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SOWING THE SEEDS OF GROWTH

A STUDY ON SCHENECTADY, NY'S FOOD DESERT

Kelsey M. Ling

Degree: Master of Architecture

School of Architecture, Art, and Historic Preservation

Roger Williams University

Date: May 19, 2020

“Submitted in fulfillment of the requirements for the Master of Architecture degree”

SOWING THE SEEDS OF GROWTH, A STUDY ON SCHENECTADY NY’S FOOD DESERT

Author Name	Author Signature	Date
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Advisor Name	Advisor Signature	Date
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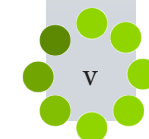
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TABLE OF CONTENTS

CITED IMAGES.....	vi-vii
ABSTRACT.....	viii-ix
PROBLEM STATEMENT.....	2
PROJECT STATEMENT.....	4
ARCHITECTURAL INTENTIONS.....	5
CLIENT AND USERS	
SELECTION OF.....	6
NARRATIVES.....	7
INITIAL PROGRAM OUTLINE.....	8-9
SITE	
IDENTIFICATION AND SELECTION.....	12-13
ADAJECENT FEATURES.....	14
SITE PLAN AND SECTION.....	15
BUILT FEATURES.....	16-19
NATURAL FEATURES.....	20-21
SOCIAL FEATURES.....	22-23
HISTORY.....	24
ECONOMY.....	25
ZONING.....	26-27
PARCEL MAP.....	28
INITIAL BUILDING ORGANIZATION.....	29

PRECEDENTS	PRECEDENT ONE	
	INTRODUCTION.....	32
	SITE ANALYSIS.....	33-35
	OFFICIAL DOCUMENTATION.....	36-39
	ANALYTICAL DIAGRAMS.....	40-43
	PRECEDENT TWO	
	INTRODUCTION.....	44
	SITE ANALYSIS.....	45-47
	OFFICIAL DOCUMENTATION.....	48-51
	ANALYTICAL DIAGRAMS.....	52-54
	TECHNICAL SYSTEMS PRECEDENTS.....	55-59
INITIAL DESIGN	FIRST ITERATION.....	62-63
	SECOND ITERATION.....	64-67
	THIRD ITERARION	
	SITE RELATIONSHIP.....	68-69
	DOCUMENTATION.....	70-75
FINAL DESIGN	FINAL DESIGN.	
	SITE RELATIONSHIP.....	78-79
	FORM + PROGRAMMATIC RELATIONSHIP.....	80
	DOCUMENTATION.....	81-91
	TECHNICAL ASPECTS.....	92-93
	CONCLUSION.....	94-95
	ANNOTATED BIBLIOGRAPHY.....	96-99



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Sefaira

ABSTRACT

Humanity, it seems has always struggled to find a balance between human comfort and other factors, such as environmental and political factors. Sometimes even when our intentions are good, they are not enough to meet basic human needs. A common worldview of many living in the United States is that a lack of food is a third-world problem, but this is somewhat of a fallacy. Food availability varies greatly from one part of the US to another.

Many issues can contribute to a lack of food. For example, out west water shortages sometimes create crop shortages. Cities such as Los Angeles have to rely on outside sources for water now. In other areas, food deserts might be a rural issue of distribution, or an urban issue that is politically or economically charged. In the era of COVID-19, food shortages are caused by an increase in demand. One thing is for certain, areas where food is scarce, and especially where healthy food is scarce, tend to form in clusters, each with its own unique cause.



It's been a topic of discussion within architecture for some time now, the issue of how to integrate agriculture with a cityscape, mostly in order to cut down on transportation time, and to save precious undeveloped land from turning into farmfields. However, one subject that has not been looked into much is how we can integrate the concept of the urban farm with the issue of locational food shortages, also known as a "food deserts", which is later discussed in more depth.

How can we create an urban atmosphere where food is healing physically, emotionally and economically? Where the concept of farming reverts back to an activity that is carried out together by families, but in a modern atmosphere? Can we design in a way that is educational in relation to the topics of farming, healthy living, and sustainable practices? Lastly, how can we make this concept into an architectural language that is accessible to different groups of people, and economically feasible while keeping a low environmental footprint?



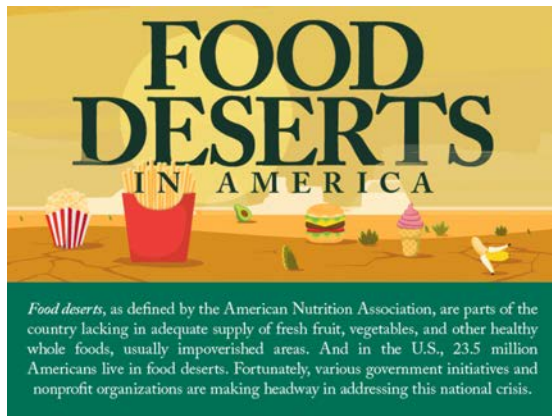
INTRODUCTION



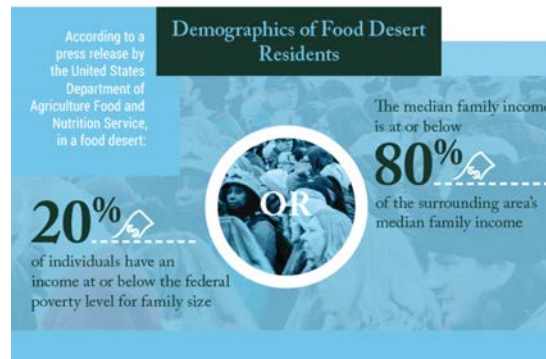
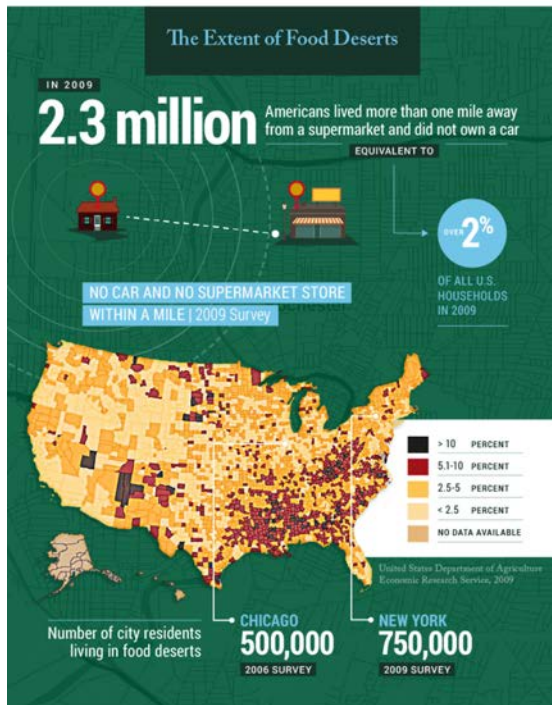
PROBLEM STATEMENT

Food deserts are neighborhoods with limited food access - for example they may have convenience stores and fast food restaurants but no grocery stores selling meat and fresh produce. Average BMIS are higher in food deserts and lower in more affluent areas that have a larger variation of food available. The problem is exacerbated when some residents don't have transportation either. Children are vulnerable especially, even in school. Schools within food deserts are sadly no exception to the issue in terms of being able to provide. Since food deserts occur in impoverished areas, minorities are at a higher risk for living within one. Food deserts can be either an urban or rural problem.





STATS ABOUT FOOD DESERTS IN AMERICA



PROJECT STATEMENT

Explore how to solve the issue of a food desert and high bmis with the use of a community garden. Additionally, the program can be combined with classroom and event space so that the building becomes an agriculture education center for individuals of all ages and improves local social life. The community function will help put sustainability on display as something attainable for anyone who needs it, not just the privileged. The very latest in technology will be used in order to power and grow plants, and the methods will match local availabilities and climate. Attention will be on finding a method that is economical and as simple as possible, but effective.

- Improve Physical and Mental **Health** of Residents
- Provide Adequate **Garden** Space
 - Research plants and cater designs to their biological needs
- **Educate** Residents On How to Grow Produce
 - Provide lecture spaces for adults and teenagers
 - Provide program for children, and educational experiences at their learning level
 - Provide staff offices
- Put **Sustainability** on Display
 - Technologies maximize efficiency while keeping installation and maintenance costs low
 - Exhibit to showcase why/how it works, (Will be in accordance with climate and culture)
- Improve **Community** Interaction
 - Opportunities for human interaction will be maximized, including event space



ARCHITECTURAL INTENTIONS

The greenhouses have individual plots as well as the demonstration plot. It includes a seed germination lab and support spaces. The individual plots instill feelings of ownership and pride. Plants are grown vertically on panels. It is a large steel and polyurthene structure with pitched roofs, oriented for maximum solar exposure. Some walls are solar walls.

The kitchen connects the greenhouse and multifunction. It has a prep area, a cooking area, and a basement for a cooler and dry storage. The kitchen is essentially a communal and classroom setting.

The food processing room is a large room in-between the communal plot and kitchen, and it is for processing product to be sold, possibly shipped out, or eaten at an event.

The multifunction room is a large event space with a flexible layout and furniture arrangement that is near the south entrance. It will have views along the back wall into the courtyard, and glazing is placed in a way that allows natural light to penetrate in from this courtyard. This space is double-height with a dramatic space truss overhead.

The offices are spaces for employees to retreat to. They are the backbone of the establishment so the offices and break room will be filled with all needed amenities, including a kitchen, storage, and space to lounge so that when they are ready to get back to work they are refreshed.

The classroom and daycare are for younger visitors to be able to learn gardening skills and healthy eating habits. They will have a colorful, playful color scheme and be well-lit. The design needs to have a particularly high focus on hands-on learning. They also allow adults to drop off their children at a safe location while they work.

The lecture halls are for older visitors (teenagers included), who can handle lecture-format classes on gardening skills and healthy eating habits. The lighting needs to be diffuse to be able to incorporate electronics including a presentation screen.

Exhibit space is on both the first and second floor of the southern wing, in circulation space, so that people pass by the exhibits and are encouraged to view them.

The outdoor farmer's market has tents under which produce is sold. It's located off of Broadway to draw people in. This is what makes it a co-op. There is also an indoor market, which is on the ground floor of the north wing, also off of Broadway. The two open into each other.

CLIENT/USERS

Capital Roots is a farming co-op local to New York's capital region. Their motto is "grow, educate, provide". Their website says "Our mission: to nourish healthy communities by providing access to fresh food and green spaces for all." This meshes well with the project goals.



The end user of the community garden and community/education center will be all residents of Schenectady. There is not a particular target demographic, however there is in a sense a "critical" demographic, or one that is recognized as needing the building more, and that demographic is those that live in the public housing or Hamilton Hill neighborhood, near the downtown. Other users of the project would be whoever shops at the farmer's market, or individuals who eat at restaurants that the greenhouses provide food for.

Employees of the co-op would be mostly locals because it would generate jobs in an area where the area's downtown economy is majorly failing its inhabitants in recent decades. However, it is likely that some specialists would have to be outsourced. The building is by the people for the people.

NARRATIVE ONE AVERAGE DAY - As you approach the building, the peaked roofs of the greenhouse stick up over the rest of the building, stating the building's function. Today there is a farmer's market, so the front lawn is covered in vendors and customers. Passing through the vestibule, you enter into an entryway. There is glazing in front of you viewing into a courtyard, where children are playing ball. To your right through some windows you see a large event space, where a small group is eating. You keep walking, and continue upstairs. The classrooms, offices and lecture spaces wrap around the courtyard, which you can see down into. To your right you can also see down into the multifunction space. A female voice carries from a lecture hall, explaining the benefit of eating unsaturated fats to his audience. The laughter of children is heard from the daycare. You meander through multiple exhibits, explaining how the growing works. You turn around the other way and pass the private employee offices, but head back downstairs. Further to the northern part of the site, you walk past the garage entrance, which is an old weigh station. You pass the kitchen, where a few families are using the free resource to their advantage. Lastly, you pass through a set of doors into the greenhouse, where the smell of ripening tomatoes hits you. It's summer in the greenhouse. There will be a summer harvest event soon. You walk past the processing area, through the communal plot, where a lesson is being given. Then you pass into the indoor farmers market, and up some stairs. You walk over to your family's plot. Plant panels are arranged in a circular manner around a central atrium, which provides dazzling light.

NARRATIVE TWO AUTUMN FESTIVAL - You walk in through the main entry door, pass through the vestibule and are greeted with an amazing smell. A door greeter welcomes you in. The multifunction room is set up for a communal dinner. Circular tables fill the back half of the space, and people are happily eating an autumn vegetable stew, corn on the cob, squash, and grilled chicken, which was donated for the event from a farm partnering with them for the dinner. The very back has glazing viewing into the courtyard, and the golden evening light is thrown into the space. People have brought their families, their friends, or even their neighbors, and all of these members of the town of Schenectady are enjoying a safe evening activity. You're helping out tonight, so you go all the way to the back of the hall, and enter the kitchen. Everybody is busy stirring, chopping and grilling, but also everyone is chatting away with smiles on their faces and having a good time. Through the kitchen glazing you can see the towering greenhouses. The central plot, where corn and larger crops are grown, is looking bare after the harvest.

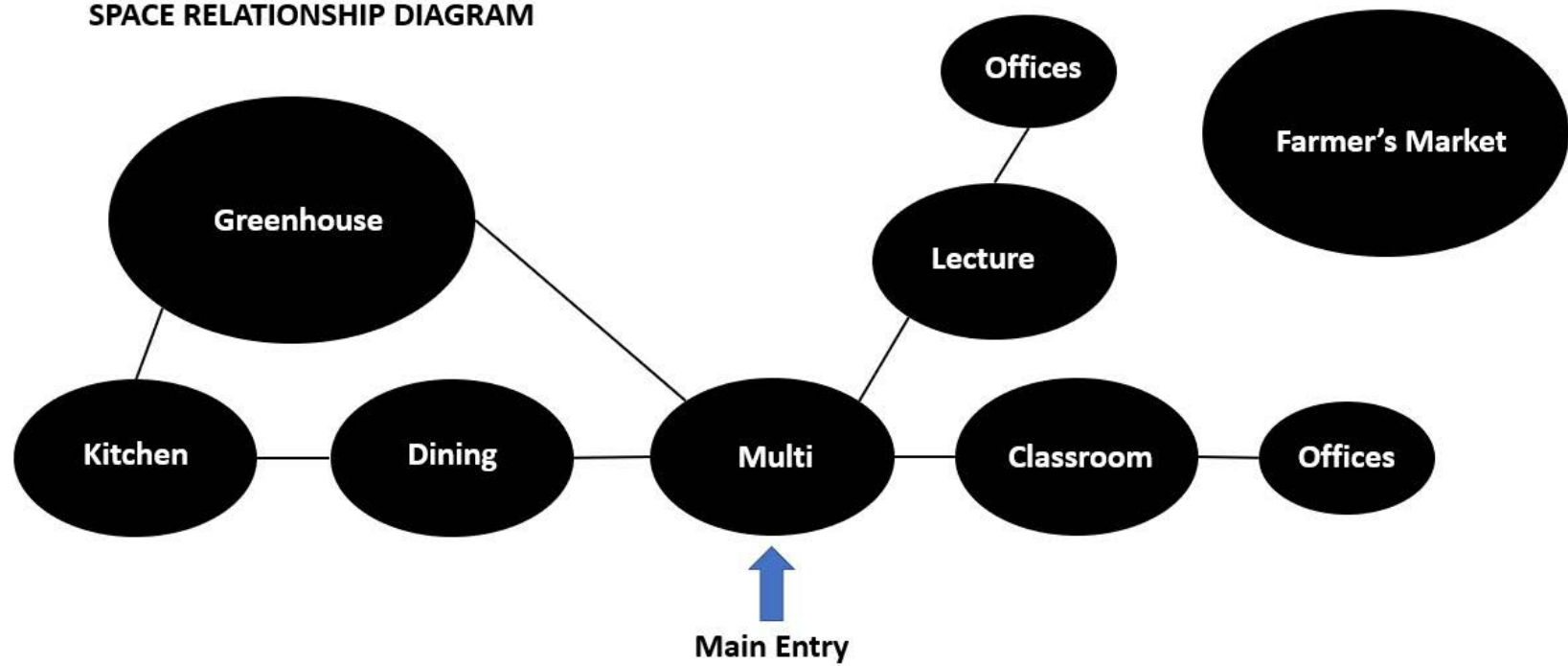


INITIAL PROGRAM OUTLINE

AREA ALLOCATIONS				
Space	Quantity	Net Sq Ft	Total Net Sq Ft	Gross Sq Ft
Greenhouse	1	76,000	76,000	126,616
Dining Hall	1	5,000	5,000	8,330
Kitchen (Cooking Classroom)	1	1,000	1,000	1,666
Multifunction	1	5,000	5,000	8,330
Lecture Halls	2	500	1,000	1,666
Classrooms	2	500	1,000	1,666
Offices	10	100	1,000	1,666
Misc. Employee Space	1	450	450	750
Kitchen Storage	1	4,700	4,700	7,830
Multifunction + Dining Storage	1	1,000	1,000	1,666
Class/Lect/Offices Storage	1	200	200	333
Greenhouse Storage	1	4,000	4,000	6,664
Maintenance Storage	1	1,000	1,000	1,666
Farmer's Market	1	13,000	13,000	21,658
Parking	2	76,000	152,000	253,232
Total			101,350	168,849

(Totals do not include Farmer's Market or Parking)

SPACE RELATIONSHIP DIAGRAM



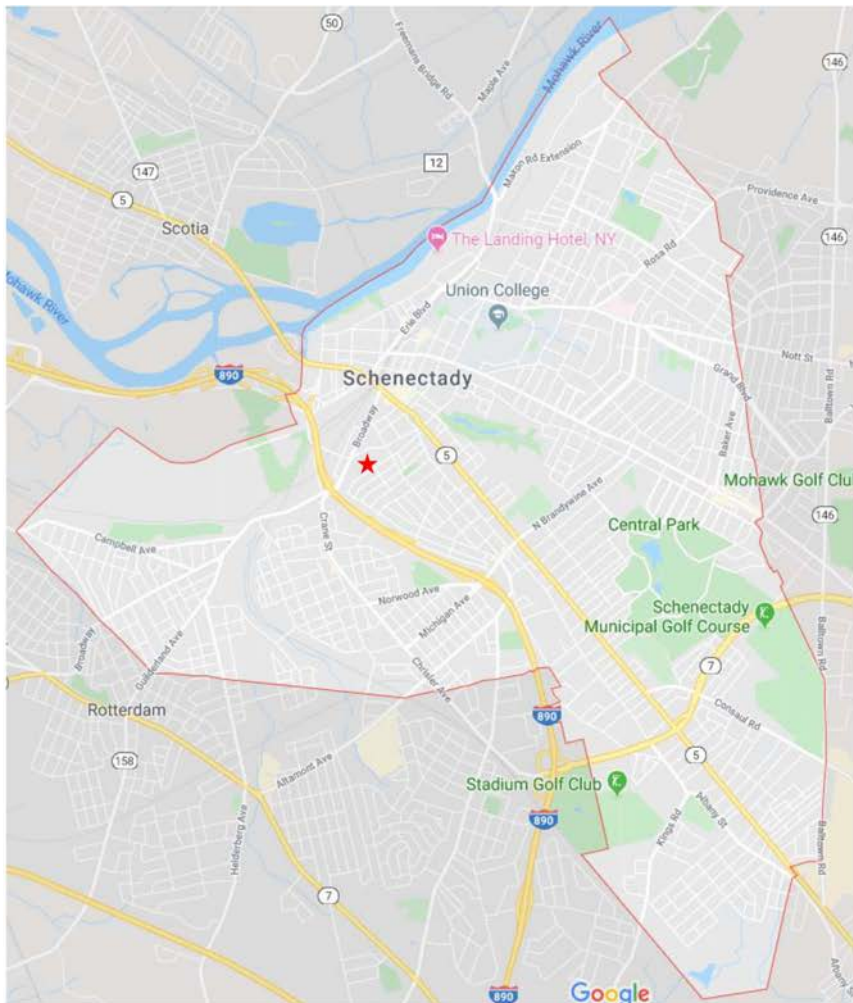
SITE RESEARCH



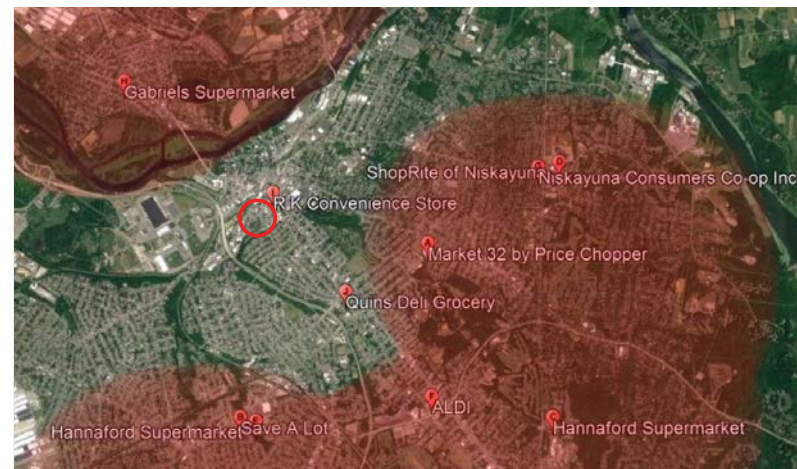


SITE IDENTIFICATION

Schenectady is a city in New York's capital region. The site is a parking lot in the southern portion of Schenectady's downtown, just north of a group of municipal housing buildings. The Hamilton Hill district is just south of that. The General Electric factory is to the northwest. To the north and northeast is the greater downtown area and historic district. Parts of Schenectady have a poverty rate of over 60%, including Hamilton Hill and the multi-family housing just north of it. Additionally, the area is a known food desert. In upstate New York, there are few places that could use a community garden more.



LOCATION MAP



LOCATIONS OF GROCERY STORES

The specific site was chosen for its relaxed zoning, and proximity to public housing as well as the Hamilton Hill district. The building will be within walking distance for many and has two bus stops adjacent. There is a parking garage right next to it. Nearby is a new luxury apartment building (242 Broadway), whose construction was controversial in the area among locals. These residents aren't the main reason that a community garden is needed, but they would make good customers for a co-op.



ZONING

On the corner across from the site is a barber shop, (the small brick wedge-shaped building). Across from the building on the south side, is a dermatologist's office, architecture firm, TV and home cinema supply company, and the office of the public defender. Lastly, there is also one building on the site, but it is completely unused. It was a produce weigh station for an area nearby that used to be an outdoor market, and it is now structurally unstable and being monitored by the local historic preservation group.



242 BROADWAY APTARTMENTS



PARKING GARAGE



DERMATOLOGY BUILDING



BARBER SHOP



HOME CINEMA STORE



HISTORIC WEIGH STATION



The site is 125,400 sq ft, and is 271 feet by 359 feet. It lies within a dip in the terrain. The public housing south of it is on a hill, and the railroad lines to the north are also higher in elevation. It is along Broadway, which lies within the dip and is a view corridor.

The precedent Romainville Habitat OPH is only 22,000 sq ft. However, the growing space needs to be significantly larger than this precedent because the goal is to provide for hundreds of families to grow their own food, as well as the co-op. Romainville is designed for a different scale. If including the farmer's market, the goal is to reach thousands of families.



SITE ELEVATION



SITE PLAN

Dimensions of Precedent One



22,000 sq ft vs 125,400 sq ft

BUILT FEATURES

Initial architectural influences were mainly Dutch, but later English. Brick is extremely popular, especially in the historic district which is along Union Street. Examples of popular styles include Dutch, Georgian, Romanesque, Colonial Revival, Art Deco, Modern and Neo-Gothic. The construction of the Erie Canal sparked a construction boom in 1825.



In recent years, many parts of the downtown area have experienced issues with degrading building value as well as vacancies. Some of the most well-known buildings include the Schenectady City Hall, the Schenectady Train Station, the General Electric Factory, Union College, Proctors Theater, and the newly constructed Rivers Casino.



TRAIN STATION



GENERAL ELECTRIC FACTORY



RIVERS CASINO



CITY HALL

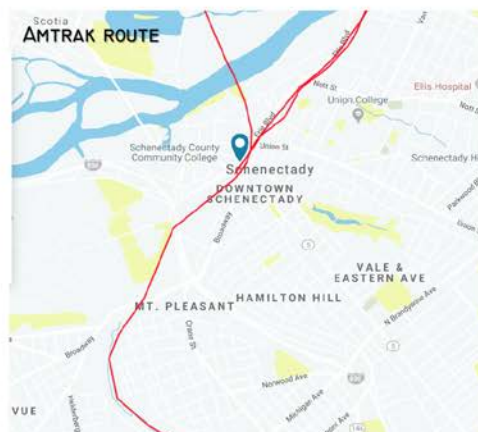
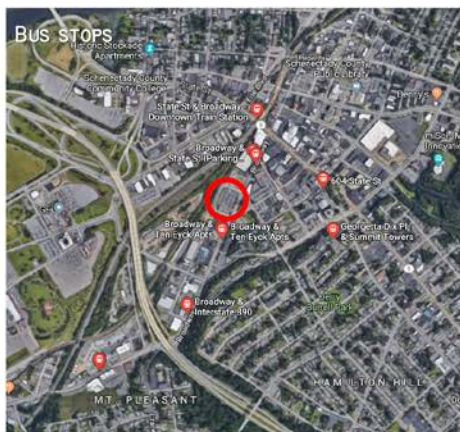
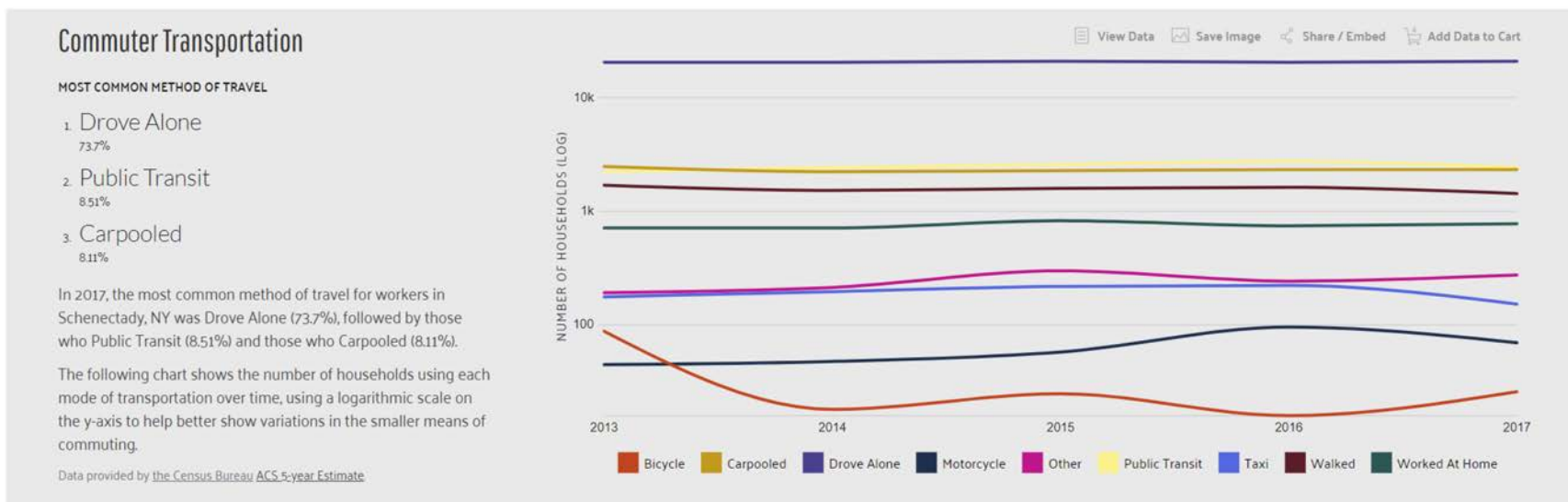


PROCTORS THEATER

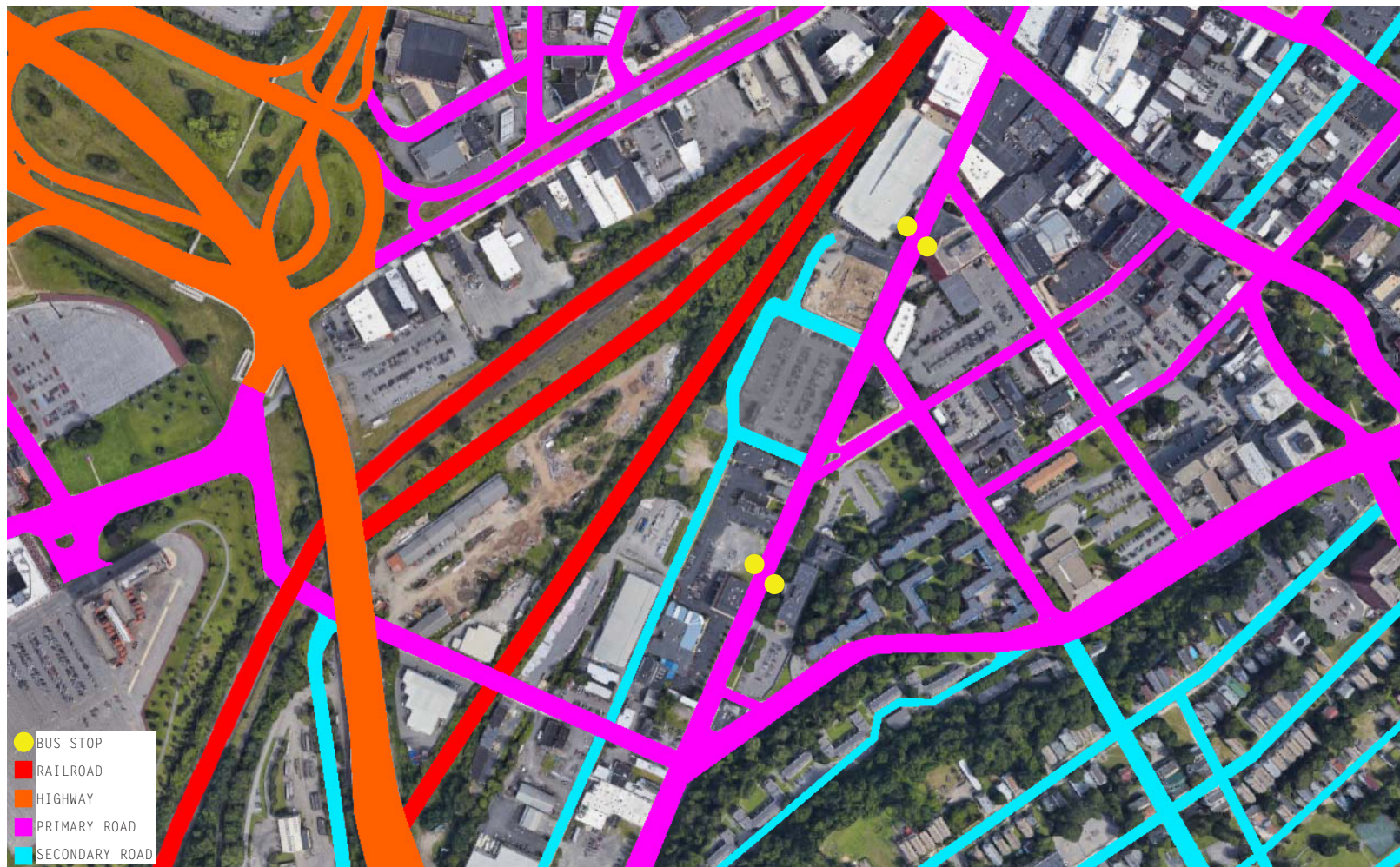


UNION COLLEGE

There is an Amtrak passenger line running through the city, as well as bus routes. The line closest to the site is not in use, but the other two are. The train station is further north, deeper into the downtown area. The specific plot chosen has one bus stop just north of it, and one just south, both within walking distance, and both with a waiting area on each side of the street.



