Growing GreenWays:

A Multimodal Trail System For Moorhead, Minnesota

Daniel Nipstad | LA 572 Design Thesis | Spring 2015 | Primary Advisor: Jason Kost | Secondary Advisor: Matthew Kirkwood

Growing GreenWays:
A Multimodal Trail System For Moorhead, Minnesota

A Design Thesis Submitted to the
Department of Architecture and Landscape Architecture
of North Dakota State University

By

Daniel Nipstad

In Partial Fulfillment of the Requirements
for the Degree of
Bachelor of Landscape Architecture

Primary Thesis Advisor

Secondary Thesis Advisor

May 2015
Fargo, North Dakota

Table of Contents

Thesis Disclaimer

This thesis booklet was prepared by one Daniel A. Nipstad as an undergraduate assignment at North Dakota State University for academic purposes. The content to follow was developed over two semesters time between LA 563 and LA 572. This content is the final solution and is a reflection of the projects growth and development in design. Furthermore this thesis booklet represents the process used to come about the final solution presented in conclusion.

Abstract

The following thesis relates to the Fargo-Moorhead buyouts for the Fargo-Moorhead Diversion. More specifically it will be focuses on Moorhead's side of the Red River and their additional concern of the results of the Diversion and lack of bike facilities along the river. The parcels directly adjacent to the Red River in Moorhead between I-29 and Main Avenue are used as a test site for future expansion to include all adjacent parcels along the Red River to create an established Multimodal Greenway. This Multimodal Greenway will be incorporated into Metro COG's current vision of the future by displaying the strengths of such an asset and will be used to make some of the improvements that have been suggested in the long term transportation plan for the future of the Fargo-Moorhead Metropolitan Region.

Thesis Statement

I propose a design for a Multimodal Greenway in the Red River Corridor of the Fargo-Moorhead Metropolitan area. I intend to demonstrate methods to increase local commuter options and reduce automobile traffic and promote a healthier community. With further studies and exploration I plan to explore the current problems and plans

for the future of the Fargo-Moorhead Metropolitan Region, find similar precedents to grow from such as the Atlanta Beltline, The 606, and the Midtown Greenway, as well as explore current studies of preferences in trail design and new technology for encouragement of use. Following these steps I plan to introduce a functional Multimodal Greenway into the Fargo-Moorhead Metropolitan Region that will flourish and attract old and new users improving the transportation habits of the region and the quality of life in the city year round.

There has not been an official Red River Greenway designated by any local governmental units but there has been some development for future plans such as the Red River Greenway Study by Metro COG in 2007 which focused on relatively adjacent land along both sides of the Red River. This area was from 124th Avenue South to 100th Avenue North on North Dakota's side and 110th Avenue North to 120th Avenue south on Minnesota's side. There currently is a Greenway along the Red River with brother sister parks along the way with bike routes but in the design world there is always room for improvement and opportunities for development in time.

With my observations and current resources I plan to narrow my focus more specifically to Moorhead's side of the Red River between Main Avenue and Interstate 94. This smaller more focused selection can act as a template for further coherent development of the Fargo-Moorhead Greenway. In selection my specific site location I will be looking to increase connectivity to the Red River, account for flood management, and establish a multimodal corridor to encourage smarter more sustainable travel.

Literature Review

Project Typology: Multimodal Greenway

Critical Evaluation of Cited Papers:

The current Greenway in Fargo-Moorhead metropolitan area can use a breath of fresh air with more open naturalized spaces for wildlife habitat as well as parks and a well-connected trail for pedestrian use and more commuter options for sustainable travel. These are reoccurring ideas in a majority of the studies done on the Red River Greenway for the Fargo-Moorhead metropolitan area in the past 20 years. These are the foundation ideas behind the future of the greenway and present the perfect opportunity for the repurposing of the buyouts, from the Fargo-Moorhead Diversion, along the Red River in the community. The natural trees in the existing parks and spaces along the river are a strong part of the Greenway and introducing more naturalized spaces brings more life to the Greenway by inviting animals to stay and inhabit the area rather than fleeing which brings more activity to the park giving people something to look for. The tree growth also helps to stabilize the river banks from erosion. Both Fargo-Moorhead and Cass-Clay County have come up with comprehensive plans to help protect the greenway from flood mitigation effects. Both cities have added more zoning restrictions to limit the availability of land adjacent to the Red River to the public market. The County's also added stipulations to better protect the Greenway from development by adding stricter building setback requirements. In Cass County you now have to build at least 450 feet from the center line of the river and Clay County has a 200 foot setback for streams and rivers. Fargo and Moorhead both want to see a stronger pedestrian and bicycling network between the communities as well as significant destinations for a regional trail system. In one of the studies titled Metro Bike and Pedestrian Plan (2006) by Metro COG, connections across the river were suggested at the following locations:

- Bridge between 19th Avenue North in Fargo and 28th Avenue North in Moorhead
- Connection from 52nd Avenue South Fargo with Clay County State Aid Highway 12
- Bridge at 32nd Avenue in Fargo and River Haven Road in Moorhead
- Bridge at 40th Avenue in Fargo to Trollwood Performing Arts site

In Metro COGs Greenway Study (2012), the primary intent was to identify a strategy for the additions to the existing Greenway system based on the review of the preexisting conditions, data and stakeholder involvement. Based on Metro Cogs results from consultations with the public, land owners and stakeholders the requirements for the Greenway system are as follows:

- The Red River Greenway system will be that of a transportation corridor for bicyclists and pedestrians. The Red River Greenway will serve as a continuous bicycle and pedestrian corridor linking several significant community facilities along and adjacent to the Red River. As a continuous north south corridor, the Red River Greenway will also serve as a commuter corridor for residents who choose bicycling or walking as a mode of transportation.
- The Red River Greenway as a year round facility will aim to provide year round recreational opportunities by allowing for cross-country skiing and snow shoeing.
- The Red River Greenway serves as an educational and interpretive resource by showcasing the importance of the Red River to the larger region. To that end, the Red River Greenway will aim to interpret significant cultural and historical aspects which exist along the Red River.
- The Red River Greenway will serve as a tool for local government entities to implement flood protection plans and riparian set back standards as well as develop opportunities for public and private groups and agencies to educate the public in matters of riparian restoration, care of the river and other environmental topics.

The Red River Greenway is a perfect opportunity to introduce Bike Share to the Fargo-Moorhead metropolitan area. Using the greenway as a sort of bicyclist highway can introduce Bike Share ports at the significant community facilities used as destinations along the trails and greenway as well as introducing the Bike Shares at the bus terminal, airport, and at main bus stops for turnovers supplying more opportunities to use different style forms of transit. This will in turn cut down on traffic as more people begin to choose bicycle routes and public transit over door dings and parking tickets. Bikes Shares are currently being worked into North Dakota State University college campuses and major civic centers in the downtown area; however the rest of the Fargo-Moorhead metropolitan is currently deprived of this future amenity. Spreading these same facilities along the greenway and other high traffic areas in the metropolitan will promote more sustainable travel and better health. These same ideas can help accomplish goals put forth in Metro COG's 'The Long-Range Metropolitan Transportation Plan (MTP) (2014)'. In this plan they look at current commuter habits and road uses and how and why they should improve. For example lowering the number of vehicles traveling on the road would lower city infrastructure costs in roads and parking, increase emergency vehicle response, cut down on local VMT's (vehicle miles traveled), and lower CO2 levels in the Metropolitan area. Providing a multimodal greenway would allow and encourage people to choose the more sustainable form of travel that can improve their personal health as well as their communities both financially and physically.

In an article titled 'Motivators and Deterrents of Bicycling: Comparing Influences on Decisions to Ride' I found a number of strong qualities to look for in developing a successful greenway with an increasing number of users. Winters, Davidson, Kao, and Teschke (2010) presented the top 10 Motivators as follows:

Top Ten Motivators

The route is away from traffic noise and air pollution.
The route has beautiful scenery.
The route has bicycle paths separated from traffic for the entire distance.
The route is flat.
Cycling to the destination takes less time than other modes.
The distance to your destination takes less time than other modes.
The distance to your destination is three miles or less.
The trip can be made in daylight hours.
You can take your bike on public transit at any time.
Off-street path has a reflective center line for night and poor weather.
Service indoor bike storage.

The list presented helps to highlight the potential motivators that will encourage an increase of users along the multimodal greenway. The fact that the greenway follows the Red River makes the experience very beautiful with very few possibilities of interruption of automobile traffic. The further incorporation of naturalistic wetlands for flood protection would also enhance the beauty of the experience, isolate and protect the users from the danger of outside traffic and reduce the noise and air pollution within the site. With further analysis and rethinking of current bus routes we can find and create locations to connect to the public transit as well. That alone covers most of the list and with collaboration with local business indoor bicycle storage could be provided.

After visiting Winnipeg during their winter festivals I realized how much more connected their community was the Red River and its past. Using Winnipeg as a model and remembering our history with the Red River is a good first step in spiking interest in winter activities at the Red River. Having a strong sense of culture is a key part to festivals as well as having plenty of interaction with events and activities. Snow sculpting is a great way to get people to visit and can be competitive like a community contest. This can be held at a significant community center along the Red River or perhaps there is a buyout with proper setback and that's out of the flood plan for the new construction of such a facility. The same location can be a center to educate the community on this terrific public amenity. With proper signage at a pedestrian/bicyclist level rather than an automobile level we can raise people's awareness of where they can go and how long it might take on foot compared to bicycle. The same map could tell you how far you are from a Bike Share. Introduction of an incentive program to encourage bicycle commuting can also be a strong aid in molding a strong bicyclist community. With proper setbacks and the FM diversion to the current levees in the FM area the water levels will in theory be better managed potentially allowing more activities in the new open spaces.

Research Questions

- How do you design a greenway for periodic flooding?
- How do you encourage people to choose public transit, walking or bicycling over driving?
- Where connections between the greenway and public transit should be made?
- What parcels adjacent to the Red River have the required setback distances for development of community centers or shelters?
- How would the greenway improve public transit?
- How do we make the greenway a safe multimodal corridor?
- How do we increase awareness of events and activities along the Red River?
- How do we change people's transportation habits?

Research Hypothesis

By introducing a multimodal greenway with progressive flood control and an incentive program we can change transportation patterns. Improving the health of the community by lowering the number of vehicles on the road, lower traffic levels for safer streets and emergency response time as well as the city's budget for infrastructure such as street repair and additional parking. It can also dramatically effect individual health by increasing ones physical activity and relations in the community and lower the average vehicle miles traveled in the metropolitan area. Lowering the number of vehicle miles traveled in the metropolitan region means lowering the traffic levels which will cut down on carbon emissions improving air quality and noise pollution. Once established I expect great success in number of users and improvements to the community as well as future expansion to include all the parcels adjacent to the Red River.

Project name: Atlanta Beltline

Location: Atlanta, Georgia

Date designed/planned: First trail opened in 2008

Construction completed: Still under construction (25 year project)

Cost: $3 billion

Size: 640 Acres

Landscape architect(s): Kevin Burke

Client: Atlanta, Georgia

Consultants: James Corner Field Operations
Perkins + Will
City's department of watershed management and parks department
Trees Atlanta

Managed by: Atlanta BeltLine Inc.

Context: The Atlanta Beltline will be a twenty-two mile transit greenway along an old railroad corridor connecting 45 neighborhoods with light-rail transit, parks and multi-use trails.

Site analysis: The neighborhoods vary and can be vastly different but they have all come together for a chance to use the Atlanta BeltLine, which will essentially stitch the 45 neighborhoods together allowing people to travel and interact.
Project background and history: It all started in 1999 with Ryan Gravel's joint master's thesis in Architecture and City Planning at Georgia Tech. He proposed connecting multiple neighborhoods in the city with a new transit system along the Atlanta "Belt Line" rail corridors. Gravel's thesis gained immediate interest and local support inspiring what has become the Atlanta Beltline.

Genesis of project: From Ryan Gravel's ambitious visions for the BeltLine a twenty-two mile transit greenway rises from the remains of old railroad corridors with a new found life from the incorporation of light-rail transit, parks and multi-use trails that will produce economic growth and improve the quality-of-life in 45 historic neighborhoods.

Design, development, and decision making processes: Gravel immediately gained support from Cathy Woolard, former City Council President and current Board member of the Atlanta BeltLine, Inc... Under their leadership the project began to gain grass roots support in 2002. Continuing their efforts in 2004 Alexander Garvin produced The Trust for Public Land's Emerald Necklace Study, outlining an achievable, connected, park, trail, and transit system along the current Beltline of Atlanta. Shirley Franklin, the current mayor also commissioned a feasibility study to determine that 60 percent of the cost of the Atlanta BeltLine could be funded by

a Tax Allocation District without requiring a tax increase. Another Study produced by the Metropolitan Atlanta Rapid Transit Authority recommended that the Atlanta BeltLine be included in the City's future Alternatives Analysis Study. In 2005 the Atlanta BeltLine Partnership was formed and the Atlanta City Council, Fulton County Board of Commissioners, and the Atlanta Public School Board of Education approved both the Atlanta BeltLine Redevelopment Plan and The BeltLine Tax Allocation District. Continuing into 2006 The Atlanta BeltLine Partnership worked closely with Invest Atlanta and the Boston Consulting Group in the development of The Five Year Work Plan. The plan was formed from the input of more than 10,000 community members, and outlined the priorities, goals and organizational structure, as well as developing a $427 million budget for the first five years of the project. In 2007 they gained $300 thousand in funding from the Federal Transit Administration to further support initial design and engineering costs and were able to successfully complete and open the first section of the trail in 2008.

Role of landscape architect(s): Landscape architecture is the clever design that threads the Atlanta BeltLine together to be the success story that it is becoming today. The Historic 4th Ward Park, a sustainable sites Initiative pilot project is a perfect example of this. With clever design the BeltLine team created a new storm water basin that doubles as a beautiful park. For only $50 million they built a new piece of infrastructure for the city with a seventeen acre park that has changed the economic development of the area spurring $400 million in development around the site.

Program elements: They have the design of trails and parks along the way with almost a limitless typology list but what are more impressive are there programs for engaging and strengthening the communities. The BeltLine promotes health,

fitness and art with affordable housing involvement along with employment with the adjacent businesses developing along the BeltLine. The BeltLine has been such a success that the land adjacent to the greenway has become some of the most desirable land in the city.

Maintenance and management: The BeltLine has done an excellent job involving diverse local communities along the way and they continue to play a role in the upkeep of BeltLine. Groups formed from the 45 neighborhoods along the line are able to Adopt the Beltline to organize clean-up crews.

Photograph(s):

- Figure 1: Storm Water
- Figure 2: Trails
- Figure 3: Site plan

Figure 1: Storm Water

Figure 2: Trails

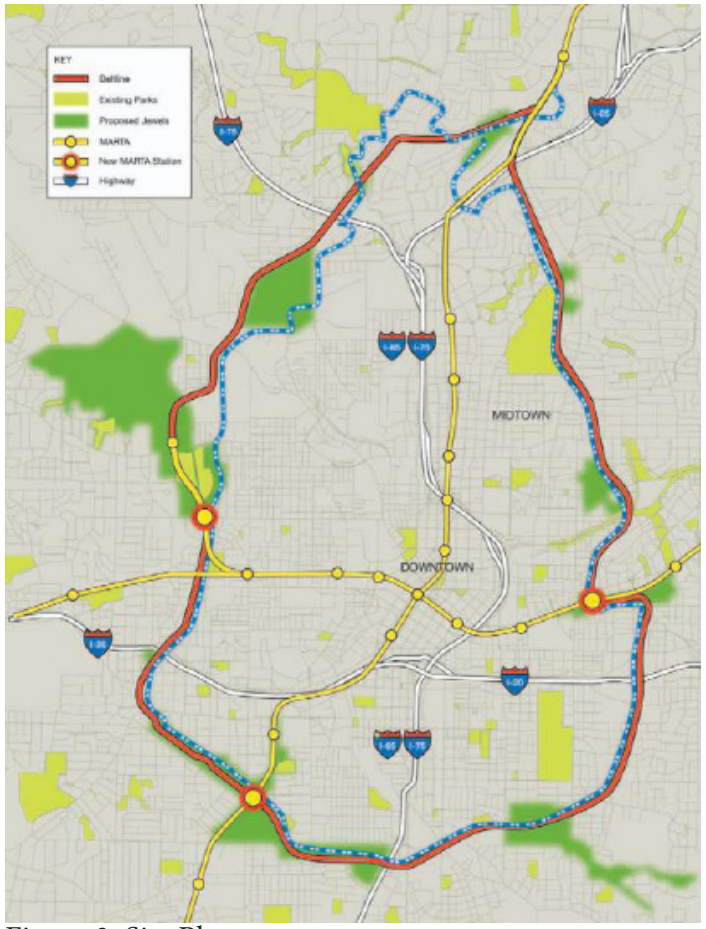


Figure 3: Site Plan

User/use analysis: The whole community seems to be the current user which also drastically diversifies the uses. You can visit the site and find children and teens on their way to school or out enjoying the weather, business men nearby that may be on their lunch break, mothers taking the Beltline to get groceries, bicyclists and dog walkers.

