



ALTERNATIVE
FUTURES FOR
**SOROPTIMIST PARK
& BOZEMAN CREEK**



Fall 2020
HORT 432: Advanced Landscape Design
ENSC 448: Stream Restoration Ecology

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I N T R O D U C T I O N

1.1 PARTICIPANTS

Project Partners

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Emily Cope (Downtown Bozeman Partnership)
Troy Scherer (Design5 Landscape Architecture)
Rob Pertzborn (Intrinsik Architecture)
Jim Lovell (Confluence Consulting Inc.)

MSU Courses

ENSC 448 Stream Restoration Ecology
HORT 432 Advanced Landscape Design

MSU Course Professors

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Park + Parking Redevelopment

Tara Medina Caplis (Hort 432)
Sierra Bos
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Nicholas Markson
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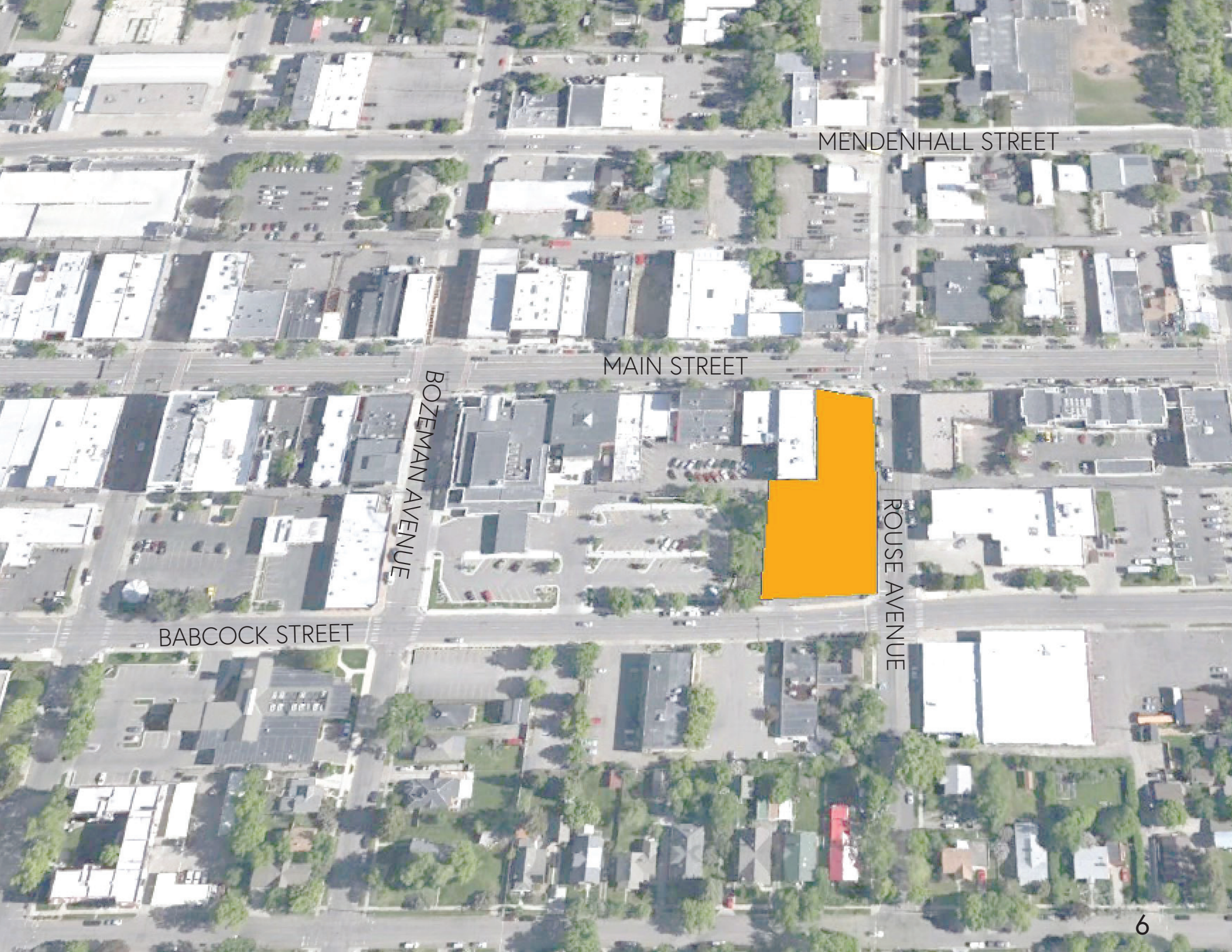
Park + Park (Extended Park)

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Emily Daniels
Eli Harmon
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STREAM ASSESSMENT TEAM

ENSC448 Assessment Team

Andrew Farber
David Forbes
Ricky Jones
Colton Komar
Chase Morgan
Ruth Roys
Bailey Servais



MENDENHALL STREET

MAIN STREET

BOZEMAN AVENUE

ROUSE AVENUE

BABCOCK STREET

1.2 PROJECT OVERVIEW

Partnership Story

In the Summer of 2020, Montana State University's (MSU) Community-engaged And Transformational Scholarship (CATS) Initiative matched a project need from the Downtown Bozeman Partnership (DBP) with two MSU undergraduate courses in the College of Agriculture. The two courses are the ENSC Stream Restoration Ecology housed in the Department of Land Resources and Environmental Sciences and HORT 432 Advanced Landscape Design Studio in the Department of Plant Sciences and Plant

Pathology. The resulting service-learning partnership (Figure 1) collaborated on the project shown in this report during the 2020 Fall semester. DBP engaged three professional mentors who had been consultants on past related projects: Jim Lovell of Confluence Consulting Inc., Rob Pertzborn of Intrinsic Architecture, and Troy Scherer of Design 5 Landscape Architecture. The professional mentors, along with DBP staff, provided additional expertise and insights for student learning at several course activities dispersed throughout the semester.

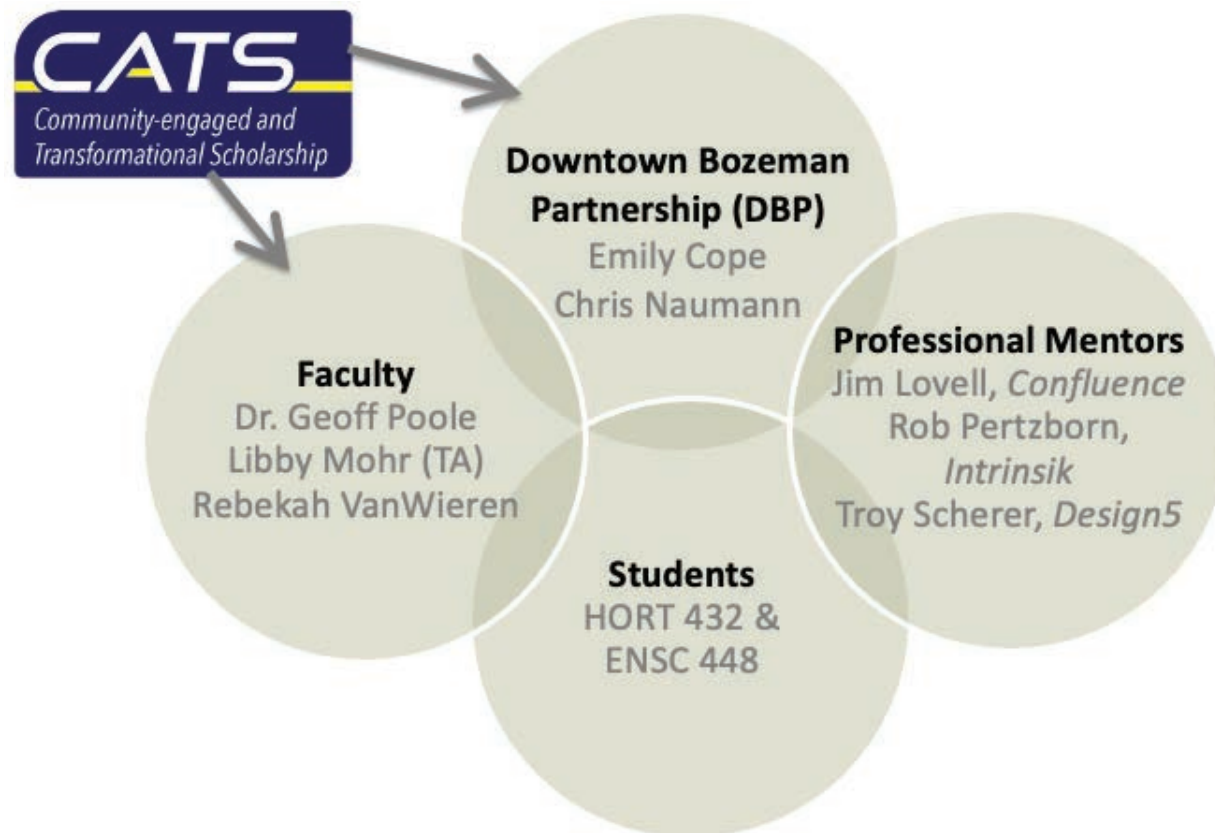


Figure 1

Course Contexts and Collaboration

A list of course activities and processes are shown in Figure 2. In addition to collaborative activities related to the service-learning project, each course included disciplinary content and learning objectives. The HORT 432 course covers sustainable site design strategies and landscape performance in the context of public green infrastructure. The ENSC448 course delves into

the integration of scientific knowledge with stream restoration practices. Student teams from ENSC448 acted in a consulting capacity to the HORT432 students to provide an in-depth assessment of the creek and to increase the scope of the design work to include opportunities for stream improvements to complement park improvements.

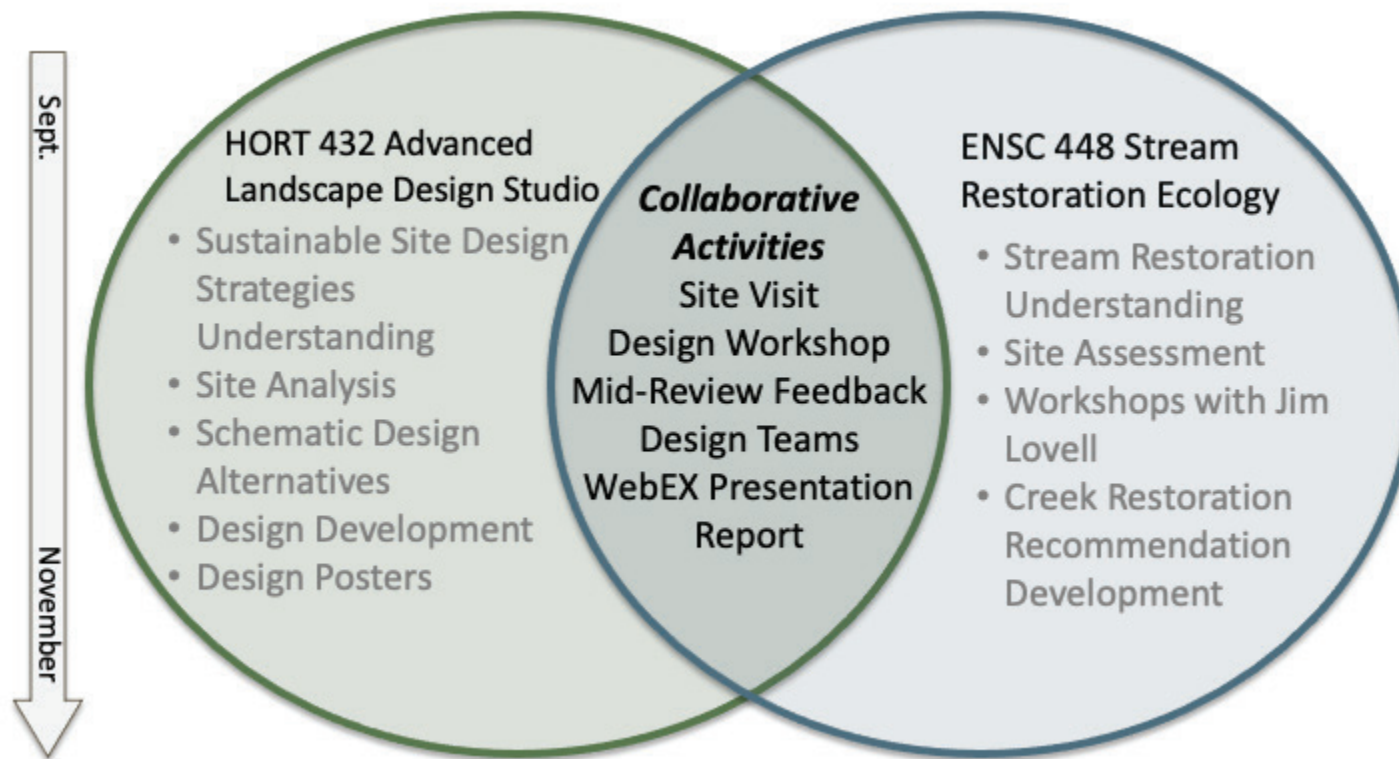


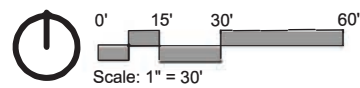
Figure 2

1.3 PROJECT SCOPE

The design challenge was to re-imagine future alternatives for the area encompassing the existing Soroptimist Park, the Rouse Public Parking Lot, Eagles-owned parking spaces, and Bozeman Creek. The total project site is 0.88 acres (38,300 square feet) and is located in the heart of Bozeman's downtown district.

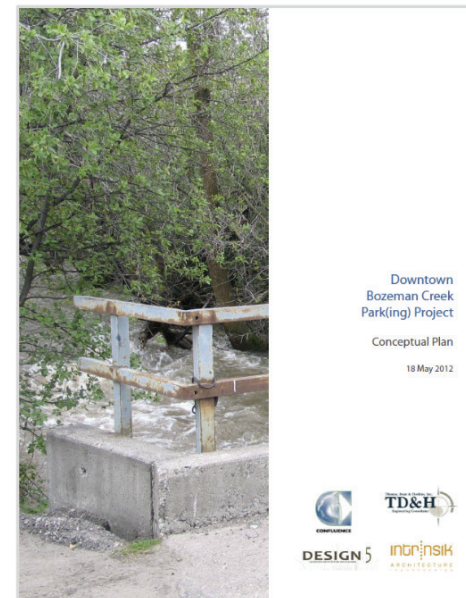
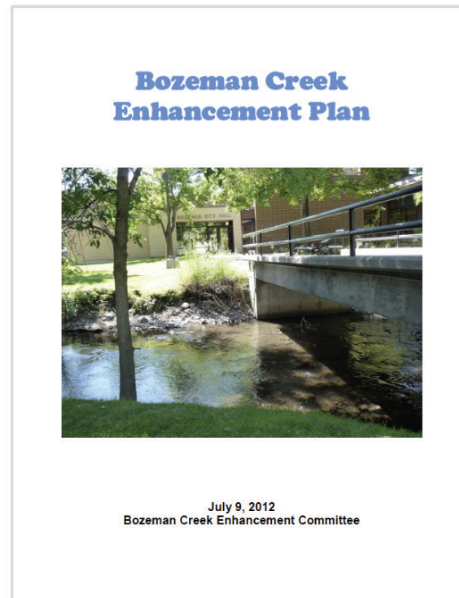


SITE BASE MAP



The design challenge was guided by three planning documents: Downtown Bozeman Improvement Plan(2019), Bozeman Creek Enhancement Plan (2012), and Downtown Bozeman Creek Park(ing) Project: Conceptual Plan(2012). The plans outline essential goals and objectives identified by the Bozeman community for the creek and downtown, that, ultimately, the site's future redevelopment needs to address. The Downtown Bozeman Improvement Plan (2019) included findings based on extensive community engagement opportunities and survey data, which included ideas for improvements to Soroptimist Park. "Chapter 7: Connected to Nature and Culture" was particularly relevant to this project. A summary of relevant information from the entire plan is included in the Cultural Fabric analysis.

The project used an alternative futures approach (Nassauer and Corry, 2004) to schematic design development. In this approach, varying assumptions on future conditions are identified to inform a series of scenarios that drive schematic design choices. The scenarios and resulting design visuals and data can then be utilized by DBP for future analyses, decision-making, and community engagement activities. The scenario and design development were grounded on goals outlined in the Downtown Bozeman Improvement Plan and Bozeman Creek Enhancement Plan (Figure 3), and then further refined based on project research, site visits, and design workshop discoveries. The four developed scenarios are described in Chapter 4.



Bozeman Creek Enhancement Plan

- 1) Foster broad awareness of an appreciation for Bozeman Creek, leading to a strong community stewardship effort.
- 2) Restore the natural processes necessary for a functioning stream ecosystem.
- 3) Improve water quality to support aquatic life and primary contact recreation.
- 4) Provide ample public access and appropriate recreational opportunities along the creek corridor, while ensuring resource protection.

Top 5 Activities for Soroptimist Park's Future, from Downtown Bozeman Improvement Plan

- 1) Community Gathering (plaza)
- 2) Passive Uses (seating, picnicking)
- 3) Performances (movie night, music)
- 4) Food (pop-up vendors, markets, beer gardens)
- 5) Play (equipment, games, interactive water features)

Figure 3: Key Goals in Guiding Documents for the Creek and Park

REFERENCES

- Agency Landscape + Planning, Groundprint, Intrinsic Architecture, and Leland Consulting. (2019). Downtown Bozeman Improvement Plan. Prepared for the City of Bozeman and the Downtown Bozeman Partnership. Bozeman Creek Engagement Committee. (2012). Bozeman Creek Enhancement Plan. Prepared for the City of Bozeman and the Downtown Bozeman Partnership. Intrinsic Architecture, TD&H Engineering, Confluence Consulting, Inc., and Design 5 Landscape Architecture. (2012). Downtown Bozeman Creek Park(ing) Project: Conceptual Plan. Prepared for the City of Bozeman.
- Nassauer, Joan Iverson, and Robert C. Corry. (2004). Using normative scenarios in landscape ecology. *Landscape Ecology*. 19: 343-356.

BUILDING AN
UNDERSTANDING



2.1 HORT 432 INVENTORY & ANALYSIS

In the beginning of the semester we divided the entire site into four main categories for analysis and each chose one. After visiting the site and speaking with the design mentors, we were able to identify some topics related to each of the categories. These are the categories and the topics related to each.

Cultural Fabric

- Site history
- Cultural assets
- Land use study
- Visibility and safety
- Noise patterns
- Use patterns
- Zoning and UBC
- Building frontage codes

Gray Fabric

- Utilities
- Parking on site and nearby
- Furnishings
- Sittable space
- Hardscape materials and permeability
- Parking codes

Green Fabric

- Ecosystem context
- Vegetation inventory
- Tree benefits calculator
- Microclimate study and surface temperature

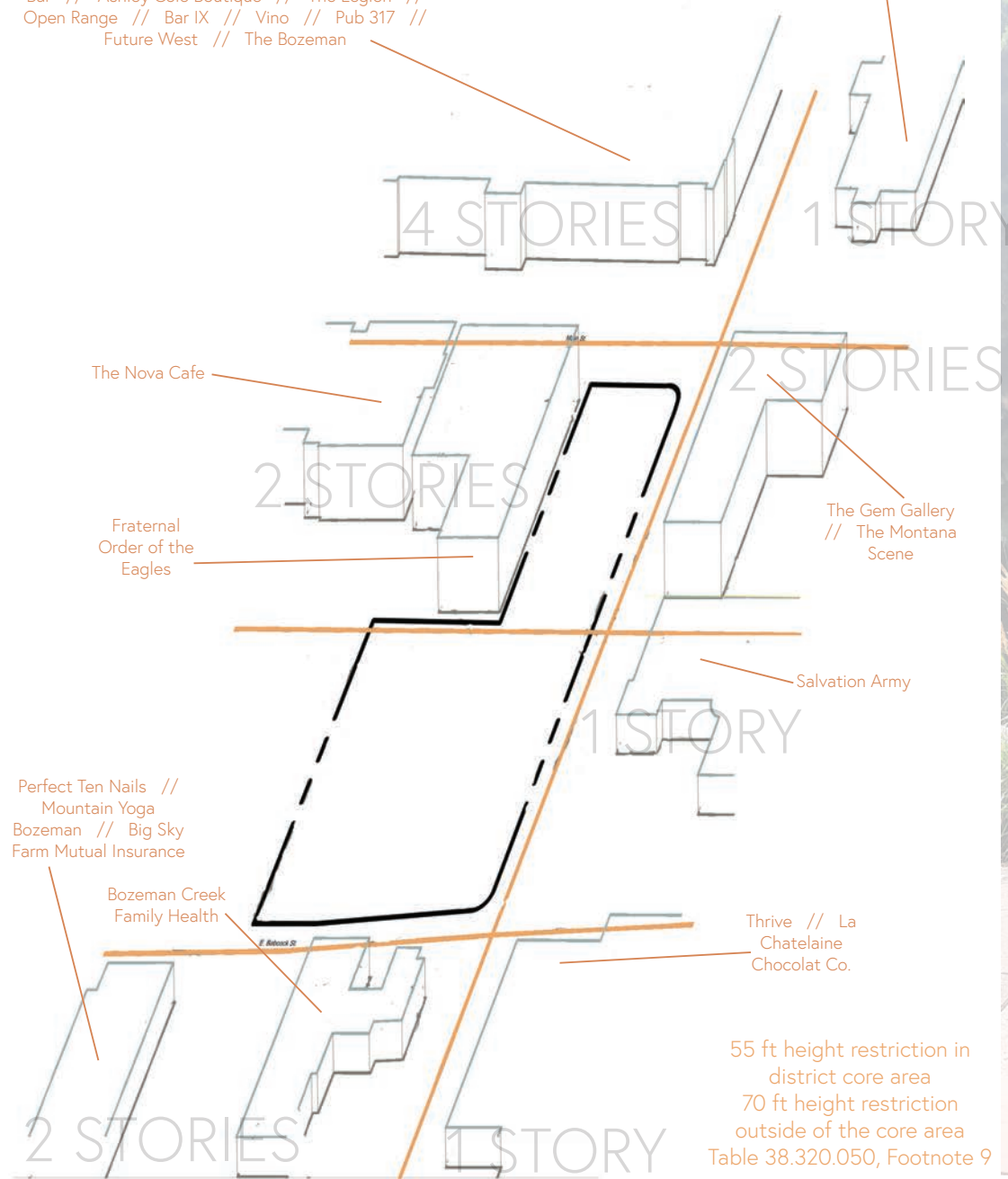
Blue Fabric

- Watershed context
- Site drainage patterns and infrastructure
- Stormwater runoff estimates
- Watercourse setback codes and FEMA mapping

Social & Recreational Connections

Rocky Mountain Rug // El Camino // Rocking R Bar // Ashley Cole Boutique // The Legion // Open Range // Bar IX // Vino // Pub 317 // Future West // The Bozeman

Knife // Cushing Terrel Architecture



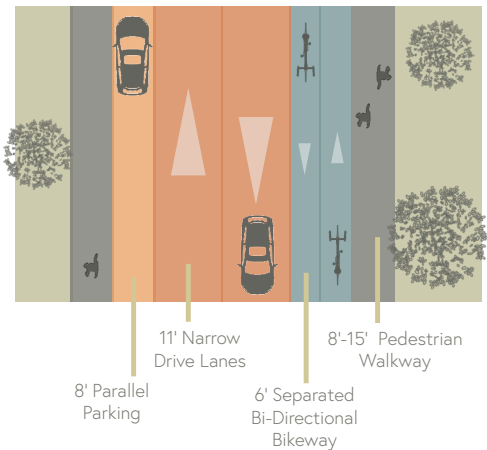
Downtown Bozeman Improvement Plan

Community Participation
 26 Meetings
 230+ Participants in 8 Workshops
 300 Written comments
 120 Web comments
 1,891 Online Surveys
 100+ Stakeholders engaged

Downtown Character Areas
 Grand Ave - Cultural Arts
 Black Ave - Downtown Bike Hub
 Rouse Ave - Civic Gateway
 Wallace Ave - Industrial Heritage
 Main St - Historic Core

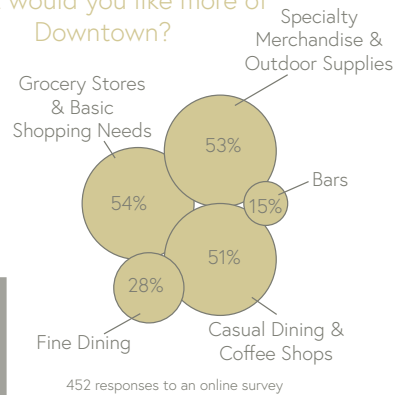
Economic Drivers
 Higher Education
 Tourism and Recreation
 Health Care
 Technology
 Regional Trade Center

Planning for the Future of Transportation
 EV Charging Stations
 Ride Share Infrastructure
 Public Car Share
 Bike Share



Proposed Babcock Street

What would you like more of Downtown?



Invest in Great Streets
 Implement streetscape improvement programs
 Incorporate art
 Connect indoors to outdoors
 Manage sidewalk encroachments

Walkable and Accessible
 Expand transit and bicycle access and facilities
 Use streets, sidewalks and alleys as a safe and comfortable multi-modal network

Expand Parking
 Unlock privately owned parking that is unused during extended times of the day and evening
 Add on-street parking where possible
 Expand and clarify signage
 Expand structured parking

Welcoming to Everyone
 Design new buildings for sustainability, durability and design excellence
 Inclusive of all ages, incomes, abilities, and backgrounds

More than Main Street
 Reinforce Downtown as the city center with diverse mix of uses
 Protect the characters of the Main Street Historic District with context-sensitive development

Heart of a Thriving City
 Create connections Downtown and among surrounding districts
 Manage and regulate parking

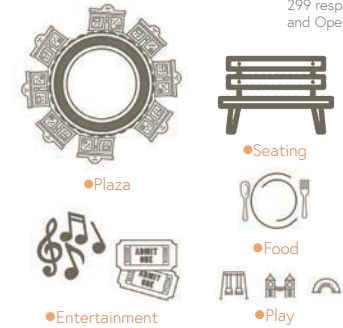
Enliven the Alleys
 Promote smaller alley-based retail/offices
 Create secondary connectors
 Plan for maintenance, business operations, and winter needs
 Build a unique alley personality

Urban Housing/Mixed-Use

Promote a range of housing options
 Townhomes
 Duplex
 Triplex/Fourplex
 Multi-family
 Downtown Mixed-Use
 Courtyards
 Maker Spaces
 Offices/Workspaces
 Lobbies
 Retail/Dining
 Residential

What do people want in Soroptimist Park?

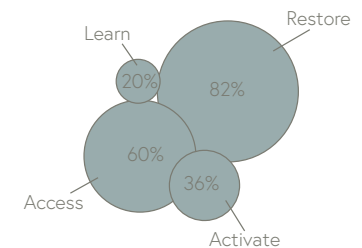
299 responses to a Parks and Open Spaces survey



Soroptimist Park can be a great living room for downtown - a common ground that enables community gathering, performances, play and markets. Designed as a flexible plaza, it will be both a great place for downtown visitors everyday and a useful space for large events.

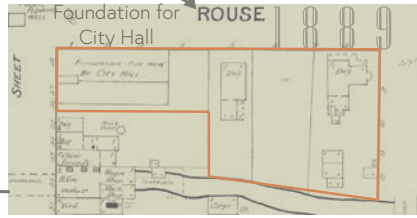
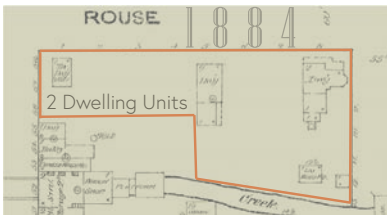
Connected to Nature and Culture

Highlight nature whenever possible
 Ensure Downtown open spaces foster gathering, recreation, flexibility, programming and local identity
 Activate the most central open spaces as social and cultural hubs
 Connect the more passive outer ring parks to the downtown neighborhoods that rely on them
 Revitalize the creeks and drainage systems for improved ecological health and community benefit



How should Downtown engage with Bozeman Creek?

Cultural Story Line



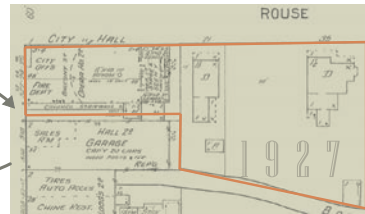
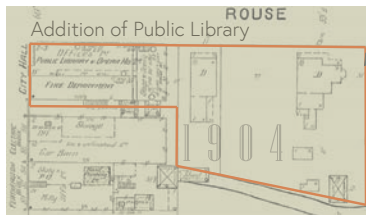
The Museum of the Rockies holds both an Opera House window and a backdrop scene within their cultural history collection.



Fire House Addition Ruins of Fire Next Door



Fire bell now sits in front of the fire station on Rouse



*Note lack of buildings on parking lot side of site

1959 Earthquake cracks the walls which are temporarily reinforced with beams

77 stone blocks were retained from the original arched entrance and now sit in the city's impoundment yard

1965



Addition of mural commissioned by the Eagles



Creation of park by the Soroptimists



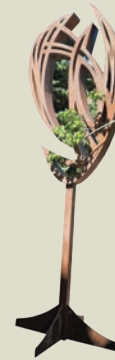
Mural wall is in disrepair

Timeline

While this site is not directly recognized as a historic entity in Bozeman, it holds the stories of some culturally significant points of Bozeman's development

Current Cultural Significance

Currently this site is home to several sculptures and a mural that tie into Bozeman's overall art scene and enhance the cultural fabric of the city.



Fish Face
By Erik 'Ole' Nelson



Phosphorous Bronze Pillar
By Laird Hovland



Commandments Statue



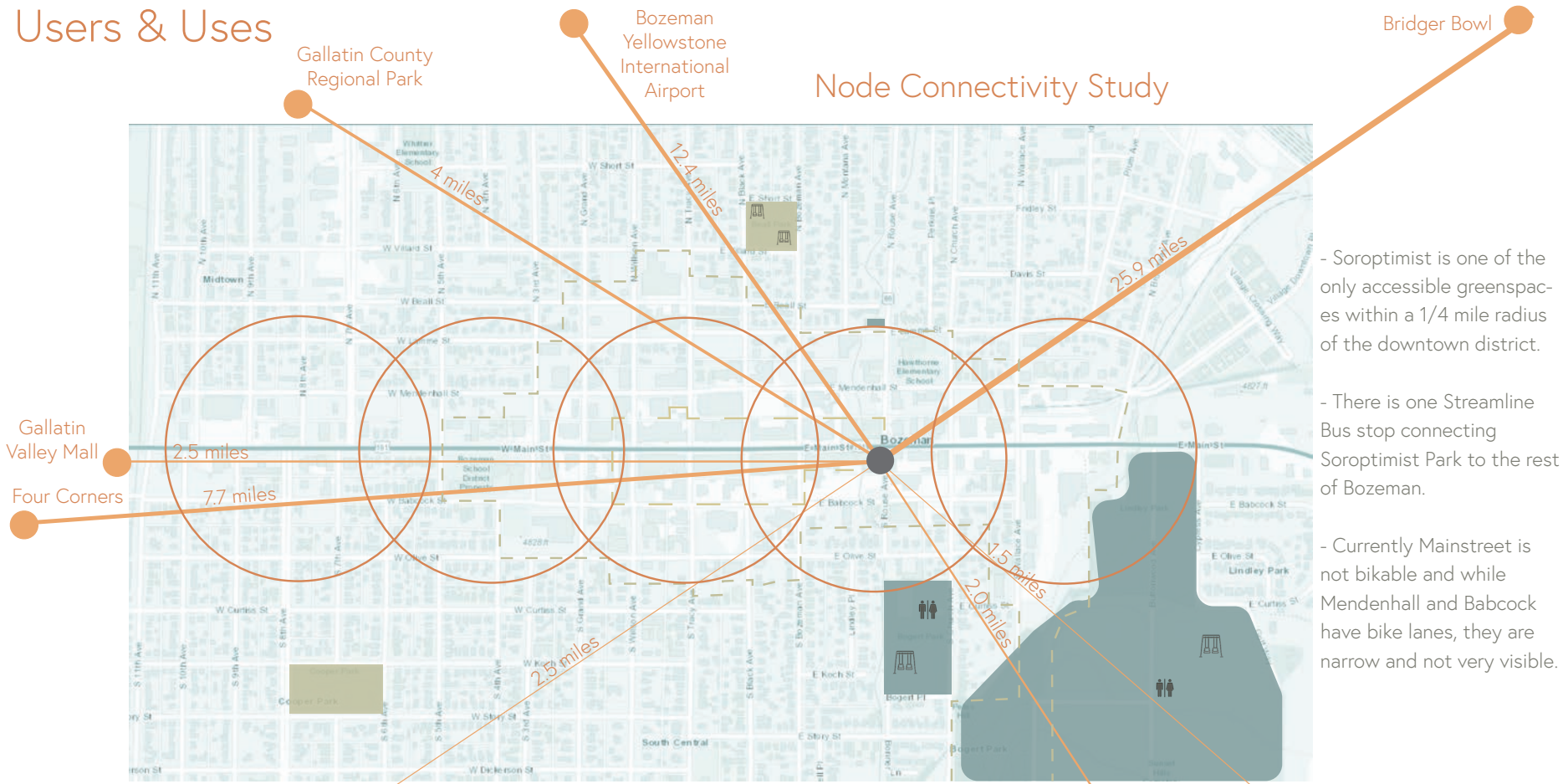
Between Earth & Sky
By Danny Kraus



Map of Art and Sculpture within the Gallatin Valley
Repurposed Lift Tower

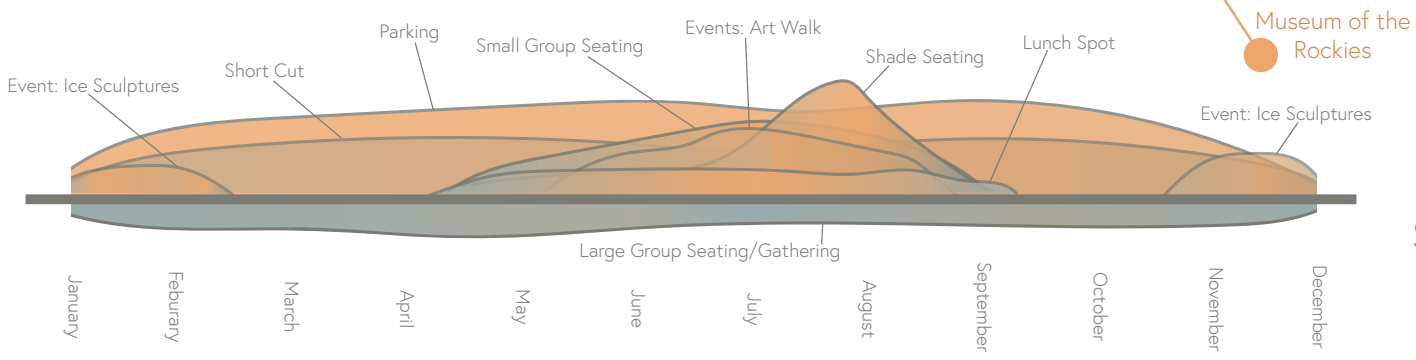
Users & Uses

Node Connectivity Study



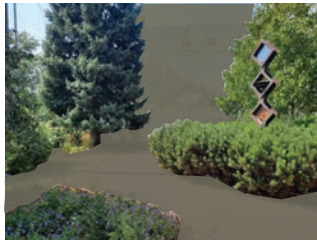
- Soroptimist is one of the only accessible greenspaces within a 1/4 mile radius of the downtown district.
- There is one Streamline Bus stop connecting Soroptimist Park to the rest of Bozeman.
- Currently Mainstreet is not bikable and while Mendenhall and Babcock have bike lanes, they are narrow and not very visible.

- - - Central Business District
- - - Main Street Historic District
 Playground
 Public Restroom



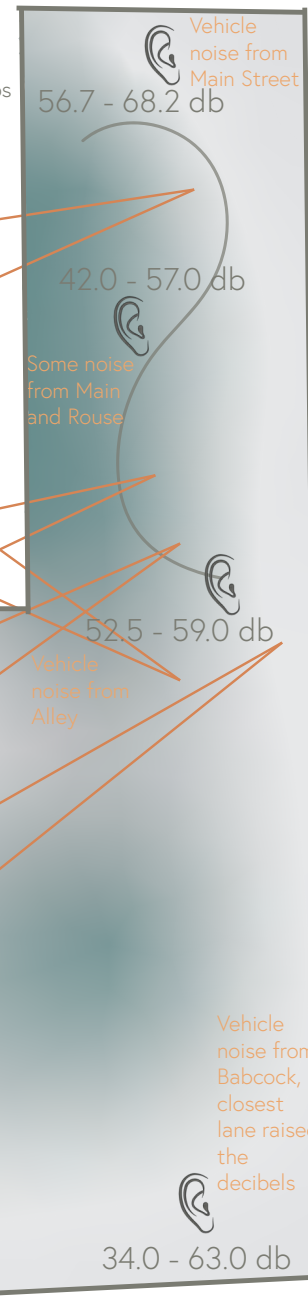
Site Use Timeline

Site Safety



Visibility Study

Visibility Analysis
 A majority of this park site is lined with dense shrubs which reduces the overall visibility into the site. Additionally larger shrubs and low tree canopies decrease the visibility within the site.



