I, Nicholas Matthews, hereby submit this original work as part of the requirements for the degree of Master of Architecture in Architecture (Master of).

It is entitled:
Re-Utilizing Transit Opportunity: Creating Multi-Modal Opportunity as a Way to Attract Growth in the North Hills Region

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This work and its defense approved by:

Committee chair: Udo Greinacher, M.Arch.
Committee member: Michael McInturf, M.Arch.
Re-Utilizing Transit Opportunity

Creating multi-modal opportunity as a way to attract growth in the North Hills region.

A Thesis Submitted to the

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of the University of Cincinnati

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Masters of Architecture

in the School of Architecture and Interior Design
of the College of Design, Art, Architecture, and Planning

by

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ABSTRACT

The population of Pittsburgh is expected to grow dramatically over the next decade. This influx of people may catch some communities within the Pittsburgh region off-guard, as their potential to attract these new residences and businesses to settle in their area cannot be met because of their lack of adequate regional transit.

The North Hills region of Pittsburgh has a valuable tool in its Route 8 transit corridor. It is comprised of both roadway and potential rail transit that, if used effectively, can give the area a competitive advantage in attracting more residence and business to the area. It will also create better connections between those residences and businesses with the local communities and downtown Pittsburgh. However, the current roadway will not handle the anticipated growth in the region, while the rail transit is not being utilized for public transportation. This thesis examines why the North Hills is not currently in an optimal position to attract new residence within the region, how the North Hills can utilize its existing rail infrastructure to create more conducive areas for business and residential growth, what way the region can develop the Route 8 corridor to create more effective land use and connections with its residential neighborhoods, and why the Route 8 corridor is in a unique position to create dense developments. This thesis discusses how principles of transit-oriented design, new urbanism, and the creation of dense developments improve communal and transit benefits for residences of the North Hills neighborhoods and better connects the area to the greater Pittsburgh region. The thesis contends that re-utilizing the existing rail transit within the Route 8 corridor, which is currently reliant on car-oriented transit for commuter purposes, and creating nodes of multimodal transit opportunities can be a catalyst for increasing the value of the North Hills.
Hills’ communities and produce development and growth within the region.
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RESEARCH:
01
SIX-STATEMENTS

1. Pittsburgh is expected to grow dramatically in population and business growth within the next decade. This influx of people may catch some communities within the Pittsburgh region off-guard, as their potential to attract these new residences and businesses to settle in their area cannot be met because of their lack of adequate regional transit.

2. This new influx of population will settle in the south and west regions of Allegheny County, congregating around the transit Highways of I79, I279, and I376, where car transit is more directly connected to the downtown business district. The Pittsburgh’s North Hills region cannot compete because its transit artery system is less direct than the surrounding communities.

3. A solution for the North Hills is to convert its existing rail transit infrastructure, within the Route 8 corridor, into a public transit system creating transit nodes and developing the areas around those nodes.

4. Utilizing the current rail system would better connect the North Hills regions, without expanding the Route 8 and 28 roadways into the current urban fabric, and maximize the potential land-use.
This project focuses on developing a new transit station along a proposed commuter rail system in the Route 8 corridor. The program for the station will also include residential and commercial use, multiple modes of transportation, and propose how the area around it needs to develop using mixed land use, density, public transit, and elements for a pedestrian friendly walkable neighborhood.

These transit nodes will increase the value of the local communities and aid in the growth of the North Hills population as well as improve the potential attractiveness to businesses looking to settle in the Pittsburgh region.
This thesis takes an architecture view that proposes changing a currently populated region into an area that utilizes multi-modal transit as a tool to generate effective and efficient urban development and economic growth. The main contributing factor for the pursuit of this topic came from my experience while on co-op in Houston, Texas. While working in Houston, I lived in The Woodlands, a residential area 30 miles outside of the city. The Woodlands connected to downtown Houston via Interstate 45, an eight-lane highway with a direct route to the urban core. Even though the distance from my residence was 30 miles, it took one hour and 30 minutes to travel to the downtown area, and one quarter of a tank of gas for a round trip. Shortly after moving to Houston, I learned about a “park and ride” business that was stationed five miles away from my residence, and one of its destinations happened to be just one block away from my downtown office building. The “park and ride” cost $10 round-trip per day, and the trip to my building took 45 minutes. Here I found a system that cost less money, required half the time, and reduced the exhaustion of driving in a congested area that left me stressed and with less energy before I even started working for the day.

Many people like having a car at work for the convenience of travel while at work (to go out for lunch, or the ability to have a car at anytime), but while I was on co-op, I found that I did not require a car while at work, since most service commodities, such as places for lunch, convenience stores, supply stores, or various other commodities could be found within or near my office building. This is part of living in a dense city—most service aspects are within walking distance and rarely require a drive. In fact, I only used my car for local service demands such as buying groceries, taking my clothes to the
laundromat, or getting a haircut, which all were close to my residence, and did not require driving back into the city.
From what I experienced while living in Houston, I refocused my efforts to the North Hills region of Pittsburgh. The Pittsburgh region has been going through a dramatic change over the past decade, and is expected to grow considerably within the next decade. Regional economic groups project the population to increase as much as $\frac{1}{4}$ of a million people by the 2020’s, while the US Bureau of Economics predicts the population to increase $\frac{1}{2}$ million people by 2025.\footnote{Briem, Christopher, and Shirley Cassing. "The Pittsburgh REMI Model: Long-Term Remi Model Forecast for Allegheny County and the Pittsburgh Region and Policy Simulation Methods." \textit{UCSUR}, University Center for Social and Urban Research. 2010. \url{http://www.ucsur.pitt.edu/files/frp/REMI\%201999.pdf} (accessed October 5, 2013).} This influx of people may catch some communities within the Pittsburgh region off-guard, as their potential to attract these new residences to settle in their area may be difficult because of their lack of suitable regional benefits, mostly due to their bleak transit connections to the downtown and surrounding areas. In addition, companies are locating further away from the downtown region. A main reason why the North Hills has recently been unable to attract new population growth (compared to other regions in the Pittsburgh area), and the income that it brings, can be attributed to its lack of adequate infrastructure and transit benefits.
Local population gains

Eleven municipalities in Allegheny County were estimated to show growth of at least 1 percent between July 2011 and July 2012, and nine gained at least 100 people in that period, according to new estimates.

BIGGEST POPULATION GAIN

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<th>Municipality</th>
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<tr>
<td>Franklin Park</td>
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<td>South Fayette</td>
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<td>Pine</td>
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<td>Collier</td>
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<td>Pittsburgh</td>
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<td>Moon</td>
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<td>Ohio</td>
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<td>Jefferson Hills</td>
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<td>Marshall</td>
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<td>Plum</td>
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01.01_Pittsburgh Post-Gazette

01.02_U.S. Census Bureau
PROBLEM:
“North Hills is missing the ability to attract new anticipated residences and businesses due to lack of adequate infrastructure and transit benefits...."
BACKGROUND

This infrastructure/transit problem came to fruition with the increase, and anticipated increase, in Pittsburgh’s population. There are two explanations for this increased migration to Pittsburgh: one, since the 1980’s Pittsburgh has re-branded its market from industrial and manufacturing to a center of technology, biomedical research, and banking, and it has also seen a significant growth in its healthcare industry. Second, there is an explosion of recent investment, by the state, in the fracking of Marcellus shale as a new energy resource for harvesting natural gas and petroleum. This has created an influx of both young professional “white-collar” and “blue-collar” workers into the Pittsburgh region.²

So why is transit important to a region that is trying to attract new residents? If recent history is any indication as to where this new influx of the population will settle, it will be in the south and west regions of Pittsburgh, congregating around the transit highways of I79, I279, and I376.³ Also, because of the influx of growth within the Pittsburgh markets, businesses are competing for more downtown real estate. Four new skyscrapers have been designed or built within downtown over the last six years, yet businesses are still looking for space. Those that can’t find the amount of space required for their companies are locating themselves in the areas of Cranberry Township, the west region, and in South Pointe, the south region. Both areas are located on the outskirts of the Pittsburgh urban region but have direct connections to I79, I279, and I376. The North


Hills is losing most of this new population and business growth to the south and west regions of Pittsburgh, which are further away from the downtown city center compared to the North Hills region. These decisions to locate so far away are due to greater transit access by a direct connection to the city center through the four and six lane highways of I79, I279, and I376, while having similar commute times over a greater, and less congested, distance. Furthermore, the south and western regions have access to public transportation, which includes the west and south Busway BRT system, and a light rail system. Clearly access to transit connections to the region is a big priority to these new young residences and businesses that are looking for easy access to get to work or connect to their business partners in downtown Pittsburgh.

So why is this a problem for the North Hills? What is wrong with their infrastructure? In the North Hills, the only highway artery system consists of a combination of state Route 8 and Route 28, each varying from a two to four lane highway at multiple points. Most of the residence who live near these transit corridors, in particular the Route 8 corridor, will even try to avoid using these corridors because they do not provide a direct link to the downtown area. Route 8 passes through all the connecting neighborhoods along the route. In addition, there are many traffic lights and a lower speed limit that disrupts the flow of commuter traffic. What makes improving the Route 8 corridor more difficult is that it is situated in a narrow valley terrain with steep hillsides on either side, while also having to share space with a railway and commercial areas that follow alongside the roadway. This restricts the development of the Route 8 corridor and keeps it narrow.

The roadway meanders its ways through residential neighborhoods that are
SOLUTION:

“Convert existing rail transit infrastructure into a public transit system creating transit nodes and developing the areas around them....”
positioned on top of the hills overlooking the corridor in the valley. Transit through these residential areas is chaos, culminating in a free-for-all of roads running through the residential neighborhoods and creating indirect routs to the major transit arteries. Furthermore, since many residence’s prefer to avoid the Route 8 corridor altogether, these chaotic roadways are further burdened by the residents who decide, instead, to head through these neighborhoods to get to the more direct I279 highway via the six lane roadway of McKnight Road.

The Route 8 corridor is currently made of light commercial industry with little correlation between its businesses. The businesses within the corridor comprise of fast food restaurants, car oriented industries such as dealerships and maintenance facilities, deteriorating buildings that house locally owned bar/restaurants and small businesses, and sparse residential supply industries such as hardware supply stores and grocery stores. Most of these businesses take up more square footage than what is required for their operations, i.e., more parking spaces than are necessary and more customer capacity than actual customer traffic within the store.

In addition, the North Hills currently has no connection to rapid transit and limited indirect connections to feeder bus systems. Yet, the Route 8 corridor is in close proximity to the downtown business district, and, if there were a better connection to the region, the Route 8 corridor would have good potential to develop its commercial business base. This would also help expand Pittsburgh’s business real estate needs into the North Hills.