Peer reviews: N/A
Criticism: There are people that believe the Tax Allocation District involved in supporting the development of the Atlanta Beltline should be reserved for Public School use.

Significance and uniqueness of the project: The Atlanta Beltline has grown from an ambitious thesis project to a current three billion dollar project with overwhelming community support from all 45 neighborhoods. It is quickly affecting the economic growth of the area around it stirring up bidding wars for any adjacent land.
Limitations: The project seems almost limitless in its possibilities but I would say the biggest limit would have to be the local people. Though it has overwhelming support it can be very difficult to change people's everyday habits. Only the future will tell if the project alone is enough to encourage people to choose public transit, biking, or walking over their cars.

General features and lessons: With good design and proper support you can transform an undesirable asset into a desirable one.

Future issues/plans: The Atlanta Beltline is a 25 year project so currently the future is simply completion. There is overwhelming support for the project and a belief that the project will be completed as envisioned. Future development possibilities seem limitless.

Bibliography of project citations/related references:

Beltline map / Atlanta Beltline, Figure 1 / Steve Carrell, Figure 1- 1 / Atlanta Beltline

Web sites/links:

http://dirt.asla.org/2013/06/04/with-the-beltline-atlanta-wants-to-become-a-new-city/
http://beltline.org/wp-content/uploads/2012/01/The-BeltLine-Emerald-Necklace-Study_Alex-Garvin-Associates-Inc..pdf
http://beltline.org/

Contacts for further information: N/A

Approach to Research

Using current river lot buyouts in the Fargo-Moorhead Metropolitan area and assuming that all river lots are subject to future buyouts, I propose to repurpose the land for the introduction of a multimodal greenway in Moorhead's river lots from I-94 to Main Avenue. With this river front land I plan to introduce a multimodal greenway to encourage modes of transportation other than the personal automobile, as well as providing a city amenity to absorb high waters during floods. To do this there are many questions that need to be answered first such as:

- How can the addition of a multimodal greenway benefit the city's current plans for the future?
- What kind of users would use the multimodal greenway?
- What qualities are preferred in bicycle and pedestrian trails?
- How can you encourage new users to change old habits?
- What kind of setbacks and regulations are involved in building the multimodal greenway?
- How can we develop a naturalistic greenway that can also act as storm water infrastructure or overflow protection from the river?

These questions will be explored further in the Data Measures section were I will explain how I plan to answer them using literature from past and present studies from Metro COG, collection and analysis of GIS maps, and further research of what is popular and trail design.

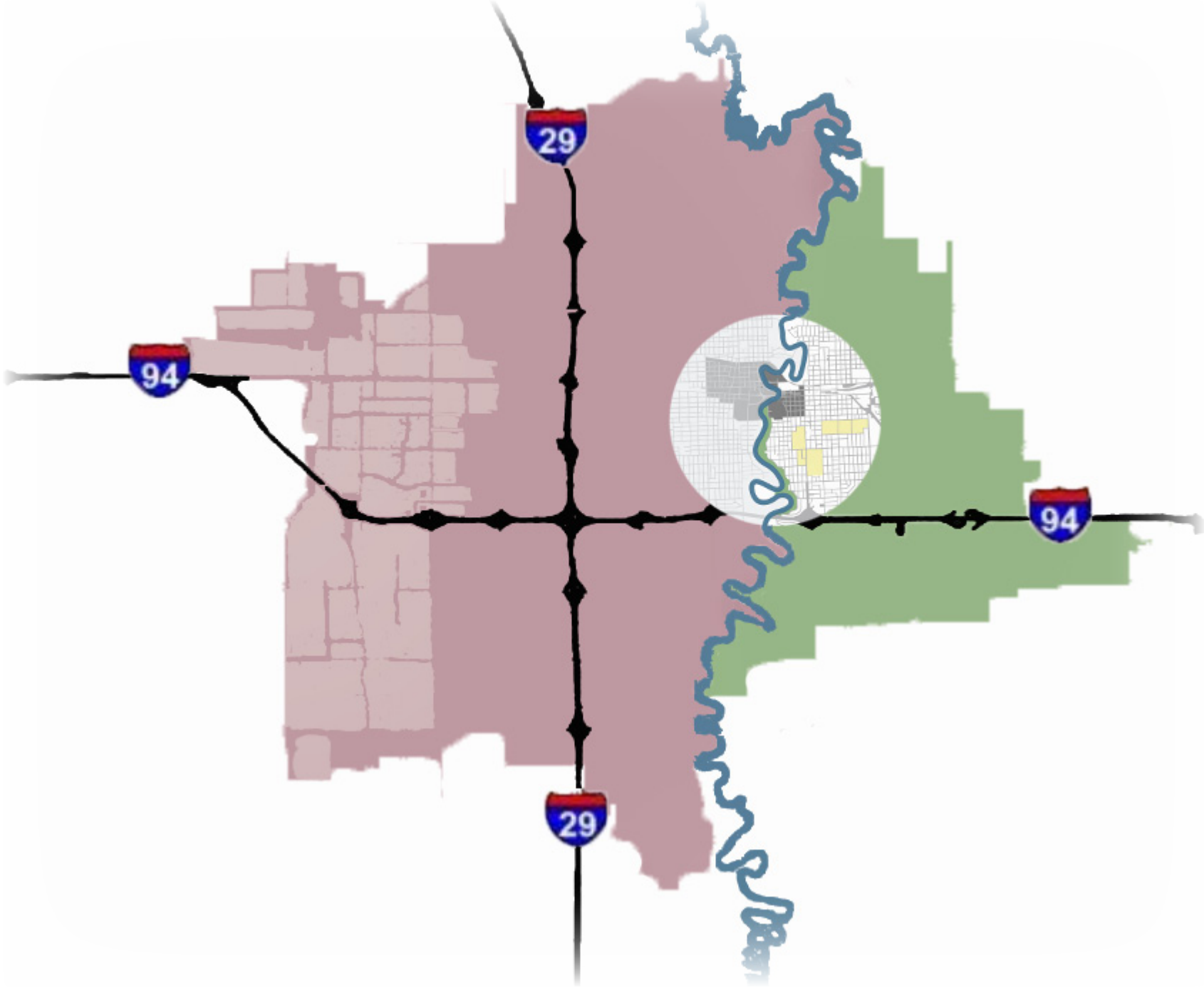


Figure 4: Location Map

The site is located on river front parcels adjacent to the Red River in Moorhead, Minnesota, from I-94 to Main Avenue. Excluding Gooseberry Park, the rest of the parcels within the multimodal greenway make up 103 acres. Flooding has been a large issue in the past in the Fargo-Moorhead Metropolitan area. With the introduction of the greenway, I plan to use the land to produce a flood protection infrastructure by incorporating naturalistic wetlands. In addition the multimodal greenway provides a strong opportunity for local commuters to change current commuter habits to healthier more sustainable forms that can easily coexist with and benefit the current transportation systems of the metropolitan area. The multimodal greenway will become an escape from the busy city to a safe naturalistic trails to sustainably travel located in the parcels highlighted in pink in Figure 5.

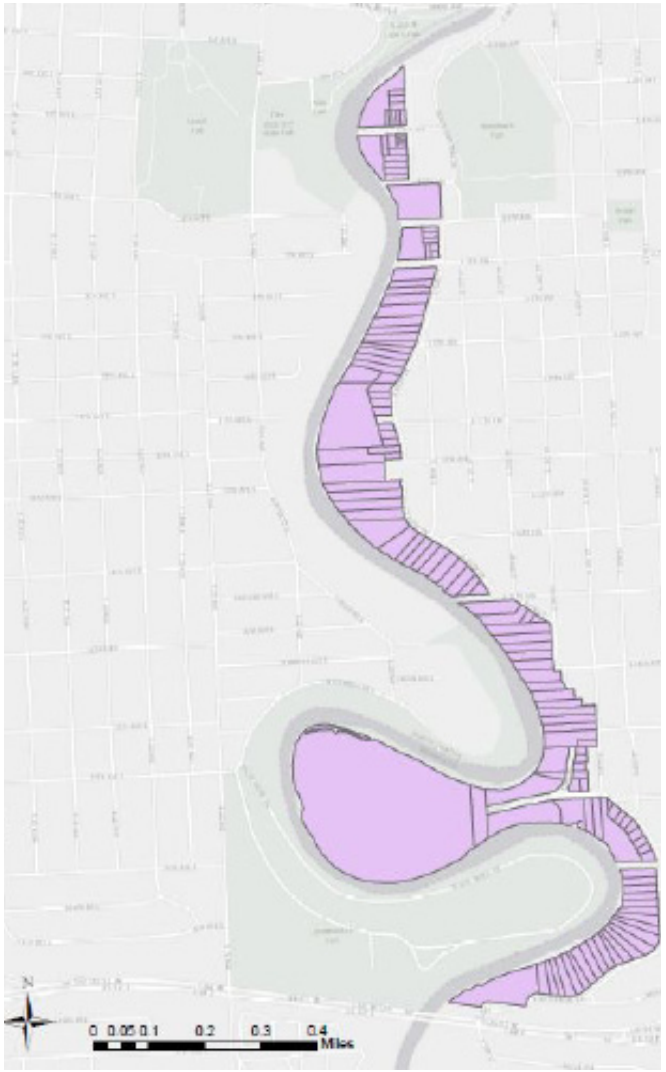


Figure 5: Site Boundaries

The client for this particular multimodal greenway would be the City of Moorhead with close relations to the Parks Department, Mat Bus, and possibly local colleges. The users would be the local commuters, cyclists, outdoor enthusiasts, Mat Bus riders and local families. However with the current bicycling population low due to the automobile hierarchy of the city we will need to introduce an incentive program of sorts to encourage change. For this I recommend the Zap program in Minneapolis. The city of Minneapolis works with a nonprofit organization, local businesses, and Dero, who manufacture the solar powered scanners, on the Zap program. The program has been a great success in Minneapolis and is an ideal solution for the Fargo-Moorhead greenway to encourage new users. Not only would it present incentives to local users, it would also introduce an incentive to local businesses and become an amenity to the city.

Data Measures

How can the addition of a Multimodal Greenway benefit the city's current plans for the future?
From Metro COG's 2014 Long Range Transportation Plan I have found qualitative benefits towards the Fargo-Moorhead's metropolitan region and its active goals for 2040 as set forth by Metro COG. These qualities will improve local commuter options, community connectivity and strength and improve the physical environment of the metropolitan region.

What kind of users would use the multimodal greenway?
Looking at local demographics of ages for qualitative data, we can get an idea of current users and the users of the future.

What kinds of qualities are preferred in bicycle and pedestrian trails?
With literature from an article titled 'Motivators and Deterrents of bicycling: Comparing Influences on Decisions to Ride' I have found qualities to work for and qualities to avoid, in order to make the multimodal greenway comfortable and enjoyable to users.

How can you encourage new users to change old habits?
With introduction of the Zap program we can encourage better commuter habits for local users and benefit the city and local business owners. For this I have been in contact with Damian Goebel of Smart-trips who has played a large role in the Zap program of Minneapolis.

What kind of setbacks and regulations are involved in building the multimodal greenway?
With literature I have found set back and building regulations to consider in the development of different portions of the multimodal greenway.

How can we develop a naturalistic greenway that can also act as a storm water infrastructure or overflow protection from the river?
With literature I have found the Fourth and Ward Park along the Atlanta Beltline, a storm water basin park, to research and learn from to further development of the multimodal greenway that can retain flood waters when necessary.

Research Findings

How can the addition of a multimodal greenway benefit the Fargo-Moorhead Metropolitan area? Reading into Metro COG's 2014 Long Range Transportation Plan I found many reasons why the metropolitan area would benefit from the introduction of a greenway such as the following:

- Vehicle miles traveled per year would lower
- Lower carbon emissions and improved air quality
- Lower traffic levels and road noise
- Faster emergency vehicular response time
- Lower infrastructure maintenance costs in roads and parking facilities

What kind of users would use and benefit from the multimodal greenway? Looking at local demographics we can see what type of users might occupy such a space today and in the future. This might seem like a small factor since anyone can use a greenway, however we have to take into consideration that one of the largest generations are now coming up for retirement. Baby boomers make up a large portion of the Fargo-Moorhead Metropolitan area and as people get older they begin to drive less and rely more on public transit. Therefore we should expect an increased number of users in the future with that alone, and current trends show that younger generations are trending towards public transit as well.

What kinds of qualities are preferred in bicycle and pedestrian trails? It's good to know what people look for as a pedestrian/bicyclist in trails. Using literature I've found that the best way to encourage use is to develop a safe scenic route with little to no traffic noise and air pollution, a relatively flat trail and well lit at night. Following the river has limited involvement with traffic and can be a very scenic escape from the city.

How can we encourage new users to change old habits? Changing any habit can be quite a task, but much like animals people change much faster with incentives. In my research I have found the Zap program in Minneapolis, Minnesota, that I propose be implemented in the Fargo-Moorhead Metropolitan area. The program has been met with outstanding success in users and shows great potential in aiding in the future of trail development when it comes to mapping were one might be successful. It is run as a non-profit organization with Dero bike racks, who build the solar powered scanners and tags, city government, and local business. Users would simply sign up for free and attach a provided tag to the front wheel of their bicycle which would be recorded any time they ride by one of the solar scanners, located throughout the city. The scanners keep track of how often you ride and depending on your personal involvement you are placed in drawings to win prizes. Some businesses also offer discounts to users and some employers even offer lower health insurance rates according to your involvement.

What kind of setbacks and regulations are involved in building the multimodal greenway? In my research I have found that in order to build in Fargo, North Dakota, you must have at least a 450 foot setback from the center line of the Red River. Moorhead, Minnesota is more lenient only requiring a 250 foot setback for construction. Since this portion of the greenway resides in Moorhead, Minnesota, I will only have a setback of 250 feet but in the case of further expansion of the multimodal greenway the setbacks will have to be regulated according to city and state regulations.

How can we develop a naturalistic greenway that can also act as a storm water infrastructure or flood control? In my research of the Atlanta Beltline I found their design of the Fourth and Ward Park very intriguing. With one design they built a

concrete storm water basin that was also a functional park with some greenscape. Knowing Moorhead's concerns for the functionality of the Fargo-Moorhead Diversion I plan to create a similar, more naturalistic park as that of the Fourth and Ward Park. In this manner I plan to create natural wetlands to retain flood waters when necessary.

Applicable Site Values

Applying these values to the multimodal greenway will ensure its success in the future. Introducing the multimodal greenway to the Fargo-Moorhead Metropolitan area will strongly benefit the metropolitan's plans for the future as set forth by Metro COG as well as its users. It will reassure Moorhead's concerns of the future results of the Fargo-Moorhead Diversion with the introduction of wetlands for retaining flood waters. This will create an even more naturalistic escape from traffic for pedestrian and bicyclist users. We also know to expect an increase of potential users but look to change people's habits as well towards more sustainable commuting for personal and community health increasing the number of users and decreasing traffic levels.

