



El Paso Pedestrian Pathways Methods

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Research Strategy

The evaluation of El Paso's Downtown Pedestrian Improvement Project's landscape performance incorporated a comparative analysis between historical (pre-existing) conditions and those that arose as a result of the project's completion in 2016. Data collected by the research team or shared by SWA firm liaisons were compared to historical data provided by local contacts or collected through public archives in order to determine the extent that the landscape played a role in meeting or exceeding the project goals.

The primary data collected by the research team consisted of 1) air/surface temperatures at predetermined onsite locations as well as several comparable areas adjacent to the site; 2) observation of visitors' use of various site features and those of similar installations in the El Paso area; 3) Results of a questionnaire survey distributed to local communities and business owners and interviews with public sector stakeholders. These data were collected between May and July 2022.

The secondary data included site plans and inventories of design elements which were ground-truthed by the research team onsite, as well as data shared by municipal agencies and local advocacy organizations which include 1) a 10-year report issued by the City of El Paso upon re-designation of its Downtown Arts District in 2021; most of this data was collected between 2011 and 2021. 2) List of projects incentivized by the city. 3) List of the event permits issued by the

Downtown Management District each year from 2011-2021. 4) List of the hotels which increased the number of rooms in the downtown area.

Since the El Paso Pedestrian Projects represent a sequence of discrete landscape design projects, connected along a series of public pedestrian trails and sidewalks, the research team focused on collecting and aggregating data across the combined project area. In some instances, the uneven distribution of data between each individual site made the research team's analytical efforts more challenging. This recognition served as the guiding principle in defining the project's performance benefits and how they are quantified and measured.

Environmental Benefits

- ***Reduces stormwater peak runoff rate at San Jacinto Plaza by 15% for a 100-year, 24-hour storm event***

Background:

El Paso lies in the Chihuahuan desert ecosystem. It has unique natural, urban, and rural landscapes, with an array of surface roughness that rainfall has to saturate before the drainage collection (Juarez 2008).

The stormwater calculation also depends on the type of soil and land cover at the site, which determines the run-off coefficient. For the purpose of this report, the Rational Method was used and the run-off coefficients were referred to from the 'Drainage design manual' published by the City of El Paso in June 2008 (Juarez 2008).

The old San Jacinto Plaza was 1.53 acres. However, after the relocation of the bus stop, 0.2 acres were added to the plaza space. In order to make a fair comparison to the redesigned plaza site, the previously bus lanes were included in the total site area calculation for pre-construction conditions.

Method:

The following steps were followed to calculate the stormwater runoff volume:

1. Identify the different ground covers in the old design and the new design.
2. Select the average intensity of rainfall (i) in inches per hour (in/hr) for a 100-year storm event for 24 hours.
3. Calculate the areas of the ground cover (A) in square feet.
4. Select the runoff coefficient number (C) for each land cover type included
5. Apply the Rational Method formula $Q=CiA$, and calculate the peak surface runoff rate (Q) in cubic feet per second (cfs)

Calculations:

The redesign of the San Jacinto Plaza reduces the surface runoff by 1,808 cubic feet per second in a 100-year storm event over 24 hours. The pre-construction condition at the plaza had approximately 55% of the site area as impervious asphalt contributing to a high stormwater runoff volume. The post-design intervention consists of an arroyo planted with native species that can facilitate stormwater retention and infiltration during a storm event and reduce surface stormwater runoff.

There are 273 new trees in addition to 48 existing trees preserved across all sites of the project. Trees contribute to the reduction of stormwater runoff as tree roots take up water from the soil. The desert landscapes include unique desert-adaptive plants that have the tendency to take advantage of water whenever it is available. Those desert plants stay dormant when there is no water and absorb and grow faster when water becomes available. Thus it is likely that the desert landscapes can contribute to the stormwater runoff reduction in a small storm event.

Table 12: Stormwater calculation of pre-construction condition of San Jacinto Plaza**i=0.8 inches (24-hr, 100-yr event)**

San Jacinto Plaza	Land cover	C	A (SF)	Q (cfs)
	Impervious	0.95	41826	31787.8
	Gravel	0.88	6,700	4,716.8
	Lawn	0.50	26,832	10,732.8
	Total		75,358	53,317.4

Table 13: Stormwater calculation after the redesign of the San Jacinto Plaza.**i=0.8 inches (24-hr, 100-yr event)**

San Jacinto Plaza	Land cover	C	A (SF)	Q (cfs)
	Paved area	0.95	44,463	33,791.9
	Vegetated area	0.50	12,300	4,920.0

	Arroyo¹ (desert wash)	0.33	2,353	621.2
	Lawn	0.50	11,698	4,679.3
	Desert Landscape	0.33	4,544	1,199.6
	Total		75,358	45,212.0

Rational Method formula to calculate stormwater:

$$Q=CiA$$

Q = peak stormwater runoff rate in cubic feet per second (cfs)

C = runoff coefficient, a dimensionless unit

i = average intensity of rainfall in inches per hour (in/hr)

A = the watershed/drainage area in acres (ac)

Percentage reduction of stormwater runoff volume = $((53517.4-45,212)/53,317)*100 = 15\%$

Sources:

Juarez, Bert. 2008. "Drainage Design Manual." City of El Paso Texas.

<https://www.elpasotexas.gov/assets/Documents/CoEP/Planning-and-Inspections/Applications/Building-Permit-Checklists/DDM-COEP.pdf>.

"National Stormwater Calculator | US EPA." n.d. US Environmental Protection Agency.

Accessed July 18, 2022. <https://www.epa.gov/water-research/national-stormwater-calculator>.

Limitations:

- Hydrological engineering modeling data was not available to compare and calculate the designed stormwater retention capacity.

¹ Arroyo- a watercourse (such as a creek) carved in an arid area.

- ***Increased biodiversity at San Jacinto Plaza, with the Simpson's Diversity Index score increasing from 0.78 to 0.91. There was 243% increase in number of species from just 7 species of trees to 24 species and cultivars of trees, shrubs, and groundcovers.***

Background

Biodiversity refers to the idea of the variation of the living species from genes and traits to species and ecosystem (Faith 2003). For the purpose of this study, biodiversity is referred to the variations of the plant species present on the site.

El Paso is part of the Chihuahuan desert ecosystem. Chihuahuan desert is the largest desert in North America, extending 1500 km extending from south of Albuquerque, New Mexico to 250 km north of Mexico City. 90% of the desert lies in Mexico (National Park Service, US Department of the Interior 2022).

The desert is home to 3,500 plant species, including one-fourth of the world's cactus species. A wide variety of yuccas and agaves distinguishes this desert from the rest (National Park Service, US Department of the Interior 2022).

There are three ways of calculating biodiversity:

1. Counting the species richness
2. Simpson's Diversity Index
3. Shannon-Weiner diversity index

Simpson's Diversity Index calculator helps to measure the species diversity in a community. It reflects the number of different species in a community and the distribution of each species' population (Singh 2022).

Method:

The method used to calculate the diversity of species between pre-renovation to post-renovation conditions is Simpson's Diversity Index.

Below are the steps taken to calculate Simpson's Diversity Index for each plant community – before and after construction (Singh 2022):

1. First, add the individual species populations to get N.
2. Then determine the $N \times (N - 1)$.
3. Work out $n \times (n - 1)$ for each species, where n is the number of individuals in each species.
4. Calculate the sum of step 3, $\Sigma(n(n - 1))$.
5. Divide the sum obtained in step 4 by the value obtained in step 2. As a result, you will get Simpson's index D.
6. Evaluate Simpson's Diversity Index as $1 - D$. (Singh 2022)

7. Evaluate Simpson's Reciprocal Index as 1/D.

The formula to calculate the Simpson's Index (D):

$$D = \Sigma(n(n - 1)) / (N(N - 1))$$

As the 'D' increases the diversity decreases. The higher Diversity index (1-D) indicates higher biodiversity. If the diversity index is equal to zero, that means that there is only one species in the community. The diversity index closer to one indicates the several numbers of evenly distributed species in a community.

Plants were determined based on the planting plan and confirmed with on-site observations.

Calculations:

Table 1: San Jacinto Plaza habitat biodiversity before redesign

	S.No.	Scientific Name	Common Name	Qty. (n)	n(n-1)
Trees	1	Fraxinus texensis	Texas ash	7	42
	2	Quercus buckleyi	Texas red oak	3	6
	3	Quercus virginiana	Southern live oak	22	462
	4	Washingtonia filifera	California fan palm	11	110
	5	Pinus halepensis	Aleppo pine	1	0
	6	Vitex-Agnus castus	chaste tree	7	42
	7	Morus alba	white mulberry	5	20
				(N)= 56	682

Simpson's Index (D) for this set is **0.22**.

Simpson's Diversity Index (1-D) for this set is **0.78**.

Simpson's Reciprocal Index (1/D) for this set is **4.52**.

