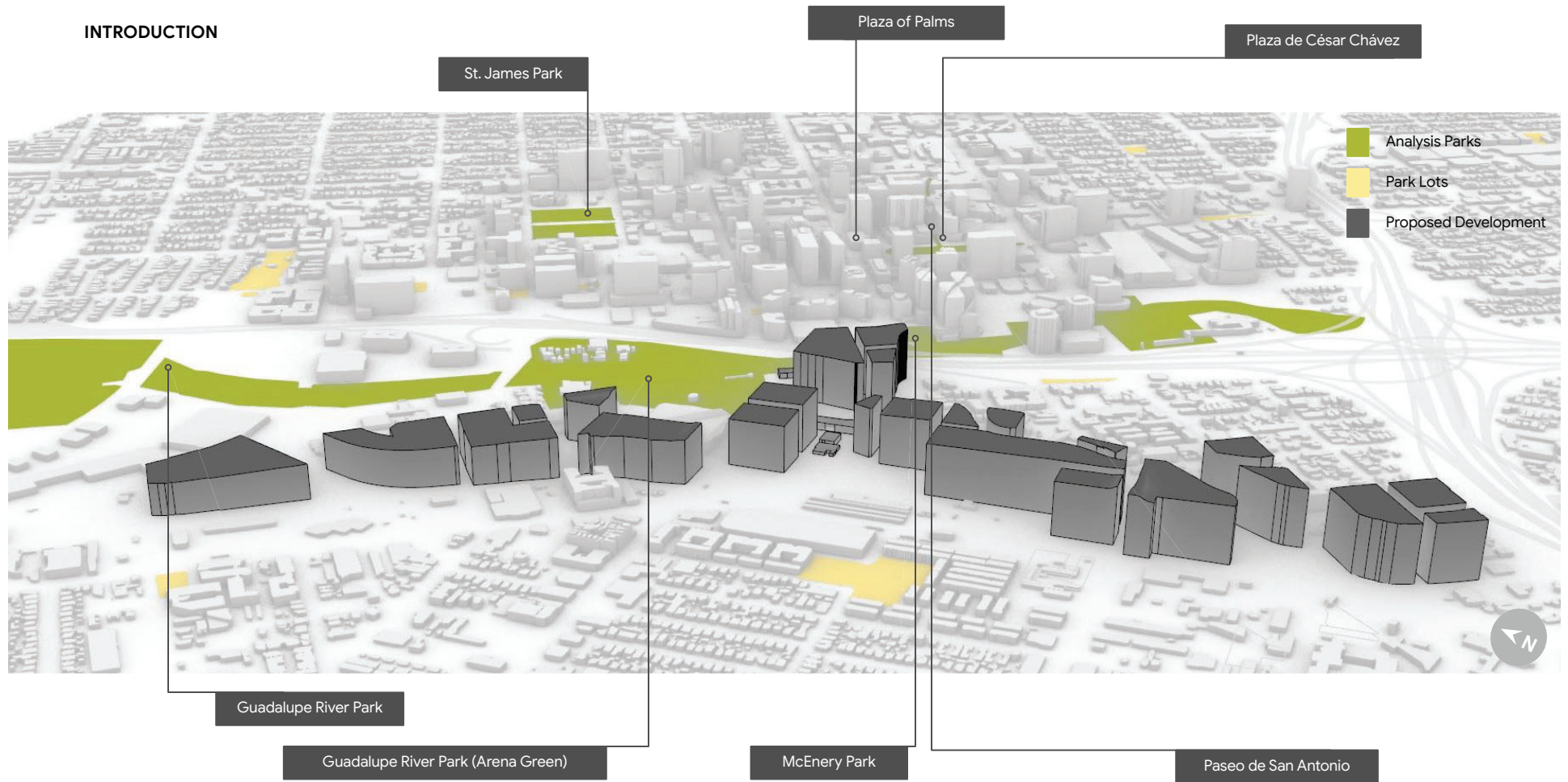
As development in urban areas increases, as does the risk of public outdoor spaces being overshadowed. It is imperative that these risks are managed so that all visitors maintain a high level of enjoyment.

The subject locations which will be included as part of this analysis are; (1)St. James Park, (2)Paseo de San Antonio, (3)Plaza de Cesar Chavez, (4)Plaza of Palms, (5)McEnery Park, and (6)Guadalupe River Park. All sites are located to the east of the proposed development area.

Other nearby open areas have been identified and included as Park Lots.



INTRODUCTION



METHODOLOGY

Qualitative Analysis

A qualitative analysis has been undertaken to determine which parks will be impacted by the proposed development. This has been demonstrated with a shadow analysis which indicates where shadows are cast at different analysis hours. The results from this analysis represent shadows from both existing and proposed buildings.

Only parks that have been obstructed in the qualitative analysis have proceeded to a quantitative analysis.

Quantitative Analysis

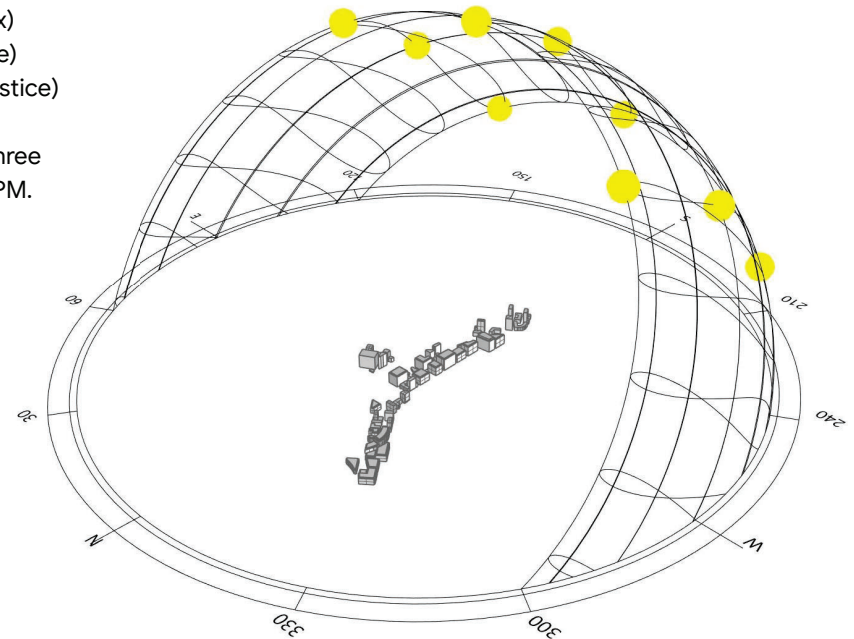
A comparison between the shadows cast by the existing and proposed development cases has been utilized to calculate the effect the development has on these spaces. Where the park area which is covered in shadow increases by 10% or greater, the development is considered to have “significant” impact.

Analysis Hours

The analysis has been conducted for the following representative dates of the year;

- March 21st (Spring equinox)
- June 21st (Summer solstice)
- December 21st (Winter solstice)

Each date has been simulated for three analysis times - 10AM, 12PM, and 3PM.



Sun path diagram indicating the 9 sun positions considered in the analysis

Areas of Shadow

Qualitative Results

QUALITATIVE ANALYSIS

Shadow Visualisations

The following pages present the results of a shadow analysis, where existing and proposed buildings have been modelled and their overshadowing impact on the six parks and surrounding park lots has been visualised.

The six major parks have been indicated in green, and all park lots are indicated in yellow.

All results will be shown in plan view with all context included. Refer to Appendix A: Magnified Analysis Results for results illustrated on park areas only.