Week of (January 11th): Collect any additional inventory left and begin analysis
Week of (January 18th): Develop basic site maps and run further analysis
Week of (January 25th): Analysis review and final modifications
Week of (February 1st): Begin programing elements for greenway
Week of (February 8th): Begin schematics and detailed programing elements
Week of (February 15th): schematic plan review and final modifications
Week of (February 22nd): Begin developing a master plan
Week of (March 1st): Final programing changes and modifications
Week of (March 8th): Begin brainstorming perspectives and details
Week of (March 15th): Complete Research and programing enhancements
Week of (March 22nd): Develop final booklet layout
Week of (March 29th): Finish master plan
Week of (April 5th): Finish final perspectives and details
Week of (April 12th): Produce final renderings
Week of (April 19th): Begin to build board layouts and get dimensions for foam core
Week of (April 26th): Work on final presentation of thesis
Week of (May 3rd): Test print and final plot of boards
Week of (May 10th): Final boards and booklet due for presentation

Design Goals

Designing for alternative transportation

- Connect people to destinations by providing more sustainable alternative routes to motor vehicle transportation.
- Create strong connections to the existing public transit.
- Create safe, comfortable trails connecting larger green spaces along the Red River.
- Improve existing transportation system by lowering the traffic levels.

Designing for Community

- Strengthen social bonds by creating destinations for community gathering and collaboration of all ages.
- Improve the quality of life and overall health of local users with sustainable choices.
- Change local commuter habits to more sustainable ones.

Designing for the Environment

- Design a multimodal greenway for user to engage and interact with the environment.
- Create more naturalist habitat.

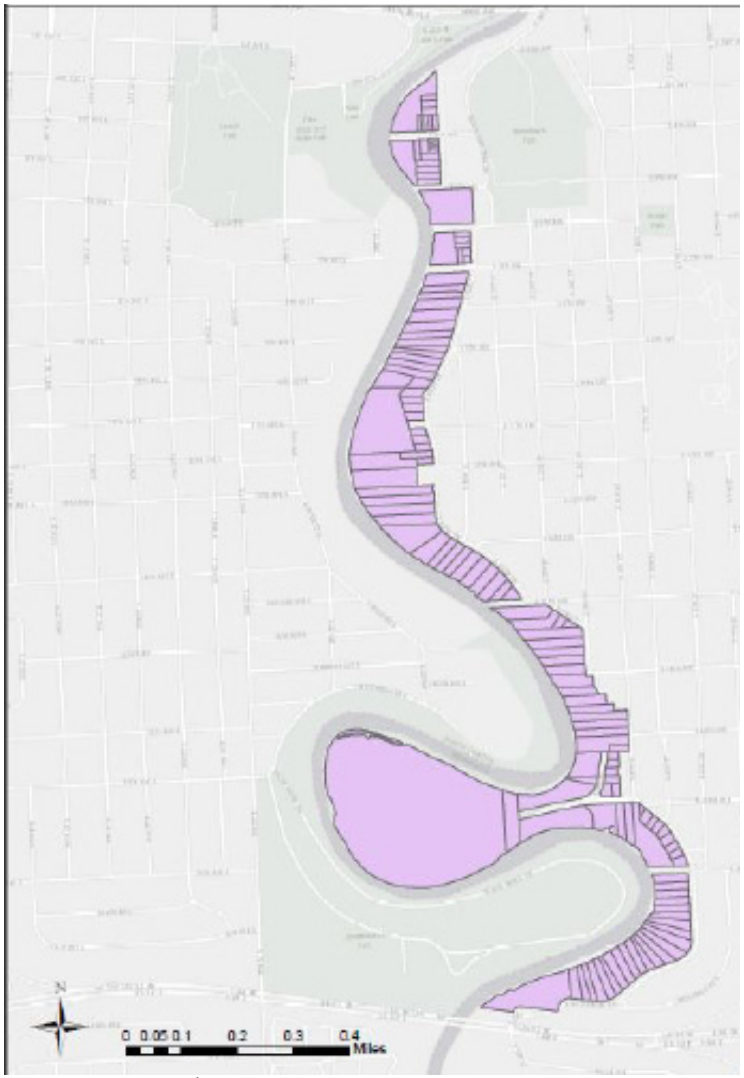


Figure 6: Parcel Map

Moorhead, Minnesota Multimodal Greenway Parcel Base Map

Pink highlighted parcels make adjacent the Red River in Moorhead, Minnesota, make up the multimodal greenway which contains 103 acres.

Red River Flood Plains in the Fargo-Moorhead Metropolitan Region

This make locates the 100 and 500 year flood plain on both sides of the Red River as well as highlighting the currently bought out parcels in Fargo, North Dakota, and Moorhead, Minnesota, adjacent to the Red River along with the Setback regulations along the river for Fargo and Moorhead.

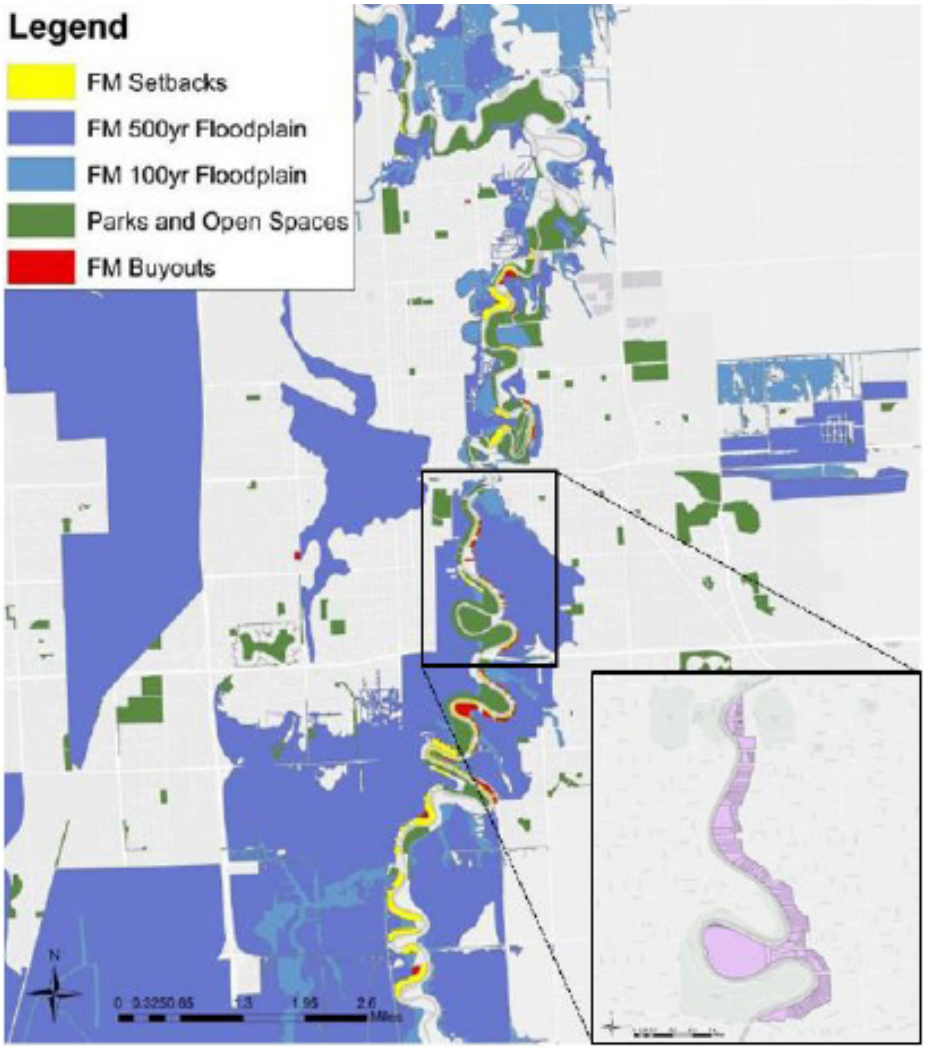


Figure 7: Flood Map

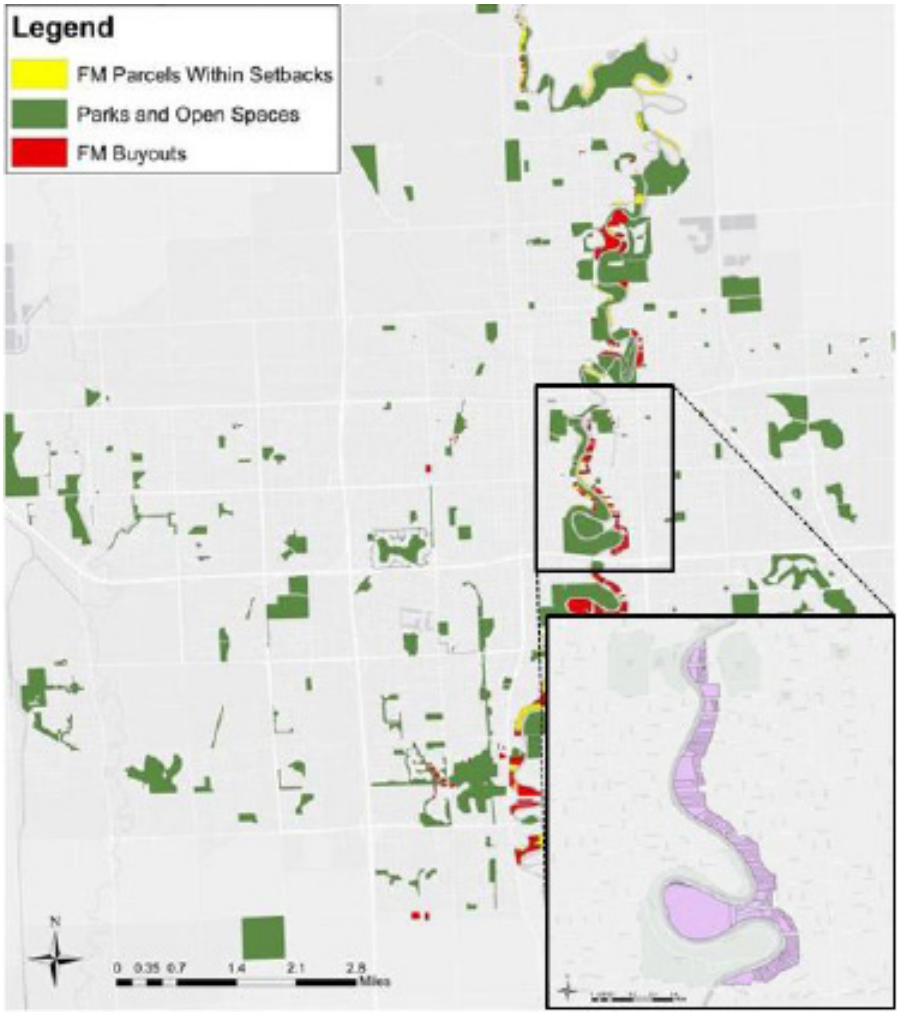


Figure 8: Parks Map

Setback Regulations for the Fargo Moorhead Metropolitan Region

This map is meant to focus more directly at the Setback Regulations and the current bought out parcels adjacent the Red River in Fargo, North Dakota, and Moorhead, Minnesota, in comparison to the current Parks and Open spaces in the Metropolitan region.

Bike Paths and Bicyclist Activity in the Fargo-Moorhead Metropolitan Region

This map locates the current bike paths in the Metropolitan region as well as the most current bike counts with pie charts linked to locations displaying the percentage of pedestrians, bicyclist and street bicyclist.

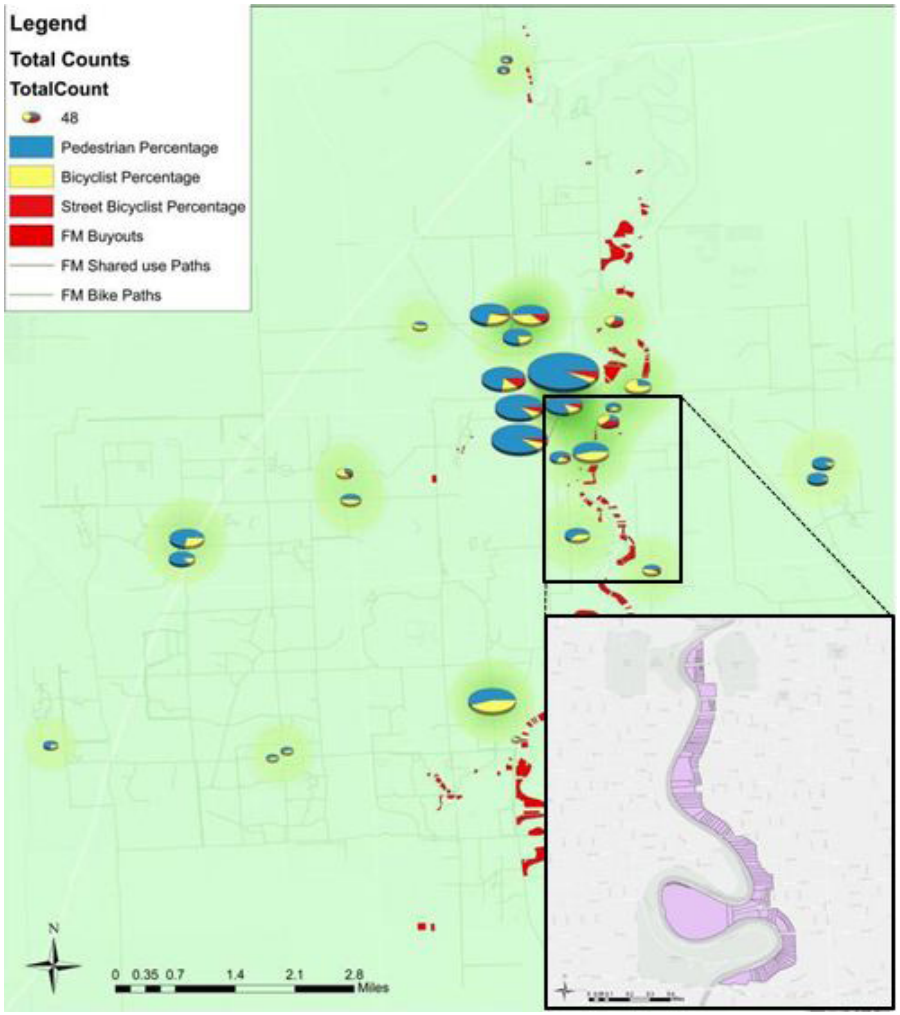


Figure 9: Bicyclist Activity Map

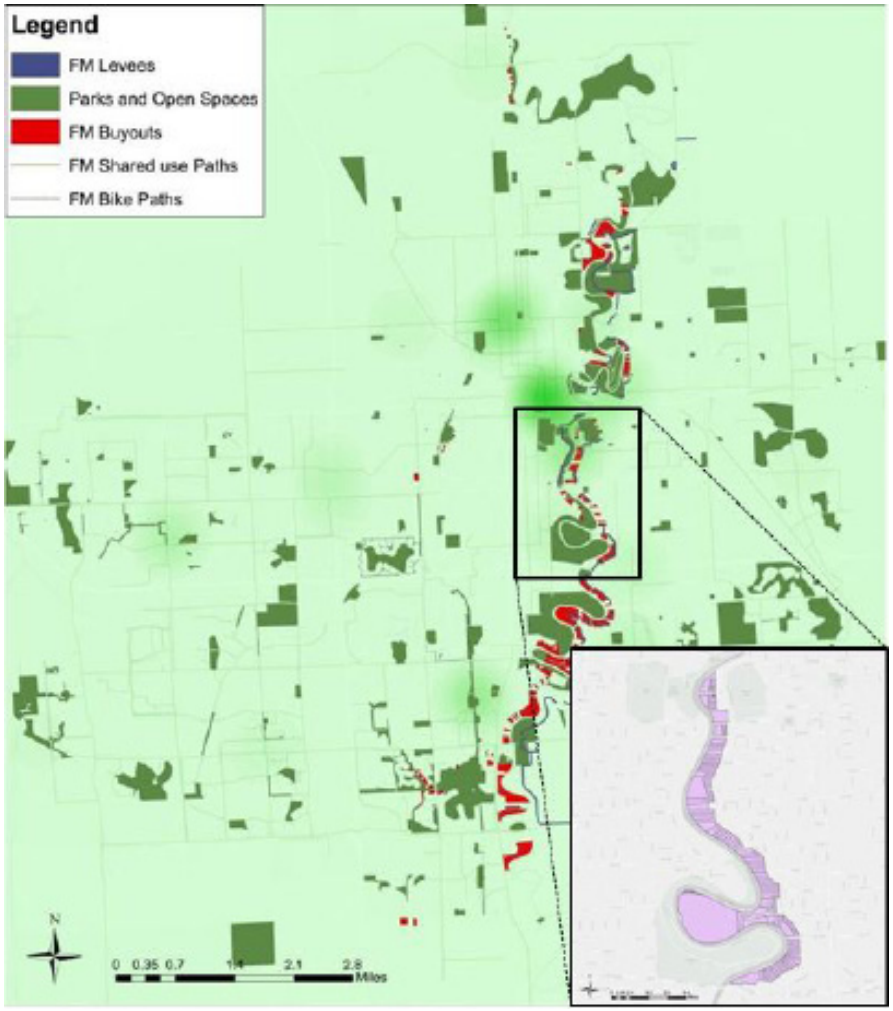


Figure 10: Leaves Map

Leaves in the Fargo-Moorhead Metropolitan Region

This map locates were the existing leaves are located within Fargo, North Dakota, and Moorhead, Minnesota, in relation to the current buyouts, parks and open space and bike paths.

