NEW DIRECTIONS FOR LOCAL MOBILITY

Improvements for Suburban Communities

Better Boulevard Analytics

Traffic21 Smart Mobility Challenge Study

Remaking Cities Institute | CMU Robotics | Carnegie Mellon University

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(New Directions for Local Mobility)

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Cover Photograph: Mount Royal Boulevard in the Southern Shopping District. (Source: RCI).

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Executive summary

A. Overview

The Carnegie Mellon University (CMU) research team, working with the community organization Walk Bike Shaler and the Shaler Township, undertook a study to observe, analyze and make recommendations for increasing opportunities for better mobility on and along Mount Royal Boulevard, in Shaler, a township in the Pittsburgh Region. The project was supported by the 2021 Traffic21 Smart Mobility Challenge.

Mount Royal Boulevard is a major cultural, transit, vehicular traffic, and economic corridor. The boulevard provides access to many convenient neighborhood, town, and regional services, including libraries, schools, churches, restaurants, laundries, stores, and shopping centers along its length, generally in concentrated districts. It is also bordered by housing, both multifamily dwellings and single-family homes, which are typical of the side streets. These amenities are, in terms of distance, conveniently located for drivers. For those without a car, whether nearby residents or students or other visitors moving between venues, these amenities are significantly less convenient. There are serious mobility and safety challenges in a right of way where there are incomplete sidewalks, bus stops without waiting areas or connecting sidewalks, and little room for bikes, personal vehicles (such as wheelchairs), or other types of micromobility. These conditions also pose significant equity challenges, disproportionately impacting elderly individuals, people with disabilities, school children, and lower-income individuals.

The community has indicated a strong interest in improving these conditions, yet as in many similar municipalities and roadways in the Southwestern Pennsylvania region, has lacked the planning and resources to address them. This is changing, with new state resources available to plan and ultimately implement critical sidewalk infrastructure in one area, connecting the school, the shopping center, and the route to the township's most used park. This study builds on that momentum, focusing on both incremental, near-term change, and long-term systemic opportunities.

The study analyzes existing conditions, reports findings, and makes preliminary recommendations for how the boulevard, a streetcar suburb era Main Street, can become safer, and more equitable. The team's approach included urban design and planning tools of literature review, engagement with community partners, and mapping, analysis, and design concept iteration, together with the techniques of camera installation and computer vision data analysis. Together, this information and analysis provided the basis for prioritized recommendations for improved opportunities for making more trips by walking, rolling, biking, and transit. Shaler's pattern of a long, historic main street in a suburban residential context—often with a constricted roadway with limited space dominated by vehicular travel lanes and roadway shoulders–is a mobility and urban design case study relevant to numerous communities in Southwestern Pennsylvania and nationally.

Background

Team/Related Project Background: The Remaking Cities Institute/CMU research team's work on the Better Boulevard project for Shaler is part of the ongoing *New Local Mobility* study initiative for the region, as in the 2021 report prepared for the Quaker Valley Council of Governments, with Mobility21 UTC support "New Local Mobility: Local Improvements for Communities in the Region." and highway corridor report completed with Michael Baker International as lead consultant, also for the Quaker Valley Council of Governments, with PennDOT Connects support, 2021, "Redefining Regional Highway Corridors: Strategic Design Guide: Opportunities for Design, Transportation, Economic Development, and Governance."

The overall thrust of this work is on how municipalities outside of the city center can re-envision the shared community asset of a main street or regional highway corridor to serve more local functions than a commuting- and, in the case of highways, freight-dominated roadways. Routes that were once verdant boulevards and/or busy main streets served by streetcars, have over time become poorly connected to the neighborhoods they pass through, despite the legacy of relatively dense mixed-use centers that line them. As in suburbs throughout the region, most community members make most of their trips from home, including short trips (under .5 miles) by car, despite the proximity of shops, services, and

dwellings. RCI's research and engagement in New Local Mobility has focused on how towns and communities in suburban locations, not just the center city, can have the opportunity to embrace a wider range of mobility, and potentially renew a wider range of land uses, to rebuild more walkable, more complete places. And not only more walkable: new local mobility includes the range of micromobility, defined as most types of surface-based vehicular movement, human-powered or otherwise. This approach is of increasing interest beyond the younger, center city populations generally associated with bike- and scooter-share mobility hubs.

CMU is a national leader in developing Smart Mobility Challenge solutions for communities. The RCI project team joined with CMU's Robotics Institute to test the application of computer vision and related techniques developed to observe and analyze existing mobility conditions, and through analysis, contribute to developing approaches to increase the safety of drivers, pedestrians, and everyone sharing the roadway.

B. Findings

The roadway is primarily designed for and used by private vehicles.

- Analytically and anecdotally, private automobiles and trucks dominate the boulevard, and for most of its length, it is not a safe or comfortable environment for pedestrians and other non-drivers.
- Sidewalks are limited, generally continuous for two blocks or less, and often are the same material as other uses, with little or no delineation from parking and roadway areas.
- Bus stops generally have no delineated area for waiting and are often not connected to sidewalks.
- There are especially dangerous conditions where there are "100 percent vehicular curb cut" blocks, and head-in parking spaces that overlap with existing or potential sidewalk locations.

However, there are other users today and there is interest in meeting their needs.

- There are households without access to a private vehicle in Shaler.
- Pedestrians do use sidewalks (or roadway shoulders) to reach local shops, services, and bus stops.
- There are many pedestrians on the streets nearby, presumably for recreation trips, but they often avoid Mount Royal Boulevard.
- There are bicyclists using travel lanes, gutter-shoulder, and sidewalks.
- For special events, such as the high school homecoming, there are hundreds of pedestrians, lining the street for parades and for walking. Other special events, such as July 4, also see hundreds of pedestrians walking from the Boulevard to Kiwanis Park on Wetzel.
- Camera data confirmed a low amount of non-vehicular traffic, yet also confirmed that there are pedestrians and bicyclists at different times throughout the day and evening.
- Observation and camera data confirmed that with current driving habits, pedestrians and/or bikes or other mobility, faces great challenges at existing intersections, crosswalks, and along the length of the boulevard.
- The community is motivated to make changes, moving forward on a sidewalk plan to connect the school, shopping center, and potentially Kiwanis Park.
- The community is interested in a type of what has been referred to as "lean urbanism," how to improve/add sidewalks while recognizing home and business-owner priorities and township resource limitations.

- *Limitations.*
  - While the camera installations at Wetzel were in place for many months, the camera installations at the two other locations have had a relatively short duration to develop the data for analysis.
  - While the computer vision was able to recognize and record bike use, there was not sufficient pedestrian or bike traffic to develop "near miss" analytics.
  - This is a research study, which while it looks at specific conditions, is not a master plan or engineering plan for sidewalk and/or parking design.

C. Recommendations

Start with Sidewalks.

- **Push for completion of the School to Park sidewalk**. The PennDOT grant for the Wetzel Sidewalk, a proposal developed while this study was underway, is an optimal starting point reflecting community priorities. The route is already a pedestrian desire line pathway, given summer activities, with a key interest in providing greater safety for school-age children, and for the full range of residents in the area, providing greater and more equitable access to the Kiwanis Park.
- **Push for sidewalk continuity in mixed-use districts**. There are schools, daycare centers, dentist offices, ice cream parlors and laundries in the mixed-use centers along the boulevard. Yet they are difficult to reach by rolling or walking from the adjacent neighborhoods or laterally along the street. Continuity could be established through a commitment to continuous materials (whether a conventional concrete sidewalk or a more modest solution), introducing sidewalk curb cuts for wheelchairs, and through approaches as modest as striping the walkway, and through a commitment to maintaining the ADA-required minimum clear width of 36 inches.
- Provide new/improved intersections and crosswalks for mixed-use centers.
- **Tackle the most challenging parking conditions**. Design concepts in this study should be further developed.
- Delineate bus stop waiting areas, connect bus stops to continuous sidewalks when possible.

Continue with Improvements for Bikes and Emerging Mobility.

- The existing roadway is extremely challenging for a continuous bike or bike+ lane given its width, actual and perceived right-of-way boundaries, and existing building locations. However, **there are sections of the boulevard, particularly north of Wetzel, with wide shoulders with the potential for bike+ lanes.**
- A broader **shared roadway model** for mixed-use centers would require a reduction in speed below the existing 30 mph regulation (and below the actual driving speeds indicated in the report), and a range of modifications for greater safety, and should be investigated as part of any larger improvement plan.
- **Develop sidewalk and parking space design modifications** (concepts are included in the report) to address the most challenging locations for pedestrian and vehicles, where there is parking directly off the Boulevard.

This is critical for several reasons, including:

- The ongoing transformation of local mobility, including potentially autonomous delivery (requiring a new level of sidewalk management and speed modification).
- New forms of sustainable mobility continue to emerge and are gaining popularity. E- bikes, “golf carts” and other modes are expected to have an increasing share of trips, especially in predominantly residential areas.
- The elderly, children, lower income households, or people with disabilities face an equity challenge if the private automobile is the only available means of transport. New local mobility is generally less expensive, more sustainable, and a less technically challenging mode of mobility, if they could use them.
- **Greater health**. Active Transportation work identifies increased levels of walking and biking as benefiting health and wellbeing.
- Greater choice for all. Suburban municipalities often identify as places that provide more choice to their residents. The choice of more diverse local mobility is one that residents will increasingly aspire to and expect.

CMU Team And Partners

- Ray Gastil, Remaking Cities Institute (RCI) Director
- Stephen Quick, RCI Fellow and Adjunct Faculty
- Jonathan Kline, Associate Studio Professor, School of Architecture
- Robert Tamburo, Senior Project Scientist, The Robotics Institute, Carnegie Mellon University (CMU).
- CMU Robotics graduate student research team: Khiem Vuong and Dinesh Reddy
- SoA/RCI student research team: Saloni Agarwal and Ritika Narang, Master of Urban Design (MUD) 2023, with contributions by Schuyler McAuliffe, MUD/MArch 2022.

Shaler Township leadership provided critical expertise and cooperation. The inspired civic vision, knowledge-sharing, and enthusiasm of Chris Chirdon and Chris Watts, leadership for Walk Bike Shaler, were fundamental to the work.

I. Methodology

In the Traffic21 Smart Mobility Challenge project development process, Walk Bike Shaler, a Pittsburgh metropolitan region local community organization advocating for walking and bicycling, connected with Mobility21 and the Remaking Cities Institute (RCI) and CMU's Robotics Institute for assistance with their initiative seeking a community-university partnership. Mobility21 is one of 14 National Transportation Centers for Improving Mobility appointed by the U.S. Department of Transportation. The Remaking Cities Institute is a planning and design research institute at CMU housed in the School of Architecture.

RCI had been studying issues of local mobility for Pennsylvania's highway corridors and urban neighborhoods and saw the potential of expanding their mobility studies to include suburban communities. Funding for this study was provided by a grant from Mobility21 to inform and contribute to the Better Boulevards initiative for local mobility research in suburban locations and with the integration of camera-based technology to inform the design research.

RCI's local mobility research had previously focused on integrating personal micromobility vehicles and pedestrians with heavily used arterials in conjunction with Pennsylvania's Department of Transportation's equity-based policy creating complete streets for use of all vehicles, including pedestrians. Former local mobility research concentrated on major highway corridors and streets within urban neighborhoods and this study carries this research further to suburban communities with different street patterning and auto dominance.

Methods

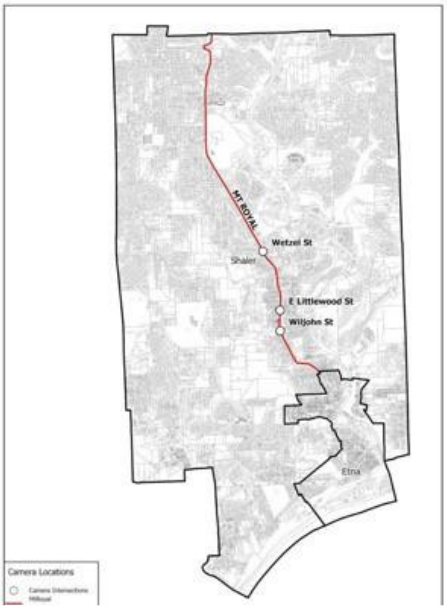
***Literature Review*:** As with the team's earlier work on mobility outside of the city center, there is a wide range of studies and proposals for rethinking and retrofitting streets and sidewalks like those of the boulevard, whether from suburban retrofits studies (Dunham Jones and Williamson, 2009, 2011, 2013, 2020), or the pedestrian-oriented remaking of town centers across regions (Speck. 2012, 2022). These are also embodied in policies and reports at the state level, such as PennDOT's Active Transportation Plan and in the Southwestern Pennsylvania Commission plan. There is also extensive work done on the expansion of micromobility, although often focused on center cities. As in earlier studies, the literature continues to reveal that the conditions of an older metropolitan region, like Greater Pittsburgh, are not always well represented. Our region's streets are narrower, our topography restrictive (main streets are often on ridge lines), and our existing pattern of buildings often do not allow for streets at widths expansive enough to accommodate all the elements of complete street design such as dedicated bike lanes, wide sidewalks, parallel parking, or many other local mobility infrastructure practice developed by NACTO and others.

Mapping: Existing walking, biking, and traffic patterns were mapped, together with existing land uses, demographics, bus stops and transit service, and sidewalks. In addition, the team observed, mapped, and assessed destination points, alternative routes (avoiding Mount Royal Boulevard) for walkers and bikers, including where and how Mount Royal Boulevard was partially closed for special events such as the fall homecoming. Through this process, as well as reviewing earlier proposals from Walk Bike Shaler, the study established three focus areas for further analysis of sidewalks, parking, and existing and potential safety issues.

***Establishing Focus Areas*.** The ongoing work by Walk Bike Shaler provides an on-site data basis for a portion of the research using strategically placed cameras intended to provide useful data and analytics for mobility and urban design recommendations. Three focus areas were developed, following up on earlier analysis by the community organization, including the Southern Shopping area, near Undercliff Street, the Hilltop Shops near Glenn Avenue, and the Mount Royal Cultural District from Wetzel Road, looking west to Kiwanis Park and up to the library. These allowed for a review of different conditions, from locations with no sidewalk (at Wetzel Road), to those with partial sidewalks. They also varied from areas where the boulevard has wide, paved shoulders, to those with much narrower sections where the right-of- way, or the perceived right-of-way, is much narrower, and where parking is so constricted that in some cases it comes close to the travel lanes.

***Design Concepts*:** In homing in on the focus areas, and in learning from our community partner and Township leadership, the team recognized that there were several critical issues including sidewalk continuity in mixed-use centers for shops, services, multifamily dwellings, and bus stops, and addressing existing and potential parking-pedestrian conflicts in those same areas. In response, key design concepts were developed for the most difficult conditions, generally where parking overlapped with or interfered with existing or potential sidewalks.

Work sessions were held with Walk Bike Shaler to map local destinations, landmarks, activities, and issues that informed the analysis work. (Source: RCI).



Six cameras were set up in three locations to map movement data of vehicles and pedestrians in heavily trafficked commercial area. (Source: RCI).

***Cameras and Computer Vision**:* Establishing focus areas led to the location of camera installations that would provide the most relevant data. Deploying six cameras in three locations, observing traffic in different seasons, on high traffic, low traffic, and partial street pedestrianization periods, the cameras provided visual data, allowing for the development of computer vision algorithms, helping to understand when and where safety challenges are most prevalent.

Further information on the computer vision research methodology is included in the report section: Shaler As a Suburban Main Street Case Study: Camera Data.

II. Place-Making and Local Mobility Findings

D. Place-Making: Why New Local Mobility Matters For Suburbs

In its earlier study on New Local Mobility, RCI noted that the concept of the "15-minute City" and "5-minute neighborhood" could be applied, with adaptations, to many suburban communities in Southwest Pennsylvania and in similar regions. There are many places in the metropolitan regions that will be difficult because jobs, services, schools, and shops are widely dispersed. However, in places that already have many goods and services in proximity, such as Shaler and scores of others, there is no structural reason to make non-auto-dependent mobility work for many, even most trips for many households, even without changes in land use. As we wrote then: "A better understanding and improvement of the relationship between the places where we live, work, learn, shop, and recreate and how we move between them–our mobility–is fundamental…" (Gastil and Quick, 2021).

The relationship is the fundamental point, improving sidewalks is not just about improving pedestrian mobility, it is about improving mobility–and opportunity–for all. There are critical practices of mobility from street design to traffic management, many aspects of which are addressed in this study. Yet the core of the work is about making better places for people. The 15-minute city and related terms all revolve around the idea of understanding, and leveraging those relationships, to build thriving communities, in urban centers and suburbs, that live up to their aspirations to be thriving places of opportunity, connecting mobility and livability.

The literature on, study of, and practice of micromobility has had extensive developments in the past year, and there has also been significant new work and findings, informed in part by the changing commuting and life patterns since the COVID epidemic, as well as the increasing awareness and responsiveness to sustainability goals at multiple levels of government, business, and community.

Among the key points, developed both earlier this century and quite recently, several stand out for reiteration, are first and foremost, that change is doable. Ellen Dunham-Jones and June Williams have supplemented their earlier work with a recent publication on 80 case studies retrofitting suburbs (2021). Williams notes that these examples "demonstrate the significant potential for profound transformation, over time, of the unsustainable sprawling patterns of late twentieth century suburbanization. We spent fifty years building and living in these suburban landscapes, and we must spend the next fifty retrofitting them for the new needs of this century, to help build a resilient future suburbia that is climate-sensitive, compact, pedestrian -and bike-friendly, and responsive to changing demographics and contemporary lifestyles offers better choices for all (Williamson, 2021,11 Urban Design Tactics).

Williamson is not underestimating the challenge–it is a long-term project. People know that they don't have great ways to get around without a car. The PennDOT active transportation study noted the results from a recent public survey, which "showed that 30% of respondents found it challenging or very challenging to walk in their communities, and 58% found it challenging or very challenging to ride a bike," and that for most of them, they wanted better physical infrastructure to walk or bike (PennDOT 2019).

At the same time, there is increasing awareness that incremental change such as sidewalk improvement, even modest ones, matter. Among the compelling points in the recent article/interviews "In Praise of Humble Sidewalks (Wright, 2022), are those made by Charles Marohn, who notes that: "Sidewalks are often thought about as afterthoughts in urban transportation projects…This is backwards…On a street, we're attempting to grow the complex ecosystem that produces community wealth." And health. As Gil Penalosa comments, the "magic pill" for health is often active transportation. "The answer is getting around by walking, crutches, wheelchair–I don't care how you move, but you need to move about in ways other than using a car. It's also very crucial to mental health…" The only places where large amounts of people walk at least five days a week are those with the infrastructure to support walking, biking, transit, and mobility for people with disabilities." As stated by other researchers, health and wellbeing can hinge on street design and operations decisions: "Public health professionals are beginning to look at walking- and bicycling-supportive environments to reduce or eliminate environmental barriers." (Frank & Engelke).

In brief, the experience of COVID, increasing sustainability concerns, and an increasing study and practice of thriving and resilient communities is also supported by the increasing interest in health, and more generally, younger (and older) generations interested in a less auto-dependent lifestyle. Millennials

– likely to become a key part of Shaler's population – in lifestyles that are less auto dependent. As with Speck's work, as well as the metrics such as LEED ND (Neighborhood Design), there is an interrelationship between land use, walking, and livability. The "Economics of Walkability" argument notes that walking and walkability, together, can save money, increase fitness and health, support equity objectives, and support economic development. In addition, they are connected not only to work, education, or services, but also walking and bicycling offer recreational benefits (Litman, 2013).

E. Local Mobility/Micromobility Going Forward

After close to 10 years of pilot programs, some trends and lessons learned are beginning to take shape that provide helpful advice for communities beyond center cities. Shared bicycles and scooters are the most heavily used micromobility vehicles and form the basis for the information described below. Most of the information below was provided during a webinar conducted by the Eno Center for Transportation in early December 2022, where representatives from Lyft, Bird, and NACTO shared their findings. (Eno Center, 2022)

Pilot Programs

- Progressive cities have welcomed and supported vendor-funded, limited pilot testing with few restrictions.
- Acceptance of shared devices (bikes and scooters) has grown as public familiarity has increased and as more hub locations are added.
- Overall use of shared vehicles has steadily increased, and demand is becoming more stable and predictable.
    - Lyft reported that ridership is growing at over 60% on an annual basis, with recreational use of shared devices up strongly within parks and greenspaces.
    - Bicycles are the most popular type and commuter bike use has been increasing in all markets. Scooters, the second-most popular, have also been growing and have attracted new users and not necessarily competing with shared bike use.
- Shared bicycles and scooters are converting to all electric vehicles which are easier to use and more responsive.
- Lyft and Bird reported that cities have been good supporters of their systems, have become more professional in their approach with micro-vehicle companies, and are beginning to tighten rules for micromobility use.

First Mile / Last Mile

- Information collected from shared bicycles and scooters is showing that use by urban populations indicate a sustainable future for them in downtowns and other locations with a younger demographic.
- Most trips are within two miles.
- Compared with mass transit fares, competitive pricing is spurring more ridership as an alternative to walking.
- Micromobility providers are increasing the number of shared vehicles in high-use locations and are beginning to expand service areas beyond downtowns, often in conjunction with bus stops.

Growth of Shared Vehicles

NACTO reported there have been three stages of growth, which NACTO described as the "Beginning" phase, of shared micromobility:

1. First Stage: Cities took the lead over 10 years ago instigating person-powered, shared bike programs. Since then, use grew over 100-fold through today. In Pittsburgh, Healthy Ride owned by Pittsburgh Bike Share began in 2015 with 50 stations and 500 bikes provided by Nextbike.
2. Second Stage: Shared-micromobility systems provided by vendors have doubled their growth over the last 2-3 years. For-profit companies own the equipment and handle fares, typically by credit card.
3. Third Stage (Recent): The shared-vehicle programs are settling down, beginning to consolidate, and are seeking collaborative partnering with cities. Lately, programs are stressing equity arrangements to provide accessible transportation for economically

stressed residents and communities. A “blurring” of company-owned and individually owned vehicles is beginning to occur with several new vendors entering the market. Pilot programs are transforming to collaborative partnerships with cities, where limited-vendor programs are accepting more regulation based on city-generated terms for the ability to expand their systems and cities invest in micromobility infrastructure.

Current Situation

- Lyft reported that car use is beginning to decrease where shared bikes and scooters are in place. Portland’s Bike Downtown and Bike Town, as reported by Portland’s Department of Transportation, has experienced a 52% growth year over year and the system has expanded to meet the demand.
- Bird reported that the lifespans of scooters is short, but scooter and bicycle quality has become more reliable, and vehicles are now equipped with GPS.
- Both firms noted that micromobility is now offering safer and more useful vehicles in auto-dominated cities and that cities are now beginning to see how micromobility is starting to adjust existing circulation infrastructure with, for example, shared-use travel lanes and docking hubs.

Equity

NACTO reported that equity is being addressed by micromobility vendors seeking public-private partnerships with cities with two agendas:

- **Affordability**: Limited low-cost options are being added to existing systems in qualified locations where residents can qualify for lower-cost fares or, in some cases, no-cost fares with restrictions. Locations for lower-cost fares are only being offered in dense
- **Availability**: Shared vehicle systems require good availability, easy access, and affordable fares to be viable. Providing shared vehicles in areas with low ridership requires good cooperation between private and public interests and may require public subsidies to create equitable resolutions.

Most cities do not have the funds to invest in these shared systems, including staff time for their administration. Achieving equitable shared vehicle systems requires collaboration.

Public-Private Partnerships

Not all companies are willing to invest in cities or enter into partnership agreements with them, citing costs, rules, and restrictive time limits for pilot programs. Many vendors have pulled out.

According to Lyft, there are core issues for both parties to consider in forming partnerships.

- Programs need to be long-term relationships. Three years is a minimum and many agreements are for 3-5-year commitments and up to 10 years.
- Station-based locations are preferred by companies.
- Coordination between public transit and shared systems are preferred, with docking stations located at bus stops.
- Cities need to be willing to invest in infrastructure to help create safe travel zones on streets and docking stations on sidewalks.

Lyft and others are now looking for permanence and ways to achieve it.

NACTO is witnessing a shift toward partnerships with cities.

- Cities want strong systems that can support a robust system network of locations and availability along with a strong commitment by companies, acknowledging that each city is different.
- Cities will need to up their side of the equation to build trust with private vendors, such as requiring permits, reaching agreements (contracts) with companies, and investing in infrastructure to increase safety.

Bird, a global micromobility company, believes there needs to be a federal government presence for partnerships to work. Currently, the federal government continues to favor automobiles and is currently investing in electric cars and private companies need to reach 20% levels of current local traffic for sustainable operations. Bird sees the need for federal investment in micromobility for long-term success.

Safety

With most roads designed exclusively for cars and trucks, cities will need to think about road design to increase safety. Bird recommends penalties (fines or installation of good infrastructure) for autos as opposed to lighter weight micromobility vehicles and asks how the focus of road design could be shifted to autos being the safety problem. They also noted the need to use parking spaces in viable docking station locations and travel lanes restricted to only shared personal vehicles.

NACTO predicts that electric bikes and scooters will grow and the need for streets to adapt, including:

- Wider lanes where cars and micromobility vehicles share lanes.
- Smoother surfaces to accommodate two-wheeled, lightweight vehicles.
- Intuitive locations about where the public can understand are intended for micromobility use.

What to Expect in the Next 10 Years

- Lyft: Shared bike and scooter dockable stations, with electrified charging for each vehicle and pay stations that accept pre-loaded fare cards, credit cards, and cash. Lyft believes these changes will lower operating costs because vehicles would be docked by their riders, not by the company.
- Bird: It is realistic to assume that e-bikes will increase the use of shared bikes, with an expectation that they will increase the number of trips by 10% to 15%.
- NACTO: Shared micromobility stations teamed with transit systems.

For suburban communities, there are many lessons to be learned from the above comments from vendors at risk and the professional advice and evidence-based research from NACTO.

III. Shaler As a Suburban Main Street Case Study: Challenges & Initiatives

F. Shaler As a Suburban Model For New Local Mobility

The findings from RCI's LINC study identified the importance of main street in an urban neighborhood, community, and smaller-scaled town as a significant link to the overall transportation network. Main streets are the primary first and last mile of the transportation system collecting local streets for distribution to the broader network of arterials, corridors, and highways. They are primary candidates for the new local mobility where pedestrians, users of bikes and scooters, personal and shared automobiles, and local transit users converge to access local activities and make connections to places of work. Speed limits are slower, roadways are narrower, and the setting is scaled for complete street accommodations.

Shaler's main street throughout most of its history, including today, has been Mount Royal Boulevard. Although it has changed character over the years from a streetcar main street lined with local businesses and residents to today's busy connecter roadway, it nonetheless is the single north-south roadway that makes connections to all portions of the township. While its commercial character has changed over time, the boulevard has retained its role as the township's primary local commercial street, albeit with few stores providing for daily needs and services, and primary access to local neighborhoods and homes.

Mount Royal Boulevard is multi-functional. It is the primary connector to Etna and downtown Pittsburgh, to Route 8 shopping and its northern communities, and west to Babcock Boulevard, McKnight Road, and Interstate 279. In addition to its connector character, it also serves as:

- Shaler's primary commuter route to Pittsburgh and places of employment.
- Main access to most of the township's residences and schools.
- Main street for the library and fire station, and the primary access to township municipal offices, parks, and recreational areas.
- Shaler's event street for township-wide events where portions of the boulevard are closed for parades, including Community Day on July 4th, the annual high school Homecoming celebration in early fall, and Holiday "Lite" Up Night in November.