Light & Sound Distribution

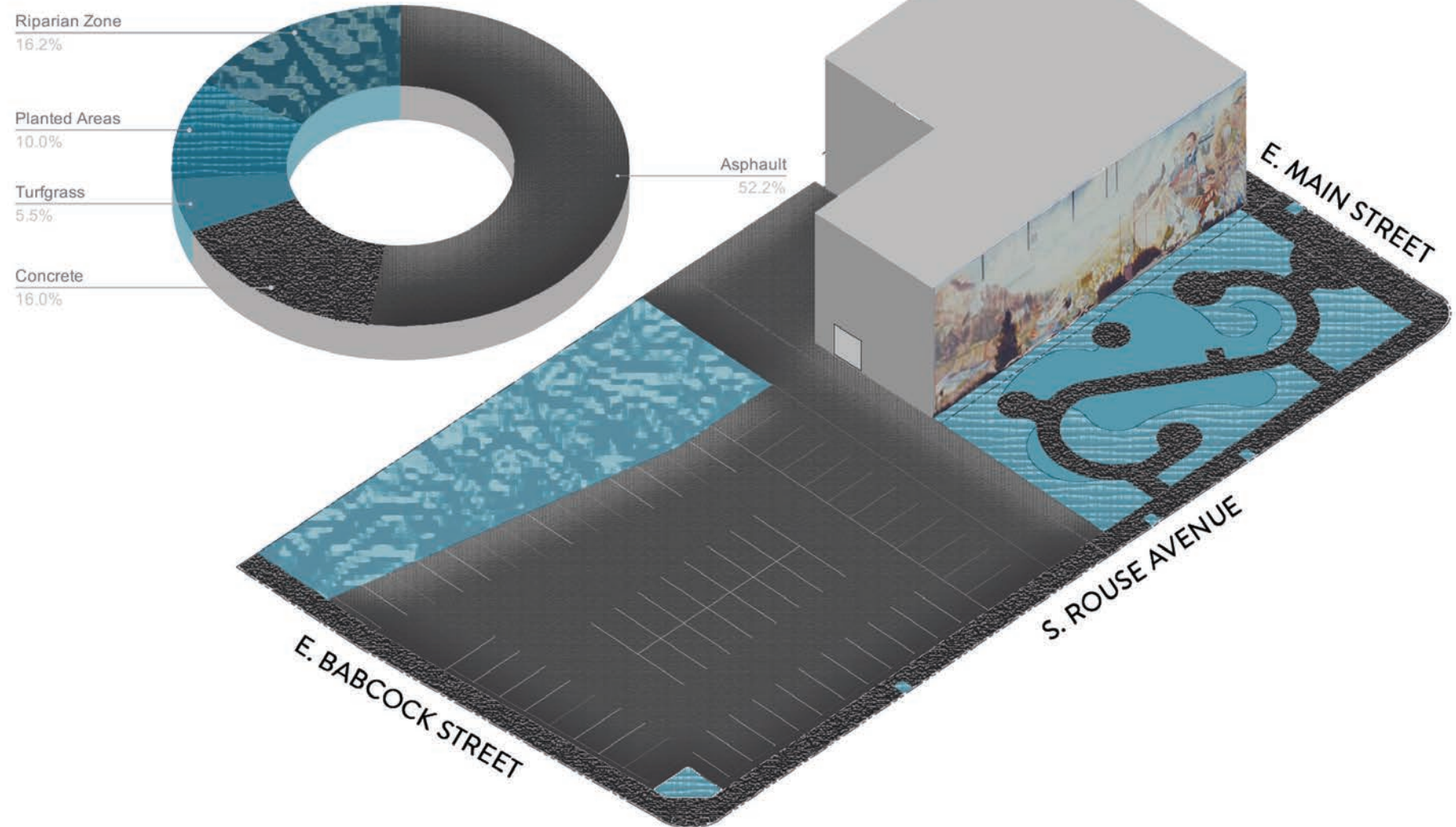
Permeability

This graphic compares the current certain surface conditions permeability of stormwater. These surfaces are also divided into separate surface conditions.

Total Area: 38,693 sqft

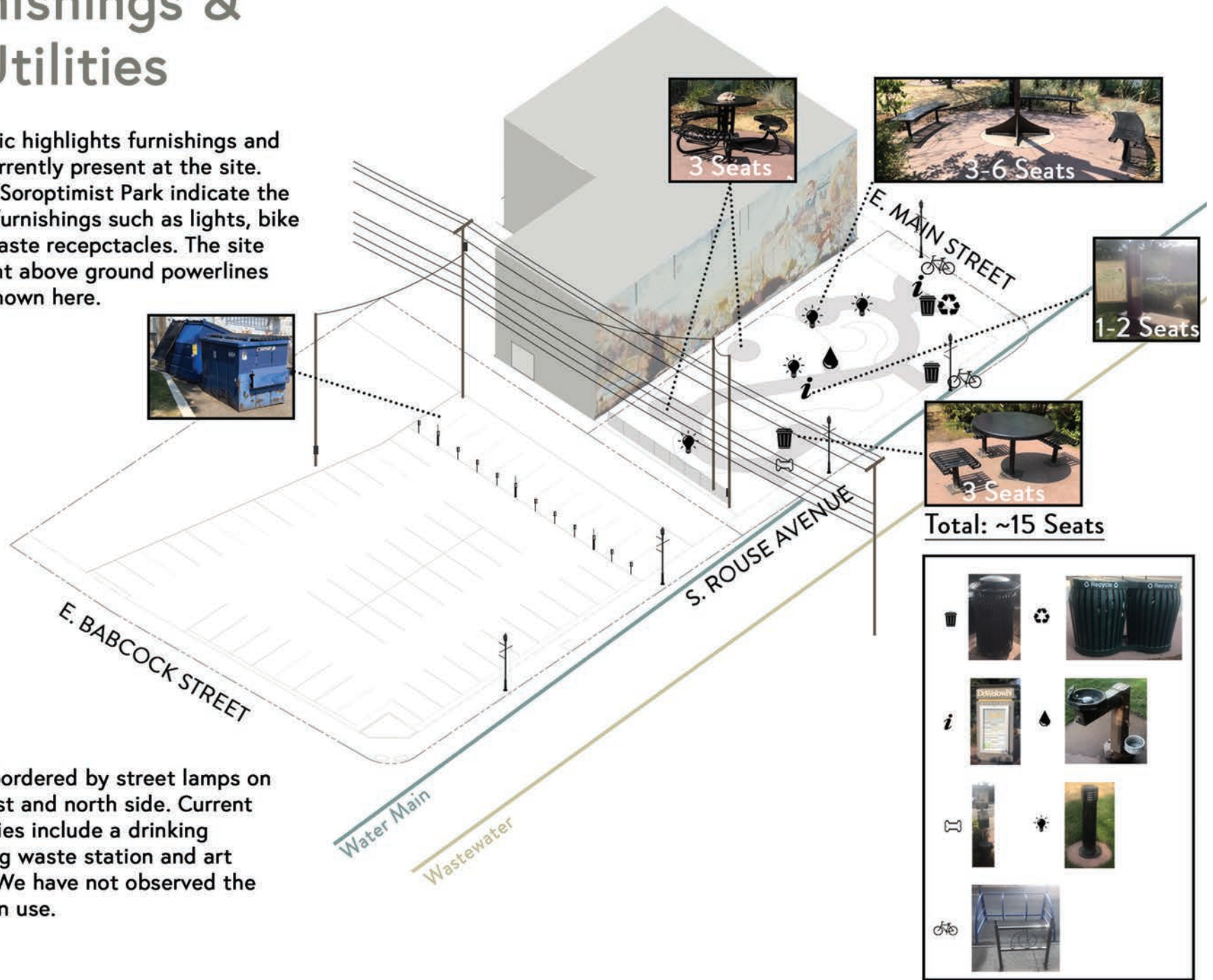
Permeable Surface Area: 12,307 sqft (31.7%)

Impermeable Surface Area: 26,386 sqft (68.2%)



Furnishings & Utilities

This graphic highlights furnishings and utilities currently present at the site. Symbols on Soroptimist Park indicate the location of furnishings such as lights, bike racks and waste receptacles. The site has prevalent above ground powerlines which are shown here.

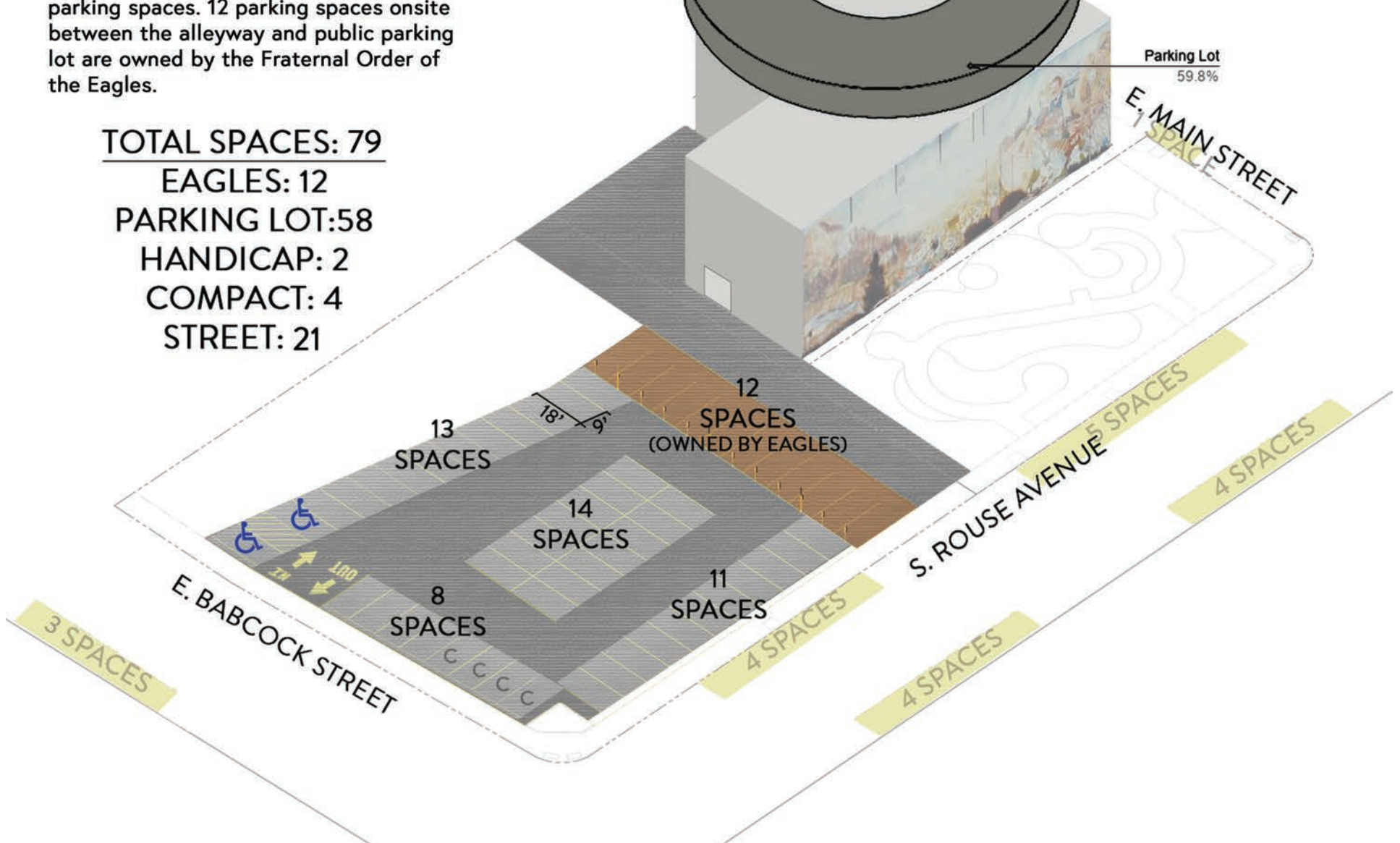
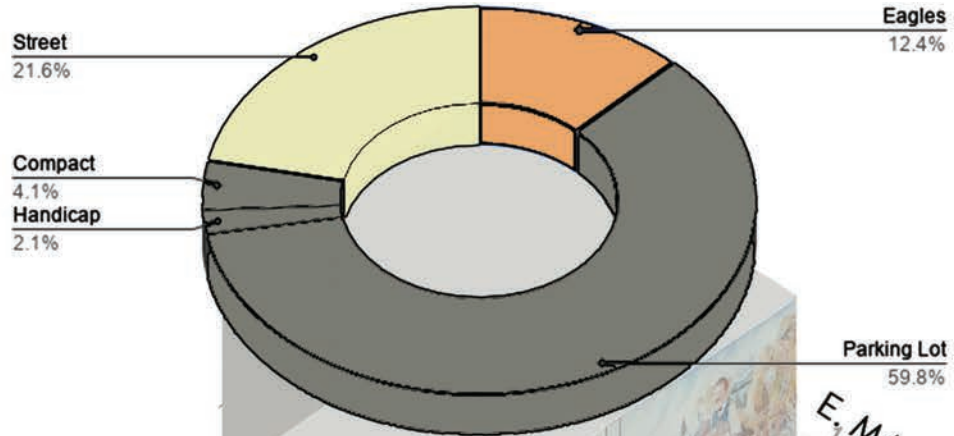


The site is bordered by street lamps on both the east and north side. Current park amenities include a drinking fountain, dog waste station and art sculptures. We have not observed the park lights in use.

Site Parking

The site is currently home to 58 parking spaces. Street parking along the borders of the site also provides 21 additional parking spaces. 12 parking spaces onsite between the alleyway and public parking lot are owned by the Fraternal Order of the Eagles.

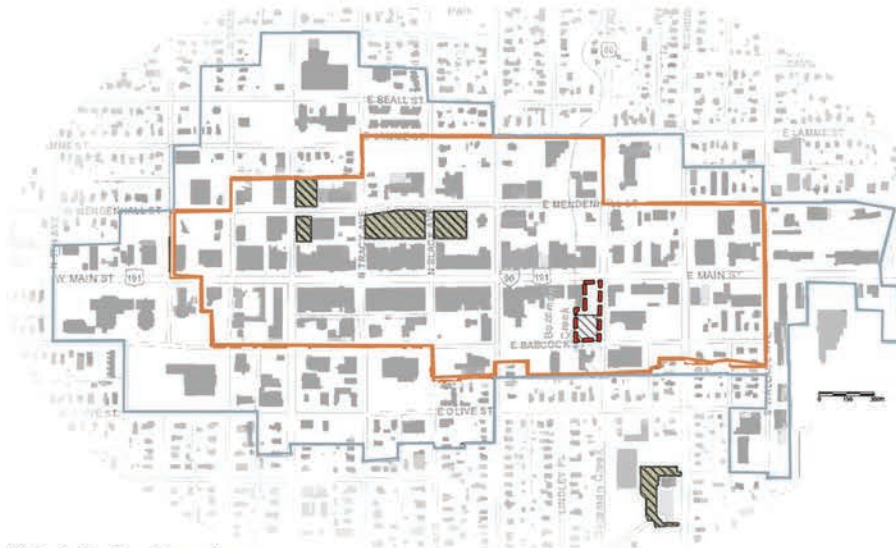
TOTAL SPACES: 79
EAGLES: 12
PARKING LOT: 58
HANDICAP: 2
COMPACT: 4
STREET: 21



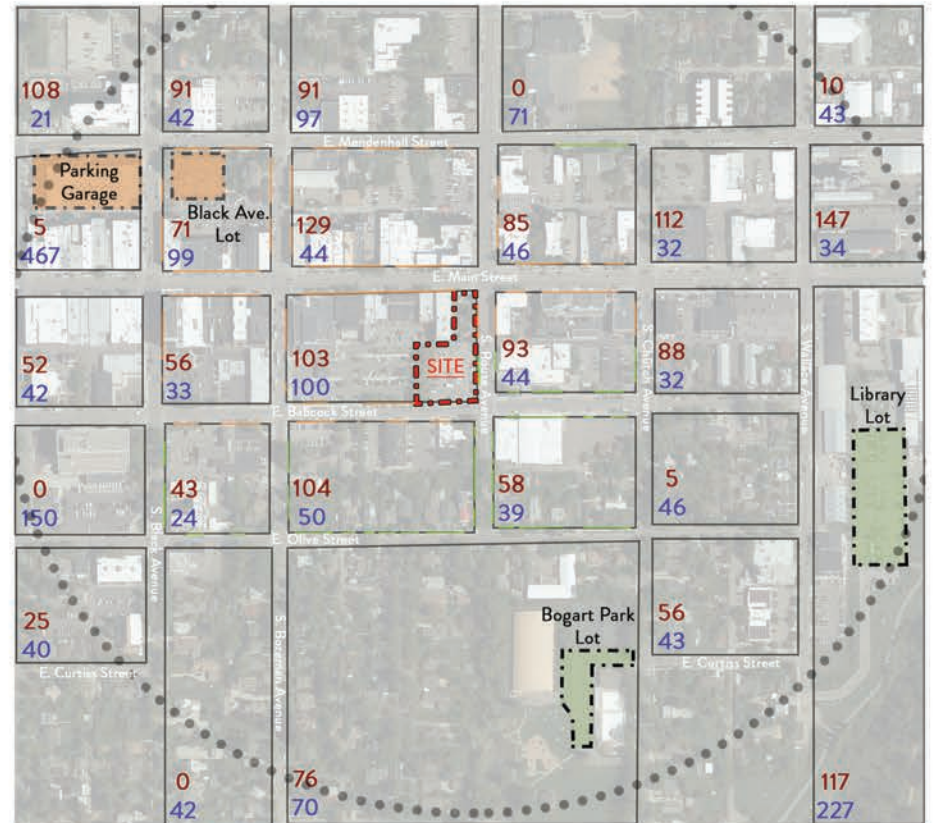
Parking Context

Currently the site is home to the Rouse Public Parking Lot which is one of several parking lots in downtown Bozeman highlighted below. The parking lot provides parking for the southeast section of downtown Bozeman.

The graphic below shows parking available currently within a 5 minute walk of the site. Parking space amounts are grouped by block and also divided into private vs. public parking.

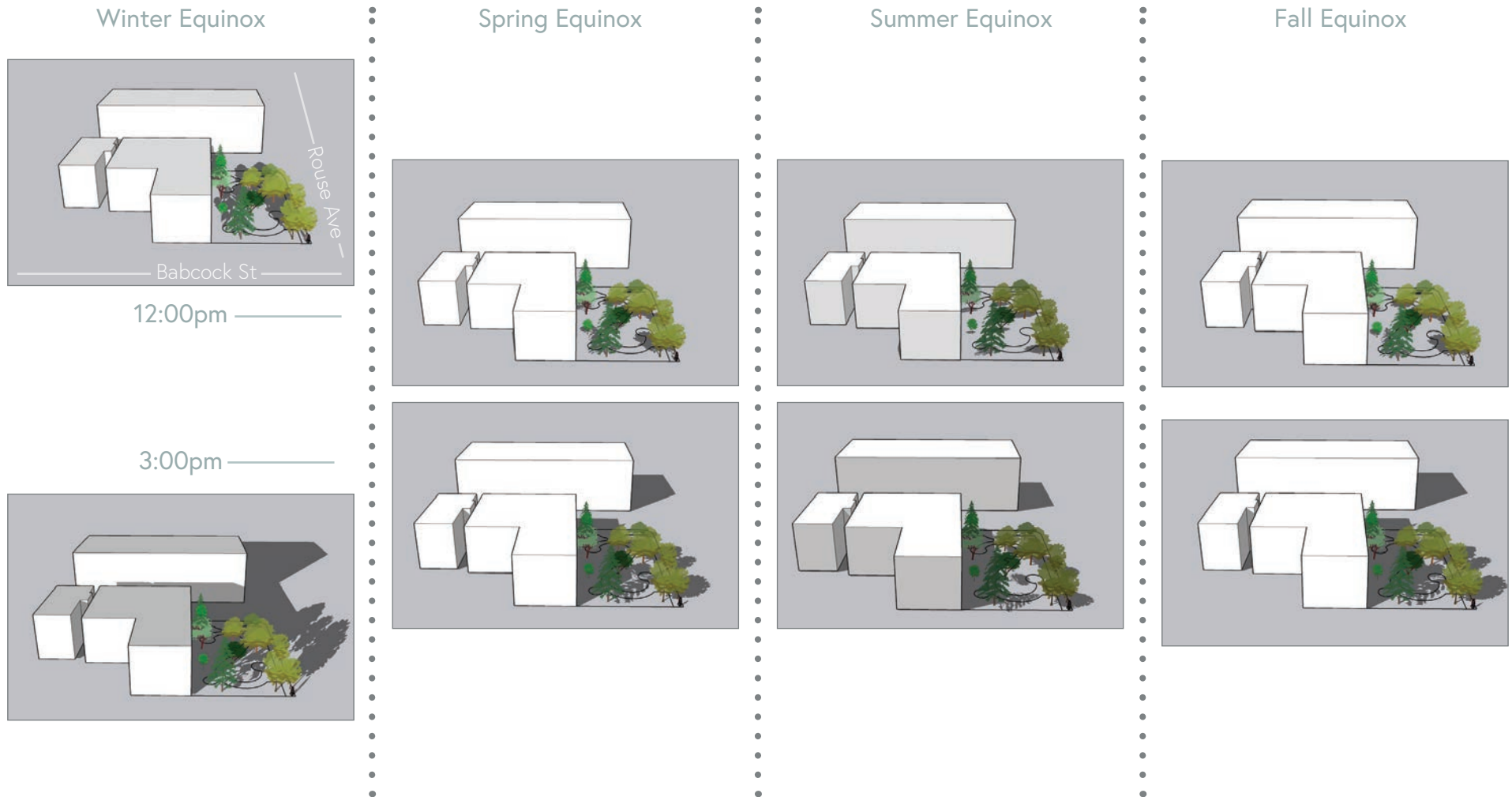


- Public Parking Lot
- Downtown B-3 District
- Downtown Business Improvement District
- Site Boundary



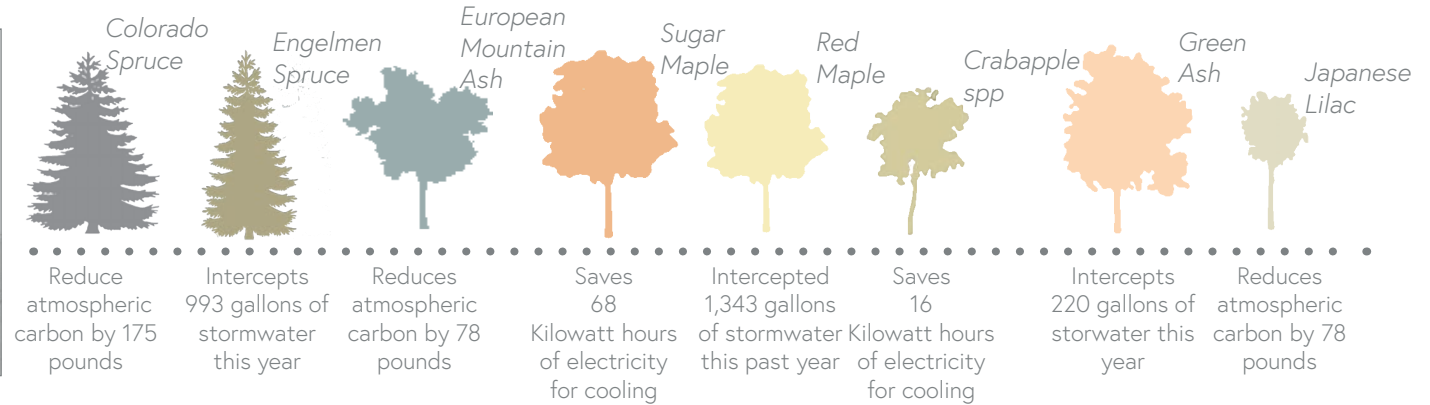
- Amount of Spaces per Block
 - 2 Hour Parking
 - All Day Parking
 - 5 Minute Walkability Radius
 - Site Boundary
 - Private Parking
 - Public Parking
- 0 250 500 1,000 Feet

Microclimate Study Temperature and Shade Coverage



Using an infrared thermometer in late August,, paving exposed to full sun by 3:45pm had an average temperature of 122 degrees fahrenheit. Surrounding exposed turf averaged a temperature reading of 103 degrees. The parking lot located on the south end of the site is completely exposed having read the warmest temperature at 129 degrees. It was noted that at the same time of day, pavement found in shaded areas were significantly cooler with an average temperature reading of 83 degrees

Vegetation Analysis Current Site Conditions



Bozeman Creek is an integral part of the Gallatin Valley ecosystem. This particular section of the creek is lined by a tree canopy consisting of *Green Ash*, *Quaking Aspen*, *Willows*, and *Chokecherry shrubs*. Minimal herbaceous material is found along both sides of the slope of the creek due to excessive sun



Planting Zone 2

- Common Ninebark
- Hedge Cotoneaster
- Japanese Spiraea
- Karl Foerster Grass

Planting Zone 1

- Blazing Star Liatris
- Blue Fescue Grass
- Bush Cinquefoil
- Cranesbill



Planting Zone 3

- Common Ninebark
- Black-Eyed Susan
- Japanese Spiraea
- Mugo Pine
- Narrow-leaved Purple Coneflower



Key:



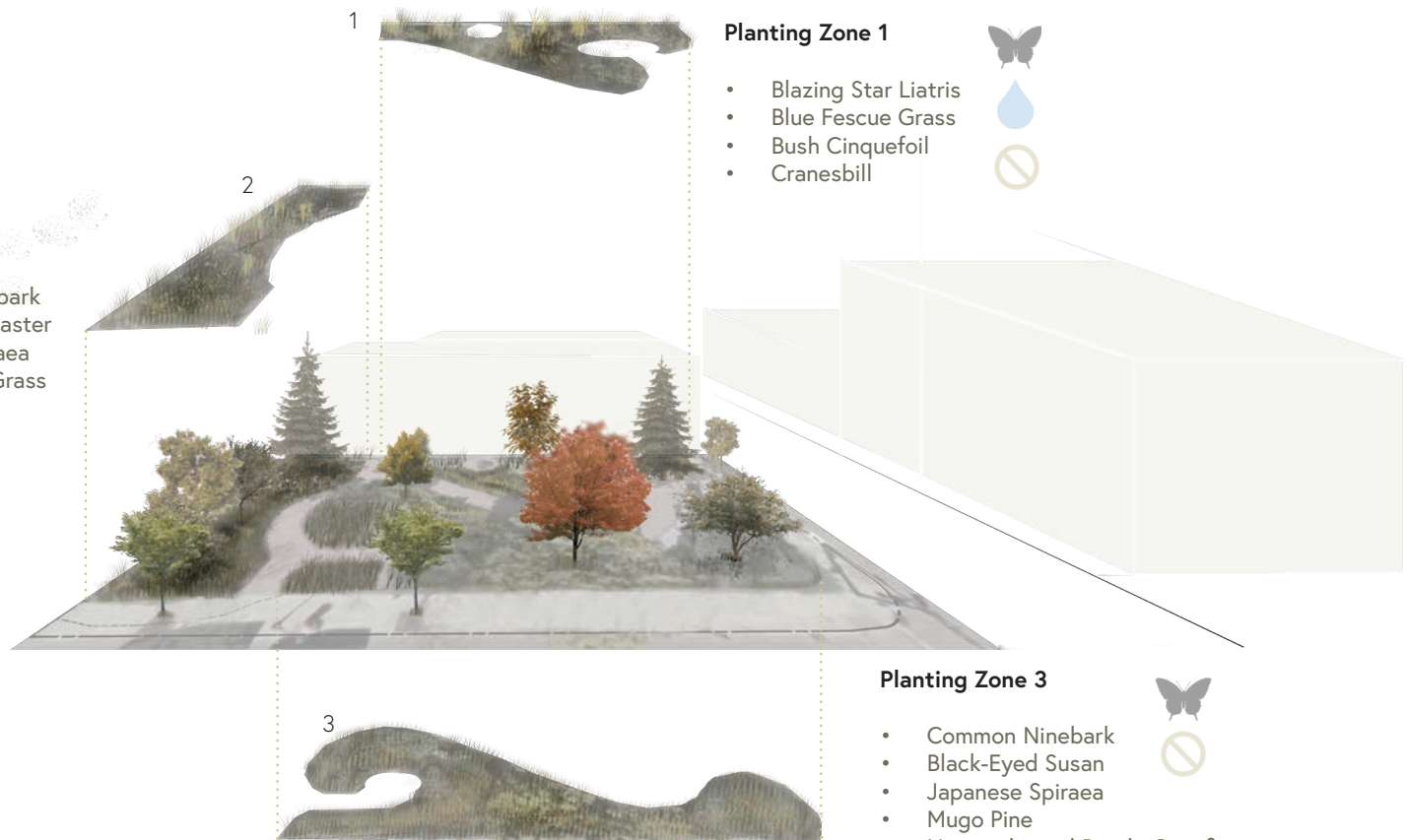
Pollinator Friendly



Raingarden Attributes



Poor Health Found Within Vegetation



Ecological Systems Ecological History Within the Landscape

Field Guide - Ecological Subregions in the Gallatin Valley



Deciduous Shrubland Systems



Forest and Woodland Systems

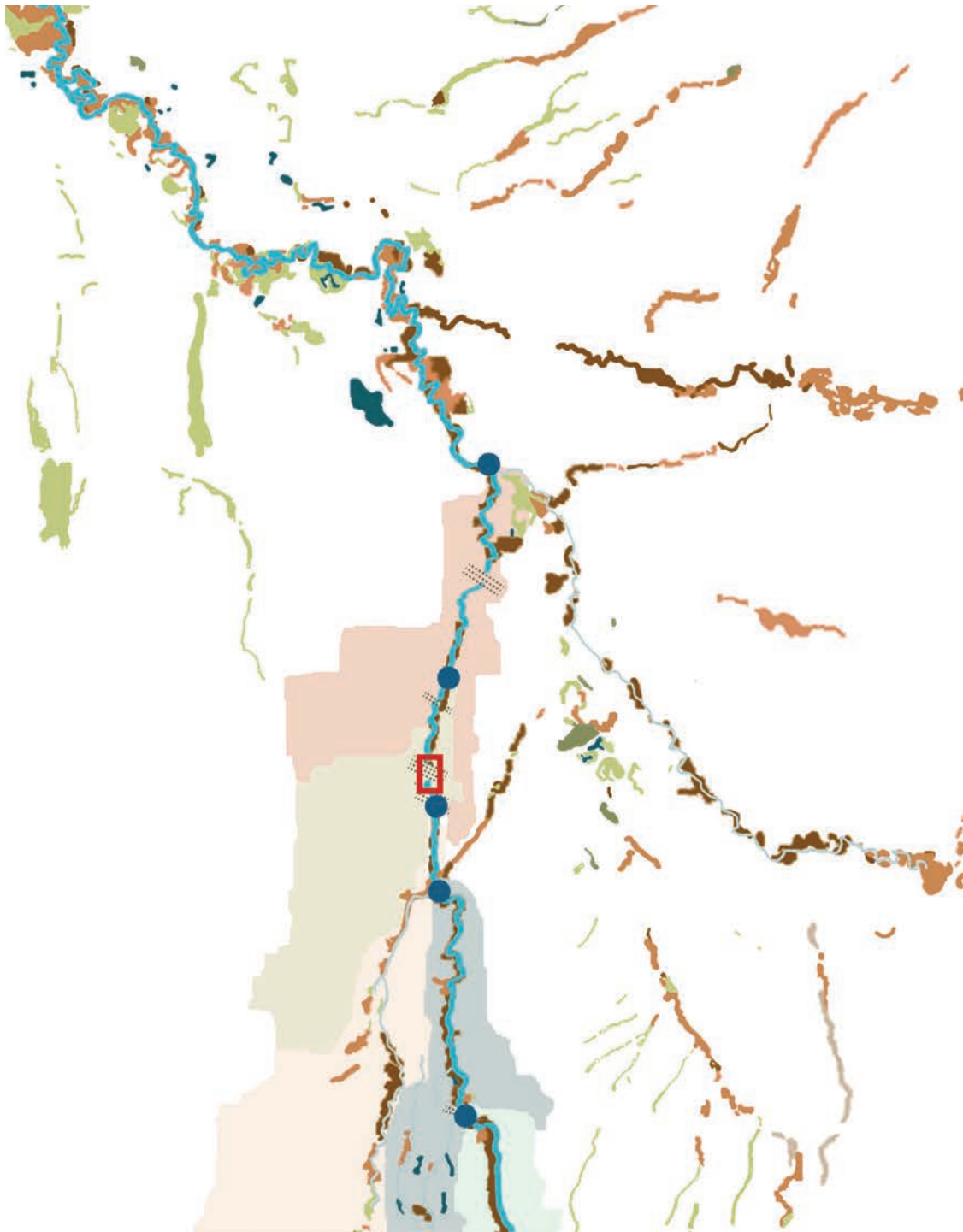


Grassland Systems



Shrubland, Steppe, and Savanna Systems

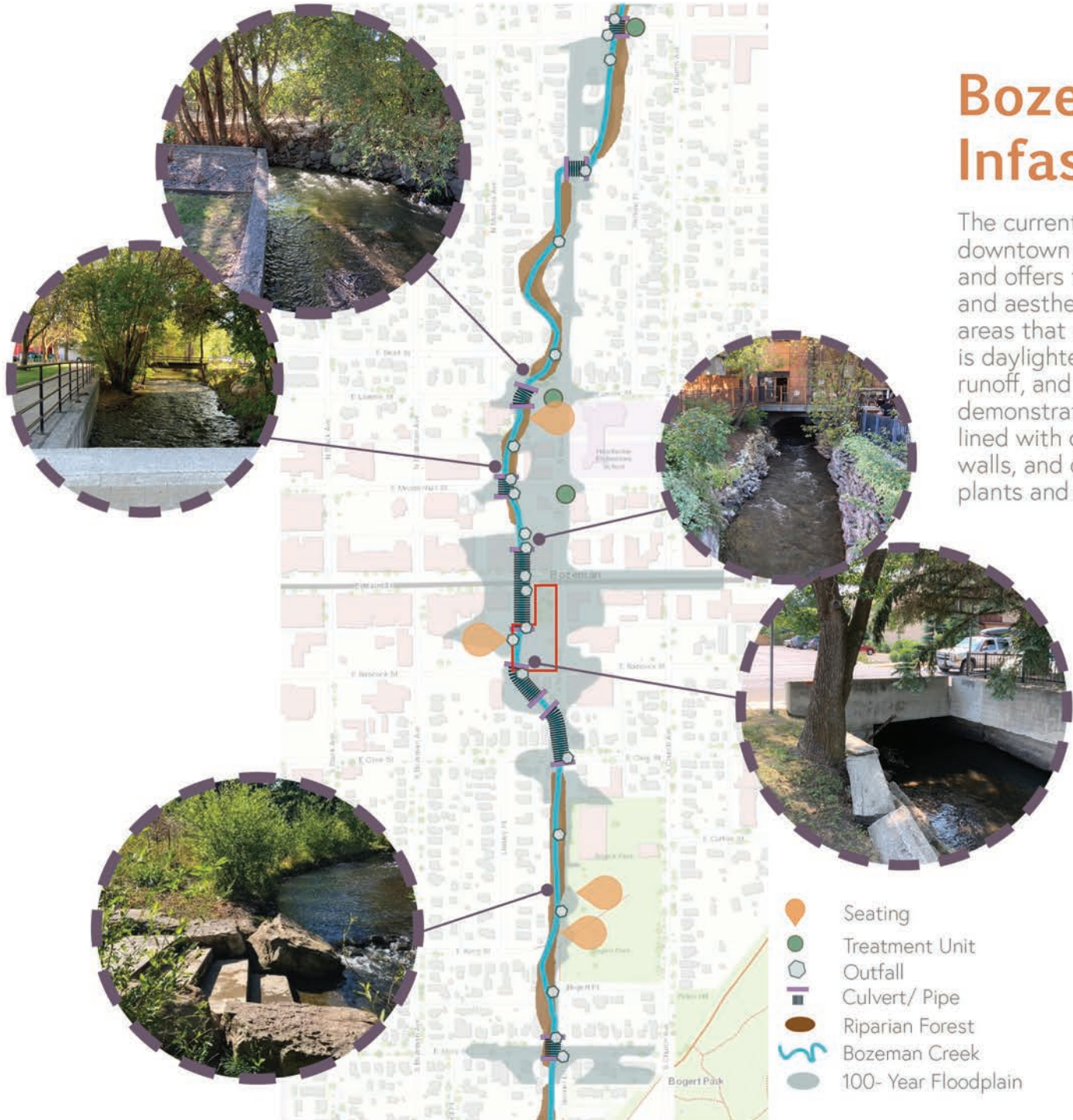
Bozeman Creek Watershed



-  Site
-  Flow Rate Change
-  Gravity Line
-  Bozeman Creek
-  Riparian Forest- Vegetation that is greater than 20 feet.
Total: 135 ac
-  Riparian Scrub-Shrub - Dominated by woody vegetation less than 20 feet tall. Vegetation Includes tree saplings and tree stunted due to environmental conditions
Total: 74 ac
-  Freshwater Forested - Wetlands dominated by woody vegetation less than 20 feet tall. Vegetation includes tree sampling and trees stunted due to environmental conditions
Total: 23 ac
-  Freshwater Emergent - Wetlands with erect, rooted herbaceous vegetation present during most of the growing season
Total: 30 ac

Bozeman Creek Infrastructure

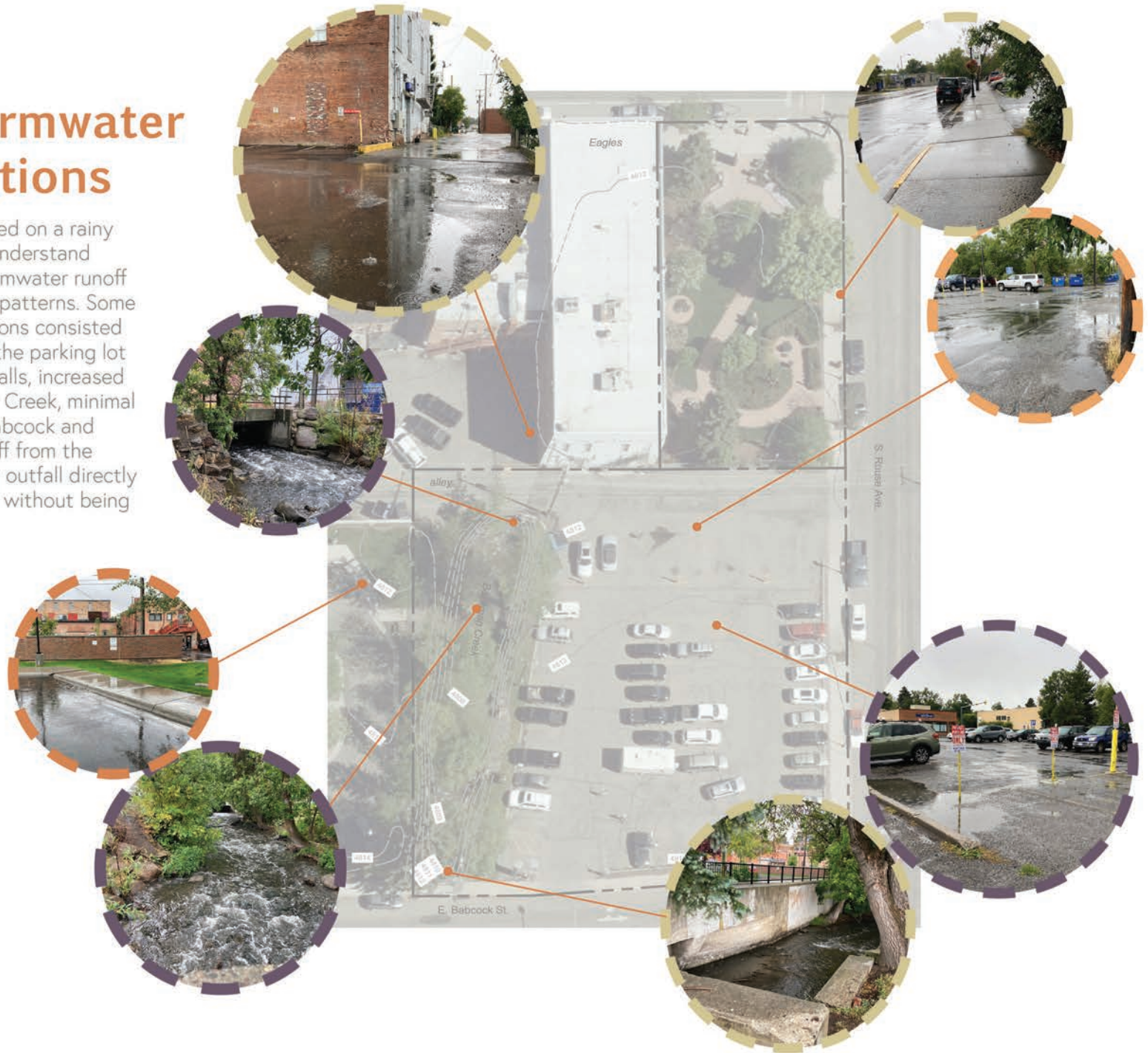
The current state of Bozeman Creek in downtown Bozeman is ecologically impaired and offers the community minimal recreation and aesthetic enjoyment. This map highlights areas that are public seating, where the creek is daylighted, outlet point for stormwater runoff, and treatment units. The images demonstrate how the creek riparian zone is lined with deteriorating concrete blocks and walls, and does not offer a habitat for both plants and animals to thrive.



