

# Mending the Gap

Taking Advantage of Missed Opportunities  
Through Bridge Design

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To Charles F. Brant, the one who guided me to where I am today both as a person and architecturally. The one who sat with me while watching buildings get constructed during your visits, and laid on the floor to help me construct Lego® sets. The one who will never be forgotten! Life has been an adventure,

“I’ll tell you all about it when I see you again”

-Wiz Khalifa & Charlie Puth





# Mending the Gap

Taking Advantage of Missed Opportunities  
Through Bridge Design

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Mike Christenson: Primary Thesis Advisor



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Mike Christenson, Thesis Committee Chair



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**Can a bridge be more than just a passageway to get from one side of a natural feature to another? Can different typologies be integrated into bridge design to create more of a destination than just a passage?** Bridges have been around throughout the history of mankind, whether it was a log crossing a mud hole or the Golden Gate Bridge spanning over a mile. What these two widespread examples have in common is that they are both solely used to travel over an obstacle. A bridge can be much more than just a way to cross a difficult path. With bridges being greatly utilized in larger cities, additional uses and activities can be successfully integrated into bridge design to create a more interactive and impactful space for the surrounding community. This, in turn, will give bridges more of a purpose by creating a destination and landmark rather than just a passage. We must learn to design not for just the present but the future as well. By designing a bridge which integrates its surrounding landscape, one can bridge an obstacle, as well as bridge and connect a community. By understanding the surrounding community, its people, as well as their habits and interests, one can design a bridge that doesn't just act as a passageway but as an addition to the city.

Typology: Mixed-Use Bridge

Site: Minneapolis, Minnesota

# Thesis Narrative

## Introduction

Currently, bridges only serve one purpose; whether it be a vehicular bridge or a pedestrian bridge, and that purpose is to get its user from point A to point B. Pedestrian bridges miss a great opportunity to expand their uses by being occupied and explored rather than just crossed. Bridges are more often than not constructed in some of the most breathtaking areas, yet you can't always get the perspective you want from the side. Bridges allow you to have the perspective that cannot always be achieved, one from on top of the natural feature. By designing a bridge as a destination and a place to linger, one can take some time to enjoy that wonderful perspective rather than just pass by it. In addition, bridges also should be more aesthetically pleasing than just forms made of concrete or steel. Designing something that compliments nature rather than contrasts is a very important aspect of bridge design.

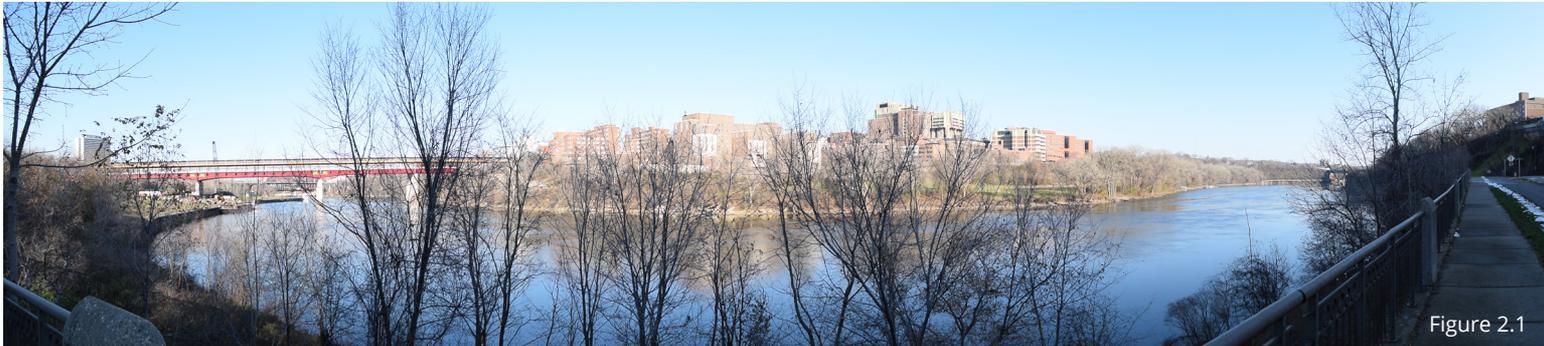


Figure 2.1



Figure 2.2



There are over 26,500 trips across The Washington Avenue bridge in Minneapolis on a single day. That striking number consists of only pedestrians and bicyclists. With pedestrian traffic becoming more common in growing and developing cities such as Minneapolis, there needs to be a shift in who or what we are designing for. Since the Federal-Aid Highway Act of 1956 was passed by Dwight Eisenhower, our country has been predominantly gearing road design towards the motor vehicle. A shift towards the pedestrian and cyclist has been seen developing over the last few years but not to the caliber it should be. In Minneapolis for example, bridges are much more prominent in and around the city due to the city's relationship to the Mississippi River being on the east side of the downtown area. Therefore, bridges are even more needed yet are scarce in places such as on the University of Minnesota campus where pedestrian traffic is even higher due to the student activity. Where there are bridges near campus, they are not geared towards the pedestrian but rather the car. Consequently, bridges should be designed with an emphasis on pedestrians as well as cyclists.

With that said, this is not the only issue at hand. Bridges are used to cross obstacles such as rivers, valleys, wetlands, canyons, lakes, as well as other natural features. What all these features have in common is that they were all created over time due to natural occurrences. In 2015 nearly 1.5 billion hours were spent in National Parks across the country. The natural features in the national parks, as well as features outside of parks, is what people greatly enjoy about the outdoors. Sadly, when not in a national park, onlookers are typically encouraged to cross over these obstacles and features with haste due to the lack of engaging things present. If a variety of typologies and features were integrated into bridge design, not only would it give people the opportunity to linger and spend time observing the landscape, but it would also give the bridge a more diverse use.



Lastly, bridges in the United States, according to NACE International (National Association of Corrosion Engineers), are built to have a fifty-year life span. Designing a bridge to only last fifty years may be the more affordable design option at the time, but designing cheaply is not always the best answer. With cheap design comes more expensive repairs, which likely occur more often. One example of this can be seen by looking at the comparison of asphalt versus concrete. Concrete will cost about one and a half times as much up front but will, on average, last about twice as long as asphalt. It just goes to show that designing cheaply in the beginning design phases may not always be the cheapest option in the long run. What is really important is to not waste materials, and to design projects to stand the test of time.

The Ponte Vecchio is a bridge that is a great example of all these concepts. Built back in the year 1345, it has successfully been around for almost ten times longer than the average bridge in the United States. In addition to that, it is home to dozens of shops and stores where people can stop in and look around or purchase items on the way home from work. With the design that the Ponte Vecchio has progressed into today, it has done so in a way that gives people the option to stay on the bridge for an extended period of time by integrating shops as well as vantage points of the river. Unlike most bridges in the United States, the Ponte Vecchio is a destination, not just a passageway.



Figure 4.1



By responding to the three concepts listed above, and designing a bridge that not only is around for centuries but also one that engages the users, architectural bridge design can change the way people, not only interact with the bridge, but the spaces it connects as well.



Figure 5.1

## The Typology

A project similar to this one is unique and is one that has only been done a handful of times. For this project, there needs to be a connection between the two banks in a way that not only integrated the green space on either side but also links the community together. Creating a place where people can come together and be proud to call it home or part of their community. In addition to the site integration, the project will also include a variety of building typologies that are needed or seen as prosperous and beneficial additions to the area. These typologies include apartments, office space, restaurants, bars, coffee shops, library, convenience store, shops, as well as an equipment rental office and desk. The bridge and its surround landscapes will integrate activities and things for people to do in order to bring the community together as well as provide a place for people to spend time together. A variety of seating will also be mixed into the bridge design in order to give the users a wide selection of seating types to fit their need or preference. Architectural bridge design can provide the surrounding community with a great addition to their area as well as creating a destination for locals and visitors alike.





Figure 7.1

## Project Emphasis

### Connecting Communities

One concept that is slowly dwindling away with today's society is that personal human interaction is happening less and less due to current and upcoming generations habit of relying more on technology to connect them with one another. With that said, connecting the communities that surround the site, Dinkytown and Prospect Park to the east and Seward and Downtown East to the west is something that I find to be very important given today's society. Therefore, bring everyone from the surrounding communities and beyond together is something that bridge design should strive to do.



Figure 8.1

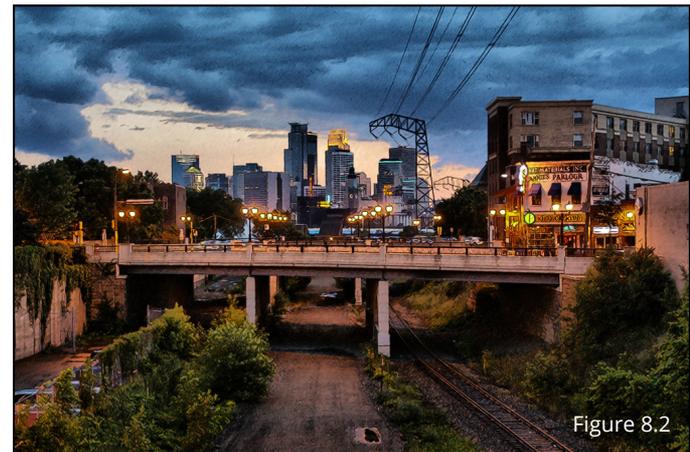


Figure 8.2

### Meet the Needs of the University and Community

The bridge will need to be made up of both buildings and activities that the users will enjoy and indulge in. Therefore, the bridge will have to incorporate such activities for the surrounding community and the visitors as well. As of 2009, the University of Minnesota (Twin Cities) has a revised campus master plan to help guide and influence their further development. This plan will be consulted in order to make a design decision that best reflects what the master plan feels is best for the campus.

With the average life span of a bridge in the United States being seventy years, it is important to work towards changing that number to be higher. By using materials that are capable of withstanding Minnesota's diverse climate, the bridge will require less maintenance as well as have an extended lifespan. By investing in the initial bridge design, it will help to ensure the bridge will be around to have a positive impact on as many generations as possible.



Figure 9.1



Figure 9.2

Bridges have been used to cross obstacles and get people and things from point A to point B for centuries. Since the development of recent bridge technologies over the last few decades, bridges have been missing out on a great opportunity to become much more than a means of passage. Bridges are typically placed in locations that would provide a great possibility for becoming a destination and landmark for locals and visitors.

## Minimize River Impact

One of the University of Minnesota master plan's guiding principles is to "Preserve and enhance natural systems and features". By designing the bridge to have minimal runoff as well as not impact the river banks and river as much as possible will contribute to the concept of that guiding principle. Not incorporating a structural support within the river is a good way in preserving the rivers micro-habitats as well as aesthetic. By incorporating all these concepts into the design, not only will it satisfy the client but it will also be doing good by nature.



Figure 10.1

Hennepin Avenue bridge in foreground, Central Avenue Bridge beyond



## Goals for the Thesis Project

### The Academic

This project will be the highlight and capstone to my collegiate career and will more than likely become the focal point to my portfolio. It will bring together all that I have learned architecturally thus far at North Dakota State University and produce one cohesive design project. This Thesis project will also be one of its kind and be unique when compared to the rest of my classes project topics.

### The Personal

For this thesis project, I hope to create a project that I can enjoy while designing and be proud of once it is complete. I also hope to show this project to the University of Minnesota in order to show them the type of opportunity their university is missing out on by not utilizing the river their campus is divided by. In addition to that, I hope to raise awareness to all the opportunities that bridges are missing out on around the country and globally.

### The Professional

By designing a project using a more in-depth design process I hope to take a step towards what designing is like in the professional workplace in order to have an easier transition into the professional field. This project will also become my focal point when it comes to finding a job at a firm that best fits my interests and abilities as I move into the professional practice.



## User & Client Description

### User

The users will consist of a wide variety of people, typically ranging from the ages of 18 to 65. The users will either be residents of the apartment complex, workers at one of the offices, employees of one of the many shops, restaurants, or bars. The user may also be a student at the University of Minnesota or the nearby Augsburg College. Since the campus is placed among several large neighborhoods near the city of Minneapolis, the user could also be a citizen of the surrounding community as well as a visitor.



Figure 12.1



Figure 12.2

### Client

Since the University of Minnesota is a state-run public university, the client would be the state of Minnesota. However, the client in charge of making a majority of the design decisions would be the board at the University of Minnesota. The various boards and committees at the university would be in charge of making the decisions for the project while keeping the interests of the university and its future in mind.

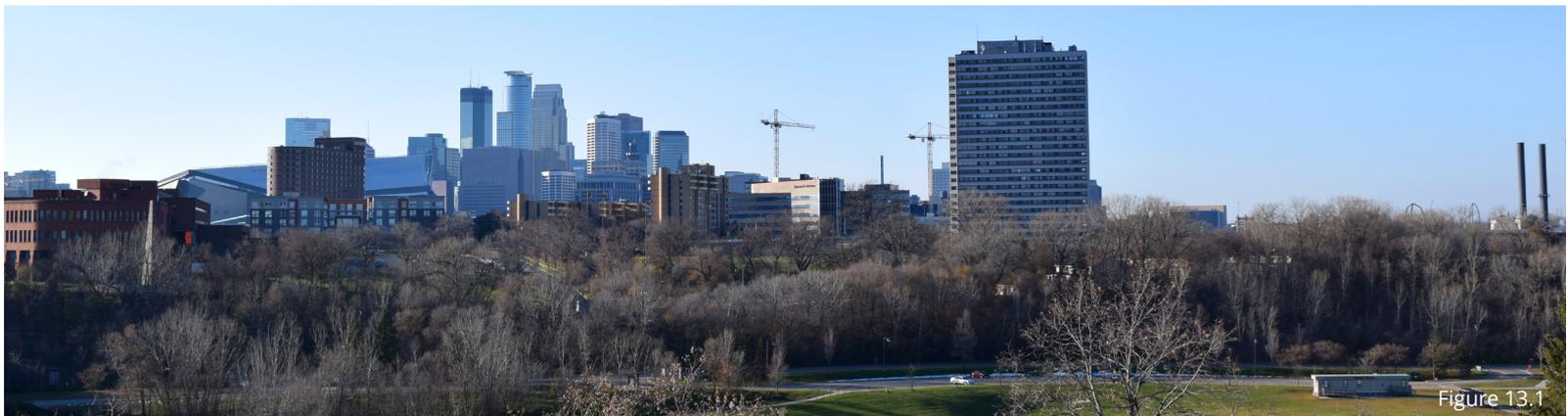
### Ownership

The University of Minnesota is a public university, and therefore, the state of Minnesota would be the owner of the new development. Portions of the building may be used by the university whereas other parts will be rented out or leased to other businesses and companies.



By designing a bridge with a variety of uses compared to its one traditional use, not only will it be a nice addition to the area and community but it will also serve as a precedent for future bridge design. By designing bridges with more of a purpose, they will serve as both a means of passage as well as a destination and place for locals and visitors to spend time and enjoy all that the area has to offer. For the University of Minnesota more specifically, this project will benefit the campus by adding an additional crossing point over the Mississippi River as well as providing the area with some much-needed building types that the area currently lacks. This will also make a nice focal point for the university when showing prospective students the developing campus and its close proximity and integration with nature despite its city location.

Bridges in the United States have an average life span of seventy years and are designed to only last fifty. With the large number of bridges in the country, it would be very beneficial for the environment to reduce the amount of building materials that ended up in the landfill each year from old torn down bridges. Therefore, by designing a bridge to last for at least a century, the amount of building materials used would be reduced and in turn reduce the amount of waste in landfills. Also by designing more of a landmark than just a typical bridge, the desire to keep it in good condition and functional for many years to come would be of great benefit to the university and the surrounding community.



#### Interpretive Research:

This project's research will all stem from looking into the different types of bridge structure and interpreting what those different forms could mean for the site and the campus as a whole. With there being several basic design options, looking into how those different types could limit the design composition and how they would have an aesthetic influence on the overall project.





Figure 15.1

## Project Documentation Methods

### **Physical Mediums:**

Hand Sketching  
Physical modeling  
Digital Graphics  
3D Printing

### **Design software:**

Autodesk Revit 2017  
Sketchup 2017  
AutoCAD 2017  
Rhino  
Fuzor

### **Graphics Software:**

Adobe Photoshop  
Adobe Indesign  
Lumion

## Final Project Documentation

**Project book:** The project book will be made up of the design process and research that went into producing this project. It will contain graphics as well as descriptions to help the reader better understand all that went into the project.

**Project Boards:** A graphical compilation of final renders, plans, and elevations. This display will help the project speak for itself through brief descriptions and explanations accompanied by graphics.

**Physical Model:** A site model will be made to help the viewer understand the surroundings and elevations of the area. Integrated into the site model will be a model of the project's final design to show how the bridge is integrated into the site.

**Presentation:** At the end of the project, a graphic presentation accompanied by an oral presentation will be given to faculty, critics, family, friends, and visitors. This will be done to critique the work that I have done over the course of the year to help me grow and become a better designer.

**Animated Video of the Project:** To accompany the presentation as well as the project board display, an animated video will be made. This is to help the onlookers and views to have a more comprehensive understanding of the design and hopefully communicate why some of the design decisions were made.



