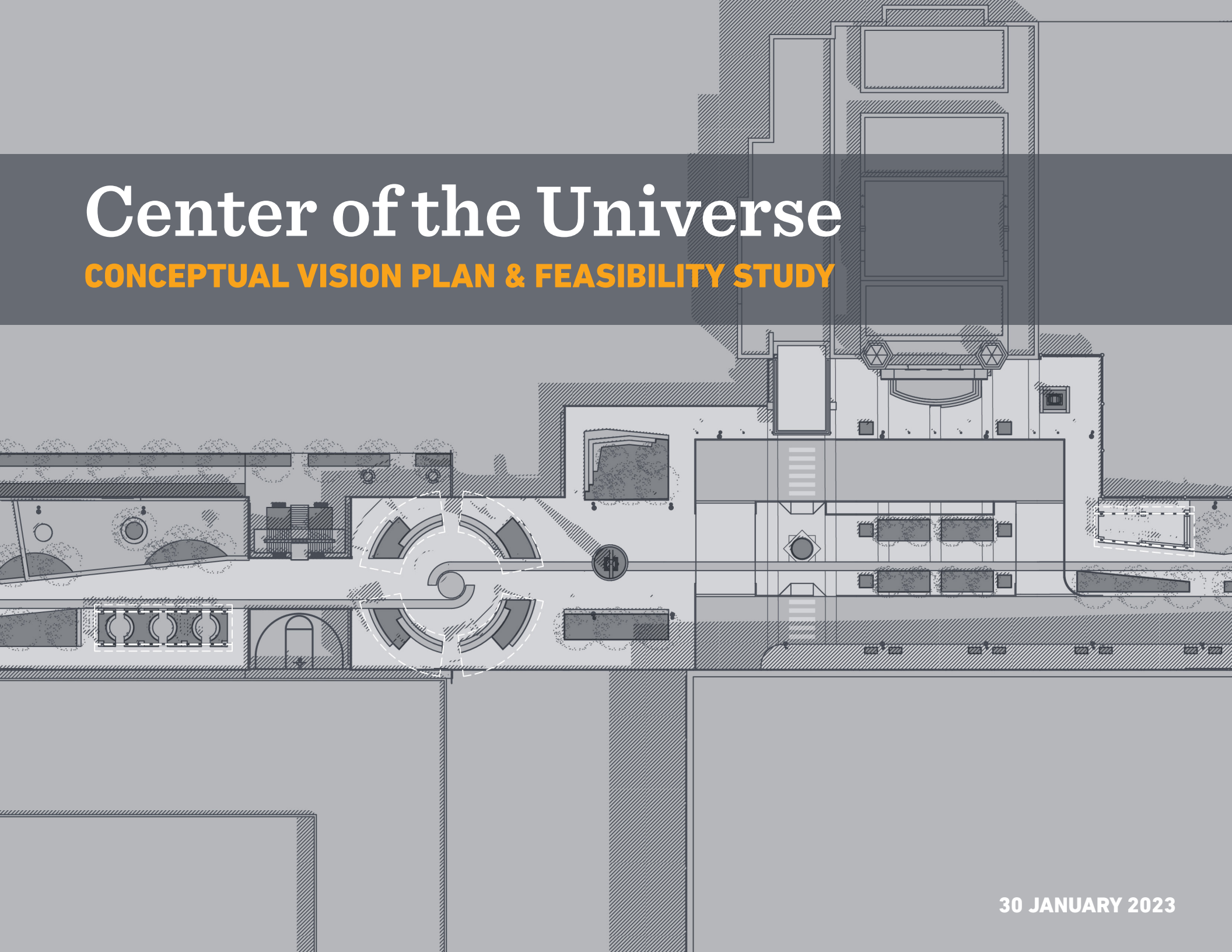
# Center of the Universe

## CONCEPTUAL VISION PLAN & FEASIBILITY STUDY



30 JANUARY 2023

# Acknowledgments


## Client

Downtown Tulsa Partnership

## Stakeholder Advisory Group

Downtown Tulsa Partnership

City of Tulsa

Tulsa Country

Tulsa Foundation for Architecture

Partner Tulsa

Williams Companies

Tulsa Community College

American Residential Group

Public Service Company of Oklahoma

AHHA

Garver Engineering

Comstara Development

We Are Moore

## Focus Group Participants

Oklahoma Jazz Hall of Fame

Visit Tulsa

Human Rights Commission

Greater Tulsa Area Indian Affairs Committee

COTU Festival

Bob Haozous

University of Oklahoma Students

George Kaiser Family Foundation

Tulsa Regional Chamber

Greenwood Main Street

Area Businesses

## Consultant Team

MKSK

Project / Design Lead

SELSER SCHAEFER ARCHITECTS

Design Collaboration / Local Architect

JEA ACOUSTICS Engineered Vibration Acoustic & Noise Solutions

Acoustic Features Analysis / Design Review

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# Introduction

## History & Importance to Tulsa

The Center of the Universe and the Boston Avenue Pedestrian Bridge is an iconic public space in the heart of downtown Tulsa. The existing plaza design was completed in the 1980s after a damaging fire, and this was also when the beloved acoustic anomaly was created.

At this time, the Boston Avenue Bridge was an important pedestrian connection for employees of the Williams company who occupied, then, One Williams Tower as well as the Union Depot building. Decades later, the Boston Avenue Bridge and Center of the Universe is the primary pedestrian connection between Tulsa's downtown business district and the Tulsa Arts District.

The mystery and phenomenon of the acoustic anomaly has made the Center of the Universe a first-day tourist destination for visitors to Tulsa.

## Continued Investment

There are also many accounts of engagements, weddings, and other memorable moments that Tulsans have experienced on the bridge over the years.

Over the course of 40 years, the Boston Avenue Bridge and public space has fallen into disrepair, While the City of Tulsa embarks on a maintenance project for the bridge structure, this Conceptual Vision Plan & Feasibility Study looks to reimagine the Center of the Universe and Boston Avenue Bridge so that it can continue to be enjoyed by Tulsans and visitors for years to come. The Conceptual Vision Plan strives to make the Center of the Universe a best-in-class public space while upholding the historical and cultural significance it has for Tulsa and beyond.

# PROJECT BACKGROUND

# In-Depth Inspection

## City of Tulsa

***In 2021 the City of Tulsa requested an inspection of the Boston Avenue Bridge to determine the feasibility of the Center of the Universe as an event destination.***

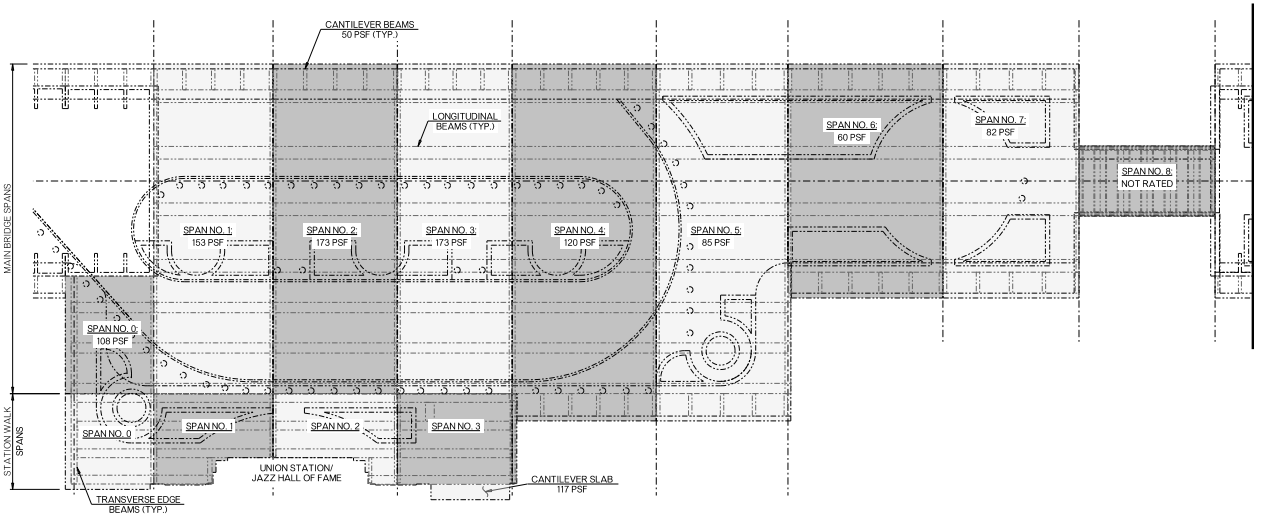
In 2021, the City of Tulsa engaged Garver Engineering in an in-depth inspection of the Boston Avenue Bridge over the BNSF railroad tracks. With the already popular Center of the Universe destination located above the bridge deck, there was a desire to determine the bridge's suitability as an event destination. The inspection explores the possibility of rehabilitating the bridge and extending its life span and studies the structure's ability to support additional pedestrian loading.

The bridge also serves as access to the Oklahoma Jazz Hall of Fame, which is located in the historic Union Depot building and a Tulsa Country parking structure. The inspection helps to determine the feasibility of the structure to continue to provide access to these businesses and to support their future needs.

The report concluded that below deck repairs to extend the life of the bridge would cost at least $4 million. These improvements would maintain the bridge but not improve the pedestrian loading or improve the pedestrian experience above the bridge deck.

## Pedestrian Loading Analysis

| Location | Span No. | Max. Pedestrian Load |
|---|---|---|
| Main Bridge - Longitudinal Beams | 0 | 108 psf |
| | 1 | 153 psf |
| | 2 | 173 psf |
| | 3 | 173 psf |
| | 4 | 120 psf |
| | 5 | 85 psf |
| | 6 | 60 psf |
| | 7 | 82 psf |
| Main Bridge - Cantilever Beams | | 50 psf |
| Station Walk Bridge - Transverse Edge Beams | 0 | 111 psf |
| | 1 | 19 psf |
| | 2 | 22 psf |
| | 3 | -7 psf |
| Station Walk Bridge - Longitudinal Beams | 0 | 148 psf |
| | 1 | 91 psf |
| | 2 | 116 psf |
| | 3 | 119 psf |
| Station Walk Bridge - Deck Slab | | 127 psf |
| Station Walk Bridge - Cantilever Slab | | 117 psf |



# Boston Avenue Bridge Rehabilitation

## City of Tulsa

***Following the In-Depth Inspection, the City of Tulsa developed plans to extend the life of the Boston Avenue Bridge with repairs to the bridge structure.***

Following the In-Depth Inspection Report, the City of Tulsa developed construction plans with Garver Engineering to extend the life of the Boston Avenue Bridge. The plans consist primarily of surface repairs to the below-deck structure including concrete repairs to columns, beams, and soffit, and expansion joint replacement. Above-deck repairs include pavement patches, floodcoating, and resurfacing the asphalt driveway.

The proposed improvements are intended to extend the life of the bridge, but will not increase pedestrian loading or improve the pedestrian experience. Improvements such as site lighting, landscaping, public art, or other amenities are not included in the construction project.

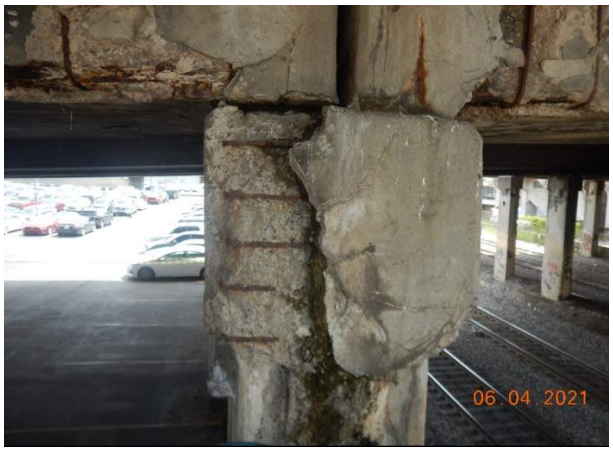
As of December 2022, the Pre-Mylar construction plans were being reviewed by the BNSF railroad with an anticipated bid date of February 2023.

**$4.14 Million**

Estimated Cost for Repairs

**15+ Years**

Estimated Extended Lifespan




Example of below-deck concrete to be repaired


Example of pavement to be patched / repaired

# Re-imagining the Center of the Universe

## Downtown Tulsa Partnership

***In 2022 the Downtown Tulsa Partnership began a community engagement and planning process to re-imagine the pedestrian experience on the Boston Avenue Bridge.***

In early 2022, the Downtown Tulsa Partnership kicked off a public engagement and planning process for the renovation of the Center of the Universe plaza with the goal of improving the pedestrian experience on the Boston Avenue Bridge. With an understanding of the City of Tulsa's Bridge Rehabilitation project, which primarily consists of below-deck structural improvements, the Re-imagining the Center of the Universe project explores the feasibility of above-deck surface improvements, pedestrian amenities, and programming. The project also looks at the long term viability of rehabilitating the bridge with history, community, and culture in mind.

As part of the feasibility study, a conceptual vision plan was developed to respond to community priorities and develop a budget for implementing the above-deck improvements. The City of Tulsa has identified capital funding for the improvements and the Downtown Tulsa Partnership is fundraising additional dollars to realize the vision for the Boston Avenue Bridge.

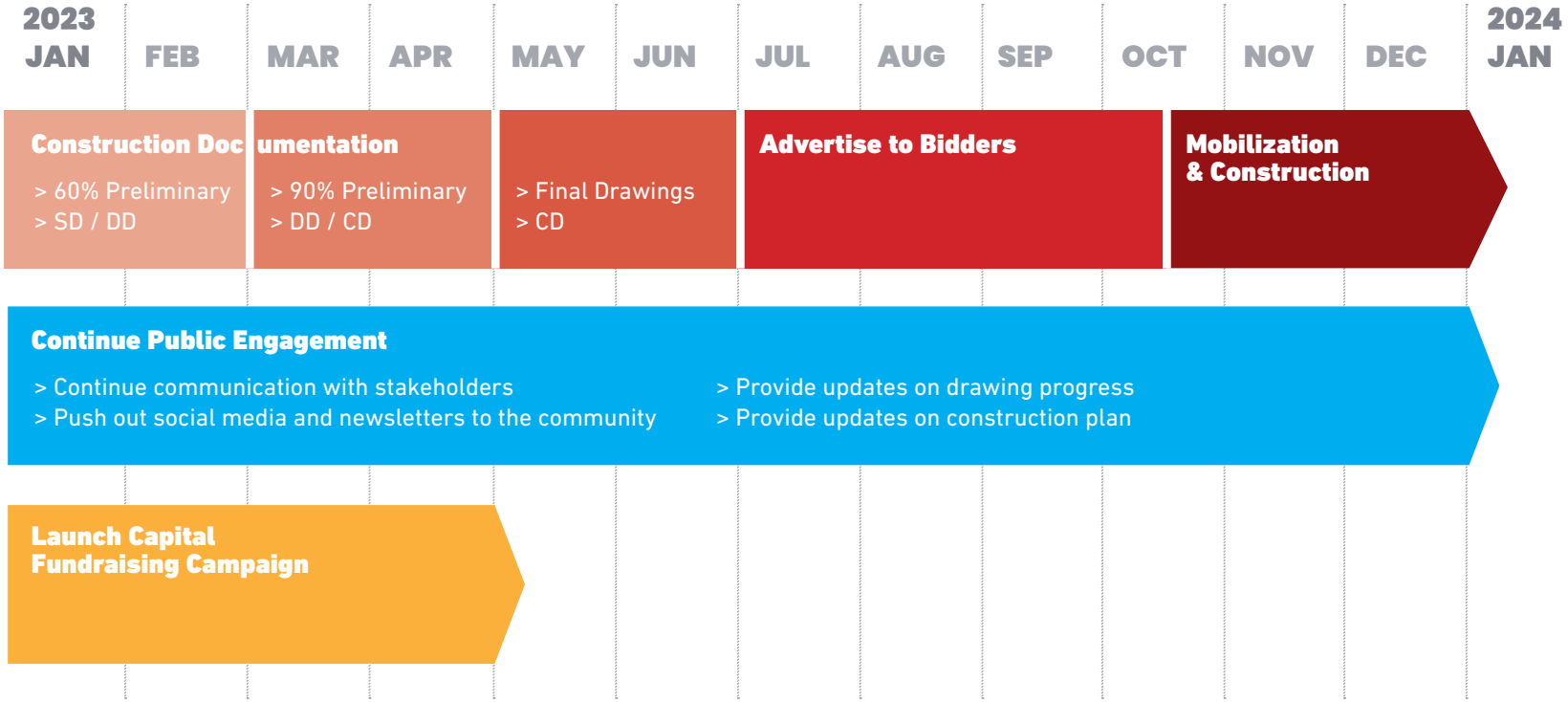
# Anticipated Timeline

# $3.25-6.25 Million

Estimated Plaza Improvements

# $.25 Million

Maintenance Reserve

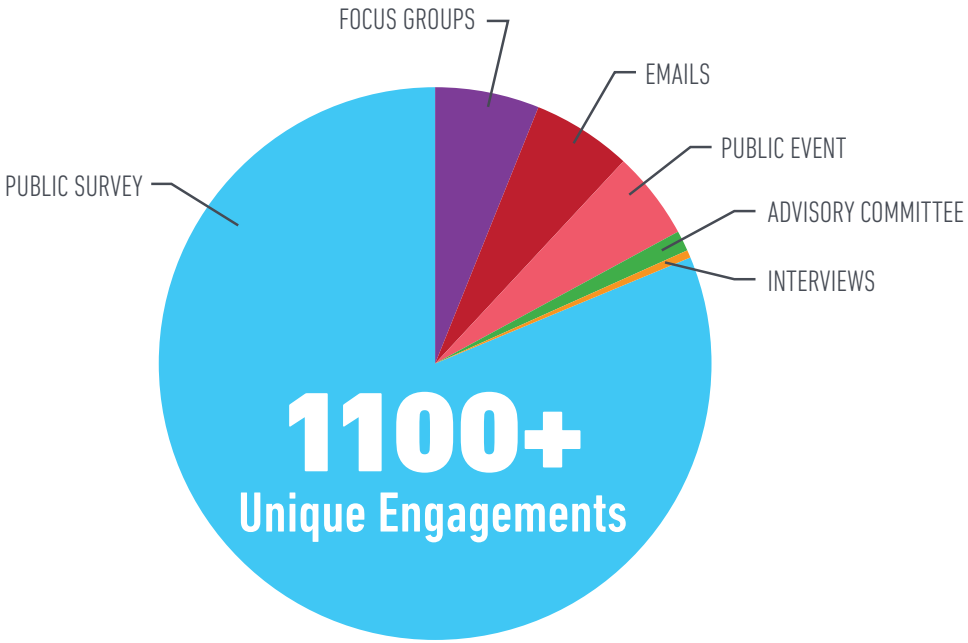


# COMMUNITY ENGAGEMENT

# Engagement Summary

Beginning in July 2022, the project team embarked on a multi-faceted public engagement process that gathered feedback specific to the proposed conceptual vision plan design. The greatest number of touchpoints were from an online public survey that ran from October to November. The survey, which was promoted through television, radio, and newspaper outlets received nearly 1000 responses. Focus groups that included key stakeholders were brought together several times for in-person and virtual touchpoints. The Downtown Tulsa Partnership also continues to receive many unsolicited emails from individuals who are interested in the project.

