city provident

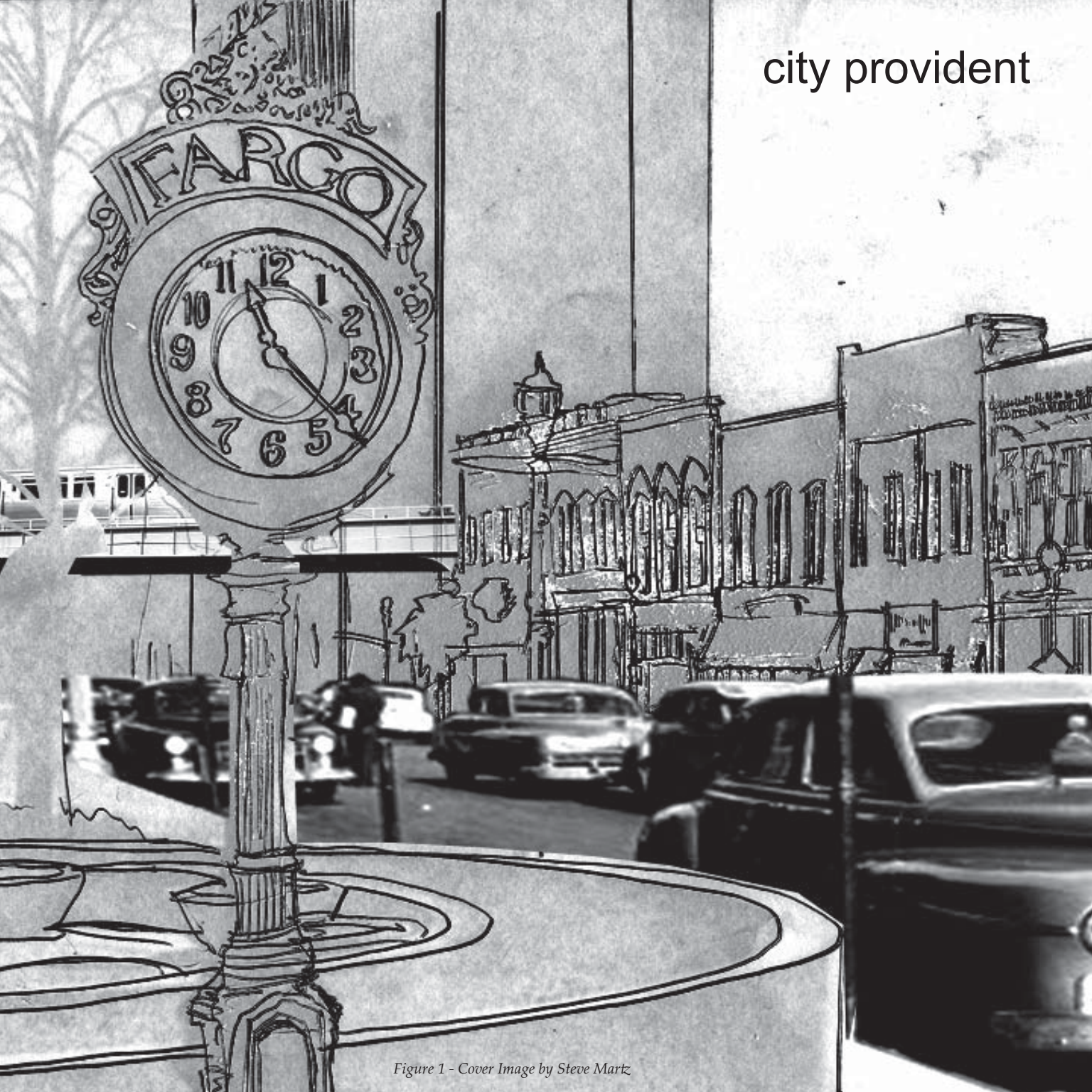


Figure 1 - Cover Image by Steve Martz

city provident

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

By
Steve Martz

In Partial Fulfillment of the Requirements
for the Degree of
Master of Architecture

Primary Thesis Advisor May 8th, 2014

Thesis Committee Chair May 8th, 2014

contents

tables and figures

tables and figures

abstract

This thesis models a system of movement. Any space containing obstacles and needing to be traversed offers resistance to whom or whatever may be trying to navigate it.

This resistance transfers directly to inefficiencies of both time and resources.

In the case of a city the problem becomes multiplied by both the number and complexity of obstacles and is then exponentially complicated by the number of individuals and their direction of travel.

Attempting the removal of all obstacles for all involved is futile.

The answer lies in offering an alternative to the majority and doing so in a way that encourages its utilization.

City Provident

project typology:
public transportation

560,000 sqft

project location:
Northwest of the I-94 - I-29 interchange; Fargo, ND

key words:

boundary
barrier
navigate

problem statement

How does a city plan for future growth through infill and expansion and their inherent transit issues?

statement of intent

project typology
theorretical premise/unifying idea
project justification

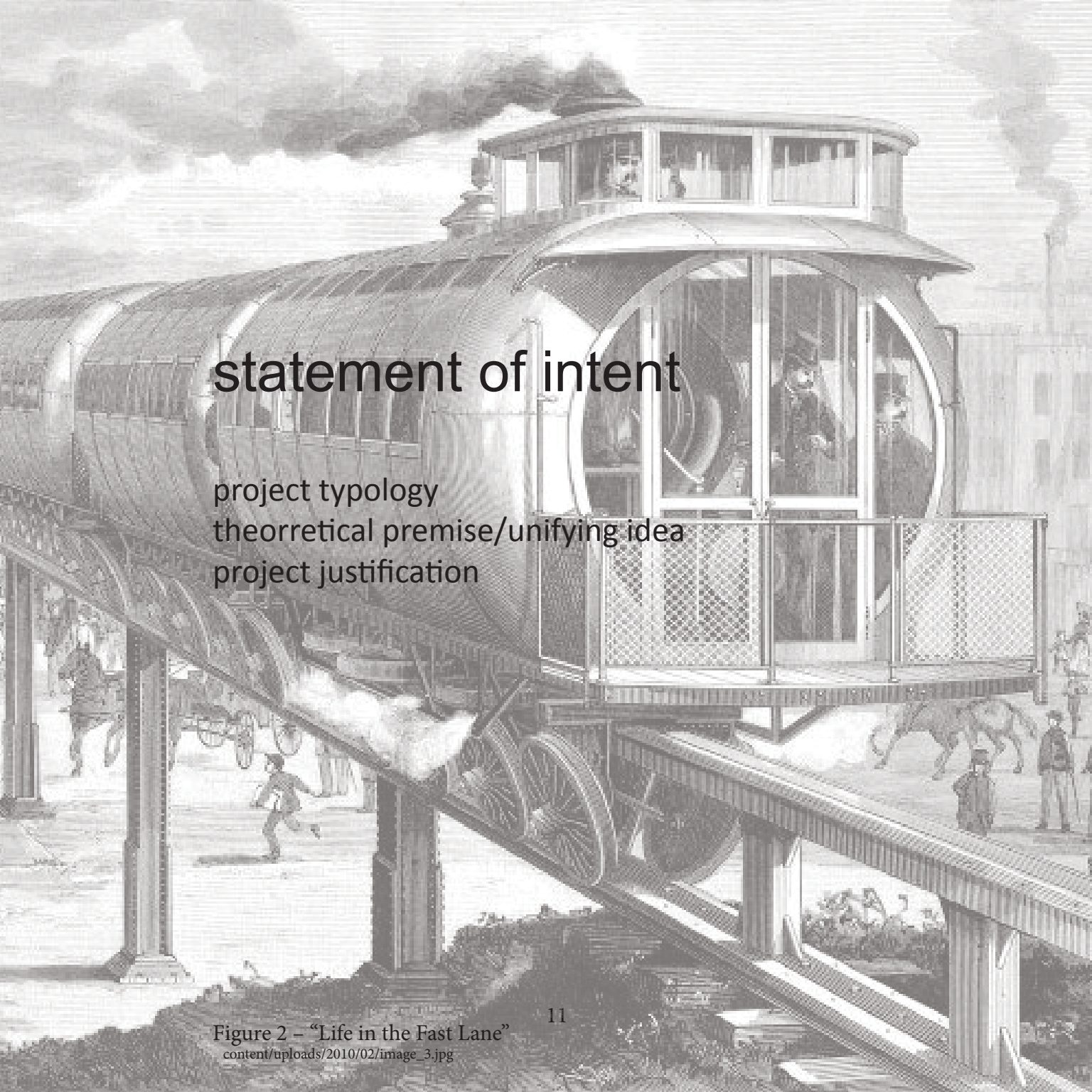


Figure 2 – "Life in the Fast Lane"
content/uploads/2010/02/image_3.jpg

claim:

By inciting critical thought towards future likelhoods it is possible for a municipality to arrange projects and places in a deliberate manor and curb many difficulties of change.

actors:

Affecting all people moving through Fargo

project typology:

Public transportation

action:

Bringing this proposed transportation idea to fruition will require a plan be considered during ongoing negotiation of current systems and utilities, their limits, and their future expansion. It will require management of civil and utility projects with attention to specific plan requirements both for initial use and future development and will require strategic acquisition of land and easement rights to provide logistical leverage.

theoretical premise:

As a city grows in density its obstacles become denser, as it grows in size it is its size that becomes an obstacle. Our ability to move through a space needs to adapt to the changes of that space. Like many of the major cities in this country transit with in the Fargo Moorhead metro area will become an issue eventually.

justification:

The design and integration of a plan into future municipal projects in anticipation of its requirements provides a logical and responsible answer albeit definitely not a total solution to a problem predicted.

site

F-M Area

proposal

narrative
user/client description
major project elements
site information
project emphasis
plan for proceeding

narrative

This thesis is a look at how a city can prepare for the movement of people and products throughout a city during and following rapid population growth and increasing size. First and most importantly I believe it is important to note that personally I have no opinion on urban sprawl; this project is not meant to be a solution to those who are opposed to the rapid growth in suburban areas. Nor am I a huge proponent of urban infill projects; my research and ideas are not with the intent of promoting such projects. The basis of my project is not to point out and then try and correct something I think is a problem. This project is intended to simply take present day information and trends of population growth and expansion and apply them in some form to the future of a city and along the way try to anticipate and plan for major problems regarding transportation throughout a developing metropolis. Specifically I believe and evidence and expirience show that the most economically sustainable and efficient mode of mass transit on terra firma is by rail. Currently in the Fargo/Moorhead metro area (the area I have based my project in) the bus system is the only available mode of civic managed transportation. The system is effective and sufficient for the current state of the cities. I would like to look ahead however to the possibilities of the really not too distant future. In 100 years what will the cityscape of this area look like? What will its population be and where will we be as a civilization following 100 years of technological advancement? Of course these questions and any solutions to them rely entirely on the romantic view that life will indeed continue in an upward and onward style with no hindrances from any major trauma; natural, social, or otherwise.

The politics of any massive infrastructure project are the deciding factors as to whether or not or to what degree it is implemented. Therefore political push and pull weighs heavily on every facet of this project from its financing and its placement to the design of its construction and the selection of the contractors who will erect it. Complicating matters further is the fact that the Fargo/Moorhead area encompasses not only multiple city and county governments but also two separate state governments. Involving different jurisdictions in a single project will complicate any project of any magnitude; definitely a problem for a project of this scale. Because of the multiple jurisdiction issue cost sharing analysis will be needed to assess financial responsibility of each involved entity which will no doubt raise objections from constituents and tack sizable sums of money to the overall project cost making it that much more difficult to obtain approval from the citizens involved. It seems that there would be benefit for this potential problem to be addressed presently. If a rail system turns out to not be the best solution I don't believe that my project is fails. The idea of planning ahead is the true idea behind the energy put into this thesis.

The client for whom this project is designed is the current collective of the cities within the Fargo/Moorhead area (list...) and their citizens. The project is meant to make life easier for a collective majority by providing safe, clean, and reliable transportation to and from select hubs and terminals located in strategic locations so as to benefit the maximum amount of people. This project will not make everyone happy even though technically every tax paying citizen would be considered a client. Time will need to be given for public question and concern and time will need to be given to address legitimate issues within the design.

The users will not only be the tax payers from the cities involved but will include all citizens, visitors, and temporary residents like the 1000's of college students who call the area home for short while. It will be important that this project reflects positively on the communities it encounters and connects; it will be important that the presence of the rail system enhances and never detracts from where it is placed.

user client description

major system elements

The Construct

The physical presence of this project, the tracks the stations and the support buidlings, will indubitably change each and every place it becomes part of. It will need to react with its surroundings in a way that reflects a conscious and creative design effort.

Longevity/Durability

Similar to any large government funded project there will be an obligation to the tax paying public to ensure that the design of the mechanics throughout the entire development is done with the intention of a long service life and are engineered with the ability to withstand a workload above what would be expected.

Efficiency

For a system to be called on to run constantly with high loads and low input there will need to be serious and educated thought towards the ability of this system to not only provide for its own energy needs but also possibly provide excess for consumption elsewhere.

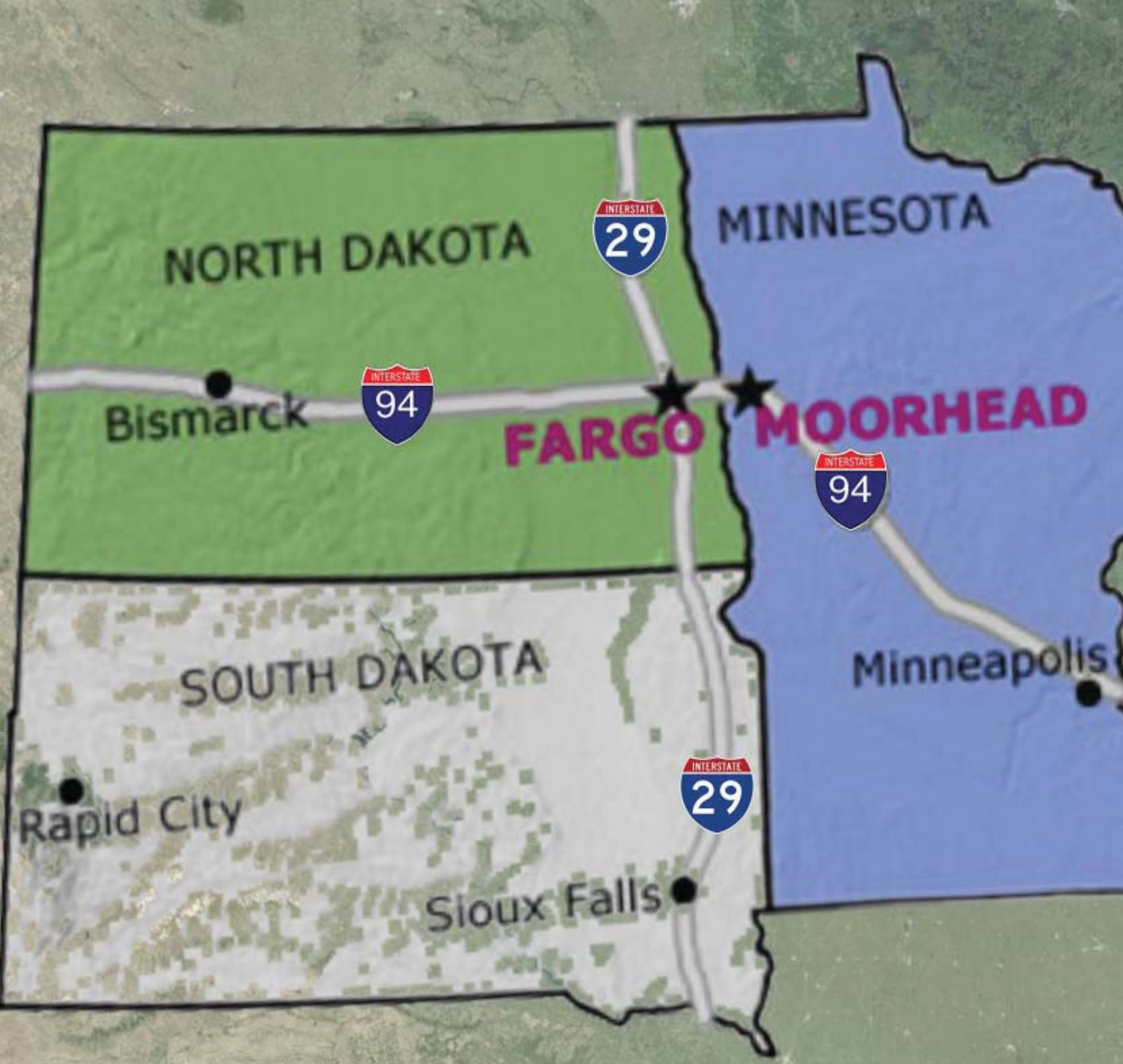


Figure 3 – "Regional Site"; Steve Martz

site

The cities of Fargo and Moorhead and the surrounding communities are currently experiencing rapid growth similar in magnitude to that of Western North Dakota. Presently a strong economy and strong growth in industry, specifically the energy sector has government coffers filled with tax surplus and the oil boom in Western North Dakota is serving as the driving factor. Although the growth there is a long way from the doors of people in the metro area to the East, the industrial expansion that Fargo is experiencing has a lot to do with the demand for products and materials back on the opposite end of the state; it isn't entirely the cause but it is a monstrous portion. With the growing production a necessary housing boom has also begun in the area, related again to the growth in the Western end of North Dakota.

This rapid growth of both population and industry is bitter sweet. The growing population allows for increased tax base and civic development and the financial gain for citizens and business is a welcome stimulant for an economy that has always been stable but that has rarely seen such rapid expansion. That being said, the effects that massive industrial and residential development has on what was once a steady and quiet state leaves much to be desired by the way of both qualitative and quantitative aspects.

With boom often comes bust. Any plan for major development will need to take into account this simple fact. There seems to be a turning tide in our country's view on our dependency on oil and a growing interest in the negative impacts of current fracking techniques that could spell a downturn of production in the future. It is important that plans for expansion and improvements on the state, county, or city level pay heed to the possibility of economic stress even though currently such an event seems impossible. A plan to spend money (with reserve of course) while the money is available allows for future problems to be dealt with early and will allow for breathing room if and when purse strings become a bit tighter.

Figure 2 - Regional Site Map by Steve Martz

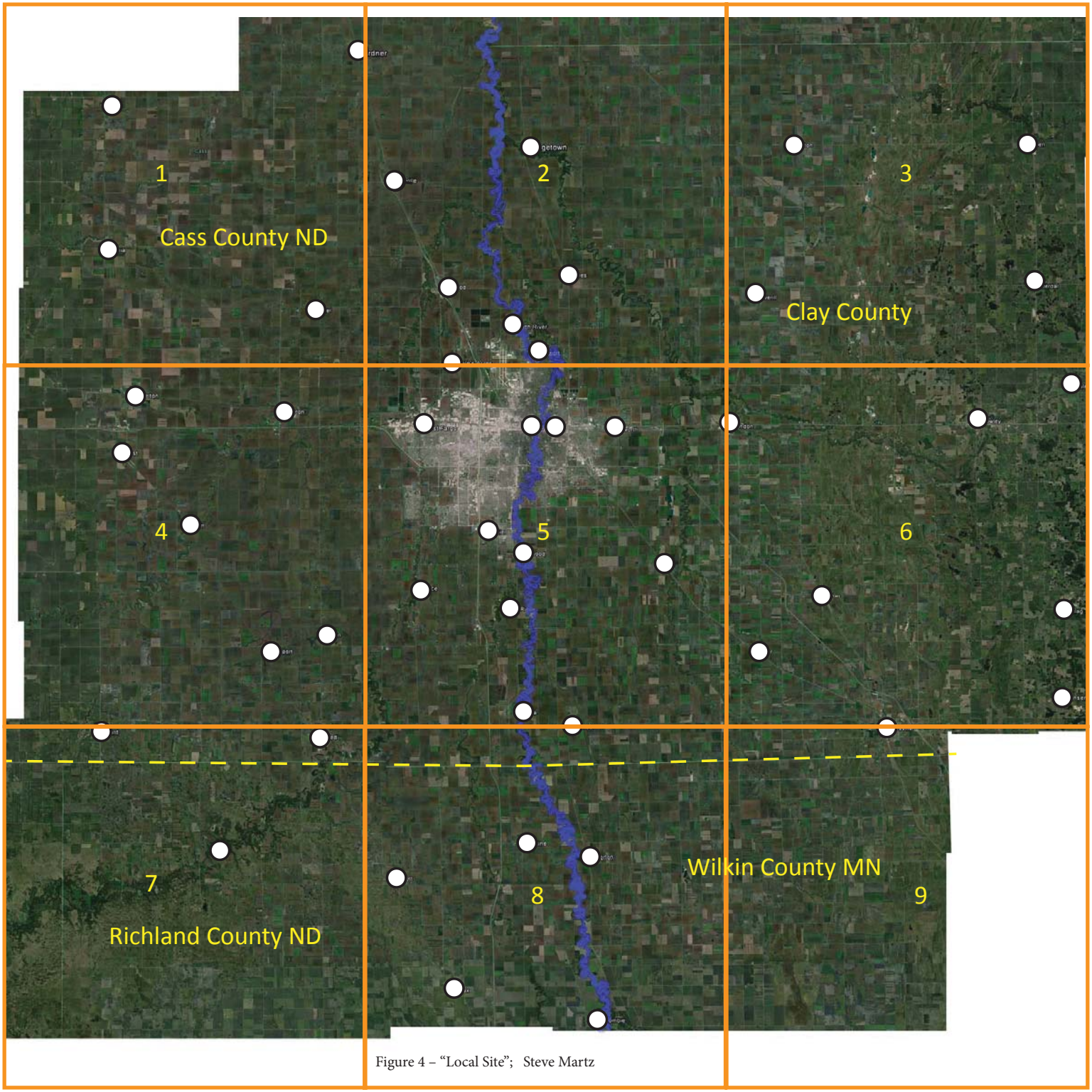


Figure 4 – "Local Site"; Steve Martz

Due to the nature of transportation projects, especially rail based ones, the local site for my idea is rather large. I have boken it down into a grid in order to allow viewers to become more familiar with the locations and their geographical layout to form a better understand of the reasearch and evidence following.