As a suburban model for the study of local mobility, Mount Royal Boulevard provides both the basic transportation network functions of urban main streets, and, likewise, its candidacy as a venue for new local mobility and complete street functionality, and a setting that is almost entirely automobile dominant and dependent. It is these two conflicting characteristics that provide a good case study test environment for new local mobility and how it might adapt for locations beyond center cities and their urban neighborhoods.

The boulevard now sits in contrast to Shaler's local residential streets that continue to provide the suburban environment treasured by families and residents of all ages who seek a more tranquil setting than the bustling city.

What added an element of reality to this study is the work of a few Shaler residents and the cooperation of Shaler's Board of Commissioners. Walk Bike Shaler, a local grassroots organization, reached out to the Remaking Cities Institute after learning of RCI's participation with two prior local mobility studies, the Route 65 Boulevard Corridor Study for PennDOT and the LINC study, researching the same issues as the organization and looking for institutional support and input for their local initiative. From RCI's perspective, the possibility of working with a suburban community to further study issues of the new local mobility with another urban design model type was a fortuitous coincidence. Walk Bike Shaler was providing the opportunity to directly engage with a local community on the very issue of the future of local mobility in a suburban environment.

Walk Bike Shaler and the Better Boulevards Initiative

A contingent of Shaler Township residents are avid bike riders and advocates for safer walking and biking conditions throughout the township and proponents for strengthening the sense of community that has deteriorated over the years. As bike commuters to downtown Pittsburgh, they are consciously aware of how the automobile has changed Mount Royal's main street environment and they avoid the boulevard and use alternate local streets for a safer commute. As residents they are keenly aware that Mount Royal Boulevard has lost its former character as a walkable main street with local shops, safe pedestrian access to schools and recreational activities, and an atmosphere that catered to families. Recognizing this situation, Walk Bike Shaler was formed in 2017 (later incorporated as a non-profit in 2019) and began the community and local government engagement to make the case for rethinking the boulevard. They see its potential.

In 2018 Walk Bike Shaler prepared a presentation for Shaler's Board of Commissioners, *"Let's Build a #BetterBoulevard" – A Shaler Complete Streets Initiative*, to make the point about pedestrian and bicycle safety along the boulevard and some of the other heavily trafficked streets in the Township. Its objective was educational: provide residents with a better understanding of the boulevard's conditions, inform the community that Allegheny County and PennDOT have identified it as unsafe, inform residents and others of recent statewide transportation policy changes that now advocate rethinking and modifying the state's roadway system for multi-functional use, and using design illustrations to show how the boulevard could be easily modified to create safer places for users other than cars. These are some of their findings (Walk Bike Shaler, 2018):

Justification

- The density of Shaler Township at 3200 persons/square mile is enough to justify roadway investment by PennDOT and Allegheny County.
- Although Shaler has a higher median income than other state communities, there are residents who cannot afford to own a car, are both younger and older to operate one, and are dependent on local transit or others to drive them to essential services.
- Shaler Township has been identified as a "Live Well Allegheny Community" whose objective is to improve the health and wellness of Allegheny County residents.
- Allegheny County's recently adopted Comprehensive Plan, Allegheny Places, supports the "Complete Streets" policy and concept "… of making streets comfortable, safe and convenient for travel by auto, foot, bicycle and transit" to ensure "… that the entire right-of-way is routinely designed and operated to enable safe access for all users." (Allegheny County, 2008)
- Most minor arterial and collector roads are owned by PennDOT or Allegheny County, not the Township. Mount Royal Boulevard is owned by PennDOT.

Observations of existing conditions by Walk Bike Shaler noted several challenges facing pedestrians and bicyclists along the boulevard:

Existing Challenges

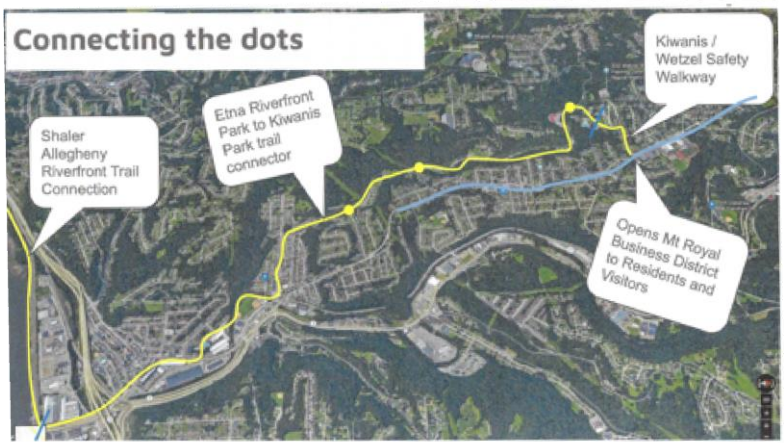
- Pedestrians, bicyclists, and persons in wheelchairs or using walkers often travel in the 32" wide paved concrete drainage zone located between the curb and auto travel lanes on both sides of the boulevard where there are no sidewalks. Beyond the commercial areas the drainage zones are replaced by asphalt without curbs.
- Bus stops are in the right-of-way's shoulders, often with no paving or curbs.
- Utility poles are also located in the right-of-way's shoulder areas. They are obstructions where the shoulders have been constructed as sidewalks, often with the utility poles located next to the curbs and not providing minimal ADA clearances for wheelchairs.
- Numerous curb cuts in the boulevard's commercial areas allow head-in parking in front of storefronts with parked cars in some locations encroaching within the right-of-way.

Sidewalks are not always available in Neighborhood Commercial zones on Mount Royal Boulevard, so pedestrians use the 32" wide concrete drainage zone between the curb and travel lanes. (Source: Walk Bike Shaler).

The proposal included several ideas for a low-cost complete street infrastructure of sidewalks and painted bicycle lanes in the roadway for safer biking. For locations without curbs and outside the commercial areas, the proposal would widen the boulevard on one side out to the right-of-way line to create separate asphalt-paved bicycle and pedestrian lanes or an alternate larger combined lane. Painted lines designated the new lanes and buffer zone.

Encouraged by the Township Commissioners, Walk Bike Shaler updated their earlier presentation in 2019 that illustrated two new ideas for safer biking and walking. The first, a bicycle "complete street" along Little Pine Creek Road as a bypass of the heavier trafficked southern portion of the Boulevard.

The second involved thoughts for restriping the Boulevard in the commercial areas. Two options were shown: one would create bicycle lanes on both sides of the roadway and the other would combine them on one side. Both could be accomplished by restriping the travel lanes from 11 feet to 9.5 feet, which would create 4-feet wide bicycle lanes on both sides of the boulevard or a single 8-wide two-way on one side.



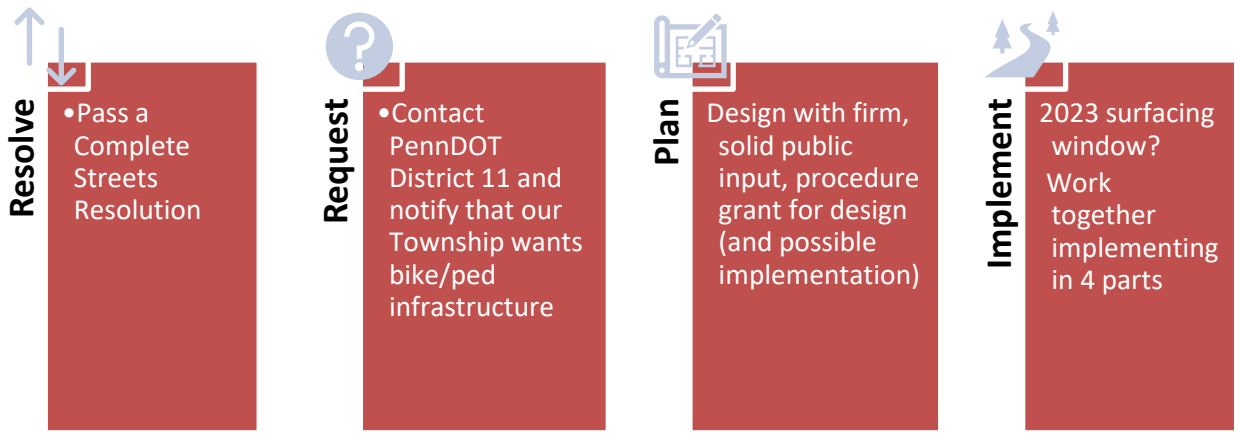
Little Pine Creek Road alternate "complete street" proposal for safer bypassing most of Mount Royal Boulevard's heavy trafficked southern commercial areas. (Source: Walk Bike Shaler).

Walk Bike Shaler produced later version in 2021 that expanded the complete street concept with additional supportive and detailed information, including illustrated plans for safer walking and biking infrastructure on Mount Royal Boulevard. Titled *#BetterBoulevard: A Community Vision for Activity, Equity, and Economic Growth*, the proposed "plan" included an expanded section identifying additional support for needed Mount Royal Boulevard safety improvements for both pedestrians and autos.

Support

- The 1962 Shaler, Hampton, and Richland long range development plan recommended that Mount Royal Boulevard be widened, sidewalks installed, and bus pull-offs be added.
- Walk Bike Shaler conducted a local survey that identified public interest in sidewalks for the boulevard.
- Bicycle and pedestrian app Strava identified Mount Royal Boulevard as a heavily used walking and biking roadway
- A PennDOT 2019 Mobility Survey noted the boulevard for 28 reports of pedestrian-bicycle concern (crashes), among the most cited in the Pittsburgh area. The 2021 Survey reported 57 and the locations covered the full length of the boulevard in Shaler Township.
- The Southwest Pennsylvania Commission's 2020 Regional Safety Action plan identified Mount Royal Boulevard as one of five Bicycle Focus Areas and overrepresented for the number of bike crashes on the boulevard.

The "plan" identified four unique sections along Mount Royal Boulevard, each with its own character, beginning at the Etna border traveling north. The first three contain neighborhood shopping zones separated by residential buildings and the fourth, and largest, is residentially zoned and includes the 175-acre Mt. Royal Cemetery.



Mount Royal Boulevard Sections

- **Southern Shopping District** - The largest of the commercial zones located in the first section north of Etna
- **Hilltop Shops** - The second and smallest section
- **Central Cultural District** - The third commercial and combined civic zone (middle school and library)
- **Northern Plateau** - The large residential zone to the Hampton Township border

Mount Royal Boulevard's four unique sections. (Source: Walk Bike Shaler).

Cultural District sidewalk additions and sidewalk extension down Wetzel Road to Kiwanis Park for safer walking from the library to Kiwanis Park. (Source: Walk Bike Shaler).

Sidewalks and crosswalks in the Hilltop Shops

The complete street extension on Wetzel and Littler Pine Creek Road was retained and the recommendations provided additional information and specific ideas for the three commercial zones. One principle guided the later version: "Work with what we have." Activity would be increased by creating pedestrian-friendly sidewalks and designated local mobility improvements along the boulevard. Equity would be achieved by creating ADA accessible sidewalks in commercial areas and ADA pedestrian lanes in the Northern Plateau. Economic Growth would be spurred by infrastructure and aesthetic improvements in the commercial zones. (Walk Bike Shaler, 2021)

Hilltop Shops detail of a portion showing sidewalks identified by painted lines in curb cut locations in front of retail locations. (Source: Walk

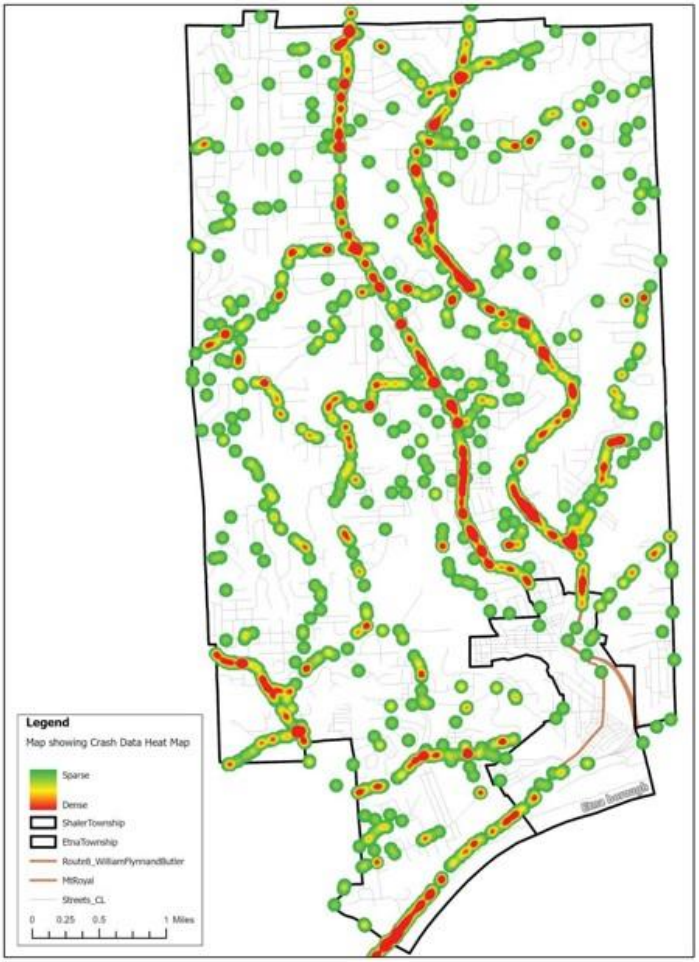
The 2021 Walk Bike Shaler proposals recognized that infrastructure funds for street improvements in suburban communities is limited. Independent communities such as Shaler Township, Boroughs, and incorporated small towns depend on smaller populations to support essential local services, including public works, without large tax-based budgets and often depend on state and federal funds for large improvement and infrastructure projects. They have learned to seek funding from others and join funding sources when local needs match those of others with deeper pockets. Compounding Shaler's situation, which is not the case for most suburban communities, its main street is a state roadway that is maintained and improved only by PennDOT, Pennsylvania's Department of Transportation. Mount Royal Boulevard is not Shaler's property.

Walk Bike Shaler and the Township's Commissioners realize that low-cost improvements with minimal infrastructure changes have a greater chance for success. Diverting the Boulevard's biking pathway to Little Pine Creek Road, utilizing striping to adjust auto, bike, and pedestrian territories, and using asphalt instead of concrete are all strategies to "work with what we have."

Role of PennDOT

The Pennsylvania Department of Transportation (PennDOT) is responsible for planning, improving, and maintaining the boulevard. PennDOT classifies Mt. Royal Boulevard as a "connector" arterial, one level below "arterial" or "highway arterial." In other words, the boulevard is a major feeder street, or connector, to more heavily used arterials, such as the Route 8 William Flynn Highway. As a PennDOT roadway the speed limit is set by the State of Pennsylvania's PennDOT at 30 mph. for its full length through Shaler Township. PennDOT is also responsible for the planning and construction of all improvements, neither of which are controlled or can be changed by Shaler Township alone. Shaler residents have been vocal about the unsafe speed of local traffic often over 40 mph. through commercial areas, in front of the middle school and library, and through residential zones of the Boulevard where driveways back onto the roadway.

PennDOT's recent Mobility Surveys identified the boulevard as a high concern location with many auto- auto, auto-pedestrian, and auto-cyclist collisions and PennDOT District 11 keeps annual data on the numbers and types of crashes. On two-lane roadways PennDOT has noted that most collisions occur from left turns across oncoming traffic (at intersections and mid-block locations) and rear-end collisions at signaled intersections. Note that collisions on Mount Royal Boulevard in Shaler are almost as frequent on the adjacent and much-heavier trafficked William Flinn Highway (Route 8).



Crash data heat map shows locations where more crashes occur. Mount Royal Boulevard is in the center of the diagram and Route 8 to its right. They are almost identical even though the Boulevard has a lower speed limit and significantly less traffic than Route 8. (Source: PennDOT).

In 2021 PennDOT identified a portion of Mount Royal Boulevard for milling, resurfacing and drainage improvements from Etna to Irene Street in Shaler Township, which is south of the Southern Shopping Street. Shaler's Town Manager has reported that PennDOT is planning a larger milling, resurfacing and drainage project for the boulevard in the future. This may be an opportunity for Shaler to work with PennDOT for sidewalk improvements in the right-of-way in locations identified by Walk Bike Shaler and this study for complete street initiatives.

Role of the Southwestern Pennsylvania Commission

Shaler Township with Walk Bike Shaler submitted a proposal to the Southwestern Pennsylvania Commission (SPC), the region's Metropolitan Planning Organization (MPO) responsible for the region's transportation planning, for SPC Transportation Alternative (TA) Set-Aside Program funding to begin the BetterBoulevard Initiative. SPC identified the Initiative "as a catalyst to improve the safety, equity, and economic potential of the community" (SPC, 2021). Funding was approved for Phase 1, consisting of:

> "This first phase focuses on providing safer pedestrian amenities to connect the community's cultural assets. The project consists of adding sidewalks, curb ramps, ADA strips, high-visibility crosswalks, and pedestrian countdown signals at the Mt Royal Blvd and Wetzel Road intersection. Additionally, this project will deploy sidewalks along Mt Royal Blvd and Wetzel Road to connect Kiwanis Park, Crawford Pool, Mount Royal Shopping Center, Shaler Area Middle School, and the Shaler North Hills Library." (SPC, 2021)

Environmental Planning and Design (EPD) will provide planning and design services in 2023 and design services are scheduled to be completed in 2024. Construction of the improvements is planned for 2025 – 2026. It is expected that this project will coordinate with the PennDOT resurfacing project by providing the complete streets infrastructure within the right-of-way as originally proposed by Walk Bike Shaler in their 2021 proposed "plan."

Remaking Cities Institute Better Boulevards Initiative

RCI began this research study in 2021 and in partnership with Walk Bike Shaler for the Shaler Township case study. When RCI's work began, Walk Bike Shaler had already presented their 2018 *"Let's Build a #BetterBoulevard" – A Shaler Complete Streets Initiative* and their 2021 updated proposal/plan, *#BetterBoulevard: A Community Vision for Activity, Equity, and Economic Growth.* Soon after getting started, RCI became aware of the SPC TA Set-Aside Program and encouraged Walk Bike Shaler to apply. It was apparent that SPC's intentions closely matched those of Walk Bike Shaler. It was also apparent that RCI and Walk Bike Shaler shared mutual interests and a commitment to work as partners with RCI for the case study portion of the research.
RCI adopted the Better Boulevards Initiative for this study's title because of its relevance to RCI's former local mobility work with boulevards, including their role as an arterial corridor and as a local connector between four urban neighborhoods as their integrated main street, and Shaler's suburban equivalent.

Mount Royal Boulevard serves many functions as Shaler's main street, a minor arterial connector to regional arterials, maintains three separate commercial areas each with its own character, and its two-lane roadway within a 50-foot right-of-way offers opportunities for the inclusion of new local mobility options.

The following sections document RCI's case study investigation of Mount Royal Boulevard's role as a suburban main street and model.

- Design Data Research
- Camera Data Research
- Roadway Design Analysis
- Design Findings and Concepts

G. DESIGN DATA RESEARCH

RCI performed several design research tasks, including census and Internet research of Shaler's demographics and context, interviews, photographic documentation of Mount Royal Boulevard issues, and documentation of its right-of-way for later analysis.

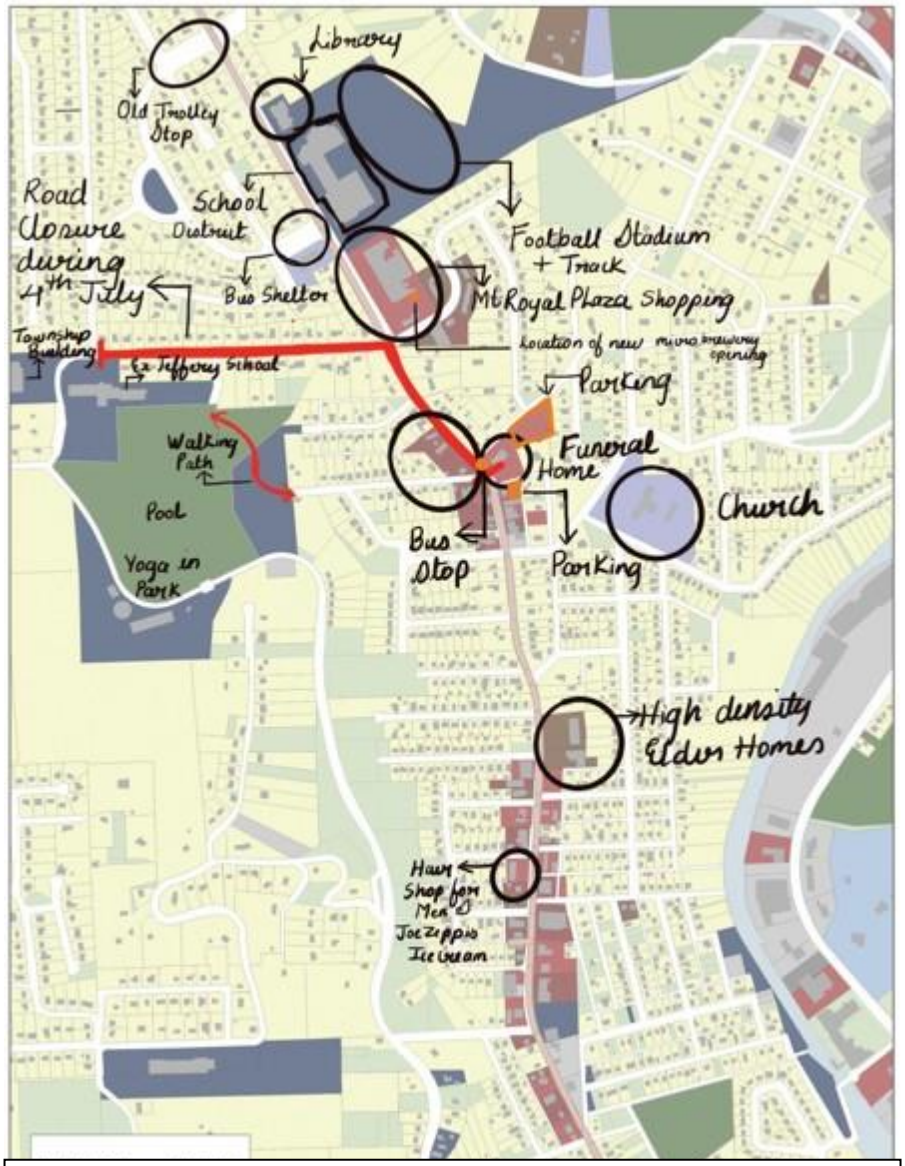
Census and Internet Research

The Appendix contains research about Shaler's history, its demographics, transportation network, land uses, and Mount Royal Boulevard's commercial areas. The information confirmed Shaler's suburban nature and role as a bedroom community of the Pittsburgh area. The Township is a mature suburban community mostly settled and populated after the introduction of the streetcar in the early 1900s to the 1930s and the automobile after World War II. It is middle and upper-middle in terms of income, almost all white, mostly owner-occupied single-family homes with some rental multi-family units concentrated along the Boulevard and clustered near the commercial areas. Most citizens are middle-aged or older and there are fewer children than one would encounter in a newer suburb.

The auto is dominant for travel to work and for daily living needs, such as groceries, which are not located on main street. PennDOT crash and published data identified the Boulevard a location of concern and the Strava heat maps of walking and biking activities shows less use of Mount Royal Boulevard than other local streets.

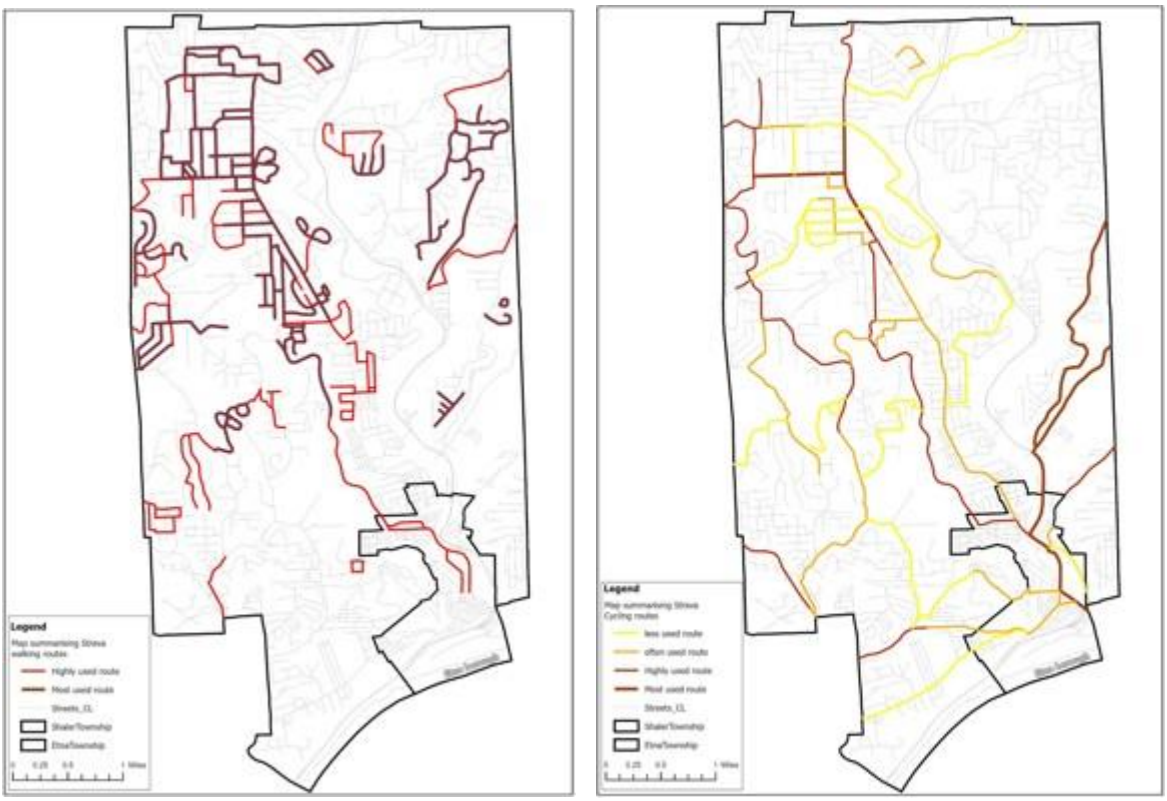
Interviews

RCI conducted several working sessions with Walk Bike Shaler to understand their work and knowledge of how the community functions daily and differently for special events. Their observations were documented on RCI's base maps which are illustrated in the Methods section of this document; below is one of the examples.



Interview research documentation identifying local landmarks, destinations, events, and issue locations. (Source: RCI with Walk Bike Shaler).

Many discussions involved the walking and cycling environment, the use of the Boulevard by pedestrians and cyclists, and how other streets served as safer detours than personal mobility travel on main street. RCI also prepared Strava heat maps that show the magnitude of activity, which are shown below.



Walking heat map is on the left and cycling on the right. Note that Mount Royal Boulevard is heavily used as a pedestrian route on the Northern Plateau down to the Wetzel Road intersection for access to Kiwanis Park; however, it shows minimal use farther south in the Hilltop Shops and Southern Shopping District areas. Bicycle use on the Boulevard is heavy to the north but detours to Vilsack Road for access to Kiwanis Park and onto Little Pine Creek Road down to Etna and shows less use from the library to Etna. (Source: RCI).