All of these unique engagements help to paint a picture of the unique place that the Center of the Universe holds in the lives of Tulsans and the history of Tulsa.

The walkway is a portal to the Tulsa Arts District

I love the idea of making this space a little more green and usable

There should be more spaces to sit and enjoy the sights, sounds, and great weather of downtown Tulsa

The historical and cultural story is currently missing on the site

Lighting for safety and to enhance the experience

It's about connecting people and creating community

Selfie worthy spots would be nice for promoting Tulsa!

# Community Priorities

## PRIORITIZE PEDESTRIANS

What is now a shared space amongst cars, scooters, walkers, bikes is overwhelmingly believed to be capable of better serving pedestrians and prioritizing walking as dominant use.

## CELEBRATE ART & CULTURE

The bridge is an asset for the Arts District and Historic Greenwood community. It is also an iconic and recognizable asset within the arts and cultural expression community of Tulsa – the redesign should inherit this creativity.

## PRESERVE THE ANOMALY

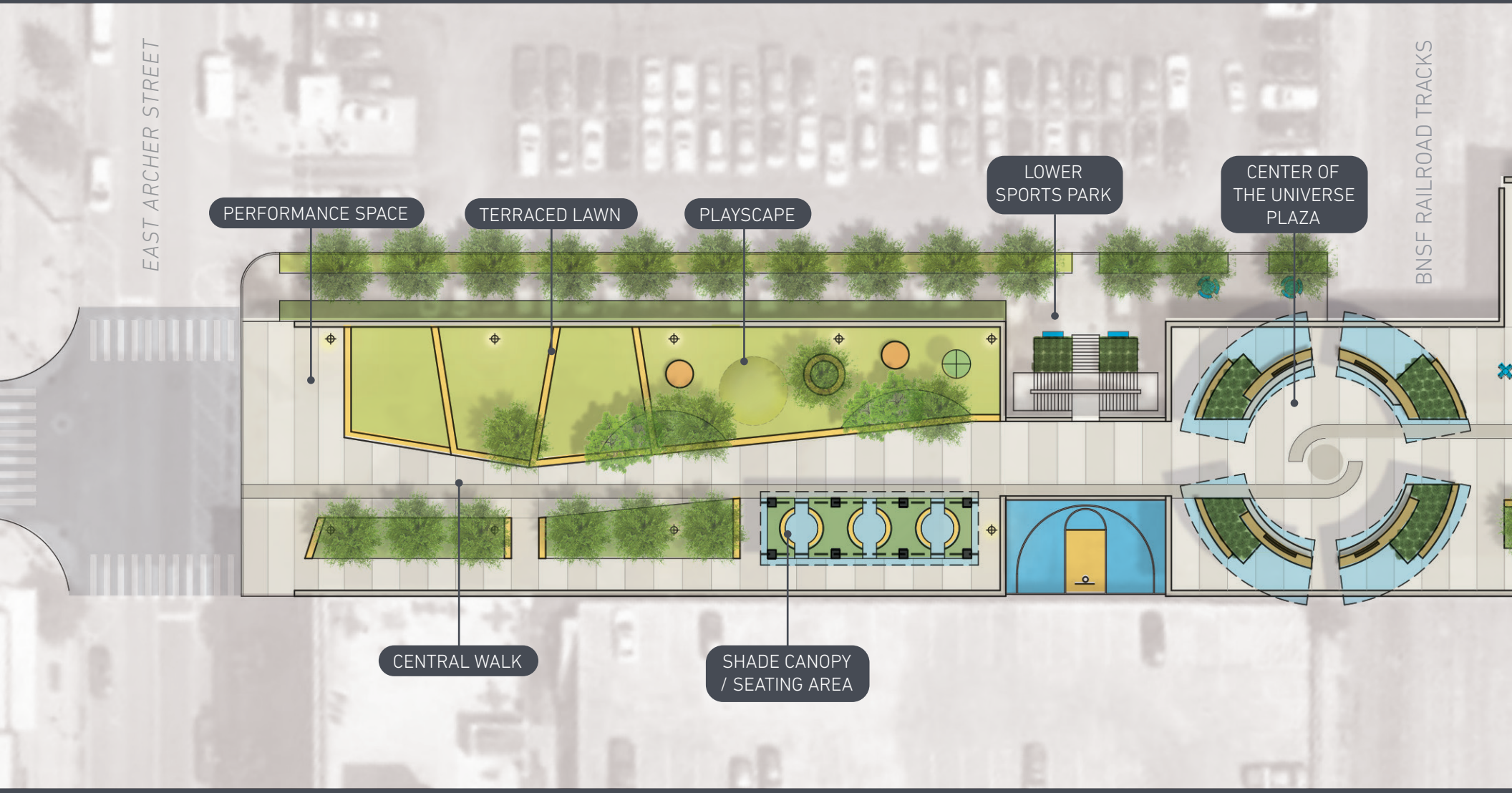
The acoustical attributes have made this space iconic to locals, but there are a range of ways to invite others to the experience through education, gaming and play, and wayfinding both in and around the bridge.

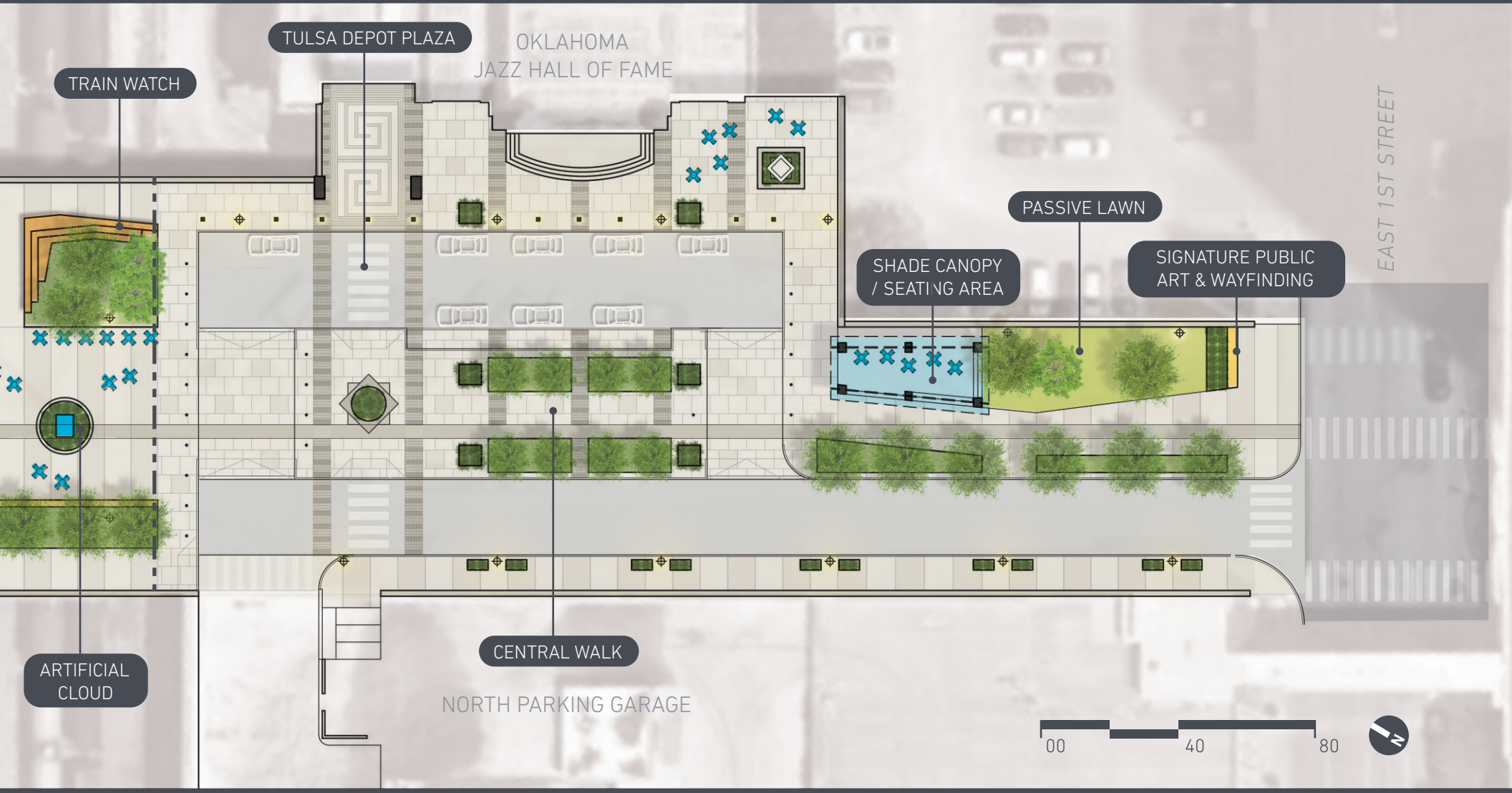
## PROVIDE CREATURE COMFORTS

The bridge should be better adapted to the comforts we all seek as humans: shade, seating, water, lighting, safety, refuge, rest, and play for children!

# VISION PLAN

# Vision Plan


EAST ARCHER STREET
BNSF RAILROAD TRACKS
PERFORMANCE SPACE
TERRACED LAWN
PLAYSCAPE
LOWER SPORTS PARK
CENTER OF THE UNIVERSE PLAZA
CENTRAL WALK
SHADE CANOPY / SEATING AREA


TULSA DEPOT PLAZA
OKLAHOMA
JAZZ HALL OF FAME
TRAIN WATCH
PASSIVE LAWN
SHADE CANOPY
/ SEATING AREA
SIGNATURE PUBLIC
ART & WAYFINDING
EAST 1ST STREET
ARTIFICIAL
CLOUD
CENTRAL WALK
NORTH PARKING GARAGE
00
40
80
N

# Vision Plan Components & Design Features

### Center of the Universe Plaza

Preserved feature walls that create the beloved acoustic effect at the Center of the Universe Plaza

### Pedestrian Connection

A dedicated and safe pedestrian path from E 1st Street to E Archer Street

### Creature Comforts

Amenities such as shade, seating, places to play, and places to relax

### Art & Culture

A celebration of existing art, history, and culture including the Artificial Cloud, and dedicated places for new public art

### Lighting

Upgraded site lighting so the Boston Avenue Bridge is safe and vibrant at all times of day or night

### Identity & Wayfinding

Dedicated places for new signage that identifies the Center of the Universe and directs visitors to attractions like the Tulsa Arts District

### Planting

Sustainable, native, and indigenous planting that can be easily maintained for many years

### Train Watch

Places to watch trains pass under the bridge and celebrate the rich history of the Tulsa Union Depot

### Food Trucks

Dedicated places for food trucks and local vendors to conduct business

### Concerts & Events

Places to host small to medium public events and support the programming needs of the Oklahoma Jazz Hall of Fame


MLK JR BLVD
Oklahoma Jazz
Hall Of Fame
LOADING
North Parking Garage
E 1ST STREET


PARK
S. Boston Ave

## South Approach

The south approach is a shared space for vehicles and pedestrians. A row of shade trees and ornamental plantings provide separation between the uses. The brick "link" pavement design is restored in place and leads pedestrians toward the Artificial Cloud and Center of the Universe. The South Approach is open to East 1st Street and will be a prominent place for wayfinding and large-scale public art. A passive lawn area and shade structure provide creature comforts for visitors while maintaining open views to the Tulsa Union Depot.

> **"The more trees and plants, the better. Make it a place people want to stop and sit for a bit."**

## North Approach

Where the Boston Avenue Bridge meets E Archer Street, the North Approach is an extension of the Tulsa Arts District. A terraced lawn is a venue for small performances and public events. The North Approach also includes updated site lighting, bench, seating, and an area for children to run and play. Shade tree plantings and a covered seating area provide for a comfortable experience for visitors to the Center of the Universe.

> **“I’m excited to see this area re-imagined and draw even more people and events!”**

## Center of the Universe Plaza

The Center of the Universe Plaza is re-imagined as a destination on the Boston Avenue Bridge. The original concrete feature walls are protected in place to preserve the mystery and phenomenon of the acoustic anomaly. This plan proposes two options for the Center of the Universe Plaza: an option with an architectural shade canopy that frames the feature walls and an alternate with a signature light feature floating above the circular plaza area.

Ornamental planting, additional seating areas, new plaza pavement, and site lighting are among the many improvements proposed for the Center of the Universe Plaza.

> **“Shade is important. That and the new trees are the most appealing aspects of the new design.”**

# COTU Plaza Alternates

## OPTION 1

Architectural Shade Canopy

An architectural shade canopy frames the interior walls and articulates the circular shape of the plaza upward. Along with providing shade on hot summer days, the shape of the Center of the Universe can be seen from afar from the approaches on East 1st and Archer Streets.

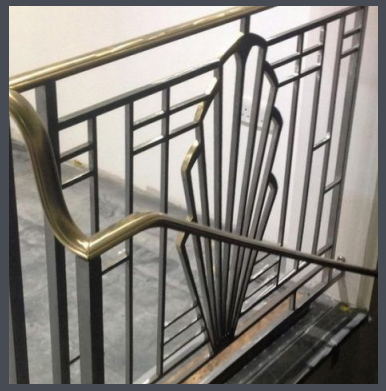

# OPTION 2

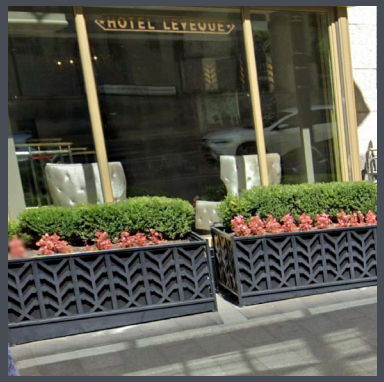
## Signature Lighting Feature

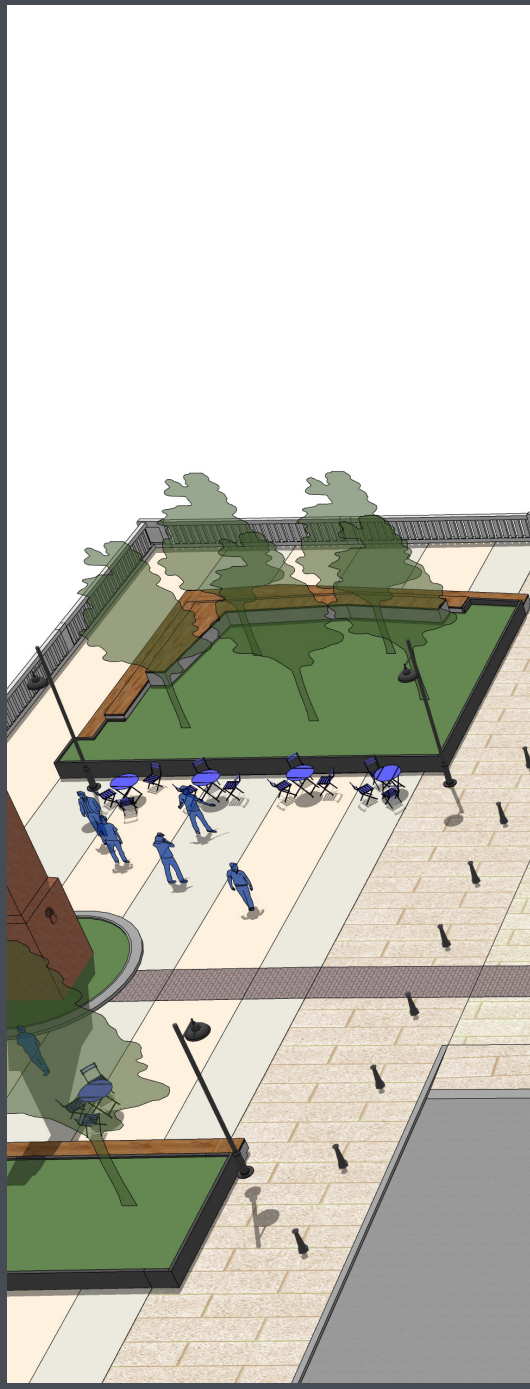
A signature lighting feature is suspended from a supporting structure and floats above the circular plaza. This option will be subtle during the day, but at night it will provide a light that traces the shape of the feature walls and announces the location of the acoustic phenomenon.


