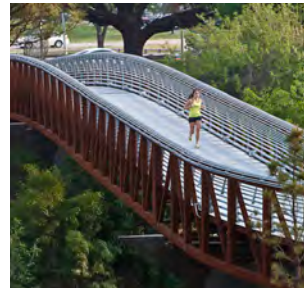


# BRIDGE DESIGN EVALUATION

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Recommendations and Case Studies for the Austin Avenue bridges over the North and South San Gabriel Rivers



**GEORGETOWN, TX**

December 30, 2014

# BRIDGE DESIGN EVALUATION

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Recommendations and Case Studies for the Austin Avenue bridges over the North and South San Gabriel Rivers

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## ACKNOWLEDGEMENTS

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# REPORT OBJECTIVE

This report evaluates options for repair or replacement of the Austin Avenue bridges over the North and South San Gabriel Rivers leading into downtown Georgetown, and offers recommendations that reinforce planning documents such as the Downtown Master Plan and Downtown Design Guidelines.

Many concerns regarding the future of the bridges have been raised. In January 2014, A BRINSAP (Bridge Inventory, Inspection and Appraisal Program) study lowered the rating of the bridge superstructures from a "6" (satisfactory) to a "5". In June 2014, the Austin Avenue Bridge Assessment Report (Aguirre & Fields) was completed, offering several options for repair or replacement of the bridges in response to the BRINSAP rating.

Of course, safety is of utmost importance and the structural evaluations of the bridges provide effective evidence for needed repair. In addition to safety concerns, business owners are worried about construction timing and the effects it will have on their business. The historic significance of the bridges, specifically the bridge railings, is another concern. Finally, pedestrian safety must be enhanced and connectivity to surrounding pedestrian networks, such as the North and South San Gabriel hike and bike trails, must be improved.

This report addresses the following:

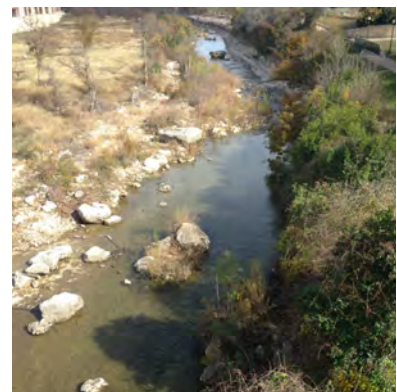
- The importance of increased pedestrian connectivity and safety
- Consistency with objectives and goals as outlined in the Downtown Master Plan and Design Guidelines
- Considerations for evaluating current options for bridge repair or redesign

Preferred recommendations based on the above considerations are outlined. Furthermore, a series of case studies are provided to assist in visualizing the future potential of these bridges.

This is a time of opportunity in terms of making downtown Georgetown a destination, while preserving the character and significance of the area and enhancing its inherent assets. Improving the bridge connections to downtown can improve circulation and access, provide amenities in its own right, and enhance the use of other resources, such as the parks and trails system.



*Pedestrian safety along the bridges are a major concern.*



*Celebrating the natural beauty of the area is desired.*

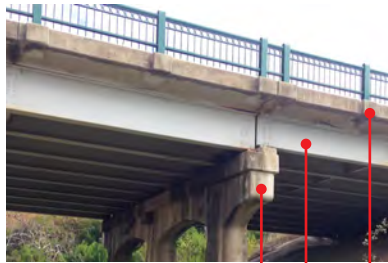


*Repairing the bridge superstructure is needed.*



*Linking into the surrounding pedestrian networks and hike and bike trails is an important consideration.*

# BACKGROUND



concrete pier  
steel beams  
railing "bump outs"



Existing sidewalk



railing  
baluster  
circle design  
post

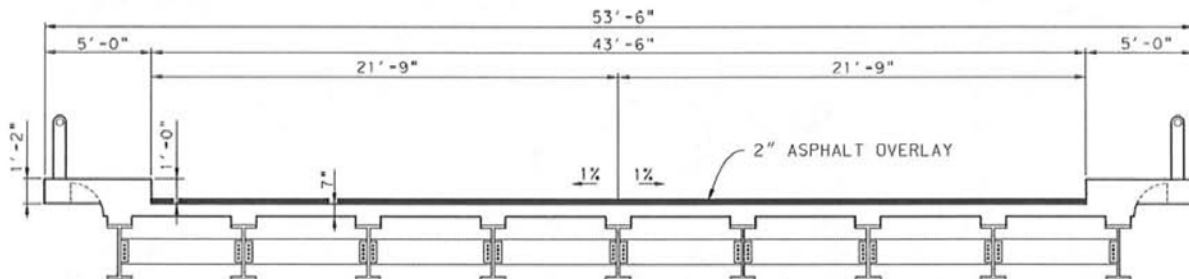
## EXISTING BRIDGE DESIGN

The existing bridges are identical, each 367 feet long and 53'-6" wide. There is approximately the same length in between the bridges (+/- 365 feet) for a total distance of approximately 1,100 feet from end to end, or about 0.2 miles.

They were designed in 1938 and constructed in 1940, making them nearly 75 years old and therefore potentially eligible for being considered to be historically significant. They are a simple design of steel beams spanning between concrete piers with reinforced concrete decking and attached sidewalks. Key design features are existing metal railings. The railings are in good condition and have been well-maintained. They are located at the outside edge of the sidewalks and contain small "bump outs" in the concrete structure to support them. They consist of square posts approximately 8' apart with a pipe railing which is supported on small vertical balusters. These contain a circle design located between balusters at the top abutting the railing.

Traffic is carried on four lanes, two in each direction, which appears to be of sufficient capacity. The existing travel lane width is 43'-6", or four 10'-10 1/2" lanes.

Pedestrian travel is accommodated with 5-foot sidewalks on either side, however the railing takes up about a foot of the sidewalk, leaving a 4-foot clear pathway. This minimal width has been a topic of concern, as pedestrians do not feel comfortable walking alongside traffic with only 4 feet to spare. There are also no street or pedestrian lights on the bridge, making pedestrian safety even more of a concern.



Existing bridge cross-section

## PREVIOUS PLANNING DOCUMENT VISIONS

### Downtown and Old Town Design Guidelines

This document provides guidelines for improvements to historic properties and new construction within the city's overlay districts. While it mainly addresses *building* design, the objectives should apply when considering bridge improvements.

The fundamental community values are defined as:

1. Georgetown **protects its historic resources** and its heritage in general.
2. The community **maintains its unique character** in the downtown area.
3. Downtown is **safe and inviting** for visitors, residents, and workers.

The bridges are considered historic resources and do contribute to the character of Georgetown, however they are not safe for pedestrians.

This document also highlights the importance of preserving historic resources in order to contribute to livability and quality of life, minimize negative impacts on the environment and yield economic rewards. Acknowledging the craftsmanship and construction quality of historic structures and considering their adaptability is an important consideration.