-  Seating
-  Treatment Unit
-  Outfall
-  Culvert/ Pipe
-  Riparian Forest
-  Bozeman Creek
-  100- Year Floodplain

Site Stormwater Observations

The site was observed on a rainy day to help better understand management of stormwater runoff and runoff drainage patterns. Some of the key observations consisted of heavy pooling in the parking lot and around the outfalls, increased velocity of Bozeman Creek, minimal inlet points along Babcock and Rouse, and the runoff from the parking lot and alley outfall directly into Bozeman Creek without being treated.



Site Stormwater

The site was broken into mini watershed to map where the stormwater runoff will flow, and eventually drain. Based off the mini watershed areas, the peak runoff rate was calculated for a 1 inch storm using the Rational Method (formula $q=CiA$). This allows us to determine the volume of stormwater runoff that flows into directly into Bozeman Creek without being treated, and for future designs to manage stormwater on-site to predevelopment conditions.

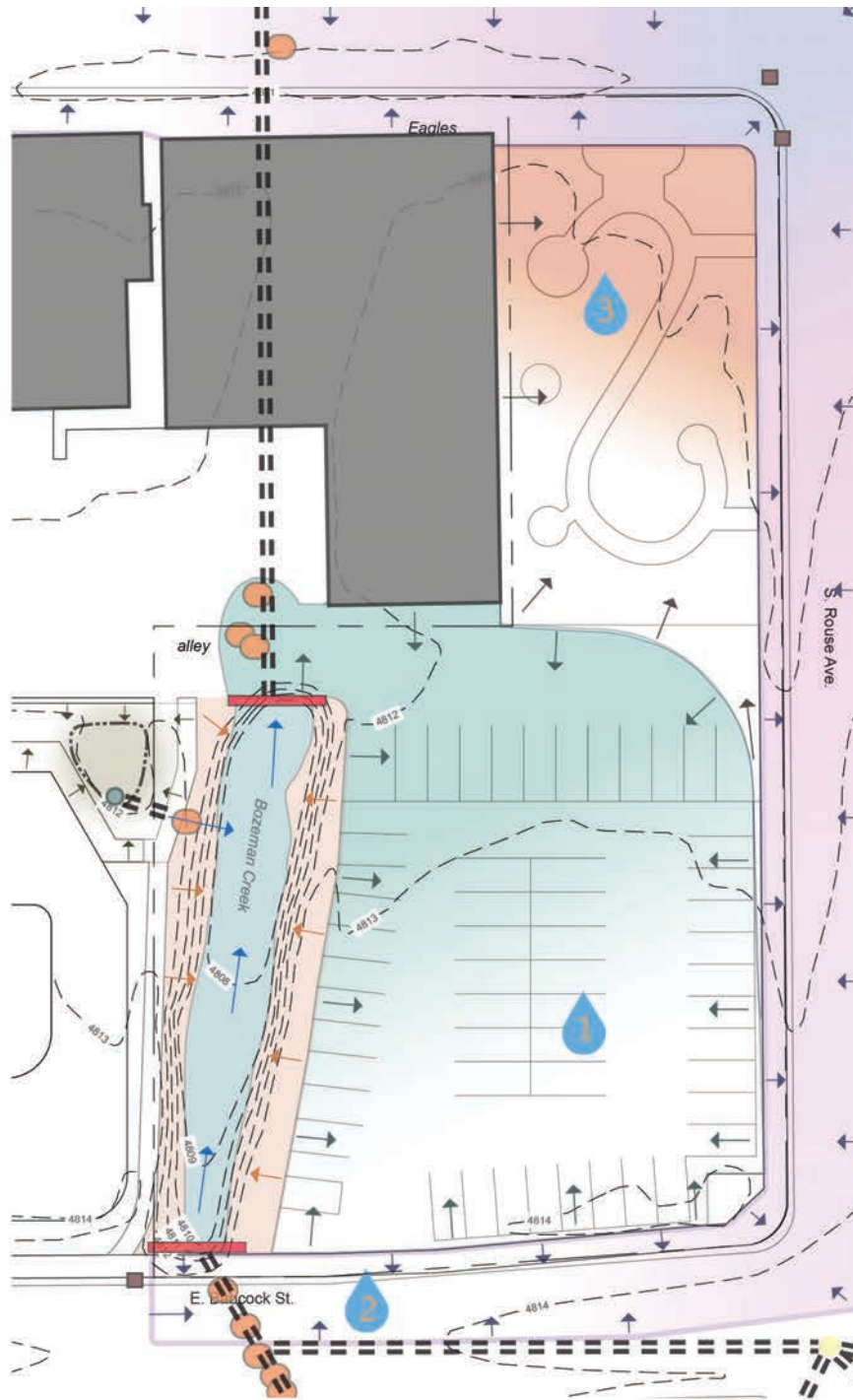
Formula: $q = CiA$

q = peak runoff rate (cfs)

C = dimensionless coefficient for runoff (between 0 and 1)

i = rainfall intensity

A = area of drainage (sf)



The raindrop flows NW, down the parking lot entering Bozeman Creek through a drain outfall. As the raindrop moves through the asphalt parking lot, it picks up pollution from cars and people. The untreated water then direct enters Bozeman Creek, flowing N to enter East Gallatin River..

Parking Lot
 $C = 0.85$
 $i = 0.083 \text{ ft}$
 $A = 25265 \text{ sf}$
 $q = 1783 \text{ cf}$



The raindrop starts west of Rouse Ave, on Babcock St and continues to travel all the way down until enter a drain inlet on the corner or Rouse Ave and Main St. As the raindrops travels it collects runoff from the parking lot and the park, containing numerous pollutants before entering the inlet.

Street
 $C = 0.85$
 $i = 0.083 \text{ ft}$
 $A = 20473 \text{ sf}$
 $q = 1445 \text{ cf}$



The raindrop will percolated and infiltrate into the permeable ground. Once the turf and soil reach maximum absorbency, the runoff will then flow through the park onto the sidewalk, entering the drain inlet. The raindrop will enter a gravity main, traveling N down Rouse Ave.

Park
 $C = 0.20$
 $i = 0.083 \text{ ft}$
 $A = 8712 \text{ sf}$
 $q = 144.62 \text{ cf}$

2.2 SITE VISIT DISCOVERIES

Cultural Fabric

- Soroptimist park is the only public greenspace within 1/4 mile of the downtown district. A Streamline bus stop connects the site to the City.
- Enhance site programming and entertainment for all ages.
- Improve site features for use in the evening and winter.
- Increase visibility and connectivity to Main Street and Bozeman Creek.
- Highlight art or historic features as landmarks to activate space.
- Redesign circulation to be flexible and act as a node
- Site is quietest near Creek and SW corner of the park; utilize vegetation to mitigate noise at street intersections.
- New buildings on-site can be 55-70' high.



Gray Fabric

- Increase seating options and quantities. Site only has ~15 seats/~1 ac.; 1 ADA accessible table seat.
- Make hardscape features multi-functional to increase benefits. Current hardscape only facilitates circulation and seating pods; gathering options are constrained and present issues for universal design.
- Integrate intentional lighting to extend usability during the evenings and wintertime.
- Parking lot accommodates 46 public stalls + 12 private stalls. On-street parking and Black Ave. and Library lots allow a 5-minute walk to same 6-block stretch on Main St.
- If parking lot remains, utilize as a community asset for pop-up events.



Green Fabric

- Pockets of planted zones have vegetation with poor health or structure, lack under-story, or have compacted soil.
- Utilize ground plane more effectively to meet park and Downtown needs. Reduce single-use areas.
- Maintain or recreate shady canopy for urban tree benefits and park-like feel.
- Sustain urban forestry asset through healthy soil systems and efficient irrigation.
- Employ watersmart planting design for reduced potable water use and visitor education.
- Soften and brighten building edge especially during shaded afternoons.
- Celebrate riparian and maintain ecological context through use of more native plants.



Blue Fabric

- Celebrate Bozeman Creek as ecological asset. Creek not visible from most of the site. Poor conditions and access.
- Stormwater runoff management in parking lot does not meet standards and outfalls directly into Bozeman Creek.
- Utilize sustainable stormwater management strategies on site and from surrounding streets. Increase permeability and water quality ~ the site now is 32% permeable.
- Accommodate watercourse setback and revised FEMA 100-yr. floodway and floodplain.
- Integrate more interpretation or engagement on the urban water systems currently hidden from visitors.



EMILY COPE



Cost analysis of different scenarios would be important

Think about flooding > Ice damming causes flooding. The city is looking at pumping in warm water to mitigate.

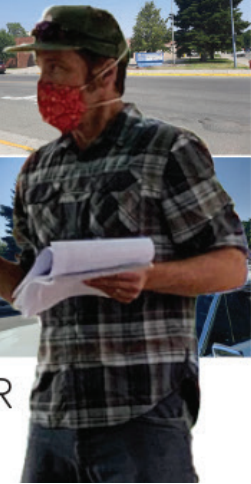


How can we utilize the Eagle's roof for stormwater collection? Green roofs? Blue roofs?

CHRIS NAUMANN



TROY SCHERER



Safety is a super important consideration, especially with the creek



JIM LOVELL

If you make the creek extremely accessible then you have to consider that overuse will make it hard to get new vegetation established



ROB PERTZBORN



Opera House arch and Firehouse bell are still attainable

Up and downstream points are fixed

2.3 ENSC 448 ASSESSMENT

Introduction

The redesign of Soroptimist Park, the parking lot just south of the park, and its adjacent stream has been in a conceptual stage since 2012 as an extension of the Bozeman Creek Enhancement Plan. As mentioned in this plan, the goals and objectives of this ongoing project includes the improvement of the overall channel and floodplain, ecosystem function, and water quality to name a few. To aid in the redesign of the stream our team assessed the stream conditions of this reach, and two other reaches further upstream. The parameters in which we measured include assessment of macro-invertebrates, riparian vegetation, water quality, and stream substrate. These parameters were measured and assessed over a two-week period of time in mid-October, shortly after the beginning of the 2021 water year. Our analysis of this stream assessment data aims to provide insight on how the proposed designs of this site may adhere to the goals of the Bozeman Creek Enhancement Plan.

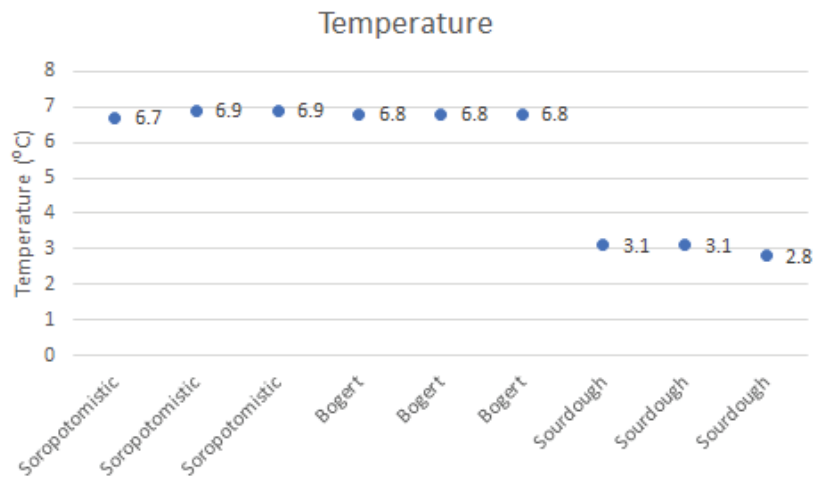


Figure 6: This figure displays the values for temperature, recorded sequentially from downstream to upstream on Bozeman Creek.

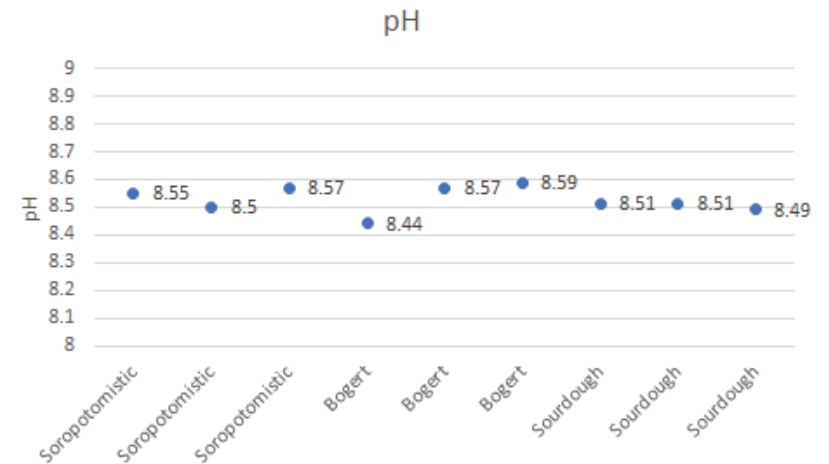


Figure 5: This figure displays the values for pH, recorded sequentially from downstream to upstream on Bozeman Creek.

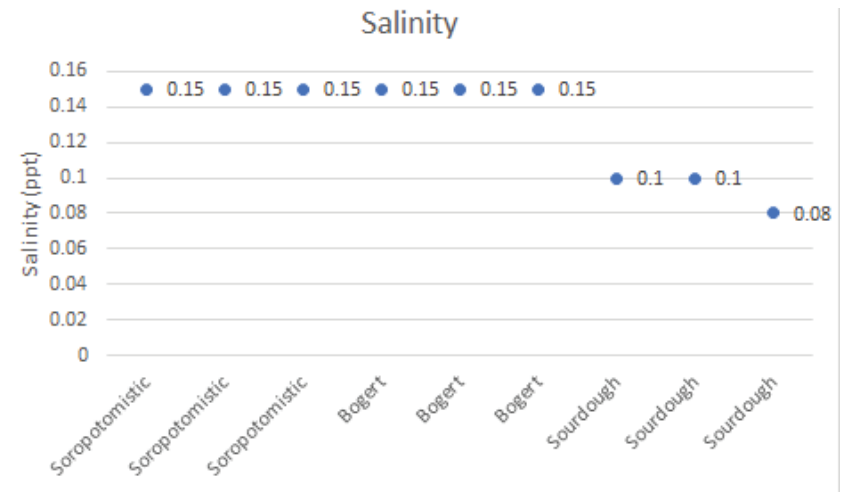


Figure 7: This figure displays the values for salinity, recorded sequentially from downstream to upstream on Bozeman Creek.



Water Quality

Water quality was tested at three different reaches of Bozeman Creek, starting at the Soroptimist Park and moving upstream to Bogert Park, then further upstream on the Sourdough Trail. Water quality was assessed at three separate points for each site and were measured sequentially upstream to reduce error. The parameters measured to assess water quality were temperature, pH, dissolved oxygen, electrical conductivity, total dissolved solids, and salinity. As seen in Figures 5-9, there was no discernable difference in these parameters between the practicum site at Soroptimist Park and Bogert Park. The parameters measured upstream on Sourdough Trail serve as a reference to contrast urban and natural stream conditions. With this in mind, the large differences observed between these two sites may also

be attributed to different testing times. The water quality at the Sourdough Trail site was tested two days after the other reaches, during which time, snowfall occurred.

Moving forward on the proposed plan for Soroptimist Park, the collected data on water quality can serve as a baseline that serves to track progress over time. As recorded on October 22, 2020, the water quality parameters at Soroptimist Park averaged a pH of 8.54, temperature of 6.83 °C, dissolved oxygen of 12.57 mg/L, electric conductivity of 294 $\mu\text{S}/\text{cm}$, 208.33 ppm total dissolved solids, and a salinity of 0.15 ppt. To align with Goal 3 of the Bozeman Creek Enhancement Plan (2012), these water quality parameters can be utilized to "improve water quality to support aquatic life."

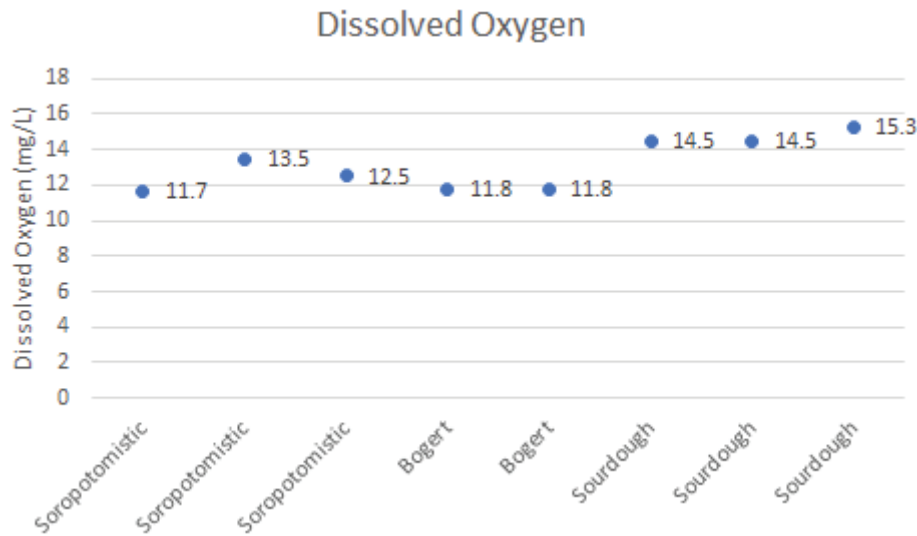


Figure 8: This figure displays values for dissolved oxygen, recorded sequentially from downstream to upstream on Bozeman Creek.

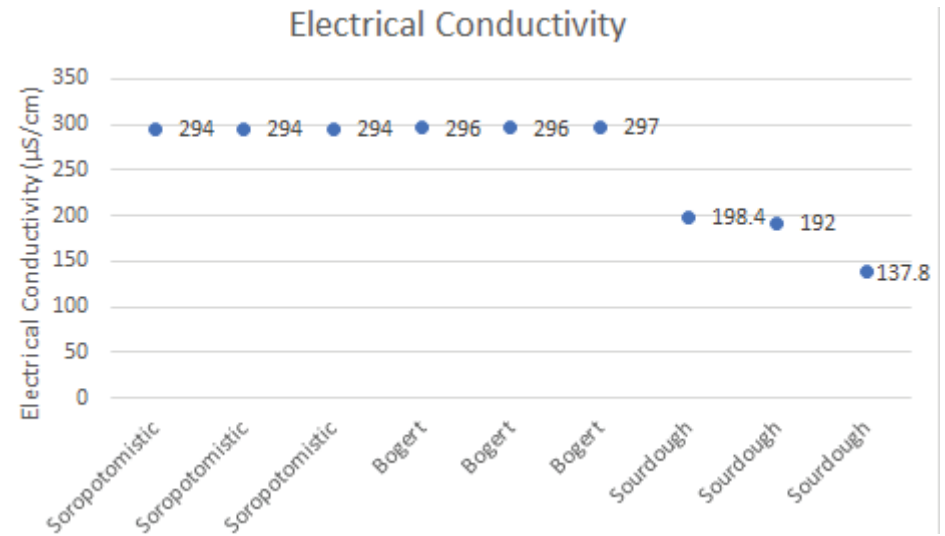
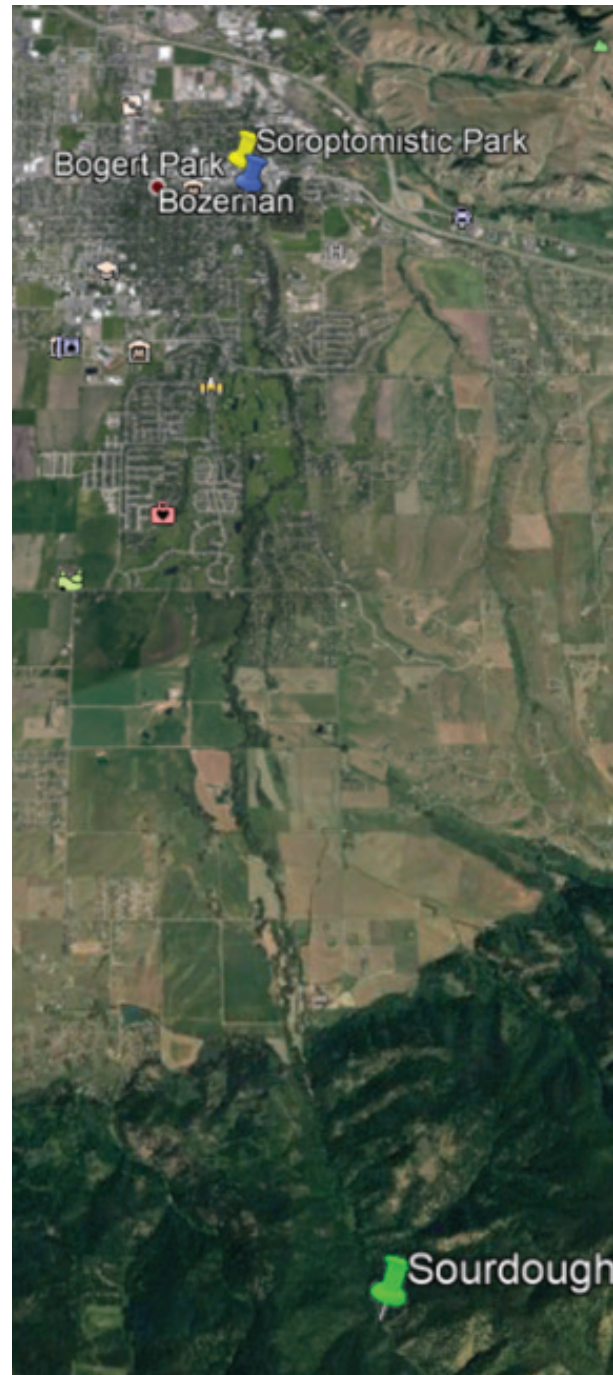


Figure 9: This figure displays values for electrical conductivity, recorded sequentially from downstream to upstream on Bozeman Creek.

Riparian Vegetation




The assessment team sampled the present vegetation in the reach of Bozeman Creek west of the Rouse Public Parking Lot. The reach is roughly 150ft in length, and we found a total of nine species. We only sampled trees, shrubs, and prominent forbs. Cottonwood (*Populus spp.*) trees were the dominant form of vegetation. There was a patch of medium-large willows (*Salix spp.*), likely a collection of native species, on the north and south end of the reach. There was also a small patch of aspen (*Populus tremuloides*), which is native, on the north and south end of the reach, on the terrace above the banks of the reach. There was a large, solitary Engelmann Spruce (*Picea engelmannii*), which is native, on the south end of the reach close to the road. Native and relatively large elderberry (*Sambucus nigra* and *racemosa*) patches lined the upper portions of the bank along the stream reach. Non-native species that were found include dandelion (*Taraxacum officinale*), yellow sweet clover (*Melilotus officinalis*), common burdock (*Arctium minus*) and the common tansy (*Tanacetum vulgare*), all of which are non-native to SW Montana. Grasses were present, but not in significant quantities, and bare ground, rocks, or cement were more prominent.

This assessment shows us that there is roughly even split between native and non-native species. The trees and most of the large shrubs were native, which is promising for establishing those species for the restoration project. However, it will be important to keep in mind the removal of large trees if a meander is to be implemented in the restoration. The banks along the stream are quite steep, which is likely limiting the establishment of more species, and therefore contributing to a denser vegetation presence along the stream. The assessment team sampled a re-mediated reach of



Assessment Sites

Legend

-  Bogert Park
-  Soroptomistic Park
-  Sourdough

Bozeman Creek that runs through Bogert Park about a quarter mile upstream from the Soroptimist Park reach. The reach contained a reconstructed meander that spanned about 150 feet - or roughly the length of the stream reach at Soroptimist Park. Compared to the eleven species we observed at the Soroptimist Park section of the creek, we successfully identified a total of fifteen different trees, shrubs and forbs. There are healthy populations of aspen, willow, dogwood, birch, spruce and cottonwood at the site. Of the sixteen total species present, only three are non-native invasive species. These invasive species were observed in very limited concentrations compared to the abundance of native, more desirable vegetation. Riparian vegetation overall was lush and dense, with little observed bare ground. This can clearly be seen in pictures posted to the survey. The designed flood plain has created abundant room for a healthy riparian community to develop. Erosion control mats are present but only sparsely visible, which indicates their success at this site. The dynamic design of the riverbed - which has encouraged the formation of numerous eddies, pools and pour overs - has provided variation in bank structure that has allowed for varying bank vegetation throughout the stream reach. Additionally, the slope of the stream banks are gradual, which has greatly promoted the success of diverse vegetation. Furthermore, there is a smooth continuum of vegetation stretching from the riverbed

to the limits of the floodplain. This amount of area covered thoroughly with healthy and diverse plant communities further suggests the success of this restoration project. Overall, we think that the Bogert Park restoration will serve as a good reference point to determine the long-term success of the Soroptimist Park restoration.

The added biodiversity in Bogert park is something that we could look to include in the Soroptimist Park design. This could be done by reseeding the new stream banks when disturbed by the addition of the new meanders. With reseeding and a focus on the area to be disturbed we could also help with keeping down the number of invasive species as we saw a greater number at the Soroptimist Park site compared to the Bogert Park area.

Adding the meanders could be done in a way to limit cost if a focus on the east banks is at hand. The east banks have a lower total tree diameter and number of trees making cost of removal less for the east bank with the east bank having seven noticeably large woody species and the west bank having fourteen. Total diameter for the east bank was 358 inches with an average of 51 inches where the west bank had a total of 545 inches of tree diameter but an average of only 39 inches. The east bank also doesn't come in conflict with steeper slopes and property boundaries.

Stream Substrate

The assessment for stream substrate consisted of three main observations: width, D50, and shape. Notable aspects of the surrounding area were also included in the assessment. The goal of this assessment was to identify the natural stream components (rocks/rock location and shape) present in the reference reaches and compare them to the reach in Soroptimist. By comparing these stream components, we can then identify the modifications necessary to emulate them at the Soroptimist restoration site. Below is a summary of the current conditions at Soroptimist park, followed by the conditions in the reference reaches. This assessment is concluded with recommended channel compo-

nents based on the reference reaches and restrictions of the Soroptimist reach.

The stream substrate in the Soroptimist reach was dominated by small cobbles about fist-sized with a small number of larger boulders. Other rigid materials such as concrete slabs are present along the length of the reach but concentrated to the south side near Babcock street and the north side near the alley. The banks are very steep on either side starting from the water line, and are approximately 6 feet in height. The width of the stream was consistent throughout the reach with each measured segment being 12 feet \pm 6 inches. While depth can vary, the shape of the stream bed was relatively consistent, with the exception of the inlet



area. The bed material on the east side was close to the surface of the current water level. The bed material slopes down halfway across the stream (perpendicular to the flow of water) to about 1.5 feet in depth at current conditions. An important aspect of this reach is also the lack of meander. The stream is straight from the inlet to the outlet when it goes beneath the Eagle's lounge.

Just a few hundred yards upstream is the Bogert park stream reach. This is still in an urban setting but has undergone rehabilitation in recent years. The reach used in this study started at a meander a few hundred feet upstream from the concrete stepped area and finished about 20 feet past the same steps. The width of the stream here averaged about 21 feet with a depth of 2.5 feet. The banks of the stream were not quite as high and had a more mellow slope before reaching a height again of about 6 feet above the water level. The cobble size varied slightly from the Soroptimist reach, but overall remained about the same. This section of stream also incorporated a high flow flood channel to accommodate higher flows in this area. Finally, a meander was introduced in this section of stream to mimic that of a more natural stream in this area.

The final assessment site was the most natural of the

three, located 1.5 miles up the Sourdough trail south of Bozeman. This reach was still part of Bozeman Creek and was above any infrastructure that the city uses to divert and treat water for municipal use. It should be noted that this reach is in a slightly different landscape than Soroptimist park. The major difference is the mountainous topography that is present in this reach. The banks of the stream are similar in that they are approximately 6 feet in height before leveling out, but after just a few feet of flat topography the hill climbs up a few hundred feet, confining the shape of the stream. This reach was also steeper than Soroptimist in the direction of flow. The main difference here was the presence of large boulders in certain spots of the creek. The variation in substrate size created multiple levels of pools and riffles on both sides of the stream. There were also areas where larger boulders approximately 50 cm or greater created a small cascade across the full width of the stream. The width of the stream in this reach varied from 12 feet up to 16 feet. The main factor from this natural stream reach was the presence of the boulders and cascades that created variable water behavior. This variation could be implemented in Soroptimist to help reduce water velocity and create habitat for aquatic plants or macro-invertebrate species.

Macro-invertebrates

Stream macro-invertebrates were sampled at two different reaches of Bozeman Creek, starting at the reach at Soroptimist Park, moving upstream to Bogert Park. In both sites three riffles in the single reach were identified and using kick nets stream macro-invertebrates were sampled. From the contents of the nets the number of Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (Caddisflies) were identified and counted. This was

repeated three times per riffle in a stream, totaling in 9 samples per reach. From the data collected, the percent EPT, richness and Simpson's index (diversity and evenness) were calculated from the data collected (Table 1). Referring to the data collected on macro-invertebrates (Table 1), it can be seen that Bogert Park has a higher abundance of macro-invertebrates, however, the difference in diversity is negligible between the two sites.

$$D_i = 1 - \sum \left(\frac{n}{N}\right)^2$$

(Equation 1) The infinite formula for Simpson's index calculates the diversity index (D_i) to equate to 1 minus the summation of quantity of each individual species divided by the total number of individuals, taken to the second power.

SITE	TOTAL EPHEMEROPTERA	TOTAL TRICHOPTERA	TOTAL PLECOPTERA	TOTAL INDIVIDUALS	SIMPSON'S INDEX
SOROPTIMIST PARK	75	82	50	211	0.66
BOGERT PARK	120	135	55	314	0.65

Table 1: Data collected from both Soroptimist park and Bogert Park and calculate Simpson's diversity Index, which is a measurement which takes into account the number of species present, as well as the relative abundance of each species.

From the data in the data above the percent EPT was calculated (Table 2) the percent EPT indicates the amount of pollution in a system that is affecting the organisms. This is because Ephemeroptera, plecoptera and trichoptera tend to be less tolerant to pollutants than other taxa like Diptera. So, if you have a high percentage of Diptera in the system then the stream is more polluted and vice versa. Although with the data retrieved

there is a high chance of error due to the high number of small macro-invertebrates that are difficult to identify to the naked eye. That being said there is still a much higher abundance of macroinvertebrates in the Bogert Park reach when compared to the Soroptimist park reach (Table 2) suggesting that the Bogert reach is less polluted than the soroptimist reach in regard to stream macro-invertebrates.

SPECIES	PERCENT AT SOROPTIMIST SITE	PERCENT AT BOGERT SITE
EPHERMEROPTERA	36.23	38.71
TRICHOPTERA	39.61	43.54
PLECOPTERA	24.15	17.74

Table 2: Percent EPT calculated, blue highlight indicating the dominant species present in the stream.

Conclusion

The stream reach of Bozeman Creek located at Soroptimist Park has long been a proposed site for the Bozeman Creek Enhancement Plan. In summary, the riparian vegetation is more abundant and diverse in Bogert relative to Soroptimist, the macro-invertebrate (EPT) presence has higher abundance in Bogert relative to Soroptimist, the variation in water quality is negligible between the two sites, which is not surprising given that water

from Bogart Park flows almost immediately into the Soroptimist Park reach. The difference in stream substrate can be seen in varying amounts of pools and riffles, as well as the slope grades of the bank slopes. The assessment of this stream reach aims to provide a historical data source that can be used as a point of reference. Furthermore, the current conditions of this reach described in our assessment can be utilized as a tool to track the progress of the proposed restoration project for this stream.

Soroptomist Park Macroinvertebrate Counts

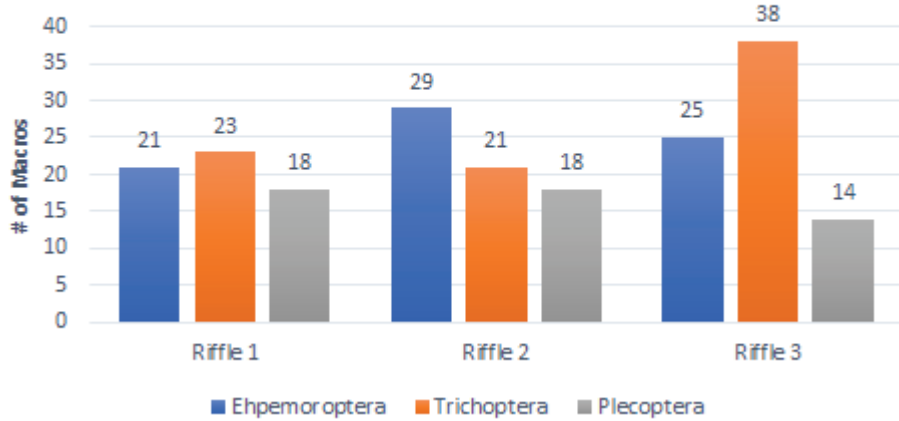


Figure 1: Macro-invertebrate counts from Soroptimist Park reach of Bozeman Creek. These are the total counts for each riffle. 3 counts were taken on each riffle.

Bogert Park Macroinvertebrate Counts

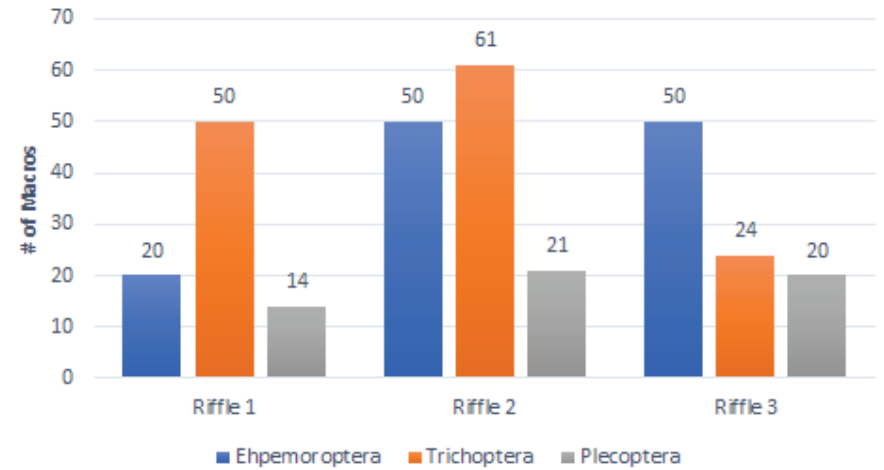


Figure 2: Macro-invertebrate counts from Bogert Park reach of Bozeman Creek. These are the total counts for each riffle. 3 counts were taken on each riffle.