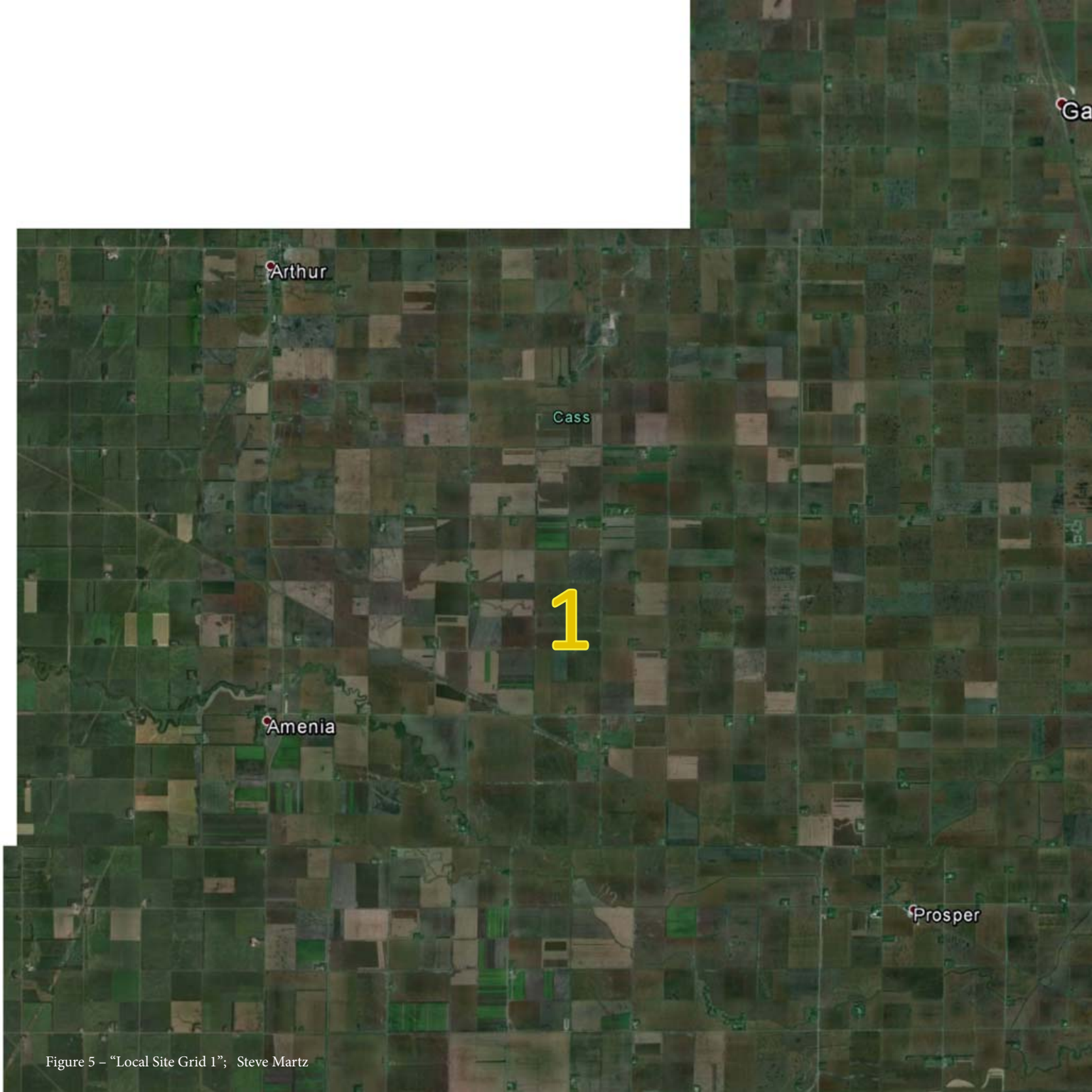


Figure 5 – "Local Site Grid 1"; Steve Martz

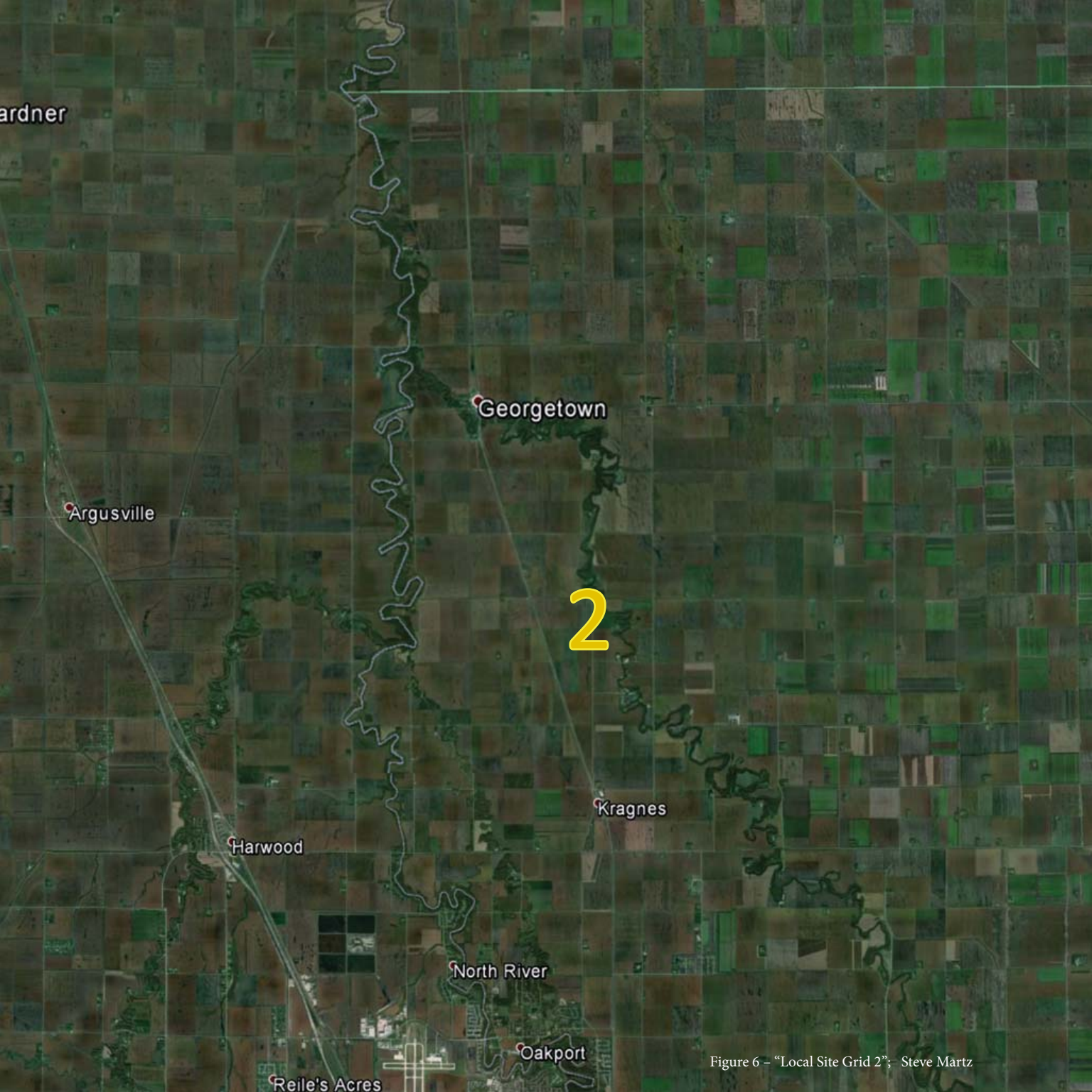


Figure 6 – "Local Site Grid 2"; Steve Martz

Figure 7 – “Local Site Grid 3”; Steve Martz

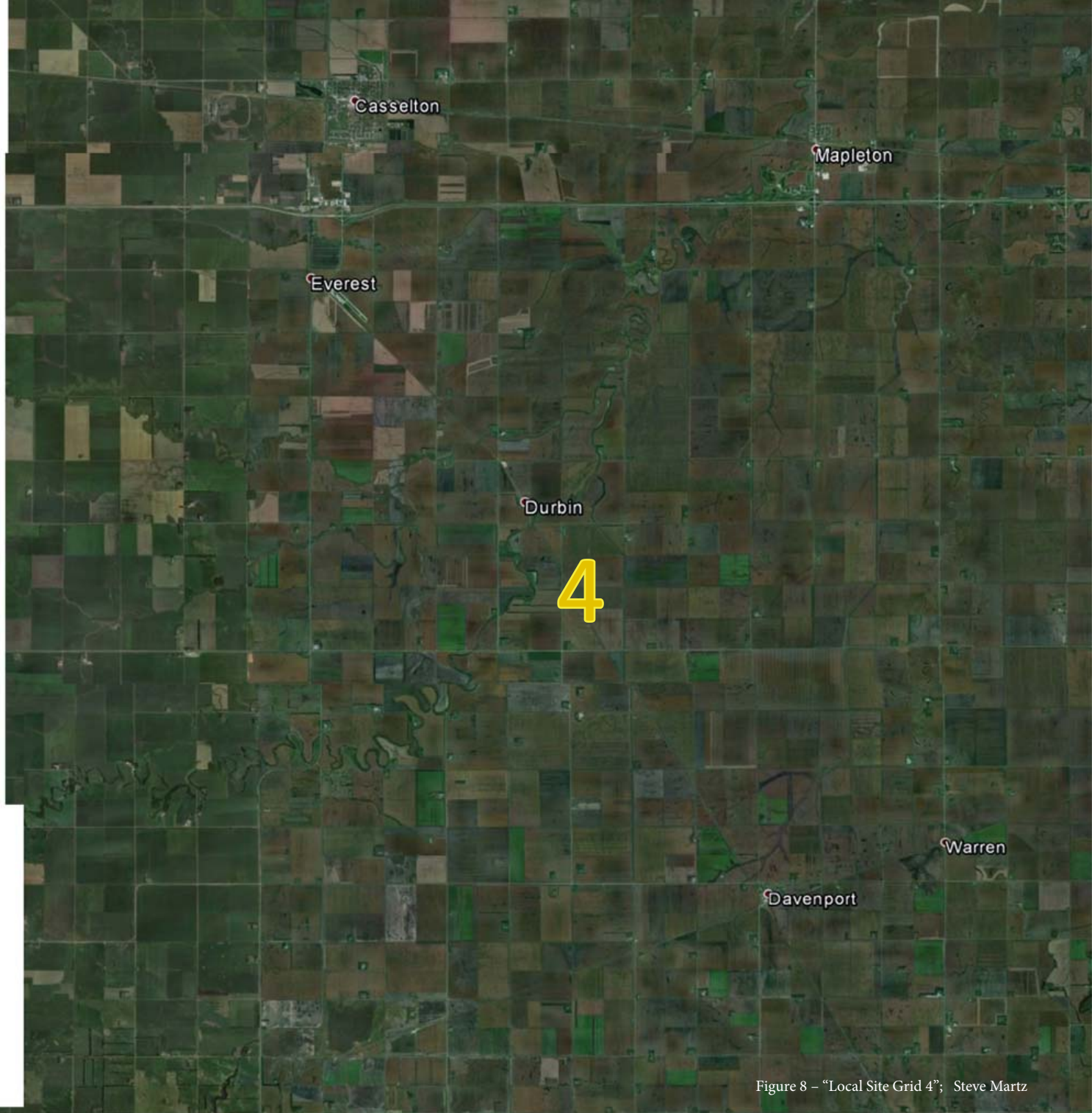


Figure 8 – "Local Site Grid 4"; Steve Martz

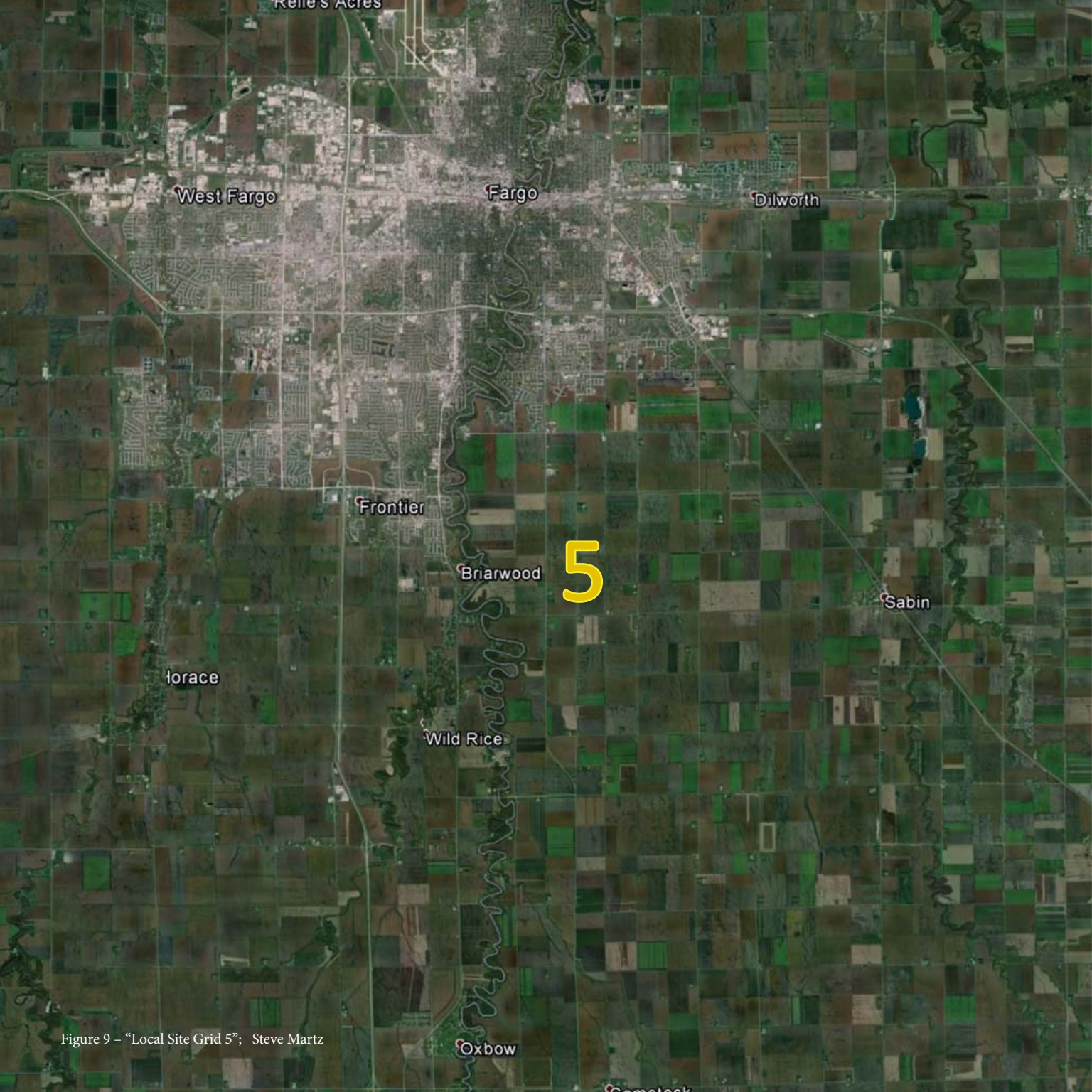


Figure 9 – "Local Site Grid 5"; Steve Martz

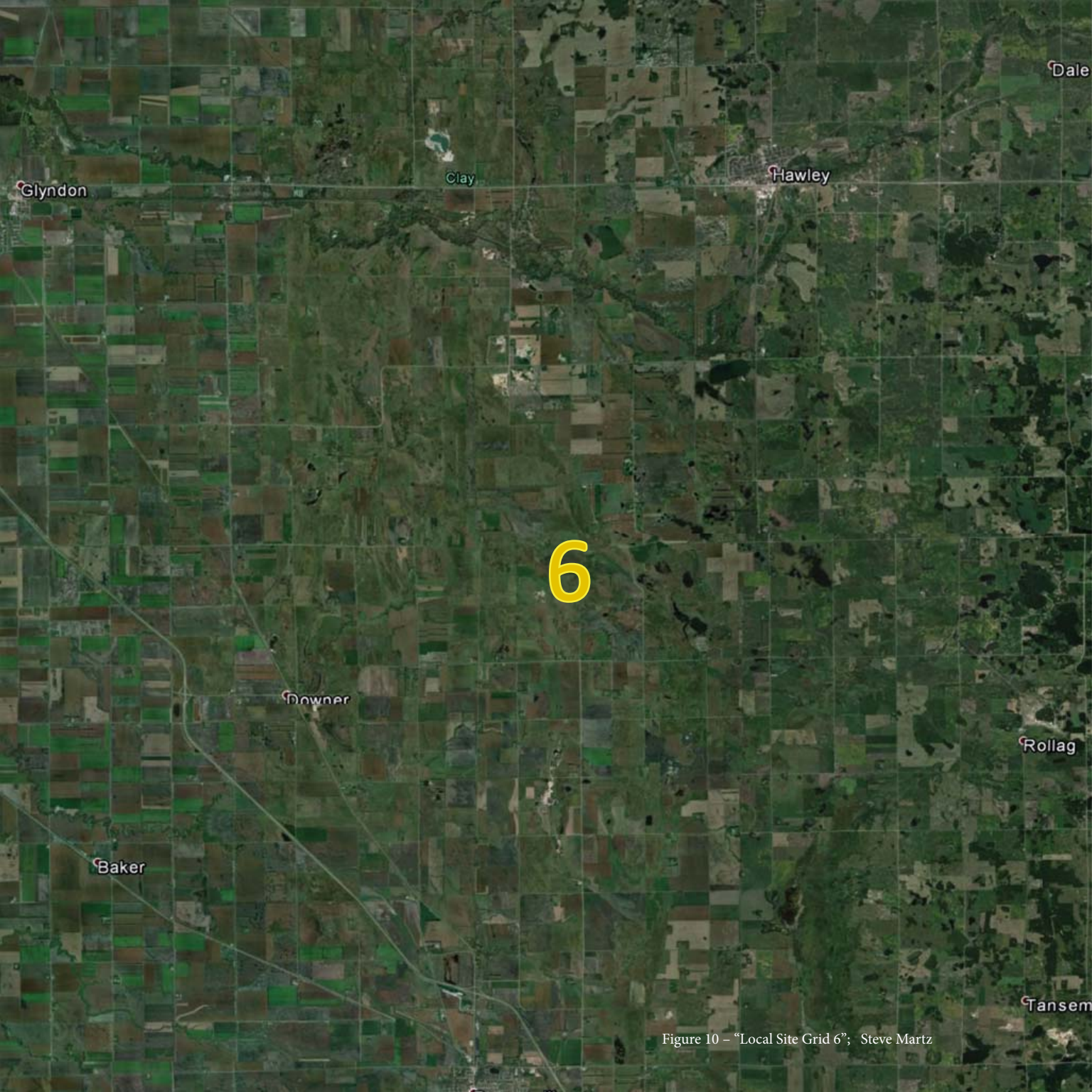


Figure 10 – “Local Site Grid 6”; Steve Martz

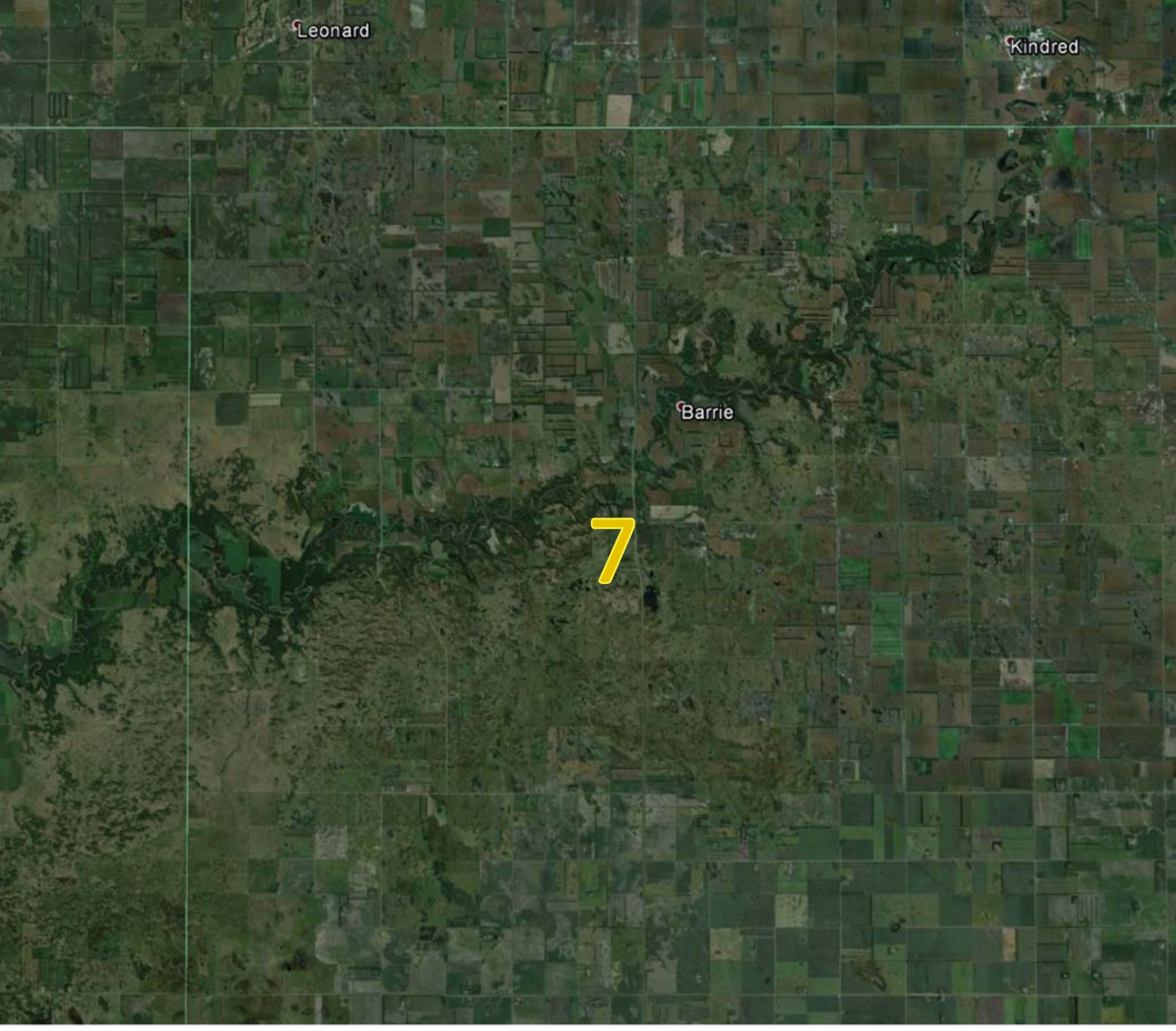


Figure 11– “Local Site Grid 7”; Steve Martz

Figure 12 – “Local Site Grid 8”; Steve Martz

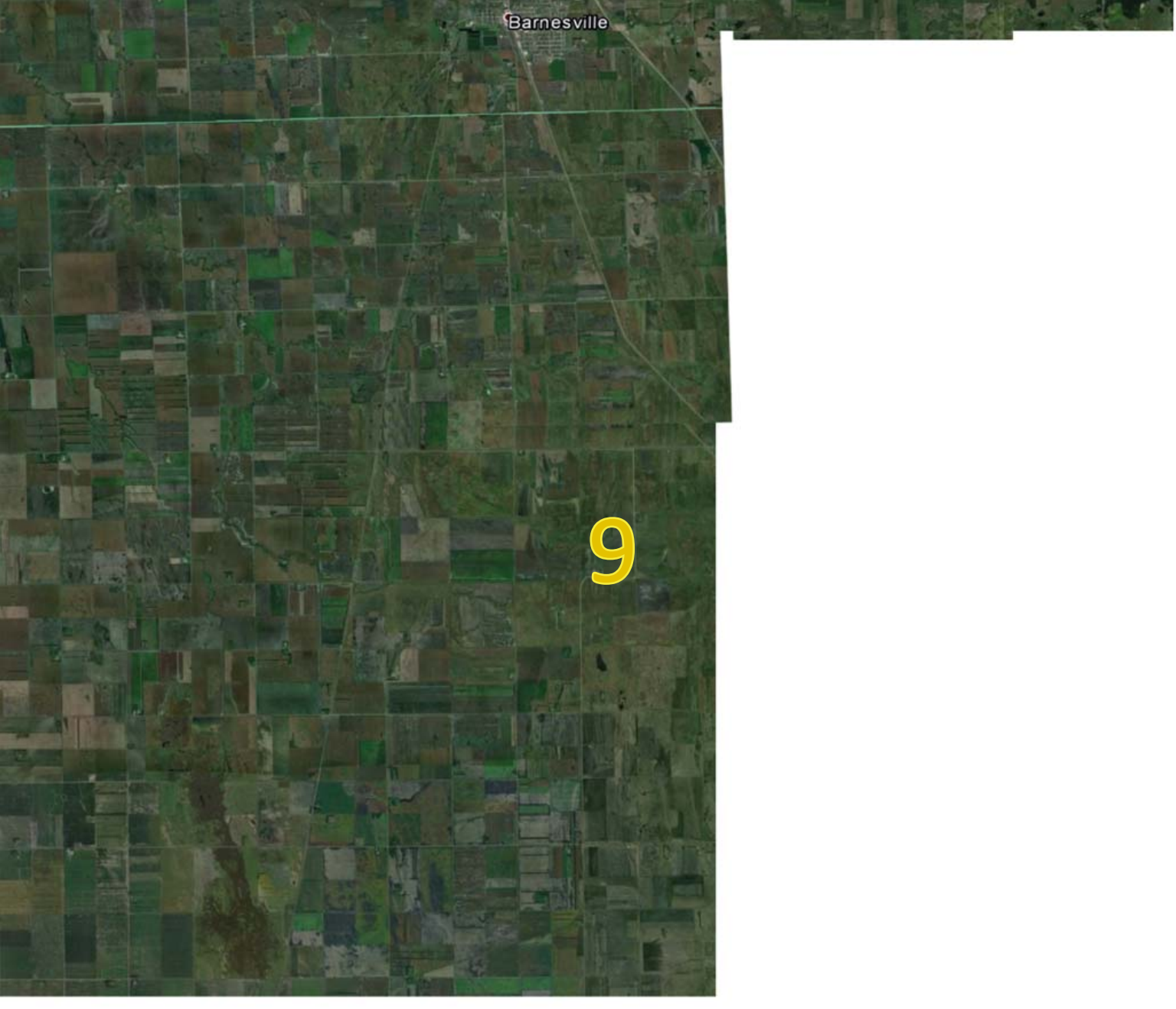


Figure 13 – “Local Site Grid 9”; Steve Martz

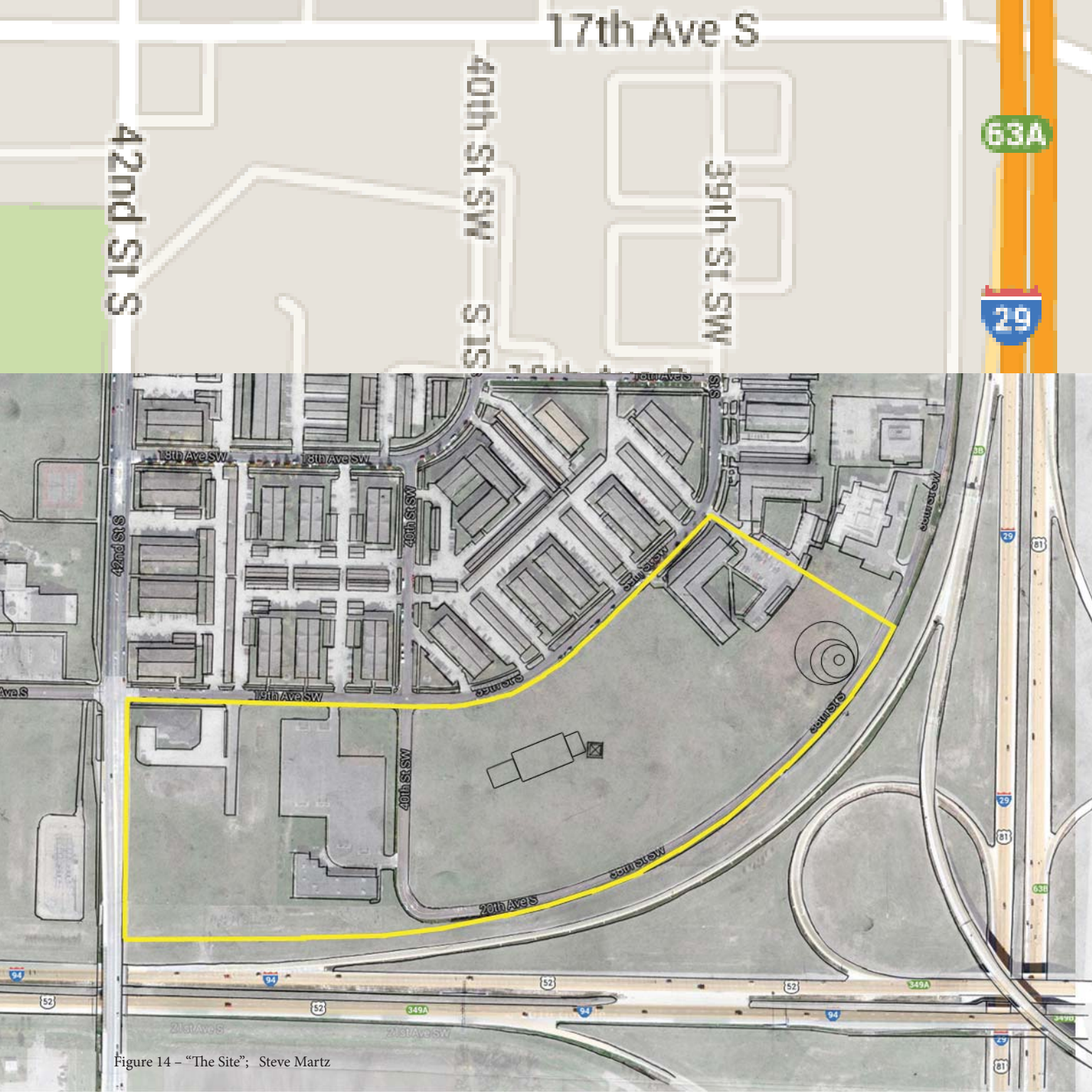


Figure 14 – "The Site"; Steve Martz

The site is bounded by 42nd Street to the West and wraps around to follow the curve of the I-29 Southbound to I-94 Westbound ramp in a Northeast direction. The site is approximately 1500' end to end as the crow flys and 580' in depth along 42nd St. deepening to 640' right before the curve begins headed East on 19th Ave. SW; the site's Noethern boundary. There is a frontage road to the South that follows exactly the aforementioned interchange and is numbered 20th Ave. S or 38th St. SW. Traffic on 42nd St. is rather busy but all other bounding streets are relatively slow. If this site is to be utilized, the lack of entrance and exit ramps from 42nd St. on and off of I-94 East and West bound will be beneficial as there is less congestion to deal with for the placement of the complex track system required for a large main station.

The site is completely void of any notable topography with less than 1' change in total elevation going either way across the site except for one spot towards the Eastern side where there are some trees. The spot where the trees are is the lowest spot; it isn't registered on any of the topo maps I observed but it is easily two feet lower in an area of about 100' in diameter. I am not positive but I would guess there is a street sewer drain in the area somewhere.

The site is also completely void of all vegetation except grass and in a spot towards the Eastern side where there is a small growth of brush; likely basswood or cotton wood trees and some dogwood bushes. The lack of trees and tall buildings allows uninhibited light at all times of the day the entire year.

Wind from the North may be blocked partially from the buildings across the street but it is unlikely that they will have much effect because of the large size of the site. Possibly in the future the site will be bounded by larger buildings which could help or just exasperate the situtation.

This site was chosen partly because it seems like a likely spot for a very busy mixed use "downtown" type of neighborhood in the future and as Fargo and Moorhead's existing dowtown areas become void of free space a new spot for similar use will be designated. Similarily to what happens in many larger cities there will likely be more that one "downtown" like area.

Emphasis

The theoretical premise of this thesis is an attempt identify the possible avenues of preparation that can be taken in the planning of a future civic project of considerable size allowing its construction to be efficient and cost effective both for the sake of saving time and money and in anticipation of the possibility that total outright funding may not be feasible when the system is needed. The design emphasis in this case is a rail system for the transportation of both people and products.

Research Direction

Research for this thesis will be conducted on past, present and projected growth plans and data for not only Fargo and Moorhead but also for the communities in direct proximity and those who could be in the future. Also taken into account will be the serviceable life of both above ground and buried infrastructure and options for modification in regard to their ability to support a proposed rail system design and increased service load. Research for the design of the rail system will be conducted using case studies of existing successful systems and formal analysis of proposed systems and their requirements.

Documentation Plan

All Information will be compiled digitally and organized by project aspect and made available for review via CD-ROM or USB Flash Drive.

Design Methodology

Mixed method quantitative/qualitative analysis
Graphic Analysis
Digital Analysis

Mixed Method, Quantitative Qualitative Approach: Concurrent Transformative Strategy

- The strategy will be guided by the theoretical premise/unifying Idea
- Implementation: Both quantitative and qualitative data will be gathered concurrently.
- Priority will be assigned by the requirements of the theoretical premise/unifying idea.
- Integration of the data will occur at several stages in the process of the research and will
  depend on the requirements of the examination of the theoretical premise.
- Analyzing, interpreting, and reporting of results will occur throughout the research process.
- It will be presented in both text and graphics.

Quantitative Data, including but not limited to:

- Statistical Data: Gathered and analyzed locally or obtained through an archival search.
- Scientific Data: Measurements obtained through instrumentation and or experiment: Gathered directly or through an archival search.

Qualitative Data:

- Gathered from direct observation
- Gathered from a local survey

Figure 15 – "Wuppertal-Mono-fig3"; http://images.nycsubway.org/articles/wuppertal-mono-fig3.jpg

previous studio expirience

Fall 2010-Spring 2011 – 2nd Year
- Fall Studio – Joan Vorderbruggen

Tea house
Boat House
- Spring Studio – Joan Vorderbruggen

Montessori School
Dwelling

Fall 2011-Spring 2012 – 3rd Year
- Fall Studio – Regin Schwean

Zombie House Competition
Artist in Residence
- Spring Studio – Mike Christenson

New Science and Math Building on NDSU Campus

Fall 2012-Spring 2013 – 4th Year
- Fall Studio – Don Faulkner

San Francisco High RiSpring Studio- Don Faulkner
Marvin Windows Competiti
Creative Solution

Fall 2013-Spring 2014 – 5th Year
- Fall Studio – Regin Schwean
- Spring Studio/Thesis Design - Mark Barnhouse

program document

research direction, goals
review
evidence building
typological research
history
site analysis
climate analysis
programmatic requirements
appendix

research direction/goals

In the year 2114, 100 years from the current, what will be the current state of affairs in the Fargo/ Moorhead metro area? What will the social and political layout be; what sort of boundaries physical or otherwise will have been established? Is it possible that limits will have been put in place to physically constrain the footprint of the cities or will the combined effort of the municipalities of the area have created a huge and sprawling conglomeration of houses and strip malls as currently seems to be the situation? In regard to my project; what will these boundaries mean for the need, or lack thereof for public transportation. I believe the starting point of my design lies in the development of a predicted metro area footprint.

Upon beginning research necessary to complete a comprehensive design, my logic points me first towards the examination of the historical, recent, and predicted growth trends of the F/M area. Where has this area been and what has it taken to get to where we are now? Do I use the common practice exponential theory or a simple law of averages to predict population and size? Combining that mathematical information with professional opinion I need to decide where we will be headed moving forward. Whatever information I find delving into these topics however can't be used exclusively as a basis for design. Good ideas (albeit and some bad ideas) have the habit of becoming trends; trends spread and evolve to accommodate specific situations. Just like fashion in pop culture, design ideas spread and are emulated and continually adapted and refined to solve individual problems, it is architectural evolution. Research into the current trends of larger cities regarding their actions taken to limit sprawl and promote infill will prove to be valuable insight into decisions up and coming concerning the growth in the Fargo/ Moorhead area.

review

FARGO

The city of Fargo's official growth plan from 2007 on the City of Fargo website claims and average physical growth of 266 acres per year for the last 35 years and has projected population growth being anywhere from 170,000 to 243,000 people in 50 years. Considering the current population of Fargo at 105,549 (according to the 2010 census) and the present hotbed for industry and ensuing rapid growth of the city that Fargo is experiencing that wasn't factored during the development of this plan (in 2007) I would say rationally the 243,000 number will be more accurate by the year 2057 (50 years from 2007, the year the growth plan for Fargo on its website is dated).

Of particular interest is Fargo's plan for expansion through the developments of neighborhoods. The plan is that each neig hborhood becomes a 1x1 mile area with bordered on all sides by arterial roads. Each section will have a park or an elementary school at the center and a park doubling as storm and melt water retention at the center of each quarter. The neighborhoods will contain mixed use development allowing simple services to be within walking distance. The main idea behind Fargo's city plan is to "elevate the pedestrian and transit to an equal level of consideration as the automobile." This view lends direct merit to the basis of my thesis project. **An extremely important part of making a city walkable is to make its public transit system efficient but above all else reliable.**

The city of Fargo has obviously put a lot of time and effort into their predictions of the changes to take place in the next twenty years. Twenty years is a reasonable amount of time to expect a relatively accurate calculation of a growing city's size and population. Both Moorhead and West Fargo have in similar fashion developed growth plans for their individual wants and needs. At first I was planning to cite and display directly these graphic representations from each of the individual cities' plans but it seems that because my project reaches so far it would be more pertinent to simply observe population and density trends of these communities and their surrounding neighbors. Also as a guideline for my thinking and for relatable comparison for the reader I've decided to use The Minneapolis-St. Paul Metro area as my case study for urban growth. The Minneapolis St. Paul area is not only close and familiar but is also demographically similar to Fargo in many respects, most notably its industry and commercial sectors. Historically both areas have been built as inter and intrastate commercial hubs with a huge emphasis on the transport and production of commodities and currently both remain heavily rooted in similar industry.

WEST FARGO

One of the most intriguing parts of West Fargo's comprehensive plan developed in 2008 is the note on one of their maps stating "downtown infill and investment." One thing I've always thought would be key to making West Fargo seem more like a community is to invest some effort into the Sheyenne Street corridor. It is no secret that a lot of people in the architectural design community have a dislike for the city of West Fargo. Mostly you hear people state the lack of separation of industrial and residential (I love West Fargo for this very reason; to me it feels more honest).

I believe this city will continue to expand exponentially for at least the next several years if not the next decade or longer. Following probably a maximum of no more than a couple decades I believe the population increase will follow a model more linear in fashion. No specific projections of population were noted on the West Fargo site however the 2010 Census placed the population at 25,830 and 14,940 in 2000; the last population listed according to the West Fargo site is in 2006 at 24,184 people. I'm not sure of the explanation for the extremely small increase in population from 2006 to 2010 but it could have had something to do with the economic trouble that began in 2008. West Fargo claims to have extra territorial land to allow the city to grow another 15,000 to 20,000 residents before another plan will be needed.

MOORHEAD

Moorhead operates its own separate transit system but works hand in hand in hand with the Fargo system allowing transfers from a Moorhead bus to a Fargo bus and vice versa at the ground transportation building in downtown Fargo. Moorhead is growing less aggressively than the communities on the West side of the Red River. Moorhead's comprehensive plan from the city website drafted in 2004 claims several reasons like a misunderstanding about higher income taxes which Moorhead claims to be offset by lower property taxes. Another reason given is Fargo's status as the largest city gives it more allure to rural residents moving to the city and Moorhead does not hold the same status on the Minnesota side. According to the U.S. Census Bureau Moorhead the population of Moorhead was 38,065 residents in 2010 and in 2000 the population of Moorhead was 32,177 proving the simple fact that regardless of the pace of growth, it is indeed growing.

evidence building

As the metro area grows it will continue trending South faster than North, East, or West due existing and future flood mitigation, and geological flood protection (higher elevation, increased topography). Western expansion will continue almost as quickly and development will stay tight to the both I-29 and I-94 and along other main routes like state highways and busy county routes. Southern expansion could reach as far South as the cities of Christine on the North Dakota side and Wolverton on the Minnesota side and possibly further to Abercrombie, ND and Kent, MN.

Western expansion will be facilitated by the high traffic volume on I-94 and its convenience to and from the core cities. This development could continue as far West as Casselton but more likely it will simply meet Casselton somewhere West of Mapleton, Mapleton becoming a suburb of either Fargo or West Fargo. The existing municipalities surrounding Fargo, Moorhead, and West Fargo will become stand-alone suburbs (like Mapleton), become annexed by the larger neighboring cities, or become terminal growth communities restricted by the larger cities surrounding them.

Expansion to the East will be limited if Minnesota isn't able to complete a successful turn-around in their economic situation. My initial thoughts are of an expansion along highway 10 being the most likely. In the case of development along that corridor the Eastern boundary of the metro area could easily be a little way East of Glyndon. Southern expansion I don't think will extend very far East of the Red River, with the exception being a merging with the city and of Sabin and the current interest in development in that direction. Development to the South could follow the city of Fargo however and as stated earlier reach as far South as Wolverton.

The benefits of living in Moorhead over Fargo have been in the past and seemingly will remain in the future rather pale. Minnesota's city funding model poorly reflects the needs of its cities by requiring cities to request funding a year in advance of the next state budget and even if the requests are in on time for the next fiscal year larger cities have more political pull and therefore take the majority of the money before smaller cities like Moorhead, Dilworth, and Glyndon are even considered. Also in Minnesota property taxes are not kept and spent locally within the county they were collected, they are sent to St. Paul where they are used to make each year's state budget. This is the reason property taxes can be so high in a city where civic services are struggling. This is not an attack on Moorhead, it is simple economics and it is reflected in year after year of slow growth (compared to across the river) both in citizen population and commercial and industrial investment in the city. It is important to note however that even though the growth is slow compared to Fargo and West Fargo, it is still positive.

Northern expansion will also be limited because of geographically poor building opportunity. Flooding to the north of Fargo is significantly more severe and current flood mitigation plans don't address very much area to the North of the Existing city boundaries. Fargo and Cass County are restricting growth to the North and following completion of any flood project the likelihood of extending or rerouting to open land on the North end of Fargo along I-29 is poor.

As Fargo, Moorhead, and West Fargo grow there will be opportunity for these cities to annex other smaller cities and unincorporated developments. The process of annexation could be well received by these communities because of the advantages of city services or become messy hard fought battles that could very easily not end in favor of the larger cities. Many smaller surrounding communities whether incorporated or not enjoy an existence of quiet convenience with many of their needs such as groceries and fuel being met by business within their city limits they live happily without the higher property taxes and mandatory fees that come with a changed jurisdiction and city services and would resist becoming part of a larger city.

The upper Midwest is an area where people are proud of being more independent and public services are often shunned as being for people dependent on government. This same mindset of proud independence is also reflected in an unwillingness to depend on someone or something else for transportation services. One of the most notable traits of people from this part of the world as a whole is their mindset towards saving and borrowing money. There is an ever prevailing attitude about being careful and responsible with the way money is spent; something government is constantly being criticized for (yet they seem to make no effort to improve their image). Most government entities mysteriously seem to have no ability to operate entirely in the black and therefore are constantly asking for more and more money from their constituents and within the city of Fargo and Cass County it comes in the form of currently the highest property taxes and sales tax in the state. It will be a tedious and stubborn process of convincing the citizens as a whole that a service like this will be eventually beneficial and worth the cost even though the cost will be astronomical and may be impossible if the process means raising taxes. One key factor will be the way the project is promoted. If the process is brought forward as a plan for the future and a responsible budget is relegated to provide for future implementation and a fair amount of it is done with very little or no increase in tax (like a savings account with excess state appropriated funding in the fat years) there will be an ability to promote both the idea and the city as being responsible and affordable.

If a conceivable territorial and population plan can be developed then creating and planning for a specific project defined dollar value would be possible. Figuring the amount of funds that will be needed to set the ball rolling will be another problem. Without a doubt the cost will not be exact but how often does someone save for a new vehicle or the down payment on a house with an exact amount in mind (much shorter time periods exist on these purchase also). Having in hand considerable money allocated specifically for the project would weigh heavily toward the credibility of a project when it is presented in front of state legislators. Another huge benefit of considering far ahead of time the scope of a civil project of this nature is the ability for neighboring communities to become involved and appropriate funds for a certain percentage of responsibility. Expecting a community of a couple hundred or less people to be able to prove any funds is not feasible and predicting accurately to any extent the population (or even the possibility of survival) of any community in 98 years cannot be a very accurate undertaking but allowing each city to weigh in on the plan and then make the decision of whether or not they want to or can afford to participate will dictate how they are able to benefit when plans are someday put into motion.

One excellent and nearby example of satellite (neighboring) cities benefiting from the metro transit system of a nearby large city is The Northstar Commuter Rail that traverses over 40 miles from the heart of downtown Minneapolis to the suburb of Big Lake; currently set for further expansion to St. Cloud bringing the reach of the cities metro system to 65 miles out of the city. In similar fashion the system I am designing could easily be extended to benefit communities around the area such as Wahpeton-Breckenridge, Hawley and possibly Detroit Lakes, and maybe even as far as Valley City (Valley City is 60 miles from Fargo). The benefit of having the system reach out to these cities is twofold: first is the obvious benefit of reliable transportation for people who commute long distances daily and second is the shared installation and operation cost. If these cities were in on the project from the consultation stage on, their individual responsibilities could be calculated approximately and what started as a small idea could soon make major connections.

While the F-M area grows it will be interesting to see how the layout of the towns react. In 100 years the population of the metro area will likely exceed 300,000 with many nearby cities growing independently of and in direct response to the growth of the F-M area. Total city populations in the local site area should easily exceed 500,000 people. With a population that large the issue of Urban Growth Boundaries (UGB) will probably be raised at some point especially as Fargo specifically begins to spread towards County lines and other cities' boundaries.

“Premature development outside of its current municipal boundaries, coupled with shortsighted infrastructure extensions could lead to longer term growth pains for the City.”
-city of Fargo Website-

The first UGB was in Lexington Kentucky in 1958, the most popular and controversial is Portland Oregon. The intent of a UGB is to limit urban sprawl and to protect agricultural and natural spaces and to force a city to develop more compact and contiguous. This intent fits directly into what both the Fargo and Moorhead growth plans specifically call out as a desired effect of their future growth plans and that is a city with a large amount of parks and public space and the progressive development of walkable neighborhoods. Limiting the outward growth of the city provides incentive for these things to become reality. The limiting of city development also limits city controlled utilities and infrastructure which basically caps maintenance budgets and alleviates emergency instances where city slush fund money is needed for repairs or replacement. When it comes to city run transportation services the compact development will hopefully allow for people within the city to be more efficiently served by public services like a public transportation system.

A downside to any sort of UGB stems from the viewpoint of private citizens; specifically landowners and developers. As these groups of people see it any sort of boundary on the territorial development of a municipality directly limiting development inside the city limits severely handicaps their industry. People living very near a city want city services like utilities and busses and if the development where they live falls outside the current growth boundaries those services may not be available and if they were to be they would come at a hefty cost to the citizens of said community because having those services installed or rendered would come at a premium without the benefit of a city contract. Also living so close to a city and being denied certain desired services (some people specifically don't want city services) is controversial when considering the tax base that people who work and shop there and therefore contribute significantly to that city's tax base and it would seem ill advised for the city to ignore those requests.

Another very specific drawback to the idea of urban growth boundaries is the idea that although the growth of the city is in essence forced to become increasingly compact and contiguous is still doesn't actually stop the development of areas outside of the boundary. The areas outside of any growth boundary are still available for development in a free market (any owner can sell his/her land to any buyer and if the land is lacking zoning restrictions its repurposing is pretty much open ended) however the developments will not be considered part of the city. The fact that development isn't really impeded is the reason many people don't believe that UGB's have any real valuable impact on urban sprawl.

If Fargo were to implement some sort of urban growth boundary strategy the plan would need to be in conjunction with the surrounding municipalities, Cass and Clay counties and any other political precinct affected by the growth of the F-M area. I personally would like to believe that the market supply and demand would take care of the problem of urban sprawl. The land in the Red River Valley is the most fertile farm land in the world and it is sad to see it being taken up by development after development filled with what really amounts to half assed attempts at individualism but I am also in favor of capitalism (more along the lines of reserved capitalism) and I believe in trying to restore some sort of free market economy (impossible as it may seem!!!) and imposing rules and regulations really does nothing but force people to find ways around them. The amount of legislation passed in this country on every topic and ideal imaginable that tries to account for every eventuality is staggering and although they try year after year the job they wish to do is impossible and the trail of failed attempts is immeasurable. Laws are only as good as their enforcement and if they're lost in translation and unenforceable they equate to nothing more than wasted time and money.

NOTE: In Oregon the growth legislation gives the cities the ability to acquire and dedicate land specifically for natural and agricultural areas allowing

I need to build evidence for the size and population of the metro area in 100 years based on growth plans and trends and population trends… then design my system to fit…

In order to establish some sort of overall population for the F-M metro area in 100 years I will need to make some educated guesses; a hypothesis of sorts. Specifically I will pick the year 2100 for simplicities sake. For the following population analysis I will refer to several types of cities

Anchor cities – An anchor city is a major community within the entire metro area. In this case there are three cities that fit this description in the F-M metro area: Fargo, Moorhead, and West Fargo

Suburb – A suburb is a community within the entire metro are that is not considered an anchor city but is also not entirely dependent on the anchor. A suburb maintains autonomy and does not rely entirely on the anchor, in fact the relationship is of mutual benefit.

BR Comm. – A bedroom community is a smaller community either attached (inside or on the periphery) or detached from the anchor or one of its suburbs whose major function is that of a residential community. There is no major commercial or industrial entity in a BR community.

The charts below outline population and density figures estimated by me. I am not an expert in the field. The figures are calculated lineraly instead of exponetially due to existing evidence that world population is expected to plateau and the U.S. population is expected to begin decline somwhere near the middle of the next century.