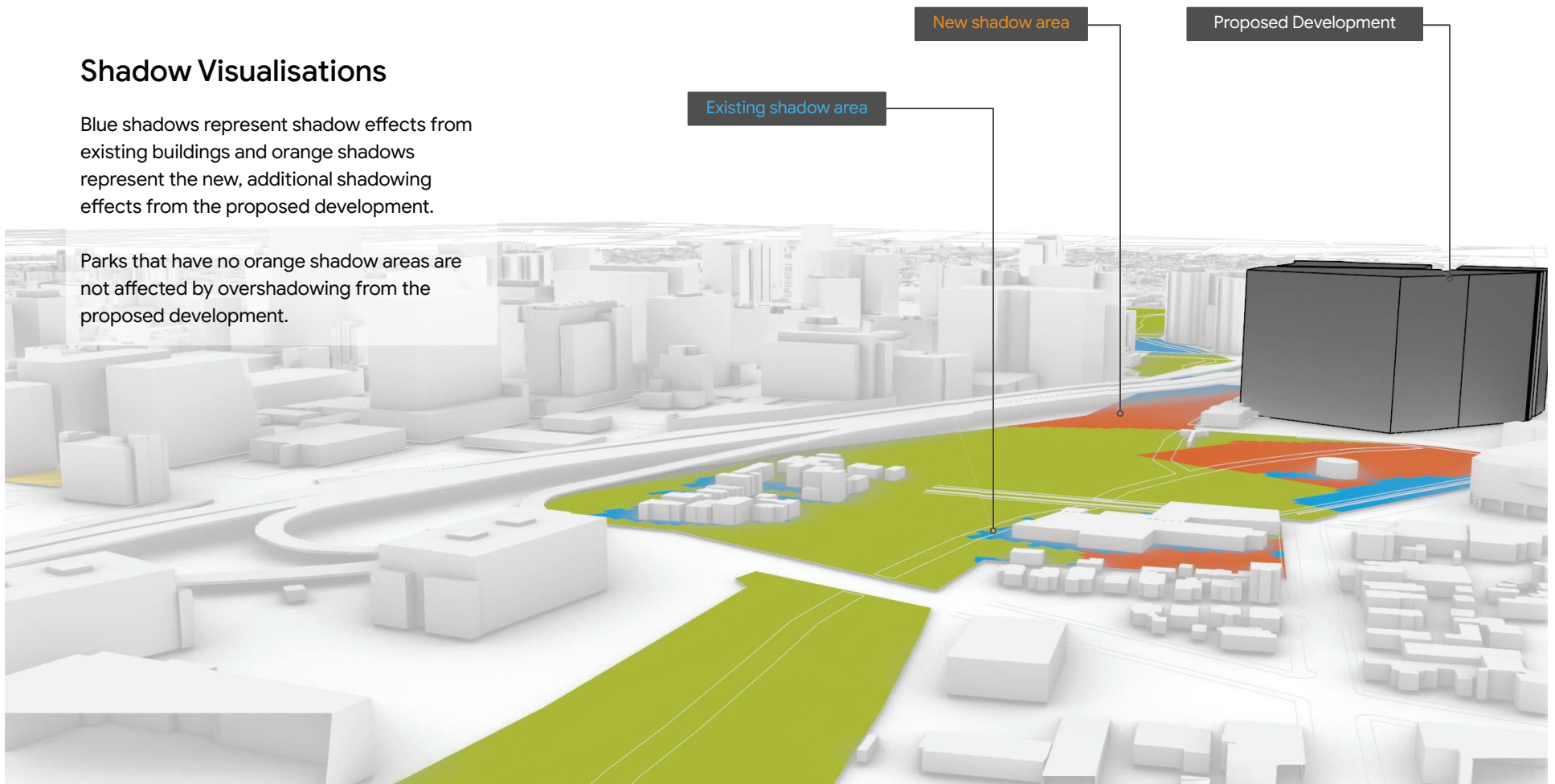


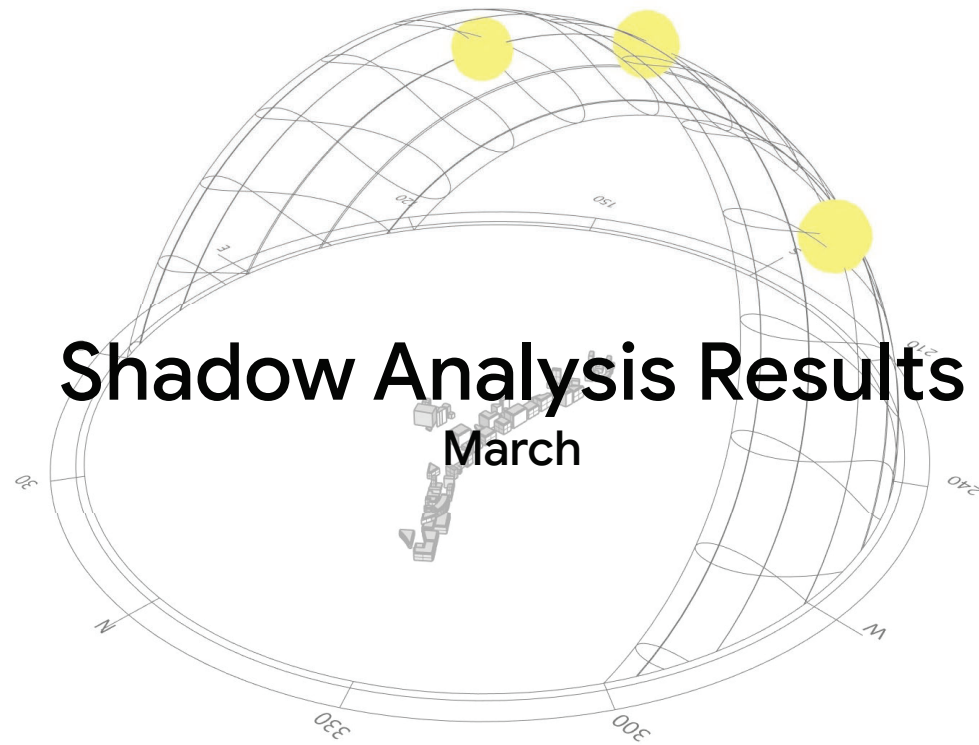
QUALITATIVE ANALYSIS

Shadow Visualisations

Blue shadows represent shadow effects from existing buildings and orange shadows represent the new, additional shadowing effects from the proposed development.

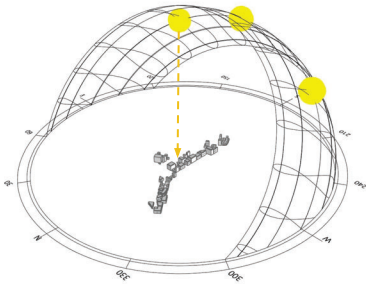
Parks that have no orange shadow areas are not affected by overshadowing from the proposed development.





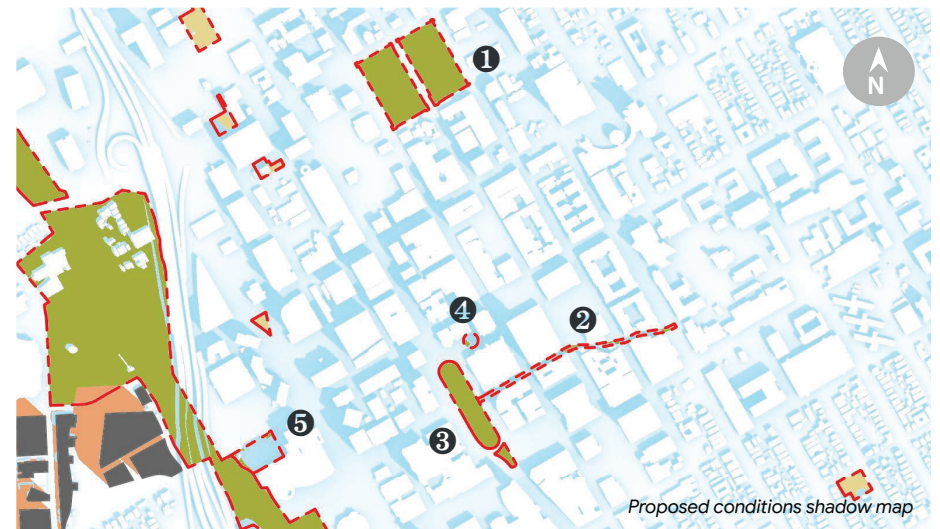
SHADOW RESULTS

March 10AM



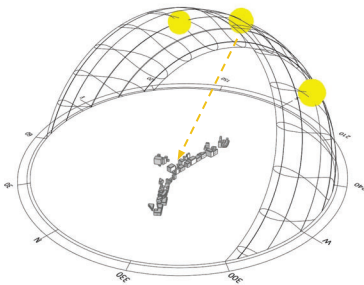
- ① St James Park ✓
- ② Paseo de San Antonio ✓
- ③ Plaza de César Chávez ✓
- ④ Plaza of Palms ✓
- ⑤ McEnery Park ✓

No parks overshadowed by the proposed development ✓



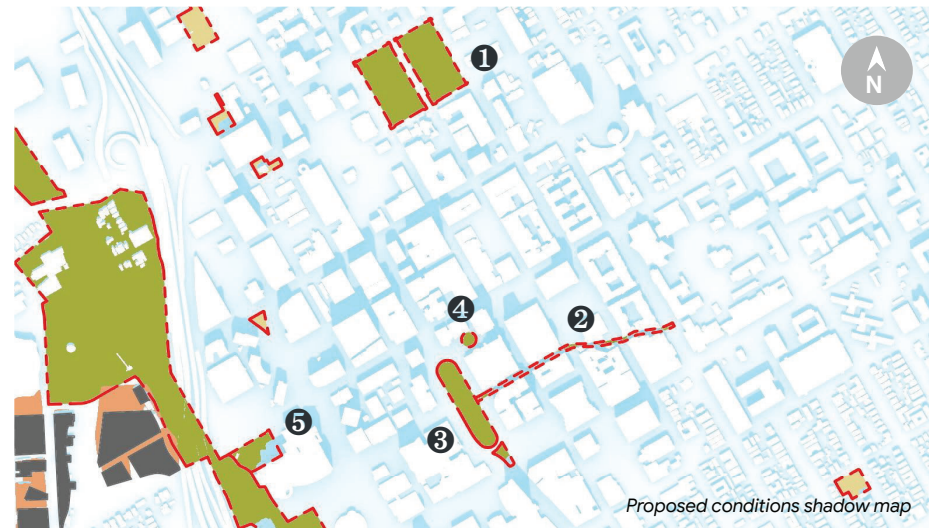
SHADOW RESULTS

March 12PM



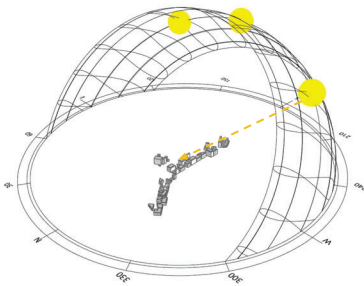
- ① St James Park ☒
- ② Paseo de San Antonio ☒
- ③ Plaza de César Chávez ☒
- ④ Plaza of Palms ☒
- ⑤ McEnery Park ☒

No parks overshadowed by the proposed development ☒



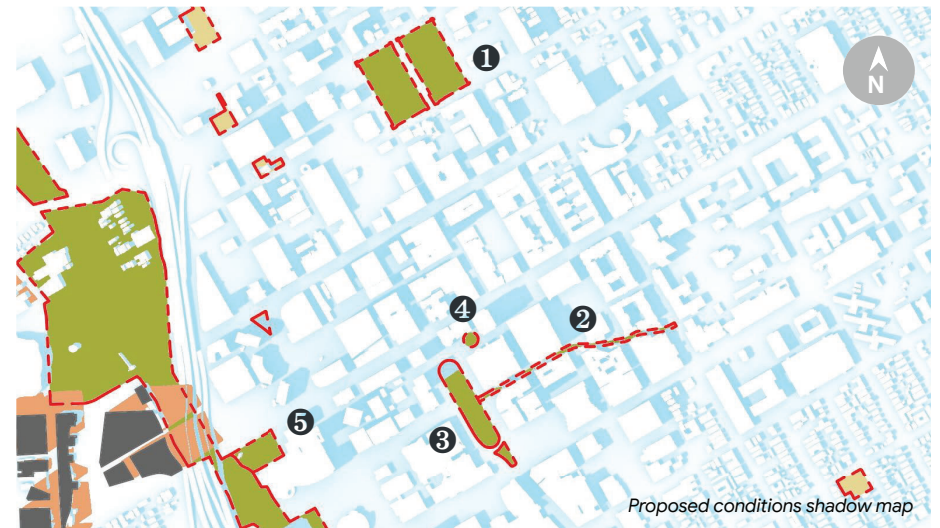
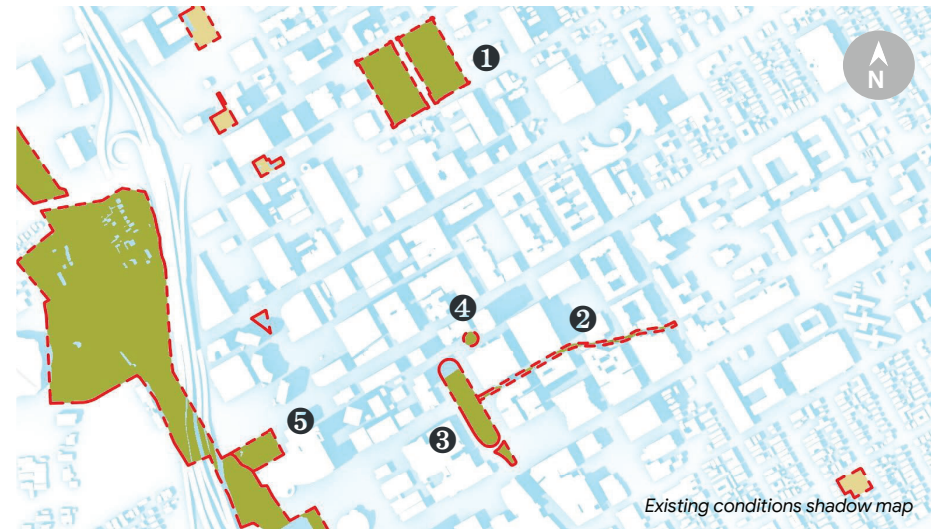
SHADOW RESULTS