Thesis Project Schedule

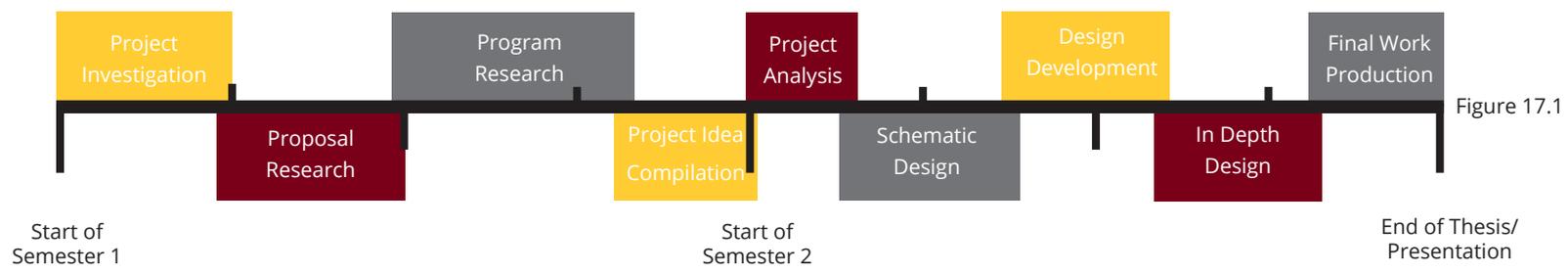


Figure 17.1



Figure 17.2

Still image from an Unreal Engine animation (Apartment)



# Research & Discoveries

## Unifying Idea Research

### Outdoor Spaces

Incorporated in the bridge program will be outdoor spaces both on the bridge and the surrounding site. This is something that will be important in order to keep visitors on site for an extended period of time due to people's interest and desire for outdoor experiences. One thing that will highly influence the success of the project is how well and often the visitors or residents interact with the spaces integrated into the design. Skyline Park in downtown Denver, Colorado is a park that has been fairly successful since it opened in 1975. This one-acre park is three blocks long located in the heart of downtown Denver. The perimeter of the park is surrounded with many different species of shrubs and trees in order to create a barrier from the traffic and the noise of the city. In the 1980's, the use of the park saw a drastic decline and as a result it underwent a major redesign in 2003. Now, throughout the course of the year, the park is transformed for multiple functions depending on the season. There is a mini golf course, ping pong, corn hole, a dog park, as well as open green space and a water feature. According to downtown Denver's website, a beer garden, as well as a movie series takes place during the summer.



In the winter they noted that an ice rink is set up where there is open skate as well as broomball leagues. According to Tami Door, Downtown Denver Partnership's CEO and President, during the winter of 2014-2015 the rink saw almost 49,000 skaters. From the success of this park, one can infer that parks with activities and green spaces are more utilized by the public particularly when in a dense urban environment. The author of Parks: Design and Management, Leonard Phillips said that, "Most urban residents want physical recreation facilities. They want attractive parks that also serve a purpose." Now with a majority of the country living in the urban environment, the design process used in the suburbs is no longer relevant to designing modern parks in a city. The amount of open space in most cities is often limited if not nonexistent, therefore, designing parks has changed drastically in the last fifty years. Not only will development of the existing parks and landscapes near the potential bridge's site take place, but the incorporation of new activities and green spaces will as well. These green spaces will not just be



Figure 19.1



Figure 19.2



open grass fields, but there will be actives and various types of seating spaces as well. Activities such as volleyball, corn hole, mini golf, shuffle board, among other activities will be integrated into the design of this bridge and the surrounding park. In terms of seating spaces, there will be various benches and tables along the main walk way as well as some quiet more secluded spaces where one can get away from the city life. This bridge's design will incorporate something for people of all ages.



Figure 20.1



Figure 20.2



Figure 20.3



Figure 20.4



Figure 21.1

## Site and University Research

Site location will also play a major role in the success of the project. The site chosen for the bridge is on the University of Minnesota's Twin Cities Campus. The campus is divided by the Mississippi River and split into the East and the West Bank (excluding the St. Paul campus). There is currently only one way to cross the river in order to get from one bank of the campus to the other and that is via the Washington Avenue Bridge. This bridge was constructed in 1965 and is 1,130 feet long with six total spans, two of which required supports in the river. The bridge was originally designed for vehicular and pedestrian traffic using steel girders. In 2013, additional structural support was added to account for a second level which incorporated the light rail system.



The University of Minnesota had 51,526 total enrolled students, in 2013 making them the sixteenth largest university in the country. This site has a lot of potential due to the large student body and amount of people that live both in the city as well as the metropolitan area. In 2015, the Washington Avenue Bridge had an estimated 7,370 bicyclists and 20,350 walking pedestrians daily, making it the busiest bridge for both types of pedestrian transportation in the state. The large amount of pedestrian traffic is due to the bridges great location, not only linking the banks of the university's campus but also linking the east bank to downtown Minneapolis. The Washington Avenue Bridge is one of two bridges that can be used by pedestrians between the 35W and the 94 river crossing, which are about a mile and a half apart. With that aside, the number of pedestrians at twenty-three benchmark locations increased twenty-six percent from 2007 to 2015, and the number of bicyclists increased fifty-three percent during the same time frame at thirty benchmark locations. This demonstrates that in a high density city like Minneapolis, pedestrian transportation is becoming increasingly popular. With this as a trend, this site makes for a perfect area to design another pedestrian dominant bridge, which will then be used as a precedent for future bridges of its kind.



In addition to the ideal bridge location, there are several guiding principles in which the University's Master Plan of 2009 incorporated, and once constructed the bridge design would satisfy several of these principles. The eleven guiding principles were used to derive 41 key guidelines in which the campus will follow to develop the campus to its full potential. Below is a list of guiding principles (but is not limited) that will be used during the design process of the new bridge:

- Cultivate a genuine sense of community.
- Strengthen connection to adjacent communities.
- Create a cohesive, memorable system of public spaces.
- Foster a safe, secure and accessible campus environment.
- Preserve and enhance natural systems and features.
- Integrate transportation systems to emphasize pedestrians, bicycles and transit.

The east side of the potential bridge is a part of East River Flats Park, which is a short walk from the Coffman Memorial Union. On the west end of the bridge is the Ted Mann Concert Hall which has green space that will be integrated into the design. Therefore, both ends of the bridge would connect with green space of some sort as well as having some green space on the bridge itself. One of the difficulties with this site is the wide river span. The ideal bridge would not incorporate any structural supports in the river and therefore, would consist of a single span that is around 700 feet long. This is a desirable design consideration so the river bed as well as the river banks are disturbed as little as possible. It is definitely an attainable project goal, but it is something that will have to be considered early on as it will affect the bridge's structural thickness and the structure type.



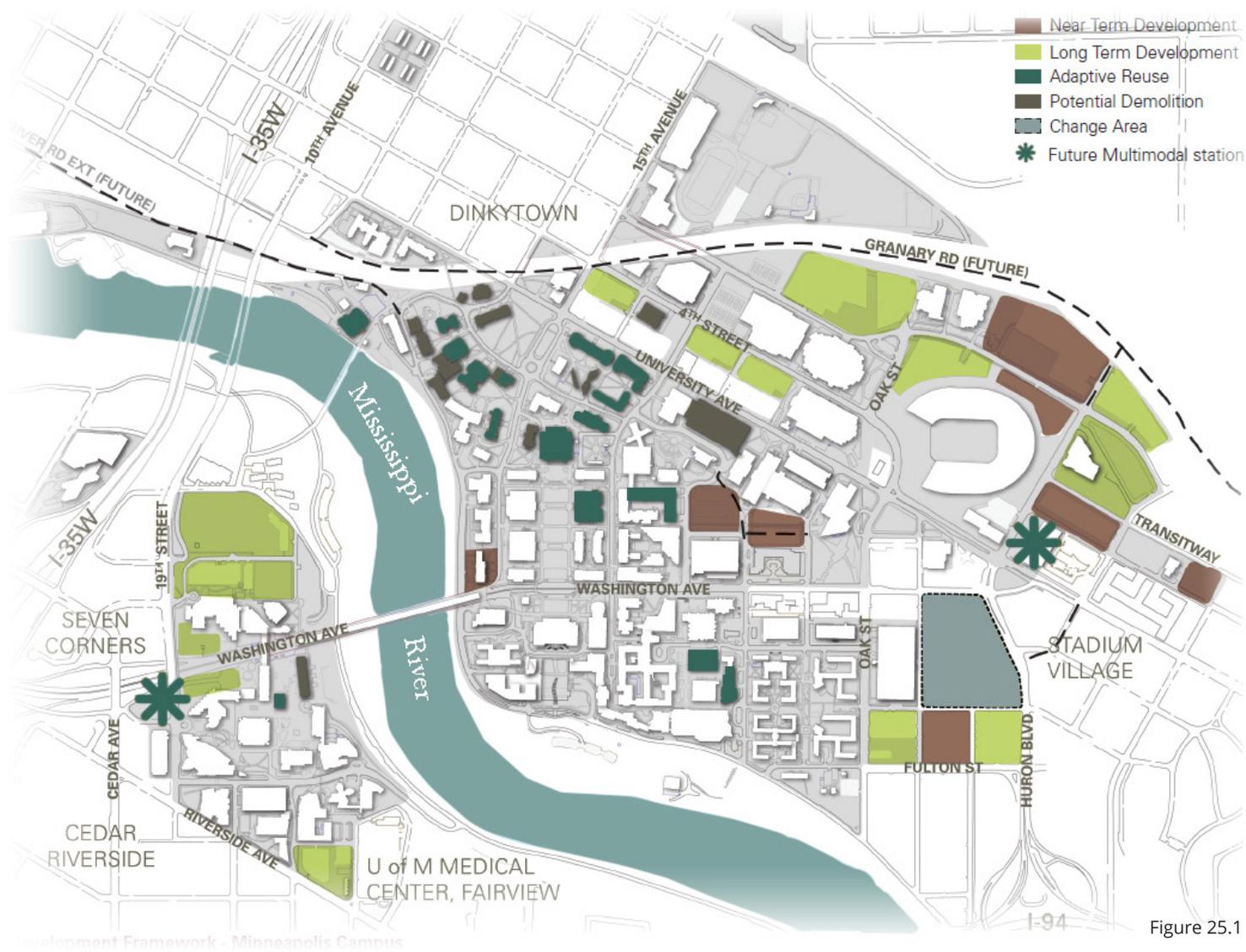


Figure 25.1



## Building Typology Research

Another important concept to this design project will be the integration of mixed-use buildings into the bridge composition. From the initial analysis, some types of stores that the area could use are as follows: a small convenience and grocery store, coffee shop, bar and restaurant, a fitness center, equipment check-out office for the activities on the bridge, and residential apartments. According to a Harvard research study, "54% of Americans over the age of 18 drink coffee every day" and "The U.S. spends \$40 billion on coffee each year." With a majority of the users of the bridge being adults due to the location within a city and being on a college campus, a coffee shop would be a successful typology to have on the ground floor of the bridge. The fitness center would be a successful addition for the university since their gym is near the north east corner of the campus, about a mile and a quarter walk from the Carlson School of Management. Having a gym on the bridge would reduce the distance to a gym by one half. Many people don't exercise because its inconvenient for them to do so. By designing another gym closer to the west bank, it will make exercising more convenient and accessible to students in that area. Another thing that is nice to



Figure 26.1



Figure 26.2





Figure 27.1



Figure 27.2

have in a convenient location is a grocery store. All of the grocery stores are a few blocks from the perimeter of the campus, and having a store located centrally on campus would be nice for those who want to buy groceries or just grab a quick snack between classes. A bar and restaurant when located near a college campus, if managed right, is very likely to be successful due to college student's habits of drinking as well as dining out. According to a study done at Villanova University, "about 80 percent, of college students use alcohol." Lastly, apartments would appeal to college students due to the convenient location in proximity to their classes. In addition, the apartments could also appeal to business professionals who work in Minneapolis due to its close location to the downtown area. The bridge would be about two and a quarter mile from the financial district of Minneapolis, making it a short bus or bike ride to work for the residents.

## Outside Noise Reduction

With so many activities happening simultaneously, a major issue for this project is noise reduction for both indoor and outdoor spaces. Additionally, a bus lane will be incorporated into the bridge design in order to increase its functionality as well as accessibility for all. The bus lane will also double as a bike lane due to the increase in cyclists in the Minneapolis area. The bridge will have a variety of area types, both private and exposed so people can make the space what they want it to be. Whether that be a group of people cheering and playing corn hole on the plaza or a couple cuddled on a private bench watching the sunset, the bridge will have a space for many different types of activities. According to Thomas Elmqvist, "Green walls can, if properly constructed, reduce up to 40 dB of outdoor noise and vibration." If green walls as well as water features are placed where the desired noise level is to be lowered, quieter spaces within a city, and specifically this project, are able to be obtained. Using the previously stated strategies alongside vegetation barrier incorporation, noise should be able to be controlled to a reasonable decibel level when outside.



Figure 28.1



Figure 28.2



Figure 29.1

## Precedent Analysis

### Tabiat Bridge

**Location:** Tehran, Iran

**Construction Complete:** 2014

**Architect:** Leila Araghian

**About:** The Tabiat Bridge is Iran's largest pedestrian bridge which spans 890 feet, consisting of 3 tiers and spans over the Shahid Modarres, one of the city's major highways. On either side of the highway rest nature filled parks, which are now linked via the Tabiat Bridge.

The bridge was designed using five main principles (depicted to the right):

- 1 - Connecting the parks at more than one point
- 2 - The bridge is not only a path, but a place to stay
- 3 - Avoid one point perspective with a curvilinear form
- 4 - Place columns in locations where the least amount of trees would be impacted
- 5 - Have the depth of the structure large enough to create architectural spaces

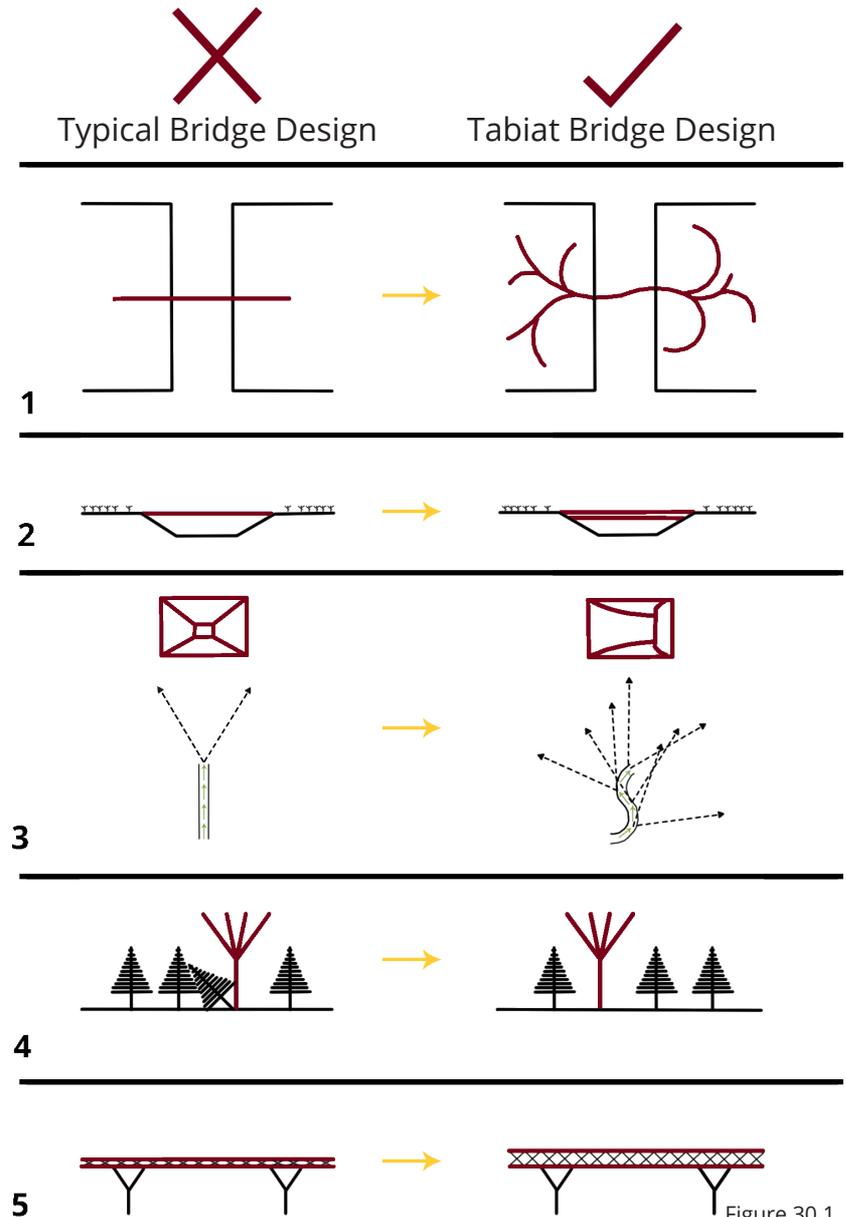


Figure 30.1





The Tabiat Bridge was completed in 2014, and instantly became popular to locals in the city of Tehran, Iran. The Iranian Architect Leila Araghian spoke about her design by saying, “I wanted it to be a place for people to stay and ponder, not simply pass.” Its intent was to connect two sides of a park which were divided by one of Tehran’s largest highways, but it doesn’t just bridge the highway, rather it creates an extension of the park using walkways and restaurants. This bridge’s design also creates a stronger communal bond between the two sides due to its multi-purpose design. The Tabiat Bridge is a great example of how history can repeat itself by reimagining previously successful ideas and turning them into something that is successful today. This example shows that bridges can be designed in a much more successful and utilized manner than the common bridge which we see in America and around the world today.





Figure 32.1

**Conclusions:** The Tabiat Bridge has a lot that one can learn from when it comes to designing both a pedestrian bridge as well as the integration between two parks. The five principles that were used to design this bridge are nearly all relevant to the potential bridge design on the University of Minnesota Twin Cities Campus. Connecting the bridge with East River Flats park in more than one spot allows for easier bridge access for all the potential users and integrates more of the park than if one walkway was used. Another interesting idea is using a curvilinear form to avoid a one point perspective bridge which can be seen as being visually unappealing. Lastly, the idea of placing columns where they leave the least amount of impact on the surrounding environment is crucial, not only when designing in tree covered parks but also when near a river, such as the Mississippi.