Percent per Species at Soroptomist Park

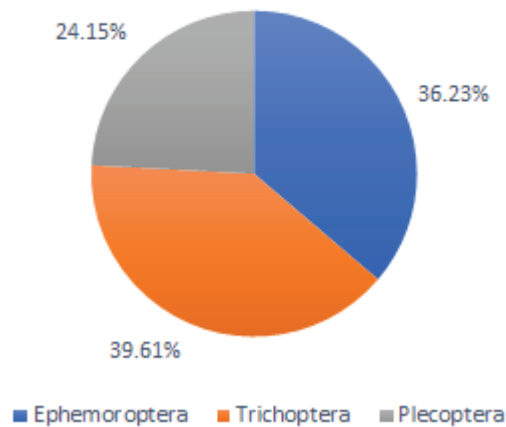


Figure 3: Percent of each macro-invertebrate species found at Soroptimist Park reach of Bozeman Creek. Trichoptera was the most prevalent species at this site (39.61%) with Ephemeroptera closely behind at (36.23%).

Percent per Species at Bogert Park

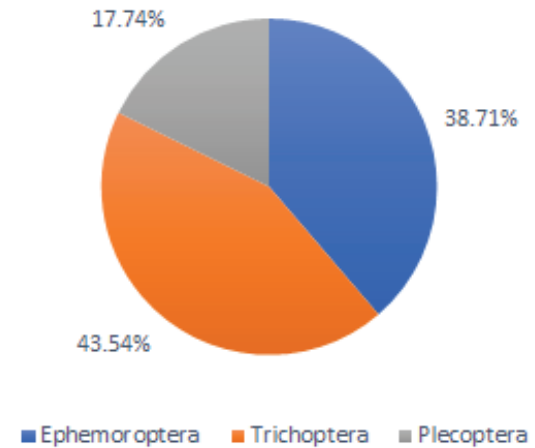


Figure 4: Percent of each macro-invertebrate species found at Bogert Park reach of Bozeman Creek. Trichoptera was the most prevalent species at this site (43.54%) with Ephemeroptera closely behind at (38.71%).

2.4 PRECEDENT STUDIES

Yanaguana Garden at Hemisfair

LEAD LA / DESIGN TEAM:
MIG, Inc.

Location: San Antonio, Texas
Size: 4.1 Acres
DATE COMPLETED: 2015

Design Summary & Sustainable Sites Highlights

Yanaguana Garden is located in the Hemisfair District in San Antonio, Texas. The Garden offers passive and active features designed to encourage play among all age groups and to promote social relationships. The garden is able to capture, infiltrate and evaporate annual rainfall by using infiltration basin, permeable surfaces and recycling the water to irrigate vegetation.



By capturing, infiltrating and evaporation the garden uses 34% of annual rainfall.

The garden uses installations by local artist to educate visitor on the site's cultural and historic.

A study found the features encourages physical activity in 69% of garden visitors.

On average the park keeps air temperatures 7°F cooler in the morning and 12°F in the afternoon.

References:
<https://www.landscapeperformance.org/case-study-briefs/yanaguana-garden-at-hemisfair#/sustainable-features>

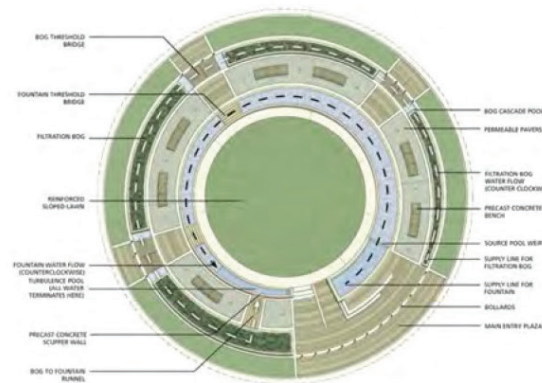
Uptown Normal Circle and Streetscape

DESIGN TEAM: Hoerr Schaudt Landscape Architects

Location: Normal, Illinois
 Size: 4.87 Acres
 DATE COMPLETED: 2010

Design Summary & Sustainable Sites Highlights

The site project transformed an awkward 4-way intersection with a roundabout. The roundabout features stormwater management and a public gathering space. The stormwater is daylighted in a circular water feature that is accessible to the public, while also eliminating energy use to pump water.

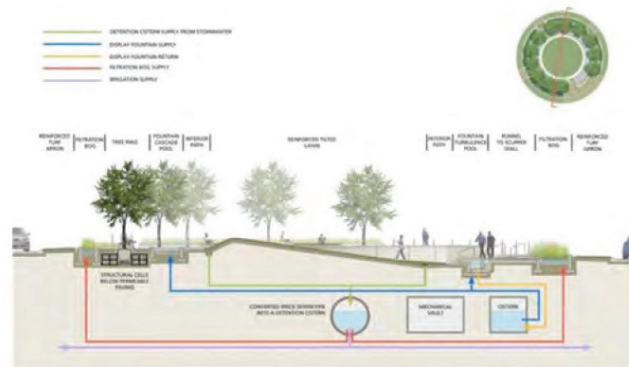


Captures 1.4 million gallons of stormwater and reuses it for irrigation and the public water feature

Improves water quality by removing solids and chemicals found in stormwater using sand, UV and bog filter system

67 street trees are provided with underground structural cells for root growth, to absorb and filter stormwater runoff

Reduces traffic accidents by 35% by using a roundabout



References

<https://www.landscapeperformance.org/case-study-briefs/uptown-normal-circle-and-streetscape>

Central Wharf Plaza

LEAD LA / DESIGN TEAM: Reed Hilderbrand, LLC

LOCATION: Boston, Massachusetts
 SIZE: 13,100 sf
 DATE COMPLETED: 2007

Design Summary & Sustainable Sites Highlights

This plaza features a micro-forest with 25 mixed-species of oak. Pervious surfaces comprise 75% of the site. This was achieved by using dry-laid granite pavers with permeable joints, stone-dust and planting soils. Physical barriers are reduced within the root zone through mini-piles and spanning grade beams.



Key Related Characteristics to Project Site

Reduction of site runoff in a small urban space that not only keeps water out of the pipe systems but benefits the plants on the site.

Site-wide lighting keeps the site usable throughout the day.

Innovative structure allows for more seating without interfering with the plant systems.

Creation of the micro-forest reduces site temperature and overall urban heat island effect.



The City of Bozeman has already implemented pervious paving systems. In front of City Hall they laid water retention pavers with aggregate in the seams. On 7th St. a new suspended pavement system was installed.



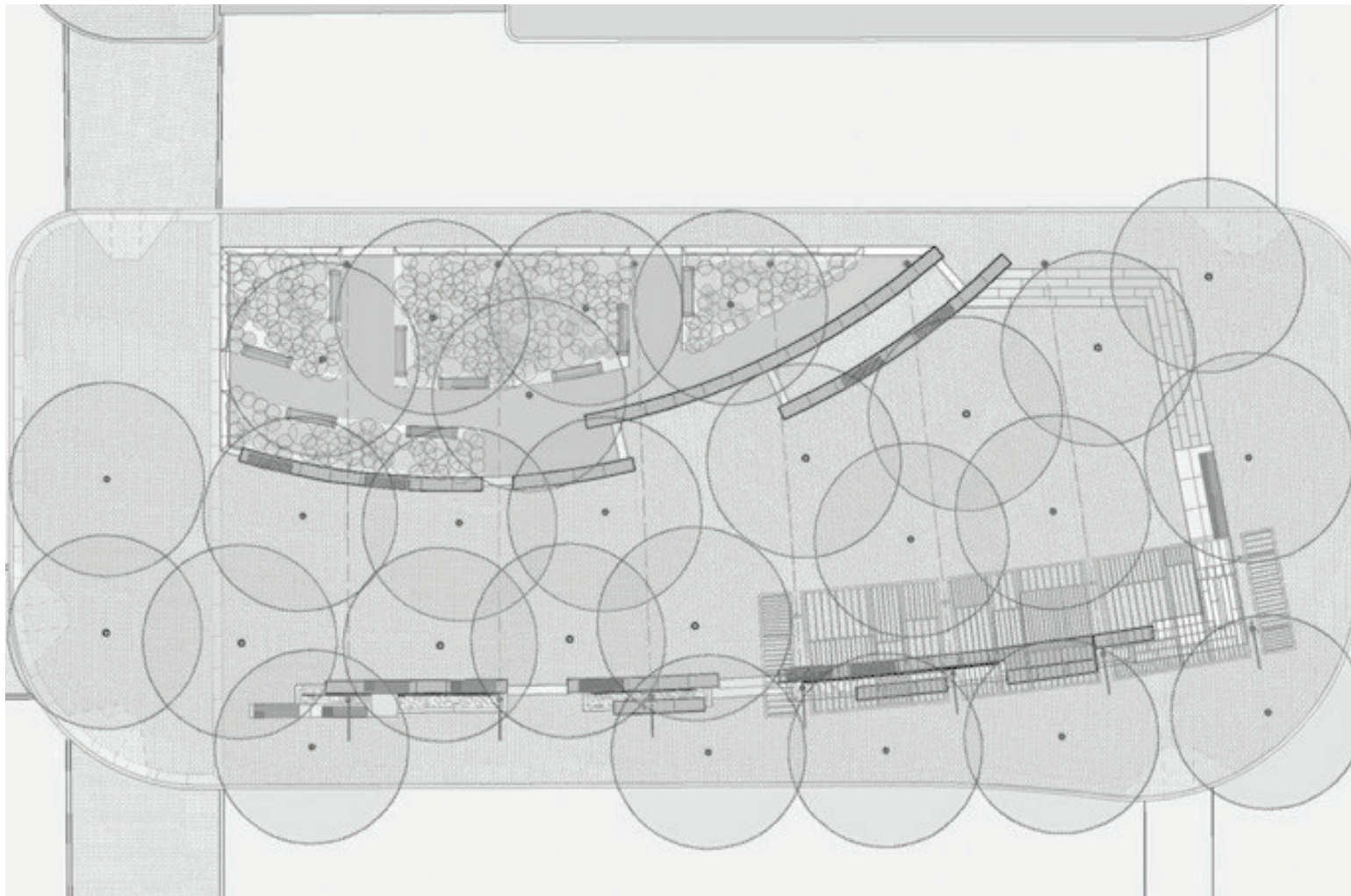
Suspended paving systems in combination with permeable pavers benefit overall tree health as well as mitigate stormwater runoff. Another system to look at is that of heated paving, which generally consists of a wire grid under traditional paving.

References

- <https://www.landscapeperformance.org/case-study-briefs/central-wharf-plaza#/sustainable-features>
- <https://greenblue.com/na/products/arbortflow/>
- <https://www.prolineradiant.com/snow-melting/docs/PL-paver-combined-snowmelt-photos.pdf>
- <https://www.bozeman.net/government/stormwater>



- Drip Irrigation Tube
- Flood Bubble
- 4" Perf PVC
- Slot Drain
- 4" Dry Paving
- 2" Stonedust Setting Bed
- 6" Crushed Stone
- 3"-0" Sand-based Structural Soil
- 12" Crushed Stone Mat
- Compacted Subgrade



Buffalo Bayou Promenade

LEAD LA / DESIGN TEAM: SWA Group

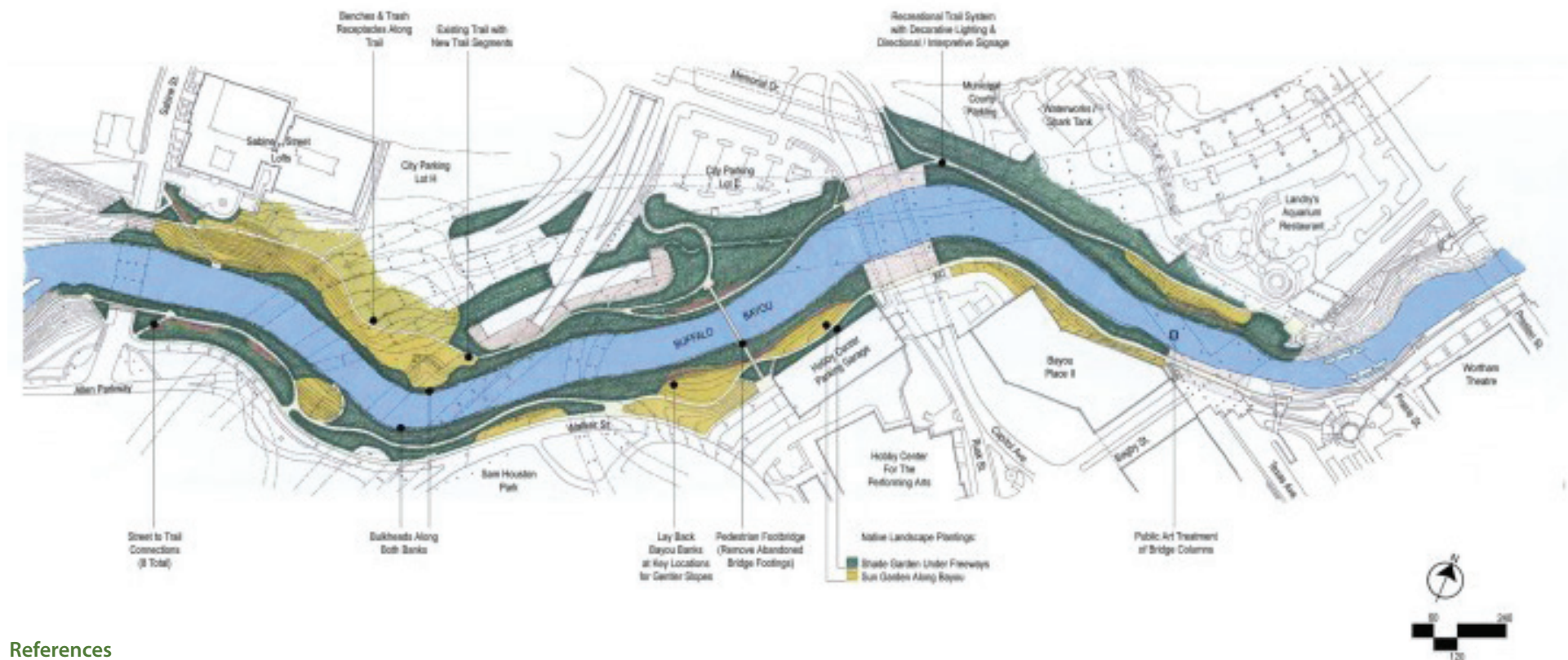
LOCATION: Houston, Texas

SIZE: 23 acres

DATE COMPLETED: 2006

Design Summary & Sustainable Sites Highlights

What started as an urban greyfield became a new pedestrian focused space with improved flood capacity through innovative river edge restoration and structural additions. Hike and bike trails, interpretative signage and public art are all new features that bring a sense of community to the space.



References

- <https://www.landscapeperformance.org/case-study-briefs/buffalo-bayou-promenade#/overview>
- https://gabion1.com/gabion_erosion_control.htm
- <https://www.prospectcontractors.com.au/post/2016/04/05/is-your-riverbank-or-creek-ready-for-potential-flooding>
- <https://www.stormh2o.com/erosion-control/article/13029946/preventing-erosion-with-riprap-and-gabion-walls>
- https://cooperperkins.com/case_study/houston-orb/

Key Related Characteristics to Project Site

Gabion sacks and cages used on the river edge allows water egress that mimics the natural conditions of the channel.

Use of native riparian planting used to control erosion and anchor exposed slope faces.

A pedestrian bridge allows for safe access between parking lots.

Lighting creates a welcoming and safe environment that is accessible through the day.



This promenade used several different types of lighting and a lot of that was custom design and built specifically for this project. One specific implementation includes LED orbs that change color and as a whole site scale are synchronized with the phases of the moon. Each of these lights can be individually controlled. Additionally, because of climate, these orbs have an enclosure that is submersible up to 20 ft of water.



Gabions are ideal for waterway bank restoration and stabilization because they are naturally flexible and are permeable in their structure. Additionally they don't leach as many harmful chemicals into the water and generally have a longer life span. Vegetation growth is even benefited when river sediments flow through and become trapped in the spaces between the rocks. The spaces can also sometimes provide habitats for small aquatic creatures.

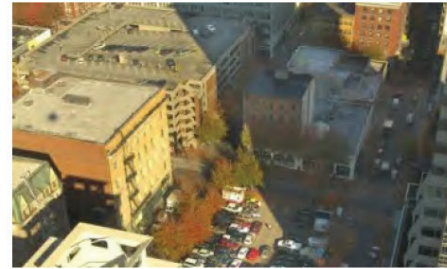
Simon and Helen Director Park

OLIN & Mayer/Reed

877 SW Taylor Street Portland, Oregon 97205
0.5 Acres
Completed in 2009

Design Summary & Sustainable Sites Highlights

Formerly a parking lot the size of a city block, Simon and Helen Director Park is now a bustling urban plaza in the center of downtown Portland. While the city has many green spaces, Director Park is unique as a European-style urban piazza offering diverse programming and rental space for events of varying size. Amenities include a water feature with arching jets, movable tables, permanent seating and an on-site cafe. The plaza's edges are defined by street trees and rain gardens planted with species appropriate to both the urban and Pacific Northwestern context.



Before



After

Key Related Characteristics to Soroptomist Park, Bozeman MT Parking

- Parking for Simon and Helena Director Park was re-located to underneath the park as underground parking.
- Stormwater from the site and its immediate surroundings is captured through systems of grading, porous hardscape (water drains between mortarless pavers), and sunken infiltration planters that capture and store rainwater for reuse in the park's rain gardens, stormwater planters and fountain.
- This design move in particular can potentially support the re-location of the parking lot behind Soroptomist along Rouse and Babcock.
- Re-locating Soroptomist Park parking to a nearby or neighboring block could allow for an opportunity to better connect and expand the park's perimeter to the Bozeman Creek.



References

Landscape Performance Series. 2020. Simon And Helen Director Park. [online] Available at: <<https://www.landscapeperformance.org/case-study-briefs/director-park#/project-team>> [Accessed 7 September 2020].



Fountain Feature



Local event held at Simon and Helen Director Park

Key Related Characteristics to Soroptomist Park, Bozeman MT

Water Feature

- The scale and slope of the interactive fountain make it suitable for the use of both children and adults. Ample seating space and the pooling of water at the fountain's low-point create a restorative environment in which adults can put their feet into the water without being affected by children playing and splashing water higher on the slope.
- To maximize reuse while adhering to Portland municipal codes governing human contact with recycled stormwater, the interactive fountain has a closed system for treating and recirculating water.
- A flat fountain feature as pictured above in the top-left image is multifunctional and could be valuable to Soroptomist Park's location in downtown Bozeman for events
- An example of having an interactive water feature in combination with Bozeman Creek could be utilized in the winter for activities such as room for an ice sculpture building festival, a small water park in the summer for the public or a space for performances.

Samford Park at Toomer's Corner

Holcombe Norton Partners, Inc.

Samford Park Auburn University, Auburn Alabama
1 Acre
Completed in 2014

Design Summary & Sustainable Sites Highlights

The redevelopment of Samford Park sought to remove contaminated soil and ensure the continuation of local campus traditions. The addition of seat walls, permeable paving, and an enhanced threshold under the historic gateway creates a space that entices people to pause and admire the campus's Victorian architecture before continuing into campus or downtown.



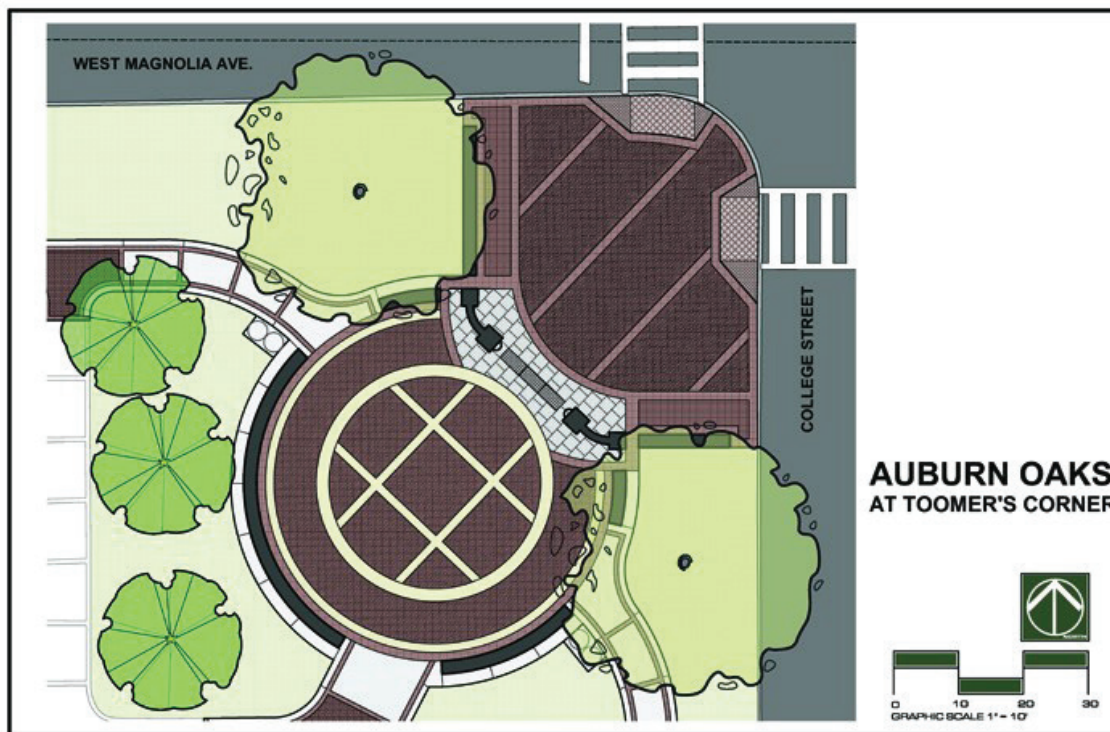
Before



During Construction



After



Key Related Characteristics to Soroptomist Park Bozeman, MT

Parking

- The historic brick portals were left in their original location, and a new granite threshold inscribed with a quote from the Auburn Creed was added.
- LED lighting illuminates the seat walls, historic brick gates, and the live oaks so that the space caters to the nightlife that accompanies the intersection.
- The circular form of the design allows for the cornerside site to utilize maximum potential for foot-traffic flow similar to a problem Soroptomist faces.
- Soroptomist Park does not currently have adequate lighting within its parameters at night creating a potential safety concern.
- Like Toomer's the history of Soroptomist Park has the opportunity preserve and/or restore many historical attributes.

References

Landscape Performance Series. 2020. Samford Park At Tommer's Corner [online] Available at: <<https://www.landscapeperformance.org/case-study-briefs/samford-park#/project-team>> [Accessed 7 September 2020].

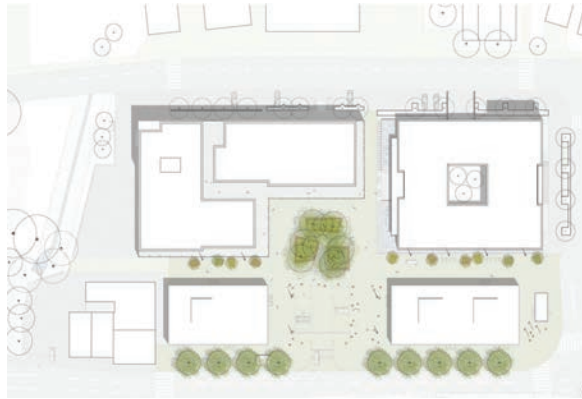
Riedmatt Ebikon

ASP Landscape Architects

Ebikon, Switzerland:
2015

Design Summary & Sustainable Sites Highlights

A classical situation outside the gates of Lucerne, a growing Swiss city. The four-lane central road crosses the city straight, the old village road, winds still through the historical center. All the signs that the place offers its visitors and residents relate to traffic. With the new community house and its adjacent outdoor areas, the linear structure is provided with a core, which stands as a germinating point for the intended revitalization of the city's center. The three green islands offer seating, shade and space as well as a hint of lakeside-atmosphere to visitors.



Key Related Characteristics to Project Site

The site is abutted against multistory buildings in an urban setting.

This project also lies along a growing city's main central road.

The city looks for the park to be a "germinating point" for a revitalization of the city center.

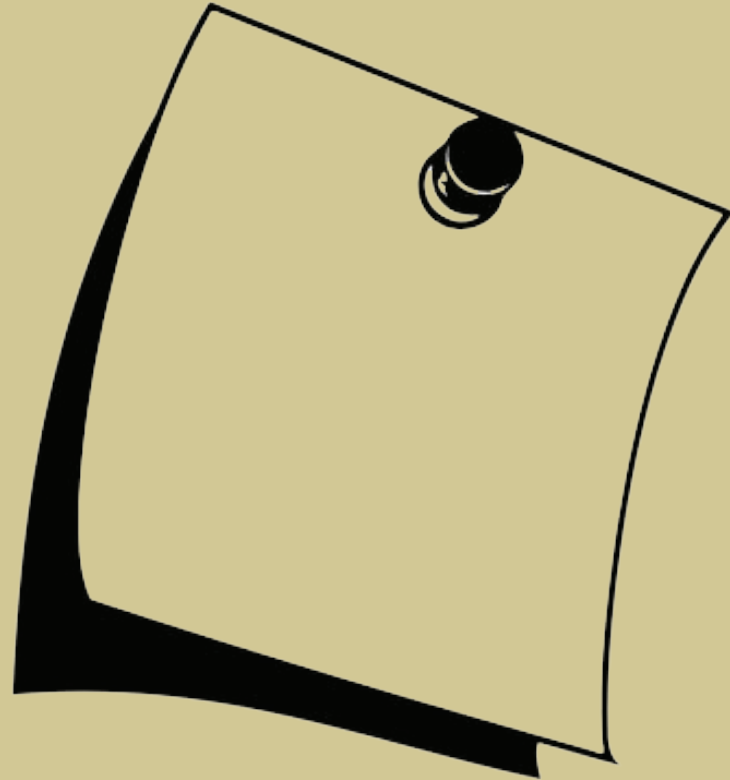
Combinations of vegetation, tree canopy, seating and hardscape create a multifunctional plaza

References

<https://asp-land.ch/projekte/riedmatt-ebikon/>

<http://landezine.com/index.php/2015/06/riedmatt-ebikon-by-asp-landscape-architects/>

D E S I G N
W O R K S H O P



3.1 OBJECTIVES AND ACTIVITIES

ACTIVITY A

Existing Site Thoughts -

Participants were asked to view a site collage poster and write down their opinions regarding the existing site on said poster. Topics such as concerns, existing assets, good and bad features, and improvement thoughts were encouraged.



ACTIVITY B

Precedents/Programming -

Participants were given a packet of images and asked to mark what features they liked and disliked in addition to writing commentary on those features. The images were broken into six categories, seating, creek engagement, entertainment, activity (play), plaza, and food. Afterwards, discussions took place in regards to the participants opinions of those features in a general sense but also in relation to the Soroptimist Park site.



ACTIVITY C

Design Drawing -

Participants were split into 4 groups, each with a different scenario. They were then asked to draw out several charettes with specific written notes related to their scenario. After the drawing time finished, each group discussed their ideas amongst themselves.



3.2 SUMMARY OF COMMENTS

ACTIVITY A

Bozeman Creek

- Should we mimic the other side of the creek?
- Possible safety concern, re-form creek edges?
- Future creek crossing to separate pedestrians and vehicles?
- How to enhance visibility of creek with new vehicular surface or bridge?
- Is groundcover vegetation important?

Location in Downtown Bozeman

- I like the connection to main street here
- At one of the busiest intersections downtown should have a WOW factor

Parking Lot

- Add vegetation/permeable surfaces in parking lot for stormwater management
- Unbroken pavement looks really uninviting
- Seems neglected.....Shade tree?
- Site triangle considerations but with views
- UGH

Safety

- Is visibility an issue?

Site Vegetation/Canopy

- Improve site canopy?
- It would be nice to see more native plant species that don't need a lot of water, especially if there is difficulty in managing a sprinkler system.

Park Paving/Hardscape

- Incorporate permeable paving system?
- Better transition between park and sidewalks
- Work with city to address materials, accessibility and improve paving along project edges

Programming Elements

- More interesting art/sculpture could be used
- Increase art in park, use local artists
- What should be done with the mural on Eagle's building?
- Separate seating from signage? Is this seating a really desirable place to sit?
- Alternative transportation could be increased

ASSETS? CONCERNS? PRESERVED? REMOVED? RE-THOUGHT?



Handwritten notes in blue ink, possibly including the word "visibility" and a date "10/25/21".



ACTIVITY B

Seating

IMAGE	YES	NO
S.1	4	2
S.2	2	2
S.3	6	3
S.4	7	0
S.5	4	2



S.1 – Very cool idea! This is cool. Swings would be fun. Great, attractive seating and shade

S.2- Smaller scale? Very cool seat, but large without much seating

S.3 – More drawn to built-in seating but understand flexibility. Moveable. Moveable seating can be stolen. Flexible seating great for people downtown. Provides opportunities for small or larger groups but theft? Flexible seating spaces. I like the idea of having built-in seating to avoid having to be worried about vandalism.

S.4 – Light integration, okay... . Can double as stage.

S.5 – Expensive. Too much maintenance. Like organic forms for seating. Beautiful but vandalism?



Discussion:

- Create multiple "types" of seating that can serve a variety of purposes
- Consider maintenance and durability when deciding seating materials (wood vs. metal)
- Concern of potential vandalism > can we mitigate that through our seating choices?
- Sanitization (long term) with Covid

Creek Engagement

IMAGE	YES	NO
C.1	5	2
C.2	4	3
C.3	4	1
C.4	4	0
C.5	2	1

C.1 – Really cool...wish it had shade! Accessibility. Funding topography/gradation. Like the idea of tiered seating. Awesome engagement with water, needs trees!

C.2 – This might work on our site. Lack of vegetation. Day light creek influences microbial communities. Looks nice but no engagement w/water. Not user friendly.

C.3 – Can we bridge? Love it!

C. 4 – Access! Too armored.

C.5 – Pooling and accessible. Green elements. Longevity of the material (grow maintenance). Limited access everywhere to creek for public, allows riparian buffer to improve. Looks like an unfinished project mad hole. Sandy/dirty to clean up.

Discussion:

- Should we limit how much access is allowed? (Thinking about safety concerns and establishing new vegetation)
- Think about interaction differently (bridge or overlook)
- Like the idea of terracing > accommodates variable flow but this idea may not be as inviting to visitors
- Create multipurpose features such as retaining wall steps



C.1



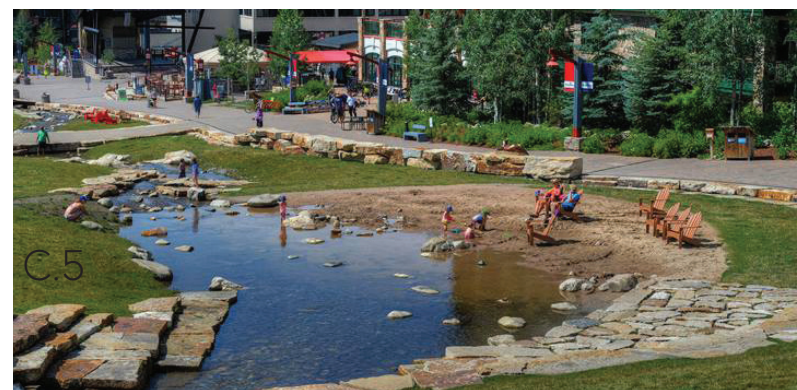
C.3



C.2



C.4



C.5

Entertainment

IMAGE	YES	NO
E.1	3	3
E.2	3	1
E.3	1	4
E.4	7	0
E.5	0	7

E.1 – Like shade. Love idea of a movie screen. Like screen for projection of images/videos. Out of scale and character. Projection/screen feature.

E.2 – Do we need cover for this program? Too industrial, too big. Soroptimist Park space is too small. Out of scale and character. One-dimensional.

E.3 – Confused by image purpose? Dual Purpose. Too formal for Bozeman, nice lighting. Out of scale and character. Limited users.

E.4 – This just looks cool but can't be done. Like cover to use for multiple seasons. Like this covered stage. Unique and flexible. Stage that can double as shade or another amenity.

E.5 – Seems Massive. Too structured. Too large for space. Too expensive. Out of scale and character.

Discussion:

- How much space (permanent or temporary) do we allow for entertainment purposes?
- Create dual purpose/multi-functional spaces > a band shelter acting as seating shelter in the off time
- Consider logistics > maintenance and security



Activity (Play)

IMAGE	YES	NO
A.1	3	2
A.2	3	2
A.3	1	1
A.4	5	0
A.5	3	3



A.1



A.2

A.1 – Would be a great addition to the park- I could see many people enjoying this feature! Also fits the culture of Bozeman. Great to connect to the rest of Bozeman. No visibility could be a safety concern.

A.2 – I love this, but design doesn't convey this is a play area or art that is not to be walked on. Does this count as play? Water feature could use stormwater. Water quality could be tough to manage.

A.4 – Cool organic playground. Minimal Scale.

A.5 – Fun Idea? Practical for downtown. Not logistical, but looks fun. Fun programming element, splash pad? Love game idea at large scale.



A.3



A.4



A.5

Discussion:

- Interactive water features + irrigation
- Who are the users? What activities do they want?
- People watching and eating are activities too
- Create a space downtown that is "family friendly" and fun for all ages

Plaza

IMAGE	YES	NO
P.1	4	1
P.2	2	0
P.3	8	0
P.4	0	4
P.5	1	2

P.1- Like the open feel. Incorporating lighting into structure. Too large for space, maybe small scale. Too modern. Chopped

P.2 – Water features!

P.3 – Open center is a really interesting concept. Both Stopping and through fair. Like the circle, landscaping. Connectivity and form/flow and seating. Love modern look and incorporating of hard and soft/ green scaping. Level ground. Gives a space for a stage.

P.4 – Main through fair = less stopping. Looks like parking lot. Like how space can be converted for multiple uses.

P.5 – Good mix of softscape and hardscape. Like the tree material color, but gazebo is old fashion/cliche

Discussion:

- Designing for snow removal with hardscape and plowable angles
- Incorporate waste receptacle placement in design
- Balance of park and plaza > hardscape amounts?
- Central area with peripheral seating
- Openness can be inviting



Food

IMAGE	YES	NO
F.1	5	1
F.2	3	1
F.3	0	2
F.4	6	3
F.5	5	1

F.1 – Small carts.

F.2 – This could be good, but how? Year-round function throughout all seasons. Great option to consider, how to operate in colder weather? Interesting idea for winter.

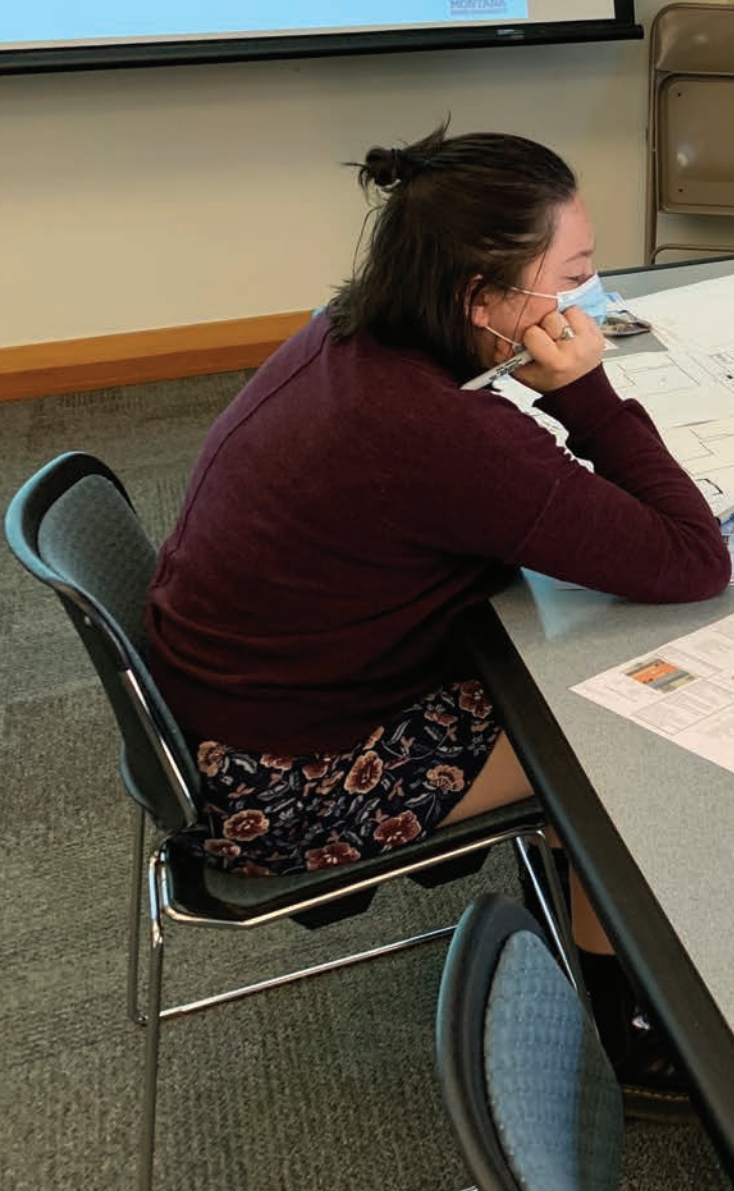
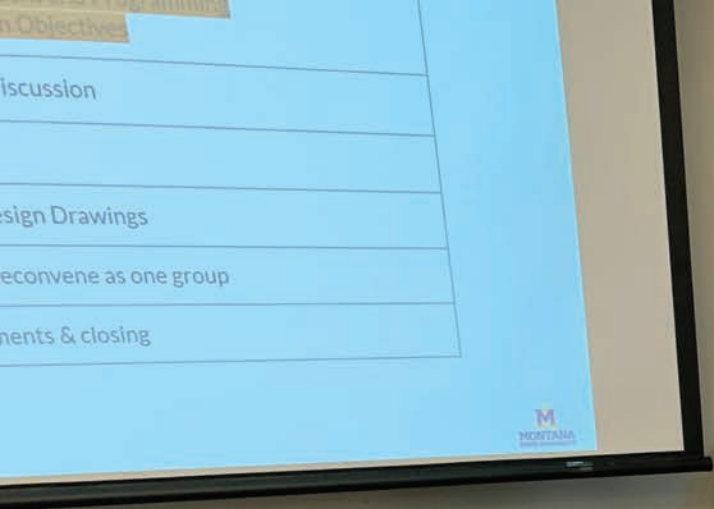
F.4 – Depends on scenario, creates and new space. A space for music + market would be great! Use flexibility, where food is more of an event.