A solution for the North Hills’ transit and connection problems is to convert existing commercial rail transit infrastructure, within the Route 8 and 28 corridors, into a
public commuter rail system, creating transit nodes and developing the areas around them into residential and commercial areas. This will increase the value of the local communities and aid in the growth of the North Hills population as well as improve the potential attractiveness to businesses looking to settle in the Pittsburgh region. It can also help organize the flow of commuter traffic, giving the city yet another tool for creating efficient business and economical development. Because of the limited ability for Route 8 to expand its roadway (due to the its geographical makeup and topography), the North Hills area would benefit significantly by extending their connectivity to the Pittsburgh region through expanding the multiple modes of transportation used within the corridor, which would not require addition infrastructure, and by creating and developing commercial and residential areas to coincide with this transit development.
CURRENT ARCHITECTURAL PRACTICES

The idea of creating developments of residential and commercial areas around access to multiple forms of transit options is relatively new in the US, even though its precedents can be seen in the creation of most American cities. As the car-oriented developments (i.e., development spurred by the private car as a primary form of access) of the 1950s start to fall out of favor, the movement towards redeveloping transit infrastructure has been steadily escalating. Part of this escalation can be contributed to some aspects of the “New Urbanism” movement and community planning that tries to re-socialize communities through walkable neighborhoods, mixed-use of residential and commercial development, public space, green space, and community-building.

Proponents of creating dense areas of urban development have also indirectly contributed to these new walkable communities with less reliance on personal transportation. Dense neighborhoods aim to create communal benefits by reducing public infrastructure costs, transportation cost, and environmental costs and increase the communities’ ability to invest in additional public infrastructure projects, such as public transit, parks, healthcare, and education, which will increase the region’s standard of living.

The idea of communities working with transit development has lead to the movement towards “transit-oriented development” or TOD. A TOD neighborhood is typically centered on a transit station or stop that is surrounded by high-density development with gradual low-density development spreading outward from the center. The developments are a mixed-use of residential, commercial, office and retail. The idea is for those hubs that are located in outlying residential communities, to combine housing
“New Urbanists, proponents of dense developments, and TOD advocates cover ideas and goals on how to spur development and generate economic growth.”
opportunities with neighborhood services that can be found outside of the central business district. This is an attempt to encompass residential needs within the transit development and lessen the need for personal vehicle use outside of the mass transit hub. This also creates job opportunities within the outlying communities while still having the majority of career professional jobs located in the central business districts, which can be accessed through linking transit stations. Some stations or hubs incorporate multi-modes of transportation to connect the transit hub with its community. These forms of transportation can include buses that connect secondary centers of the community to the transit hub, cars and other personal vehicles, bikes, and pedestrian walkways.

New Urbanists, proponents of dense developments, and TOD advocates have published numerous reports in an attempt to illustrate best practices, and lessons learned from the past. They cover ideas and goals on how to implement mixed land use developments, multi-modal transportation hubs, development of public spaces, and dense developments of neighborhood cores, thereby creating attractive, lively, and pedestrian-friendly communities that are spurred by development of multi-modal transportation.
LITERATURE REVIEW


Hank Dittmar and Gloria Ohland’s book *The New Transit Town: Best Practices in Transit-Oriented Development* is a text for an updated look into rediscovering transit-oriented land use patterns as an alternative to the past generation’s use of sprawling, traffic congested development patterns. In other words, this book sets up principles of transit-oriented design (TOD) that combat urban sprawl by implementing developments centered on public transit. Hank Dittmar is the Chairman of the Board of Directors of the Congress for the New Urbanism. Gloria Ohland is a founding member of the Center for Transit-Oriented Development. The first half of their book discusses the “concepts” of TOD, such as its goals, its role in urban planning, and its performance-based design (which include the resolution between “nodes” and “place,” making of place, value capture, mixed-use choices, and location efficiency). It also includes the different “dimensions” of TOD, such as urban design, transportation planning, land use, and the professions involved with each dimension. The second part of the book offers case studies as a first pass of implementing developments centered on transit programming. Multiple case studies present urban situations that make use of public and rail transit.
Lessons learned from these examples establish guidelines of design for future transit-oriented design projects, as well as give approaches to the implementation of transit-oriented design.4

The initial chapters of this book discuss what makes up transit-oriented design, and outline the principles behind TOD. Because each neighborhood or community within our urban region has its own unique attributes, understanding TOD goals and their scope helps give a clearer picture of how to create proper developments that differ from place to place. Hank Dittmar and Gloria Ohland’s book recognizes that a “one-size fits all approach” to TOD will not create an effective development; each community is different. The book distinguishes six general typologies--urban downtown, urban neighborhood, suburban town center, suburban neighborhood, neighborhood transit zone, and commuter town, which create a base of rules and principles for designers to build from, but still do not limit the rules of implementation of a neighborhood or community because not all practice may work well within each one. It is very helpful to understand which neighborhood typology surrounds the area to be developed, and how to initially start the design process.

The second theme in the book is the idea that each neighborhood development must function as both a neighborhood that is attractive and communal, or “place,” and it must be a point of connection to the rest of the region, or “node.” New developments must blend these aspects together to be successful. This broad understanding allows for a wide-ranging view of the how development can be created along Route 8 but still keeps a limit on what principles are to be achieved. Overall, this book helps set up-to-date ideals

from lessons learned from the past, and can provide a progressive vision for this thesis.

A Country of Cities: A Manifesto for an Urban America

Vishaan Chakrabarti’s book, *A Country of Cities: A Manifesto for an Urban America*, illustrates how we should intelligently design our cities of the future to increase job opportunities as well as create sustainable living and healthier environments within our urbanized regions. This is the first time since the 1920’s that America’s urban centers are outpacing their suburban regions. The book argues that even with this new rediscovery of the city, the country is still geared towards suburban development through social ideals, misconceptions, and public subsidies. This type of lean to a suburban ideal has lead to much of the problems that the United States has faced in the past few decades, including obesity, environmental change, increased mortgage debt, car dependency, increased healthcare costs, and wasteful public spending. Chakrabarti’s book reveals how much more productive our dense urban areas are in growing the nation’s GDP compared to the sum of GDP by sprawled growth that is common throughout the nation. If we reevaluate the way we focus on developing our urban regions, our cities can become catalysts in leading the way into a more progressive and wealthy future for our nation.5

A Country of Cities is full of informative research and persuasive information that promotes building dense, multi-use, and walkable areas as well as defining reasons for investing in public infrastructure. One of the most significant contributions of Chakrabarti’s book is its diagrams. The diagrams provide a visual mapping of benefits and arguments on how the ideals of dense neighborhoods can be achieved. It provides the reader with an insight to what type of new lifestyle our future cities can have with dense developments and multiple forms of transit, and the benefits that they achieve over the current choices the American citizen has in the present suburban context. The book also does not choose one style of living over another, but insists on providing more options and choices for the future American city as a means to grow the standard of living and regional economies.

Yet, one of the drawbacks of A Country of Cities is its Utopian-like outcome that asserts its product will generate successful, livable cities. Countless writings and idealistic experiments of the ideal city, similar to the ones presented in this book, have proven in the past to be less successful when implemented in reality. Yet A Country of Cities’ key assertions are the engagements in the social and political problems that have lead to the current urban climate of less dense, more sprawled-out areas that the American infrastructure finds itself in, and why we must bring these problems to the forefront and change them. The book overall looks at the public and private sector challenges towards transit, density, and consumption and how they can be resolved through the future growth of the American city. This thesis uses much of the arguments that are diagrammed in this book to help persuade the assertion that a design providing multiple options in the forms of transit and dense developments are needed to give the
American citizen better value and convenience in his transit ability as well as increase the neighborhood’s value and standard of living. This book also helps emphasize why the city itself can see benefits in promoting the production of dense surrounding communities and the benefits in investing in regional public transit.

Planning for Transit-Friendly Land Use, A Handbook for New Jersey Communities

Planning for Transit-Friendly Land Use, A Handbook for New Jersey Communities is a handbook published by United States Federal Transit Administration, with cooperation from consulting firms Skidmore Owings & Merrils, a leading national architectural firm, and Lehr & Associates, a civil engineering firm. The handbook includes practical examples and currently used tools that address all modes of transportation for transit friendly development. The book outlines strategies, implementations, and techniques to improve transit planning and developing land use to create communities that incorporate more transit and pedestrian-friendly environments. It is geared towards educating planning officials, review boards, and the general public in how to create development around transit hubs that is clean, safe, lively, and active. The book states that transit stations should support the identity of its neighborhood; it contains critical features that need to be included in the station and its surrounding developments.
These features include access to the hub that is clear and direct, pathways for safe pedestrian access, and creation of comfortable spaces for meeting and waiting.

Development of the surrounding neighborhood should be a mix of land use that includes retail, housing, employment centers and major destinations that are interesting to the community’s inhabitants. The development priorities of that context should be based on the type of community where the station is based (i.e., outlying suburban community versus central urban business district). None the less, the development should include services close to the transit hub that help eliminate the need for making additional stops during a trip, such as daycare or dry cleaning, and well-lit areas that help direct transfer between the different modes of transportation. The overall environment of these stations and developments should be active, human-scaled, and visually diverse, where people are encouraged to walk and rest.6

Although, it was initially created for the use of development within New Jersey, this handbook is a useful tool in setting up guidelines on how to develop a location of urban context that already exists. The handbook uses general ideals, rather than situation details of the New Jersey communities, which helps make it a useful tool outside the state. It recognizes the different types of urban communities and acknowledges that not all the communities require the same type of development. The handbook uses charts and diagrams to help a user locate and determine the type of context he is working with, which is crucial for establishing the best practices to use. It also is geared toward those that have little initial knowledge of the subject of creating transit hubs and what is needed to make them successful. This gives a broad base of design principles to work from

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when considering land use development and the situational aspects of a neighborhood that give it unique qualities. Some issues of using this handbook arise when it starts to generalize community types without taking into consideration that different communities might be made-up of their own unique situation and problems that would not relate to others of the same type. So, again, the premise of using this resource is the broad view it has on developing the transit station, and creating guidelines, rather than rules, from which to work.

The TCRP Report 102: Transit-Oriented Development in the United States

The TCRP Report 102: Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects provides a comprehensive assessment of the state of the practice, and the benefits of transit-oriented development (TOD) and joint development throughout the United States. The report is meant to be helpful to transit agencies, the development community, and local decision makers considering TOD. It is written by the Transit Cooperative Research Program (TCRP), which includes three cooperating organizations: the Federal Transit Administration (FTA), the National Academies, and the Transit Development Corporation, Inc. (TDC). Chapter four of the TCRP report focuses on implementation of TOD programming, and tools that can be
used by public entities with private interests. First, the chapter briefly describes different techniques implemented that have proven successful for TOD, which include Stockholm’s “Finger Plan,” Copenhagen’s “Planetary Cluster,” and, one of the US’s more successful use of transit-oriented design, Arlington Virginia’s “Bull’s Eye” plan. These programs are set up through the use of regional zoning practices, which must embrace compact growth, provide pedestrian orientation, and accommodate mixed-use development. The report asserts that research suggests density gradients decay exponentially with distance from a station and density gradients maximize ridership (i.e., keep the most dense areas closer to the transit station). Lastly, the chapter goes on to discuss implementing tools that can be used to spur transit-oriented development. Such tools consist of direct grants or loans, assistance with land assembly, relaxed parking standards, streamlined development reviews, and “other mechanisms that encourage developers to undertake projects that might not fit their usual business model.”