Table 2: San Jacinto Plaza habitat biodiversity after renovation

	S.No	Scientific Name	Common Name	Qty. (n)	n(n-1)
Trees	1	Fraxinus texensis	Texas ash	8	56
	2	Quercus buckleyi	Texas red oak	5	20
	3	Quercus virginiana	Southern live oak	44	1892

	4	Parkinsonia florida	blue palo verde	6	30
	5	Parkinsonia x cercidium ' desert museum'	palo verde hybrid	4	12
	6	Prosopis glandulosa 'maverick'	thornless honey mesquite	4	12
	7	Pinus canariensis	Canary Island pine	1	0
	8	Acacia farnesiana (small) 'Sierra sweet'	sweet acacia	4	12
	9	Rhus lanceolata	Prairie flameleaf sumac	6	30
	10	Rhus ovata	sugarbush	20	380
Shrubs	11	Buddleja marrubiifolia	wooly butterfly bush	10	90
	12	Leucophyllum frutescens 'compacta'	Texas sage	5	20
	13	Anisacanthus quadrifidus var. wrightii	flame acanthus	5	20
Shrubs-Median planting	14	Caesalpinia gilliesii	yellow bird of paradise	54	2862
	15	Tecoma stans var. angustata	esperanza	14	182
	16	Tecoma x 'orange jubilee'	orange esperanza	17	272
	17	Tecoma x 'crimson flare'	red esperanza	8	56
	18	Rosemarinus officinalis 'tuscan blue'	upright rosemary	4	12
Succulents	19	Dasyliirion wheeleri	sotol	6	30
	20	Pachycereus marginatus	Mexican fence pipe	10	90
	21	Yucca elata	soaptree yucca	9	72
Perennials	22	Salvia clevelandii	chaparral sage	11	110
	23	Salvia greggii	autumn sage	11	110
	24	Tagetes lemmonii	Mount Lemmon marigold	7	42
				(N)=273	6412

Simpson's Index (D) for this set is **0.09**.

Simpson's Diversity Index (1-D) for this set is **0.91**.
Simpson's Reciprocal Index (1/D) for this set is **11.58**.

From Tables 1 and 2, it is evident that the diversity index of the new plant palette increased from 0.78 to 0.91, with the number of species increasing from 7 to 24 (243%) and the number of individual plants increasing from 56 to 273 (387%).

Sources:

Singh, Purnima. 2022. "Simpson's Diversity Index Calculator." Omni Calculator.

<https://www.omnicalculator.com/statistics/simpsons-diversity-index>.

SWA Group. 2013. *Planting Plan*, Previous and proposed.

Plunz, Richard, and Elizabeth Moskalenko. "High Line Methods." Landscape

Performance Series. Landscape Architecture Foundation, 2017.

<https://doi.org/10.31353/cs1251>

Faith, Daniel P. 2003. "Biodiversity (Stanford Encyclopedia of Philosophy)." Stanford Encyclopedia of Philosophy. <https://plato.stanford.edu/entries/biodiversity/>.

Limitations:

- The calculations are measured only for San Jacinto Plaza due to a lack of vegetated areas designed for the other two sites - Durango Street Pedestrian Bridge and the Mills Avenue Pedestrian Promenade.

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- ***Reduces surface temperatures at San Jacinto Plaza by up to 23°F with engineered shade structures and up to 40°F with tree shade, as measured during peak heat hours in May. The colored asphalt used for the Durango Street Improvements cools by up to 23°F as compared to the dark asphalt previously on-site.***

Background:

El Paso is a city in the Chihuahuan desert region with a hot and arid climate during the summer season (June-September) and a cold and arid climate during the winter season (December-February). The warmest month is July with an average temperature of 82.7°F, and the coldest month is January with an average temperature of 44.7°F (National Weather Service, accessed June 2022). The wettest month is August with 1.75 inches of rain, and the average annual precipitation is 9.71 inch.

The average number of days El Paso experiences temperatures above 100°F is 15.4 days mostly between June 13 and August 3 (National Weather Service 2014).

Prior to the redevelopment, San Jacinto Plaza served as a central station for city buses. The streets were wider to include bus lanes and drop off areas resulting in more impervious and asphalt pavement areas, which were likely to contribute to increased urban heat microclimate.

Measuring the air temperature of a place plays an important role in understanding the microclimate of the temperature difference in full sun surrounded by various landscape elements and characteristics and with different types of shade structures. Shade, whether it is naturally provided by vegetation, passively provided by the surrounding structures, or artificially provided by engineered shades, plays an important role in hot and arid cities such as El Paso. The pedestrian improvement projects were designed to take advantage of the shade cast by the neighboring buildings and by preserving 42 mature trees with additional 231 new trees and 2500-square feet of engineered shade structure at the San Jacinto Plaza.

Method:

We selected key points for each of the three sites and compared the current condition to the aerial photos dated in 2010 prior to the construction of the project for before-and-after comparison purposes (Figure 1 and 2). The air temperature, surface temperature, average wind speed, and relative humidity were measured at each point using the infrared thermometers and the pocket Anemometer.

In general, there are three shade conditions in combination for site condition before and after the constructions at the San Jacinto Plaza: under a tree shade, under an engineered shade structure, no shade. At the Mills Avenue Promenade, before-and-after construction conditions were compared between the shaded and unshaded seating areas. At Durango Street Bridge, the surface was dark-gray original asphalt material before the design intervention of various colored paints over the asphalt pavement. Each site has two sets of readings at two different times of the day.

At Site 1a and 1b, at the San Jacinto Plaza, the readings were taken near the water feature under the engineered shade structure. There were two sets of readings taken on the opposite sides of the structure, one side (site 1a) was covered with shade and the other side (site-1b) was exposed to the sun.

At Site 2a and 2b, at the San Jacinto Plaza, the readings were taken under a tree near the cafe. There were two sets of readings taken on the opposite sides of the tree. Site 2a was covered with the tree shade, whereas site 2b, was opposite site 1a, exposed to the sun.

At Site 3, Mills Avenue Pedestrian Promenade, the measurements were taken at three points. Point A was the plaza seating shaded by a tree, point B was in the middle of the road shared with pedestrians during the events, and point C was the seating near the Plaza theater.

At Site 4, the Durango Street Pedestrian Bridge, there was no shade to measure the thermal comfort. Hence, it was interesting to note the painted pedestrian pathway and how different colors absorb and react to the sun.

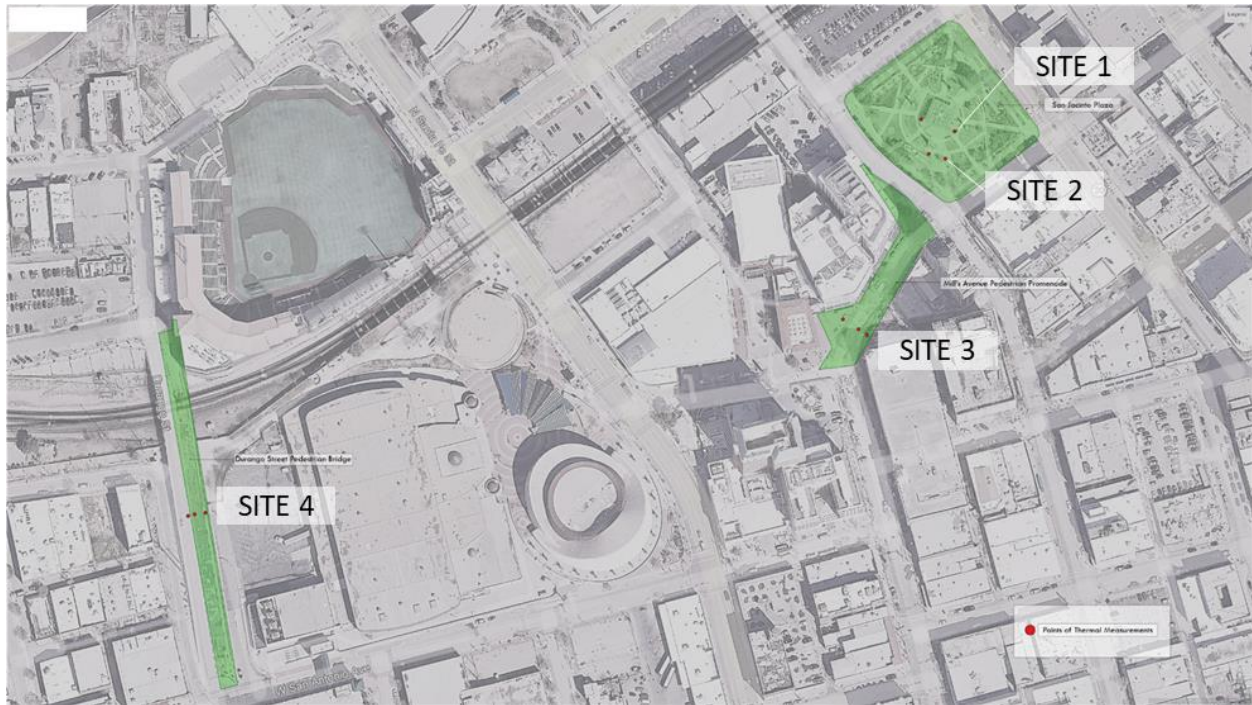


Figure 1: Key map - Image showing the location of the four sites and the points of measurements on the project in 2022.