The Strava heat maps demonstrate that Mount Royal Boulevard is not the preferred cycling location, and that other routes are important for walking, as well. Walk Bike Shaler was clear in noting that the Boulevard is not safe for either activity. Note the walking and cycling activity on the local residential streets off the main street Boulevard. Recreational walking is heavy on the Northern Plateau residential streets and in locations where the street network allows for a variety of loop pathways. While biking is not as heavy as walking in these same areas, the local streets are still active and safer for family recreational biking. Also note the walking activity in the Hilltop Shops and Southern Shopping District areas where the map shows a medium level of walking to and from the Boulevard's shops. This demonstrates that pedestrian activity does occur getting to the shops but not necessarily along the Boulevard where sidewalks are poor or nonexistent.

Events

The interviews also noted that Mount Royal Boulevard is the Township's ceremonial route for community-wide events: Fourth of July Community Day, the high school Homecoming Parade in September, and "Lite" Up Night in November celebrating the beginning of the holiday season. All occur in and around the Cultural District area and close the Boulevard from the Wetzel Road intersection to Vilsack Road for pedestrian and/or parade activities. Residents, former residents, and visitors use the roadway for walking and its sides for viewing the Homecoming Parade and later for the Homecoming Game on the former

high school track and field behind the Shaler North Hills Library and the Shaler Area Middle School. The Fourth of July event involves linking the Boulevard to Kiwanis Park nighttime fireworks.

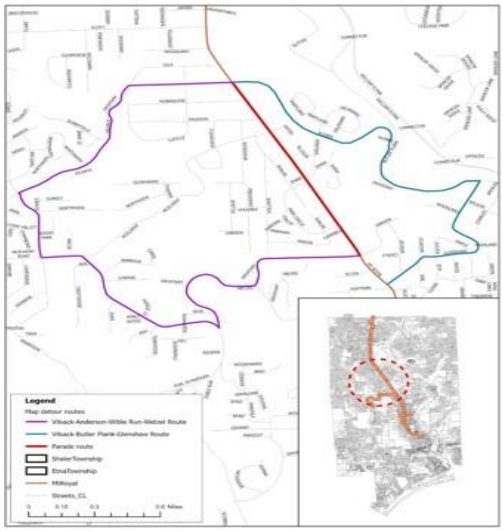
The community events demonstrated the importance of the Boulevard as Shaler's cultural celebratory place and the sense of community and place created for all participants. Residents have a strong bond with Mount Royal Boulevard: it is their main route in and out of the Township and it is their primary location for community-wide events, both of which demonstrate its "main street" importance. Cities also use their notable main streets for parades and celebrations. This is not a coincidence in cities, suburbs, and small towns and communities. The symbolism of the community overtaking the roadway for pedestrian-oriented activity is cultural and the pedestrian-roadway relationship is critical for solidifying resident association with pedestrian access to its main street. It is interesting that Shaler's does not occur in its "downtown" commercial area as most communities do, but in its "Cultural District" where its institutions, wide sidewalks, and wide front yards are prevalent.



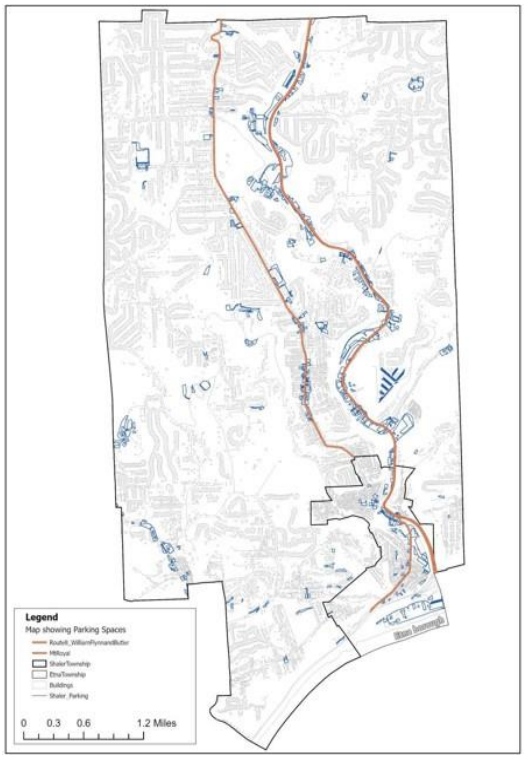

The detours also are instrumental for understanding the necessity of a network of streets paralleling main street to provide alternate pathways for autos and pedestrians alike. For Shaler Township, whose main street follows the topographical ridge line for most of its distance, that network is limited creating wide and long detours around the mile-long parade route. This points out two lessons for understanding main street's role: first, the Boulevard is the single, most direct commuter and local route to community and other locations outside the Township, and, secondly, the topography has created Shaler's secluded residential neighborhoods but has also made it difficult for residents to access its main street as pedestrians. Auto access to the Boulevard's commercial activities is critical for their survival; however, its commercial environment is not pedestrian-friendly making traveling a little farther to Route 8 or Babcock Boulevard and McKnight Road more inviting.

Public Parking

The community events and their associated Boulevard closures highlighted another issue that many suburban communities face: the lack of public parking. Kiwanis Park, the site for fireworks on the Fourth of July, has the largest public parking facility in the community; however, it cannot handle the large crowds for community events nor can the surrounding residential streets. For these events, Shaler relies on the goodwill nature of the community's businesses and institutions for use of their larger parking lots to accommodate the large numbers of cars. A combination of church and funeral home parking lots, along with some businesses in the Southern Business District and their local streets are needed, but even they struggle to handle the large crowds. Local officials and residents, including Walk Bike Shaler's leadership, yearly scramble to find additional spaces and the Township rents buses and trams to shuttle visitors from the Southern Business District to the Cultural District event.Public parking in suburban communities is an expense that most smaller communities cannot afford to develop or maintain that often results in unintended consequences. Almost all property in these communities is privately owned and civic facilities, such as libraries, municipal buildings, and even recreational areas deliberately size parking demand based on typical use activity. Given their smaller populations, smaller municipal budgets, and penchant for low taxes, these communities depend on their business community for their goodwill to step up and allow use of their property for these occasional events. In Shaler's situation, which is not uncommon, businesses likewise do not invest in additional space for parking but when street parking is not allowed, such as along Mount Royall Boulevard, the demand can have deleterious effects. For example, businesses on the Boulevard have enlarged their on- site parking areas to now include the 5- to 6-foot roadway's right-of-way out to the curb line for parking.



Shaler's mile-long parade route is in the township's cultural and institutional center due to its friendlier setting for participants and in a section of the 3.6-mile-long Mount Royal Boulevard main street where auto



All public and private parking in Shaler Township is shown on this map. While businesses on Route 8 to the right have ample parking, there are few other locations in the Township. Those along Mount Royal Boulevard in the business areas are primarily located between the roadway and building entrances. (Source: RCI).

Some of business buildings are located closer to their property lines, yet still allow head-in parking that are too short for standard autos and rear bumpers extend to the curb line requiring pedestrians to walk onto the roadway's drainage zone. While private paving of the right-of-way simulates missing sidewalks, the visual effect sends a strong and nuanced public message that belies Shaler's sense of community, concern for the community's appearance of their "front door," or concern for the viability and encouragement of the business community. It is dangerous for pedestrians and exiting drivers, alike.

Without off-street parking facilities in the business zones, each business has devised their own parking solution often

H. Photographic Documentation of Key Study Areas

Each of the three business areas in Shaler Township Cultural District were also documented to understand how they could accommodate additional local mobility activities and vehicles. Existing sidewalks are shown on the plan drawings as thin black lines. North is at the top of all plan views.

Cultural District

The northern most of the three shopping districts begins the Northern Plateau portion of the Township. The three properties beginning at the Wetzel Road intersection on the eastern side of Mount Royal Boulevard (the right-hand side on the plan) are the Mt. Royal Plaza shopping center, the large Shaler Area Middle School, and the Shaler North Hills Library before the all-residential portion of the Boulevard continues to the Hampton Township border. Kiwanis Park is the light green area on the bottom left.

Public sidewalks on the Boulevard only occur in front of the middle school and a portion of the library. There are no sidewalks at the Wetzel bus stop, in front of the shopping center, to Kiwanis Park, or along the western frontage of the Boulevard for the District's full length.

Hilltop Shops

The middle of the three shopping areas is located between the northern Ellen Street to Glenn Avenue at the bottom edge of the green area. Peace Dental, the last northern parcel on the west side of the Boulevard, is a local landmark. Stores are located at the southern end.

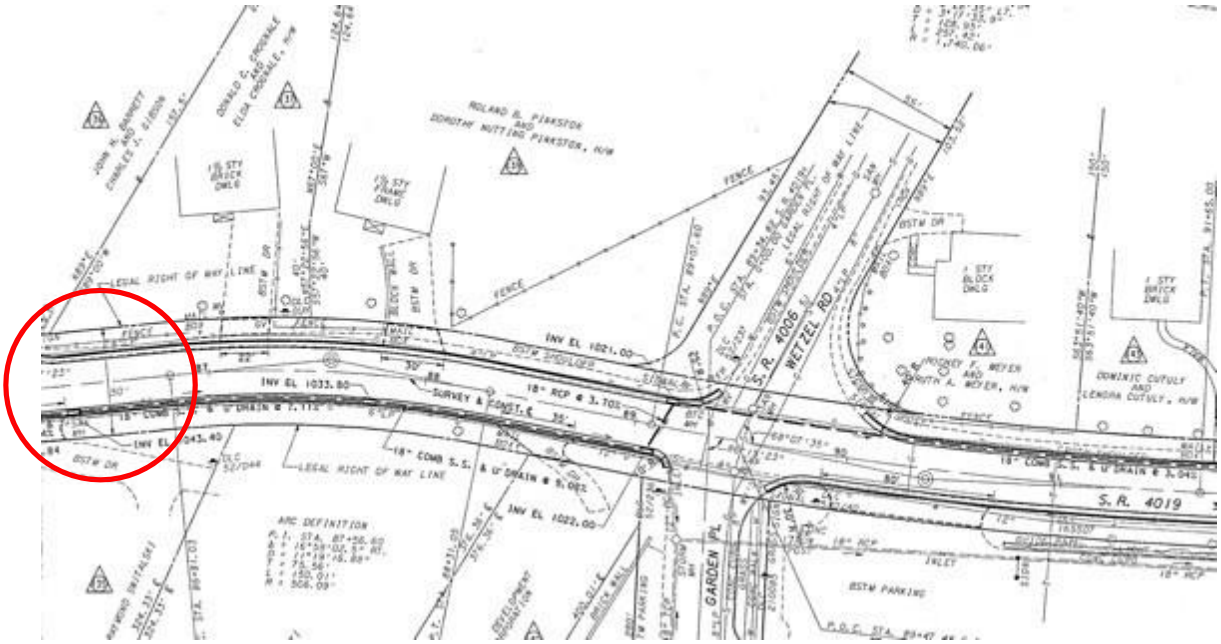
This section of the Mount Royal Boulevard study area has very limited sidewalks. Commercial buildings are built close to the Boulevard's right-of-way and much of the front-of-store parking is inadequate and sometimes dangerous.

Southern Shopping District

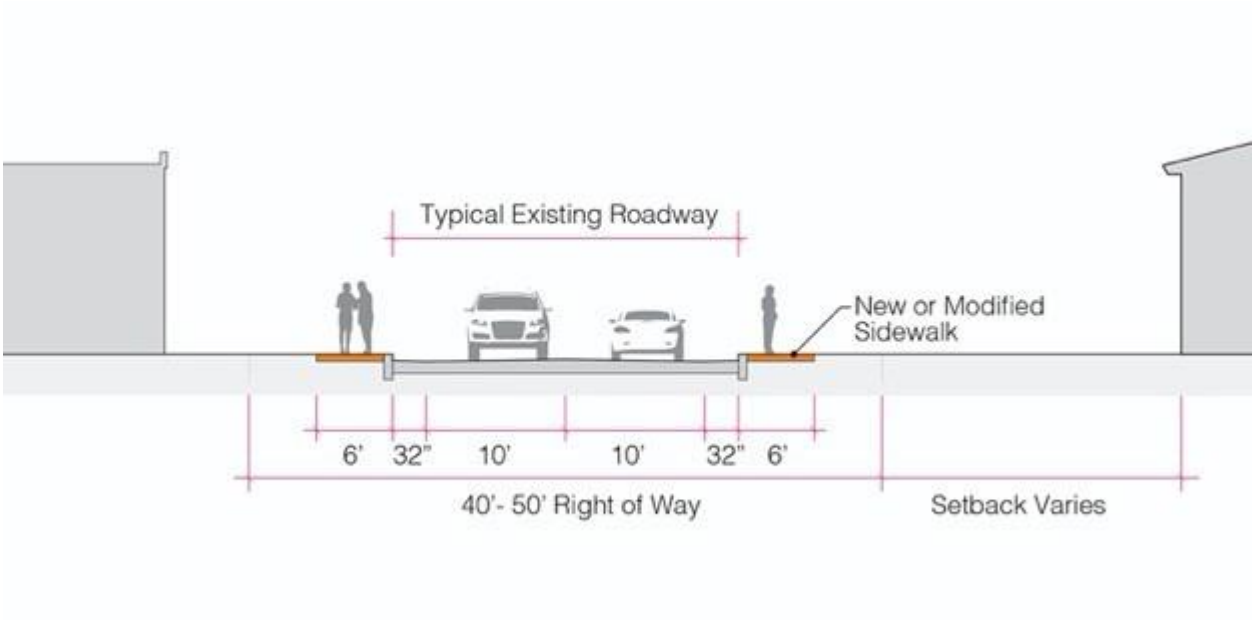
The southernmost of the three shopping areas is Shaler's oldest commercial area and its largest. The district begins at Braun Street to the north and extends south to West Pennview Street. Local landmarks (community destinations) include Joe Zeppi's Frozen Treats, Z Florist, the fire station, and the GetGo and Sunoco service stations. The district also includes a pizza shop, pharmacy, several auto service businesses, and in its northern portion several multi-family residential buildings.

Partial sidewalks occur sporadically in this zone, however many of the storefronts have paved their frontages out to the curb line which provides a semblance of a sidewalk, but many do not. The small shopping plaza where Joe Zeppi's is located has one of the safest sidewalks on the Boulevard where the owners have installed a raised asphalt bed in the right-of-way shoulder that separates a "sidewalk" walking area between it and the plaza's parking lot. "Sidewalk" walking spaces in this district explore the possibilities of home-grown sidewalk creativity, some of which is dangerous to pedestrians and not at all wheelchairs friendly. Intersection corners are also noteworthy where the frontage curbs begin to turn the corner onto side streets but stop where wheelchair curb ramps would normally be installed.

I. Mount Royal Boulevard Right-Of-Way



Mount Royal Boulevard's 50-foot right-of-way in the Cultural District can accommodate other uses within its boundaries. 28- to 30-feet are not used for moving vehicles when the travel lanes are 10'-0".



A generic cross-section of the Boulevard through Shaler Township shows two travel lanes, two 32" drainage zones, and side shoulders with a sidewalk in the right-of-way. (Note: Right-of-way to be confirmed for all locations.) Travel lanes can vary between 10'-0" and 11'-0" depending on conditions and desired use of the drainage zones. The side shoulders can also vary. Narrower shoulders are more prevalent in the commercial areas where the sidewalk width, including the curb, can achieve around 6-feet in width. Other locations, without curbs, have wider paved shoulders. Note that the right-of-way does not stop at the face of curbs and can extend far from the edge of pavement to a property line.

IV. Shaler As A Suburban Main Street

CASE STUDY: CAMERA DATA & DESIGN CONCEPTS

J. Camera Data Research

Visual Data Analytics

Video cameras have long been used in public spaces primarily for security or traffic monitoring purposes. In either case, the extent of the video analysis (live or recorded) has traditionally been examined by a human operator making it virtually impossible to reliably observe events and patterns of interest due to a big data problem. For example, a single 4MP camera with H.265 compression at 15 frames per second generates 1.3 million frames and requires 937.5 GB of data storage. In recent years, the big data problem has been addressed by utilizing computer vision, machine learning, and artificial intelligence to automatically process the data in real-time. These resulting visual data analytics have led to much more effective surveillance and traffic monitoring[1,2].

The use of visual data analytics has led to numerous smart cities applications, where local governments use the analytics to improve their infrastructure, safety, and mobility. Two Pittsburgh-based examples are Roadbotics[3] and Rapid Flow Technologies[4]; two companies that spun out of Carnegie Mellon University.

Roadbotics assesses infrastructure quality (e.g., road surface cracking, sign condition, street light condition, etc.) by applying AI to video data captured by vehicle mounted cameras. The system has been used around the country creating more efficient work planning and freeing up to repair infrastructure instead of collecting data[5]. Rapid Flow Technologies' SurTrac system also applies AI to video data for real-time traffic signal control to optimize traffic flow. It has been shown to have significant mobility benefits such as 25% less travel time, 40% less intersection wait time, 30-40% less stops, and 20% fewer exhaust emissions[6].

For this project, cameras were installed to capture visual data at locations along Mount Royal Boulevard that were determined to be key locations for understanding activity along the corridor. The data were then analyzed with custom algorithms for reliably detecting and tracking vehicles and computing various analytic information. Analytics include vehicle counts, vehicle direction of travel, vehicle speed estimates, and vehicle classification. An initial goal of this project was to also compute analytics for pedestrian and bicyclist activity. Unfortunately, it was found that these activities are rare. Coupled with the low image capture sampling rate, pedestrians and bicyclists were not detected enough to useful.

In the sections below, the methodology and results for each component is described in detail.

Visual Data Information

Cameras: Secure Technology Solutions (New Kensington, PA) was contracted to source six cameras and install them at pre-determined locations. The cameras are 2MP HD PTZ cameras made by JideTech. The first 3 cameras were installed on March 3, 2022. Two cameras were installed at the intersection of Mount Royal Boulevard and Wetzel Road and one camera was installed in the shopping center parking lot between Wetzel Road and Campbell Place. On July 6, 2022, two cameras were installed along Mount Royal Boulevard in front of the GetGo gas station. The sixth and final camera was installed on August 7, 2022, in the parking lot at the intersection of Mount Royal Boulevard and W. Littlewood Street.

1. https://carnegieendowment.org/2019/09/17/global-expansion-of-ai-surveillance-pub-79847
2. https://www.traffictechnologytoday.com/news/congestion-reduction/ai-based-traffic-monitoring-system-developed-by-researchers.html
3. https://roadbotics.com
4. https://rapidflowtech.com
5. https://www.roadbotics.com/case-studies
6. https://www.rapidflowtech.com/surtrac

The locations of all six cameras are illustrated in **Figure 1**. Camera location information is listed in **Table 1** with camera designations used throughout the remainder of this report.

Figure 1: Location of 6 cameras that were installed along Mount Royal Boulevard. Each camera is illustrated with approximate viewing angle and field of view as shown in example image captures. Top: First 3 installed and Bottom: Last 3 installed cameras. (Source: CMU Robotics).

Table 1: Information About Camera Deployment Locations

Camera ID	Camera Location	Direction	Camera Name	Latitude	Longitude
1	Wetzel	SW	wetzel-sw	40.524806	-79.962040
2	Wetzel	NE	wetzel-ne	40.524637	-79.962152
3	Shopping Center	NW	shopping-center	NA	NA
4	GetGo	N	getgo-n	40.514347	-79.959257
5	GetGo	SE	getgo-se	40.514347	-79.959257
6	Littlewood	S	littlewood	40.516671	-79.959172

Infrastructure: All the cameras have LTE connectivity thus allowing for remote control access through a web browser and wireless data transfer. Data were wirelessly transferred via RTSP protocol to a data server a lab in Newell-Simon Hall at CMU on Oakland's campus. The visual data was captured as single image frames captured at fixed intervals throughout the day. Once the images were saved, vehicles were detected and tracked by executing custom algorithms on an ad hoc cluster of computers. Relevant information was then stored in a PostgreSQL database in order to later calculate analytics of interest.

Image Capture: One of the goals of this project is to retain as much visual data as possible for future analysis as more data is captured and more advanced computational algorithms are developed.

However, the storage requirements for six video cameras are unsustainable. Fortunately, vehicular activity is relevantly repetitive throughout the day, week, and month. To capture and store sufficient data, approximately 100 frames were captured every hour. In total, images were captured for a three-month period from July 25, 2022, to October 25, 2022. The data were captured at random times throughout the day to build temporal distribution models for an entire day.

The littlewood camera is located at the top of the pole in the center. (Source: RCI).

Camera Localization and Calibration

Methods were developed to automatically localize and calibrate the cameras to estimate intrinsic and extrinsic parameters without physical measurements. These parameters are needed to estimate the 3D ground plane of the scene and estimate vehicle speeds. The method works be using the camera's approximate GPS location and leveraging Google Street View (GSV) to build the scene's geometry. GSV is a street-level imagery database and a rich source of millions of panorama images with wide coverage all over the world. Every panorama image is geo-tagged with accurate GPS coordinates, capturing 360 degrees horizontal and 180 degrees vertical field-of-view with high resolution.

Multiple panoramas are sampled around the desired camera's location inside a radius of 40 meters and structure-from-motion (SfM) is used to reconstruct the scene. Note that we also geo-registered the up-to-scale SfM reconstruction using the provided GPS coordinates of the GSV panoramas. Thus, the final 3D reconstruction of the scene is in the metric scale. To obtain the camera's intrinsic and extrinsic parameters, the typical visual localization pipeline was followed by localizing the desired background image with respect to the 3D reconstruction built with GSV images. To establish robust 2D-3D

correspondences, the work of Sarlin was followed[7] by using learned feature matching method SuperGlue[8] with SuperPoint[9] feature descriptors to match the query image with the database images. Given the 2D-3D correspondences, a bundle adjustment step was performed to retrieve the camera intrinsic and its 6 degree-of-freedom extrinsic parameters.

The large number of accurate matches between the background image and the rich GSV database images, produced by the learned feature matching modules, allows us to robustly recover both intrinsic and extrinsic parameters of the camera. Prior to applying the method to data from Shaler, the method was validated by localizing more than 70 cameras from publicly available, in-the-wild video streams all over the world. We were able to successfully localize and calibrate 5 of the 6 cameras. The method did not work for camera shopping-center because of the lack of Google Street view images for that location. Camera estimates of height from the ground, pitch, roll, horizontal field of view, and vertical field of view are shown in **Table 2**.

Table 2: Estimated Camera Parameters

Camera Name	Latitude	Longitude	Height (m)	Pitch	Roll	H FOV	V FOV
wetzel-sw	40.524806	-79.962040	4.16	21.6o down	negligible	74o	45.7o
wetzel-ne	40.524637	-79.962152	4.71	19.6o down	negligible	74o	45.3o
shopping-center	NA	NA	NA	NA	NA	NA	NA
getgo-n	40.514347	-79.959257	4.78	14.2o down	negligible	71o	44o
getgo-se	40.514347	-79.959257	4.26	19.6o down	negligible	72o	44o
littlewood	40.516671	-79.959172	5.75	18.3o down	negligible	71o	44o

7. P-E. Sarlin, C. Cadena, R. Siegwart, and M. Dymczyk, "From Coarse to Fine: Robust Hierarchical Location At large Scale," CVPR, 2019.
8. P-E. Sarlin, D. DeTone, T. Malisiewicz, and A. Rabinovich, "Superglue: Learning feature matching with graph neural networks," Proceedings of the IEEE/CVF conference on computer vision and pattern recognition, pp. 4938-4947, 2020.
9. D. DeTone, T. Malisiewicz, and A. Rabinovich, "Superpoint: Self-supervised interest point detection and description," Proceedings of the IEEE conference on computer vision and pattern recognition workshops, pp. 224-236, 2018.

Vehicle Detection and Tracking

Detection: To detect vehicles, a variation[10] of Mask-RCNN[11] was used. There are hundreds of classes that are detected, but only vehicles (cars, trucks, and buses), motorcycles, bicycles, and people are reported here. The detection methods take as input the RGB camera images and outputs the objects' bounding box and a segmentation mask (not used here). The object class with the highest confidence score is assigned to the object. The bounding boxes, class names, and confidence scores are shown for an example image in **Figure 2**.

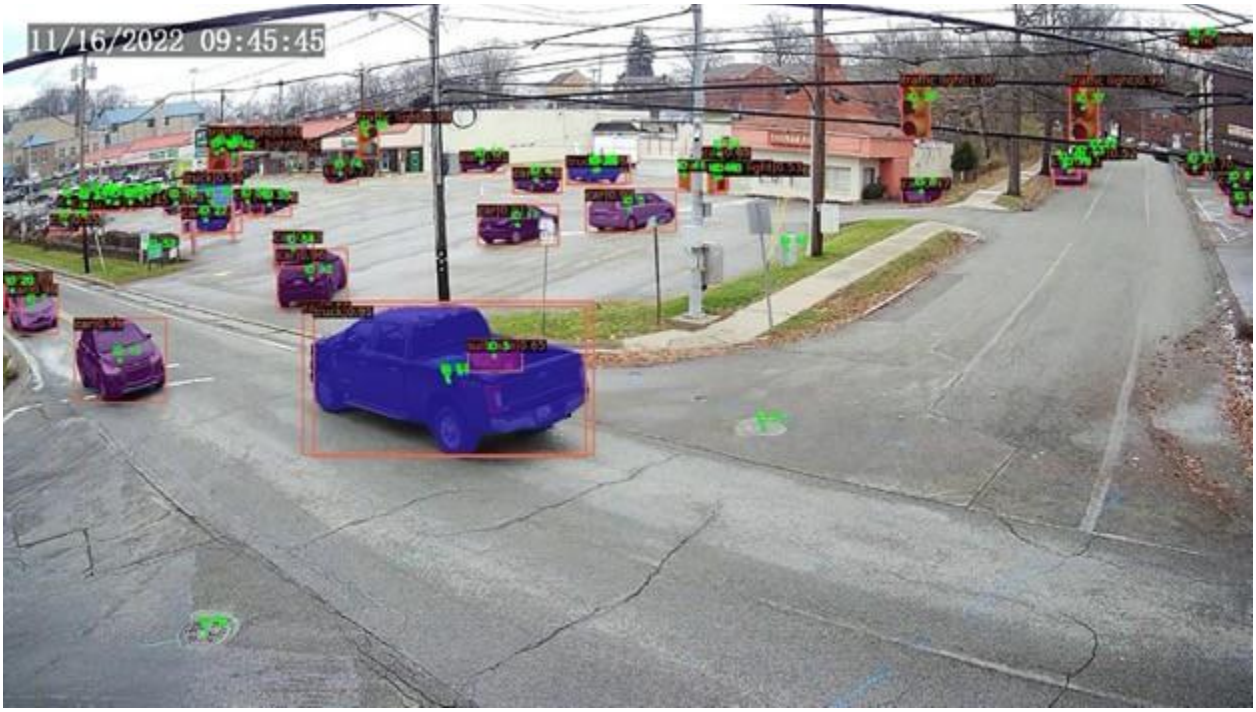


Figure 2: Example output of object detection algorithm. Detected objects are shown with a cover overlay and within a bounding box. The class name and confidence score are also shown. (Source: CMU Robotics).

Tracking: Once a vehicle is detected, it needs to be tracked so that 1) it is not counted multiple times while it is within the camera's field of view and 2) the vehicles trajectory can be connected during the image sequence. Vehicles were tracked using the intersection over union (IOU) method[12]. Briefly, the bounding boxes for detected vehicles in consecutive frames are used to compute an IOU metric, which is simply the area of overlap over the area of union. If the metric surpasses a given threshold, the vehicle is assigned a unique track. To eliminate ID switching, i.e., cases where separate vehicles are so close to each other (e.g., passing vehicles) that they are assigned to the wrong track, simple heuristics (e.g., no abrupt change in direction) are applied to each track. This tracking method works very well because the detections are robust against occlusion and is the basis for calculating the visual data analytic results.