March 3PM



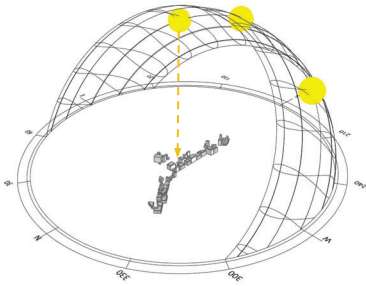
- ① St James Park ✓
- ② Paseo de San Antonio ✓
- ③ Plaza de César Chávez ✓
- ④ Plaza of Palms ✓
- ⑤ McEnery Park ✓

No parks overshadowed by the proposed development ✓



SHADOW RESULTS

March 10AM



⑥ Guadalupe River Park



New shadow at southern
end of Arena Green



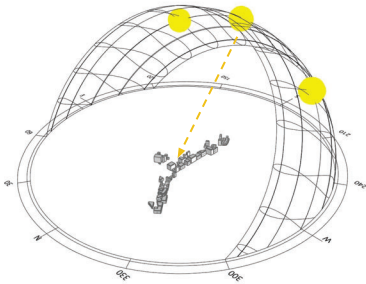
Existing conditions shadow map



Proposed conditions shadow map

SHADOW RESULTS

March 12PM



⑥ Guadalupe River Park

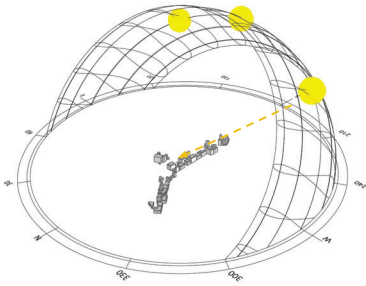


New shadow at southern
end of Arena Green



SHADOW RESULTS

March 3PM



⑥ Guadalupe River Park



New shadow at southern
end of Arena Green



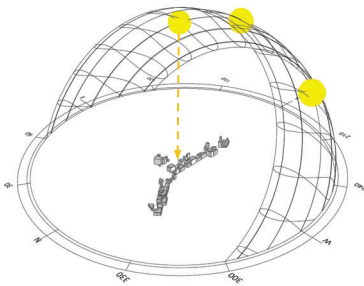
Existing conditions shadow map



Proposed conditions shadow map

SHADOW RESULTS

March 10AM



Other Park Lots



No park lots overshadowed by
the proposed development



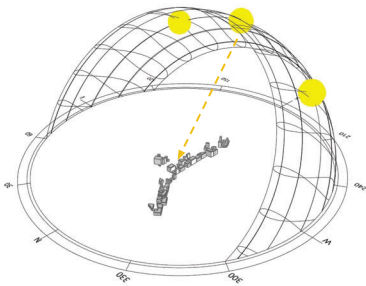
Existing conditions shadow map



Proposed conditions shadow map

SHADOW RESULTS

March 12PM



Other Park Lots

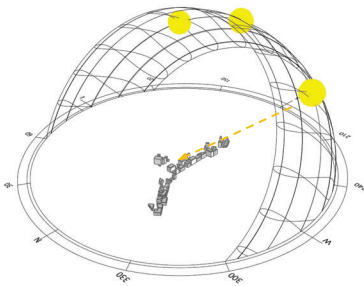


No park lots overshadowed by
the proposed development



SHADOW RESULTS

March 3PM



Other Park Lots



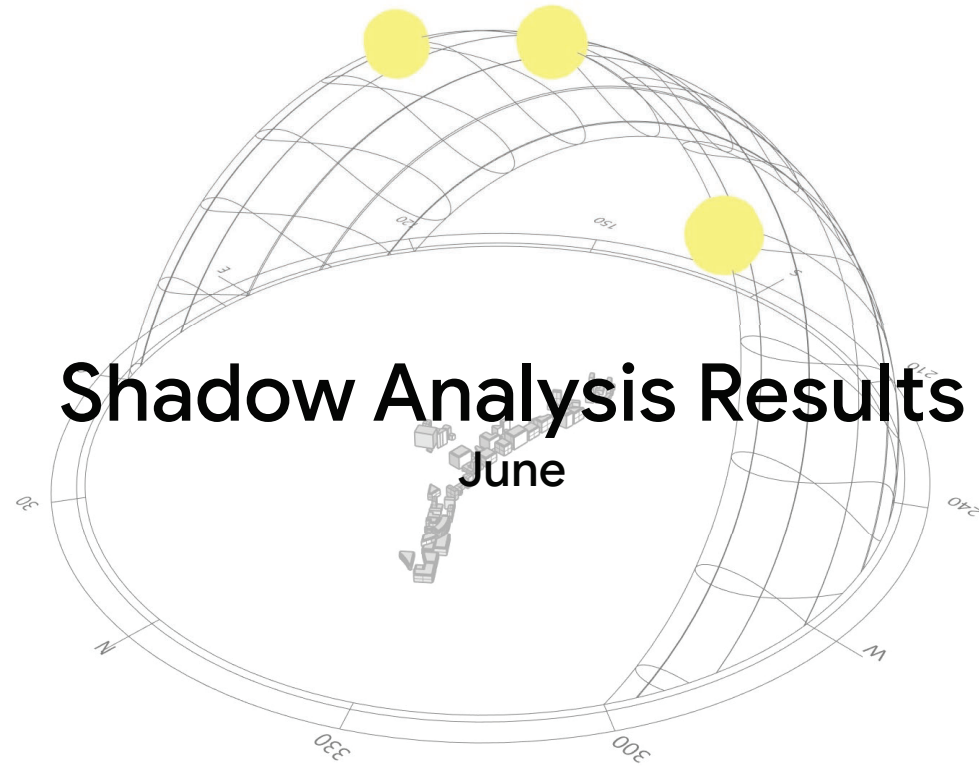
No park lots overshadowed by
the proposed development



Existing conditions shadow map

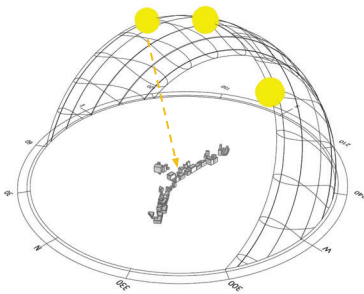


Proposed conditions shadow map



SHADOW RESULTS

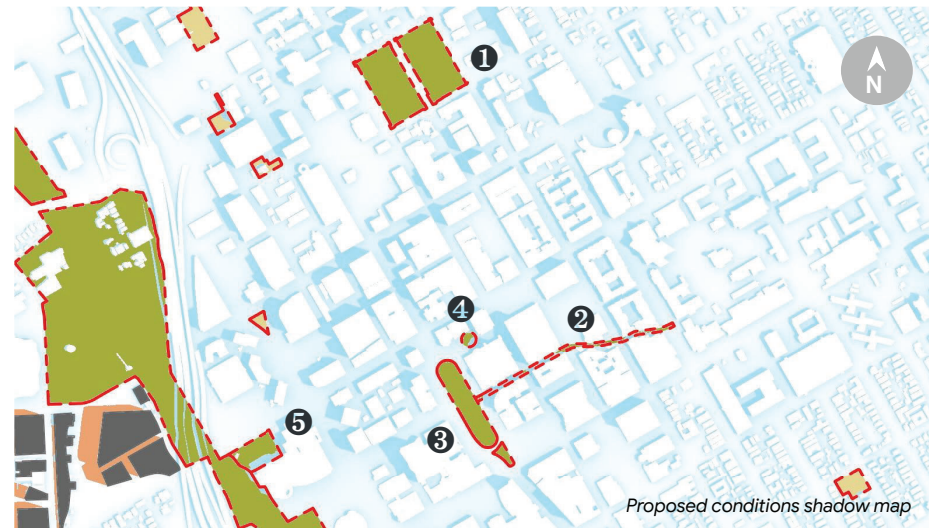
June 10AM



- ❶ St James Park
- ❷ Paseo de San Antonio
- ❸ Plaza de César Chávez
- ❹ Plaza of Palms
- ❺ McEnery Park