Site Elements

Topography: Current and Proposed
Looking at current topography I can tell how water will move on the sight and how it needs to change in order to accommodate the naturalistic wetland retention basins on the sight and where they might fit best.

Hydrology: How water moves on site during a flood occurrence
By looking at the 100 and 500 year flood plains we can see how the water moves naturally on the site as it stands today during a flood occurrence.

Vegetation: Plants used on site
Introduction of more plant life will improve air quality, habitat potential, and buffer users from the road noise of adjacent streets.

Wildlife: Potential wildlife inhabitants
People currently enjoy the chance to see wildlife along the river and participate in bird watching. By developing an even more naturalist space more users will be invited to escape the city both human and animal.

Land use: Were you can build more than just a trail with setback regulations
With the dimensions of the current bought out parcels adjacent the Red River in Moorhead Minnesota and measuring out the setback regulations accordingly we can find potential locations for built facilities to accommodate community event buildings or shelters.

Recreation: Display different trails and there uses
Current maps of the parks and open spaces in the Fargo-Moorhead Metropolitan region can help to determine were the best place would be to connect the greenway with existing green spaces. This will also help to map connections to existing bike paths and find the most popular bicyclist locations.

Transportation/circulation: Display how the site can be used as a multimodal corridor
Looking at corridor studies we can see how busy and congested different roads get and how changing our transportation habits can lower traffic levels and congested roads.