8.5% of local employees take public transit to work, so there is a significant need for the facility to be accessible to public transit. The site is along Broadway, which has only two lanes but is high-traffic compared to other nearby streets. To the south is the Schenectady County Memorial Highway, which has four lanes each way.



TRANSPORTATION

NATURAL FEATURES

The average high temperature in Schenectady is 82 degrees Fahrenheit, and the average low is 18 degrees Fahrenheit. Humidity is 68%. On average there are 6 inches of rain per year. Wind is on average 7 mph and mainly comes from the south, north and north-west. The soil within the site boundaries is all cut and filled, not naturally occurring.

All Year Climate & Weather Averages in Schenectady

High Temp: 82 °F

Precipitation: 0.51"

Wind: 7 mph

Low Temp: 18 °F

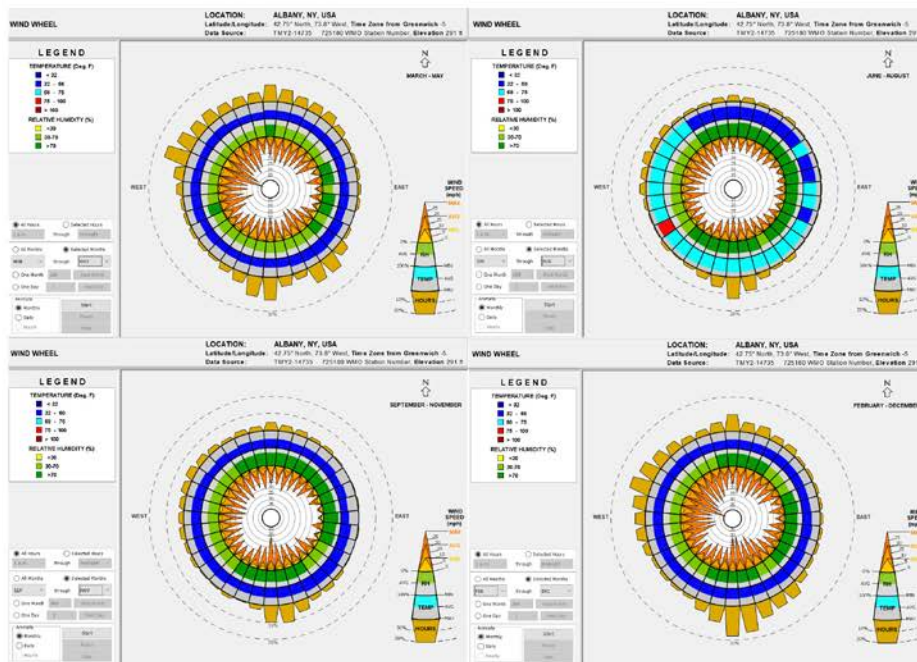
Humidity: 68%

Pressure: 30.03 "Hg

Mean Temp: 50 °F

Dew Point: 39 °F

Visibility: 11 mi



Quick Climate Info

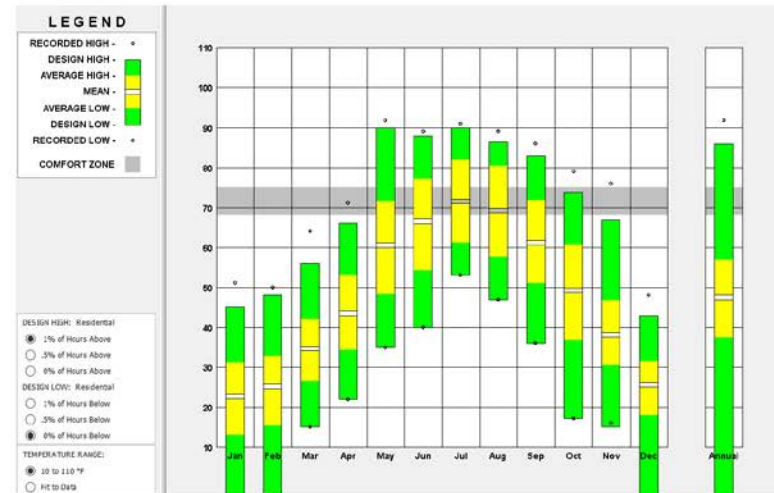
Hottest Month July (74 °F avg)

Coldest Month January (25 °F avg)

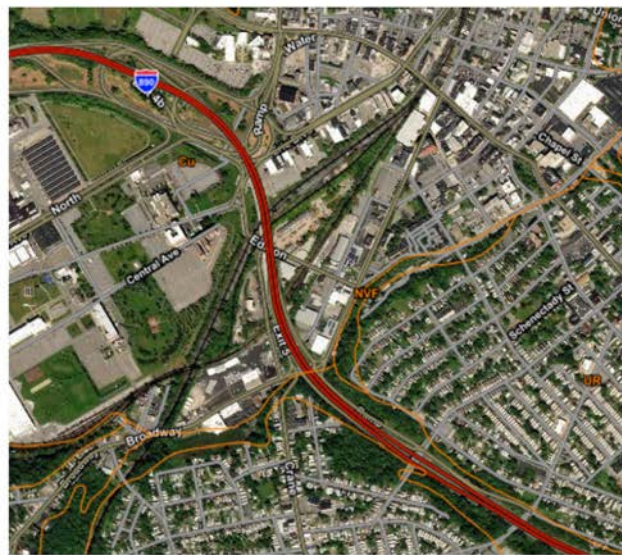
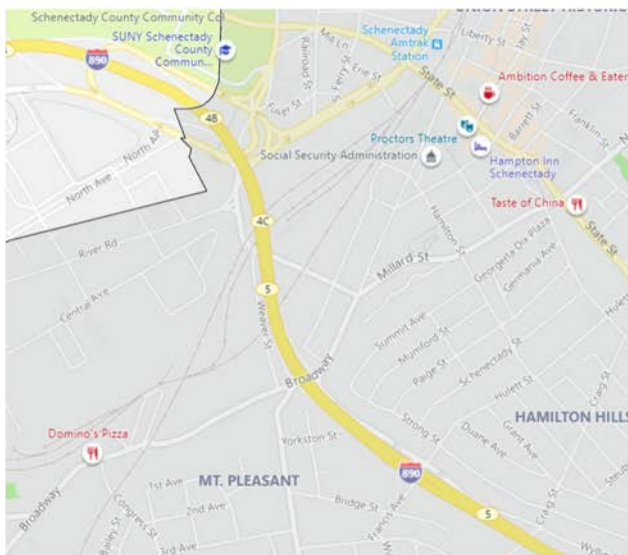
Wettest Month December (0.66" avg)

Windiest Month March (9 mph avg)

Annual precip. 6.08" (per year)

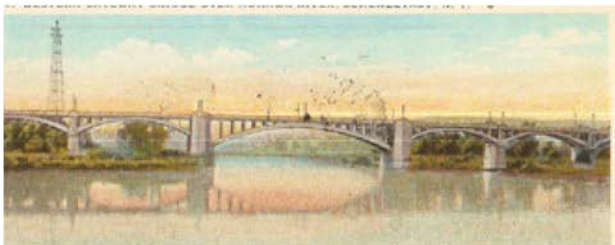


Schenectady is located on the Erie Canal and the Mohawk River runs north of it. Construction for the canal was completed in 1825. The canal would transport both goods and people. It spurred the movement of settlers westward, helped the north win the Civil War by transporting supplies, and helped create both a trade and a building boom.



NVF	Nunda soils, very steep	150.8	0.60%
UR	Urban land-Colonie complex	####	4.80%
Cu	Cut and fill land	####	5.80%

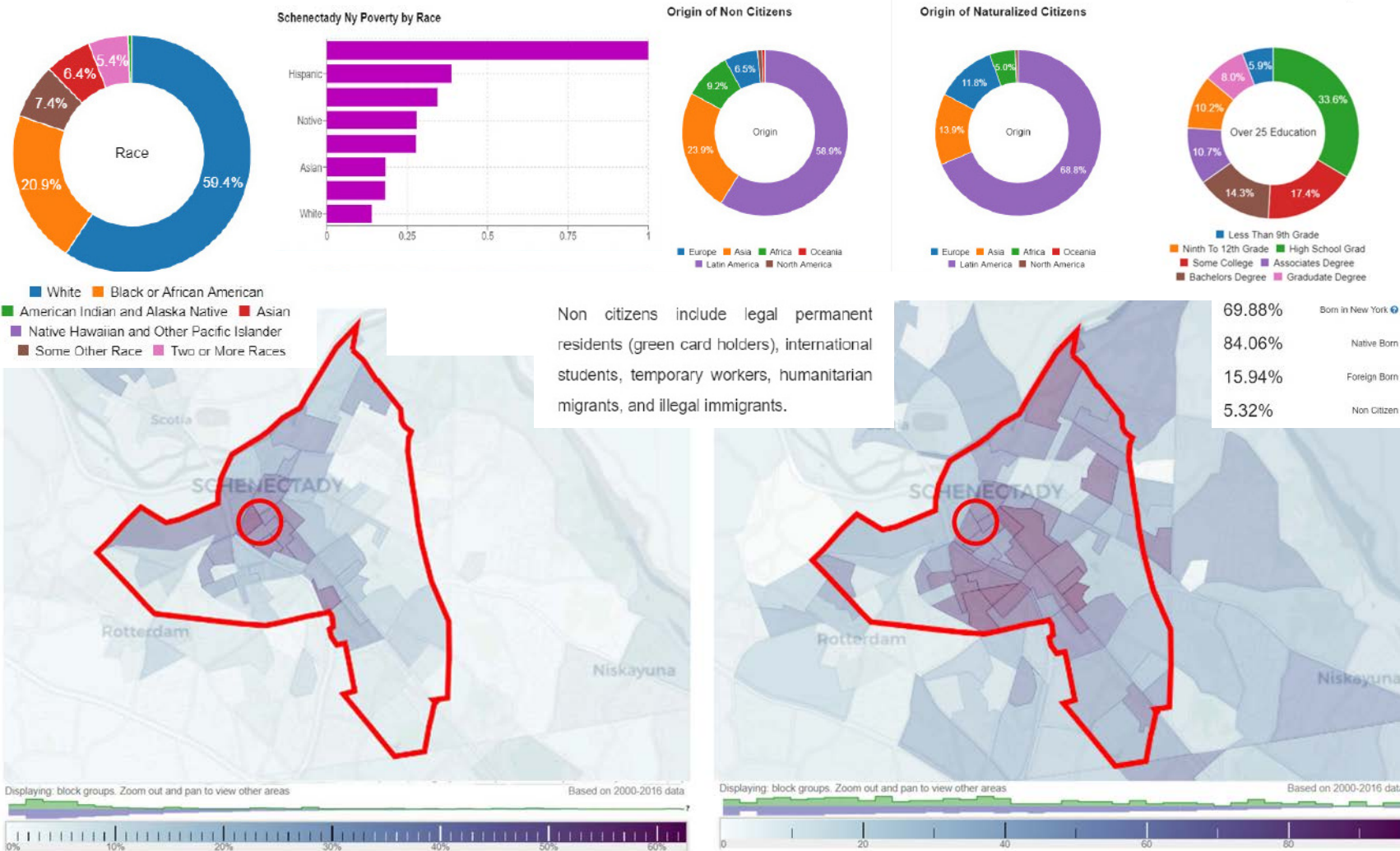
SOIL



ERIE CANAL VINTAGE PRINTS

SOCIAL FEATURES

The big population boom occurred at the end of the 1800's and continued up until about 1930. After 1930, the population began to fall. A slight uptick occurred at the turn of the 21st century. The current median household income for Schenectady is \$62,514. Unemployment rates are 5.6%. This is not horrible. However, poverty rates within the Hamilton Hill and downtown districts are as high as 60%, and the poverty in the area can be tied to racial issues. The areas of Schenectady with the most diversity have by far the most poverty.



20.9% of residents in Schenectady are black or African American. 6.4% of residents are Asian. 5.4% are mixed race. 7.4% are another race. This leaves 59.4% left over, which is the white population of the area. However, this percentage does include Latin Americans. 58.9% of non-citizens in the area are from Latin America. 48.4% of Schenectady residents are part of a non-family household. 33% are married. 5.89% of residents have an education of less than 9th grade. Only 33.6% of residents are high school graduates. 33% are college graduates.

% Schenectady Ny Households by Type

Type	Count	Average Size	Owned
All	22,812	2.73	51.9
Non Family	11,052	1.34	39.4
Married	7,528	3.7	77.6
Female	3,186	4.66	37.5
Male	1,046	4.55	42.6

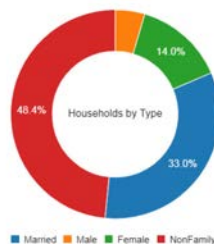
3.91 Average Family Size

6.6% Unmarried (Opposite Sex)

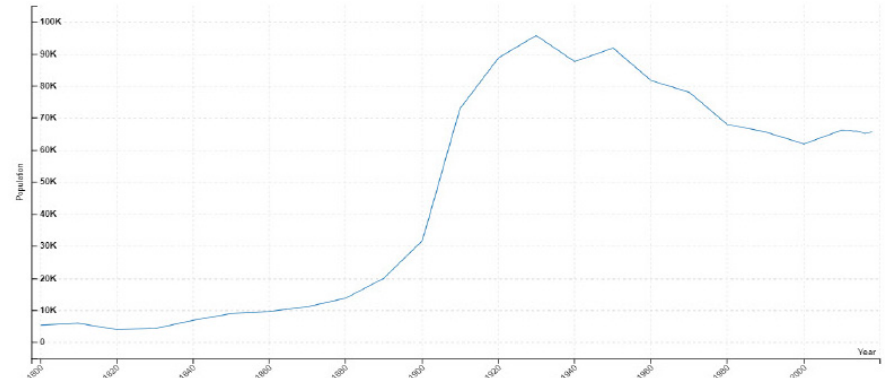
2.73 Average Household Size

0.5% Unmarried (Same Sex)

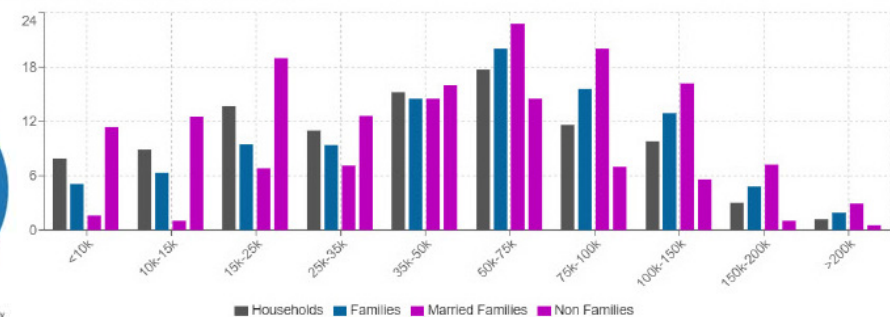
Education Attained	Count	Percentage
Less Than 9th Grade	2,605	5.89%
9th to 12th Grade	4,504	10.19%
High School Graduate	14,843	33.57%
Some College	7,673	17.35%
Associates Degree	4,738	10.71%
Bachelors Degree	6,331	14.32%
Graduate Degree	3,527	7.98%



% Schenectady Ny Population by Year

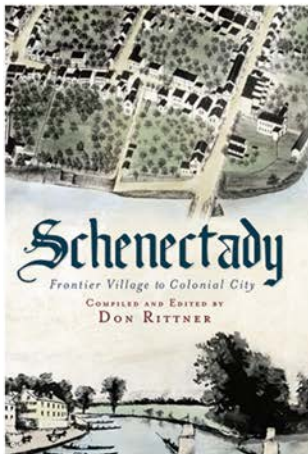


Schenectady Ny Income by Household Type



HISTORY

- 1661: First settled by the Dutch Colony
- 1690: The Schenectady Massacre occurred, killing all but 60 inhabitants
- 1795: Union College was founded
- 1809: Schenectady County was formed
- 1887: Edison Machine Works was moved to Schenectady by Thomas Edison
- 1892: GE made its headquarters in Schenectady NY
- 1940: The first ever television broadcast was relayed to WRGB in Schenectady
- 1969: American Locomotive Company closes its plant

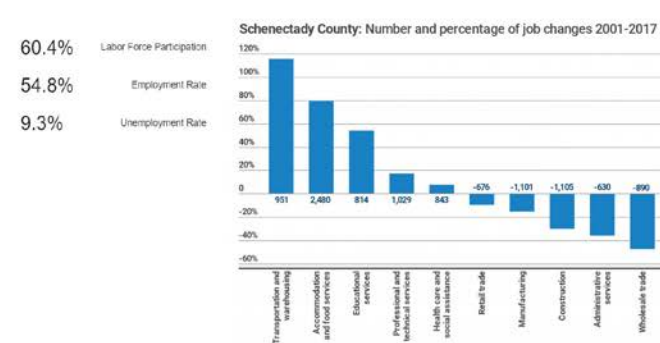
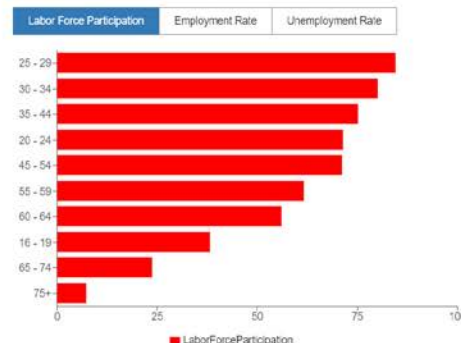
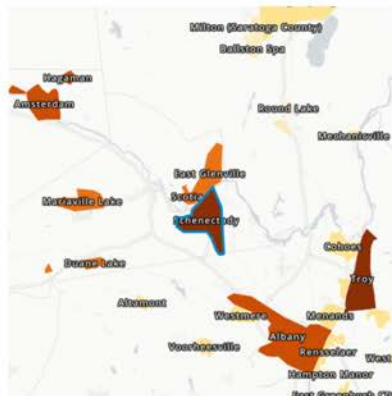


" The GE was the thing. Almost all my uncles worked for General Electric in Schenectady, everybody worked for GE. And when I was brought up, that's what we heard all the time. ' Oh, when you get out of high school, you go to GE, you go to GE ' " he explained. " My cousins went to GE I went. " (Terry Phillips).



ECONOMY

American Locomotive Company closed its plant in Schenectady which was one of the factors that caused the city's population to decline by nearly a third since the mid-1900s. When GE downsized in the late 18th century and made changes in their technological innovations, more and more people were laid off. Fast forward to today, GE only has about 4,000 employees in the Schenectady location, and the downtown is almost dead. Unemployment rates are 9.3% within the downtown and Hamilton Hill area. The downtown was once supported by GE employees taking their lunch breaks. Some types of businesses are growing such as food service, warehousing and transportation as well as educational. However, manufacturing is not nearly what it used to be. Rivers Casino is a large part of their current economy as well. Additionally, the Erie canal is no longer a major part of the region's economy.



ZONING

It is zoned as C-4 Downtown Mixed-Use. (Shown in red). Buildings can be 75 feet tall, or 100 with a special permit. The minimum height is 35 feet. Maximum lot coverage is 95%. A 5 foot setback is required on the rear. To the south is the multi family residential, (characterized by the government funded housing project), and the Hamilton Hill district just to the south of that, which is one and two family housing with some smaller amounts of space for recreation. To the west is manufacturing, warehousing and industrial.

□ § 264-15 C-4 Downtown Mixed-Use District.

[Amended 3-23-2009 by Ord. No. 2009-02]

- A. Purpose. The Downtown Mixed-Use (C-4) District is intended to represent the central business district of the City. It encourages a mix of commercial, civic, cultural and hospitality uses in a pedestrian-oriented setting. Increased densities and scale are encouraged in this district while creating a walkable, attractive downtown for residents and visitors.
- B. Permitted and special permit uses. See Schedule B, Use Regulations for Nonresidential Districts.^[1]
^[1] Editor's Note: Schedule B is included as an attachment to this chapter.
- C. Bulk, space and yard requirements. See Schedule C, Lot Development Standards.^[2]
^[2] Editor's Note: Schedule C is included as an attachment to this chapter.
- D. Additional limitations. The following limitations and conditions shall apply to and be complied with by all uses permitted and permissible in the C-4 District:
- (1) No use shall be conducted in any manner which would render it noxious or offensive by reason of dust, refuse matter, odor, smoke, gas fumes, noise, vibration or glare.
- E. Accessory uses and structures. Accessory uses and structures are permitted in the C-4 District subject to the provisions of § 264-29 of this chapter.

SCHENECTADY CODE

District	Building Height ¹ (feet)	Minimum Lot Area (square feet)	Maximum Lot Coverage	Maximum Impervious Surface	Minimum Lot Frontage ² (feet)	Maximum Development (GFA)	Principal Building Setbacks			
							Front Minimum (feet)	Front Maximum (feet)	Rear Minimum (feet)	Side Minimum (feet)
C-3	Not to exceed 110 feet; no special use permit required	2,250/dwelling unit; 1,250/dwelling unit with special permit	Principal: 50% Accessory: 20%	None	30	None	Lots adjacent to river: 50 feet from high water mark on the river side, 10 feet on all other front yards All other lots: 10 feet	No maximum	Lots adjacent to the river: see front setback minimum. ³ All other lots: 5 feet ⁴	Lots adjacent to river: 50 feet from high water mark ⁴ All other lots: 10% of lot width or 5 feet, whichever is greater up to 10 feet ⁵
C-4	75, 100 with special permit Height minimum of 35 feet; 2 stories or the average of the adjacent lots	None	Principal: 95% Accessory: 15%	None	None	None	0	0	5' ⁶	None ⁷
C-5	56	1,250/dwelling unit; 5,000 nonresidential	Principal: 70% Accessory: 15%	None	40	None	No minimum	No maximum	5' ⁶	5' ⁶
I	45 residential 120 institutional	2,250/dwelling unit; 5,000 institutional	Principal: 50% Accessory: 10%	None	40	None	25 or as established on the block ⁸	None	25	10 each side
M-1	56	5,000	Principal: 50% Accessory: 10%	None	40	None	1 per foot of building height	None	5	5 each side
M-2	56	5,000	Principal: 70% Accessory: 15%	None	N/A	None	No minimum	No maximum	5'	10 each side ⁹

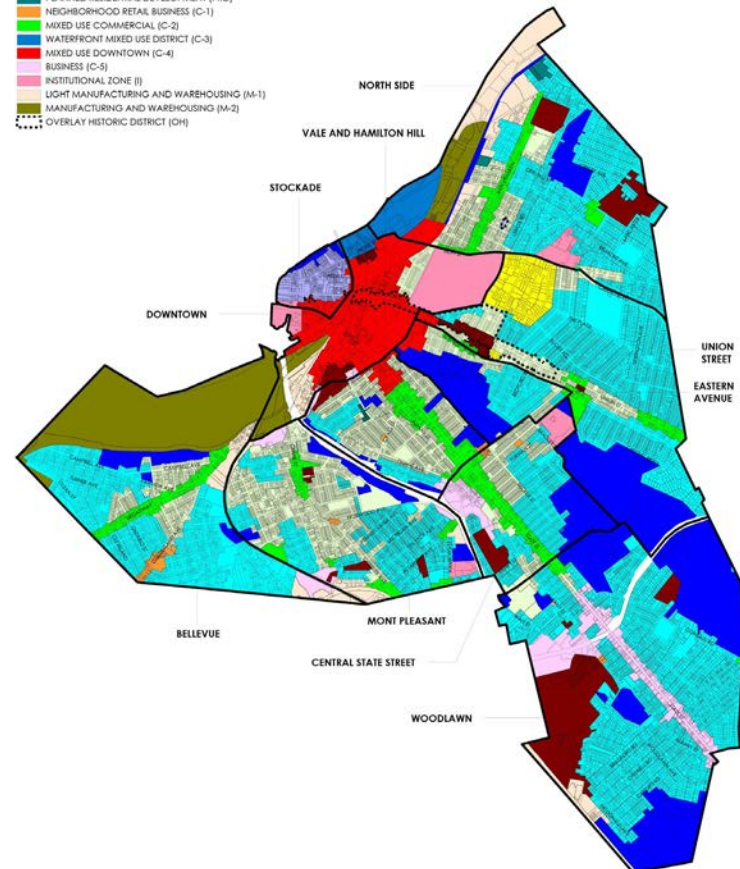
NOTES:

- ¹ See also § 264-30, Additional height regulations.
² Corner lots are to be measured according to the lot frontage which is the shortest.
³ See also § 264-25, Preexisting front yards.
⁴ Public access areas, recreational areas and water dependent uses, which require proximity to or location on the water, may not be subject to any shoreline setback requirements at the discretion of the PC.
⁵ See § 264-37, Transitional yards.
⁶ For motor vehicle repair uses, see § 264-106 and 264-107.