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10. Z. Liu, Y. Lin, Y. Cao, et al. "Swin Transformer: Hierarchical Vision Transformer using Shifted Windows," IEEE/CVF International Conference on Computer Vision (ICCV), 2021.
11. K. He, G. Gkioxari, P. Dollar, and R. Girshick, "Mask R-CNN," IEEE International Conference on Computer Vision (ICCV), 2017.
12. N. Wojke, A. Bewley, and D. Paulus, "Simple online and realtime tracking with a deep association metric," IEEE International Conference on Image Processing (ICIP), 2017.

Visual Data Analytic Results

Activity: Heatmaps are used to show the magnitude of vehicle activity at each camera location. The heatmaps are calculated by aggregating the tracks of all vehicles over the entire data acquisition period. The result is that each image pixel accumulates a sum value for the number of times a vehicle passes over that area of the image. For a given heatmap, the accumulated values are normalized by the maximum count yielding a value from 0 to 1, where 0 (dark blue) indicates no vehicular activity at all and 1 (dark red) indicates the most vehicular activity. The color scale is unique to each heatmap, e.g., 1 in one heatmap is not equivalent to 1 in another heatmap. To visualize the results, a color scale is applied to the value range and smoothed with a Gaussian function. Finally, the heatmap is overlayed onto an image of the scene. Heatmaps were generated for each camera location over two data acquisition periods. The first acquisition period was three-month period from July 25, 2022, to October 25 and the second acquisition period was homecoming day (September 24, 2022) from 6 AM to 9 PM. For the Homecoming acquisition the sampling rate of data capture was increased by approximately 50x resulting in around 5000 images captured every hour (instead of 100 images per hour). The increased sampling rate ensures that the analytics are representative of the day's activity. Calculated heatmaps for each camera during both acquisition periods are shown in **Figures 3 and 4**. All the heatmaps are overlaid on a representative image of the scene. The overall activity trends are similar with a decreased activity density for the Homecoming data acquisition. The Homecoming data acquisition heatmaps also show less or no activity from parking lots off Mount Royal Boulevard.

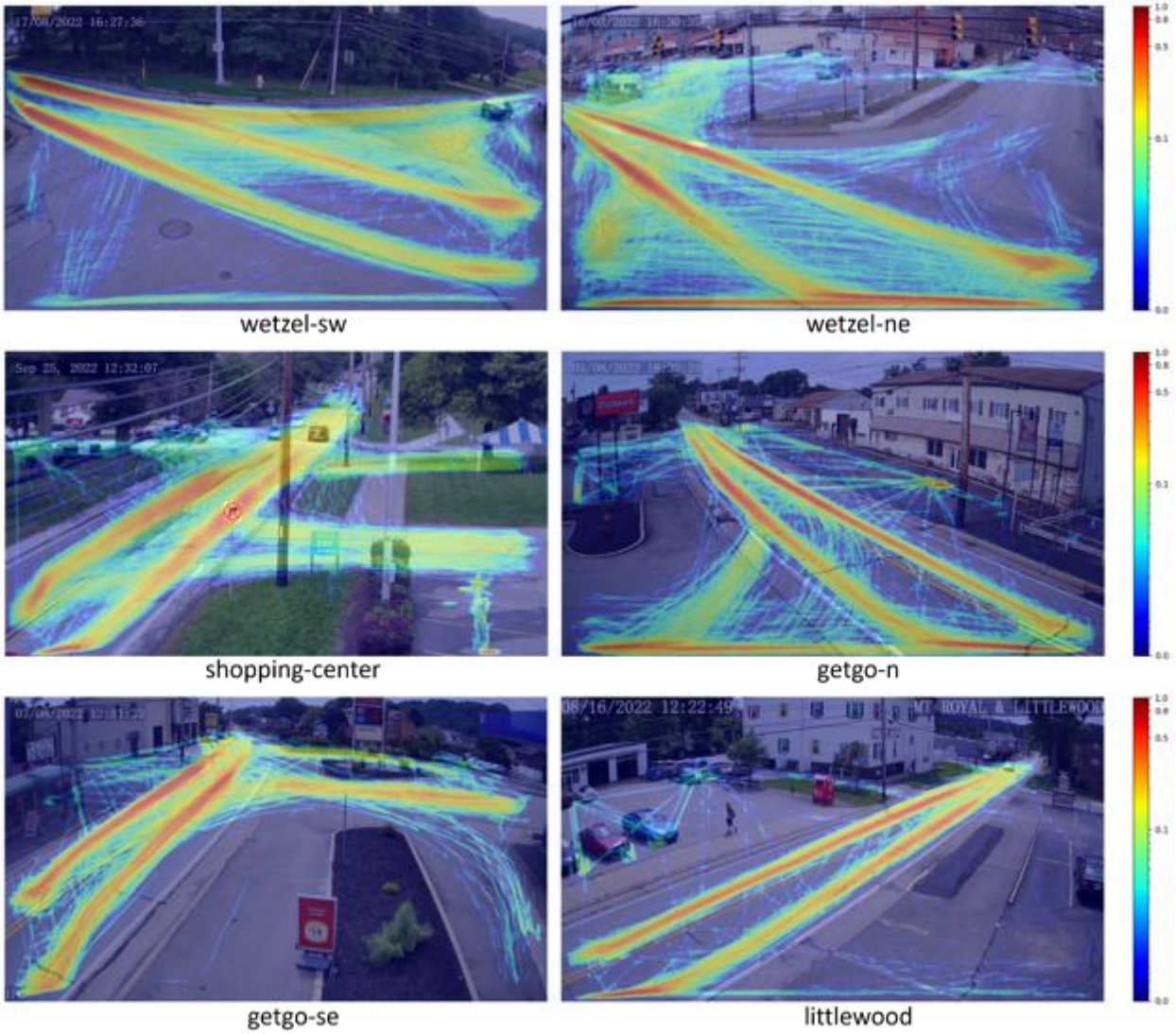


Figure 3: Heatmaps generated for all 6 cameras for the 3-month data acquisition period. (Source: CMU Robotics).

Figure 4: Heatmaps generated for all 6 cameras for the homecoming data acquisition period. (Source: CMU Robotics).

Flowmaps: While heatmaps help visualize locations of generalize vehicular activity, they lack any indication of directionality. To visualize the direction that most vehicles travel, we created flowmaps for each camera. Flowmaps are calculated by dividing the image into 108x108 grids and clustering the directional vectors within each grid (Figure 5). The primary and secondary dominant directions seemed to capture most of the common directions of travel. Directionality is visualized as an arrow within each grid. **Figure 5** shows the primary and secondary dominate directions in separate images. For compactness, the two directions are shown together on top of the heatmap and background image for each camera (Figure 6).

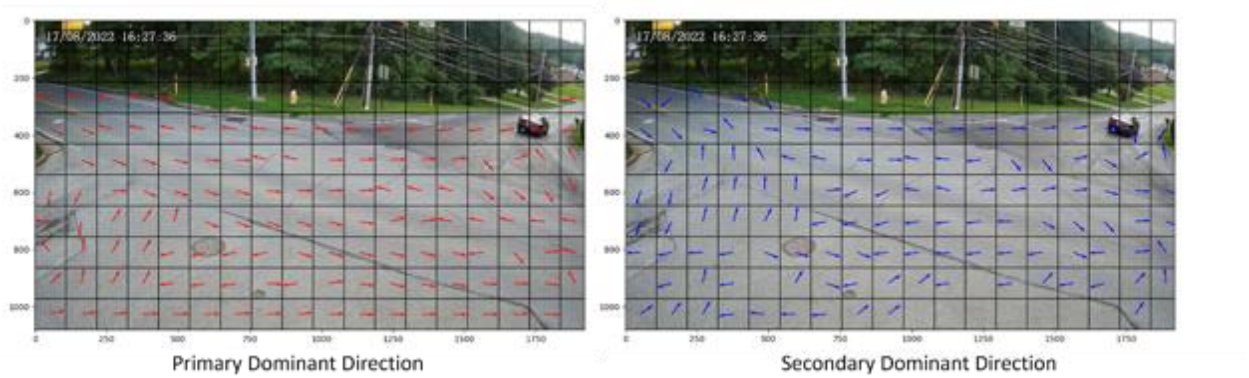


Figure 5: Flowmaps are calculated by dividing the image into 108x108 grids and clustering the directional vectors within each grid. The primary and secondary dominant clustered vectors seemed to capture most of the common directions of travel. Source: CMU Robotics.

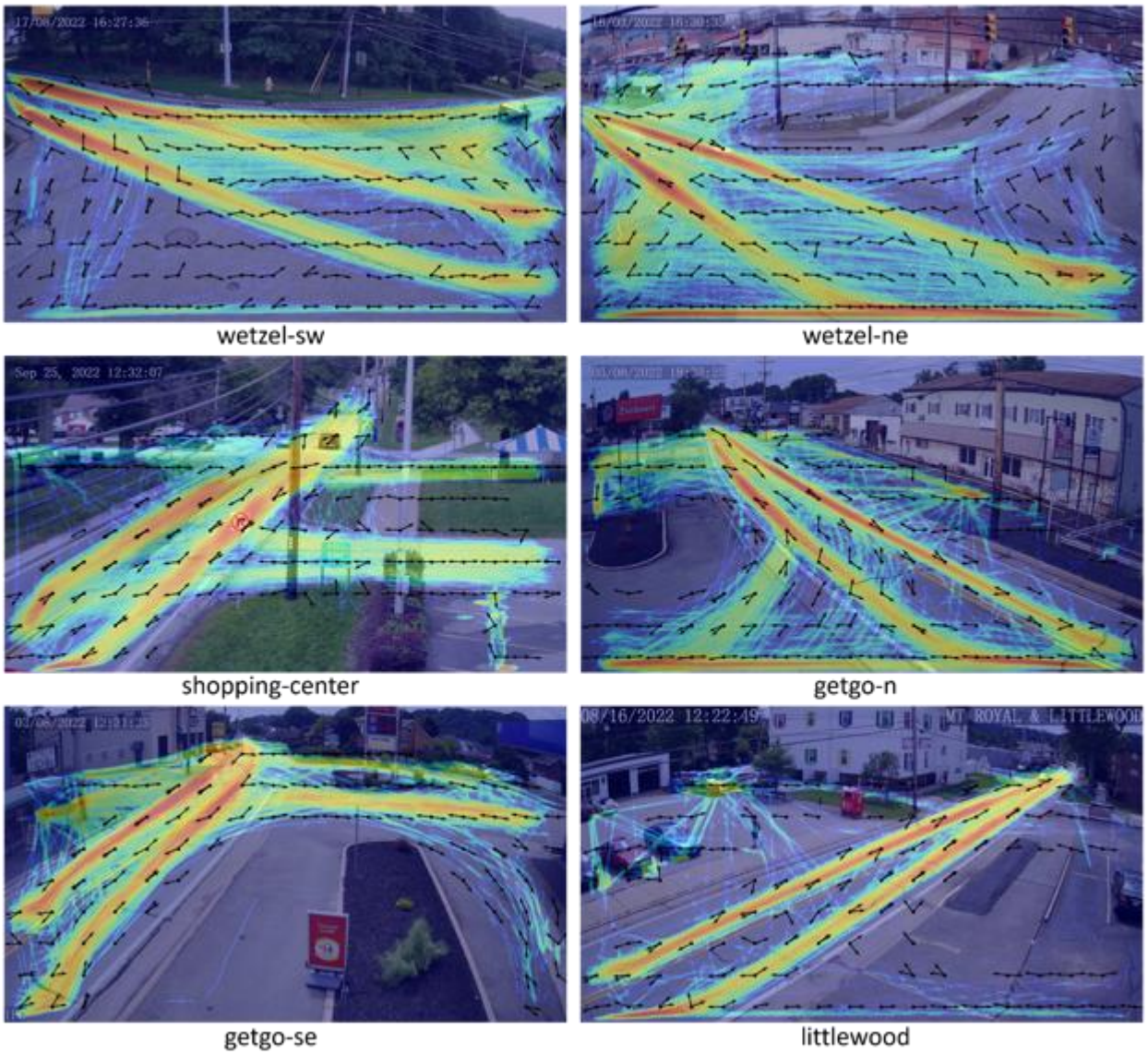


Figure 6: Flowmaps for all the cameras overlaid on the heatmap and background image. (Source: CMU Robotics).

Vehicle Counts: The total number of vehicles for each camera location was estimated from the 3-month data set. Vehicles include (cars, buses, and trucks). To estimate the daily vehicle counts, the hourly number of vehicles was calculated as the sum of all vehicles during the capture time divided by the total capture time (seconds). Then that was multiplied by 3600 seconds/hour to extrapolate an hourly count. To arrive at the total daily vehicle count, the hourly counts were summed for all 24 hours of the day. The estimated daily counts are reported **Table 4**. Note that the counts are based on a detection algorithm that has some amount of error associated with its accuracy and an extrapolated scaling time factor. Therefore, actions should not be taken on the numbers alone. Instead, consider the relative relationship between the numbers, which are more easily digestible as percentages (Table 4). There is more traffic on weekdays than the weekends for all camera locations.

Table 3: Vehicle Counts for Each Day of the Week at Each Camera Location

Camera Name	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
wetzel-sw	18953	19624	20476	23155	21222	18548	14690
wetzel-ne	32768	34451	33591	32212	37680	28564	22289
shopping-center	43913	47854	48393	52117	46337	40237	28002
getgo-n	18954	20314	19985	20163	21404	15271	13674
getgo-se	20835	19980	19840	19144	22476	17251	16563
littlewood	20088	20428	18941	18440	19497	11480	11570

Table 4: Vehicle Counts as a Percentage of the Total at Each Camera Location

Camera Name	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
wetzel-sw	14%	14%	15%	17%	16%	14%	11%
wetzel-ne	15%	16%	15%	15%	17%	13%	10%
shopping-center	14%	16%	16%	17%	15%	13%	9%
getgo-n	15%	16%	15%	16%	16%	12%	11%
getgo-se	15%	15%	15%	14%	17%	13%	12%
littlewood	17%	17%	16%	15%	16%	10%	10%

Vehicle Classification: Once a vehicle was detected, it was classified by type. The categories were car, truck, and bus. These are reported for each camera as percentages in **Table 5 and Table 6. Table 5** is based on the 3-month dataset and **Table 6** is based on the Homecoming dataset. Motorcycles and bicycles were also included as categories. Unfortunately, the algorithm was not able to make the distinction between bicycles being ridden by a person or a bicycle being transported by a vehicle.

Table 5: Classification of Vehicle Type for 3-Month Dataset

Camera Name	Car	Truck	Bus	Motorcycle	Bicycle
wetzel-sw	93.65%	5.81%	0.21%	0.29%	0.04%
wetzel-ne	95.98%	3.58%	0.14%	0.24%	0.06%
shopping-center	96.28%	3.43%	0.18%	0.05%	0.06%
getgo-n	88.42%	11.29%	0.11%	0.09%	0.09%
getgo-se	95.50%	4.15%	0.18%	0.12%	0.04%
littlewood	95.67%	3.75%	0.47%	0.03%	0.07%

Homecoming Dataset

Table 6: Classification of Vehicle Type for 3-Month Dataset

Camera Name	Car	Truck	Bus	Motorcycle	Bicycle
wetzel-sw	94.26%	4.56%	0.39%	0.68%	0.12%
wetzel-ne	96.09%	2.81%	0.51%	0.47%	0.12%
shopping-center	94.86%	3.38%	0.74%	0.55%	0.47%
getgo-n	93.79%	5.72%	0.06%	0.42%	0.02%
getgo-se	95.89%	3.84%	0.13%	0.09%	0.04%
littlewood	97.78%	1.89%	0.18%	0.15%	0%

Vehicle Speed: Vehicle speed was estimated by using the camera calibration and localization methods previously discussed to estimate the ground plane yielding approximate speed calculations in 3D space. Rather than average the speed of the vehicle within the camera's field of view, a specific region of interest was defined for individual cameras. These virtual speed traps" permitted estimates of speed a vehicle crossed over the region of interest, which was defined as a line on the road. Therefore, any reported speed estimates are instantaneous speed estimates. Estimated speed estimates are not linked to any personally identifying information and are reported only as aggregate findings.

Location of Interest: The lower commercial district along Mount Royal Boulevard was the focus of the speed estimates since there are many parking lots so close to the street. Two separate virtual speed traps were used at the getgo-n camera location to capture both lanes of the road. The other two camera locations were getgo-se and littlewood. The posted speed limit along this stretch of Mount Royal Boulevard is 30 MPH.

Results: The shopping centre location was of interest because of its proximity to the middle school. However, our method was unable to calibrate and localize the cameras due to a lack of Google Street view images for that location. The issue can be resolved by going to the location and taking multiple photos from the ground of the area around the camera. Speeds were estimated for both the 3-month and homecoming datasets for these cameras. Shown in **Figures 7 and 8** are images of the scene with a virtual speed trap shown as a green line and histograms of the speed distribution. The vertical axis of the histograms is vehicle counts as a percentage of total vehicles at the camera location and the horizontal axis is speed in miles per hour.

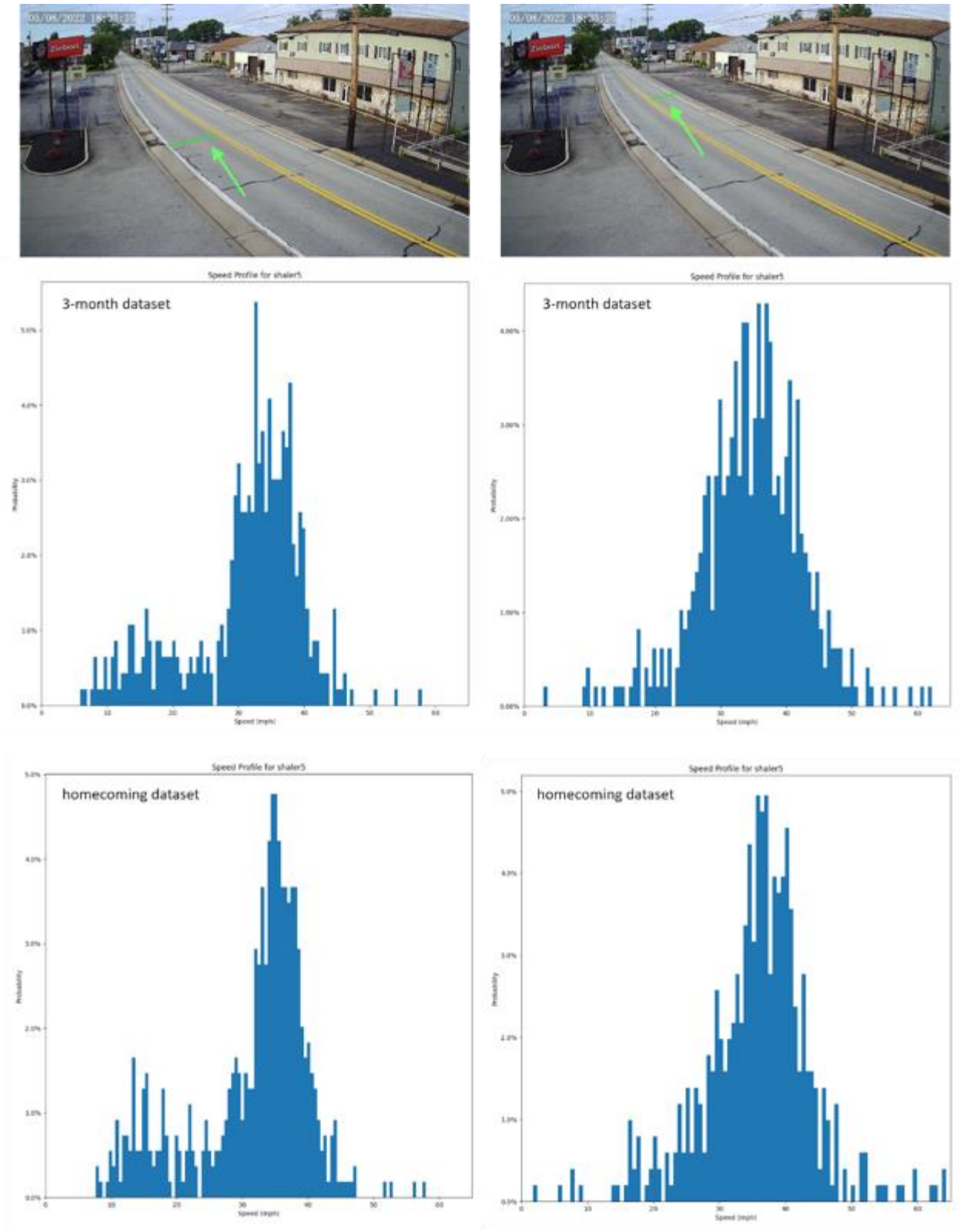


Figure 7: Speed estimates for two different virtual speed traps at the getgo-n camera location. In the top images, the virtual speed trap is shown as a green line with a green arrow pointed towards it. (Source: CMU Robotics).

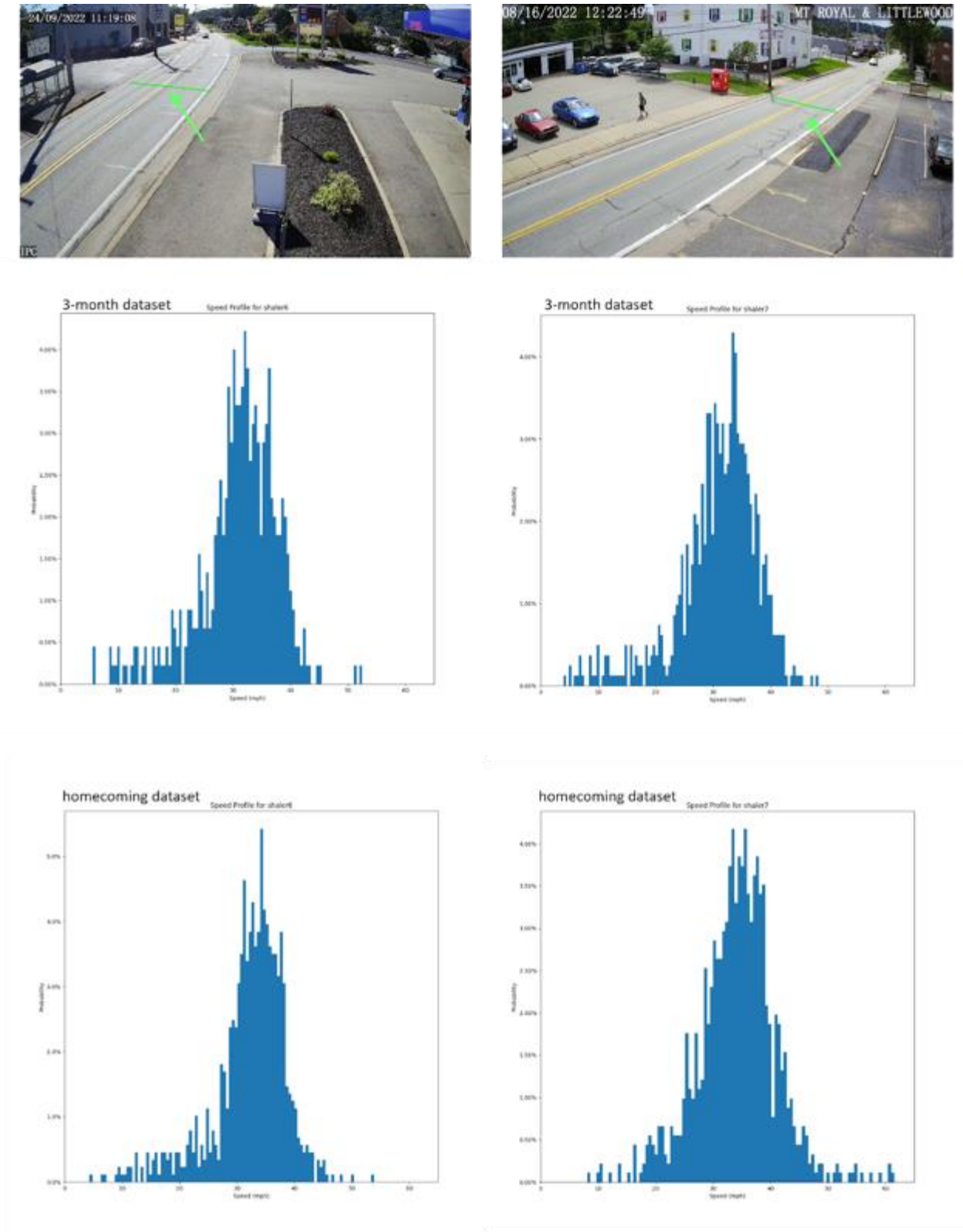


Figure 8: Speed estimates for two different virtual speed traps at the getgo-se and littlewood camera location. In the top images, the virtual speed trap is shown as a green line with a green arrow pointed towards it. (Source: CMU Robotics).

Pedestrian and Bicyclist Activity

As previously discussed, analytics could not be computed for pedestrian and bicyclist activity for two reasons. First, the low image capture sampling did not allow for enough frames to track an object for its entire travel path within the camera field of view. The starting point and ending points were unknown, and thus, any computed analytics were incomplete. Second, coupled with the low sampling rate, the observation of pedestrians and bicyclists were not frequent enough to aggregate summary analytics.

However, the detection algorithm was able to identify instances of pedestrian and bicyclist activity. Example images are shown in **Figures 9 and 10**. From these examples, it was observed that people walk and bike on the sidewalk and the narrow road shoulders. It was also observed that people jaywalk and ride their bicycles in the road. To address the limitations for computing analytics in the future, we would need either a large amount of data storage infrastructure or a mechanism for real-time video compression and long-term data retrieval (e.g., a YouTube live stream).

Figure 9: Example images of pedestrian activity for multiple cameras from both 3-month and homecoming datasets. A) getgo-n camera: person walking on roadside with adjoining commercial parking lot. B) littlewood camera: two people crossing Mt Royal Blvd at location lacking a painted crosswalk. C) littlewood camera: person walking at night on narrow shoulder. D) shopping-center camera: multiple people walking on narrow road shoulder. E) wetzel-ne camera: multiple people (including baby stroller) crossing the Wetzel intersection. F) wetzel-sw camera: multiple people walking along and crossing Wetzel Road. (Source: CMU Robotics).

Figure 10: Example images of bicyclist activity for multiple cameras from both the 3-month and homecoming datasets. A) getgo-n camera: person riding on shoulder of Mount Royal Boulevard. B) littlewood camera: person utilizing sidewalk on Mount Royal Boulevard. C) littlewood camera: person riding in the road toward traffic. D) shopping-center camera: person utilizing sidewalk near the middle school. E) wetzel-ne camera: bike rider passing through the Mount Royal Boulevard and Wetzel Road intersection at night. F) wetzel-sw camera: two people turning onto Wetzel Road. (Source: CMU Robotics).

K. Roadway Design Analysis

Observations

Mount Royal Boulevard: The two-lane Boulevard behaves like a commuter arterial meant to move as much traffic as possible with high efficiency. Except for the traffic signal at Wetzel Road in the Cultural District, there are no stop lights in the commercial study locations allowing a continuous flow of traffic to be maintained. The speed limit has been set at 30 mph. There is one crosswalk that provides access to the library and middle school from Park Circle Drive. The roadway environment is meant for automobile, van, truck, and bus use with no accommodation for pedestrians, local mobility functionality, or reason to drive slowly.