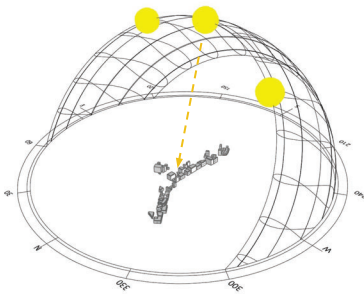


No parks overshadowed by
the proposed development



SHADOW RESULTS

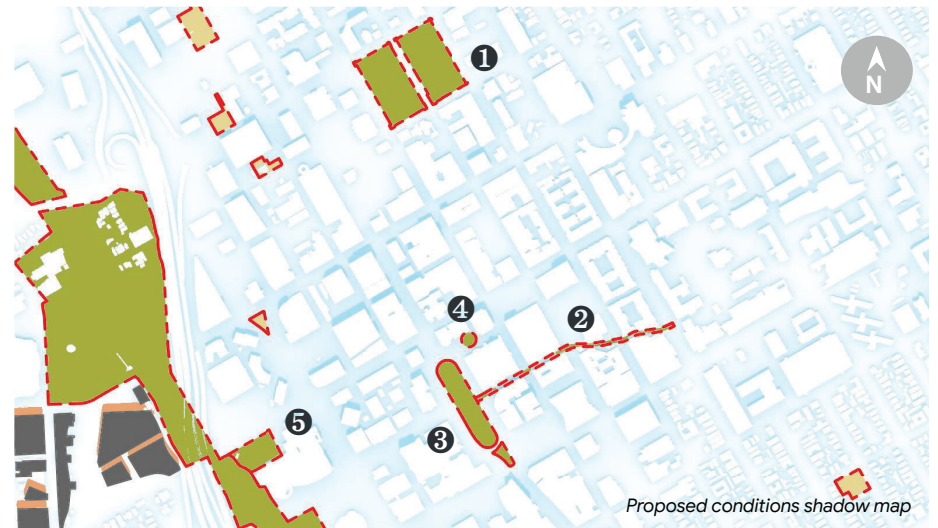
June 12PM



- ① St James Park
- ② Paseo de San Antonio
- ③ Plaza de César Chávez
- ④ Plaza of Palms
- ⑤ McEnery Park

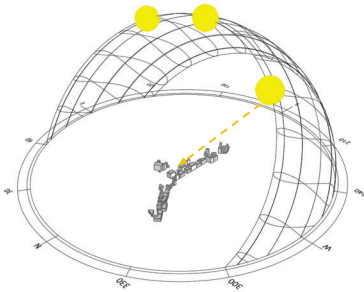


No parks overshadowed by
the proposed development



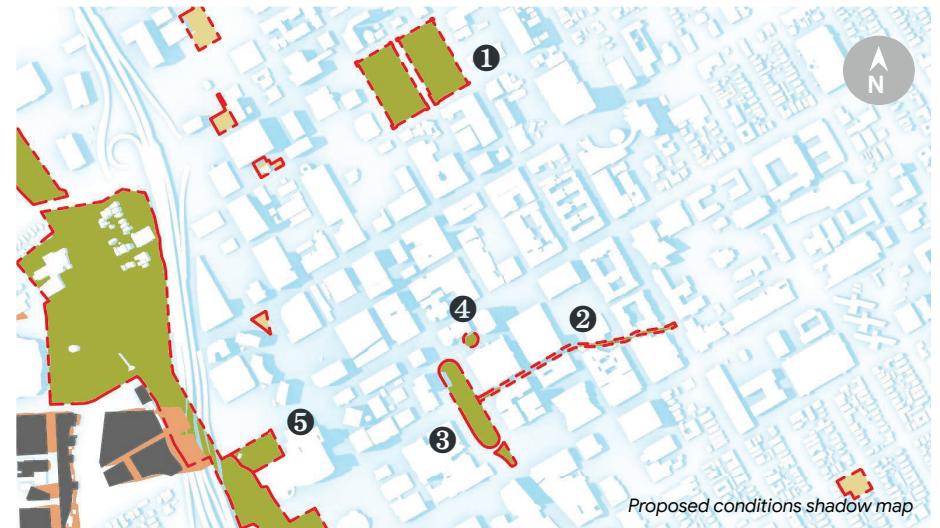
SHADOW RESULTS

June 3PM



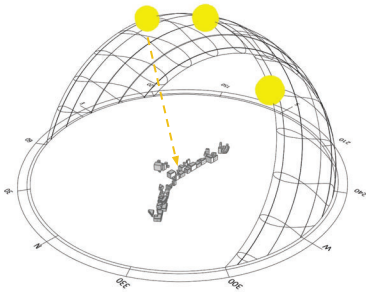
- ① St James Park ✓
- ② Paseo de San Antonio ✓
- ③ Plaza de César Chávez ✓
- ④ Plaza of Palms ✓
- ⑤ McEnery Park ✓

No parks overshadowed by the proposed development ✓



SHADOW RESULTS

June 10AM



⑥ Guadalupe River Park



No parks overshadowed by
the proposed development



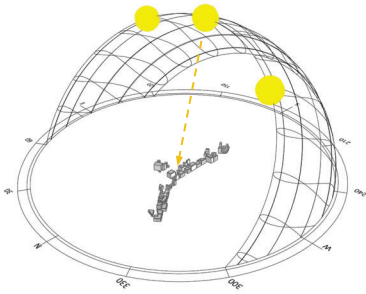
Existing conditions shadow map



Proposed conditions shadow map

SHADOW RESULTS

June 12PM



⑥ Guadalupe River Park



No parks overshadowed by
the proposed development



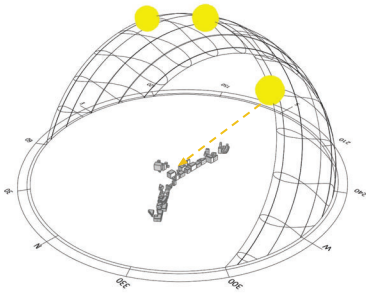
Existing conditions shadow map



Proposed conditions shadow map

SHADOW RESULTS

June 3PM



⑥ Guadalupe River Park



New shadow at southern
end of Arena Green



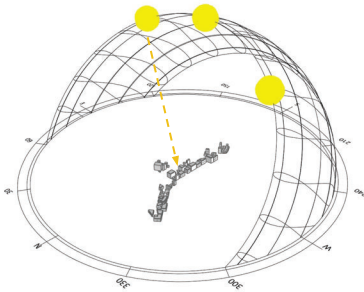
Existing conditions shadow map



Proposed conditions shadow map

SHADOW RESULTS

June 10AM



Other Park Lots



No park lots overshadowed by
the proposed development



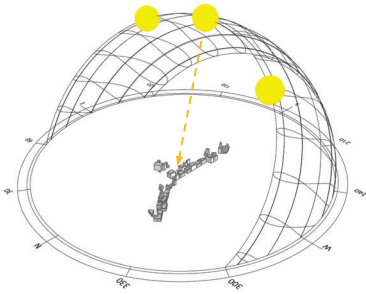
Existing conditions shadow map



Proposed conditions shadow map

SHADOW RESULTS

June 12PM



Other Park Lots

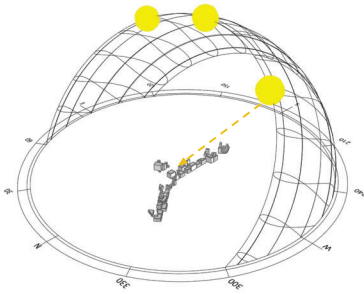


No park lots overshadowed by the proposed development



SHADOW RESULTS

June 3PM



Other Park Lots



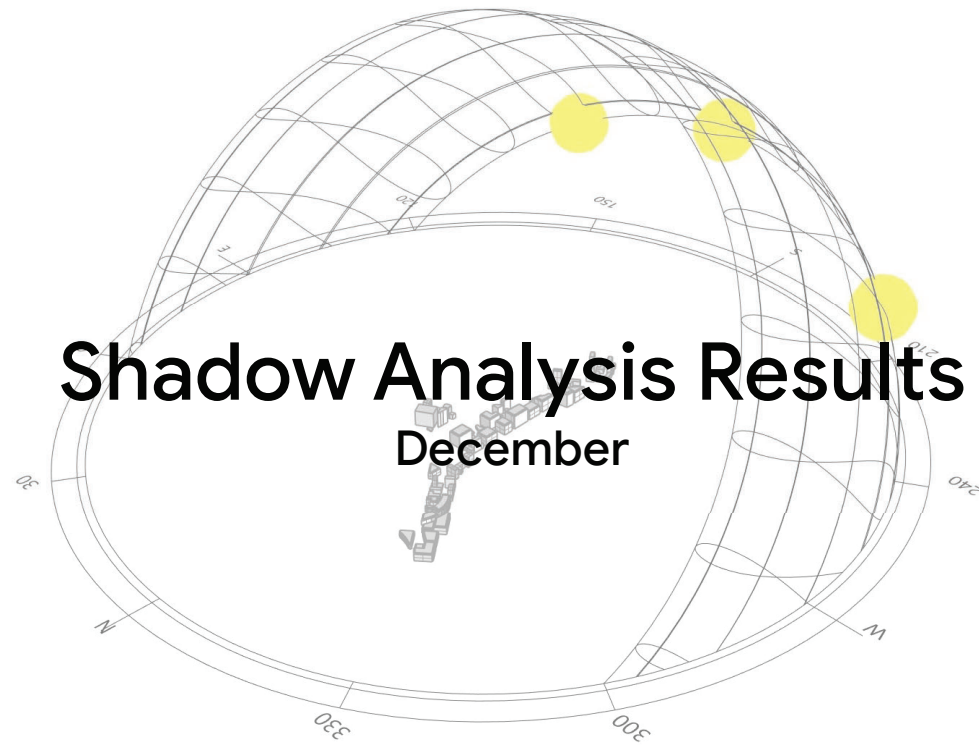
No park lots overshadowed by
the proposed development



Existing conditions shadow map

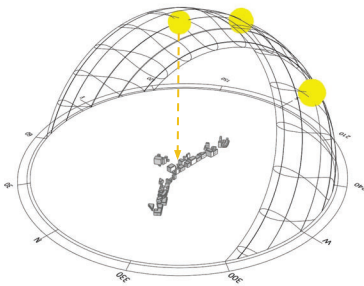


Proposed conditions shadow map



SHADOW RESULTS

December 10AM



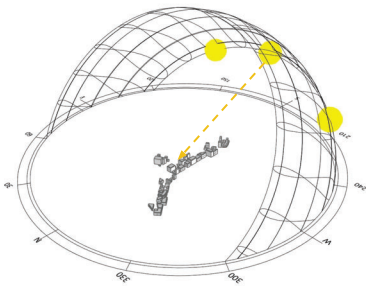
- ① St James Park ☒
- ② Paseo de San Antonio ☒
- ③ Plaza de César Chávez ☒
- ④ Plaza of Palms ☒
- ⑤ McEnery Park ☒