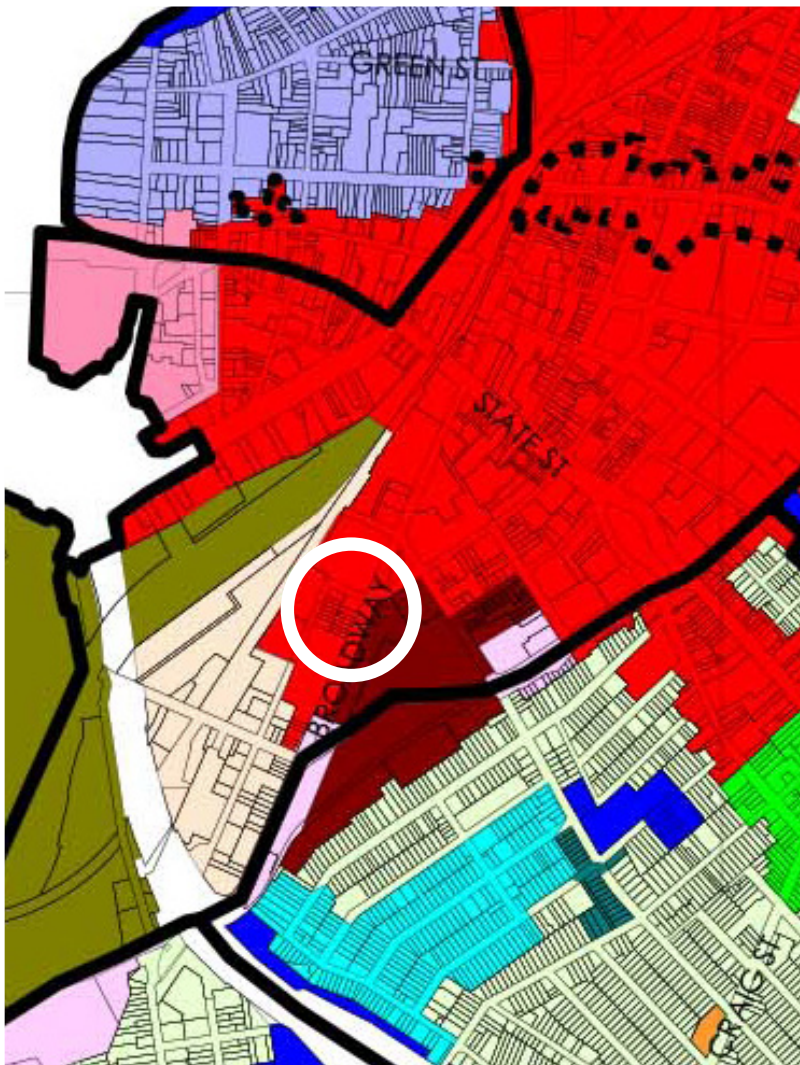
City of Schenectady New Zoning Map

EXISTING ZONING DISTRICTS

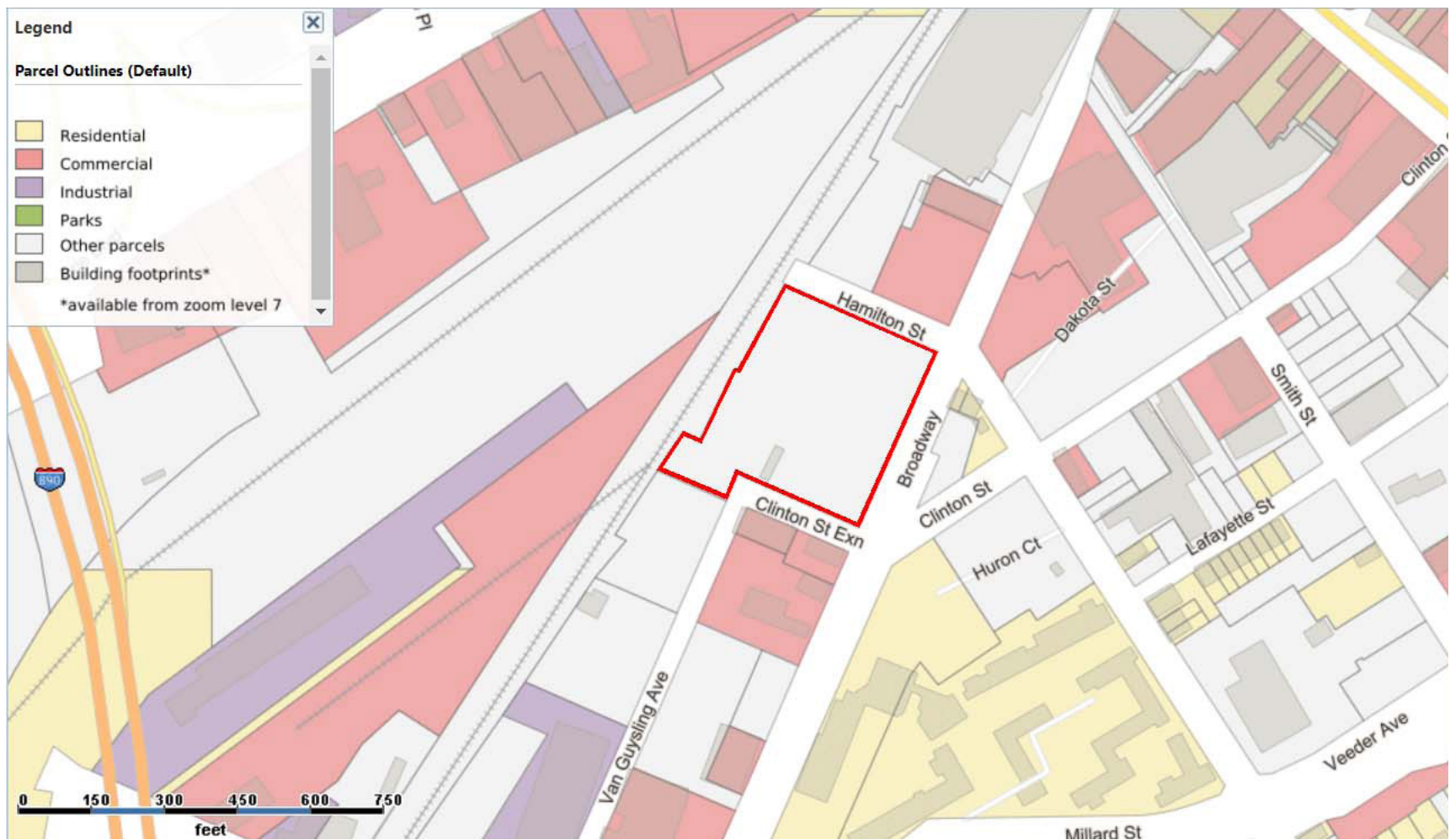
- RECREATION AND OPEN SPACE (OS)
- SINGLE FAMILY RESIDENTIAL (R-1)
- TWO FAMILY RESIDENTIAL (R-2)
- MULTI FAMILY RESIDENTIAL (R-3)
- HISTORIC RESIDENTIAL (RH-1)
- STOCKADE HISTORIC RESIDENTIAL (RH-2)
- PLANNED RESIDENTIAL DEVELOPMENT (PRD)
- NEIGHBORHOOD RETAIL BUSINESS (C-1)
- MIXED USE COMMERCIAL (C-2)
- WATERFRONT MIXED USE DISTRICT (C-3)
- MIXED USE DOWNTOWN (C-4)
- BUSINESS (C-5)
- INSTITUTIONAL ZONE (I)
- LIGHT MANUFACTURING AND WAREHOUSING (M-1)
- MANUFACTURING AND WAREHOUSING (M-2)
- OVERLAY HISTORIC DISTRICT (OH)



Smaller plots of land to the east and west are designated business districts. The historic part of the downtown area is shown with a dotted line, and is much farther to the north. The site is in a “cusp” so to say, where the buildings transition quite rapidly from smaller residential buildings to tall commercial, business and industrial buildings, with the multifamily acting as a transition. Maximum lot coverage is 95%. Buildings can be 75 feet tall, Or 100 with a special permit.

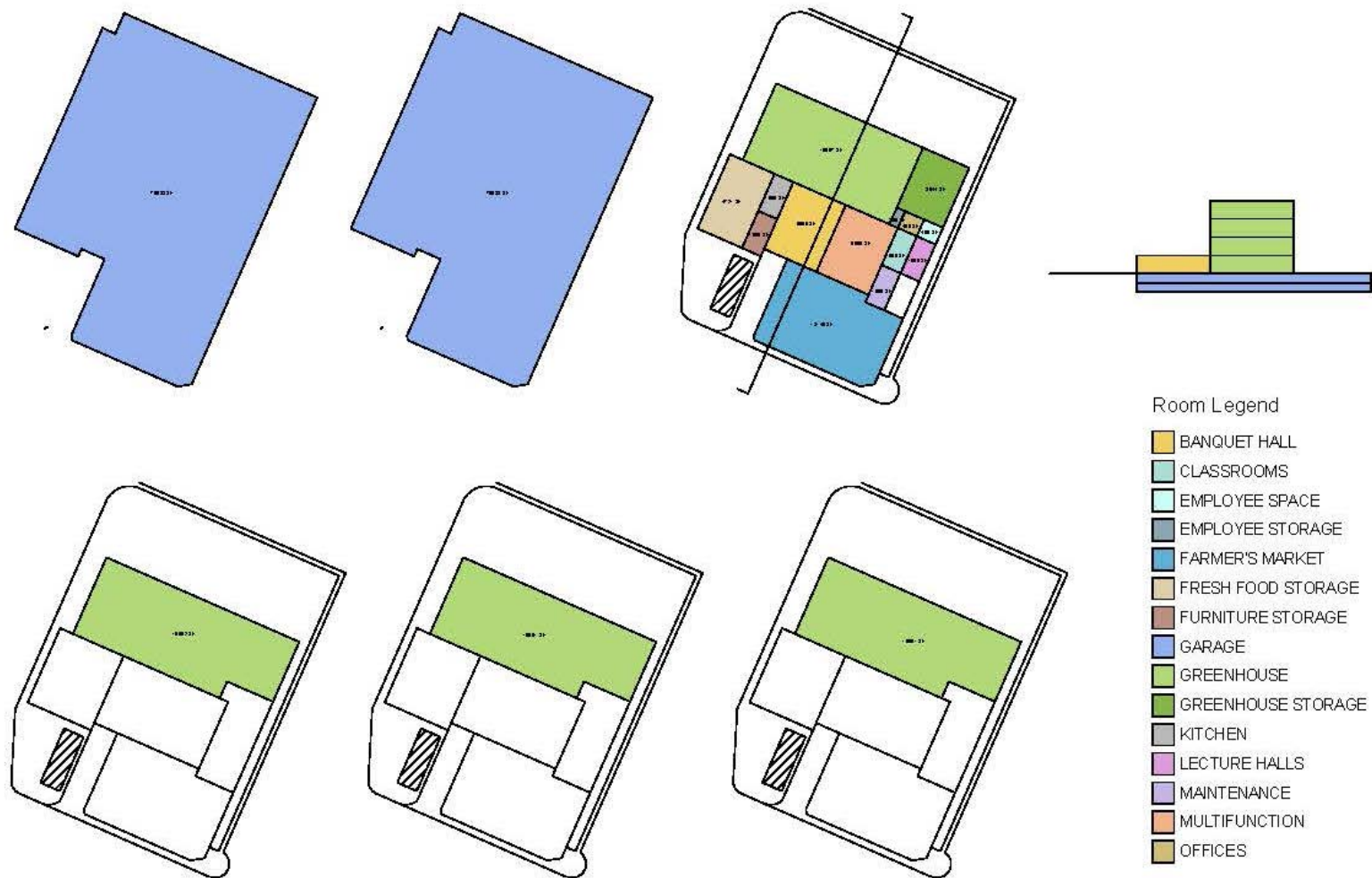


The plot is in-between Hamilton Street to the north, the Clinton Street extension to the south, and the busiest street, Broadway to the east. To the west is the railroad. There is a smaller parking lot to the southwest that is actually also a part of the plot, and is currently used as overflow. The small historic building is shown on the site in gray, just off of the Clinton Street extension.



INITIAL BUILDING ORGANIZATION

The building would be organized in three layers, with the historic building and farmer's market at the front, the building at the center, and an open backyard along Hamilton Street. Two floors of parking space on garage level would be required in order to both replace the current parking and provide for the new building. The greenhouse would require two floors, but three or four in order to keep the backyard. The farmer's market should be visible from the street level.



PRECEDENTS





PRECEDENT ONE: Romainville Habitat OPH Farming Tower

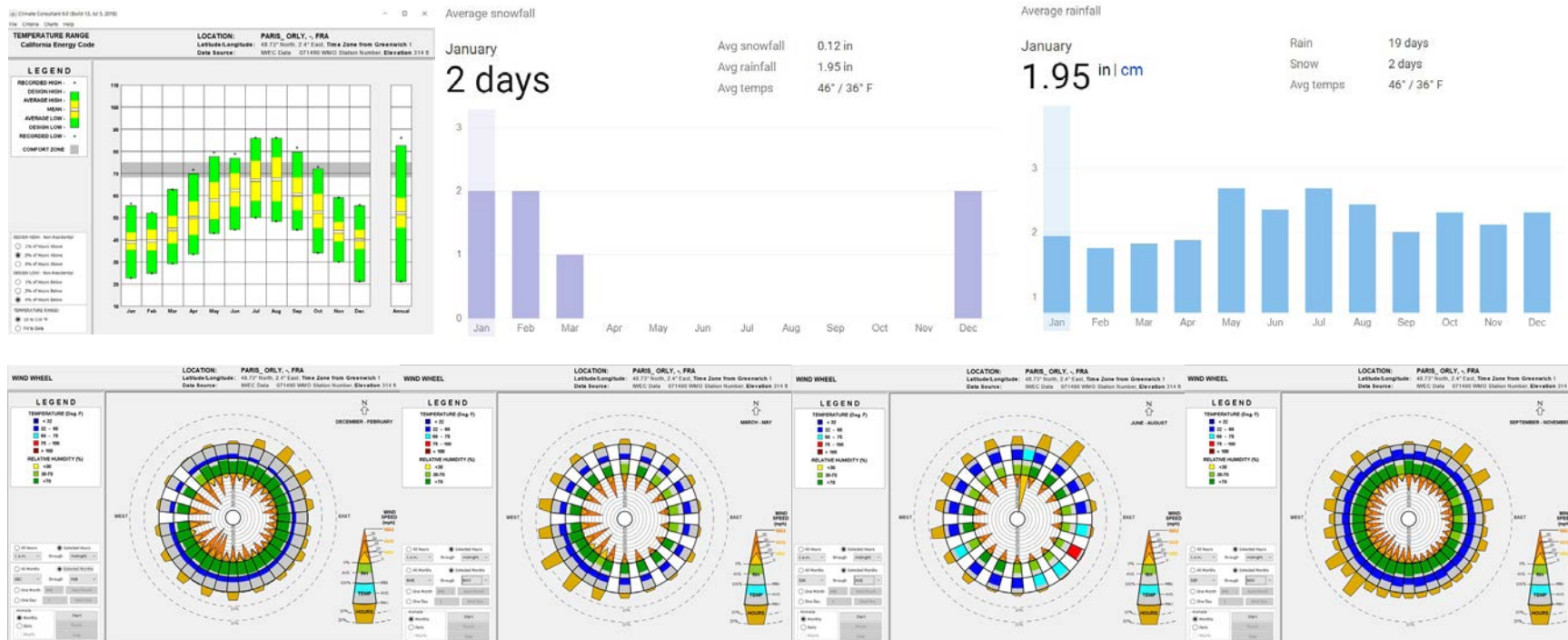
Location: Romainville, France.

This project is currently under construction. It will be the first project to grow sustainable, local produce for urban France in a large-scale community garden setting. Educational workshops and a farmer's market are integrated as well. The project is being phased and will also include neighboring residential buildings as a part of other phases. The building was intended for the locals to use, including those who will live in the surrounding residential buildings. By integrating an educational center, it becomes a community center. This is also what makes it a good precedent. Additionally, many of the technical systems are brilliant ideas.



SITE ANALYSIS

The climate of Paris France is quite temperate, although the temperatures are slightly less mild than they are in the UK, with warmer temperatures and colder winters. It generally only gets below freezing in December and January. July and August are the hottest months but do not often get above 80 degrees. November through December is the most windy. Precipitation is frequent, with most months having an average of at least 2 inches per month.



The project is located in Romainville, France which is located just outside of Paris. The site is a large vacant lot, with a light industrial zone to the north, as well as a military complex. To the west and east are residential zones. The east has more dense housing, incorporating buildings for multifamily use, with some one and two family housing. The west is strictly one and two family. Additionally, to the west are some sports fields. To the south is more multifamily housing as well as the corporate office for Romainville Habitat OPH, a non-profit, national organization that provides social housing.



The project site is located over a busy highway, which tunnels underneath of it. The highway is a major local artery with multiple lanes going in each direction. There are a few other major roads in the area, and the site is bounded on three sides by them. Unfortunately, while urban France generally has plenty of bus and train routes, there does not seem to be much public transportation directly near the site, and there are no stops directly adjacent.



TRANSPORTATION

DOCUMENTATION

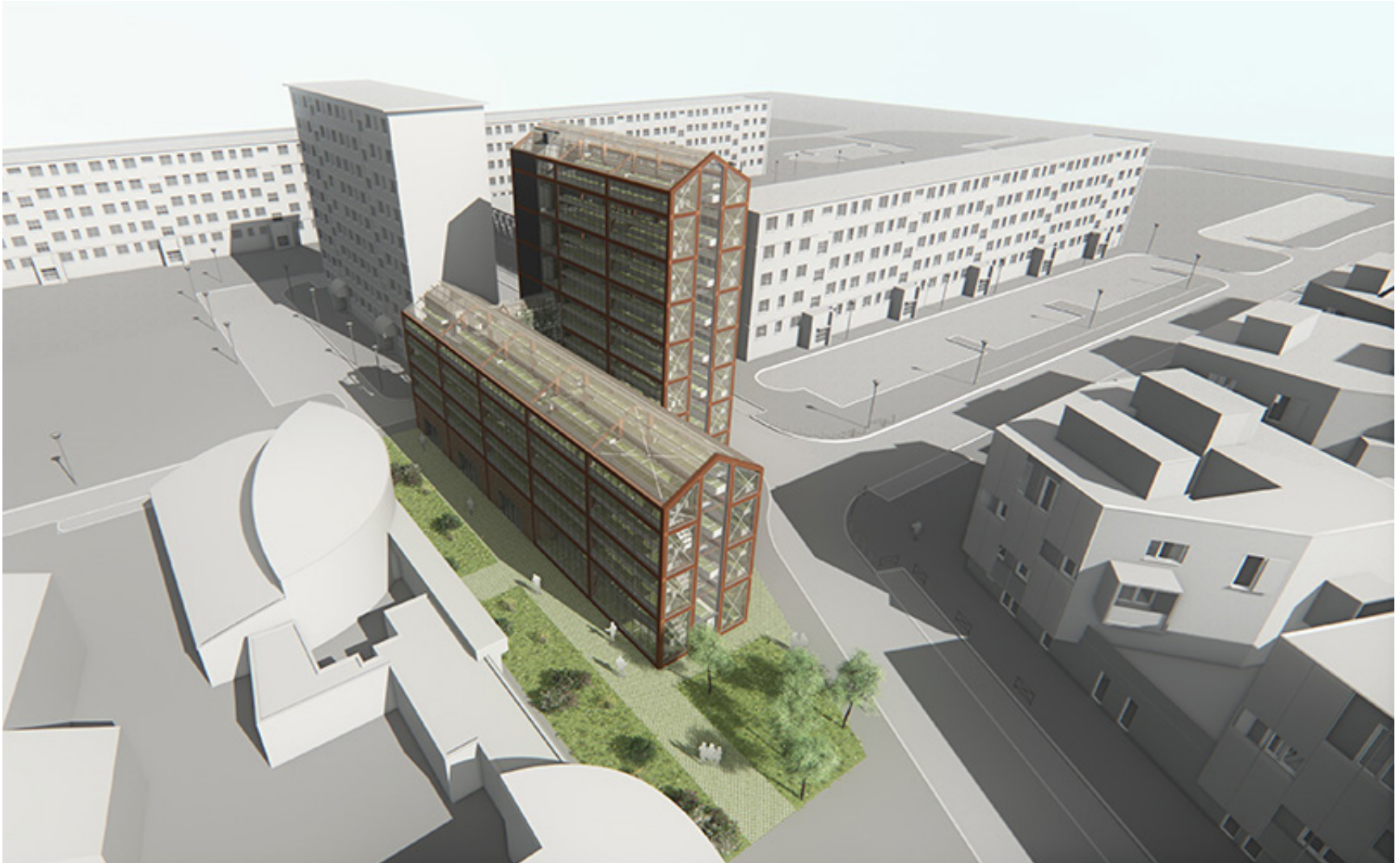
The project has two main wings, each of which is a farming tower with a pitched roof. Both of the towers take the form of a greenhouse, so they are heavily glazed. The two wings are connected by a shorter portion in the center of the mass, as well as with a glass bridge.



SITE PLAN



SECTION



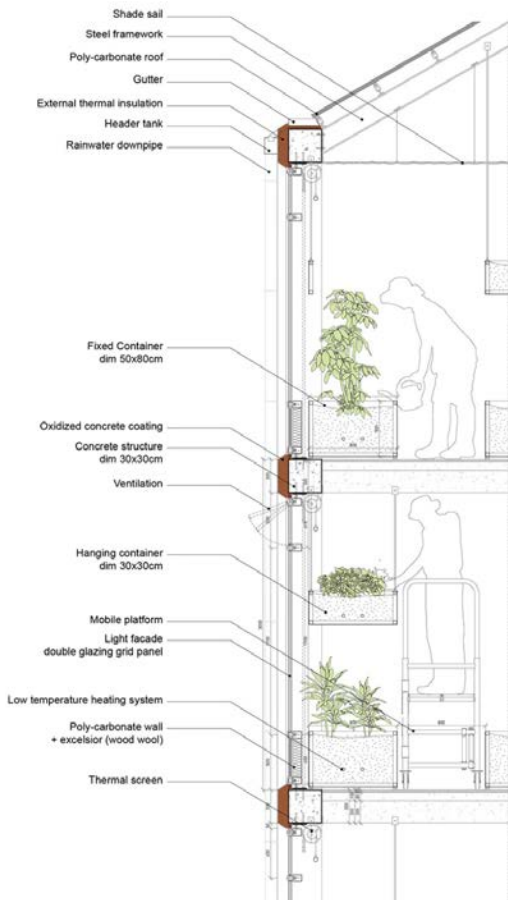
BIRD'S EYE



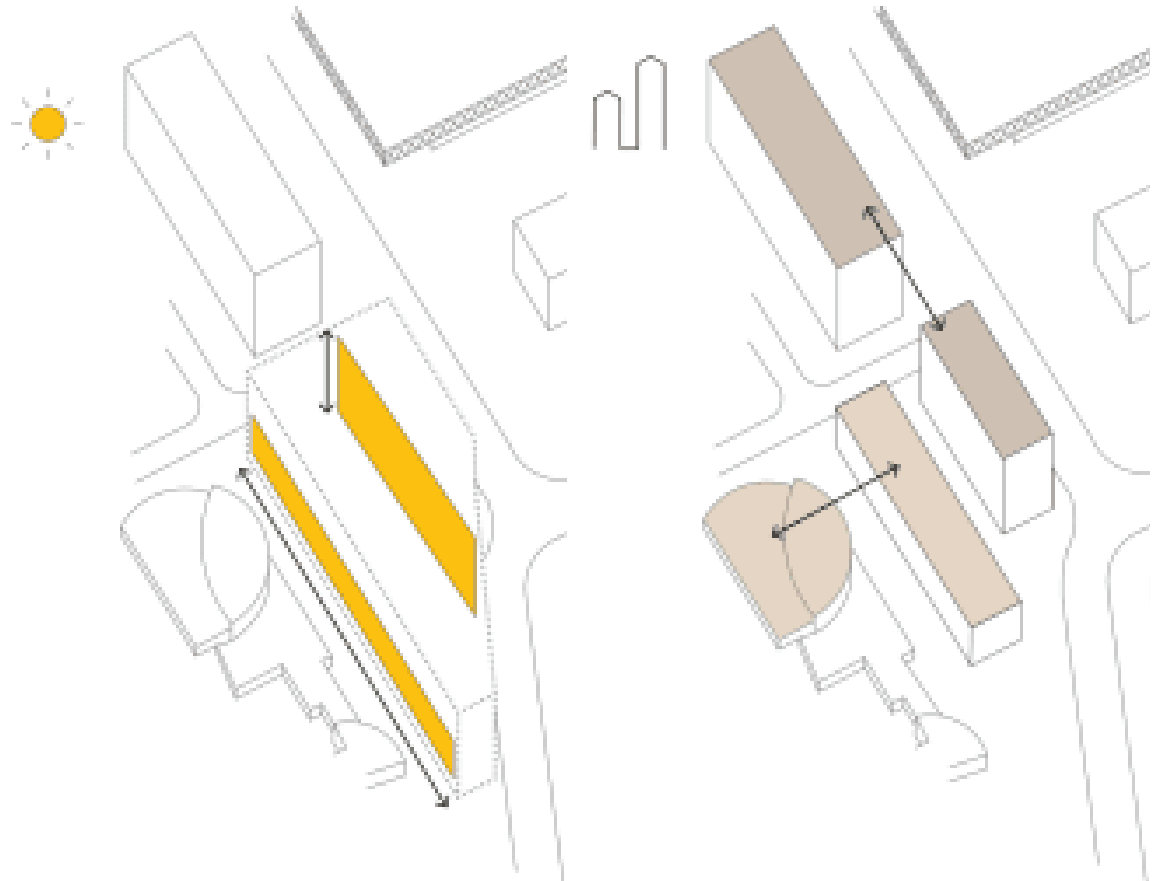
VIEW INTO CENTRAL ATRIUM

DIAGRAMS

The building's structural system is made up of heavy steel members arranged in a simple grid. At the top, the angled members carry the load of the roof. These forces continue down into the members at each floor and continue down until they eventually end at

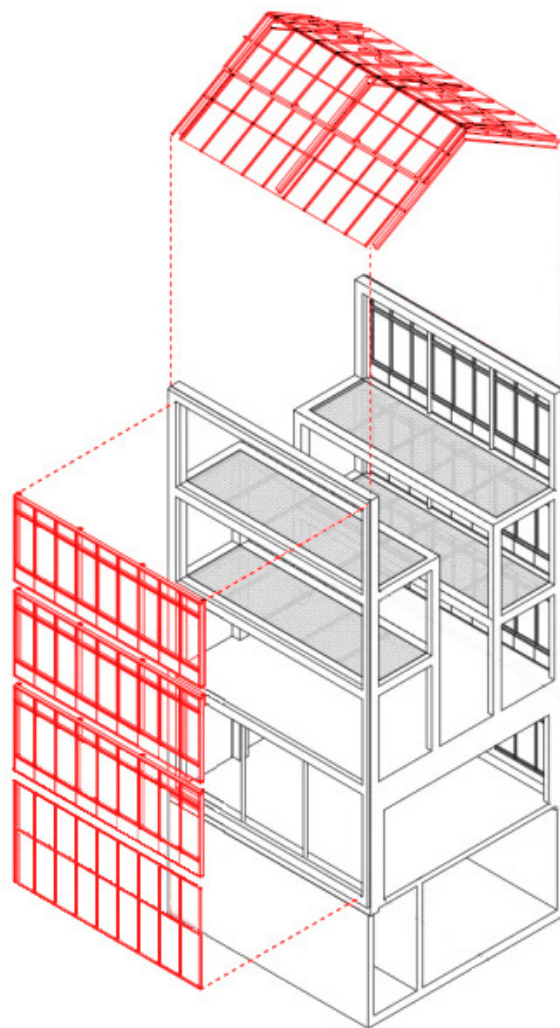


WALL SECTION

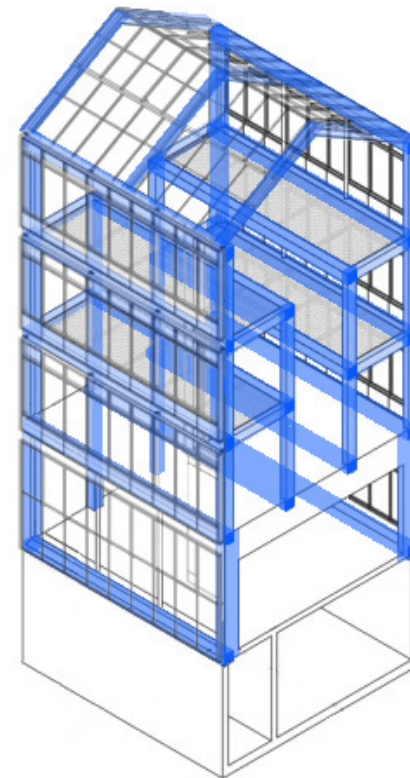


FORM DIAGRAMS

heavy bearing walls at the basement level. The façade also incorporates metal, and weathered concrete that is a warm brown color. These two systems together form curtain walls. The curtain wall and roof is made out of polycarbonate. The floors are poured concrete.