Parking Facilities: No parking is permitted directly on Mount Royal Boulevard and few locations are provided for cars to pull over to discharge passengers. Parking in the shopping districts is provided by each property owner on space they control, either in front of stores, to their side, or sometimes access to rear parking lots from the Boulevard. Head-in parking is the dominant type because most establishments are built close to the roadway and stretch fully across the width of the property. The consequence for almost all shopping area parking is unsafe conditions for both drivers and pedestrians. For drivers, making left turns across fast-moving traffic risks rear-end collisions, backing out from head-in parking into the roadbed can be visually blind, and exiting from side streets and larger parking lots is risky.

Pedestrians are poorly accommodated in the commercial areas due to few sidewalks and the predominance of head-in parking.

Sidewalks: Most of Mount Royal Boulevard is without sidewalks. At one time sidewalks were installed along the southern portion of the Boulevard when and where the streetcars were prevalent. The few that remain are in parts of the Southern Shopping District and south toward Etna ending at Cherry Street.

These were installed next to the curb in the Boulevard's right-of-way and without a planting strip between the sidewalk and the curb. This pattern has informally continued in other locations where commercial property owners have provided their own. The Boulevard's right-of-way is wide enough for sidewalks on both sides; however, there has been no regulating or design standards set for sidewalks by PennDOT or the Township. Sidewalks benefit business activity when pedestrians can walk by storefronts and merchandise displays and sidewalks in residential areas encourage residents to walk to stores, school, and community amenities. Unfortunately, pedestrians on this busy main street are forced onto the roadway.

Sidewalk and no-sidewalk examples in Southern Shopping District. (Source: RCI).

Curb Cuts: Due to commercial area parking configurations, many of the curb cuts in the Hilltop Shops and Southern Shopping District extend across the full width of properties. Those with larger lots typically have a set of curb cuts for entrance and exiting, some of which are blind due to setbacks. Curb cuts are not pedestrian-friendly because of their slope configuration in the Boulevard's sidewalk zone and the off- street parking they promote.

Bus Stops: Bus stops are given little attention along the Boulevard. They are often located in awkward locations, usually without a paved surface to stand on, and without shelter accommodations. Bus ridership is low in favor of personal transportation, and, consequently, transit service and use has eroded over time. Little attention to Shaler's bus stops is an equity issue, especially for those who do not drive, own automobiles, the elderly and frail, and any passenger with disabilities or who has trouble walking.

Example of a full-length curb cut. (Source: RCI).

Bus stops at Wexzel Road and in the Southern Shopping District. (Source: RCI).

Visual Clutter: Most people are unaware of the clutter caused by signage, utility poles and overhead wires, parked cars, signposts, fences, nighttime lighting and lit signs, roadway guiderails, sidewalk substitutes, inconsistent street infrastructure, and the myriad of signs and other structures found along roadways. Mount Royal Boulevard, particularly in the Southern Shopping District and southern portion of the Hilltop Shops, are good examples of visual clutter. There is little visual consistency. (Source: RCI).

Visual clutter examples. (Source: RCI).

Side Streets: Curbs and sidewalks rarely occur on adjacent residential side streets and lawns, or landscaping extends to the pavement edge. Most residents park in their driveways and not on the streets, leaving them for visitor parking.

Traffic Calming: Other than the roadway limited to two lanes, there is little calming that has been applied to the Boulevard. Parking is not allowed within the right-of-way, a common traffic calming measure that visually narrows the roadway and increases, because there is not enough width to add even one much less two parking lanes. Trees are located on private property and generally set back from the roadway; they are typically configured in small clusters and ineffective at narrowing the perceptual width of the space between buildings. While there are small number of traffic signals and marked crosswalks, the general lack of them a steady and continuous flow of traffic. While the speed limit set at 30 mph, many autos travel at higher rates of speed, including 40 mph and above, as noted in the camera data research.

Street Trees: All three shopping districts are generally devoid of street trees. These are an essential component of traffic calming because their canopies stretch over the roadway and narrow a driver's field of vision. When the field is narrowed drivers psychologically lower their speed, a situation very similar to that of driving through a tunnel, but one much pleasanter and aesthetically pleasing. With no on-street parking on the Boulevard, parking in front of stores is at a premium and not conducive to street trees.

Main Street Aesthetics in the Commercial Areas: Mount Royal Boulevard has grown and redeveloped haphazardly over time with little attention to visual "wholeness." The Boulevard's appearance is the opposite as each building seeks its own attention to alert drivers to its presence. Setbacks are indiscriminate and rarely align with one another. Architectural styles and building colors vary throughout the three commercial areas and it is difficult to tell the visual difference between the Southern Shopping District and the Hilltop Shops. Only the Cultural District, with its institutional character set by the library and middle school, maintains a visual continuity between the Mt. Royal Plaza shopping center and the civic buildings, mostly due to the three being significantly set back somewhat from the roadway and with green space and trees providing some screening, yet its character is diminished at the Wetzel intersection by the wide auto entrance into the shopping center.

Main Street Aesthetics in the Residential Areas: Visual continuity is typically strong where single-family homes dominate. Most are set back a reasonable distance from the Boulevard, maintain grassed and landscaped front yards, and are well maintained. Sidewalks and curbs remain in some of the older sections which provide a strong street edge to the Boulevard. Although curbs and sidewalks are sparce

north of Wetzel, lawns are extended out to the pavement edges which brings a similar, but informal, order to the roadway edge. Mailboxes, decorative fences, and landscaping occupy the shoulder right-of-way on many residential properties.

Main Street Aesthetics in Multi-Family Locations: The residential visual continuity breaks down when the density changes to multi-family buildings, not due to their height or change of building materials but because of how their front yards present to the Boulevard. Off-street parking areas and a complex array of parking layouts and configurations, dumpsters, and occasional landscaping do not maintain the appearance of care exercised by the residents in the single-family areas.

L.Design Findings for a Suburban Context

The physical dynamics of suburban communities is often quite different from their larger urban centers. Infrastructure that could support micromobility vehicles and new local mobility is not a high agenda item for communities with small budgets geared for maintenance operations. Significant infrastructure change is only possible with generous subsidized funding. The physical environment has been specifically designed and groomed over time to specifically support automobiles, trucks, and buses. Concrete curbs are not standard, nor are sidewalks. Local roadways are usually two lanes throughout the community and there may be an occasional arterial connector, arterial, or significant corridor connecting with other communities or into the center city.

For these reasons, Shaler has been a useful model for the study of challenges for suburban communities throughout the Pittsburgh metropolitan area and beyond. The major lesson learned is that “work with what we have,” the principle put forth by Walk Bike Shaler, is a valuable starting point and can become the basis for future physical improvements in suburban communities. Most residents have chosen to live in their suburban communities for various reasons, so bigger changes to the physical environment or land use tend to be met with skepticism. The issue for planners and designers is how to grow and upgrade without changing that dynamic. For Shaler, the recommendation is to proceed incrementally, and to harness the deep experience and knowledge of the community.

Proceeding slowly, though, is not a reason to not act. RCI’s observations of the Shaler transportation network, irrespective of micromobility, identified safety and equity as two major concerns.

Safety: Mount Royal Boulevard is generally unsafe for pedestrians, bikers, and not optimal for drivers, either. Allegheny County’s Comprehensive Plan, PennDOT, SPC, and residents have all recorded that finding. Pedestrians, in particular, are more at risk than others, simply because Shaler’s main street does not have adequate sidewalks. Sidewalks are either not there or informally built by property owners in high-use zones and have not been installed on almost all residential properties. Pedestrians of all ages and abilities use the narrow drainage zone for walking and are at risk, given the traffic at 30 mph and faster, and the reality that not all drivers have excellent driving skills, especially at night.

Equity: Not everyone in Shaler owns or has access to an automobile. Off the Boulevard children use the local streets to ride bikes or walk to a friend’s house, and some go farther distances to reach playgrounds and schools. Likewise, older adults rely on walking to destinations as does anyone with a movement disability, such as wheelchairs, e-wheelchairs, or walkers, must use the street. In addition, those without cars rely on bus transportation for other destinations. The quality of bus stops is poor and often inaccessible with assisted devices. Most are unpaved. Fully 41% of Shaler’s residents are either under 18 years of age or 65 and older.

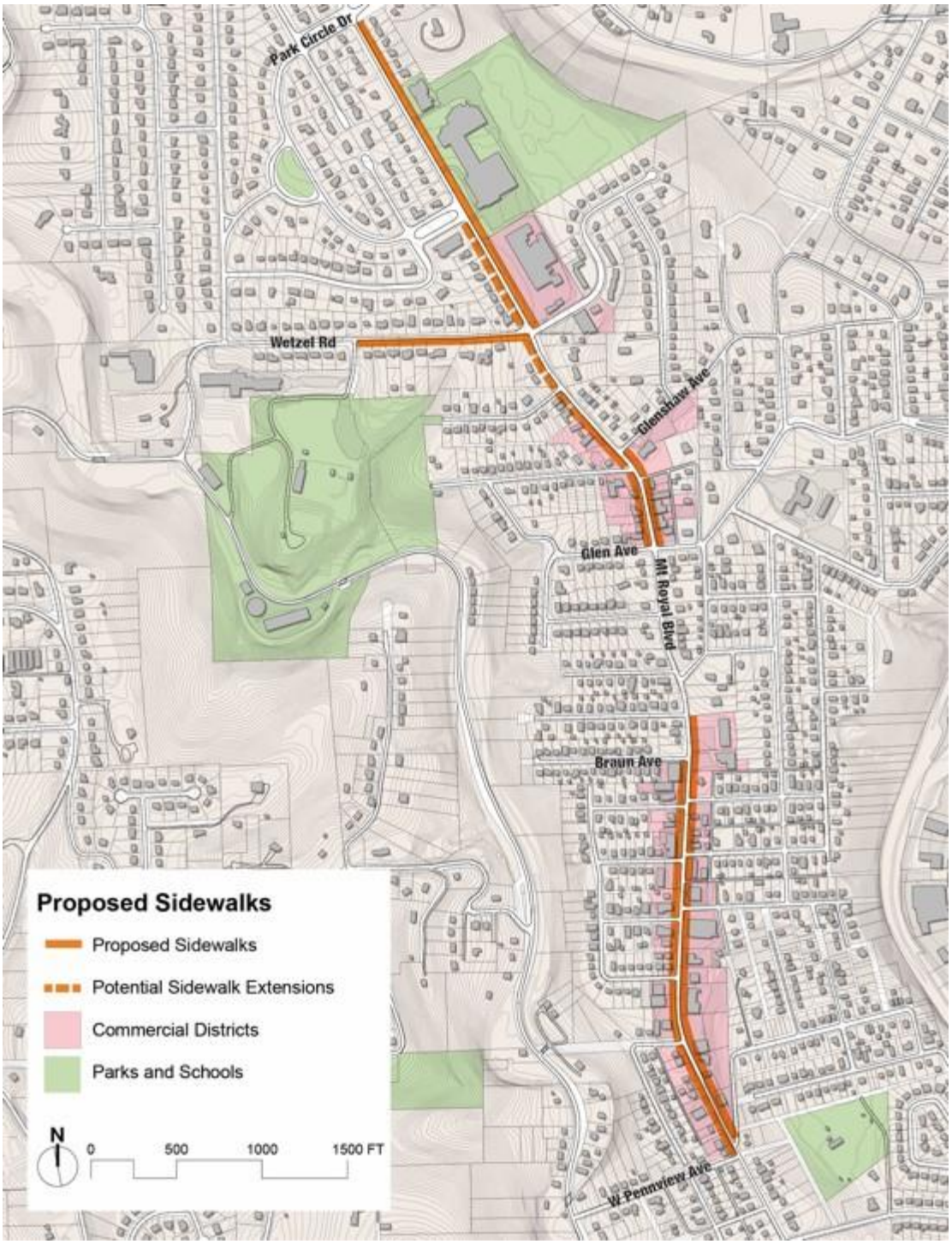
Sidewalks

Building on Walk Bike Shaler's recommendations, installing sidewalks in the three commercial areas and to Kiwanis Park should be the top priority for safety and equity of Shaler residents and visitors. RCI recommends they be continuous on both sides of the Boulevard, sized as wide as possible extending to the outside edge of the right-of-way, composed of concrete, and all curb cuts standardized. See below for recommended sidewalk details for commercial locations with on-site parking.

Sidewalks are recommended for all pedestrians, mobility devices for disabled persons including e-wheelchairs, and bicycles for all children. Electric scooters and adult bicyclists should continue to use the concrete drainage zone that lines both sides in these locations, although these can be improved and expanded.

The accompanying map identifies recommended sidewalk locations. The solid line indicates where sidewalks should be continuously installed and with wheelchair ramps at each intersection. The dashed lines indicate where the sidewalks could potentially be added for better access to Kiwanis Park, the middle school, and the library.

RCI also recommends that Shaler work toward adding sidewalks to the remaining portions of Mount Royal Boulevard and those sidewalks that connect from the Boulevard to civic destinations.



Recommended locations for sidewalks along Mount Royal Boulevard and Wetzel Road as high priority safety and equity initiative. (Source: RCI).

Bus Stops

As a second priority, all bus stops on Mount Royal Boulevard should be provided with paved concrete pads and curb ramp access if needed. Pads should be located and sized as if they were a portion of the sidewalk and installed within the roadway right-or-way. Where possible, three-sided roofed shelters with benches are recommended, including electrical service for nighttime lighting. Consider expanding the bus stop onto adjacent property if more space is needed for the shelter.

Roadway Striping for Bicycles, Scooters, and Other Micromobility Vehicles

There is enough space between curbs to consider restriping the roadbed to create larger, designated travel spaces for smaller vehicles that are not appropriate for use in the standard travel lanes.

Curbed Locations

The current grated inlets should be replaced with smaller-opening grates or reconstructed as curb inlets when installing sidewalks. The asphalt portion of the drainage zone could be painted green as an identifier. Curb inlets should be discussed with PennDOT as part of PennDOT's upcoming resurfacing project, irrespective of whether the lanes are restriped. Restriping should also be thoroughly discussed with PennDOT before resurfacing and could be tested beforehand to determine optimal dimensions for travel and bicycles.

Paved Shoulder Locations

Walk Bike Shaler has already proposed well-designed asphalt paved walk-bike lanes or zones. RCI recommends that these options be considered and installed. Some additional asphalt paving may be needed to meet proper width dimensions.

M. Commercial Area Sidewalk Design Concepts

Three options are illustrated for creating safe sidewalks given the parking/storefront configurations now prevalent in the Hilltop Shops and Southern Shopping District areas. They address head-in and parking lot conditions and the options are interdependent on both building setbacks from the right-of-way and the widths of buildings (on-street parking may require several building widths to accommodate a standard parking space at 23'-0"). For the options to work properly and without changing the present 11'-0" travel lanes, all new curb cuts should be standardized, and new curbs should maintain the present curb heights and face location with respect to the center of the roadway. The depths of all sidewalks should end at the outside edges of the 50'-0" Mount Royal Boulevard right-of-way.

Automobile Dimensions: All options assume a standard automobile length of 18'-0" with some tolerance for longer vehicles, with the assumption that most cars will not exceed the 18-foot length. If there is a prevalence of longer vehicles or larger pick-up trucks, then the setback dimensions will need to be adjusted.

Parking Space Dimensions: All options assume an on-street parallel parking space of 8'-0" by 23'-0" and on-site spaces of 10'-0" by 18'-0".

Curb Cuts: Curb cuts themselves require a 10% ramp and flair slopes. The width of the curb cut's throat should be by local ordinance (in Pittsburgh that amount is 8'). Total width of any curb cut, including flairs on both sides, would be about 12-wide and larger.

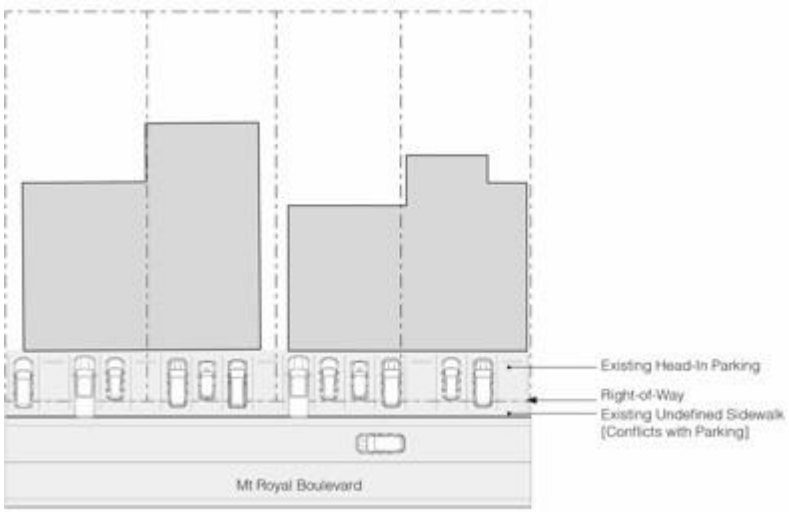
Storefronts Not Eligible for Parallel or Head-In Parking: Any commercial property where the building setback is less than 6'-0" back from the right-of-way.

Option 1: Shallow Head-In Parking – Sidewalk Modifications (On-Street Parallel Parking)

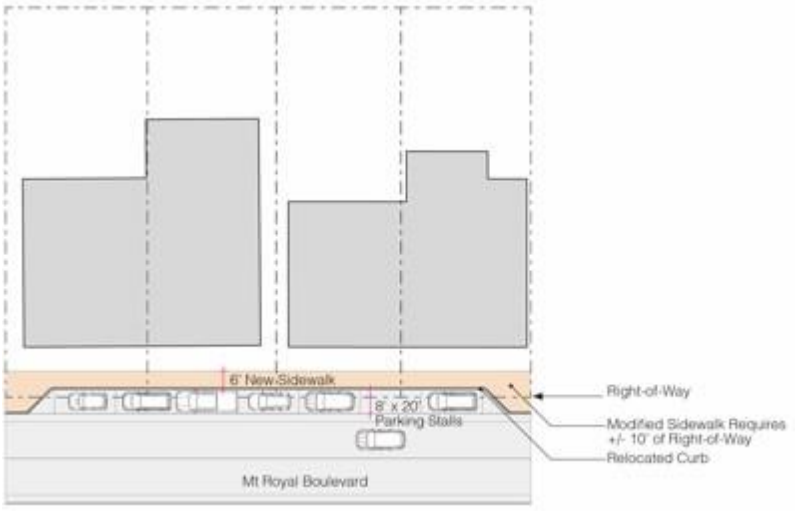
This option creates an on-street parallel parking zone within the right-of-way for a total depth of 8’-8” measured from travel lane edge of shoulder to the curb face. Note that the sidewalk will move inboard of the right-of-way line and onto private property. The distance between the relocated sidewalk and the building face could be paved or landscaped.

This option only applies in storefront locations where the building setback measures at least 6’-0” inboard of the right-of-way line and up to a depth of 24’-0”. On-street parking can be created by taking advantage of the 32” (2’-8”) drainage zone and the 6’-0” (8” curb + 5’-4” sidewalk) dimension from face of curb to the right-of-way line. Alternative: Parallel spaces can be created on properties with enough width to accommodate parallel parking and with a setback of at least 10’-0” inboard of the right-of-way line. This option is not recommended because a very long curb cut would be needed, autos would unsafely cross over the sidewalk, and viewing storefront displays would be difficult.

Shallow Head-In Parking - Existing Conditions (Source: RCI).



Option 1: Shallow Head-In Parking – Sidewalk Modifications (Source: RCI).



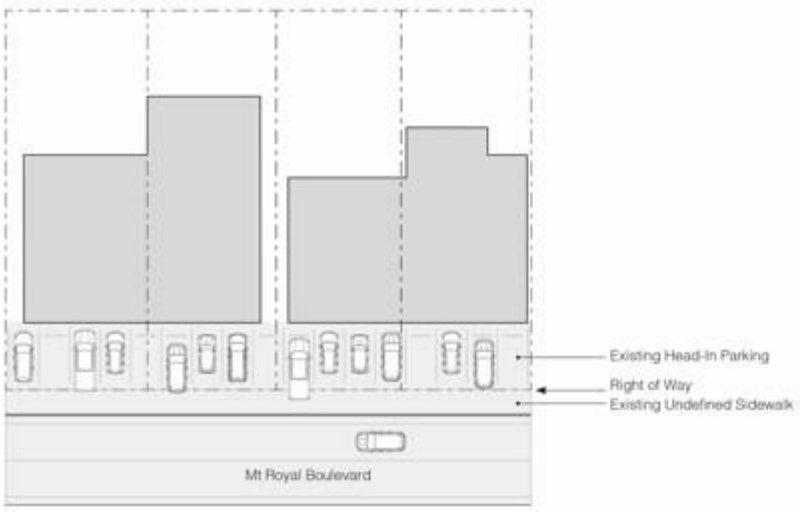
Option 2: Deep Head-In Parking – Sidewalk Modifications

Option 2 is the most common condition for head-in parking. It maintains head-in parking by creating a space between parked vehicles and the sidewalk for drivers to view oncoming traffic from both directions. The sidewalk is located within the 50'-0" roadway right-of-way. Front yards are assumed as asphalt or concrete for both autos and pedestrians, which will allow pedestrians to walk around curb cuts that slope to the roadway.

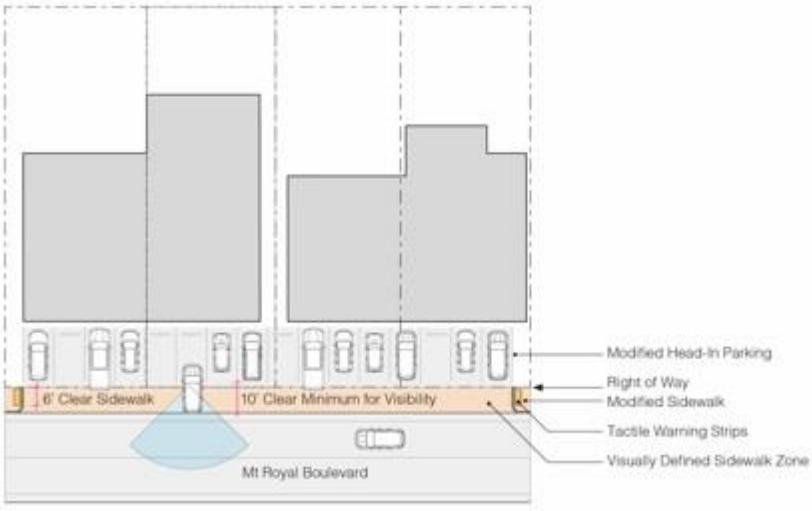
This option applies to current head-in parking locations where the building setback measures at least 24'-0" inboard of the right-of-way line and up to a depth of 30'-0". The 24' depth allows parked drivers to see oncoming traffic by backing as far as the travel lane marking and a 26'-6" depth maintains viewing inboard of the curb line. Issue: head-in parking spaces located next to adjacent buildings with shallow setbacks within 4-feet of the right-of-way line will block driver vision.

For properties 30' and deeper and at least 40' wide, a pull-in parking lot configuration would equal that of an all-head-in parking configuration; however, for buildings 60' wide and larger a pull-in configuration would be more efficient.

Deep Head-In Parking – Existing Conditions (Source: RCI).



Option 2: Deep Head-In Parking – Sidewalk Modifications (Source: RCI).

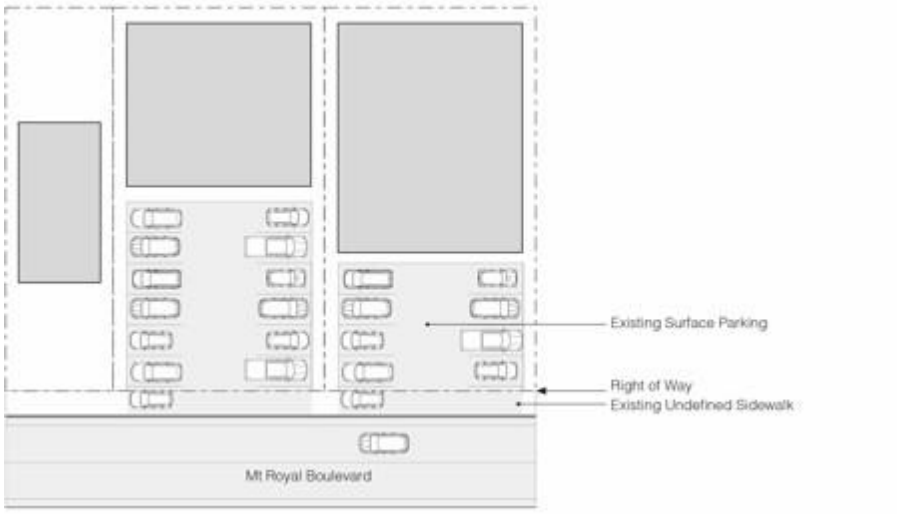


Option 3: Surface Parking Lot – Sidewalk Modifications

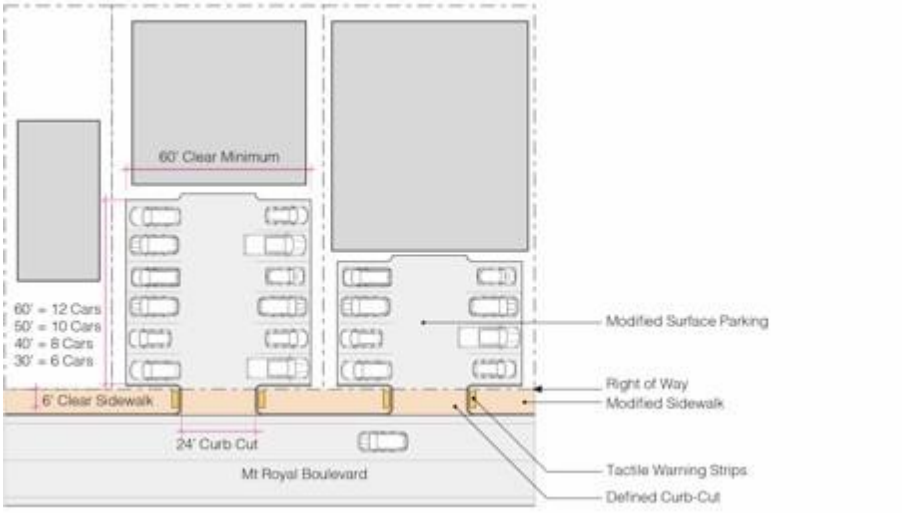
Where building frontages set back larger allowing for parking lots with pull-in spaces parallel to the roadway, sidewalks become more plausible, easy to achieve, and minimize the length of the curb cuts. Option 3 is meant for setbacks of 30'-0" to 60' and larger; however, they do not become efficient until the building width exceeds 40'. An example would be the lot in front of Joe Zeppi's Frozen Treats and several other storefronts.

A lot of 60'-0" in width is equivalent in width to a typical double-loaded parking garage allowing for 18'-0" deep parking spaces and a 24'-0" center driving space capable of two-way movement. With this arrangement the single curb cut of 24' maintains a level sidewalk, not possible with a row of head-in parking spaces. A landscaped buffer is recommended between the sidewalk and the first row of parking spaces.

Surface Parking Lot – Existing Conditions (Source: RCI).



Option 3: Surface Parking Lot – Sidewalk Modifications (Source: RCI).