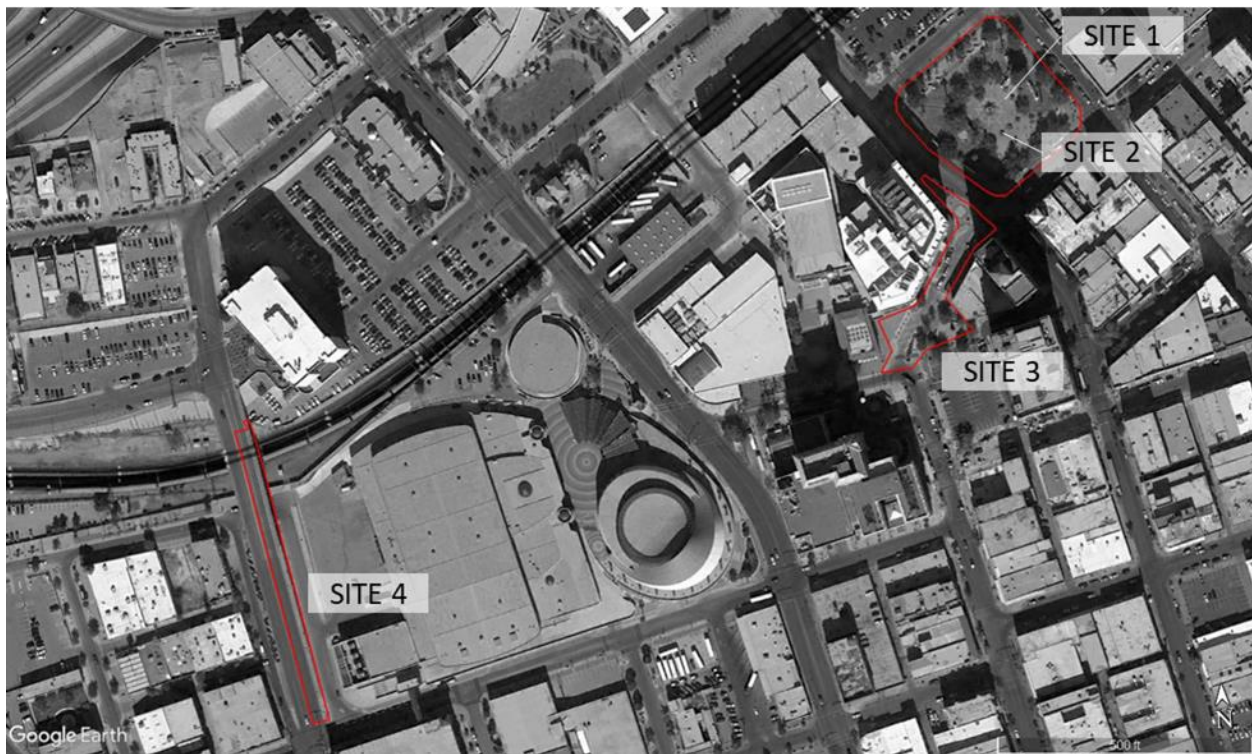


Figure 2: Image showing the projects before construction.

Calculations:

Site 1

At San Jacinto Plaza, during the peak heat hour, the engineered shade structure reduces up to 23°F and the tree shade reduces up to 40°F in surface temperature when compared to the pre-design condition of no shade. In other words, by installing the engineered shade structure, the reduction in surface temperature is 18% compared to the pre-construction condition. Providing a tree shade at the same location could reduce up to 30% in surface temperature.

The surface temperature with no shade on paver surface (pre-construction condition) = 130.6°F (Table 7, row A', column 15:30)

The surface temperature under engineered shade structure on paver surface = 107.7°F (Table 6, row A, column 15:18)

The surface temperature under tree shade on paver surface = 90.8°F (Table 8, Row A, column 15:45)

1. Difference between surface temperature under engineered shade and pre-construction condition of no shade on paver surface = **23°F**
2. Difference between surface temperature under tree shade and engineered shade on paver surface = 17°F
3. Difference between surface temperature under tree shade and pre-construction of no shade on paver surface = **40°F**

Table 5: Calculation to compare the percentage difference between the pre-construction scenario and the present scenario at the San Jacinto Plaza.

#	Temperature difference	Calculation	Percentage difference
1	23	$(23/130)*100$	18%
2	17	$(17/107)*100$	16%
3	40	$(40/130)*100$	30%

Calculated percentage difference for Steps 1,2, and 3 using the formula below:

Percentage difference = (Difference in surface temperature / baseline surface temperature) * 100 (see Table 10)



Figure 3: San Jacinto Plaza, before (Left) and after (Right) construction aerial photos, showing sites 1a and 1b of measurements. (Source: Google earth)

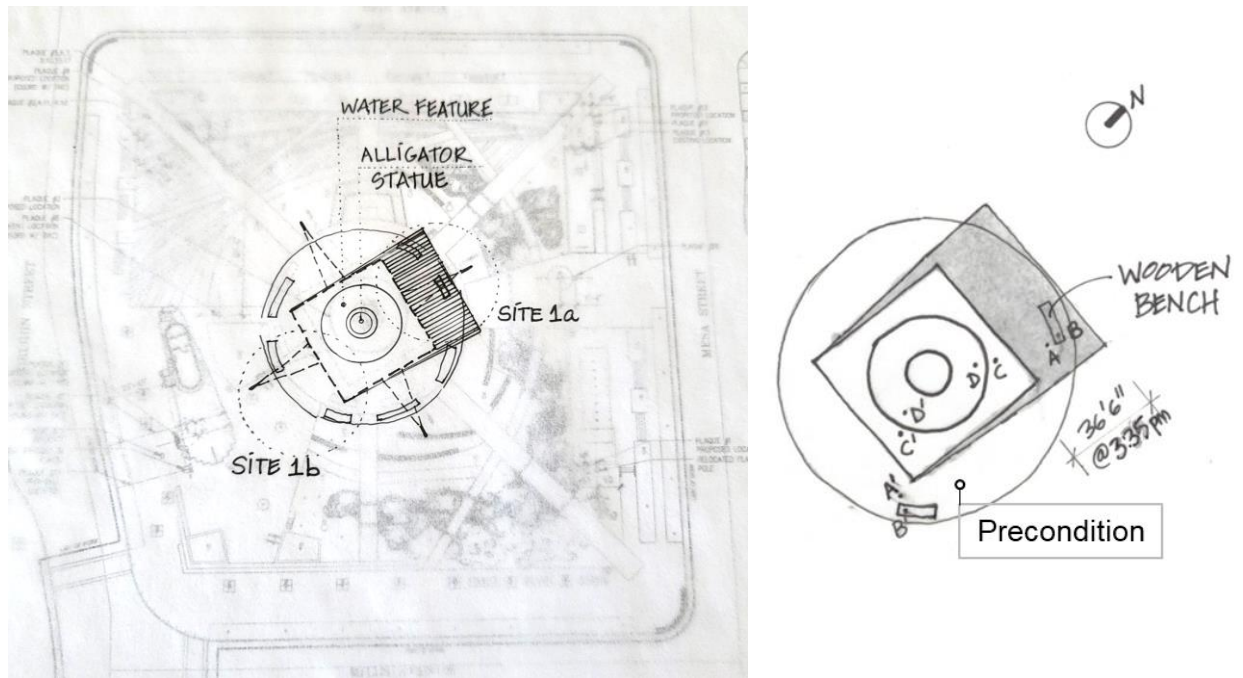


Figure 4: Sites 1a and 1b at San Jacinto Plaza (Left) and a diagram with a close up indicating the points where the readings were taken (Right).



Figure 5: Site 1a at San Jacinto Plaza, measurements taken at 15:18, May 19, 2022.

Table 6: Readings of Site 1a, at San Jacinto Plaza - Readings were taken under the engineered shade structure

Date- May 19, 2022, Time- 15:18 and 19:45 (24-hour time format), Temperature- max. 94F, min. 74F and humidity- max. 13%, min. 5%

	Surface conditions	Surface Temperature (F)		Air Temperature (F)		Relative Humidity (%)		Average wind speed (Mph)	
	Time	15:18	19:45	15:18	19:45	15:18	19:45	15:18	19:45
A	Paving next to the benches	107.7	90.5	94.2	88.0	16.4	13.1	1.3	0.8
B	Wooden Bench (shaded by structure)	88.5	71.9	93.7	87.5	16.4	13.1	1.3	0.8
C	Near the Fountain	85.8	81.3	92.3	86.9	8.7	10.5	0.9	0.8
D	In the fountain	64.2	66.9	91.5	86.1	9.0	9.9	1.1	0.8

F- temperature measured in 'Fahrenheit'

%- Relative humidity measured in 'percentage'

Mph- Average wind speed measured in 'Mile per hour'

Table 7: Readings of Site 1b at San Jacinto Plaza under un-shaded seating area near the engineered shade structure

Date- May 19, 2022, Time- 15:30 (24-hour time format), Temperature- max. 94F, min. 74F and humidity- max. 13%, min. 5%

	Surface conditions	Surface Temperature (F)		Air Temperature (F)		Relative Humidity (%)		Average wind speed (mph)	
	Time	15:30	20:00	15:30	20:00	15:30	20:00	15:30	20:00
A'	Paving next to benches	130.6	82.7	94.5	87.4	17	9.6	0.9	1
B'	Wooden bench (not shaded)	89.7	78.4	94.5	87.4	17	9.6	0.9	1
C'	Near the fountain	117.3	82.4	93.7	86.8	7.6	9.3	1.1	0.9
D'	In the fountain	67.6	64.9	93.1	86.4	17.3	9.2	1.1	0.9

Site 2

At site 2, comparing the data of Tables 7 and 8, the results demonstrate that the air temperature under the tree shade in the grass lawn (point C of Table 7) as compared to the pavement tiles (point C' of Table 8) is 5.4°F cooler (89.3°F - 83.9°F) (Figure 6).