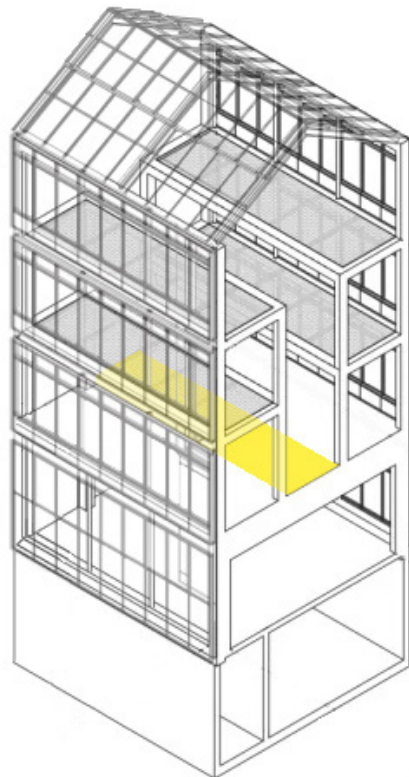


ENVELOPE

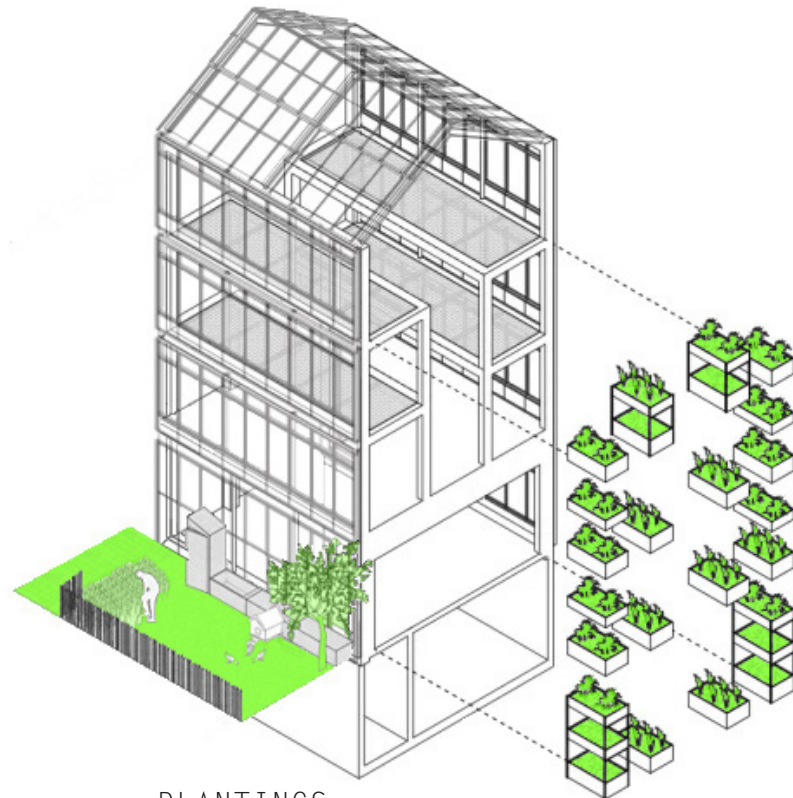


STRUCTURE

The circulation and plantings relate directly to the structural system. There are four rows of columns, creating three long inhabitable spaces. The central space is reserved solely for circulation. On either side of the circulation, crops are growing within their planting boxes. Some boxes are stacked, depending on the plant. While not the main focus, the project also provides ample yard space outdoors, and a germination lab.

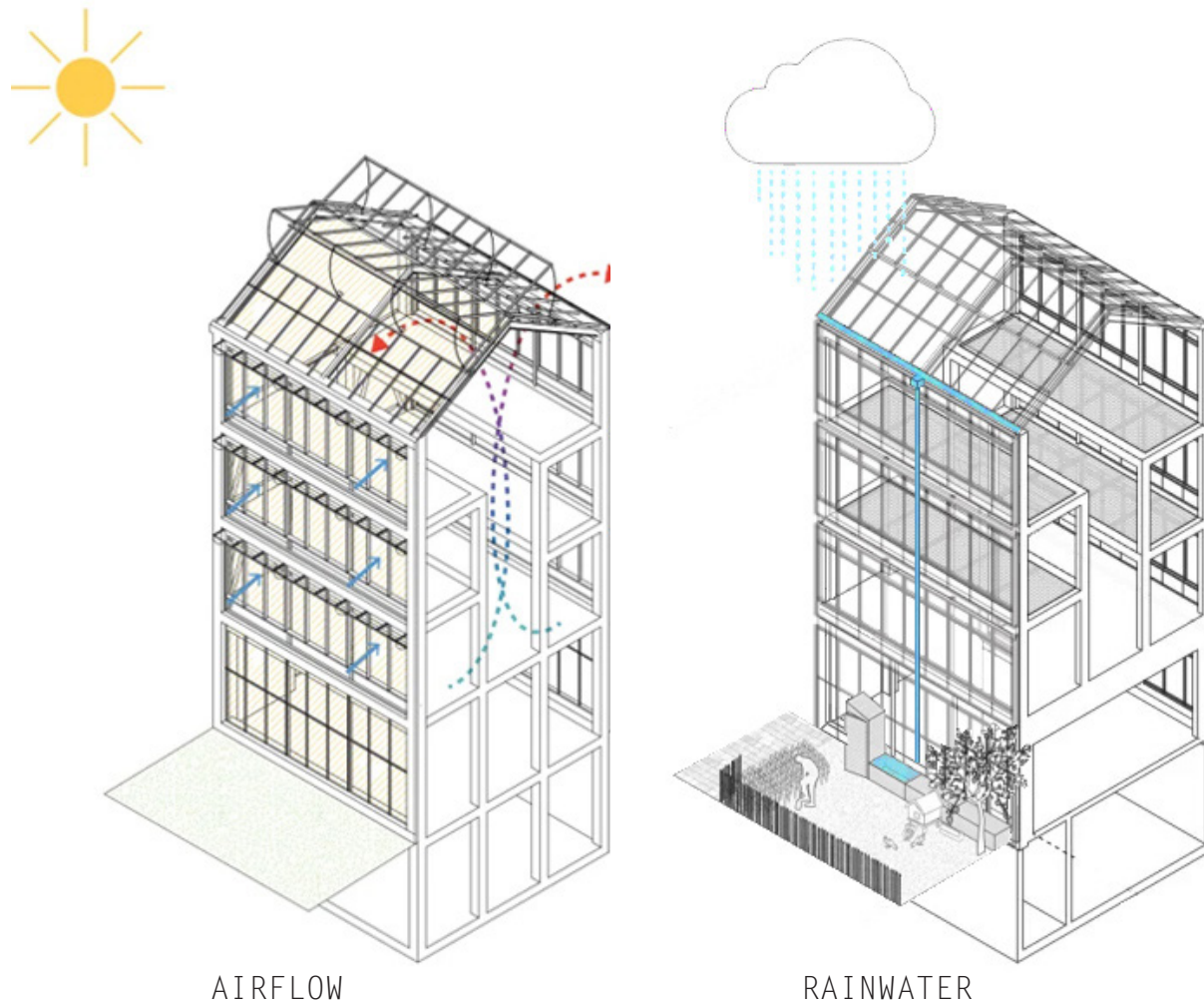


NATURAL LIGHT



PLANTINGS

The open space in the center is multi-purpose. The central space allows for the circulation of air, and more penetration of sunlight downwards. Temperatures are controlled using a full HVAC system as well as the integration of operable curtains, and straw/wood fiber insulation. Rainwater for watering crops with is collected by the curtain wall system and collected near the base of the building.



PRECEDENT TWO: Güssing Agricultural School

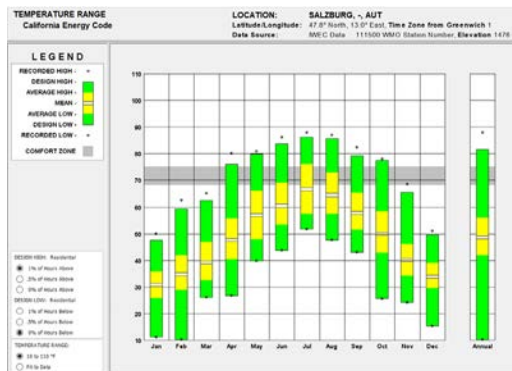
Location: Güssing, Austria

This proposed agricultural school combines teaching individuals farming through lectures and classes with museum space. Much of the learning is hands-on at this school. The school combines modern form and ideas of sustainability with traditional farming methods. It is a good precedent because of its centralized plan, which feels very communal, and its integration of exhibit and education space, showcasing sustainability.



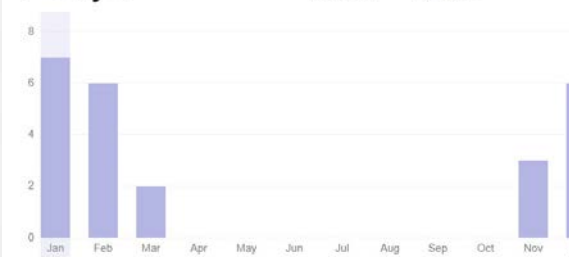
SITE ANALYSIS

Güssing, Austria has a continental temperature and is at a high elevation. Temperatures rarely get above 80 degrees. December through February the temperatures are frequently below freezing. Rain is the most frequent May through September, with all of these months having more than 2 inches on average. Snow is heavy during the months of December, January, and February, with the average amount of snow per year often totaling upwards of 24 inches of snow. Strong southern winds are common throughout the year.



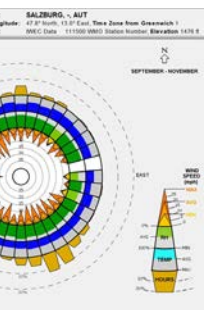
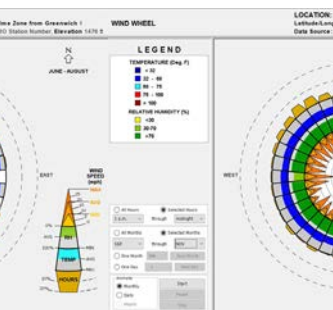
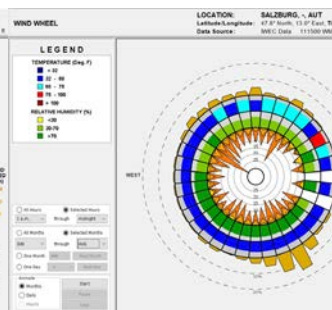
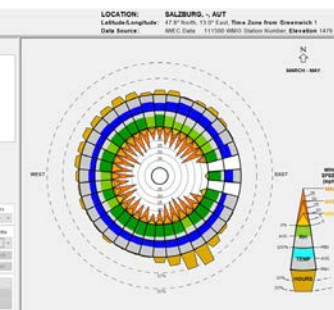
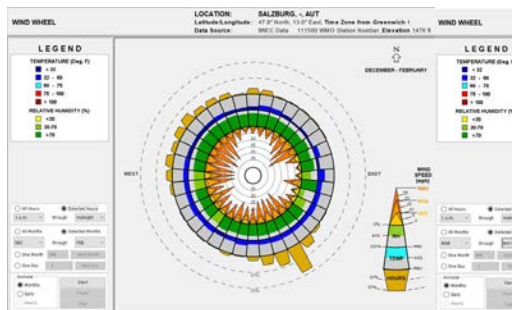
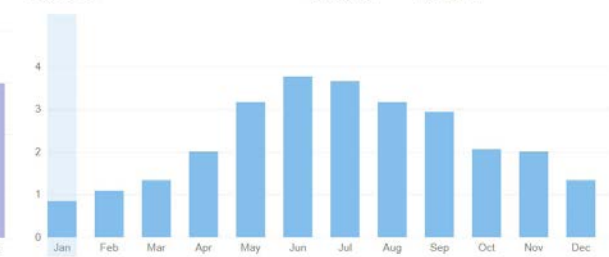
Average snowfall

January
7 days



Average rainfall

January
0.85 in | cm



The project is located in Güssing, Austria. Güssing is a town in Austria with a population of only a few thousand. The site is surrounded by agricultural fields and buildings that belong to an agricultural school. The building currently lying where the proposed one will go is itself a part of this school. A large zone of one and two family residential buildings borders to the west and south. Farther to the west is a more built area with mainly industrial and commercial use.



ZONING

There are no highways anywhere near the site. There are however some major roads. One artery runs from the more industrial northwest eastwards through the residential area, passing by the school. Another passes by the school to the west. Further to the west, there are many more major roads, some of which have as many as three lanes. In this direction there are also some bus stops.



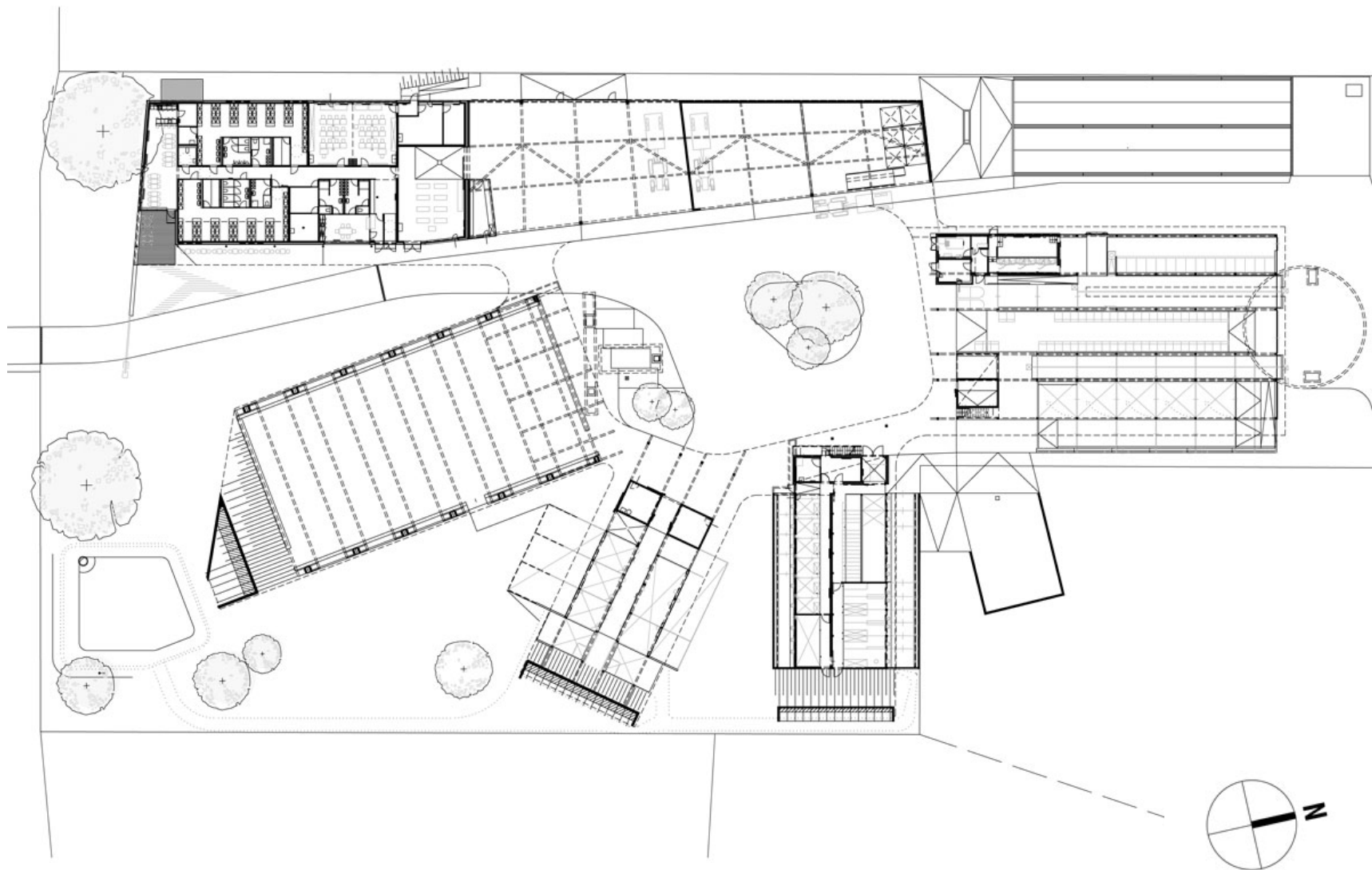
TRANSPORTATION

Transportation

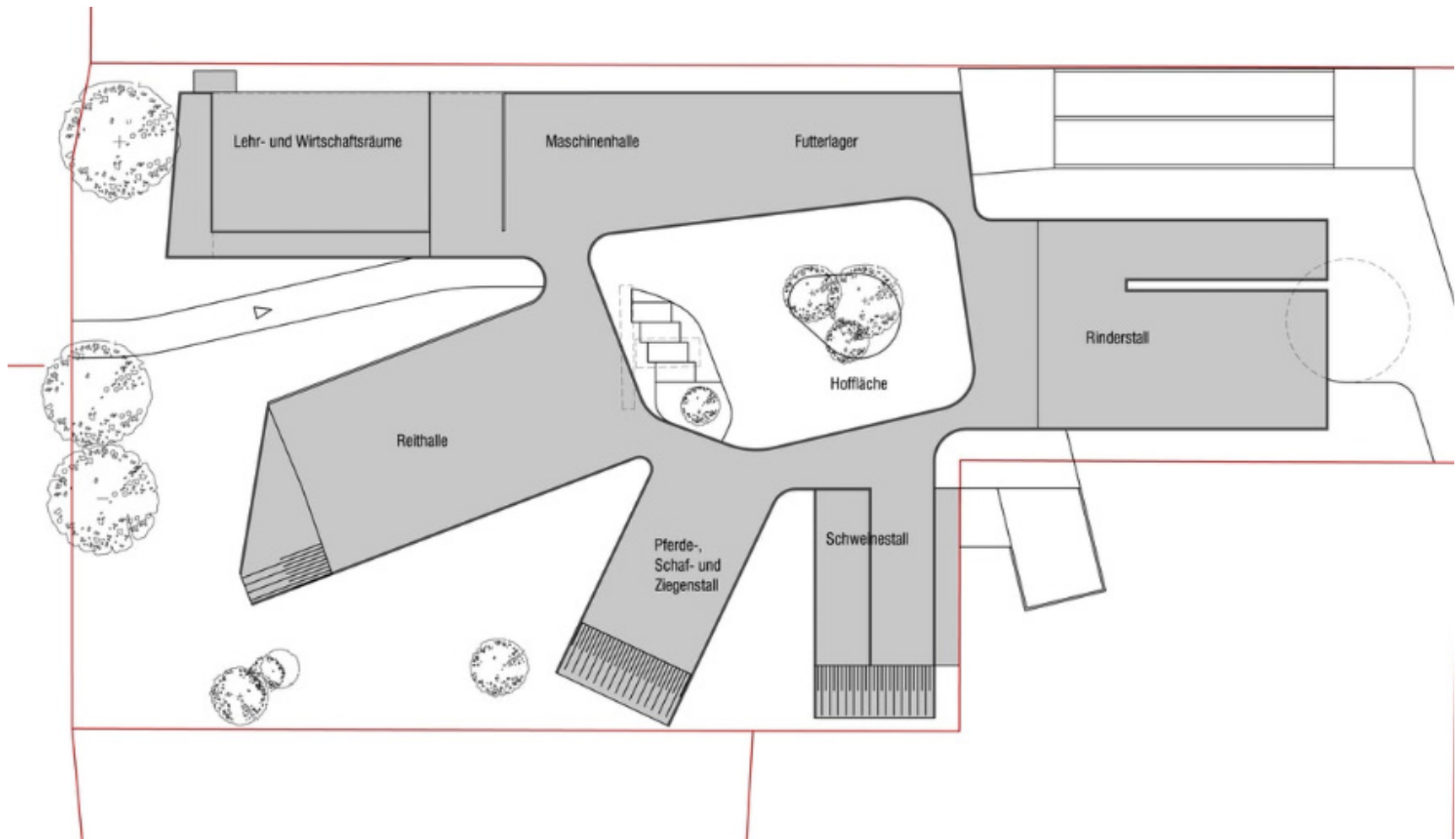
DOCUMENTATION

This proposed project will be directly connected to the main school building to the south and the equestrian facility to the north. The building has multiple wings arranged around a central courtyard, and the resulting form is extremely unique and modern. The central organization is not only convenient for staff members but creates a community feeling.