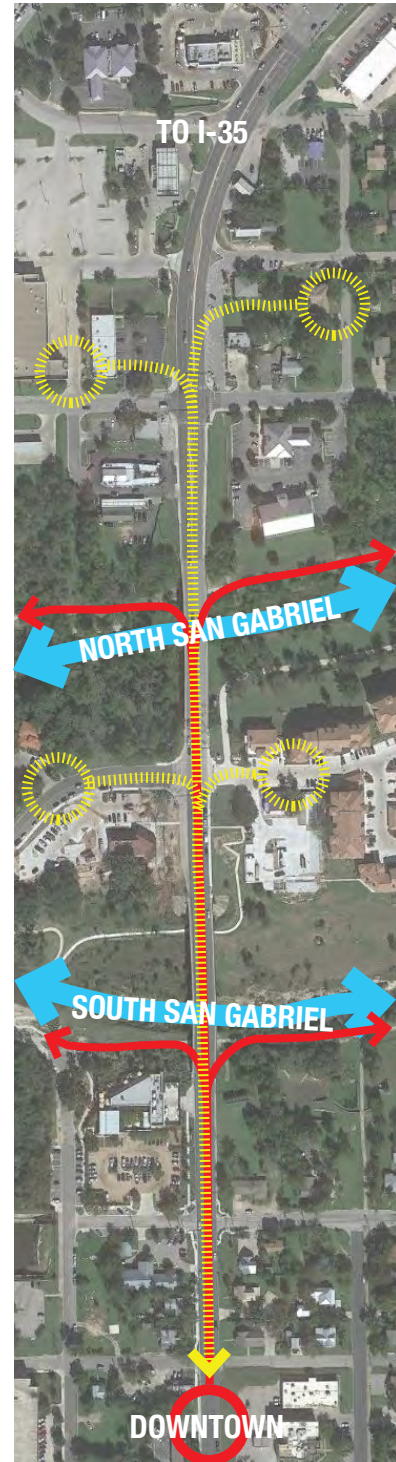
### Downtown Master Plan

The Downtown Master Plan focuses on enhancing the livability and overall identity of downtown Georgetown. It outlines numerous ideas and concepts that should be considered when thinking about updating the Austin Avenue Bridges. The main points are:

#### 1. Improve pedestrian circulation.

The City has championed a movement toward making downtown a pedestrian-oriented place. Pedestrian improvements continue to be made to support walking as a primary mode of transportation. As was discussed in numerous community workshops, the existing bridge sidewalks are not ideal for pedestrians, as they are too narrow and uncomfortable to walk along. This deters people from walking to downtown from the growing residential areas north of the rivers.

Recommendations from the plan include studying the feasibility of providing pedestrian connections across both rivers that are separate from those used by automobiles and/or the feasibility of adding a cantilevered sidewalk to the existing bridges.



*Enhancing pedestrian connections from downtown to the river trails and from existing residential areas to downtown, across the rivers, is desired.*

## 2. Link trails to downtown.

The City has an extensive network of hike and bike trails that are near downtown, but not easily accessible. One major barrier is the lack of convenient connection from Austin Avenue to the trails along the rivers. Providing a direct connection from the bridges to the trails would encourage better use of these amenities and allow the city to promote them as a tourist activity.

Another important consideration is providing access from the Rivery development east of the interstate. This area is expanding and will be an important attraction for out-of-town visitors. Providing a safe and comfortable pedestrian and/or biking experience from the Rivery to downtown would further boost economic vitality and overall identity. Ideally, this type of improvement would be included as part of the bridge upgrades.



*North San Gabriel River Trail at bridge.*



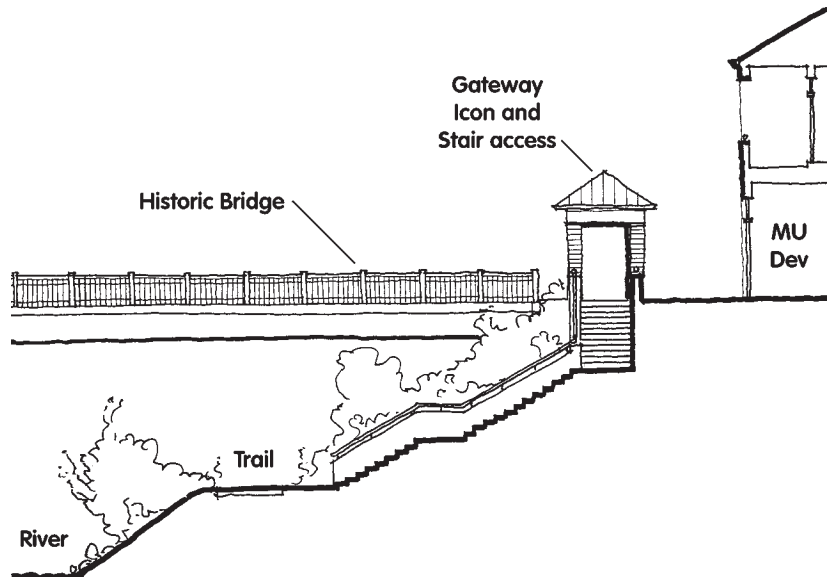
*South San Gabriel River Trail at bridge.*



*Improving access to and the experience of Blue Hole Park is desired.*

## 3. Enhance gateways.

Currently, there is no celebrated entry into downtown. The master plan calls for two "enhanced gateways" along Austin Avenue, one being at the south edge of the bridge over the South San Gabriel. The concept identified in the plan is to build a vertical circulation access point at this location to serve as a "gateway icon". This would also give pedestrians a direct connection from Austin Avenue to the South San Gabriel trail. Improved gateways are listed as "A" priorities, or 1-2 years post-plan completion, in the implementation strategy.



*The concept identified in the master plan is to build a vertical circulation access point at this location to serve as a "gateway icon."*

## 4. Celebrate natural amenities.

The North and South San Gabriel Rivers are wonderful amenities to downtown and they should be celebrated. The master plan encourages improving existing and adding new open space areas along the rivers. Areas such as Blue Hole Park could be cleaned up and enhanced to be more inviting and family-friendly and new pedestrian connections over the rivers could include areas to sit and enjoy the scenery.

## **AUSTIN AVENUE BRIDGE ASSESSMENT OPTIONS**

In June, 2014, Aguirre & Fields Engineers and Planners evaluated the condition of the bridges and provided four options for repair, along with cost estimates and life cycle costs. This engineering report followed the latest BRINSAP (Bridge Inventory, Inspection and Appraisal Program) report which lowered the condition rating from a "6" to a "5", meaning the bridge superstructure elements are now in fair condition with minor deterioration.

The following is an assessment of the options with a list of pros and cons for each, based on the main objectives of this report:

### **Option 1: Do Nothing**

This option simply delays the issue. It states that the bridge may need to be replaced in another 5 years due to continued deterioration and that short-term repairs and maintenance would cost about \$20,000.

Pros:

- Saves money in the short-term

Cons:

- Delays addressing the major structural deficiencies
- Does not improve access and safety

### **Option 2: Short Term Repairs**

This option involves replacing the existing header expansion joints, sealing construction joints and painting the steel to extend the remaining life of the bridge to about 10 years, when eventual replacement may be needed. Design and repair costs are estimated to be \$60,000 over the next 10 years. This approach would require a 2-month construction period during which traffic would be reduced to two lanes. This option does not affect the historic value and does not change the load posting (both bridges were recently load posted with a gross weight limit of 48,000 pounds and a tandem axle weight limit of 21,000 pounds due to the corrosion of beams observed by the BRINSAP inspector.)

Pros:

- Saves money in the short-term
- Does not affect historic value
- Short construction timing/less disturbance to business owners and road users.

Cons:

- Delays addressing the major structural issues
- Load posting remains
- Does not include improved pedestrian facilities

### Option 3: Deck and Bearing Replacement

This option extends the life of the structure to 20 years and strengthens the superstructure to eliminate load postings. Initial construction costs are estimated at \$2.6 million with additional maintenance costs of \$60,000 over the next 20 years. It includes replacing the bridge deck, sidewalk, and bridge rails; replacing bridge bearings; and painting the steel beams and diaphragms. This option also allows for a 2-foot widening of the deck to allow for slightly wider sidewalks. The historical value of the bridges would be affected due to the replacement of bridge railings and widening of sidewalks. Construction would last 4-6 months and require 2-lanes of traffic during construction.

Pros:

- Fixes major structural issues
- Addresses the narrow sidewalks by adding a foot to either side
- Short construction timing/less disturbance to business owners and road users.

Cons:

- Historical value affected
- More expensive than first two options

### Option 4: Total Replacement with Phased Construction

This option removes the existing bridges and replaces them with two new ones each estimated at 75 year life spans. It widens each bridge by 14 feet and would include 4 travel lanes, a 12-foot sidewalk on one side and a 6-foot sidewalk on the other. The construction would be phased to allow for 2 travel lanes to remain open during construction, which would last 12-18 months.