Furthermore, on analyzing the ground cover material, the infrared temperature of the grass lawn in shade at the peak heat hour is 56°F cooler (129F - 73F) than the temperature of the pavement tiles. This makes the grass lawn more comfortable to sit on during the hottest time of the day in the afternoons. The research team observed a similar pattern that during the hot daytime, users preferred sitting on the green lawn under the tree shade compared to the wooden benches.

Figure 6: Site 2 at San Jacinto Plaza. The top photo illustrates the location of the tree and the points of measurement. The red line shows the distance of the shade when the measurements were taken, and the yellow line shows the diagonal direction and distance of the measurements taken. The bottom diagram illustrates the points of measurement at shaded direction on the right (site 2a) and unshaded direction on the left (site 2b) of a tree.

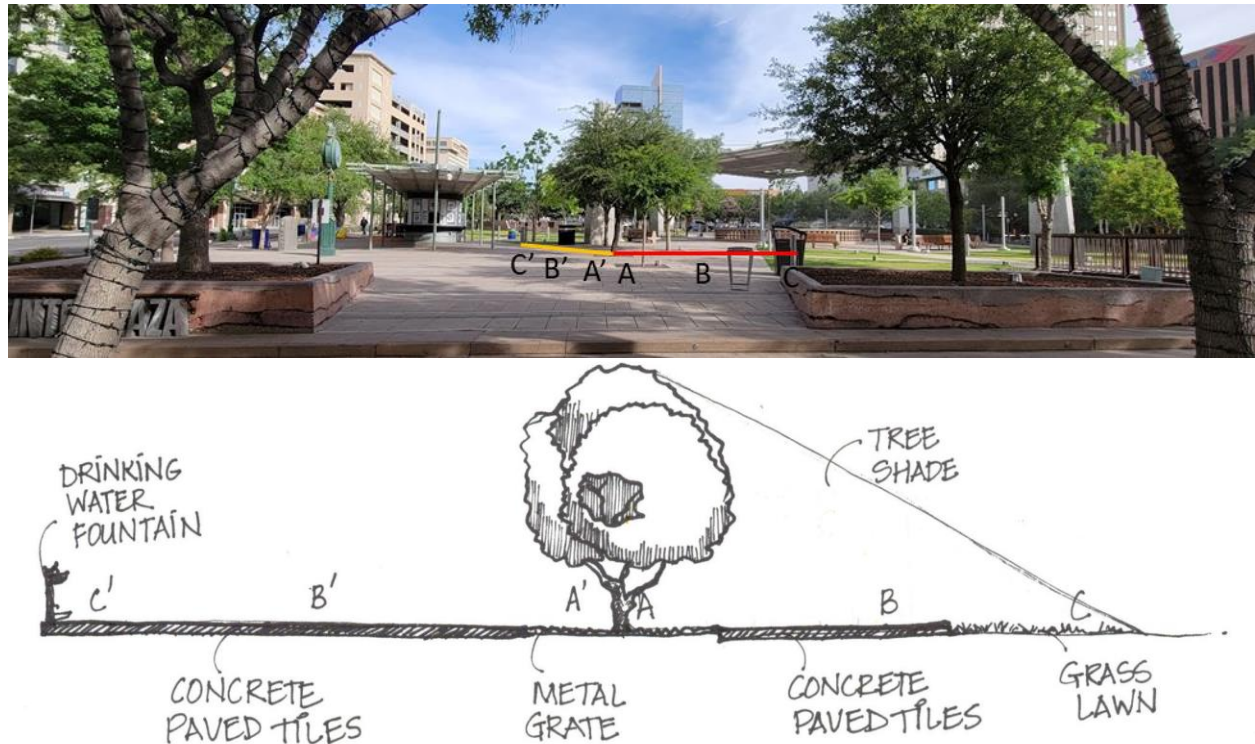


Table 8: Readings of Site 2a at San Jacinto Plaza under a shade tree, near a Cafe

Date- May 19, 2022, Time- 15:45 (24-hour time format), Temperature- max. 94F, min. 74F and humidity- max. 13%, min. 5%

	Surface conditions	Surface Temperature (F)		Air Temperature (F)		Relative Humidity (%)		Average wind speed (mph)	
		15:45	19:33	15:45	19:33	15:45	19:33	15:45	19:33
A	Under the tree	93	81.5	85.4	77.9	8.1	10.5	0.9	0.7
B	Midpoint of the shadow	90.8	80	86.3	79.8	7.2	11	0.9	0.7
C	End of the shadow (grass)	73	61.8	83.9	75.6	7.4	12.5	0.9	0.7

Table 9: Readings of Site 2b at San Jacinto Plaza not shaded by the tree near the Cafe

Date- May 19, 2022, Time- 15:55 (24-hour time format), Temperature- max. 94F, min. 74F and humidity- max. 13%, min. 5%

	Surface conditions	Surface Temperature (F)		Air Temperature (F)		Relative Humidity (%)		Average wind speed (mph)	
	Time	15:55	19:33	15:55	19:33	15:55	19:33	15:55	19:33
A'	Under the tree	109.4	83.1	85.8	78.1	7	10.6	1	0.8
B'	Approximate midpoint distance of the shadow	137.8	92.8	89.6	83.4	7.3	10.5	1	0.8
C'	Approximate end distance of the shadow.	129	86.7	89.3	83.2	7.6	11.4	1	0.8

Comparing the surface temperature under a tree shade and the engineered shade structure, the difference is 15.5F.

The surface temperature under an engineered shade with respect to non shaded area= 47F

Surface temperature under a tree shade area with respect to non shaded area= 31.5F

Surface temperature difference between the two shades= 47F - 31.5F = 15.5F

Site 3

At site 3, Mills Avenue Promenade, the measurements were taken at three points. Point A was the plaza seating shaded by a tree, point B was in the middle of the road shared with pedestrians during the events, and point C was the seating near the Plaza theater. Comparing the data at the three points in the morning, the maximum difference in the ambient temperatures of the three points is 1.6 F (75F - 73.4F) whereas the maximum difference in the ambient temperature during noon is 3.9F (86.5 F - 82.6F). It is worth noting that the tree shade reduces the ambient temperature by approximately 4°F.

The material temperature difference on the other hand varies from 3.2°F on the pavement material in the morning to 49.6°F at noon (comparing the concrete pavements on either side of the road).



Figure 7: Site-3- Before and After image of the Mills Avenue Pedestrian Promenade, indicating the points of measurements. (Source: Google earth)



Figure 8: Photo illustration of Site 3 at Mills Avenue Pedestrian Promenade indicating the points of measurement

Table 10: Readings of Site 3 at Mills Avenue Promenade

Date- May 20, 2022, Time- 8:21 (24-hour time format), Temperature- max. 92°F, min. 73°F and humidity- 20% max, 7% min.

	Surface conditions	Surface Temperature (F)		Air Temperature (F)		Relative Humidity (%)		Average wind speed (mph)	
	Time	8:21	12:00	8:21	12:00	8:21	12:00	8:21	12:00
A	Plaza seating	71.4	74.3	73.4	82.6	22.5	18.6	0.7	4.8
B	Road	73.9	122	75	84.2	22.2	18.8	0.8	4
C	Theater seating	74.6	123.9	74.2	86.5	21.7	18.0	1	3.8

Comparing the three sites, we found a general pattern that the trees create a microclimate that is cooler than the engineered shade over the pavement, however, the trees are even more effective in cooling over the lawn and grass ground cover. Hence, the combination of grass and trees provides a favorable microclimate in the landscapes.

Site 4

At site 4—the Durango Street pedestrian bridge—there was no shade provided. Hence, the comparison was between the pavement colors. The color-painted pedestrian pathway absorbs heat and reacts to the sun differently. The materials absorb heat during the day and radiate

back in the evening. The surface temperature between at noon and during the evening can vary up to 27.8°F on dark-colored original asphalt paving compared to the light-colored pink asphalt that only has 8.7°F difference (Table 10). The evening temperatures ranged from 87.6°F (yellow) to 93.7° (dark gray) in the evening. The measurements show that the color dark gray remains warm for a longer period of time. The coolest color in the evening was yellow with a temperature of 87.6F.

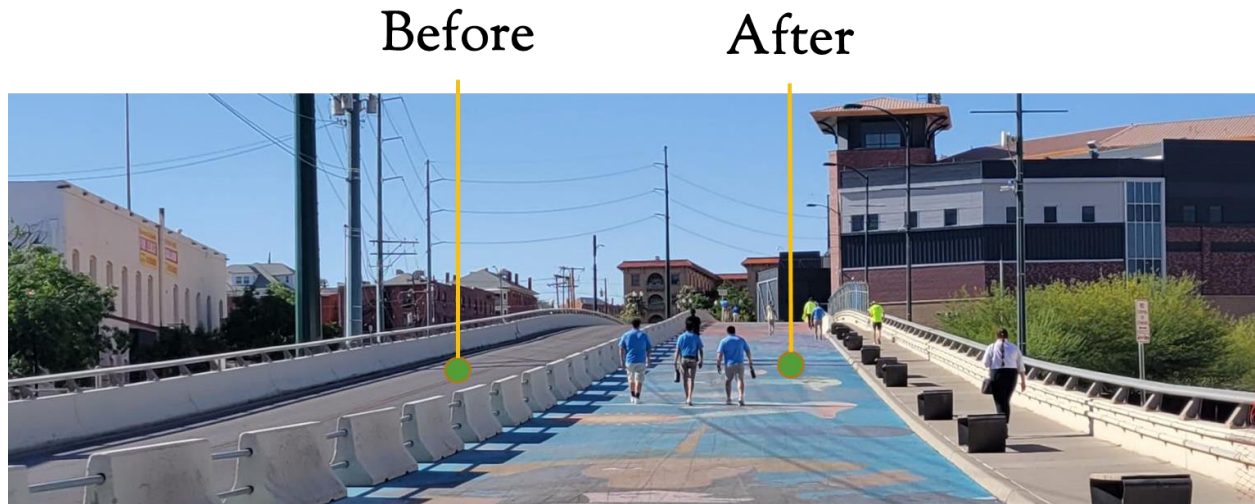


Figure 9: Photo illustration of Site 4- Durango Street Bridge indicating the before and after scenario for the measurements.