This chapter is also successful in describing how the development of transit-oriented design requires appropriate zoning initiatives as well as implementing tools such as incentives and regulations to encourage TOD growth. The key is understanding the types of programming that are considered ideal for transit-oriented developments, which include apartments, townhouses, single-family residences, banks, professional businesses, retail stores, offices, and childcare centers. According to the report, the focus is to create activity that spurs more communal growth in TOD, such as housing and convenience shops. The report reviews the implementation of incentives and regulation which aids in the understanding of what public agencies are looking for, and what they need when it

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comes to creating transit-oriented developments. What appears to be the theme, and what the chapter overall states, is that money is the most important resource that respondents from the local public sector levels need--“specifically for strategic station-area planning, infrastructure, and on-the-ground improvements.” Upfront capital, and state and federal investment are critical factors in spurring growth of TODs. It is critical to know the principals of planning for TODs, how they should be laid out, what should and should not be included, and ways of creating partnerships with private and public agencies in order to create interest for developments.
For more than 30 years, Arlington, Virginia has been one of the best transit oriented design models in the US. Since the 1970’s it has become an increasingly popular place to live, work, and shop due to its high density developments along the Rosslyn-Ballston transit corridor, part of the Orange Line of Washington D.C.’s Metro rail rapid transit system, or subway. Of nearly 190,000 people who live in Arlington, 26% reside in Metrorail corridors even though they make up only 8% of the land area. To do this, Arlington County implemented many tools, such as an illustrative general land use plan (GULP) which created the famed “bulls-eye” planning scheme that promoted higher-density development and integrated “mixed-use” designations to zoning.

Specifically, the Ballston Station development, one of the high-density developments that is situated within Arlington’s Rosslyn-Ballston transit corridor is particularly instructive. Ballston Station combines the transit-oriented design ideals of density, mixed-use development, and multi-modal connections between the transit hub and users’ residences. TOD enthusiasts see these types of ideals as superior urban patterns as opposed to “sprawl,” which is produced through car-dependent communities. Ballston Station, to promote the overall ideal of Arlington County’s TOD vision, includes incorporating affordable housing options to insure the full potential of the workforce for sustaining Arlington’s economy, and adopts open space policies to recognize the importance that greeneries, parks, and other open spaces have on the quality of life in the community. Outstanding transit access, coupled with connecting thoroughfares, ensures that trains, buses, private cars, and pedestrians can easily reach neighborhoods that
“40% of workers in Ballston commute via public transportation.”
surround the Ballston Station using multiple modes of transit. Public outreach and community involvement were critical in keeping the public informed and involved in the transit development process. There was a public demand to create access to the Metrorail by multiple modes of transit, including car, although most customers were expected to take advantage of bus, biking, and walking which was encourage by the new, pedestrian-friendly designs of the developing communities. The Station itself has steadily seen an increase in ridership for the past 30 years. Approximately 40 percent of workers in Ballston commute via public transportation. Staggering growth in developments near the transit stop has been witnessed for the past four decades. Nearly one million square feet of retail space and over seven million square feet of office space have been created around the Ballston station, as well as housing, which has risen by 6,900 units in the last three decades.8

Ballston Station, as part of Arlington County’s TOD vision, is a prime example of TOD best practices on America’s east coast. Overall, Ballston Station shows how properly planned developments around transit nodes can generate businesses and residential growth in areas with direct connection to urban cores through the use of transit that is not car dependent but rather multi-modal and multi choice. Its design focuses on connecting the transit hub to its base community through the use of new development and revitalization of under-utilized land use. The Metro station becomes the direct linkage to the urban core and surrounding neighborhoods, rather than the personal vehicle. Unfortunately, Arlington County itself is also suffering from some retail leakage, meaning the County is losing potential retail consumers to neighboring cities that are

supported by car development. Although new retail centers within the County that combine pedestrian-friendly, transit-oriented design with automotive access for regional customers have yielded positive results, there is still some loss in retail potential. Some questions that arise are: should a complete phase out of automobiles be so heavily implemented at a quick pace, or should it be phased out slowly with pre-established neighborhoods? What methods have seen the most success with this phasing out of automobiles while losing the least amount of retail and development potential? And, is their a way to create “traffic calming” that restricts the use of cars enough to give the “main street” of urban neighborhoods the pedestrian superiority that is similar to those seen in rural town centers?

**Orenco Station, OR**

One of the most recent massive public transit projects undertaken in the past half-century happened in Portland, Oregon, which invested $214 million in a new light rail system, known as MAX, to connect its east and west rural suburbs to its dense downtown core. Many of these sprawling suburbs lacked neighborhood cores where the transit line could connect to the regions population. Because of this, designs for dense developments around these new stations where proposed to coincide with the new construction of the light rail line. Since its establishment, more than $8 billion of new development has occurred in light rail station areas. A study of the MAX light rail stations found that development occurring after light rail investment has an average development density or Floor Area Ratio (FAR) of 0.65 more than the average FAR for development outside of station areas. This means that for every 1,000 square feet of land area developed, station

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“...planned development around multi-modes of transit **ATTRACTS** residences to these areas...”
area tax lots realized an additional 650 square feet of building area. The rate of development within MAX light rail stations are 69 percent higher than elsewhere within a one-mile major transit corridor. Applied across the region, savings on transportation costs were substantial. Residents of the Portland region on average travel four miles less each day than those in comparable cities in the United States. That means the region drives 2.9 billion fewer miles and saves $1.1 billion in travel costs (fuel, vehicle wear and tear, insurance, permits, etc.) annually. The value in annual travel time savings is estimated to be $1.6 billion.\(^{10}\)

One specific development along the MAX’s Blue Line, which connects the western suburbs to Portland’s urban core, is the Orenco Station in Hillsboro. The previous site was mostly comprised of rural farmland and sprawled suburban housing. Design for the development around the station started in 1993, while the light rail station itself opened in 1998. At 199 acres, Orenco Station is the largest master-planned community on the MAX system. The master plan provides additional housing for 4,000 Hillsboro residents in 1,834 single-family homes, townhouses and apartments. Further independent developments south of the master plan, but adjacent to the MAX station, added even more additional housing units. The master plan is designed to capture the essence of small-town business and residential districts with traditional neighborhood services, retail shops below apartments, small residential lots with front porches and minimal setbacks, and well-distributed parks and open space. Since the implementation of the design for Orenco Station, retail and commercial square footage has increase by 60,000 square feet, and the population has grown six times that of its 1990 population

total (as of 2010). The residential population continues to see growth even during the recession of 2009. Prior decades had only increased at a growth rate of 1.5 times the previous decade’s population, showing that planned development around multi-modes of transit attracts residences to these areas. Orenco has much higher density than is typical for the American suburbs, up to 25 units to the acre, and 67% of Orenco Station residents report using mass transit at least once a week.\textsuperscript{11}

Orenco Station, and the other planned developments around the MAX Light Rail system, are good examples of TOD principles in America on the west coast. Yet, the Orenco Station development does have drawbacks, namely that much of the development is too distant from rail station, even though it is within walking distance. The designed “town center” is oriented to the Orenco Parkway, a car-oriented corridor that runs parallel to the rail line and straight through the development. The roadway divides the residential area from the retail area, which is connected closer to the station. The development does not center on the station, and creates an emphasis of a community that is more “transit adjacent” rather than “transit oriented.” This can be seen in many “west coast” TOD examples where the master plan for the development is not implemented as designed, creating controversy over the successes of promoting better use of the multi-modal transportation opportunities. The question that arises from this study is clearly--what would the living prospects and lifestyles of the residences have been if the development were better situated toward the light rail station?

In the 1960’s Pittsburgh had one of the nation’s largest light rail transit networks. By 1964, when the system was acquired by Allegheny County’s transit organization, the Port Authority of Allegheny County (PAT), much of the light rail system was carved-up in favor of a bus system and car occupied roadways. Only two lines still exist from the previous light rail system, the Blue Line and Red Line, which both serve the South Hills region of Pittsburgh. The South Hills is comprised of dense suburban sprawl with various commercial areas located throughout the suburban neighborhoods. The light rail system, commonly known as “the T,” uses stations situated in residential neighborhoods with no additional plans for urban development around those stations.

The “T” is a great form of transit for those residents who live close to the transit stops and can utilize the system as an option for their commute. Local residents exclaim about their commute using the “T”, “I know what time I’ll get there, and that’s very important to me. I think it has great value to the city.” 12 It is cheaper to ride the “T”, usually around $9 round trip, than it is to pay for downtown parking, average $10 for a full day. The time it takes to commute during rush hour is faster riding the light rail system (40 minutes compared to 30 minutes) but the system is slower during off-peak traffic hours. The “T” rail transit system is a very valuable tool for the South Hills community; however, because its stations are mostly located in areas of low density, it does not effectively support the whole region. 13

One of the stations along the T’s Blue Line is the South Park Station located in

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“Pittsburgh has *always had a light rail presence*, and there are many communities that still have residences that grew up with light rail transit.”
Bethel Park. The Station was rebuilt in 1987 and saw steady growth within its population until the 1990’s when Pittsburgh’s stalled manufacturing industry, and the collapse of the steel industry of the 1970’s produced a population migration away from the region, and started to affect the South Hills suburbs. At first the South Hills, and the neighborhood around the South Park Station, were able to support themselves during the economic downturn through the regional transit amenities that allowed the population to have a greater connection with the downtown area and business prospects. Yet, much of the commercial fabric around the station remained light in its development, with little additional business services to help spur the declining neighborhood. The businesses themselves vary in the types of customers they try to attract, as tire stores are situated near flower shops. The residential area also added little to the ability of the area to offer a diverse opportunity for different domestic lifestyles, and was made up of mostly single-family homes. With a lack in housing diversity and service opportunity, the neighborhood around the South Park Station began to lose the already limited population to other parts of the city that offered better living opportunities.

Pittsburgh has always had a light rail presence, and there are many communities that still have residences that grew up with light rail transit. Much of the transit lines can still be seen throughout the region, and some of the lines are still in use today. The South Park Station is an example of the past presence of the light rail system, but the area only sees the system as a commuter option, and not as a potential development tool. The area itself is not conducive for new development since much of the land is already developed into private residential homes. There is little room for a new built program, yet the opportunity still exists. The question here is: is there an opportunity to use the existing
transit amenity as a tool for attracting future development and population growth, rather than just a commuter option for those residents who already live around the Station?
BACKGROUND SUMMARY

Transit is one urban resource that makes a significant impact on the growth and stability of our cities and their communities. Having development that can make the connection from living space to the work place through multiple modes of transit, and generate growth within the region, is critical to the success of our local economies. It is also critical that these developments are to a pedestrian scale, and allow for more interaction with neighborhood residences outside of personal vehicle usage. These developments must also foster thriving neighborhoods and build social and active communities that enhance the standard of living of their residences. These factors are driving forces behind transit-oriented designs and New Urbanism principals.

Furthermore, creating density in neighborhoods will not only enhance the lifestyle of the neighborhood residences by situating amenities within walking distance or shorter trips, but also lower infrastructure costs to local governments and residences. Dense developments also increase the amount of public amenities available to neighborhood residences, such as transit, healthcare, education, and green space. Elements such as multi-modal transportation hubs, mixed-use developments, creating dense neighborhood cores, and creating attractive, lively, and pedestrian-friendly communities can be seen in the literature and precedents. A strive for developments that encompass one or multiple elements is presented in many of the book reviews and case studies, such as the proposed redesign of urban “gray fields” in Peter Calthorpe and William Fulton’s, *The Regional City*, or the development of multi-modal access to the numerous stations hubs within
Arlington County.\textsuperscript{14} It is key that these elements are adjusted and work together with the neighborhood context to develop the most effective and efficient land use, and create the most life within the neighborhood, for the environment of their communities.