Figure 33.1

## Ponte Vecchio

**Location:** Florence, Italy

**Construction Complete:** 996 /1345

**Architects:** Taddeo Gaddi, Neri di Fioravante

**About:** The earliest documentation of the Ponte Vecchio dates back to 996, when the initial bridge structure was built. However, the buildings on the bridge were added at a later date during the 13th century. The bridge spans the Arno River in Florence, Italy and has a total length of 276 feet. The structure is made of stone due to its availability and structural capabilities when the bridge was rebuilt for a second time in 1345 after being, again, swept away by a flood. Today the bridge houses jewelry and leather shops as well as several other types of shops. The bridge consists of one main central path, and near the center of the bridge the shops disappear and in their place are arched openings where views of the river can be seen.





Figure 35.1



Figure 36.1



a new colour  
Figure 36.2

This 700-year-old bridge is unique because not only is it a pedestrian bridge, but is also home to markets, butcher shops, restaurants and jewelry stores which line the walkway. Shortly after the bridge was built, few of the neighboring bridges on the Arno River could withstand the floods and debris floating down the river. A lot of times the pillars were swept away by the fast flowing currents or large pieces of debris. What Taddeo Gaddi decided to do was use lower and wider arches in order to have fewer pillars in the water. This allowed the debris to flow under the bridge and allow the water to flow more freely with less resistance. During World War II, Adolf Hitler came to Florence and prior to his arrival, bigger square windows were put in to allow him to admire the view. When the Germans were retreating in 1944, the Ponte Vecchio was the last bridge left standing not to be bombed by the Germans.





Figure 37.1



Figure 37.2

**Conclusions:** The Ponte Vecchio is the most relevant precedent that can be looked into for a project type such as this. This is where the inspiration for the design project started and where the most can be learned. The relevance to the Ponte Vecchio comes strongly from the use of the buildings on the bridge. For this project, building integration on the bridge will be much more present than it was on the Tabiat bridge. Yet with the building integration, greenery and open space will need to be evident throughout in order to provide the community with spaces to spend time in rather than just passing through. Lastly, the idea of breaking up the building facades in order to allow for views of the river and surrounding town was a very nice touch to allow for an enhanced visitor experience.

## High Line

**Location:** Manhattan, New York, New York

**Construction Complete:** 2014

**Architects:** James Corner Field Operations, Diller Scofidio + Renfro, and Piet Oudolf

**About:** The High Line was designed in three stages, the first being completed in 2009 and the last section wrapped up in 2014. The total length of the completed High Line is nearly a mile and a half long. The High Line used to be an old railroad that was above the street level of New York where goods were transported in and out of the city. During the year 1980 the last train used the line due to the expanding trucking industry in the United States. In 2002, the planning for the revitalization of the High Line began. The park now includes native vegetation, public seating, and walkways. In addition to the parks features, along the walkways users are provided with great views of both the city and the Hudson River in spots along the way.



Figure 38.1

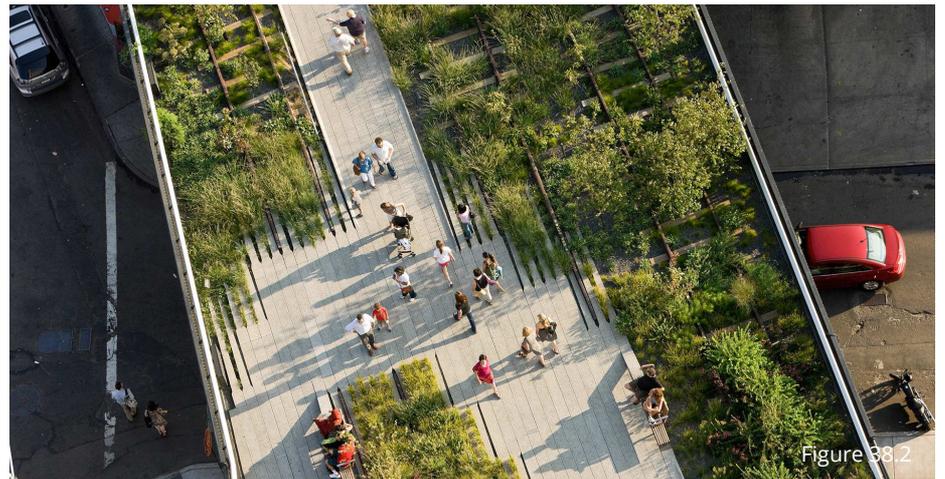


Figure 38.2





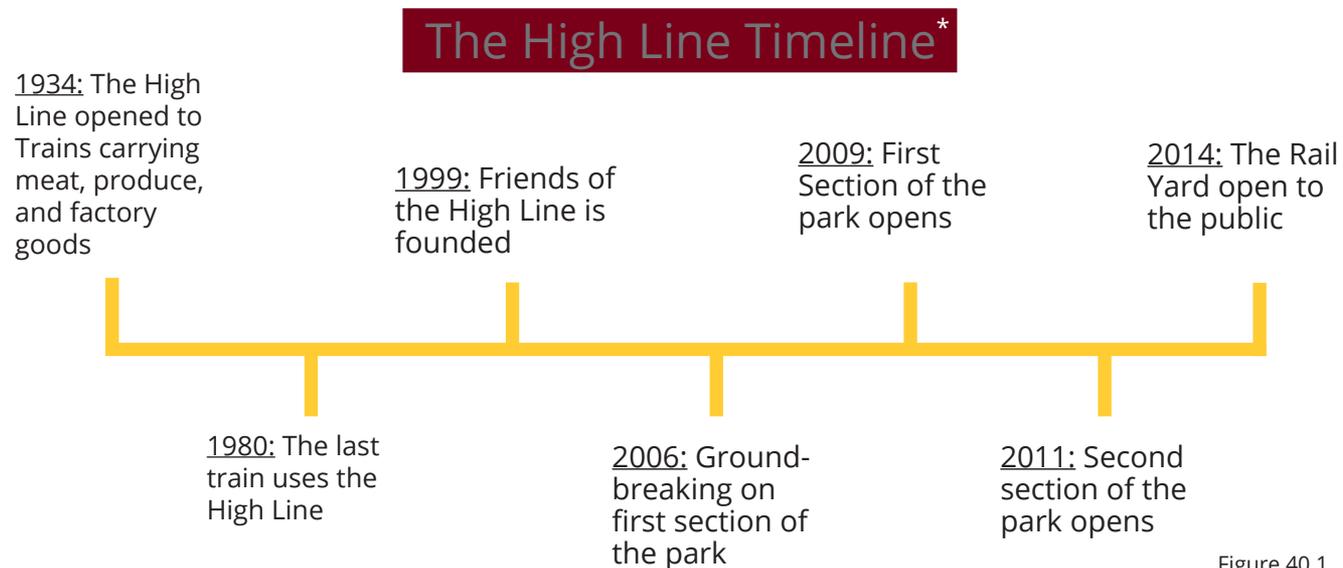
Figure 39.1



Figure 39.2



**Conclusions:** The High Line is a very unique project that was integrated into the city due to its preexisting nature. For this design project, not only will the bridge design incorporate two parks but also the city as well. By looking at the High Line, one can learn how to build a city around a bridge, and therefore, look at it in the other order and learn how to build a bridge around a city. The project may not directly connect to downtown Minneapolis, but it would ideally link the University of Minnesota and the downtown areas together. The use of over 350 species of native plants are also a good design choice in order to select plants that are indigenous to the area which will provide greenery year round. Also incorporated into the design were several different types of seating, which allows for the user to select a spot depending on their desired activity while occupying the space.



\*Timeline information and phrasing, courtesy of thehighline.org

Figure 40.1





Figure 41.1

## Programming

### Problem Statement



**Function:** The University of Minnesota Twin Cities is divided into an East and West bank due to the Mississippi River running through part of the campus. The University is also in close proximity to Downtown Minneapolis which provides the project with a potentially diverse user base. Due to the limited number of bridge crossings in the area, another bridge in the desired location is important for the flow of students and civilians alike when walking about the campus. Along with another bridge being desired several other building typologies are in need in the area or are anticipated to be very successful once opened. Therefore; by intertwining the buildings into the bridge design the bridge will not just be another pedestrian bridge but a destination and landmark for the campus and the city as well.



**Economy:** With the scale of this project, the University is aware that the cost will be very high. With that said, they want to go through with it and do it right without cutting any corners. They are prepared to gather funds from their wide range of Alumni as well as money from the state and local governments to fund a portion of the project and acquire long terms bonds for the remaining costs.



**Form:** The University of Minnesota Twin Cities, is driven to increase the amount of outdoor space on campus, and therefore, they are very interested in integrating green space on both ends of the bridge. This would include East River Flats Park on the East bank, as well as a smaller plot of green space on the West Bank. Also due to the University being built around the Mississippi River, their guiding principles of development include the preservation and enhancement of the natural systems and features in and around the campus. Thus, leaving the river and its banks undisturbed is a must for this project.



**Time:** The University it determined to make this project long lasting and therefore wants to take the time to make sure it is done right and with high quality craft. The project shale not be rushed but done to stand the test of time.



Square Footage Basics

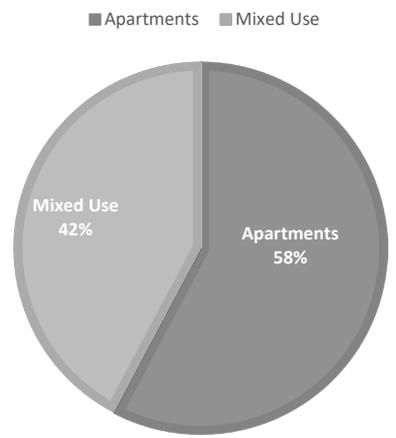


Figure 43.1

Square Footage Details

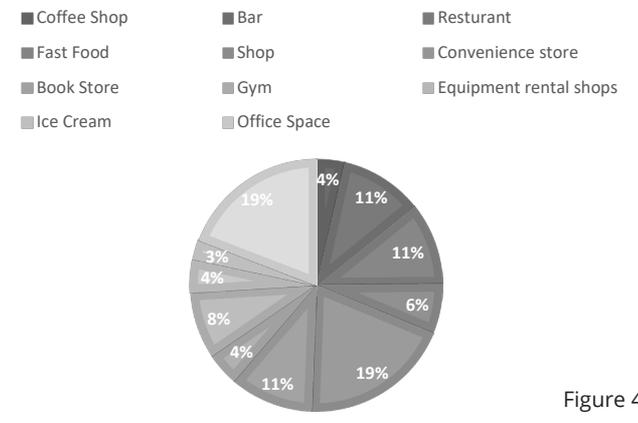


Figure 43.3

Occupancy

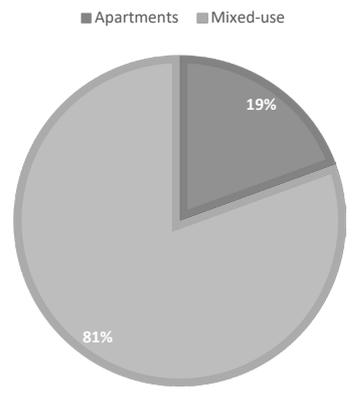


Figure 43.2

Land Use

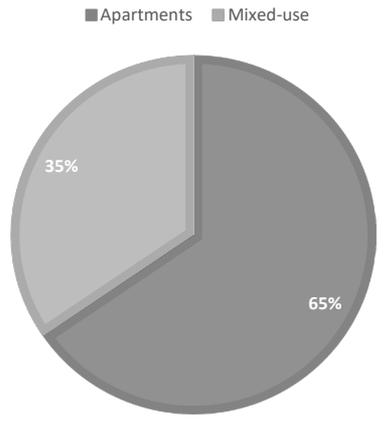


Figure 43.4



**Basic Space List**

Basic Space List Sorted by Client Organization					
Building Type	Room/Area Name	Number	NSF/Unit	NSF	Qualitative Comments
Apartments	2 Stories				Make a variety of luxurious and standard units
	Studios	12	425	5100	
	1 Bedrooms	15	675	10125	
	2 Bedrooms	25	950	23750	
	3 Bedroom	12	1250	15000	
	4 Bedroom	7	1450	10150	
	<b>Apartment Total</b>	<b>71 Units</b>		<b>64125</b>	
Mixed-use	Coffee Shop	1	1675	1675	Have a variety of seating throughout
	Bar	2	2500	5000	Appealing to college students as well as young professionals
	Resturant	2	2500	5000	Nice Italian resturant, nicer food than burgers/bar food
	Fast Food	3	1000	3000	Something like a Jimmy Johns or Chiotle (No Mc. Donalds)
	Shop	7	1300	9100	Local and small business shops, No chains
	Convenience store	1	5000	5000	Something Like a Target Express = Food and essentials
	Book Store	1	2000	2000	Something like a B&N but with more Textbook options
	Gym	1	4000	4000	Similar to a Snap Fitness or 24 Hour Fitness
	Equipment rental shops	2	1000	2000	Place to check out equipment for activities on the bridge
	Ice Cream	1	1200	1200	Place to grab a delicious treat
	Office Space	6	1500	9000	Rentable office space for businesses
		<b>Mixed Use Total</b>			<b>46975</b>
<b>Total Interior</b>				<b>111100</b>	

Figure 44.1



Building Area Summary									
Building Type	Room/Area Name	People/Unit	Capacity/Unit	Number of Units	NSF/Unit	Occupant Load Factor (IBC 2015 Used)	Number of Occupants/Unit	NSF	Total Occupants
<b>Apartments</b>									
<b>2 Stories</b>									
	Studios	1	1	12	425	200	2	5100	26
	1 Bedrooms	1	2	15	675	200	3	10125	51
	2 Bedrooms	2	3	25	950	200	5	23750	119
	3 Bedroom	3	3	12	1250	200	6	15000	75
	4 Bedroom	4	3	7	1450	200	7	10150	51
	Apartment Total	141	448	71 Units				64125	321
			589						
<b>Mixed-use</b>									
	Coffee Shop	6	44	1	1675	$15 \cdot 9 + (200 \cdot 1) = 33.25$	50	1675	50
	Bar	12	91	2	2500	$15 \cdot 95 + (200 \cdot 05) = 24.25$	103	5000	206
	Resturant	15	88	2	2500	$15 \cdot 95 + (200 \cdot 05) = 24.25$	103	5000	206
	Fast Food	4	12	3	1000	$15 \cdot 9 + (200 \cdot 1) = 33.25$	16	3000	48
	Shop	5	38	7	1300	30	43	9100	303
	Convenience store	10	61	1	5000	$30 \cdot 85 + (300 \cdot 15) = 70.5$	71	5000	71
	Book Store	4	24	1	2000	$30 \cdot 85 + (300 \cdot 15) = 70.5$	28	2000	28
	Gym	4	76	1	4000	50	80	4000	80
	Office Space	15	30	6	1500	$100 \cdot 0.85 + (15 \cdot 0.15) = 87$	45	9000	270
	Ice Cream	6	44	1	1200	$15 \cdot 9 + (200 \cdot 1) = 33.25$	50	1200	50
	Equipment rental shops	3	7	2	1000	100	10	2000	20
	Mixed Use Total	101	693					46975	1332
<b>Total</b>								111100	1653

Figure 45.1



Land Use Sorted by Client Organization							
Building Type	Room/Area Name	Total Occupants	Gross Building	Floor Building Footprint	GAC	Land Area	
<b>Apartments</b>							
	Studios	24	5950	2	2975	0.75	4463
	1 Bedrooms	45	9450	2	4725	0.75	7088
	2 Bedrooms	125	26600	2	13300	0.75	19950
	3 Bedroom	72	18750	2	9375	0.75	14063
	4 Bedroom	49	11600	2	5800	0.75	8700
	Apartment Total	315	72350		36175		54263
<b>Mixed-use</b>							
	Coffee Shop	50	1675	1	1500	0.85	1725
	Bar	206	2500	1	2500	0.85	2875
	Resturant	206	2500	1	2500	0.85	2875
	Fast Food	48	2000	1	1600	0.85	1840
	Shop	303	5200	1	4800	0.85	5520
	Convenience store	71	5000	1	5000	0.85	5750
	Book Store	28	2000	1	2000	0.85	2300
	Gym	80	4000	1	4000	0.85	4600
	Equipment rental shops	20	1000	1	1000	0.85	1150
	Ice Cream	50	1200	1	1200	0.85	1380
	Office Space	270	1500	1	1500	0.85	1725
	Mixed Use Total	1332	28575		27600		28635
<b>Total</b>			100925		63775		Land Area

Figure 46.1





Figure 47.1



Figure 47.2



Figure 47.3

	Outdoor Activities	Apartments	Offices	Coffee Shop	Bar	Resturant	Fastfood	Shop	Convenience Store	Book Store	Gym	Equipment Rental	Outdoor Space	Near Campus*
Outdoor Activities	Essential	Essential	Essential	Essential	Essential	Desirable		Desirable		Desirable		Essential	Essential	Essential
Apartments	Essential	Unnecessary	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable	Essential		Essential		Essential	Essential
Offices	Essential	Desirable	Unnecessary	Essential	Desirable	Desirable	Desirable		Desirable		Desirable		Essential	
Coffee Shop	Essential	Desirable	Essential	Unnecessary						Essential	Desirable	Desirable	Essential	Desirable
Bar	Essential	Desirable	Desirable		Unnecessary	Essential	Essential	Desirable	Desirable			Desirable	Essential	Desirable
Resturant	Desirable	Desirable	Desirable		Essential	Unnecessary		Essential				Essential	Essential	Desirable
Fastfood		Desirable	Desirable		Essential		Unnecessary	Essential					Essential	Essential
Shop	Desirable	Desirable			Desirable	Essential	Essential	Unnecessary				Desirable	Essential	Desirable
Convenience Store		Essential	Desirable		Desirable				Unnecessary	Desirable	Desirable		Essential	Essential
Book Store	Desirable			Essential					Desirable	Unnecessary			Essential	Essential
Gym		Essential	Desirable	Desirable					Desirable		Unnecessary	Desirable	Essential	Essential
Equipment Rental	Essential			Desirable	Desirable	Essential		Desirable			Desirable	Unnecessary	Essential	Essential
Outdoor Space	Essential	Essential	Essential	Essential	Essential	Essential	Essential	Essential	Essential	Essential	Essential	Essential	Unnecessary	Essential
Near Campus*	Essential	Essential		Desirable	Desirable	Desirable	Essential	Desirable	Essential	Essential	Essential	Essential	Essential	Unnecessary

\*Indicates not part of new design, but included for proximity relations

Unnecessary

Desirable Connection

Essential Conection

Figure 47.4

## Space Allocations

### **1:** Apartments

64,125 Square Feet

-71 Units (12 Studios, 15 One bedrooms, 25 Two bedrooms, 12 Three Bedrooms, 7 Four Bedrooms)

### **2:** Offices (6)

1,500 Square Feet

-Cubical Area, Private Offices, Restrooms, Conference Rooms, Storage, Lobby, Copy Room, Human Relations Offices

### **3:** Coffee Shop

1,650 Square Feet

-Preparation Area, Kitchen, Variety of Seating Areas, Restrooms, Storage

### **4:** Bar (2)

2,500 Square Feet

-Kitchen, Bar area, Seating Space, Restrooms, Storage

### **5:** Restaurant (2)

2,500 Square Feet

-Kitchen, Bar area, Seating Space, Restrooms, Storage

### **6:** Fast Food (3)

1,000 Square Feet

-Kitchen, Register Area, Seating Space, Restrooms, Storage

### **7:** Shops (7)

1,300 Square Feet

-Storage, Display Space, Open Floor Space, Checkout Area, Restrooms

### **8:** Convenience Store

5,000 Square Feet

-Storage, Cold Storage, Restrooms, Employee Break Room, Checkout Area, Open Floor Space

### **9:** Book Store

2,000 Square Feet

-Reading Areas, Book Stacks, Checkout Area, Restrooms, Storage

### **10:** Gym

4,000 Square Feet

-Locker Rooms, Storage, Office/Check-in, Open Floor Space

### **11:** Equipment Rental Office (2)

1,000 Square Feet

-Storage, Check Out Desk

### **12:** Ice Cream Shop

1,200 Square Feet

--Kitchen, Register Area, Seating Space, Restrooms, Storage

---

**Total: 111,100 Square Feet**



The chart on the previous page lays out the different types of businesses and spaces that bridge will integrate. Below are the general square-footages of the different space requirements when compared to one another. The number in the graphic below correlate to a row in the chart on the previous page.