At noon, the surface temperature varies from 96.6°F on pink asphalt, 115.8°F on dark gray asphalt, 115°F on the concrete sidewalk, and 120°F on the original dark-colored asphalt pavement representing the site before the intervention. The temperature difference is up to 23.4°F, comparing the original dark-colored asphalt to the pink asphalt.

Table 11: Readings of Site 4 at Durango Street Bridge

Date- May 19, 2022, Time- 12:10 (24-hour time format), and Temperature- max. 94°F, min. 74°F and humidity- max. 13%, min. 5%

Surface conditions	Surface Temperature (F)		Surface temperature difference between time difference (F)	
	Time	12:10	18:50	
Asphalt surface original dark color		120.0	92.2	27.8

Concrete sidewalk	115.0	93.3	21.7	
Colors painted on asphalt surface				
White	107.0	89.4	17.6	
Purple	109.0	93.3	15.7	
Blue	108.8	91.5	17.3	
Yellow	107.7	87.6	20.1	
Green	108.3	92.3	16.0	
Dark gray	115.8	93.7	22.1	
Pink	96.6	87.9	8.7	

The designed Durango Street pedestrian bridge reduces the surface temperature by **23°F** (96.6° - pink asphalt) when compared to the pre-construction asphalt road (120°F) during the peak heat hours of the day.

Sources:

“Climate Data for El Paso - Weather.gov.” n.d. National Weather Service. Accessed July 20, 2022. <https://www.weather.gov/epz/climatedataforelpasso>.

“El Paso's 100 degree days FAQ.” 2014. National Weather Service.
https://www.weather.gov/epz/elpaso_100_degree_page.

“Ambient temperature - Designing Buildings.” 2020. Designing Buildings Wiki.
https://www.designingbuildings.co.uk/wiki/Ambient_temperature.

Limitations:

- The limitations of this method were the limited sample size and the time. The measurements were taken two times on each sampling location to better compare.
- Errors from the equipment can happen, however, we took two sets of equipment to take the readings in case of failure.
- The weather conditions changed on the last day while taking the measurements for the Mills Avenue Pedestrian Promenade, the winds were predicted to be high, however, we

were able to take the measurements in the morning and noon to avoid the wind speeds and the cloudy weather hindering the readings drastically.

- The tree shade measurements were taken under a Texas red oak tree. The shade and ambient temperatures could vary in different locations under different tree species.

-
- ***Sequesters an estimated 7.5 tons of atmospheric carbon annually in 102 newly planted and preserved trees, which is a 45% increase in the amount of carbon sequestered annually compared to before the San Jacinto Plaza redesign.***

Background:

Carbon dioxide (CO₂) is the most common greenhouse gas produced in the atmosphere. According to the USGS², 'Carbon sequestration is the process of capturing and storing carbon dioxide from the atmosphere by plant species' ("What is carbon sequestration? | US Geological Survey", n.d.).

The i-Tree app is an online free tool provided by USDA³ Forest Service to estimate the current tree benefits (USDA Forest Service 2006). I-Tree has different apps to measure tree benefits at different levels such as site level, city level, and future construction. For this study, we used the MyTree app to calculate the carbon sequestration and the amount of carbon dioxide equivalent to carbon that is absorbed by the planted tree species.

Through photosynthesis, plants play a critical role in carbon sequestration. Among plant communities, woody plants have been studied extensively. i-Tree was developed in 2006 as a tool to quantify ecosystem services provided by trees in terms of carbon sequestration, air pollution mitigation, carbon dioxide equivalent, stormwater mitigation, etc. i-Tree has been widely used in landscape performance research (e.g., LAF performance benefit - High Line (Moskalenko, 2017))

Method:

Calculated through the i-Tree application. For this study, we used the MyTree app to calculate the carbon sequestration and the amount of carbon dioxide equivalent to carbon that is absorbed by the planted tree species.

The following steps were followed to calculate the carbon sequestration:

1. First, add the tree species in the i-Tree app, to determine the carbon sequestration and total carbon dioxide equivalent (lbs.) absorbed by individual species
2. Multiply the amount by the quantity of each tree species (n) to find out the total CO₂ equivalent of carbon and CO₂ sequestered by each tree species.
3. Evaluate the total CO₂ equivalent of carbon and the CO₂ sequestration for all plants.

² USGS- United States Geological Survey

³ USDA- United States Department of Agriculture

4. Repeat steps 1 to 3 for the other set of data to compare.

Plants were determined based on the planting plan and confirmed with on-site observations.

Calculations:

Table 3: San Jacinto Plaza tree community carbon sequestration before the redesign

	#.	Scientific Name	Common Name	Qty. (n)	CO2 equivalent of carbon (lbs.)	total CO2 equivalent of carbon (lbs.)	CO2 sequestration value	CO2 sequestration value (Total)
Trees	1	Fraxinus texensis	Texas ash	7	72.84	509.88	\$1.69	\$11.83
	2	Quercus buckleyi	Texas red oak	3	199.84	599.52	\$4.65	\$13.95
	3	Quercus virginiana	Southern live oak	22	236.75	5,208.50	\$5.51	\$121.22
	4	Washingtonia filifera	California fan palm	11	78.55	864.05	\$1.83	\$20.13
	5	Pinus halepensis	Aleppo pine	1	131.48	131.48	\$3.06	\$3.06
	6	Vitex-angus castus	chaste tree	7	96.83	677.81	\$2.25	\$15.75
	7	Morus alba	white mulberry	5	100.67	503.35	\$2.34	\$11.70
				56		8,494.59		\$197.64

Table 4: San Jacinto Plaza tree community Carbon sequestration after the redesign

	#.	Scientific Name	Common Name	Qty. (n)	CO2 equivalent of carbon (lbs.)	total CO2 equivalent of carbon (lbs.)	CO2 sequestration value	CO2 sequestration value (Total)
Trees	1	Fraxinus texensis	Texas ash	8	72.84	582.72	\$1.69	\$13.52
	2	Quercus buckleyi	Texas red oak	5	199.84	999.20	\$4.65	\$23.25
	3	Quercus virginiana	Southern live oak	44	236.75	10,417.00	\$5.51	\$242.44
	4	Parkinsonia florida	blue palo verde	6	78.10	468.60	\$1.82	\$10.92
	5	Parkinsonia x cercidium ' desert museum'	palo verde hybrid	4	126.17	504.68	\$2.93	\$11.72
	6	Prosopis glandulosa	thornless honey mesquite	4	87.84	351.36	\$2.04	\$8.16

	'maverick'						
7	Pinus canariensis	Canary Island pine	1	119.42	119.42	\$2.78	\$2.78
8	Acacia farnesiana (small) 'Sierra sweet'	sweet acacia	4	20.79	83.16	\$0.48	\$1.92
9	Rhus lanceolata	Prairie flameleaf sumac	6	136.57	819.42	\$3.18	\$19.08
10	Rhus ovata	sugarbush	20	56.43	1,128.60	\$1.31	\$26.20
			102		15,474.16		\$359.99

15,474.16 lbs to tons = **7.37 tons**

8,494.59 lbs - 15,474.16 lbs /15,474.16 x 100 = **45% increase in sequestration**

Sources:

USDA Forest Service. 2006. "MyTree." I-Tree. <https://mytree.itreetools.org/#/tree>.

Moskalenko, Elizabeth. 2017. "High Line Methods." Landscape Performance Series.

<https://www.landscapeperformance.org/sites/default/files/High%20Line%20Methods.pdf>.

National Park Service, US Department of the Interior. 2022. "Chihuahuan Desert

Ecoregion (U.S." National Park Service. <https://www.nps.gov/im/chdn/ecoregion.htm>.

Limitations:

- Single-stem versus multi-stem data was not collected due to the time constraints.
- The trees were assumed to be in excellent condition and not shaded by the neighboring buildings.

Social Benefits

- **Increased sense of community (including perceived inclusion, historical values, cultural heritage, and sense of belonging) by 32% when comparing the results of a large-scale community survey before (2015) and after (2017-2021) projects were implemented. An on-site survey of 10 visitors indicates a relatively high sense of community at San Jacinto Plaza (average score of 3.9 out of 5)**

Background:

Sense of community is widely conceptualized in concepts of feelings of emotional security and belonging, having the influence in the community, shared memories, trust-building, as well as fulfillment of physical and psychological needs (McMillan and Chavis, 1986). In this report, we collected both primary and secondary data, applied both quantitative and qualitative mixed methods, and synthesized the results to assess how the community members perceived a sense of community before and after the revitalization of the downtown improvement and specifically the perceptions towards this project that includes three sites: San Jacinto Plaza, Durango Street Improvements, and Mills Avenue Pedestrian Promenade.