**THESIS**: Re-utilizing existing rail infrastructure can be used as a tool for directing residential and commercial growth within the urban fabric.
The North Hills region of Pittsburgh has a valuable tool in its Route 8 transit corridor. It is comprised of both roadway and potential rail transit, that, if used effectively, can give the area a competitive advantage in attracting more residence and business to the area, as well as creating better connections between those residences and businesses with the local communities and downtown Pittsburgh. However, the current roadway will not handle the anticipated growth in the region, while the rail transit is not being utilized for public transportation.

A solution for the North Hills is to convert existing rail transit infrastructure into a public commuter rail transit system, creating transit nodes and developing the areas around each node. Pittsburgh comes from a strong industrial past, mostly comprised of steel manufacturing in the early 1900’s. In order to sustain their industrial production and move its supply, Pittsburgh required an infrastructure of railways that moved both product and commuters in and out of the Pittsburgh region. Within the North Hills region, a major network of rail systems still exists today, running parallel to the Route 8 Highway, but it is currently only utilized for freight operations. Re-utilizing existing rail infrastructure for commuter purposes within the North Hill region can be used as a tool for directing residential and commercial growth within the urban fabric towards the Route 8 corridor.

This creation of a commuter rail system with the existing railway is a way to create multiple modes of transportation options in an area, which is currently dependent on one form of transportation (the personal car), without having to add more to the area’s
infrastructure. The transit infrastructure would consist of converting the Allegheny Valley Railroad system, currently running along the Route 8 corridor, into a commuter rail system, connecting Allison Park, Glenshaw, Etna, Sharpsburg and Millvale to downtown with potential connections to Oakland, North Park, Valencia and Mars. Similar commuter rail projects are currently being implemented in the eastern neighborhoods of New Kensington, Oakmont, Verona, and Lawrenceville whose current population is being strained due to a lack of mobility from its added congestion on the overloaded Route 28 corridor. This proposed commuter rail project in the North Hills would add to the eastern region’s commuter rail system to connect to downtown and grow the North Hills connection to those eastern neighborhoods. Because the rail already exists, there would be no need for expanding or rebuilding the Route 8 roadway to create a more direct connection to the downtown business district. Utilizing the current rail system also means that there would be no need to elevate Route 8 to bypass the linking neighborhoods in order to make the area more directly accessible to downtown Pittsburgh. Nor would this require any demolition to the current urban fabric. If Route 8 had to be expanded, it would cause further isolation of the neighborhoods along the Route 8 corridor from their residing communities, much like I279 and I376 currently do by creating an uncrossable six-lane sea of transit.

So why not just rail, why is development also necessary? Rail nodes themselves can grow population and business interest in the area, but cannot sustain it, so properly planned and designed developments must be made around the transit node. Earlier precedents have shown that unplanned, or improperly planned developments around these nodes can generate non-cohesive businesses sprouting up next to each other, which
lead to underdeveloped commercial areas. Residences around the node may also develop with a less optimal connection to the transit node, due to obstructions in the urban fabric or due to greater distances away from the stations, thus creating a decrease in the potential of ridership with the transit system and further isolating the residences of the community. This creates light, less dense, commercial and residential areas, limiting the amount of productivity the surrounding area has to offer. Properly planned developments can be designed to create dense developments that maximize the potential land-use and community value by creating coherent commercial and retail establishments with a better connection to the area’s residences and its transit station. Additionally, as previously stated, the Route 8 corridor is in close proximity to the downtown business district, and, with a better transit connection to the region, the Route 8 corridor has potential to develop its commercial business base that would also be optimal in expanding Pittsburgh’s business real estate needs into the North Hills.

Furthermore, the Route 8 corridor may be the most conducive for potential dense development compared to other residential and commercial areas of the Pittsburgh region. What makes Route 8 unique is the fact that it lays within the river valleys of the North Hills topography. On either side of these valleys are steep hillsides, which restrict the development of the Route 8 corridor, keeping it narrow, following the rail and roadways. There is great land-use potential for this corridor to develop into dense developments considering that the additional commuter rail transit system will not infringe on current limited buildable space within the corridor. There is increased accessibility to the corridor through newly created sites that develop around the transit stations. If transit nodes are created here, the consequential development will have to
remain tight around the transit station and develop vertically due to the topography constraints within the valley. If these transit nodes develop vertically, they have the potential for connecting the older residential neighborhoods on top of the hills with the transit station within the corridor, further increasing the connectivity of the North Hills communities with the downtown market of Pittsburgh.
FOCUS

The project will focus on the development of a station, or hub, in one of the proposed sites along this new commuter rail system. The purpose of this transit station is to incorporate a new form of transit into the context of an already established urban neighborhood. Connecting an outlying community to its urban core, through the use of a new transit hub, will create more interest in that community by public and private officials, resulting in stakeholders who are now invested into the area’s, and project’s, future outcome. Also, the project will increase the neighborhood’s interest into the site’s residential and commercial areas. The residents can be involved in the development of their own neighborhood elements, such as revitalization of green space and public space, which might not have been afforded to them without the new investment of a transportation hub. A regional goal will be to show how to create urban communities, along the Route 8 corridor, that are more conducive to creating dense programs with better neighborhood amenities. The development of these sites will aim to create communities that promote the continual creation of dense urban cores through the success of a highly connective and efficient transit system. The project’s goal will be to help promote a more efficient and productive future for the pre-existing urban neighborhoods and outlying communities, as well as staying sensitive to the environment and livable nature that those neighborhoods might already possess.
OUTCOMES

This project will produce a transit station within a chosen site along the proposed commuter rail system, whose program will include residential and commercial use within the station, and can utilize multiple modes of transportation. This project also proposes how the area around the transit station needs to develop using mixed land use, density, public transit, and attributes for a pedestrian friendly walkable neighborhood. The idea of integrating this new transit station with existing rail infrastructure in the North Hills community to create multi-modal transportation within the area, while surrounding it with mixed-use development, is key to the architectural focus of this project. Those elements are the driving factors in increasing the development and attractiveness of the Route 8 corridor. The multi-modal program of the transit station will encompass parking for cars, car and potential bus lane access for dropping off and picking up commuters at the station, pathways for safe pedestrian access, travel by bike, and comfortable spaces for meeting and waiting. The transit station must look aesthetically pleasing at street level and have clear entrances and circulation for efficient use. The program of the station must be well defined, with areas for residential development, commercial office space, and retail that support the users such as coffee shops, convenient stores, or bike repair. Other user neighborhood amenities, such as groceries, green space, recreational space, and restaurants will be part of or adjacent to the station program, or may be built within the neighborhood context.

The broader goal for this project is to show, through the success of the North Hills project, that greater implications for the Pittsburgh region to re-utilizing existing rail infrastructure, already spread throughout Pittsburgh, and how it can be used as a tool for
directing residential and commercial growth within the urban fabric. The North Hills can serve as a model for the Greater Pittsburgh region to build from while leading the movement to a more multi-model lifestyle for its residence and businesses. This will further grow Pittsburgh’s regional economy, increase the city’s ability to compete for business nationally and globally, and improve the standard of living for its residences.
FINDINGS/DATA: 02
SITE/CONTEXT

CLIMATE CONTEXT

Pittsburgh lies in the transition between a humid continental and humid subtropical climate (Köppen Dfa/Cfa), although it lies much closer to the former. It features four distinct seasons, with precipitation somewhat evenly spread throughout the year. Summers are hot and humid (with occasional heat waves), while winters are cold and snowy. Spring and autumn are generally unstable yet mild.

According to Norbert Lechner’s book, Heating, Cooling, Lighting, the Pittsburgh region belongs in climate region 3. Top priorities of this region are: keep heat in and cold temperatures out during the winter, protect from cold winter winds, and let the winter sun in. Other priorities of this region are: keep hot temperatures out during the summer, protect from the summer sun, and use natural ventilation for summer cooling.

The Pittsburgh region receives the most natural sunlight during the late summer months, when direct heat gain is in the least demand, and it receives little natural sunlight during the winter months. It is during the winter months when the sun is lowest in the sky, that there is a need for direct heat gain to passively heat a space. During the summer months, when the sun is highest in the sky, shading can help passively cool a space, and require shorter overhangs from buildings.


02.01 Köppen Dfa/Cfa

02.02 Region 3 Climate Zone
The Lechner Climate Chart illustrates the basic climatic condition, temperature, relative humidity, and wind speed for a specific location.

- **BASIC CLIMATIC CONDITION**
  - Comfortable period: 14% of the year
  - Too hot: 20%
  - Too cold: 66%

- **TEMPERATURE**
  - Range of comfortable temp.
  - Afternoon maximum temperature
  - Average daily temperature
  - Morning minimum temperature

- **RELATIVE HUMIDITY**
  - Average morning humidity
  - Average afternoon humidity
  - Range of comfortable humidity

- **WIND SPEED**
  - Mean daily wind speed
  - Wind speed for effective natural ventilation

For wind direction, see the wind roses on pages 42-45.
SITE

This thesis proposes a commuter transit system that reutilizes existing rail infrastructure within the Route 8 corridor containing various sites and stations along the railway. One site will be utilized for the design of the transit station and the development of the land around it. The chosen project site is located at a proposed transit station at St. Ursula’s Church, located in Hampton Township. This site includes the Route 8 roadway, the existing Allegheny Valley railway, the Pine Creek riverbed, and the residential neighborhood surrounding St. Ursula’s Church and School. The site’s access to the Route 8 corridor, as well as its proximity to the existing Allegheny Valley Railway, makes it ideal for showing multi-modal transit options integrating with the pre-existing auto-oriented infrastructure.

St. Ursula Station sits in a valley carved out by the Pine Creek River, and is surrounded by a hilly terrain on three sides. It is comprised of mostly residential neighborhoods located on top of the hillsides, a recreation field, some blighted properties, and undeveloped cleared lots. St. Ursula’s site sits on Duncan Avenue. Most people approach St Ursula’s site in one of two ways. The first one is from the main transit artery of Route 8, turning at a traffic light adjacent to a gas station on to Duncan Avenue, a smaller local roadway. The second way is by coming down the hill on Duncan Avenue and straight through the site towards the Route 8 corridor.

This proposed site is better than other sites because more features can be included in the development of the proposed station. The St. Ursula’s site has the most potential in creating an all-new transit hub that can make use of a development that incorporates retail, commercial, and a variety of residential housing types. It has plenty of underdeveloped spaces and has a good connection to the less dense neighborhoods of the
community, which can help promote the suburban use of the transit hub.