V. Findings, Recommendations & Conclusion

Priorities

Existing safety priorities include better connecting students from the Middle School to the Library and other assets in the Central Cultural District. These priorities are already being acted upon, and their implementation will be informed and supported by this study. Additional critical goals include improving pedestrian, bike, and other non-motorized connections between the Central Cultural District, Hilltop Shops, and the Southern Shopping District; and providing safer, more equitable connections for elderly and lower income residents living close to the Boulevard but unable to access services without a car, throughout and especially in the Southern Shopping District and Hilltop Shops areas. While this study is not a master plan, it will review and provide recommendations regarding best practices, including incremental steps to meet longer-term goals.

N. Findings

The roadway is primarily designed for and used by private vehicles.

- Anecdotally and analytically, private automobiles and trucks dominate the boulevard, and for most of its length, it is not a safe or comfortable environment for pedestrians and other non-drivers.
- Sidewalks are limited, generally continuous for two blocks or less, often with the same materials, and with little or no delineation from parking and roadway areas.
- Bus stops generally have no delineated area for waiting, and often are often without connecting sidewalks.
- There are especially dangerous conditions where there are “100 percent vehicular curb cut” blocks, and head-in parking spaces that overlap with existing or potential sidewalk conditions.

However, there are other users.

- There are households without access to a private vehicle in Shaler.
- Pedestrians do use sidewalks (or roadway shoulders) to reach local shops and services and bus stops.
- There are many pedestrians on the streets nearby, presumably for recreation trips, but they often avoid Mount Royal Boulevard.
- There are bicyclists who avoid the Boulevard.
- For special events, such as the high school Homecoming, there are hundreds of pedestrians, lining the street for parades and for walking. Other special events, such as July 4, also see hundreds of pedestrians walking from the Boulevard to Kiwanis Park down Wetzel Road.
- Computer vision confirmed a low amount of non-vehicular traffic.
- Computer vision confirmed that with current driving habits, pedestrians and/or bikes or other mobility, faces great challenges at existing intersections, crosswalks, and along the length of the boulevard.
- The community is motivated to make changes, moving forward on a sidewalk to connect the Middle School, the Mount Royal Plaza shopping center, and potentially Kiwanis Park.
- The community is interested in a type of “lean urbanism,” how to improve/add sidewalks while recognizing home and business-owner priorities and township resource limitations

Limitations

- While the camera installations at Wetzel were in place for many months, the camera installations at the two other locations have had a relatively short duration to develop the data for analysis.
- While the computer vision was able to recognize and record bike use, there was not sufficient pedestrian or bike traffic to develop “near miss” analytics.
- This is a research study, which while it looks at specific conditions, is not a master plan or engineering plan for sidewalk and parking design.

Recommendations

Start with Sidewalks

Push for completion of the Middle School to Kiwanis sidewalk.

The SPC grant for the Wetzel Sidewalk, a proposal developed while this study was underway, is an optimal starting point reflecting community priorities. The route is already a pedestrian desire line pathway, given summer activities, with a key interest in providing greater safety for school- age children, and for the full range of residents in the area, providing greater and more equitable access to the Kiwanis Park.

Push for sidewalk continuity in mixed-use districts.

There are schools, daycare centers, dentist offices, ice cream parlors and laundries in the mixed- use centers along the Boulevard. Yet they are difficult to reach by rolling or walking from the adjacent neighborhoods or laterally along the street. Continuity could be established through a commitment to continuous materials (whether a conventional concrete sidewalk or a more modest solution), introducing sidewalk curb cuts for wheelchairs, and through approaches as modest as striping the walkway, and through a commitment to maintaining the ADA-required minimum clear width of 36-inches.

Provide new/improved intersections for mixed-use centers.

Marked intersection and mid-block crosswalks, preferably with warning crossing beacons, will encourage more active pedestrian use of both sides of the Boulevard and safer passage instead of requiring illegal jaywalking to reach more commercial shops without having to drive from one location to another.

- **Tackle the most challenging parking conditions**. Design concepts in this study should be further developed.
- **Delineate bus stop waiting areas and connect bus stops to continuous sidewalks**. Provide paved bus stops, preferably with shelters and benches, when possible.

Continue with Improvements for Bikes and Emerging Mobility.

- The existing roadway is extremely challenging for a continuous bike or bike+ lane given its width, actual and perceived right-of-way boundaries, and existing building locations. However, **there are sections of the boulevard, particularly north of Wetzel, with wide shoulders with the potential for bike+ lanes.**
- A broader **shared roadway model** for mixed-use centers would require a reduction in speed, and a range of modifications for greater safety, and should be investigated as part of any larger improvement plan.
- This is critical for several reasons:
    - The ongoing transformation of local mobility, including potentially autonomous delivery (requiring a new level of sidewalk management and speed modification).
    - New forms of sustainable mobility (e-bikes, “golf carts” and other modes) are expected to have an increasing share of trips, especially in predominantly residential areas.
    - The **equity** challenge for elderly, lower income, or individuals with disabilities, to ensure that as these generally less expensive, more sustainable, and less technically challenging modes of mobility are adapted, they can use them.
    - Greater **health.** Active Transportation work identifies increased levels of walking and biking as benefiting health and wellbeing.
    - Greater **choice** for all. Encourage greater mobility choices. Suburban municipalities often identify as places that provide more choice to their residents. More diverse local mobility is one that residents will increasingly aspire to and expect.

O. Conclusion

The Better Boulevard Analytics study underscored the importance of addressing the fundamentals of complete infrastructure for communities, beginning with sidewalks. Using the longstanding methods of urban design documentation and analysis together with the more recent developments of camera data from six cameras installed at key sites on the Boulevard, demonstrated what was known anecdotally–that

most of the travel along the roadway was by private vehicle, and that pedestrian and cyclist, or other forms of mobility (wheelchairs, kick scooters and other micromobility modes) were few.

However, this was countered by key engagement, data, and related findings that when given the opportunity, such as a special event with limited or vehicle free portions of the Boulevard (as at the Homecoming Parade), effectively a “tactical urbanism” event, that there were significant numbers of pedestrians and cyclists.

In addition, while the numbers were not high, there are pedestrians and cyclists using the Boulevard for their everyday trips to shops, services, and bus stops. As in many parts of the Pittsburgh metropolitan region, the town is laid out on a pre-WWII, streetcar suburb type plan, in which there are concentrations of shops and services, which at one time were used heavily by pedestrians.

The finding was that with an incremental approach, there is every reason that the Boulevard, and so many main streets like it in Pennsylvania and beyond. There are opportunities for “micromobility” or “bike+” lanes, and compelling reasons to develop them. However, the first incremental step is to introduce, or reintroduce, sidewalks, first where the township already has commitments for funding, to connect the Cultural District amenities of library, school, shopping center, and park with walkways that are safe for the full, multigenerational character of Shaler, so evident at special, community-engaging events such as the Homecoming Parade. That type of experience can be, with intention, designed into the everyday life of communities, and sidewalks are key to this.

Similarly, the shopping districts, today with very limited sidewalks, with truly challenging environments for anyone walking or cycling, the introduction of sidewalks, both pavement and paint, together with marked crosswalks, is critical for rebuilding a place where a resident or visitor might go not only from home to the shop or service, but between them, helping to build a more thriving main street. While more resources are always welcome, for safety, functionality, and esthetics, the key here is to recognize that there are a range of improvements that would be meaningful. Therefore, the study developed design concepts for sidewalk and parking modification that work to remake but not eliminate the retail and services parking close to the Boulevard.

There were many lessons learned regarding camera data on this project, including the limitations posed for pedestrian and cyclist data and analytics when the numbers of people walking, biking, and rolling are low. One of the purposes of this study was to test the use of these technologies outside of center cities, and inevitably there is learning and adaptation, both within this project and in future ones. Camera data, like micromobility itself, is a technology that is not always the same everywhere. Deploying this technology was key to the study and yielded several valuable findings on how the Boulevard is used today, with implications for its future. The application of these technologies in non-center city locations is key to developing policies and practices for a thriving region, and this study endeavors to contribute to the knowledge of and potential of those applications.

This study draws the conclusion that there is every reason to apply new technologies, whether in terms of camera data, a position that extends to micromobility as well. At the same time, the findings were clear that new directions for local mobility need to grapple with the everyday urbanism of, in this instance and for so many other communities, sidewalks, even as they prepare for communities where new modes of travel continue to emerge. It also notes that none of this works without the contributions of the community, directly and indirectly, who generated the knowledge and vision to use this applied research towards policy and action.

VI. **Appendix**

P. Shaler Township Study Community

The Shaler Township (Shaler or Township) began as a large swath of land north of the Allegheny River just east of the Borough of Millvale, north of the Borough of Etna, and centered in today's Glenshaw community. Shaler originally comprised several small communities including, Cherry City, Bauerstown, Cabbage Hill, Sharps Hill, Undercliff, Elfinwild, and Glenshaw, but over time sections were carved out for the Boroughs of Etna and Millvale in 1868 and later surrounding townships. The Township was officially recognized as a first-class township in 1900. Shaler Township is named after Judge Charles Shaler, who served as President Judge of the 5th District Court in Beaver County and was a prominent citizen who lived in the township. (Shaler, 2022)

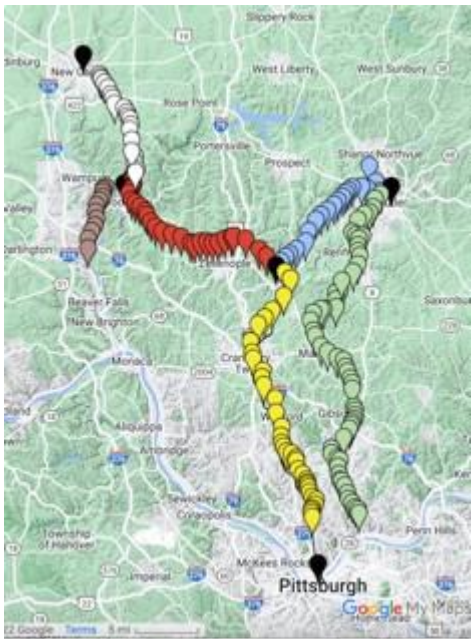
Today the Township operates as an independent local government with seven electoral districts, or wards, with one supervisor per district for a total of seven. In 1951 the supervisors elected to hire a township manager for operations, a position that continues today. Shaler maintains its own police force, fire department, and public works, engineering, building, and zoning departments in addition to managing other services. Township municipal offices are located on Wetzel Road about ¼-mile west of Mount Royal Boulevard and geographically at the center of the township. The Township Manager has responsibilities beyond general operations management, including planning and engineering.

Most people know of Shaler by its two main arteries that serve communities north of Pittsburgh and south to the city, the William Flinn Highway and Babcock Boulevard, and their flood-prone streams that flow, respectfully, through Etna and Millvale. The William Flinn Highway, also known more informally as Route 8, parallels Pine Creek and connects Etna to the City of Butler. Babcock Boulevard parallels Girths Run and connects Millvale to McKnight Road, Route 19, and several northern communities including New Castle. Commercial and industrial uses now mostly occupy the ravines and homes occupy their slopes and ridges. Mount Royal Boulevard, which runs atop the ridge between two north-south oriented ravines, is the main roadway artery that serves Shaler's residential neighborhoods of those of Hampton Township to its north.

Shaler (Glenshaw) was one of Pittsburgh's early streetcar suburbs. The Butler Short Line connected Pittsburgh to the City of Butler about 50 miles northeast of the city. Streetcars ran both ways on Mount Royal Boulevard from one end of the township to the other with numerous stops along the way.

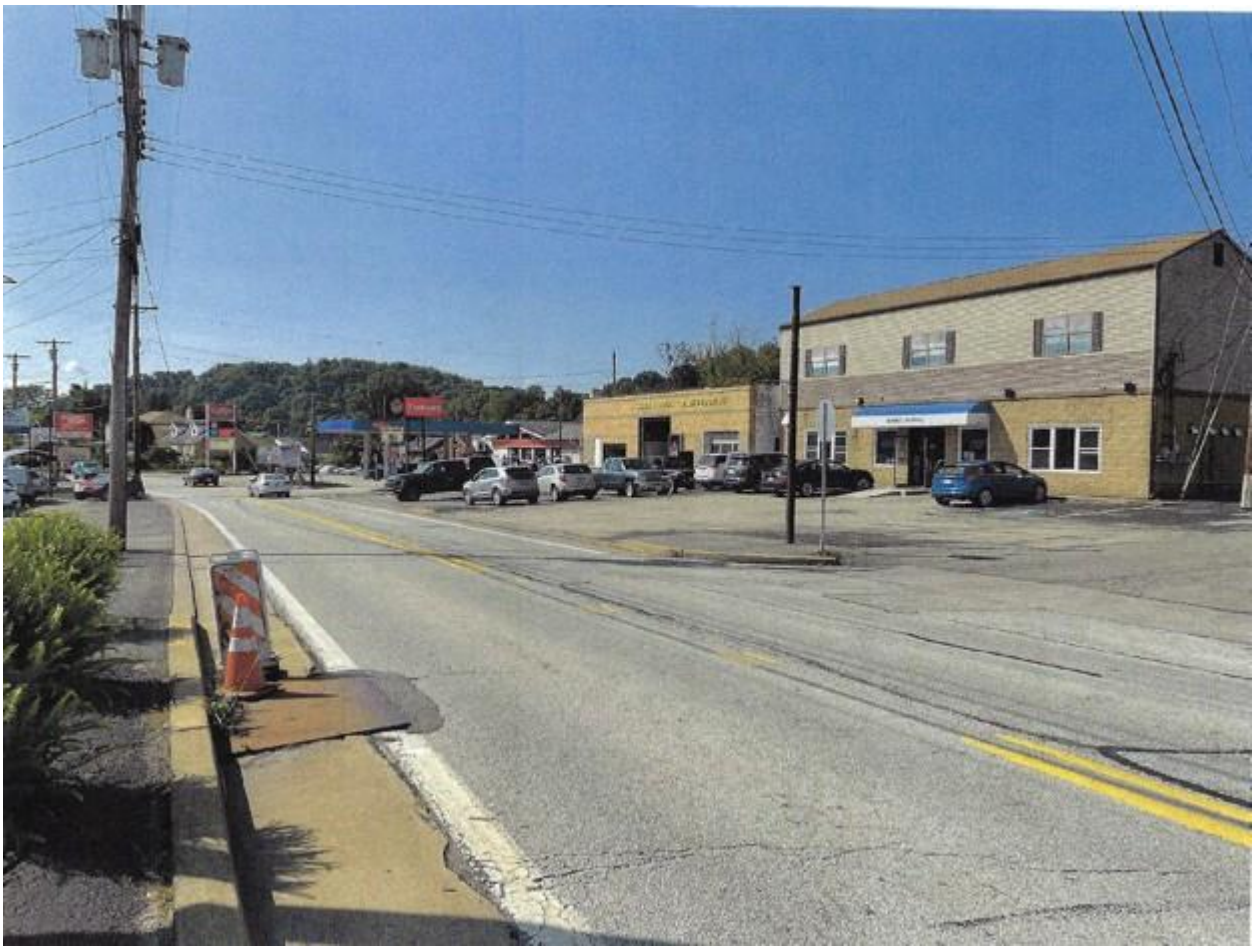
Today those stops correspond mostly with the local bus transit stops. Downtown Pittsburgh has historically employed close to 60% of the region's business population and the streetcar suburbs were prominent early-Twentieth century communities.

As Shaler grew after World War II and buses replaced the streetcars, Mount Royal Boulevard converted to a busy auto roadway. Its former pedestrian character with local shops bracketed by quiet suburban neighborhoods on both of its sides, is now an active connector connecting commercial and shopping corridors to its east and west. Business activity on the Boulevard is now mostly auto oriented with parking pads and lots separating the roadway from its few remaining local shops. While the commercial inversion changed the Boulevard's character to one that is more auto- and business-oriented, it does protect and shelter quiet suburban neighborhoods on both of its sides from motorist shortcuts through them to reach other destinations.



Butler Short Line streetcar route shown in green. Source: Christopher Rolinson. (https://www.google.com/maps/d/viewer?mid=1iV5-HFmcGSTBenOpvvcJj1NUEUE&ll=40.619114746336%2C-80.019543124121 11&z=11)

According to recent surveys, the Township is known as a family-friendly community, inviting, and with not a lot of kids (Niche, 2022). Mount Royal Boulevard retained some of its smaller services, including a landmark ice cream shop, florist, and dental practice, but everyday shopping for groceries, pharmaceuticals, and other goods and services are now several miles away and down along the arterial corridors. Auto repair services and professional offices and a scattering niche and community service shops dominate the boulevard. Restaurants and everyday services, except for the single GetGo service station, the type of retail services that can activate a main street, are located elsewhere. The community is now car-oriented and dependent.



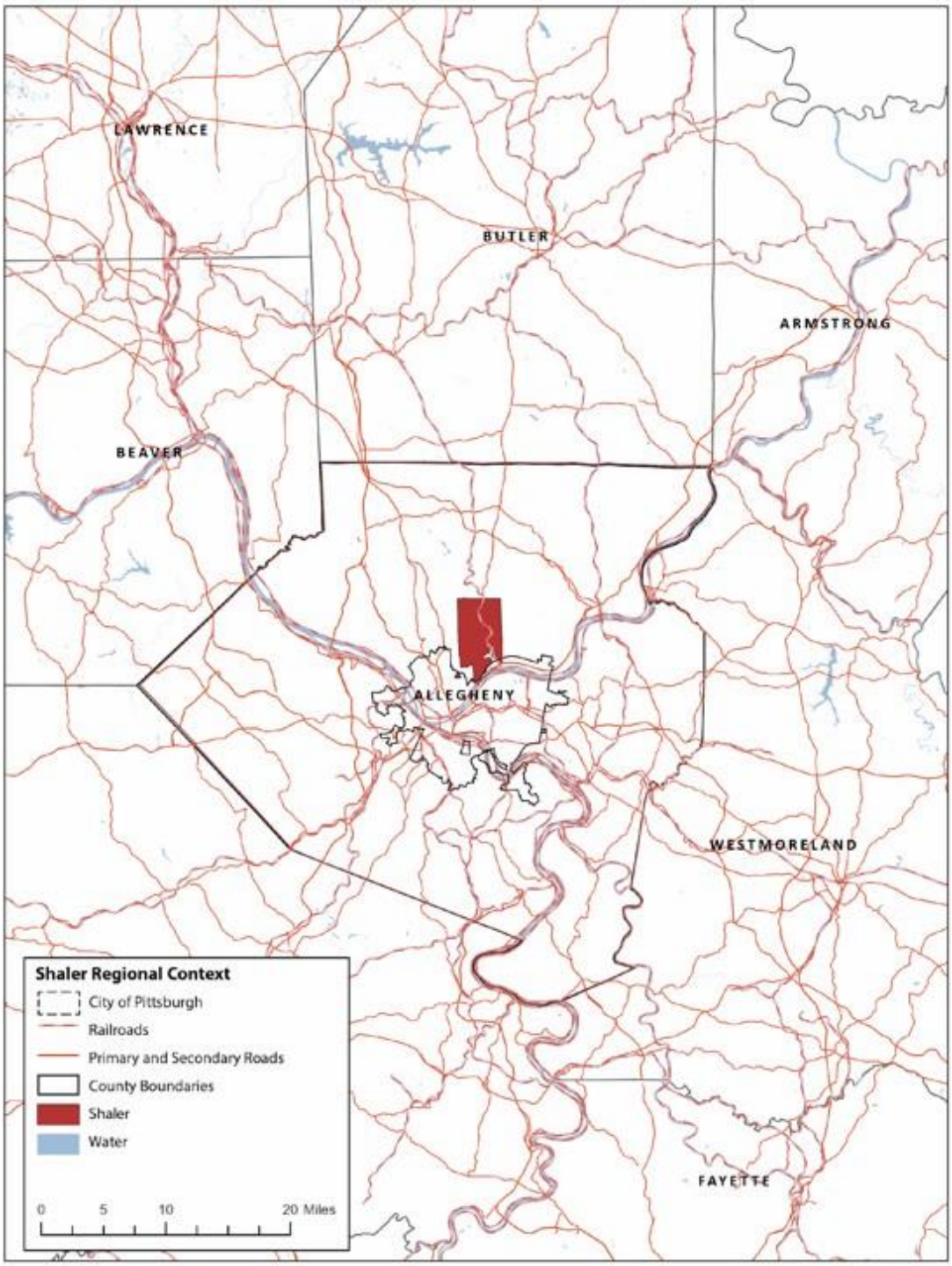
Mount Royal Boulevard looking south in the Southern Shopping Mount District. (Source: RCI).

Today's Shaler Township is a bedroom suburb of Pittsburgh known for its beautiful and serene residential landscape atop the Pittsburgh plateau. Its landscape is subdivided into smaller residential enclaves by its ravines that feed the Allegheny River. Shaler is home to almost 28,000 residents within its 11.07 square miles, or about 2,500 residents per square mile at 4 residents per acre. Median yearly income is around

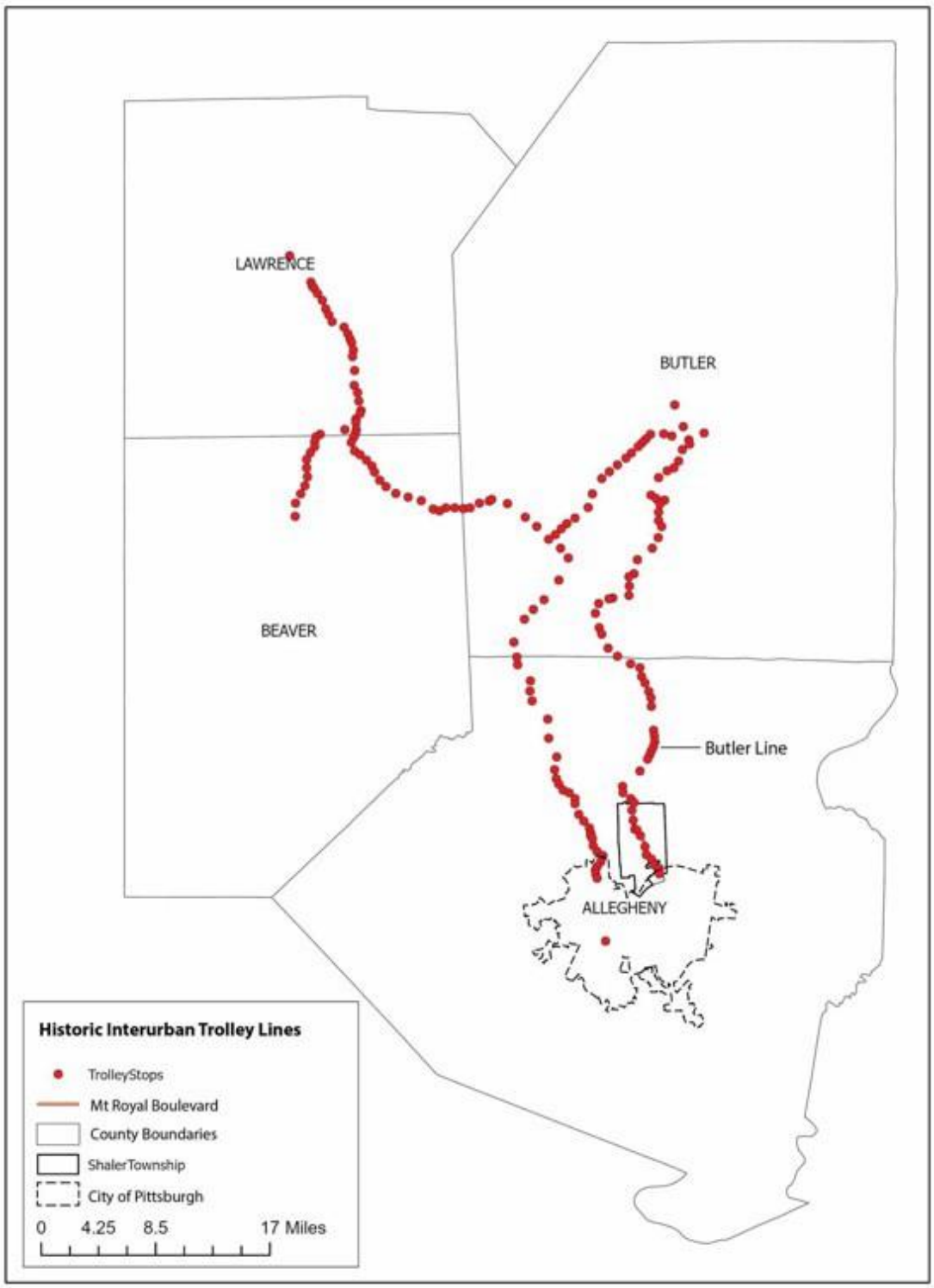
$75,000 (national is about $65,000) and most residents have a post-high school education (66%) compared to the national average of 62%. Those below the poverty line comprise about 4% of the population and the unemployment rate is 3.6%. 17% of its residents are school-age or younger, 59% between the ages of 18 and 65, and 24% are 65 and older. 95% of the population is white. (U.S. Census, 2020 and Niche, 2022)