Design Development

Figure 11: Filling the Gaps of Existing Conditions

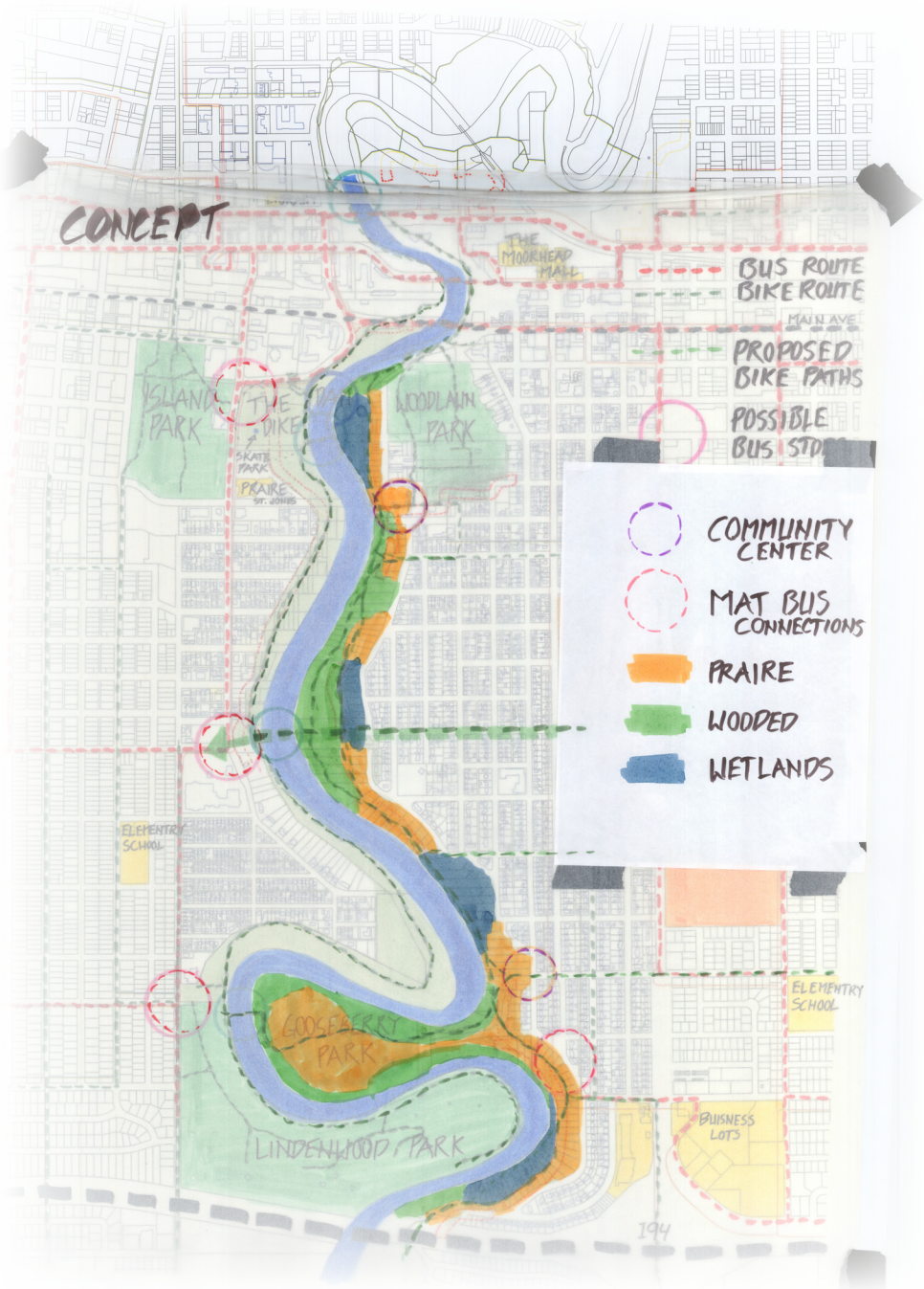


Figure 12: Concept Development

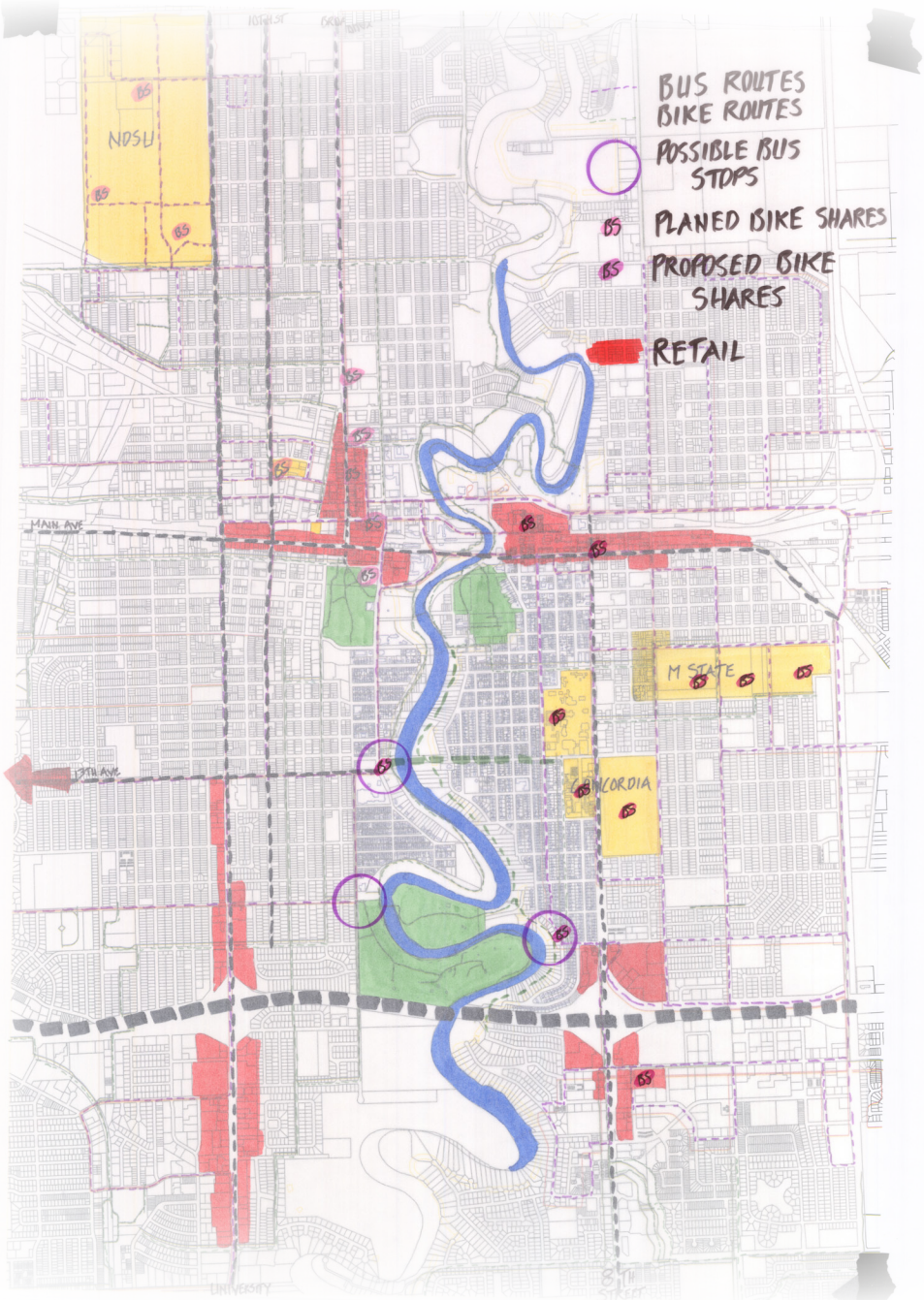


Figure 13: Big Picture Analysis

Figure 14: Flood Process Model

Preliminary Plan

Figure 15: Schematic Plan

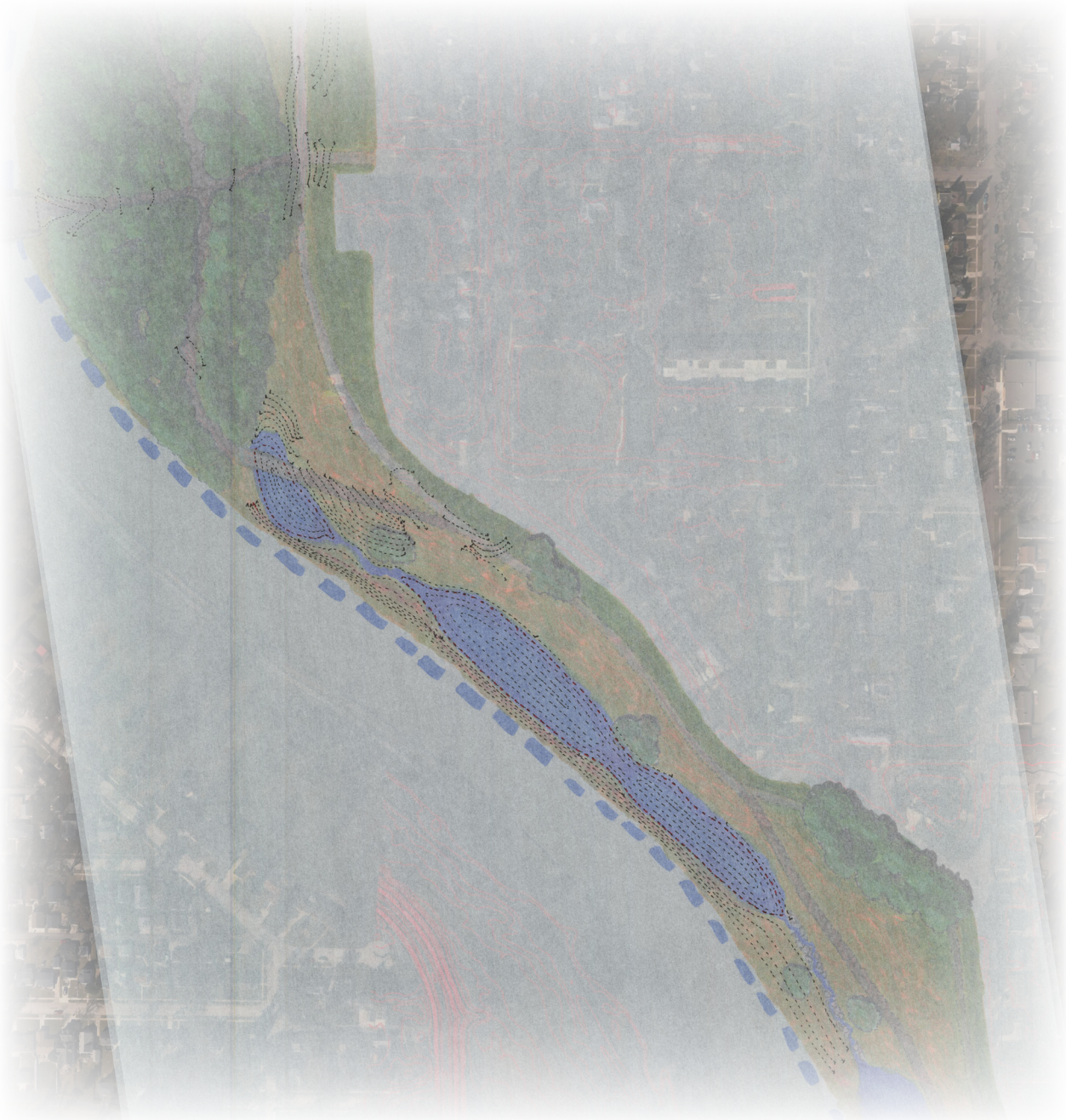


Figure 16: Proposed Contours

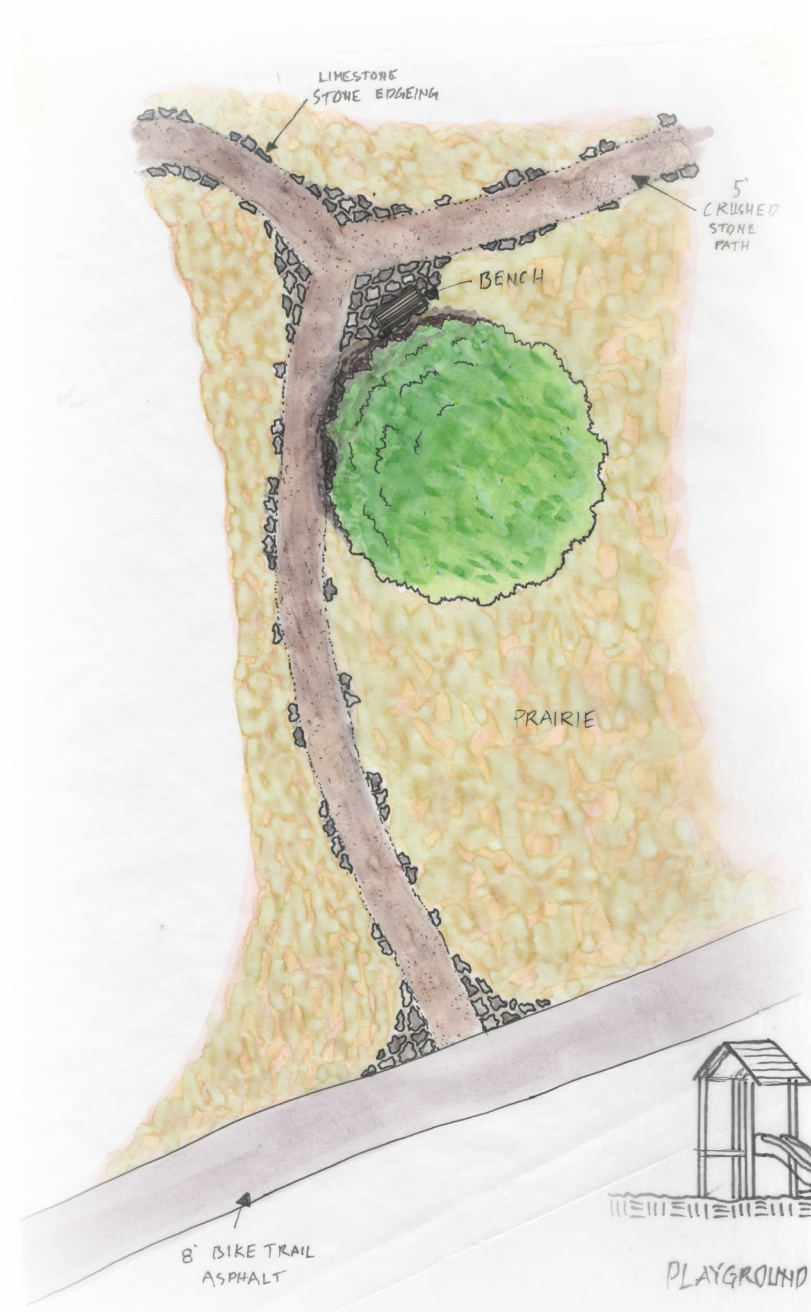


Figure 18: Preliminary Secondary Path Plan

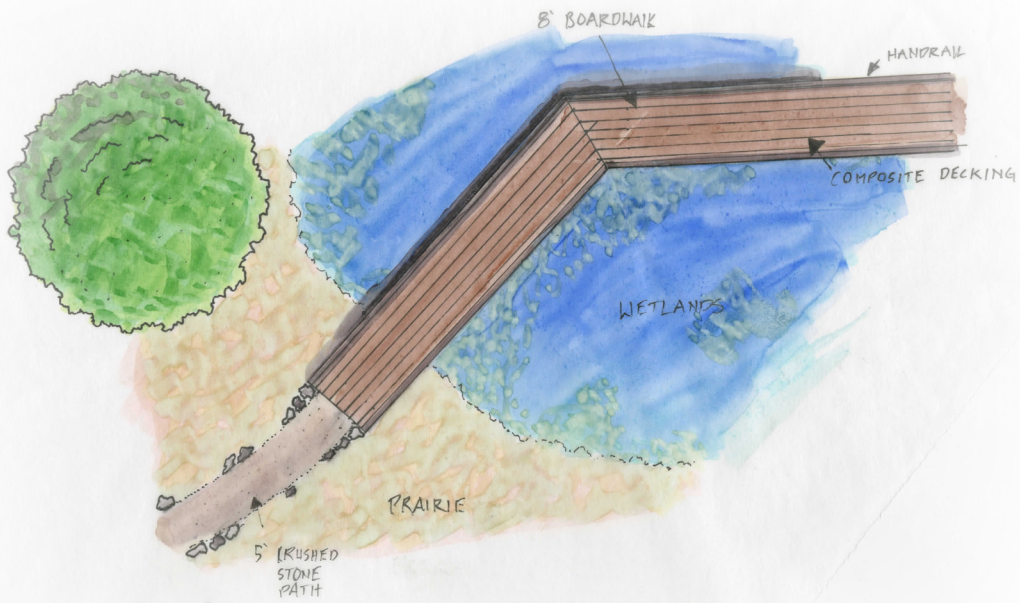


Figure 17: Preliminary Boardwalk Plan

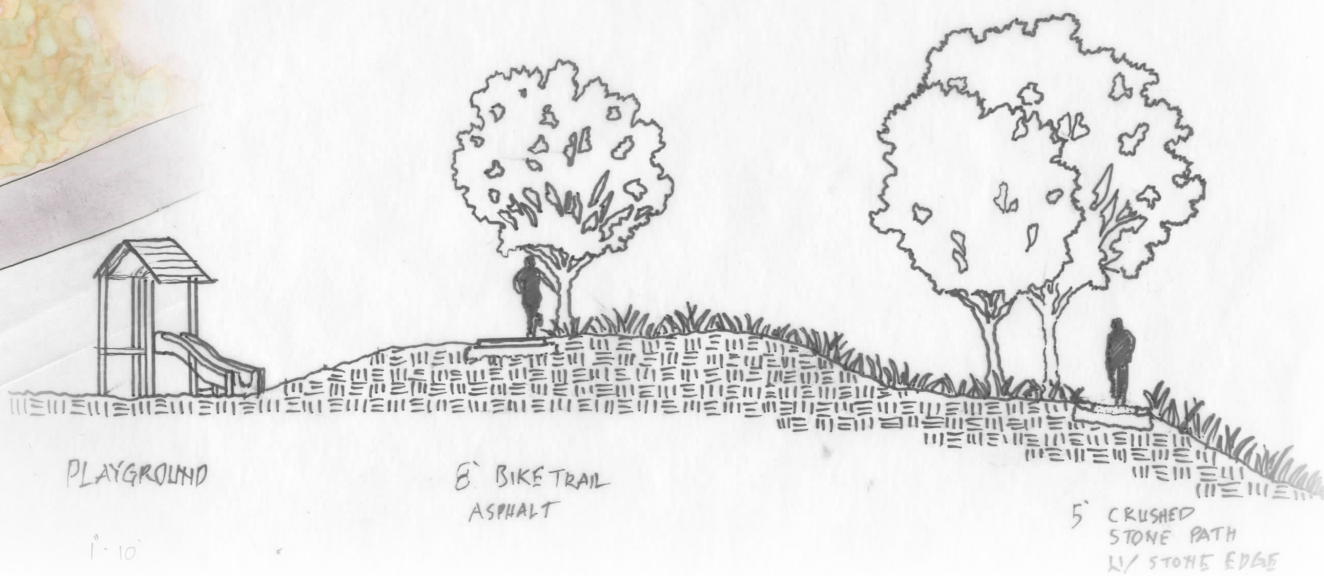


Figure 19: Preliminary Path Type Details

Community Center Development

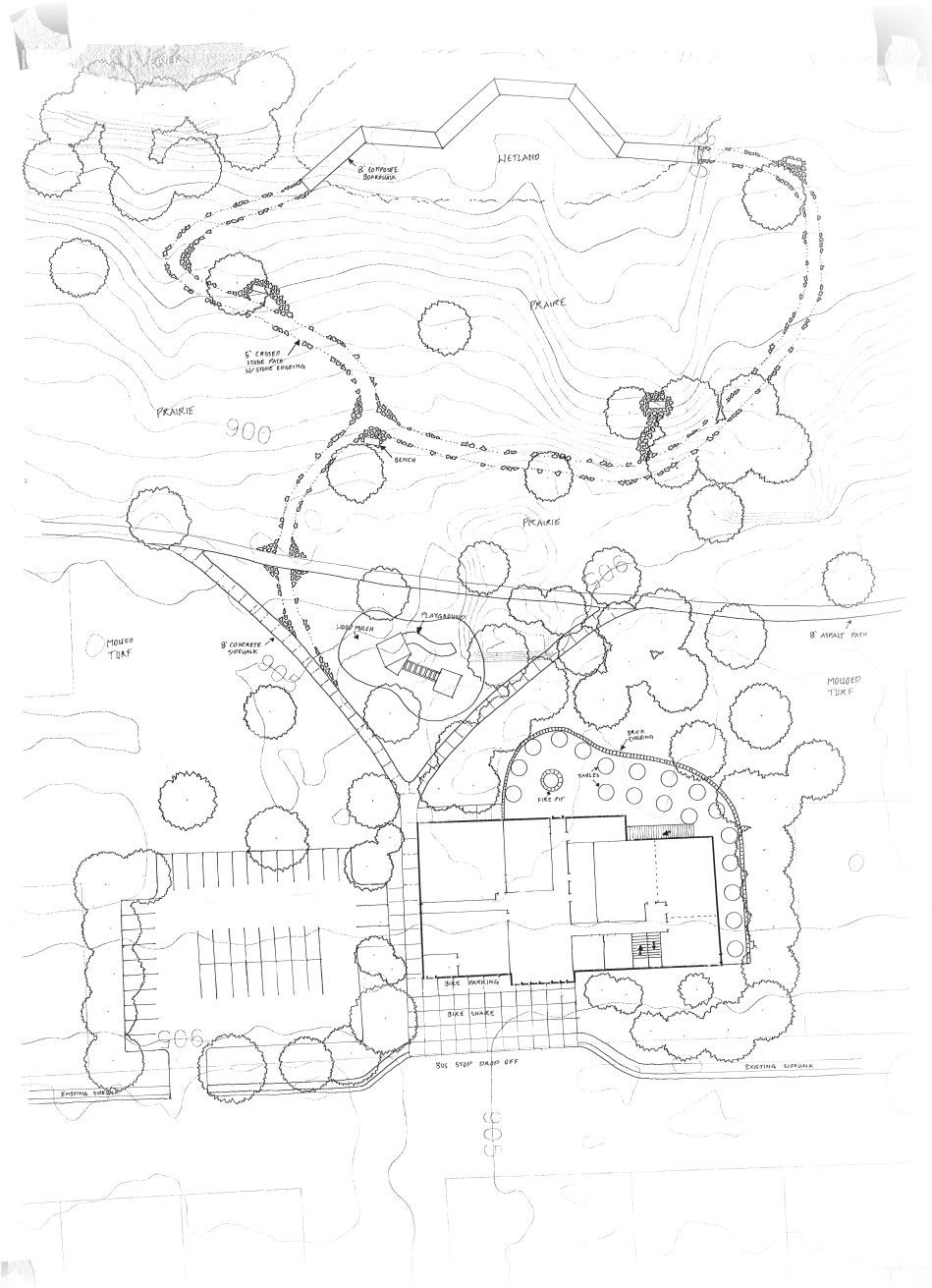


Figure 20: Preliminary Community Center Plan

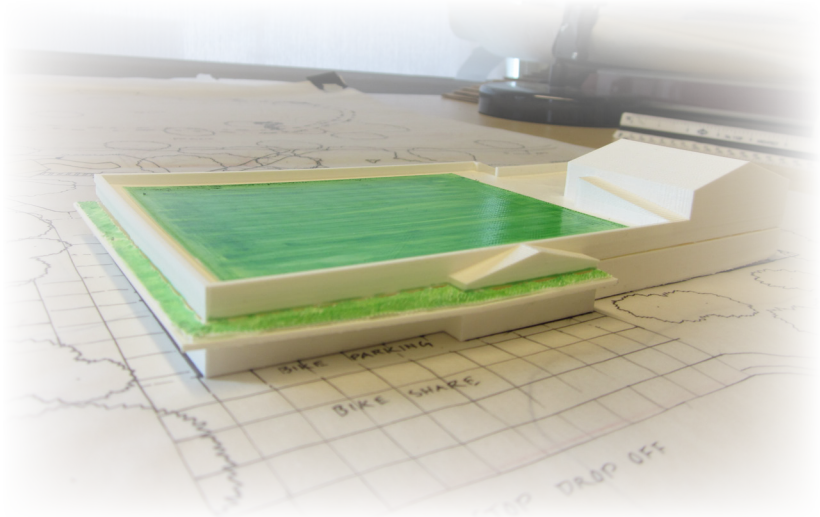


Figure 21: Community Center Process 3D Model 1

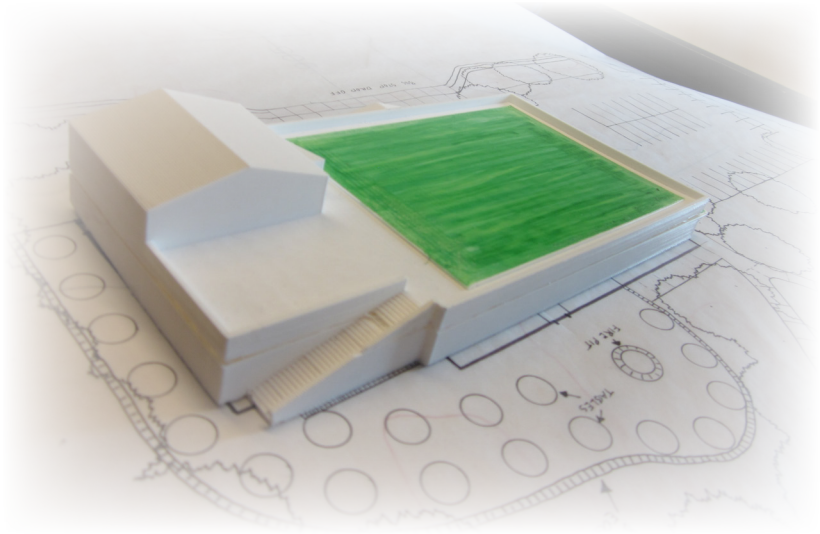


Figure 22: Community Center Process 3D Model 2

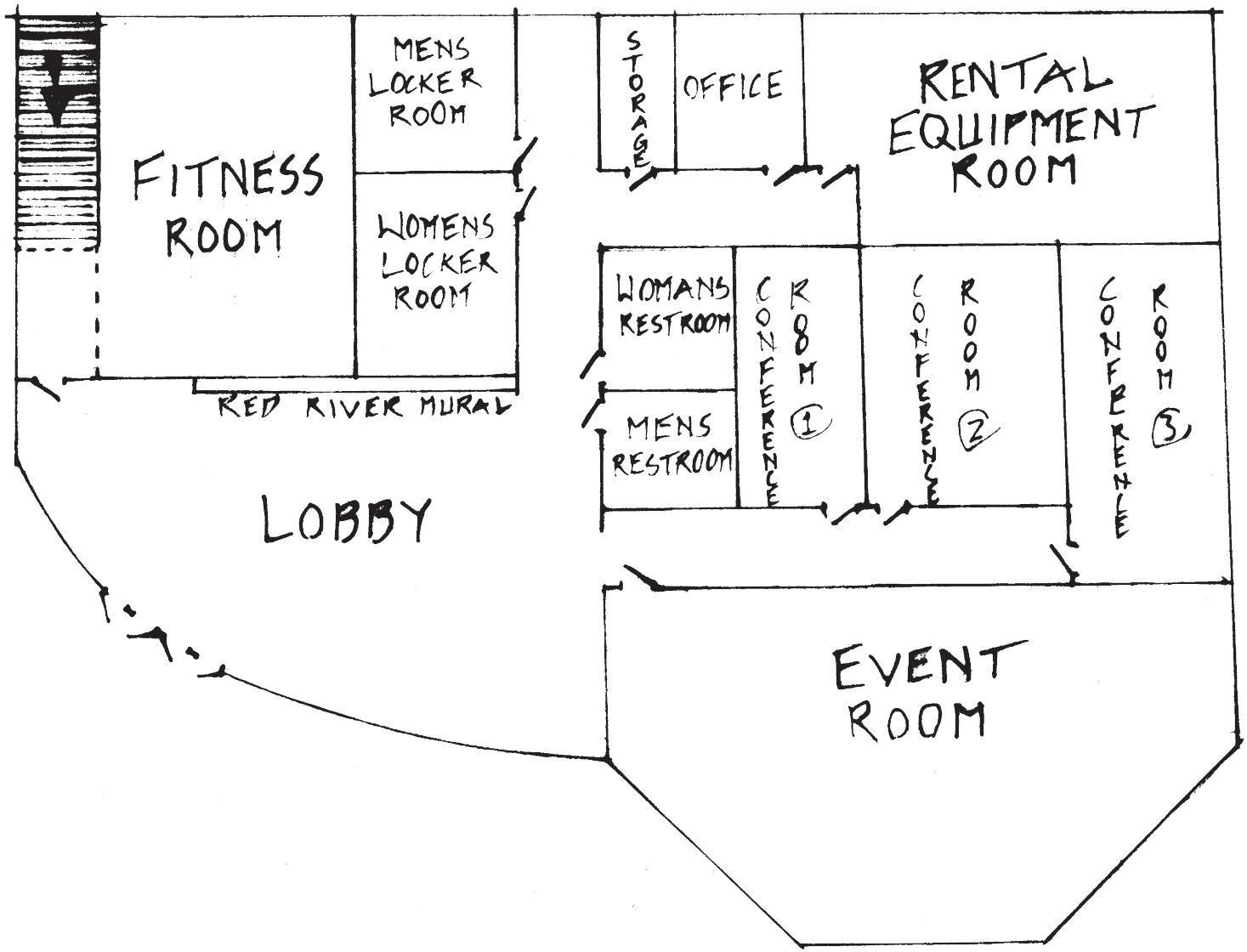
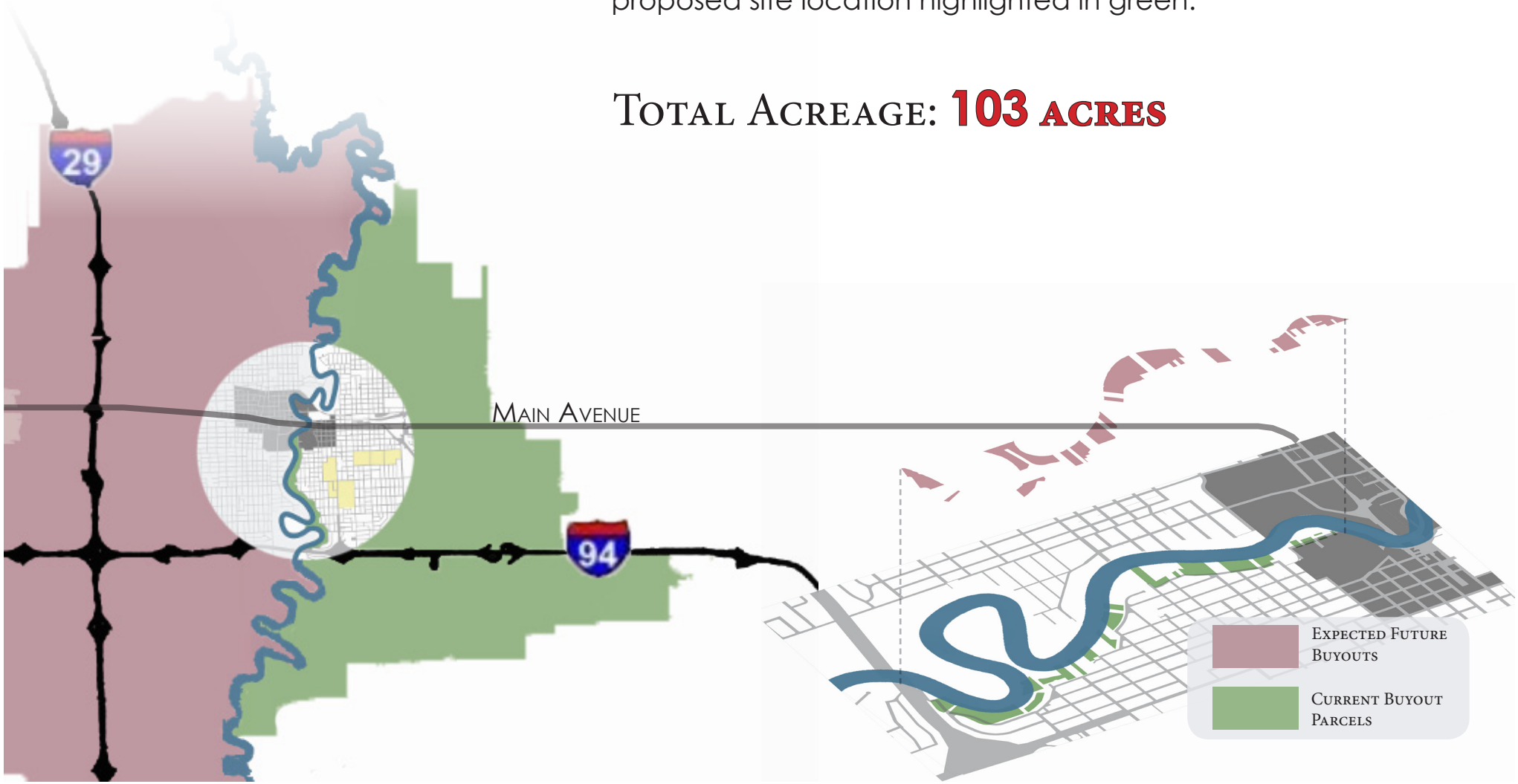


Figure 23: Final Community Center Floor Plan

Further Analysis

The parcels highlighted in green in the graphic below represent the current properties already bought out while the parcels highlighted in pink represent the properties assumed will be bought out in the future for the purpose of this thesis. One the adjacent page you will see the collaboration of these two parcel types make up my proposed site location highlighted in green.

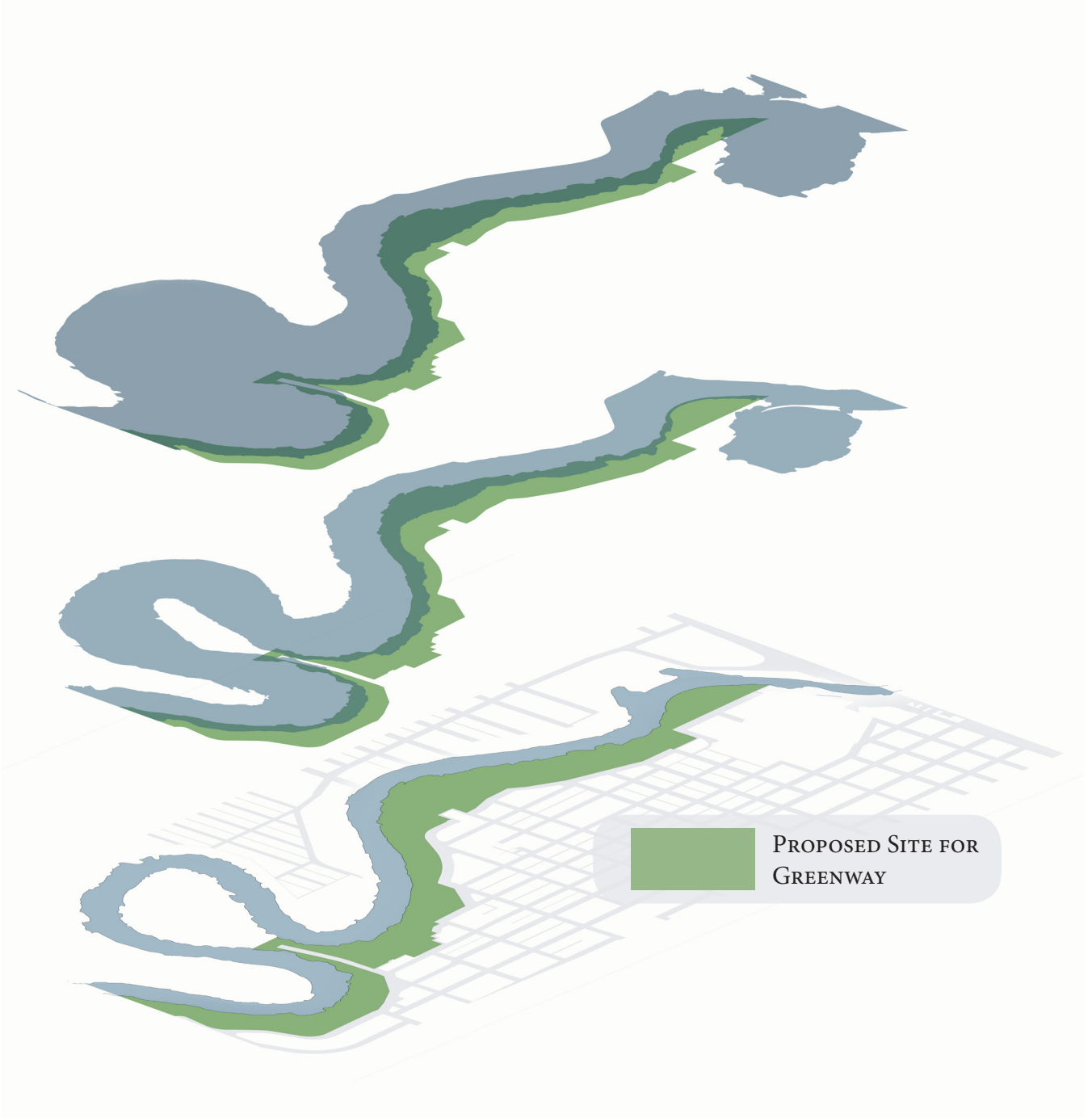
Total Acreage: 103 acres



100 Year Flood Event:
Approximate Elevation 900'

Major Flood Event:
Approximate Elevation 892'