Pros:

- Fixes major structural issues
- Increases sidewalk width substantially on one side and minimally on the other

Cons:

- Historical value is affected
- Most expensive option in the short-term
- Long construction timing/more disturbance to area businesses and road users

### Breakdown of Costs per Option

Year	Do Nothing (Option 1)	Short-Term (Option 2)	Replace Deck (Option 3)	Replace (Option 4)
0	\$ 20,000	\$ 640,000	\$ 2,600,000	\$ 6,100,000
5	\$ 6,100,000	\$ 60,000	\$ 20,000	\$ -
10	\$ -	\$ 6,100,000	\$ 40,000	\$ -
20	\$ -	\$ -	\$ 6,100,000	\$ -

Source: Aguirre & Fields Bridge Assessment Report, June 2014

While each of the options presented in the engineering report has merit, they overlook some key urban design considerations such as the ability to create a destination and identity for the City of Georgetown. The opportunity for celebrating these bridges as a "gateway" is lost in the current options. Ideally, when bridge improvement occurs, it also will help to enhance the overall vitality of downtown, as described in the policy documents. The following section provides recommendations to consider, based on the opportunities that may have been overlooked.



# RECOMMENDATIONS

This report recommends a modified version of option 3 from the Aguirre & Fields assessment. The primary goals are to:

- Retain the existing bridges
- Maintain the historical value of the bridges
- Minimize construction disturbance
- Improve pedestrian circulation and safety across the rivers
- Connect to existing hike and bike river trails
- Celebrate the bridges as a "gateway" feature, as planned and prioritized in the Downtown Master Plan, and
- Celebrate the natural beauty of the rivers

This recommendation is not a "quick fix". Rather, it considers the future of downtown and the entire city. This recommendation offers the following key features:

- To repair the existing bridges' superstructures and keep the historical value in place
- To construct a separate pedestrian bridge for improved pedestrian connectivity and safety

This recommendation separates pedestrians from vehicles, and develops a pedestrian bridge as an amenity unto itself. It allows the bridges, and rivers, to become a *destination* for residents and visitors of Georgetown. Ideally, the pedestrian bridges would be constructed first to provide a safe and comfortable route for pedestrians while the bridges are under construction. However, timing depends on the severity of the bridges' superstructures and the ability to secure funding for the pedestrian bridges. The project could also be phased by river, i.e. construct the south pedestrian bridge first, then make south auto bridge repairs, then construct the new north pedestrian bridge, and finally repair the north auto bridge.

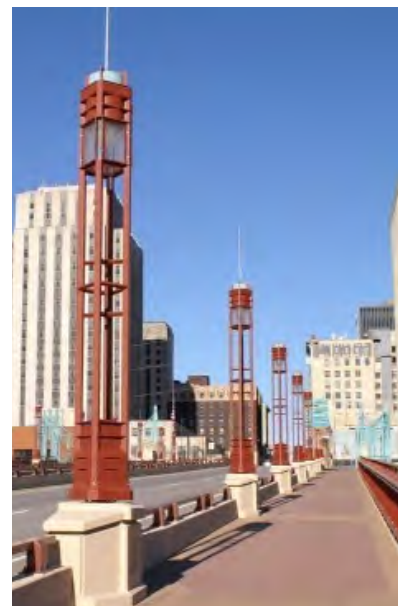
## EXISTING BRIDGE REPAIRS

### Re-hab and Re-deck

Implement major structural repairs to the existing bridges, such as replacing the bridge deck and bearings, and painting the steel beams and diaphragms. This initial step could be phased to allow 2 lanes of traffic. Construction is estimated to last 4-6 months.

### Keep existing rail and sidewalks

Because the existing railings are a key historical feature of the bridges, we recommend keeping them in place, along with the existing sidewalks. The sidewalks can be used for placement of lighting (and perhaps public art) and as a secondary pedestrian connection, once the new pedestrian bridges are in place.



*The sidewalks can be used for placement of lighting and as a secondary pedestrian connection.*



*An iconic bridge is visible from afar.  
Wilmington Waterfront Park -  
Los Angeles, CA*



*A distinctive design enhances tourism.  
Elliott Avenue Bridge -  
Seattle, WA*



*A unique identity enhances interest in  
the area.  
Millenium Bridge -  
Denver, CO*



*A simple design defers to the natural  
setting.  
Los Alamitos Creek Bridge -  
San Jose, CA*

## NEW PEDESTRIAN BRIDGES

In order to improve pedestrian connectivity and safety, and to celebrate the rivers as a destination, we recommend constructing parallel, but separate pedestrian bridges across each river. Ideally, these bridges would be located on the west sides of the existing bridges. New pedestrian crossings along Austin would allow people walking on the east side to cross over safely.

The pedestrian bridges could have an identical design, or each one could be designed to have a unique identity, which could enhance the diversity and interest of attractions in the area. However, construction quality and materials should be similar to unify them. The bridges should be wide enough for pedestrians and bicyclists to use them. Each bridge should include a vertical circulation access point -- with stairs, elevators, and ramps overall -- to allow access to the existing river trails.

In the end, the pedestrian bridges should be an "experience" in themselves, where the beauty of the rivers is celebrated and the choice to walk or ride a bike to and from downtown is an obvious one. Important elements of the pedestrian bridges are described in more detail below.

### Iconic design

The pedestrian bridges should be aesthetically pleasing and draw people to them. Bridge structures, such as cables and towers or trusses should be used to serve as iconic elements. At the same time, the structures need not be out of character with the community and the design should fit within the character and scale of Georgetown.

### Programmable space

The bridges should be designed to host events and other small gatherings. For example, the bridges should be designed to accommodate a gala or awards dinner, a small wedding ceremony, or a picnic with a few friends. They should provide a place to celebrate the beauty of the river and have a unique experience.



*This pedestrian bridge in Denver, CO is used to host a gala every year to benefit the Greenway Foundation, a non-profit organization aimed at protecting the South Platte River.*

### A safe and comfortable experience

The bridges should be safe and usable at all hours of the day. Therefore, lighting will be very important to enhance visibility and increase safety. Because the bridges are quite long (367 feet), there should be areas of respite for children or elderly people to rest. Areas for benches, or simply an area out of the way of the main path to rest and overlook the river, is ideal.

### Enhance tourism

Ideally, the pedestrian bridges will enhance tourism and bring people from downtown to the river, and vice versa. The bridges also would be excellent locations for placing kiosks to celebrate the history and heritage of Georgetown.



*The Land Bridge in Vancouver, WA overlooks the Columbia River and kiosks tell the story of the river's history. This bridge also incorporates benches and a programmed area for the kiosks which are out of the way of the direct path of pedestrian flow.*

### Provide access to trails

Both rivers include hike and bike trails along them. The pedestrian bridges should incorporate access down to the trails - on the north side of the North San Gabriel River and on the south side of the South San Gabriel River. These access points could be celebrated as "gateway" features with small plazas, vertical circulation towers, public art, and more. Improving access to these trails will promote their use, and the more populated the trails are, the safer they will feel.