F.5 – Like the flexibility! Vendors change in programs. Great to support local vendors. Music on main. I like the food tents over trucks.

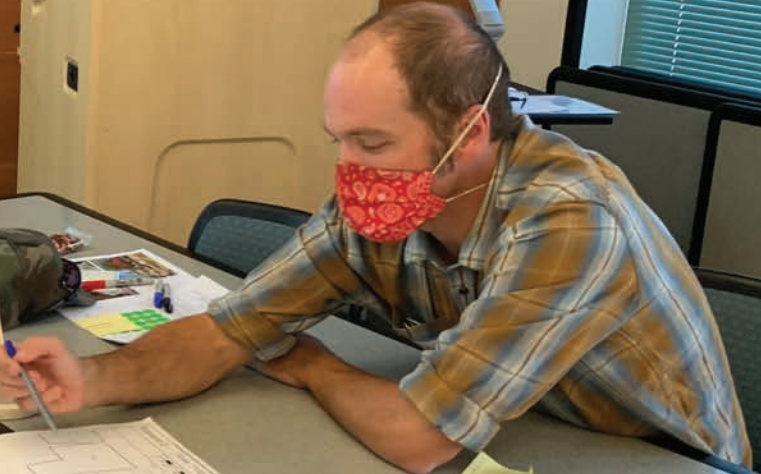
Discussion:

- Allow local agriculture to be displayed through farmers markets (a way to monetize the space)
- Create a gathering space for Bozeman's many food trucks. (Cafeteria for Music on Main)
- Possibility of growing food on site? (greenhouses in the shoulder seasons/winter?)

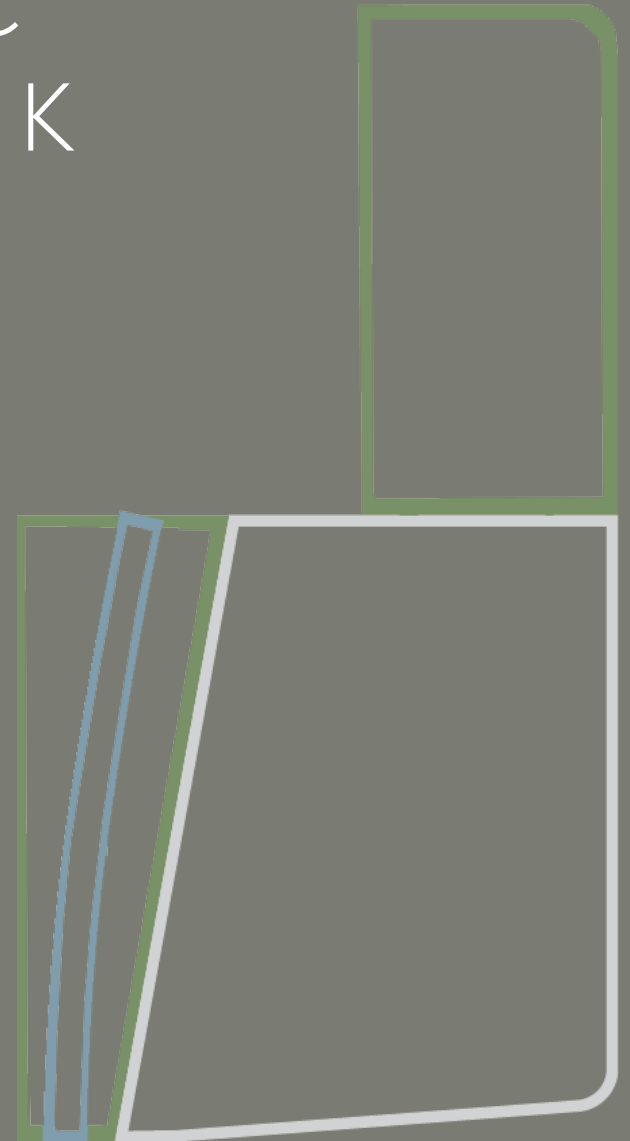




PARK + PARKING



S I T E
S C H E M A T I C
F R A M E W O R K



4.1 SCENARIO DESCRIPTIONS

SHARED SCENARIO GOALS

- Increase range of programming and uses through time and space
- Increase capacity and seating flexibility
- Incorporate art and other cultural assets
- Improve ecological assets related to water quality and creek habitat

SCENARIO-SPECIFIC ASSUMPTIONS

- Implementable with no land use change.
- Constrained riparian restoration.
- Retains maximum parking quantities.
- Implementable with minimal land use change.
- Re-imagines improved park, parking, & riparian restoration, while satisfying all uses in a balanced way.
- Utilizes land use change as economic driver for converting parking into a new park.
- Increases creek restoration integration and passive engagement features.
- Utilizes land use change to prioritize increased programming.
- Maximizes creek restoration and active engagement features.



RESULTING SCHEMATIC DESIGN DEFINING CHARACTERISTICS

Play & Gather
Plaza 1st - Park 2nd
Edge Enhancement

Park to Plaza
Flexibility
Creek Connector

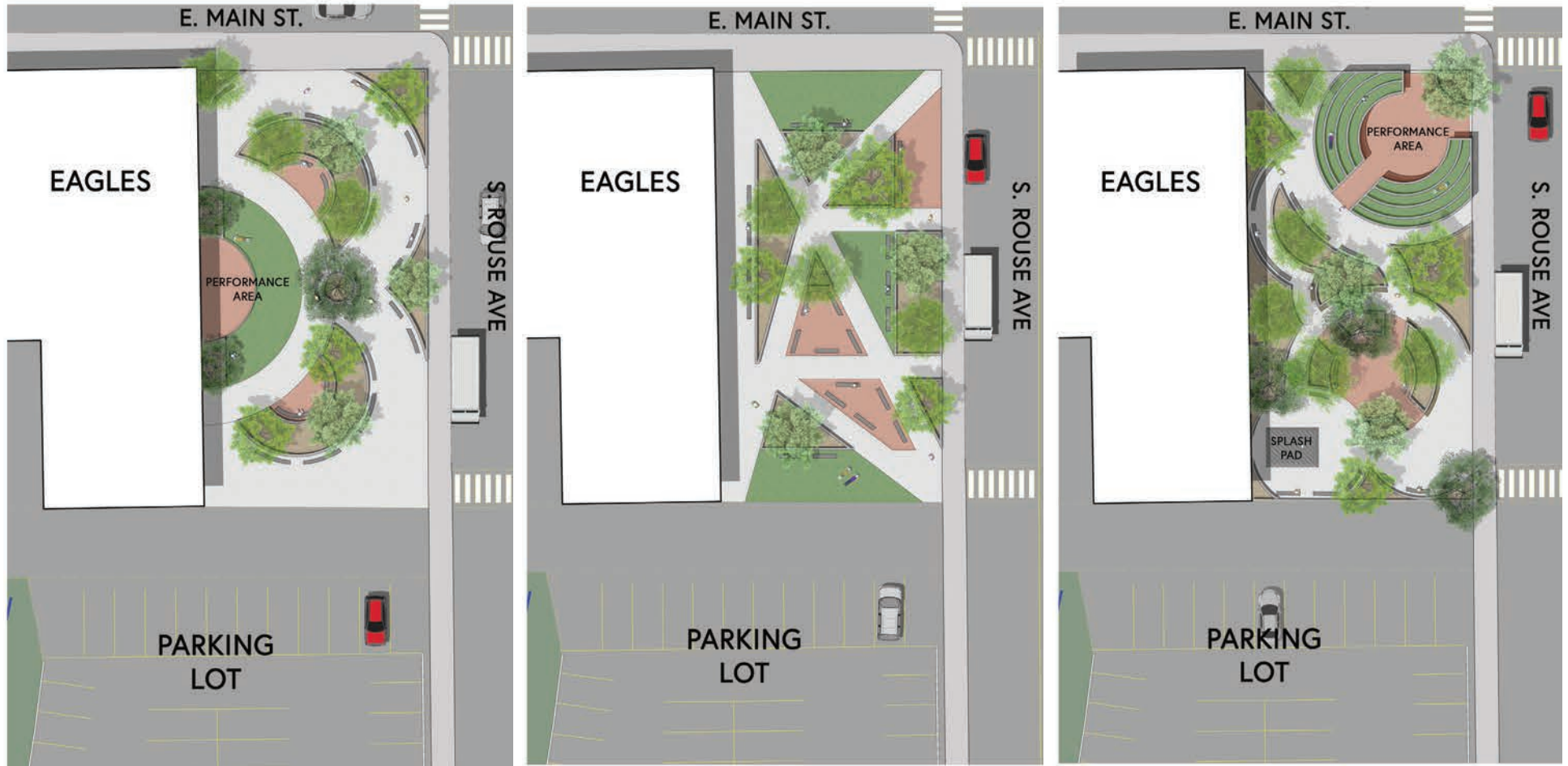
Build-out
Sidewalk Extensions
Creekside Gathering

Gather
Water Play
Eco-Engagement

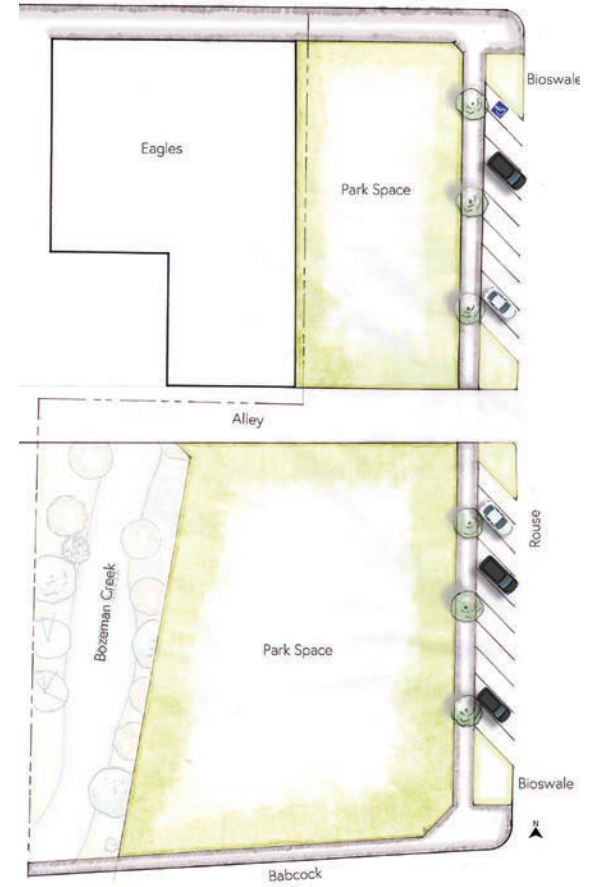
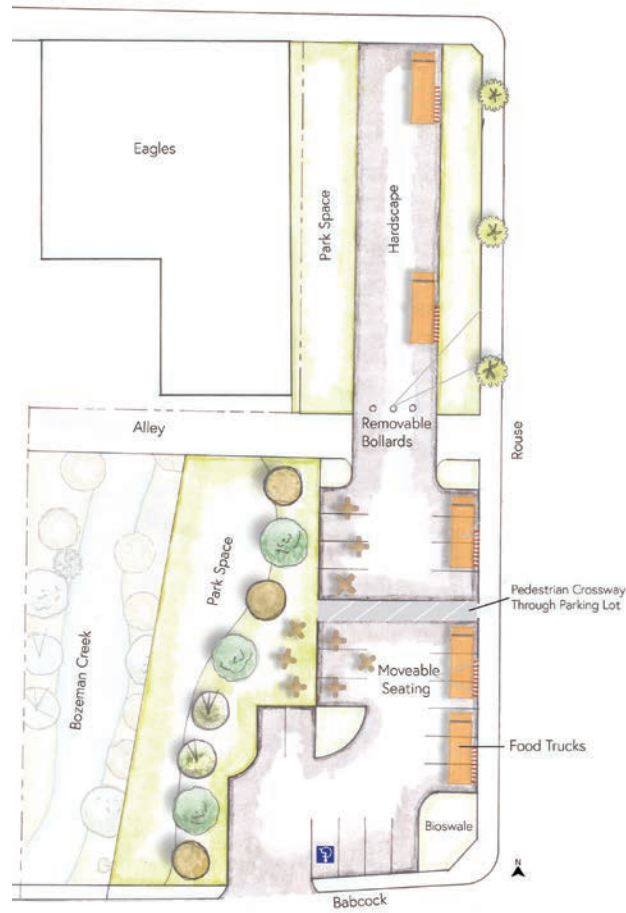
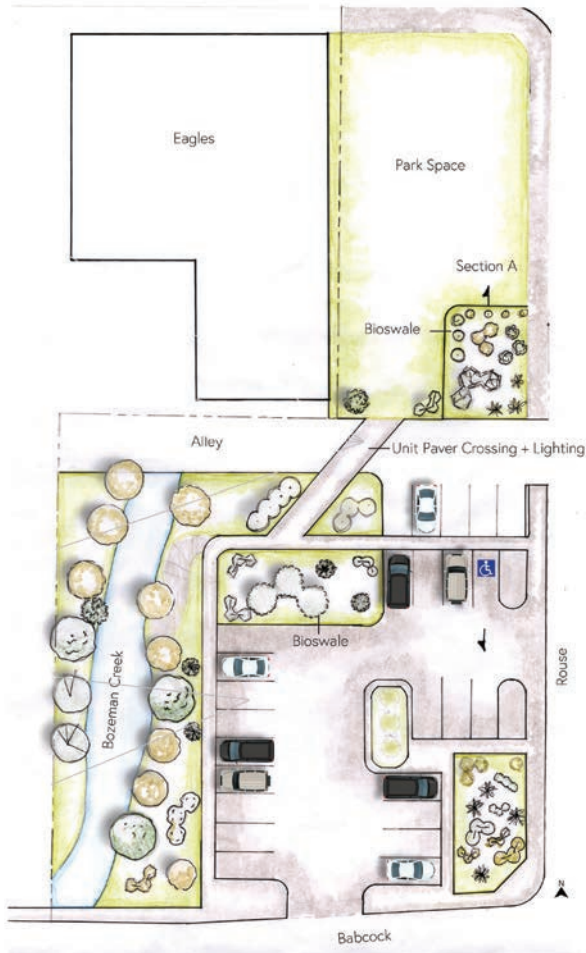
4.2 SCHEMATIC DESIGN ALTERNATIVES

Three schematic design alternatives were explored for each scenario for a mid-point review. Professional mentors and ENSC 448 students provided feedback, which informed design revisions and refinement of final schematic designs.

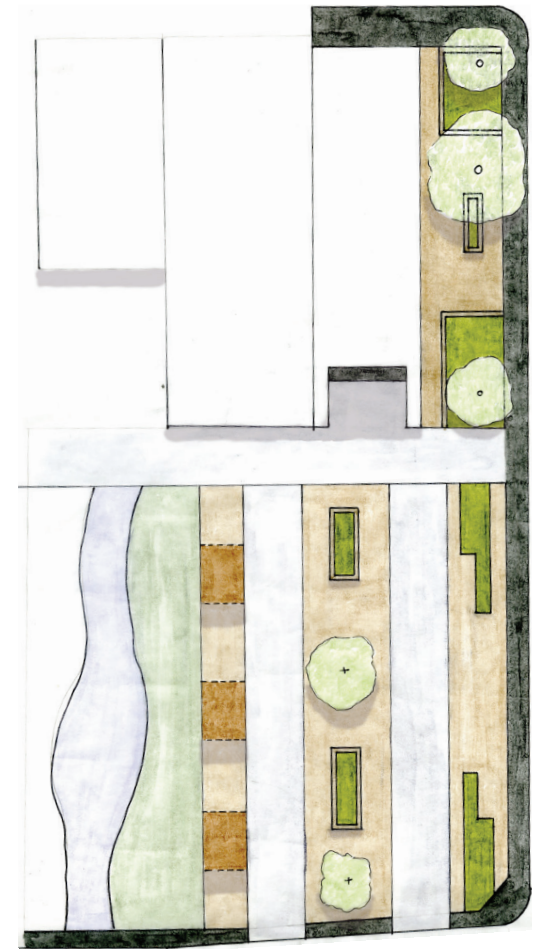
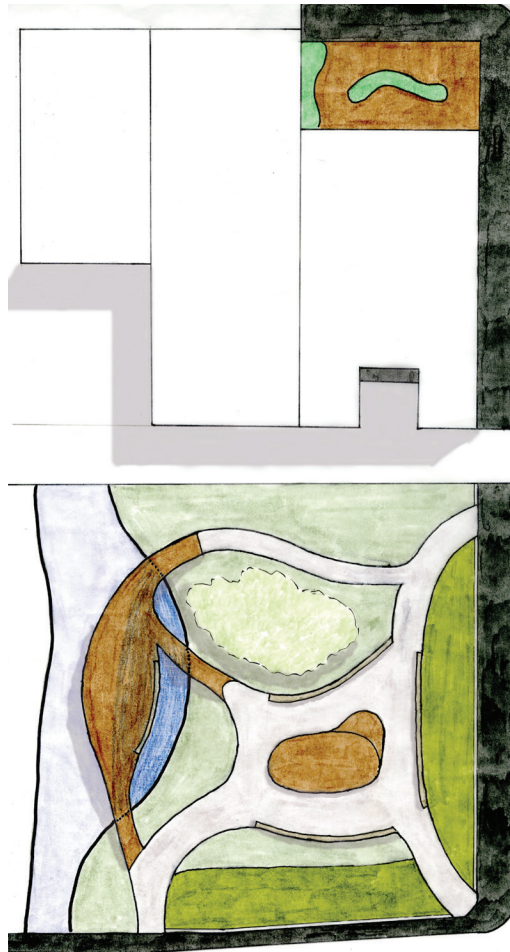
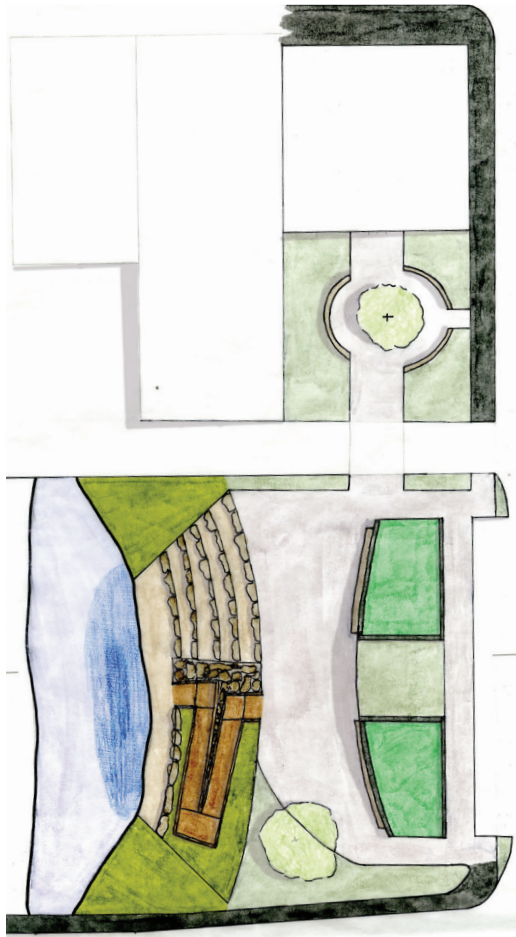
PARK SCENARIO



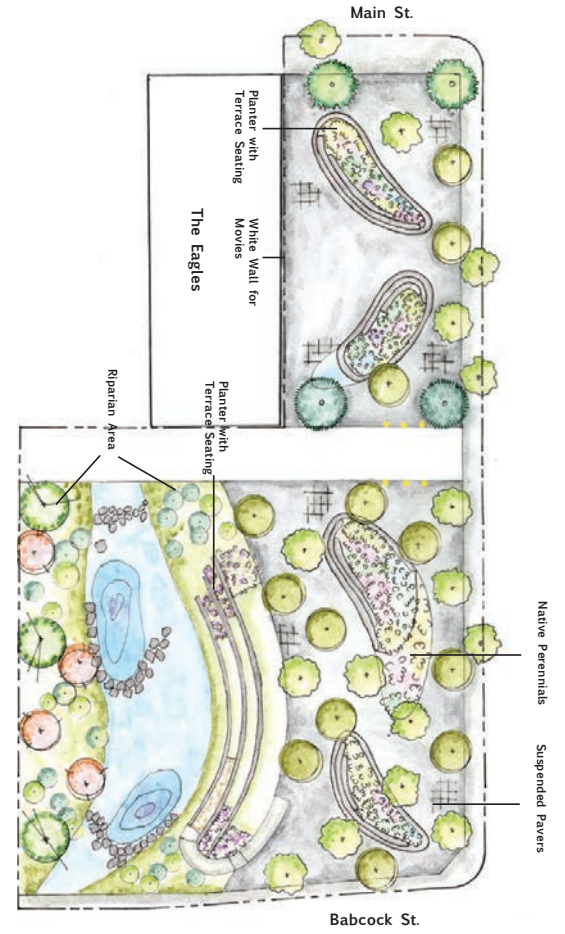
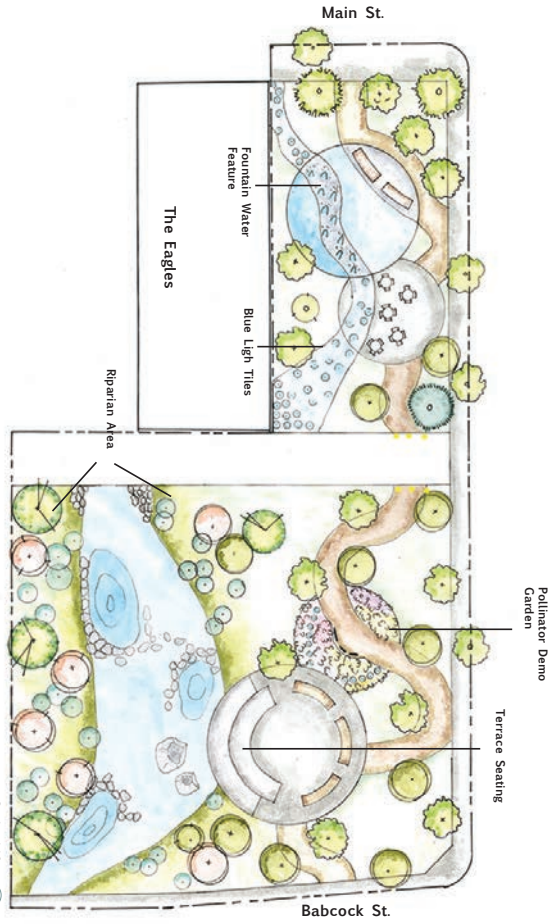
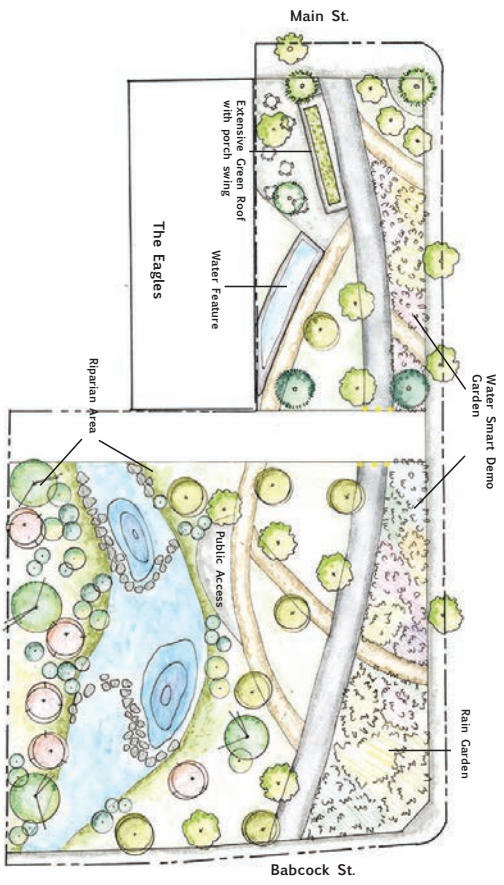
PARK+PARKING SCENARIO



PARK+BUILDING SCENARIO



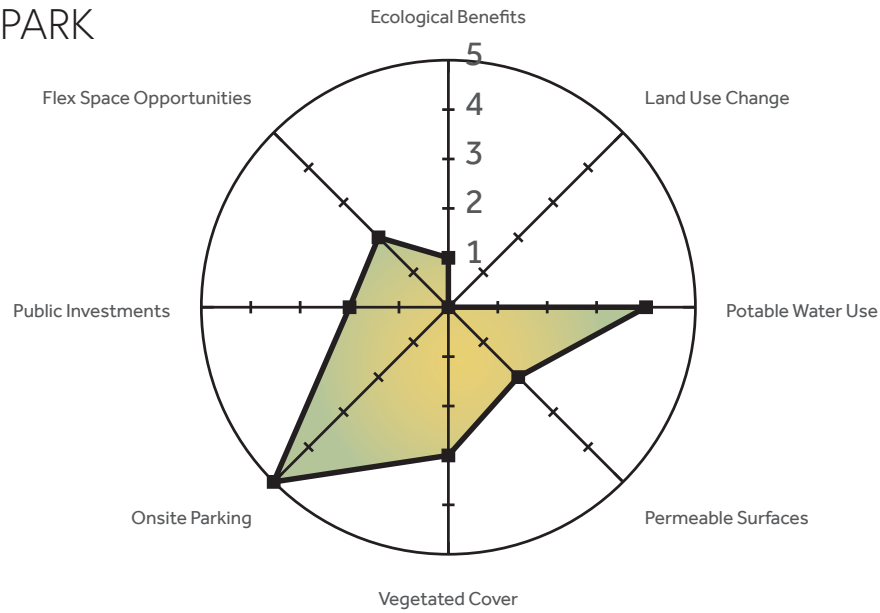
EXTENDED PARK SCENARIO



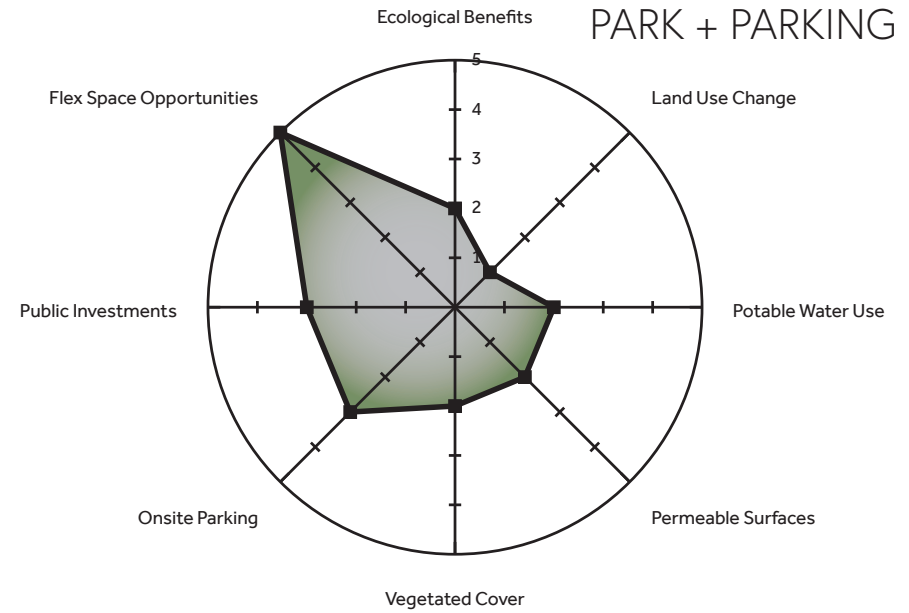
SCENARIO DESIGN PERFORMANCE FEATURE RATINGS

KEY: 5 = High 1 = Low 0 = None

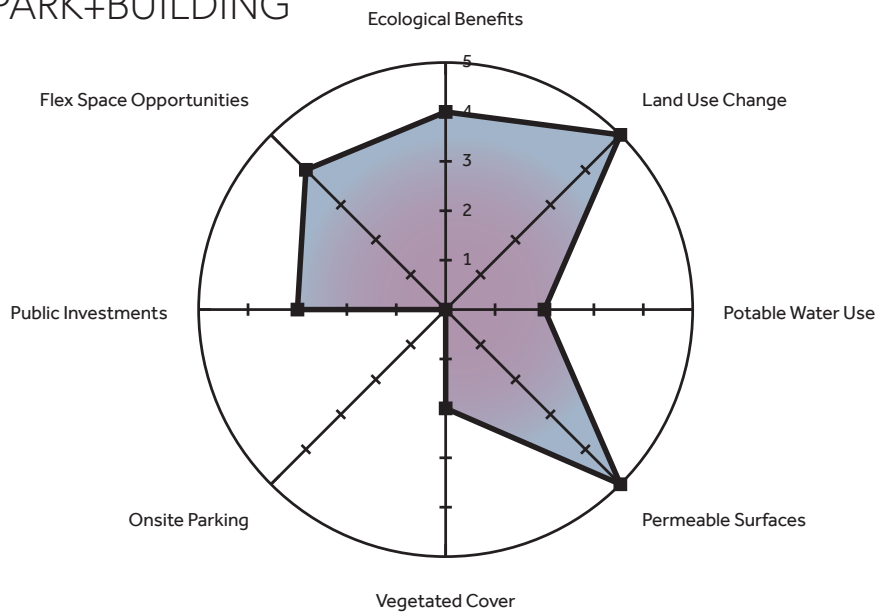
PARK



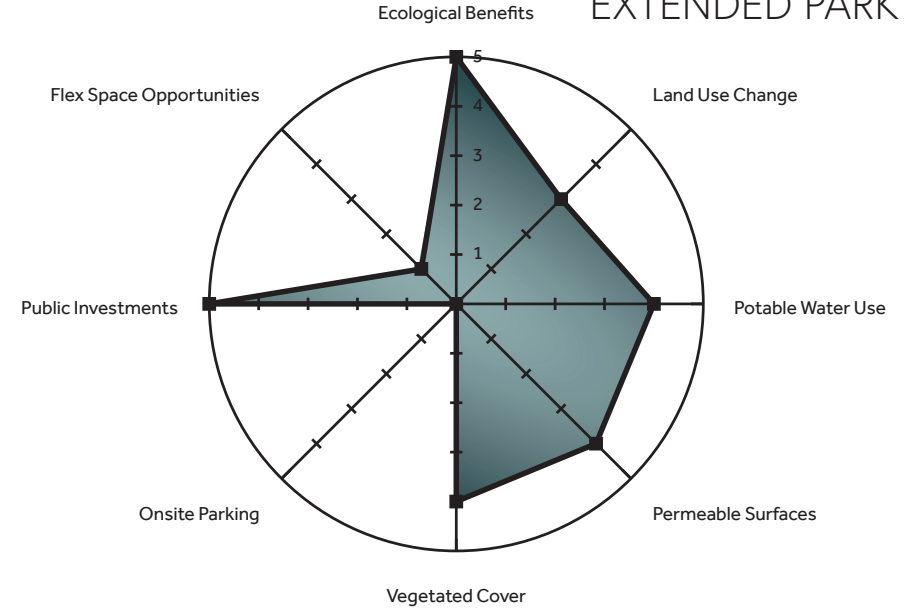
PARK + PARKING



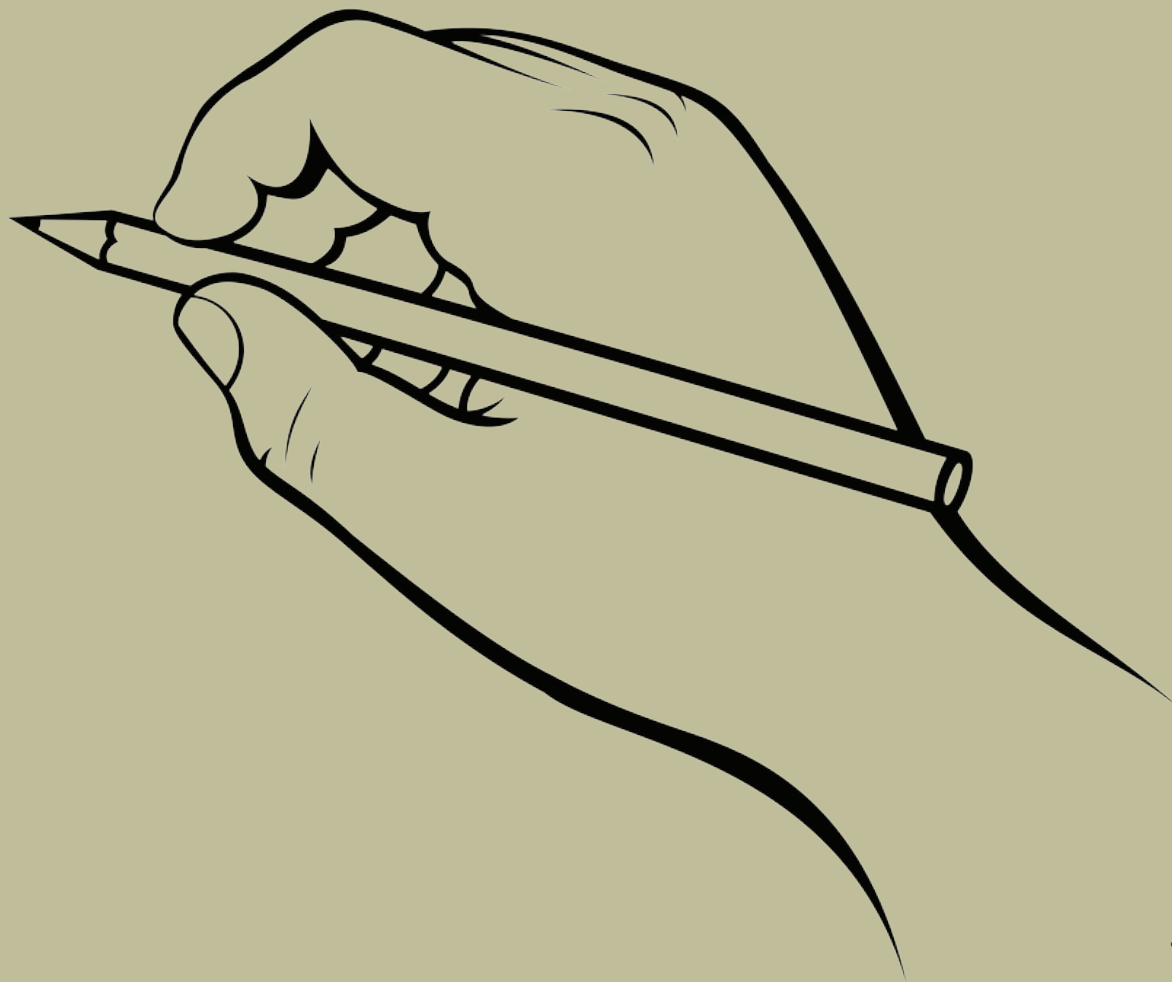
PARK+BUILDING



EXTENDED PARK



S C H E M A T I C
D E S I G N S



5.1 PARK SCENARIO SCHEMATIC DESIGN



The "Park Scenario" is assumed to be implementable without land use or property ownership changes. This scenario focuses on improving the existing park space, while minimally altering the parking lot and riparian area to meet the City's goals. There are four design goals for this scenario that are achieved. These design goals were determined through both observation and a survey of public desires for Soroptimist Park:

- The first goal is addressing Address current issues within the park of related to poor visibility and connectivity for pedestrians.

- Reducing irrigation levels while supporting thriving urban vegetation
- Produce spaces that accommodate multi-functionality and allow for play
- Enhance seating opportunities within the park

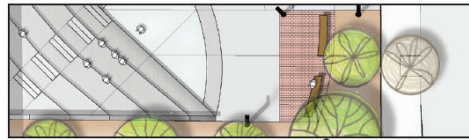
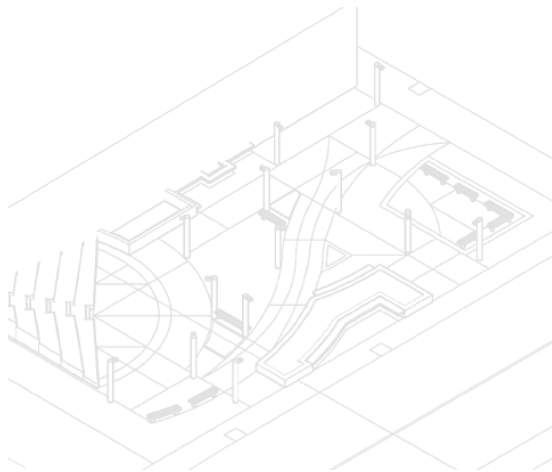
This design addresses the issues of poor visibility and connectivity within the existing park in a few ways. Visibility is improved by removing the overgrown vegetation currently in the park, which opens up more sight-lines for its visitors. Nighttime visibility is greatly improved through the addition of overhead lighting throughout Soroptimist Park. The pathways through the park are designed to follow natural "desire lines" or preferred routes for people moving through the space. The proposed paths allow for much better connectivity and pedestrian flow which should increase visitors to the park even if they are just passing through. A hierarchy of path sizes incorporated into the design separates heavily trafficked areas from those more intended for leisure.