No parks overshadowed by the proposed development ☒



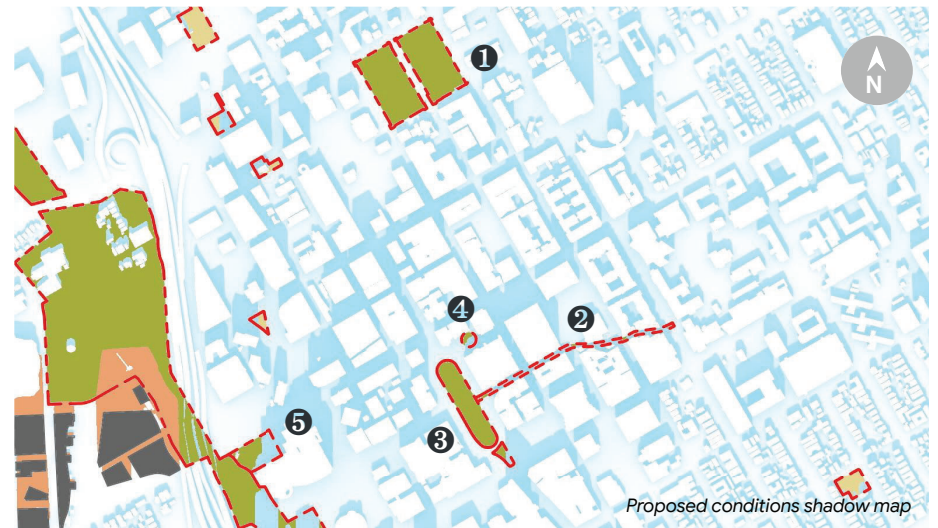
SHADOW RESULTS

December 12PM



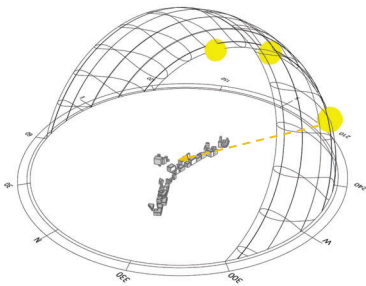
- ① St James Park ☒
- ② Paseo de San Antonio ☒
- ③ Plaza de César Chávez ☒
- ④ Plaza of Palms ☒
- ⑤ McEnery Park ☒

No parks overshadowed by the proposed development ☒



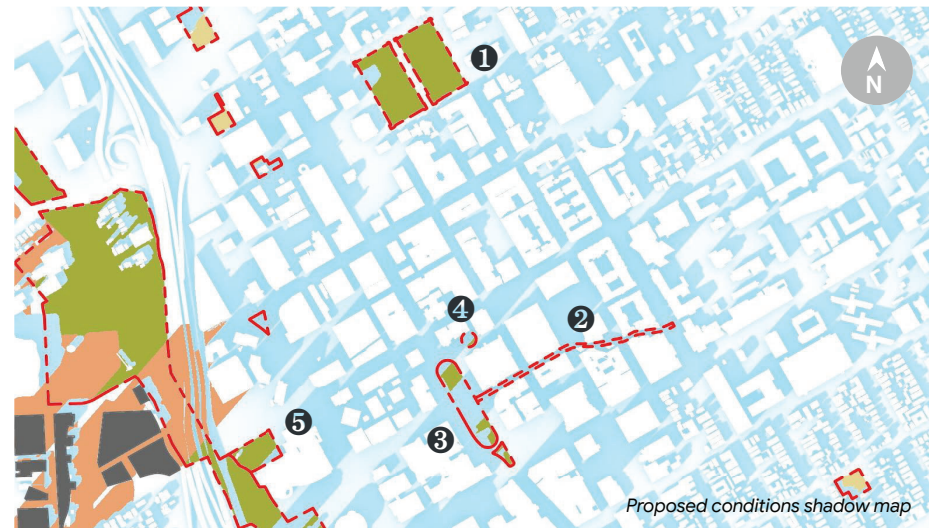
SHADOW RESULTS

December 3PM



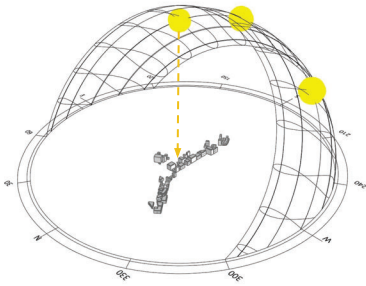
- ① St James Park ☒
- ② Paseo de San Antonio ☒
- ③ Plaza de César Chávez ☒
- ④ Plaza of Palms ☒
- ⑤ McEnery Park ☒

No parks overshadowed by the proposed development ☒



SHADOW RESULTS

December 10AM



⑥ Guadalupe River Park

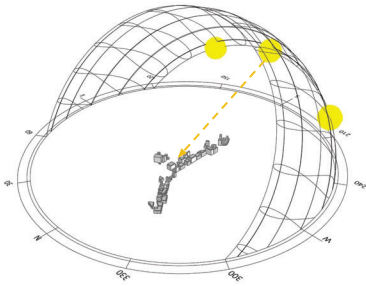


New shadow at southern end of Arena Green



SHADOW RESULTS

December 12PM



⑥ Guadalupe River Park

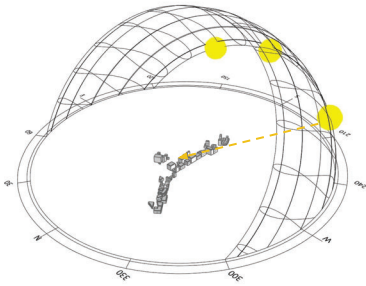


New shadow at southern
end of Arena Green



SHADOW RESULTS

December 3PM



⑥ Guadalupe River Park



New shadow at southern
end of Arena Green



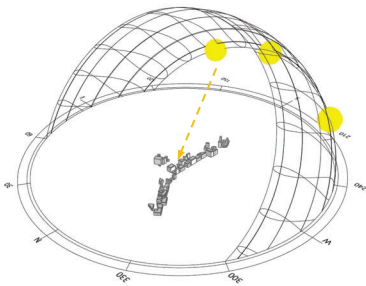
Existing conditions shadow map



Proposed conditions shadow map

SHADOW RESULTS

December 10AM



Other Park Lots



No park lots overshadowed by
the proposed development



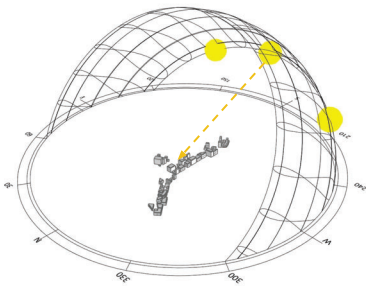
Existing conditions shadow map



Proposed conditions shadow map

SHADOW RESULTS

December 12PM



Other Park Lots

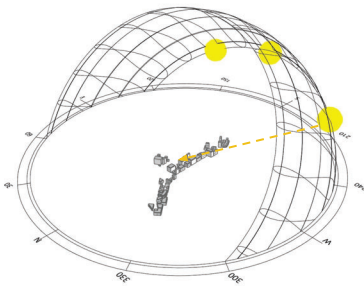


No park lots overshadowed by
the proposed development



SHADOW RESULTS

December 3PM



Other Park Lots



No park lots overshadowed by
the proposed development



Guadalupe River Park Impacts

Quantitative Results

QUANTITATIVE ANALYSIS

Guadalupe River Park

The qualitative results indicate that St. James Park, Paseo de San Antonio, Plaza de César Chávez, Plaza of Palms, and McEnery Park will not be affected by overshadowing from the proposed development as the preliminary shadow analysis indicates no additional shadowed areas.

Guadalupe River Park, particularly within the Arena Green Area, is the only park to be impacted by overshadowing due to the proposed development.

The following slides show in closer detail this affected area of Guadalupe River Park. An increase of shadow area that is 10% or greater is considered to be a “significant impact”.

Guadalupe River Park total area: 11,549,245 ft²



QUANTITATIVE ANALYSIS



Proposed development shadow map

March 10AM

Existing Shadow Area	384,713 ft ²	3.3%
Proposed Shadow Area	415,260 ft ²	3.6%
Percentage Increase	0.3%	



Proposed development shadow map

March 12PM

Existing Shadow Area	343,638 ft ²	3.0%
Proposed Shadow Area	360,655 ft ²	3.1%
Percentage Increase	0.1%	



Proposed development shadow map

March 3PM

Existing Shadow Area	364,014 ft ²	3.1%
Proposed Shadow Area	472,912 ft ²	4.1%
Percentage Increase	1.0%	

QUANTITATIVE ANALYSIS



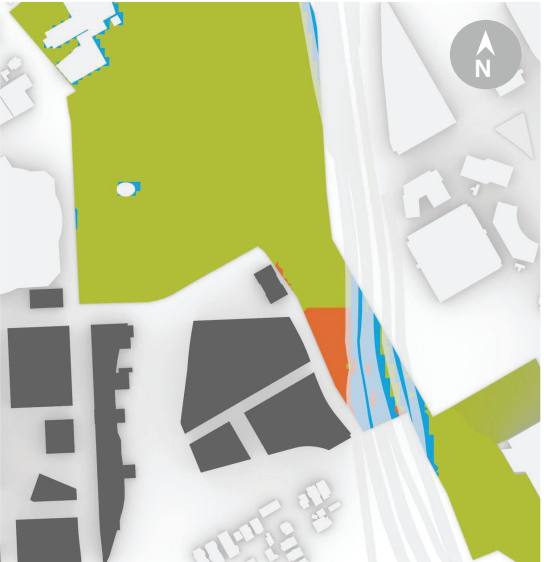
June 10AM

Existing Shadow Area	351,926 ft ²	3.0%
Proposed Shadow Area	351,926 ft ²	3.0%
Percentage Increase	0.0%	



June 12PM

Existing Shadow Area	295,426 ft ²	2.5%
Proposed Shadow Area	295,426 ft ²	2.5%
Percentage Increase	0.0%	



June 3PM

Existing Shadow Area	331,453 ft ²	2.9%
Proposed Shadow Area	370,504 ft ²	3.2%
Percentage Increase	0.3%	

QUANTITATIVE ANALYSIS



December 10AM

Existing Shadow Area	516,398 ft ²	4.5%
Proposed Shadow Area	725,993 ft ²	6.3%
Percentage Increase	1.8%	



December 12PM

Existing Shadow Area	446,820 ft ²	3.9%
Proposed Shadow Area	628,213 ft ²	5.4%
Percentage Increase	1.6%	



December 3PM

Existing Shadow Area	524,880 ft ²	4.5%
Proposed Shadow Area	931,820 ft ²	8.0%
Percentage Increase	3.5%	

QUANTITATIVE ANALYSIS SUMMARY

Source of overshadowing

Results from the shadow analysis show that most of the proposed development plots do not have any overshadowing effect on Guadalupe Park, or any other analysed parks.