FLOORPLAN



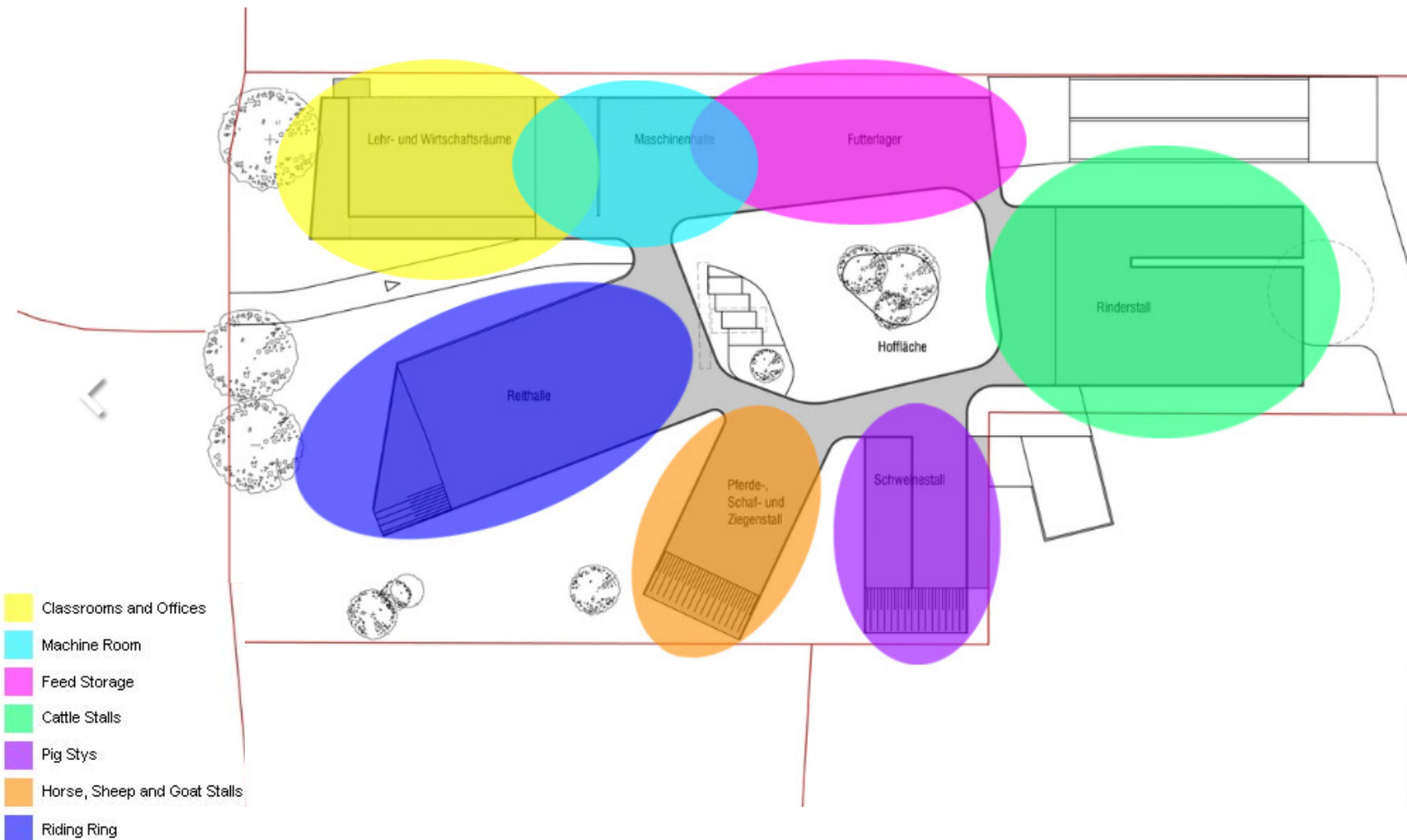


SECTION

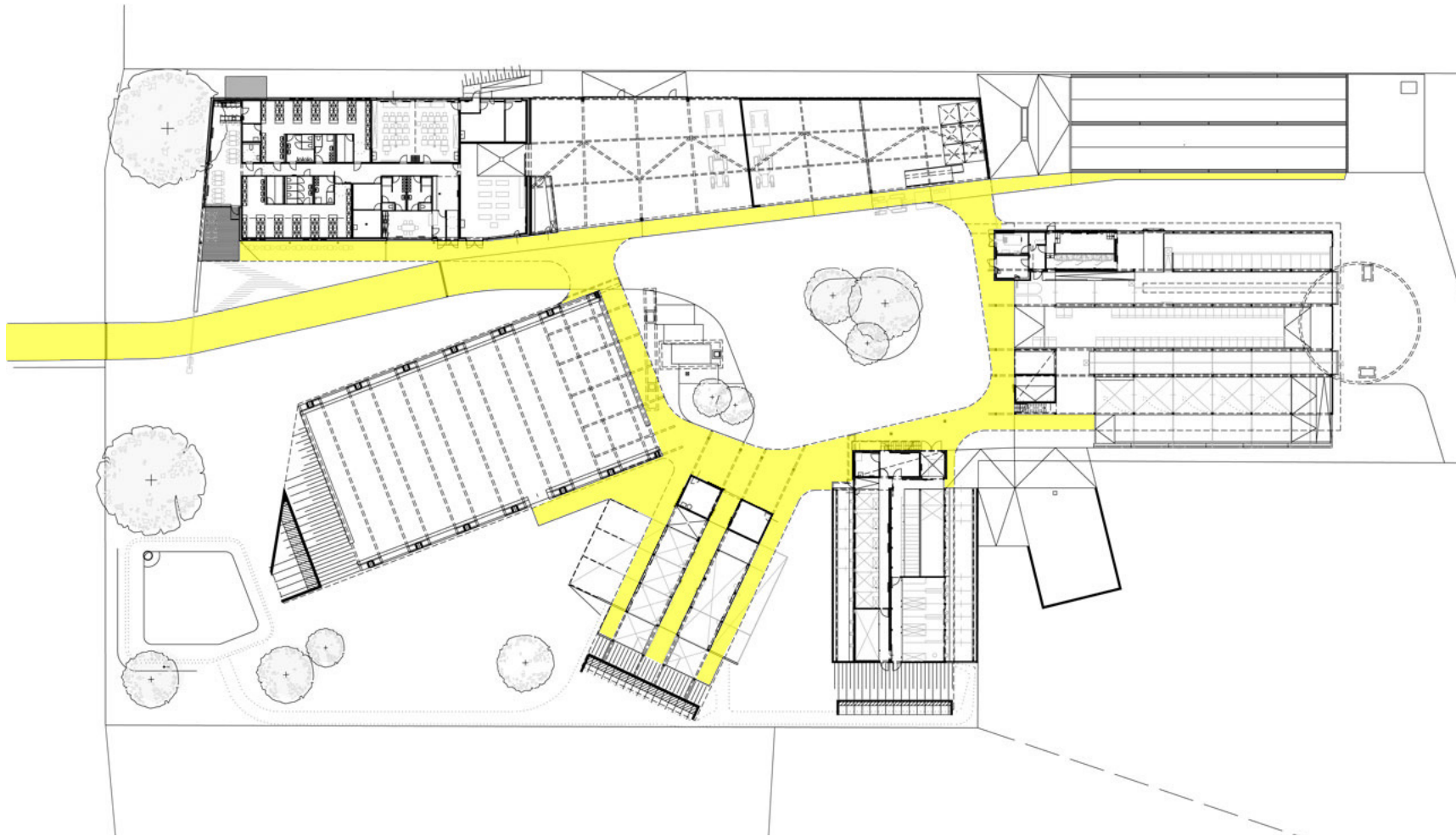


DIAGRAMS

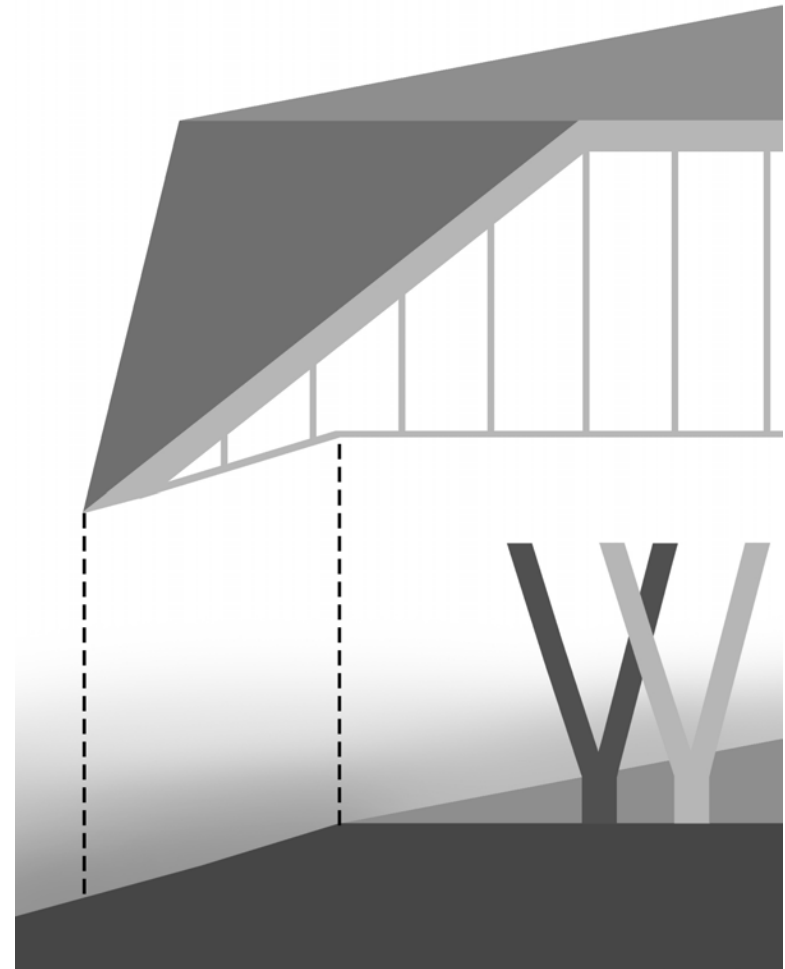
This proposed project will be directly connected to the rest of the school by the existing road. The building has multiple wings arranged around a central courtyard, and resulting form is extremely unique and modern. The central organization is not only convenient for staff members but creates a community feeling. Many of the wings hold animals and are not fully enclosed. The animals housed



include horses, cows, goats, sheep, and pigs. Other wings are specifically for riding and feed storage. There is also a wing for offices, classrooms, and exhibit space. The roof itself also hosts a program, as it is covered in crops. A deck in the northern part of the site provides picnic space. The circulation within the building matches the circular layout, and is arranged around the courtyard.



The structural system is mainly a light timber frame, although concrete is used near the base of the building and is load-bearing. The timber frame system is able to incorporate the gentle curves of the form. The roof has to bear the weight of the soil and crops, and is supported by timber frame walls as well as wooden struts. The envelope surrounding the enclosed areas is heavily glazed and has steel mullions separating tall panels.



Structure and Envelope

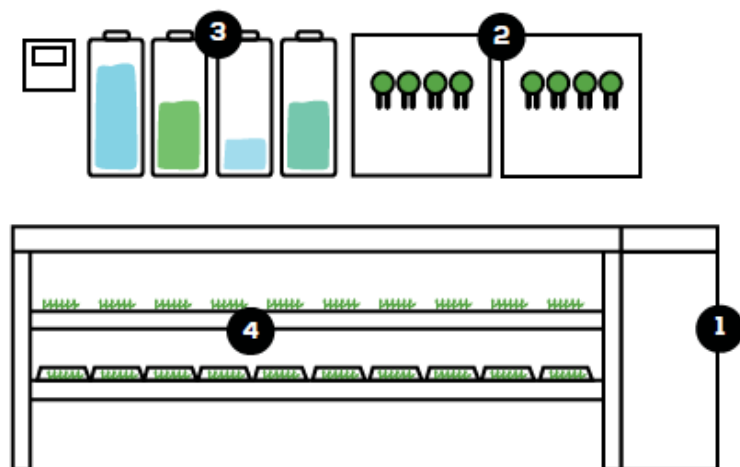
TECHNICAL SYSTEM PRECEDENTS

One issue with the design and upkeep of greenhouses is energy. With large buildings and in cold climates it can get expensive, because in these cases it is necessary to have a full HVAC system as well as a watering system. One way to offset the electricity useage is by using a renewable resource. Solar energy is very accessible; while other sources such as geothermal also work in a cold climate, they aren't affordadable on a large scale. For this reason, solar power is ideal. A common myth is that solar is not good in cold climates, but in fact with snow reflection it can actually be even more effective.



Freight Farms is a company that sells greenhouse systems that fit within an affordable, compact, and transportable freight container. Within each shipping container are panels that are used as growing hosts. Each container also includes a germination area. While the shipping containers cannot be used in their exact form for the community garden, a similar system can be used. The main appeal of the freight farm panel system is its ease of use, simplicity of the system, and low price tag.





1. Nursery Station Tank

Water level sensors in the tank communicate to farmhand® when water levels fall below their set point, triggering the tank to auto-fill. An aerator and in-tank air stone oxygenate the water to mix nutrients evenly and prevent algae growth.

2. Dosing Panels

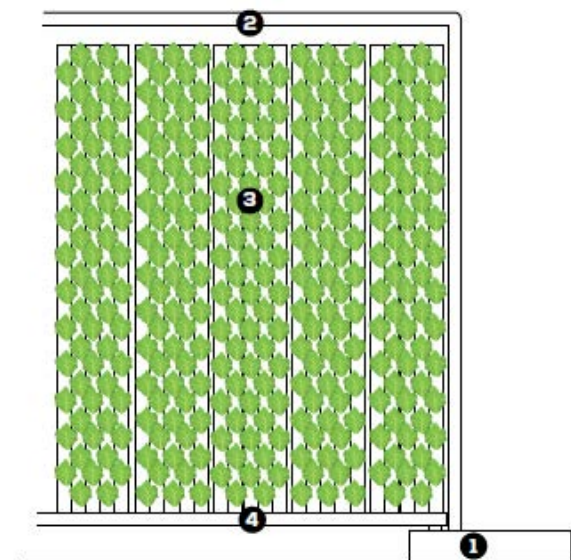
Nutrient, pH, and temperature sensors monitor water conditions and relay data to farmhand®. Peristaltic pumps automatically dose nutrient and pH solutions to maintain levels around predetermined set points.

3. Nutrient & pH Reservoirs

6-qt. refillable reservoirs contain nutrient and pH solutions for the Greenery's seedling and main tanks. The four reservoirs hold nutrient solutions A and B, a pH buffer, and experimental solutions, all of which are available for purchase online at farmhand® Shop.

4. Seedling Troughs

The dual-irrigated, full-width seedling troughs work using ebb and flow irrigation. Water pumps fill the troughs with nutrient-rich water, saturating the seedling roots to help the plants grow. The troughs can be controlled individually, and can multitask as germination, seedling, and microgreen shelves.



1. Cultivation Area Tank

The 110-gallon tank supplies nutrient-rich water to the entire irrigation system. Farmhand® automatically monitors and manages the water's nutrient concentration and pH balance.

2. Gravity-Assisted Drip Irrigation

Pumps send nutrient-rich water from the cultivation tank to overhead plumbing at regular intervals based on a pre-set watering schedule. 440 pressure-regulating emitters control the water flow at a continuous drip, as water travels towards the ground at a rate of 2 gallons/hour.

3. Plant Panel

Reticulated foam nestled in rigid plant channels holds crops in place as gravity pulls water down the cloth wicking strip along the length of the plant panel, giving the roots direct access to water.

4. Gutters

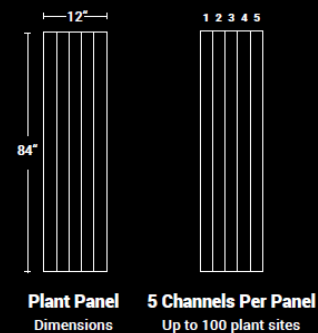
Recirculation gutters move with each row and drain unused water back into the main tank, where pH and nutrients are rebalanced and the water is recycled.

Expert Panel

The Greenery's high-density five-channel plant panels maximize usable space in the farm to unlock new crop possibilities, farming styles, and yield potentials.

The lightweight and sturdy removable panels are shaped from food-safe, high-impact polystyrene. All five channels are

PLANT PANEL PROFILE



BUILT TO GROW

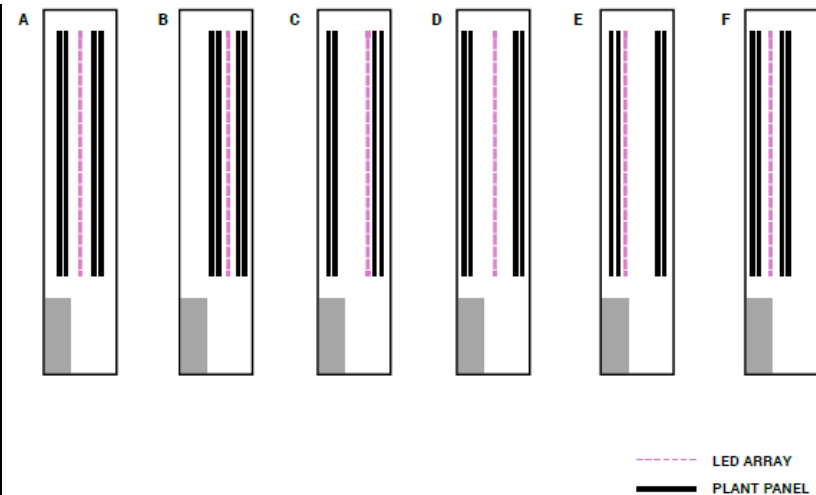
88 Plant Panels
Up to 8,800 plant sites

36,960 Inches
Total linear planting space

BUILT FROM

High-Impact Polystyrene
Food safe panel material

Inert Reticulated Foam
Food safe growing medium



A. Standard Growing Position

For the majority of the time, the Greenery's racks remain in four evenly-spaced rows, with plant panels and LED arrays separated by 18 inches. Visual guides help operators reposition back to this default spacing.

B - F. Customizable Spacing

Row widths can be easily adjusted to allow for in-row transplanting, harvesting, cleaning, and maintenance. Additionally, row widths can be shifted and fixed to meet the spacing needs of different plant varieties. For example, herbs grow small and close together, while vining crops need room to expand. The Greenery is able to accommodate both simultaneously.

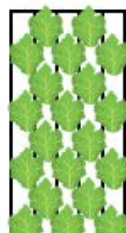


Row planting



Active channels	1 3 5
Plant sites per channel	10-15
Total farm plant sites	2,600-3,900
Recommended crops*	Large crops: Lettuces, kale, mizuna, Swiss chard

Linear planting



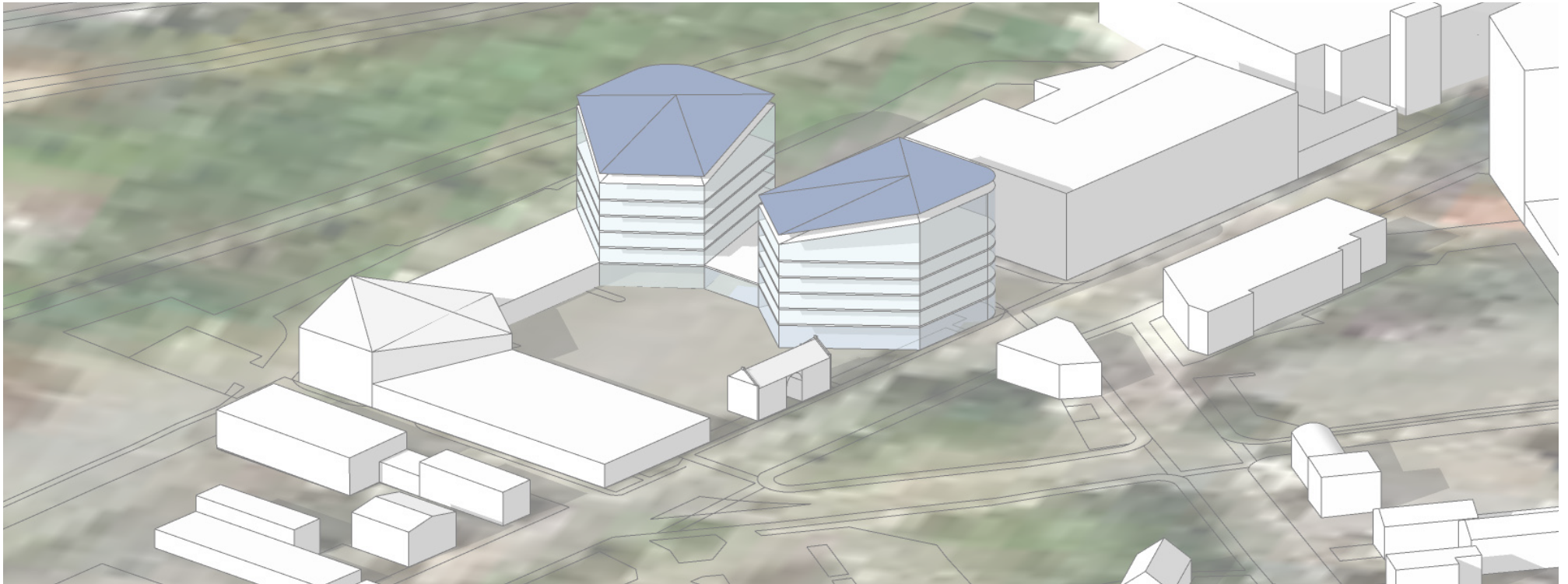
Active channels	1 2 3 4 5
Plant sites per channel	15-20
Total farm plant sites	6,600 - 8,800
Recommended crops*	Small trim crops: Arugula, watercrest, mustard greens Herbs: Basil, parsely, cilantro, thyme

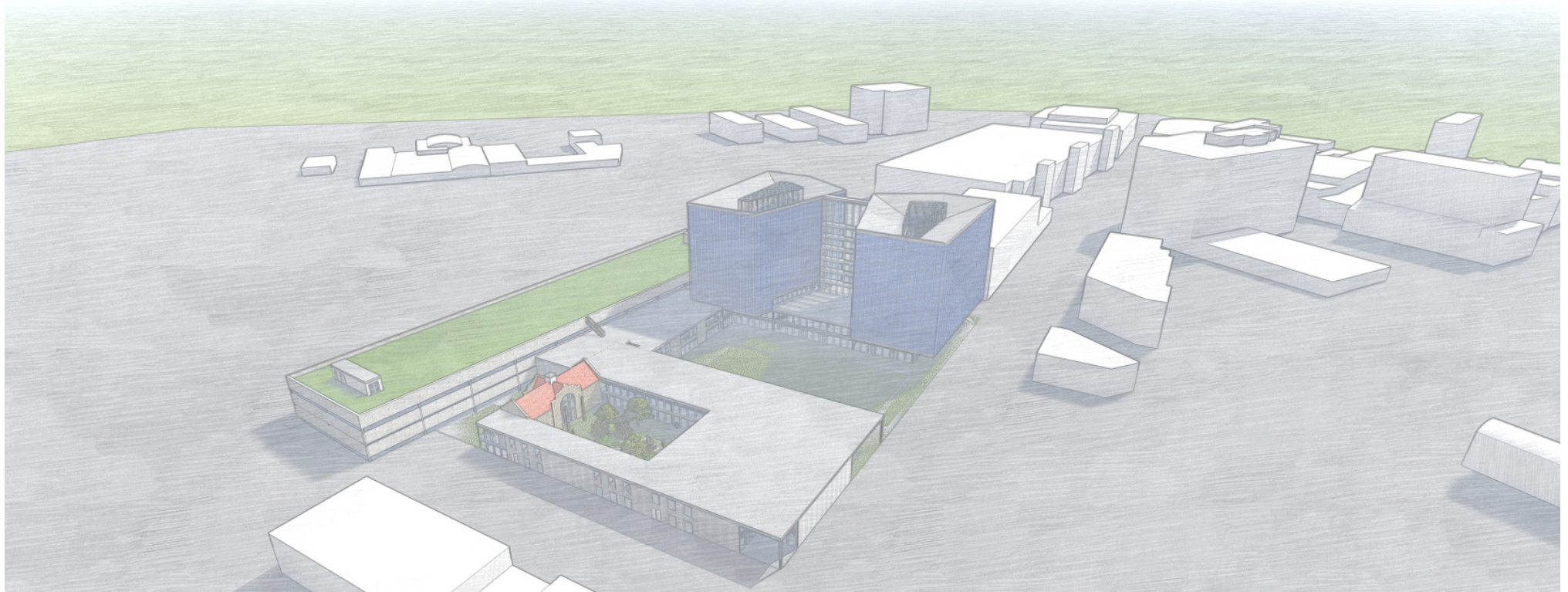
Intercropping



Active channels	1 2 3 4 5
Plant sites per channel	Large crops: 10-15 Small crops: 17-20
Total farm plant sites	5,600-7,900
Recommended pairings*	Large crops: Lettuces, kale, mizuna, Swiss chard + Root vegetables: Radishes, turnips, carrots, beets

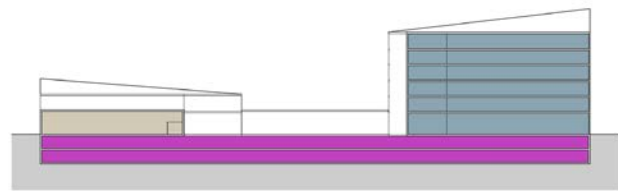
INITIAL DESIGN





FIRST ITERATION

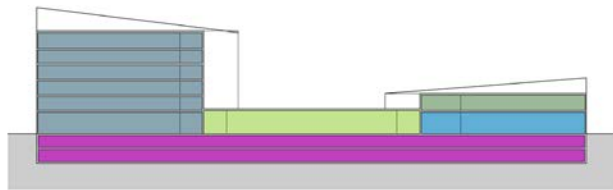
The form immediately took on a C-shape, allowing for a shape that opened up onto Broadway and “hugged” the farmer’s market. This form had two greenhouse towers and a communal plor in-between, and a shorter tower with the kitchen on the ground floor, and classrooms, lecture space and offices above. The far southern wing had a dining hall and multifunction space. Parking was on a basement level. This early version relocated the weigh station and used it as an entry to the outdoor market.



SECTION ONE

Room Legend

- INDIVIDUAL PLOTS
- MULTIFUNCTION AND LOBBY
- PARKING



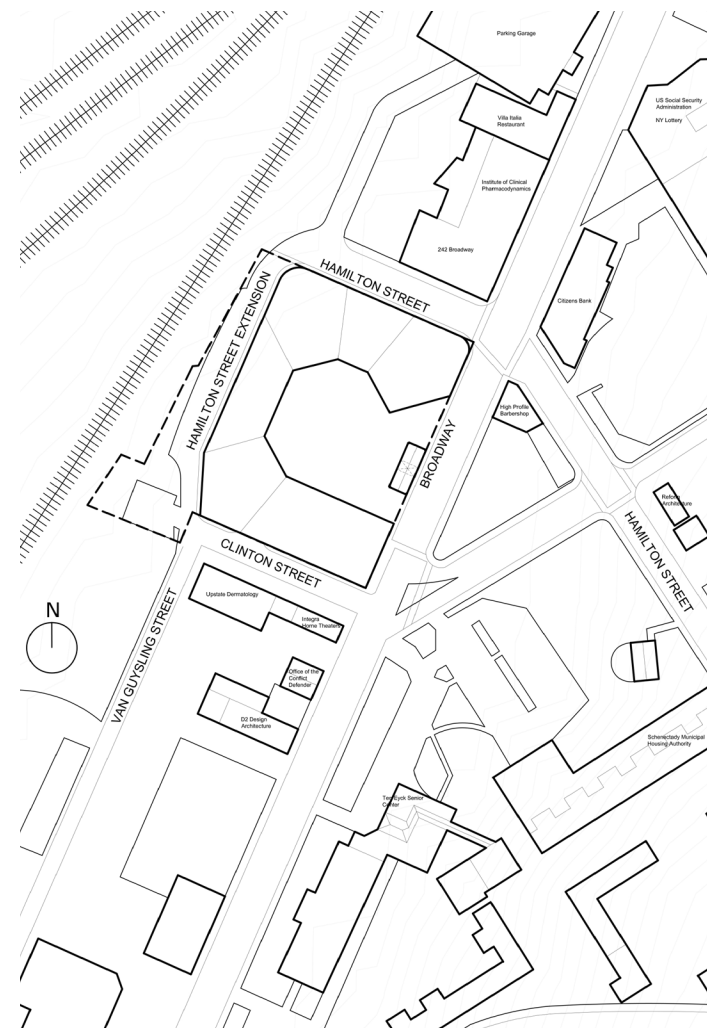
SECTION TWO

Room Legend

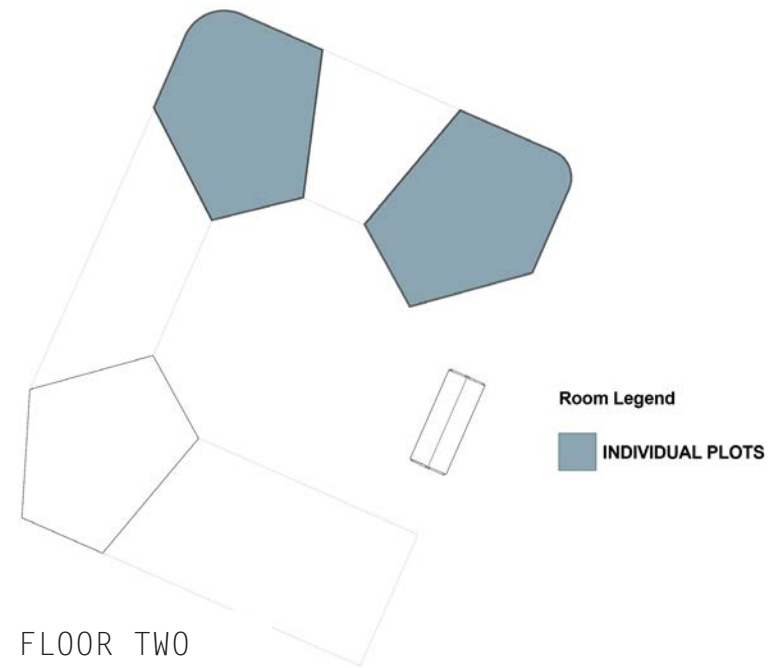
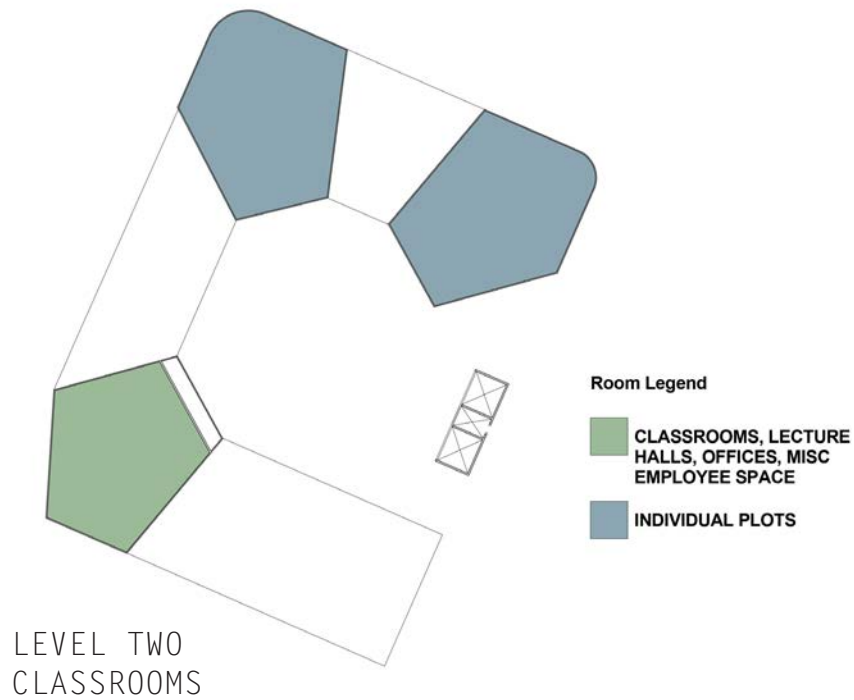
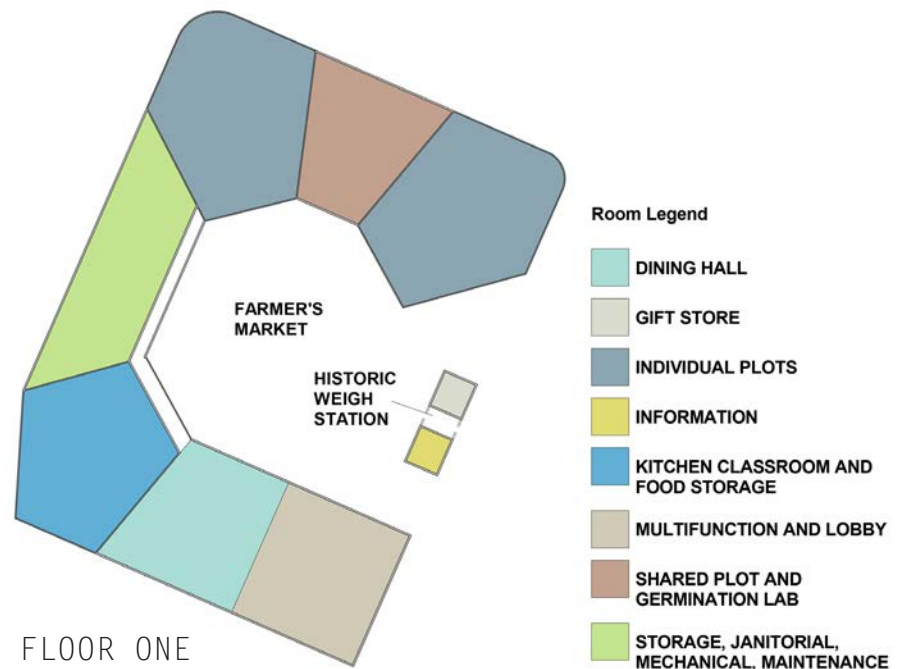
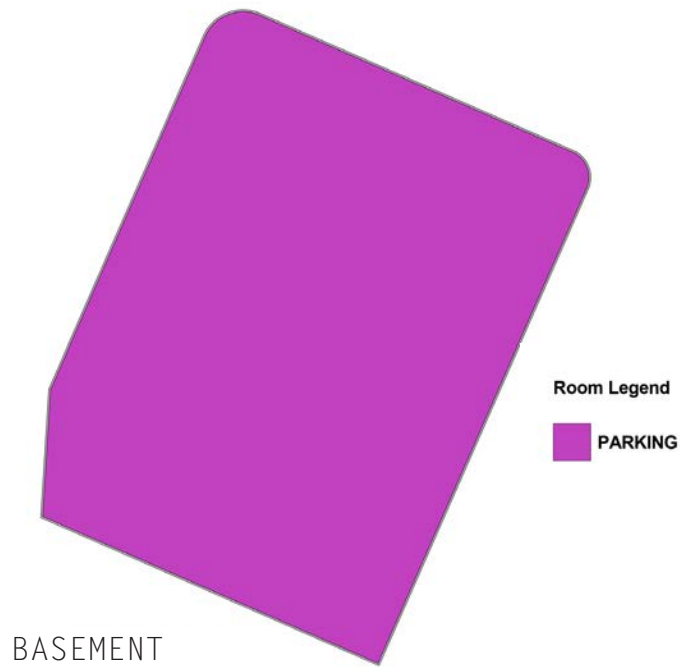
- CLASSROOMS, LECTURE HALLS, OFFICES, MISC EMPLOYEE SPACE
- INDIVIDUAL PLOTS
- KITCHEN CLASSROOM AND FOOD STORAGE
- PARKING
- STORAGE, JANITORIAL, MECHANICAL, MAINTENANCE OFFICES