Minor Flood Event:
Approximate Elevation 880'



Crash Incidents Involving Pedestrians and Motor Vehicles:

Most Incidents

Least incidents

Existing Bike Trails and Shared use Paths:

Bike Routes

Existing Bus Routes: and City Destination Points:

Bus Routes

Colleges

Shopping Malls

Grocery Stores

Downtown

Greenway Site

The Dero Zap Program

Participants of the program are entered to win prizes depending on there personal level of activity in the program. Local supporting businesses may offer discounts to customers who participate or incorporate insurance benefits to employees who participate.

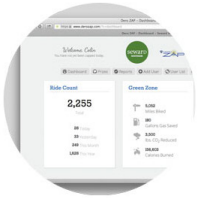
1

Attach the free rigid tag to the front wheel of your bicycle.

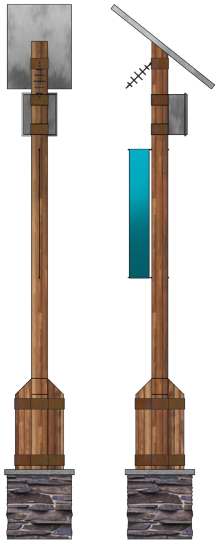
2

Scanners detect users as they pass by.

3

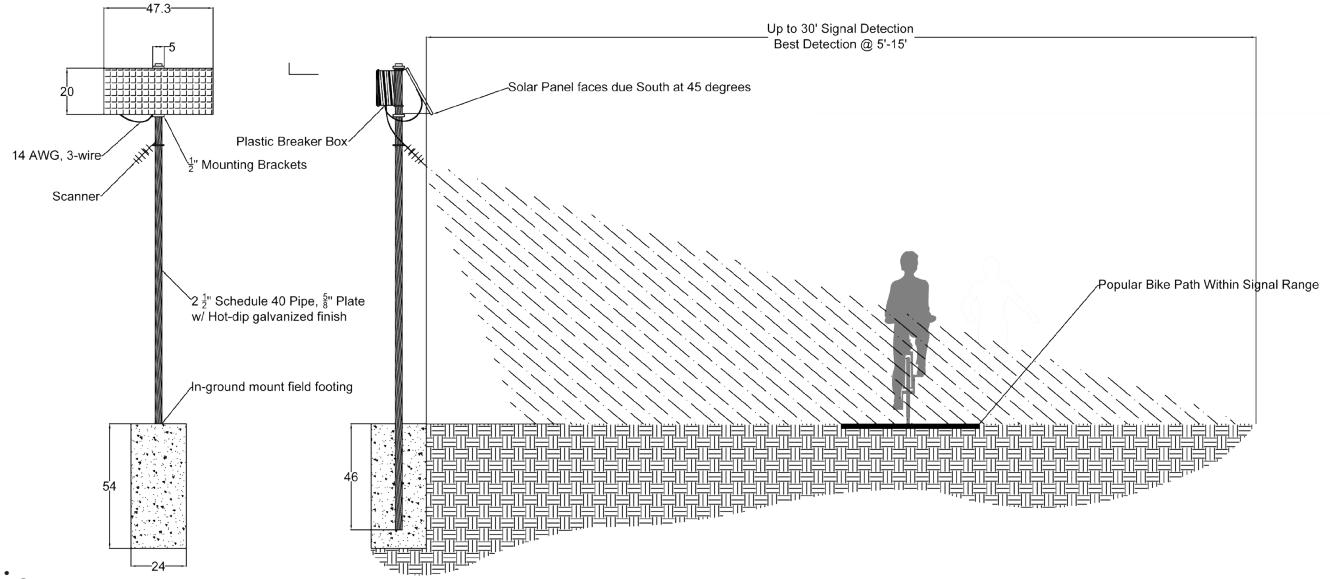


Use Dero's web app to track your activity.



Zap Scanners:

Redesigned to maintain a sense of place for users along the Multimodal Greenway



Note: There are also handheld tags available for participants who prefer to walk or roller blade.

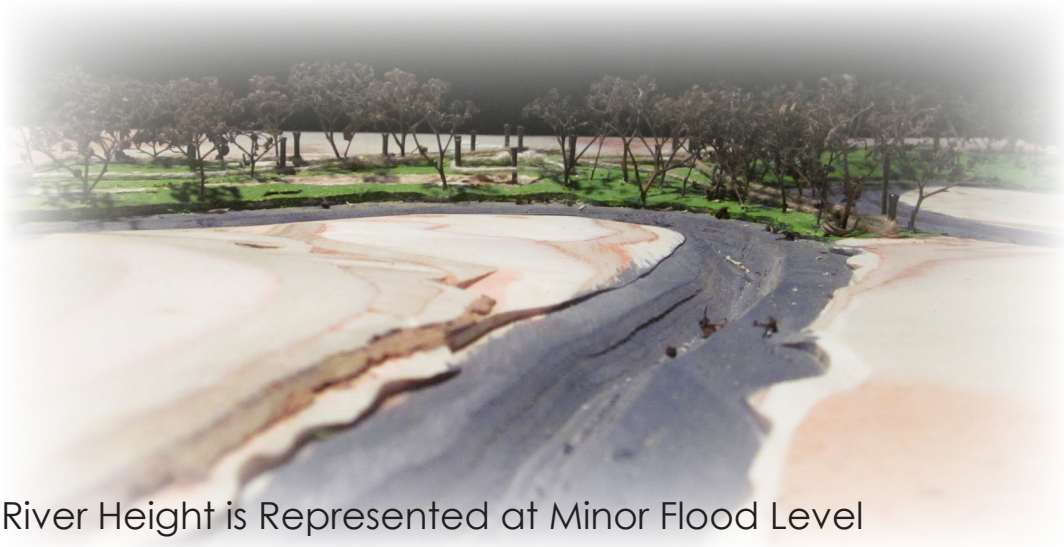
Physical Model

The model was produced from the proposed contours using a CNC machine to produce an accurate physical representation. I exaggerated the Z axis of the contours by Three times their normal elevation for a more understandable model at a 1:200 Scale. Two Different Strings were used to represent the Primary and Secondary Trails and the Primary String was elevated at the pedestrian bridge location. The trees represent the expected tree cover with an exaggerated Z axis.