Q. SHALER TOWNSHIP SETTING AND CURRENT CONDITIONS

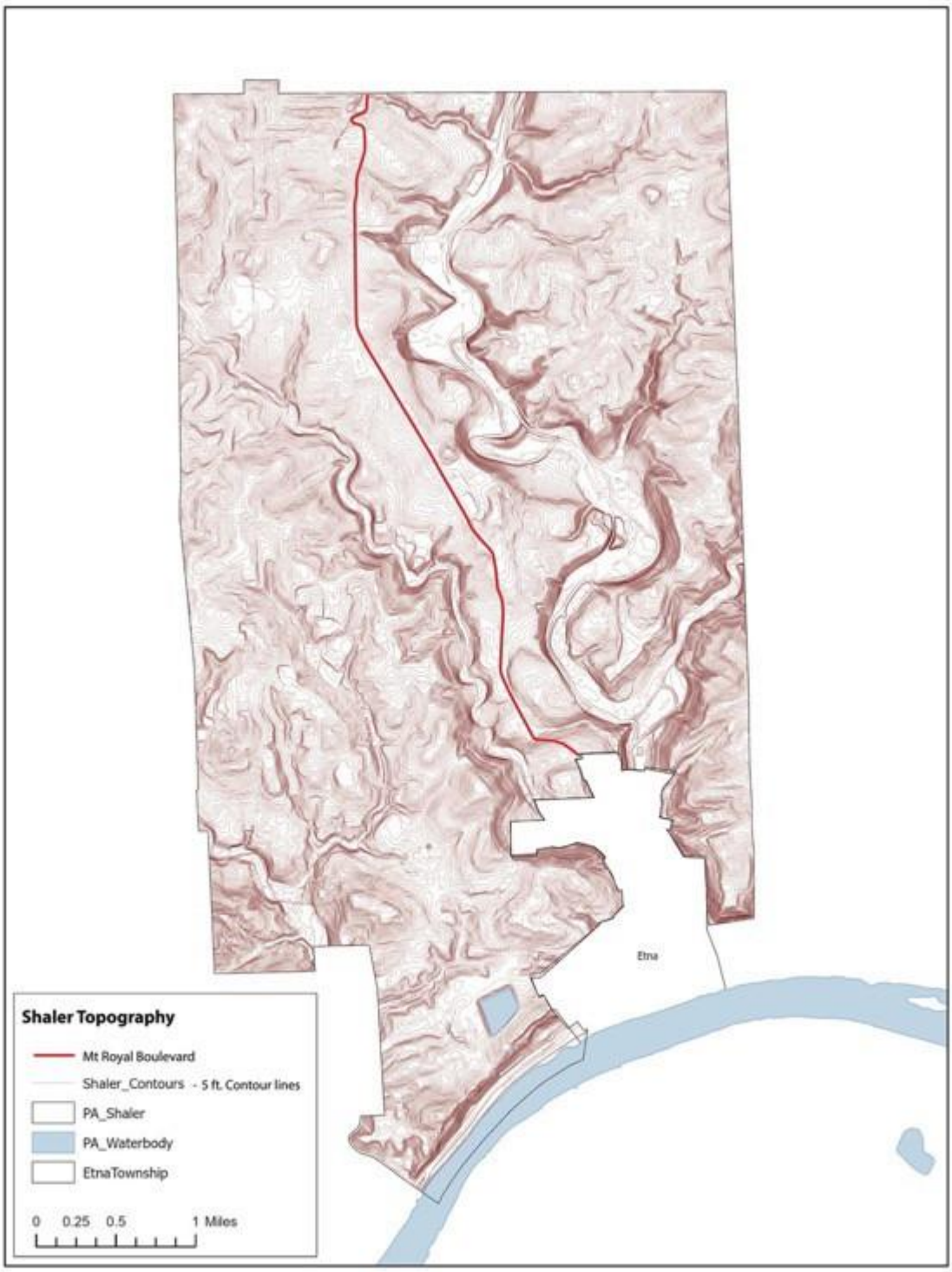
Shaler Township in Allegheny County



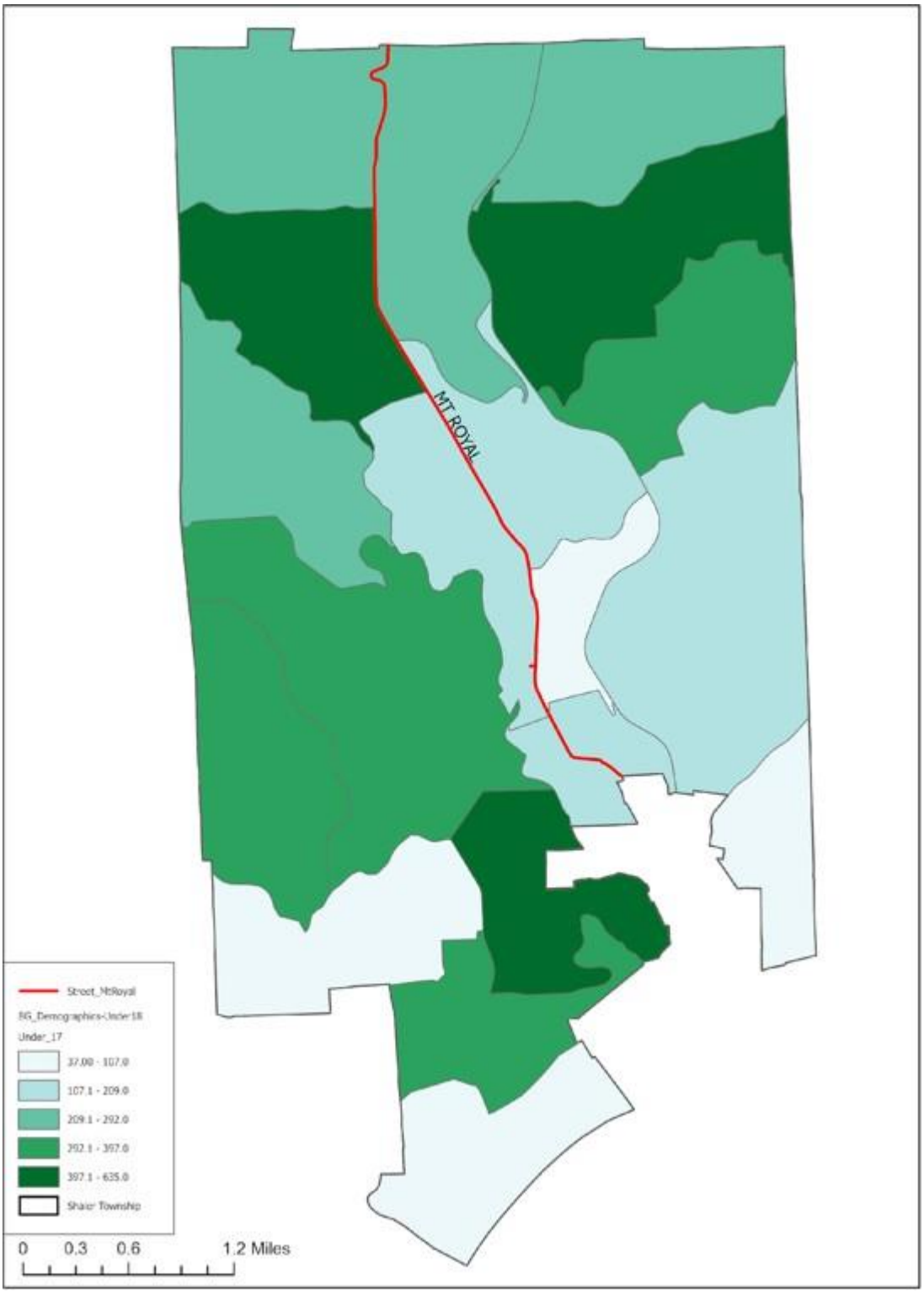
Shaler Township with Butler Short Line Streetcar Connecting to Butler, Pennsylvania



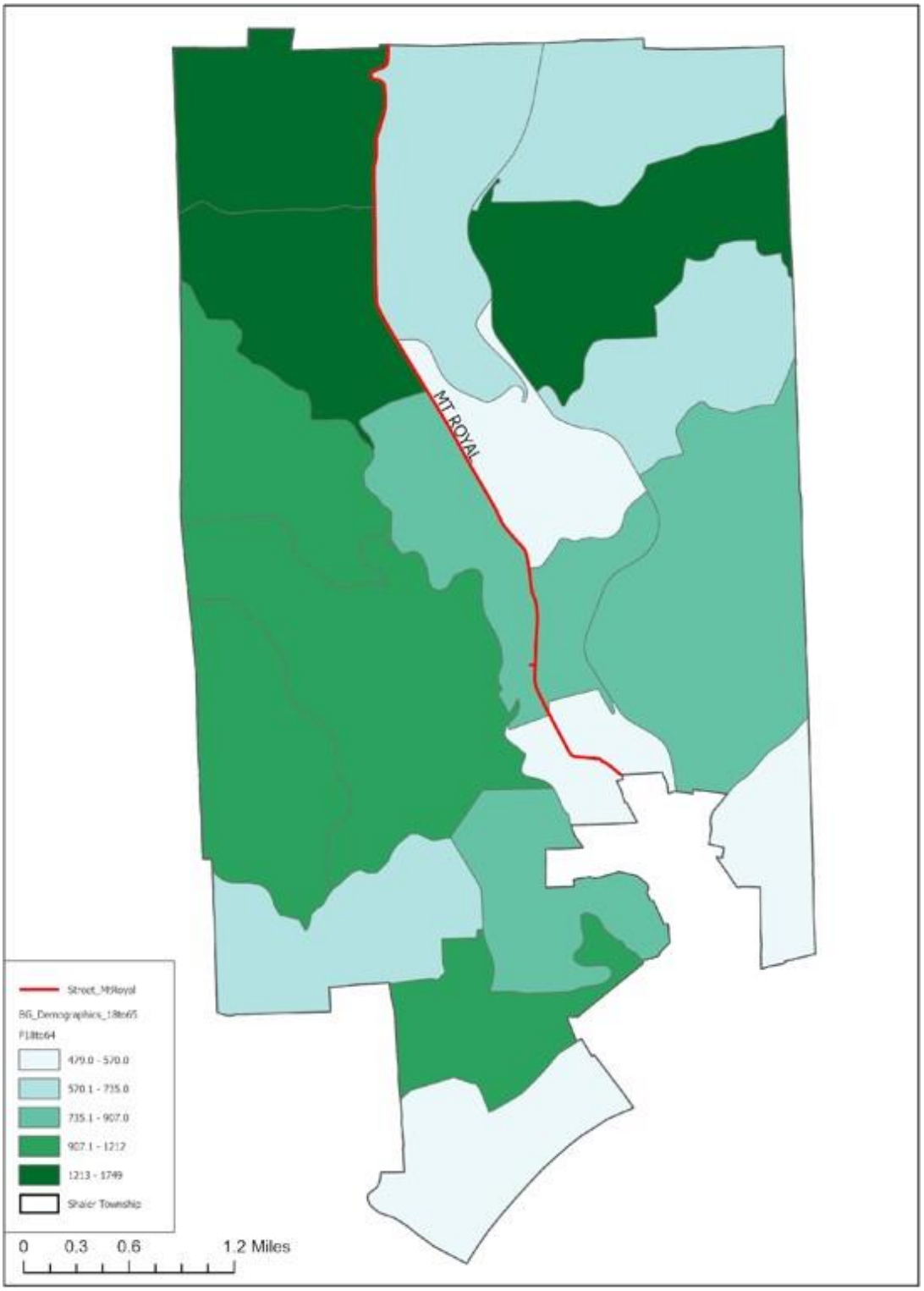
Shaler Township Topography



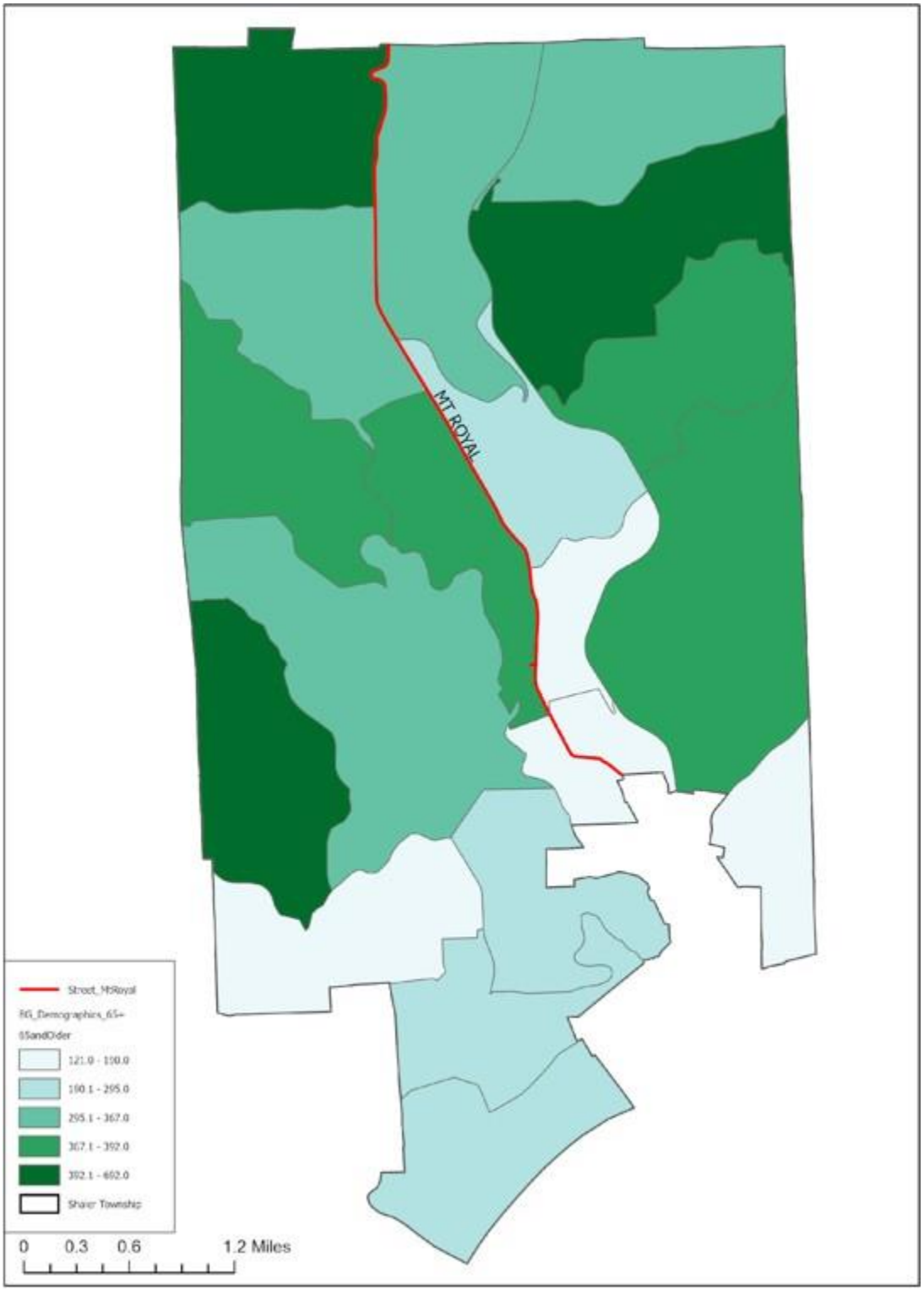
Shaler Township Age Distribution by U.S. Census Block – 17 Years and Under



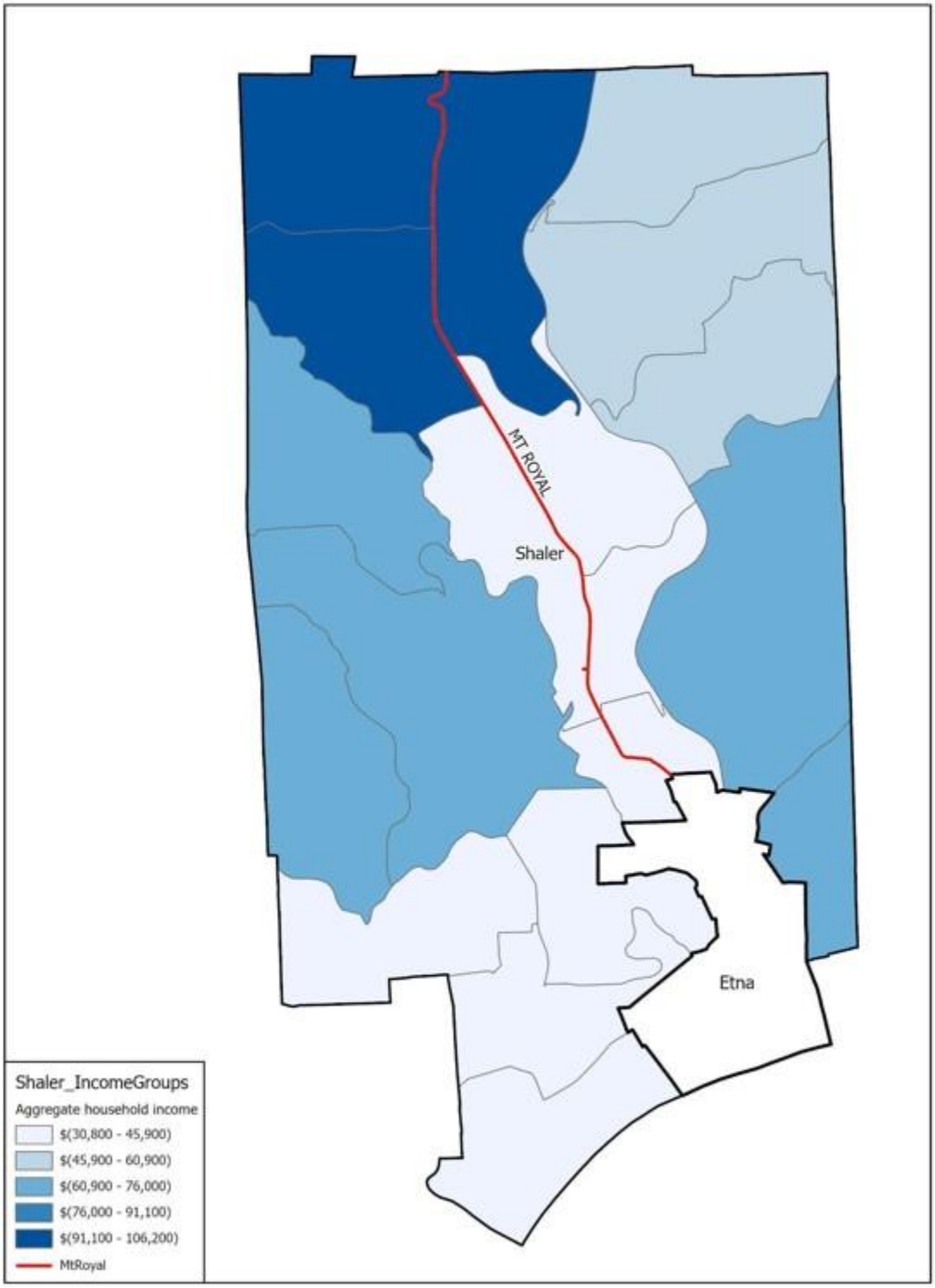
Shaler Township Age Distribution by U.S. Census Block – 18 to 65 Years



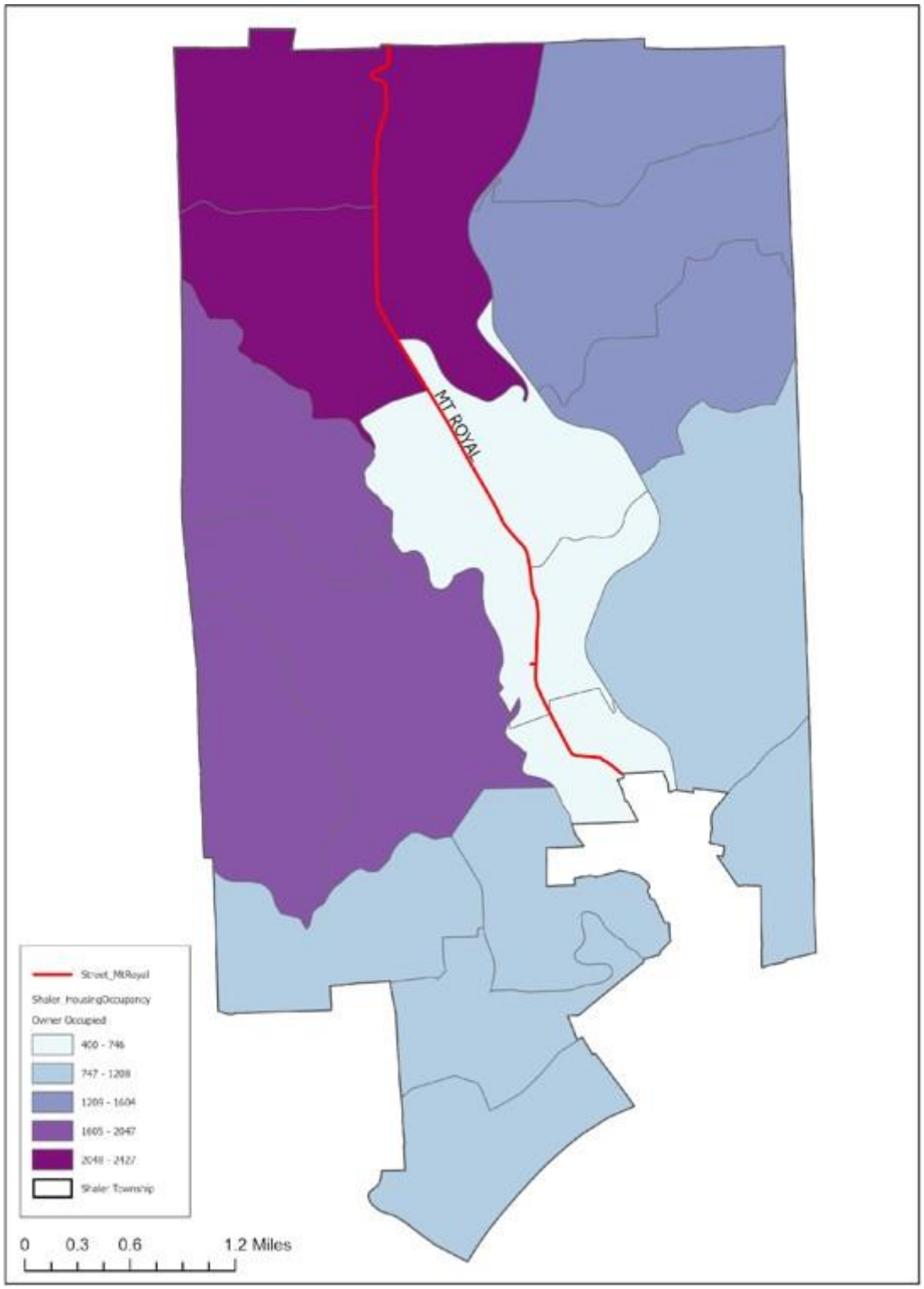
Shaler Township Age Distribution by U.S. Census Block – 65 Years and Older



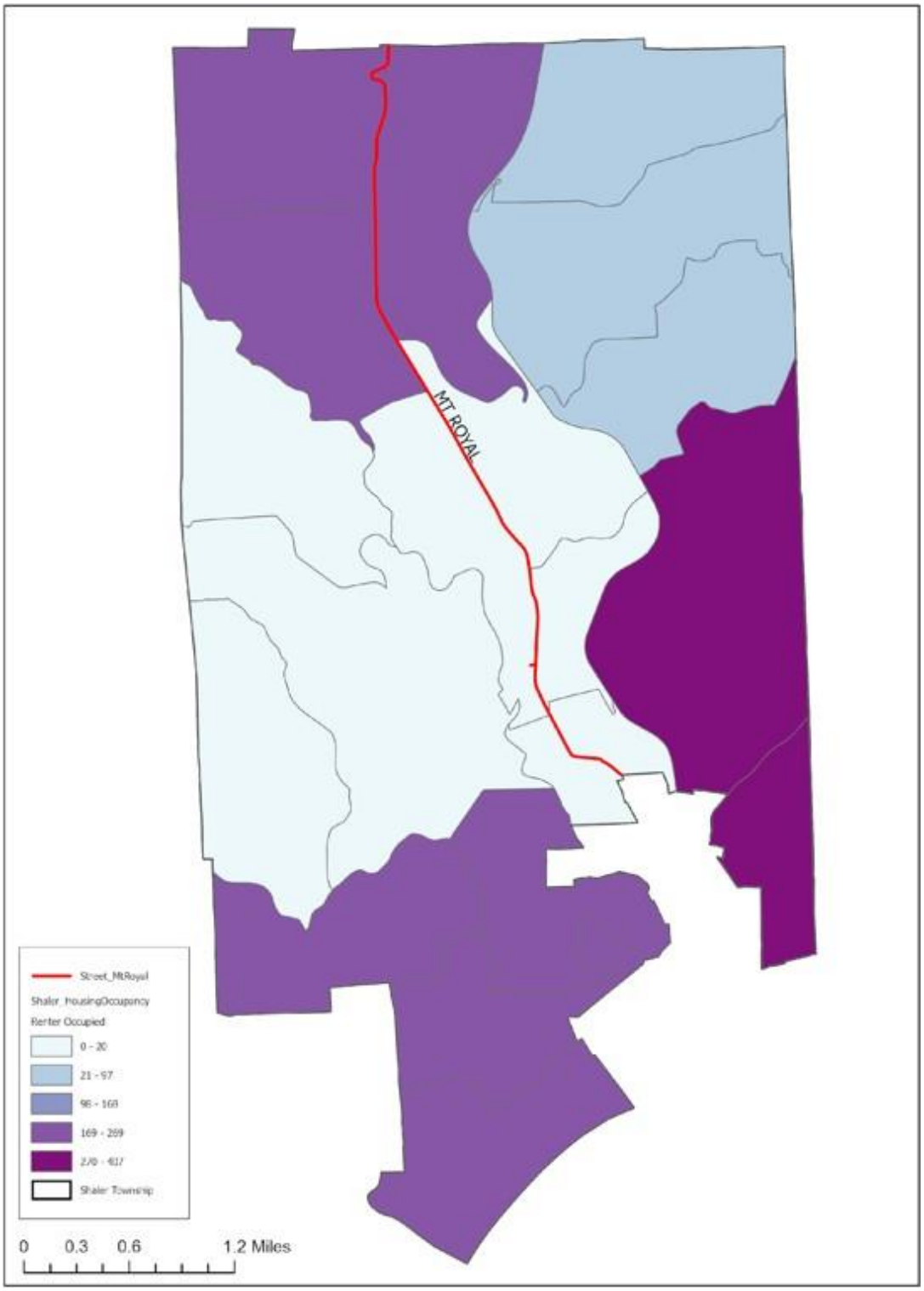
Shaler Township Income Groups by U.S. Census Block



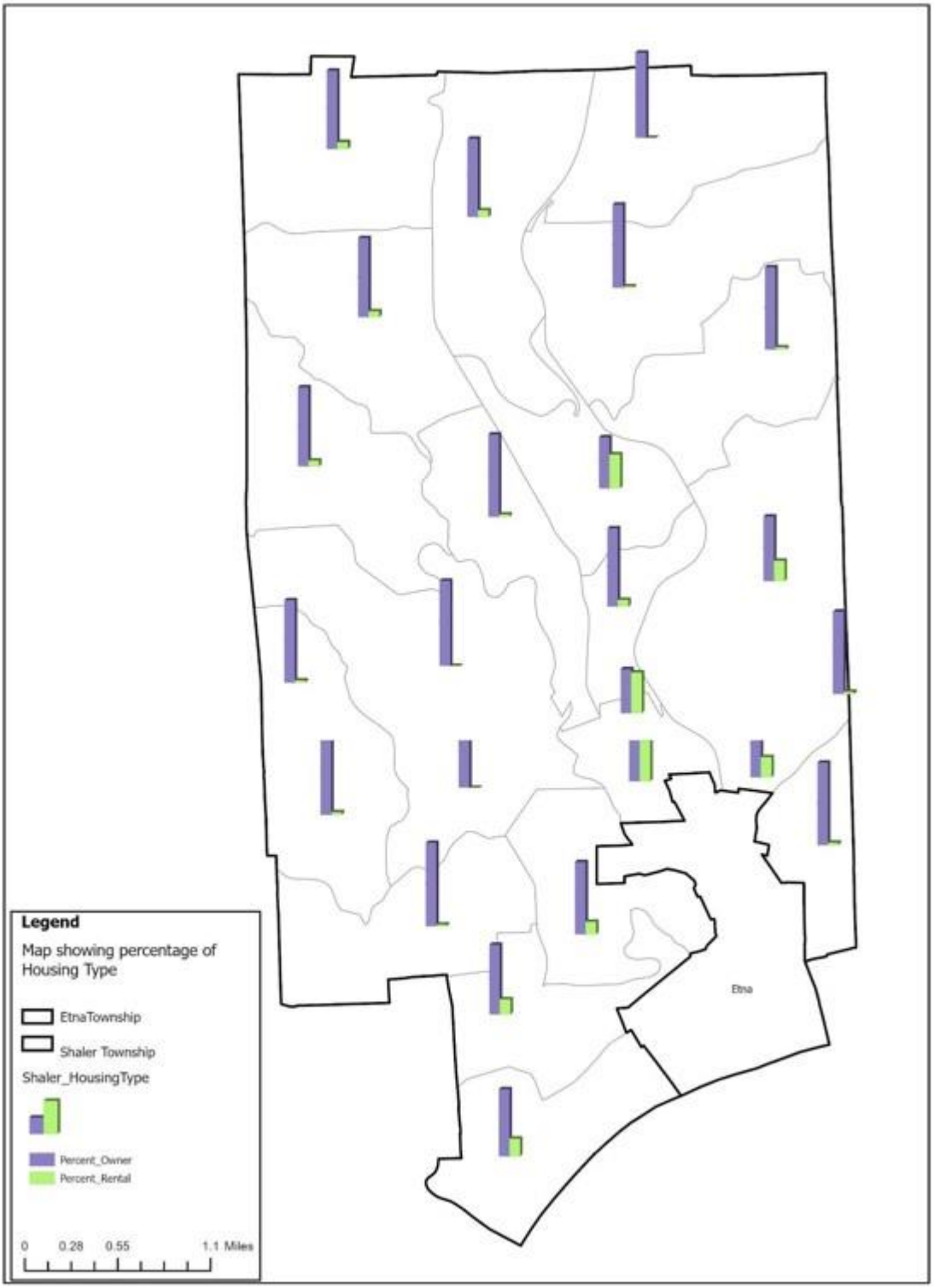
Shaler Township Housing Types by U.S. Census Block – Owner Occupied