BIRD'S EYE

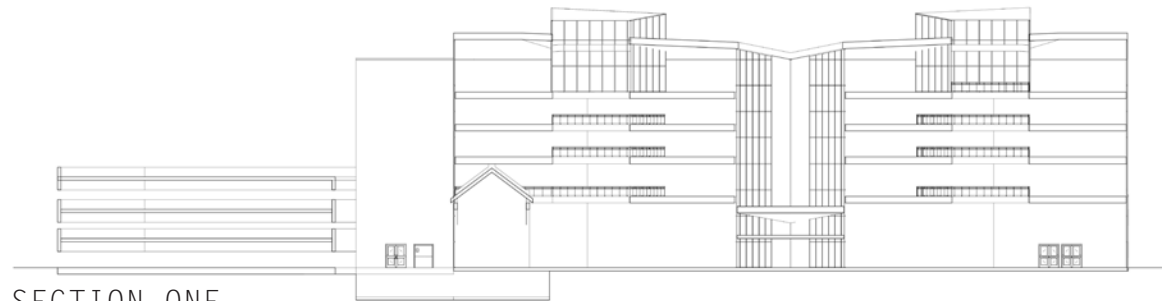
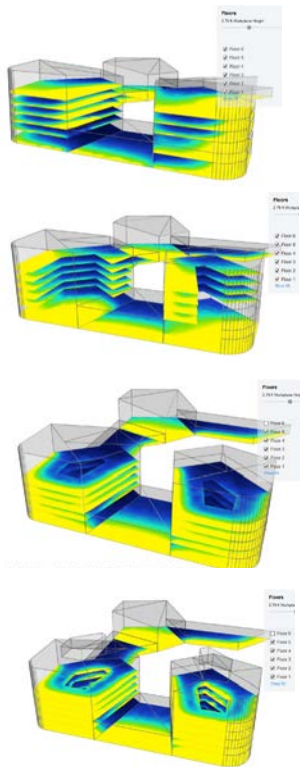


SITE PLAN



SECOND ITERATION

This iteration experimented with placing the greenhouses to the south, and moving the multifunction and dining spaces to the northern wing. This was to see if the solar penetration into the greenhouses would be improved. Sefaira analysis began to be carried out, to see what forms would be best. The kitchen moved to the central location. Classrooms, lecture spaces and offices remained on a second level, above the other public spaces. Parking was implemented for the first time, and located at the back frontage of the site, with an entry off of Hamilton Street, so that Broadway was reserved for pedestrians. The weigh station became an entry from the garage. An indoor version of the farmer's market emerged, as well as a food processing area.



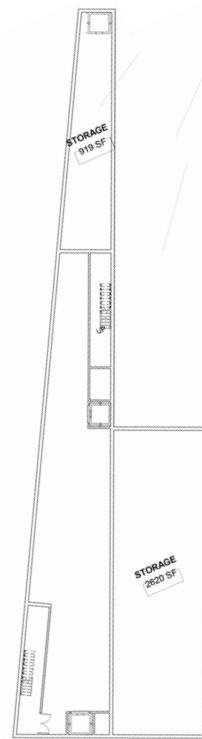
SECTION ONE



SECTION TWO



EAST ELEVATION

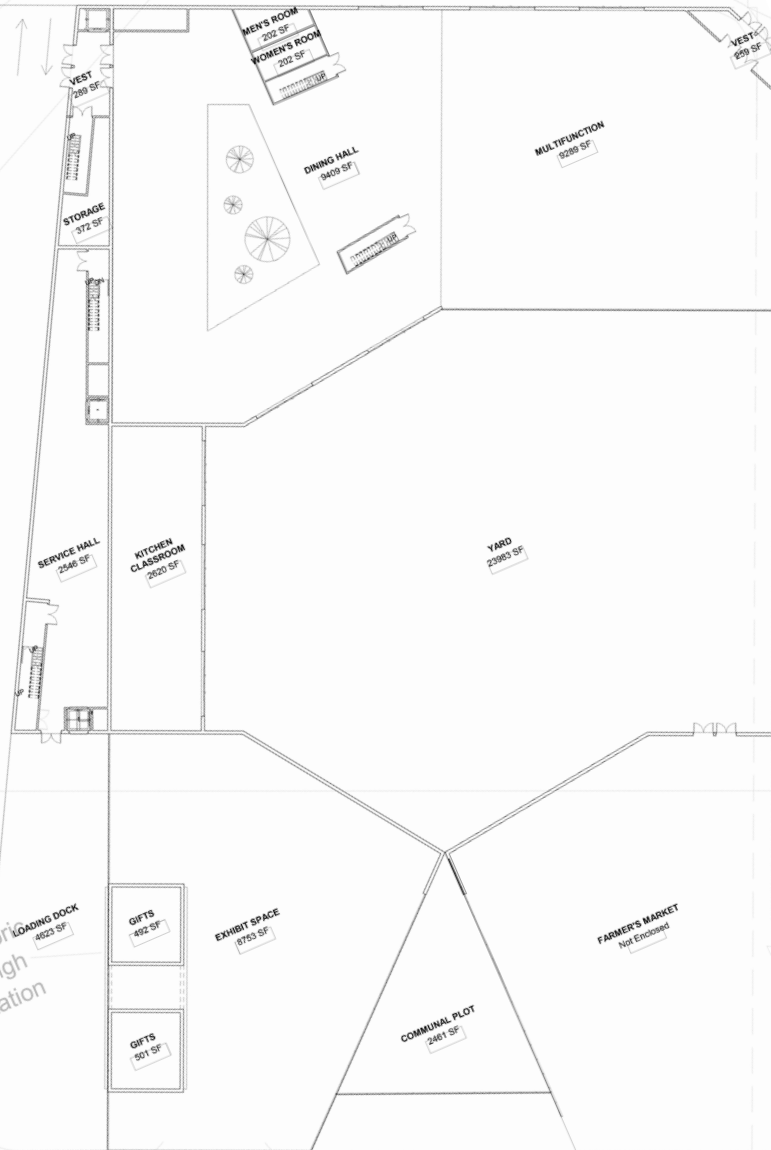


BASEMENT

HAMILTON STREET EXTENSION

HAMILTON STREET

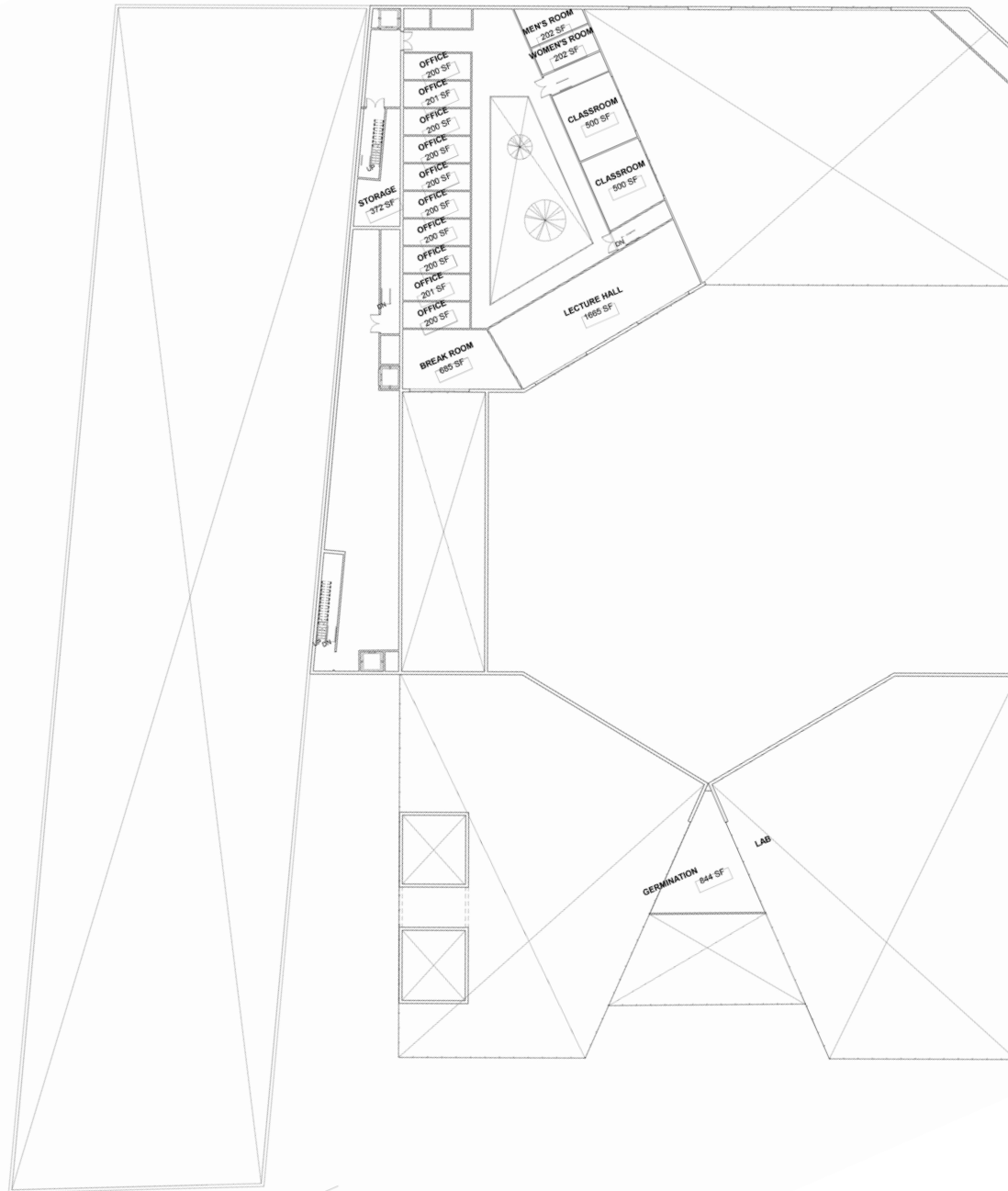
Historic Weigh Station

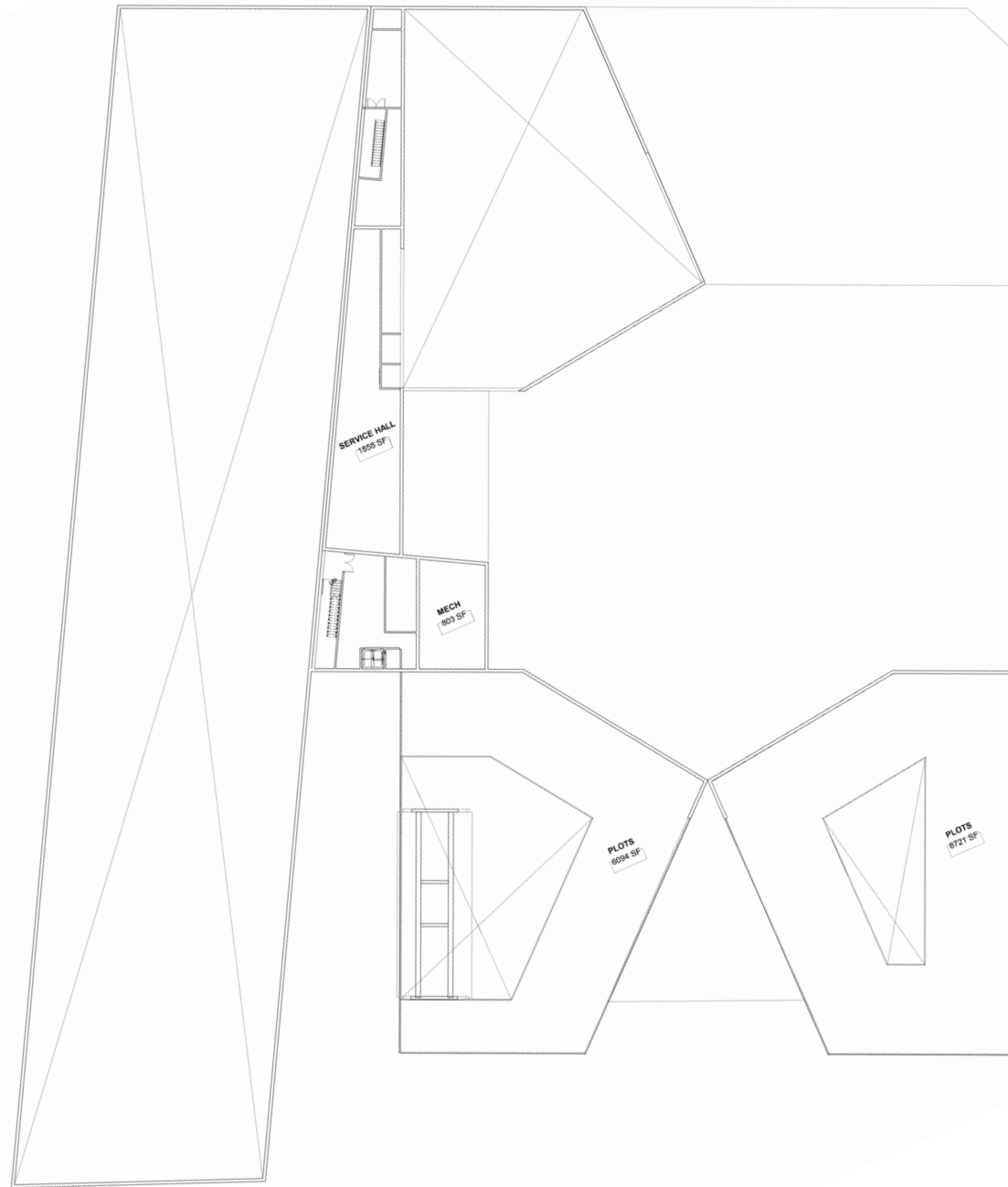


BROADWAY

CLINTON STREET

FLOOR ONE

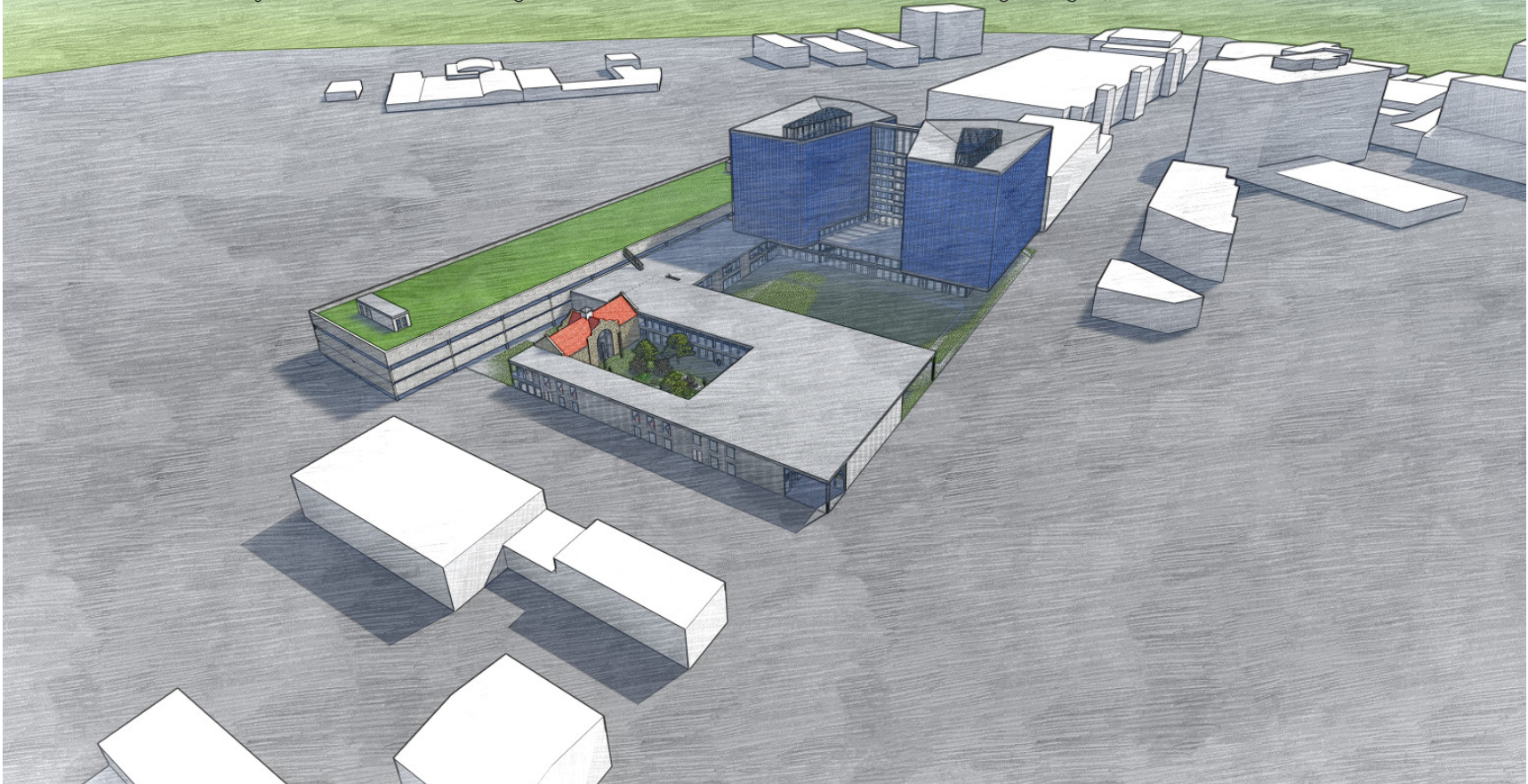


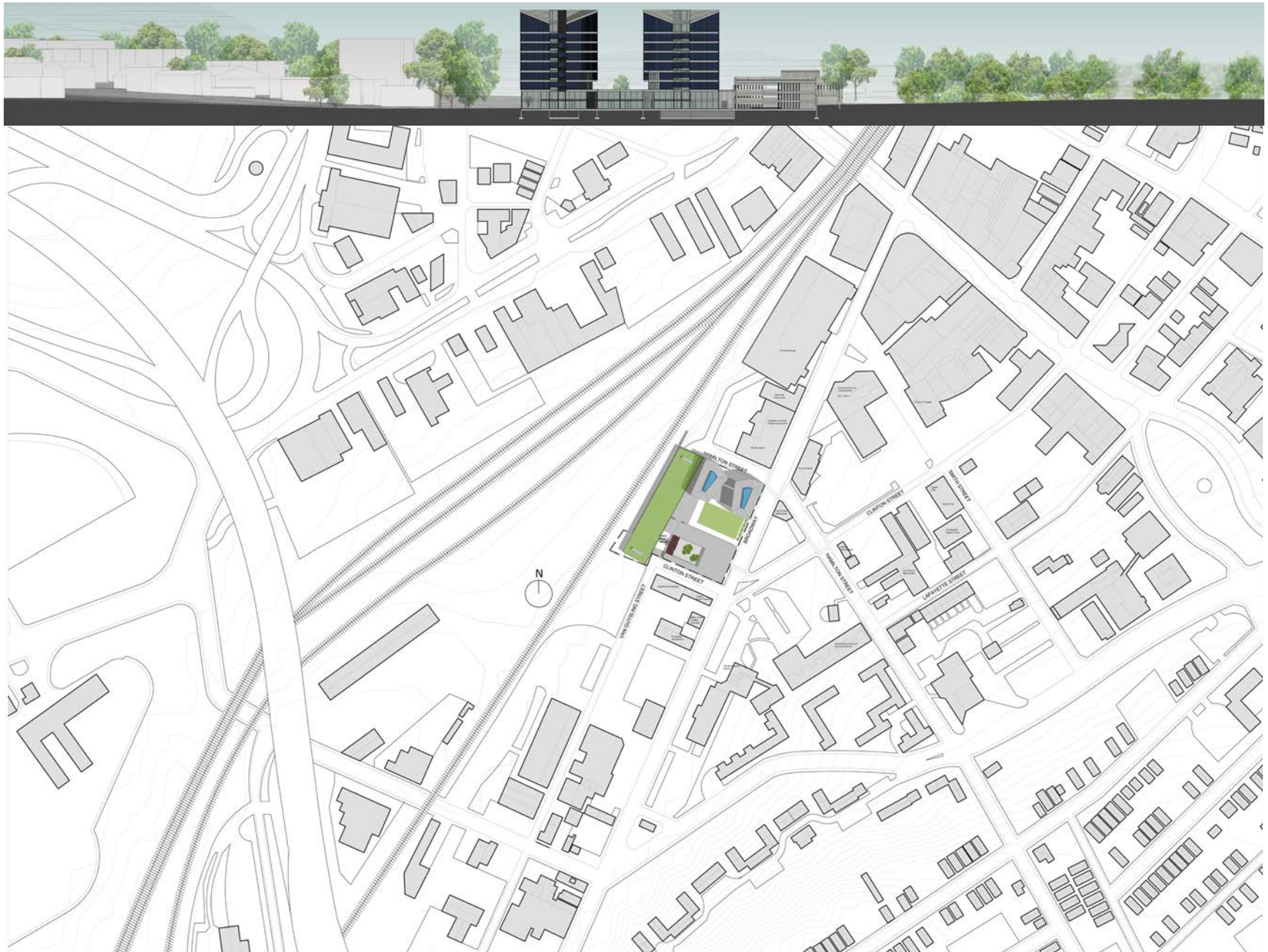


FLOOR TWO

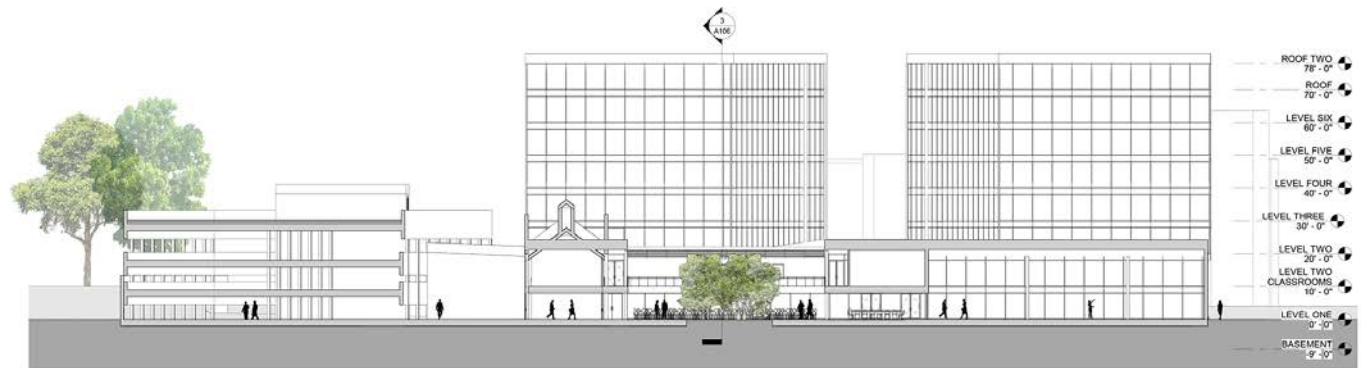
THIRD ITERATION

The greenhouses were moved back to the north, and the community spaces back to the south, because this way access to the community spaces is closest to the public housing and Hamilton Hill District. The two greenhouses were connected by a bridge. The southern wing became rectangular. The dining hall was removed, because it was repetitive. Private dining rooms emerged. The courtyard developed, whereas previously it was an indoor green area. This improved the general energy as well as the lighting of the southern wing. The exhibit space became integrated with circulation space. Upstairs, meeting rooms were added as well as a room for the children to hang out in. By this point, the facade and structure was mostly developed. The structure chosen was steel because of the large scale and industrial use. The facade is mostly a prefab metal panel system, with some windows glass and others polyurethane. There is a polyurethane and solar wall curtain wall system for the greenhouse towers. For the garage, concrete was selected.