# Tulsa Depot Plaza

- Celebrate the historic Tulsa Union Depot architecture
- Provide a high quality pedestrian experience for visitors to the Oklahoma Jazz Hall of Fame and the Center of the Universe
- Provide accessible parking spaces for Jazz Hall of Fame
- Provide loading / valet lane for Jazz Hall of Fame




ART DECO DETAILS
ORNAMENTAL LIGHTING
GEOMETRIES RELATE TO ARCHITECTURE
ART DECO SCULPTURE
RICH HARDSCAPE MATERIALS
ORNAMENTAL PLANTING
MAINTAIN CENTRAL PATHWAY
TULSA UNION DEPOT

# DESIGN FEATURES & GUIDING PRINCIPLES

# Acoustic Feature & Phenomenon

An acoustic anomaly is an occurrence that can be found throughout the built environment in both architecture and landscape. Like Tulsa's Center of the Universe, the most well known acoustic anomalies occur in civic spaces and are known as whispering walls or echo spots, and they become mysterious spectacles and tourist destinations.

## Acoustic Focusing

The unique echo effect that visitors experience at the Center of the Universe is an example of acoustic focusing. There are different types of acoustic focusing depending on the type of surface the sound is bouncing off of (reflection, anti-focusing, and focusing). At the Center of the Universe, sound waves reach the hard, curved surfaces of the feature walls, which are a focusing surface, and are bounce back to the center of the plaza, creating a hot spot. The proximity of the human mouth to ear is also a factor in experiencing the echo effect -- and the reason why the echo is experienced by the speaker and not by bystanders.

## Preservation

The acoustic anomaly at the Center of the Universe would not exist without the curved walls and hard, non-porous materials of the plaza, so this conceptual vision plan preserves those features and builds on the plaza in ways that will not alter, dampen, or interfere with the elements that create the beloved acoustic effect.

### Whispering Wall Anomalies

National Statuary Hall | Washington DC


Grand Central Terminal | Manhattan NY

### Echo Effect Anomalies

Pioneer Courthouse Square | Portland OR

Mystery Spot | Lake George NY

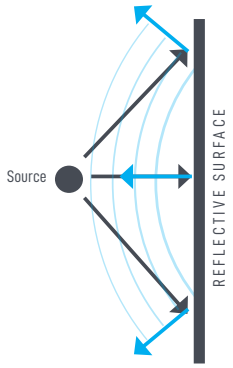
# Acoustic Feature & Phenomenon

## GUIDING PRINCIPLES

- Preserve the curved feature walls that create the echo effect
- Maintain hard, non-porous surfaces in the plaza
- Build on the plaza in ways that will not alter, dampen, or interfere with the elements that cause the echo effect

### Sound Reflection

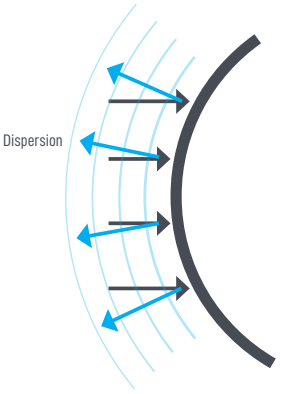
Sound waves are reflected from a surface similar to light waves from a shiny surface or prism




Example: The straight, parallel and perpendicular walls of a gymnasium reflect sound and create an echo

### Anti-Focusing Surface

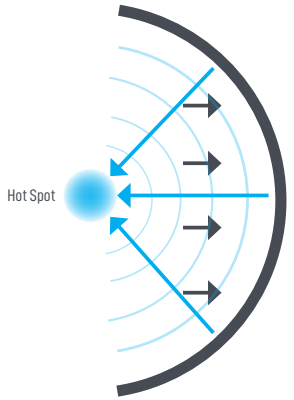
Convex or angled surfaces disperse reflecting sound waves outward and produce a more even sound




Example: An auditorium has convex or angled walls to project sound evenly and avoid echoes

### Focusing Surface

Concave surfaces focus the reflecting sound waves inward and produce "hot spots"




Example: This is the phenomenon that is experienced at the Center of the Universe

# Acoustic Report Summary

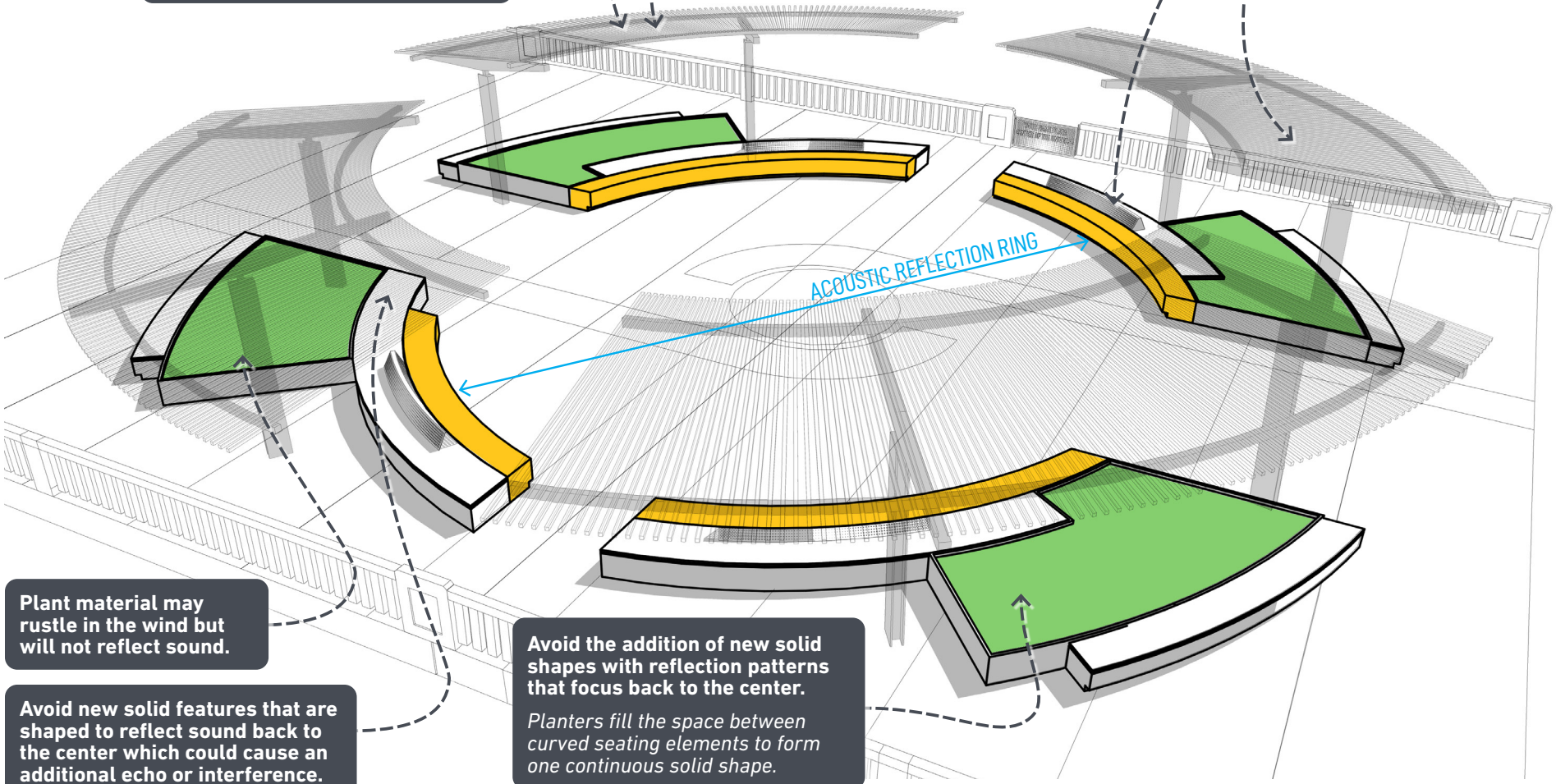
**Avoid new features that could generate noise (parts moving, squeaking, whistling, rustling).**

*Shade structure will have stiff features, avoiding fabric or features that are not rigidly fixed.*

*The shade structure is outside of the acoustic reflection ring and unlikely to affect the acoustic feature.*

**New features outside of preserved seat walls could provide new and different reflection that muddles existing feature.**

*Overhead structure, seat backs, and other features will have at least 22% perforation.*




**Plant material may rustle in the wind but will not reflect sound.**

**Avoid new solid features that are shaped to reflect sound back to the center which could cause an additional echo or interference.**

**Avoid the addition of new solid shapes with reflection patterns that focus back to the center.**

*Planters fill the space between curved seating elements to form one continuous solid shape.*

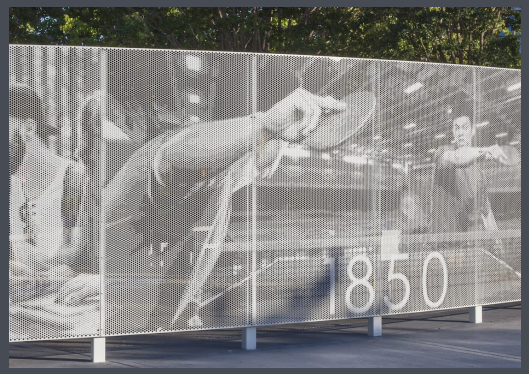
# Artificial Cloud

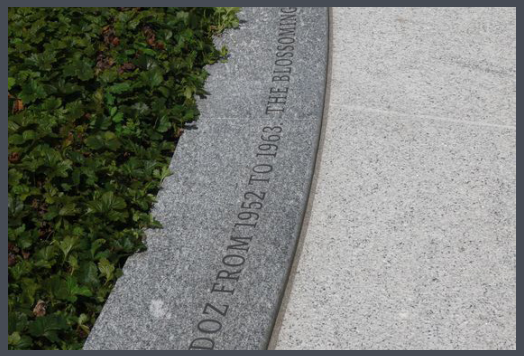
## Bob Haozous | Apache Sculptor

- The Artificial Cloud represents the delicate balance between man's use of technology and its impact on the environment
- The sculpture's location is historically the demarcation line between "white" and "black" Tulsa
- The metal material is intended to weather and deteriorate, representing degradation of the environment

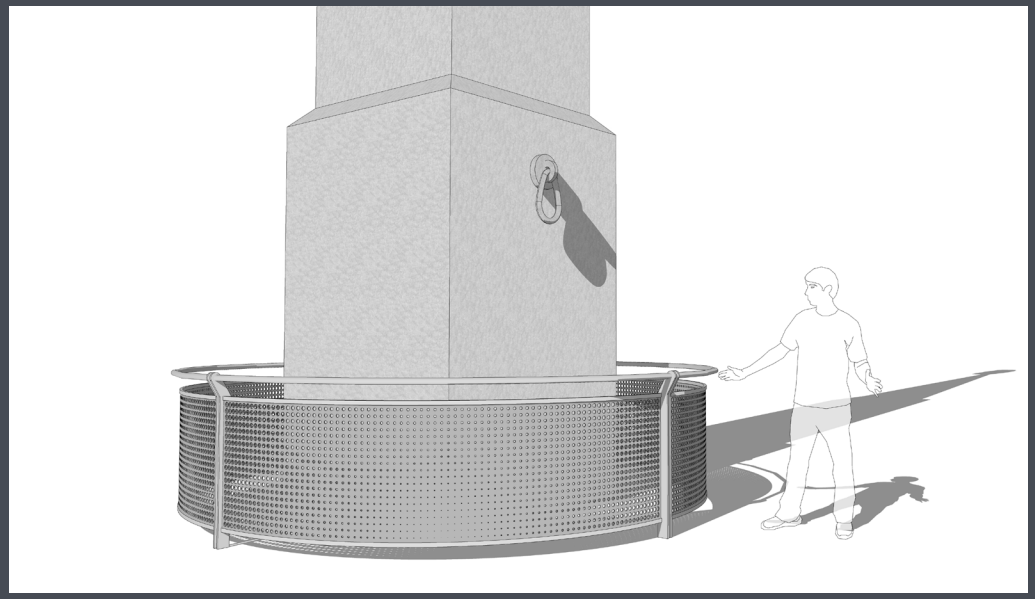
## GUIDING PRINCIPLES

- Protect the Artificial Cloud in place
- Provide history and context through environmental graphics that do not compete or take away from the sculpture
- Study methods for discouraging the use of the “gong”
- Protect the sculpture from vandalism




Curbed Planter Option

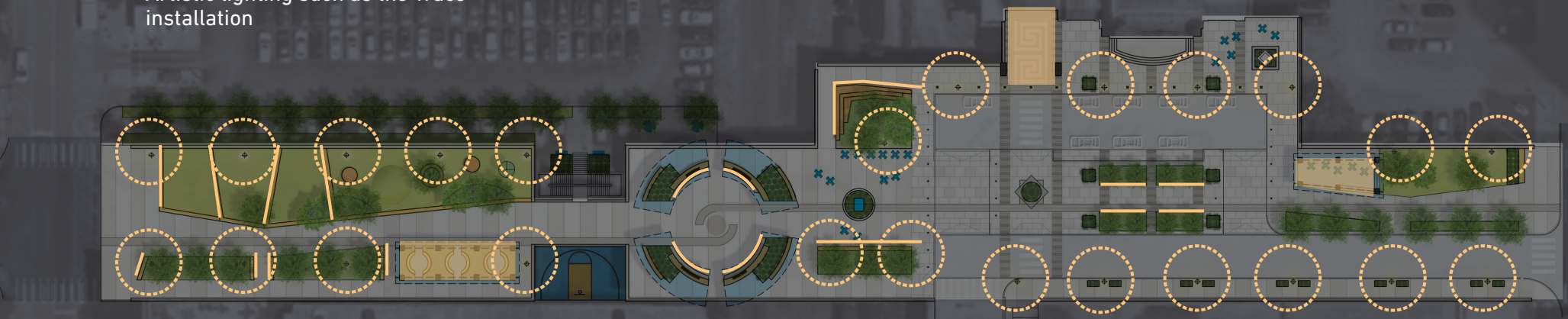


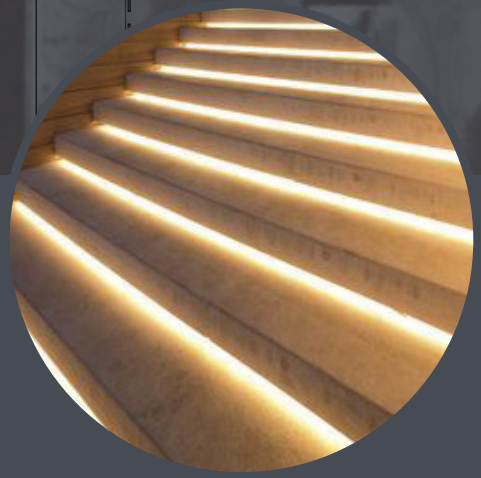
Decorative Rail Option

# Lighting

## GUIDING PRINCIPLES

- Upgraded site lighting that makes the Boston Avenue Bridge a safe route and destination at all hours of the day and night
- Lighting that highlights the unique features of the site including the Tulsa Union Depot, the Artificial Cloud, and the Center of the Universe
- Artistic lighting such as the Trace installation