Irrigation levels in the park are reduced by incorporating more hardscape and other non-irrigated infrastructure, while reducing the size of planted areas and turfgrass in the park. These planted or softscape areas are strategically placed to maintain things such as tree canopy for shade and stormwater capture, permeable surfaces for stormwater management, and simply vegetation as an aesthetic amenity. A small multi-functional turfgrass area in the southern central section of the park allows for a variety of activities, while requiring much less maintenance and irrigation compared to the amount currently in the park.

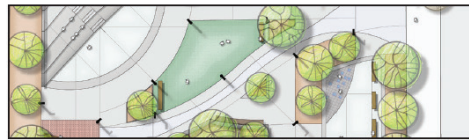
A variety of spaces with different intended uses are created within this design. Spaces for single individuals or smaller groups seeking privacy are created with both the built-in and freestanding benches throughout the design. An area that can accommodate an array of larger gatherings is created through the raised seating in the southwest corner of the park. Places for play within the park include both the seasonal spray-pad water feature in the northeast corner as well as the turfgrass area in the southern central part of the park.

DESIGN GOALS

Seating opportunities within the park increase drastically with this proposed design. Both the overall seating capacity as well as the variety of types of seating are enhanced within Soroptimist Park. These seating opportunities cater to an array of different uses and gathering sizes. Raised seating created in the southwest corner allows for new views not currently obtainable in the park. Seating is placed in places that allow users to have their backs to things such as vegetation and walls, which instinctively gives them a feeling of safety while allowing them to look out onto the park or street.



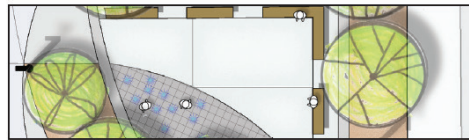
1 Generate Spaces for an Array of Gathering Sizes



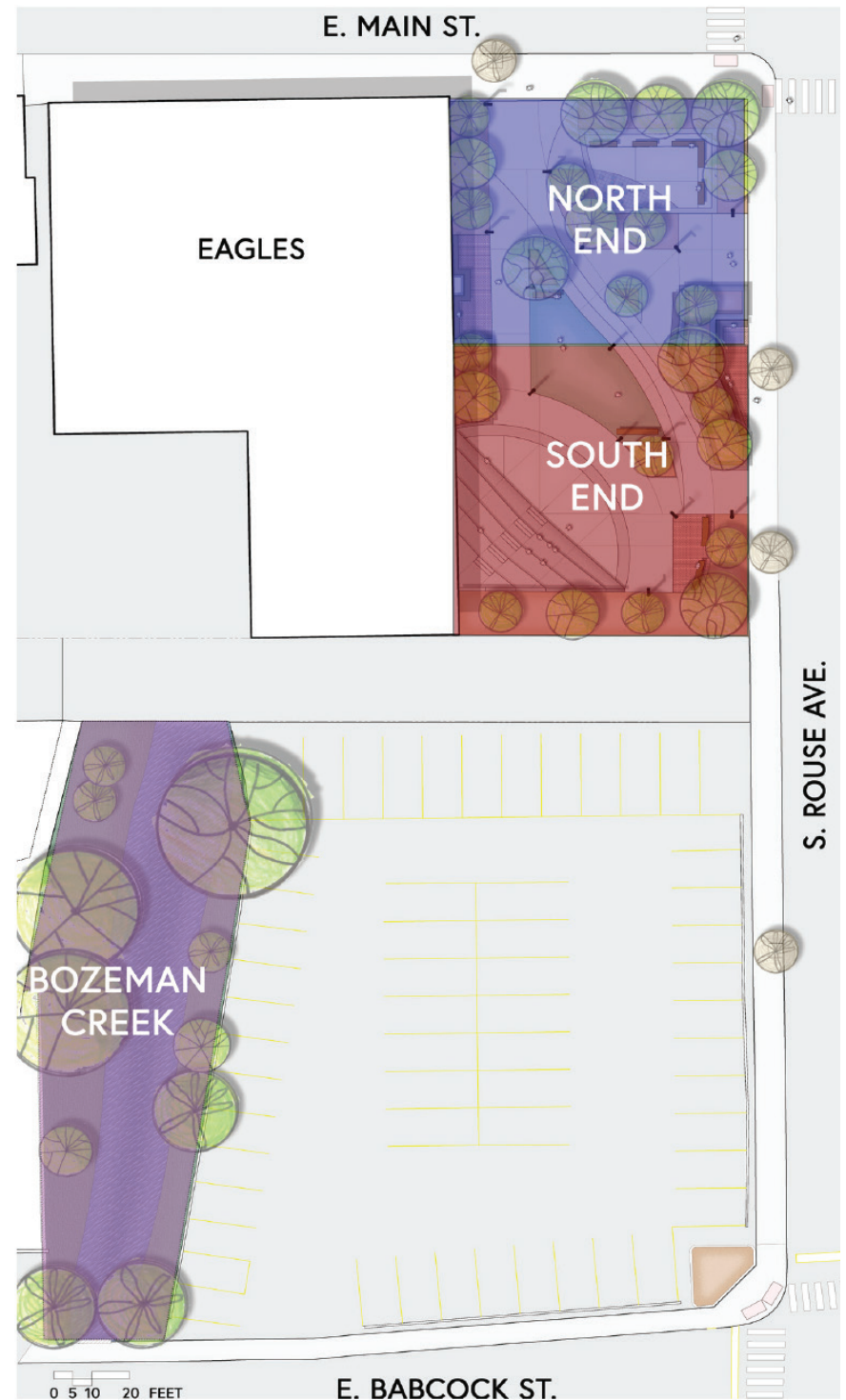
2 Improve Pedestrian Circulation Through the Park



3 Increase Visibility and Lighting in the Park

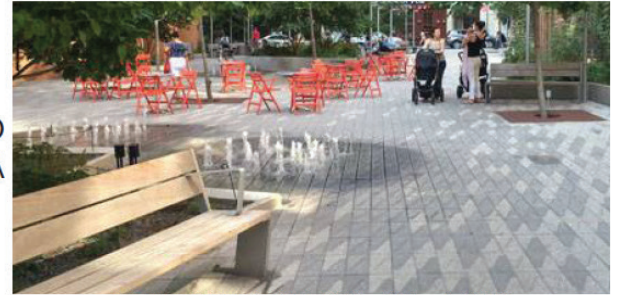


4 Design Areas and Facilities for Play





SPRAY-PAD
PLAY AREA



UNIQUE FUN FOR ALL AGES

MULTI-USE
TURF
SPACE



PICNICS, GAMES & DOGS

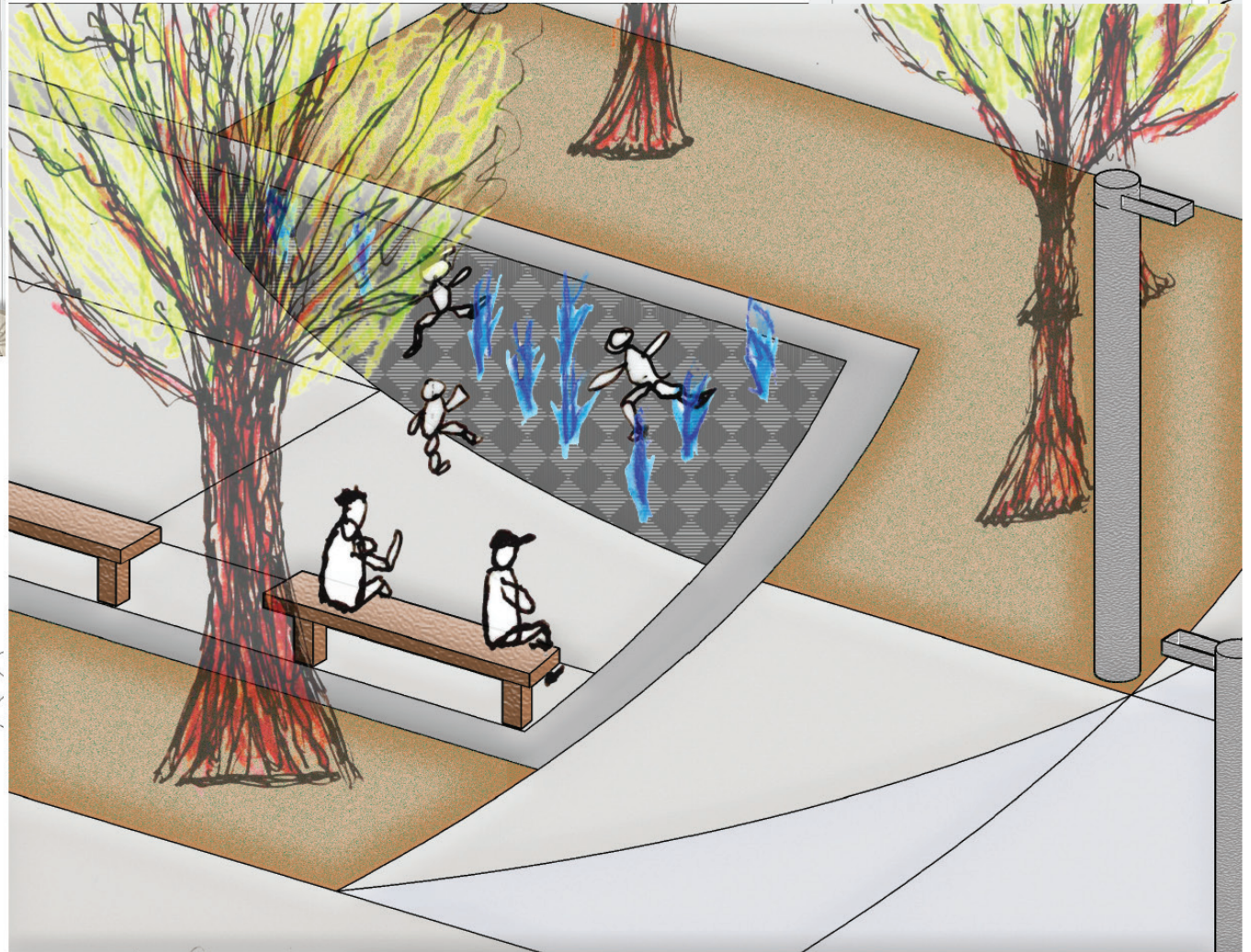
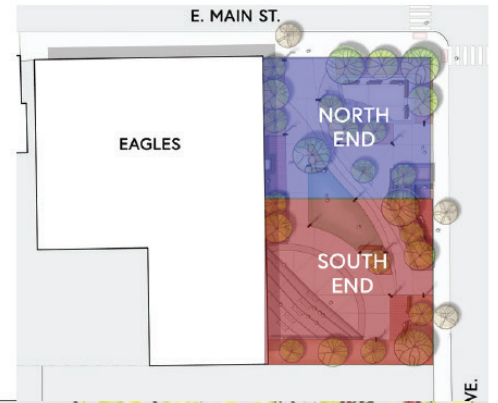
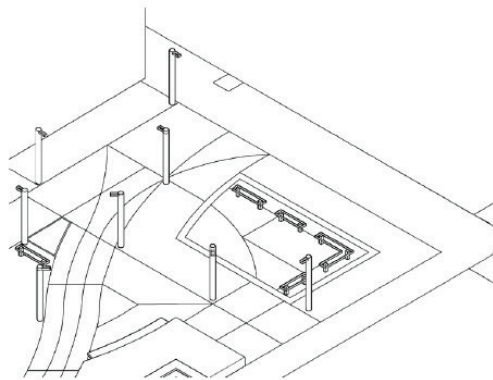
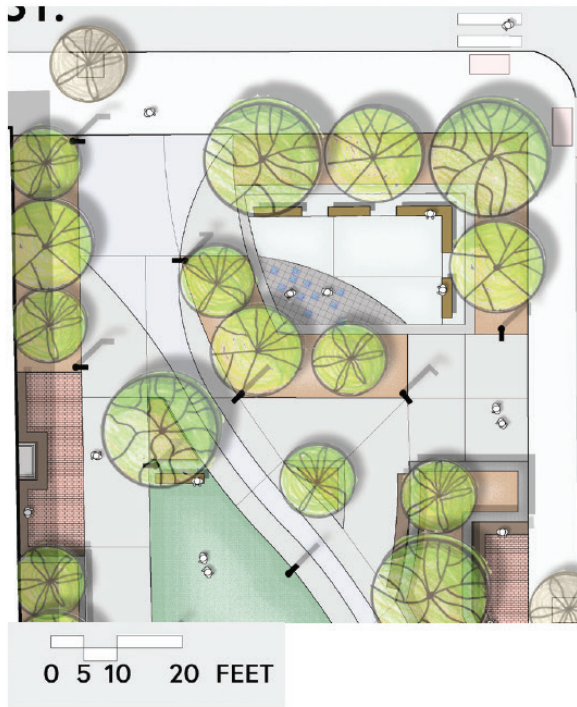
CONCRETE
RAISED
SEATING



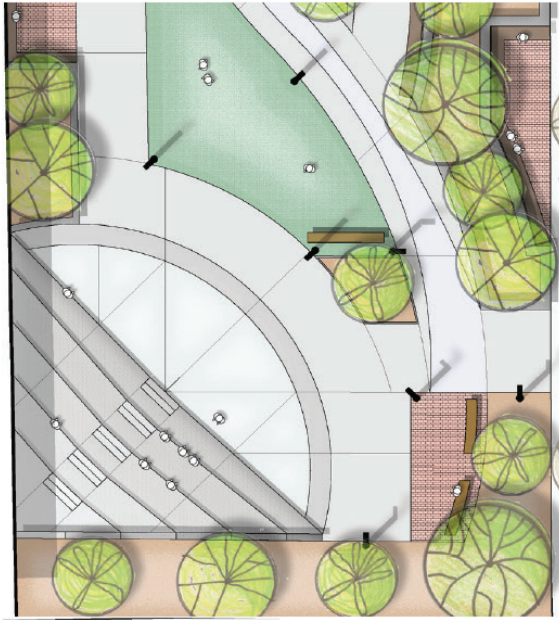
PERFORMANCES, SPEECHS & LEISURE

0 5 10 20 FEET

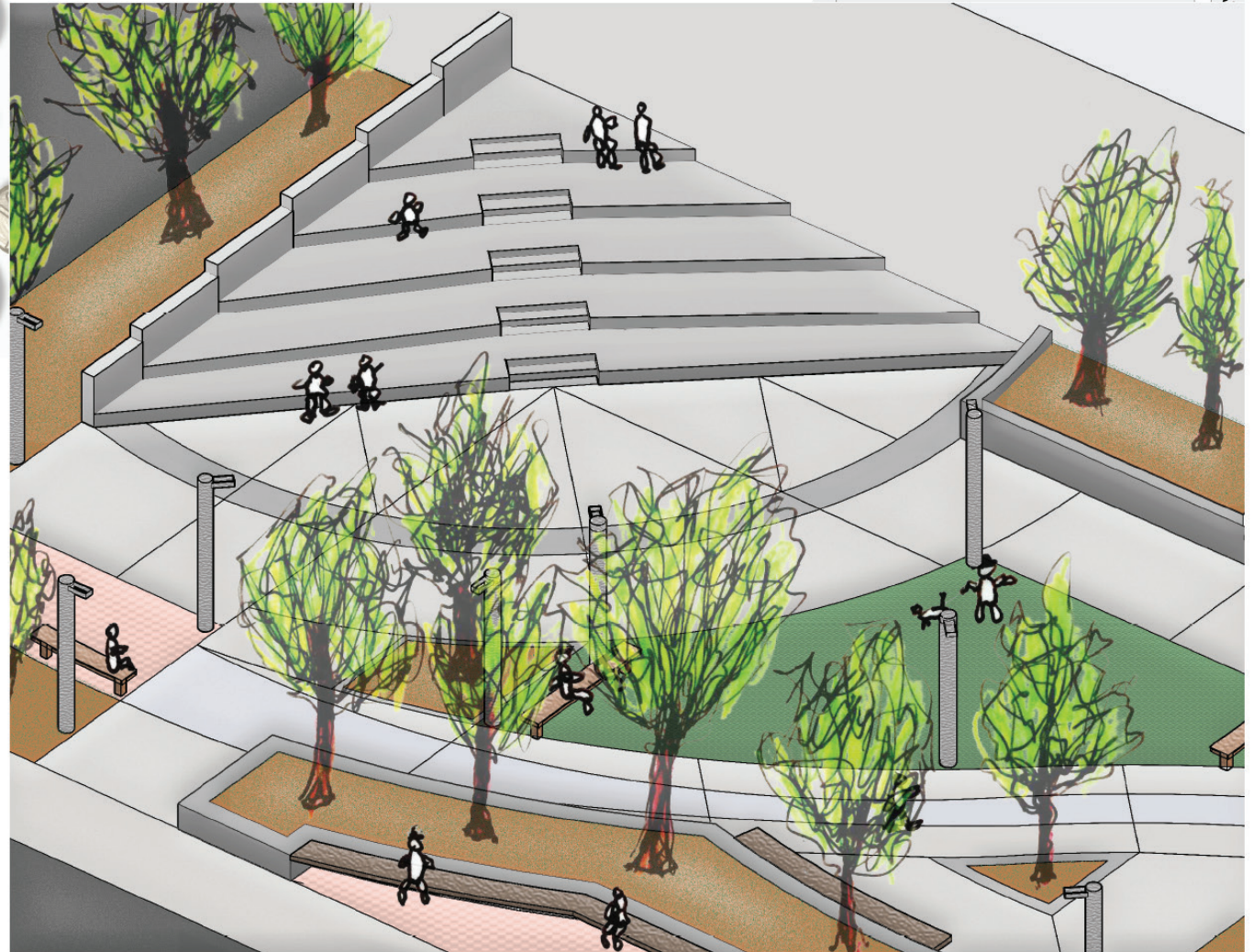
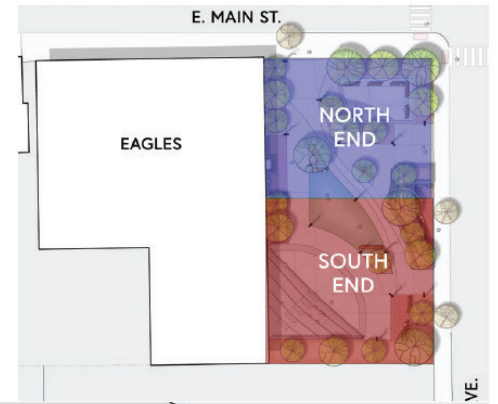
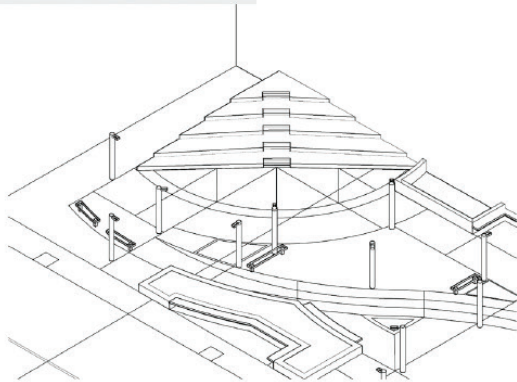
NORTH END



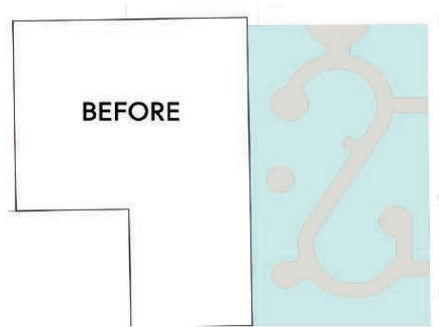
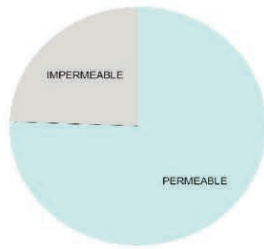
SOUTH END



0 5 10 20 FEET



SURFACE PERMEABILITY

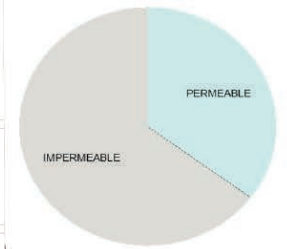


PERMEABLE SURFACE AREA: 8738 SQFT (76%)
IMPERMEABLE SURFACE AREA: 2825 SQFT (24%)

PERMEABLE SURFACE
IMPERMEABLE SURFACE



PERMEABLE SURFACE AREA: 4058 SQFT (35%)
IMPERMEABLE SURFACE AREA: 7481 SQFT (65%)



SEATING SPACE



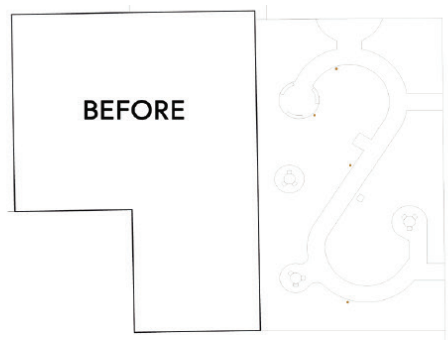
SEATING CAPACITY: ~15 people



SEATING CAPACITY: ~120 people

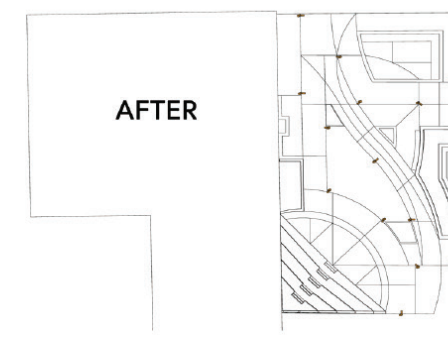


SITE ILLUMINATION



TOTAL NUMBER OF LIGHTS: 4

AN INCREASE OF 800%!

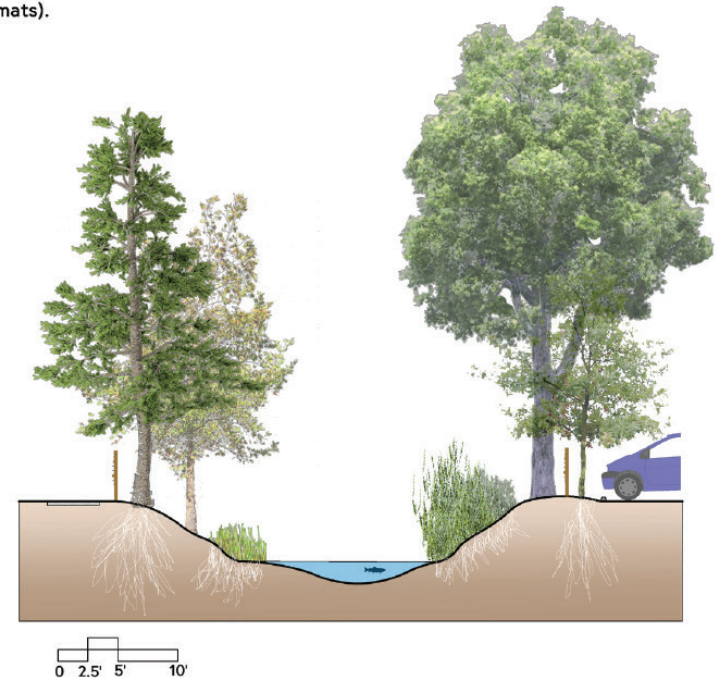
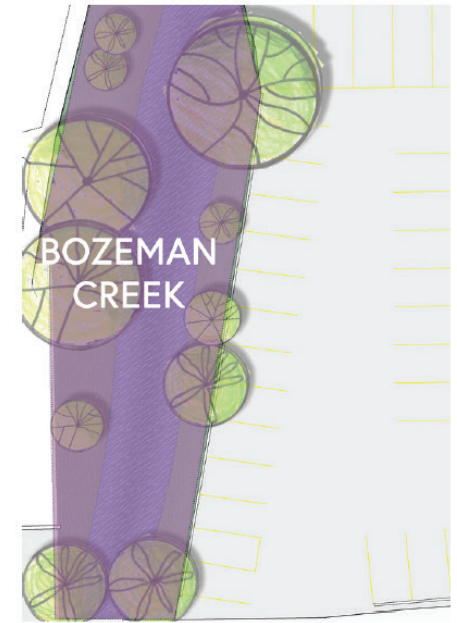
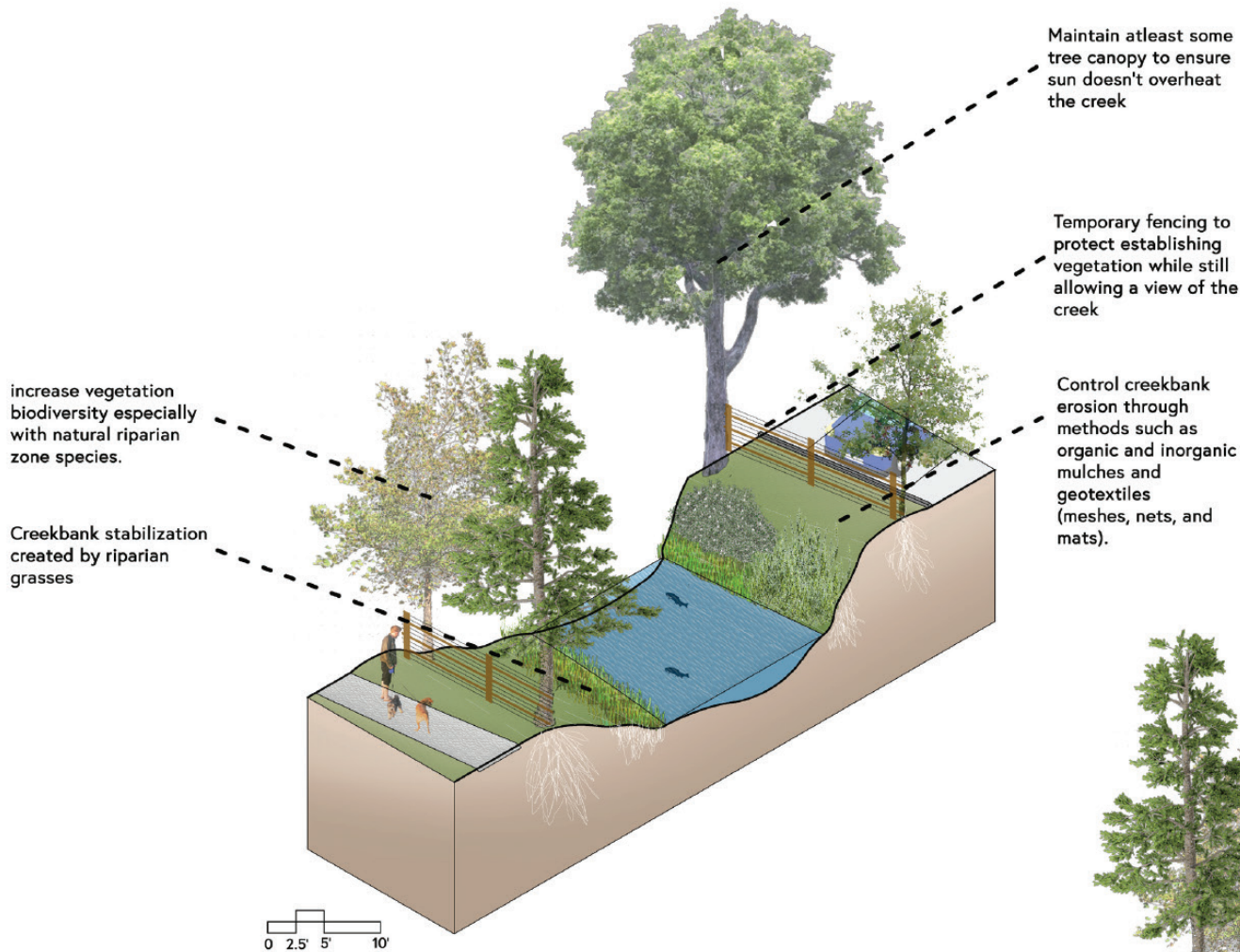


TOTAL NUMBER OF LIGHTS: 14



AN INCREASE OF 350%!

BOZEMAN CREEK



5.2 PARK + PARKING SCENARIO SCHEMATIC DESIGN



I. The conceptual framework for the park + parking scenario, is the revised addition of the 2012 conceptual plan for the City of Bozeman's Rouse Ave. and Babcock St. parking lot. This conceptual plan is also part of the bigger Downtown Bozeman Improvement Plan. The project's original objectives were to enhance and create a creek side park, maximize public parking function and capacity all while mitigating stormwater issues.

After revisiting this concept and adding Soroptimist Park to the project, this scenario of park + parking envisions a new design direction as follows:

- Improve connectivity and visibility
- Create a flexible space for people and capacity
- Extend use of space through time of and season
- Merge parking potential and stormwater management

As a result, Vendor's Way was produced using skills for sustainable site design, SITES strategies, and landscape performance metrics as a base to build, learn and identify those key design goals.

The site itself can be oriented and divided into three key place-making zones (See *Figure 1.1*):

- Events + Seating
- Redefine Parking + Utilize Stormwater
- Riparian Area + Creek Restoration

Additional design moves were the result of

using the DBIP to foster a better awareness of the site by including the integration of art and restoration efforts for Bozeman Creek. This can be seen conceptualized and depicted in *Figure 1.2* and *Figure 1.3*

Further key programming elements that were also included are as follows:

- Event Space
- Seating types and spaces: Fixed vs. Movable; Open vs. Private
- Multifunction parking lot that is also used as additional event space
- Activity and seating spot adjacent to Bozeman Creek riparian area with shade structure element

Ecological learning opportunities and signage along the Bozeman Creek riparian area for further community engagement and interaction

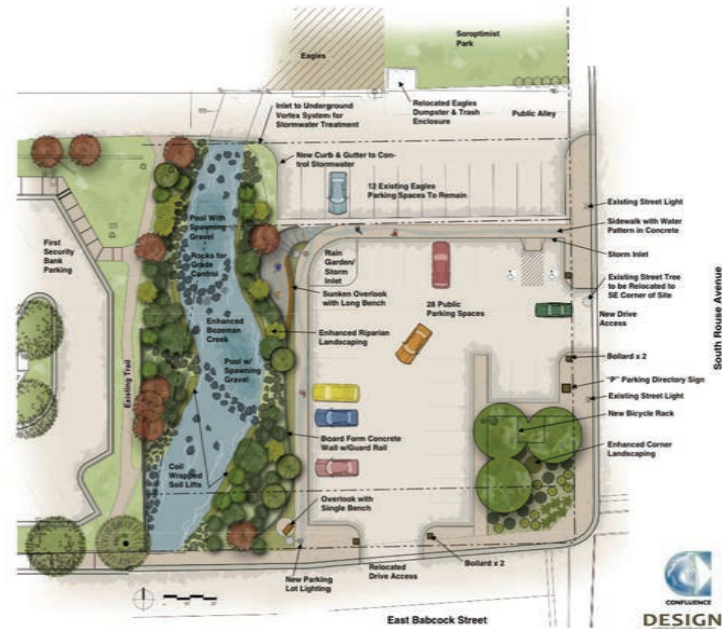
II. Vendor's Way as a design concept creates a unique space that integrates well into Bozeman's downtown culture. The space itself is versatile, showcasing a variety of opportunities and programming elements which will benefit the Bozeman community as a whole.

2012 Conceptual Plan for Downtown Bozeman Park(ing) Project

Based on landscape performance metrics, Vendor's Way strives towards the best possible environmental, social, and economic outcomes. By embracing the Bozeman community, culture, and landscape, efforts put into the quality of design and planning, elevates the public's understanding regarding sustainability in this scenario.

Moving forward, considerations that are needed to be taken into account require proper implementation as listed below:

- Financial support
- Engagement and outreach from the community concerning the project
- Official city approval
- Collaborative efforts from local artists and businesses
- Master-plan
- Construction documentation concerning the viability surrounding construction, engineering, and building code amendments



This 2012 conceptual plan for the city of Bozeman sought to redesign the public parking lot and adjacent section of Bozeman Creek northwest of the intersection of South Rouse Avenue and East Babcock Street. The project's objectives were to:

- » Enhance Bozeman Creek and create a creek side park
- » Maximize public parking function and capacity
- » Mitigate stormwater issues.