My population formula:

((1950-1900)/50)+((1990-1950)/40)+((2000-1990)/10)+((2010-2000)/10)+((2012-2010)/2)/5 = Approx. increase in ppl/yr over 112 yrs (A) then ((A*50)+2012)-(2000)/50=avg ppl/yr till 2050 = (B) then B*50+(2050)= avg. pop. in 2100 according to me. ≈

Anywhere years are missing they were simply skipped. Numbers that seemed absolutely asinine were "adjusted" per my opinion.

Current anchor city populations and estimated 2050 and 2100 populations.

Cities' Population According to Census Year

	1900	1950	1990	2000	2010	2012	2050*	2100*
ND Anchor Cities								
Fargo	9,589	38,256	74,111	90,599	105,599	109,779	176,864	263,129
West Fargo		1,632	12,287	19,940	25,830	27,478	88,936	157,933
MN Anchor Cities								
Moorhead	3,730	14,870	32,295	32,177	38,065	39,039	56,263	80,349

*denotes an estimated population value derived from the cities' growth p lans and U.S. Census data

The chart below lists the populations of area cities that will either become part of the Fargo, Moorhead, or West Fargo Municipalities or depending on their ability to grow and geographic location may become surrounded and therefore become terminal or become major suburbs. The last line is their combined total population for 2012 and my estimated combined populations for 2050 and 2100.

Yellow – Cities that will most likely become suburban communities.
Red – Current BR communities that could remain as such and/or become terminal possibly being incorporated into either Fargo or West Fargo.
Blue – Cities that may not quite become part of the growing Metro and could either become bedroom communities or suburban communities.

	1900	1950	1990	2000	2010	2012	2050*	2100*
ND Cities								
Harwood			590	607	718	733		
North River			68	65	56	56		
Reile's Acres			210	254	513	568		
Frontier			218	273	214	215		
Prairie Rose			49	68	73	73		
Briarwood			88	78	73	76		
Horace		190	662	915	2430	2496		
Oxbow			100	248	305	306		
Kindred		504	569	614	692	707		
Davenport	426	150	218	261	252	253		
Mapleton	322	169	682	606	762	806		
Christine	140	153	150	149				
Warren								
Colfax			80	91	121	121		
Everest								
Durbin								
Abercrombie	290	244	252	296	263	261		

Area city population chart Cont.

	1900	1950	1990	2000	2010	2012	2050*	2100*
MN cities								
Dilworth		1,429	2,562	3,001	4,024	4,091		
Glyndon	250	411	862	1,049	1,394	1,393		
Sabin		211	495	421	522	532		
Georgetown		192	107	125	129	129		
Oakport				1,334	1,387	1,387		
Comstock		139	123	123	93	93		
Kent		178	131	120	81	81		
Wolverton		198	158	122	142	143		
Baker					55			
Kragness								
Averill								
Downer								
Total				**10,820**		**14,520**	**33,020**	**51,520**

Current distant municipalities that will be affected by and possibly benefit from the growth of the F-M area but probably not directly encountered.

Yellow – cities that will most likely will remain stand-alone communities.
Red – Current communities that will likely develop into BR communities.

	1900	1950	1990	2000	2010	2012	2050*	2100*
ND Cities								
Leonard			310	255	223	226		
Alice		162	62	56	40	40		
Enderlin	636	1,504	997	947	886	871		
Grandin		156	213	181	173	176		
Wheatland					60	68		
Amenia		127	82	89	94	95		
Argusville		126	161	147	475	480		
Walcott			178	189	235	234		

Current distant municipalities cont.

	1900	1950	1990	2000	2010	2012	2050*	2100*
MN cities								
Felton		258	211	216	177	180		
Ullen	317	525	547	532	547	549		
Hitterdahl		262	242	201	201	202		
Hawley	526	1,196	1,655	1,882	2,067	2,070		
Rothsay	296	537	433	497	493	494		
Downer								
Baker								
Averill								
Total				**5,192**		**5,655**	**7,970**	**10,470**

Larger ND/MN cities that will become Satellite Cities to the F-M area meaning they will grow with the larger city but will remain mostly independent.

	1900	**1950**	**1990**	**2000**	**2010**	**2012**	**2050***	**2100***
Wahpeton	2,228	5,125	8,751	8,586	7,760	7,800		
Valley City	2,446	6,851	7,163	6,826	6,585	6,589		
Breckenridge	1,282	3,623	3,708	3,559	3,386	3,387		
Detroit Lakes	2,060	5,787	6,635	7,348	8,569	8,812		
Barnesville	1,326	1,593	2,066	2,173	2,563	2,560		
Total						**29,148**	**35,598**	**43,048**

These charts outline the population of all the cities I believe will be affected by growth in the F-M area in the next 98 years. The number of variables and subsequent variables of those makes guessing both population and density almost impossible. Again I can look East at Minneapolis and interpret that city's experience and effect it on the data I have calculated in an attempt to make my predictions more accurate and if not more accurate than more convincing!

The estimated 2050 and 2100 populations are simple averages I figured out extrapolated from existing census data from 1900. I didn't figure the populations on an exponential model as is usually customary for this type of calculation due to the fact that the census bureau believes and current birth and death rate data point to a plateau in the population growth in the U.S. and a slowing in the overall population growth worldwide. An online "Scientific American" article titled "Will Human Population Growth Peak in the Late 21st Century?" cites the United Nations Population Fund (UNPF) which predicts that the world population may peak in the late 21st century and then begin to shrink. It seemed more likely that the population would increase more linearly than exponentially into the next century.

I calculated the population of what I believe to be the expanse of the entire metro area in 2100 by mapping my territorial estimate and researching the population histories of all included cities and municipalities that were encountered. The current population of these communities combined with the main cities of Fargo, Moorhead, and West Fargo as of a 2012 U.S. Census estimate is 192,010 people. Through my extrapolation I deduced a 2050 population of 253,943 and a 2100 population of 313,725.

Now with after settling on figures of population I can produce my opinion of the Fargo Moorhead area in 2050 and 2100 by using the density figures to estimate the territorial size of these cities based on my population figures. The smaller surrounding communities will be I admit, entirely speculation as I don't have time to really delve into each little town specifically nor is it possible to, with any accuracy at all, predict the future performance of each of these smaller communities. I can however draw on my own personal experience with these smaller cities to provide a feasible future possibility.

Due to the current and increasing value of farmland and considering simple convenience issues I predict with the utmost certainty that development of the F-M area will follow closely the two interstates and state highways throughout the area. I don't think that this city will quite resemble the uniform shapeliness that Minneapolis has experienced as it has developed. The land that Minneapolis and St. Paul and their surrounding communities inhabit is not as suitable for productive farmland albiet there is plenty of farm land in the area along with very productive livestock operations. However it is continuously broken up by numerous rivers and lakes and is more topographically notable than the flat and fertile Red River Valley.

The current population of Minneapolis is 392,880 with a population density of 7,019.6 people/sq. mile. Fargo is listed at 2,162ppl/sq. mile according to the same census. As Fargo and Moorhead grow their density is sure to increase. Their ability to spread out will begin to be limited. If one looks at a map Minneapolis and St. Paul don't really physically occupy a huge amount of land. Minneapolis currently is rated at 58.4 sq. miles with a population of 392,880 (est. 2012 pop.) and St. Paul is 56.18 sq. miles with a population of 290,770 resulting in 5,484.2ppl/sq. mile. Fargo on the other hand is currently already 48.82 sq. miles. I believe that the population density of Fargo and Moorhead will increase to approximately 5,000ppl/sq. mile; this is the density I will use for my design for these two cities. West Fargo, Horace, and Dilworth because of their relationship to the two currently larger cities (flanking) will have the opportunity to spread further and faster to the South, East, and West not having to achieve the same density and remaining largely as residential cities. I will figure an ultimate pop density for my project of approx. 2000ppl/sq. mile for West Fargo and Dilworth. I decided on approx. 2000 by reviewing the population densities of some of the more prominent suburbs of Minneapolis and St. Paul. I believe cities like Harwood and Horace, and Glyndon will remain low in population density because of the availability (lower competition) of land for development.

Current Population and Population Density of anchor cities and adjacent suburbs

City	Current Population	Current Density/sq. mi.	Total Miles Squared
ND Cities			
Fargo	109,779	2,162	48.82
West Fargo	27,478	1,788.8	14.72
Horace	2,496	225.6	10.77
Harwood	733	569.8	1.26
Mapleton	806	190.5	4
MN Cities			
Moorhead	39,039	1,922.5	19.8
Dilworth	4,024	1,215.7	3.32
Glyndon	1,394	923.2	1.51

Estimated 2050 Population and Population Density of anchor cities and adjacent suburbs

City	2050 Population Est.	2050 Density Est.	Total Miles Squared
ND Cities			
Fargo	176,864	3,400	52.01
West Fargo	88,936	2,000	28.5
Horace	7,096	700	14.47
Harwood	4,200	1,000	4.2
Mapleton	1,746	300	5.82
MN Cities			
Moorhead	56,263	2,400	23.44
Dilworth	7,419	1,600	4.64
Glyndon	3,119	1,000	3.119

Estimated 2100 Population and Population Density of anchor cities and adjacent suburbs

City	2100 Population Est.	2100 Density Est.	Total Miles Squared
ND Cities			
Fargo	263,129	4,500	58.47
West Fargo	157,933	3,000	42.64
Horace	12,019	1,000	23.09
Harwood	8,345	1,600	5.21
Mapleton	3,234	500	6.47
MN Cities			
Moorhead	80,349	3,000	26.78
Dilworth	10,814	2,000	5.40
Glyndon	6,514	1,200	5.43

The previous figures are estimations made by me based on linear growth instead of exponential growth due to the evidence I've found supporting a slowing world and plateauing country growth rate with the possibility of decline within the next century. These numbers are for me to use as a basis for my design of this project and are in no way scientific and should not be evidenced to support any theory outside of this design.

The long list of figures and numbers probably isn't really necessary since I'm not a professional social scientist and I can be sure it is not accurate and nowhere near as thorough as a project like this would require however for the proposal of a single iteration of one possible idea I think it will suffice.

typological research

minneapolis light rail system
lindbergh station

The Minneapolis light rail system is a great example of an above ground surface mounted rail system. The unique part of this system is that because it follows surface streets for much of the current track it interacts with the traffic. The light rail is easy to board and is probably the most un-confusing system I've ever been on. The stations are easily accessible and the ones I the downtown warehouse district are right on the street. The light rail system in Minneapolis is a totally unique and absolutely great way to retrofit a rail transit system in an existing city.

Another really interesting aspect of the Minneapolis light rail is its interaction with other modes of mass city transportation. The system is linked directly with the city's bus system allowing people to depart from the train and board a bus directly. I would say that most cities that have both a rail and bus system have this same aspect but I would submit that not many are as smooth in transition as Minneapolis. Another aspect of this light rail system is its connection to the Northstar Commuter Rail system. This system connects downtown Minneapolis with many of its suburbs to the Northwest. It travels currently more than 40 miles using existing heavy rail along highway 10 to the suburb of Big Lake MN, and plans are to soon add another 40 miles headed west from Big Lake to St. Cloud. Minneapolis has connections over 80 miles from the center of downtown Minneapolis and more importantly the system has been successful meaning that people are using it. The most important part of the feasibility of this type of system is the availability of paying customers. It is easy to see this same type of idea taking place in our area. I don't think it's feasible to use the existing heavy rails surrounding the F-M area however because currently they are some of the busiest lines in the nation and finding a spot for another train especially one that will need to make multiple trips a day is going to be possible. Instead I believe additional tracks will be needed but if all involved jurisdictions work together it is probably possible and it is obviously feasible to modify current bus routes to better serve a city with a rail system.

As far as this system being used as one of my case studies the reason I chose the Lindbergh Station on the rail in Minneapolis is because the Lindbergh station is the only underground station on the current track system in Minneapolis. It is the stop at Terminal 1, Lindbergh Terminal at Minneapolis-St. Paul International Airport. The reason the station was built underground is due to the extremely crowded ground traffic between the freeway and the airport runways there was no room for an above ground rail to move freely through the space. This unique solution although expensive is an important option to add to a list of possible solutions to possible problems.

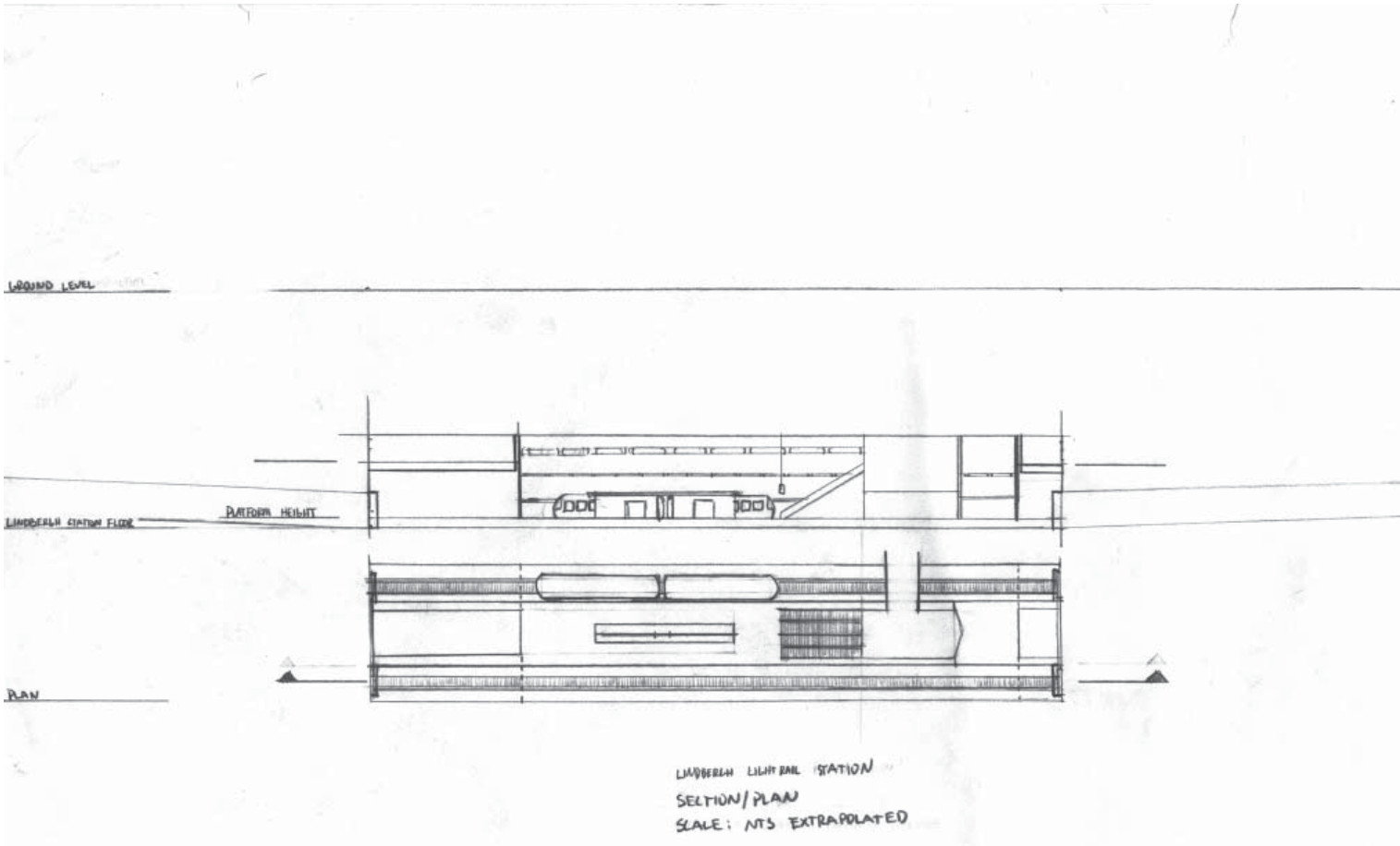


Figure 16 – "Lindbergh Station Section/Plan"; Steve Martz

Figure 17 – “Lindbergh Geometry”; Steve Martz

GEOMETRY

MASSING

Figure 18 – “Lindbergh Massing”; Steve Martz

Figure 19 – “Lindbergh Hierarchy”; Steve Martz

HIERARCHY

PLAN TO SECTION

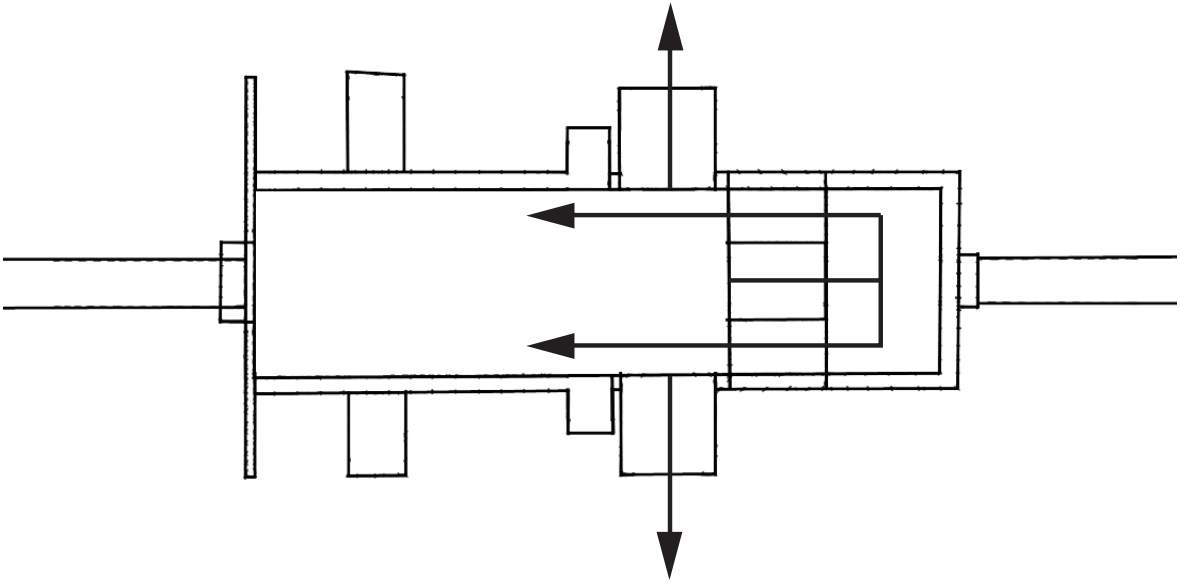
Figure 20 – “Lindbergh Plan to Section”; Steve Martz

Figure 21 – “Lindbergh Structure”; Steve Martz

STRUCTURE

SUNLIGHT

Figure 22 – “Lindbergh Sunlight”; Steve Martz



CIRCULATION

Figure 23 – “Lindbergh Circulation”; Steve Martz

waterloo station
london u.k.

This station has been in service since 1848. It has been remodeled and added on to here and there throughout the years. There are currently plans under way for a major renovation in anticipation of increasing the traffic through the station.

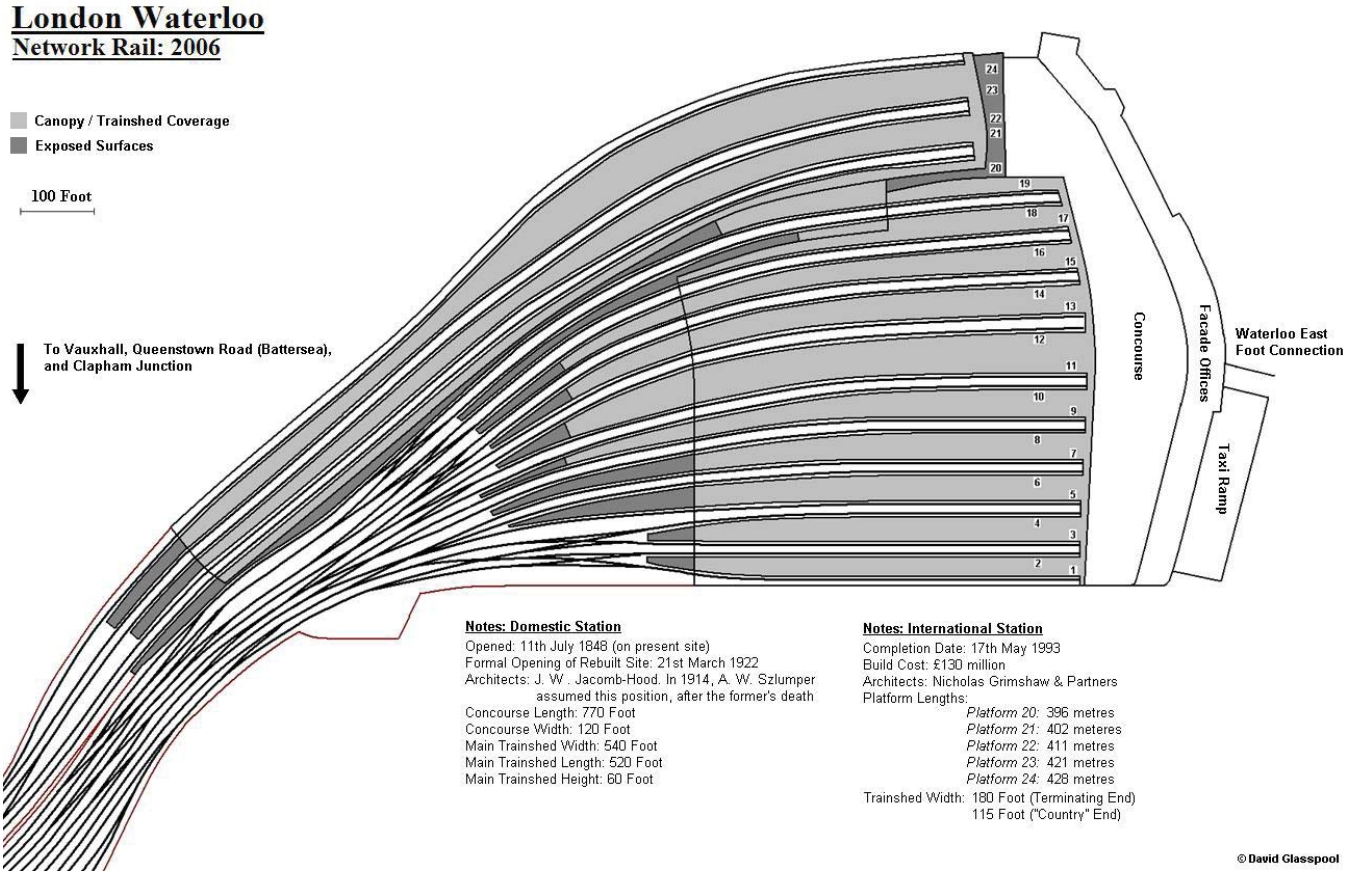


Figure 24 – "Waterloo_Track_Plan"; http://www.kentrail.org.uk/Waterloo_Track_Plan.jpg

Waterloo Station in London is Unique in one very specific way; there were two platforms that opened in 1994 designed to serve as a transition point from the city transit system to the international Eurostar rail system. This service was suspended in 2007 but is rumored to begin again in 2014. The Station is a terminal station for above ground rail but is a stop for the underground rail again increasing its place value within the context of the London and U.K. public transportation network

If we were to consider the possibility of a national rail system in the U.S. and the off chance it would stop by Fargo that would be handy to have a station like this. The other way to look at it is the probable chance that there will need to be a main station in the area and possible a few satellite stations that offer the ability to transfer from the city bus system to the rail and possibly an AmTrack connection if by some miracle that company survives.

Architecturally the Station isn't really notable except for the way the shelter structure is erected over the two international tracks. Using two dissimilar curved trusses to create a steeper wall on the West side, for what reason I'm not entirely sure, but the way the entire structure was built curved in plan to follow the tracks is a really unique aspect. It makes sense to save space because instead of taking space to line the tracks up with the building, the track were lain where the fit and the structure was then adapted to fit to them. This is a design decision that fits well with the probable situations that infill and densification projects could create 100 years from now in the F/M metro area.

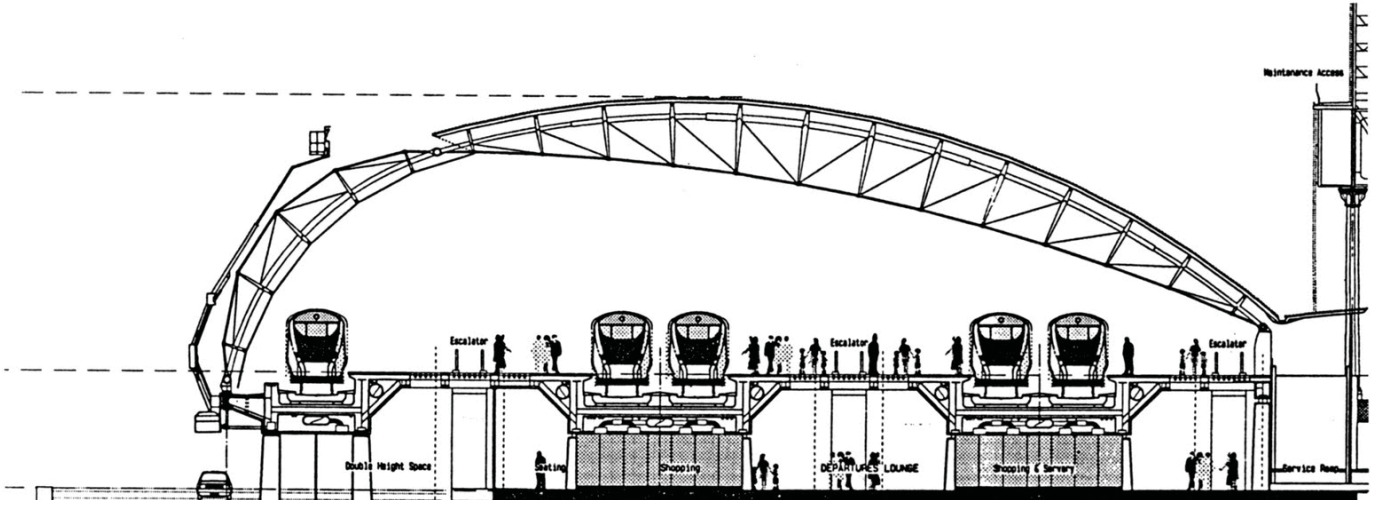


Figure 25 – "WaterlooStation"; http://2.bp.blogspot.com/_d042CW4fZzk/TEhzDasWSWI/AAAAAAAAAjA/5UDcmHA_hJs/s1600/WaterlooStation.jpg

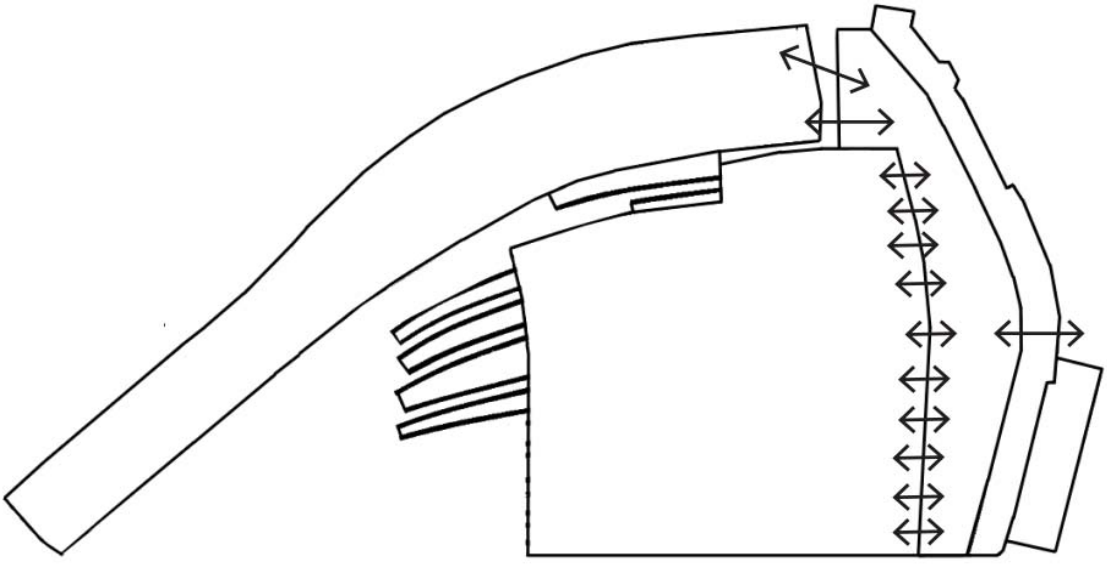
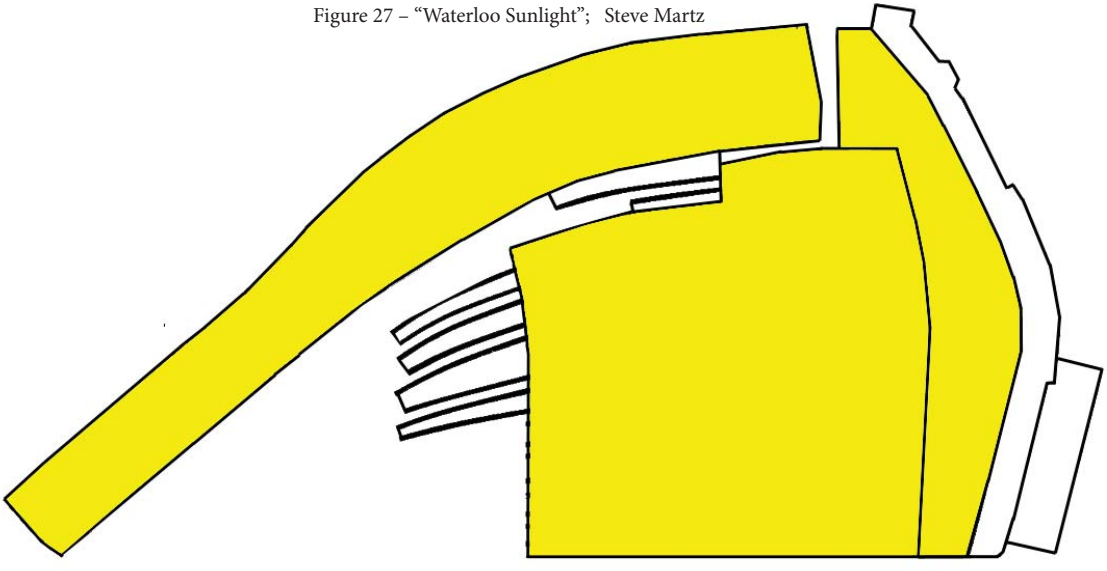


Figure 26 – “Waterloo Circulation”; Steve Martz

CIRCULATION

SUNLIGHT

Figure 27 – “Waterloo Sunlight”; Steve Martz



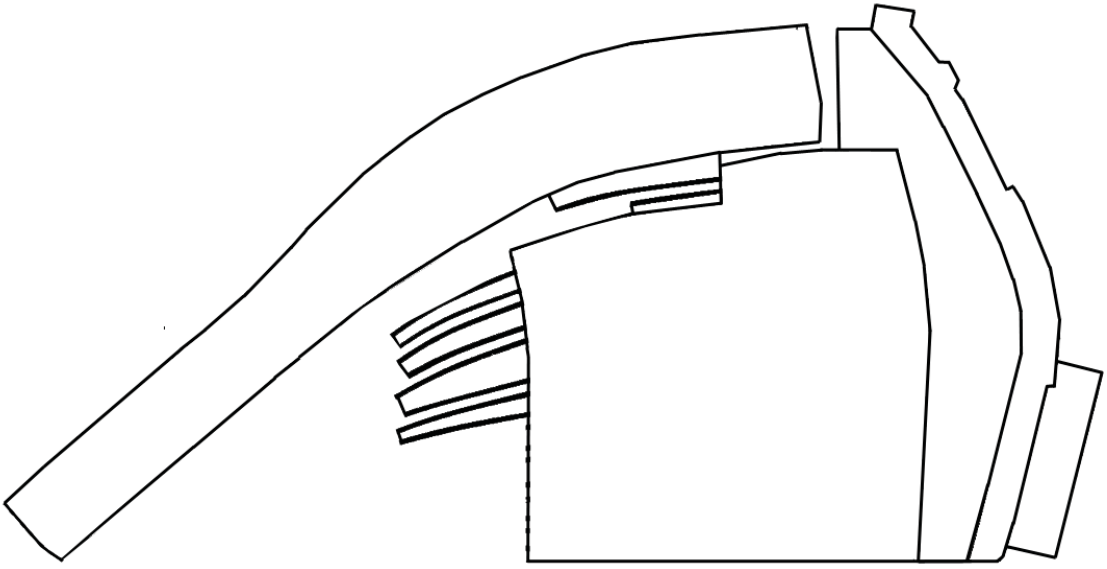
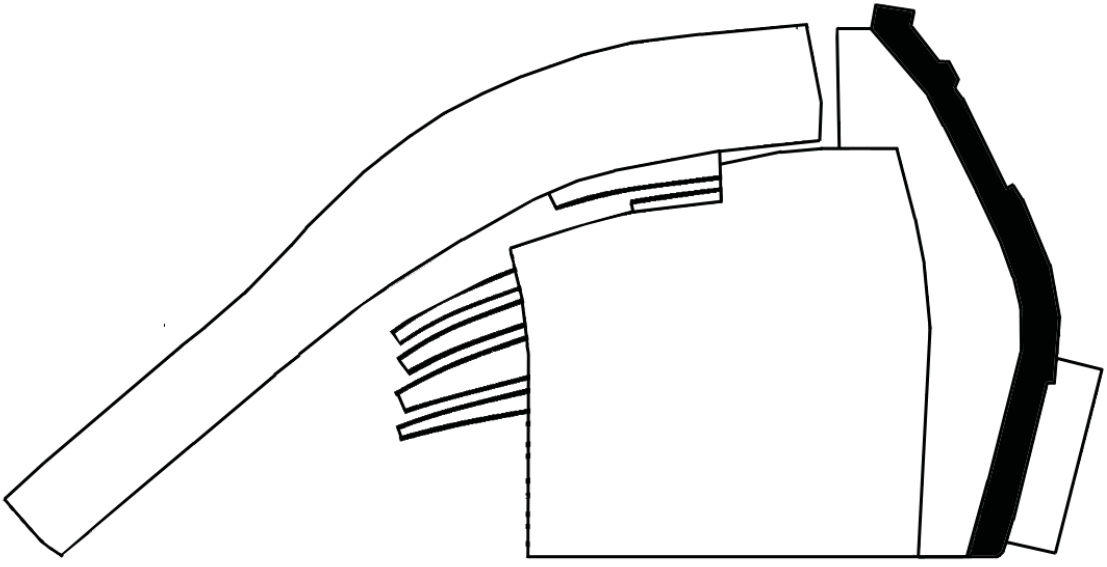


Figure 28 – “Waterloo Geometry”; Steve Martz

GEOMETRY

HIERARCHY

Figure 29 – “Waterloo Hierarchy”; Steve Martz



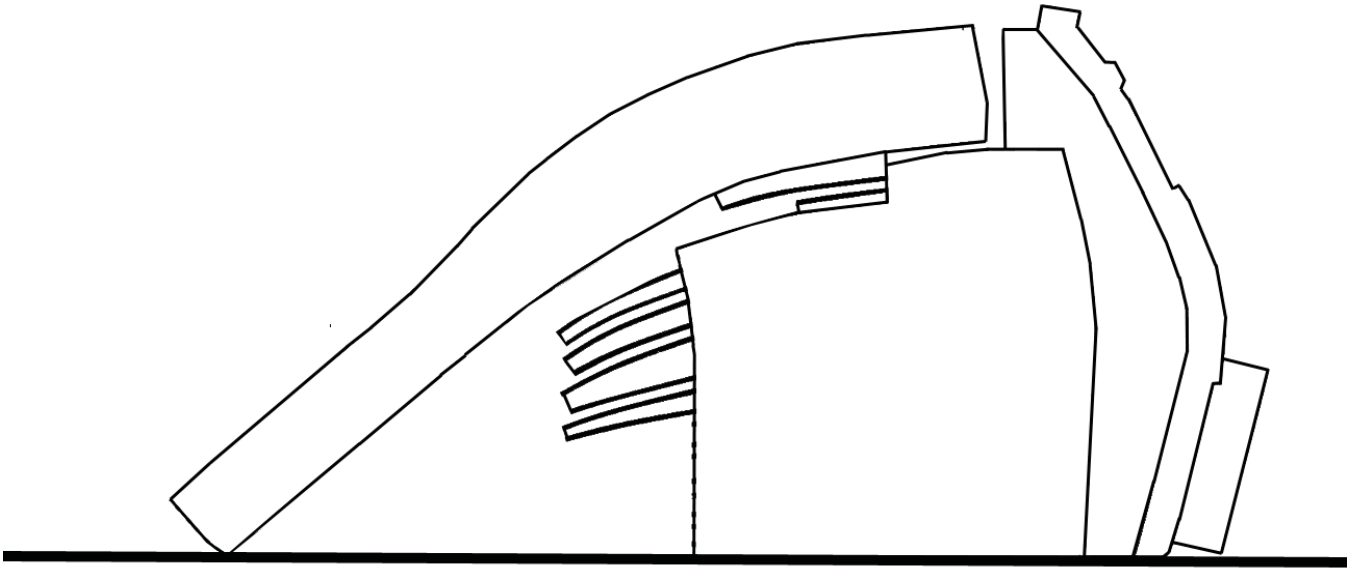
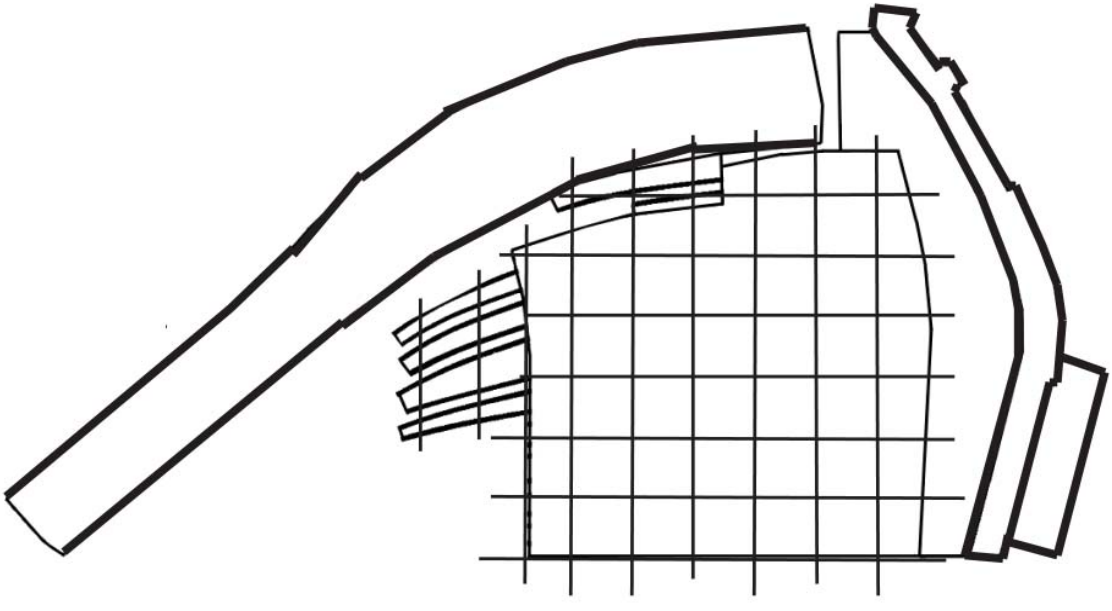


Figure 30 – “Waterloo Plan to Elevation”; Steve Martz

PLAN TO ELEVATION

STRUCTURE

Figure 31 – “Waterloo Structure”; Steve Martz



MASSING

Figure 32 – “Waterloo Massing”; Steve Martz

wuppertal monorail
wuppertal, germany

The Wuppertal Monorail was built in 1900 and has been continuously operated since 1901. First of all I don't speak German and finding information on this project in English is pretty frustrating but for a few reasons I chose this project as one of my case studies. First, and most important I would like to do part of my project as a suspended system. I believe that it offers a perfect solution to unhindered operation during and following winter storms and spring and summer flooding. Also I am a very firm believer that architecture should first solve the problem it was meant to but after the problem has been addressed there is no reason design can't be done simply because looks cool or interacting with it is fun. Second and almost as important the a lot of the stations on this system are absolutely ceremonious in their approach and departure and I believe that although a public works project should be cost effective and functional first, there is no reason that with a little thought and ingenuity it can't also be totally engaging and entertaining. There are a lot of suspended monorail systems that I looked at but the stations that make up this system to me are the most interesting.