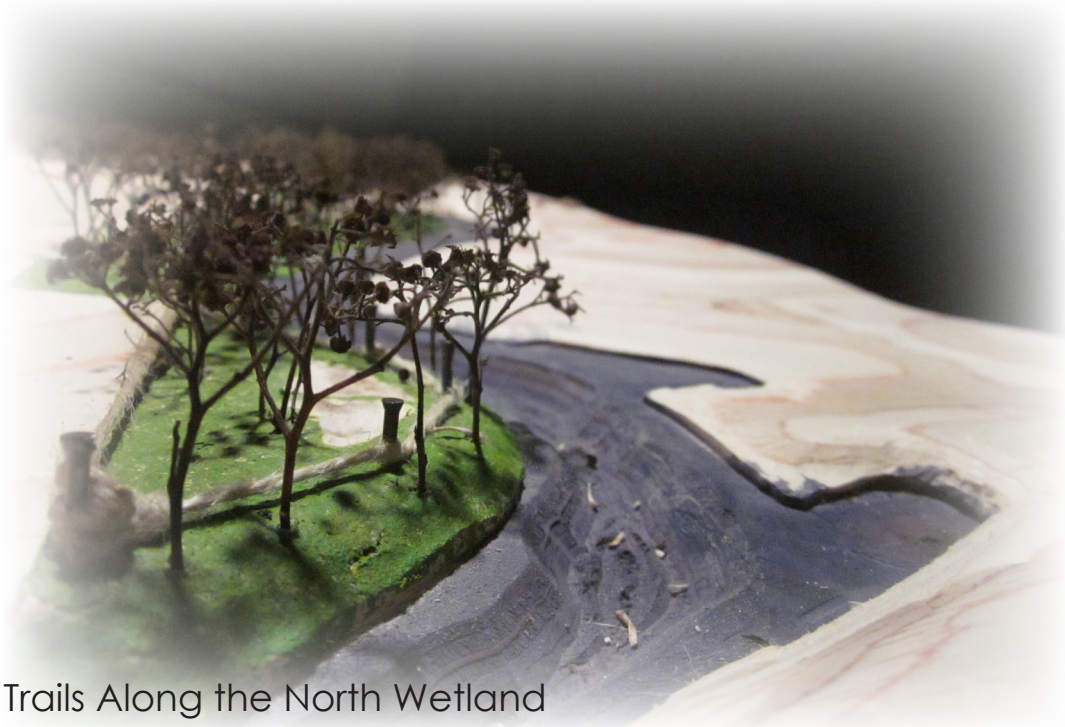
1:200 Scale 3D Printed Model of Community Center

Trail Paths are Represented by Three Different Strings

Model Built at 1:200 Scale



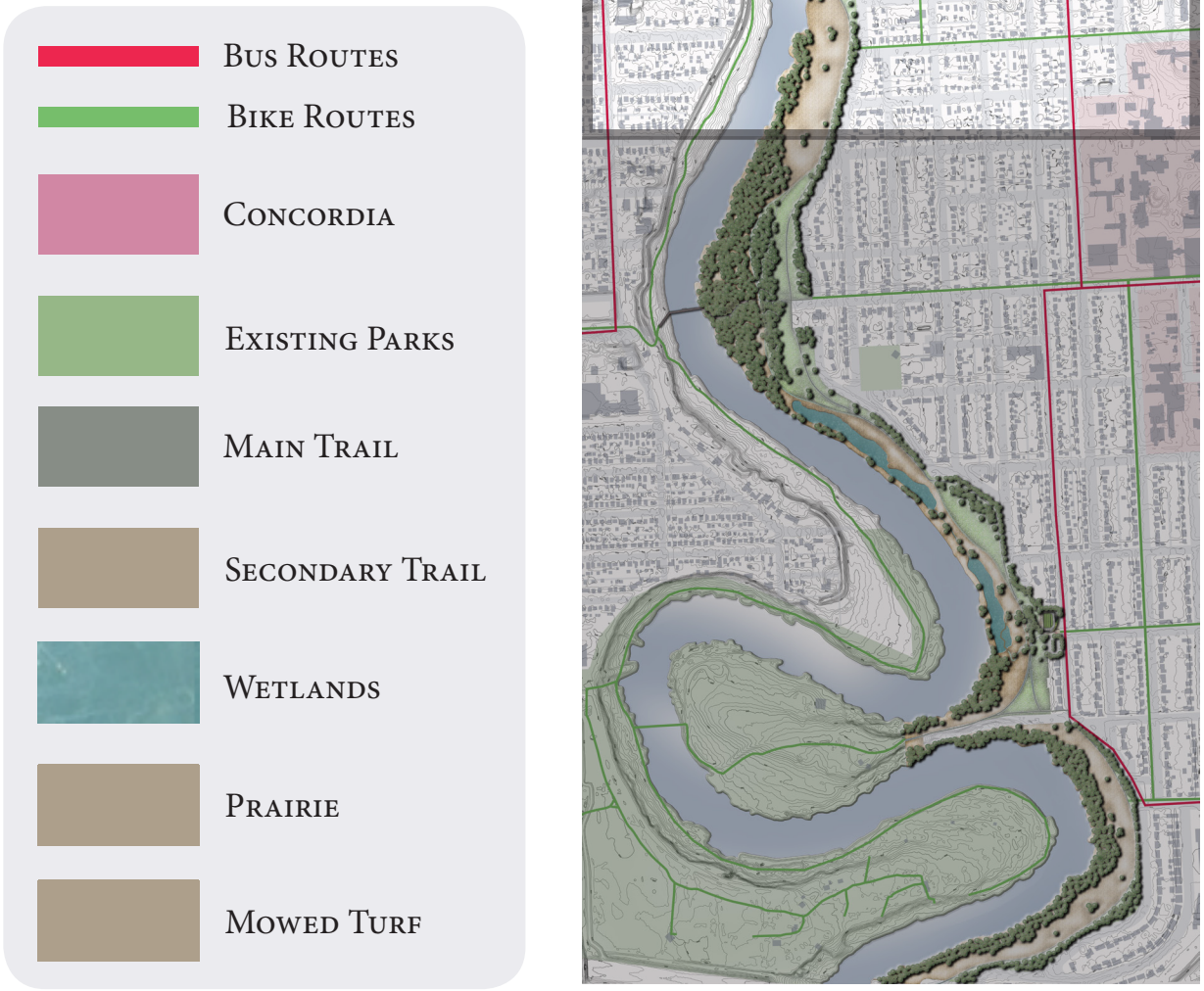
River Height is Represented at Minor Flood Level



Trails Along the North Wetland

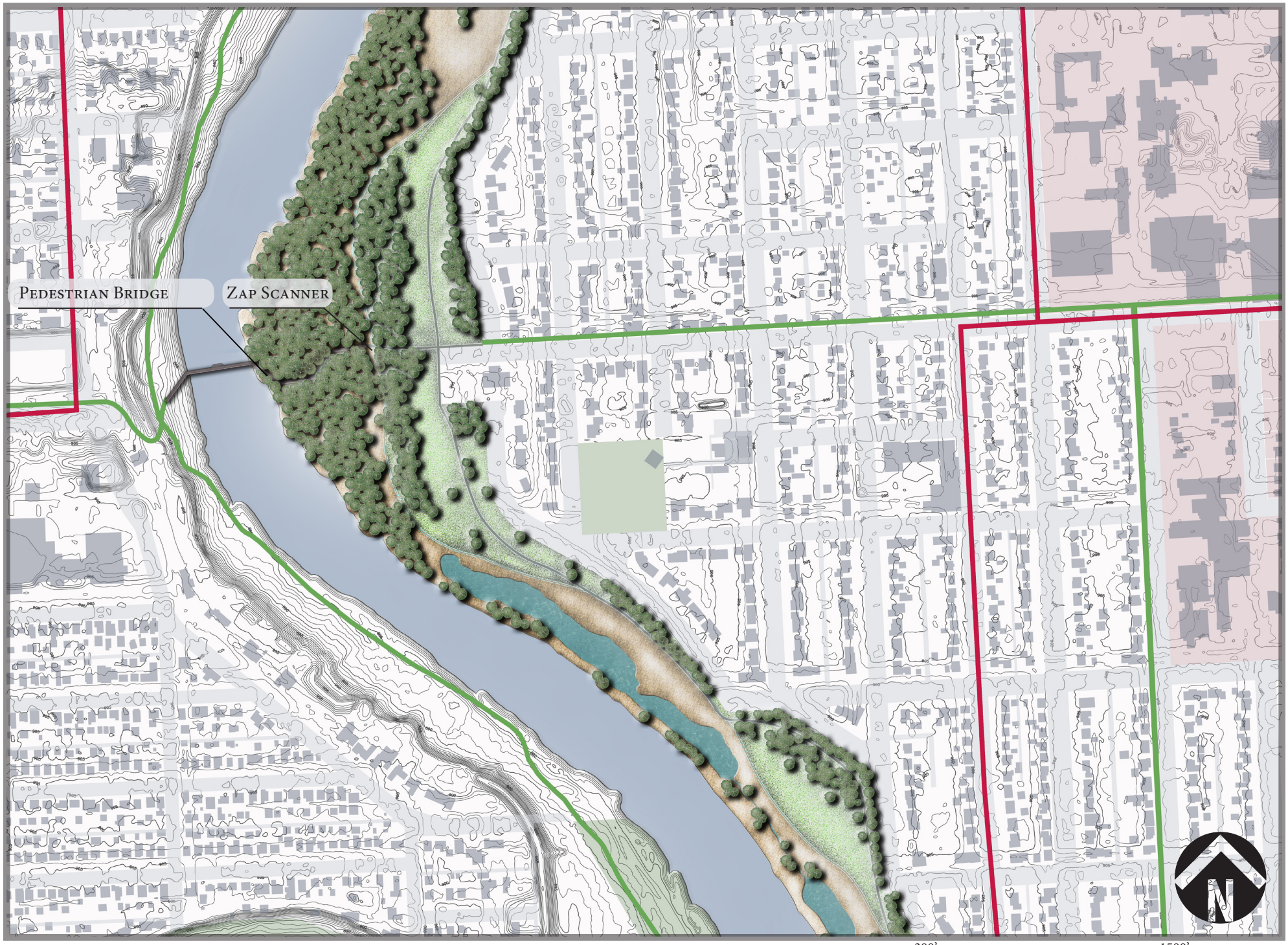
Due to the size of the proposed site and its linear qualities the site has been split in three sections across the next 6 pages.

Section one you the see the furthest north portion of the greenway. Here we can see multiple path choices exploring the prairie wetlands as well as some lightly wooded regions. The map also gives us context to were the Dike West and Woodlawn Park are in relation to the sight. We can also notice how there are many street trees east of the primary trail to isolate users from road noise and automobile traffic. Only time this is not applicable is when adjacent parks are near by were trees are more scarce to encourage a connection between parks.




Zap Scanner
Woodlawn Park
The Dike Skate Park
N
100’
300’
700’
1500’

Section two you the see the middle portion of the greenway. Here we can see multiple path choices exploring the prairie wetlands as well as densely wooded regions. We can also notice a new pedestrian bridge proposed to directly connect Concordia and Moorhead residents to 13th Avenue in Fargo. We also notice how there are many street trees east of the primary trail to isolate users from road noise and automobile traffic except for directly southwest of park to maintain easy accessibility.


Pedestrian Bridge
Zap Scanner
100’
300’
700’
1500’

Section three you the see the southern most portion of the greenway. Here we can see multiple path choices exploring the prairie wetlands as well as lightly wooded regions. Hear we can see were the new community center is proposed with direct connection to the bus route as well as a boardwalk to explore and learn about the wetlands. Once again we can see a continues buffer of street trees along the main trail except directly south of the community center. Here remains six private parcels whom could benefit from a direct connection to the greenway that would be ascetically pleasing for the residents.

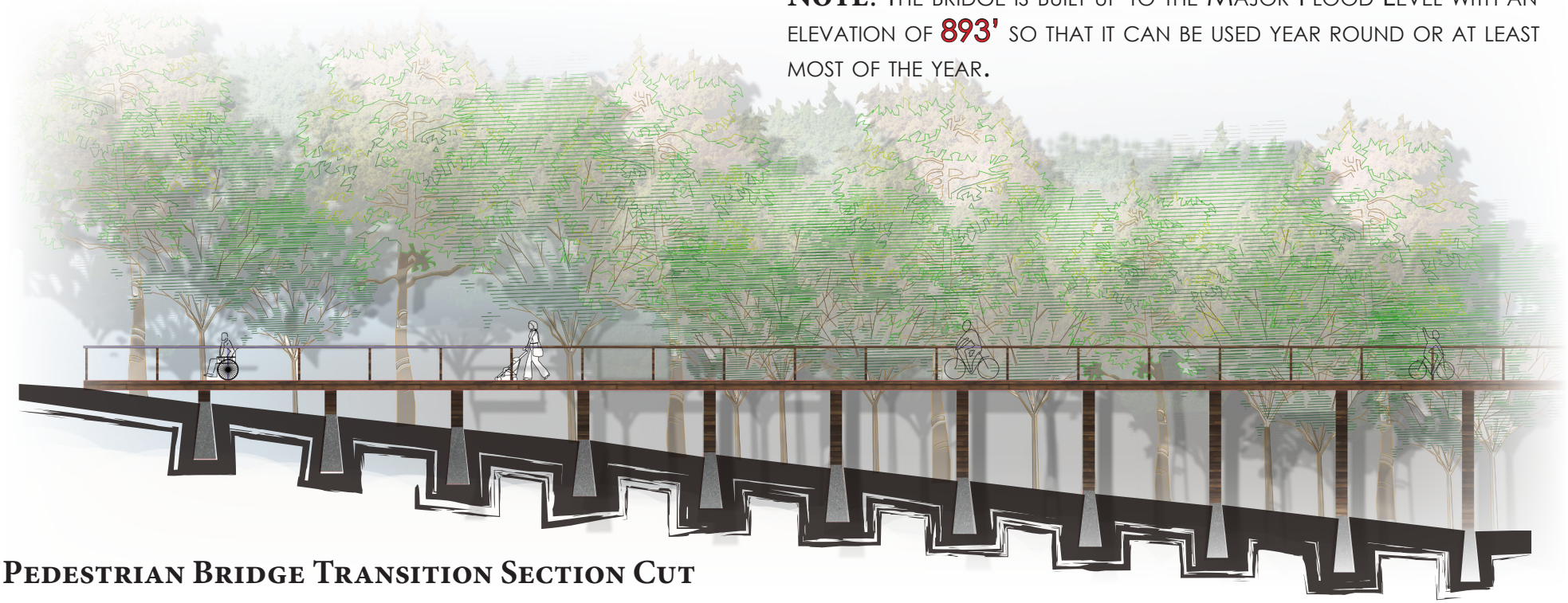
- Bus Routes
- Bike Routes
- Concordia
- Existing Parks
- Main Trail
- Secondary Trail
- Wetlands
- Prairie
- Mowed Turf


Community Center
Bus Stop
Boardwalk
Zap Scanner
Gooseberry Park
Lindenwood Park
N
100’
300’
700’
1500’

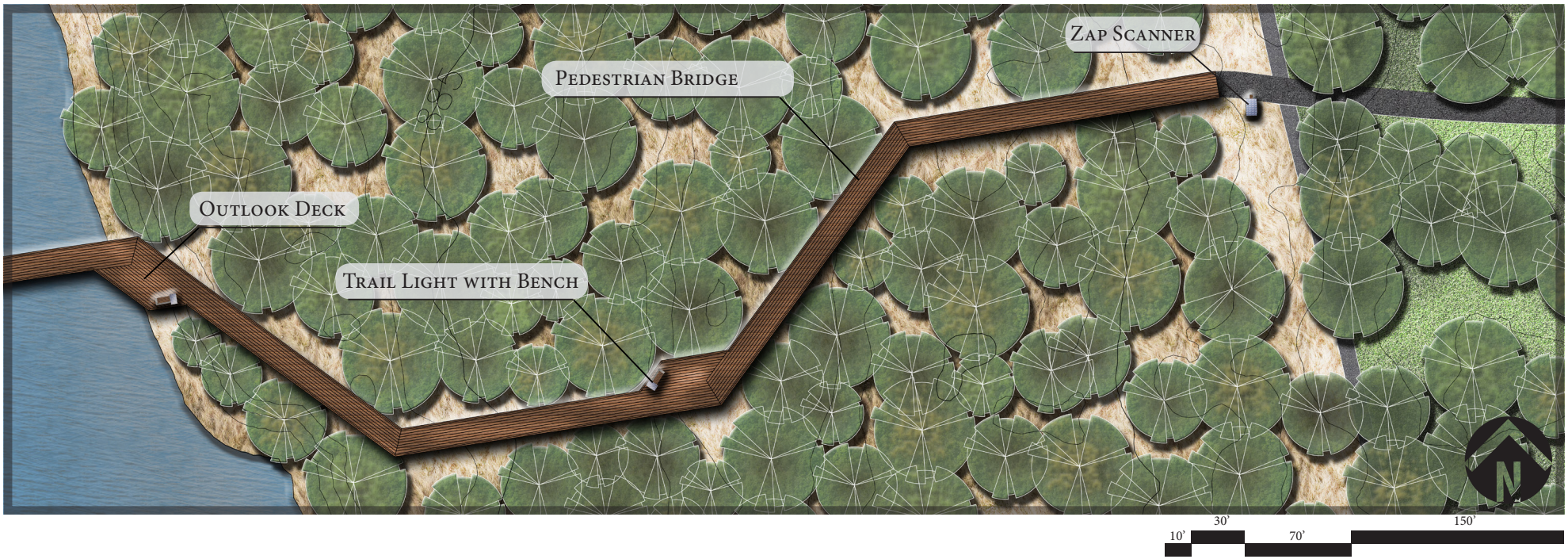
Pedestrian Bridge Site Plan

Here we can see more detailed plans of the proposed pedestrian bridge connecting Concordia and other Moorhead residents directly to 13th Avenue in Fargo. The Bridge will be elevated to maintain pedestrian crossing during most flood events at an elevation of 893 feet just above the level of a major flood event. The bridge would be an experience amongst itself were you begin below the densely wooded canopy and begin rising to the canopy level. There are multiple places along the way one could stop and rest on a bench and enjoy the space.