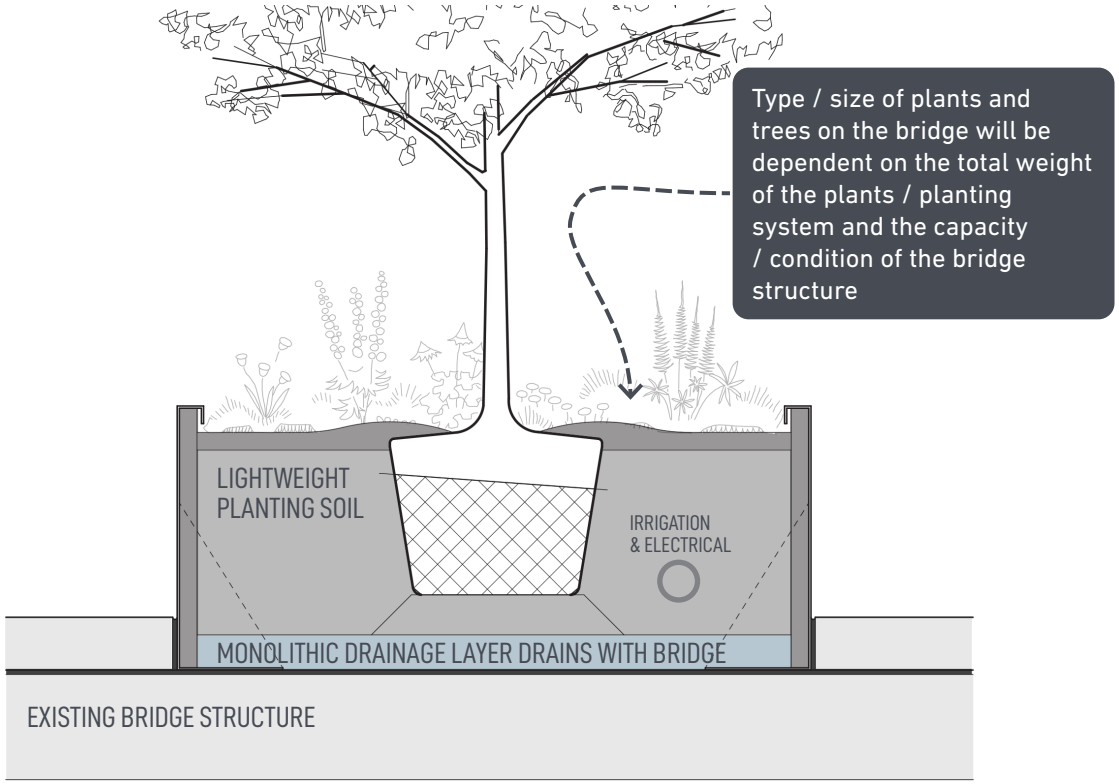


# Planting

## GUIDING PRINCIPLES

A planting showcase for Tulsa:

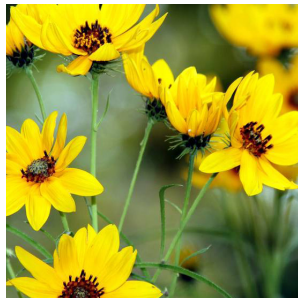
- Indigenous plants
- Native / environmental qualities including prairie grasses and pollinators
- Plants with sensory qualities that appeal to the senses of touch, sight, and smell
- Small ornamental trees such as the Eastern Redbud





Eastern Redbud


Little Bluestem


Willow Leaf Sunflower


Muhly Grass


Russian Sage

# Shade

## GUIDING PRINCIPLES

- Provide shade in multiple locations throughout the site
- Timeless architecture should relate to the Boston Avenue Bridge structure and the Tulsa Union Depot

Example Architectural Shade Structure

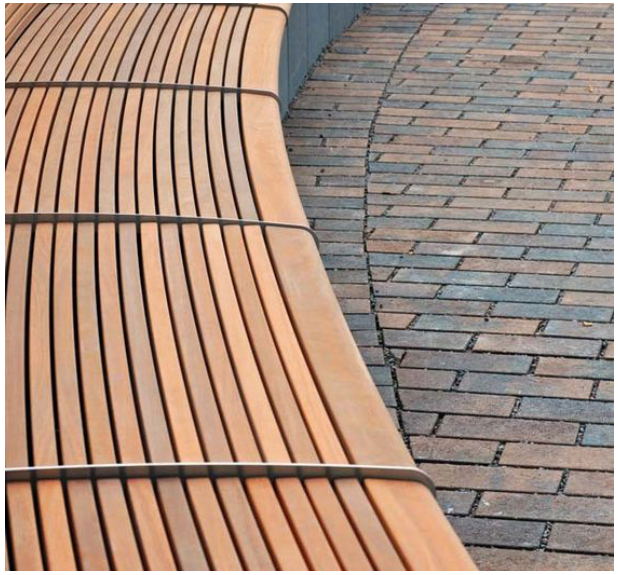

South Approach

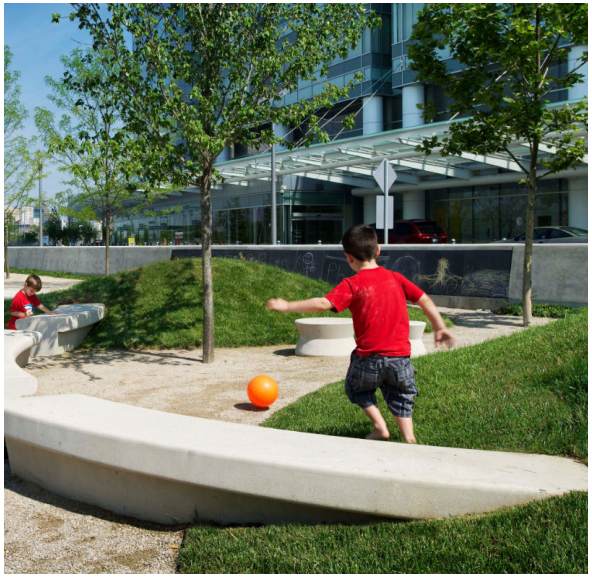
North Approach

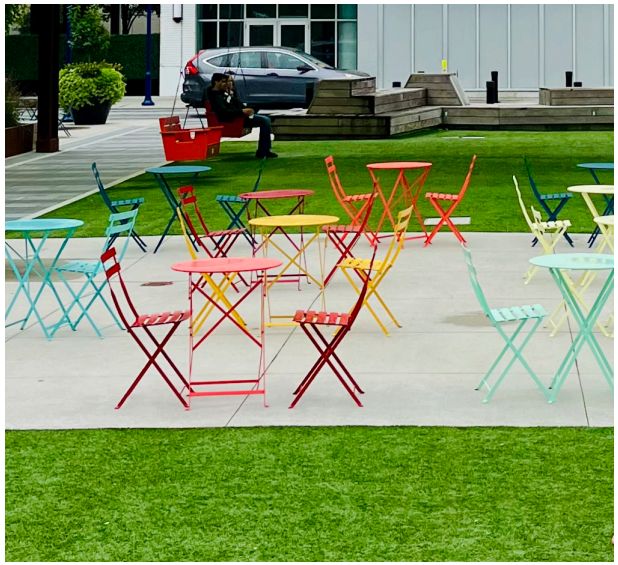
# Sitting & Gathering

## GUIDING PRINCIPLES

- Provide high quality and inviting fixed seating
- Program spaces with furniture during pop up events
- Places for different age demographics
- Places for different sized groups including small to medium-sized gatherings and individuals
- Bench designs that discourage vandalism and wear and tear







# Play Area

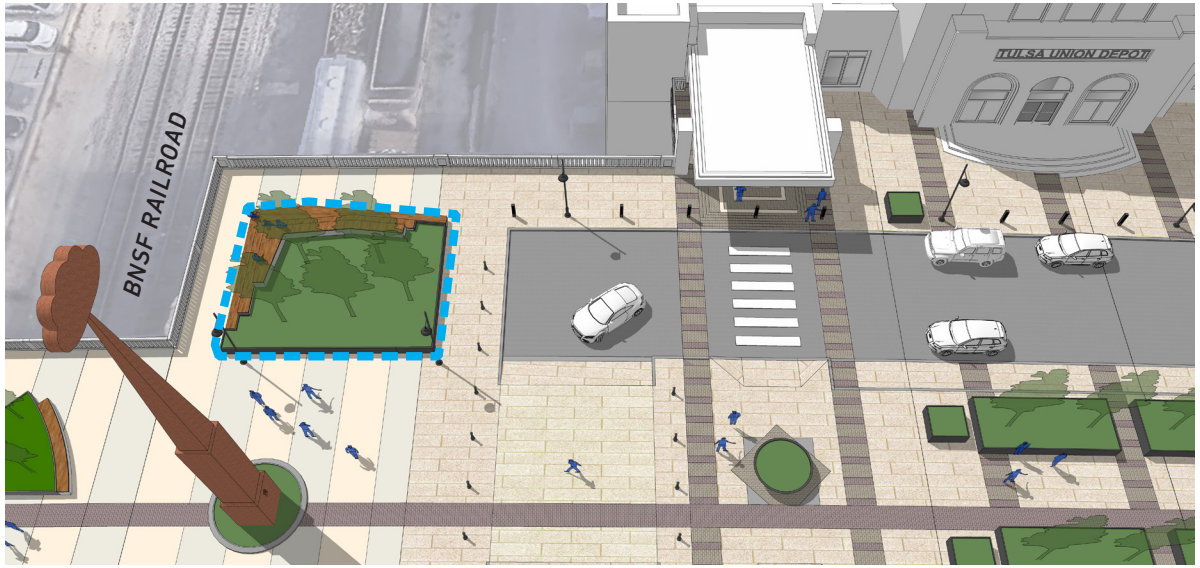
## GUIDING PRINCIPLES

- Fun and imaginative spaces for all
- Play elements that fit into the context of the Center of the Universe and the broader Tulsa Arts District
- Elements that appeal to the senses and add to the idea of phenomenon of the Center of the Universe

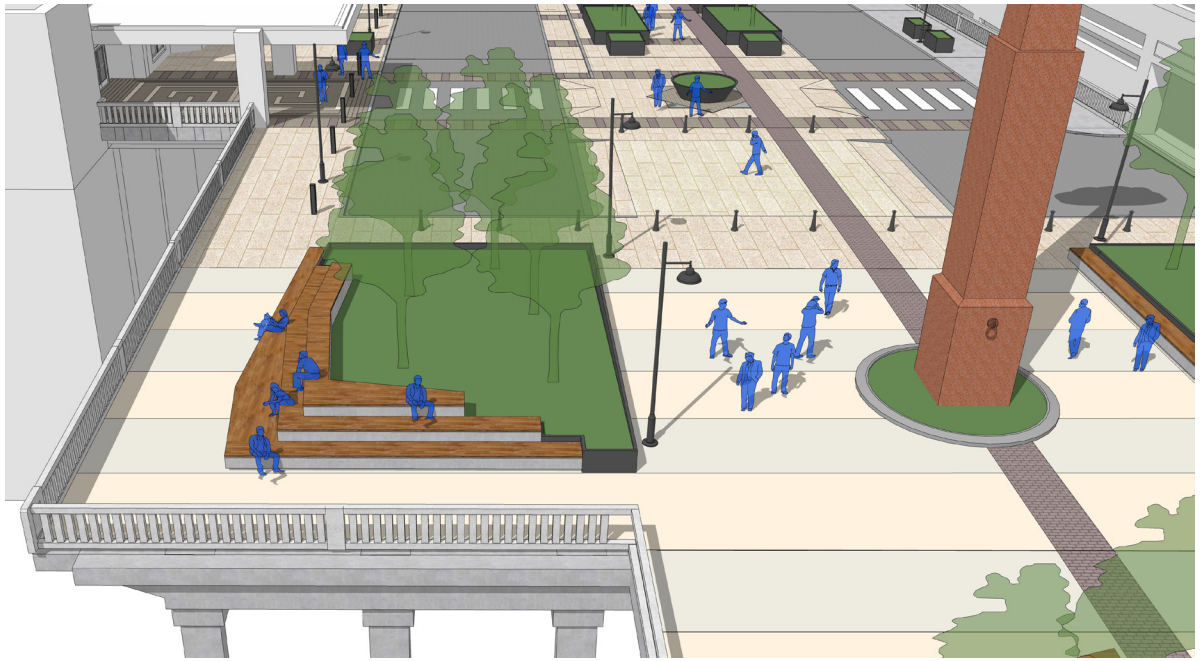
# Train Watch

## GUIDING PRINCIPLES

- A passive area above the BNSF railroad tracks to watch passing trains and celebrate the history of the Tulsa Union Depot
- Stepped seating that provides views above the existing balustrade
- Seating that can accommodate individuals or groups