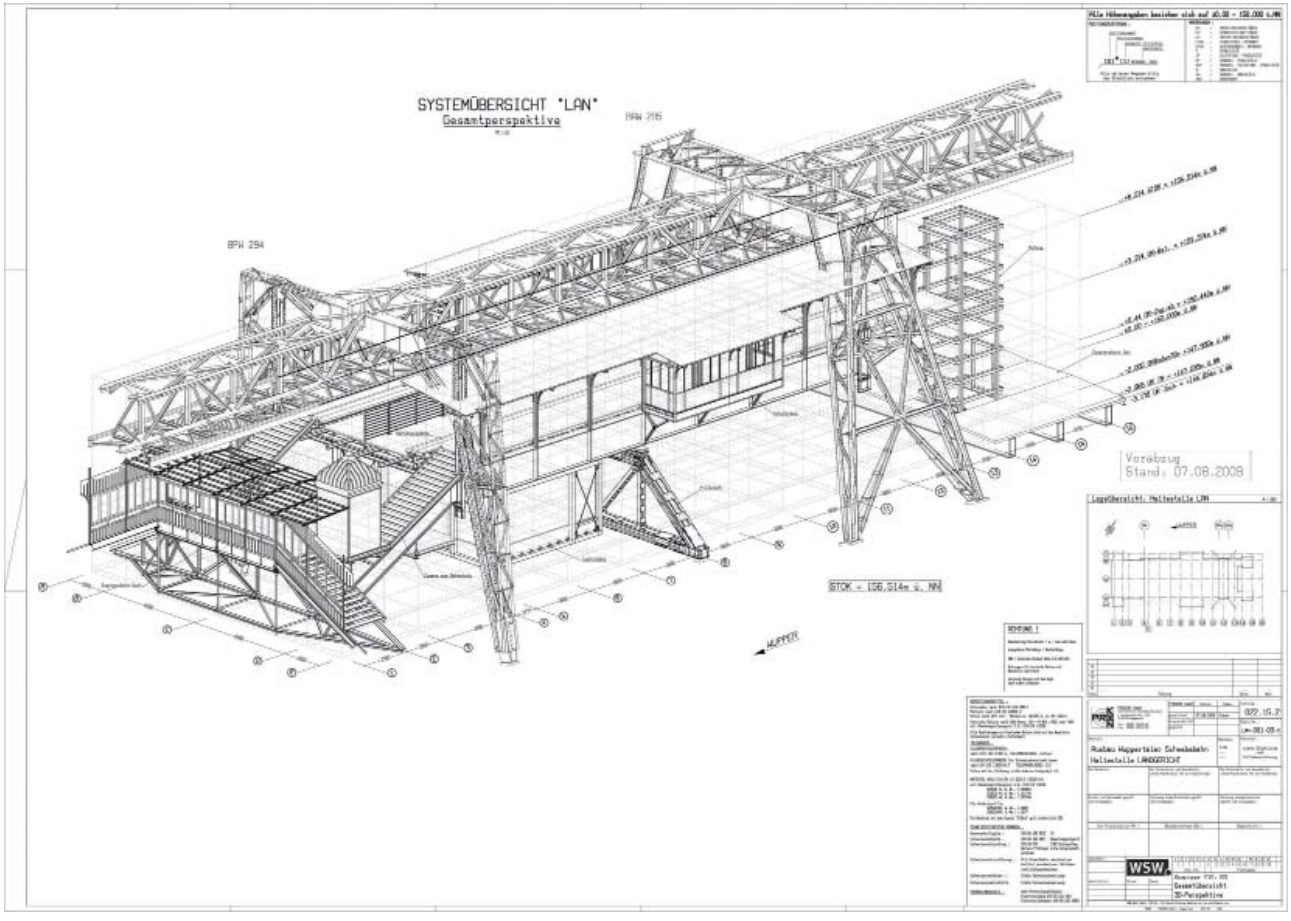


Figure 33 – "wsw-01-landgericht"; http://www.schwebebahn.net/0-pics/7-sonnborn/schwebebahnausbau/20090807/wsw-01-landgericht.jpg

From this drawing, even though it happens to be in German you can tell that the station is not just a place that the track goes through. It is actually part of the track; the actual structure that supports the tracks also lends major support to the station itself. Another important note is the fact that the stations are off ground level. Think about the implications of having the stations in the air when we're talking about urban infill and densification.

This is the one I find to be the most intriguing. I imagine the waiting area to be below where the trains enter and exit offering a unique experience during a probably mundane commute. Surely people using this system everyday would become a bit acclimated to the experience and it would lose some luster to them but to people visiting our community stations built in a similar fashion would serve as a rather memorable experience and could become a destination by themselves.

Figure 34 – "Wuppertal"

Figure 35 – "Wuppertal"

http://mic-ro.com/metro/phototour.html?city=Wuppertal

I don't like the big pipes. This station seems to address two levels of pedestrian access. This is a great situation for infill and densification projects.

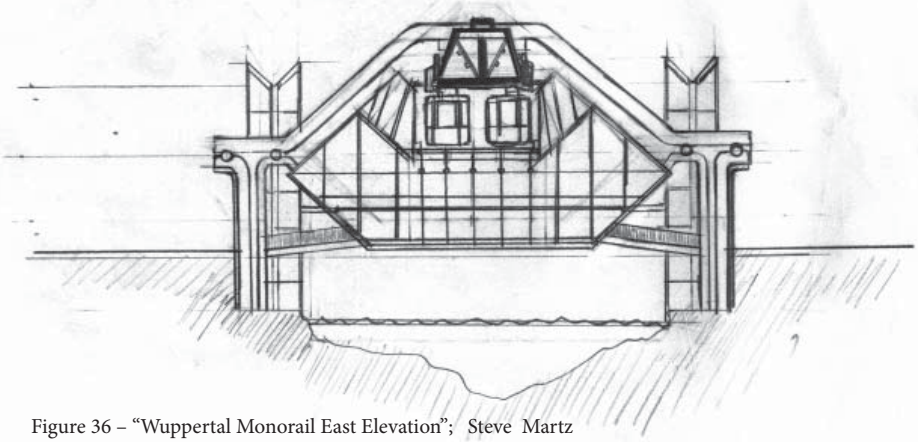


Figure 36 – "Wuppertal Monorail East Elevation"; Steve Martz

WUPPERTAL MONORAIL OHLIGSMÜHLE
END ELEVATION

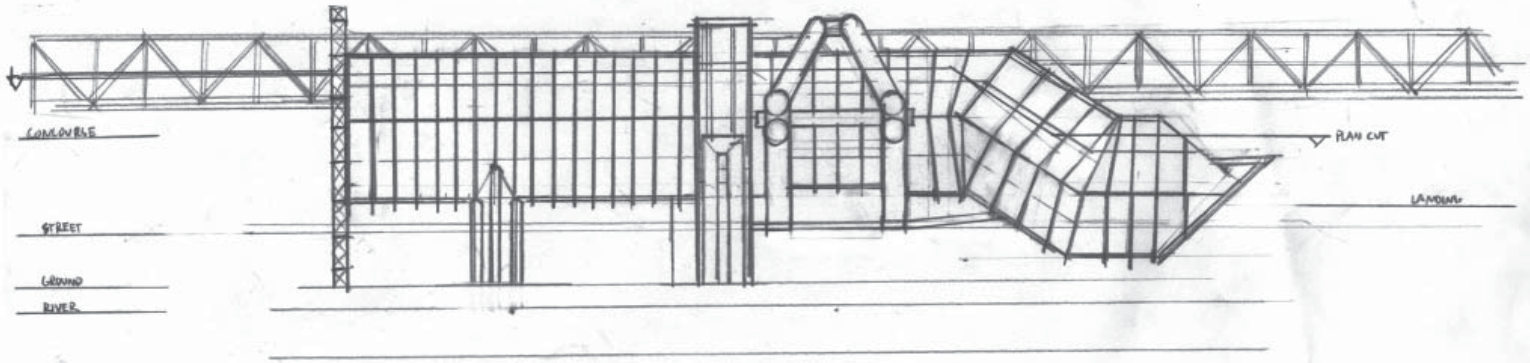


Figure 37 – "Wuppertal Monorail South Elevation"; Steve Martz

WUPPERTAL MONORAIL OHLIGSMÜHLE
SIDE ELEVATION
SCALE: NTS EXTRAPOLATED

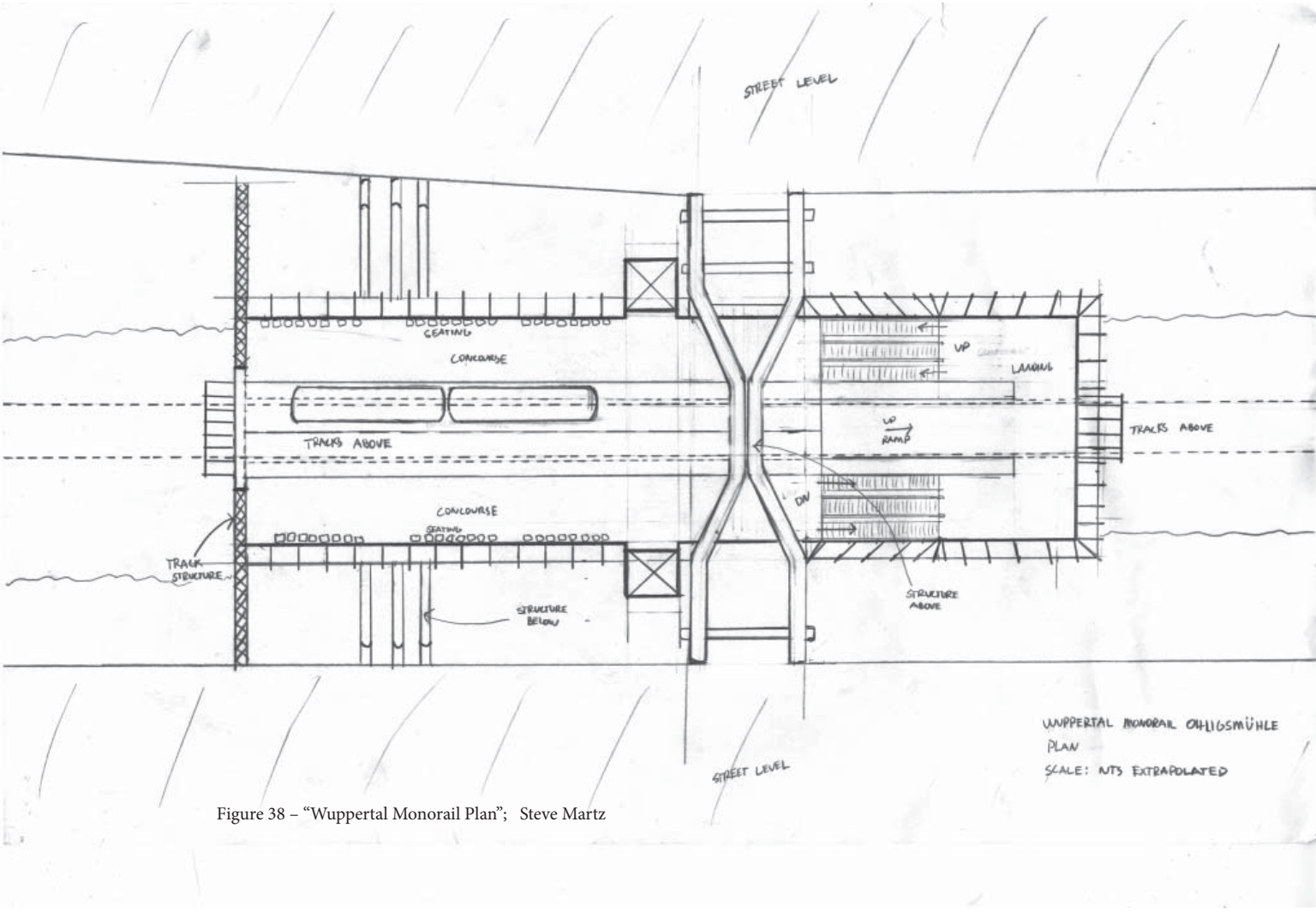


Figure 38 – "Wuppertal Monorail Plan"; Steve Martz

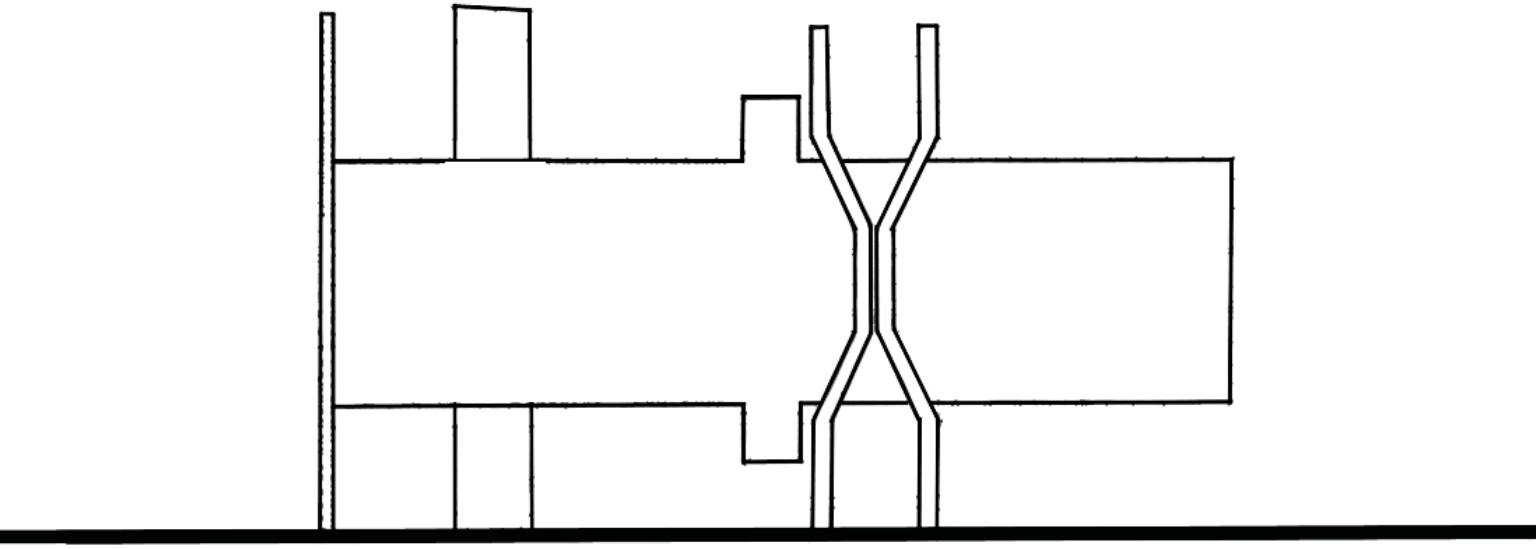


Figure 39 – "Wuppertal Plan to Elevation"; Steve Martz

PLAN TO ELEVATION

CIRCULATION

Figure 40 – "Wuppertal Circulation"; Steve Martz

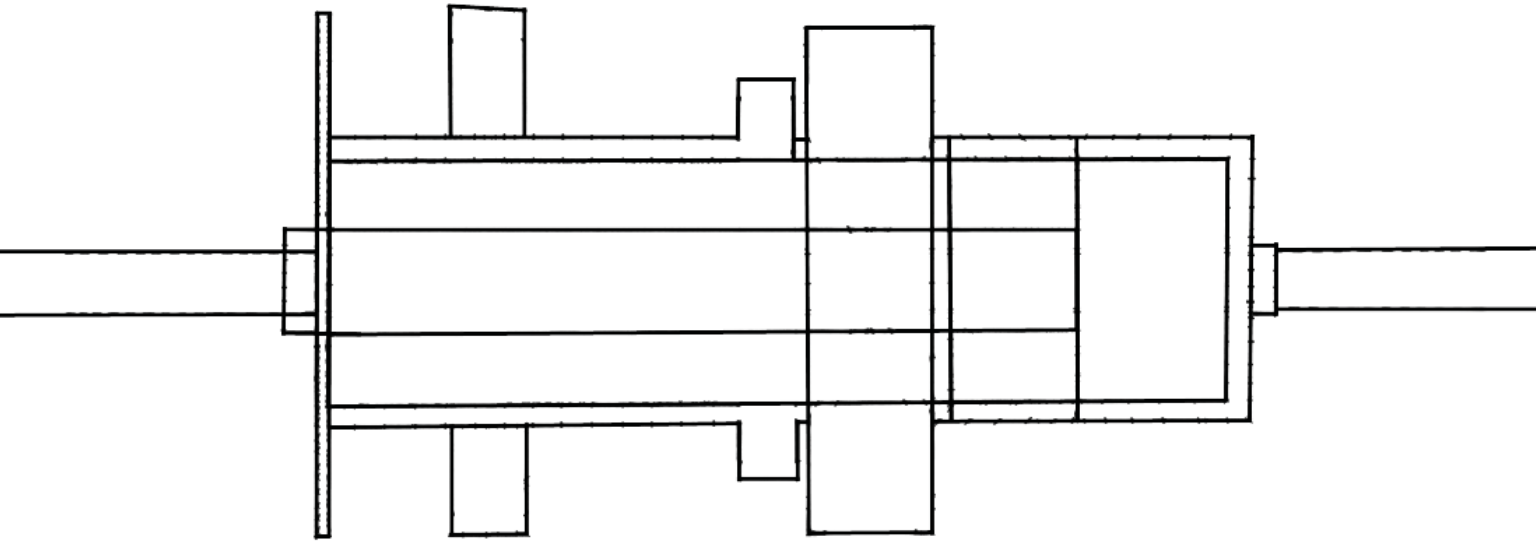
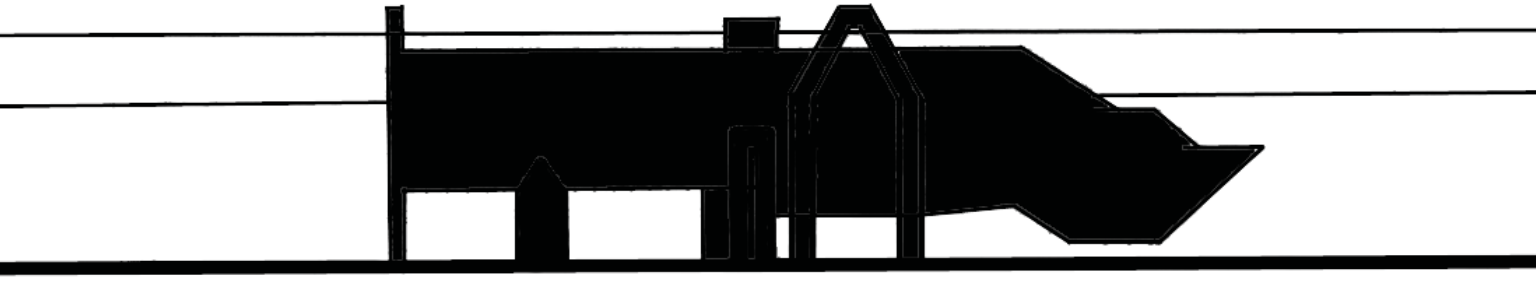


Figure 41 – “Wuppertal Geometry”; Steve Martz

GEOMETRY

MASSING

Figure 42 – “Wuppertal Massing”; Steve Martz



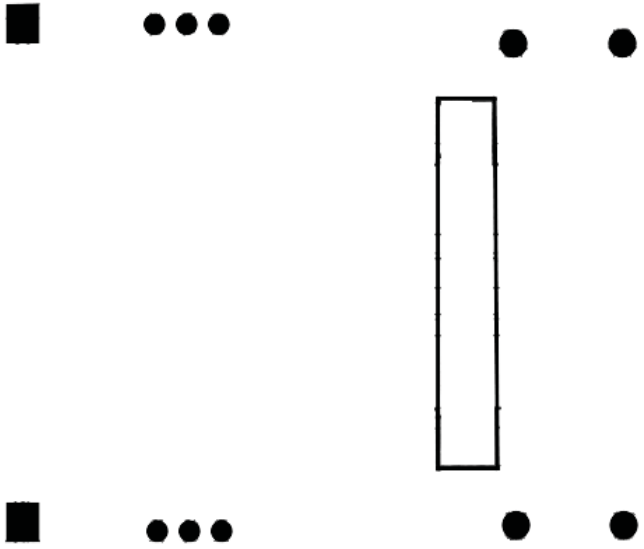
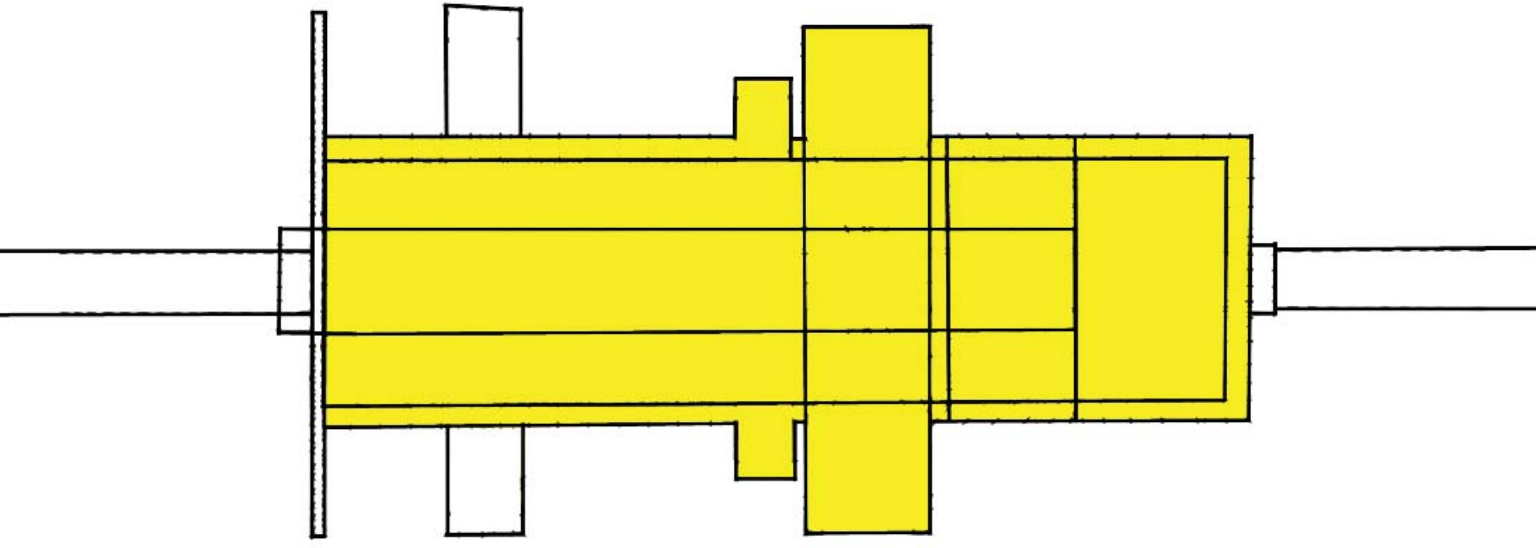


Figure 43 – “Wuppertal Structure”; Steve Martz

STRUCTURE

SUNLIGHT

Figure 44 – “Wuppertal Sunlight”; Steve Martz



HIERARCHY

Figure 45 – “Wuppertal Hierarchy”; Steve Martz

I chose these three case studies for very specific individual reasons. I believe that this project in order to be entirely successful will need to be dynamic in design and function. It will need the ability to travel between multiple platforms unlike any rail system that is currently in use. Our ability to create such a system may be limited now but I believe in 100 years there will be very few limitations.

The Lindbergh Station on the Minneapolis light rail system is an example of an underground station on the line of a system that is otherwise entirely on the surface. This could be a most useful technique especially when considering the airport in Fargo is not the most accessible and if a train traveling either on the surface or on a suspended system which still requires surface structure was to be run out to the terminal it could indeed cause a headache if the airport ever needs to expand or remodel any of their runways. Airports are by nature always in need of more land and anything to help alleviate congestion would be a good thing.

The Wuppertal Monorail in Germany is a very unique situation. It is the oldest suspended monorail system in the world and is a model of safety and durability. In well over 100 years there have been very few accidents and hardly any complete stoppages of service even considering that its years of service encountered WWII.

The stations on the Wuppertal seem to all be unique. The pictures I've seen of them and the unique mode of transportation they support make the railway seem like a definite place to visit someday.

London's Waterloo station was chosen for the fact that it has at least at one point in time and hopefully will be again a hub for multiple forms of public transit to meet in one space. The London underground rail system stops at Waterloo as does the above ground light rail. In addition to the two light rail systems and it has served as a terminal for the Eurostar transit system, an international rail transportation system and is of course a stop on the cities bus route. One of the most important parts of the station is the fact that not only does it bring all these different types of public transportation together but it also has a large parking ramp for the purpose of serving local park-and-ride customers. It is a very versatile station indeed. My plan for the main station for the system I want to design in the F-M area will be modeled very closely after this station.

Of these three only the London station was specifically chosen as a model for my particular station. The other two; the Lindbergh station at Minneapolis airport and the Wuppertal Monorail were chosen for their specific uniqueness regarding system requirements.

redundant

history

Although Fargo and Minneapolis were incorporated as cities at almost the same time (Minneapolis in1867 and Fargo in 1871), Minneapolis and St. Paul already had a population of 15,000 at the time and continued to grow much faster mostly because of its placement along the Mississippi River which has always been a major North-South transportation route in the U.S. Fargo was served similarly by the Red River of the North but the smaller and less stable river made river transportation less reliable and although an important connection to the Hudson Bay was made by the Red River it's wasn't anywhere near as significant as the connection of the Mississippi to the Gulf of Mexico through many more larger and hugely industrial cities. The proof is in the fact that the Mississippi is still used is such a fashion and the Red is not as far as U.S. cities are concerned.

Fargo and Moorhead owe their existence to the Hudson Bay Company and the Northern Pacific Railway. Before the railroad the cities of Fargo and Moorhead although currently just a settlement and without those names, were a stopping point for Hudson Bay Company riverboats and barges headed North. The company would haul goods from St. Cloud by red river cart the settlement to be loaded onto the boats and barges.

The railway had scouted its path Westward and had decided that where the tracks crossed the Red River would be the next great city to the West of Minneapolis and St. Paul. The original plan for the tracks headed west was to go North of the Missouri; had that happened Fargo would have been where Grand Forks is. The city site was chosen for the high banks of the Red River in the area due to information provided form the local Indians that the whole river turned into a sea in the spring. The first settlement on the chosen spot was named Centralia but the name was later changed in favor of Fargo, named for Northern Pacific director and Wells Fargo founder William Fargo. The original settlement consisted of two separate areas. "Fargo in the Timber" was next to the river and "Fargo on the Prairie" was located at the present intersection of Broadway and Main Ave. The main business of these first two (one settlement but two separate tent cities) communities was the construction of the railroad through the area and the bridge over the Red River.

Moorhead was founded on September 22, 1881 and incorporated the same year. The city was named for William G. Moorhead, who was like William Fargo, a director for the Northern Pacific Railway. That same decade saw the introduction of electricity, water, sewer, and fire and police services. Moorhead was also known almost immediately as "Sin City" due to the numerous (more than 100) bars in the city. Many of the patrons of those establishments came from North Dakota because at the time ND did not allow the sale of alcohol.

Figure 46 – "fargo-on-the-prairie"; http://library.ndsu.edu/fargo-history/sites/default/files/fargo-on-the-prairie.jpg

Tents of the Northern Pacific

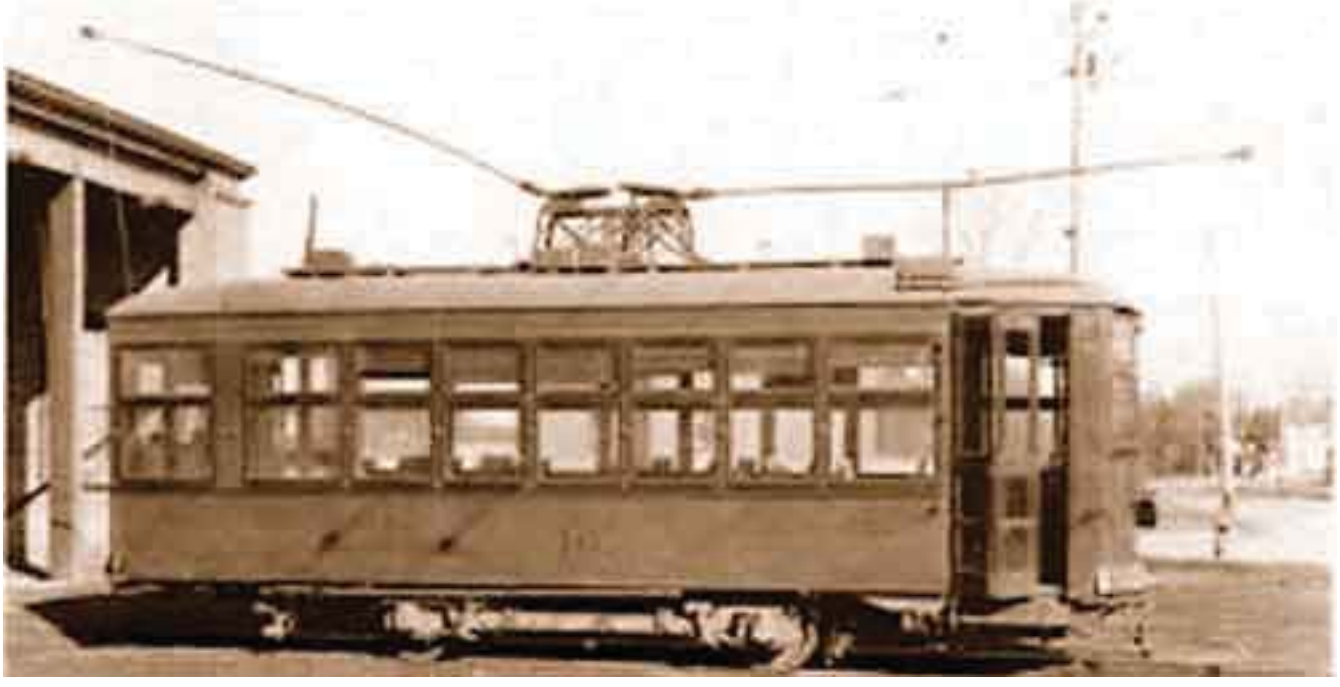
Figure 47 – "bb-building"; http://library.ndsu.edu/fargo-history/sites/default/files/bb-building.jpg

Bridge Builders Office, Fargo's first frame building

Both Fargo and Moorhead had early streetcar systems serving transportation duties in the early cities. In Fargo the first streetcar system was a horse drawn line. It began in 1879. The cars followed tracks but used horses for power. The line connected the Great Northern Depot on South Broadway along Front St. (Main Ave) West to 9th St. then South to 13th Ave. at the time Fargo did not have paved streets and as is normal in this part of the country the unstable subsoil took its toll and the tracks sank into the mud and were unrepairable. The line was abandoned.

A second horse drawn system was installed following the same basic route. The line opened in June of 1882 with two horse drawn cars, but three months later in Sept. the horse car barn and all operating equipment was destroyed in a fire.

In 1904 an electric streetcar system accepted its first passenger on thanksgiving day Nov, 24. In April of 1902 F.W. Larned and M.E. McDonald from Scranton PA submitted a franchise application to the Fargo city council. It was approves and the Fargo & Moorhead Street Railway Company was incorporated. The system had North and South loops and an Oak Grove line. The line operated continuously until 1937 when service was ended to



No. 16, one of the 15 1920-built Cincinnatis, sits outside of the Fargo carhouse on March 4, 1924.
Note the Twin City Lines-style wire fenders. It's not known whether all the Fargo-Moorhead Birneys had Twin City Lines-style fenders.