Note: The bridge is built up to the Major Flood Level with an elevation of **893'** so that it can be used year round or at least most of the year.

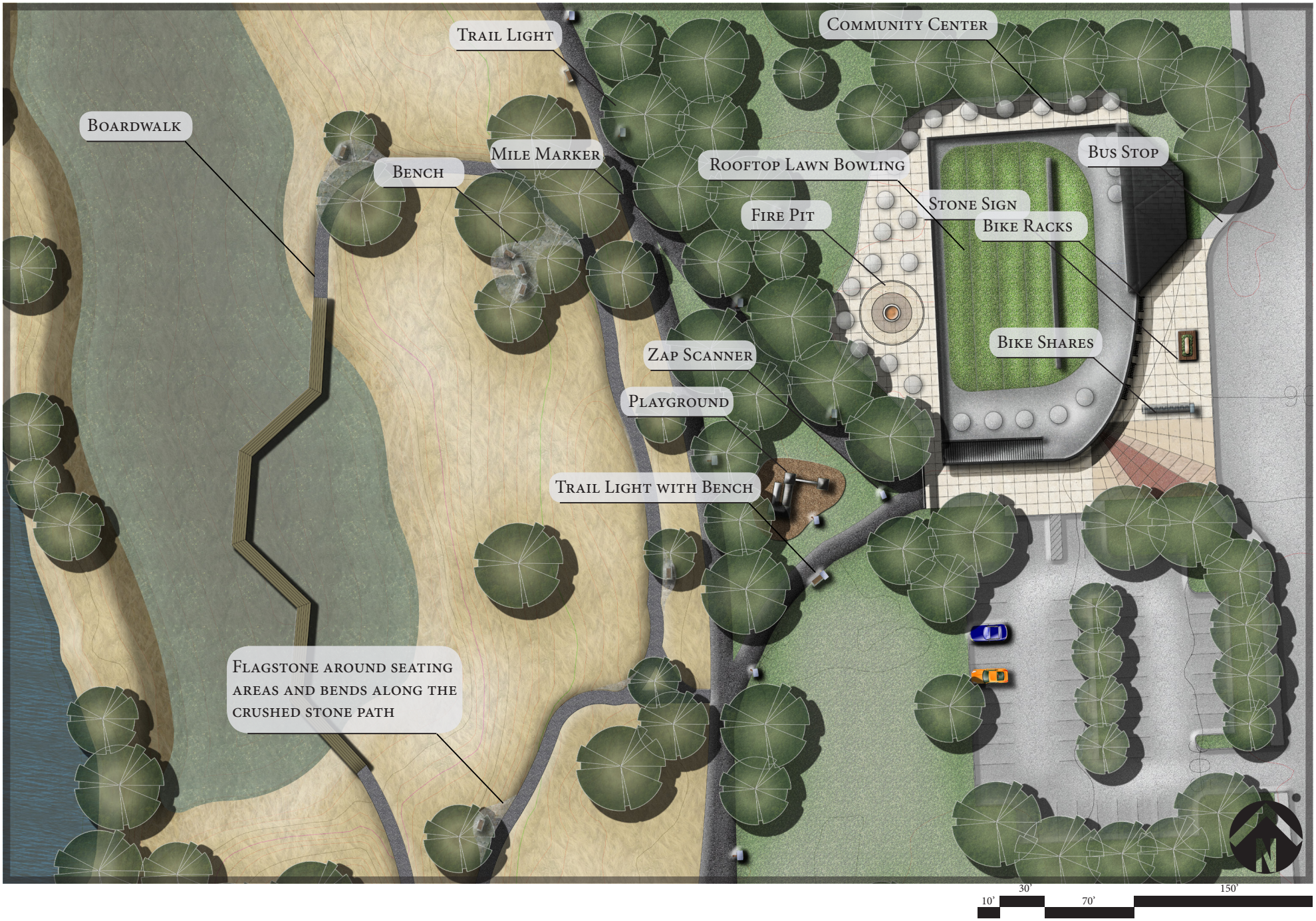


Pedestrian Bridge Transition Section Cut



Community Center Site Plan

Here we can see a closer plan of what the community center would be like. The main entrance is signified by the paving pattern for fast identification as well as located on the southern half to allow the plaza to be protected in the winter months and welcome pedestrians from the public transit or private from the parking lot. There is a large fire pit in the back patio with plenty of outdoor seating for events as well as a rooftop Patio with Turf for four lawn bowling lanes. On this plan we can also better understand the connection to the boardwalk and the properties of the secondary trails. The community center is envisioned as a destination along the greenway to cater to users were you can rent skis, roller blades or bicycles for use on the trails or simply come and enjoy the patio for an afternoon or private event.


Trail Light
Community Center
Boardwalk
Mile Marker
Bench
Rooftop Lawn Bowling
Bus Stop
Stone Sign
Fire Pit
Bike Racks
Bike Shares
Zap Scanner
Playground
Trail Light with Bench
Flagstone around seating areas and bends along the crushed stone path
10'
30'
70'
150'

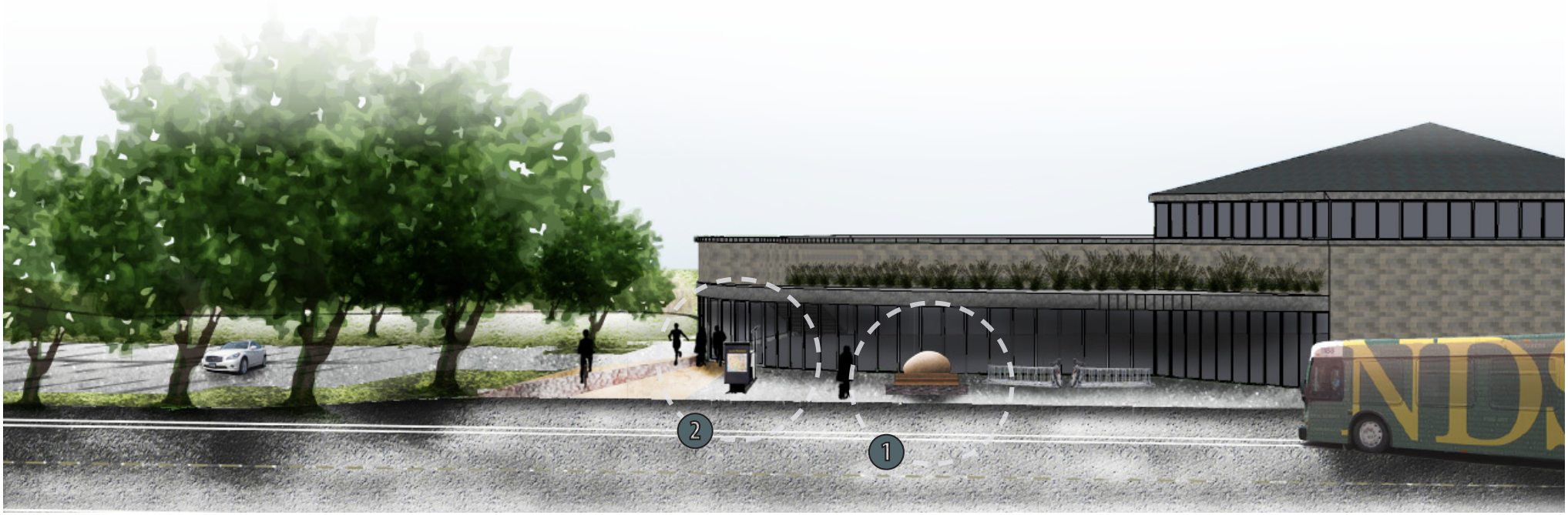
Community Center Perspective

Stone Sign

1

Bike Shares

2



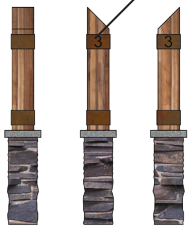

Light Pole
1
1

Crushed Stone Path Perspective

Mile Markers

1

Mile Markers are placed along the trails to allow users to navigate easily



Benches

2

Note: Some benches may be attached to park lamps depending on locations

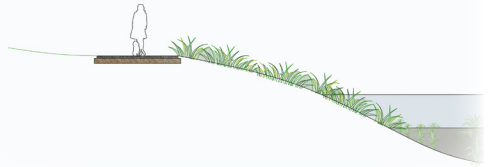
Typical Trail Types

8' Asphalt Bike Trail
Maintenance Lawn

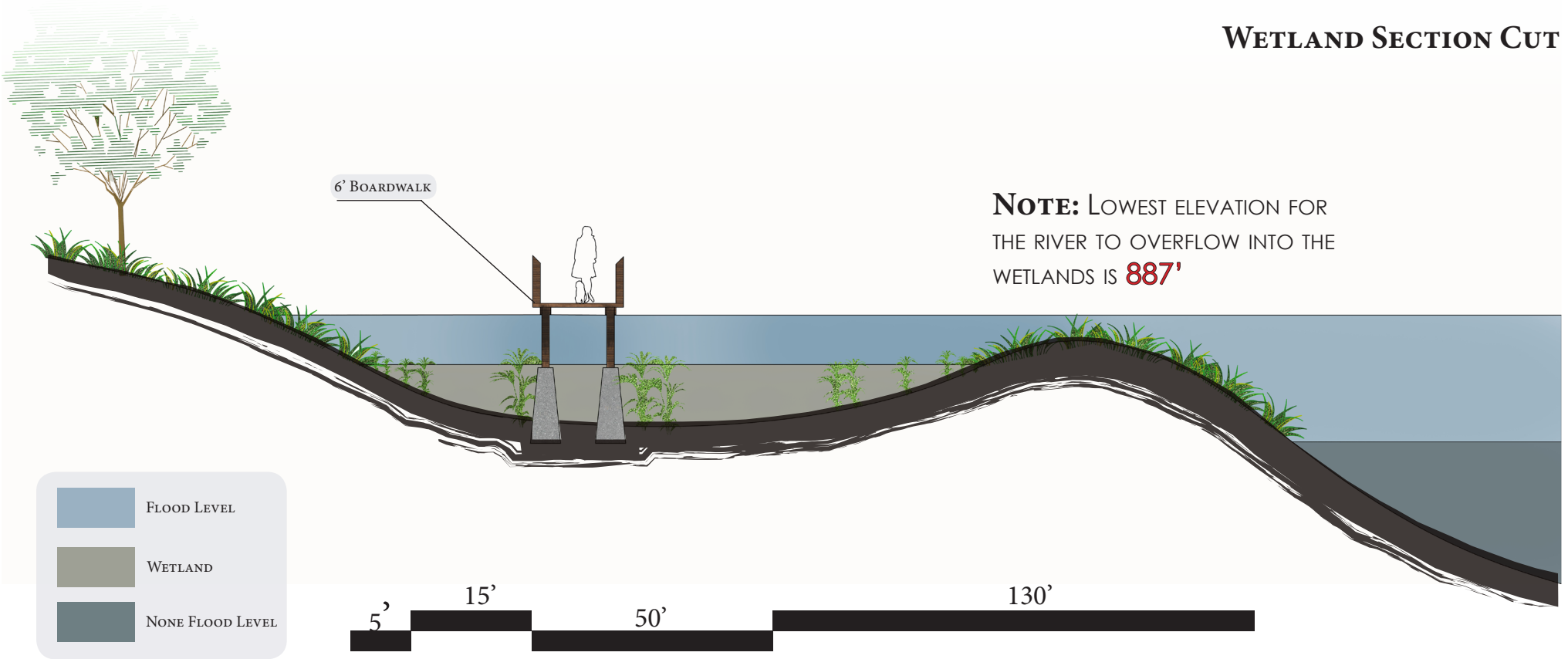
8' Asphalt Bike Trail or
6' Crushed Stone Trail
Maintenance Lawn/Prairie

8' Asphalt Bike Trail or
6' Crushed Stone Trail
Prairie/Wooded

8' Asphalt Bike Trail or
6' Crushed Stone Trail
Maintenance Lawn/Wetlands



Wetland Section Cut



Discussion

Research Summary

According to my research by introducing a multimodal greenway with flood control and an incentive program we can improve the quality of life in the Fargo-Moorhead Metropolitan Area. The multimodal greenway will provide an opportunity with incentives for both individuals and the larger community to choose more sustainable commuter options. By using naturalistic wetlands as retention reservoirs in the occurrence of a flood we will also create a naturalistic escape from the city for both pedestrians and cyclists using the greenway corridor. Upon success the greenway poses great potential in expansion to include all remaining parcels adjacent the Red River in the Fargo-Moorhead Metropolitan Area.

References & Appendix:

- COG, M. Metropolitan Bicycle and Pedestrian Plan, 2011
- COG, M. The Long-Range Metropolitan Transportation Plan (MTP), 2014
- COG, M. Metropolitan Transit Development Plan (TDP), 2012
- COG, M. Demographic Forecast, 2012
- Motivators and deterrents of bicycling: comparing influences on decisions to the ride, M, Winters. G, Davidson. D, Kao. K, Teschke. January 2011, Volume 38, Issue 1, pp 153-168
- http://dirt.asla.org/2013/06/04/with-the-beltline-atlanta-wants-to-become-a-new-city/
- http://beltline.org/wp-content/uploads/2012/01/The-BeltLine-Emerald-Necklace-Study_Alex-Garvin-Associates-Inc..pdf
- http://beltline.org/
- COG, M. Corridor Studies. Red River Greenway Study. Retrieved December 19, 2013, from http://fmmetrocog.org/new/assets/documents/2012/Greenway%20Study.pdf
- COG, M. Information. 2013 Pedestrian and Bicycle Count Report. Retrieved December 19, 2013, from http://www.fmmetrocog.org/new/index.php?id=580
- www.kvly.membercenter.worldnow.com
- www.dero.com