Looking East

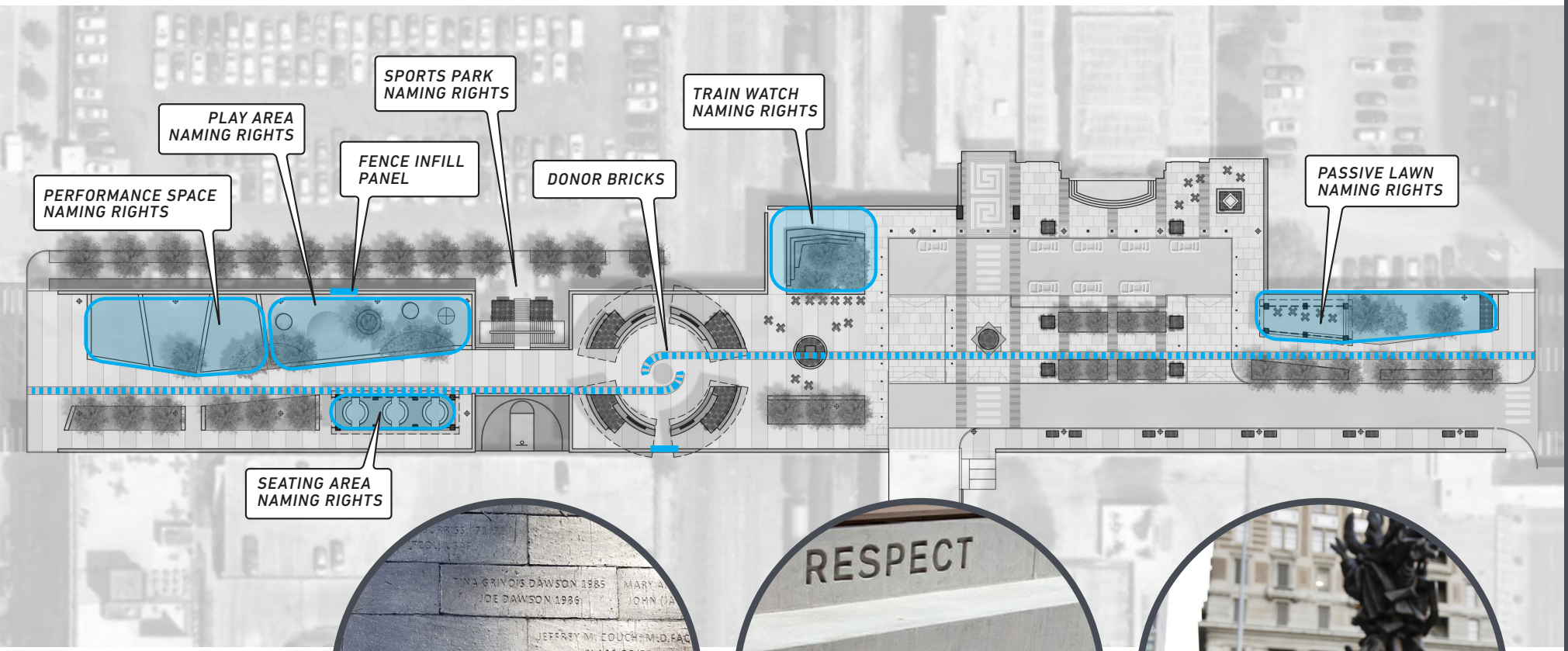


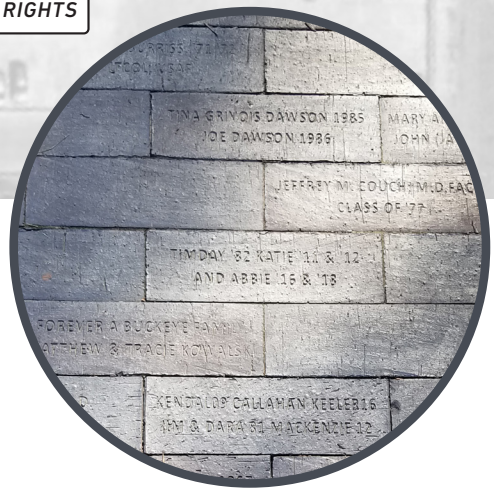
Looking South

Example Stepped Seating


# ADDITIONAL OPPORTUNITIES

# Donor Opportunities

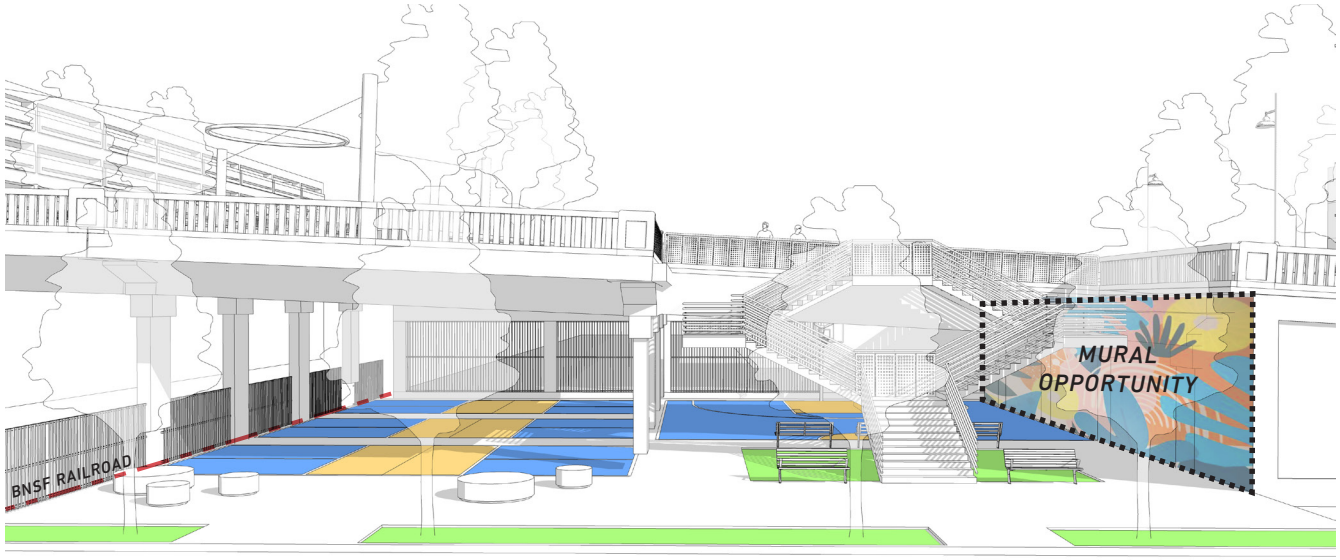




# Lower Sports Park

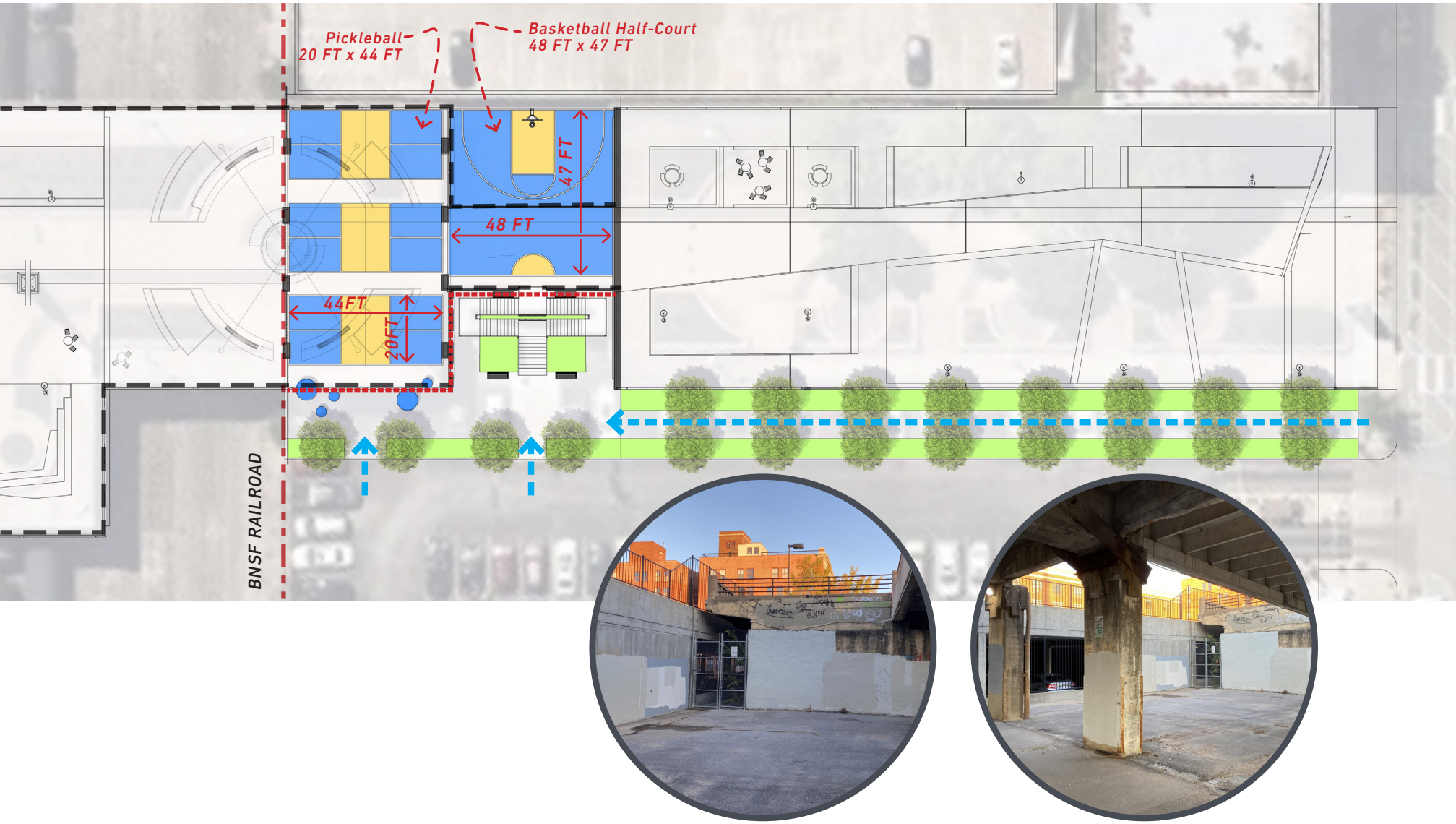
- Utilize the area beneath the Boston Avenue Bridge, north of the BNSF railroad tracks for community recreation space
- This space could include sports courts, dog agility areas, murals and / or sculpture
- Lighting, access control, and safety will be a priority in the design of this space
- This concept includes the repurposing of one entire row of parking into a pedestrian path to provide access to the space




Triborough Bridge Playground | New York NY

Waterfront Park | Mount Pleasant SC

Dog Park East River Esplanade | Manhattan NY

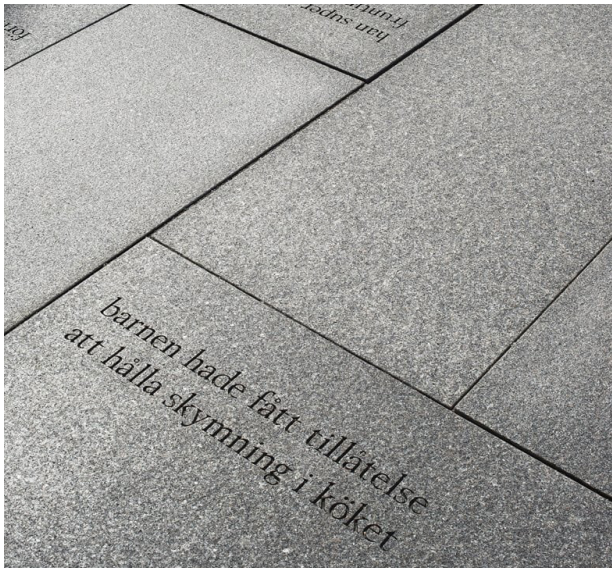

Pickleball
20 FT x 44 FT
Basketball Half-Court
48 FT x 47 FT
47 FT
48 FT
44FT
20FT
BNSF RAILROAD

# Future Art & Design Elements

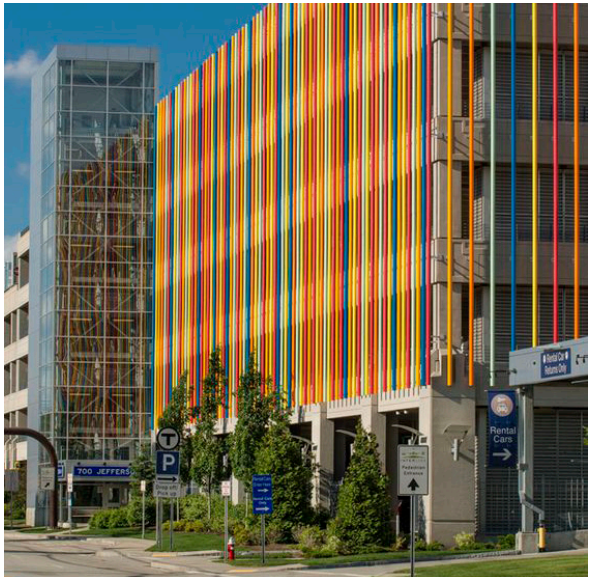
The Boston Avenue Bridge has been an evolving platform for public art throughout it's lifespan and will continue to be a canvas for various mediums. Future public art and activations will come to the bridge through public private partnerships. Through the public engagement process, many future opportunities for public art were discussed for the bridge including:

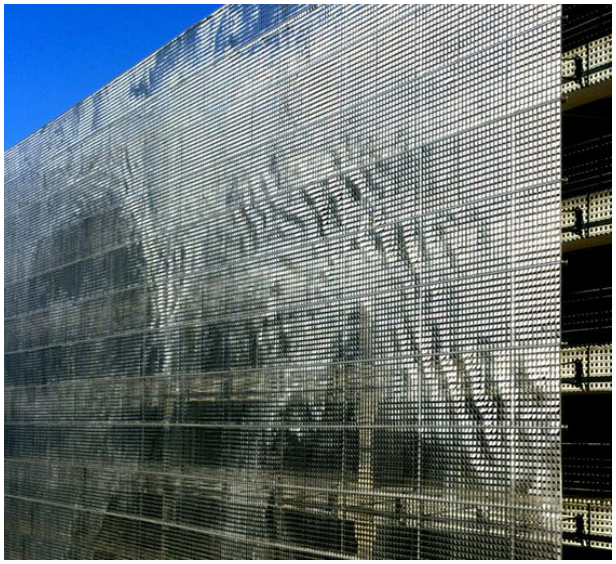
- Parking Garage Façade enhancements
- Art and activations that build on the mystery and phenomenon of the Center of the Universe -- art that can be experienced in unique ways that engage the senses
- Installations that provide a sense identity / arrival to the Center of the Universe and the Tulsa Arts District
- Art and activations that allow for "selfie" moments
- High quality Art Deco architectural elements and sculpture
- Artistic wayfinding and environmental graphics that tell the unique history of the Boston Avenue Bridge, the Tulsa Arts District, and the Tulsa Union Depot.
- Lighting elements such as the Trace light installation
- Public events on the Boston Avenue Bridge




barnen hade fått tillåtelse
att hålla skymning i köket

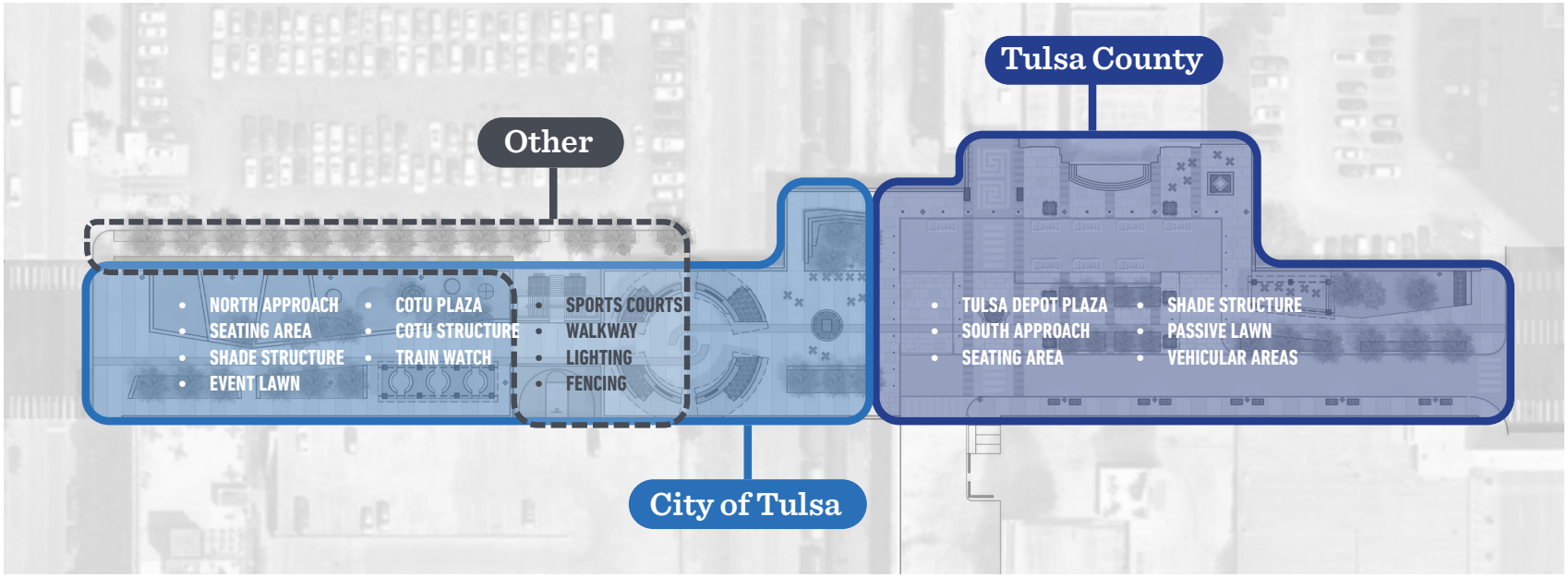

HOPE





# CONCEPT ESTIMATE

# Estimate Summary




## OVERALL ESTIMATE SUMMARY

| | |
|---|---|
| Tulsa County Base Bid<br>Portion of pedestrian bridge work within Tulsa County | $2,321,820 |
| City of Tulsa<br>Portion of pedestrian bridge work within City of Tulsa | $3,523,787 |
| Sports Courts<br>Portion of work in the Bank of Oklahoma parking lot | $454,751 |
| Overall Project Total Cost | $6,300,358 |

# City Portion

## Center of the Universe
Concept Estimate

***Prepared by:***
*MKSK*

Date: 12/12/2022
Project: Center of the Universe in Tulsa, OK

### OVERALL ESTIMATE SUMMARY

| Item | Ext. | Description | | Total Cost |
|---|---|---|---|---|
| ***Tulsa County Base Bid*** | | | | |
| | | Portion of Pedestrian Bridge work within Tulsa County | $ | 2,321,820.05 |
| ***City of Tulsa Base Bid*** | | | | |
| | | Portion of Pedestrain Bridge work within the City of Tulsa | $ | 3,523,787.30 |
| ***Sports Courts*** | | | | |
| | | Work within the City of Tulsa | $ | 454,751.00 |

**COST SUMMARY**

Refer to attached sheets for itemized breakdown.

**Overall Project Total Cost $ 6,300,358.35**

**General Notes**

*UNIT PRICE VALUES DERIVED FROM RECENT BID PRICING AND MKSK ASSUMPTION OF WORK EFFORT REQUIRED.*
*MKSK HAS NO CONTROL OVER THE COST OF LABOR, MATERIALS, OR THE CONTRACTORS METHODS OF DETERMINING BID PRICES, OR OVER COMPETITIVE BIDDING OR MARKET CONDITIONS. THEREFORE, MKSK CANNOT GUARANTEE THAT BIDS OR CONSTRUCTION COST WILL NOT VARY FROM ANY ESTIMATES OF PROBABLE CONSTRUCTION COST PREPARED BY THEM.*



## Center of the Universe, Tulsa
Concept Estimate

***Prepared by:***
*MKSK*

Date: 12/12/2022
Project: Center of the Universe - Boston Avenue Pedestrian Bridge