*The Wabash Street Bridge in St. Paul, MN has a staircase that connects the bridge to a trail. The design of the staircase's structure also serves as a "gateway icon" on the bridge. A small plaza is located at the top and another at the bottom of the stair core.*



*The pedestrian bridge at Tempe Town Lake in Tempe, AZ offers a unique experience at night with a whimsical colored lighting scheme.*



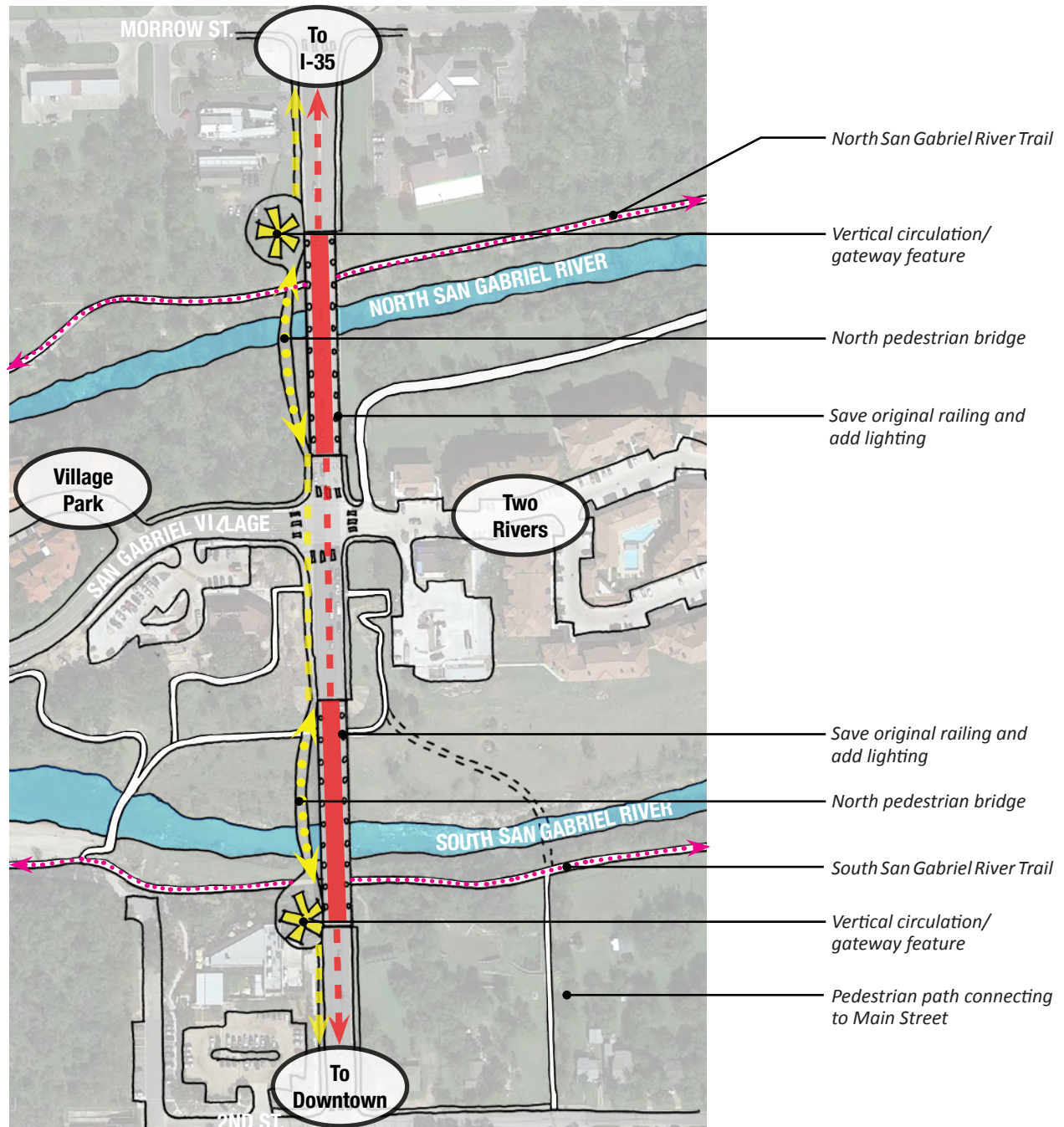
*A small plaza at the entrance to the pedestrian bridge will draw people in and serve as a gateway feature.*



*Ramps may be used to connect between the bridge and trails.*

## CONCEPTUAL DIAGRAM

Below is a diagram showing how the two pedestrian bridges could connect to each other, to the auto bridges, and to the river trails. This diagram is conceptual and not meant as an actual design proposal.



Conceptual diagram of recommendations.

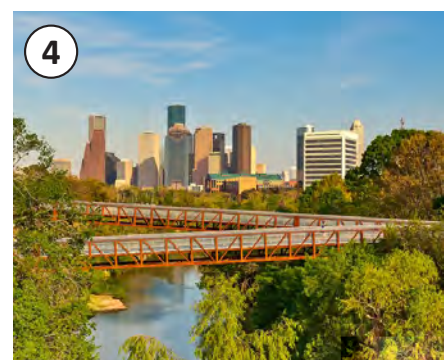
These recommendations offer a solution which increases pedestrian connectivity and safety, maintains historic character, creates a distinct identity as a gateway to downtown Georgetown, promotes tourism, activates the trails and parks network, and celebrates the natural beauty of the area. These recommendations look past planning for function and toward creating a more sustainable and desirable downtown Georgetown.

# CASE STUDIES

The following pages highlight case studies of successfully implemented pedestrian bridges that possess the qualities and features appropriate for Georgetown. Each case study has unique characteristics, as the setting, purpose, and context is different in each case. Any design should incorporate high quality in materials and design. Unique features that call attention to and increase the use of the Austin Avenue and San Gabriel Rivers pedestrian bridges should also be considered. Four case studies are provided. They are:

1. **Austin, TX - Pfluger Bridge (crossing Lady Bird Lake)**
2. **Golden, CO - Washington Avenue Bridge (crossing Clear Creek)**
3. **Greenville, SC - Liberty Bridge (crossing the Reedy River)**
4. **Houston, TX - Rosemont Bridge (crossing Buffalo Bayou)**

Each of these examples also demonstrate how cities have used bridge enhancement projects to create "places" that in themselves are amenities that enhance their downtowns while also addressing the more technical objectives of improving access and safety. Some of the specific solutions may be beyond the financial capacity of Georgetown, but they nonetheless are valid examples of how communities can combine urban design objectives with engineering needs. A key feature of each of these solutions is that pedestrian circulation is separated from automobile circulation. This opens up more possibilities for creating "places" along the pedestrian route that would not be possible if pedestrian circulation were only to be a sidewalk attached to the vehicle travel lanes.



## #1 - PFLUGER BRIDGE (AUSTIN, TX)

### Overview

The Pfluger Bridge is a pedestrian and bicycle bridge running parallel to the South Lamar Boulevard Bridge in Austin, Texas. It connects downtown to Auditorium Park and Butler Park. It links into the Ann and Roy Butler Hike and Bike Trail -- the city's premier recreation destination -- located on either side of the lake. Prior to construction, only 700-1,000 pedestrians crossed the Lamar Street Bridge daily. After opening the separate pedestrian bridge, user counts rose to 4,000 to 5,000 pedestrian and bike trips daily on the Pfluger Bridge.



Context Map

### Awards

- 2003 Gold Hard Hat
- Colorado Construction News' Heavy/Highway - Silver
- 2003 APWA Community Award
- 2004 ACEC Engineering Excellence Award



### History

In the early 1990s, thoughts of widening the South Lamar Boulevard Bridge as part of the Intermodal Surface Transportation Efficiency Act (ISTEA) began. In 1995, they began studying alternatives for widening the bridge. The Texas Historical Commission voiced their concern about the bridge widening project due to the fact that it would alter the historic structure. The community initially wanted to provide cantilevered pathways for pedestrians and cyclists to the sides of the bridge, but the bridge being designated as a historic site in 1994 prevented this option. In 1998, city council directed the engineering firm (HDR) to look at options for designing a separate pedestrian and bicycle bridge across the river to safely accommodate pedestrians and bicyclists since the existing bridge sidewalks are so narrow. Fifteen original concepts were developed and four final concepts were presented to city council for which they selected a "Double Curve" design as the preferred option.