Creating a network of pedestrian paths and bike trails to connect the less dense residential developments to a transit hub would provide a benefit to the surrounding neighborhoods by enabling them to travel short distances without the use of their private automobiles. The programming of the site will incorporate major additions of recreational features, green space, retail for local residences to buy goods and services such as food, laundry, and clothing, and supply retail such as groceries and hardware. Commercial frontage for local and small businesses would be incorporated to give more premium frontage facing the new transit hub and Route 8 to these businesses. A dense residential development would allow for further access to the proposed site by residences, lessening the need for private vehicles for commutes and service trips. There is also potential, at this site, to exhibit a design solution to better connect the residential areas, located on top of the taller hillsides overlooking the commuter rail sites, through the use of dense vertical elements to transition the residences from their homes to the transit stations at the bottom of the valley in the Route 8 corridor.

This site would also benefit from the creation of a more aesthetic Route 8, which would implement narrowing the roadway, and incorporate the use of “traffic calming” techniques, creating more pedestrian friendly walkways, and increasing vegetation to line the roadway. This site would link the local businesses and residences from one side of Route 8 to the new retail and commercial businesses on the other side. This would lessen the use of private transportation through the area, and create a more conducive environment for pedestrian travel.
This thesis proposes re-utilizing the existing rail infrastructure within the North Hills region of Pittsburgh, and developing transit nodes to coincide with this proposed transit system. The proposed site is the St. Ursula’s Station located within the suburban community of Hampton Township. Because commuter rail comes under federal oversight, a federal or regional sponsor is generally needed to receive federal grants for construction. Since the project consists of using pre-existing rail transit, the current owners and operators, the Allegheny Valley Railroad Company, must also be involved. When dealing with proposing a transit infrastructure development project located in the greater Pittsburgh region, the city of Pittsburgh must be part of the project, namely its transit authority, The Port Authority of Allegheny County. For creating residential and commercial developments that can access public funds and coordinate soliciting interests from private investors and stakeholders, the Urban Redevelopment Authority of Pittsburgh is also a key client. Last, specifically for developing a transit node within the propose St. Ursula’s site, Hampton Township must also be involved with the project.

A commuter rail system must have three things to run its operations: an operator, an owner, and a sponsor. Because commuter rail comes under federal oversight, a federal or regional sponsor is generally needed to receive federal grants for construction. Regional sponsors generally include Metropolitan Planning Organizations. A Metropolitan Planning Organization for Pittsburgh is the Southwestern Pennsylvania Commission, which has been approached to sponsor the Alle-Kiski commuter rail project.
CLIENTS

- Hampton Township
- Route 8 Corridor Commuter Rail Transit
- Southwestern Pennsylvania Commission
- Port Authority of Allegheny County
- PennDOT
- Redevelopment Authority
- Allegheny Valley Railroad Company
- Urban Redevelopment Authority

02.12_Client Organization Chart
in the eastern region of greater Pittsburgh. The SPC has currently declined being the Alle-Kiski Rail sponsor, suggesting the project is too localized and specialized for the multi-county commission to support, but, with the addition of the new purposed extension into the North Hills, that decision could be reversed. Another proposed sponsor could be the Pennsylvania Department of Transportation, which oversees transportation issues within the state of Pennsylvania.

The proposed operator for this project can be either the state-run Pennsylvania Department of Transportation (PennDOT), or locally-run Port Authority of Allegheny County. The Port Authority is responsible for Pittsburgh’s mass transit network, and services the greater region of Allegheny County, the county where Pittsburgh is located. However, PennDOT has the resources to control the substantial financial requirements of a regional rail project. The project would prefer to eventually be run by local transit authorities (the Port Authority) because it would be a higher priority for a local operator. The Port Authority has the capability to maintain the rail’s regional goals, and has a higher stake in the commuter rail’s success.

The eventual owners of the commuter rail system would be required to maintain the infrastructure and collect the revenue. Like many other commuter rail projects that share the same rail as existing freight lines, the owner would consist of the designated operator and the current rail company that owns the rail. This joint ownership would eventual be between the local Port Authority and the current owner, the Allegheny Valley Railroad Company. The Allegheny Valley Railroad Company would coordinate its existing freight rail service with the new commuter rail service, and would participate in

collecting some of the revenue for rail maintenance purposes.

The Urban Redevelopment Authority of Pittsburgh (URA) is the City of Pittsburgh’s economic development agency, committed to creating jobs, expanding the City’s tax base and improving the vitality of businesses and neighborhoods. The URA assembles and conveys sites for major mixed-use developments and provides a portfolio of programs that include financing for business location, relocation and expansion, housing construction and rehabilitation, and home purchases and improvements. The URA would be in-charge of the coordination between the public-private partnerships in developing transit nodes along the new proposed rail system.

The last “client” that must be included in the transit station development is the Hampton Township Council, the governing body of Hampton Township. Hampton Township will be the primary beneficiary of any development that is created around St. Ursula’s proposed transit station. Hampton Township will be a critical partner in creating an appropriate mixed-use zoning plan, developing procedures to implement that plan, and for upholding the plan as designed. The potential benefits of the transit station to the community, the efficiency of the transit station’s use and purpose, and the ability to maximize access to potential and available ridership relies heavily on the proper development of the transit station’s surrounding context. To do this, a proper facilitation of the transit hub’s goals and ideals must be made between the Council, developers, architects and planners.

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As stated in earlier precedents, Pittsburgh has always had a light rail presence, and there are many communities that still have residences that grew up with light rail transit. There is currently a light rail service in the South Hills known simply as the “T”. Originally, Pittsburgh had 68 interurban and streetcar routes, and the third largest fleet in North America. These transit companies were privately owned and gained federal subsidies to maintain their lines. The North Hills specifically had an interurban railway that ran through it, connecting downtown Pittsburgh to Butler, a city located 35 miles north of Pittsburgh. The system continued to operate until the late 1940s.

Being an industrial city through much of the 20th century, freight lines cover much of the Pittsburgh region, connecting the city to Baltimore, Chicago, and New York. The rail lines run through many connecting neighborhoods, and laid the groundwork for the highway system that was eventually built within the region. The existing railways are well connected to the already existing riverside and rural towns in the Pittsburgh area, such as Mars, Valencia, Butler, Arnold, Coraopolis, and Homestead, and they have many right-of-way corridors in the downtown area.

Both the streetcar and interurban rail transit fell out of favor for a local bus system by the 1950’s, when the Port Authority took over the last of the rail transit companies. The federal government also provided the traveling public a vast interstate highway system and started to gear most of its subsidies toward the automobile. Yet light rail still remains in the Pittsburgh region, albeit at a much smaller scale, and the freight lines are still utilized by commercial rail, but less frequently with the decline of Pittsburgh’s industrial economy.
This project proposes a new emergence of rail transit within a region whose history is already marked by its presence. The purpose of this new rail transit system is to utilize multi-modal transit options to better connect the workforce residing in the North Hills’ residential community to its workplace in downtown Pittsburgh. Creating a mixed-use development around proposed stations aims to make a communal node, anchored by the transit hub, where people of the community can live, rest, gather, shop for goods, find services that they use throughout their daily lives, and socialize. The overall vision for the North Hills is to make the region more conducive for business growth, and attract more residences into the community. The overall vision for the greater Pittsburgh region is to better connect the surrounding communities, reutilizing pre-existing rail infrastructure as a tool for economic growth.

**FEASIBILITY**

In order to develop a proper design, which reutilizes the proposed rail lines, we must first look into the feasibility of the project to determine what improvements need to be made for the proposed commuter rail line. Feasibility studies are evaluations and analysis of the potential of proposed projects to support the process of decision-making. For this study, certain metrics were used to evaluate each site based on current site and social conditions. Each site was graded on five different metrics (Development Potential, Sense of Community, Accessibility, Places, and Increase Density Potential) on a grading scale of 1 to 8 (8 being the most developed for that criteria).

Each site was also measured on its “capture region” which is a region determined by which residents have direct access, or are in close proximity, to each proposed transit node, and have the greatest chance of utilizing it. Future population projections to the
ST. URSULA

Development Potential: 7
Sense of Community: 3
Accessibility: 5
Places: 1
Increased Density Potential: 7

Rating: 1 (Low) - 8 (High)

Capture Region Pop.

Site Name

Criteria Scale

Rating Criteria

Capture Region Pop.

02.13_Site Evaluation

Table Breakdown

02.14_Site Evaluations
“capture region” are also used, estimating local growth over the next 20 years (2035). These growth projections are also a response to the addition of the propose commuter rail system, the community’s attractiveness to new residence due to increased transit opportunity, better connections to regional and downtown areas, and the ability for each transit node to enhance the five different criteria discussed due to increased development from the transit stations.

The Development Potential metric is based upon how much open space, or demand for development of underused space, a site has for new development that not only includes residential units, but has the ability to include urban amenities such as communal services, stores, shops and retail. Those that currently have more developable land and have the potential to develop more diverse development programs based on current and future site use/need earn higher scores. The Sense of Community metric is based on current existing neighborly interactions that exist within the community. Those that currently provide spaces and places for the community to gather, as well as provide space for community events earn higher scores. The Accessibility metric is based on how easy it is for current transit and pedestrian mobility to access the site. The Places metric is determined by the amount of areas within the site with commercial urban amenities such as restaurants, grocers, and specialty retail that not only allow residents to complete daily activities without getting in a car, but they also improve the likelihood of higher density development by increasing residential land values. The Increase Density Potential metric is based on the proposed site’s likelihood of creating dense developments rather than low-density land-use. Many sites that are located in steep valley ways, narrow site boundaries, or are already located in high-density areas with a possibility of
an increase in residential and commercial demand receive higher scores.

The evaluation of the metrics shows what programs the St. Ursula’s site needs to focus on within its development, such as more public amenities for local and future residents within the site, and better community interaction within its residents. It also points out how the St. Ursula’s site has the ability to develop into a major transit node with the most potential to develop dense and diverse urban programs, and the most open and underutilized land for developing a transit community. With a good connection to its surrounding “capture region,” and a good location along the proposed rail development, the St. Ursula’s site also has the largest potential for increasing the population within its capture region.

From the site evaluation study, the population within the capture regions of the new proposed commuter rail stations is totaled. Pittsburgh historically has a higher percentage of public transit users compared to other cities in the US. According to the 2009 US Census Bureau American Community Survey, 10% of Pittsburgh commuters used public transit as their form of transportation for getting to and from work. That number rose to 18% in the 2010 US Census (Reams). If we take a more conservative estimate of an 8% retention of the current capture region for the new proposed commuter rail system, we will have 1544 daily riders using the transit system. That would be 563,560 rides a year, generating an estimate of $3,944,920 in revenue.

In order to create a transit system that is both valuable and convenient to the local residence of the serving community, the 11-mile route will be serviced by three diesel electric locomotives running at a frequency of every 15 minutes during peak times and one train at a frequency of every 45 minutes during non-peak hours. The annual cost of
563,560 Yearly Riders (2014)

$3,944,920 Yearly Revenue

$3,675,900.00 Trackage Rights Pmts to AV+BPRR

$3,702,432 Operating Cost

$ +242,488 Feasibility: Revenue-Operating Cost
executing operations and maintenance for three trains a year is estimated at $3,675,900 with a “grant of rights” agreement from the Allegheny Valley Railroad Company of $26,532 a year. This leaves the total yearly operations cost for the new proposed rail system at $3,702,432. After subtracting revenue from operations cost, we are left with $242,488 to go towards track repairs, facilities upkeep, and general maintenance as well as additional support from any state and federal subsidies which will greatly improve the sponsorship of maintenance and operation costs to run the new proposed commuter rail project.