Figure 49 – “railway1”; http://library.ndsu.edu/fargo-history/sites/default/files/railway1.jpg

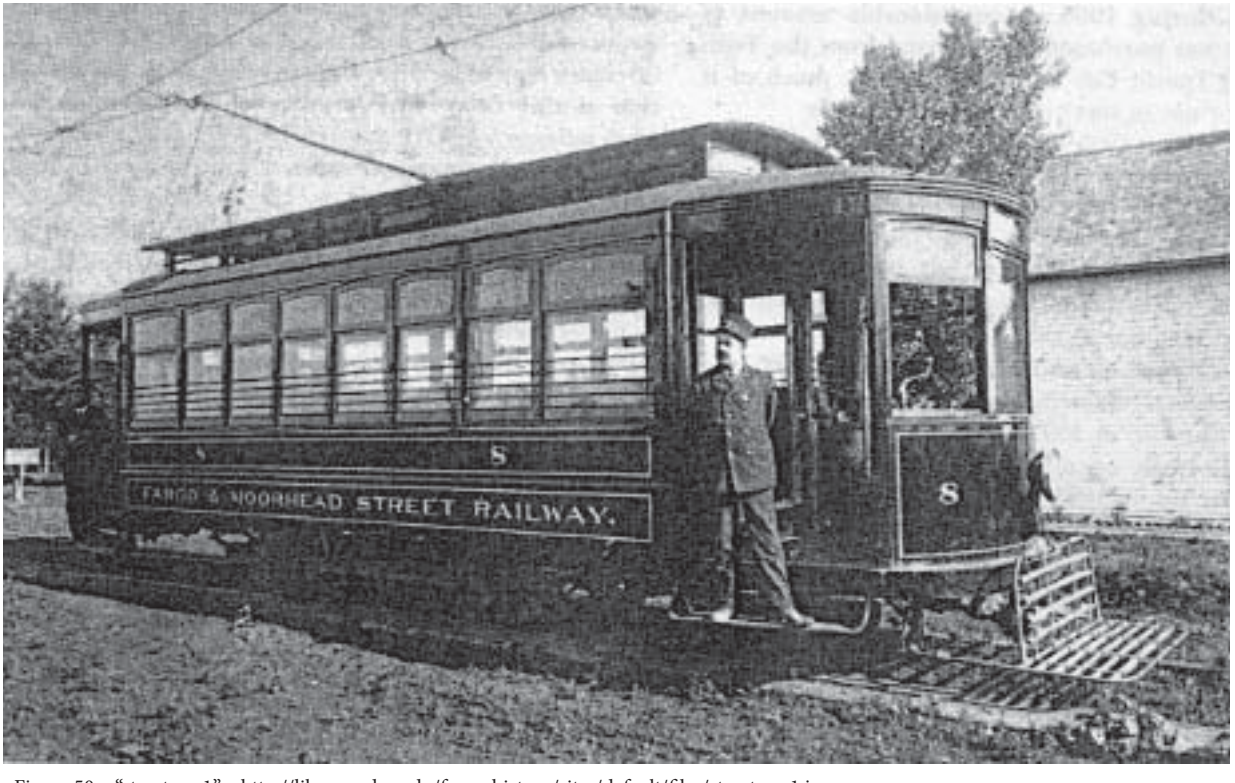


Figure 50 – “street-car1”; http://library.ndsu.edu/fargo-history/sites/default/files/street-car1.jpg

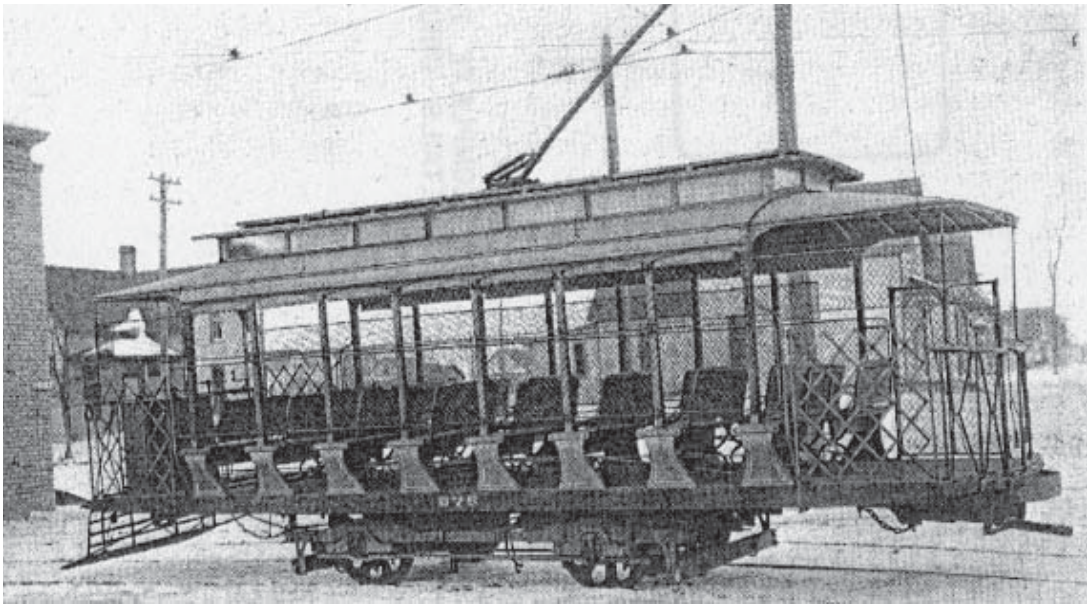


Figure 51 – "street-car3"; http://library.ndsu.edu/fargo-history/sites/default/files/street-car3.jpg

In 1906, several open cars were purchased for use in the summer, as shown above.

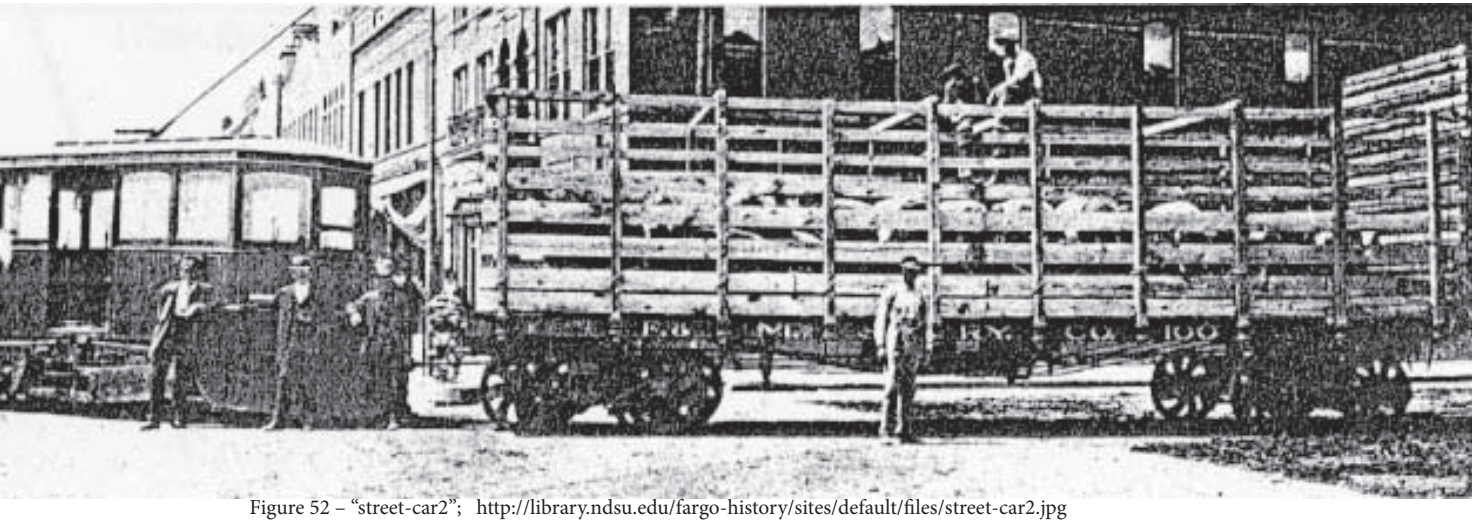


Figure 52 – "street-car2"; http://library.ndsu.edu/fargo-history/sites/default/files/street-car2.jpg

The image above shows a snow plow car pulling a trailer car. The trailer car was used to haul livestock from the downtown trains to the Fairgrounds.

site analysis

physical analysis

climate analysis

The site I have chosen for the location of the main station of the system is located just to the Northwest of the I-29/I-94 interchange; currently it is empty in the center except for a building that I'm not sure of its purpose and has an L shaped apartment building in the Northeast corner and towards the Southwest there is a Rasmussen Business campus building and an office building. These buildings will have to be razed if by any off chance they are still around in 98 years.

The site is completely void of any notable topography with less than 1' change in total elevation going either way across accept for one spot towards the Eastern side where there are some trees. The spot where the trees are is the lowest spot; it isn't registered on any of the topo maps I observed but it is easily two feet lower in an area of about 100' in diameter. I am not positive but I would guess there is a street sewer drain in the area somewhere.

The site is also completely void of all vegetation except grass and in a spot towards the Eastern side where there is a small growth of brush; likely basswood or cotton wood trees and some dogwood bushes. The lack of trees and tall buildings allows uninhibited light at all times of the day all year.

Wind from the North may be blocked partially from the buildings across the street but it is unlikely.

USDA soil classification type - Fargo Series

Fargo series soil is classified by the USDA as a local clay type.

This is the exact soil report for this area from the MLRA SOIL SURVEY REGIONAL OFFICE in St. Paul MN:

FARGO SERIES

The Fargo series consists of very deep, poorly drained and very poorly drained, slowly permeable soils that formed in calcareous, clayey lacustrine sediments. These soils are on glacial lake plains, floodplains, and gently sloping side slopes of streams within glacial lake plains. Slopes range from 0 to 6 percent. Mean annual air temperature is 42 degrees F, and mean annual precipitation is 19 inches.

TAXONOMIC CLASS: Fine, smectitic, frigid Typic Epiaquerts

TYPICAL PEDON: Fargo silty clay on a level plane slope of less than 1/10 percent under cropland. When described the soil was dry from 0 to 8 inches and moist from 8 to 60 inches. (Colors are for moist soil unless otherwise stated)

Ap--0 to 8 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure parting to strong fine granular; very hard, blocks friable, granules firm, very sticky and very plastic; many fine roots; many fine pores; neutral (pH 7.2); abrupt smooth boundary. (Combined A horizons 5 to 15 inches thick)

Bw--8 to 13 inches; black (10YR 2/1) and very dark gray (10YR 3/1) crushed and rubbed silty clay, very dark gray (10YR 3/1) and dark gray (10YR 4/1) crushed and rubbed, dry; moderate medium subangular blocky structure parting to strong very fine angular blocky; extremely hard, firm, very sticky and very plastic; many fine roots; many fine pores; faces of peds have shiny waxy sheen when moist; cracks filled with A material throughout; neutral (pH 7.0); abrupt wavy boundary.

Bss--13 to 21 inches; very dark gray (2.5Y 3/1) and very dark grayish brown (2.5Y 3/2) silty clay, gray (2.5Y 5/1) and dark grayish brown (2.5Y 4/2) dry; dark grayish brown (2.5Y 4/2) crushed and rubbed, grayish brown (2.5Y 5/2) dry; few fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; moderate coarse prismatic structure parting to strong fine and very fine angular blocky; extremely hard, firm, very sticky and very plastic; common fine roots; common pores; slickensides on vertical faces of peds; faces of blocks have waxy sheen when moist; slight effervescence in lower part, noneffervescent on tongues; cracks filled with A material throughout; slightly alkaline (pH 7.6); abrupt irregular boundary. (Combined Bw and Bss horizons 8 to 27 inches thick)

Bkg--21 to 32 inches; olive gray (5Y 5/2) silty clay, light gray (5Y 7/2) dry; common fine prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; weak medium subangular blocky structure parting to moderate fine angular blocky and granular; hard, friable, sticky and plastic; few roots; common fine pores; cracks filled with A material extend into this horizon; common fine masses of carbonates; strong effervescence; moderately alkaline (pH 8.0); clear wavy boundary. (0 to 26 inches thick)

Cg1--32 to 48 inches; grayish brown (2.5Y 5/2) silty clay, light gray (2.5Y 7/2) dry; common medium distinct brown (10YR 4/3) redoximorphic concentrations and gray (5Y 5/1) redoximorphic depletions; weak medium subangular blocky structure parting to moderate very fine angular blocky and granular; very hard, firm, very sticky and very plastic; few fine roots; common pores; strong effervescence; moderately alkaline (pH 8.0); gradual wavy boundary.

Cg2--48 to 68 inches; olive (5Y 4/3) and pale olive (5Y 6/3) silty clay, pale olive (5Y 6/3) and pale yellow (5Y 8/3) dry; many medium prominent dark yellowish brown (10YR 4/4) redoximorphic concentrations; laminated, fractures to moderate very fine blocky structure; very hard, firm, very sticky and very plastic; few medium masses of carbonates; slight effervescence; moderately alkaline (pH 8.0); gradual wavy boundary.

Cg3--68 to 80 inches; pale olive (5Y 6/3) silty clay; pale yellow (5Y 8/3) dry; common medium prominent dark yellowish brown (10YR 4/4) redoximorphic concentrations; laminated, fractures to moderate very fine subangular blocky structure; very hard, firm, very sticky and very plastic; common medium masses of carbonates; few fine masses of iron-manganese; slight effervescence; moderately alkaline.

TYPE LOCATION: Traill County, North Dakota; about 9 miles south and 6 miles east of Hillsboro; 1170 feet south and 410 feet east of the northwest corner, sec. 29, T. 144 N., R. 49 W. Latitude 47 degrees, 15 minutes, 42.7 seconds N, Longitude 96 degrees, 55 minutes, 13.5 seconds W. Halstad SW, ND USGS 7.5 minute quadrangle.

RANGE IN CHARACTERISTICS: The 10- to 40-inch particle size control section averages between 40 and 60 percent clay and less than 15 percent fine sand and coarser. It is free of rock fragments. The mollic epipedon ranges from 8 to 40 inches in thickness. The depth to carbonates ranges from 11 to 42 inches. Saline phases are recognized.

The A horizon has hue of 10YR, 2.5Y, 5Y or is neutral, value of 2 and 3 or 4 dry, and chroma of 1 or less. It is clay, silty clay or silty clay loam. It is neutral or slightly alkaline.

The Bw and Bss horizons have hue of 10YR, 2.5Y or 5Y, value of 2 to 4 and 3 to 5 dry, and chroma of 1 or 2. They are clay, silty clay or silty clay loam. It is neutral to moderately alkaline. They typically have weak or moderate prismatic structure which parts to strong fine and very fine blocky structure. Some pedons do not have the prismatic structure. Slickensides and shiny, waxy surfaces of peds are common. Cracks filled with A material commonly extend through the Bw and Bss horizons and range from l/2 inch to 5 inches in width. Some pedons have a Bg horizon.

The Bkg horizon has hue of 10YR, 2.5Y or 5Y, value of 3 to 6 and 5 to 8 dry, and chroma of 1 or 2. It is clay, silty clay or silty clay loam. It is moderately alkaline. It contains 10 to 25 percent calcium carbonate equivalent diffused or in masses. Where it has more than 15 percent calcium carbonate equivalent, it does not have more than 5 percent as masses or decrease by more than 5 percent in a lower horizon.

The Cg horizon has hue of 2.5Y or 5Y, value of 3 to 6 and 5 to 8 dry, and chroma of 1 to 3. It is clay, silty clay or silty clay loam. It is moderately alkaline. It typically contains common to many distinct or prominent low to high chroma redoximorphic features. Some pedons contain gypsum crystals in the Cg horizons. Sediments are laminated in the lower part of the Cg horizon at depths of 36 to 60 inches in most pedons. Some pedons have a 2Cg horizon that is silt loam or sandy below a depth of 40 inches.

COMPETING SERIES: This is the Clearwater series. The Clearwater series has 2 to 8 percent rock fragments throughout and formed in till.

GEOGRAPHIC SETTING: Fargo soils are on level and nearly level glacial lake plains and flood plains and gently sloping side slopes of streams within glacial lake plains. Slope gradients commonly are less than 1 percent but range from 0 to 6 percent. The soils formed in calcareous, clayey lacustrine sediments. The climate is cool subhumid. Mean annual air temperature ranges from 36 to 45 degrees F, and mean annual precipitation from 15 to 23 inches. Most of the moisture falls in the spring and summer. Frost-free period ranges from 90 to 140 days. Elevation above sea level ranges from 650 to 1800 feet.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Bearden, Cashel, Dovray, Grano, Hegne, Ludden, Overly, Ryan and Wahpeton soils. Bearden and Overly soils are on nearby lake plains and are fine-silty. Cashel soils are on floodplains of larger streams and have fine stratification below the Ap horizon. Dovray and Grano soils are in concave swales and depressions on lake plains. Ludden soils are on floodplains of larger streams. Dovray do not have cracks filled with A material that extend through the Bw horizon. Grano and Ludden soils have carbonates at depths of less than 10 inches. Hegne soils are on slight rises and have calcic horizons within depths of 16 inches. They usually are in complex with Fargo soils. Ryan soils are on nearby areas where the lake sediments contain more salts and have natric horizons. Wahpeton soils are on levees and low terraces of large streams, commonly at slightly higher elevations than the lake plain and are moderately well drained.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Poorly drained and very poorly drained. Runoff is negligible to high depending on slope. Saturated hydraulic conductivity is slow. A system of legal drains, section lines, road ditches, and field drains remove surface water from most Fargo soils. A seasonal high water table is at the surface to 3.0 feet below the surface at some time during the period of March through July. It is 1.0 foot above the surface to 2.0 feet below the surface at some time during the period of February through August in the ponded, depressional or very poorly drained phases.

USE AND VEGETATION: The soils are nearly all cropped to small grains, soybeans and sugar beets. Native vegetation is western wheatgrass, Kentucky bluegrass and a variety of forbs.

DISTRIBUTION AND EXTENT: Mainly in the Red River Valley of the North in North Dakota and Minnesota; smaller areas in glaciolacustrine areas and in west-central Montana. The soil is extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: St. Paul, Minnesota

SERIES ESTABLISHED: Grand Forks Area, North Dakota, 1902.

REMARKS: Diagnostic horizons and features recognized in this pedon are: mollic epipedon - the zone from the surface of the soil to a depth of 21 inches (Ap, Bw and Bss horizons); Vertisol criteria - cracks filled with A material extend through the Bw and Bss horizons and range from 1/2 to 5 inches in width, slickensides in the 13 to 21 inch layer (Bss horizon); the site will be redescribed in the future to better document the Vertisol criteria.

Figure 53 – "Fargo Series"; https://soilseries.sc.egov.usda.gov/OSD_Docs/F/FARGO.html

The soil structure of the Red River Valley is very poor for building. Extremely large footings or extremely deep piles are required for positive support of any building of considerable size. The reason for the poor conditions is types of clay called smectites. Smectite clays love to shrink and swell, they are slow to absorb water and slow to release it and as they absorb and release moisture they swell and shrink immensely. The smectites extend for anywhere from just over a hundred feet to hundreds of feet below the topsoil before any sort of solid bedrock formation is reached. All large buildings in the Red River Valley have to be placed on large clusters of steel piles or huge concrete caissons that extend 100 or more feet into the earth in order to either reach a solid substrate or achieve proper frictional weight distribution. When the smectites become wet they become plastic and tend to flow and cause extreme hydrostatic problems with buildings whose structure extends underground, or is not properly supported to a proper depth or with enough area. The movement caused by the intake and release causes so much movement in the soil that it creates constant problems in the area for pavement like roads and parking lots and belowground construction like basements and water and sewer lines.

The smectites are also responsible however for the extremely productive cropland in the Red River Valley because they are able to hold huge amounts of moisture allowing crops to remain healthy through very common long dry spells during the growing season.

Depth to bedrock in the F-M area is extremely deep. Depths just within the city limits of Fargo, Moorhead, and West Fargo range from 132' to as deep as 436' to reach bedrock. The area does not have solid bedrock at an attainable depth instead what is considered bedrock is consolidated glacial deposits of Cretaceous Shale or Precambrian Granite.

climate analysis

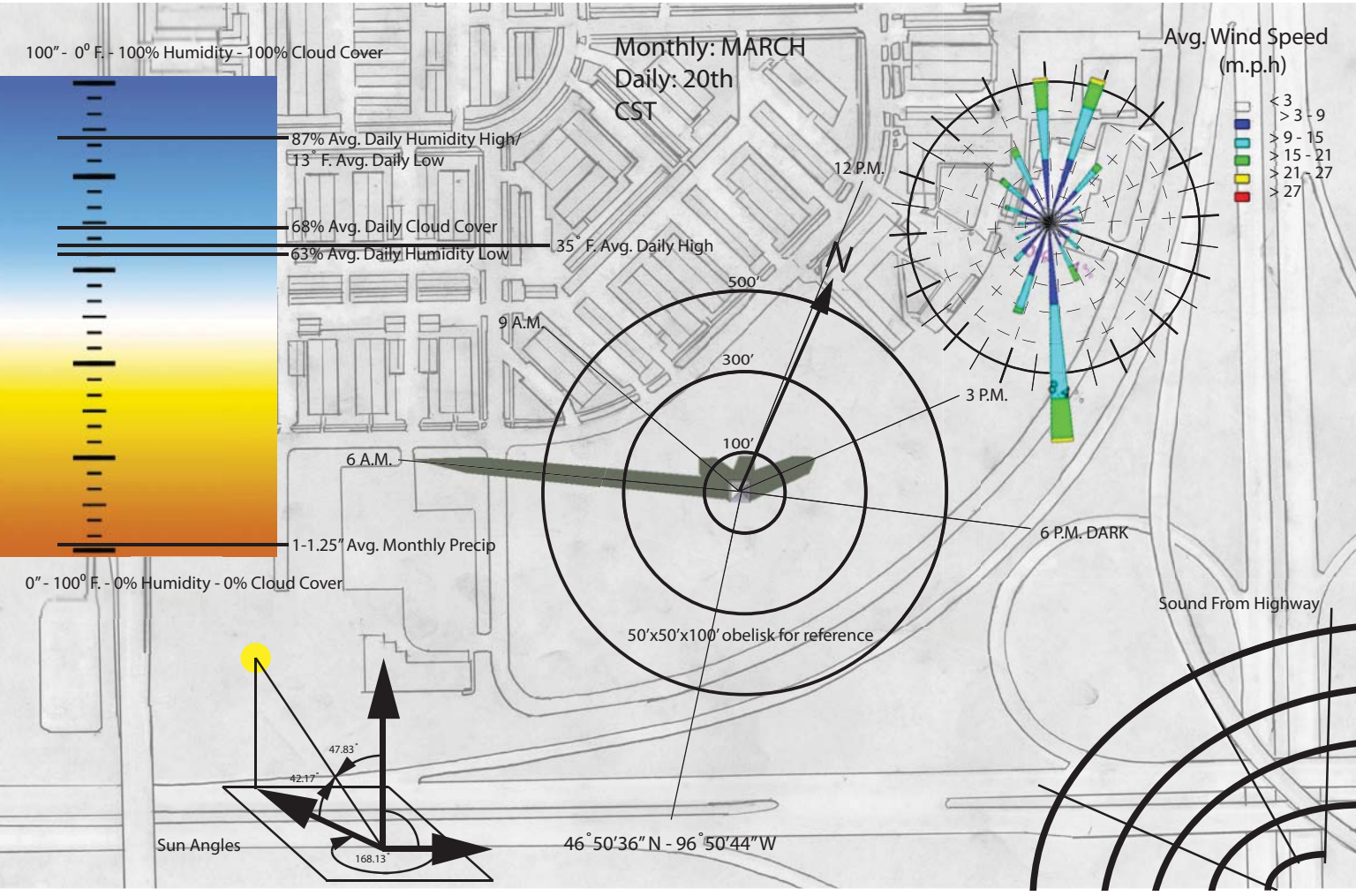


Figure 54 – "Site Data March"; Steve Martz

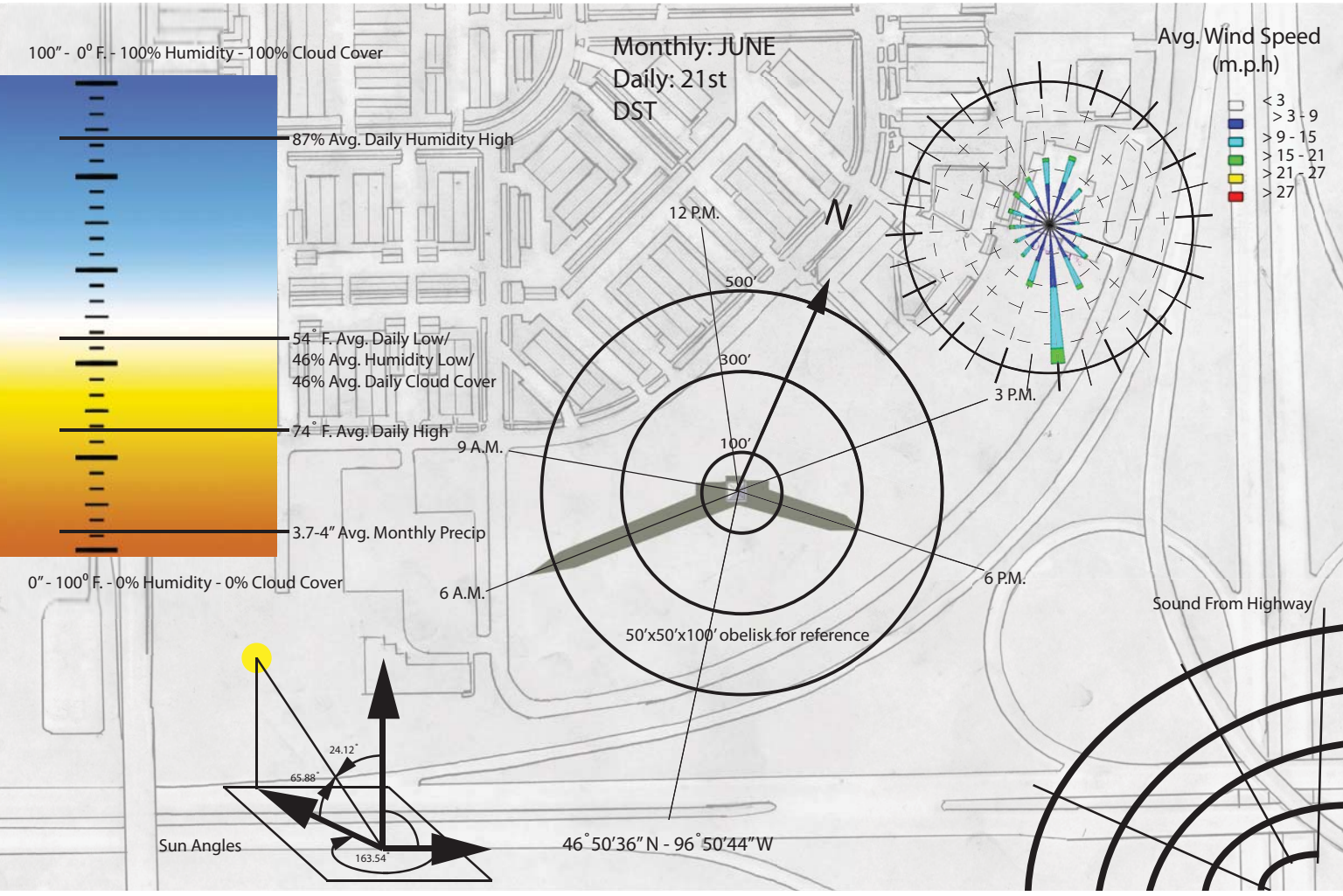


Figure – 55 – "Site Data June"; Steve Martz

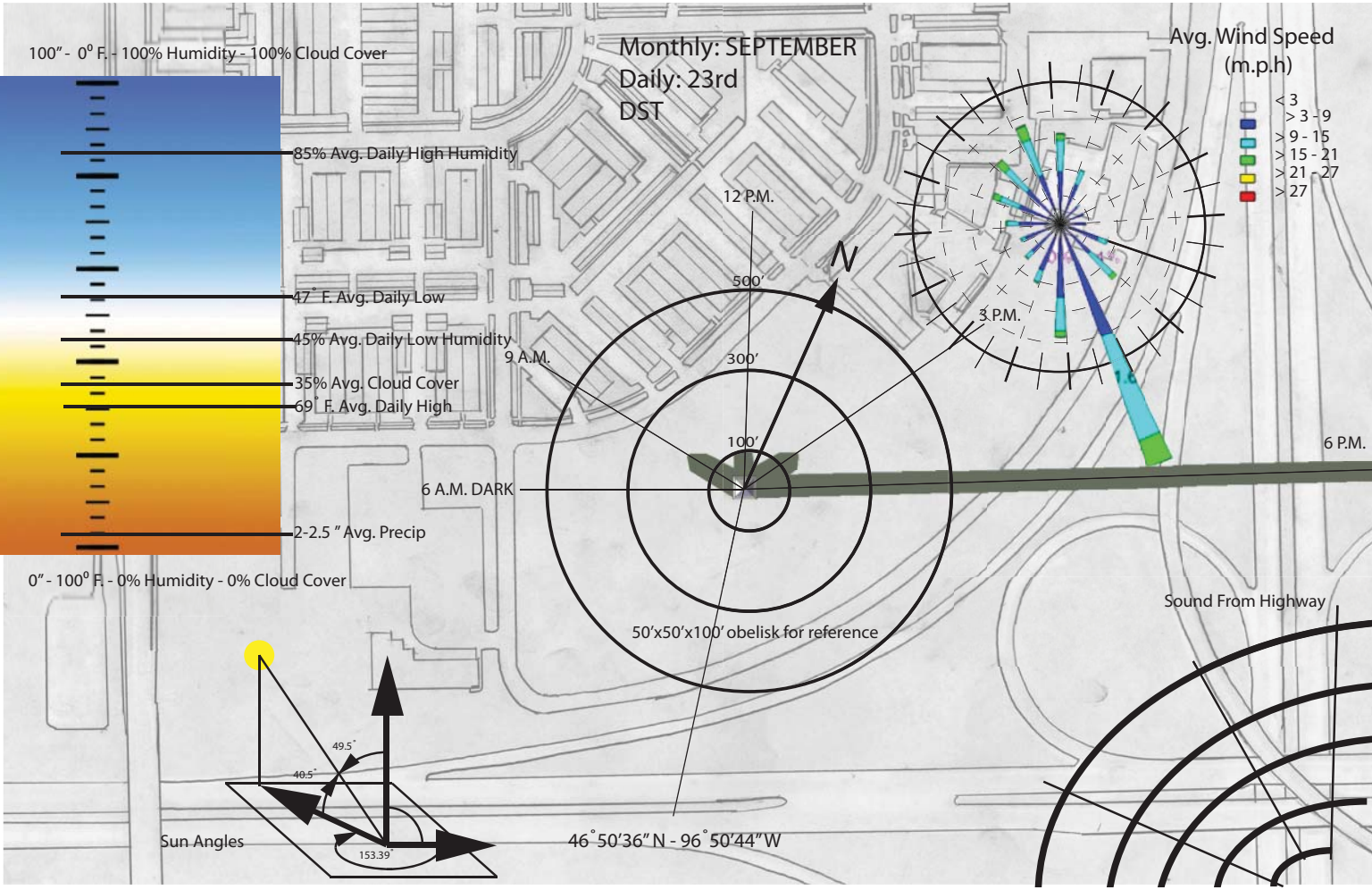
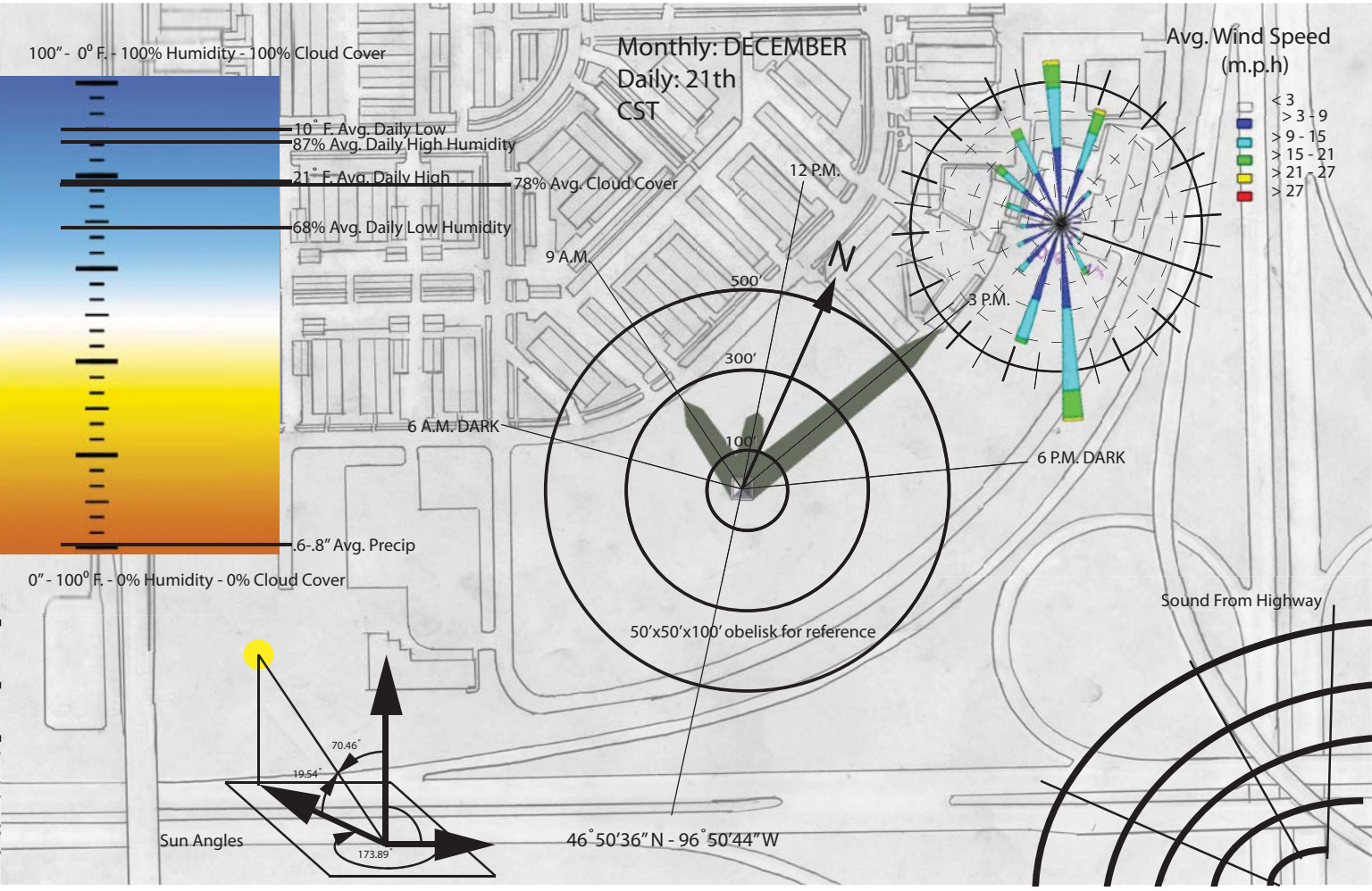