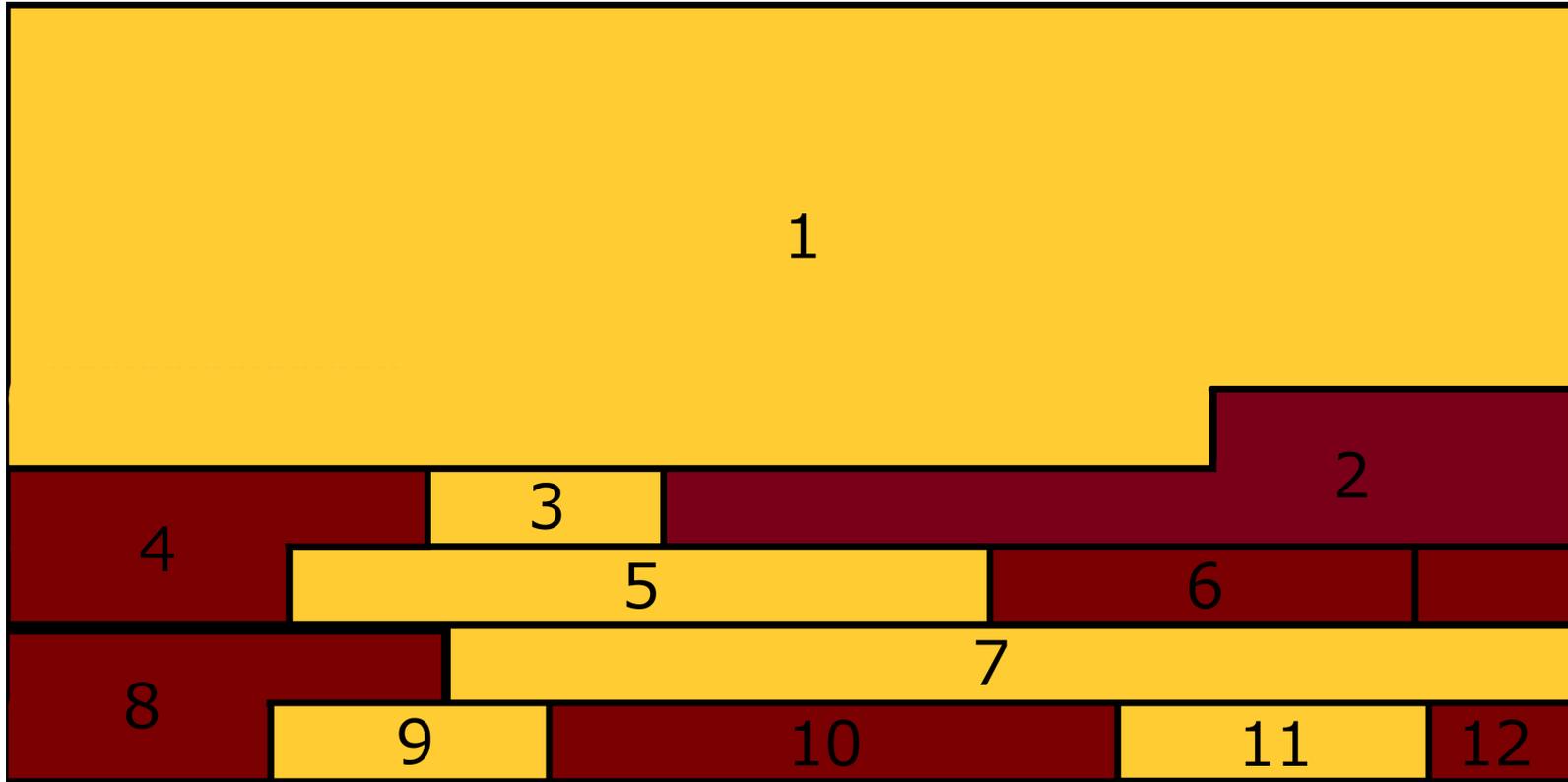


Figure 49.1



Figure 49.2



Figure 49.3



Figure 49.4



## Site Analysis

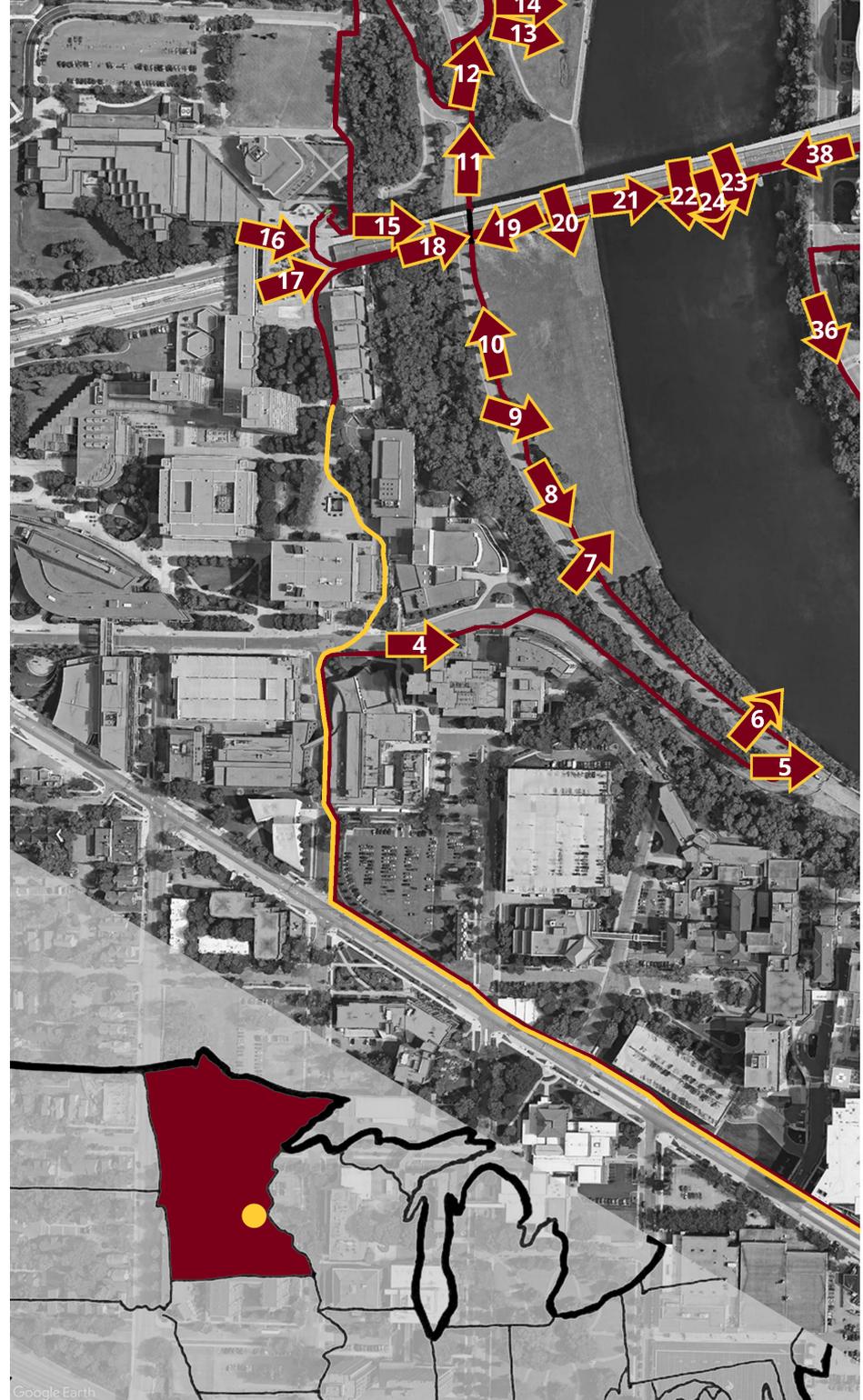
### Site Visit

#### Site Visit #1:

The first visit to the site was done on November 26<sup>th</sup> 2016 at around 12 in the afternoon. It was an unseasonably nice day for a visit this late in the year.



The map to the right shows the immediate surroundings of the site. The arrows denote the direction that the picture was taken, and the number corresponds with a photo on the following pages. The numbers for the photos can be found on the lower right corner of each image (See example above).



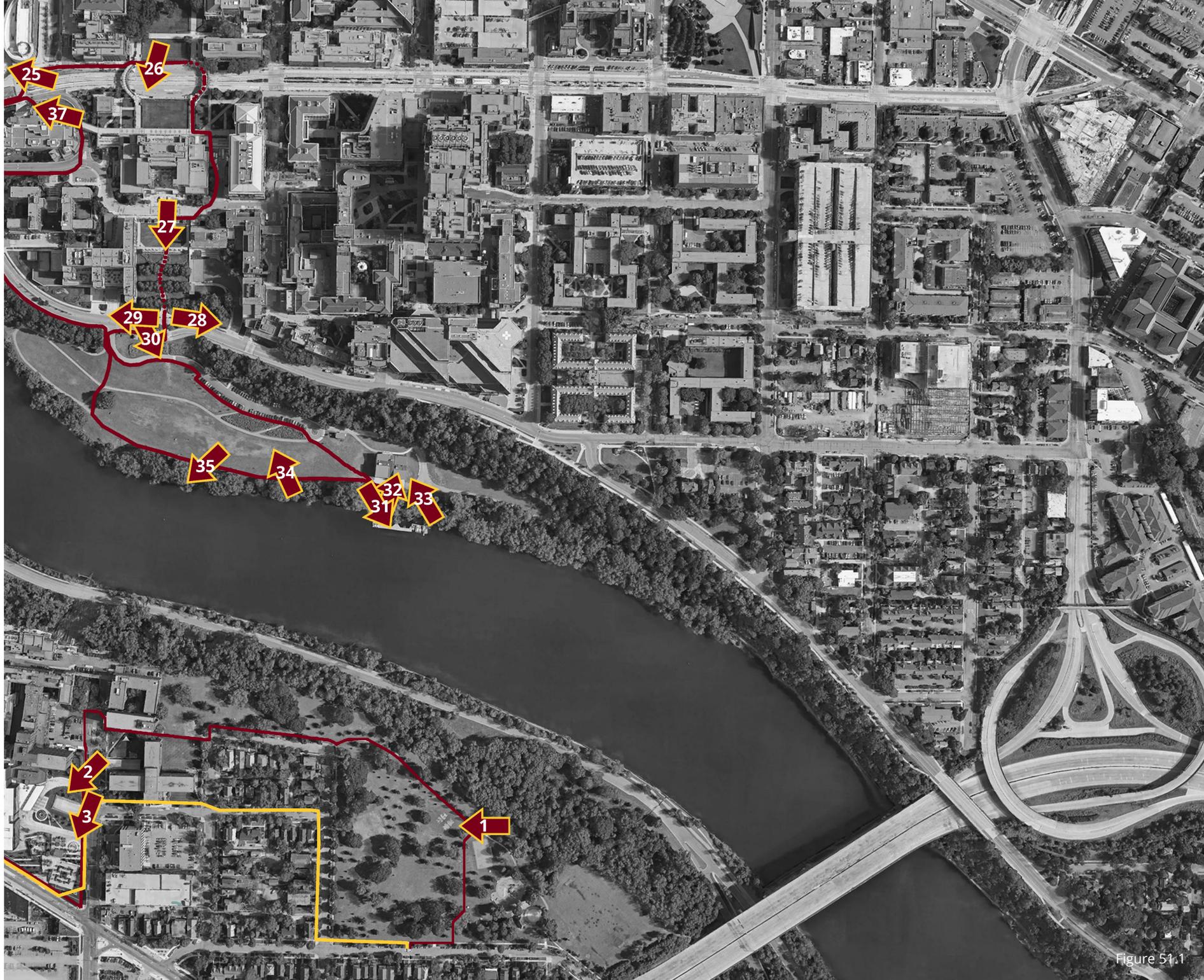


Figure 51.1



Figure 52.1

1

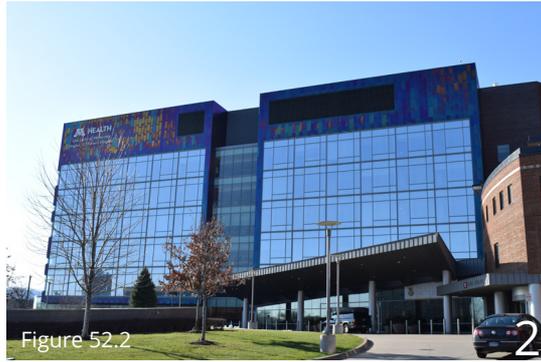


Figure 52.2

2



Figure 52.3

3



Figure 52.4

4



Figure 52.5

5

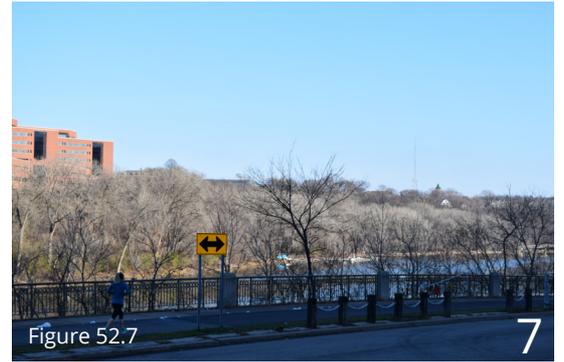


Figure 52.7

7

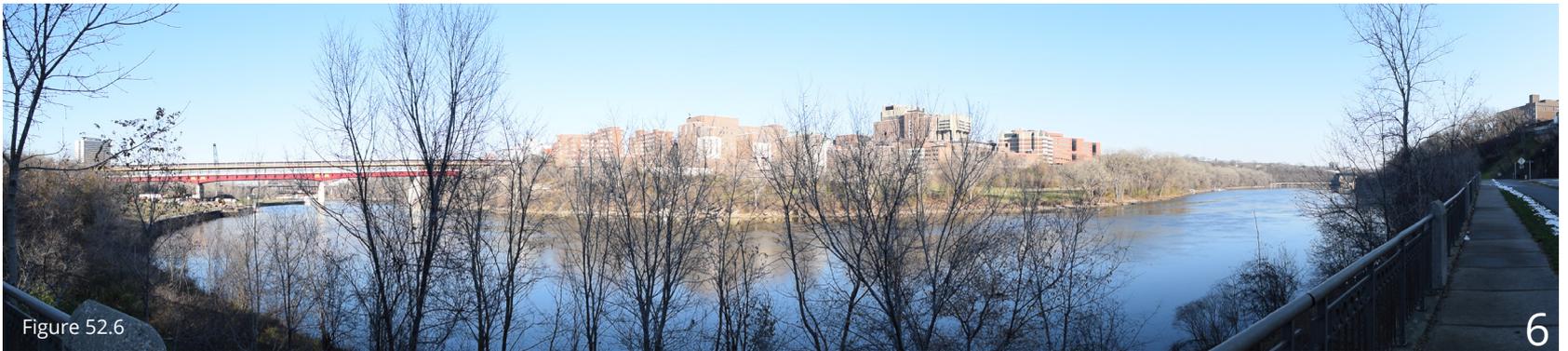


Figure 52.6

6





Figure 53.1

8



Figure 53.3

10

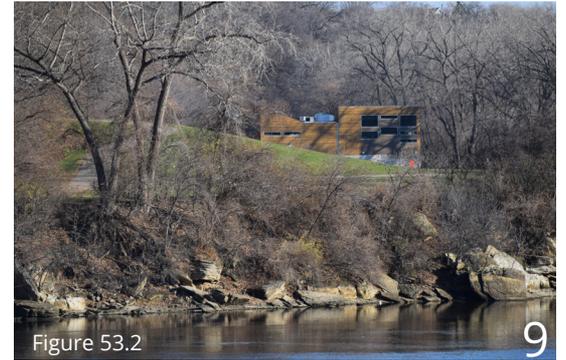


Figure 53.2

9



Figure 53.4

11



Figure 53.5

12



Figure 53.6

13

Prior to image number 14, all of the photos taken on the site visit were done so on the West Bank of the University of Minnesota Campus. There was a lot of green space near and around the future bridge site, which is good for the bridge and green space integration.