With the cost of operation and estimated service of the commuter line set, the actual adaptation of the tracks, cost of the vehicles, and construction of the stations is then estimated. Track rehabilitation, new extensions, and grade crossing for an 11-mile route can range up to $11 million, while the new construction of five new transit stations is budgeted at $30 million with additional areas for parking within the transit nodes around $13 million collectively. The cost of three diesel electric locomotives would total $5,062,250 with the cost of three sets of passenger coaches totaling $12 million. The total projected capital costs total $76,727,250.

With the proposal of the commuter rail system, the North Hills will increase its attractiveness to new residents within the area. A 30% increase within the capture region of the transit nodes over the next 20 years is estimated, but, as discussed earlier, the current population within the Pittsburgh region is expected to rise dramatically within the coming decade. Having the ability to attract new residence to the area by creating urban amenities through a multi-modal transit systems allows the area to develop with better organization at a more rapid rate. Future station locations also have the potential to
Total pop. in Capture Region (2035)
32,903
Total pop. in Capture Region (Velencia+Mars)
32,903
Total pop. in Capture Region (2014)
19,300

Yearly Riders (2014)
563,560
Yearly Revenue
$3,944,920
Operating Cost
$3,702,432
Feasibility: Revenue-Operating Cost
$242,488

Capital Cost

$76,727,250

Capital Cost

Track Rehab, Grade Crossing, Track Extension
$10,781,250
Cost of Stations (5)
$30,000,000
Cost of Parking Areas
$12,390,000
Other Equipment Costs
$906,000.00
Cost of Diesel Locomotives
$10,650,000
Passenger Coaches
$12,000,000
Trackage Rights Pmts to AV+BPRR
$10,650,000

Track Rehab,
Grade Crossing,
Track Extension

$10,781,250

Cost of Diesel
Locomotives

$10,650,000

Cost of Stations (5)

$30,000,000

Cost of Parking
Areas

$12,390,000

Other Equipment
Costs

$906,000.00

Feasibility: Capital

02.16_Feasibility: Capital

02.17_Feasibility: Capture Region Growth

Total Track Lenth: 11 Miles
Max Track time: 20-27 Mins
Trains: 3
Stations: 5

Total Track Lenth: 23 Miles
Max Track time: 45 Mins
Trains: 4
Stations: 7
develop, such as a northern connection to the dense boroughs of Valencia and Mars. This expansion will increase the ridership of the transit line as well as its total track mileage and required equipment and facilities, making it comparable to the current proposed Alle-Kiski Commuter Rail System.
SPACE/EXPERIENCE

The purpose of the transit hub is to create a transit and communal node within a neighborhood context. Activities and functions develop around the node, which raises the standard and quality of living within the neighborhood. A transit station or stop is surrounded by high-density development with gradual low-density development spreading outward from the center. The developments are a mixed-use of residential, commercial, office and retail. The idea is for those hubs that are located in outlying residential communities, to combine housing opportunities with neighborhood services that can be found outside of the central business district.

EXPERIENCES AND BENEFITS

Benefits from these transit nodes can be seen in two forms, those benefits received by the users, or residents, of the neighborhood within a node, and those benefits received by the neighborhood itself. When it comes to the neighborhood residents, transit nodes enable their inhabitants to have a lifestyle that differs greatly from the current suburban model. Neighborhood amenities, such as places to eat, to shop, to get groceries, exercise, or gather and socialize are designed to be found within walking distance of their home. Professional services such as banking, daycare, barbershops, pharmacies, and beauty salons are also located within these transit nodes. The businesses and services in these developments are designed to be mixed-use and close to each other, making multiple desired locations able to be accessed within one walking trip. Other municipal and public features, such as cultural events, community center, pool, theatre, public parks and additional green space are also located within the transit nodes.
and close to the neighborhood dwellers. Moreover, services that can be located within communal nodes, but only exist in a few transit developments, such as a building supply store, hardware stores, thrift stores, and larger grocery chains, are located so that they can be reached easily through a directly connected public transit service, if they are not located within a residence’s development. In the current suburban structure, most of these amenities are located separately from neighborhood residences. The only access a resident has to these amenities, within the suburban context, is by car. Also, these amenities seem to be so separated that, instead of being able to make one stop by car to the desired businesses, multiple stops must be made, adding to the length of the trip and time spent away from one’s neighborhood.

**Community Interaction**

The greatest benefit of these transit developments is a greater opportunity for interaction between residents within the community. In the suburban style standard of living, interaction between residents is limited to the possible immediate neighbors located adjacent to their property. It is mostly a game of chance if one resident is outside at the same time as their adjoining neighbor. Most of the time, the resident is only coming out of their house for necessary errands that must be done to sustain their standard of living, such as going to the bank, picking up items from the cleaners, landscaping, or buying groceries, which (with the exception of lawn maintenance) all require car access, and have limited opportunity for personal neighborhood interaction. This standard of living leads to very isolated lifestyles within the households. Only the most outgoing of the neighborhood residences can successfully learn to maximize their personal relationships and interactions with multiple residents, outside of their immediate
A NEW WAY TO LIVE

Current Model:

Current Interactions:

Commuting Hours Frequency (3 trains): 15 mins
Off-Peak Hours Frequency (1 Train): 45 mins
Weekend Hours Frequency (2 Trains): 30 mins

New Design:

New Interactions:

02.18_Live: Current Lifestyle

02.19_Live: Current Interactions

02.20_Live: New Lifestyle

02.21_Live: New Interactions
neighbors, living within their community.

These new transit dwellings almost completely achieve the opposite, practically requiring the residents within the community to at least interact with multiple residences, outside of their immediate neighborhoods, in order to complete their tasks within the community. This goes beyond interacting with patrons who happen to utilize the same bank or gym. Residents now interact with other neighborhood dwellers who are out in the community, who occupy the same walkable routes, green spaces, or public transit services that the resident is also utilizing. At the same time private space is not lost, as a resident can retreat back to their individual dwelling for personal business and relaxation. These transit nodes are designed for the residents to have access to more opportunities and choices, rather than restricting them to isolation and limited options.

**User Convenience**

The next public benefit enjoyed by the transit development user is the convenience of different commuter options and the ability to determine which commuter option to use based on cost. By reutilizing the existing rail infrastructure in the St. Ursula’s community for public transit, residences of these transit nodes, and the surrounding, preexisting residential neighborhoods within the North Hills, can now have more options for their daily work commute into downtown Pittsburgh. On average, a trip to downtown from the St. Ursula’s community on a non-work day is around 25 minutes. This commute time is lengthen during rush hour traffic which can run 35 minutes on average and 40 to 45 minutes at its peak, if traveling via the Route 8 corridor to Route 28 downtown. This travel time through the Route 8 corridor takes even longer if there is a traffic accident, adjacent communal events, harsh weather, or every day aggressive
02.22 _Live: New Interactions
Adapted from A Country of Cities

COMMUTING DISTANCE AFFECTS LEVELS OF PHYSICAL ACTIVITY

COMMUTING DISTANCE AFFECTS PREVALENCE OF OBESITY

02.25 _Commute: Obesity

ROMANCE AND COMMUTE TIME

02.26 _Commute: Romance
Every 10 minutes spent commuting results in 10 percent fewer “social connections.” Those social connections tend to make us feel happy and fulfilled (Lowrey).

02.24 _Commute: Social Connections
driving. The new commuter rail system adds convenience to residents of the St. Ursula’s neighborhood, and the surrounding Hampton Township community, by providing reliable public transportation with a commute time that ranges between 20-27 minutes. It also decreases the added stress that personal transportation builds through individual use by allowing the commuter to, instead, indulge in less mentally stressful activity, such as reading, listing to music, eating a prepared breakfast, or texting a friend or co-worker.

Public transportation options are considered the best for digital socializing and among the most likely to connect the user with their communities. There have been many studies that contribute long commutes by personal vehicles to lower standards of health and living such as obesity, decreased social circles, feelings of isolation, relationship problems, and malnutrition. By freeing up time saved by commuting, residents can have more time to talk with friends, participate in exercise and recreation, enjoy more nutritional diets, and have healthier relationships.

**User Cost**

The new transit commuters at St. Ursula’s Station can experience additional cost savings with the new commuter rail system. Direct cost to the consumer can be estimated at $4.50 for a one-way ticket. This is based on Pittsburgh’s current light rail ticket prices from stations equal distance from downtown to the new St. Ursula’s Station, and the


proposed ticket prices from the new commuter rail system being implemented in the eastern region of Pittsburgh. Thus, it is $9 for a round trip commute from work place to living space. Yet, that price can be cut even further to $7 round trip per day for an assumed 235 business days a year, based on yearly rates for transit passes from those same two sources. What makes the cost even more compelling is the fact that $7 would be the daily rate if a transit user ONLY used the commuter rail service for commuting purposes. Since the yearly rate is a set price, any additional usage of the commuter system would contribute to increased savings to the cost of a daily commute. Meaning that any trip to the downtown area to watch a hockey game or catch a ballet, or using the system to travel to a connecting transit node for home supplies or groceries, would decrease that cost per trip, decreasing the direct cost per commute from living space to work place.

This is compared to having only the option to commute by personal transportation. Because one goal of these developments is not to eliminate the use of the personal automobile, but rather reduce it by providing addition transit options, we will assume that most commuters using the new purposed Station have or own a car. To compare the cost of using a personal vehicle to travel to work versus using the St. Ursula’s Transit Station and leaving the car parked at home, we will also consider certain costs associated with using a car to commute to work. Using the federal government I.R.S. rate of $.55 per mile as the basis for the operating cost of the vehicle, we can then take into account that the mileage from St. Ursula to downtown is 11 miles which calculates to a daily cost of $12.10. Furthermore, we must include access to parking spaces downtown, which is another direct cost to those using personal vehicles. The
$18.10
Direct cost

WHAT SOCIETY PAYS

$6
Societal cost

Increased healthcare and agriculture costs attributed to greenhouse gas emissions and exhaust pollutants
Lost productivity attributed to time stuck in congestion
Decreased land values attributed to noise and pollution

= $24.10
Actual cost

02.27_User Cost: Personal Vehicle

($9) $7
Direct cost

WHAT SOCIETY PAYS

$3
Societal cost

Greenhouse gas emissions and pollution controlled at source and yield lower emissions per capita
More predictable and reliable commuting times with no congestion
Increased land values attributed to walkability and proximity to highly concentrated amenities

= $10
Actual cost

02.28_User Cost: New Transit

$9

02.29_User Cost: Comparison

Adapted from A Country of Cities
lowest parking rate per day is $6 on the opposite side of the river from downtown, which still requires an additional complementary shuttle service to take the user across the river to the downtown business district, further adding to the user’s commuter time. The parking rate within the downtown area will run greater than $10 for a daily rate.

Taking this into consideration, the lowest total rate for a personal vehicle commute is $18.10, which is greater than supplementing a commuter’s car usage with public transit. More daily savings can be experienced by users who can do without car ownership—they eliminate maintenance costs, insurance costs, and financing costs. There is also an argument that indirect social costs can be experienced by neighborhood residents through increased land value, productivity, and less demand on the regional electrical grid through the more controllable and user-occupied public transit system, rather than the uncontrollable, user-operated personal transit.