Overshadowing on the park is shown to be a result from massing on plots C, D and E.

Plot C3

Plot D

Plot E



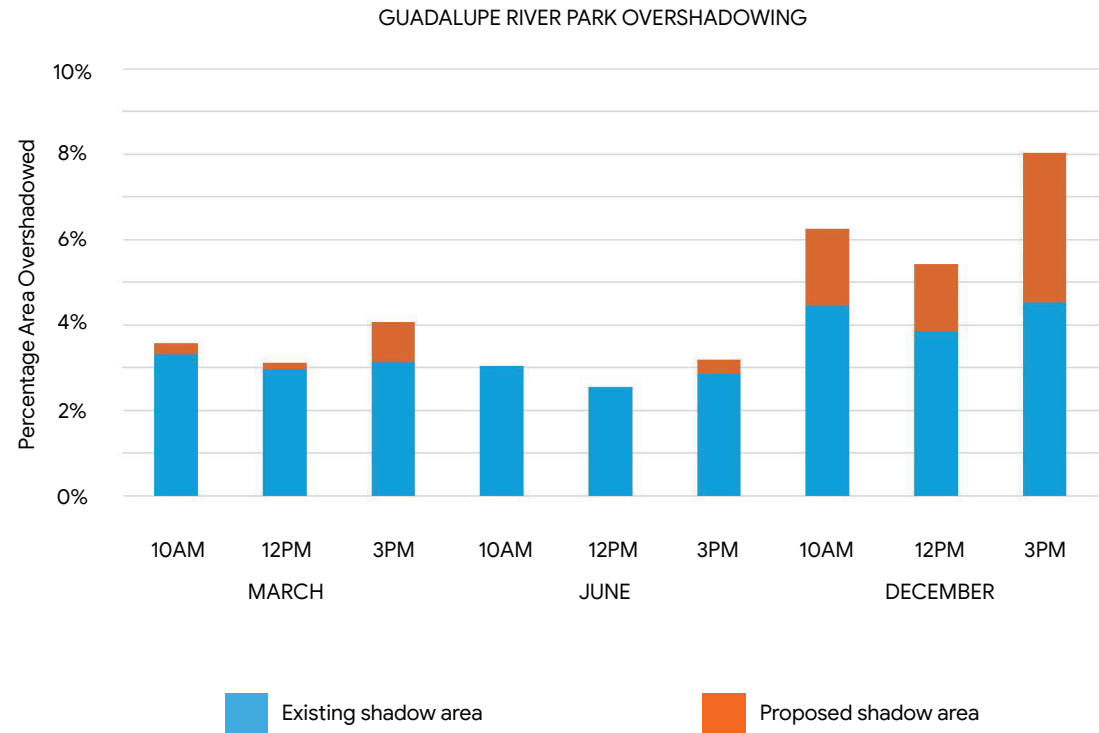
QUANTITATIVE ANALYSIS SUMMARY

Development Impacts

Of the 6 parks analyzed, only the Arena Green portion of Guadalupe River Park will be overshadowed by the proposed development. This overshadowing will only occur during 7 of the 9 indicated analysis periods, with the least overshadowing occurring during June.

The greatest shadow area percentage increase occurs during December afternoon, where overshadowed area increases by 3.5%.

None of these analysis periods have indicated a shadow area percentage increase of 10% or greater, therefore the development is shown to have no significant impact on the analyzed parks.



Guadalupe River Park Impacts

Cumulative Results

CUMULATIVE ANALYSIS

Cumulative Project Impacts

A secondary quantitative analysis has been undertaken to analyze the shading impact from the proposed development as well as the four following projects:

- (19) South Almaden Offices
- (28) Adobe - 333W. San Fernando Street
- (29) River Corporate Center - 353 West Julian Street
- (36) Platform 16 - 440 West Julian Street

This cumulative analysis has been used to determine if collectively the proposed project, with the four projects listed above, results in a shadow increase of 10% or more on Guadalupe River Park.

The analysis hours for this study are as per the Qualitative and Quantitative analyses.



CUMULATIVE ANALYSIS



Shadow map with cumulative projects

March 10AM

Existing Shadow Area	384,713 ft ²	3.3%
Proposed Shadow Area	566,181 ft ²	4.9%
Percentage Increase		1.6%



Shadow map with cumulative projects

March 12PM

Existing Shadow Area	343,638 ft ²	3.0%
Proposed Shadow Area	394,217 ft ²	3.4%
Percentage Increase		0.4%



Shadow map with cumulative projects

March 3PM

Existing Shadow Area	364,014 ft ²	3.1%
Proposed Shadow Area	509,735 ft ²	4.4%
Percentage Increase		1.3%

CUMULATIVE ANALYSIS



Shadow map with cumulative projects

June 10AM

Existing Shadow Area	351,926 ft ²	3.0%
Proposed Shadow Area	495,559 ft ²	4.3%
Percentage Increase	1.2%	



Shadow map with cumulative projects

June 12PM

Existing Shadow Area	295,426 ft ²	2.5%
Proposed Shadow Area	311,400 ft ²	2.7%
Percentage Increase	0.1%	



Shadow map with cumulative projects

June 3PM

Existing Shadow Area	331,453 ft ²	2.9%
Proposed Shadow Area	370,870 ft ²	3.2%
Percentage Increase	0.3%	

CUMULATIVE ANALYSIS



Shadow map with cumulative projects

December 10AM

Existing Shadow Area	516,398 ft ²	4.5%
Proposed Shadow Area	895,933 ft ²	7.7%
Percentage Increase	3.3%	



Shadow map with cumulative projects

December 12PM

Existing Shadow Area	446,820 ft ²	3.9%
Proposed Shadow Area	677,049 ft ²	5.8%
Percentage Increase	2.0%	



Shadow map with cumulative projects

December 3PM

Existing Shadow Area	524,880 ft ²	4.5%
Proposed Shadow Area	1,141,522 ft ²	9.8%
Percentage Increase	5.3%	

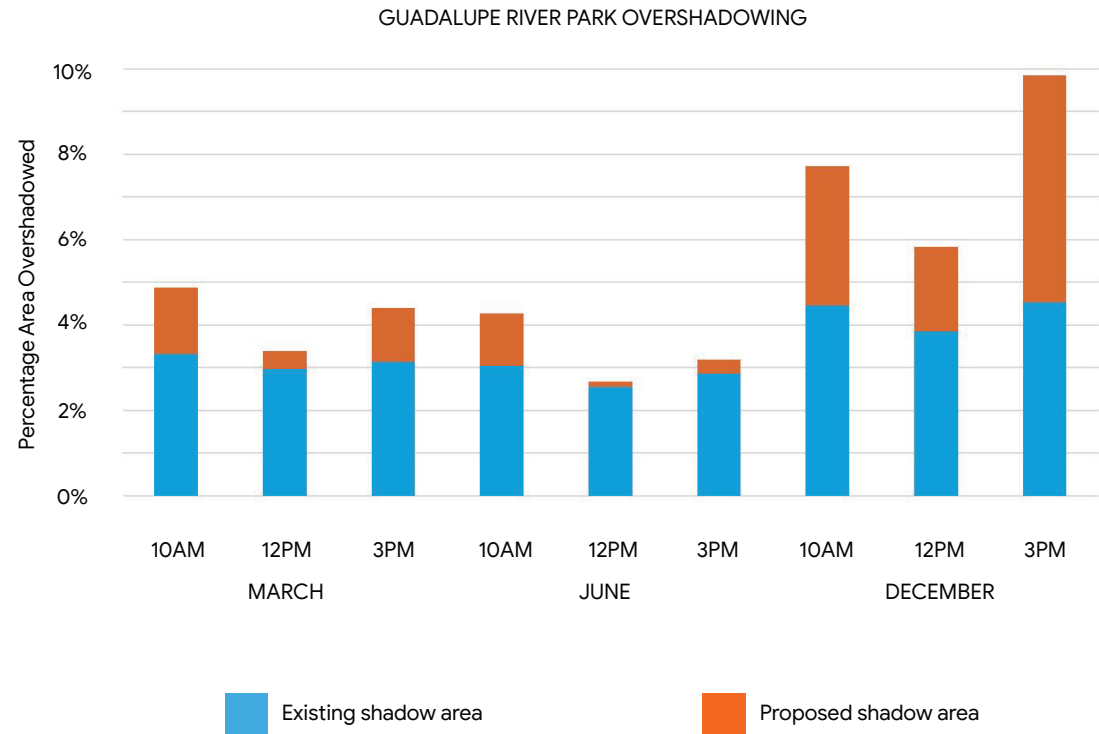
CUMULATIVE ANALYSIS SUMMARY

Cumulative Impacts

This analysis has shown that when considering the four cumulative projects in conjunction with the proposed development, overshadowing to Guadalupe River Park will occur during all of the 9 indicated analysis periods.

The greatest shadow area percentage increase occurs during December afternoon, where overshadowed area increases by 5.3%.

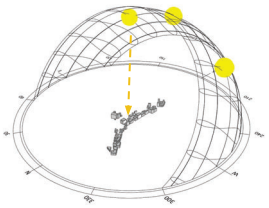
Despite an overall increase in overshadowed area, none of these analysis periods have indicated a shadow area percentage increase of 10% or greater, therefore the development is shown to have no significant impact on the analyzed parks.