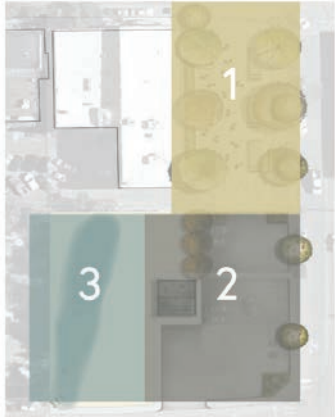
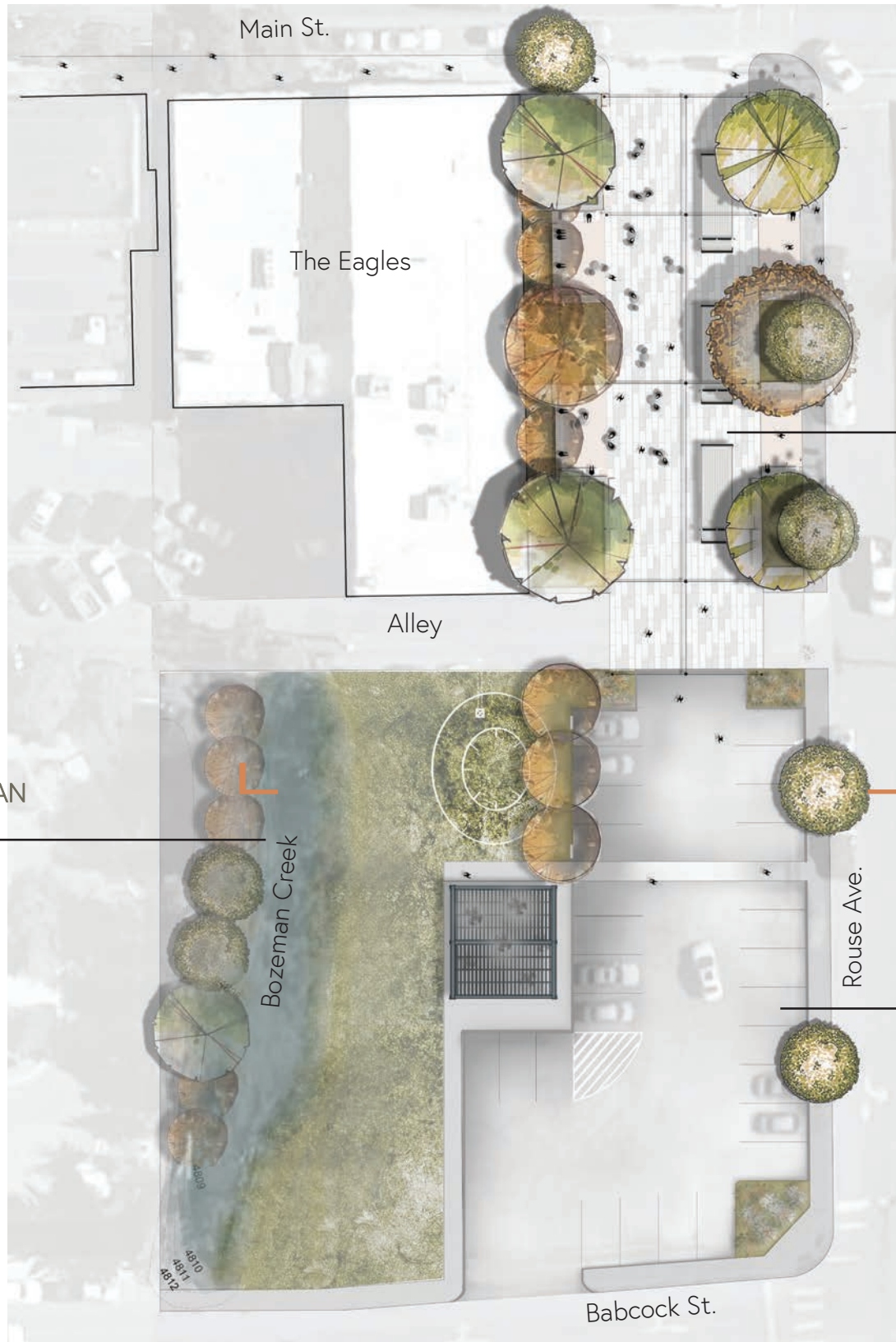


Figure 1.1 Place-making



CREEK + RIPARIAN RESTORATION

3



EVENT SPACE

1

Parking Section



PARKING

2



EVENTS SPACE IMPROVE. CONNECT. CREATE



Mayo Bench
Landscape Forms



Catena Tables
Landscape Forms



Annapolis Bollard
Landscape Forms

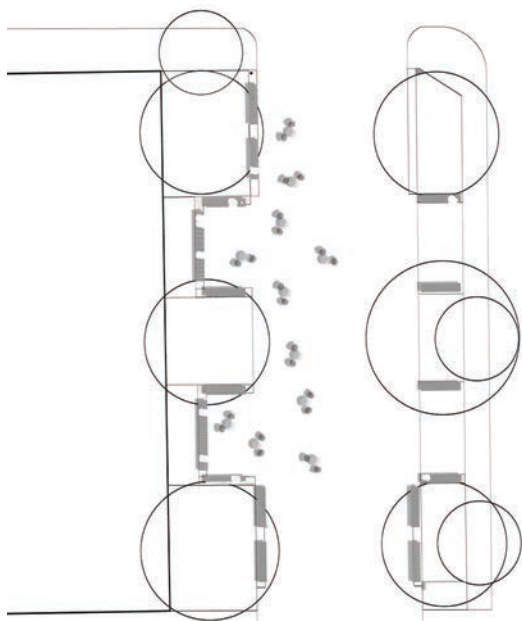


Tumbler Light
Landscape Forms



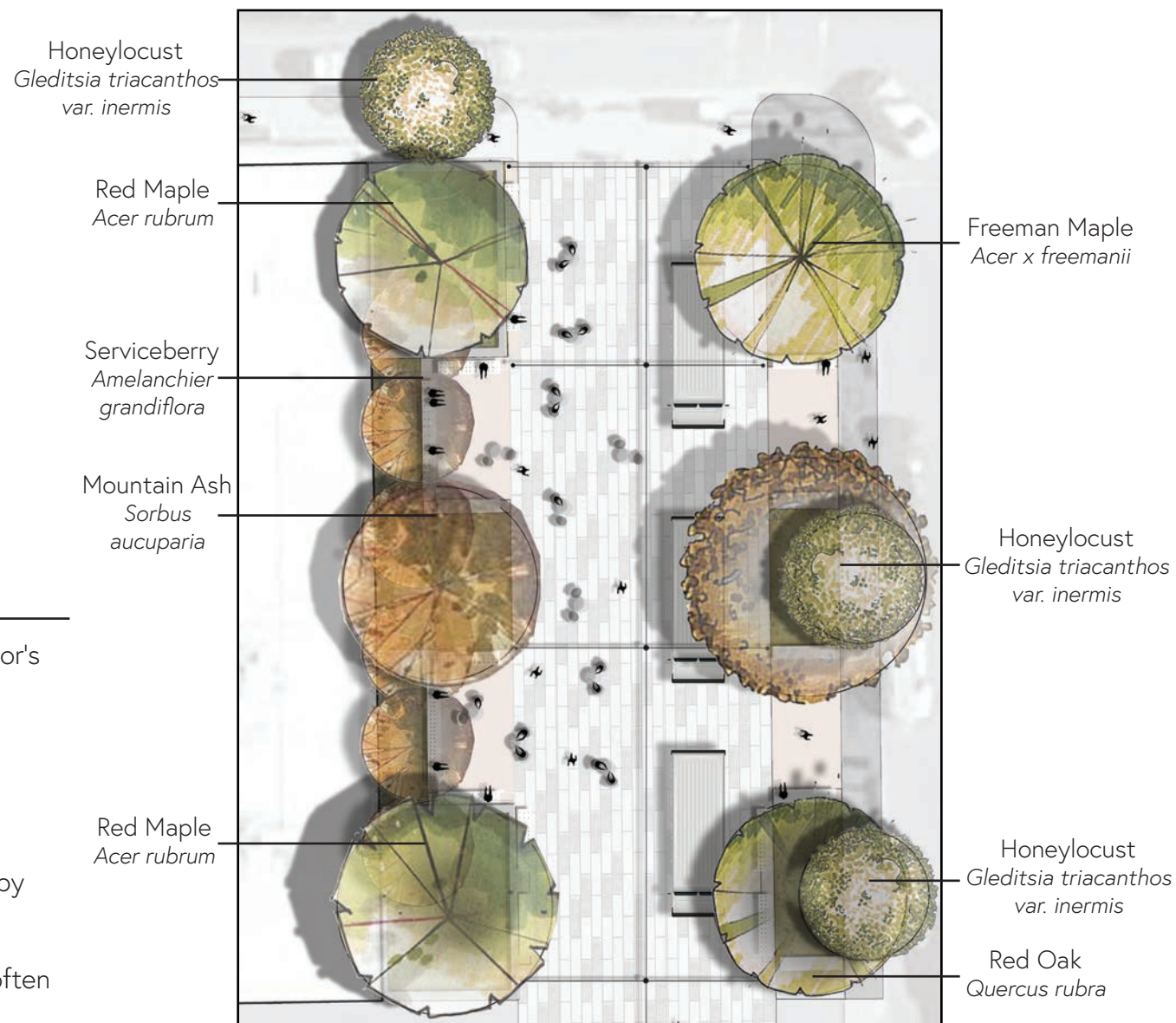
Moduline Paver
Belgard

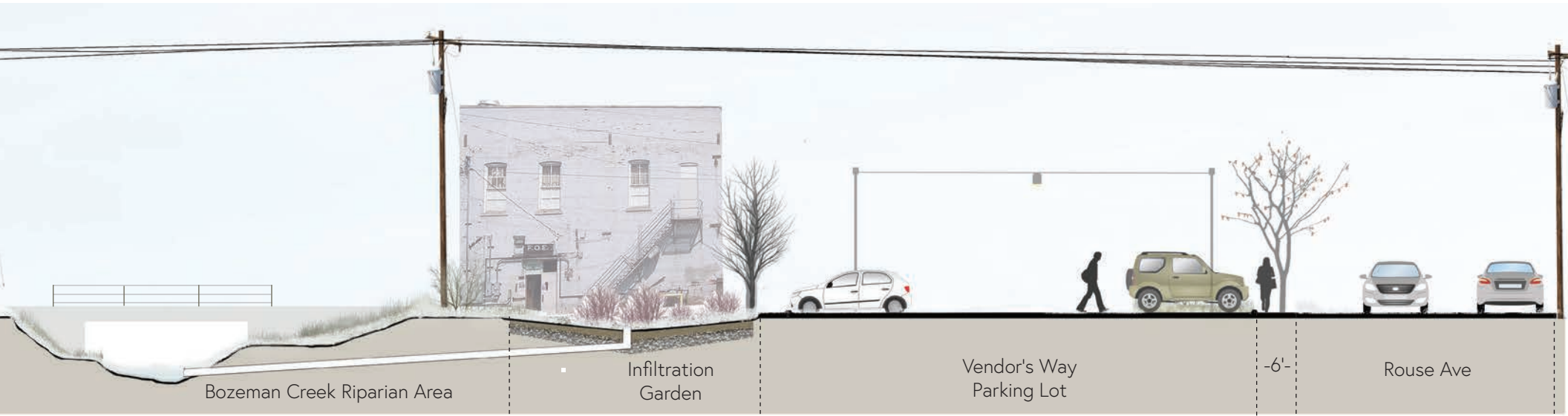
SEATING CAPACITY + FLEXIBILITY



Seating Capacity and Flexibility

- » Current number = 15 spots ---> Vendor's Way Concept = 54 spots
- » Seating types: Fixed vs. Movable
- » Seating spaces: Private vs. Open
- » Creates social seating opportunities by providing more than one type
- » Multi-stem Serviceberry canopy to soften building backdrop and edge





Parking Section



Reccomended Plant Material (Zone 4) for Infiltration Gardens



River Birch
Betula nigra



Redosier Dogwood
Cornus sericea



Switch Grass
Panicum virgatum



Indian Grass
Sorghastrum nutans

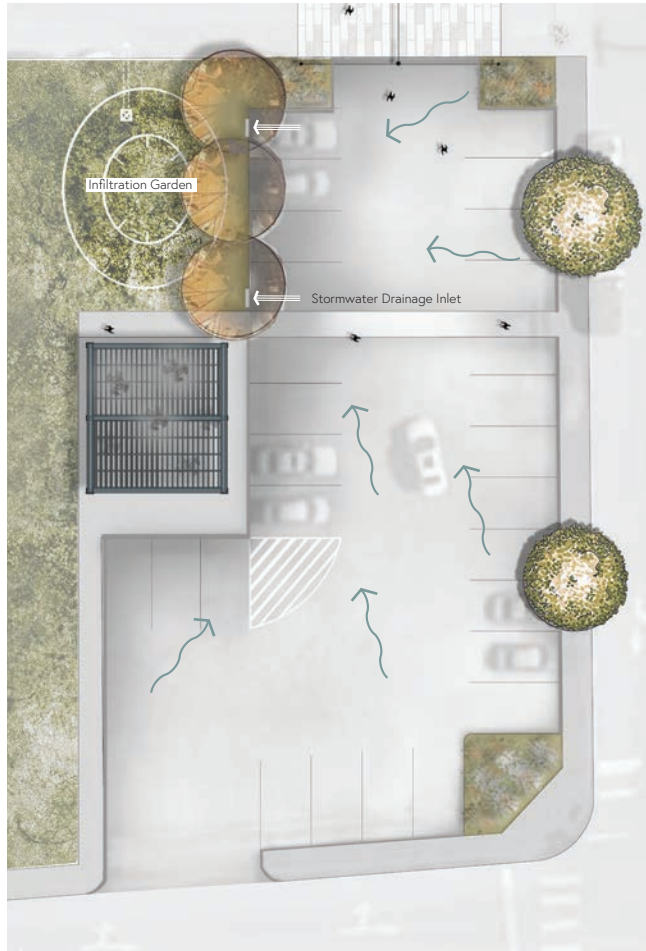


Goldenrod
Senecio spp.

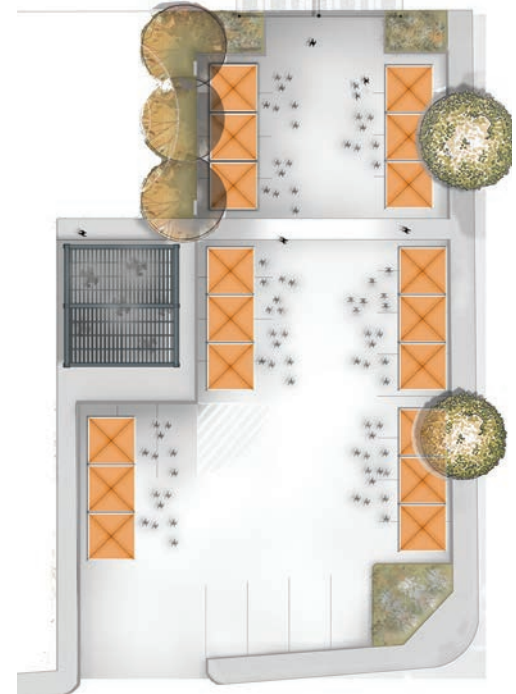


Mountain Mint
Pycnanthemum spp.

PARKING FLEXIBILITY OVER TIME



Stormwater Management



Further Food truck Opportunity and Space



Farmer's Market Opportunities and Events

BOZEMAN CREEK SUSTAINABILITY + RESTORATION



Infiltration Garden

#downtown
#bozeman

Naturalized Riparian Area

Ecological Learning Opportunities

Connection From Babcock St.

Lunch or Break Spot From Downtown Activities

RIPARIAN AREA SUSTAINABILITY + RESTORATION



Sustainability and Restoration

- » Riparian Area increased by 45%
- » Riparian Safety: Reduce direct engagement with stream to promote and maintain overall ecological health and site visibility
- » Reduces Urban Heat Island Effect by increasing ecological microclimate opportunities
- » Shaded seating provides vantage points to appreciate and admire the riparian area with a multi-stem Serviceberry canopy to soften building backdrop and edge



Ground Plane Vegetation vs. Tree Canopy

- Ground Plane Vegetation
- Tree Canopy

Materials



Aluminum Pergola Shading Solutions



Carousel Table Landscape Forms

5.3 PARK + BUILDING SCENARIO SCHEMATIC DESIGN



Three important considerations for analysis of this design scenario include:

- 1) Alley
- 2) New Building
- 3) The Creek.

In moving forward, more exploration should be done in regard to how to activate the alley. Currently it lies as a barrier between two spaces instead of acting as a transition or an extension between the two sides of the park. Through its activation the alley will become safer by slowing down the vehicles that pass through. Additionally, it would be helpful to investigate the role that the

new building plays and take a closer look at how it is interacting with the extended sidewalks along Rouse Ave and Main Street. It would be helpful to do another quick exploration of where the building could be placed in addition to investigating its direct presence to the streetscape. The building placement helps to define the landscaped spaces and is important to nail down in order to move forward with designing around it. This scenario assumes that the existing park land would be sold as a developable lot and as an economic driver for redesigning the parking lot and creek into a restored greenspace. This project did not include an economic analysis and one would need to be conducted before moving forward. This economic analysis would inform building scale, placement, and site design. Additionally, land purchase agreement specifics and policy mechanisms would need to be established before moving forward with a sale in order for the City to ensure particular site design features. One final consideration that should be looked at upon further development of this design is the interaction with the creek. The current design emphasizes a distanced interaction with the creek in order to establish beneficial species along the bank. While the overarching idea is solid it would be advantageous to explore multiple bridge options. Other bridges in the urban Bozeman area feature overhead structures and seating

in a variety of forms, this warrants an exploration of these features on the bridge in this design as well.

The Linear Plaza design follows four overarching design goals which include, integrating the space into the fabric of Downtown Bozeman, creating people scaled spaces, creating opportunities for community engagement, and highlighting the creek restoration. As the design moved forward four big design moves were implemented in order to achieve the previously mentioned goals. These moves include locating the building on the North half of the site, extending sidewalks on Rouse Ave., creating flexible spaces through strategic hardscape and softscape placement in addition to diversification in seating, and lastly creating creek engagement without vegetation inhibition which manifested into an overlook/bridge combination. The entire design follows a linear form which allows for a communication between the north and south halves of the site. Additionally, it calls back to the original City Hall/Fire Station/Opera House/Library that was previously on the site. This building had a long linear form which is echoed in this design scenario.

The North half of the site is dedicated to an extension of the sidewalk that creates a covered plaza exploring the relationship between private and public greenspace. I am

proposing the building be placed adjacent to the currently existing Eagle's building. This will allow for the extension of sidewalk I mentioned above. This new building would work well as a mixed-use program with retail on the bottom and potentially on upper floors along Main Street, but then office space in the back. As you walk along the building coming from Mainstreet, you will walk along a planter filled with native species forming a naturalized archetype. A similar planter was placed on the edge of the alley. These two planters frame an open space with benches and tables. The entire length of the building is scattered with canopy trees. There is a variety of Linden, Maple and Chokecherry. To accommodate these trees a suspended pavement system has been added.

This same language has been continued down Rouse Ave to the southern half of the site. An open plaza space with benches and tables is framed by two planters featuring water-smart planting beds and is covered by a similar tree canopy. As you move towards the creek the next section is a flexible space. This space is drivable, meaning that it is a space that would allow food trucks, or tents, or infrastructure for a small concert. The next section west of that is a turf area flanked by two areas of hardscape each with a curvy double-sided bench. These then lead to another section of all hardscape

with an open are featuring two plinths with an overhead structure covering picnic tables on each side. On the Babcock Street side and the alley side there are planters that act as buffers for the more pedestrian focused areas. This planting will also act as a transition to the more creek focused planting. On the bridge over the creek, you will find interpretive signage that could describe the vegetation or creek restoration strategies.

The creek restoration will focus on bank stabilization through two layers of willow plantings. Additionally, the plan would be to add some pools within the creek with various sizes of aggregate to help with fish habitat.



DBIP GOALS

Invest in great streets.

Welcoming to everyone

Economic Drivers

Connected to Nature and Culture

DESIGN GOALS

Integrate into the fabric of downtown Bozeman

People scaled places

Opportunity for community engagement

Highlight Creek Restoration

SITE ATTRIBUTES

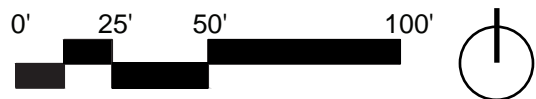
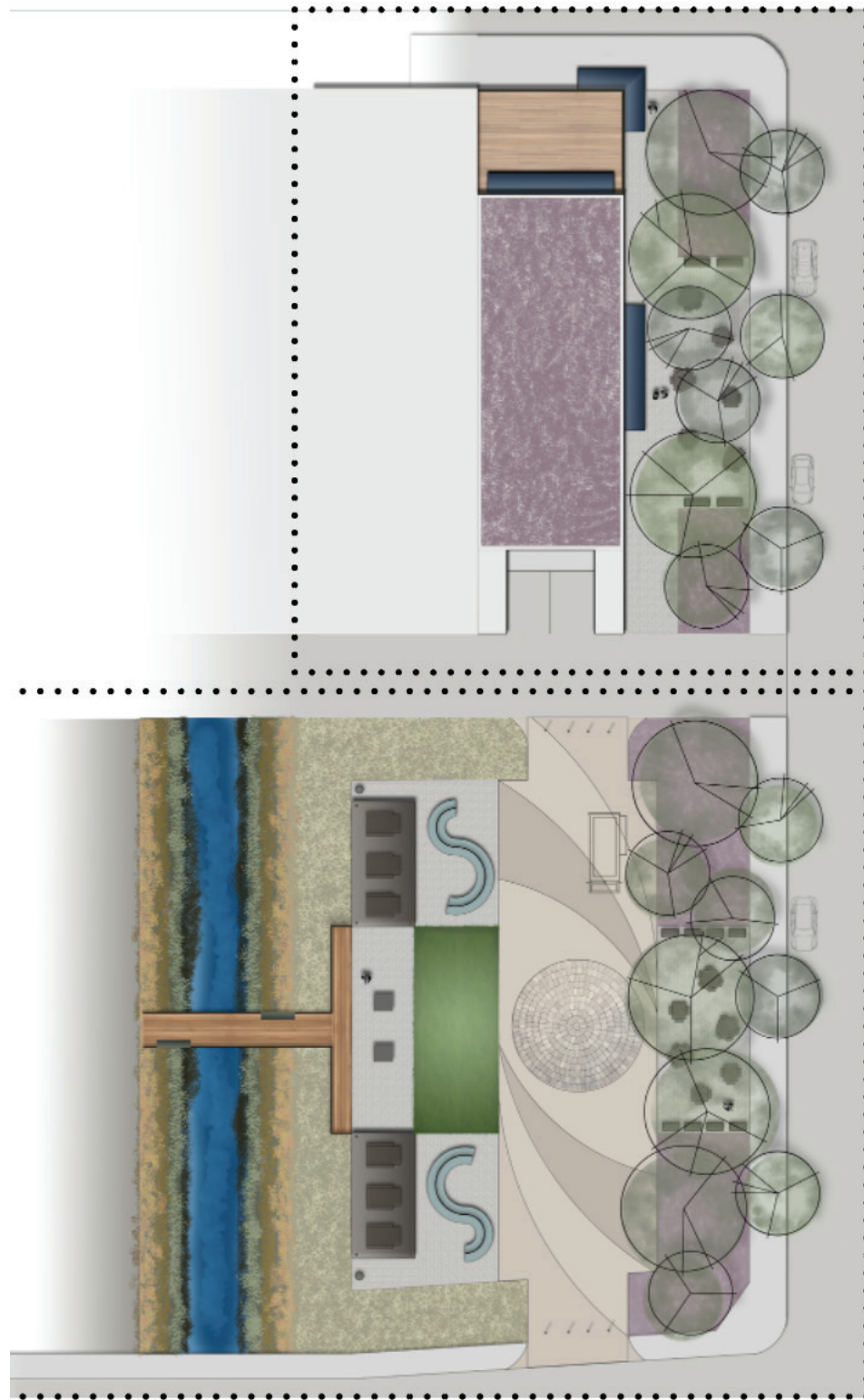
Vegetation buffering.

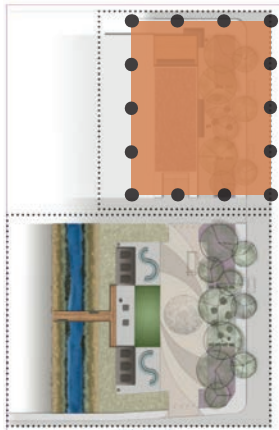
Cultural Integration

Greenspace in downtown

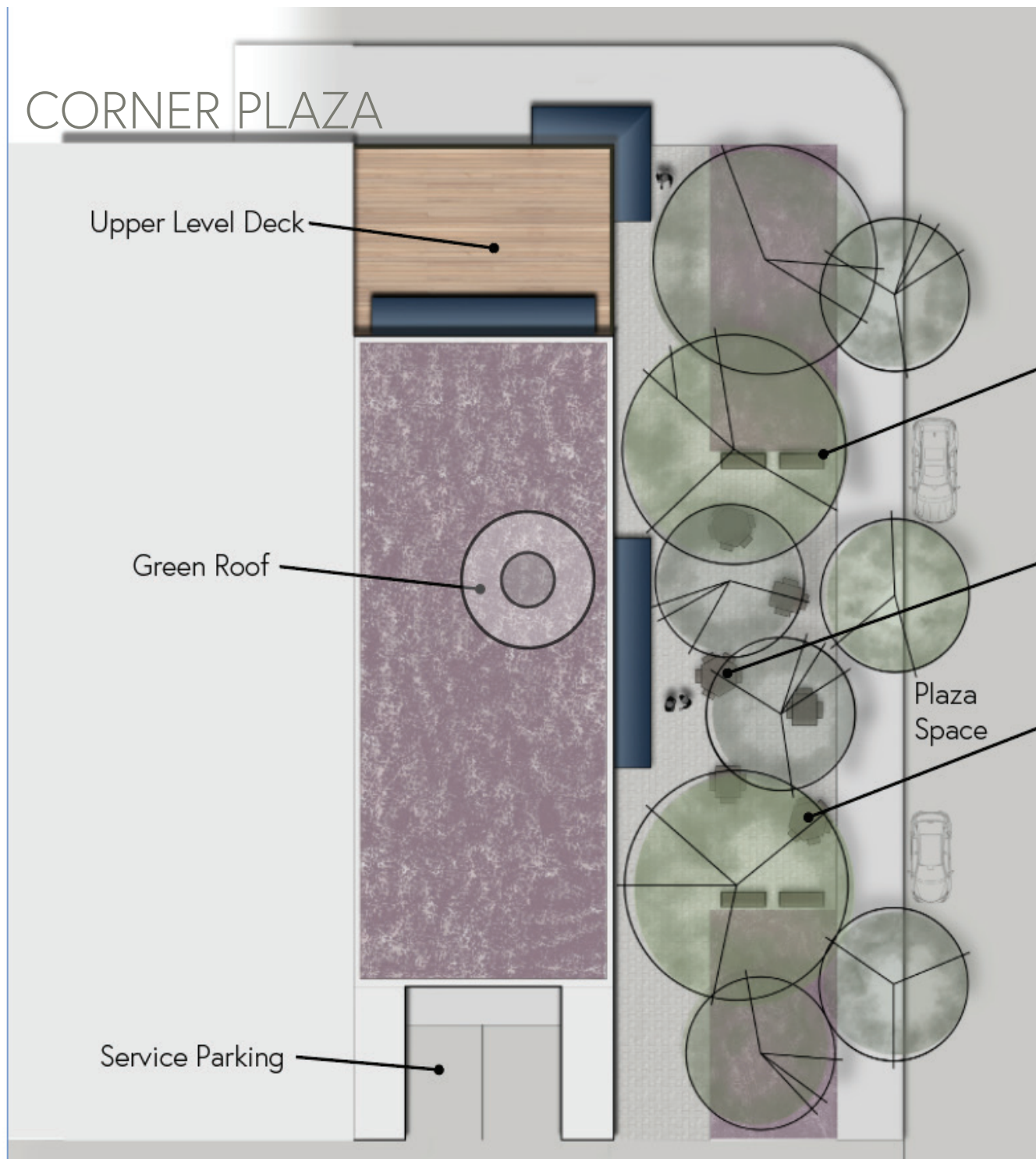
DESIGN MOVES

- » Building addition to North half of site
- » Extension of sidewalks
- » Flexible space
- » Creek engagement without vegetation inhibitions

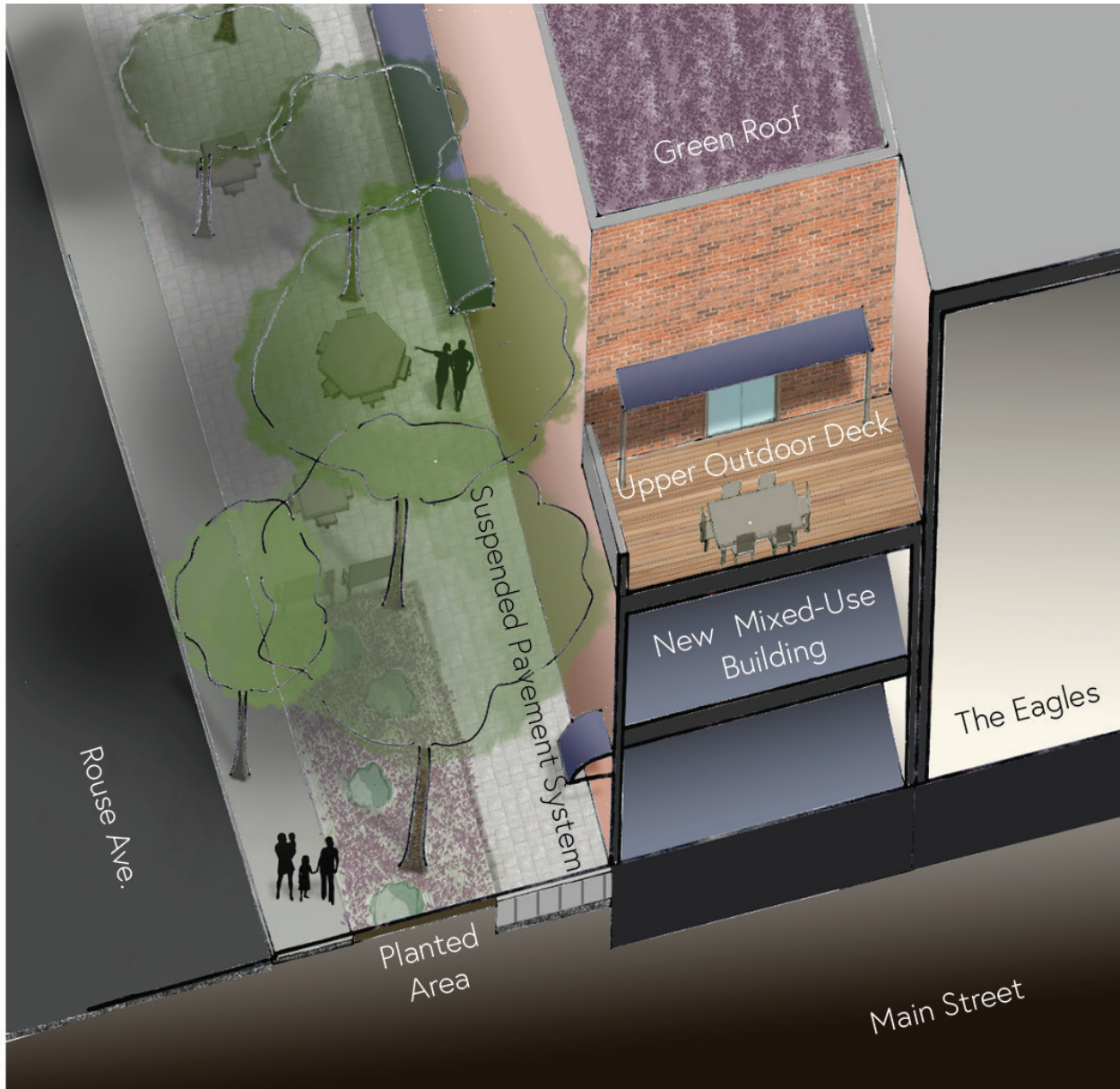




CORNER PLAZA



EXPLORING PUBLIC AND PRIVATE SPACE



4 Green Roof



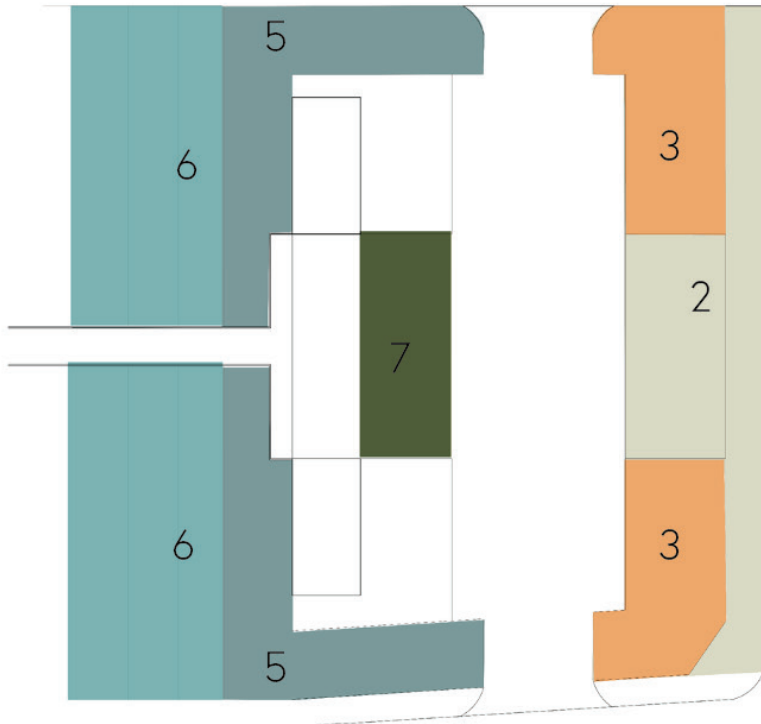
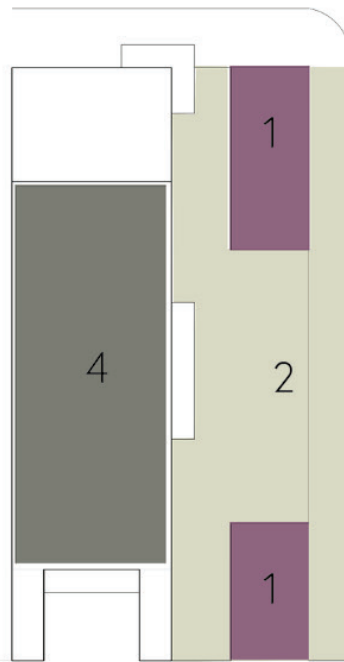
5 Riparian Buffer



6 Restoration Planting



7 Turf



1 Plaza Plantings



2 Tree Canopy

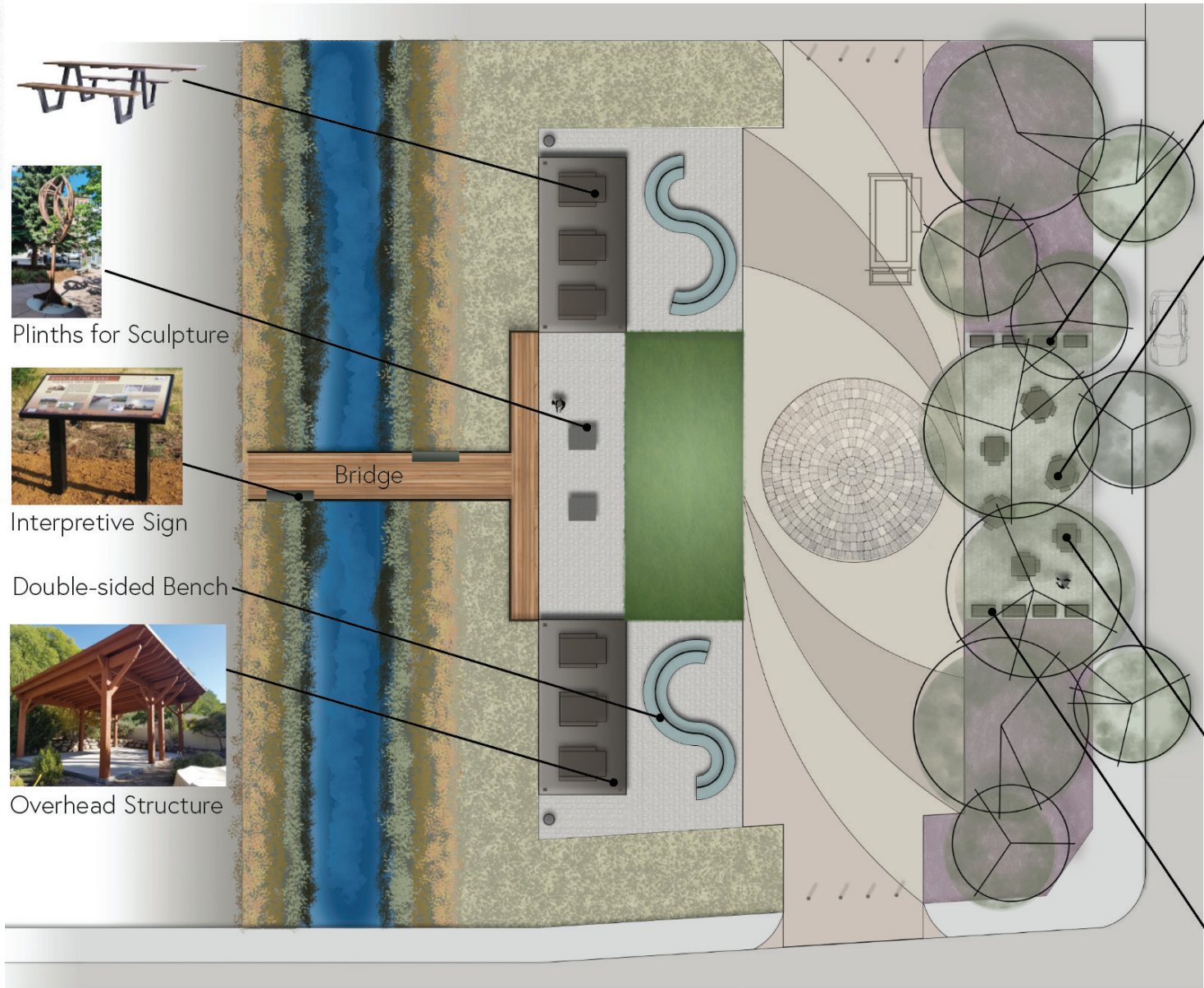
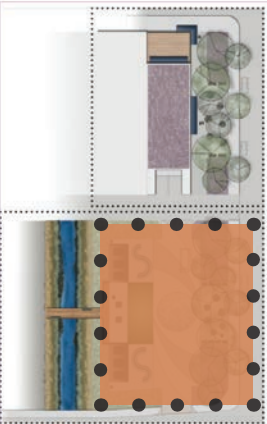
Street Trees



3 Water Highlighted Planting



CREEK SIDE PLAZA



Plinths for Sculpture



Interpretive Sign

Double-sided Bench



Overhead Structure



SITE POROSTIY

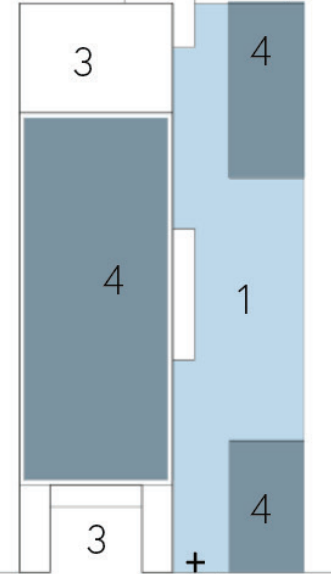
4 Softscape



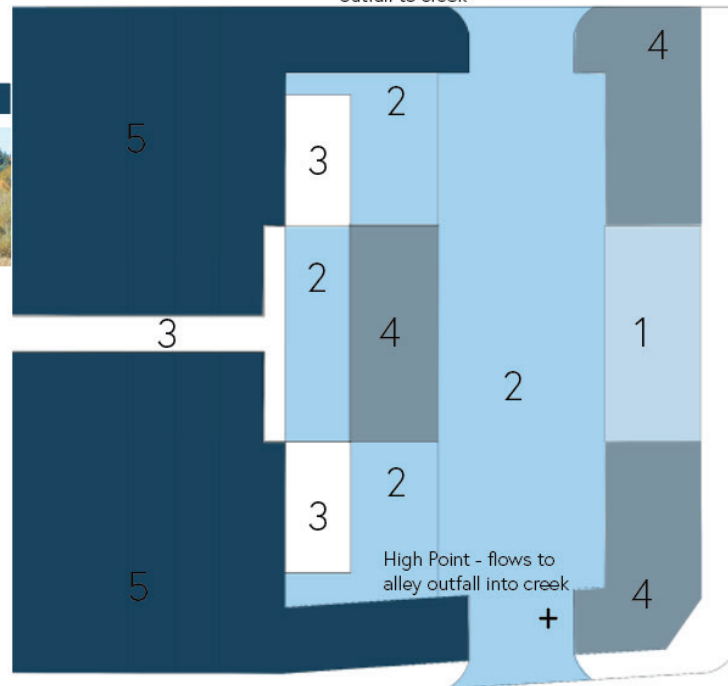
5 Creek + Associated Planting



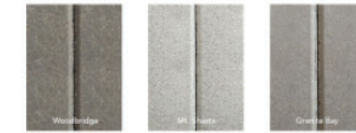
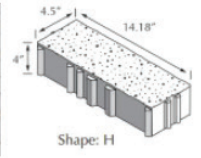
Low Point - drain inlet to city water system



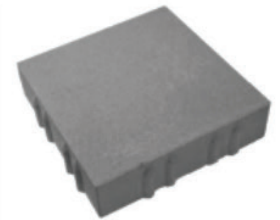
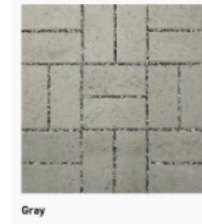
Low Point - outfall to creek



1 Suspended Pavement System + Permeable Paving

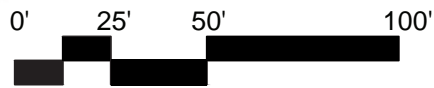
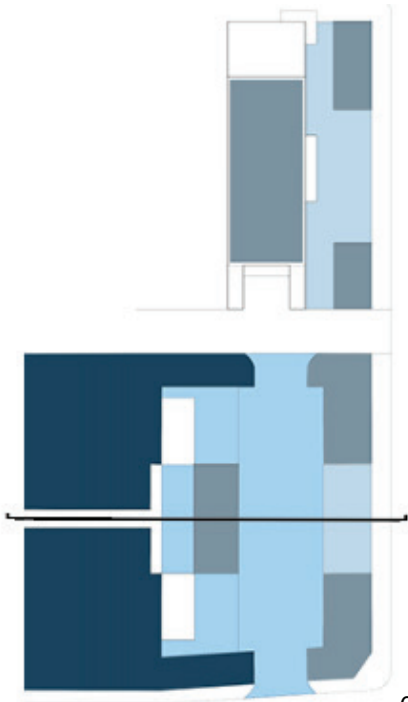


2 Permeable Paving

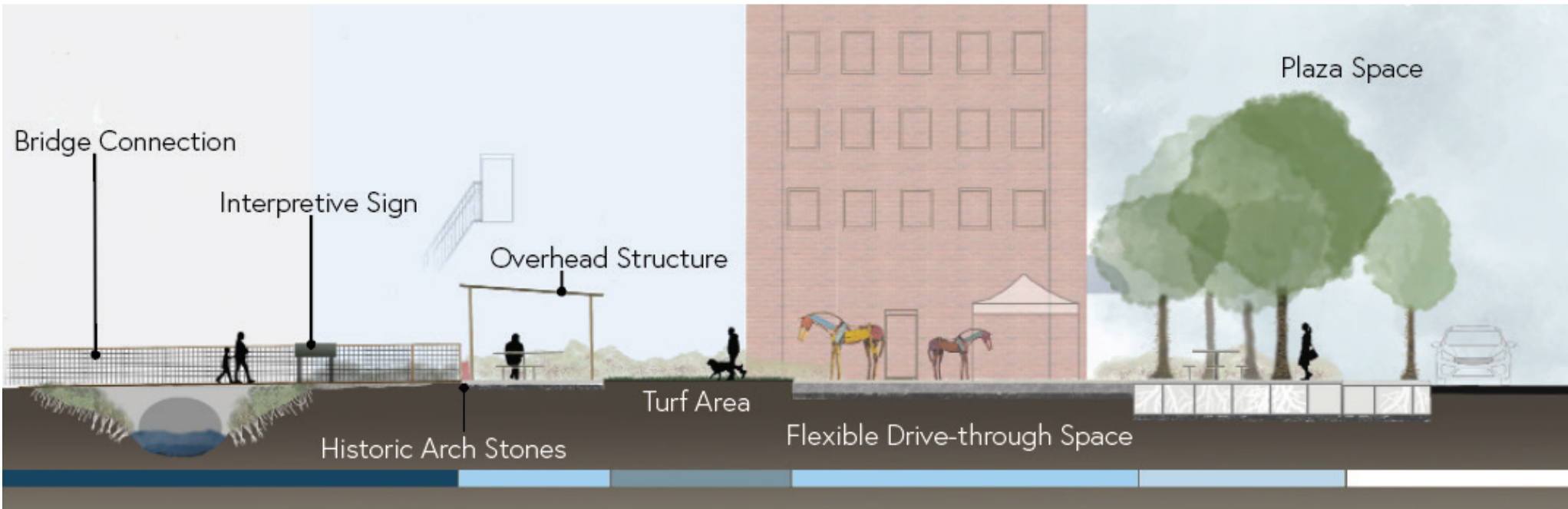


3 Impervious Materials





ACROSS SITE DESIGNATION OF SPACES



5.4 EXTENDED PARK SCENARIO SCHEMATIC DESIGN



The Extended Park scenario's intent is to remove all on-site parking and utilize the space to extend Soroptimist Park. By removing on-site parking, the site is able to provide a more cohesive park and plaza space for Bozeman's active downtown district and increase the extent and variety of amenities and sustainability impacts. The redesign for the space incorporates sustainable features to educate the public on water-wise planting and the importance of urban waterways and riparian ecosystems, re-imagine stormwater management, and align with Bozeman's climate plan.