Figure 56 – "Site Data September"; Steve Martz


100" - 0° F. - 100% Humidity - 100% Cloud Cover
10° F. Avg. Daily Low
87% Avg. Daily High Humidity
21° F. Avg. Daily High
78% Avg. Cloud Cover
68% Avg. Daily Low Humidity
.6-.8" Avg. Precip
0" - 100° F. - 0% Humidity - 0% Cloud Cover
Monthly: DECEMBER
Daily: 21th
CST
12 P.M.
9 A.M.
3 P.M.
6 A.M. DARK
6 P.M. DARK
N
500'
300'
100'
50'x50'x100' obelisk for reference
Avg. Wind Speed
(m.p.h)
< 3
> 3 - 9
> 9 - 15
> 15 - 21
> 21 - 27
> 27
Sound From Highway
70.46°
19.54°
173.89°
Sun Angles
46° 50'36" N - 96° 50'44" W

programatic requirements

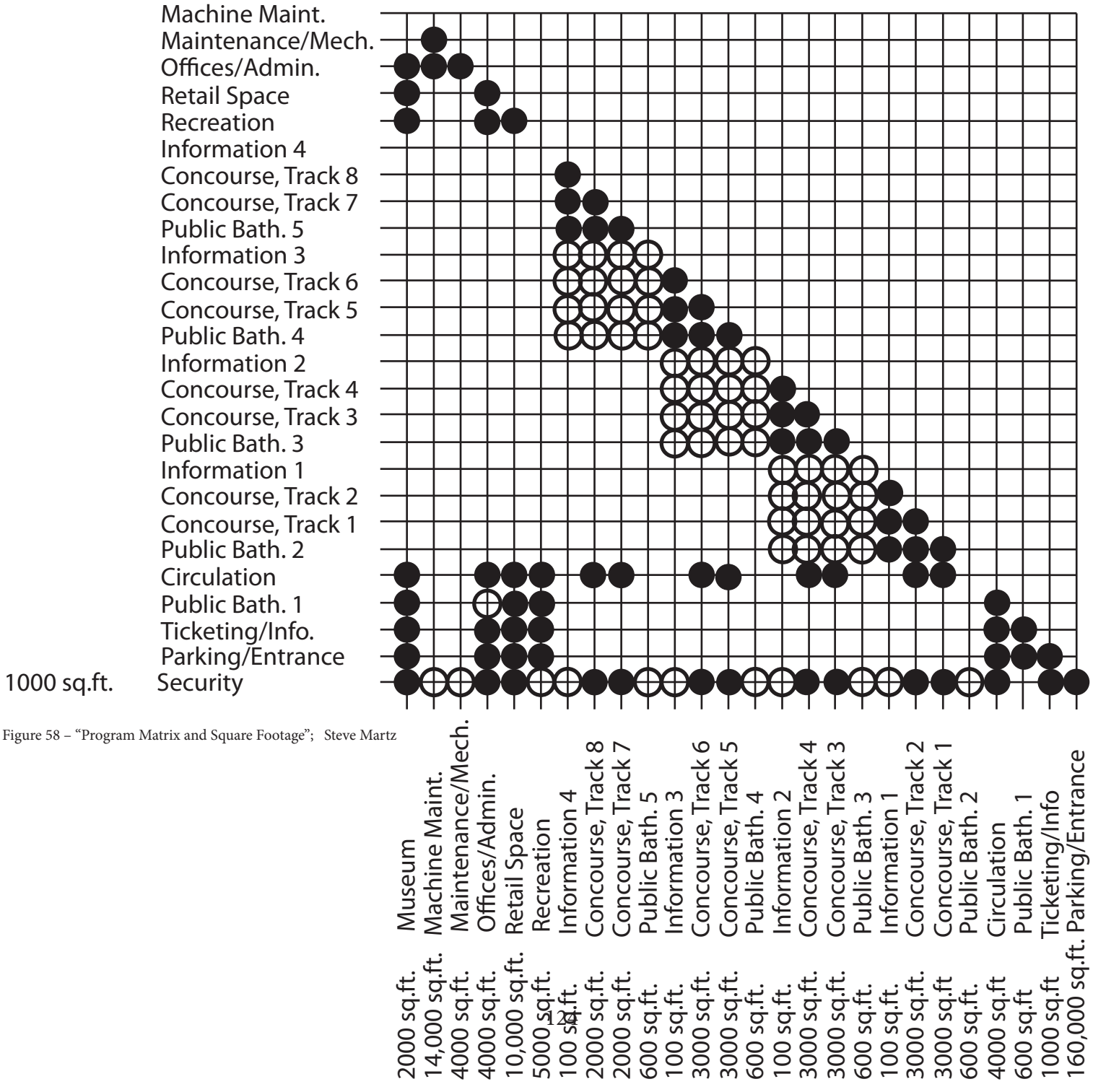


Figure 58 – "Program Matrix and Square Footage"; Steve Martz

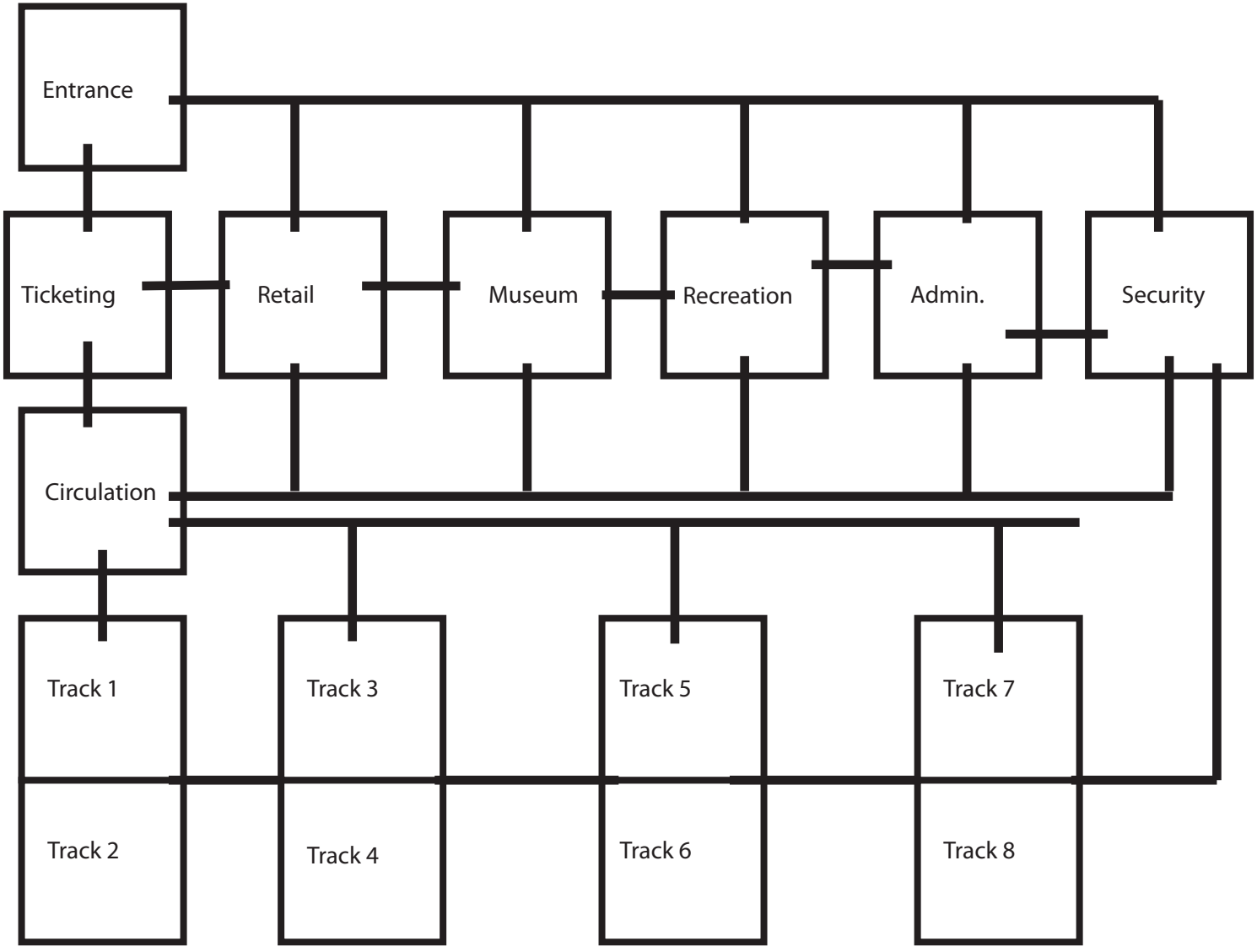


Figure 59 – "Program Flow Chart"; Steve Martz

Design Methodology

Mixed method quantitative/qualitative analysis
Graphic Analysis
Digital Analysis

Mixed Method, Quantitative Qualitative Approach: Concurrent Transformative Strategy

- The strategy will be guided by the theoretical premise/unifying Idea
- Implementation: Both quantitative and qualitative data will be gathered concurrently.
- Priority will be assigned by the requirements of the theoretical premise/unifying idea.
- Integration of the data will occur at several stages in the process of the research and will
  depend on the requirements of the examination of the theoretical premise.
- Analyzing, interpreting, and reporting of results will occur throughout the research process.
- It will be presented in both text and graphics.

Quantitative Data, including but not limited to:

- Statistical Data: Gathered and analyzed locally or obtained through an archival search.
- Scientific Data: Measurements obtained through instrumentation and or experiment: Gathered directly or through an archival search.

Qualitative Data:

- Gathered from direct observation
- Gathered from a local survey

schedule

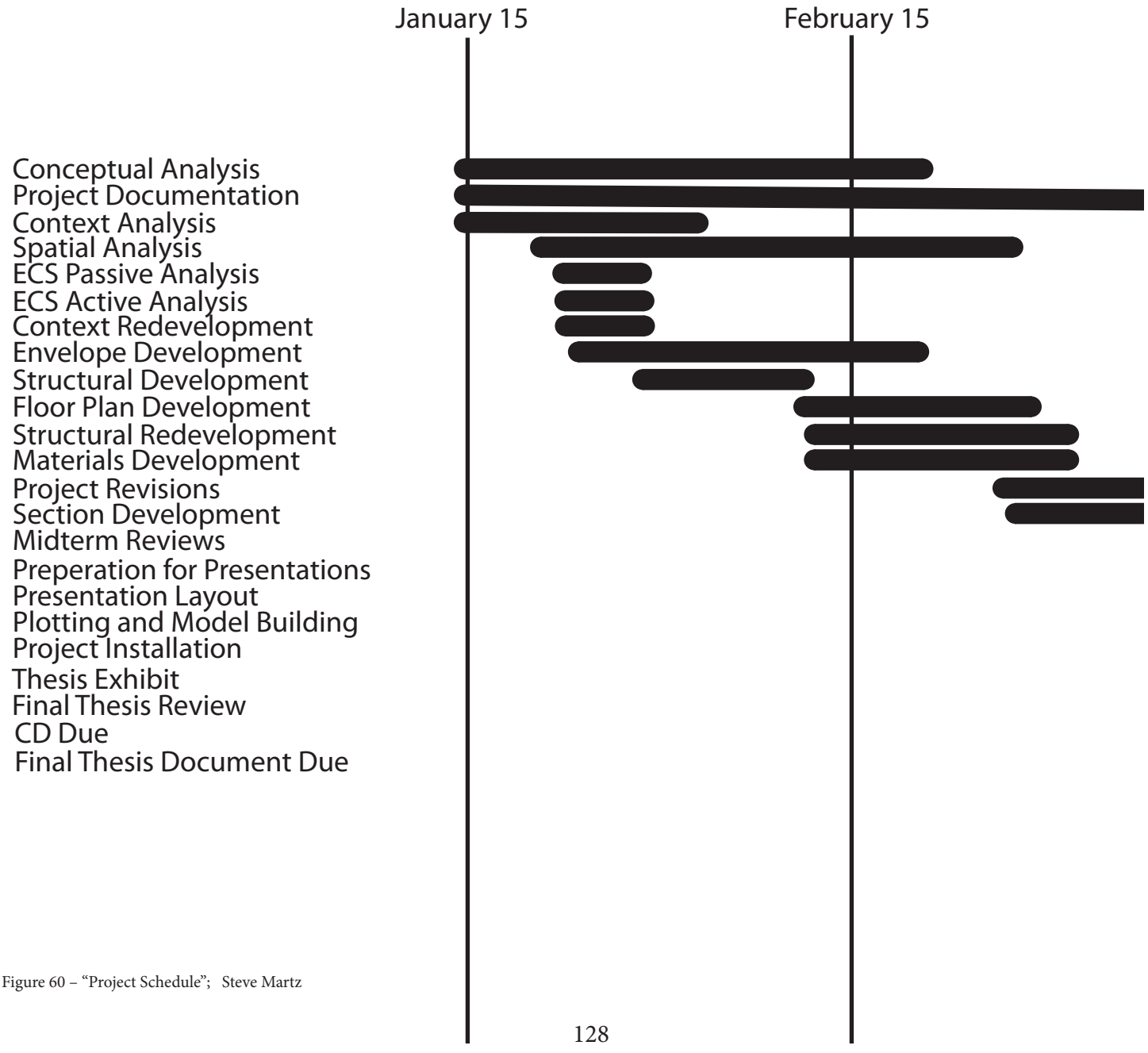
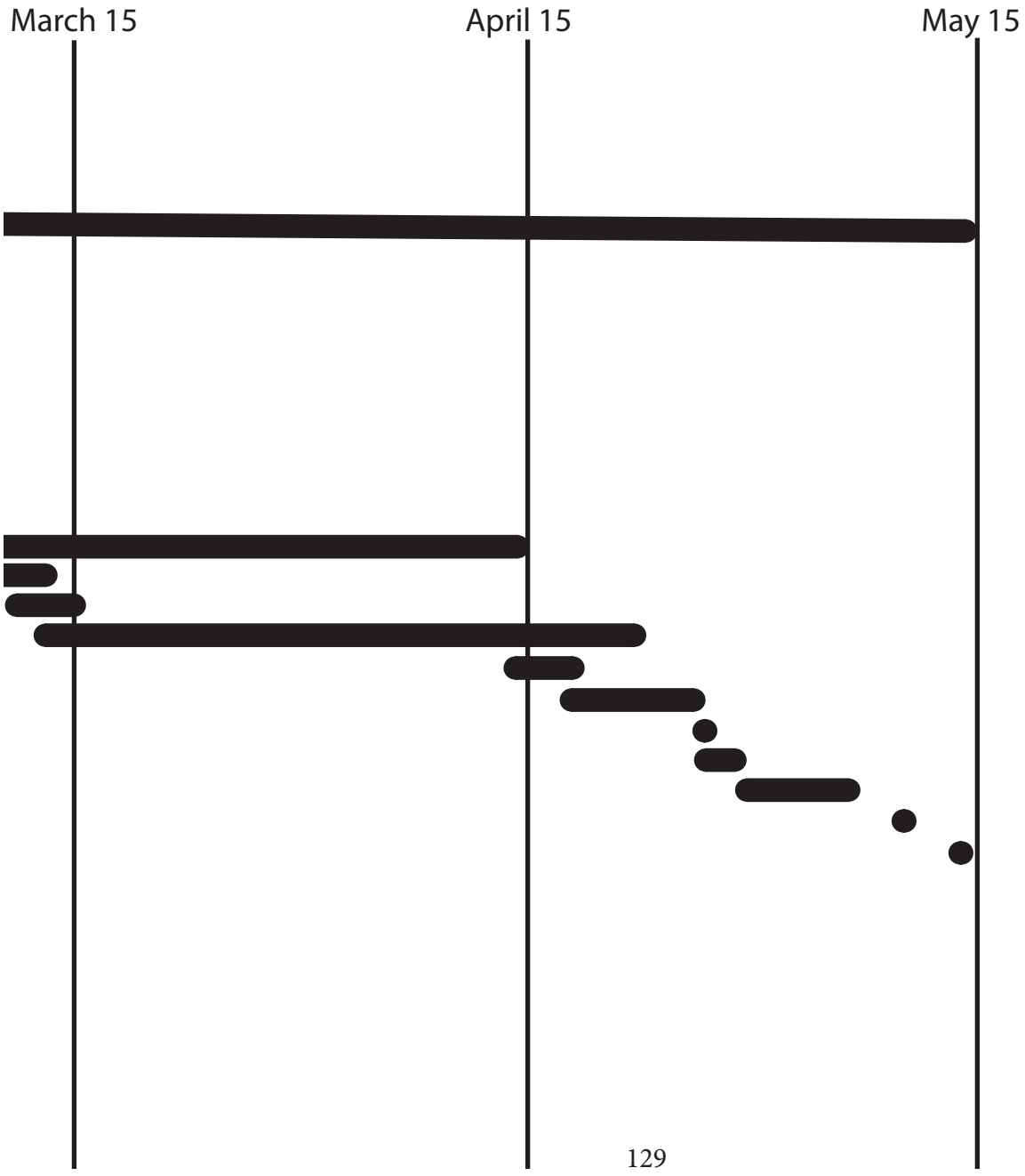