### City of Tulsa's Portion of the Pedestrian Bridge Improvements

| Item | Ext. | Description | Quantity | Unit | @ | Unit Cost | = | Total Cost | Comments |
|---|---|---|---|---|---|---|---|---|---|
| ***Division 01 - General Requirements*** | | | | | | | | | |
| ***014000 Quality Requirements*** | | | | | | | | | |
| 01.01 | | Gen. Requirements/ Insurance+ Bond | 1 | EA | @ | $ 115,000.00 | = | $ 115,000.00 | 0.05% |
| 01.02 | | Inspections/ Testing/ Permitting Fees | 1 | EA | @ | $ 23,000.00 | = | $ 23,000.00 | 0.01% |
| 01.03 | | Bonds | 1 | EA | @ | $ 23,000.00 | = | $ 23,000.00 | 0.01% |
| | | | | | | | = | $ - | |
| 01.02 | | General Contractor Fees | 1 | EA | @ | $ 184,000.00 | = | $ 184,000.00 | 0.08% |
| | | | | | | Subtotal | | $ 345,000.00 | |
| ***015000 Temporary Facilities and Controls*** | | | | | | | | | |
| 01.03 | | Mobilization | 1 | EA | @ | $ 15,000.00 | = | $ 15,000.00 | |
| 01.04 | | Temporary trailer for construction support | 1 | LS | @ | $ 10,000.00 | = | $ 10,000.00 | |
| 01.05 | | 6' temporary chainlink fence panel and gates | 200 | LF | @ | $ 30.00 | = | $ 6,000.00 | |
| | | | | | | Subtotal | | $ 31,000.00 | |
| ***Erosion and Sediment Control*** | | | | | | | | | |
| 01.06 | | Stabilized construction entrance | 1 | EA | @ | $ 2,000.00 | = | $ 2,000.00 | |
| 01.07 | | Concrete washout area | 1 | EA | @ | $ 1,500.00 | = | $ 1,500.00 | |
| 01.08 | | Wheel washout area | 1 | EA | @ | $ 1,000.00 | = | $ 1,000.00 | |
| 01.09 | | Inlet protection | 10 | LS | @ | $ 100.00 | = | $ 1,000.00 | |
| | | | | | | Subtotal | | $ 5,500.00 | |
| ***Division 02 - Site Demolition*** | | | | | | | | | |
| ***024119 Selective Demolition*** | | | | | | | | | |
| 02.01 | | Existing pavers and gravel base removal | 415 | SY | @ | $ 15.00 | = | $ 6,225.00 | |
| 02.02 | | Asphalt and gravel base removal | 0 | SY | @ | $ 18.00 | = | $ - | |
| 02.03 | | Saw cut existing paving | 60 | LF | @ | $ 10.00 | = | $ 600.00 | |
| 02.04 | | Concrete walk and gravel base removal | 2214 | SY | @ | $ 22.00 | = | $ 48,708.00 | |
| 02.05 | | Concrete curb removal | 80 | LF | @ | $ 22.00 | = | $ 1,760.00 | |
| 02.06 | | Existing 24" diam concrete bollards to be removed | 18 | EA | @ | $ 150.00 | = | $ 2,700.00 | |
| 02.07 | | Existing concrete seat walls to be removed. | 1424 | LF | @ | $ 30.00 | = | $ 42,720.00 | |
| 02.08 | | Existing shade trees to be removed | 12 | LF | @ | $ 300.00 | = | $ 3,600.00 | |
| 02.09 | | Existing plant material to be removed | 1400 | SF | @ | $ 2.00 | = | $ 2,800.00 | |
| 02.10 | | Existing tree grates to be removed. | 16 | LF | @ | $ 100.00 | = | $ 1,600.00 | |
| 02.11 | | Existing soils to be removed | 296 | CY | @ | $ 30.00 | = | $ 8,880.00 | |
| 02.12 | | Light pole and conduit to be removed | 10 | EA | @ | $ 500.00 | = | $ 5,000.00 | |
| 02.13 | | Ex. concrete balustrade (not in project) | 605 | EA | @ | $ - | = | $ - | |
| 02.14 | | Ex. metal rail (not in project) | 371 | EA | @ | $ - | = | $ - | |
| 02.15 | | Existing sign to be removed | 1 | EA | @ | $ 50.00 | = | $ 50.00 | |
| | | | | | | Subtotal | | $ 124,643.00 | |
| ***Division 03 - Concrete*** | | | | | | | | | |
| ***033300 Architectural Concrete*** | | | | | | | | | |
| 03.01 | | Concrete seatwalls on grade | 321 | LF | @ | $ 450.00 | = | $ 144,450.00 | |
| 03.02 | | Concrete seatwalls on structure | 625 | LF | @ | $ 250.00 | = | $ 156,250.00 | |
| 03.03 | | Ipe seating slats on top of seatwall | 1,110 | SF | @ | $ 50.00 | = | $ 55,500.00 | |
| | | | | | | Subtotal | | $ 356,200.00 | |
| ***Division 05 - Metals*** | | | | | | | | | |
| ***055213 Pipe and Tube Railing*** | | | | | | | | | |
| 05.01 | | Metal planter walls | 817 | LF | @ | $ 150.00 | = | $ 122,550.00 | |
| 05.02 | | Metal spindle inset for concrete balustrade | 605 | EA | @ | $ 40.00 | = | $ 24,200.00 | |
| 05.03 | | Decorative metal guardrail | 250 | LF | @ | $ 150.00 | = | $ 37,500.00 | |
| | | | | | | Subtotal | | $ 184,250.00 | |

# City Portion

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***Division 10 - Specialties and Structures*** | | | | | | | | | |
| ***101416 Pre-engineered Shade Structure*** | | | | | | | | | |
| 10.01 | Architectural shade structure - Central (20'x 40') | 4 | EA | @ | $ | 250,000.00 | = | $ | 1,000,000.00 |
| 10.02 | Shade structure (20'x 60') | 1 | EA | @ | $ | 300,000.00 | = | $ | 300,000.00 |
| | | | | | | Subtotal | | $ | 1,300,000.00 |
| ***101423 Signage*** | | | | | | | | | |
| 10.03 | Identification monument sign | 1 | EA | @ | $ | 25,000.00 | = | $ | 25,000.00 |
| 10.04 | Regulatory signs | 6 | EA | @ | $ | 250.00 | = | $ | 1,500.00 |
| | | | | | | Subtotal | | $ | 26,500.00 |
| ***Division 22 - Plumbing - Site*** | | | | | | | | | |
| ***220000 General Plumbing/Water Service (for irrigation)*** | | | | | | | | | |
| 22.01 | Tapping Sleeve and Valve (accounted for in county budget) | 0 | EA | @ | $ | 2,500.00 | = | $ | - |
| 22.02 | 1" Water Service | 400 | LF | @ | $ | 25.00 | = | $ | 10,000.00 |
| 22.03 | Hotbox (accounted for in county budget) | 0 | EA | @ | $ | 9,000.00 | = | $ | - |
| 22.04 | Water Tap Fees (accounted for in county budget) | 0 | LS | @ | $ | 25,000.00 | = | $ | - |
| | | | | | | Subtotal | | $ | 10,000.00 |
| ***221423 Storm Drainage Piping*** | | | | | | | | | |
| 22.05 | Underdrains | 800 | LF | @ | $ | 10.00 | = | $ | 8,000.00 |
| 22.06 | Yard drains | 20 | EA | @ | $ | 225.00 | = | $ | 4,500.00 |
| 22.07 | Trench drains | 100 | LF | @ | $ | 50.00 | = | $ | 5,000.00 |
| | | | | | | Subtotal | | $ | 17,500.00 |
| ***Division 26 - Electrical - Site*** | | | | | | | | | |
| ***260000 Site Electrical*** | | | | | | | | | |
| 26.01 | Raceways: 1.5" EMT, PVC w pullwire | 800 | LF | @ | $ | 15.00 | = | $ | 12,000.00 |
| 26.02 | NEMA 3R Pull box 24"x24"x10" dp | 4 | EA | @ | $ | 750.00 | = | $ | 3,000.00 |
| 26.03 | 3'x3'x3' dp handhole | 1 | EA | @ | $ | 2,400.00 | = | $ | 2,400.00 |
| 26.04 | GFCI / WP adder | 20 | EA | @ | $ | 275.00 | = | $ | 5,500.00 |
| 26.05 | WP power peds w/ 240W-1-ph, 50A recept for performances | 3 | EA | @ | $ | 2,500.00 | = | $ | 7,500.00 |
| 26.06 | WP speakers | 6 | EA | @ | $ | 3,000.00 | = | $ | 18,000.00 |
| 26.07 | AV system | 1 | LS | @ | $ | 35,000.00 | = | $ | 35,000.00 |
| 26.08 | Light pole and luminaire | 14 | EA | @ | $ | 12,000.00 | = | $ | 168,000.00 |
| 26.09 | Performance lighting | 1 | EA | @ | $ | 15,000.00 | = | $ | 15,000.00 |
| 26.10 | Specialty lighting at COTU | 1 | LS | @ | $ | 25,000.00 | = | $ | 25,000.00 |
| | | | | | | Subtotal | | $ | 291,400.00 |
| ***Division 32 - Exterior Improvements*** | | | | | | | | | |
| ***321216 Asphalt Paving*** | | | | | | | | | |
| 32.01 | Asphalt pavement/patch | 20 | SY | @ | $ | 30.00 | = | $ | 600.00 |
| | | | | | | Subtotal | | $ | 600.00 |
| ***321313 Concrete Paving*** | | | | | | | | | |
| 32.02 | Concrete paving: 4" thk conc, Type I on subgrade | 3,330 | SF | @ | $ | 10.00 | = | $ | 33,300.00 |
| 32.03 | Concrete paving: 4" thk conc, Type I on structure (lt. wt.) | 1,310 | SF | @ | $ | 12.50 | = | $ | 16,375.00 |
| 32.04 | Concrete paving: 4" thk conc, Type II on subgrade | 4,695 | SF | @ | $ | 12.00 | = | $ | 56,340.00 |
| 32.05 | Concrete paving: 4" thk conc, Type II on structure (lt wt.) | 7,730 | SF | @ | $ | 15.00 | = | $ | 115,950.00 |
| 32.06 | Concrete curb - 18" straight | 80 | LF | @ | $ | 42.00 | = | $ | 3,360.00 |
| 32.07 | Concrete ADA ramps | 2 | EA | @ | $ | 1,000.00 | = | $ | 2,000.00 |
| | | | | | | Subtotal | | $ | 227,325.00 |
| ***321400 Unit Paving*** | | | | | | | | | |
| 32.08 | Pedestrian unit pavers set in bitum over concrete subbase | 1,800 | SF | @ | $ | 27.00 | = | $ | 48,600.00 |
| | | | | | | Subtotal | | $ | 48,600.00 |
| ***321813 Synthetic Grass Surfacing*** | | | | | | | | | |
| 32.09 | Synthetic grass | 0 | SF | @ | $ | 18.00 | = | $ | - |
| | | | | | | Subtotal | | $ | - |
| ***323300 Site Furnishings*** | | | | | | | | | |
| 32.10 | Fixed bollards | 3 | EA | @ | $ | 1,200.00 | = | $ | 3,600.00 |
| 32.11 | Removable bollard | 2 | EA | @ | $ | 1,500.00 | = | $ | 3,000.00 |
| | | | | | | Subtotal | al | $ | 6,600.00 |
| ***328400 Planting Irrigation*** | | | | | | | | | |
| 32.12 | irrigation for lawns | 6,000 | SF | @ | $ | 1.00 | = | $ | 6,000.00 |
| 32.13 | irrigation for shrub beds | 4,000 | SF | @ | $ | 2.25 | = | $ | 9,000.00 |
| 32.14 | Irrig. controller and backflow preventor (under county budget | 0 | LS | @ | $ | 25,000.00 | = | $ | - |
| 32.15 | Booster pump (under county budget) | 0 | LS | @ | $ | 2,500.00 | = | $ | - |
| | | | | | | Subtotal | | $ | 15,000.00 |



| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***329100 Soils Mix*** | | | | | | | | | |
| 32.16 | Planting soil mix (on grade) | 542 | CY | @ | $ | 75.00 | = | $ | 40,650.00 |
| 32.17 | Light weight planting soil mix (on structure) | 200 | CY | @ | $ | 175.00 | = | $ | 35,000.00 |
| | | | | | | Subtotal | | $ | 75,650.00 |
| ***329200 Turf and Grasses*** | | | | | | | | | |
| 32.18 | Sodded lawn | 675 | SY | @ | $ | 7.00 | = | $ | 4,725.00 |
| | | | | | | Subtotal | | $ | 4,725.00 |
| ***329300 Plants*** | | | | | | | | | |
| 32.19 | Groundcover, perennials,shrubs +/or ornamental grasses | 4,000 | SF | @ | $ | 15.00 | = | $ | 60,000.00 |
| 32.20 | Ornamental tree | 12 | EA | @ | $ | 750.00 | = | $ | 9,000.00 |
| 32.21 | Trees: 4" caliper | 15 | EA | @ | $ | 1,200.00 | = | $ | 18,000.00 |
| 32.22 | Insulation foam sheets for planters | 1,600 | SF | @ | $ | 3.00 | = | $ | 4,800.00 |
| 32.23 | Filter fabric | 2,550 | SF | @ | $ | 2.00 | = | $ | 5,100.00 |
| 32.24 | Drainage mat | 2,550 | SF | @ | $ | 6.00 | = | $ | 15,300.00 |
| 32.25 | Waterproofing for planters | 4,150 | SF | @ | $ | 5.00 | = | $ | 20,750.00 |
| | | | | | | Subtotal | | $ | 132,950.00 |

| | | | |
|---|---|---|---|
| | Subtotal | $ | 3,203,443.00 | |
| | prevailing wage | $ | 320,344.30 | |
| | **Subtotal** | **$** | **3,523,787.30** | |
| | design contingency | $ | 528,568.10 | 15.00% |
| | market escalation | $ | 352,378.73 | 10.00% |
| | **Total** | **$** | **4,404,734.13** | |

**General Notes**

*UNIT PRICE VALUES DERIVED FROM RECENT BID PRICING AND MKSK ASSUMPTION OF WORK EFFORT REQUIRED.*

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*OR CONSTRUCTION COST WILL NOT VARY FROM ANY ESTIMATES OF PROBABLE CONSTRUCTION COST PREPARED BY T*

# County Portion

## Center of the Universe, Tulsa
Concept Estimate

**Prepared by:** *MKSK*

Date: 12/12/2022
Project: Center of the Universe - Boston Avenue Pedestrian Bridge

**Tulsa County Portion of the Pedestrian Bridge Improvements**

| Item | Ext. | Description | Quantity | Unit | @ | Unit Cost | = | Total Cost | Comments |
|---|---|---|---|---|---|---|---|---|---|
| ***Division 01 - General Requirements*** | | | | | | | | | |
| ***014000 Quality Requirements*** | | | | | | | | | |
| 01.01 | | Gen. Requirements/ Insurance+ Bond | 1 | EA | @ | $ 100,000.00 | = | $ 100,000.00 | 0.05% |
| 01.02 | | Inspections/ Testing/ Permitting Fees | 1 | EA | @ | $ 20,000.00 | = | $ 20,000.00 | 0.01% |
| 01.03 | | Bonds | 1 | EA | @ | $ 20,000.00 | = | $ 20,000.00 | 0.01% |
| | | | | | | | | $ - | |
| 01.04 | | General Contractor Fees | 1 | EA | @ | $ 160,000.00 | = | $ 160,000.00 | 0.08% |
| | | | | | | | Subtotal | $ 300,000.00 | |
| ***015000 Temporary Facilities and Controls*** | | | | | | | | | |
| 01.05 | | Mobilization | 1 | EA | @ | $ 15,000.00 | = | $ 15,000.00 | |
| 01.06 | | Temporary trailer for construction support | 1 | LS | @ | $ 10,000.00 | = | $ 10,000.00 | |
| 01.07 | | 6' temporary chainlink fence panel and gates | 500 | LF | @ | $ 30.00 | = | $ 15,000.00 | |
| | | | | | | | Subtotal | $ 40,000.00 | |
| ***Erosion and Sediment Control*** | | | | | | | | | |
| 01.08 | | Stabilized construction entrance | 1 | EA | @ | $ 2,000.00 | = | $ 2,000.00 | |
| 01.09 | | Concrete washout area | 1 | EA | @ | $ 1,500.00 | = | $ 1,500.00 | |
| 01.10 | | Wheel washout area | 1 | EA | @ | $ 1,000.00 | = | $ 1,000.00 | |
| 01.11 | | Inlet protection | 10 | LS | @ | $ 100.00 | = | $ 1,000.00 | |
| | | | | | | | Subtotal | $ 5,500.00 | |
| ***Division 02 - Site Demolition*** | | | | | | | | | |
| ***024119 Selective Demolition*** | | | | | | | | | |
| 02.01 | | Existing pavers and gravel base removal | 328 | SY | @ | $ 15.00 | = | $ 4,920.00 | |
| 02.02 | | Asphalt and gravel base removal | 1,750 | SY | @ | $ 18.00 | = | $ 31,500.00 | |
| 02.03 | | Saw cut existing paving | 60 | LF | @ | $ 10.00 | = | $ 600.00 | |
| 02.04 | | Concrete walk and gravel base removal | 1322 | SY | @ | $ 22.00 | = | $ 29,084.00 | |
| 02.05 | | Concrete curb removal | 1260 | LF | @ | $ 22.00 | = | $ 27,720.00 | |
| 02.06 | | Existing 24" diam concrete bollards to be removed | 94 | EA | @ | $ 150.00 | = | $ 14,100.00 | |
| 02.07 | | Existing concrete seat walls to be removed. | 933 | LF | @ | $ 30.00 | = | $ 27,990.00 | |
| 02.08 | | Existing shade trees to be removed | 4 | LF | @ | $ 300.00 | = | $ 1,200.00 | |
| 02.09 | | Existing plant material to be removed | 1915 | SF | @ | $ 2.00 | = | $ 3,830.00 | |
| 02.10 | | Existing tree grates to be removed. | 3 | LF | @ | $ 100.00 | = | $ 300.00 | |
| 02.10 | | Existing soils to be removed | 142 | CY | @ | $ 30.00 | = | $ 4,260.00 | |
| 02.11 | | Light pole and conduit to be removed | 9 | EA | @ | $ 500.00 | = | $ 4,500.00 | |
| 02.12 | | Ex. concrete balustrade (not in project/contract) | 212 | EA | @ | $ - | = | $ - | |
| 02.13 | | Ex. metal rail (not in project/contract) | 345 | EA | @ | $ - | = | $ - | |
| 02.14 | | Existing sign to be removed | 5 | EA | @ | $ 50.00 | = | $ 250.00 | |
| | | | | | | | Subtotal | $ 150,254.00 | |
| ***Division 03 - Concrete*** | | | | | | | | | |
| ***033300 Architectural Concrete*** | | | | | | | | | |
| 03.01 | | Concrete seatwalls on structure | 142 | LF | @ | $ 250.00 | = | $ 35,500.00 | |
| | | | | | | | Subtotal | $ 35,500.00 | |
| ***Division 05 - Metals*** | | | | | | | | | |
| ***055213 Pipe and Tube Railing*** | | | | | | | | | |
| 05.01 | | Stainless steel handrails | 20 | LF | @ | $ 100.00 | = | $ 2,000.00 | |
| 05.02 | | Metal guardrail | 115 | LS | @ | $ 100.00 | = | $ 11,500.00 | |
| 05.03 | | Metal planter walls | 656 | LF | @ | $ 150.00 | = | $ 98,400.00 | |
| 05.04 | | Metal spindle inset for concrete balustrade | 212 | EA | @ | $ 40.00 | = | $ 8,480.00 | |
| 05.05 | | Decorative metal guardrail | 250 | LF | @ | $ 150.00 | = | $ 37,500.00 | |
| | | | | | | | Subtotal | $ 157,880.00 | |