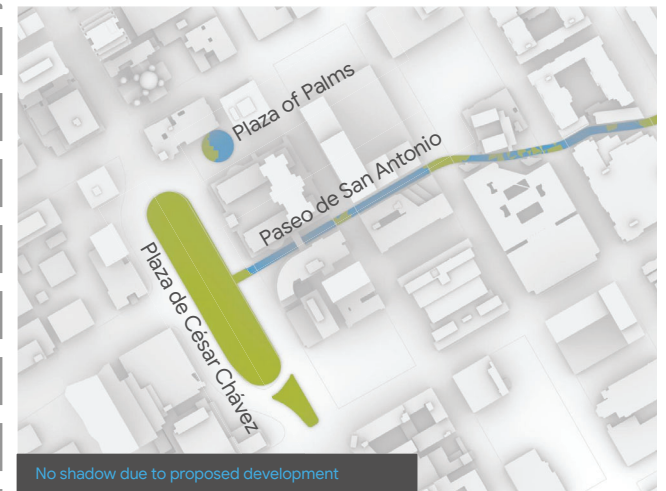
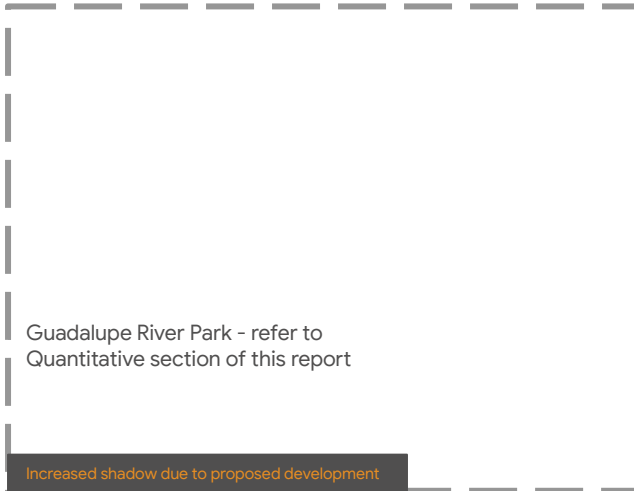
Appendix A

Magnified Analysis Results - Key Parks

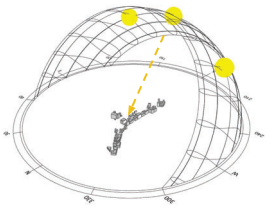
QUALITATIVE ANALYSIS



March 10AM



QUALITATIVE ANALYSIS



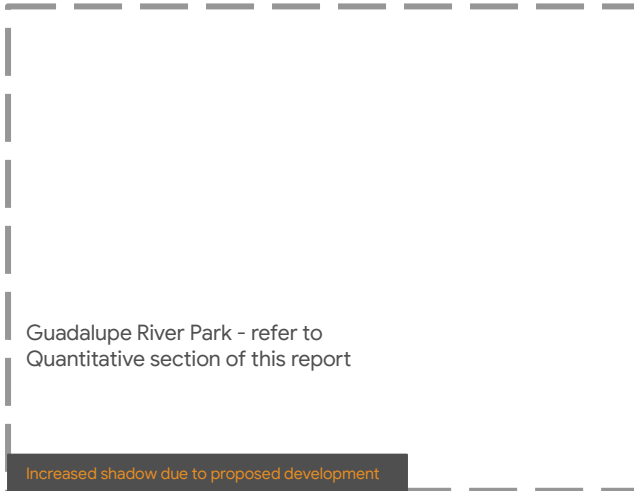
March 12PM



No shadow due to proposed development

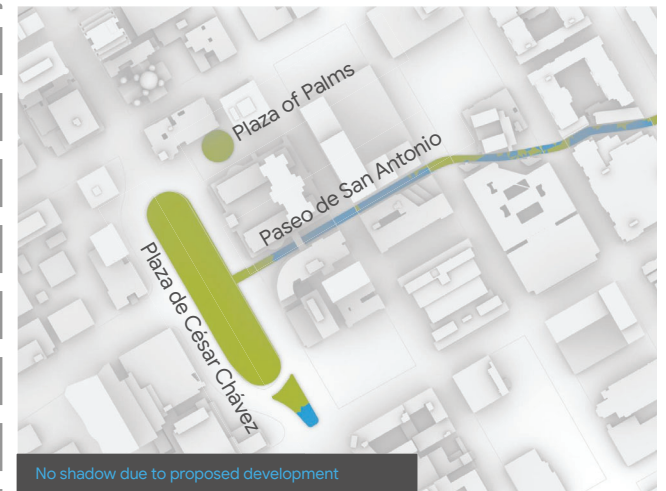


No shadow due to proposed development



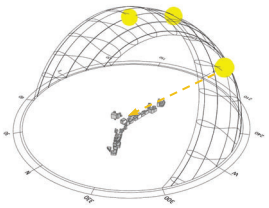
Guadalupe River Park - refer to
Quantitative section of this report