Figure 60 – "Project Schedule"; Steve Martz


March 15
April 15
May 15

Process

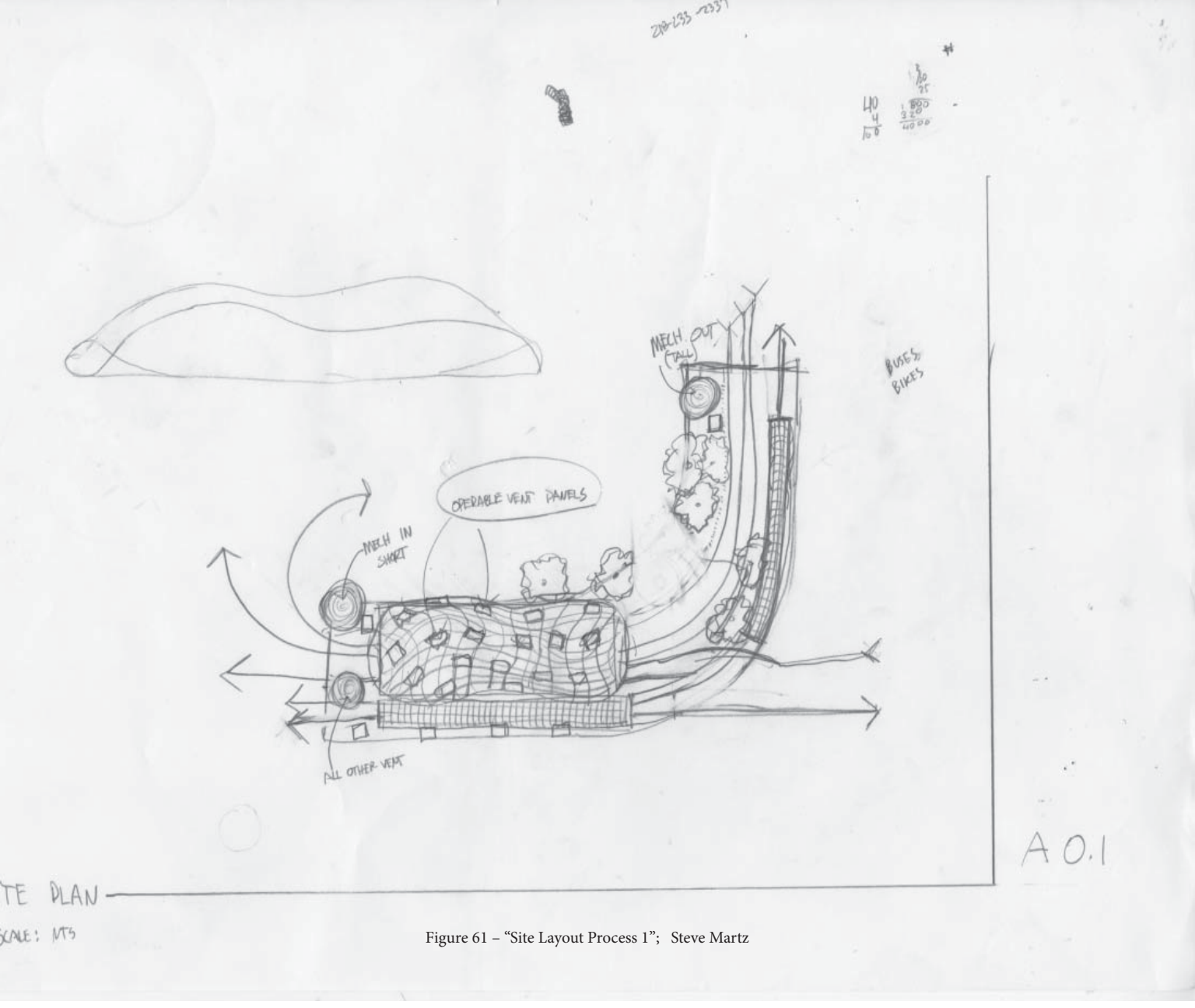


Figure 61 – "Site Layout Process 1"; Steve Martz

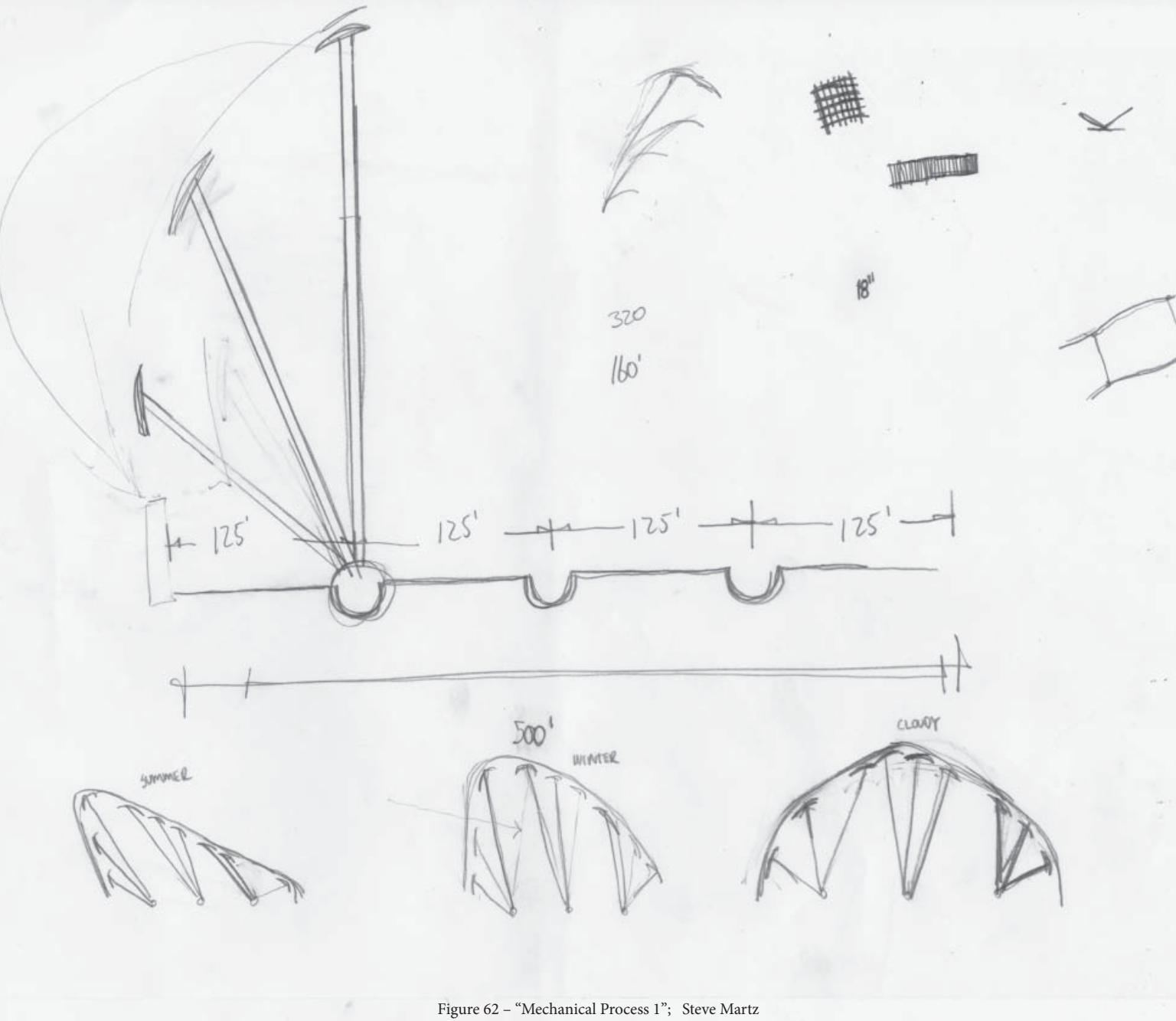


Figure 62 – "Mechanical Process 1"; Steve Martz

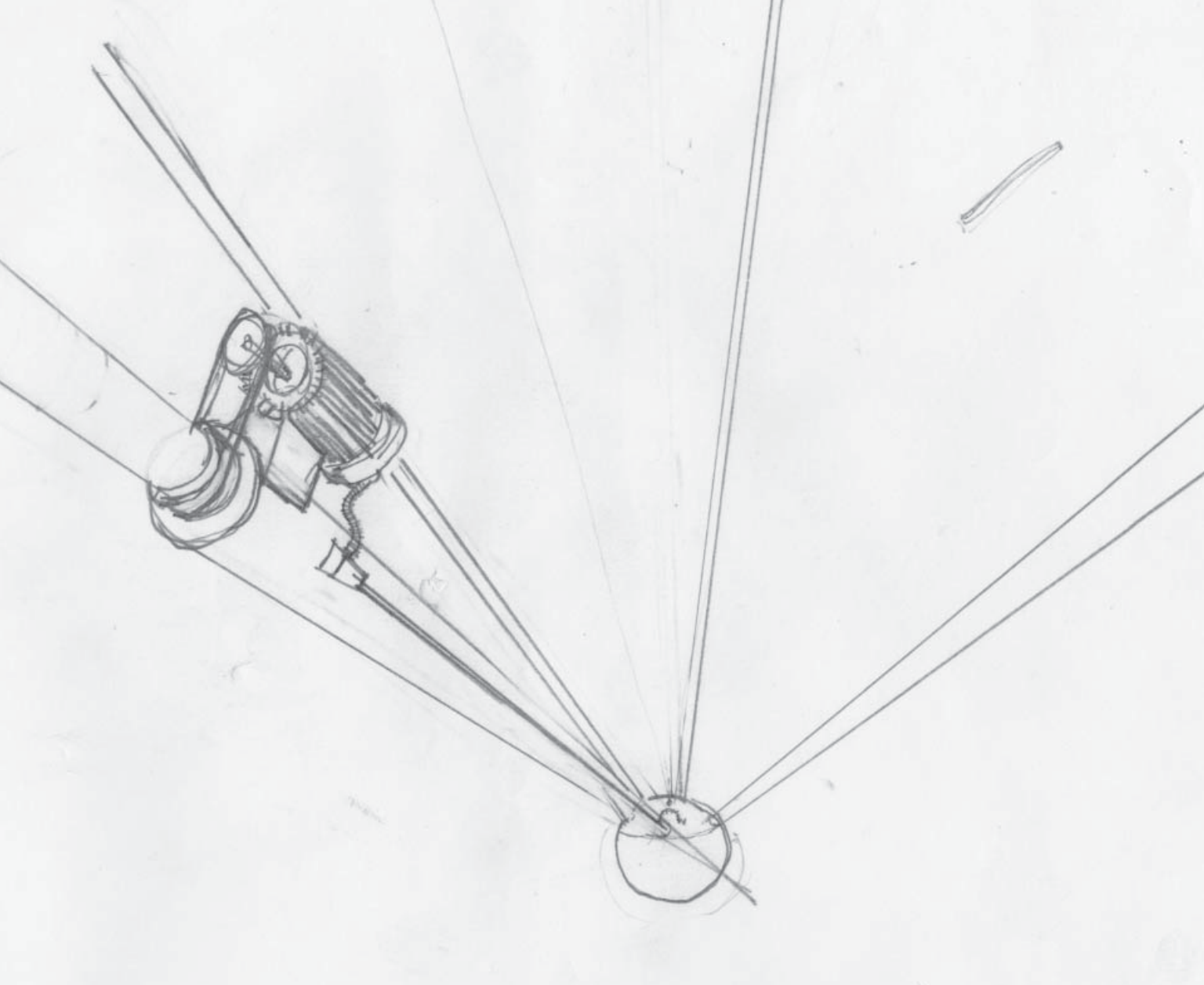


Figure 63 – “Mechanical Process 2”; Steve Martz

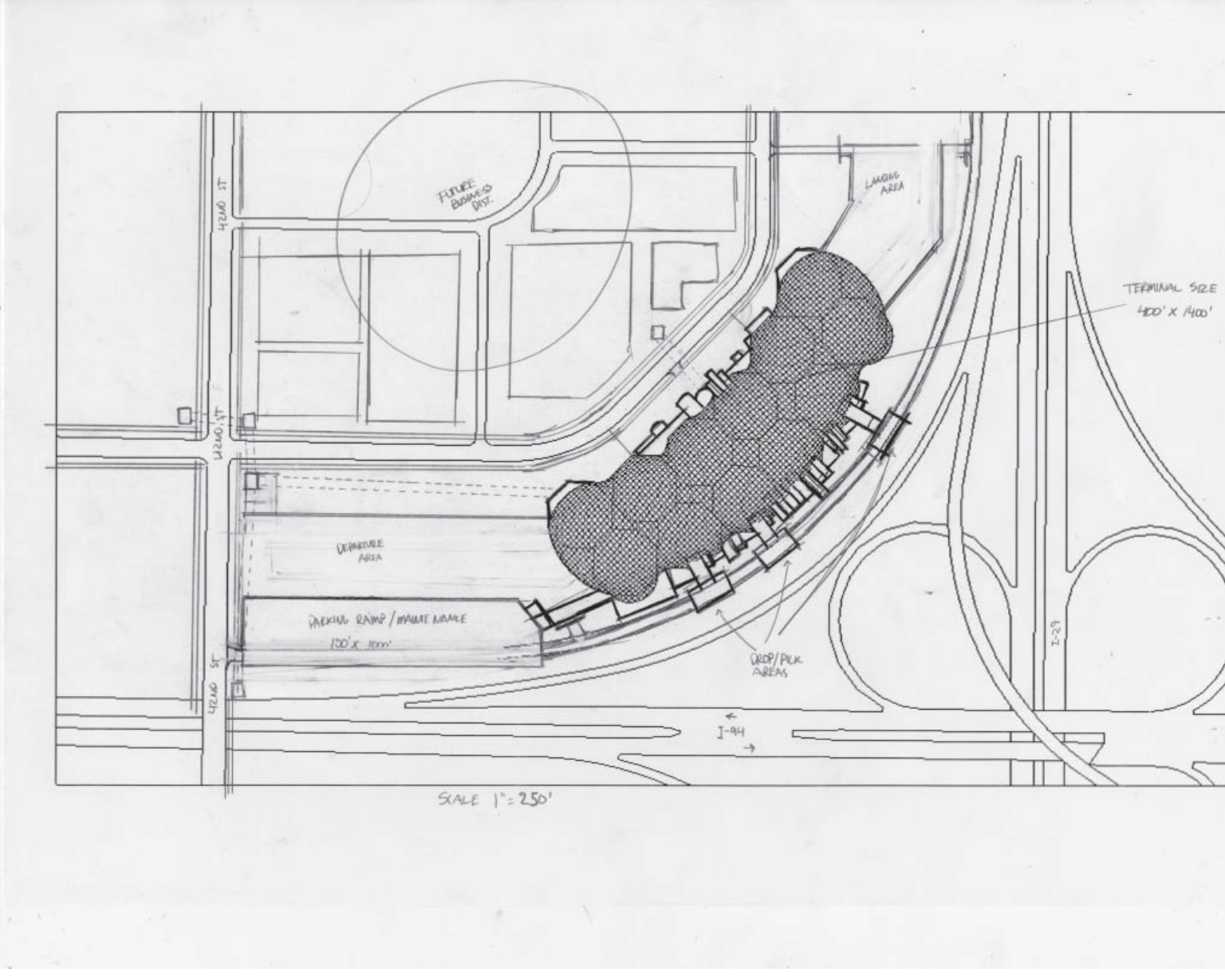


Figure 64 – "Site Layout Process 2"; Steve Martz

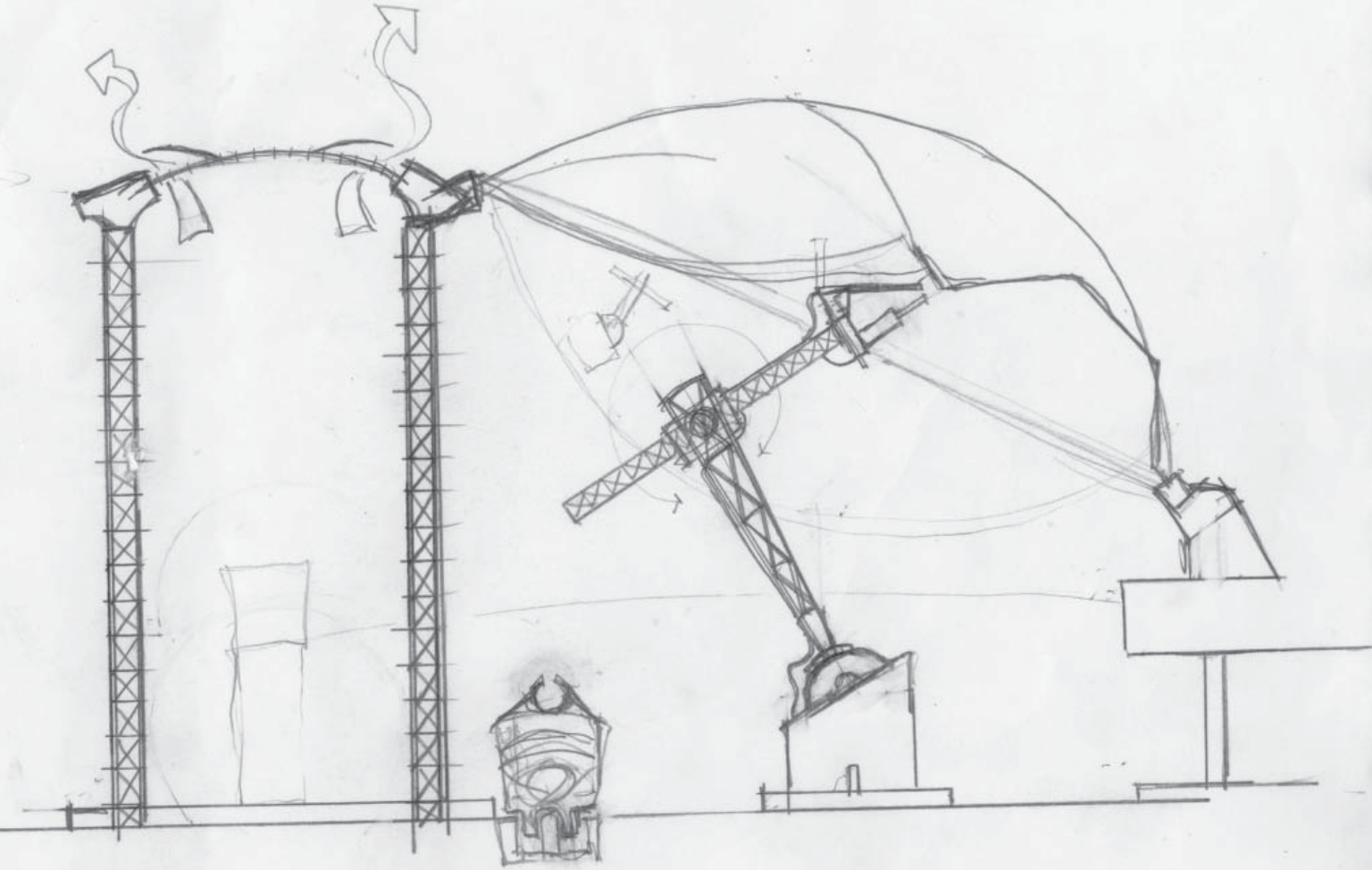


Figure 65 – “Mechanical Process 3”; Steve Martz

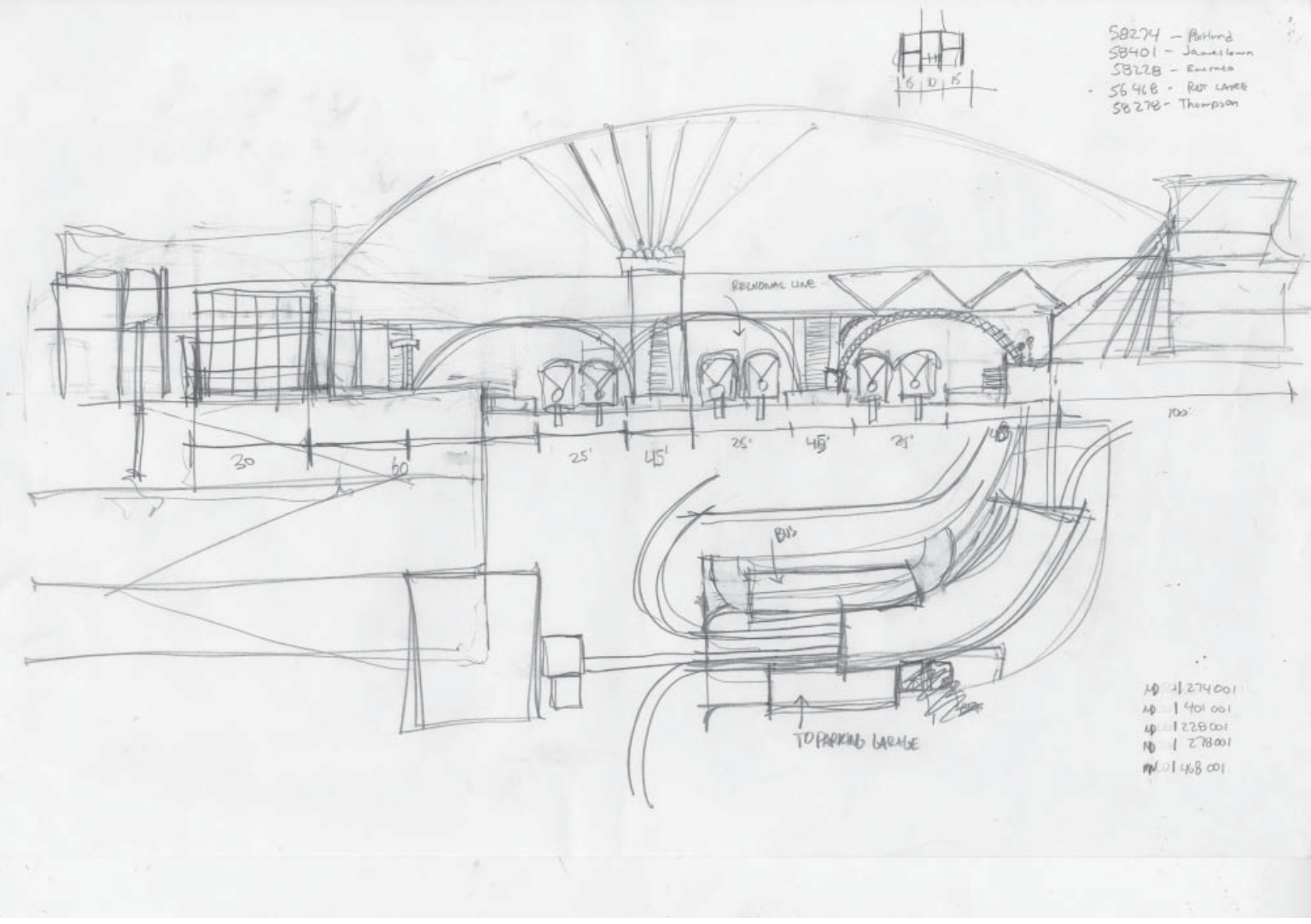


Figure 66 – "Section Process"; Steve Martz

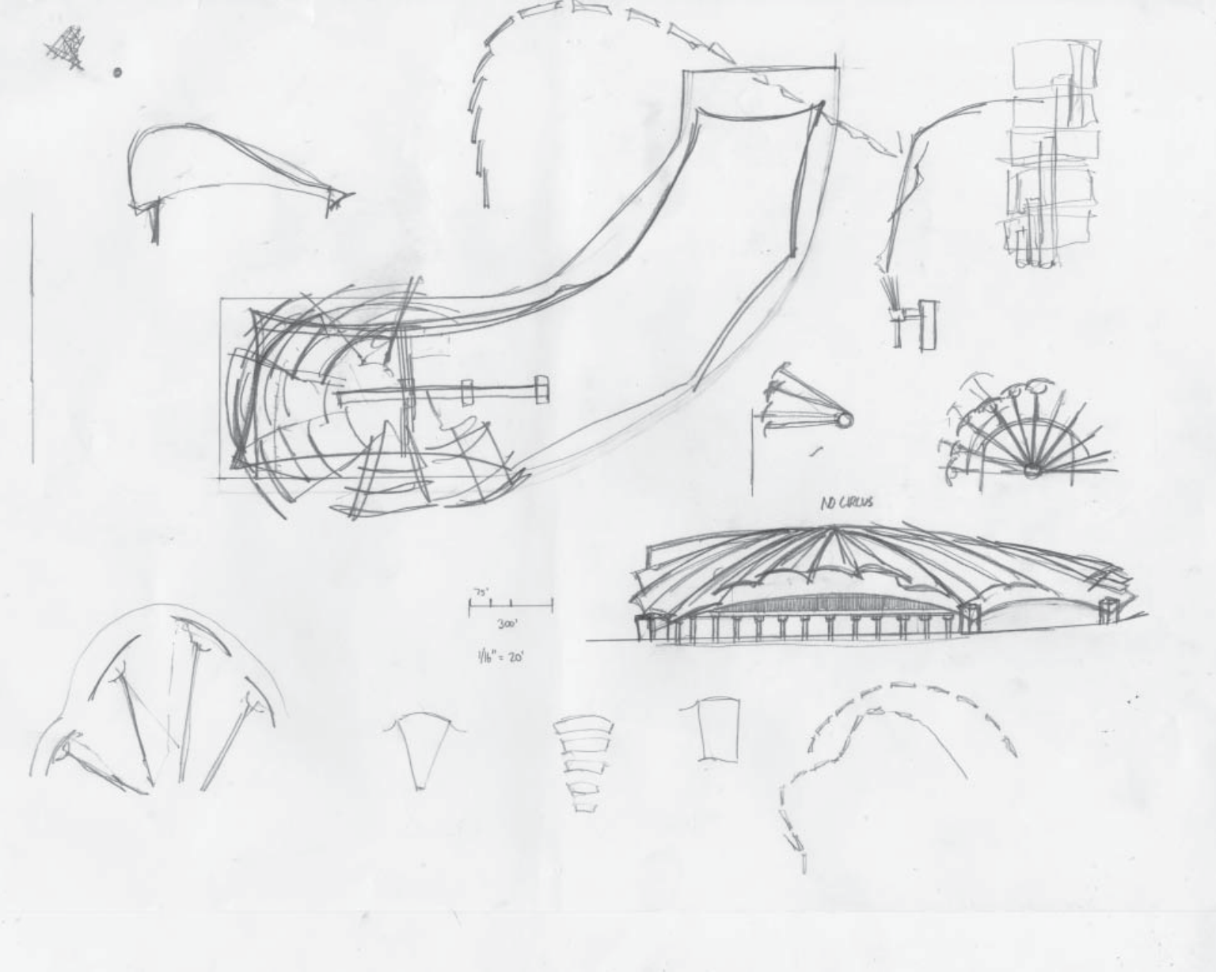


Figure 67 – "Roof Process"; Steve Martz

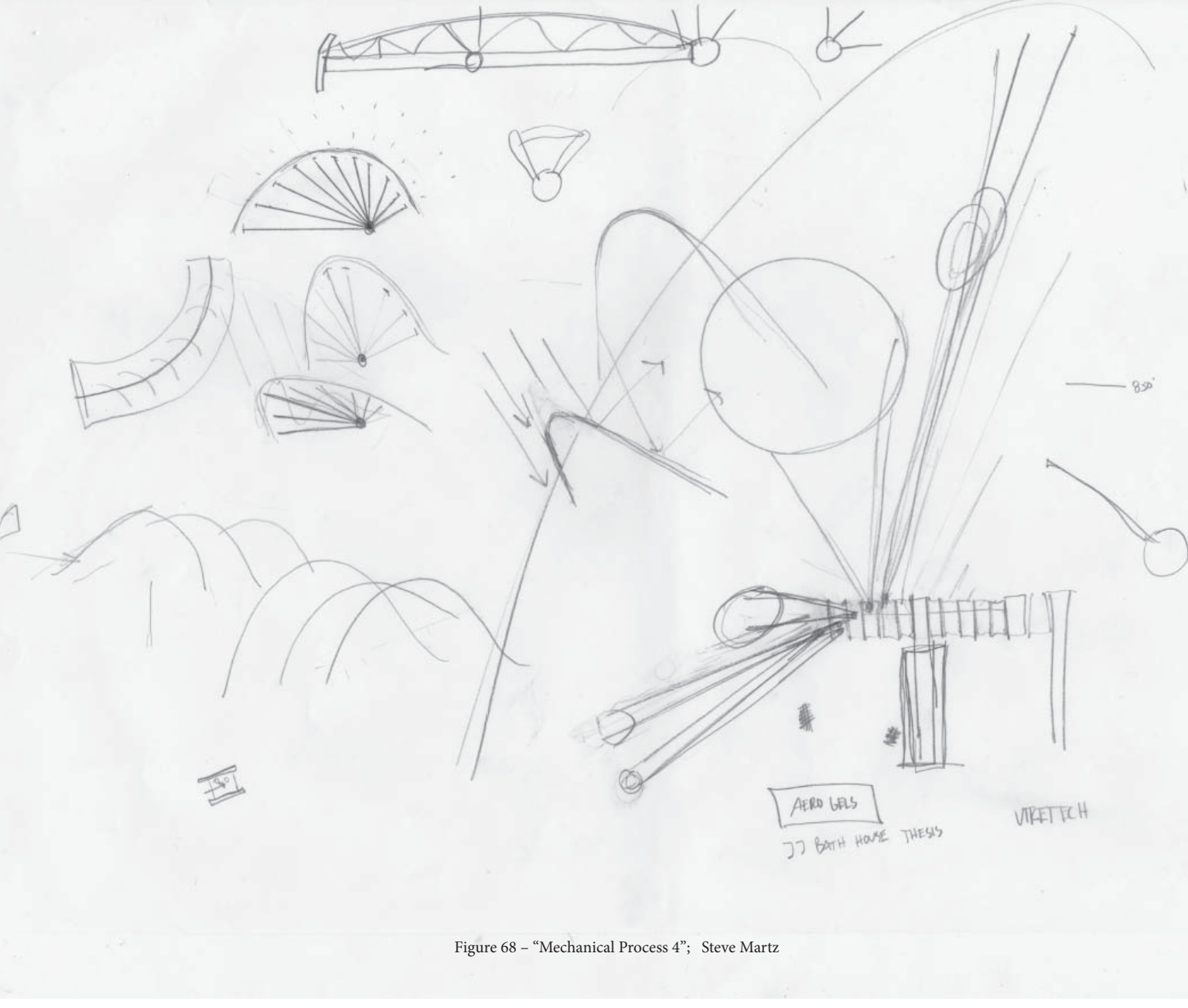


Figure 68 – “Mechanical Process 4”; Steve Martz

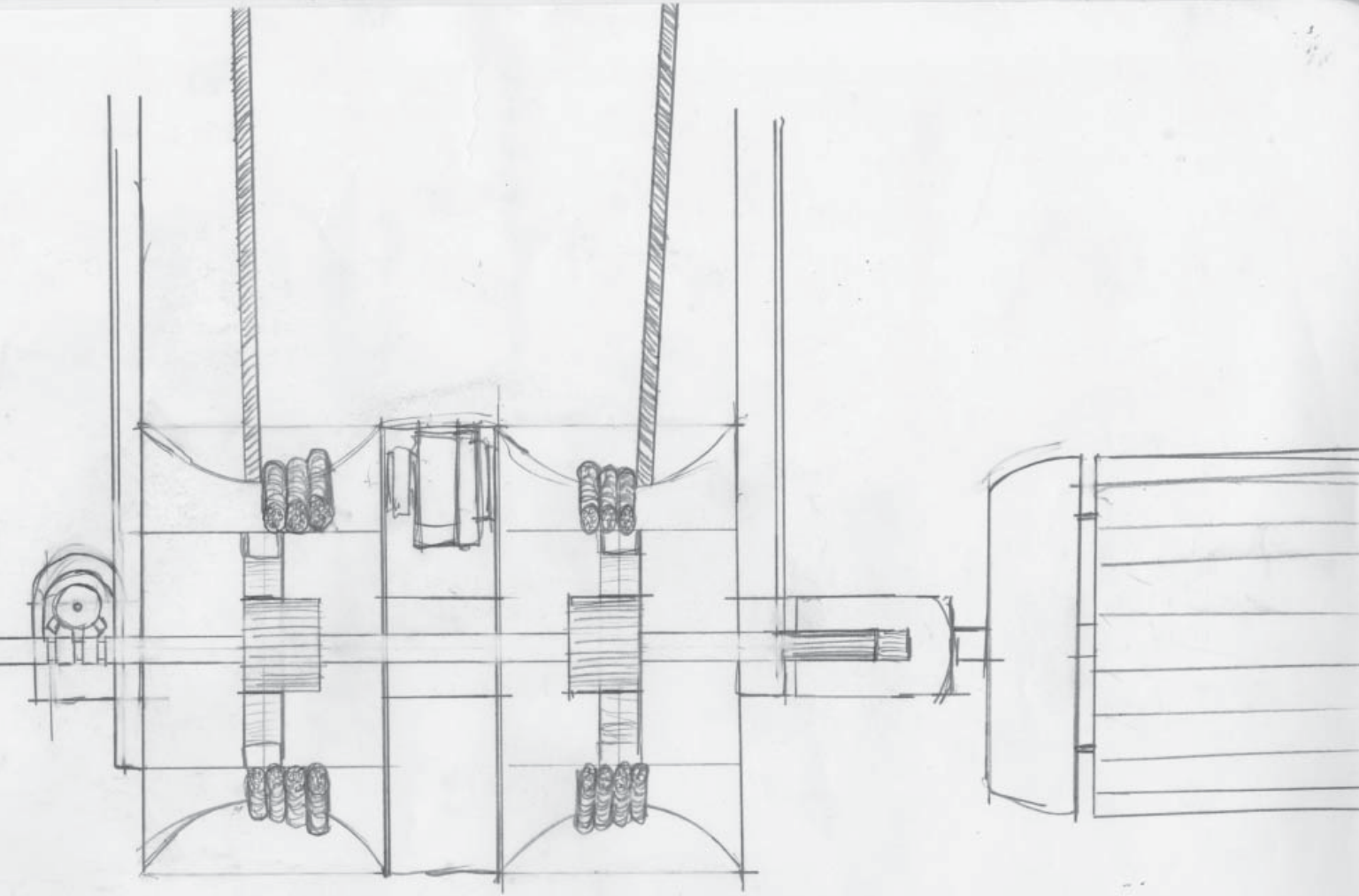
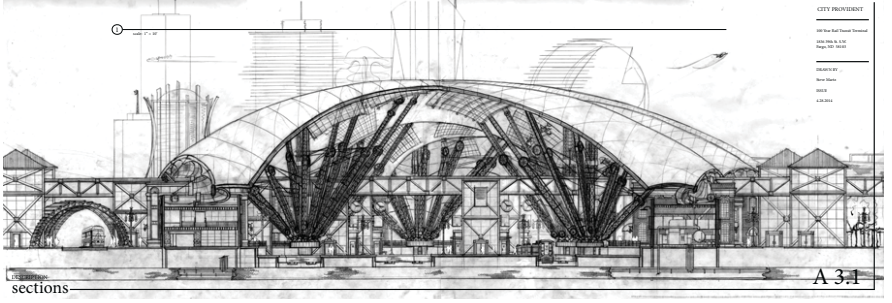
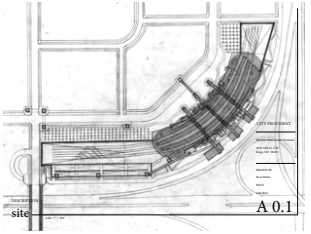
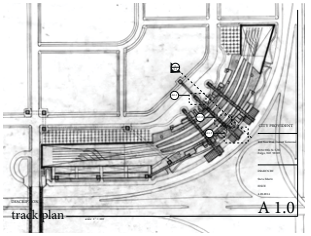


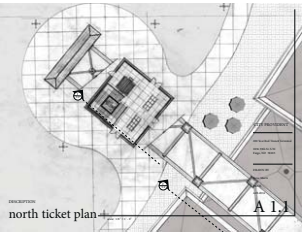
Figure 69 – “Mechanical Process 5”; Steve Martz

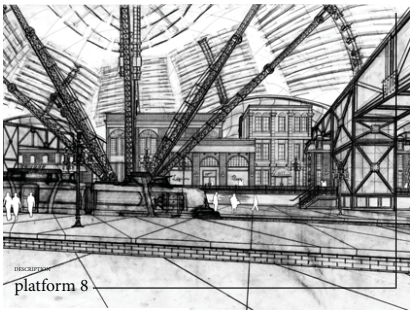
Final

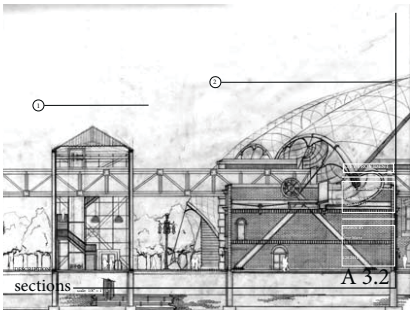


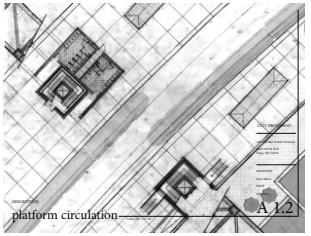


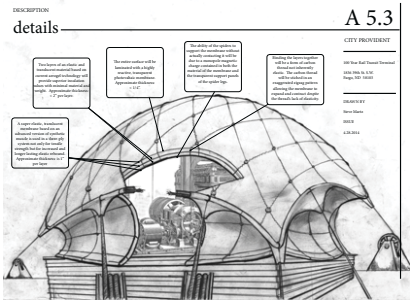


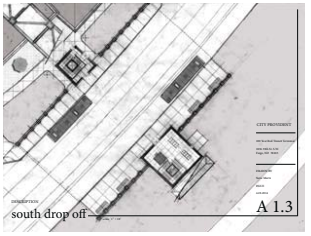


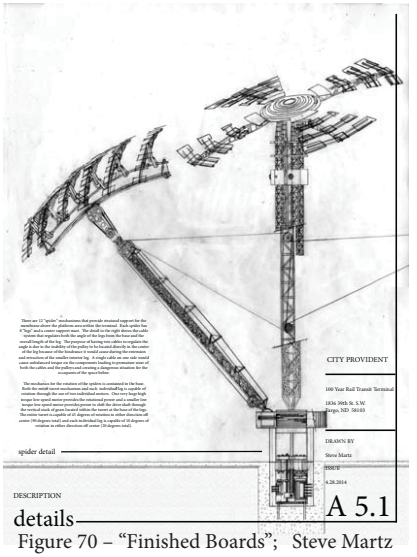












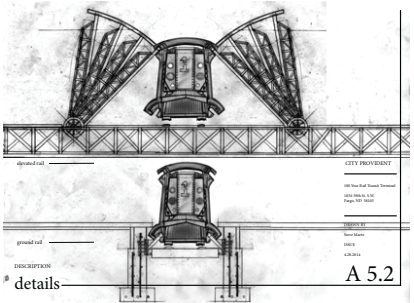


Figure 70 – “Finished Boards”; Steve Martz

ARCH. 772 Design Thesis
Spring Semester 2014
Steve Martz
Mark Batchouse
InDesign,Photoshop,Sketchup,HB,6B

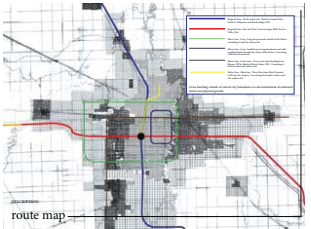


Figure 71 – "Tah-Dah"; Steve Martz

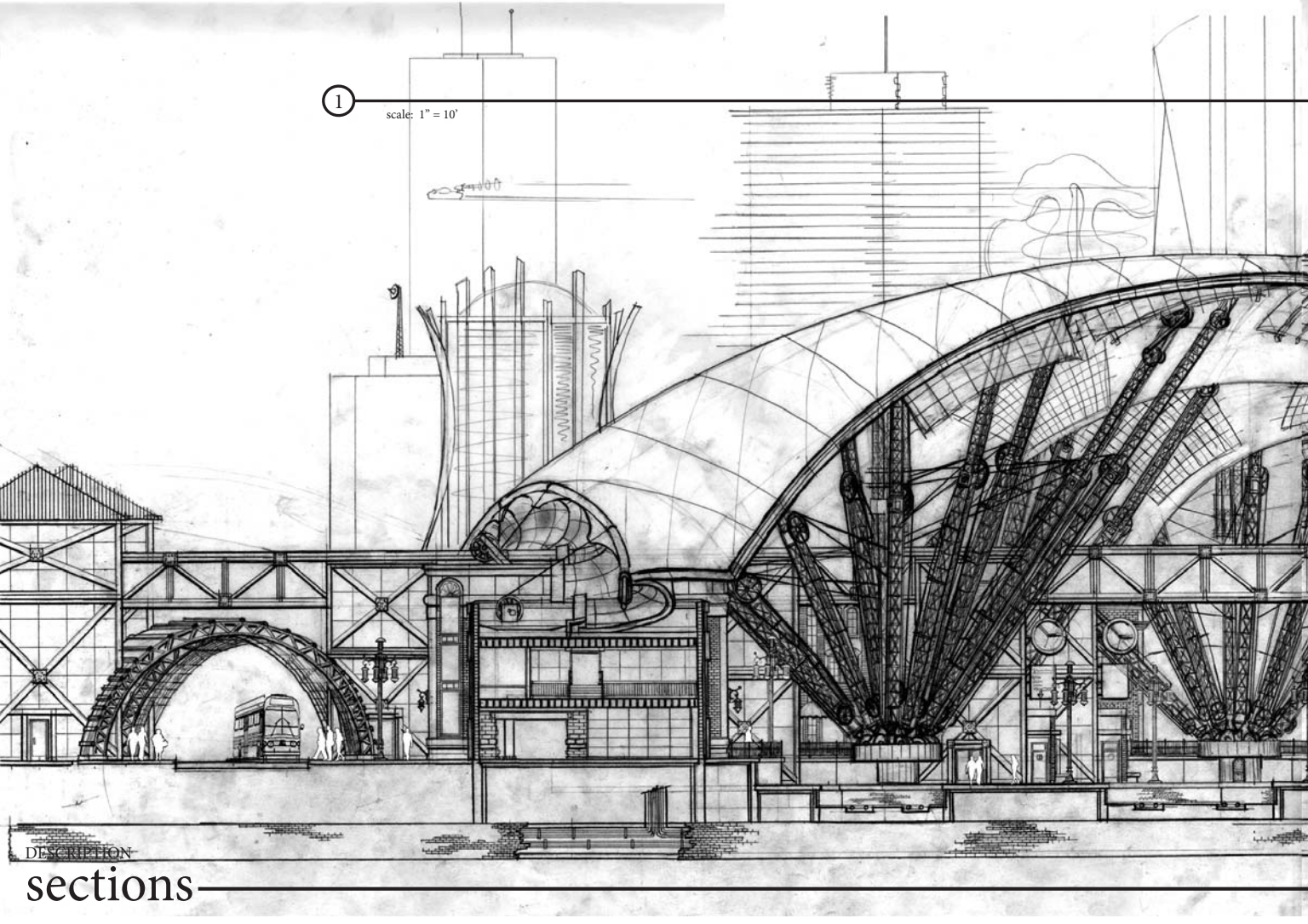
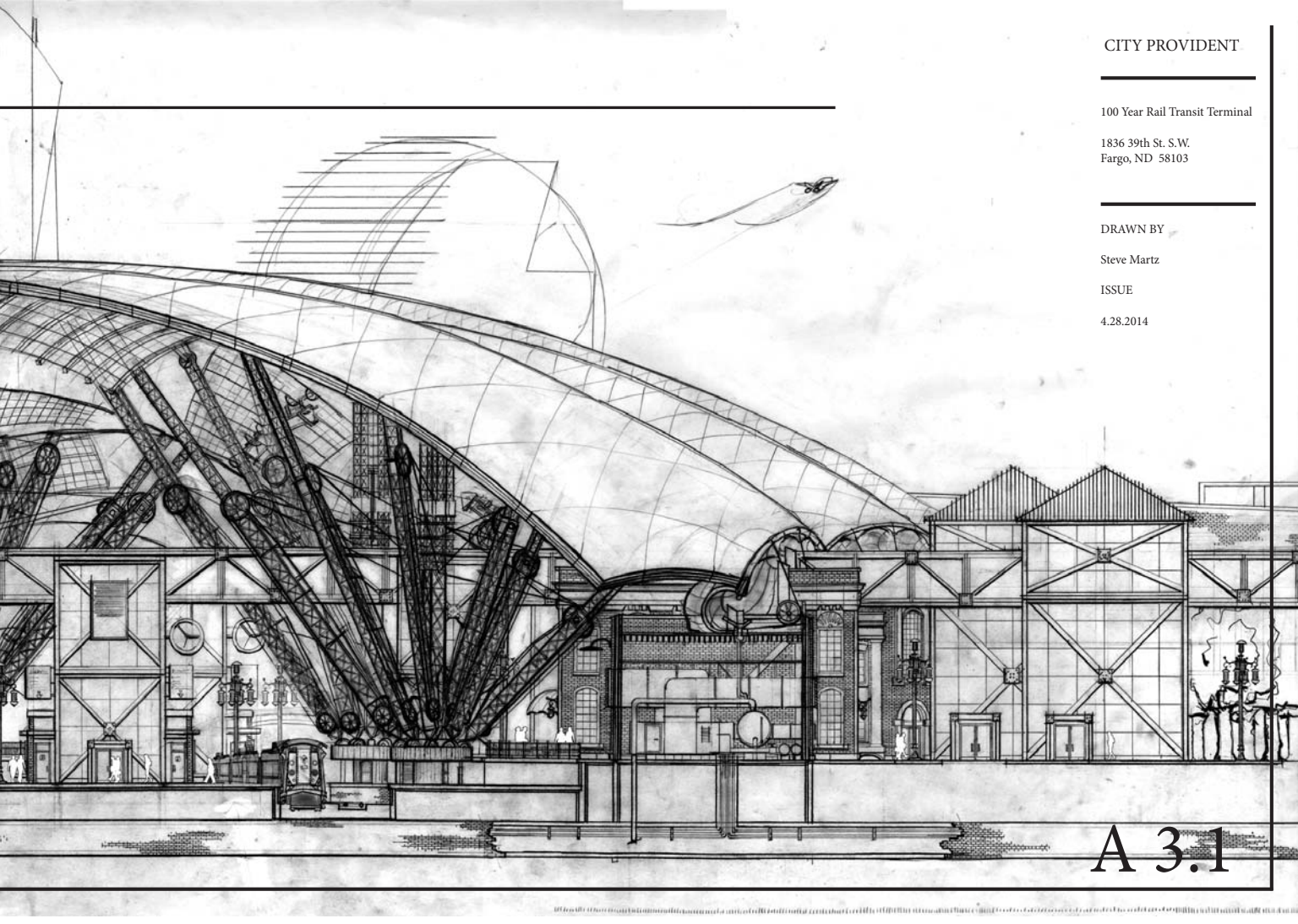


Figure 72 – "Transverse Section"; Steve Martz

Transverse section through the entire complex showing the drop off area and a section of retail space to the South on the left hand side of the drawing and a a view of the elevation differences between the consourses and platforms in the center.



On the right hand side of the drawing is a section view of one of four mechanical spaces in the building and an exterior elevation of the circulation towers on the North side of the station.

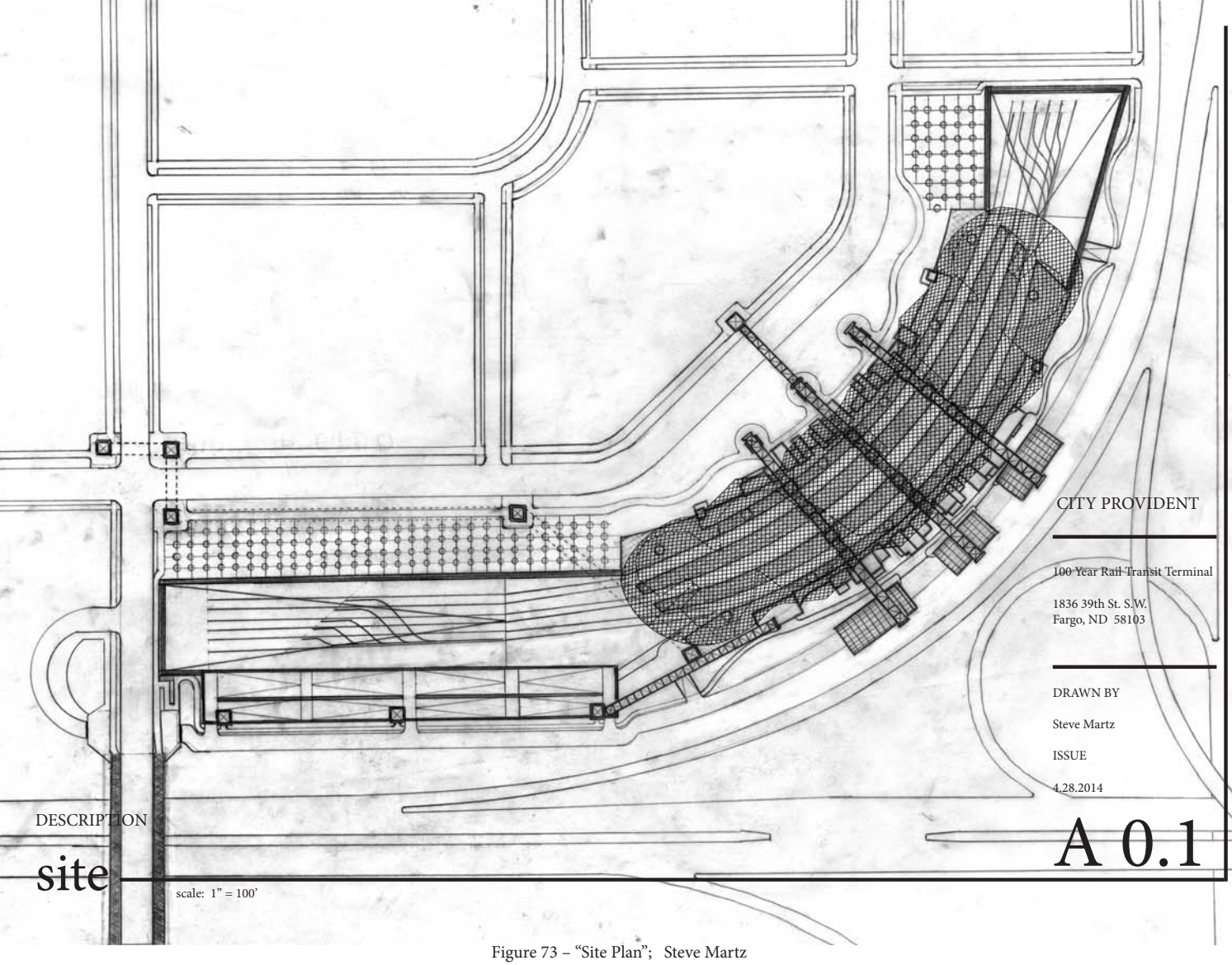


Figure 73 – "Site Plan"; Steve Martz

A plan view of the site with the station on it.

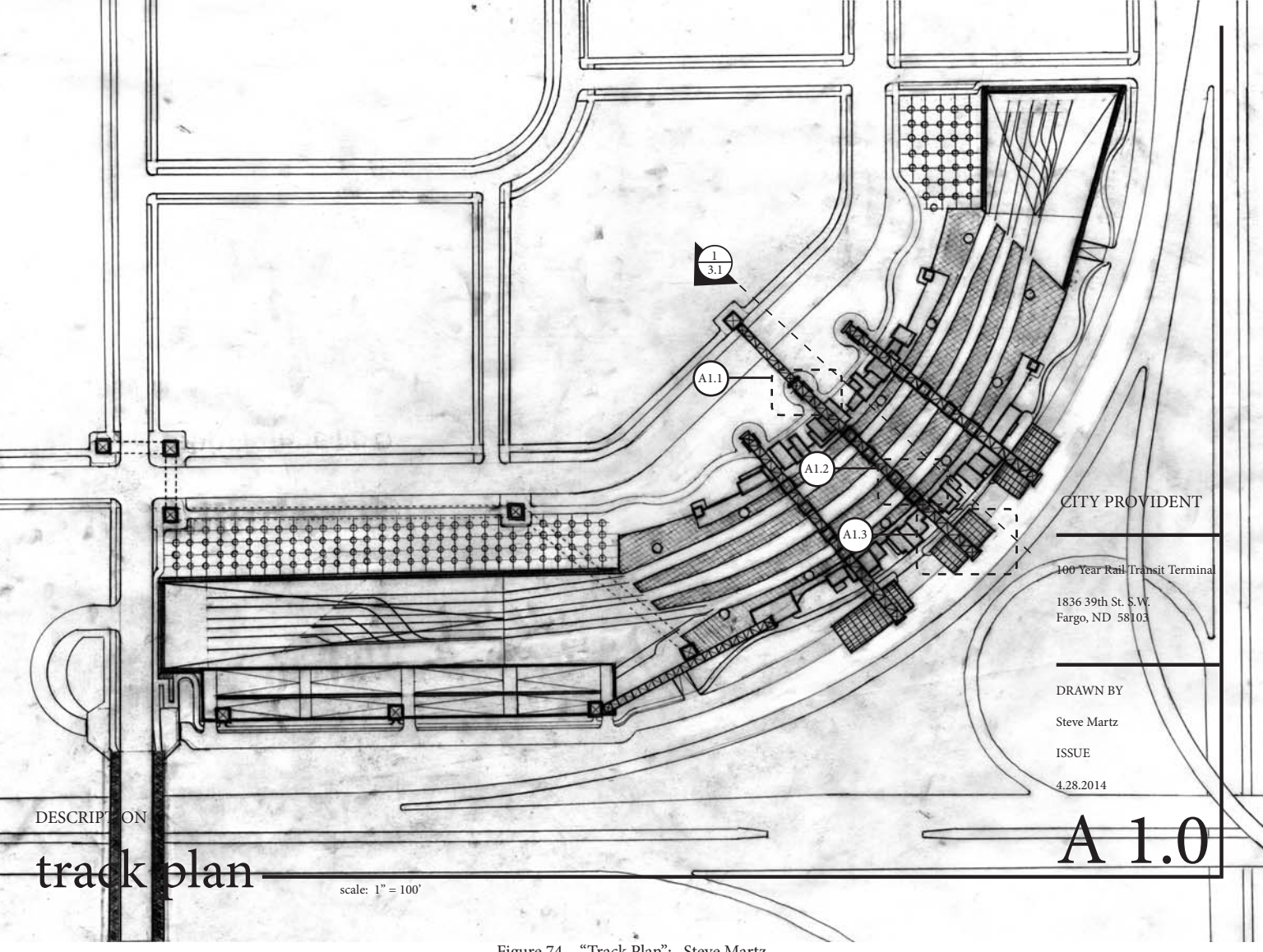


Figure 74 – "Track Plan"; Steve Martz

A plan view of the track, platform, and concourse areas.