- Primary Data: Survey Instrument (2022)

A survey was conducted on-site and distributed through the city officials and the downtown management district to understand the views of the people on the design of the three sites: San Jacinto Plaza, Durango Street pedestrian bridge, and Mills Avenue pedestrian promenade. The questionnaires were designed to include the measures for the understanding of three main concepts—site accessibility, health and well-being, sense of community—in addition to background information. In the survey we asked perceptions specific for each site. In the summary of this report, we combined the findings of the three sites and presented them as one single project. A complete survey questionnaire can be found in Appendix 1.

Category	Data collected / Questionnaires
Background	• Age • Gender • Ethnicity • Did you witness the three sites being transformed since 2010? • How many years have you lived in the Metropolitan area of El Paso? • How far do you live from San Jacinto Plaza in downtown El Paso?
Site Accessibility	• How often do you visit the following three sites: San Jacinto Plaza/ Durango Street pedestrian bridge/ Mills Avenue pedestrian promenade; for what purposes? Choose all that apply. • For each visit, how long do you spend at the outdoor space? • What mode of transportation do you use to reach the following sites? • How easy is it to navigate and find your way to the following sites? • How accessible are the following sites based on your physical and special needs (e.g., using strollers and wheelchairs, accessible for the blind, etc.)?
Health and Well-being	• How comfortable do you feel physically being in the following sites during hot weather? • How safe do you feel being in the following sites in general?

Sense of Community	• How much do you feel welcomed and included in the following sites? • How much do you feel the following sites reflect the historical context of the community living in the area from the past to present? • How much do you feel the following sites reflect your ethnic background and cultural values? • How much do you feel the three sites (San Jacinto Plaza/ Durango Street pedestrian bridge/ Mills Avenue pedestrian promenade) create a sense of belonging with the El Paso downtown area? • How much do you trust the following agency to do the best for your community?
--------------------	---

- Secondary Data: El Paso Downtown Management District Public Input Survey (annually)

The Downtown Management District conducts surveys each year to gather community input on the perceptions of downtown El Paso. Approximately 15 questions are asked in both English and Spanish language through an online survey platform. The results help prioritize the needs for future improvement of the downtown district.

Method:

- Likert scale is a commonly used technique in survey methods to quantify the measurement of perception and attitudes (Batterton et al. 2017). We used a Likert scale from 1 to 5, 5 being the most and 1 being the least ranked in responding to each questionnaire. Each question ranks three sites respectively.

Sense of Community Concepts	Questionnaires	Likert Scale Description
Inclusion	How much do you feel welcomed and included in the following sites?	1-not at all welcomed 2-somewhat not welcomed 3-neutral 4-somewhat welcomed 5-very welcomed
Historical Value	How much do you feel the following sites reflect the historical context of the community living in the area from the past to present?	1-not at all reflective 2-somewhat not reflective 3-neutral 4-somewhat reflective 5-very reflective
Cultural Heritage	How much do you feel the following sites reflect your ethnic background and cultural values?	1-not at all reflective 2-somewhat not reflective 3-neutral 4-somewhat reflective 5-very reflective

Sense of Belonging	How much do you feel the three sites (San Jacinto Plaza/ Durango Street pedestrian bridge/ Mills Avenue pedestrian promenade) create a sense of belonging with the El Paso downtown area?	Scale 1 to 5, 1 being Very Unlikely; 5 being Very Likely
Trust	How likely do you trust the following agency to do the best for your community?	1-very unlikely 2-somewhat unlikely 3-neutral 4-somewhat likely 5-very likely

- An open-ended question was asked at the end: “Please share with us your stories and experiences about the three sites (San Jacinto Plaza/ Durango Street pedestrian bridge/ Mills Avenue pedestrian promenade) that you feel connected with”. The open-ended question allows for qualitative data content analysis.
- The 2021 public input survey was conducted in July 2021 by the El Paso Downtown management. The report identified the priorities and future needs of the community. 1,045 people participated in the survey, of which 1,004 were taken in English and 41 were in Spanish. 36% of the respondents were visitors. The downtown management district offered \$100 gift cards to the respondents to take the survey (El Paso Downtown Management District, 2021).

Calculations:

- For the 2022 survey by the research team, 10 responses were received. Among the ten respondents that completed the survey, 60% were male, 80% were Hispanic/Latino, and 60% were between 25-50 years of age. All participants were familiar with the three sites. 70% lived more than 10 miles away from the three sites and visited the project several times a week commuting through private vehicles or carpooling.
- The concept of sense of community is measured by the Likert scale as quantitative scores 1 to 5 defined in each questionnaire. The total scores are calculated by the sum of rankings for each of the three sites. There is one missing value for ranking the perceived inclusion at Durango Street Pedestrian Bridge project. The standard deviation is calculated using Excel’s function “STDEV.” Each measurement is calculated for its total, average, standard deviation, and median scores. The overall sense of community is calculated using the total of five measures and 149 samples for the calculation of average, standard deviation, and median score respectively.

Table 14: Calculating the Sense of Community using the Likert scale.

Sense of Community Concepts	Total scores of three sites	Average	Standard Deviation	Median
Inclusion	132 (n=29)	4.6	0.8	5
Historical Value	114 (n=30)	3.8	1.2	4
Cultural Heritage	125 (n=30)	4.2	0.8	4
Sense of Belonging	88 (n=30)	2.9	1.5	3
Trust	120 (n=30)	4.0	0.9	4
TOTAL	579 (n=149)	3.9	1.2	4

- Based on the content analysis of assessing the patterns of concepts revealed from the texts written by the respondents, the results demonstrate an overall satisfaction of the project after redesign through the perceived improvements on accessibility, amenities, safety, aesthetics, and thermal comforts:

“SJP⁴ is very much a part of the El Paso identity. When it was under construction, the void was palpable. Durango Street bridge is a bridge. Not much to engage with and it's not as emotionally resonant or impactful. Mills Ave Promenade is a relief for pedestrians as it is better sheltered from the sun with the larger buildings, making it more inviting but again, it's not a destination.”

“I love seeing the transformation of our downtown area.”

“Its more active now compared to before. Memories with grandparents.”

“They made the downtown more lively and active.”

“feel somewhat connected. Parking is an issue.”

“The accessibility of the site has increased. They improved the aesthetic value. It is great that they preserved the gator statue.”

Some, however, feel the project could enhance the diversity of cultures represented on the site that may reflect the unique US-Mexico border city culture and a majority of Hispanic population in the city:

“They could have added more Mexican culture.”

- 2016 is the year of project construction for San Jacinto Plaza. We compared the El Paso Downtown public input survey data of the pre-construction year of 2015 to post-

⁴ SJP- San Jacinto Plaza

construction data in the years of 2017-2021 with annual averages. The sense of community measures are calculated by averaging the results from A) % participants agree Downtown El Paso is safe and B) % participants agree Downtown El Paso is welcoming. The percent increase in the sense of community is calculated by the difference between pre- and post-construction survey results: $81.5\% - 49.5\% = 32\%$

Table 15: Public input survey results from the downtown management district, 2021

Year	Total Number of respondents	A) % agree Downtown El Paso is safe	B) % agree Downtown El Paso is welcoming	% perceived sense of community (average A & B)
2015	647	59	40	49.5
2017-2021 ⁵	4363	84	79	81.5

Source: Downtown Management District, El Paso, 2021 Public input Survey (Downtown Management District, El Paso 2021)

$81.5 - 49.5 = 32\%$ increase in perceived sense of community

The researchers' survey, despite a low response rate, supports the statement that a high number of people feel a sense of community belonging at the project sites. On average 77% of the people surveyed during the site visit feel safe at the project, which is 18% higher compared to the pre-construction survey results from the public input survey.

Table 16: On-site survey results, 2022

Year	A) % agree Downtown El Paso is safe	B) % agree Downtown El Paso is welcoming
2022 (On-site survey)	77	83

Sources:

Batterton, Katherine A., and Hale, Kimberly N. "The Likert Scale: What It Is and How To Use It." *Phalanx* 50, no. 2 (2017): 32–39. <http://www.jstor.org/stable/26296382>.

El Paso Downtown Management District. 2021. "2021 Public Input Survey." Downtown El Paso. https://downtownelpaso.com/wp-content/uploads/2022/02/2021-Survey-Results_OVERALL_PresentationFormat_0892021.pdf

McMillan, D. W., and Chavis, D. M. (1986). "Sense of community: A definition and theory." *Journal of Community Psychology*, 14(1), 6–23.

⁵ The number of respondents and the percentages are averaged.

Limitations:

- The online survey was distributed largely relying on the City of El Paso and Downtown Management District partners to distribute to the community. The research team has little control of response rate as a result. The low number of participants may be due to the short timeframe for reaching out and a lack of incentives to complete the survey.
 - Spanish is the second largest spoken language in El Paso. The research team's survey did not have a Spanish version, which may have limited the participation rate.
 - The research team does not speak Spanish, which may have also limited the on-site survey response rate.
 - We do not have the raw data and questions of the city survey in the report. Therefore, we could not do further analysis of their data.
-

- ***Supports community events, with a 117% increase post-construction in the average number of events per year that involve closing the streets in the downtown district. An average of 17 event permits were issued per year before construction (2012-2015), and an average of 37 after construction (2017-2019).***

Background:

The Downtown Management District is responsible for issuing permits for any events that are hosted in the downtown district which requires occasional street closures including the events at San Jacinto Plaza. A few years before the construction of the project, the number of shoppers downtown were becoming fewer. Using events to draw visitors is a common strategy to revitalize downtowns. Since street closure affects local business, the Downtown Management District plays a role in communicating with local business owners. The measure of number of events serves as a proxy for measuring the amount of social activities occurring in the downtown district before and after the project redesign, as well as representing the degree to which local businesses were involved and invested in shaping the downtown district.