Figure 53.7

14



Figure 54.1

15



Figure 54.2

16



Figure 54.3

17



Figure 54.4

18

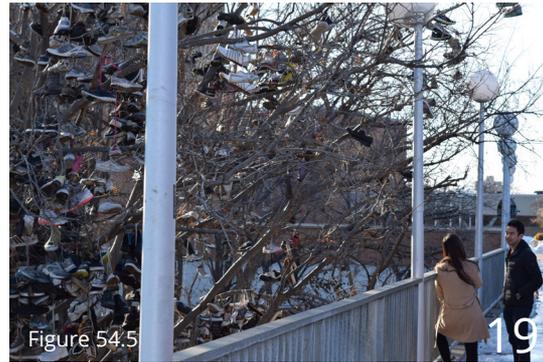


Figure 54.5

19



Figure 54.6

20

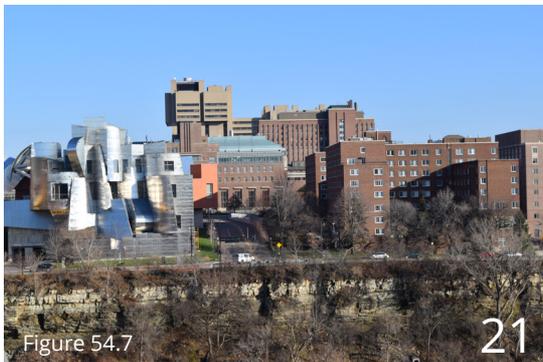


Figure 54.7

21



Figure 54.8

22

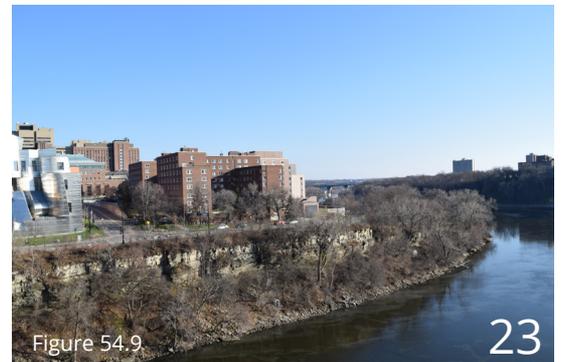


Figure 54.9

23





Figure 55.1

24

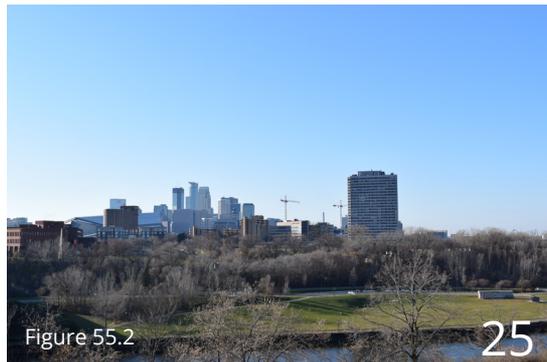


Figure 55.2

25

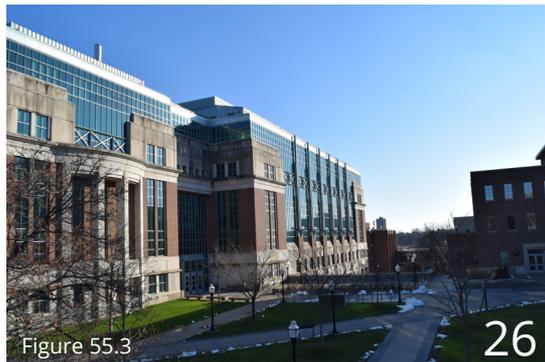


Figure 55.3

26

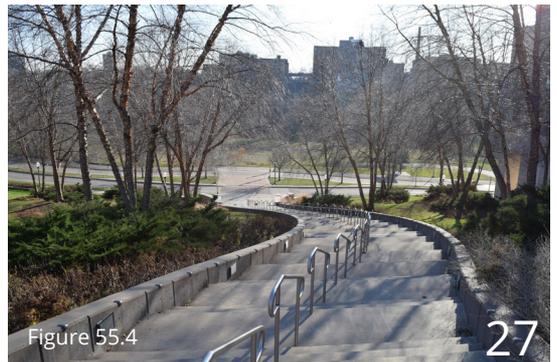


Figure 55.4

27



Figure 55.5

28

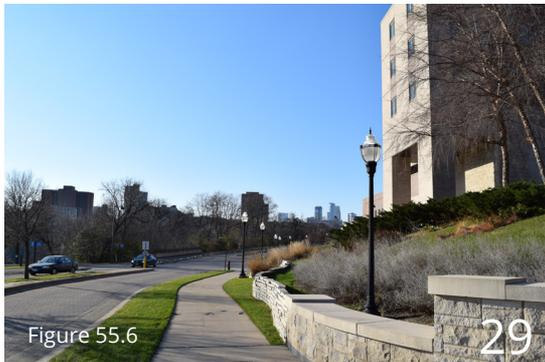


Figure 55.6

29



Figure 55.7

30





Figure 56.1

31

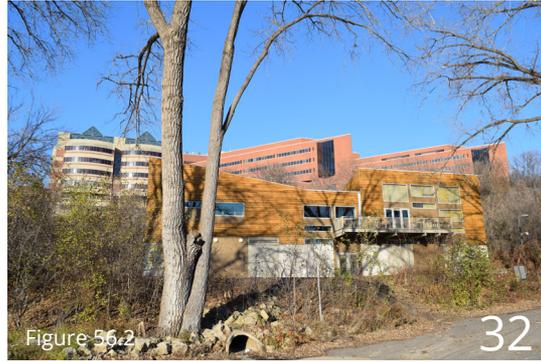


Figure 56.2

32



Figure 56.3

33



Figure 56.4

34

All of the photos numbered 25-37 were taken from the east bank of campus. All other photos (excluding 1-14) were taken from the Washington Avenue Bridge. The east bank has a great park incorporated in to the river bank, East River Flats Park, which will be a great site for the bridge on the east side of the river.



Figure 56.5

35



Figure 56.6

36

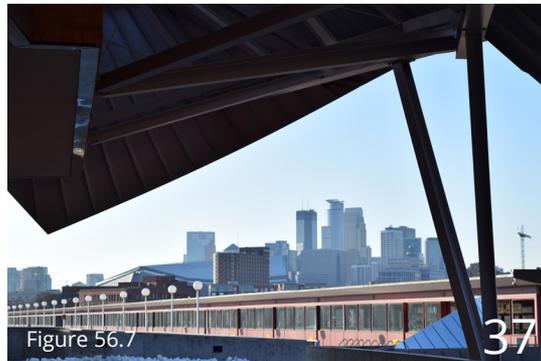


Figure 56.7

37



Figure 56.8

38



The University of Minnesota's Twin Cities campus is the chosen site for this project. There are many attributes that make this site the ideal location for a project of this type. Some of those that can be seen in the maps on the next two pages and go as follows. The campus has a fair amount of green space on or near the campus, most of which did not seem utilized by many users on my visit. By bringing people to the bridge, it would have them pass by the green space making them more aware of its presence and all it has to offer. Also with the bridge being in between the two banks of the campus it gives it a centralized location near the Coffman Memorial Union, Carlson School of Business, several residence halls, and many other buildings. This provides easy access to the site for the university students who will be a large percentage of the daily user base. The selected site is also located near a large parking ramp on the east bank with an additional two large surface lots on the west bank nearby. In addition, the new bridge will give the campus an additional river crossing location ideally located on the south side of

the student Union, a very frequent used building among students. Lastly, the site is very easy to access from downtown Minneapolis. With light rail stations being a few blocks away, it allows easy access and commutes for individuals who would live on the bridge and work in the city or people who work in the city and want to come to the projects one of many bars or restaurants. Between the campuses students and faculty and people involved in the downtown area, the bridge and its numerous businesses and stores should maintain a steady stream of clients.





Figure 58.1



Key

- Athletic Facilities
- Student Housing
- Green Space
- Mississippi River
- Buildings
- Roadways
- Future Bridge Location

Figure 59.1

## University Demographics

### Gender

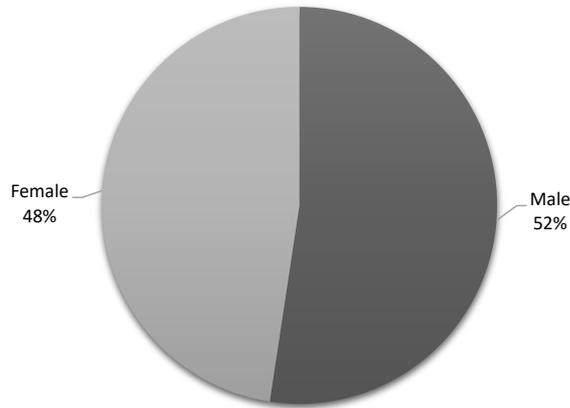


Figure 60.1

### Registration Status

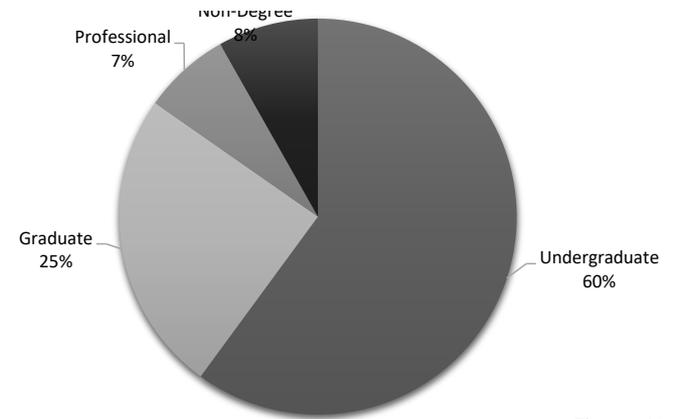


Figure 60.2

### Home Location

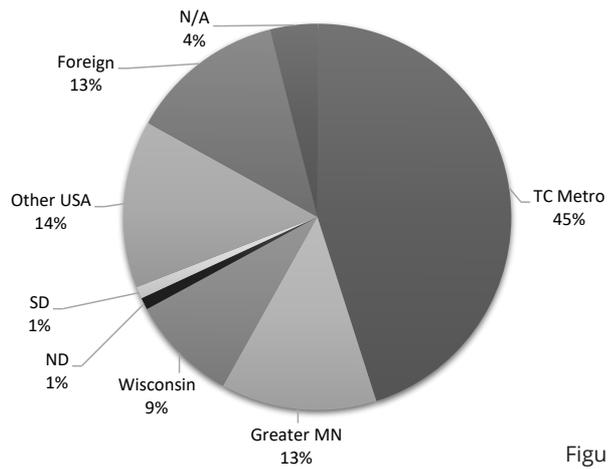


Figure 60.3

### Age

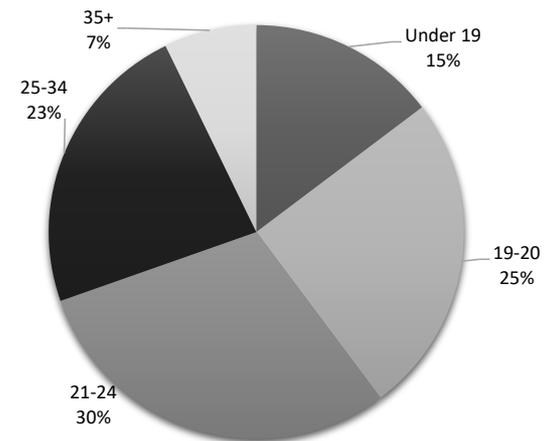


Figure 60.4



### Ethnicity/Race

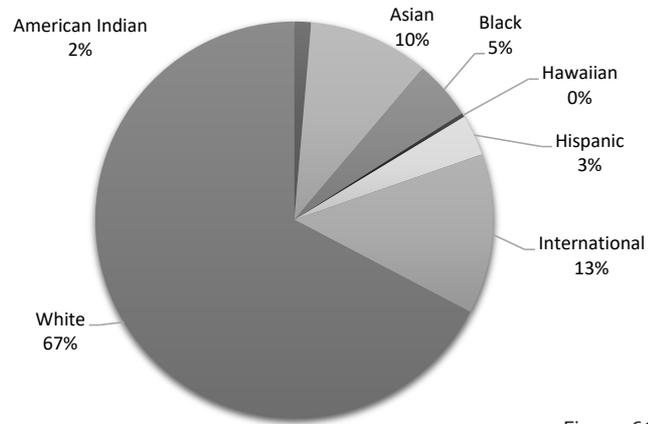


Figure 61.1

### Minneapolis Demographics

### Gender

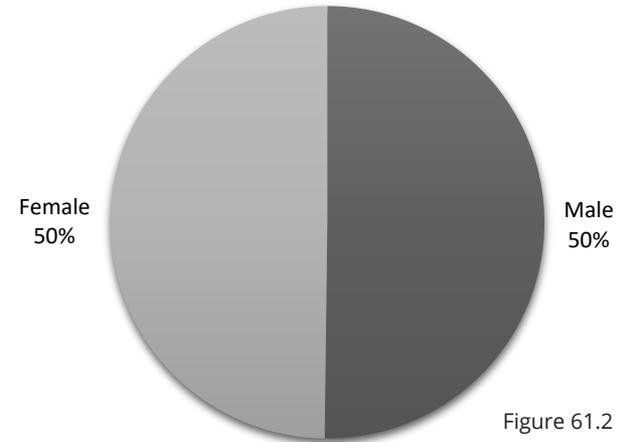


Figure 61.2

**Conclusion:** Since a large portion of the users will be from the university, it is important to understand more in depth about the students. Therefore, by understanding their backgrounds it helps the designer to understand what types of shops, activities, and restaurants they might enjoy. By learning where in the country or world the students are from, the restaurants and bars can be geared towards something that they would be more interested in.

### Ethnicity/Race

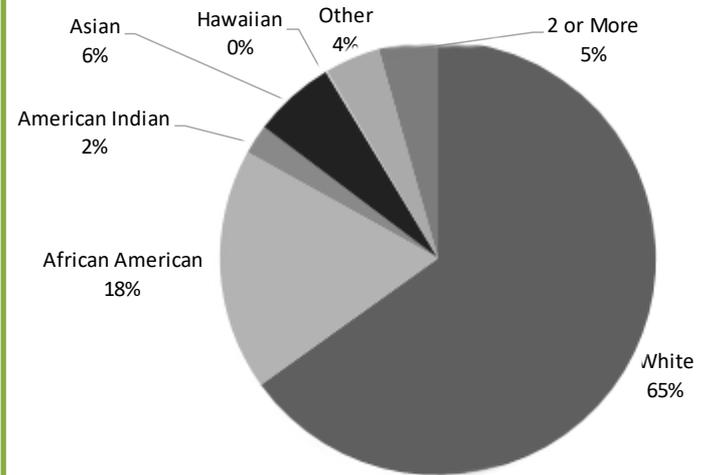


Figure 61.3



## Household Status

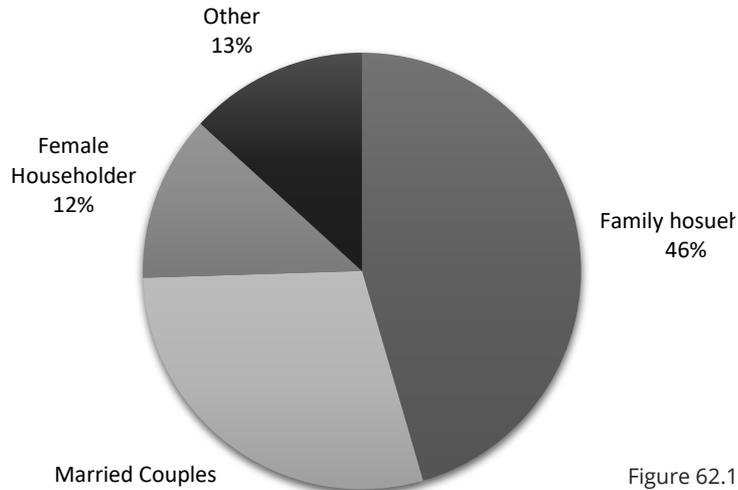


Figure 62.1

## Household Income

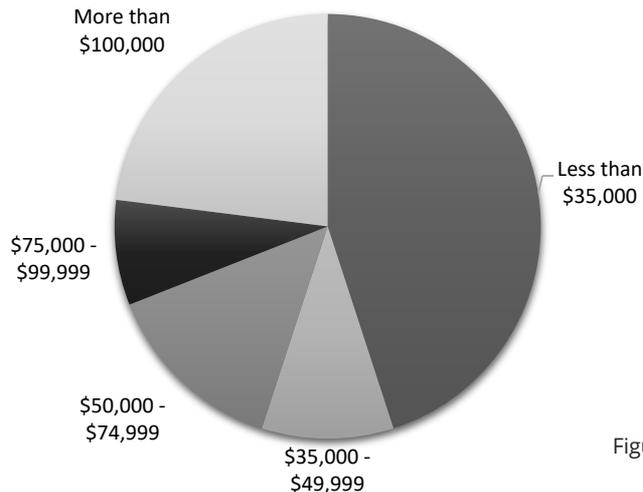


Figure 62.3

## Age

Age Range	Percentage
Under 5	6.6
Ages 5-9	6.3
Ages 10-14	5.8
Ages 15-19	7
Ages 20-24	10.7
Ages 25-34	20.6
Ages 35-44	15.9
Ages 45-54	12
Ages 55-64	6.5
Ages 65-74	4
Ages 75-84	3.4
85 and Older	1.7

Figure 62.2

**Conclusion:** With the other portion of the users being predominantly from the downtown area, it is important to learn about them to better understand what types of typologies and activities they might like incorporated into the bridge. By understanding their age and income, one can decide how high end of a store or restaurant to incorporate into the bridge based on their likelihood of using that facility.