The site design is unique to Bozeman because it is an urban plaza located in Downtown, that grants public access to Bozeman Creek. For easy navigation the site is broken up into three main zones: the plaza area, the recreation area, and the riparian area. The Plaza area, is located at the corner of Main St. and Rouse Ave. The seating in this area includes movable café tables and tiered seating attached to two large concrete planters. The tiered seating doubles as a space for the community to view movies from The Eagle's wall. The two large planters are filled with water-wise plantings to demonstrate different planting techniques to reduce irrigation use. The water wise planting will use drip irrigation for initial establishment and long term, little to no water use.

The Recreation area is located across the alley, in the Southeast corner. In this space users can find a large splash pad, with arching spray fountains that light up at night. Right below the splash pad are fixed rubber balls for kids to climb on, jump on, and sit. This allows people to go back and forth from the splash pad and play area. The area also consists of another larger planter with tiered seating that faces the splash pad and play area and is easily accessible from the street. Attached to the planter

is a vegetated infiltration basin. The basin is used not only to manage stormwater runoff from Babcock St., but it is also used to educate visitors on different stormwater management techniques.

The Riparian Area is where visitors are able to stop and enjoy Bozeman Creek. On the East side of the creek are terrace seating that are wide enough for people to lounge. The terrace is covered with turf, so they can also function as flood control for high water. At the bottom of the terrace seating is a cantilevering deck that is accessible by an ADA ramp or by stairs. The deck provides a habitat for fish and easy access to the creek for the public. At the top of the terrace seating is an area with interactive signs to read about the healthy urban water ways, Bozeman creek and the surrounding riparian ecosystem.

One of the main overarching goals in this scenario was to reduce and divert stormwater runoff and to filter pollutants from entering the creek. This was met by adding permeable pavers in the plaza area, as well as suspended pavers with a drainage gallery and an infiltration basin in the recreation area. The space is also able to accommodate the 100-year storm requirement for The Sustainable SITES Initiative.

SCENARIO GOALS

Remove on-site parking for community assets.

Extend and restore riparian zone

Reduce stormwater runoff and filter pollutants from entering creek.



DESIGN CONCEPTS

Remove on-site parking for community assets.

Extend and restore riparian zone

Reduce stormwater runoff and filter pollutants from entering creek.



Considerations for analysis of this scenario relate to:

- 1) Paving system costs
- 2) Water sources and use
- 3) Lighting value-engineering

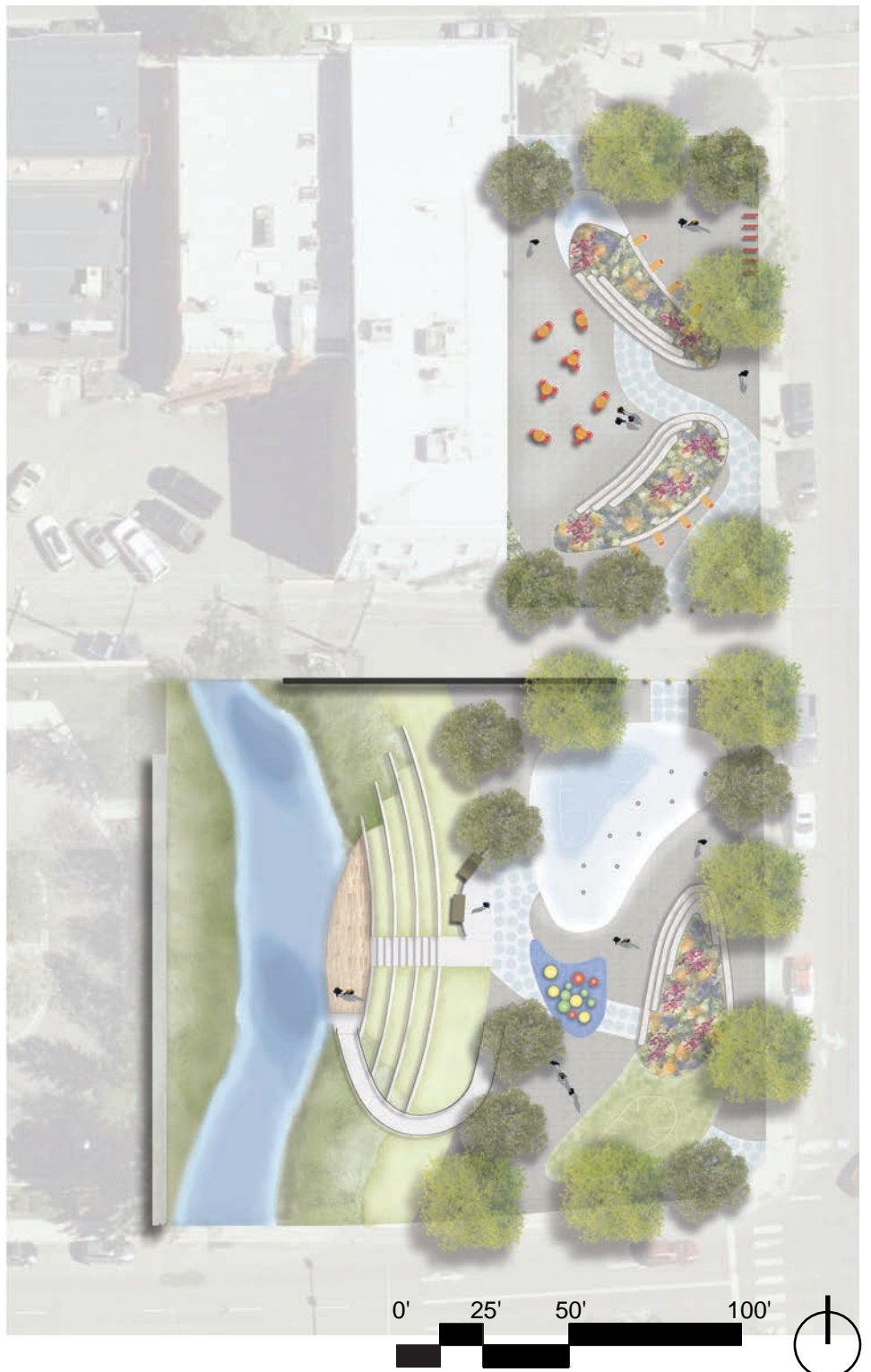
First, the amount of suspended paving needs to reduce and could be replaced with permeable pavers to make it more economical. Second, further exploring water use for the splash pad is necessary to know if the fountains can reuse water and if the city permits the fountains to use potable water. Questions with that would be whether or not the city would be able to provide potable water and what types of water treatment is necessary to reuse water. It would also be useful to research the cost of the blue LED light path to know if it is fiscally possible and if not then blue tile could be used to mimic the path. The design could be furthered by incorporating the alley into the design, instead of having it be an edge or a barrier to the park. The recreation area could be enhanced by adding another level of play for user.








Zone 1 Plaza Area

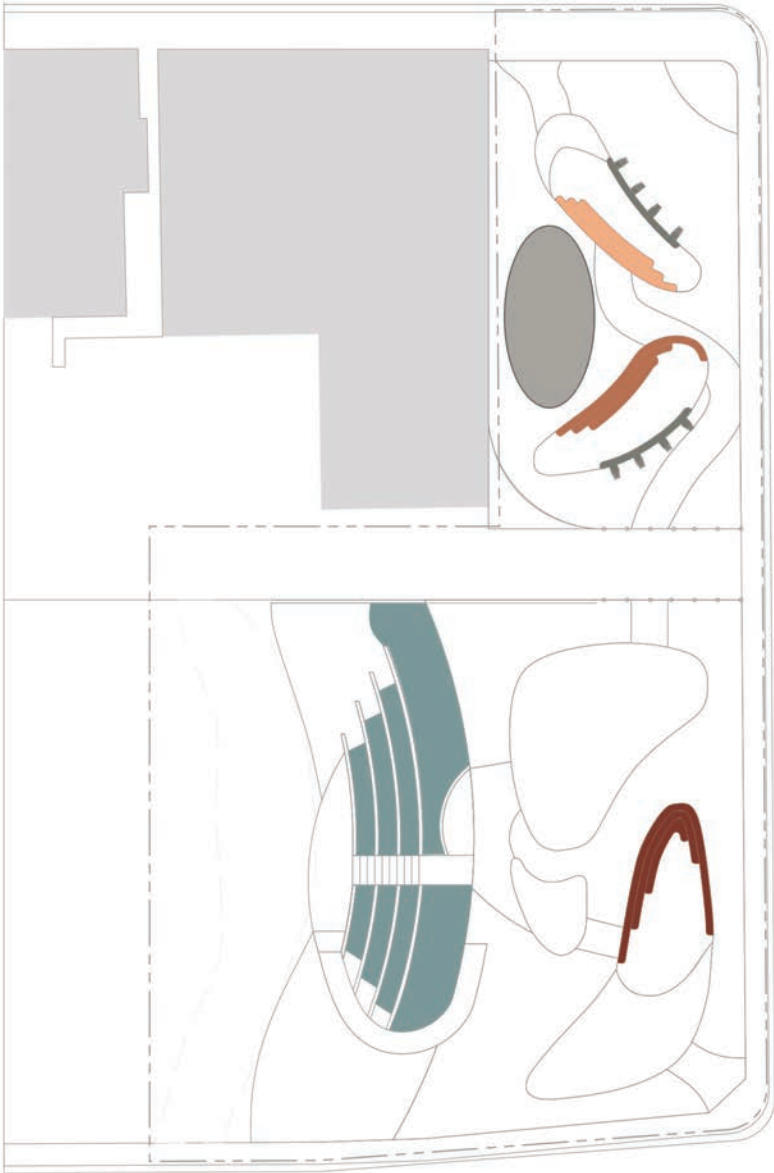
Zone 2 Recreation Area

Zone 3 Riparian Area



SEATING TYPOLOGIES

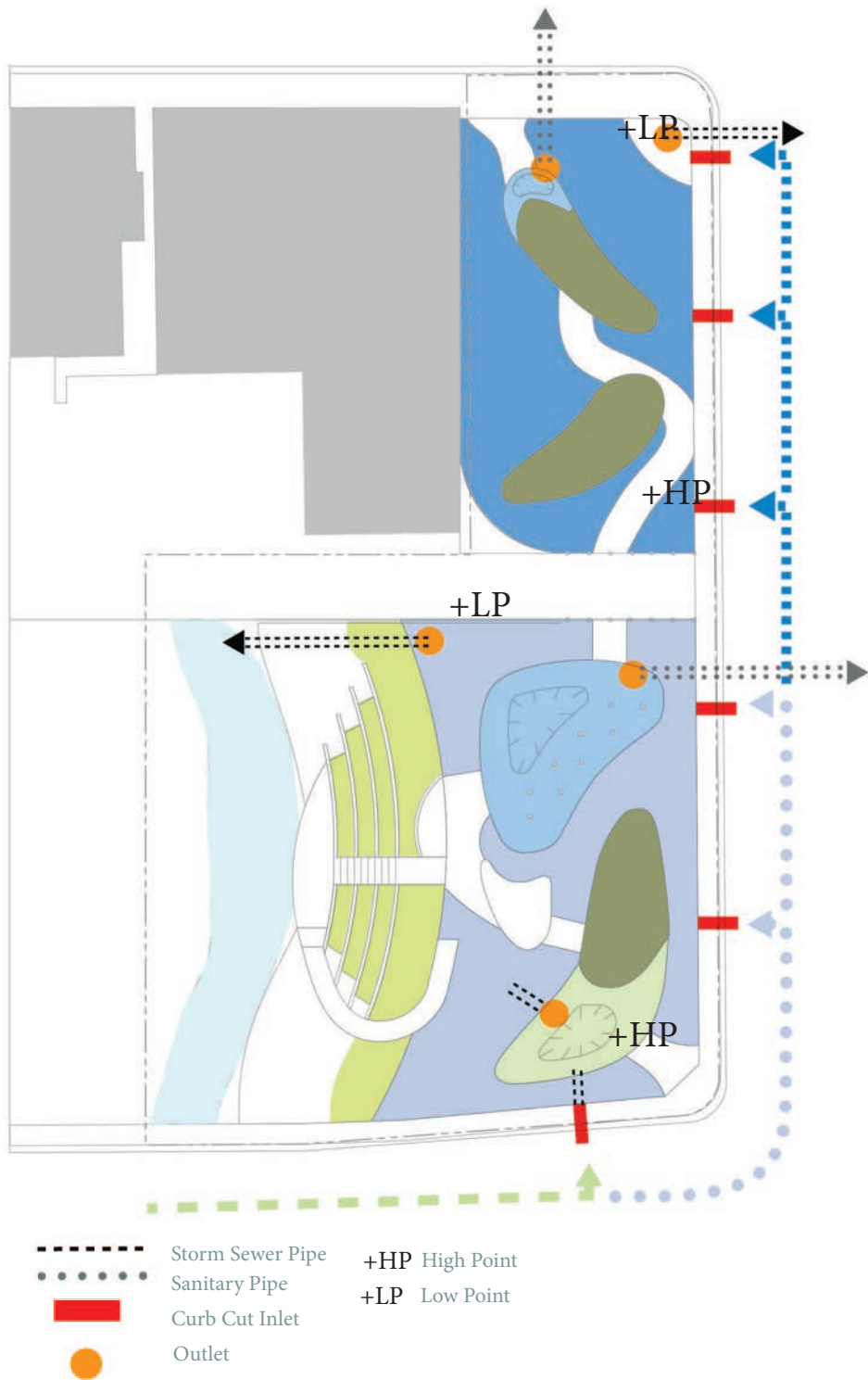
-  Tiered Seating
Number of seats: 70
-  Tiered Seating
Number of seats: 60
-  Tiered Seating
Number of seats: 106
-  Moveable Table and Chairs
Number of Tables: 16
-  Turf Terrace Seating



Moveable Table and Chairs

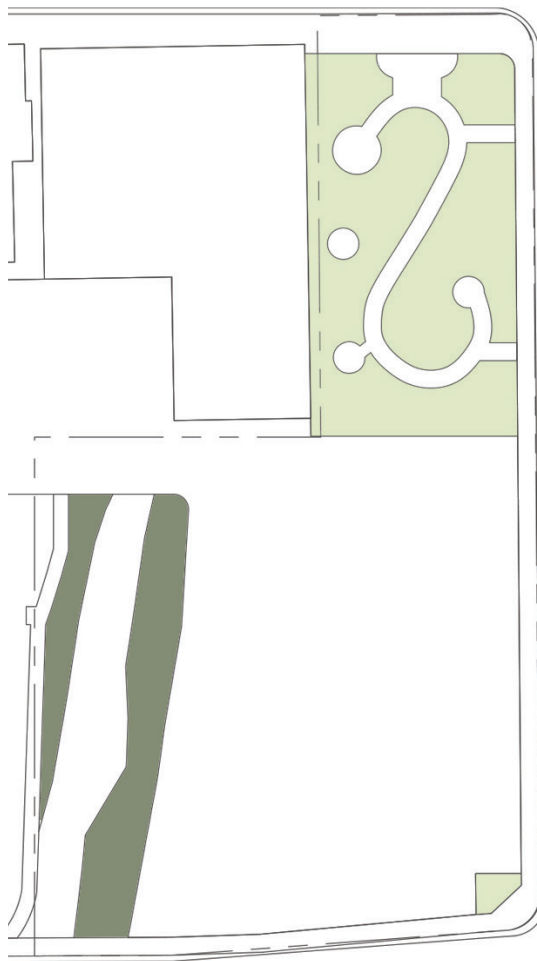


Turf Terrace Seating



WATER USE

- Permeable Paving**
 Holding Capacity: 10442.27 CF
 1" Storm Event: 606.70 CF
- Suspended Paving**
 Holding Capacity: 11598.08 CF
 1" storm Event: 557.84 CF
- Infiltration Basin**
 Holding Capacity: 1543.14 CF
 1" storm event: 161.15 CF
- Water Smart Planting**
 Drip irrigation for initial establishment
 Long term, little to no water
- Turf Steps**
 Irrigation used
- Fountains**
 Potable water - reuse water
 with necessary treatment



Before



After

GROUND PLAN VEGETATION ZONES (canopy not included)

- 
Water Smart Planting
Size: 1721 SF
- 
Turf
Size: 1684 SF
- 
Upland Zone
Size: 332 SF
- 
Transitional Zone
Size: 388 SF
- 
Overbank Zone
Size: 517 SF
- 
Riparian Buffer
Size: 2889 SF

PLAZA SPACE

Water Fountain

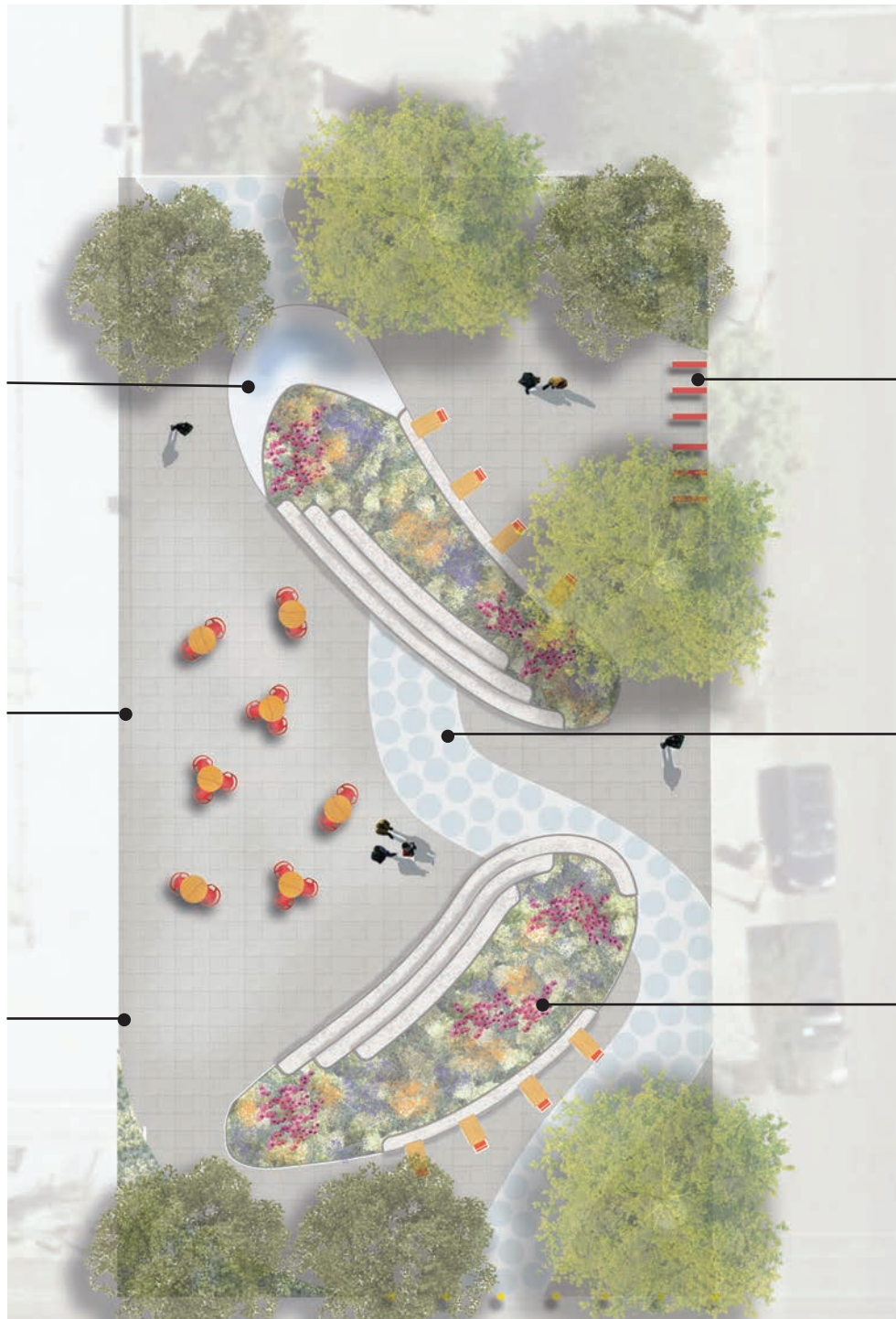
White Movie Wall

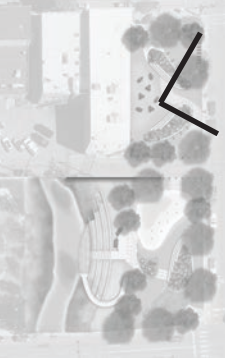
Mural by Local Artist

Bike Racks

LED Blue Light Tile Path

Water Wise Planters with Concrete Terrace Seating





Blue Tile Lights



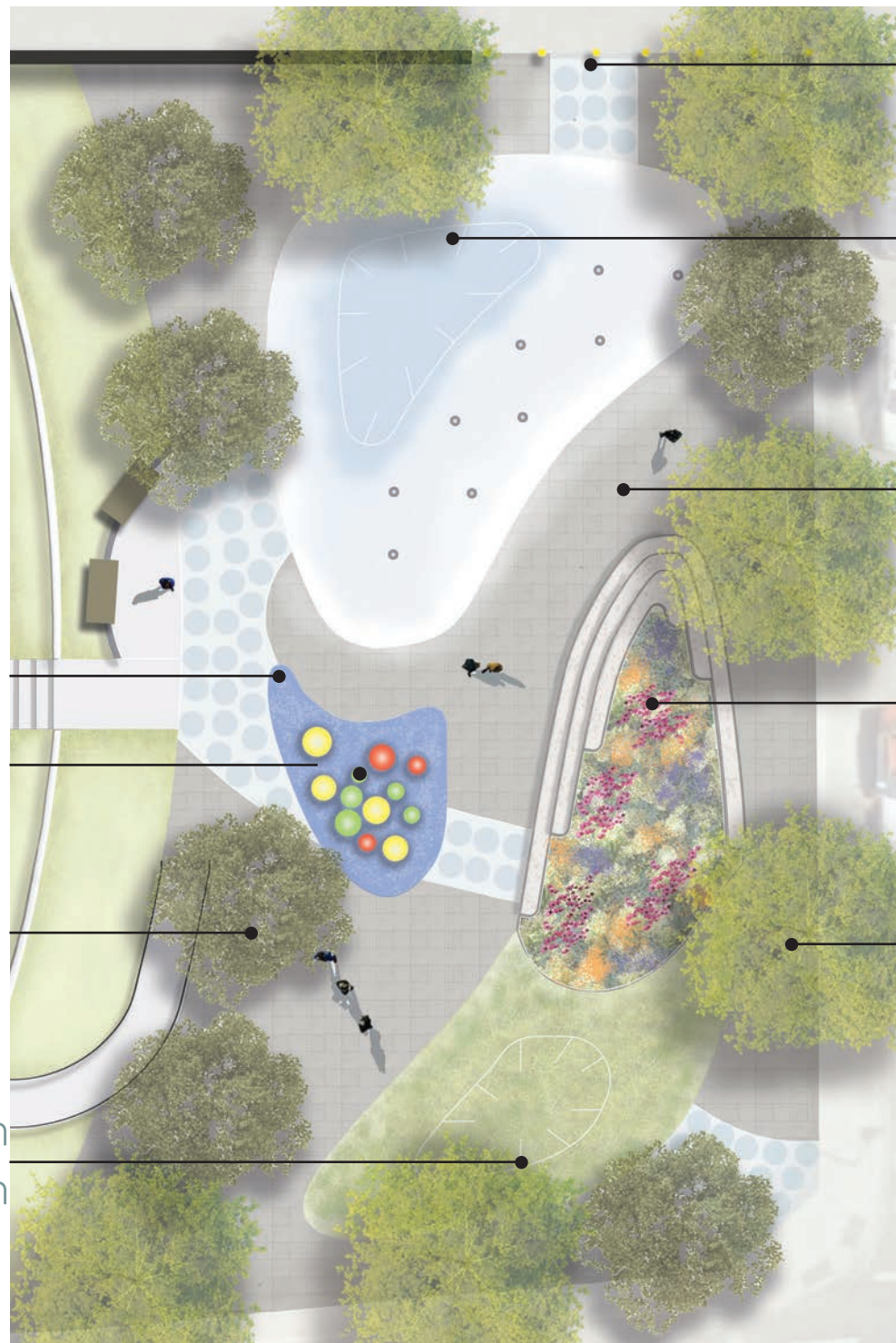
Water Wise Planting



Concrete Planter and seating



RECREATION AREA



Ballards

Splash Pad

Spray Arches
Depth: 6"

Suspended Paving
with Drainage Gallery

Water Wise
Planter

Honey Locust
Gleditsia triacanthos

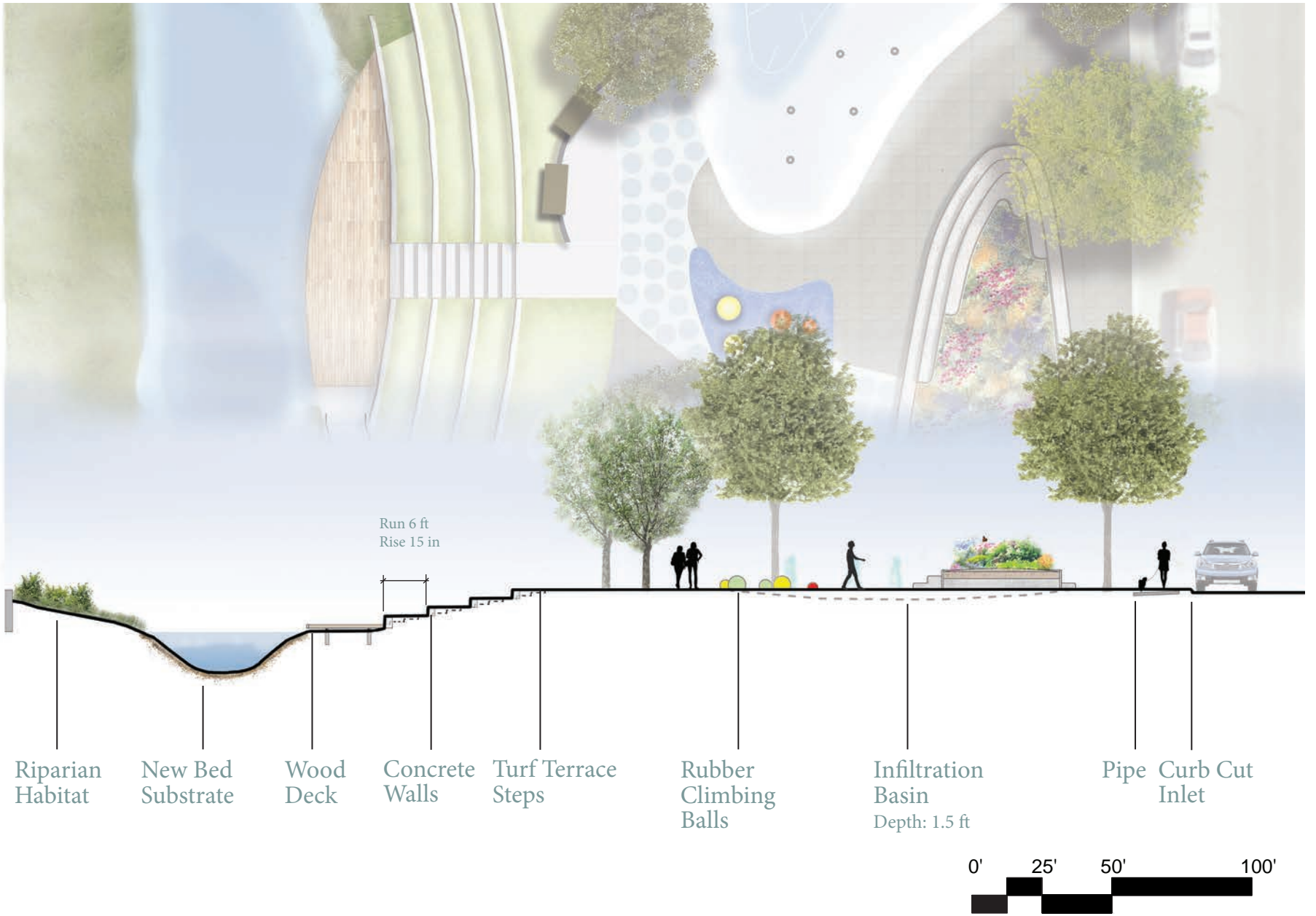
Poured Rubber Play
Pad

Rubber Climbing Balls

Elm Hybrid
Ulmus davidiana var.
japonica

Vegetated Infiltration
Basin





RIPARIAN AREA

Riparian Habitat

Cantilevering Deck

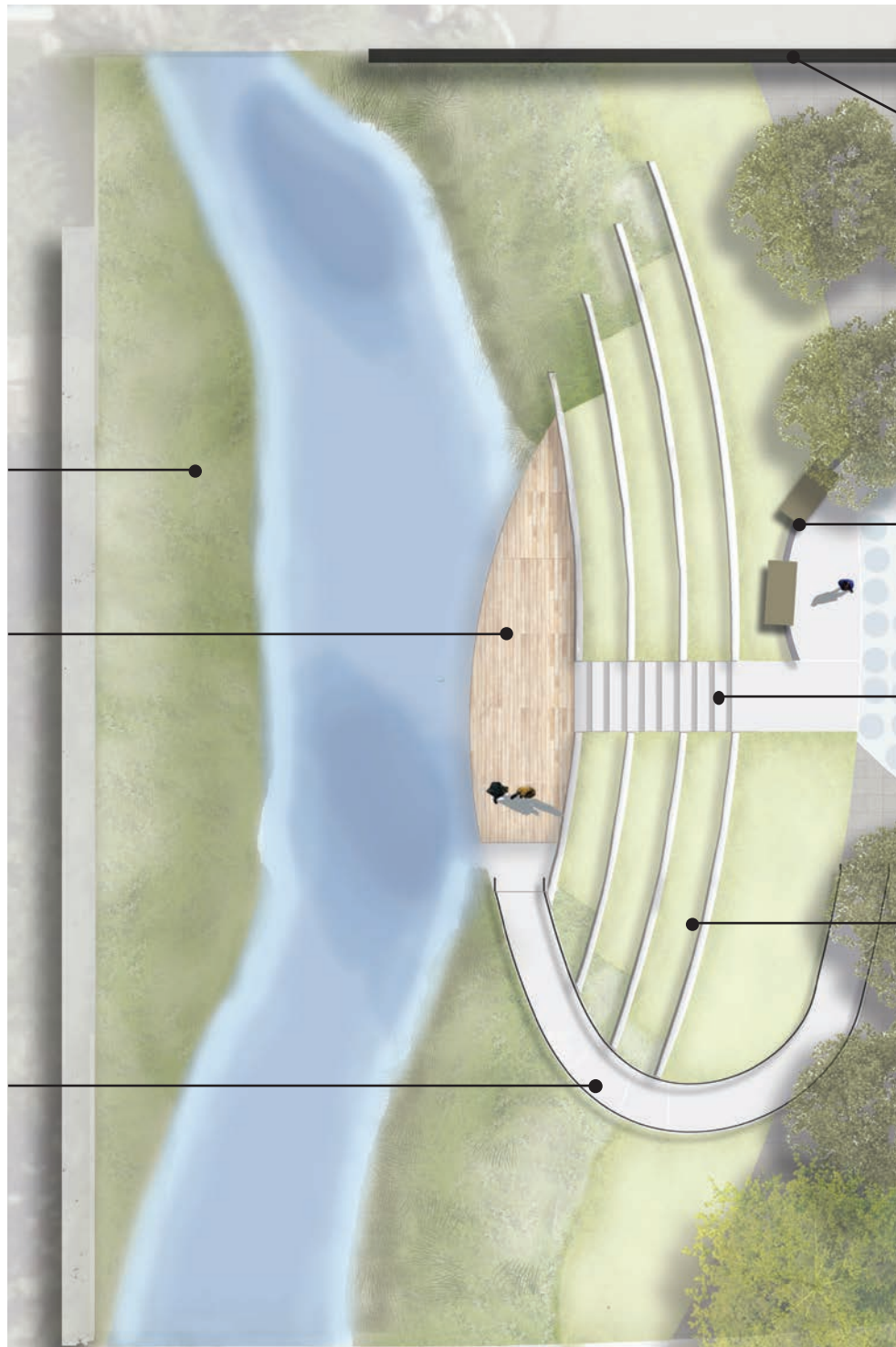
ADA Ramp
Width: 6 ft
Slope: 7%

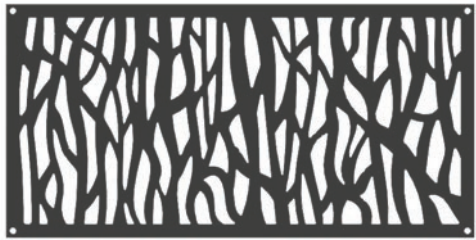
Fence
Height: 5 ft

Interpretive Signs

Access Stairs
Rise: 5 in
Run: 2 ft

Terrace Seating





Fence



Interpretive Signs



Deck



A S P E C I A L T H A N K S

On behalf of the HORT 432 and ENSC 448 senior classes, we would like to give a special thanks to the Downtown Bozeman Partnership and Professional Mentors. The entire project was an incredible learning opportunity and experience. We look forward to applying the skills and knowledge developed from this project into our own future professional careers.

Thank you.