The COVID-19 pandemic largely discourages events because of safe distances required, precautions required such as test or vaccination, it adds additional costs for operating an event, and discourages people to attend in person.

Method:

Interview with the Executive Director of the Downtown Management District, El Paso on May 19, 2022 and the secondary data collected from the Downtown Management District's public input survey conducted in 2021.

Calculations:

The Downtown Management District approved 40 special events in 2018, which was the highest number approved by far in the history of downtown El Paso. There was a sharp decline in the number of events during the onset of the pandemic in 2020. However, the number of special events started to rise again post-pandemic.

Table 17: Number of permits issued by the Downtown Management District for special events from 2012-2022.

Year	Number of permits issued for special events
2012	15
2013	21
2014	2
2015	30
2016*	18
2017	35
2018	40
2019	35
2020	4
2021	17
2022	10
Total events	227

* Year of San Jacinto Plaza renovation construction

Before the project completion, 17 permits (68/4) were issued each year on an average from 2012 to 2015.

After the project completion, the average permits issued increased to an average of 37 (110/3) permits per year from 2017 to 2019, excluding the pandemic years as outliers.

The increase in the average number of permits issued per year when compared to the pre-construction of the projects is 117%.

$$((37-17)/17) \times 100 = 117$$

Looking at the general trend in table 15, it is clear that the number of event permits being distributed was increasing each year, before the COVID-19 pandemic hit in 2020.

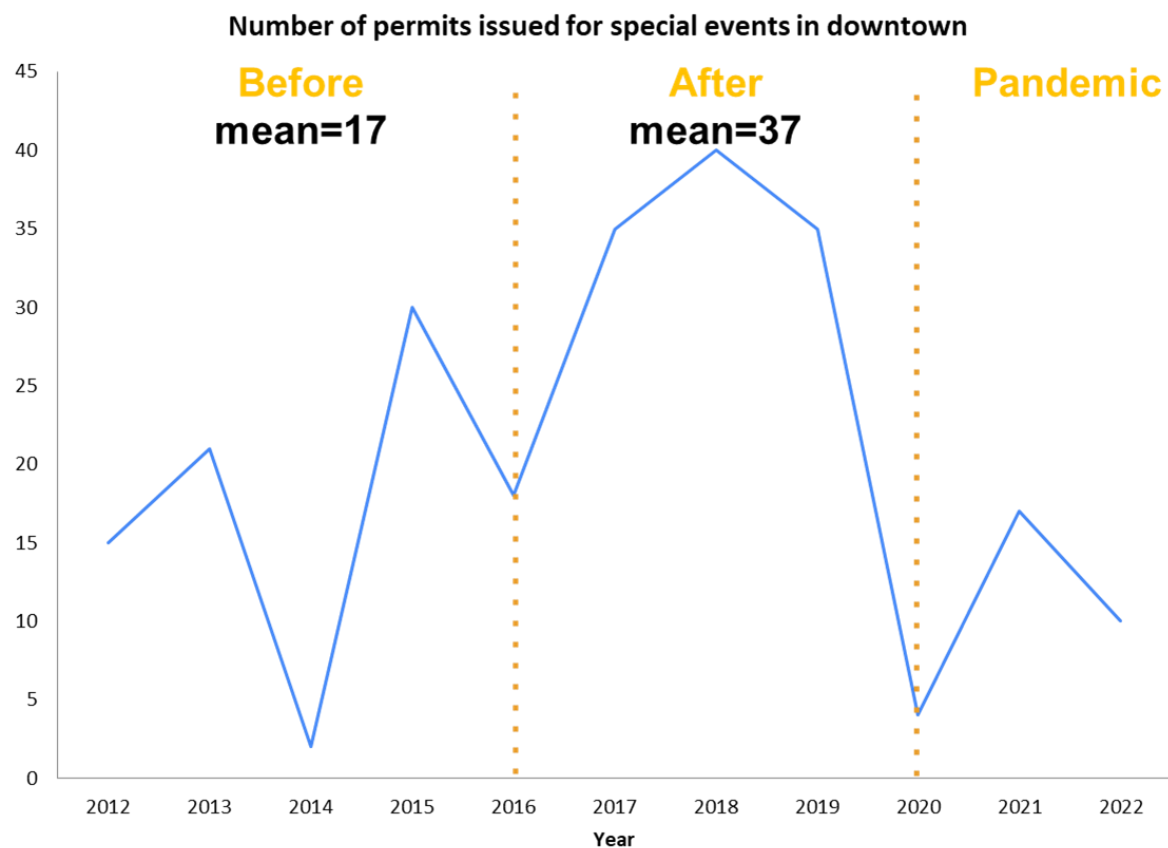


Figure-10: Graph showing the number of permits issued for special events in downtown. The x-axis represents the year, and the y-axis represents the number of permits issued for special events in the downtown area.

Sources:

In-Person Interview with Joe Guedenrath, Executive Director, El Paso Downtown Management District.

Data provided by the Downtown Management District.

Limitations:

- Secondary data source; this information was not independently verified by the research team.

Economic Benefits

- ***Supports downtown revitalization, including an increase in the number of new hotel rooms within a 3-block radius of the downtown district by 128% when comparing the periods before and after project construction.***

Background:

During the interviews, it was emphasized to the research team that increased business investment in downtown is a sign for progress of revitalization of the city downtown. The City has had an incentive program to support businesses invested in the downtown area. The city shared records dated back to 2012. Various types of business have joined the city's incentive programs. The investment in hotels is one indicator to measure the success of the downtown redevelopment project and the downtown management district has provided records from 2011 to 2021 (Ten-year report, EL Paso downtown Arts district). Improved streetscape and park amenities in the area are expected to support this effort.

Method:

Referred to the ten-year report of the El Paso downtown district, and interviews conducted with the executive director of the downtown management district and city officials.

Calculations:

The number of hotel rooms that were added before and after the design intervention were recorded and compared, as shown in Table-18.

Then the increase in number of hotel rooms was calculated using the formula:

Percentage increase in number of hotel rooms = ((number of hotel rooms post-construction - number of hotel rooms pre-construction)/ Number of hotel rooms preconstruction)* 100

Table 18: Number of hotel rooms increased with the year of expansion in the three-block radius of downtown area before and after the plaza reopened in 2016

Hotel Name	Year of expansion	Number of rooms increased
Hotel Indigo	2013	119
Stanton House Hotel	2014	43
Aloft Hotel	2015	100
Before		262

Courtyard Marriott	2017	140
Hotel Paso Del Norte	2017	357
Plaza Hotel	2018	100
After		597

The number of hotel rooms post-construction is 128% more than pre-construction.

$$((597-262)/262)*100 = \mathbf{128\%}$$

Sources:

Ten-year report of the El Paso downtown district.

Limitations:

- This benefit cannot be attributed directly to the landscape and planning efforts, but should be seen as supporting the larger effort of downtown development.

-
- **Catalyzed a 435% increase in city-incentivized projects within a 3-block radius from the period before construction (\$17.2 million from 2012-2016) to after construction (\$92 million from 2017-2020). Inventive funds provided by the city more than doubled (109%) over this period.**

Background:

The pedestrian improvement projects are part of the city's long-term plan to revitalize the downtown district and enhance the pedestrian experience by creating pedestrian-friendly zones to connect important downtown buildings. The city provides incentives for investments made within the three-block radius of the downtown core, which is within the walking distance of the project. The city started investing in the downtown district in 2012, roughly around the time these projects were being conceived. Many new businesses and investments have been installed since the project was completed.

One way to measure the economic success of the project is by looking at the subsequent investments after the installation of the project, considering that the project provides a quality environment to catalyze further development.

Method:

Referred to the city report provided by Economic and International Development at the City of El Paso. The report listed the year the projects have been incentivized, and the amount of investment that was done by the city as well as the actual investments.

It was supported by an interview conducted on May 19, 2022 with City officials.

Calculations:

The investment cost data given by the city officials was sorted based on the year from 2012 to 2022, and compared the investments done pre-construction versus the post-construction.