| Item | Ext. | Description | Quantity | Unit | @ | Unit Cost | = | Total Cost |
|---|---|---|---|---|---|---|---|---|
| ***Division 10 - Specialties*** | | | | | | | | |
| ***101416 Pre-engineered Shade Structure*** | | | | | | | | |
| 10.01 | | Shade structure (20'x 48') | 1 | EA | @ | $ 240,000.00 | = | $ 240,000.00 |
| | | | | | | | Subtotal | $ 240,000.00 |
| ***101423 Signage*** | | | | | | | | |
| 10.02 | | Identification monument sign | 1 | EA | @ | $ 25,000.00 | = | $ 25,000.00 |
| 10.03 | | Regulatory signs | 6 | EA | @ | $ 225.00 | = | $ 1,350.00 |
| | | | | | | | Subtotal | $ 26,350.00 |
| ***Division 22 - Plumbing - Site*** | | | | | | | | |
| ***220000 General Plumbing/Water Service*** | | | | | | | | |
| 22.01 | | Tapping Sleeve and Valve | 1 | EA | @ | $ 2,500.00 | = | $ 2,500.00 |
| 22.02 | | 1" Water Service | 200 | LF | @ | $ 25.00 | = | $ 5,000.00 |
| 22.03 | | Hotbox | 1 | EA | @ | $ 9,000.00 | = | $ 9,000.00 |
| 22.04 | | Water Tap Fees | 1 | LS | @ | $ 25,000.00 | = | $ 25,000.00 |
| | | | | | | | Subtotal | $ 41,500.00 |
| ***221423 Storm Drainage Piping*** | | | | | | | | |
| 22.05 | | Underdrains | 500 | LF | @ | $ 10.00 | = | $ 5,000.00 |
| 22.06 | | Yard drains | 16 | EA | @ | $ 225.00 | = | $ 3,600.00 |
| 22.07 | | Curb Inlets | 4 | EA | @ | $ 3,000.00 | = | $ 12,000.00 |
| | | | | | | | Subtotal | $ 20,600.00 |
| ***Division 26 - Electrical - Site*** | | | | | | | | |
| ***260000 Site Electrical*** | | | | | | | | |
| 26.01 | | Basic requirements - permits and gen conditions | 1 | LS | @ | $ 5,000.00 | = | $ 5,000.00 |
| 26.02 | | Raceways: 1.5" EMT, PVC w pullwire | 500 | LF | @ | $ 15.00 | = | $ 7,500.00 |
| 26.03 | | NEMA 3R Pull box 24"x24"x10" dp | 3 | EA | @ | $ 750.00 | = | $ 2,250.00 |
| 26.04 | | 3'x3'x3' dp handhole | 1 | EA | @ | $ 2,400.00 | = | $ 2,400.00 |
| 26.05 | | GFCI / WP adder | 10 | EA | @ | $ 275.00 | = | $ 2,750.00 |
| 26.06 | | WP power pedestal w/ 240W-1-ph, 50A recept for food truck | 5 | EA | @ | $ 2,500.00 | = | $ 12,500.00 |
| 26.07 | | WP speakers | 4 | EA | @ | $ 3,000.00 | = | $ 12,000.00 |
| 26.08 | | Light pole and luminaire | 12 | EA | @ | $ 12,000.00 | = | $ 144,000.00 |
| | | | | | | | Subtotal | $ 188,400.00 |
| ***Division 32 - Exterior Improvements*** | | | | | | | | |
| ***321216 Asphalt Paving*** | | | | | | | | |
| 32.01 | | Asphalt pavement | 1,220 | SY | @ | $ 30.00 | = | $ 36,600.00 |
| 32.02 | | Crosswalk striping | 3 | EA | @ | $ 500.00 | = | $ 1,500.00 |
| 32.03 | | Stop Bars | 12 | LF | @ | $ 10.00 | = | $ 120.00 |
| | | | | | | | Subtotal | $ 38,220.00 |
| ***321313 Concrete Paving*** | | | | | | | | |
| 32.04 | | Concrete paving: 4" thk conc, Type I on subgrade | 325 | SF | @ | $ 10.00 | = | $ 3,250.00 |
| 32.05 | | Concrete paving: 4" thk conc, Type I on structure (light wt.) | 8,675 | SF | @ | $ 12.50 | = | $ 108,437.50 |
| 32.06 | | Concrete paving: 4" thk conc, Type II on subgrade | 3,266 | SF | @ | $ 12.00 | = | $ 39,192.00 |
| 32.07 | | Concrete paving: 4" thk conc, Type II on structure (light wt.) | 1,956 | SF | @ | $ 15.00 | = | $ 29,340.00 |
| 32.08 | | Concrete paving: 6" thk conc, Type III on structure (light wt.) | 2,160 | SF | @ | $ 20.00 | = | $ 43,200.00 |
| 32.09 | | Concrete steps | 440 | SF | @ | $ 50.00 | = | $ 22,000.00 |
| 32.10 | | Concrete curb - 18" straight | 315 | LF | @ | $ 42.00 | = | $ 13,230.00 |
| 32.11 | | Concrete ADA ramps | 6 | EA | @ | $ 1,000.00 | = | $ 6,000.00 |
| | | | | | | | Subtotal | $ 264,649.50 |
| ***321400 Unit Paving*** | | | | | | | | |
| 32.12 | | Pedestrian unit pavers set in bitum over concrete subbase | 1,116 | SF | @ | $ 27.00 | = | $ 30,132.00 |
| 32.13 | | Vehicular unit pavers set in bitum over concrete subbase | 216 | SF | @ | $ 32.00 | = | $ 6,912.00 |
| 32.14 | | Granite curb | 815 | LF | @ | $ 175.00 | = | $ 142,625.00 |
| | | | | | | | Subtotal | $ 179,669.00 |
| ***321813 Synthetic Grass Surfacing*** | | | | | | | | |
| 32.15 | | Synthetic grass | 0 | SY | @ | $ 18.00 | = | $ - |
| | | | | | | | Subtotal | $ - |
| ***323300 Site Furnishings*** | | | | | | | | |
| 32.16 | | Sercurity bollards | 21 | EA | @ | $ 1,200.00 | = | $ 25,200.00 |
| 32.17 | | Illuminated bollard | 10 | EA | @ | $ 1,750.00 | = | $ 17,500.00 |
| 32.18 | | Ornamental planters - Type A | 12 | EA | @ | $ 2,000.00 | = | $ 24,000.00 |
| 32.19 | | Ornamental planters - Type B | 6 | EA | @ | $ 2,750.00 | = | $ 16,500.00 |
| 32.20 | | Tables and chairs sets (1 table + 4 chairs) | 24 | EA | @ | $ 3,600.00 | = | $ 86,400.00 |
| | | | | | | | Subtotal | $ 169,600.00 |

# County Portion

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ***328400 Planting Irrigation*** | | | | | | | | | |
| 32.21 | irrigation for lawns | 4,000 | SF | @ | $ | 1.00 | = | $ | 4,000.00 |
| 32.22 | irrigation for shrub beds | 2,000 | SF | @ | $ | 2.25 | = | $ | 4,500.00 |
| 32.23 | Irrigation controller and backflow preventor | 1 | LS | @ | $ | 25,000.00 | = | $ | 25,000.00 |
| 32.24 | Booster pump | 1 | LS | @ | $ | 2,500.00 | = | $ | 2,500.00 |
| | | | | | | Subtotal | | $ | 36,000.00 |
| ***329100 Soils Mix*** | | | | | | | | | |
| 32.25 | Planting soil mix on grade | 170 | CY | @ | $ | 75.00 | = | $ | 12,750.00 |
| 32.26 | Light weight planting soil mix on structure | 245 | CY | @ | $ | 175.00 | = | $ | 42,875.00 |
| | | | | | | Subtotal | | $ | 55,625.00 |
| ***329200 Turf and Grasses*** | | | | | | | | | |
| 32.27 | Sodded lawn | 656 | SY | @ | $ | 7.00 | = | $ | 4,592.00 |
| | | | | | | Subtotal | | $ | 4,592.00 |
| ***329300 Plants*** | | | | | | | | | |
| 32.28 | Groundcover, perennials,shrubs +/or ornamental grasses | 4,000 | SF | @ | $ | 15.00 | = | $ | 60,000.00 |
| 32.29 | Ornamental tree | 12 | EA | @ | $ | 750.00 | = | $ | 9,000.00 |
| 32.30 | Trees: 4" caliper | 15 | EA | @ | $ | 1,200.00 | = | $ | 18,000.00 |
| 32.31 | Tree Grate | 3 | EA | @ | $ | 2,250.00 | = | $ | 6,750.00 |
| 32.32 | Insulation foam sheets for planters | 4,572 | SF | @ | $ | 3.00 | = | $ | 13,716.00 |
| 32.33 | Filter fabric | 3,260 | SF | @ | $ | 2.00 | = | $ | 6,520.00 |
| 32.34 | Drainage mat | 3,260 | SF | @ | $ | 6.00 | = | $ | 19,560.00 |
| 32.35 | Waterproofing for planters | 4,572 | SF | @ | $ | 5.00 | = | $ | 22,860.00 |
| | | | | | | Subtotal | | $ | 156,406.00 |
| | | | | | | Subtotal | | $ | 2,110,745.50 |
| | | | | | | prevailing wage | | $ | 211,074.55 |
| | | | | | | **Subtotal** | | **$** | **2,321,820.05** |
| | | | | | | design contingency | | $ | 348,273.01 |
| | | | | | | market escalation | | $ | 232,182.01 |
| | | | | | | **Total** | | **$** | **2,902,275.06** |

**General Notes**

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*OR CONSTRUCTION COST WILL NOT VARY FROM ANY ESTIMATES OF PROBABLE CONSTRUCTION COST PREPARED BY T*

## Center of the Universe, Tulsa

Concept Estimate

**Prepared by:** *MKSK*

Date: 12/12/2022
Project: Center of the Universe - Boston Avenue Pedestrian Bridge

**City of Tulsa's Portion of the Sports Courts Improvements**

| Item | Ext. | Description | Quantity | Unit | @ | Unit Cost | = | Total Cost | Comments |
|---|---|---|---|---|---|---|---|---|---|
| ***Division 01 - General Requirements*** | | | | | | | | | |
| ***014000 Quality Requirements*** | | | | | | | | | |
| 01.01 | | Gen. Requirements/ Insurance+ Bond | 1 | EA | @ | $ 25,000.00 | = | $ 25,000.00 | 0.05% |
| 01.02 | | Inspections/ Testing/ Permitting Fees | 1 | EA | @ | $ 5,000.00 | = | $ 5,000.00 | 0.01% |
| 01.03 | | Bonds | 1 | EA | @ | $ 5,000.00 | = | $ 5,000.00 | 0.01% |
| | | | | | | | | $ - | |
| 01.02 | | General Contractor Fees | 1 | EA | @ | $ 40,000.00 | = | $ 40,000.00 | 0.08% |
| | | | | | | | Subtotal | $ 75,000.00 | |
| ***015000 Temporary Facilities and Controls*** | | | | | | | | | |
| 01.03 | | Mobilization | 1 | EA | @ | $ 10,000.00 | = | $ 10,000.00 | |
| 01.04 | | Temporary trailer for construction support | 1 | LS | @ | $ 7,500.00 | = | $ 7,500.00 | |
| 01.05 | | 6' temporary chainlink fence panel and gates | 500 | LF | @ | $ 30.00 | = | $ 15,000.00 | |
| | | | | | | | Subtotal | $ 32,500.00 | |
| ***Erosion and Sediment Control*** | | | | | | | | | |
| 01.06 | | Stabilized construction entrance | 1 | EA | @ | $ 2,000.00 | = | $ 2,000.00 | |
| 01.07 | | Concrete washout area | 1 | EA | @ | $ 1,500.00 | = | $ 1,500.00 | |
| 01.08 | | Wheel washout area | 1 | EA | @ | $ 1,000.00 | = | $ 1,000.00 | |
| 01.09 | | Inlet protection | 10 | LS | @ | $ 100.00 | = | $ 1,000.00 | |
| | | | | | | | Subtotal | $ 5,500.00 | |
| ***Division 02 - Site Demolition*** | | | | | | | | | |
| ***024119 Selective Demolition*** | | | | | | | | | |
| 02.01 | | Asphalt and gravel base removal | 200 | SY | @ | $ 18.00 | = | $ 3,600.00 | |
| 02.02 | | Saw cut existing paving | 350 | LF | @ | $ 10.00 | = | $ 3,500.00 | |
| 02.03 | | Concrete walk and gravel base removal | 715 | SY | @ | $ 22.00 | = | $ 15,730.00 | |
| 02.04 | | Concrete curb removal | 330 | LF | @ | $ 22.00 | = | $ 7,260.00 | |
| 02.05 | | Existing shade trees to be removed | 1 | EA | @ | $ 300.00 | = | $ 300.00 | |
| 02.06 | | Existing soils to be removed | 20 | CY | @ | $ 30.00 | = | $ 600.00 | |
| 02.07 | | Light pole and conduit to be removed | 3 | EA | @ | $ 500.00 | = | $ 1,500.00 | |
| 02.08 | | Existing sign to be removed | 3 | EA | @ | $ 50.00 | = | $ 150.00 | |
| | | | | | | | Subtotal | $ 32,640.00 | |
| ***Division 10 - Specialties and Structures*** | | | | | | | | | |
| ***101423 Signage*** | | | | | | | | | |
| 10.01 | | Park signage | 1 | LS | @ | $ 5,000.00 | = | $ 5,000.00 | |
| 10.02 | | Regulatory signs | 3 | EA | @ | $ 250.00 | = | $ 750.00 | |
| | | | | | | | Subtotal | $ 5,750.00 | |
| ***Division 22 - Plumbing - Site*** | | | | | | | | | |
| ***221423 Storm Drainage Piping*** | | | | | | | | | |
| 22.01 | | Underdrains | 350 | LF | @ | $ 10.00 | = | $ 3,500.00 | |
| 22.02 | | Pavement drains | 8 | EA | @ | $ 500.00 | = | $ 4,000.00 | |
| 22.03 | | Trench drains | 200 | LF | @ | $ 50.00 | = | $ 10,000.00 | |
| 22.04 | | 12" pipe to connect to existing system | 100 | LF | @ | $ 35.00 | = | $ 3,500.00 | |
| 22.05 | | Catch basin | 1 | EA | @ | $ 3,000.00 | = | $ 3,000.00 | |
| | | | | | | | Subtotal | $ 24,000.00 | |
| ***Division 26 - Electrical - Site*** | | | | | | | | | |
| ***260000 Site Electrical*** | | | | | | | | | |
| 26.01 | | Basic requirements - permits & general conditions | 1 | LS | @ | $ 1,500.00 | = | $ 1,500.00 | |
| 26.02 | | Raceways: 1.5" EMT, PVC w pullwire | 600 | LF | @ | $ 15.00 | = | $ 9,000.00 | |
| 26.03 | | NEMA 3R Pull box 24"x24"x10" dp | 2 | EA | @ | $ 750.00 | = | $ 1,500.00 | |
| 26.04 | | 3'x3'x3' dp handhole | 1 | EA | @ | $ 2,400.00 | = | $ 2,400.00 | |
| 26.05 | | GFCI / WP adder | 6 | EA | @ | $ 275.00 | = | $ 1,650.00 | |