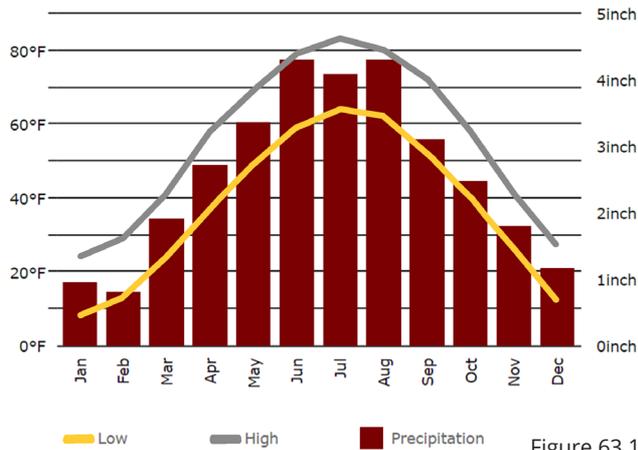


Figure 63.1

With Minnesota having one of the most diverse climates in the country, understanding how that will affect your design is very important. With drastic temperature

swings between the winter and the summer, the structure as well as the building materials will need to be able to tolerate the 120 degree Fahrenheit temperature differences. In addition to that the Minneapolis area receives about forty-five inches of snow annually. The structure will need to be designed to be able to support that additional weight.

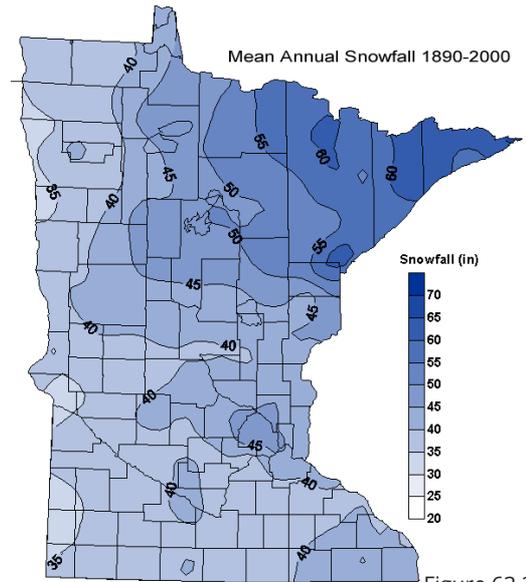


Figure 63.2

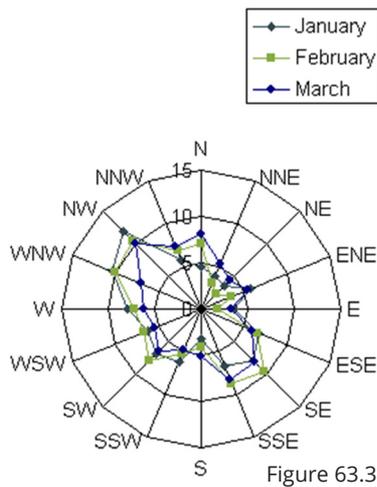


Figure 63.3

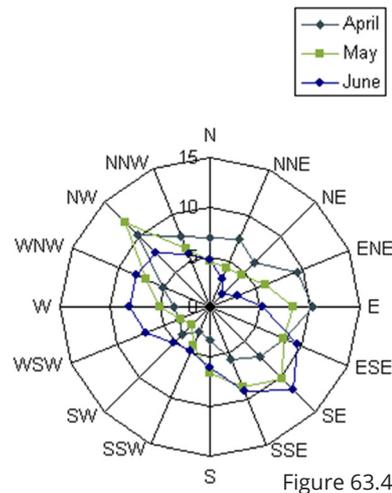


Figure 63.4

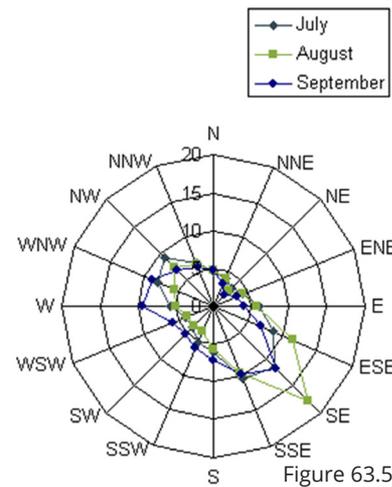


Figure 63.5

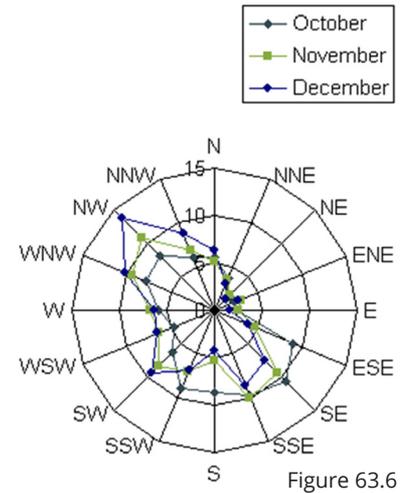


Figure 63.6



## Code Analysis

Building Typologies:	Residential Portion	Mercantile Portion	Business Portion
Occupancy Type:	R2	M	B
Occupancy Load:	72,000 S.F./200 = 360 People	74,000 S.F. x .8 = 59,200 S.F./60 = 987 People 74,000 S.F. x .2 = 14,800 S.F./300 = 49 People Total = 1036 People	85,500 S.F./100 = 855 People
Max Exit Width:	360 x .2 = 72"	1036 x .2 = 207.2"	855 x .2 = 171"
Construction Type:	Type III A (SM)	Type III A (S1)	Type III A (SM)
Max Height:	85' (S)	85' (S)	85' (S)
S.F. per Ground Floor:	72,000 S.F.	74,000 S.F.	85,500 S.F.
# of Stories Above Grade:	5 Stories	5 Stories (S1 < 1 FL.)	6 Stories
Occupant Load Factors:	Residential = 200 Gross	Mercantile: - Grade Floor Areas = 30 Gross - Storage, Stock, Shipping Area = 300 Gross	Business = 100 Gross



Assembly Portion	Totals
A2	
42,000 S.F. x .1 = 4,200 S.F.	
4,200 S.F./5 = 840 People	
42,000 S.F. x .6 = 25,200 S.F. 25,200 S.F./15 = 1,680 People	
42,000 S.F. x .3 = 12,600 S.F. 12,600 S.F./200 = 63 People	
Total = 2,583 People	4,834 People
2,583 x .2 = 516.6"	966.8" @ 42" = 23 Exits
Type III A (SM)	
85' (S)	
42,000 S.F.	273,500 S.F.
4 Stories	
Assembly Without Fixed Seating: - Standing Space = 5 Net - Unconcentrated (Tables & Chairs) = 15 Net  Kitchens (Commercial) = 200 Gross	

**Conclusion:** This project will incorporate several different building types for its mixed use purpose. With that as a major focus for the design, there will have to be separate "buildings" in order to comply to the International Building Code. The logistics behind the separation of the different buildings will not be able to be decided upon until the design work is under way. However, it is definitely something to be cognizant of during the design process. Another important thing that was discovered during the analysis was the fact that up to 23 exits will have to be incorporated into the design in order to allow for safe evacuation during the event of an emergency. With the current idea of having one side of the building being up against the edge of the bridge, the exits will have to all be on the remaining three sides of the bridge. Lastly just knowing the height limitations was another aspect that could potentially limit the design and was good to discover early on in the design process.



## Plan for Proceeding

### Research Direction

In order for this project to be successful, more research will need to be done to find out what types of buildings will be most successful in this location. Another important aspect to research is the different activities that people of the Minneapolis area would find interesting. A large part of this project is figuring out how to bridge not just the river, but the community surrounding the site as well. In order to do so, the bridge must be a place people want to go, that is the first large step towards bring the community together. Another large aspect of the research portion will be the bridge structure. Not only do I need to look into the structural types themselves, but also what they can represent for the community. One will need to be selected that can have a strong link both physically and hypothetically to the community and all the visitors the project will receive.

### Design Methodology

First, I will look into the structure of the bridge and what each structure type could represent. Using that bridge design, one can move into the building aspect of the project and decide how the form of the bridge will fuse into the buildings both physically and visually. Creating one cohesive design, where the buildings are noticeable but not too overpowering to the entire composition will play a major role on the visual appeal of the project. With the visual aspect set aside, the function of the bridge, the site integration, and the buildings that are incorporated into it is very important as well. Form and function need to meet in the middle, with one not having too large of an influence on the other in order to have a successful project design. To summarize, though research I will look into how the structural design of the bridge will influence the building and site design. Through the discoveries, interpretation of how that structure selection could influence the overall project design.



With the advancement of technology in today's architectural field, the creation of virtual reality videos is becoming much more popular in the profession. Therefore, beyond the basic requirements for the presentation, which includes a graphic display board, digital and verbal presentation, and thesis book; a digital design software will be used to create a video. One of two softwares will be used, either Fuzor, or Lumion. This video will give the audience a better and more comprehensive understanding of the design. To accompany the video, a virtual reality graphic will be set up using the Oculus Rift which will aid in the understanding of the overall design solution.



Still image from an Unreal Engine animation



Still image from a Lumion animation



March

April

May

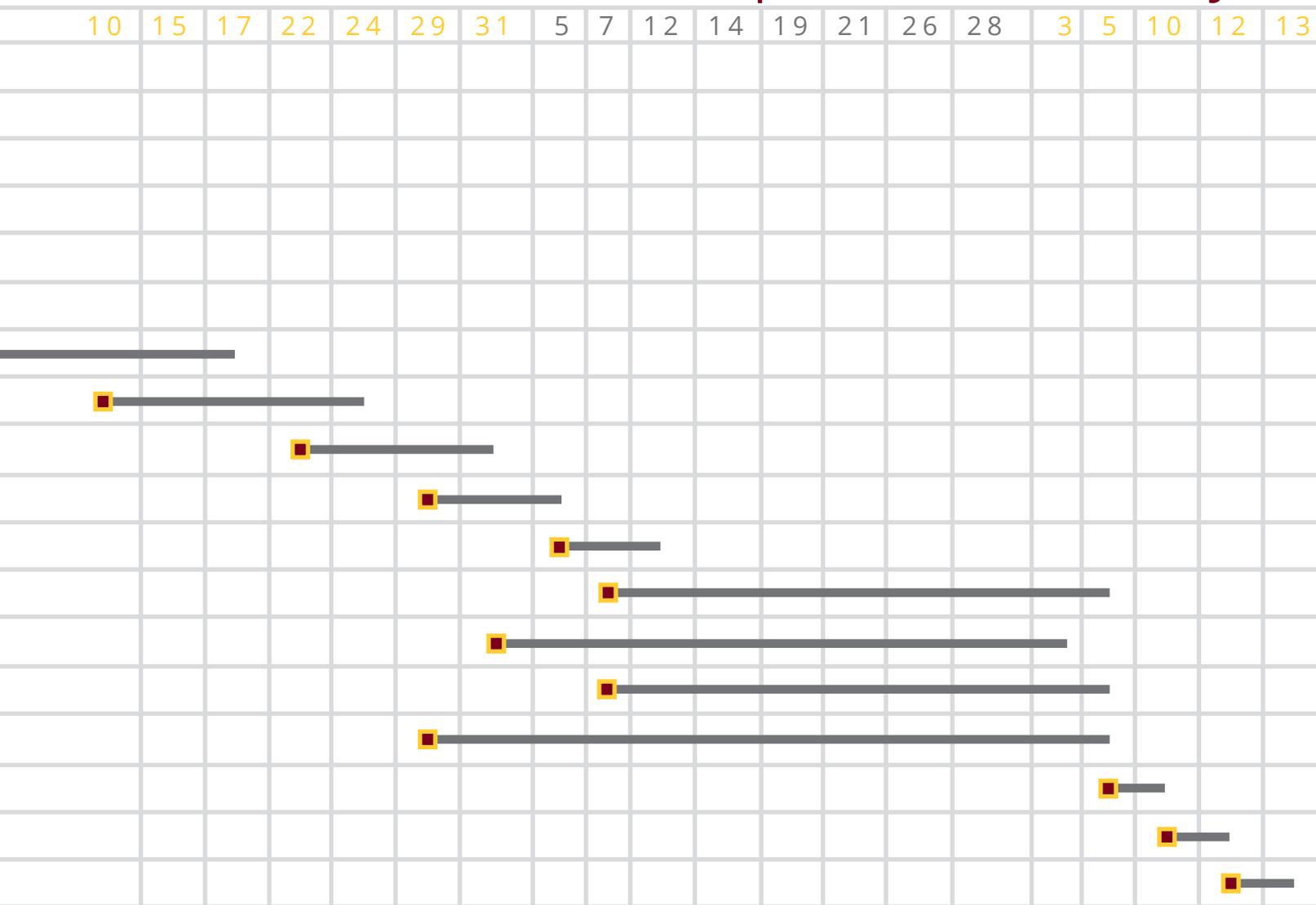


Figure 69.1

# Final Solution

## Elevation Studies

To understand projects that are similar to this type and try to decipher what has made them so successful, I took a look at the Ponte Vecchio as well as the Tabiat Bridge. One exercise I did was to study the elevations of the bridges and their surroundings. The Tabiat bridge does a good job of incorporating the surrounding parks, whereas the Ponte Vecchio blends well into the surrounding cityscape as an extension of the street facades. These two designs are opposite in terms of



Figure 70.1



PONTE VECCHIO | FLORENCE, ITALY

Scale:  
0' 80' 160'

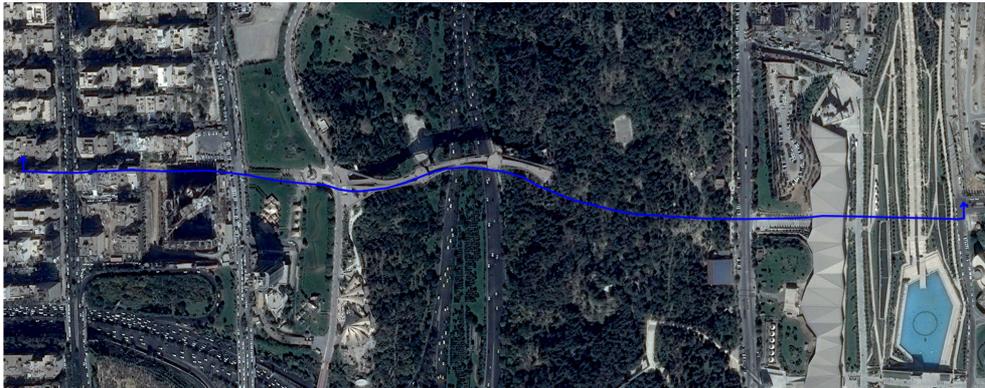


Figure 70.2



TABIAT BRIDGE | TEHRAN, IRAN

Scale:  
0' 175' 350'

site, one being surrounded by parks and the other being surrounded by buildings respectively. The site chosen for this project is a happy medium between the two, located in a less building dense city than Florence yet still surrounded by parks and green space similar to Tehran. Therefore, throughout the design I kept referring to the elevation of the project in order to make sure there was a nice blend of building and park integration.