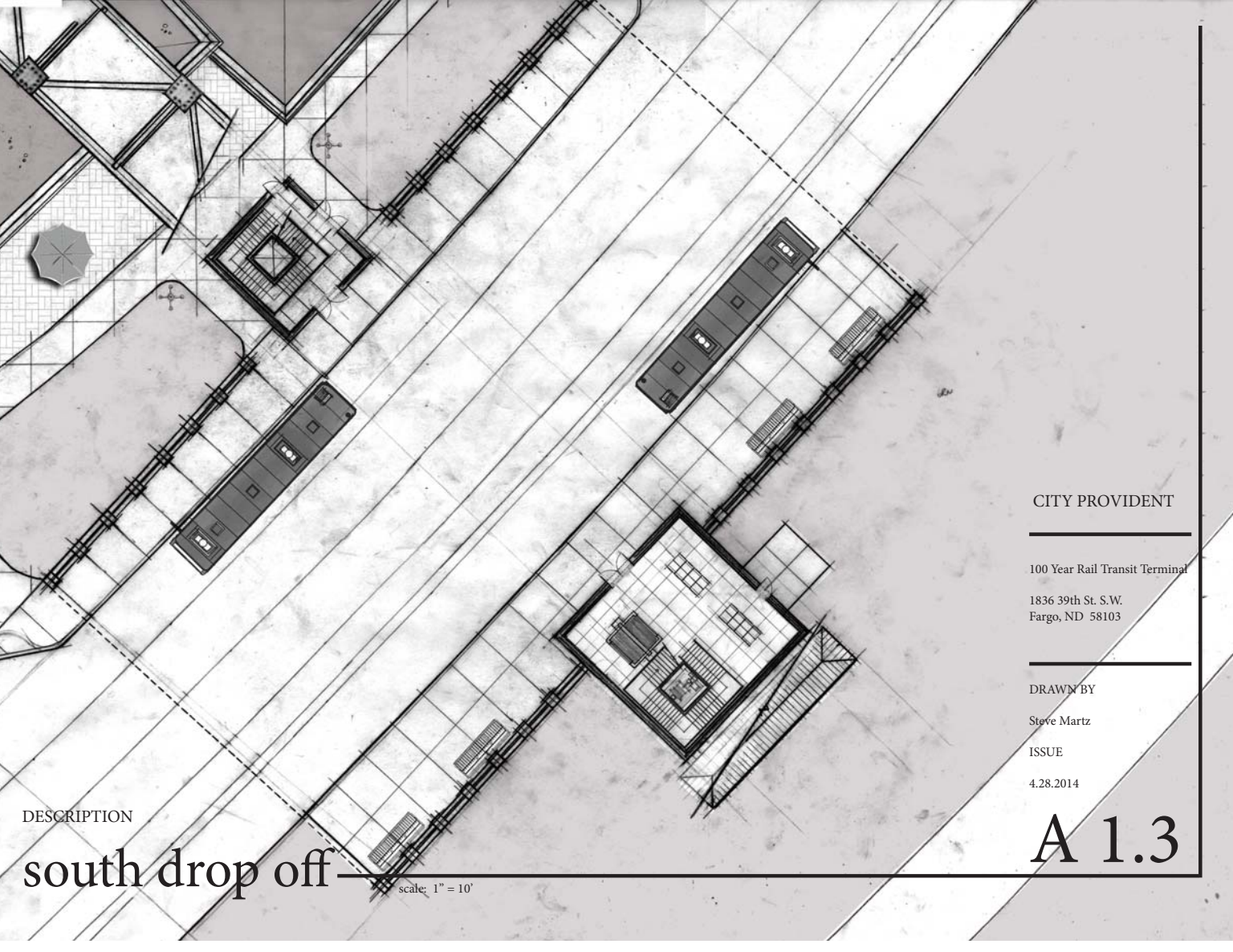


Figure 75 – "South Dropoff Area Plan"; Steve Martz

A plan view of a drop off area on the South side of the station.

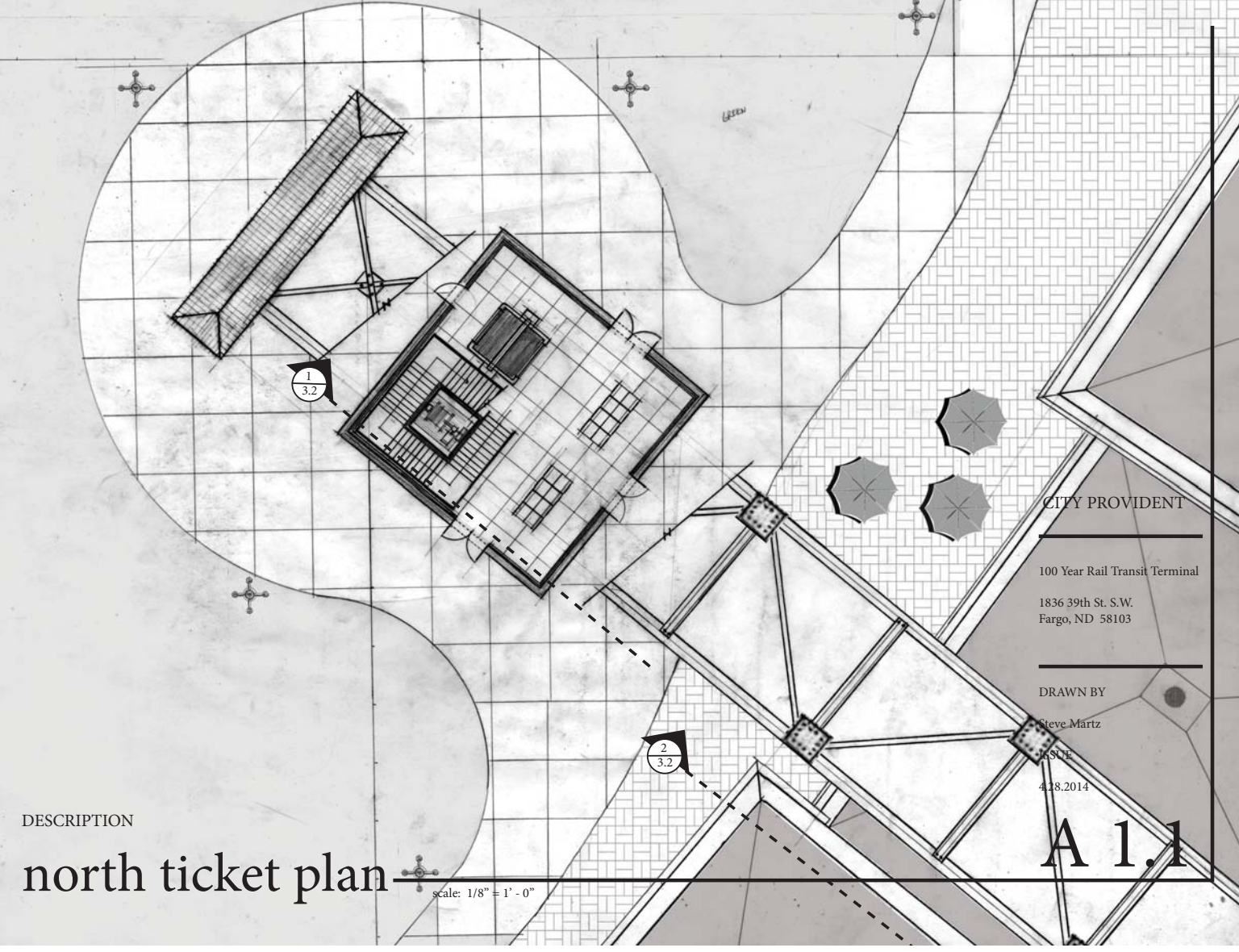


Figure 76 – "North Ticket Area/Circulation Plan"; Steve Martz

A plan view of a circulation tower on the North side of the station.

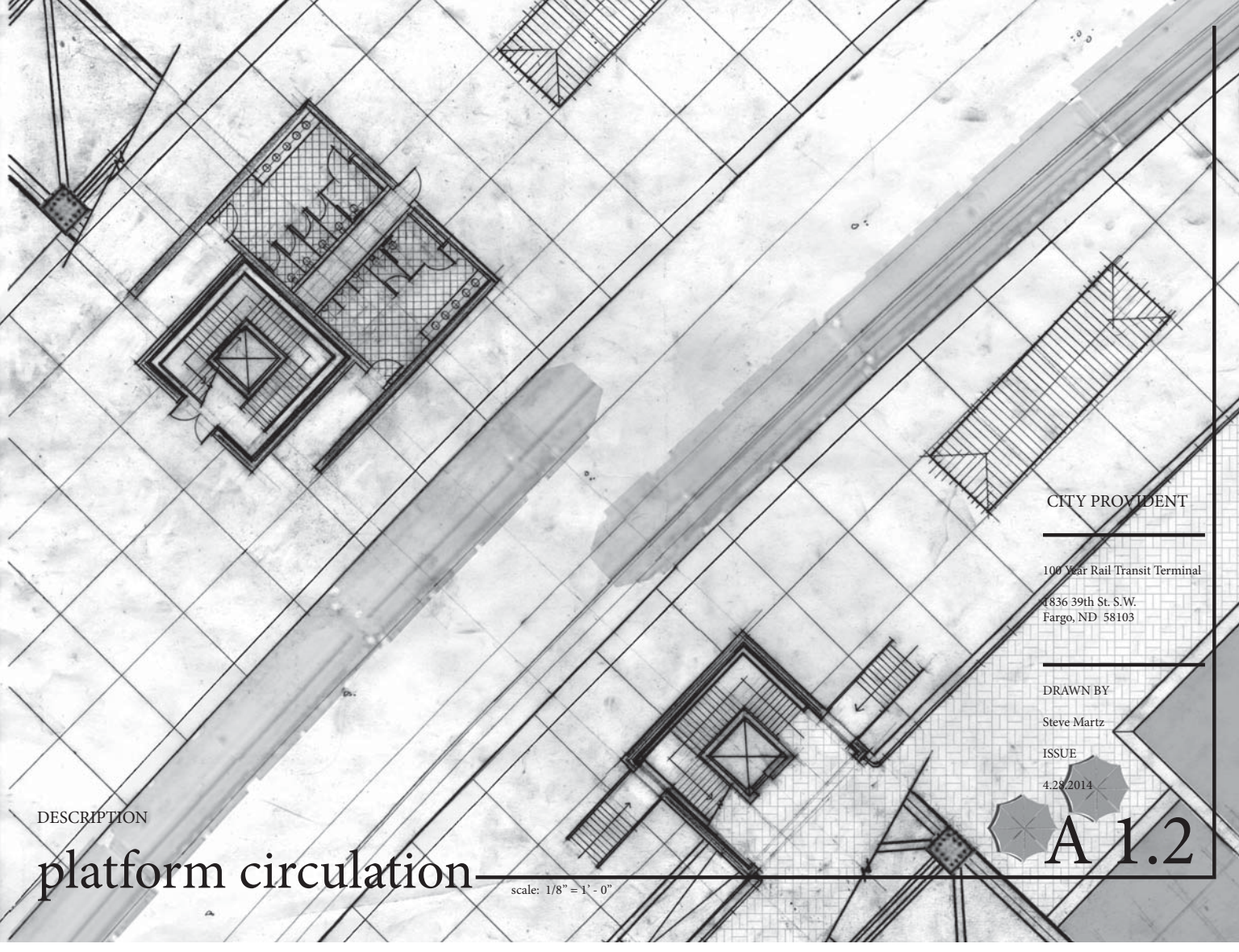


Figure 77 – "Platform Circulation Plan"; Steve Martz

A plan view of a circulation area adjacent to the concourse and a plan view of a circulation tower with public restrooms on the platform area.

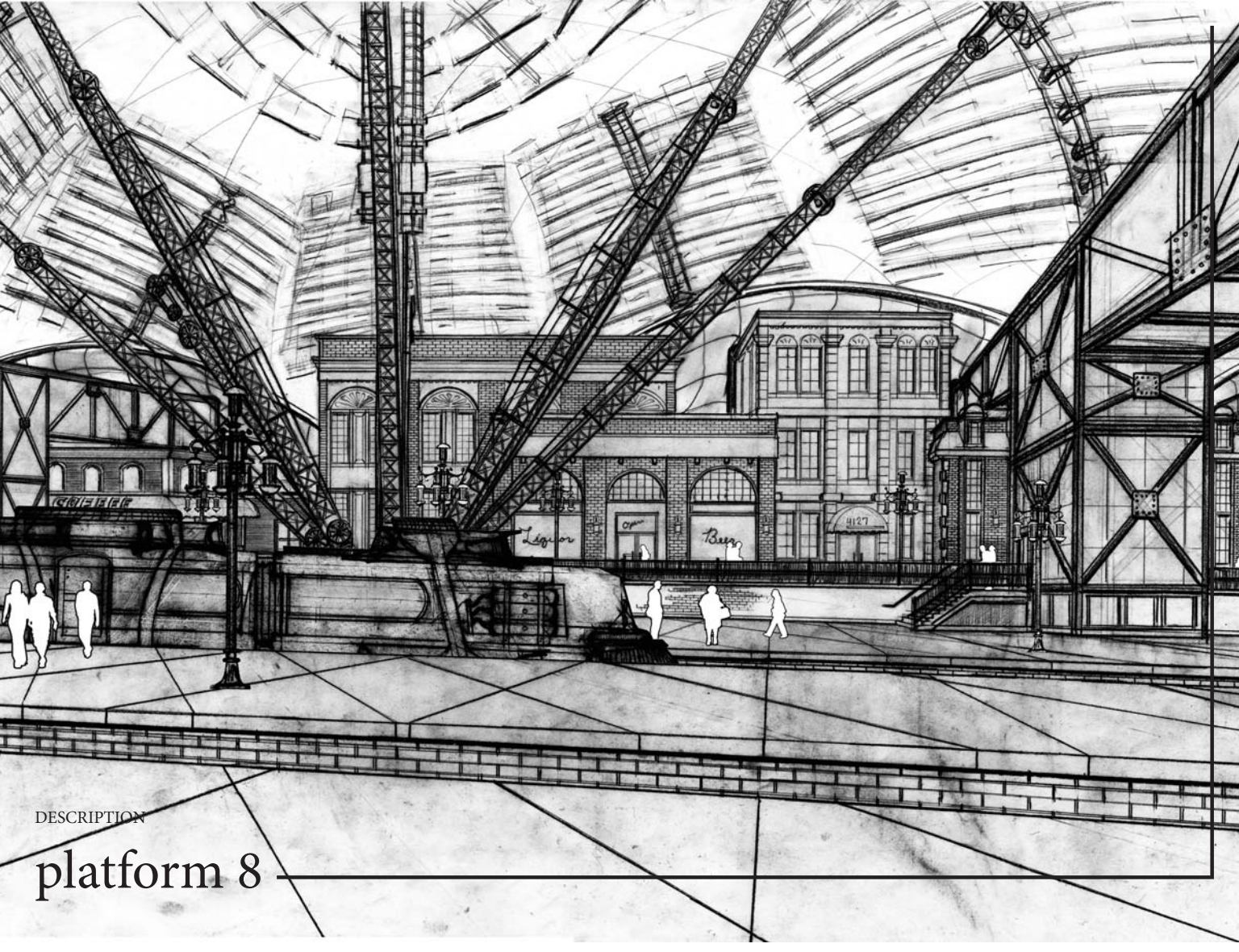


Figure 78 – "View North from Platform 8"; Steve Martz

An interior perspective looking North from the furthest South Platform area.

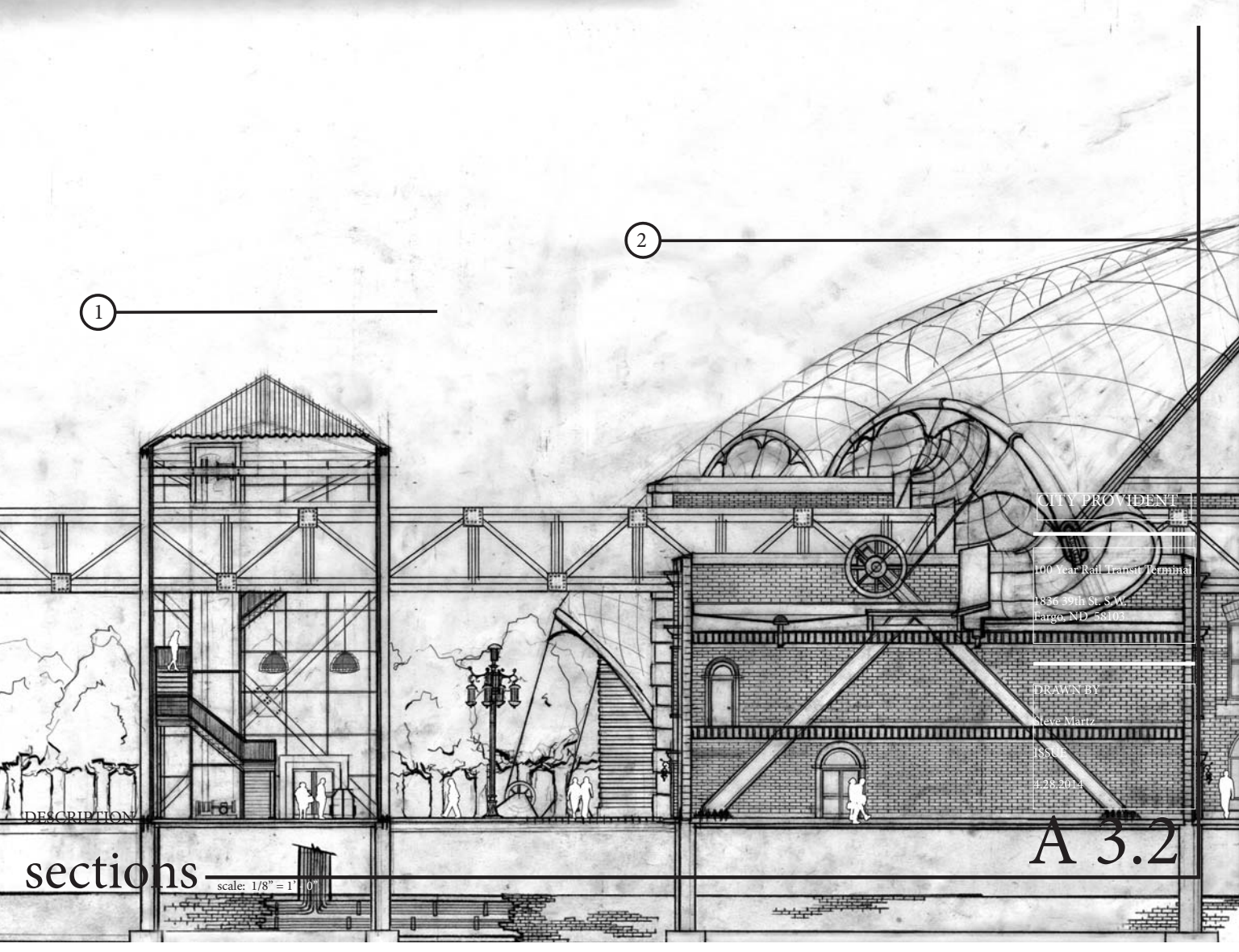
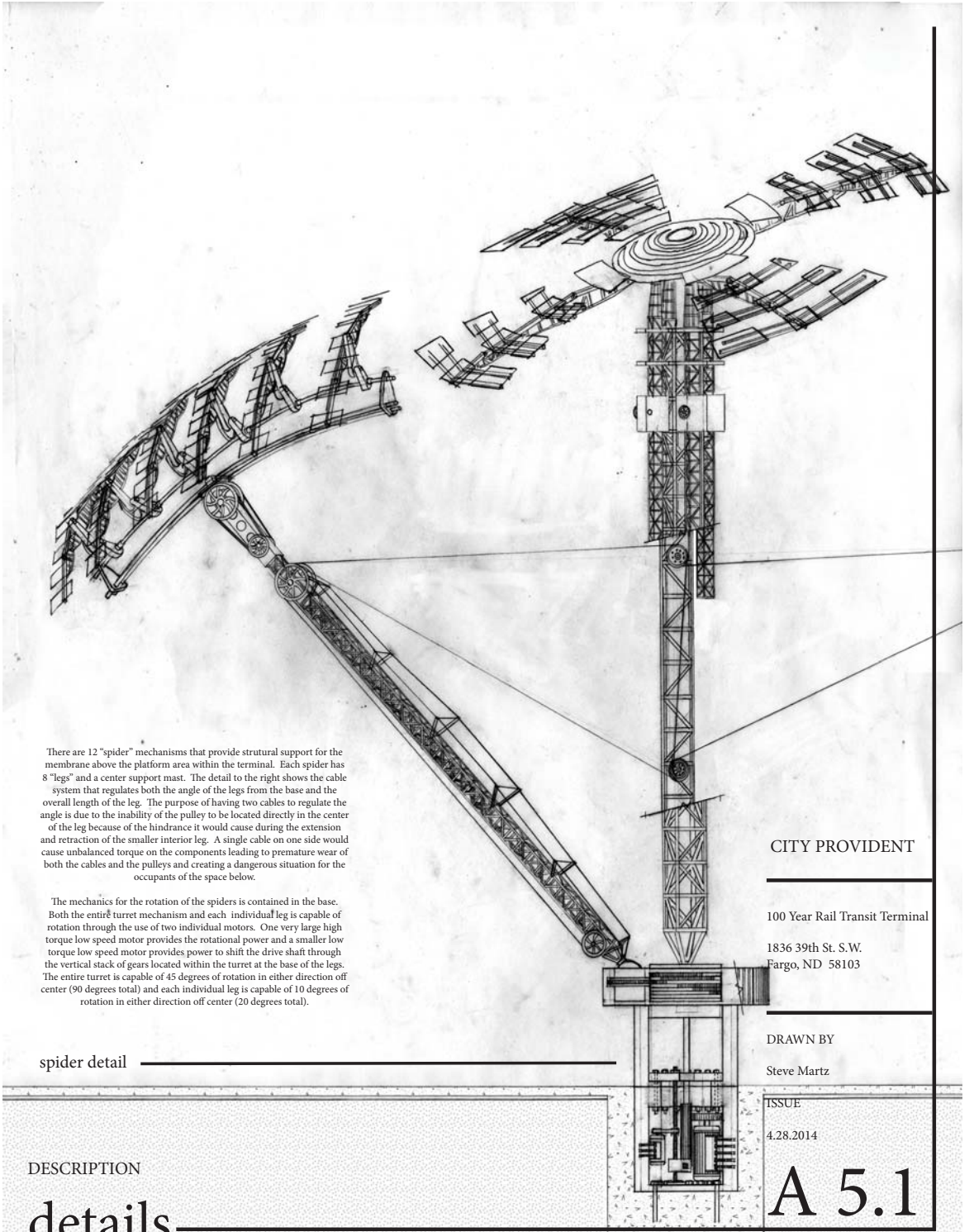


Figure 79 – "Sections 1 & 2"; Steve Martz

A section elevation of a circulation tower to the North of the station and a section view of a retail space on the North concourse as well as a detail of the recoil anchor system for the roof system.



There are 12 "spider" mechanisms that provide strutural support for the membrane above the platform area within the terminal. Each spider has 8 "legs" and a center support mast. The detail to the right shows the cable system that regulates both the angle of the legs from the base and the overall length of the leg. The purpose of having two cables to regulate the angle is due to the inability of the pulley to be located directly in the center of the leg because of the hindrance it would cause during the extension and retraction of the smaller interior leg. A single cable on one side would cause unbalanced torque on the components leading to premature wear of both the cables and the pulleys and creating a dangerous situation for the occupants of the space below.

The mechanics for the rotation of the spiders is contained in the base. Both the entire turret mechanism and each individual leg is capable of rotation through the use of two individual motors. One very large high torque low speed motor provides the rotational power and a smaller low torque low speed motor provides power to shift the drive shaft through the vertical stack of gears located within the turret at the base of the legs. The entire turret is capable of 45 degrees of rotation in either direction off center (90 degrees total) and each individual leg is capable of 10 degrees of rotation in either direction off center (20 degrees total).

spider detail

CITY PROVIDENT

100 Year Rail Transit Terminal

1836 39th St. S.W.
Fargo, ND 58103

DRAWN BY

Steve Martz

ISSUE

4.28.2014

DESCRIPTION

details

A 5.1

Figure 80 – "Spider Detail"; Steve Martz

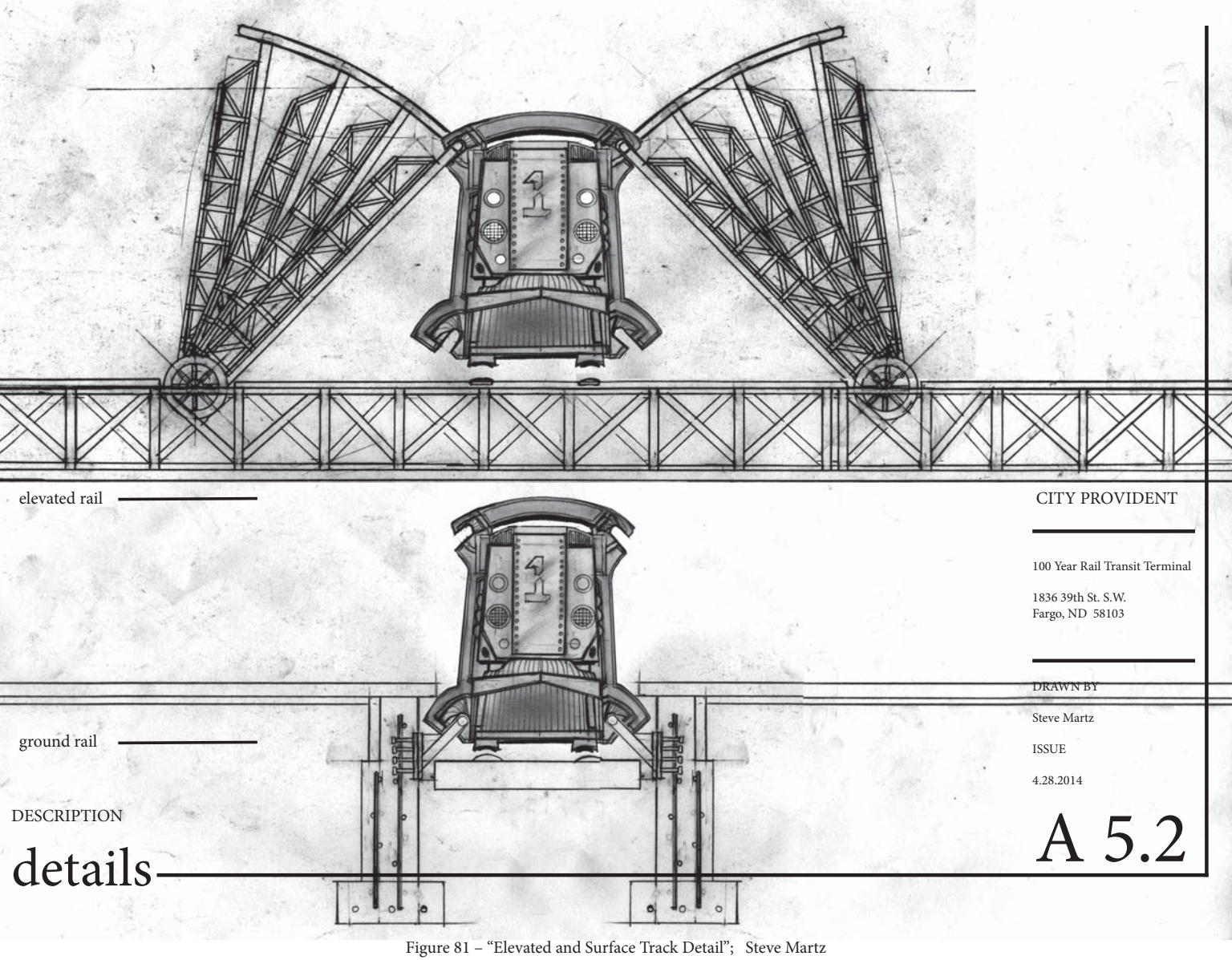


Figure 81 – "Elevated and Surface Track Detail"; Steve Martz

The proposed idea for a singular vehicle capable of traveling on both elevated and surface rail.

DESCRIPTION

details

A 5.3

CITY PROVIDENT

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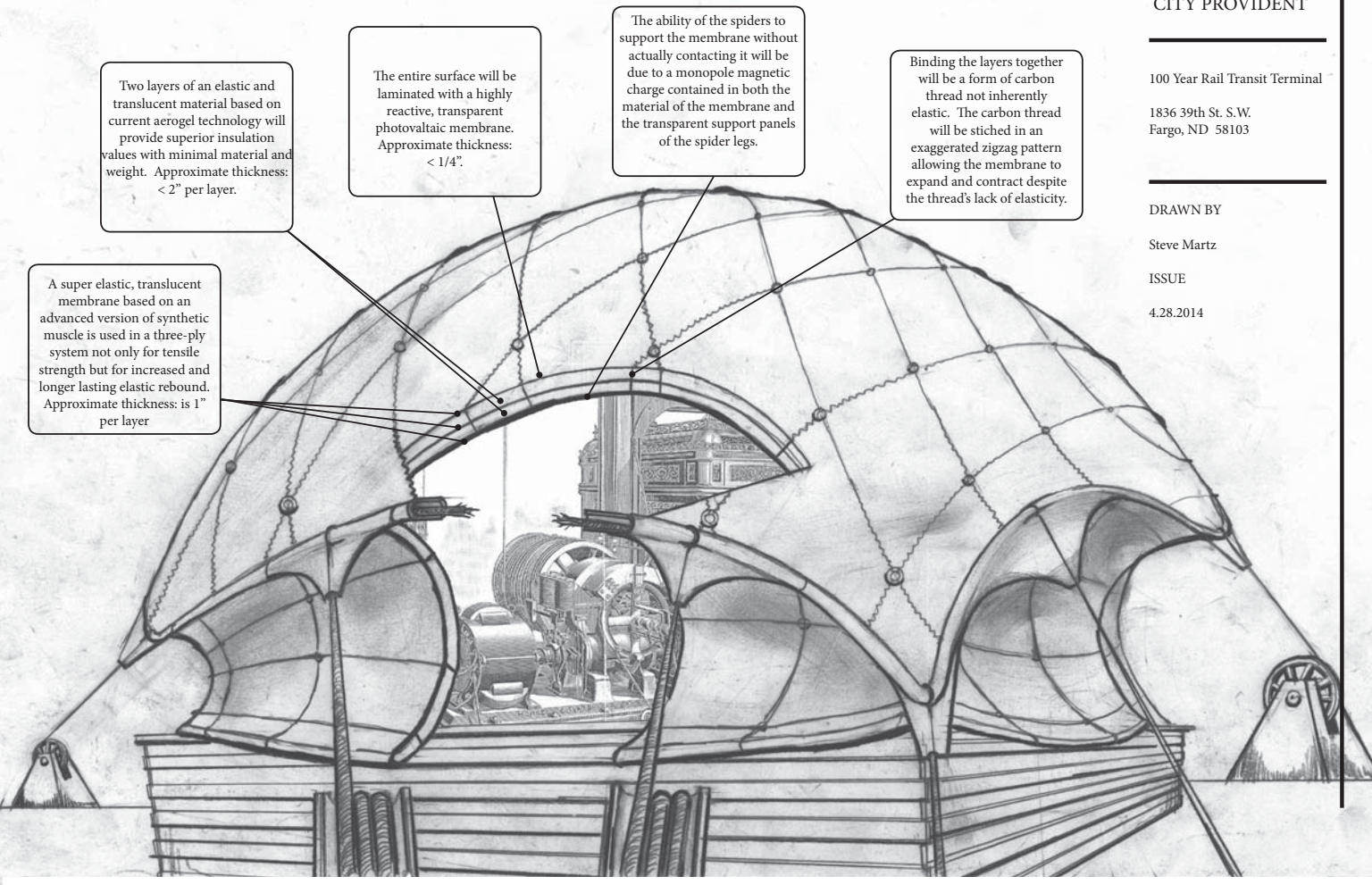

Figure 82 – "Membrane Detail"; Steve Martz

A detail of the membrane roof system.

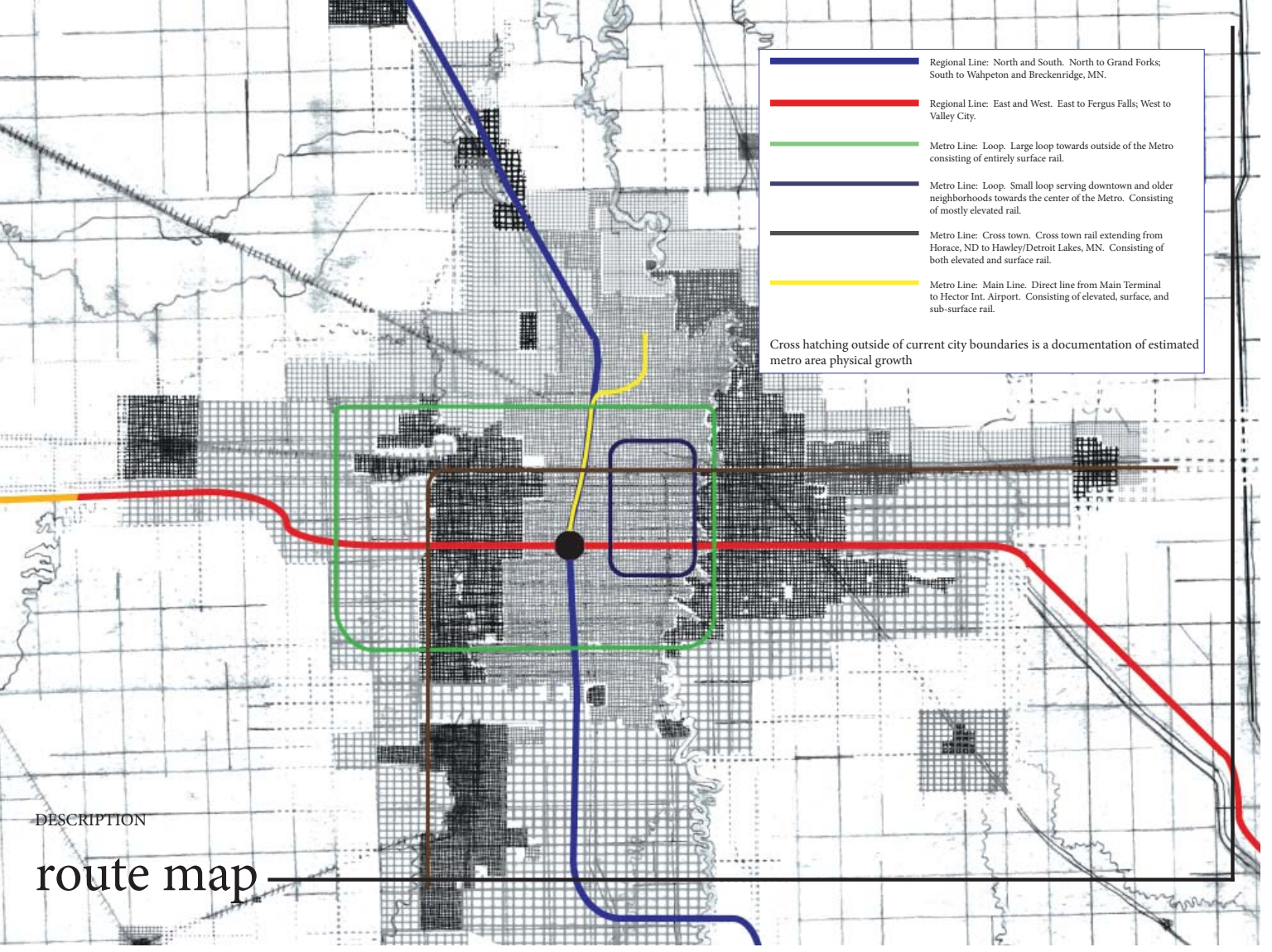

Figure 83 – "Rail System Route Map"; Steve Martz

A proposed rail route layout for the F-M metro area c. 2114.

Reflect

Design time ran out before I was able to put together any sort of comprehensive city plan for the Fargo Moorhead area 100 years from now. I had planned on developing a specific city layout and public transportation system using the information I presented in my research. I think that the research I did was still relevant to my design idea for a station however I also think that without a comprehensive city and metro transit system design to provide context the work seems bare and isolated. Had I the time and resources it would be quite and engaging process to attempt to continue building on this research and provide the missing information to this project and render it whole. It would be interesting to consider allowing future thesis students the option of selecting and building upon a project from prior years. Maybe they could take a project lacking in context or completeness (like mine) and over the course of their two semesters identify what is missing and why and provide that information as their completed project. I would love to see my ideas developed further and given a chance to become complete.

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Figure 84 – "Here It Is"; Steve Martz

Figure 85 – “Self Portrait” Steve Martz