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 26.06 | Light pole and wall packs under bridge structure | 1 | LS | @ | $ 40,000.00 | = | $ 40,000.00 | |
| | | | | | | Subtotal | $ 56,050.00 | |
| ***Division 32 - Exterior Improvements*** | | | | | | | | |
| ***321216 Asphalt Paving*** | | | | | | | | |
| 32.01 | Asphalt pavement/patch existing parking lot | 35 | SY | @ | $ 30.00 | = | $ 1,050.00 | |
| 32.02 | Asphalt pavement for sports courts | 645 | SY | @ | $ 35.00 | = | $ 22,575.00 | |
| | | | | | | Subtotal | $ 23,625.00 | |
| ***321313 Concrete Paving*** | | | | | | | | |
| 32.03 | Concrete paving: 4" thk conc, Type I on subgrade | 5,000 | SF | @ | $ 10.00 | = | $ 50,000.00 | |
| 32.04 | Concrete curb - 18" straight | 350 | LF | @ | $ 42.00 | = | $ 14,700.00 | |
| 32.05 | Concrete ADA ramps | 2 | EA | @ | $ 1,000.00 | = | $ 2,000.00 | |
| | | | | | | Subtotal | $ 66,700.00 | |
| ***321315 Asphaltic Concrete Color Coating*** | | | | | | | | |
| 32.06 | Color coating and striping of courts | 5,800 | SF | @ | $ 2.25 | = | $ 13,050.00 | |
| | | | | | | Subtotal | $ 13,050.00 | |
| ***323119 Decorative Metal Fences and Gates*** | | | | | | | | |
| 32.07 | Security fence | 250 | LF | @ | $ 135.00 | = | $ 33,750.00 | |
| 32.08 | Security fence - swing gates | 2 | EA | @ | $ 3,500.00 | = | $ 7,000.00 | |
| | | | | | | Subtotal | $ 40,750.00 | |
| ***323300 Site Furnishings*** | | | | | | | | |
| 32.09 | Tables & chairs, benches and trash recptacles | 1 | LS | @ | $ 10,000.00 | = | $ 10,000.00 | |
| | | | | | | Subtotal al | $ 10,000.00 | |
| ***329100 Soils Mix*** | | | | | | | | |
| 32.10 | Planting soil mix (on grade) | 100 | CY | @ | $ 75.00 | = | $ 7,500.00 | |
| | | | | | | Subtotal | $ 7,500.00 | |
| ***329200 Turf and Grasses*** | | | | | | | | |
| 32.11 | Sodded lawn | 335 | SY | @ | $ 7.00 | = | $ 2,345.00 | |
| | | | | | | Subtotal | $ 2,345.00 | |
| ***329300 Plants*** | | | | | | | | |
| 32.12 | Trees: 4" caliper | 15 | EA | @ | $ 1,200.00 | = | $ 18,000.00 | |
| | | | | | | Subtotal | $ 18,000.00 | |
| | | | | | | Subtotal | $ 413,410.00 | |
| | | | | | | prevailing wage | $ 41,341.00 | |
| | | | | | | **Subtotal** | **$ 454,751.00** | |
| | | | | | | design contingency | $ - | 15.00% |
| | | | | | | market escalation | $ - | 10.00% |
| | | | | | | **Total** | **$ 454,751.00** | |

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# ACOUSTIC REPORT

**Center of the Universe**

**Tulsa, Oklahoma**

**Acoustic Features Analysis**

Report No. 22030-01

January 6, 2023

Prepared for:

MKSK and Downtown Tulsa Partnership

JEAcoustics
Engineered Vibration Acoustic & Noise Solutions

Submitted by:

Chad Himmel, PE

Associate, JEAcoustics

Texas Registered Engineering Firm F-6534

JEAcoustics
Engineered Vibration Acoustic & Noise Solutions

## Table of Contents

**Report**

## 1. Introduction

JEAcoustics (JEA) was retained to conduct evaluations of acoustic reflection patterns, geometry, materials and surface finishes, with respect to the existing and future planning for the Center of the Universe (COTU) acoustical experience on the Boston Avenue Pedestrian Bridge, in Tulsa, Oklahoma.

The COTU site consists of a multimodal pedestrian, bicycle and vehicle bridge, paved with concrete and brick, and with curved concrete bench seats and planter beds that create a low, circular feature at the bridge's center. The curved benches support an acoustic echo and audible sound focusing feature, which has made the location an iconic place for locals to stop in, speak or holler, listen, and experience the phenomenon.

This report presents our findings regarding the acoustic feature, feasibility recommendations, and comments on conceptual designs for proposed redesigns, and preservation of iconic acoustic features.

**Figure 1 – Existing Project Site, View Looking East**

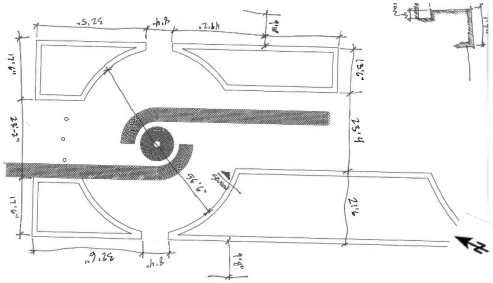


**Figure 2 – Existing Project Site, Plan View (provided by Selser Schaefer Architects)**





## 2. Goals

The following provide the basis for our review and assistance to the Design Team with proposed COTU redesign concepts and feasibility study:

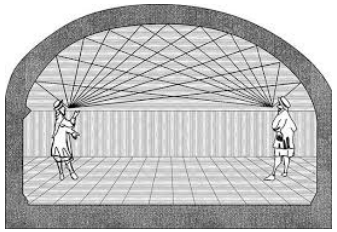
- Understand what causes and creates the acoustic properties that make the Center of the Universe such an attraction.
- Work with the Design Team to preserve and protect those essential acoustic features as part of the bridge rehabilitation and above deck design enhancement.

## 3. Acoustic Focusing Features in General

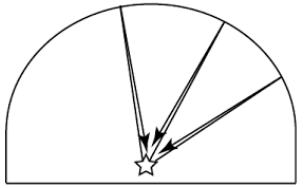
Acoustic focusing features have been built, experienced, and documented through recent human history. Some of the more remarkable examples are called a "whispering gallery" feature, in which two people may have a normal conversation at an unusually large distance within the presence of an acoustic focusing parabolic or elliptical arch or dome. Examples of "whispering gallery" features are illustrated below (left) and can be experienced at the Statuary Hall in the United States Capitol, the rotunda of the Texas State Capitol, and Cincinnati Union Terminal, among other places in the US.

Central focusing of voices or sounds within the presence of a circular arch (illustrated below, right) are similar to the "whisper gallery" feature, but tend to be experienced by only one person at a time (a conversation with oneself), as it is heard only at the central focusing location (at the star in the diagram below, right).

COTU is a good example of central focusing. Circular reflection patterns can also produce a "whisper gallery" which COTU may also exhibit at certain locations inside the concrete benches.



"Whisper Gallery" under parabolic arch or dome
Tracing from Athanasius Kircher's Phonurgia Nova, 1673



central focusing under a circular arch
generic diagram

**Figure 3 – Examples of Acoustic Focusing Features**

**4. Acoustic Focusing at COTU**

Selser Schaefer Architects (SSA) visited the project site to conduct observations and measurements of the COTU acoustic feature, along with audio recordings with paper sheet to obstruct the reflection patterns for our review and analysis. JEA has also reviewed various recorded examples of the acoustic feature in publicly available videos posted online (e.g., YouTube).

Based on our review of site plans and recordings, we worked with the MKSK and SSA to develop the following conceptual illustrations of the primary focusing features at the COTU site.

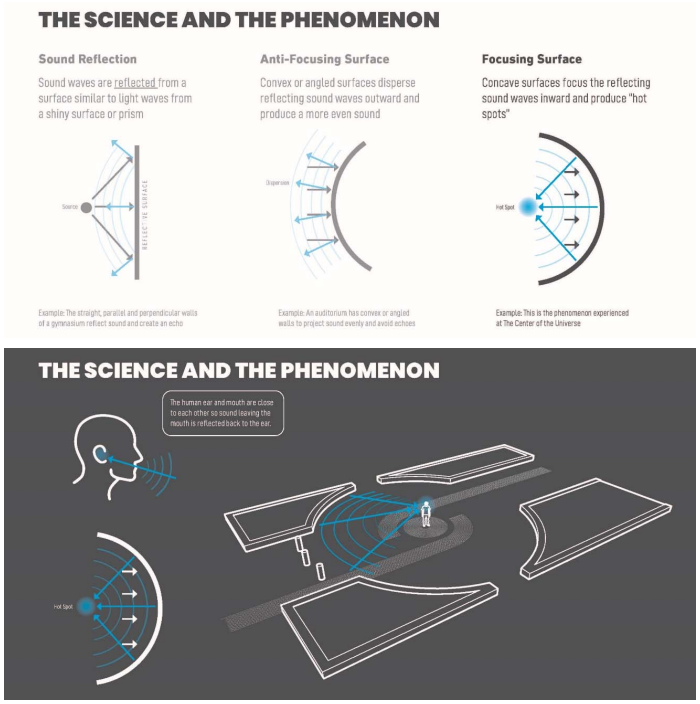



**Figure 4 – COTU Focusing Features (excerpts from MKSK/SSA presentation 12-Dec-2022)**





Several factors could affect the audibility of the focusing feature at COTU:

- The location of the observer (needs to be at central medallion, or "eye")
- Weather conditions (we understand dry weather conditions seem to be ideal)
- Presence of ambient noises (best in quiet conditions, low winds, no trains)
- Obstruction of inner bench faces (obstructions interfere with the focusing)
- Height of observer (may need further study)

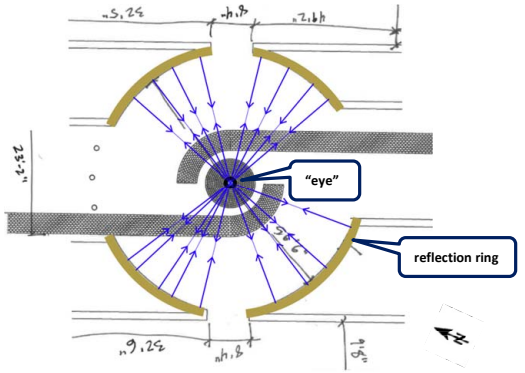



**Figure 5 – COTU Focusing in Dimensioned Plan**

As a person standing at the "eye" of COTU speaks, sound of their own voice will emanate in all directions. Some of that vocal sound may reflect from the hard bridge pavement surrounding them, and reflect again from the hard, curved, vertical concrete bench surfaces surrounding them back to their ears. The time it would take for that sound to travel (at the speed of sound through air at 75° F) from one's mouth back to their ears as illustrated below would be approximately 50 milliseconds (50 ms delay). Many 50-ms "first reflections" would happen simultaneously around the observer, front, back, and sides, reinforcing a strong echo experience.

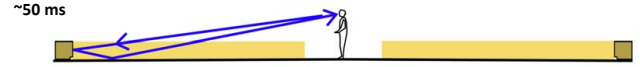



**Figure 6 – COTU Focusing "First Reflection"**

In general, a reflected echo is considered to be audible or noticeable to human ears if it has a delay around 50-60 ms or more, and becomes very noticeable or distracting at more than 80 ms.

In addition to the "first reflection" having approximately 50-ms delay, further reflections within the COTU reflection ring can propagate onward. Just a couple of those onward reflections are illustrated below, producing potentially 100-ms and 200-ms delay echoes, and possibly longer, up to 300 ms (or 0.3 seconds).

Longer delays are perceived as more prominent or more noticeable echoes. Longer delays may be perceived more often or more prominently by shorter observers, as shown with the 200-ms illustration below, compared to taller folks.

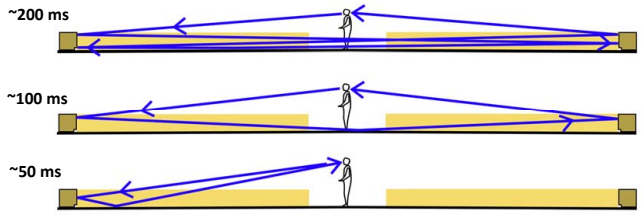



**Figure 7 – COTU Focusing "Onward Reflections"**

## 5. Recommendations

Preservation

In order to preserve the existing acoustic feature along with proposed redesign and renovations on the bridge at COTU, we have developed the following recommendations:

1. Avoid new features inside the reflection ring that could obstruct the primary mouth-to-ear sound reflection paths illustrated in Figures 5-7.
2. Avoid new features or structures outside or above the reflection ring that could reflect much sound back to the ear (at a different distance or with a different quality than the existing bench-and-pavement reflections provide).
   - New curved bench walls, planter beds, backrests, and overhead shades outside of preserved reflection ring could add a new and different focusing reflections that "muddle" the existing acoustic feature and experience.
   - New benches or planter boxes need to "hide" tucked entirely behind and outboard of the existing reflection ring as much as practical.
   - Utilize careful shaping and design of new bench backrests and upper lips of outer planter bed rings that may reflect sounds inward.
   - Bench seat backs or other new railings above existing reflective benches





should maintain at a minimum 22% open area to allow sound to pass through without reflecting back into the reflection ring or back to the "eye" location. Natural plantings tend to be acoustically transparent.

- Slanting the seat backs should also help, and further study can determine ideal angle to plan for those seat backs to reflect sound upward and away from center "eye" location, along with >22% open area to be safe.
- Overhead shade structures above the ring or outside the ring (if any) should be designed with care, mindful of adding possible reflections back into the central ring area. Shade panels, sheets, fabrics, solid framing members and structural elements such as beams or edges, all need to have attention to shape, material, perforation, or geometry that does not focus reflected sound towards the center at ear level. Those things could possibly reflect sounds inward at heights well above ear level if needed.
- Large surfaces of shade panels, fabrics, or sheathing should have enough open perforation (again, 22% or more open and breathable) to let sound pass through without bouncing sound downward or inward.

3. Avoid significantly changing the existing texture or reflectivity of the bridge's pavement surfaces and inner vertical concrete bench surfaces within the reflection ring.
   - Hard brick or concrete pavers or similar surfaces equal to the existing conditions should be fine at the bridge deck in order to repair or replace damaged areas.
   - Porous paving units, grated surfaces, granular rubber, earth/grass pavers should not be planned.
4. Avoid new features or structures that could generate noise to disturb or distract occupants, detracting attention from the acoustic feature experience (parts moving, squeaking, whistling, rustling in windy conditions).
   - Shade constructions need to be stiff enough that light breezes do not often set panels in motion to generate uncontrolled noise.
   - It could be a challenge to know which shapes like that can generate noise in winds unless we have built examples to rely on. Hanging fabric panels would certainly flap in the wind, and should be avoided. Tree or shrub leaves can also rustle in the wind, but would likely be fine.

Enhancement

In addition to preservation, MKSK asked for suggestions on enhancing the acoustic features (perhaps so it could be better experienced on rainy days or for people of different heights). JEA does not recommend significant additions or enhancements. The existing feature is a simple reflection system, and yet, it seems to have complexity and nuance. Given the slight bend in the bridge

center, the non-symmetrical ring array of four benches, and other existing things that make it unique and not a perfect circle. Messing with that to provide some enhancement would be tricky; nevertheless, the following are suggested concepts that could be tested or evaluated:

a) For example, more length of curved concrete bench could be added "in line" with the existing ring, replicating the same bench profile, texture, toe kick dimensions, etc. Maybe that would be an enhancement, maybe not.
b) Adding to the height of the existing bench could add reflective ring surface to boost the focus inward, but adding too much height makes the benches impractical for sitting, or effectively builds a walled enclosure for a different experience. Maybe that would be a feature enhancement; probably not.
c) It may be possible to smooth out the existing concrete, grind it smoother, or add concrete sealer finish to fill in pores so it does not retain moisture, or dries quicker. Tricky, tricky. We do not know that these sorts of modifications would improve the feature.

Given the guidelines recommended above, the Team developed conceptual plans dated 12-Decembe-2022, shown below.

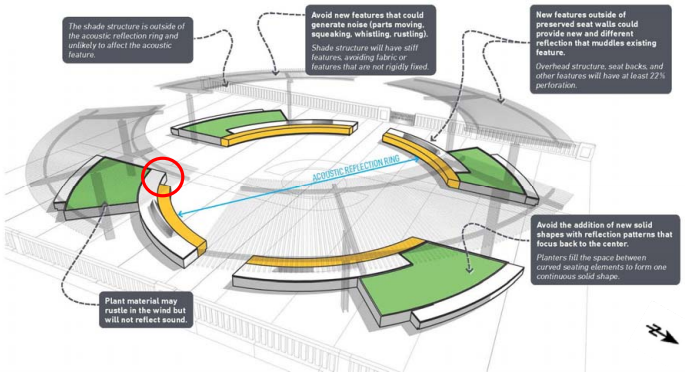



**Figure 8 – COTU 12-Dec-2022 Concept Plan**

The current schematic plan is showing a short section of new curved bench and planter bed on the southeast quadrant, extending out behind the existing acoustic reflection ring or "echo feature" bench, which is not recommended (see the red outlined bench corner above, left). This is an example of new additions to avoid, or which need to be designed with special attention to solid geometry such





that it is shaped to reflect sound away from the center, or is simply eliminated, in order to avoid a new contributing reflection pattern (red reflection arrow in Figure 9, below).

Another approach in this specific case is to modify the schematic plan, to tuck any new additions of southeast planter bed and benches east of the blue dashed line where the existing planter bed now resides.

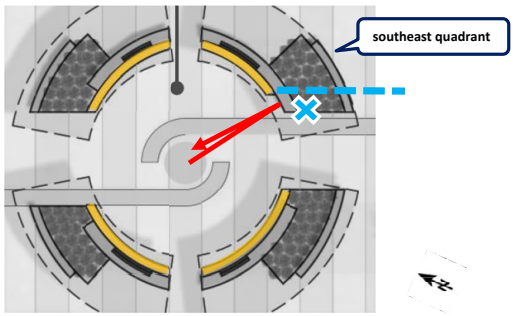



**Figure 9 – Comments for 12-Dec-2022 Concept Plan Southeast Quadrant**

We hope this discussion of acoustic features and recommendations for Center of the Universe assists with your evaluation and planning for the proposed project. Please contact me directly with any questions.

Submitted by,

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