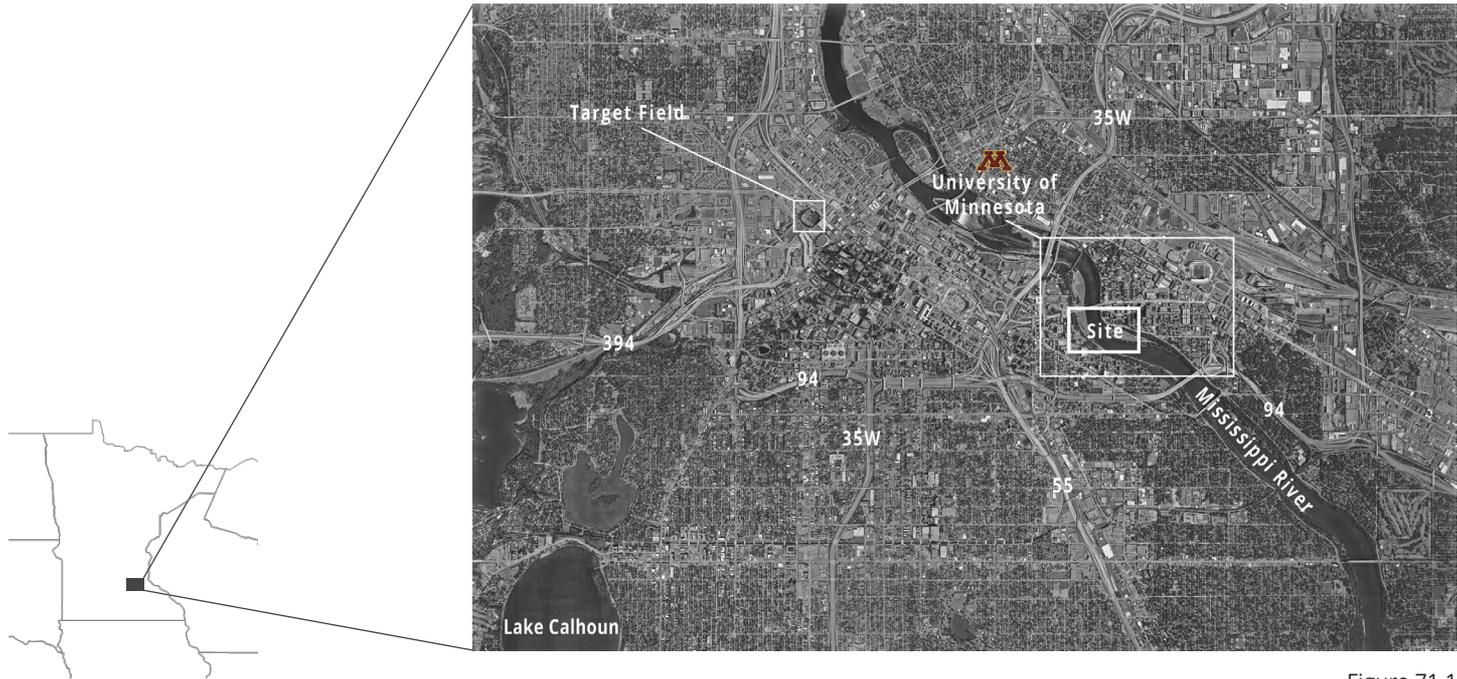


Figure 71.1

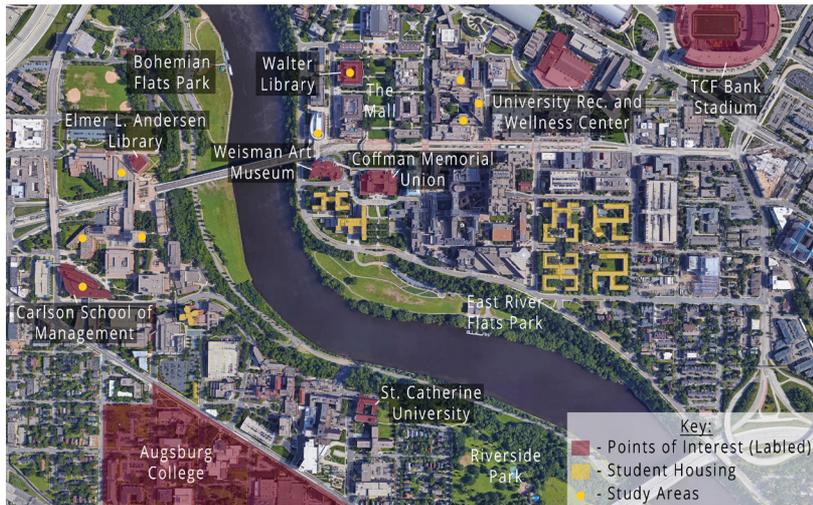


Figure 71.2

Connecting the community to what already exists was one of the main focuses for this project. Not only would this project connect the community but it would also give it something new in terms of shops, restaurants, housing, and other amenities. By analyzing the main points people travel to and from, I gained an understanding of where the bridge needed to be located to provide maximum benefit to the people of the community. In addition to this, the new addition to the area will significantly cut down



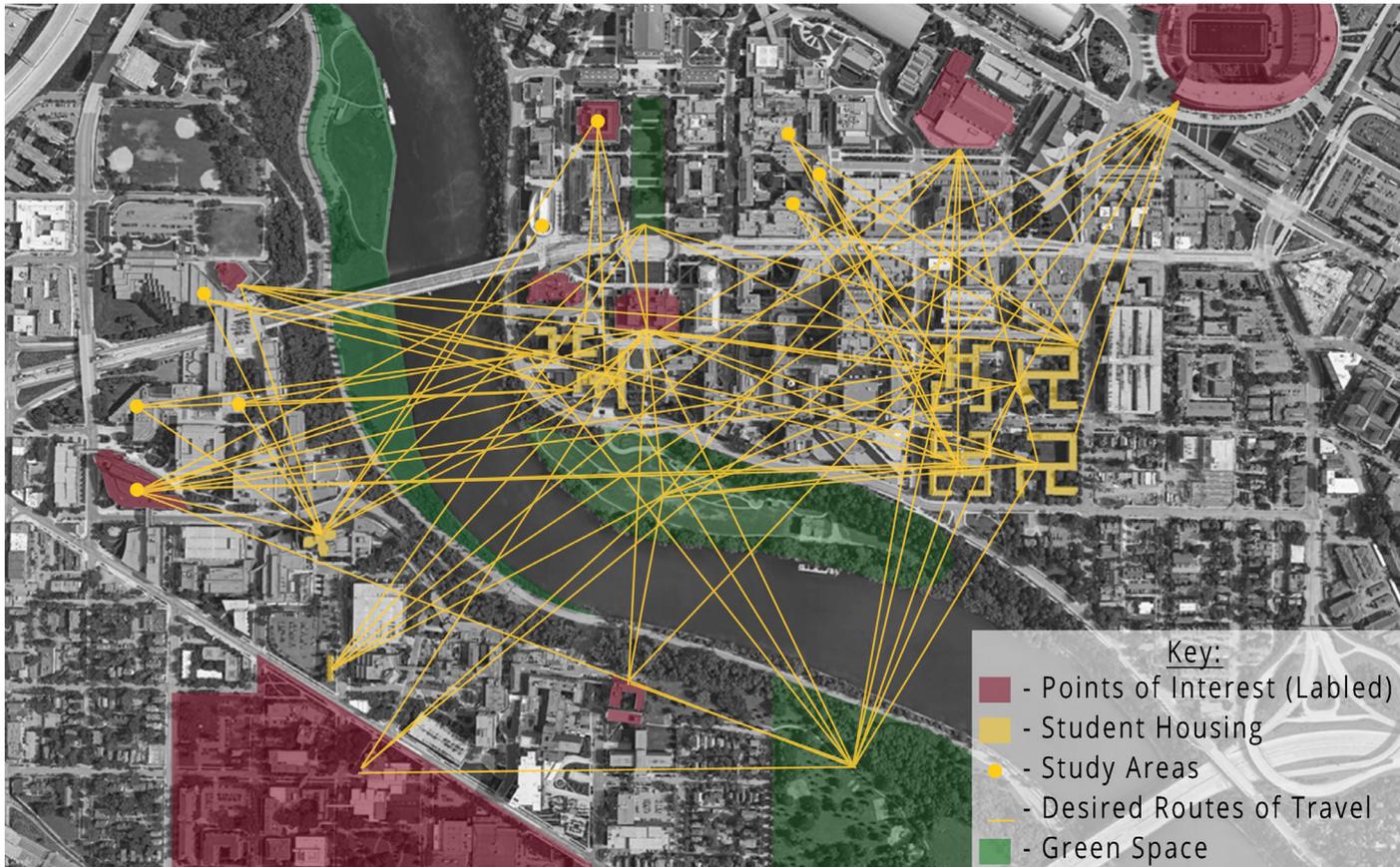


Figure 72.1

on people's travel times whether on foot or cycling. This can be an issue due to the areas drastic change in elevation as a result of being near the river. There are a limited number of stairs and walkways which allow for you to manage the elevation change, therefore, extending walk or bike times. By incorporating various ramps going to different areas of the site, it allows people to go where then need to via a more direct route.

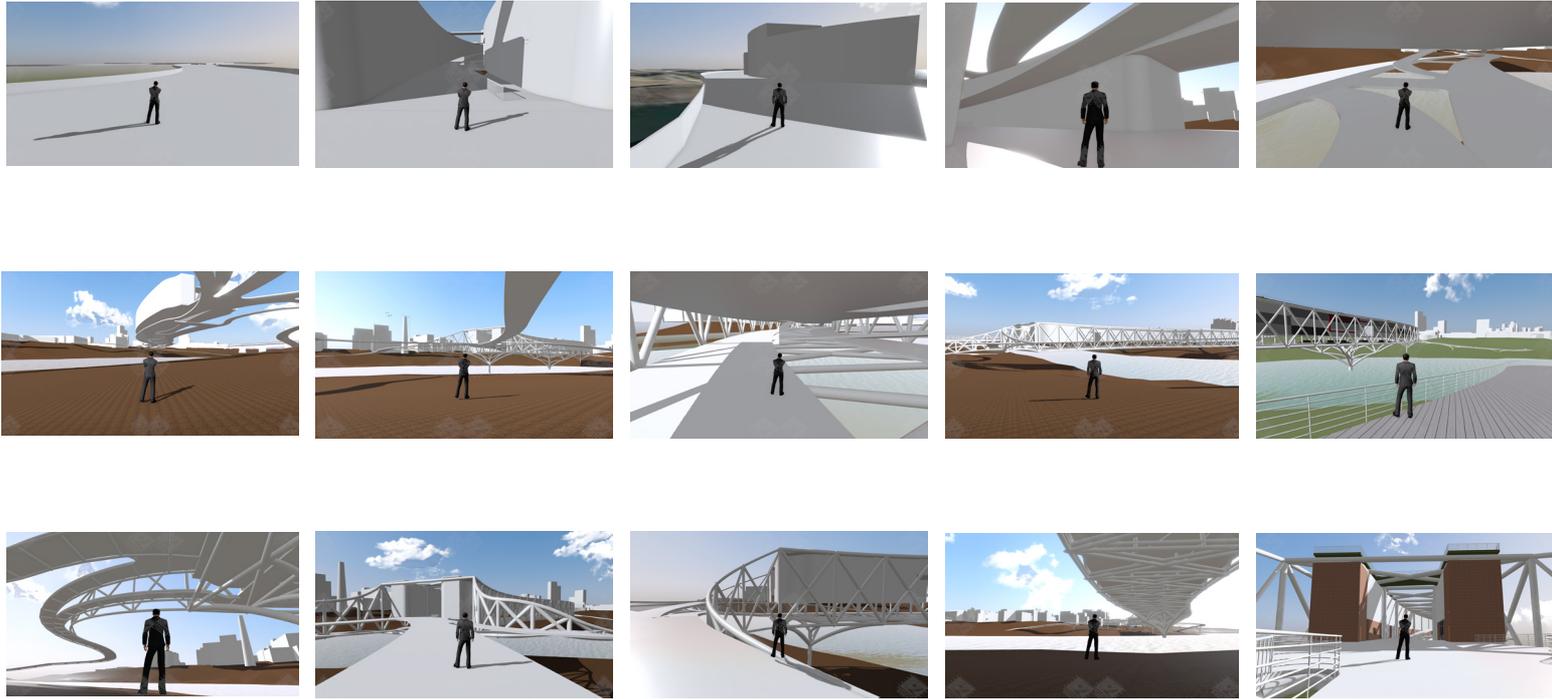


Figure 73.1

I utilized a program called Fuzor throughout the design process for this project. Fuzor is a program that is closely linked with Revit and allows the user to have either a third or first person view of the designed space. One can also “walk around” the building or the site to have a better understanding of the project’s scale and the design as a whole. In addition, having the ability to view the project in a continuous perspective view, rather than just predominately plan or elevation views, is another great benefit of using Fuzor during the design phase. For this project, Fuzor was a great program to use in order to have a better understanding of how the space would feel due to its magnitude. By “putting myself” in that space, it allows the design to be more comfortable for the users which results in a space that is used to its fullest extent.

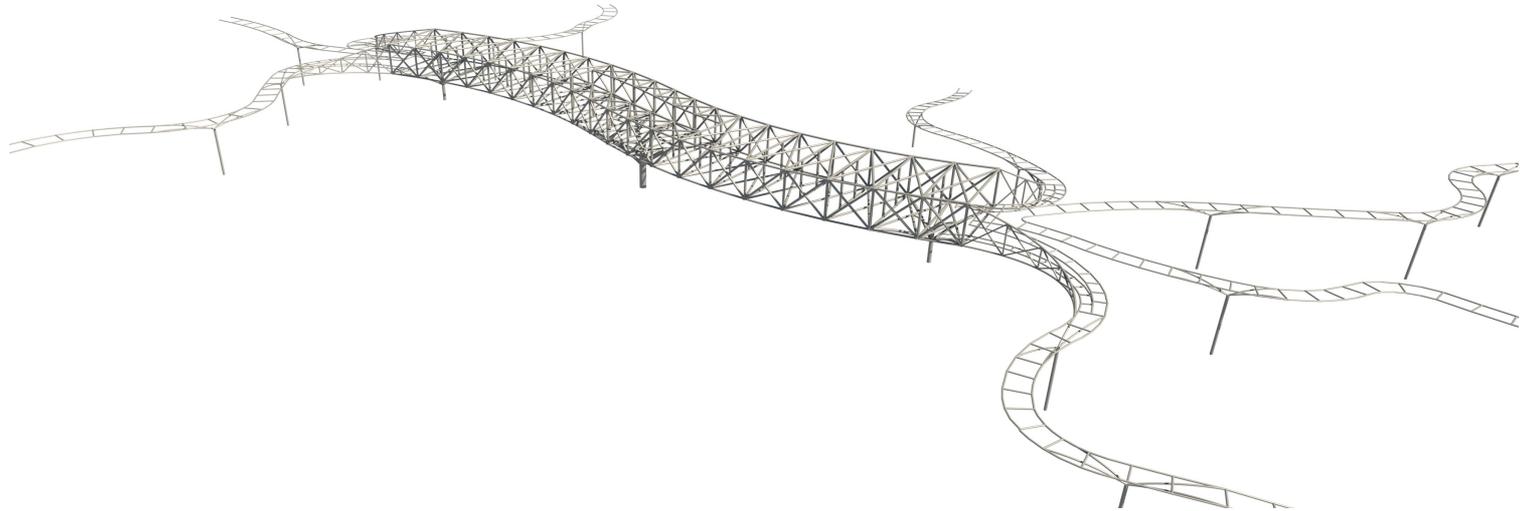


Figure 74.1

Designing the structure was something that was new to my design portfolio. I consulted a relative, Erik Zuker, who is a Structural Engineer for HNTB Corporation, a bridge design firm in New York City. This is the final structural design that resulted from my conversation with Erik. I didn't want the bridge or the building aspect of the project to play more of a hierarchical role than the other so designing them in tandem rather than as separate components in order to achieve this desired outcome.



Figure 75.1

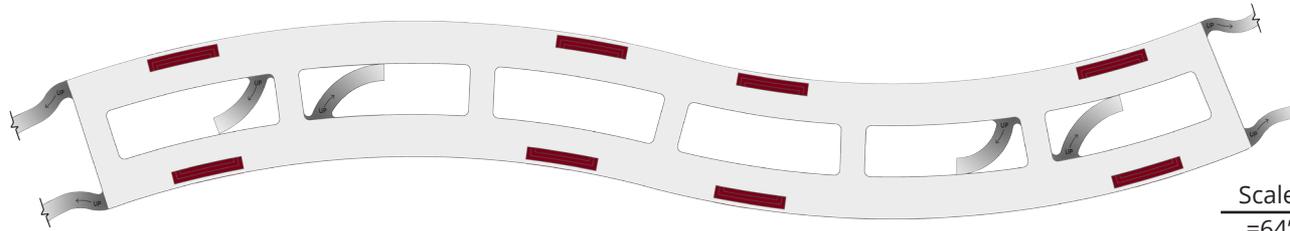


# Floor Plans

## Sub-Level

### Sub-Level

- 1: Walking Paths
- 2: Seating Areas



Scale:  
=64'

Figure 76.1

## 1st Level

### 1st Level

- 1: Equipment Office
- 2: Retail Shops
- 3: Convenience Store
- 4: Coffee Shop
- 5: Ice Cream Shop
- 6: Gym
- 7: Office Space
- 8: Fast Food Restaurant
- 9: Restaurant
- 10: Bar
- 11: Book Store
- 12: Circulation

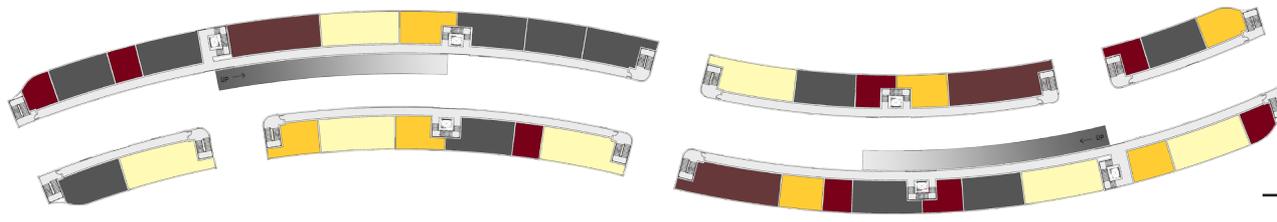


Scale:  
=64'

Figure 76.2



2nd Level



Scale:  
=64'

Figure 77.1

2nd Level

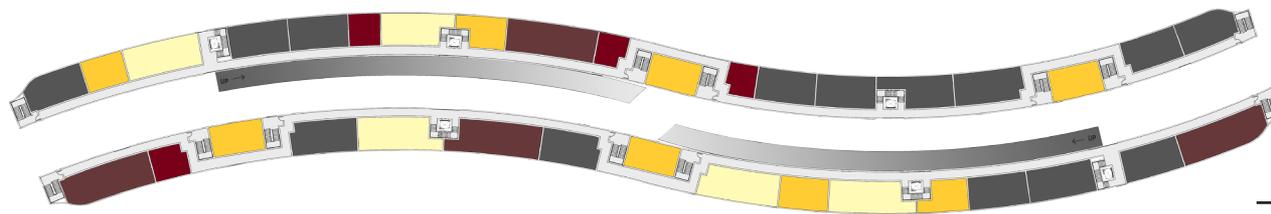
- Studio Apartment (447 - 564 S.F.)
- 1 Bedroom Apartment (654 - 829 S.F.)
- 2 Bedroom Apartment (948 - 1088 S.F.)
- 3 Bedroom Apartment (1223 - 1294 S.F.)
- 4 Bedroom Apartment (1442 - 1521 S.F.)
- 6: Circulation Space

Project Apartment Count:	
Studio:	12
1 Bedroom:	15
2 Bedroom:	25
3 Bedroom:	12
4 Bedroom:	7
<b>Total:</b>	<b>71</b>

3rd Level

3rd Level

- Studio Apartment (447 - 564 S.F.)
- 1 Bedroom Apartment (654 - 829 S.F.)
- 2 Bedroom Apartment (948 - 1088 S.F.)
- 3 Bedroom Apartment (1223 - 1294 S.F.)
- 4 Bedroom Apartment (1442 - 1521 S.F.)
- 6: Circulation Space



Scale:  
=64'

Figure 77.2



# Final Design Renders

## Aerial View

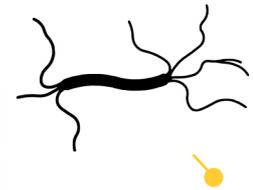


Figure 78.1



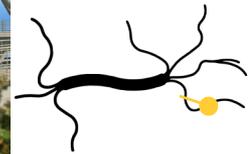


Figure 79.1



Viewing Nook

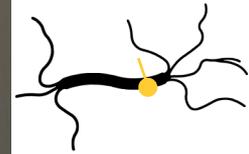


Figure 80.1



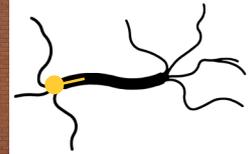


Figure 81.1



## Elevation Evaluation

The diagrams below display a comparison of the case study elevations that I frequently went back to throughout the design process of this project. Creating a design solution that took aspects of each case study was something that I felt would help make this project be successful if it were built. By studying the two elevations below, I was able to come up with a solution that I believe is a happy medium between the Ponte Vecchio's urban setting and design as well as the Tabiat Bridge's more landscape style solution.