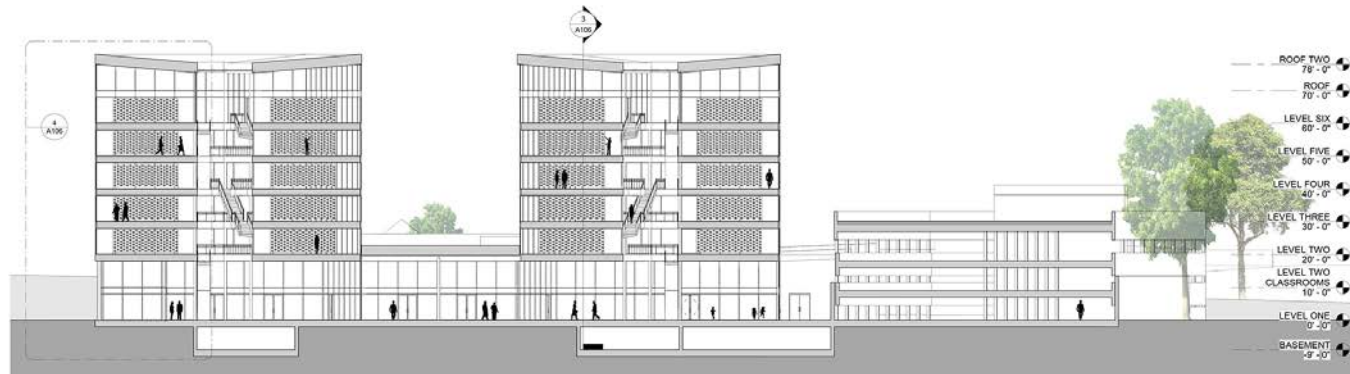




Site Plan and Section



SECTION ONE



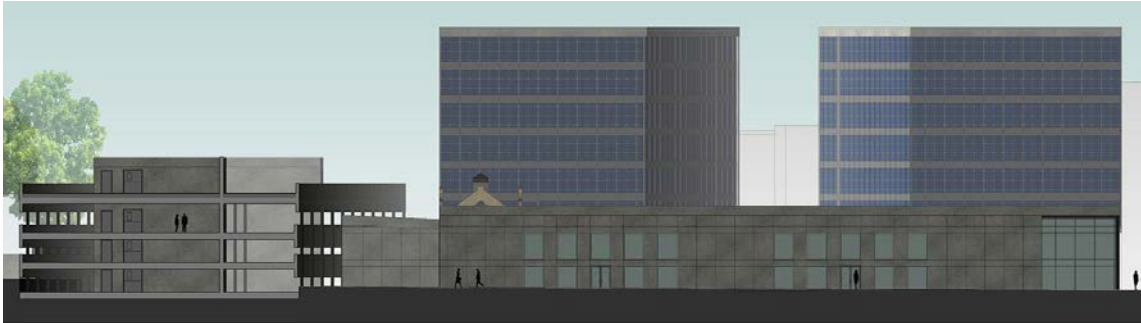
SECTION TWO



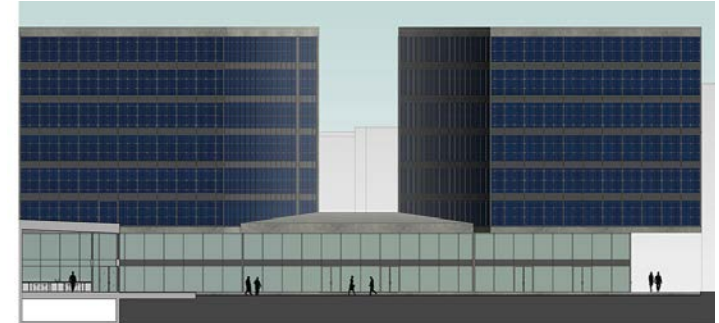
SECTION THREE



EAST ELEVATION



SOUTH ELEVATION



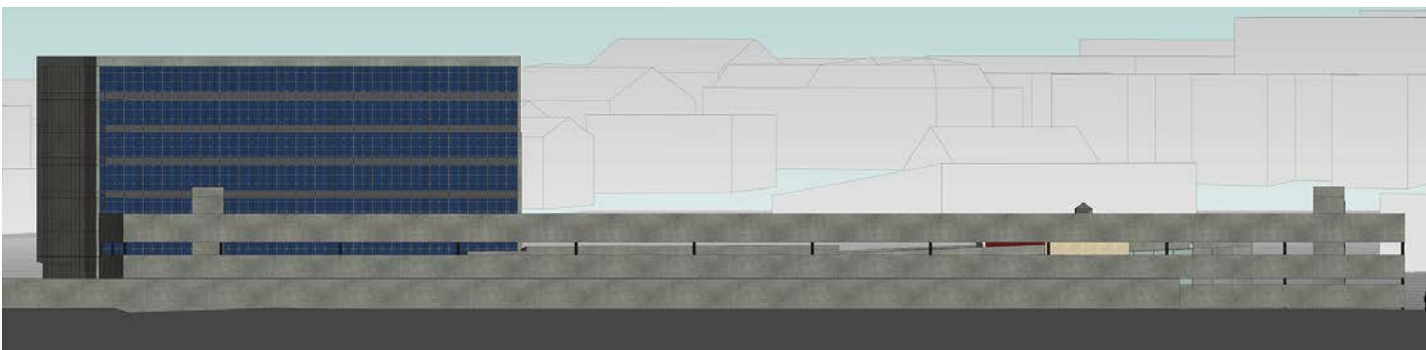
GREENHOUSES



NORTH ELEVATION



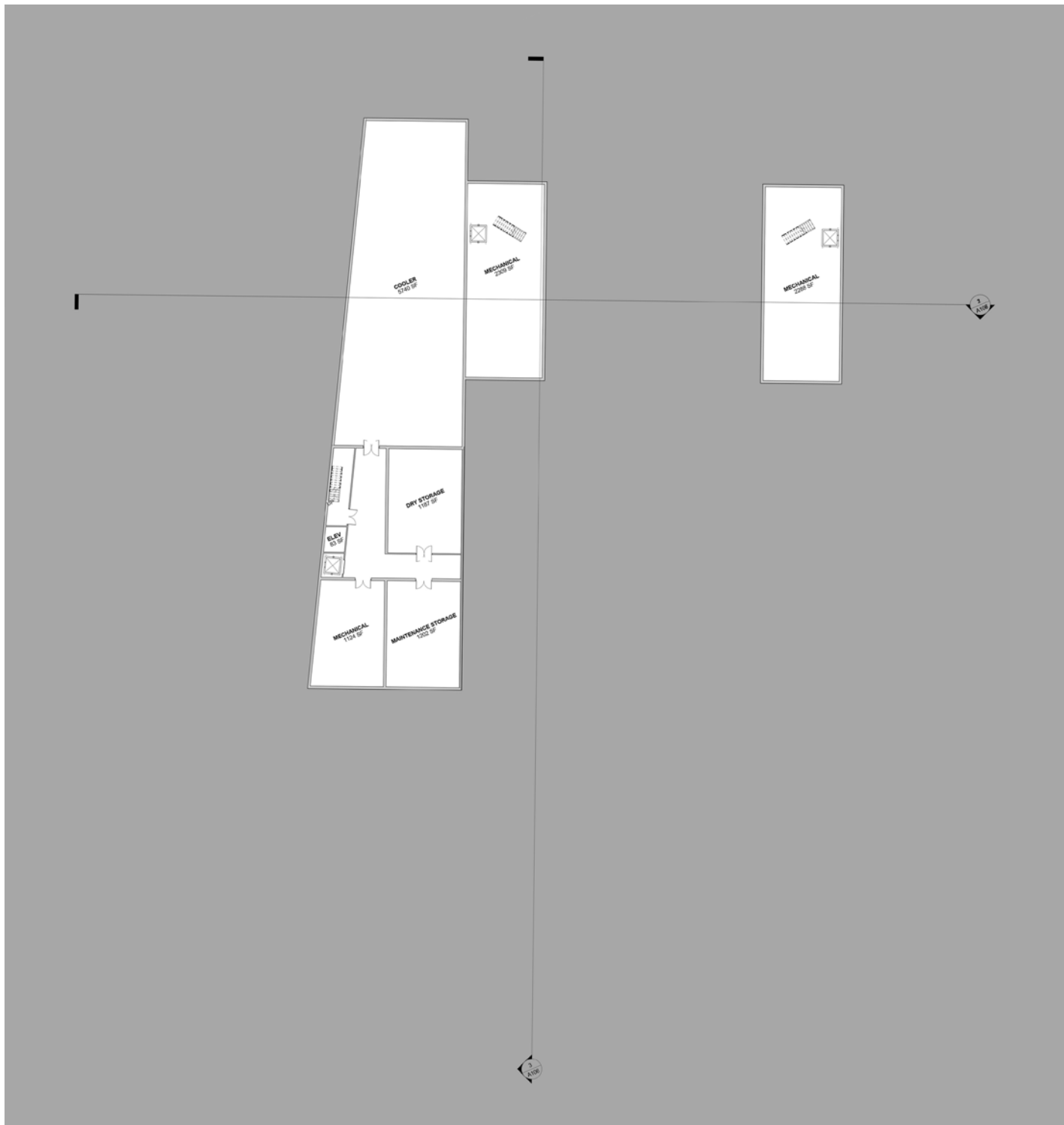
COMMUNITY CENTER



WEST ELEVATION

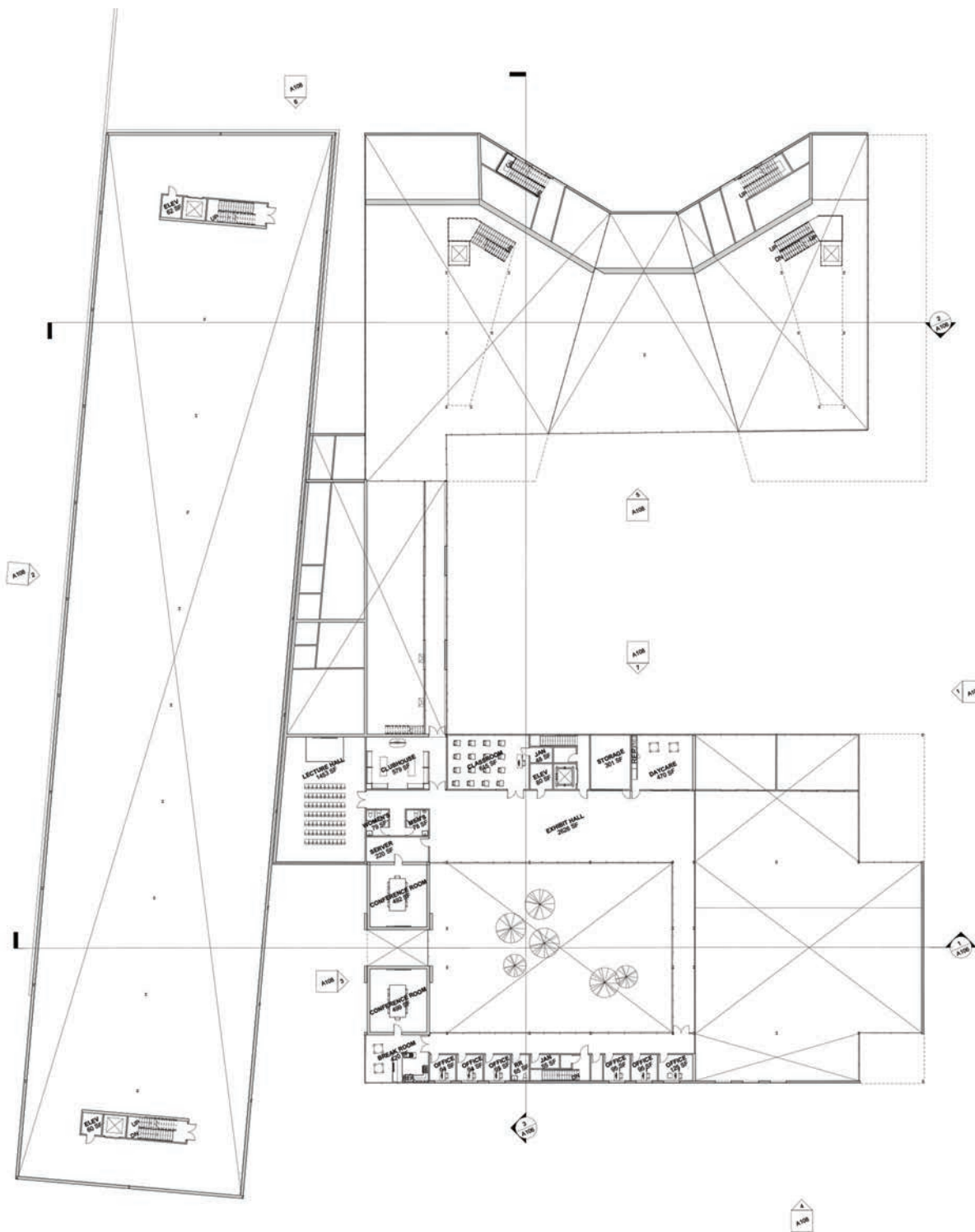


WEIGH STATION

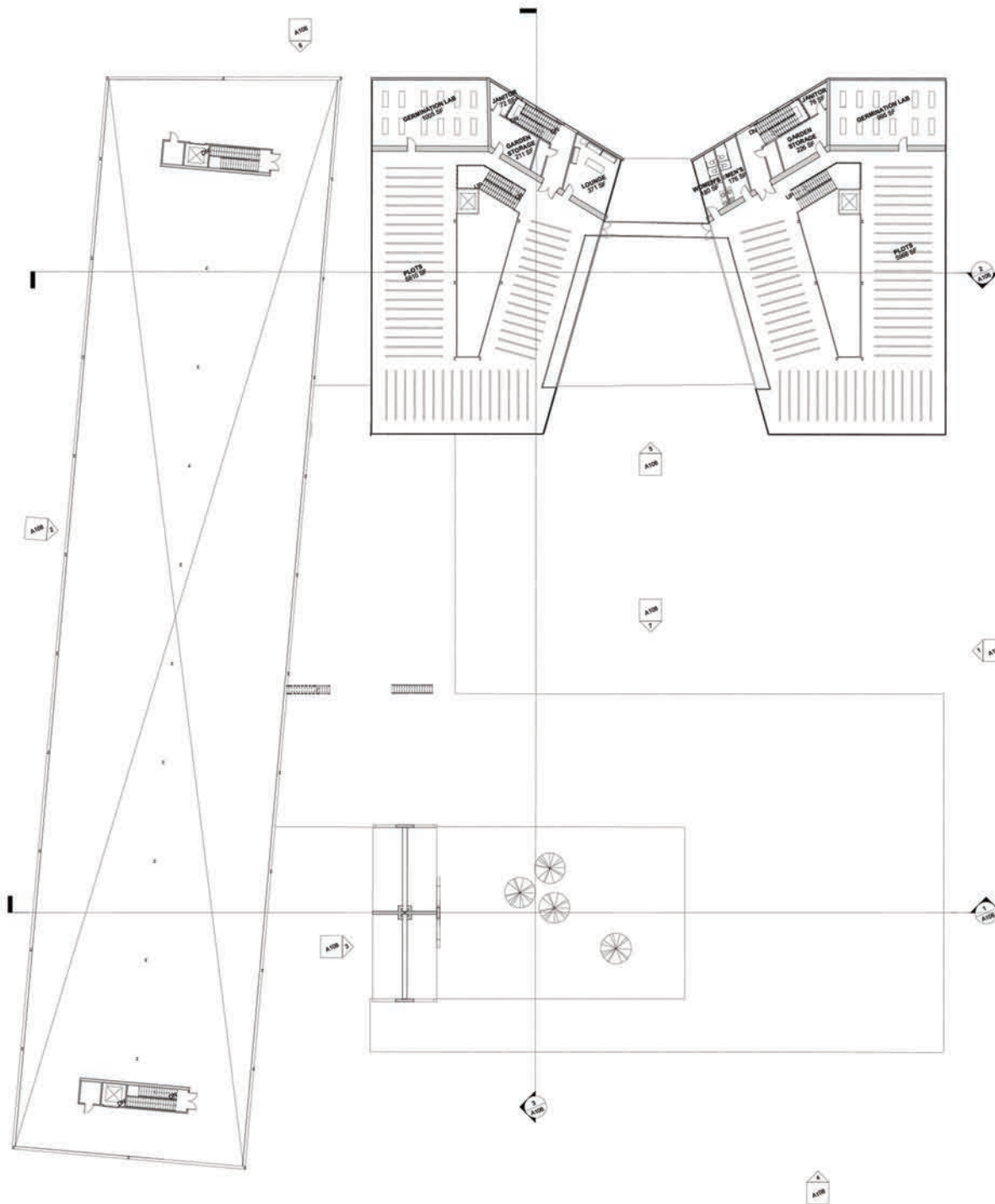


BASEMENT





FLOOR TWO CLASSROOMS



FLOOR TWO

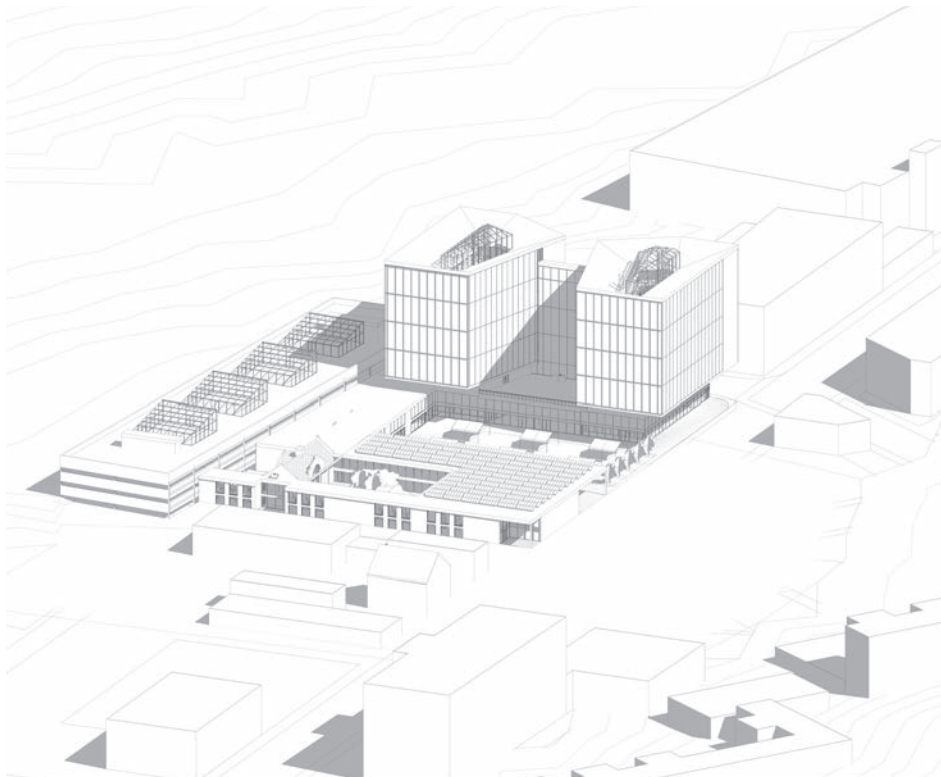
FINAL DESIGN



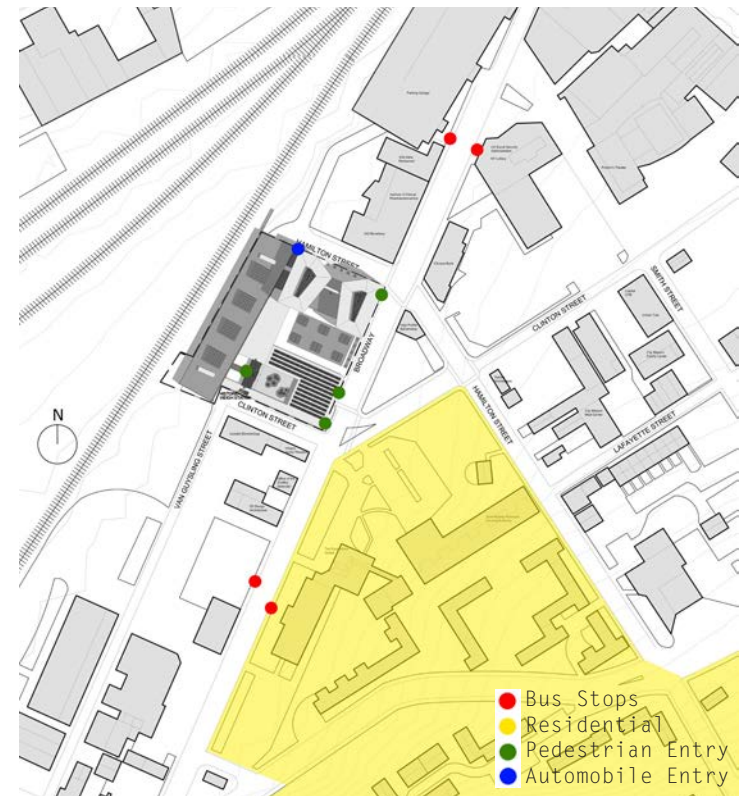


SITE RELATIONSHIP

There is no target demographic per se, since anyone can purchase produce at the farmer's market, or benefit from the food given to local restaurants. However, there is a "critical demographic", or a group with the greatest need. This group includes the residents of the neighboring public housing project as well as the low-income Hamilton Hill district just to the south of that, where there is the food desert. Transportation considerations are extremely important since many within this group do not own a car. To solve this problem, the building is located nearby bus stops, and is within walking distance of the public housing. The building wraps around the central courtyard, which serves as an outdoor market. Each end of the building facing bus stops has a main entrance. The automobile entrance is along the northern façade, in order to save the entire eastern façade along Broadway for pedestrians. The individuals entering the main building from the parking garage on the other hand will enter through the weigh station.



Axon



Site Circulation

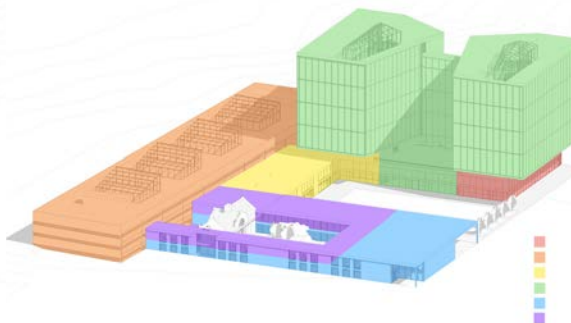
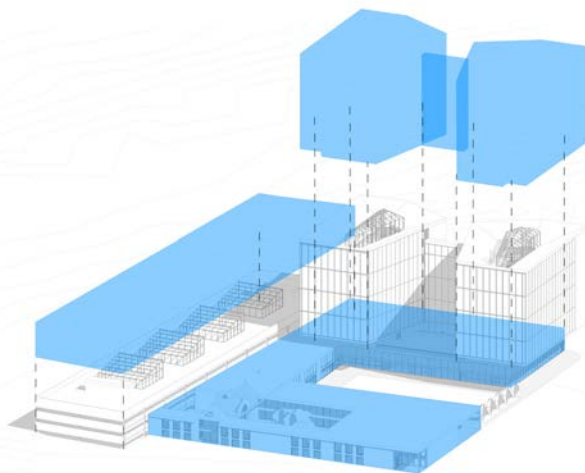


Site Plan and Section

FORM + PROGRAMMATIC ARRANGEMENT

The form of the building is a low, two or three story tall orthogonal shape except for the soaring greenhouses, which have an additional eight stories, housing the vertical farming plots. The towers have a shape that stands out, and they are designed so that every wall is placed to maximize solar penetration. The roofs pitch downwards towards the center, meeting skylights that pop up. The northern wing and its towers house programs relating to farming. The double-height ground floor houses the farmer's market along Broadway, the communal/ demonstration plot in the center, and the food processing area. The food-processing area is off of the kitchen, and adjacent to the loading dock, because all of these programs are related. Below the kitchen on the basement level is refrigerated and dry food storage. The farming towers house the vertical farming panels, which are arranged around the central opening. Along the northern side of each tower is a service core, housing necessities such as storage and germination areas. These two towers are connected by bridges. Meanwhile, the southern wing houses multipurpose and exhibit space on the ground floor, and classrooms, a lecture hall, meeting rooms, more exhibit space, and offices on the second floor. All of this wraps around a second courtyard space. Lastly, the parking garage is on the west, bordering the railroad.

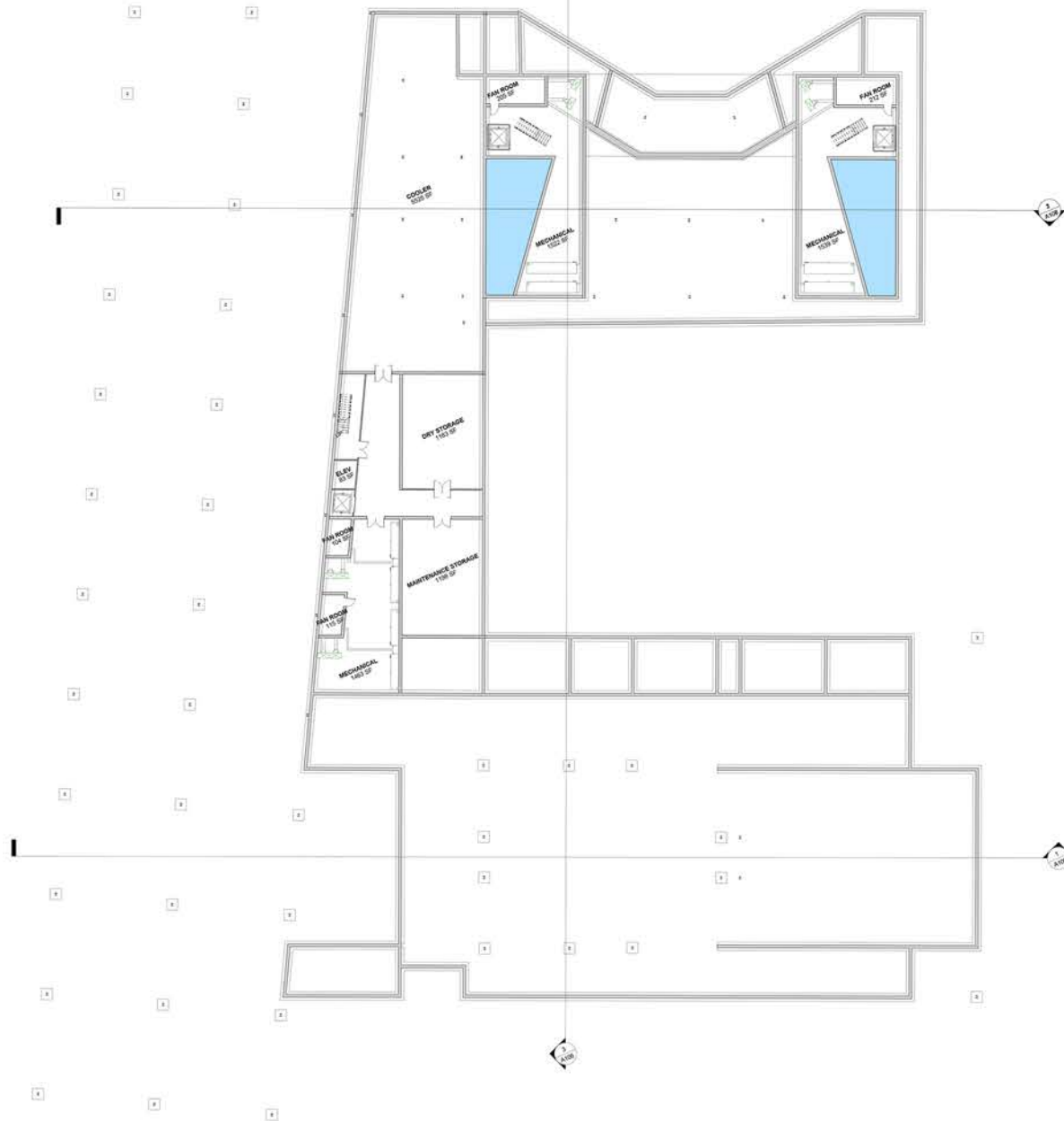
■ FARMER'S MARKET
■ PARKING
■ FOOD PROCESSING + KITCHEN
■ GREENHOUSE
■ MULTIFUNCTION
■ CLASSROOMS, LECTURE HALL, OFFICES