## #1 - PFLUGER BRIDGE (AUSTIN, TX)

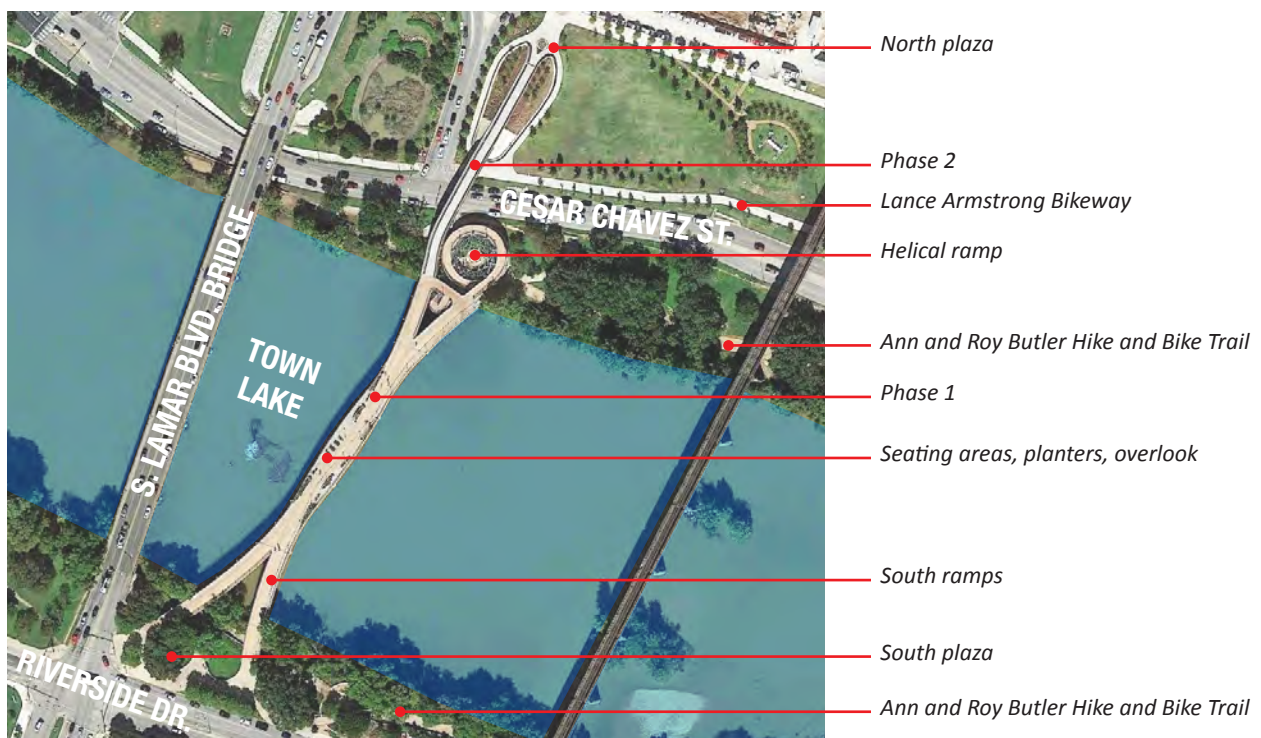
### Construction

Construction was completed in two phases. The first phase, completed in 2001, spanned the river and connected into the lake trail on either side. The second phase, completed in 2011, spans Cesar Chavez Street to the north, and connects into the Lance Armstrong bike path. The structure is a composite of steel and concrete with spans ranging from 48 to 120 feet. The entire length of the bridge is approximately 650 feet.

### Design

The "Double Curve" design was developed by Chas Tonetti, Tere O'Connell, Jamie Wise, Rush McNair and Chris Hutson. The design concept, shaped like an hourglass in plan, was based around the dominant paths of travel. The ramps on the south end are curved and the north end includes a helical ramp. The first phase includes a concrete deck with steel railings. Colored concrete is used to depict travel paths and the center of the bridge, overlooking the lake, includes areas for planters and benches. This area is popular for impromptu live music and includes a public piano. Contemporary pedestrian-scaled lights are included along the length of the bridge.

The second phase, a ramp across Cesar Chavez Street, includes low walls constructed from "ipe," a Brazilian hardwood. Built-in LED lights provide lighting for safe travel at night and enhance the overall experience of the bridge.



Plan View

### Fun Facts

- Total project cost: \$9 million (\$1 million funded by ISTEA) construction cost (Phase 1); \$3.5 million (Phase 2)
- Design firm/team: HDR Engineering with Kinney and Associates and Carter Design Associates
- Construction company: Jay-Reese Construction
- Reason for implementation: Lack of safety for pedestrians crossing Lamar Street Bridge, including two auto-related pedestrian deaths.

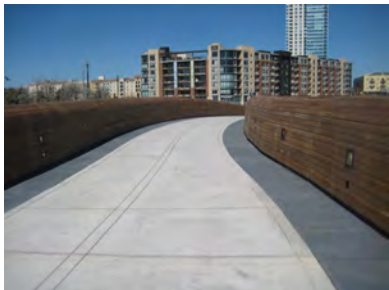
## #1 - PFLUGER BRIDGE (AUSTIN, TX)



The downtown (north) side of the bridge includes a helical ramp and plaza adjacent to the river/lake, and the second phase's Lance Armstrong Bikeway ramp over Cesar Chavez Street. (Photo credit: Christopher V. Sherman - internet)



View of helical ramp connecting bridge to waterfront and hike and bike trails.



Phase 2, the Lance Armstrong Bikeway extension ramp includes a sleek design with Brazilian ipe wood paneling.



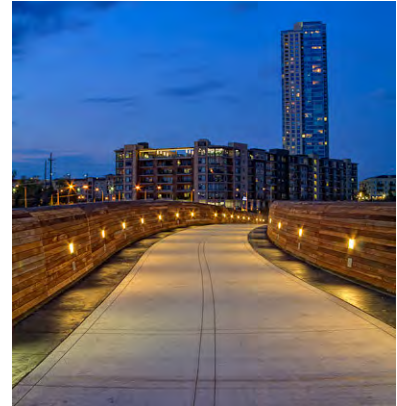
The bridge features a "double curve" design with areas for small gatherings with planters, benches, and lighting.



View of bridge piers and the city beyond.



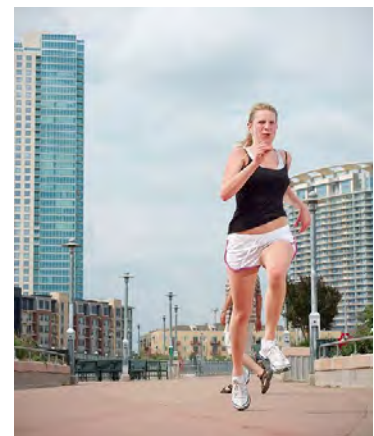
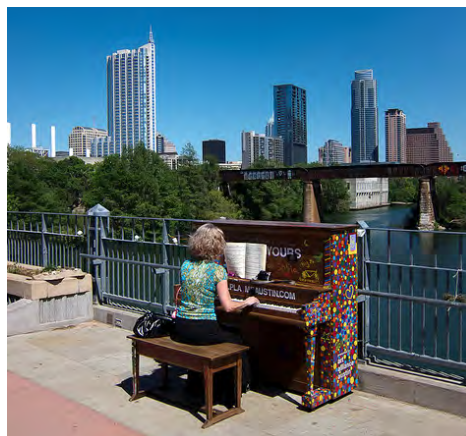
## #1 - PFLUGER BRIDGE (AUSTIN, TX)



*Lighting design is an important consideration for bridges to increase pedestrian safety at night and to create a 24-hour enjoyable space.*



*The bridge has increased pedestrian travel immensely. Previous pedestrian counts across the Lamar Street Bridge were 700 to 1,000 per day. After the Pfluger Bridge was constructed pedestrian and bicyclist counts were at 4,000-5,000 per day (source: Pedestrian & Bicycle Information Center - Austin, TX)*



*The bridge is active with joggers, bikers, and even pianists.*

## #2 - WASHINGTON AVENUE (GOLDEN, CO)

### Overview

The Washington Avenue bridge is located in historic downtown Golden, Colorado. The bridge crosses Clear Creek and connects into the Clear Creek Trail, located on either side of the creek. Golden has used the Washington Avenue bridge and adjacent parks and amphitheater as a tourist attraction within downtown. As the City Manager instructed staff and the design team for the bridge, he said he wanted to "create a bridge and plaza that would be so striking, visitors would leave their cars just to enjoy the space."