**Public Benefit**

The neighborhoods that incorporate these transit nodes see public benefits through new transit developments. Public transit can increase the development potential of real estate near high-capacity transit lines and stations, and thereby increase property values.\(^2\)\(^2\) Employers like the idea of being near a rail or bus line. They are aware of the benefits of being better connected to customers and business partners, and that members of the younger millennial generation prefer urban living and transit access.\(^2\)\(^3\) Densely designed transit nodes allow for a reduction in public infrastructure costs in healthcare, waste

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23 Harris, Marlys. "Do we really need mass transit to limit our dependence on cars?" MinnPost, June 11, 2011.
A NEW WAY TO DEVELOP

02.30_Development: Suburban Density

02.31_Development: Urban Density

02.32_Development: Urban Density w/ Transit

02.33_Development: Exurban Density

Adapted from A Country of Cities
management, electricity production and infrastructure, and water loss in piping infrastructure compared to the current suburban model. With the attraction of new residents to the transit developments, as well as increased tax revenue from additional community businesses and the reduction of infrastructure cost, neighborhoods increase the ability to invest in additional public infrastructure projects, such as public transit, parks, healthcare, and education, which will increase the region’s standard of living. Densely developed neighborhoods have environmental impacts by decreasing annual carbon emissions and energy consumption per household compared to suburban neighborhoods.\textsuperscript{24}

DESIGN: 03
PROPOSAL

TRANSIT NODE DESIGN

The design of transit nodes for the new commuter rail system vary in importance of their program from node to node, but the idea of densely developed neighborhoods with walkable neighborhood services next to the transit station remains constant in each design. For the proposed St. Ursula’s Station, its program is geared towards one that is consistent with a suburban transit node, comprised of 70%-80% residential, 10%-20% commercial/retail, 5% communal, and green and park space throughout.

The transit station itself is located in the middle of the transit development to maximize its connectivity to the surrounding community. This positioning was decided in order to maximize the development as a “Transit Oriented Development” rather than just a “Transit Adjacent Development.” The difference between the two types of developments is Transit Oriented Developments make public spaces the focus of building orientation and neighborhood activity through the use of station positioning. They create pedestrian-friendly street networks that directly connect local destinations and the transit hub, and provide a mix of housing types, densities and costs. Transit Adjacent Developments are situated next to transit nodes or stations with little hierarchy on how the area is to develop nor does it inform the resident on how to properly use their development.

The Station is adjacent to where St. Ursula’s largest community park space is located within the new development, which enhances access to St. Ursula’s annual community festival. A radial plan is then constructed from this community space, generating a structure of significant programs closer to the main community spaces to
Possible Node Locations (darkest=best scenario)

Original Site and Node Planning

03.01 Site Planning: Node Planning

Radial Planning

03.02 Site Planning: Radial Planning

Pocket Communities
“SHARE” Centers

Developing “Pocket Communities”

03.03 Site Planning: Pocket Communities
help organize the development. Commercial, retail, and residential programs are included in a dense build-up around the community park, creating a hierarchy of important programs proximal to the park space such as groceries, retail goods, a gym or community center, and the Station itself. The major community park space provides a destination for neighborhood residences to have informal and formal interaction with other residents within the community.

**Residential**

The residential areas within the St. Ursula’s transit node incorporate dense apartment complexes, townhouses, and single-family homes to combined different styles of living within the transit developments. A majority of the new transit development is comprised of apartment style/townhouse building hybrids developed in clustered areas throughout the node know as “Pocket Communities”. These “Pocket Communities” include park and green spaces that are adjacent or within close proximity to the residential buildings, as well as water features and communal pedestrian and bike paths to better connect residents from their living space to the transit station and surrounding development.

A mixture of apartment residences are geared toward young professionals and couples in all income ranges (low to high-income groups), at a density of 60-80 units an acre close to the transit station. Two story townhouses are designed for young professionals, couples, new families with kids, and single parents from low to medium income groups, and are located at street level of the apartment residences within close proximity to the transit station. The apartment style/townhouse building hybrids also allow for flexibility between demand for apartments, townhouses, commercial space, or
03.04_Site Plan

03.05_Apartment/Townhouse Hybrid Sections
retail space as each node develops its own community and demand. Other community features, such as neighborhood “SHARE” centers allow residents to sign up for neighborhood programs and better connect with their community.

Single-family homes already take up most of the existing suburban context. Existing family homes are designed towards large family households with medium to high incomes, further away from the transit station. New single-family homes will be developed outside the new development, but within walking distance of the transit station. These new single-family homes will be located within St. Ursula’s existing neighborhood fabric, but the zoning of the single-family homes will change from the current 1/2 acre lots to 1/4 acre lots or less to allow for more density. The incorporation of mixed types of residential buildings adds to the diverse opportunity the transit node has to house users of multiple lifestyles. These mixed user-type lifestyles add to the intended qualitative experience of the St. Ursula’s Transit Station. Single moms, young professionals, high school students, and working families all live and utilize the St. Ursula’s transit development - geared toward their lifestyles.

Pocket Communities
Pedestrian Friendly

Within each “Community Pocket” pedestrian pathways connect the residential buildings to the surrounding development. Narrow paths direct traffic to smaller areas and destinations within the development, while wider paths are made to accommodate heavier foot traffic to more important features such as community “SHARE” centers, local businesses, and the transit station. The paths serve for both walking and bike travel throughout the development, allowing residents to move through their community.
without competing with auto transit. Other circulation paths surrounding the “Pocket Communities” consist of 12’ wide stone paving sidewalks bordered by trees running along the two roadways that surround the development. Two major pedestrian-only streets run through the development and connect the main parking garage to the transit station and community park, as well as other residential areas to the transit station.

**Green Space and Vegetation**

Green space and vegetation features are provided throughout the St. Ursula’s transit development, and provide a key aspect in the transit node for physical and emotional health of its residence. Access to green space is an important predictor of increased physical activity (“active living”) and reduced risk of obesity. A recent study of over 40 million people in England shows that health disparities between high income and low income people are much narrow in areas with ample green space, possibly because it allows residents to become more physically active and reduce stress. Just being in, or viewing, green space for a few minutes reduces stress. These findings have been demonstrated through medical studies with hospital patients and the general public.25

Within each “Pocket Community” there is ample green space and vegetation running along the pedestrian paths and surrounding the residential buildings. Vegetated areas help with the rain runoff and water retention as well as provide areas for residents to relax or exercise though sport and other physical activity. These green areas act to emulate the main community park in the center of the St. Ursula’s transit station.

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development, but on a smaller, more intimate scale. This promotes more community interactions between the residents of St. Ursula’s development with their immediate neighbors. The main park space within the node, St. Ursula’s community park, is adjacent or within walking distance, using the connecting pedestrian paths, to the “Pocket Communities.” This makes sure that the community residents are always in sight of the main community gathering space and green area. Other vegetation features are found running along the stone path sidewalks and roadways.

**Water Features**

Because the St. Ursula’s station is located just above a flood plane, waste and waste retention are important aspects of the site. Because of this, within each “Pocket Community” there are water elements designed to help retain the overflow of rain run off and prevent flooding. Over the past decade, “net zero” community designs have found ways to clean waste and brown water using water elements such as these to naturally sanitize used water from the community and reuse it back in the neighborhood. This idea is merely proposed as an additional use for the water elements, but is not researched heavily within this thesis. These incorporated water elements are designed to follow the winding and connecting pedestrian paths within the “Pocket Communities” and add more natural aspects, along with the green spaces and vegetation, which all affect the physical and emotional health of the residents.

Because water retention and flooding are two concerns with the site, additional measures are taken in the development of the site, such as widening the Pine Creek riverbed and the Gourdhead Run riverbed, and adding a retention pond just north of the development in the Gourdhead Run riverbed. Residential and community walkways are
placed near these riverbed elements along the residential areas, mixed with vegetation and seating elements. Gourdhead Run splits the transit development in two, and a redesign of its flow pattern into “Pocket Communities,” park space, and a river path will be implemented to help develop the areas around it. St. Ursula’s community park is connected to Pine Creek, with a big opening facing the waterway to better connect the view of the river and hillsides with the park users.

“SHARE” Centers

An additional concept within the new transit developments is the incorporation of community “SHARE” Centers. At the SHARE centers, residents from the community will be able to organize and participate in such programs like carpool, car sharing, bike sharing, Zipcar rentals, clothing and furniture donations, and exchange tools and other equipment within the community that can help residents cut costs and interact with each other. These centers will act, on a smaller scale, as a community center for the different “Pocket Communities.” When it comes to things such as cars, tools, bikes, or even furniture, sometimes it’s not necessary to personally store them if they are only to be used a few times a year. Ladders, power tools, and snow machines can all be stored in one place and be maintained by the whole community that uses it. In doing so, it also promotes more relationships and interactions between residents to grow within the community.

Retail

Retail space is utilized within the transit station program and is incorporated into the street level of apartment complexes near the transit station. Most of these retail
spaces are businesses that offer goods and products and include clothing stores, bakeries, bars and restaurants, music stores, supply stores and groceries stores. Retail stores that are more important to the community, such as grocery or supply stores are located closer to a node’s transit station, adding to the program hierarchy within the transit node.

**Commercial**

Commercial areas are located around the St. Ursula’s community park space and along the Route 8 Corridor. There is also commercial space available inside the transit station itself. Like the retail stores, commercial businesses also have the ability to be mixed at street level within apartment buildings and in their own commercial complexes. Commercial programs include professional businesses such as banking, law offices, doctor’s offices, and service businesses including daycare, laundromats, dry cleaners, and hair salons. Keeping the businesses located near the community park and transit station continues to emphasize the hierarchy of programs radiating out from the community center.

**Parking**

The transit development plans for a maximum of one car space per unit in the denser apartment and townhouse complexes. There are two parking garages directly connected to the transit station though pedestrian walkways. The garages provide one parking space for the more than 1300 designed units as well as provide parking space for 500 additional cars to access the station from outside the development. The parking garages are located on the periphery of the site adjacent to the development and within walking distance to the station and residential dwellings. This is designed to limit the
03.12_ Residential Examples

03.13_ Retail Examples

03.14_ Commercial Examples
auto-oriented traffic through the site and help develop a more pedestrian oriented atmosphere for the residents within the community. A previous parking lot is also located on the opposite side of Route 8 to service the existing businesses as well as new residents.

**Communal**

The St. Ursula’s transit developments host community features such as a library, gym, community center and recreation facility. These features are located within and adjacent to the community park space. These community services have higher priority to the center of the transit node in order to create better communal hierarchy within the transit development. The programs add to the development by creating a “destination” location within the St. Ursula’s transit node.

**Traffic Calming**

“Traffic calming” will be implemented throughout the development through the addition of the wide pedestrian walkways along narrow limited car accessible roads. Walkways across paved streets consist of differentiating materials, such as brick, that delineate pedestrian pathways, and further the visual dominance of a pedestrian right-of-way. Traffic calming will further be implemented on Route 8 itself, adding a green vegetated median in the center of the road, decreasing the width of the road, as well as adding wide pedestrian pathways at traffic light intersections to help connect the housing and businesses on the other side of Route 8 to the transit development.
Community Center

03.15_Communal Examples

Community Library

Traffic Calming

03.16_Old Site Context

03.17_New Site Context


**STATION DESIGN**

The transit station design expands the station program beyond the initial gathering shelter. The design takes the commercial, retail, and residential amenities that usually surround the outside of the station, and places them into one “all-encompassing” transit program shelter. This shields them from the ever-changing climate conditions that engulf the Pittsburgh region. This allows the residents to have community gathering spaces that utilize both the programs surrounding the community park during the mild weather temperatures, and the indoor spaces where residents can meet and socialize during the more extreme months of the year.