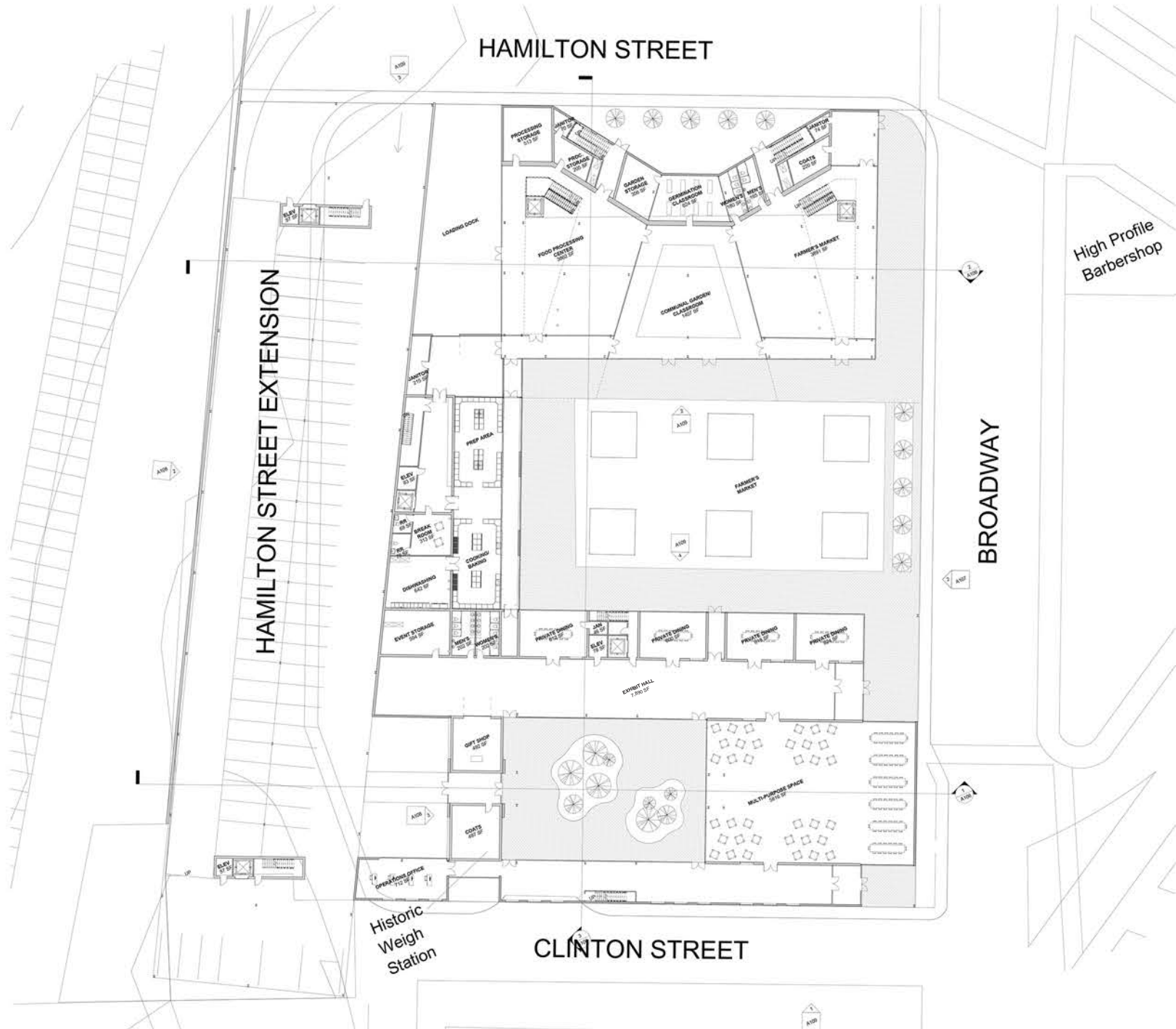
AREA ALLOCATIONS			
Space	Quantity	Actual Sq Ft	Total Actual Square Ft
Greenhouse Plots	14	6,173	86,422
Dark Growing Plots	2	2,859	5,718
Communal Plot (Farming Class)	1	1,407	1,407
Germination Classroom	1	624	624
Germination Labs	16	500	8,000
Greenhouse Lounges	8	343	2,744
Indoor Farmer's Market	1	3,891	3,891
Food Processing Center	1	3,862	3,862
Kitchen (Cooking Classroom)	1	1,989	1,989
Dishwashing	1	642	642
Multifunction	1	5,816	5,816
Private Dining	4	612	2,448
Exhibit Space	2	7,890 + 2,555	10,445
Gift Store	1	492	492
Lecture Hall	1	1,197	1,197
Classroom	1	610	610
Daycare	1	465	465
Clubhouse	1	568	568
Offices	5	95	475
President's Office	1	125	125
Operations Office	1	712	712
Misc. Employee Space	3	613+313+726	1,652
Conference Rooms	2	495	990
Coat Closets	2	497+220	717
Garden Storage	16	210	3,360
Communal Garden Storage	1	365	365
Processing Storage	2	513+205	718
Cooler	1	5,525	5,525
Dry Storage	1	1,183	1,183
Multifunction + Dining Storage	1	594	594
Class/Lect Storage	1	297	297
Maintenance Storage	1	1,189	1,189
Greenhouse Mechanical	2	1,522	3,044
Main Mechanical Room	1	1,682	1,682
Outdoor Farmer's Market	1	9,814	9,814
Rooftop	1	31,599	31,599
Parking	3	31,599	94,677
Total			159,968

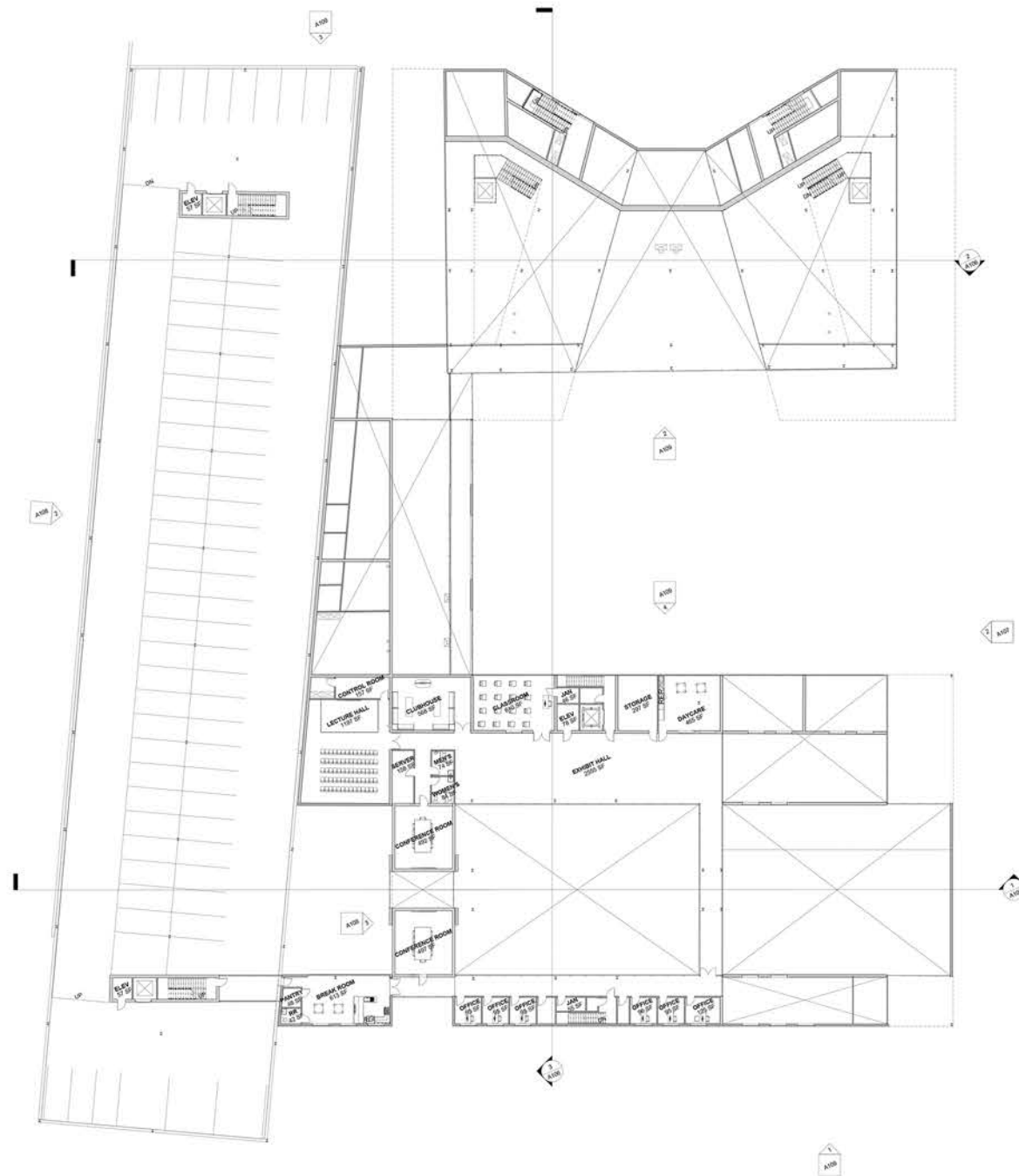
(Totals do not include Outdoor Spaces)

DOCUMENTATION

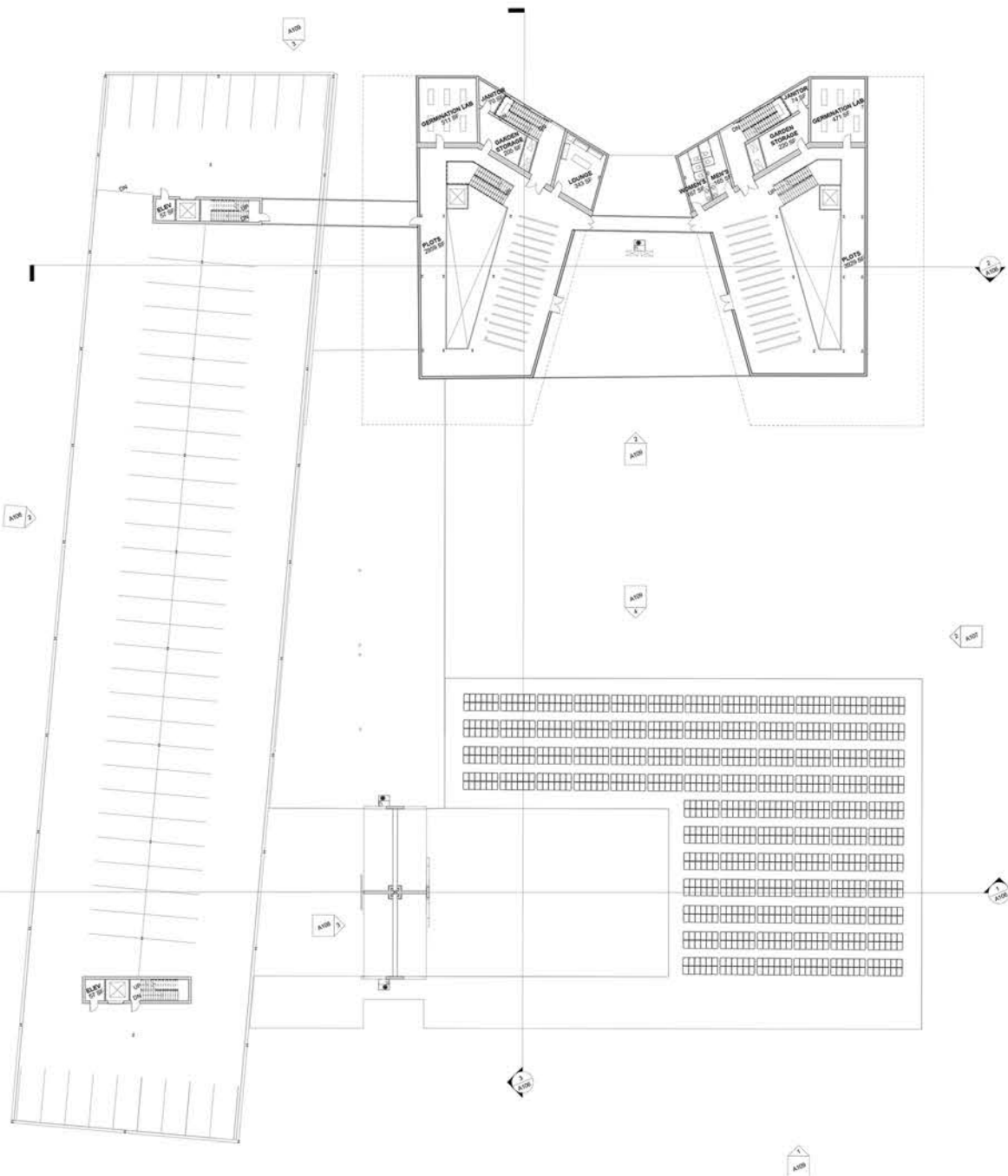


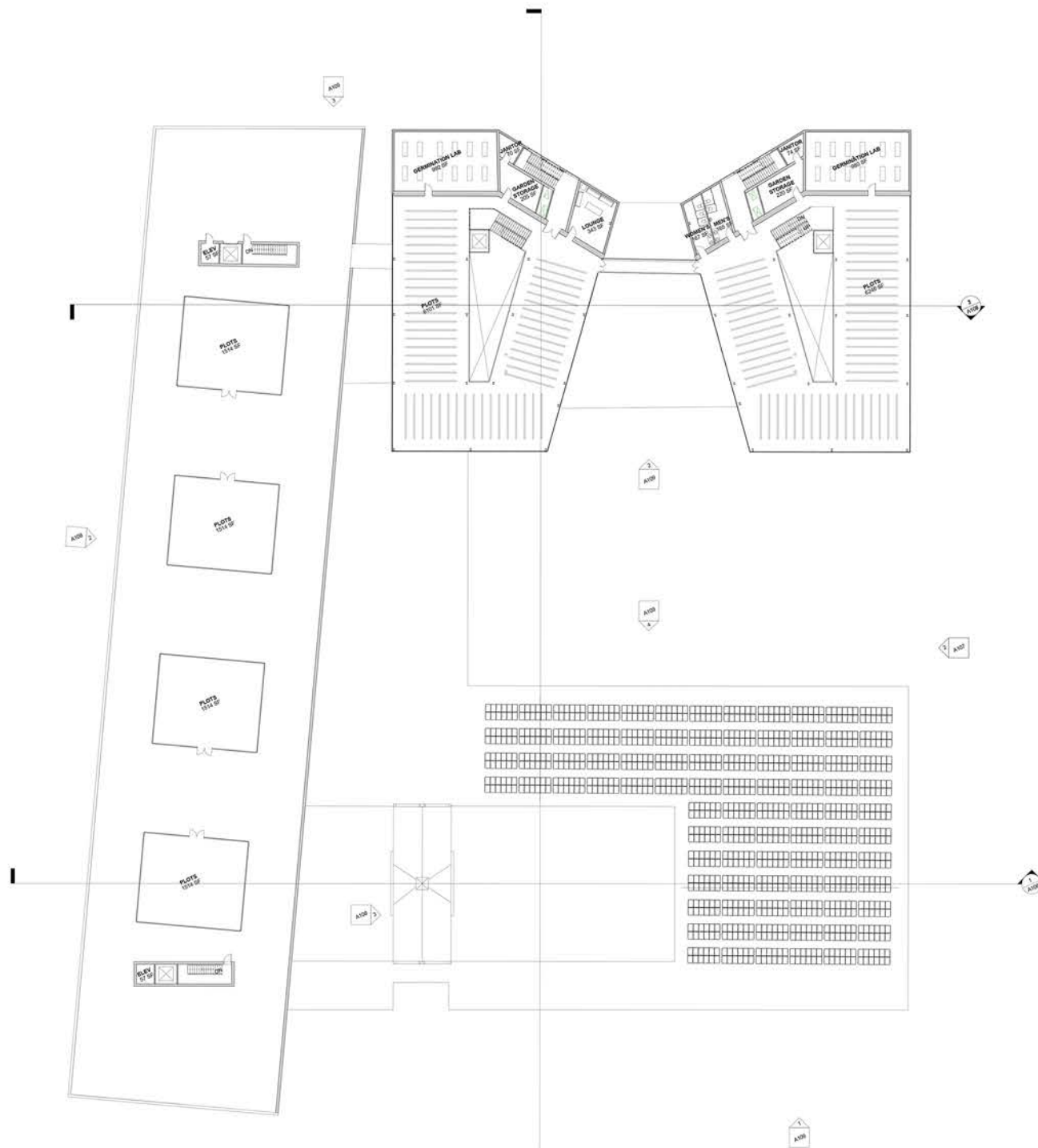
BASEMENT



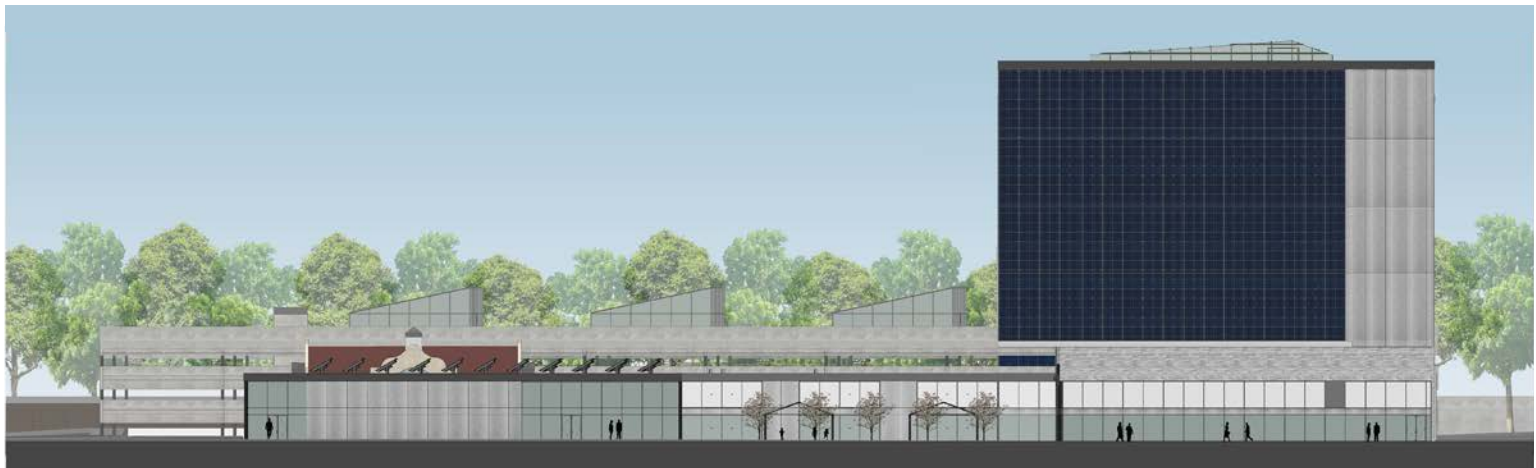


LEVEL TWO CLASSROOMS





1



EAST ELEVATION

3



WEIGH STATION

4



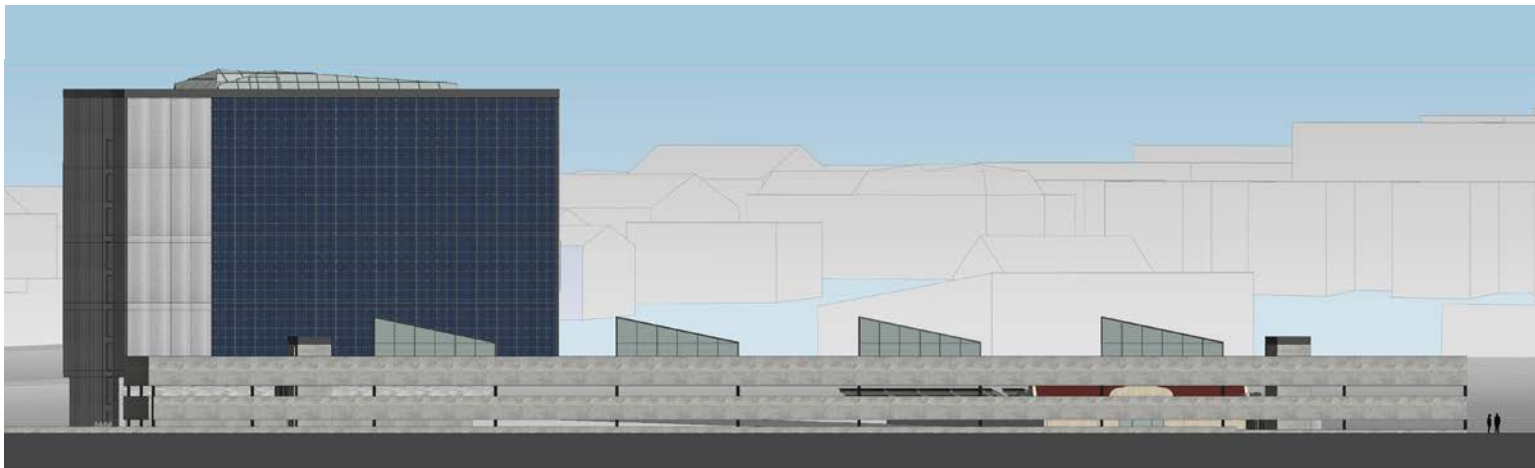
SOUTH ELEVATION

6



NORTH ELEVATION

2



WEST ELEVATION

5



GREENHOUSES

7



COMMUNITY CENTER

1



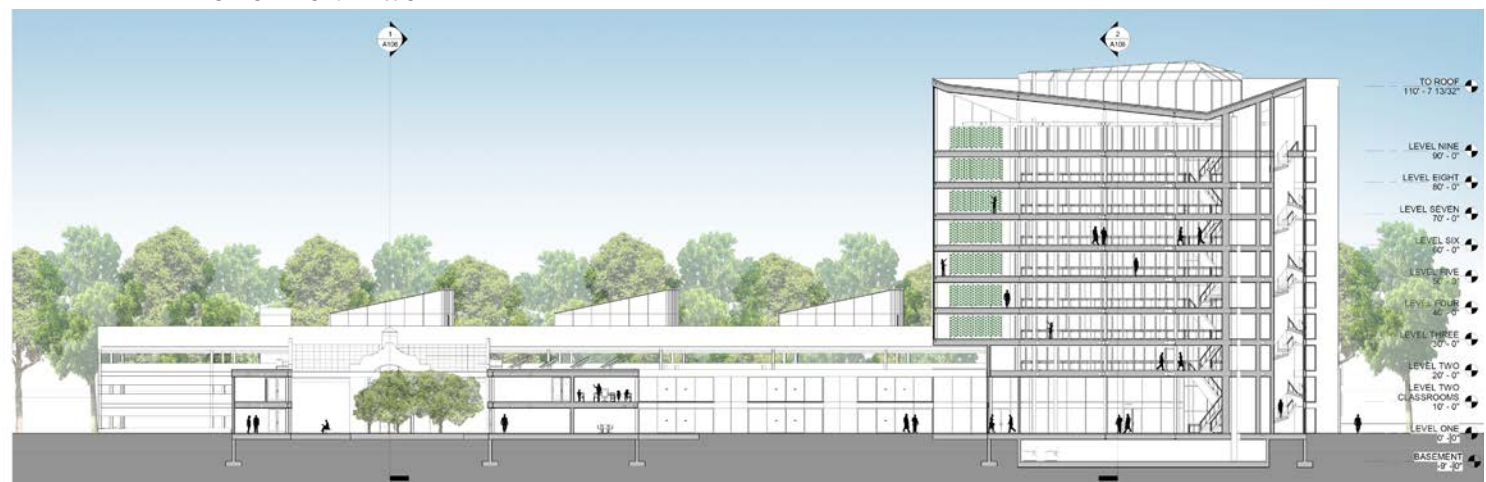
SECTION ONE

2



SECTION TWO

3



SECTION THREE



SOUTH ENTRANCE



MULTIFUNCTION



GREENHOUSE



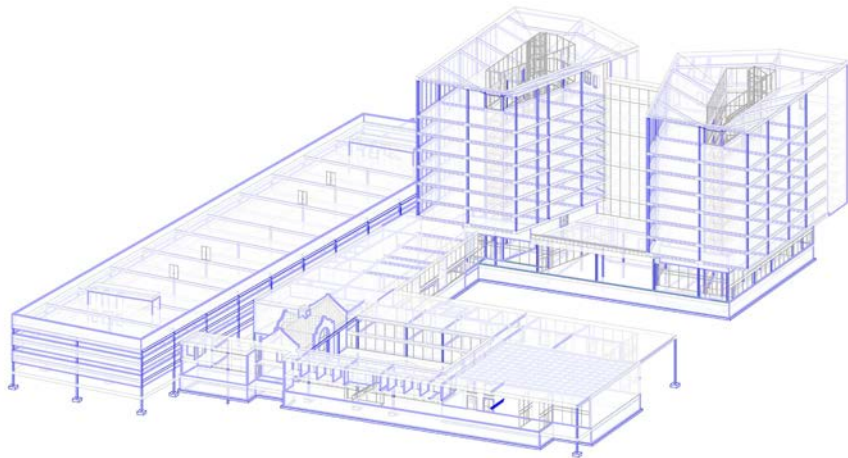
COURTYARD



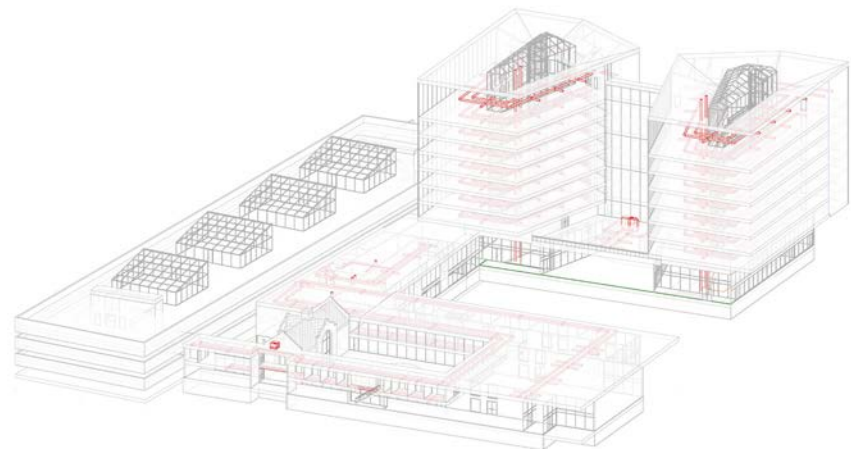
WEST ENTRY - WEIGH STATION

TECHNICAL ASPECTS

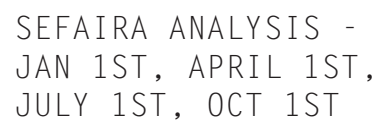
The HVAC system is VAV, and the machine rooms will be on basement level. The building will have a steel structural system. A space truss will span the large multifunction space. The façade for most of the building is a prefabricated steel panel system. However, the garage is precast concrete. The greenhouse towers use the steel panel system along the northern wall, but a solar collecting curtain wall along all others. The system layers solar glass over polycarbonate. These walls help to power the building. Another special feature of the towers is a pop-up skylight over the central void. This area helps with natural ventilation, penetration of sunlight, and also acts as a way to transport rainwater down into two central stormwater tanks. This water will be captured by the pitched roofs, will spill down into the central catchment system, and travel down into the tanks through downspouts. This rainwater will be used to water plants. Lastly, in order to save on heating, there is a 3 ft thick wall insulated with hay separating the growing areas from the service core. These walls capture and retain heat energy during the day and release it into the plots at night. At night, pink grow-lights take the place of the sunlight. These same lights will also be used inside of the germination labs and on the dark-grow floor, which is located on the second floor of north wing, which is the first level of the greenhouses.



STRUCTURE



MECHANICAL (VAV)



CONCLUSION

There is still much research to be done in regards to urban farming, and many obstacles to overcome in terms of implementing it in modern cities. Many times, the idea works out well theoretically, but cannot be realized because certain technologies aren't present, funding isn't available, there are political issues, or there is a lack of interest.

The hope is that by continuing to research precedents and new technologies, and by continuing designs such as these, even if they are “paper architecture”, that one day we will be in a place where urban farming can be implemented more frequently. In addition, perhaps if more projects had robust site and client research, more projects would come to fruition. A large concern is environmental justice, which feeds into the topic of food deserts, and the fact that many areas will need urban farming projects desperately in order to better feed their population.



More architects who design urban farming projects should be considering a whole list of factors, and how their building may impact a community on multiple levels - this goes back to the main goals of the project - health, gardening, education, sustainability, and community. The project in addition was intended to help Schenectady's economy - although this was more of an added bonus. In some cases, the economy may be a main focus.

Lastly, once implementation on a large scale is possible, it may be ideal to create prototype designs that can be replicated in multiple locations, some slightly different than others for reasons of climate, demographic needs, etc. Perhaps one day, urban farming can be a norm, and food deserts can finally be eliminated from the US for good.

- Improve Physical and Mental **Health** of Residents
- Provide Adequate **Garden** Space
 - Research plants and cater designs to their biological needs
- **Educate** Residents On How to Grow Produce
 - Provide lecture spaces for adults and teenagers
 - Provide program for children, and educational experiences at their learning level
 - Provide staff offices
- Put **Sustainability** on Display
 - Technologies maximize efficiency while keeping installation and maintenance costs low
 - Exhibit to showcase why/how it works, (Will be in accordance with climate and culture)
- Improve **Community** Interaction
 - Opportunities for human interaction will be maximized, including event space



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