Context Map

### Awards

- 2003 Gold Hard Hat
- Colorado Construction News' Heavy/Highway - Silver
- 2003 APWA Community Award
- 2004 ACEC Engineering Excellence Award



### History

The Clear Creek corridor and trail is one of Golden's many recreational highlights. It runs from the mouth of Clear Creek Canyon to the Coors brewery and continues into Denver's western suburbs. When funds for urban drainage became available to improve flood capacity and replace the aging Washington Avenue Bridge, the city recognized the opportunity to design a new bridge that could celebrate the history of the creek and city, while allowing visitors to enjoy the surrounding nature and thriving downtown at the same time. The purpose of the project was to improve flood capacity, provide multi-modal access across the creek, fit seamlessly into the character of historic downtown, provide exciting "people places" that take advantage of the natural setting, and reflect Golden's pride in its history and high-quality design.

## #2 - WASHINGTON AVENUE BRIDGE (GOLDEN, CO)

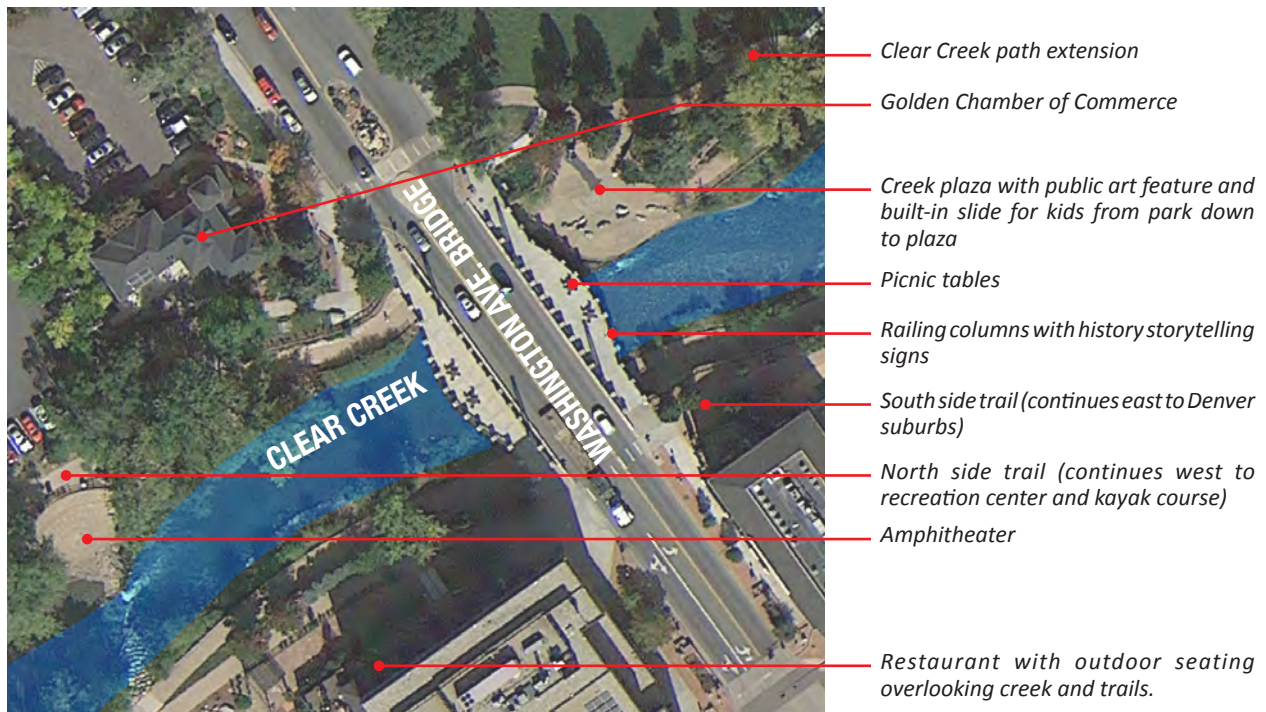
### Construction

Completed in 2003, this bridge is a cable-stayed structure featuring four towers with a fan design of cables supporting the semi-circular pedestrian plazas on either side of the bridge. The bridge spans 200 feet and the pedestrian areas range in width from 10 feet to 20 feet.

### Design

The towers are designed to look like "mining towers" as a nod to the mining heritage of the city. Square brick posts forming the balustrade also feature kiosks telling the history of Golden. The cable-stayed design features form an iconic "gateway" to the city. The plazas on either side are captivating, providing simple yet durable high picnic tables that overlook the creek. Signs telling the history of Golden add to the significance of the bridge.

A waterfront plaza and amphitheater are located along the north side of the creek east and west of the bridge, allowing multiple ways to interact with and enjoy the creek ambiance and natural beauty. Being just steps from "downtown" and located along one of Colorado's major hiking and biking trail networks, makes this area a "happening" destination, especially on weekends.



Plan View

### Fun Facts

- Total project cost: \$3 million (pedestrian and auto bridge)
- Design Firm/Team: TST, Inc. (prime, civil); LORIS and Associates, Inc. (structural); Winston Associates (landscape)
- Construction Company: Edward Kraemer & Sons
- Reason for implementation: to draw people into downtown and to the creek and to serve as a highlight and gathering place for the downtown; to meet modern auto lane and shoulder requirements.

## #2 - WASHINGTON AVENUE BRIDGE (GOLDEN, CO)



*The bridge includes four towers holding up the pedestrian plazas with stay cables. Directly southeast the bridge are mixed use buildings with residents and offices overlooking the creek.*



*The sidewalk passes under the cables and the towers present playful shadows on the concrete deck.*



*The towers serve as an iconic "gateway" into downtown. Pedestrian crossings are located on either side of the bridge to further enhance pedestrian connectivity and access to trails.*

## #2 - WASHINGTON AVENUE BRIDGE (GOLDEN, CO)



*Sturdy tables and chairs are provided on the plaza, allowing daytime workers, tourists, visitors, or residents to enjoy.*



*The fan design of the cables holds up the pedestrian plazas.*



*Historical photo panels tell the history of Golden while walking along the bridge.*



*Golden, and the Washington Avenue Bridge, include numerous bronze sculptures recalling the heritage of the area as well.*

### #3 - LIBERTY BRIDGE (GREENVILLE, SC)

#### Overview

Located in downtown Greenville, crossing the falls of the Reedy River, is the Liberty Pedestrian Bridge. The pedestrian bridge was part of a redesign of the area which included the demolition of a six-lane highway bridge. The new pedestrian bridge was implemented to improve the visibility and accessibility of the falls and adjacent park.



Context Map

#### Awards

- 2008 Waterfront Center Excellence Award
- 2007 IALD International Lighting Design Award
- 2006 Outstanding Civil Engineering Achievement
- 2006 Most Distinguished Award for Excellence in Recreation and Entertainment Structures
- 2006 Pinnacle Award for Best Project
- 2005 Arthur G. Hayden Medal
- 2005 Bridge Prize for special purpose bridges from the National Steel Bridge Alliance
- 2005 International Footbridge Award in the aesthetics category

#### History

The Reedy River and Falls were the original attraction of Greenville. That is until the textile industry grew and the river turned into a cesspool that the community turned its back on. In 1960, the Camperdown Bridge was constructed, blocking the view of the falls. The underside of the bridge, and the Falls, became a haven for criminals. In 1967, the Carolina Foothills Garden Club - with help from Furman University - reclaimed 26 acres of land for what is now Falls Park with a vision for beautifying the area. They began to raise money to help pay for park improvements, including \$500,000 from the Liberty Corp. which secured the name for the future bridge. In the 1990s, the mayor began to fight for a new vision for this area of downtown. A proposal for a pedestrian bridge surrounded by a park and gardens overlooking the falls was proposed and he carried around a rendered image of the scene as a postcard to community meetings. Eventually, the vision was sold, the Camperdown Bridge was torn down, and the Liberty Bridge was designed and constructed. Today, it IS the postcard for Greenville, South Carolina.