PONTE VECCHIO | FLORENCE, ITALY Figure 82.1



TABIAT BRIDGE | TEHRAN, IRAN

Figure 82.2



UNIVERSITY OF MINNESOTA (T.C.) | MINNEAPOLIS, MN

Figure 82.3

Scale:

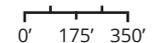


Figure 82.4







Figure 84.1

#### **Fall 2013 ~ Cindy Urness**

##### **Arch 271**

###### Projects

- Tea House ~ Moorhead, MN
- Birdhouse ~ Fargo, ND

This semester greatly contributed to the designer that I am today. It gave me a good base of the design process that comes with being a designer. It also gave me a good foundation to build on over the next three years



Figure 84.2

#### **Spring 2014 ~ Joan Vorderbruggen**

##### **Arch 272**

###### Projects

- Dance Studio ~ N/a
- Dwelling ~ Marfa, Tx

For this course I took away two key elements, those being the spacial planning that is required when designing large projects. The second aspect was the in depth research aspect that is needed when designing a foreign typology.



Figure 84.3

#### **Fall 2014 ~ Steve Martens**

##### **Arch 371**

###### Projects

- Living Learnign Center ~ White Shield, ND
- Fire Station/Community Center ~ Duluth, MN

This semester consisted of our first group project during college. It gave me a sense of how the group collaboration aspect of the practice worked. This semester gave me a cohesive understanding of basic structural principles and details of a building through drawings and models.



Figure 84.4

#### **Spring 2015 ~ Aly Ahmed Bakr**

##### **Arch 372**

###### Projects

- Library ~ Fargo, ND
- Lab Facility ~ Racine, WI

This semesters studio was very beneficial for me technologically. I learned a great deal about using Revit to design a building from start to finish. I also become familiar with Photoshop to create boards and photo-realistic renders.





Figure 85.1

## **Fall 2015 ~ David Crutchfield**

### **Arch 471**

#### Projects

- High Rise ~ San Francisco, CA

This semester consisted of our capstone project for the program. The take-a-way for this semester was the cohesive and in depth design elements that comes with a comprehensive design project. Things like HVAC, structure, plumbing, site design, and egress where all considered in depth for this project and semester.



Figure 85.2

## **Spring 2016 ~ Paul Gleye**

### **Arch 474**

#### Projects

- Urban Design ~ Brussels, Belgium

This semester took place in Brussels, Belgium where we did a group site development and urban planning project. There was a lot to take away from this semester. The group project aspect, city planning, as well as the challenges that come with designing in a foreign country.



Figure 85.3

## **Fall 2016 ~ Malini Srivastava**

### **Arch 771**

#### Projects

- Artifact
- Adaptable Building Skin
- Solar Decathlon

This was my most unique semester in terms of project types as well as the process. We did three small projects, two of which did not relate to architecture in the typical sense but more in terms of the thought process. The last project was a solar decathlon that you built off the previous two non architecture related projects. It made you think outside the box as well as research products and materials.



Figure 85.4

## **Spring 2017 ~ Mike Christenson**

### **Arch 772**

#### Projects

- Design Thesis ~ Minneapolis, MN

Design thesis was the first project that we had nearly total control over. We got to pick our typology which allowed us to explore typologies of interest. With my project, I got to explore urban planning as well as mixed use developments, both of interest to me.





## Nicholas R. Lunde

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Digital Portfolio: [nicklunde.wixsite.com/archportfolio](http://nicklunde.wixsite.com/archportfolio)

Architecture has been a passion of mine since I was little. I always loved watching buildings get built when I was young, as well as play with K'nex and Legos as a kid. That interest continued into my high school career with a handful of architectural drafting classes as well as design competitions. When it came to picking a major and future career path, there was only one option, Architecture. Once in school, I have always had a interest for private residential architecture. The importance a house can play in a family dynamic as well as the social interaction in the house is incredible. Other architectural interests include, Mixed-use developments, sustainable design, urban development, and commercial design. My personal interests include, woodworking, hiking, biking, photography, snowboarding, and traveling.

The world is a book, those who don't travel read only a page.

-Saint Augustine



## Work Cited

### Annotated Bibliography

Airlines, S. (n.d.). Cold Hands, Warm Heart! Retrieved October 8, 2016, from [http://www.prnewswire.com/news-releases/cold-](http://www.prnewswire.com/news-releases/cold-hands)  
hands

-warm-heart-the-southwest-ink-at-skyline-park-welcomes-denver-residents-to-the-ice-300184119.html

This article was done to recognize Southwest Airlines for their partnership with several other organizations to fund the skating rink that is installed in Skyline Park annually. With the funds that are donated, the rink is installed. In addition to that, if the skaters of the rink bring a book to donate to Children's Hospital Colorado, Southwest Airlines will provide that skater with free skate real for the day. Essentially the article talks about the charity work that Southwest Airlines does for the Denver community, but it also provides the reader with some park usage statistics.

Alcohol Use in College. (n.d.). Retrieved October 9, 2016, from <https://www1.villanova.edu/villanova/studentlife/counselingcenter/infosheets/alcoholuse.html>

This article was written by Villanova University in order to spread the word about drinking alcohol among college students. They discuss the patterns of alcohol use in colleges across the country as well as how to reduce the potential harm that alcohol can cause to the consumer. The article also talks about Blood Alcohol Concentration and how that can inhibit one from driving. Lastly they talk about how gender, size, and drinking tolerance can play a role in BAC and therefore the individual's driving ability.

Bicyclist & Pedestrian Count Report 2015. (n.d.). Retrieved from <http://www.minneapolismn.gov/www/groups/public/@publicworks/>

documents/images/wcmosp-179103.pdf

This is a report done by the City of Minneapolis to generate statistics about the amount of pedestrian and bicyclist traffic in and around the city. The article lists off the most heavily traveled areas, of which bridges were included. Within the article are many charts, graphs, and maps all used to display the number of pedestrians traveling among the city. The city has several locations that they employ people to go out and sit in a specific spot to count the number of walkers and bicyclists. This then gives them a better understanding of the habits of the city's residents in order to improve the area.

Bridge | Define Bridge at Dictionary.com. (n.d.). Retrieved October 9, 2016, from <http://www.dictionary.com/browse/bridge>  
This source was solely used to find a word definition to prove a point in the paper written above.

Bridge Inspection. (n.d.). Retrieved October 7, 2016, from [https://www.nde-ed.org/AboutNDT/SelectedApplications/Bridge\\_Inspection/Bridge\\_Inspection.htm](https://www.nde-ed.org/AboutNDT/SelectedApplications/Bridge_Inspection/Bridge_Inspection.htm)

This article was written to inform readers of bridge inspection processes that take place in the United States. They stated that the average life span of a bridge in the U.S. which is what I found very interesting. It was mentioned that bridges have to be inspected every two years to ensure that they are still safe to use. It goes on to talk about several instances where the bridge failed and caused casualties due to poor bridge maintenance. Also mentioned in the article, they talk about how it is cheaper, as well as safer, to inspect the bridges prior to them failing since its cheaper to fix the bridges typically if there is a problem than it is to replace them.

Coffee by the Numbers. (2010, October 4). Retrieved October 9, 2016, from <https://www.hsph.harvard.edu/news/multimedia-article/facts/>

This web page was strictly statistics about coffee consumption in the United State. It was a page designed by Harvard University using statistics from the National Coffee Association. It gave statistics on who is drinking coffee, how much they drink, when they drink it, how much do people spend on coffee, and lastly how much America spends on coffee annually. This was beneficial to view so I could elaborate and back up my theory of this bridge being a good home to a local coffee shop.

Dehghan, S. K. (2015, April 20). Take it to the bridge. The Guardian. Retrieved from <https://www.theguardian.com/world/2015/apr/20/bridge-tehran-architect-iran-leila-araghian-tabiati-sanctions-iranian-designers>

This article was done to discuss a relatively new bridge that was built in the city of Tehran, Iran. The bridge was named Tabiat (Nature) Bridge, and is solely a pedestrian bridge. The writer briefly interviews the architect behind the project, a 31-year-old Iranian architect named Leila Araghian. She was 26 when she designed the bridge and never believed that it would be built. Since it opened in 2014 it became an instant hit among locals and tourists alike. This article was very relevant to my project due to the designer having the same intentions I do when it comes to designing bridges, and that is, "wanted it to be a place for people to stay and ponder, not simply pass".



Dupré, J. (1997). Bridges. Black Dog & Leventhal Publishers.

This book was very helpful when it came to coming up with case studies to reference which were similar in design to what I hope my bridge turns out to be. This book had a time line of bridges, oldest to newest, that were significant to bridge history and design in some way or another. After finding a bridge that was relevant to my future design concepts, I read through all the information which includes, Designer/engineer, year complete, span, materials, and the type of bridge along with a few paragraphs about the bridge and its history. The bridges I referenced were the Ponte Vecchio and the Rialto Bridge.

Jeney, A. (n.d.). Skyline Park - Information & Event Calendar. Retrieved from <http://www.downtowndenver.com/places/skyline-park>

This website is used to communicate with locals and visitors, the activities that are going on in Skyline Park. The page starts off by describing the park through its location and size. It then goes on and lists off and describes the different types of activities that are going on in the park right now. Towards the end of the web page, it mentions the different installations and activities that go on in the park during the other seasons as well.

National Center for Education Statistics. (n.d.). Retrieved October 8, 2016, from <https://nces.ed.gov/fastfacts/display.asp?id=74>

This government run website displays the top twenty largest Universities in the country by student enrollment. Each rated university displays the state as well as the total enrollment as well. The numbers are from the fall of 2013 and were collected by the National Center for Education Statistics.

Phillips, L. E. (1996). Parks: Design and Management. Mcgraw-Hill.

This book talks about the design, management, and plant materials that go into park design. For this paper I mainly focused on the design section of the book. There was a sub section in the design portion that talked about "How to design a successful park" which is where most of the information was pulled from. The Author starts the section off by setting up the reader for what is to come in the book by talking about a few of the considerations that go into park design. The author goes into talking about a few case studies of successful parks around the country and what he thinks made those parks so successful based off of the design considerations.



Skyline Park | The Cultural Landscape Foundation. (n.d.). Retrieved October 8, 2016, from <http://tclf.org/landscapes/skyline-park>  
The Cultural Landscape Foundation designed this webpage to inform readers about the history of parks in several different regions around the country. This article specifically talks about Skyline Park in Downtown Denver, CO. There are some great photos to give the reader a sense of the park prior to reading the article. The article goes into the history of the park and the several renovations that it has gone through since it was initially constructed in 1975. The writer paints a visual image in your head to give you a sense and feel for what the park may look like when it was initially constructed and today.

U of M Master Plan 2009. (n.d.). Retrieved from [https://cppm.umn.edu/sites/cppm.umn.edu/files/umtc\\_mp\\_2009.pdf](https://cppm.umn.edu/sites/cppm.umn.edu/files/umtc_mp_2009.pdf)  
This document was constructed by a board of students and employees at the University of Minnesota Twin Cities campus. Their goal in writing up this document was to set some guidelines about how the university should develop its campus now and in the future. They go into certain guiding principles that are to be strongly focused on and then break off of those principle and form goals for the future campus. These goals are then used to make decisions on future development on the campus grounds.

Washington Avenue Bridge. (n.d.). Retrieved October 8, 2016, from <http://www.dot.state.mn.us/historicbridges/9360.html>  
This article was written by the Department of Transportation of Minnesota. It is an article about the Washington Avenue Bridge in Minneapolis, MN, which links the two banks of the University of Minnesota's campus. The article starts off talking about the history of the bridge as well as the significance that that the bridge has on the area. It gives some interesting statistics to inform the read on things such as the spanning length, structure type, as well as how many spans it has. The next section goes into depth about the different renovations the bridge has gone through since being constructed in 1965.



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Federal Aid Highway Act of 1956. (n.d.). Retrieved December 2, 2016, from <http://www.history.com/topics/interstate-highway-system>

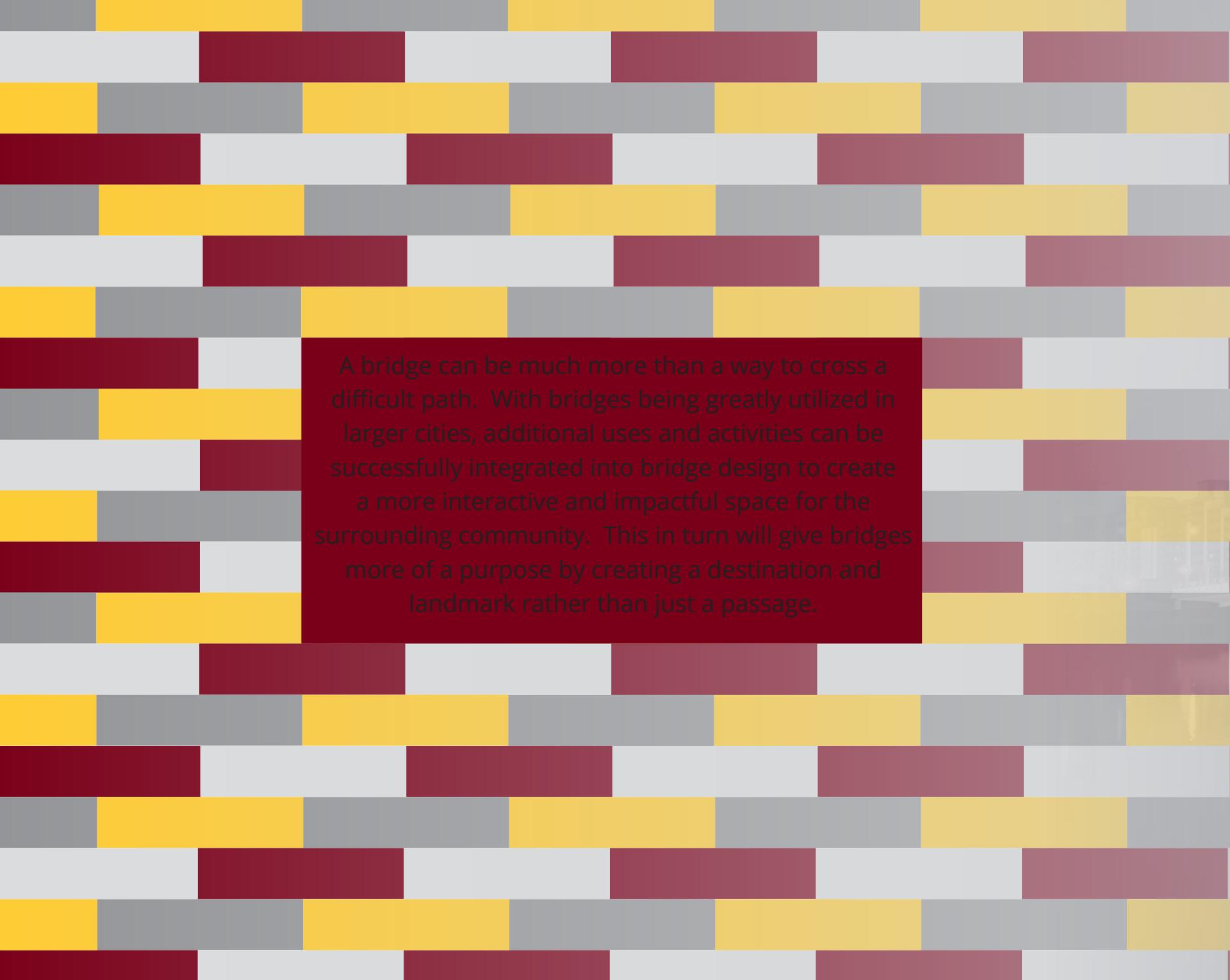
Minneapolis, Minnesota, Demographic Statistics. (n.d.). Retrieved December 9, 2016, from <http://www.infoplease.com/us/census/data/minnesota/minneapolis/demographic.html>

National Park Visitor Stats. (n.d.). Retrieved December 2, 2016, from [https://irma.nps.gov/Stats/SSRSReports/National%20Reports/Annual%20Visitation%20Summary%20Report%20\(1979%20-%20Last%20Calendar%20Year\)](https://irma.nps.gov/Stats/SSRSReports/National%20Reports/Annual%20Visitation%20Summary%20Report%20(1979%20-%20Last%20Calendar%20Year))

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A bridge can be much more than a way to cross a difficult path. With bridges being greatly utilized in larger cities, additional uses and activities can be successfully integrated into bridge design to create a more interactive and impactful space for the surrounding community. This in turn will give bridges more of a purpose by creating a destination and landmark rather than just a passage.