Increased shadow due to proposed development



No shadow due to proposed development

QUALITATIVE ANALYSIS



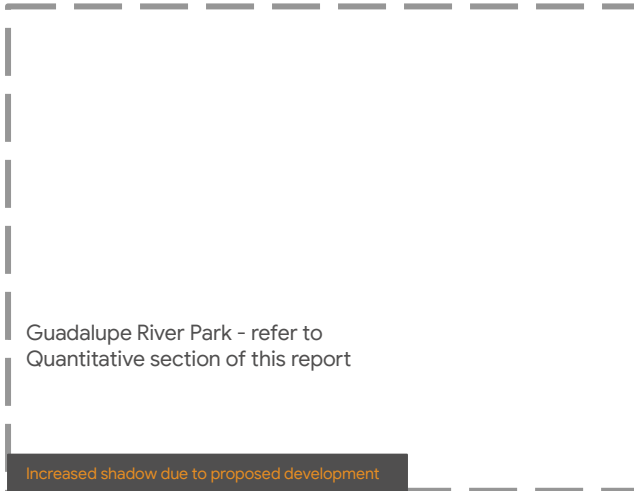
March 3PM



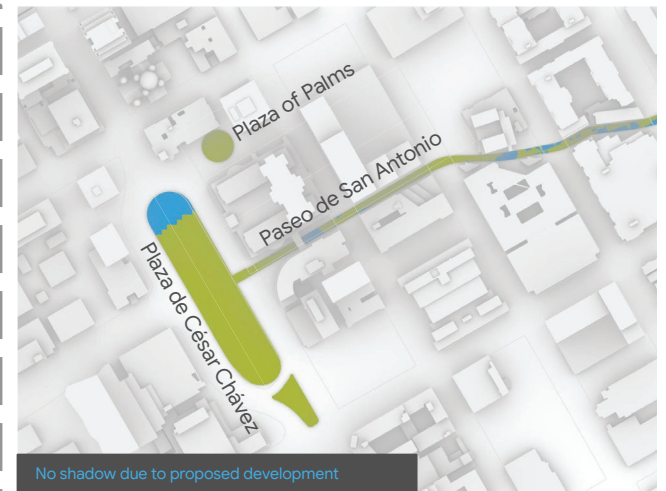
No shadow due to proposed development



No shadow due to proposed development

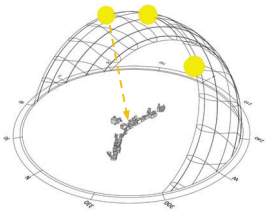


Increased shadow due to proposed development

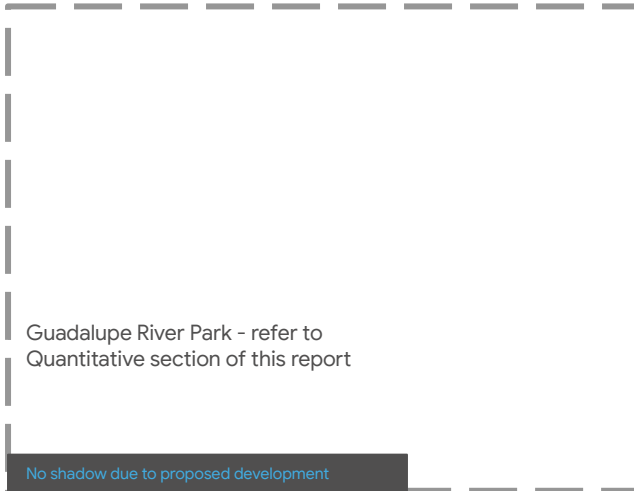


No shadow due to proposed development

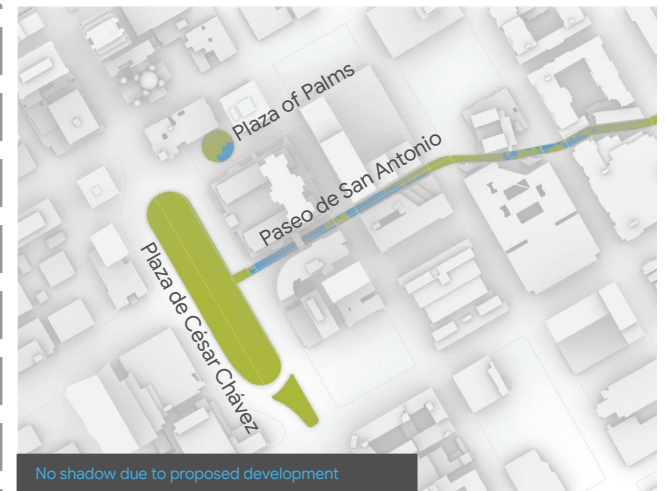
QUALITATIVE ANALYSIS



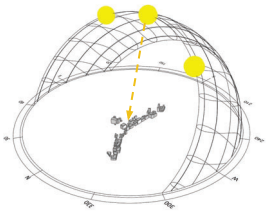
June 10AM



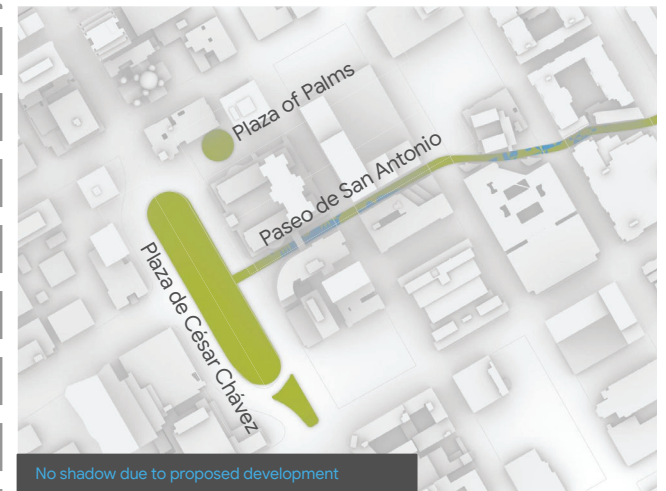
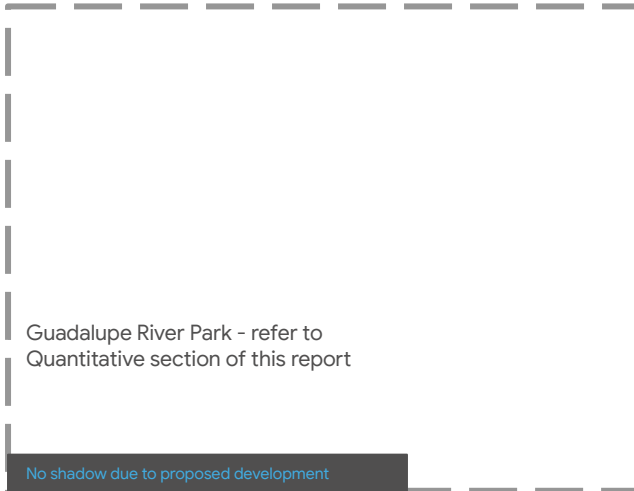
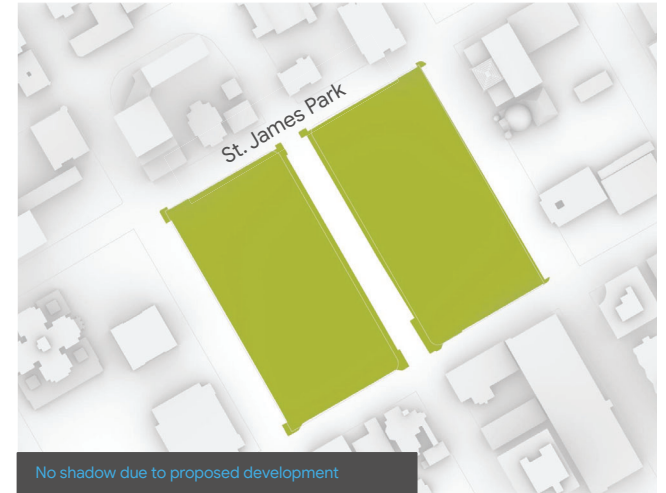
Guadalupe River Park - refer to
Quantitative section of this report



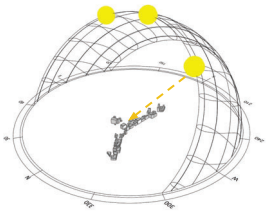
QUALITATIVE ANALYSIS



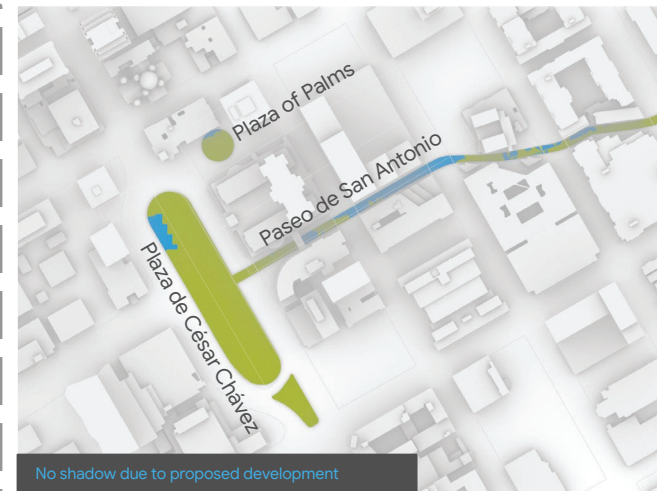
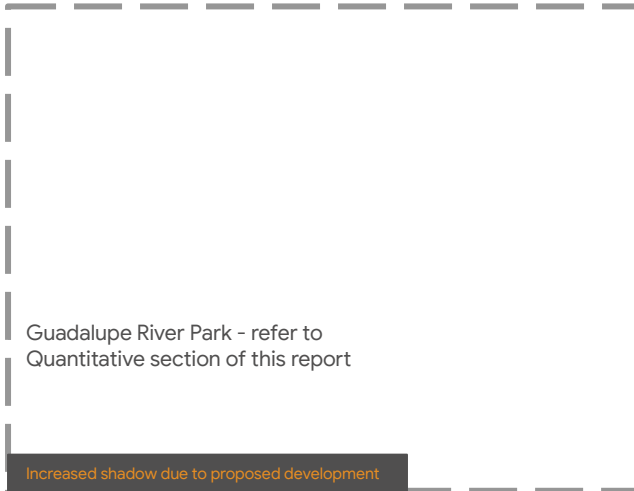
June 12PM



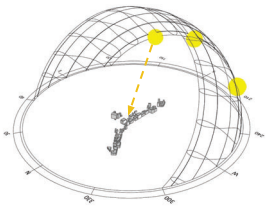
QUALITATIVE ANALYSIS



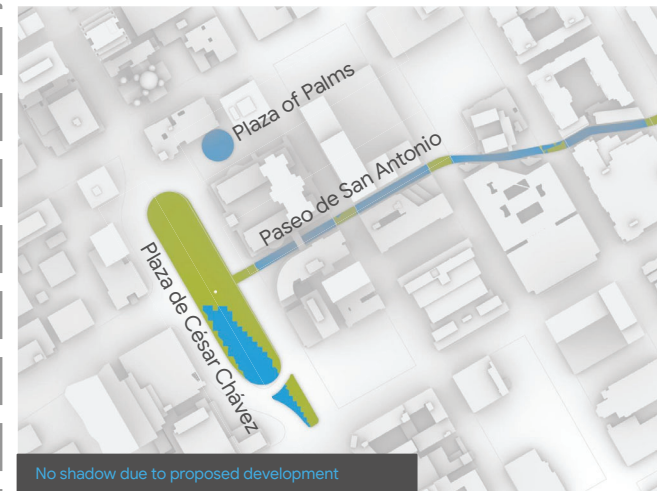
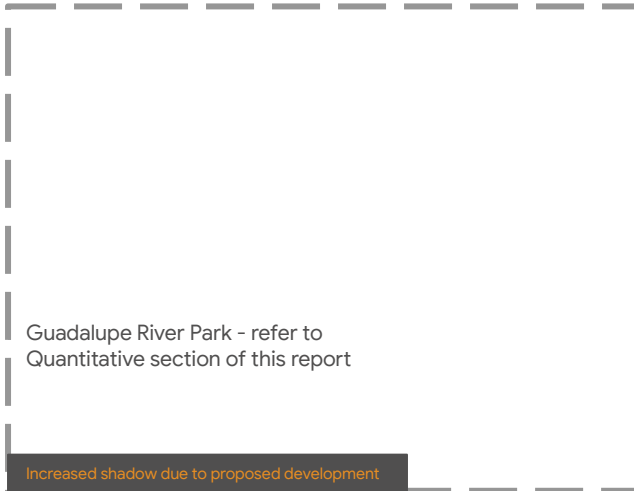
June 3PM



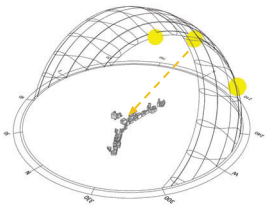
QUALITATIVE ANALYSIS



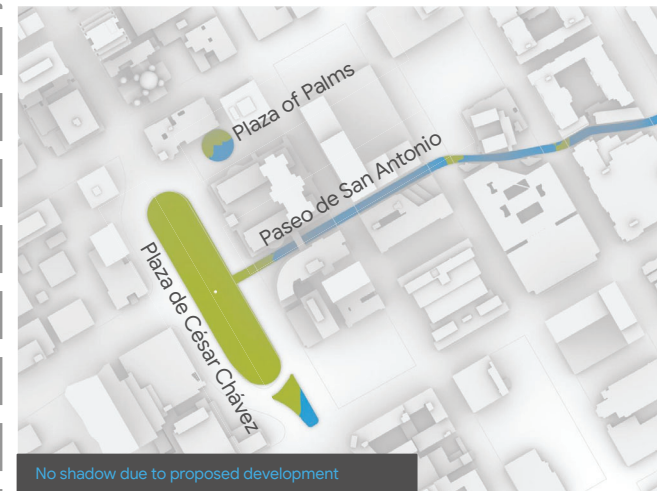
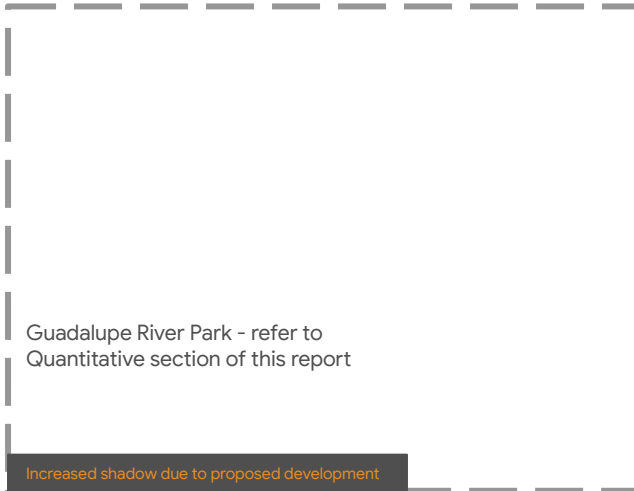
December 10AM



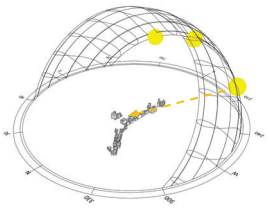
QUALITATIVE ANALYSIS



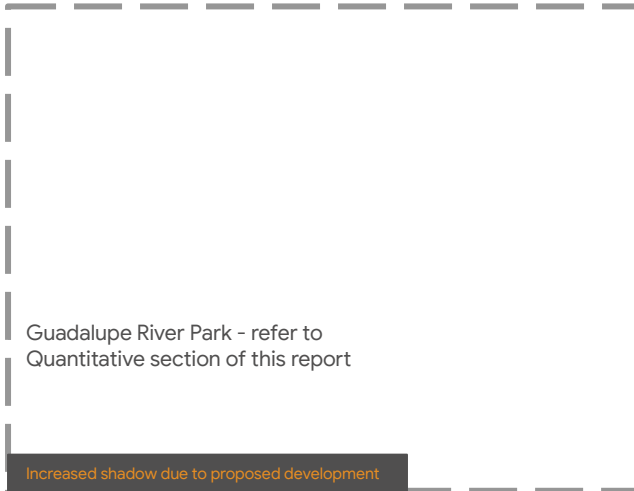
December 12PM



QUALITATIVE ANALYSIS



December 3PM



Guadalupe River Park - refer to
Quantitative section of this report