### #3 - LIBERTY BRIDGE (GREENVILLE, SC)

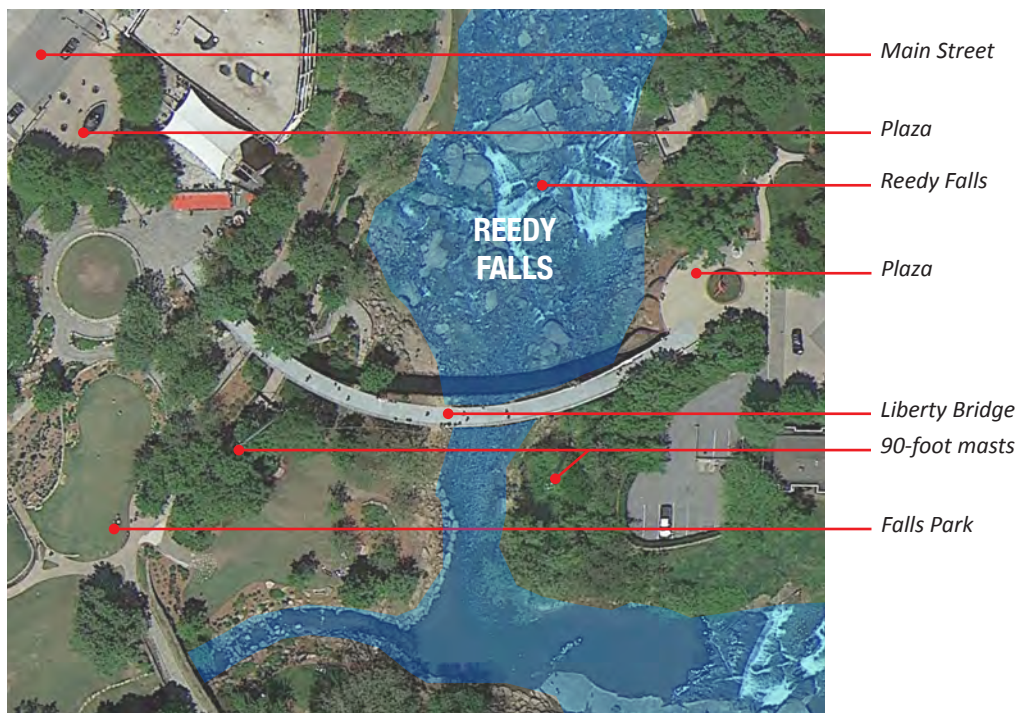
#### Construction

Completed in 2004, over a period of 12 months, the bridge is a curved shape 345 feet long and 12 feet wide. The bridge is suspended with three primary cable systems attached to two 90 foot tall masts that lean away from the bridge and falls, providing uninterrupted views. The bridge's geometry is unique with a radius of 214 feet and an incline of 3 percent from east to west.

#### Design

Designed by Boston-based transportation architects Rosales + Partners, the Liberty Bridge has won numerous design awards and serves as Greenville's main attraction. Miguel Rosales designed the bridge to frame what was most important: the view of the falls. Therefore, the design curves away from the falls with two iconic masts and suspension cables holding the bridge up on the opposite side of the falls, providing uninterrupted views of the falls. While the bridge design is iconic and inviting, it appears light and transparent and fits seamlessly into the landscape.

The bridge and park have been integral to economic development in the downtown, including RiverPlace, a multi-million dollar mixed use, high-end development adjacent to the river. The city spend about \$13 million on the park and within two years, they had about \$100 million in private investment happening.



Plan View

#### Fun Facts

- Total project cost: \$4.5 million
- Design Firm/Team: Rosales + Partners (architect); Schlaich Bergermann (engineering)
- Construction Company: Taylor and Murphy Construction Co. of Asheville
- Reason for implementation: to restore the natural beauty of and access to Reedy Falls - downtown beautification and economic development.

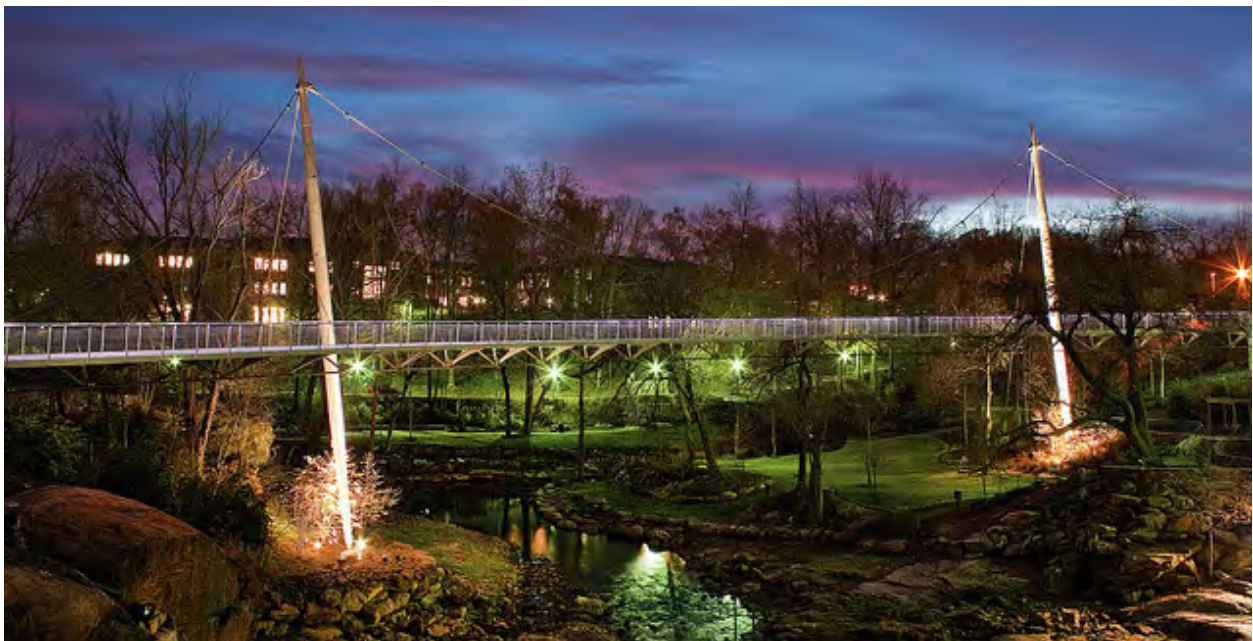
### #3 - LIBERTY BRIDGE (GREENVILLE, SC)



*The bridge is suspended and arched away from the falls with two 90-foot masts. Plazas are provided on either side of the bridge.*



*The bridge appears lightweight and transparent, providing views from Falls Park as well. (photo credit: dcej1)*



*The bridge lighting is integral to the design of the bridge. (photo credit: James Wellman)*



### #3 - LIBERTY BRIDGE (GREENVILLE, SC)



The bridge features lightweight metal railings and concrete floor. (photo credit: Crowefly images)



View underneath bridge. (photo credit: Carolina Shots)



The bridge has become a main attraction for downtown Greenville.



Plazas are located on either side of the bridge.



Nighttime view of bridge (photo credit: James Wellman)



View of falls (photo credit: Jay Capilo)

## #4 - ROSEMONT BRIDGE (HOUSTON, TX)

### Overview

Located 1.5 miles west of downtown Houston, the Rosemont Bridge runs parallel to Montrose Boulevard, crossing Memorial Parkway and connecting into both sides of the Buffalo Bayou hike and bike trails. The bridge expands recreation opportunities and hiking and biking access to and from downtown Houston. It connects the Memorial Heights neighborhoods with the nearby bayou parks, as well as a growing network of various trails that connect a variety of neighborhoods.



Context Map

### History

A decision was made early on in the history of Houston to preserve the surrounding bayous and adjacent land for parks and recreational use. Buffalo Bayou Park includes 124 acres of natural beauty with close proximity to downtown. The area is known for the hike and bike trails along both banks, a famous fountain, and one of the nation's best skate parks. The area is very popular on 4th of July, where thousands come to watch the city's fireworks show. Prior to construction of the Rosemont Bridge, pedestrians had to contend with automobiles to cross the Montrose Boulevard bridge, which only has a 3-foot sidewalk and access to the hike and bike trails along Buffalo Bayou was poor.