The transit station itself consists of 50% residential space, 20% commercial space, 5% community space, 5% operations space, and 20% retail space. It is in the transit station that much of the available office and retail spaces within the transit node are located. This provides business workers greater access to mass transit as well as the best proximity to the greater community amenities that the St. Ursula’s station provides. It is these office spaces, either incorporated or located adjacent to the transit station developments of the new proposed rail systems, which will build the Route 8 corridor into a new business district for the expanding corporate real estate market within Pittsburgh.

Residential apartment towers within the station sit on top of the commercial and retail areas. These apartments cater towards young professionals who use the transit station to commute to downtown Pittsburgh or work within the different nodes of the transit system. Much of the retail in the station is located at street level, and adjacent to the Station’s loading platform so that users both inside and outside of the station can access those retail businesses. Supplemental programs, such as convenience stores and
AXON VIEW
03.18_Station Axon

Commercial and Residential

Pedestrian

Transit

Retail/Commercial
coffee places, which cater to users “on the go” are located within the transit station. Other possible community programs, such as a community space for exhibits, which promote and support various activities throughout the community, may also be located in the station.

The St. Ursula’s transit station is located in the middle of the new transit development. As discussed before, this positioning was decided to maximize the development as a “Transit Oriented Development” rather than a “Transit Adjacent Development.” Direct pathways from the surrounding “pocket communities” make the transit station easily accessible to anyone within the surrounding development by walking or biking. This maximizes the potential ridership from those areas. The transit station’s location next to the Community Park, and adjacency to the other available commercial areas within the node, as well as the community center and gym, puts the station in a prime location to interact with the community residents. Because retail, commercial, as well as residential housing, are located within the station, this helps make the transit station a “destination location” for the surrounding community to gather, and encourages more of its use by the neighborhood, making it a community building with multiple purposes other than transit.

The station’s primary functional program consists of two axes, one for pedestrian traffic, and the other for rail traffic. The pedestrian axis allows for entrances from both the community park area, and the “auto-exchange” drop-off area (for those being dropped off by car or bus). Many of the pedestrian footpaths lead to the community park area and the front of the transit station. This entrance will receive much of the foot traffic from the surrounding residential developments. The entrance faces the gym and community
center, encouraging the connection between the community and active recreation. The auto-exchange area is one of the few places in the development where heavier traffic by car is permitted. The quick turnaround allows and encourages those who are car pulling, or who do not wish to use the parking garage during the whole work day, to be dropped off directly in front of the transit station, without having to drive their cars deep into the transit development.

The transit axis contains the boarding area itself, which is curved and composed of two platforms. These platforms are elevated above the first floor of the transit station, delineating the changing programs of pedestrian and transit. Two sets of tracks serve the riders who are either arriving from or departing to the downtown areas. The platforms consist of seating elements and waiting space for riders to relax and rest as they wait for the commuter train.

The architectural design of these axes consists of tubular facades with crisscrossing elements being penetrated by windows and skylights to allow for natural lighting deep into the transit program. The direction of these intersecting lines within the façade directs the user in a linear fashion toward the center of the station, where the station platforms are located.

Retail and commercial spaces are located on either side of the pedestrian axis, running parallel to the pedestrian circulation. In these areas, retail businesses cater to commuters “on-the-go,” such as coffee shops, snack shops, and convenience stores. Dining areas for workers within the transit node to have lunch, or places for restaurants to serve the community are also programmed into the transit station. Other types of retail can also be considered such as clothing, music, or a small department store to serve the
COMMERCIAL & RETAIL

03.24_Station Render: Retail

03.25_Station Render: Boarding Platform
community. Commercial areas for office spaces and business are also located in these areas adjacent to the pedestrian axis.

Two residential towers are located at the end of the pedestrian axis. These towers house multi-bedroom apartments. At the base of these towers, commercial space for professional offices and businesses are located which gives them direct access to the station. The overall design of the retail, commercial and residential areas of the station is more orthogonal and geometric which generates a contrasting hierarchy that is different from the more fluid and motion-evoking architecture of the pedestrian and transit axes.

The idea of these incorporating these program elements, consisting of pedestrian movement, transit, and retail areas, as well as office space and residential housing is to create areas within the transit node for the community to gather and interact, turning the station into something more than just a means of travel. Here is an overall program that the community can center on, generating a starting destination that can connect people of the community to the rest of the neighborhood context, as well as the rest of the Pittsburgh region. It is where people have the ability to catch-up on local “happenings,” meet up with friends, find things to do, and participate with others within their area. When people within the community are looking for a way to connect with what is going on around their neighborhood, the transit station is one major tool that can generate those connections.
CONCLUSION

Pittsburgh is projected to grow drastically in the coming decade. Pittsburgh was once solely an industrial town, requiring rail to move both people and product to sustain its economy. Because of this, rail is still prevalent in Pittsburgh, but its infrastructure is currently underutilized in regions that could benefit by its use. The North Hills region has the opportunity, through the use of its existing rail and auto-oriented infrastructure, to attract this new and future influx of residents by creating multi-modal transit developments within its Route 8 corridor. In order to create and generate these developments, the North Hills must convert existing rail infrastructure into a public transit system, creating transit nodes and developing the areas around them.

Benefits from these transit nodes can be seen in two forms, those benefits received by the users, or residents, of the neighborhood within a transit node, and those benefits received by the neighborhood itself. When it comes to the neighborhood residents, transit developments enable their inhabitants to have a lifestyle with greater neighborhood amenities, such as places to eat, to shop, to get groceries, exercise, or gather and socialize—all within walking distance from their home. Residents will have the ability to instantly interact with other neighborhood dwellers who are out in the community and occupy the same walkable routes, green spaces, or public services that they also utilize, while at the same time still have privacy within their personal residence. Benefits of having the option to use public transit include: creating less stress that personal transportation builds through individual use, creating healthier diets, and developing stronger social connections. Users also find a better value when the choice of public transit is convenient for them to use by having less private transit expenses, and
creating cost alternatives through the use of multiple transit options.

The neighborhoods that incorporate these transit nodes see public benefits. Public transit can increase the development potential of real estate, allow for a reduction in public infrastructure costs in healthcare, waste management, electricity production and infrastructure, and increase the ability to invest in additional public infrastructure projects. In addition, creating dense pockets of developments supported by multi-modal transportation can positively impact the region both environmentally and economically.

The design for developing a transit node at the site of the St. Ursula’s community incorporates these ideals through dense development, transit-oriented design, and increased community services. The design proposes positioning a rail station in the center of the community, re-utilizing the existing rail infrastructure adjacent to the site for public use, developing areas of public space and neighborhood amenities, creating dense residences called “Pocket Communities,” and connecting them all through the use of pedestrian paths and walkable neighborhoods. New mixed types of housing are created in the proposed development, and retail, commercial businesses, and community programs are all located within the residential developments. Residential features such as walkways, park space, water features, and developing “SHARE” programs allow the new St. Ursula’s development to create a new way of living that is more community oriented, and regionally connected than the current residential model. This no longer creates car dependence that we see in our present way of living, but rather a lifestyle that now supplements the car with public transit and walkable amenities.

The proposed transit station is no longer a program that just connects commuters from living space to work place, but connects the residents to the greater surrounding
region as well as his local community. The design proposes that the station programs grow beyond the initial development. The station becomes a starting point for those seeking to find out what is going on within their neighborhood. It encourages them to interact with other residents within the community who are utilizing the station for eating, working, relaxing, and socializing. The proposed development connects residents to amenities that surround the station within walking distance, such as the community gym, or other local services like grocery shopping, going the library, or enjoying a local event within the adjacent community park space. It is designed to be a bulletin board for the community, become a center point for residents to congregate, and neighbors to communicate.

The question now becomes, will this design hold to the ideals set by those already present by Hank Dittmar, Gloria Ohland, Vishaan Chakrabarti, and Peter Calthorpe? The next step is to see whether the design for “Pocket Communities” generates the results intended--similar to those of dense community development, New Urbanism, and Transit-Oriented Design. The station must also be studied to see if the “all-encompassing” program works well within the new proposed transit development, as well as the North Hills region itself. It must also be determined how well these types of developments are successful in attracting residents and employers to the Route 8 corridor, as well as the rest of the North Hills community.

Projecting forward, the success of the project will be determined, not just by the ability of the North Hills region to attract growth and increase the current residing population around this newly proposed commuter rail system, but also by the adaptability of the residents to make use of the multi-modal lifestyle and the new transit system.
The current suburban model in the North Hills demands the residents own and maintain a car with great cost to the user and to the community that must maintain the infrastructure for personal vehicles. The personal automobile is the only option residents of the North Hills have to interact and participate within their communities and connect themselves with the greater Pittsburgh region. With this thesis, successful movements could be observed if car dependency goes down, car usage is negated to shorter commutes or specialized trips, or overall car ownership decreases as well as increase usage and acceptance of the new commuter rail system. If the use of supplemental programs such as car-share and car pools increases and residents make use of the commuter rail system, this will be an indication the model is taking hold.

Other measurements of progress reside in the feeling of connectivity between the residents of the community and the new transit developments. Do these transit hubs and developments create places or points within these neighborhoods that generate a feeling of connectivity to the community? Do they create a place of destination for the community to go to for meeting and interacting with friends and neighbors, or areas where residents know they can find out information about events and news that are happening locally and throughout the region? If the community residents start spending less time within their personal living spaces and more time outside of their individual dwellings, due to new interactive opportunities through greater transit connectivity and new local destination places within the transit developments, enhancements to the community can be perceived through the design of this thesis project.

Through the adaptation of the different design elements within this thesis, and through future observations of what was and was not successful within the design of the
North Hills commuter rail developments, other areas of the Pittsburgh region can also make use of the vast rail infrastructure that is spread throughout the metropolitan area. The hope of this thesis is that it can serve as a starting point for the re-utilization of old, existing infrastructure so that they can provide a greater purpose than their current use. This design could be adapted and retrofitted to fit the needs of a growing population. In a broader scope, many midwestern cities are like Pittsburgh, including St. Louis, Cincinnati, and Chicago, which have existing post-industrialization rail lines that still run through populated communities within the city limits. With the proposal of this thesis, making use of this existing infrastructure increases transit options within those cities and creates new opportunities for both economic growth and community growth for their residents.

The infrastructure for creating a multi-modal lifestyle exists within the North Hills, and the area has the capability to utilize it. It has the ability to generate growth as well as create better connections between the northern communities and the downtown region of Pittsburgh. The proposed North Hills’ commuter multi-modal transit system and developments may have greater implications for the Pittsburgh region and beyond. Re-utilizing existing rail infrastructure can be used as a tool for directing residential and commercial growth within the urban fabric.
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