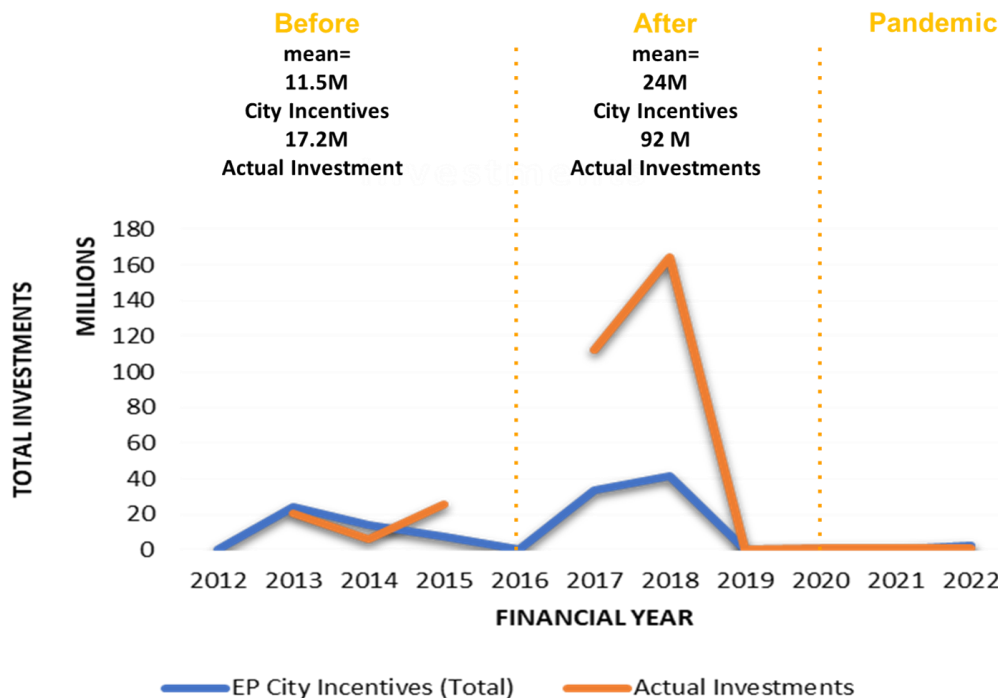


Figure 11: The graph above shows the Total incentives by El Paso city in the past decade (2012-2022). The x-axis represents the financial year and the y-axis represents the investments in million dollars.

$$\left[\frac{92 \text{ million} - 17.2 \text{ million}}{17.2 \text{ million}} \right] \times 100 = 434.884\% \text{ increase in actual investments from 2012-2016 period to 2017-2020 period}$$

$$\left[\frac{24 \text{ million} - 11.5 \text{ million}}{11.5 \text{ million}} \right] \times 100 = 108.6957\% \text{ increase in city incentive funding from 2012-2016 period to 2017-2020 period}$$

Table 19: The incentivized project invested by the downtown district

	Incentivized Project	Investment cost in million (\$)
1	Parking lots and improvements in pedestrian pathways	4.9
2	Renovation of the Historic Plaza Hotel	78
3	Complete renovation of historic Paso del Norte Hotel	70
4	Improvements in Convention center	7.4
5	El Paso Pedestrian Improvement project	25
	Total	193.3

Sources:

Report on incentivized projects by the City of El Paso, 2021.

Limitations:

- The project and the neighboring buildings have been benefited from one another in the downtown revitalization.
- This benefit cannot be attributed directly to the landscape and planning efforts, but should be seen as supporting the larger effort of downtown development.

Appendix 1: Survey Questions

1. Age (you must be over 18 to participate in this study)
Mark only one oval.
18 - 25
25 - 35
35 - 50
50 - 65
> 65
2. Gender
Mark only one oval.
Male
Female
Other
3. Ethnicity/Race
Mark only one oval.
Other:
White
Native American
Native Hawaiian and Pacific Islanders
African-American
Hispanic/Latino
Asian
More than two races
4. How many years have you lived in the Metropolitan area of El Paso?
Mark only one oval.
Less than one year
1 to 5 years
6 - 10 years
11 - 20 years
more than 20 years
5. How far do you live from San Jacinto Plaza in downtown El Paso?
Mark only one oval.
less than 1 mile
1 - 2 miles
2 - 5 miles
5 - 10 miles
10-20 miles
more than 20 miles
Out of state

6. Which places of the following have you visited in the past 10 years? Please choose all that apply.

Check all that apply.

City Hall

San Jacinto Plaza

El Paso Museum of Art

El Paso Convention and Performing arts

Durango Street pedestrian bridge

University Park (baseball stadium)

Mills Avenue Pedestrian Promenade

7. How often do you visit the following three sites: San Jacinto plaza/ Durango Street pedestrian bridge/ Mills avenue pedestrian promenade for what purposes? Choose all that apply.

Check all that apply.

	Several times in a week	Several times in a month	Several times in a year	Special Events (e.g. games, festival)	Leisure/ Recreational	Business (conference/work)	Never
San Jacinto Plaza	☐	☐	☐	☐	☐	☐	☐
Durango Street Pedestrian Bridge	☐	☐	☐	☐	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐	☐	☐	☐	☐

8. For each visit how long do you spend at the outdoor space? (Select NA if you never visit the sites)

Mark only one oval per row.

	less than 30 mins	30 mins - 1 hour	1 - 2 hours	2 - 4 hours	more than 4 hours	NA
San Jacinto Plaza	☐	☐	☐	☐	☐	☐
Durango Street Pedestrian Bridge	☐	☐	☐	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐	☐	☐	☐

9. What mode of transportation do you use to reach the following sites? (choose all that apply)

Check all that apply.

	Owned cars	Shared cars	Buses	Walk	Bikes	Scooter/Skateboard
San Jacinto Plaza	☐	☐	☐	☐	☐	☐
Durango Street Pedestrian Bridge	☐	☐	☐	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐	☐	☐	☐

10. How easy is it to navigate and find your ways to reach the following sites?

Mark only one oval per row.

	1-very difficult	2-somewhat difficult	3- neutral	4-somewhat easy	5-very easy
San Jacinto Plaza	☐	☐	☐	☐	☐
Durango Street Pedestrian Bridge	☐	☐	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐	☐	☐

11. How accessible are the following sites based on your physical and special needs(e.g., using strollers and wheelchairs, accessible for the blinds, etc.)?

Mark only one oval per row.

	1-very difficult	2-somewhat difficult	3- neutral	4-somewhat easy	5-very easy
San Jacinto Plaza	☐	☐	☐	☐	☐
Durango Street Pedestrian Bridge	☐	☐	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐	☐	☐

12. How comfortable do you feel physically being in the following sites during hot weather?

Mark only one oval per row.

	1-very difficult	2-somewhat difficult	3- neutral	4-somewhat comfortable	5-very comfortable
San Jacinto Plaza	☐	☐	☐	☐	☐
Durango Street Pedestrian Bridge	☐	☐	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐	☐	☐

13. How safe do you feel being in the following sites in general?

Mark only one oval per row.

	1-very unsafe	2-somewhat unsafe	3- neutral	4-somewhat safe	5-very safe
San Jacinto Plaza	☐	☐	☐	☐	☐
Durango Street Pedestrian Bridge	☐	☐	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐	☐	☐

14. How much do you think the following sites are being used with a variety of users and activities?

Mark only one oval per row.

	1-very inactive	2-somewhat inactive	3- neutral	4-somewhat active	5-very active
San Jacinto Plaza	☐	☐	☐	☐	☐
Durango Street Pedestrian Bridge	☐	☐	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐	☐	☐

15. How much do you feel welcomed and being inclusive in the following sites?

Mark only one oval per row.

	1-not at all welcomed	2-somewhat not welcomed	3- neutral	4-somewhat welcomed	5-very welcomed
San Jacinto Plaza	☐	☐	☐	☐	☐
Durango Street Pedestrian Bridge	☐	☐	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐	☐	☐

16. How much do you feel the following sites reflect the historical context of the community living in the area from the past to present?

Mark only one oval per row.

	1-not at all reflective	2-somewhat not reflective	3- neutral	4-somewhat reflective	5-very reflective
San Jacinto Plaza	☐	☐	☐	☐	☐
Durango Street Pedestrian Bridge	☐	☐	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐	☐	☐

17. How much do you feel the following sites reflect your ethnic background and cultural values?

Mark only one oval per row.

	1-not at all reflective	2-somewhat not reflective	3- neutral	4-somewhat reflective	5-very reflective
San Jacinto Plaza	☐	☐	☐	☐	☐
Durango Street Pedestrian Bridge	☐	☐	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐	☐	☐

18. How much do you feel the three sites (San Jacinto plaza/ Durango Streetpedestrian bridge/ Mills avenue pedestrian promenade) create a sense of belonging with the El Paso downtown area?

Mark only one oval.

	1	2	3	4	5	
Very Unlikely	☐	☐	☐	☐	☐	Very Likely

19. How likely do you trust the following agency to do the best for your community?

Mark only one oval per row.

	1-very unlikely	2-somewhat unlikely	3-neutral	4-somewhat likely	5-very likely
City Government	☐	☐	☐	☐	☐
Commerce/Business Group/Developer	☐	☐	☐	☐	☐
Community Organizations	☐	☐	☐	☐	☐
Neighbors	☐	☐	☐	☐	☐
Experts/Academics	☐	☐	☐	☐	☐

20. Did you witness the three sites being transformed since 2010?

Mark only one oval per row.

	Yes	No	Unaware
San Jacinto Plaza	☐	☐	☐
Durango Street pedestrian bridge	☐	☐	☐
Mills Avenue Pedestrian Promenade	☐	☐	☐

21. Please share with us your stories and experiences about the three sites (San Jacinto plaza/ Durango Street pedestrian bridge/ Mills avenue pedestrian promenade) that you feel connected with.

Appendix 2: Interview questions

1. Introduction
2. How did the project come to life and who were involved in the planning process?
3. Did you play a role in the process? What is your role? How long have you been in the role?
4. To your understanding, what level of participation from the community was involved in the process of project development?
5. What were the strategies employed to engage with the community? Who has been reached and who has not been reached?
6. What were your ambitions and plans? Did it meet your expectations?
7. What were the issues raised by the community?
8. What were the challenges faced in the development process?
9. How have those challenges been resolved, if any?
10. Are there issues that persist or new issues raised by the communities today?
11. What does the project mean to you?
12. What is your vision for downtown in the next 10 years?
13. What did not go well? What could have been done better?