## #4 - ROSEMONT BRIDGE (HOUSTON, TX)

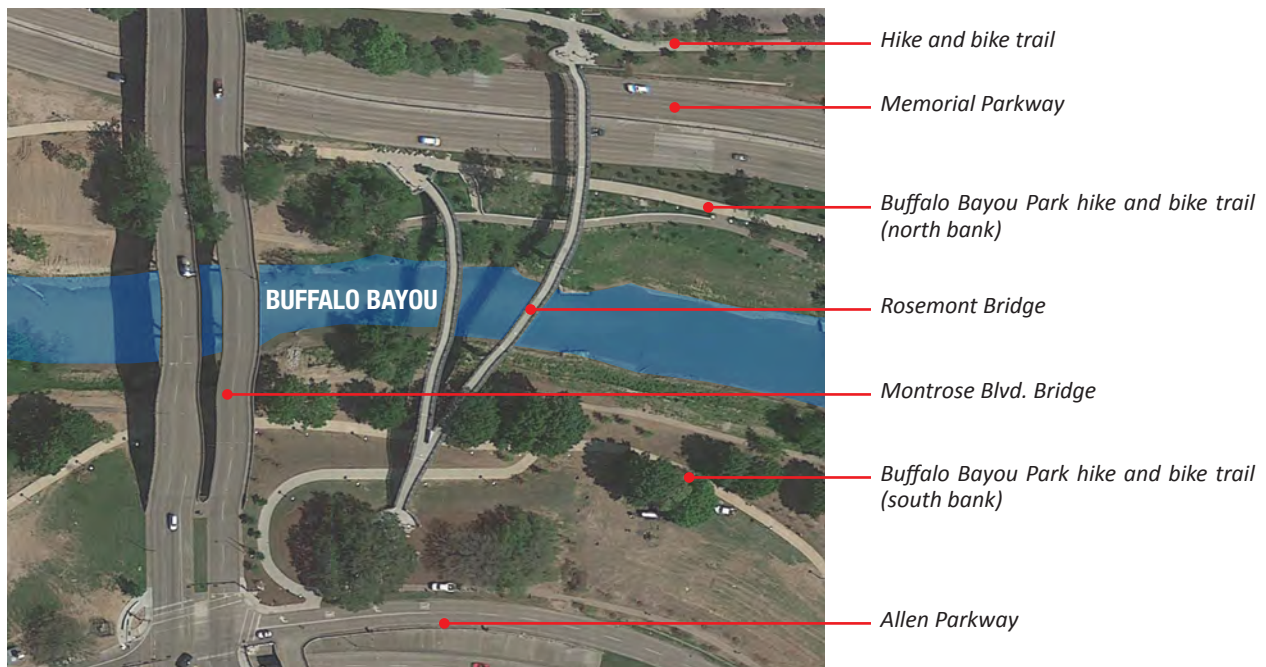
### Construction

Completed in 2011, this 780-foot long bridge is composed of seven structural sections which sit on concrete columns and drilled piers. The bridge deck is made of poured-in-place concrete. The guardrails are galvanized steel with lights for nighttime pedestrian safety. The project was completed in 12 months.

### Design

The design of the bridge was completed by local landscape architects SWA Group and German arts collaborative Elmgreen & Dragset. The wishbone-like shape of the bridge starts at the north of Memorial Parkway, crosses the freeway and the bayou to connect into the south bank trails, and then provides the option to cross back over the bayou to link into the north side of the bank trails. The zig-zag design also includes a gentle slope to better connect into the hike and bike trails. This design replaced a previous, and unpopular one, known as Tolerance Bridge, which was a metal bridge design with twirling forms and uninviting appearance.

The adjacent neighborhoods are rapidly developing, and the Buffalo Bayou Partnership is committed to improving access and the overall natural beauty of the bayou. The Partnership has created a master plan for the area, including more trails, a dog park and entertainment venue. The Harris County Flood Control District has provided \$5 million for improvements and the rest will come from private donors. The Kinder Foundation has recently donated \$30 million for the effort, a gift believed to be the largest ever given for a park project in Houston.



Plan View

### Fun Facts

- Total project cost: unknown (contact Estella Espinosa, (832) 395-7022)
- Design Firm/Team: SWA Group and Elmgreen & Dragset
- Construction Company: Millis Development & Construction
- Reason for implementation: to restore the natural beauty of and access to Buffalo Bayou - downtown beautification and economic development.

#### #4 - ROSEMONT BRIDGE (HOUSTON, TX)



*The Rosemont Bridge railings include hundreds of lights that illuminate the pathway at night and frame the view of downtown Houston's skyline.*



*The bridge crosses Memorial Parkway and the bayou and then zig-zags back to the north bank of the bayou to link in with both sides' hike and bike trails. A small plaza is provided at each "landing".*

#### #4 - ROSEMONT BRIDGE (HOUSTON, TX)



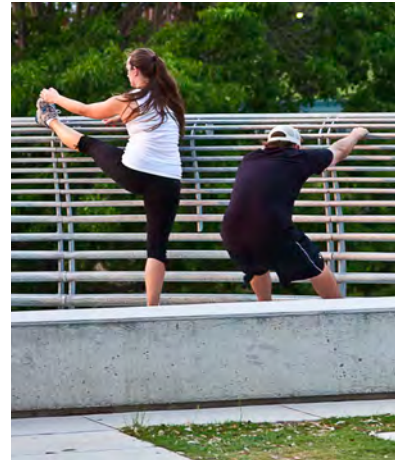
*The bridge railings are made of galvanized steel which contrasts with the corten steel truss structures.*



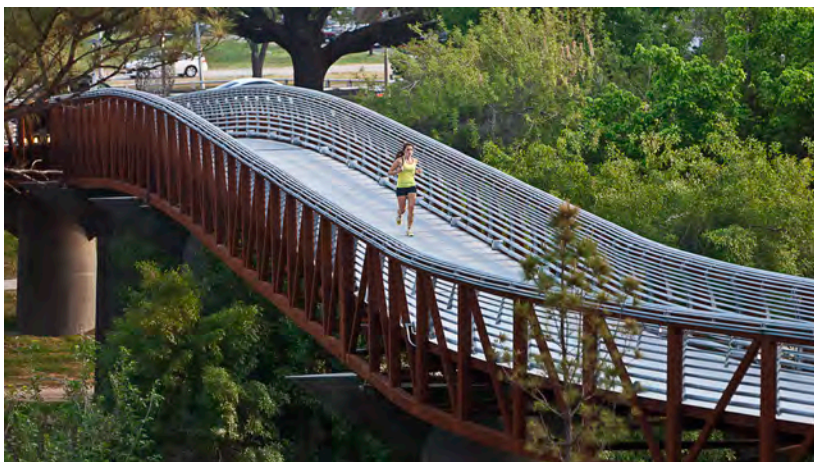
*The bridge is accessible and safe for strollers.*



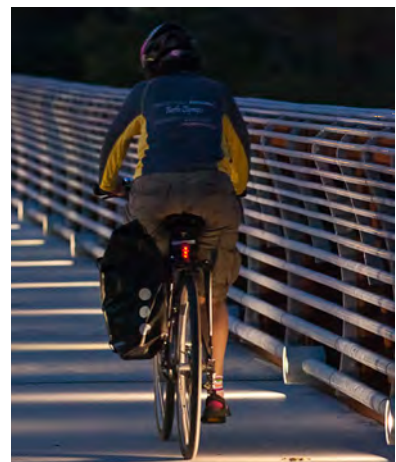
*The Tolerance sculptures, designed by Barcelona artist Jaume Plensa, add an artistic flair to the bridge landing.*



*The bridge is popular for jogging.*



*The striking contrast of texture and color of the materials used is a prominent design feature.*



*Bicyclists also heavily use the bridge.*