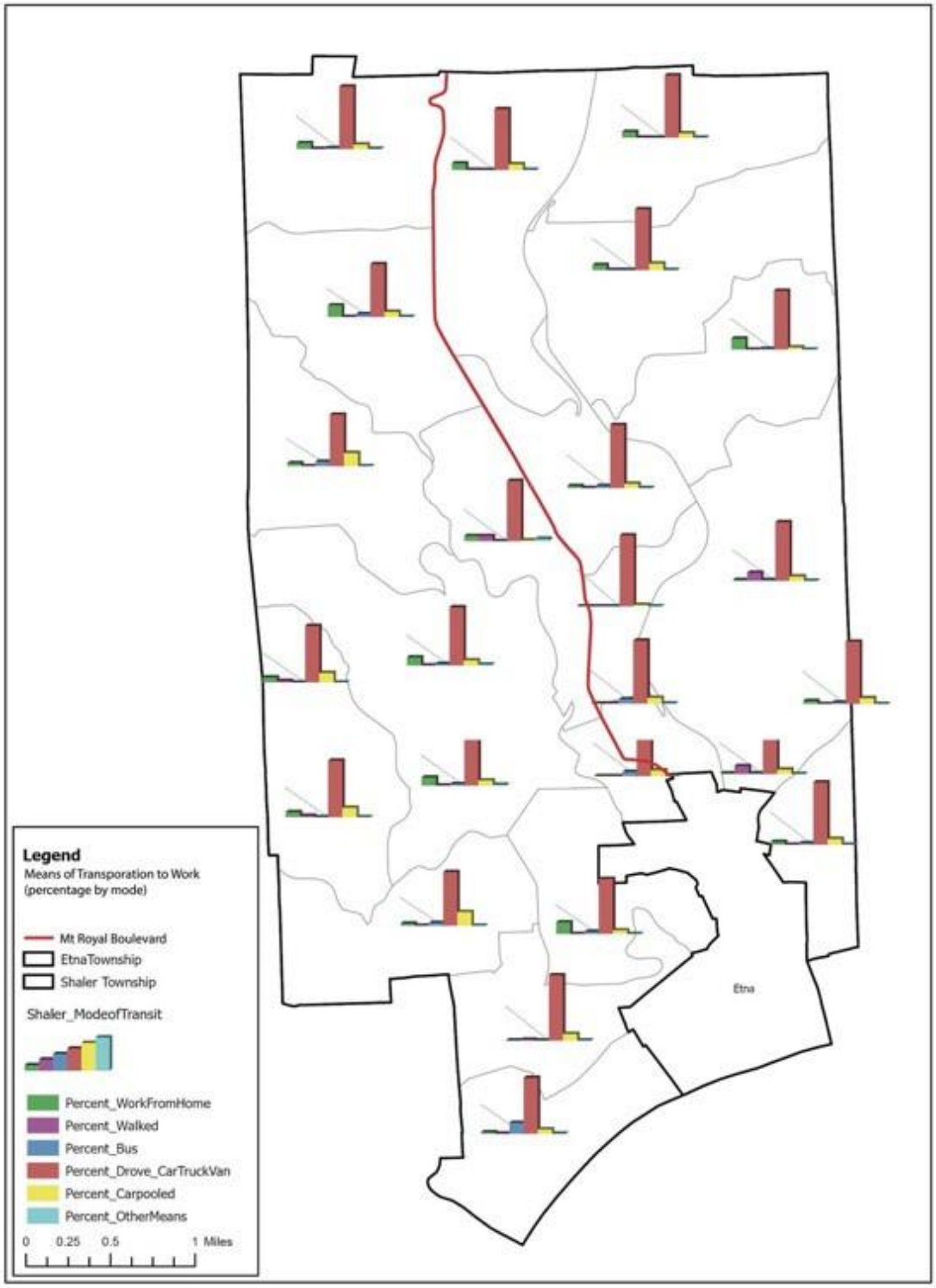
Shaler Township Housing Types by U.S. Census Block – Renter Occupied



Shaler Township Housing Types by U.S. Census Block – Housing Type by Percentage

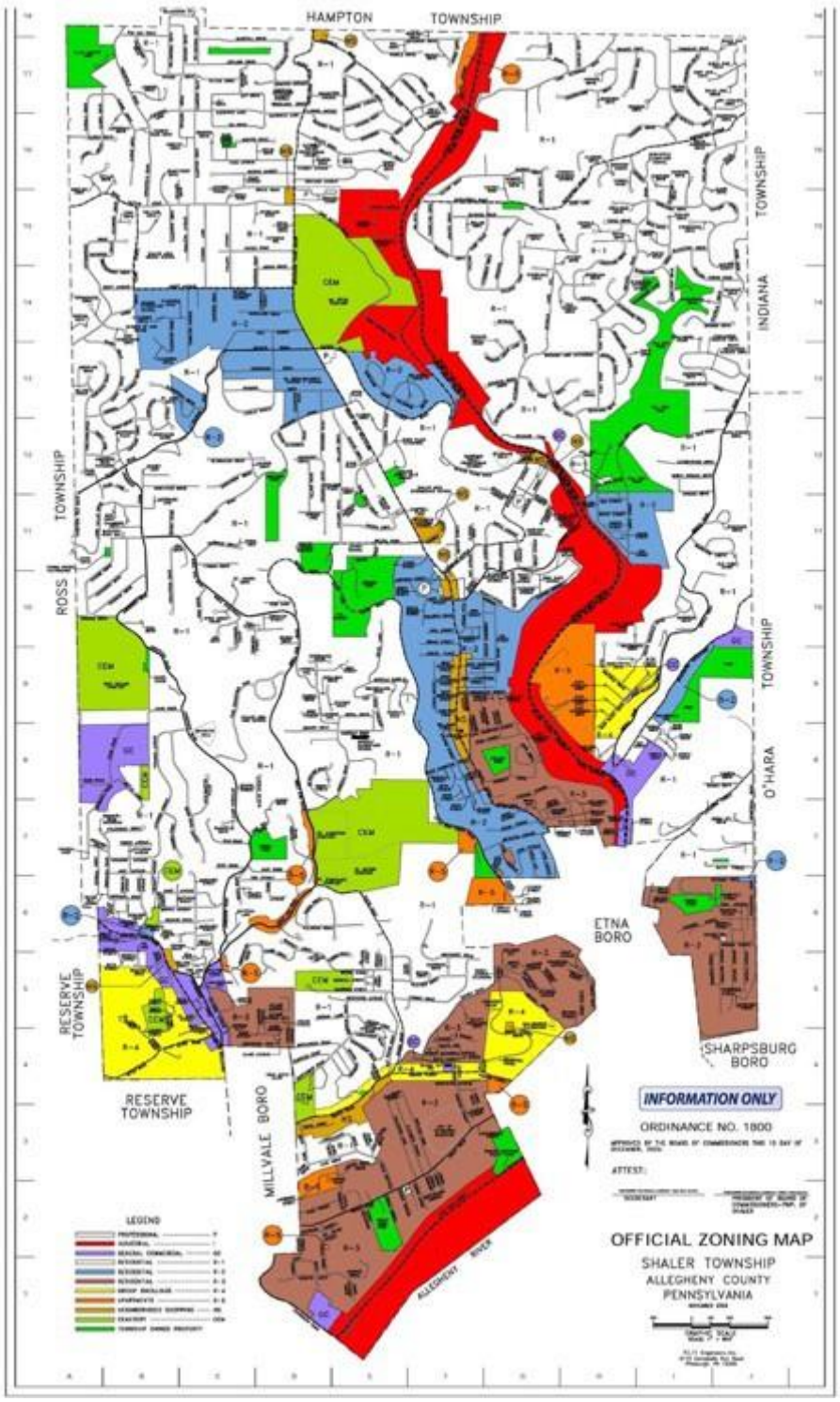


Shaler Township Transportation to Work by U.S. Census Block



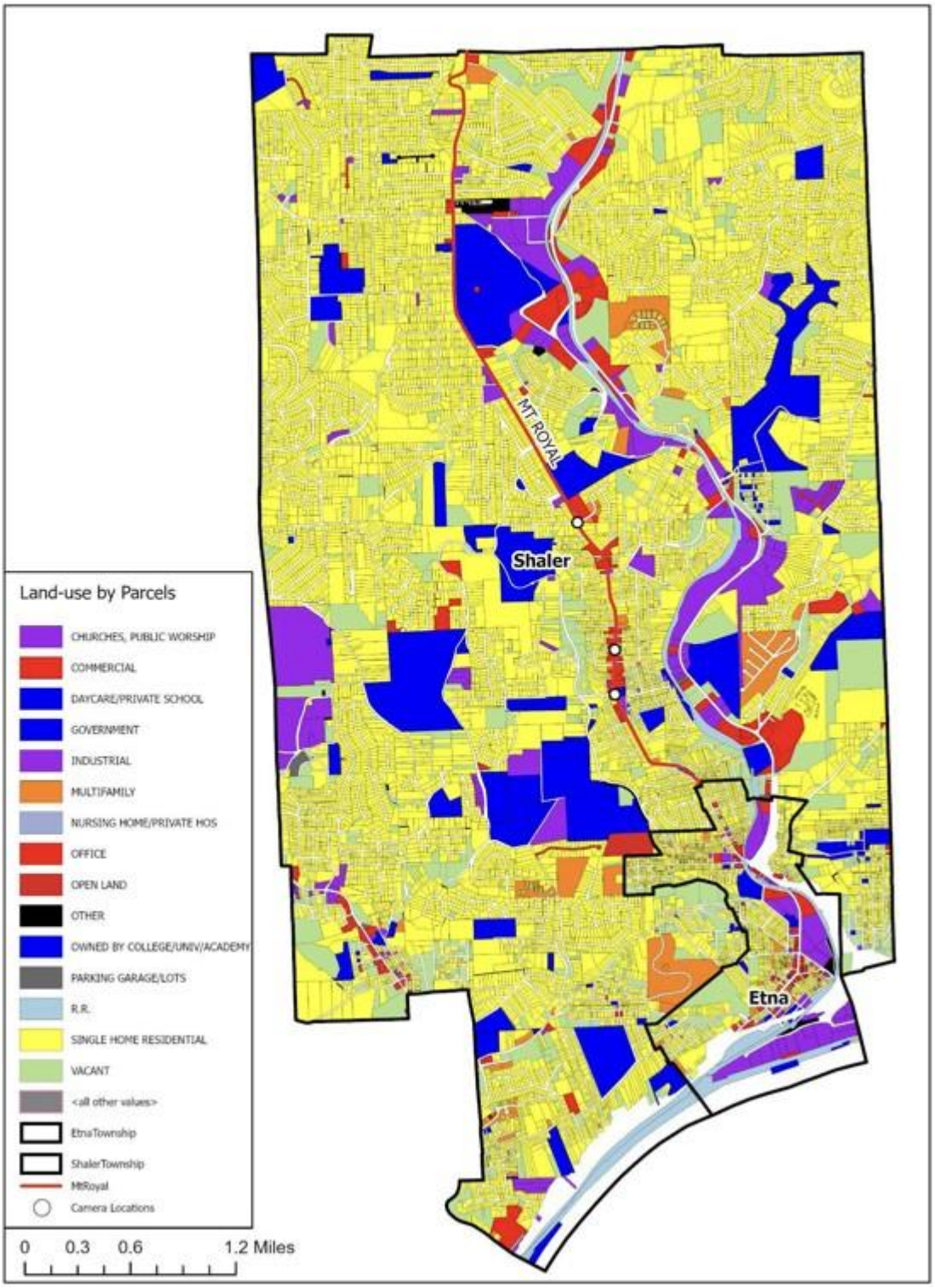
Shaler Township Street Map

Shaler Township Zoning



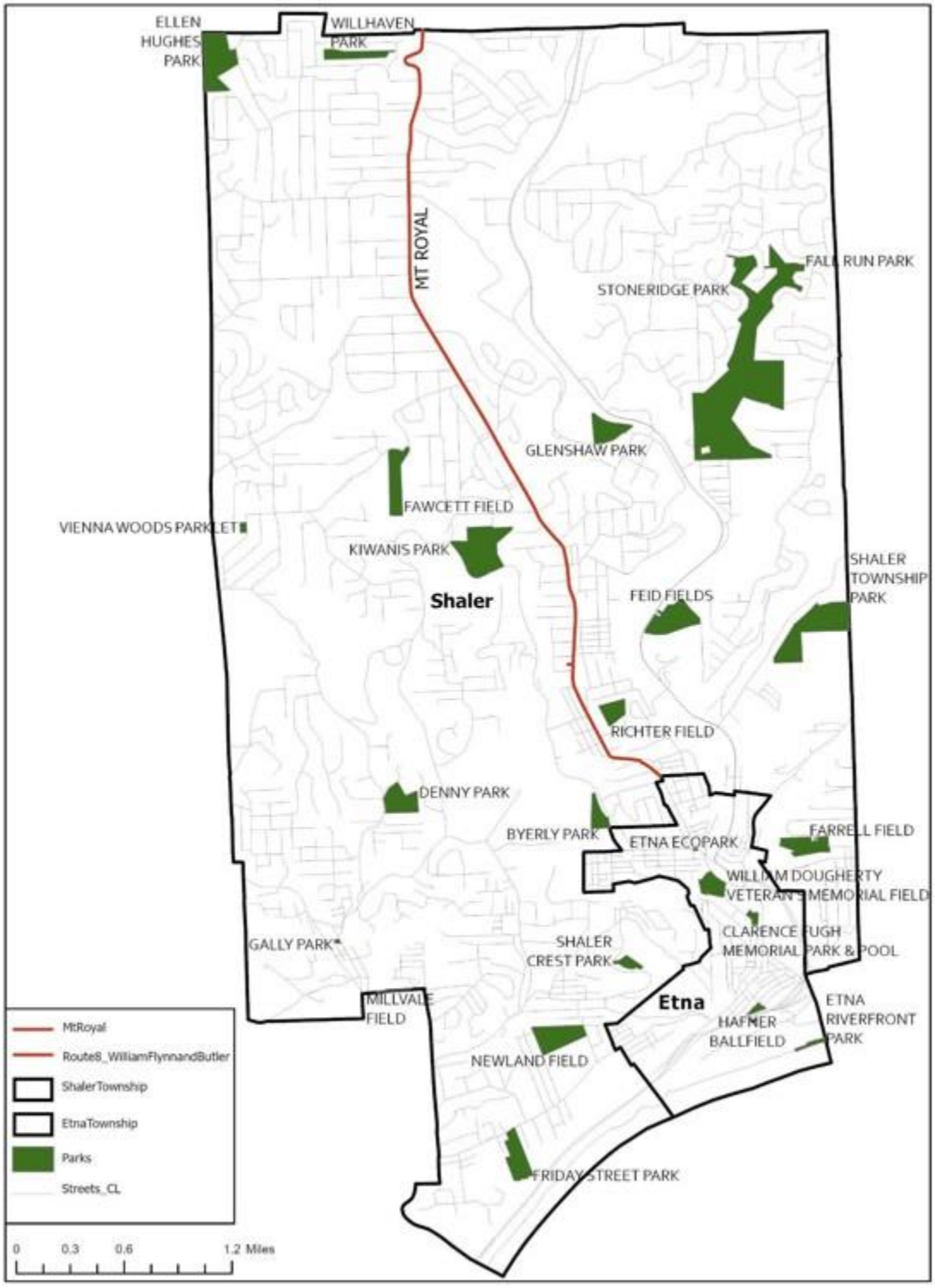
Mount Royal Boulevard Neighborhood Shopping shown in light brown. Source: Shaler Township

Shaler Township Land Use by Parcel

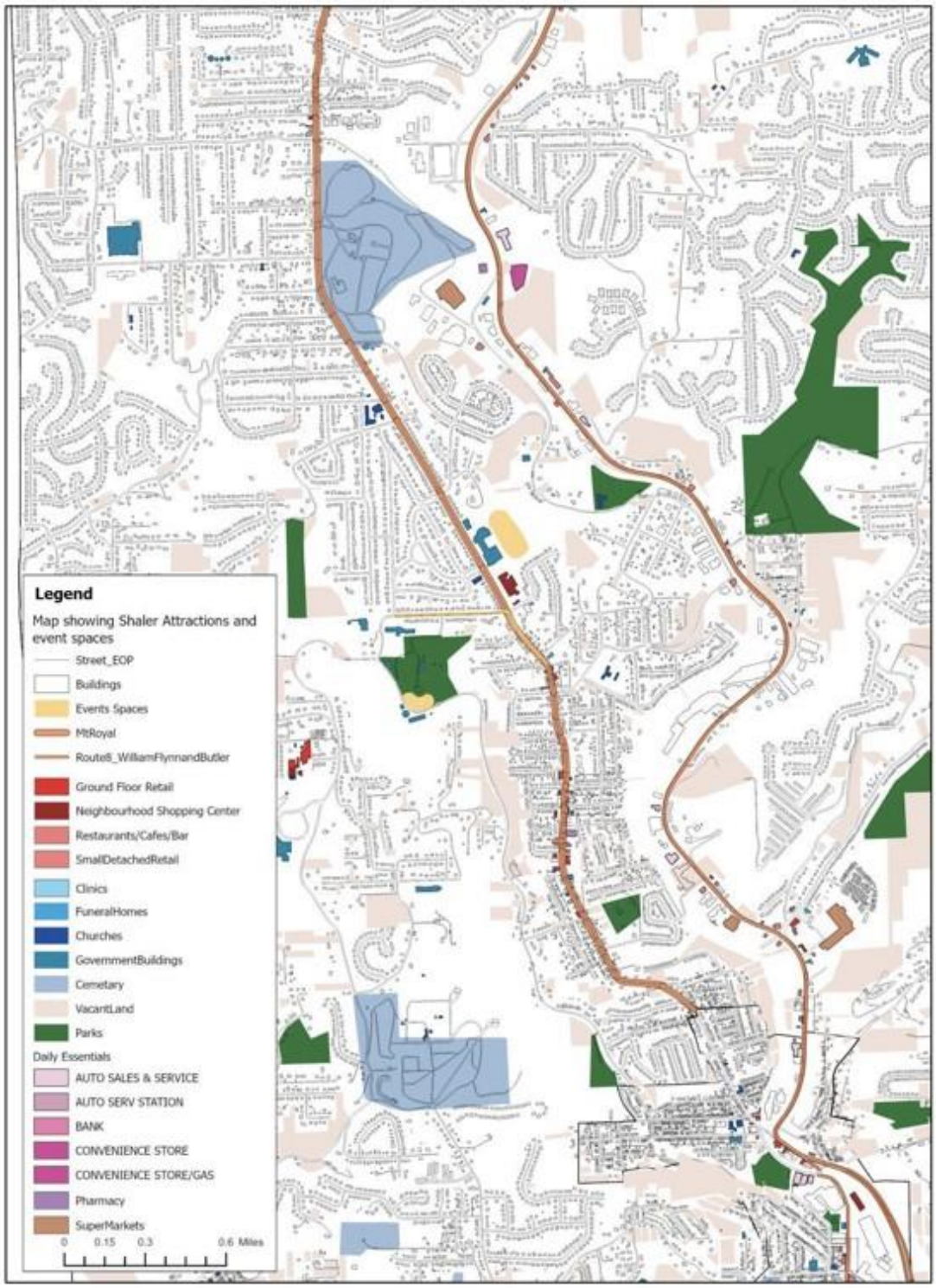


Mount Royal Boulevard Neighborhood Shopping shown in red.

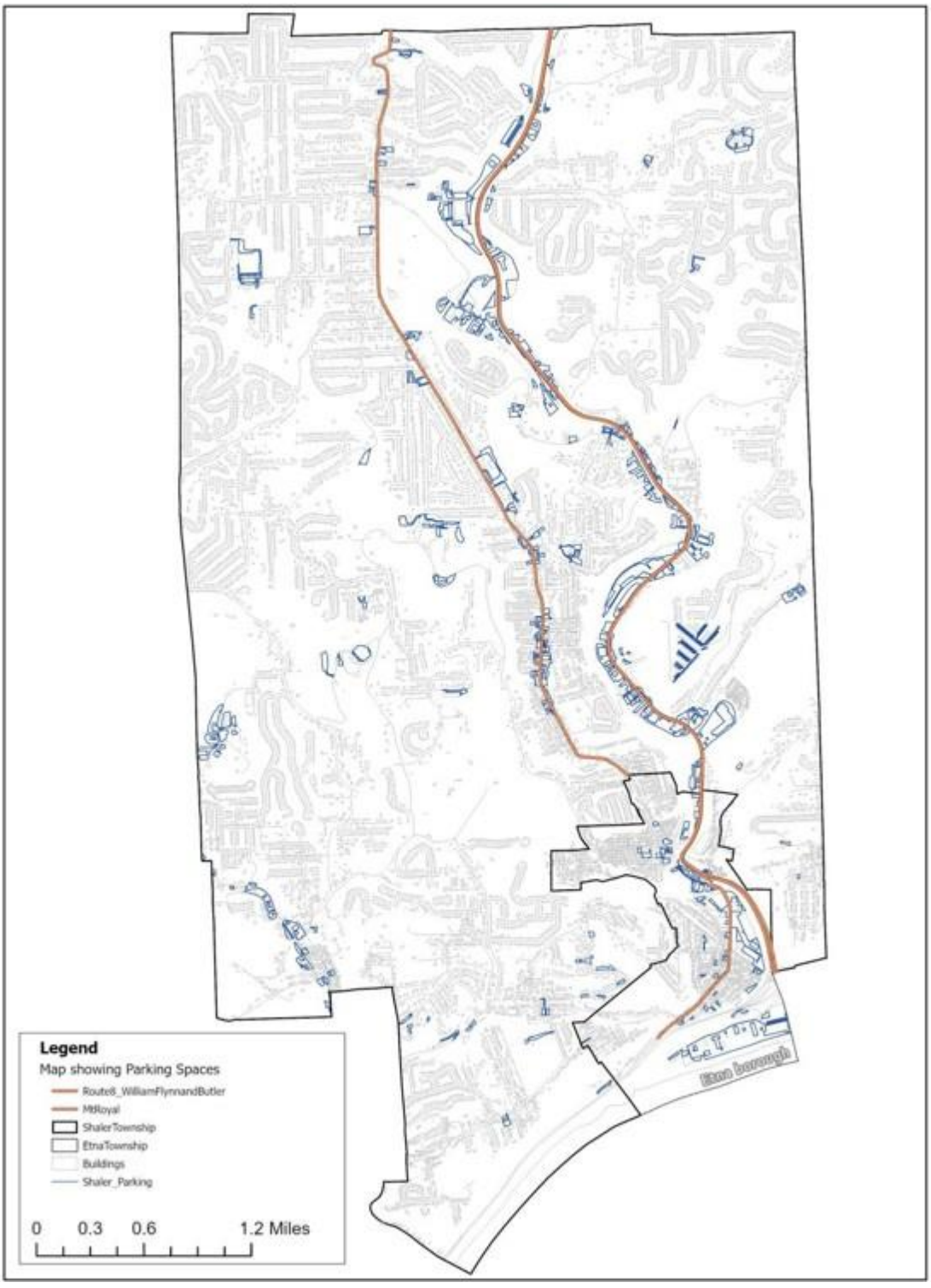
Shaler Township Parks



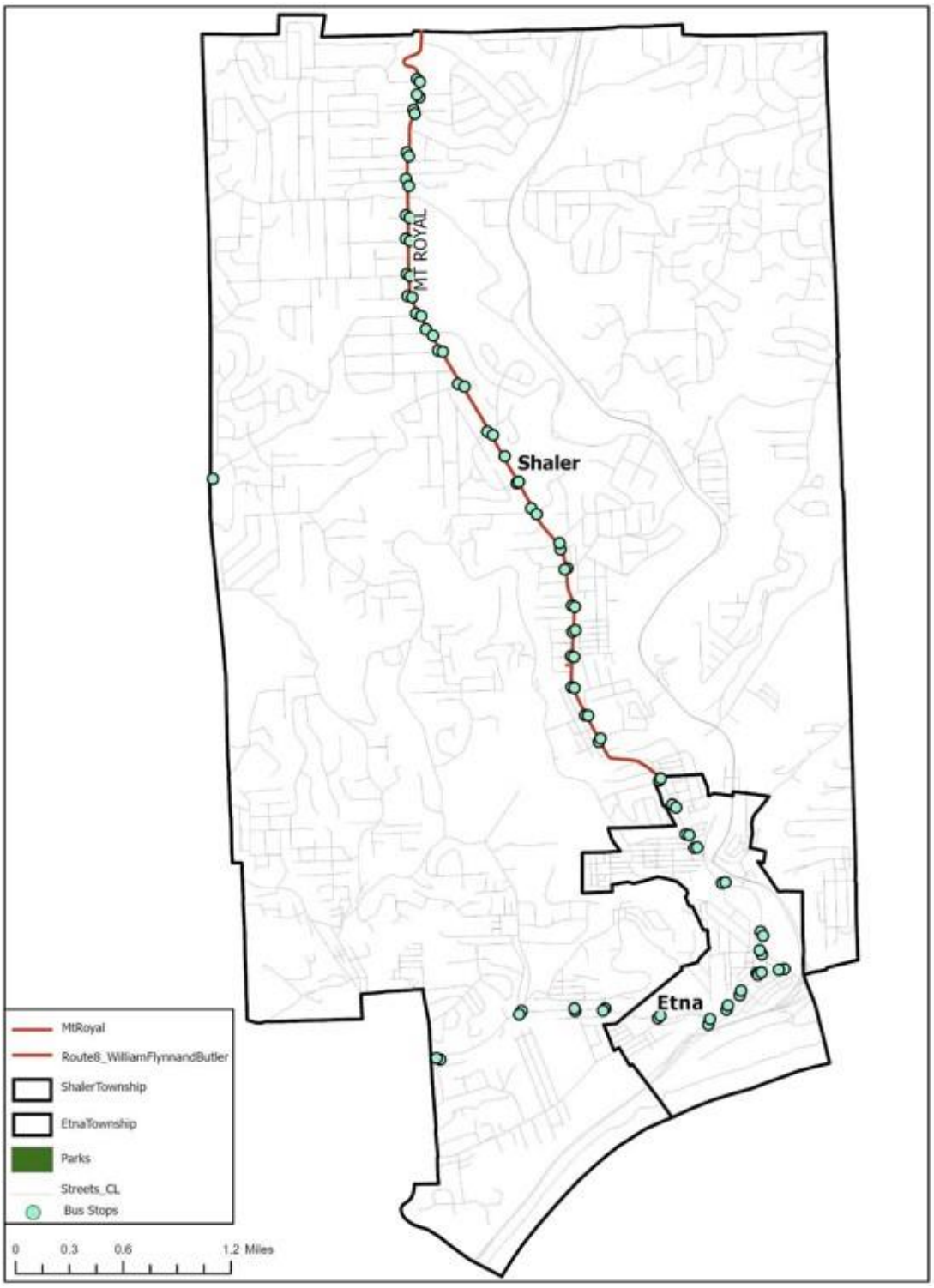
Shaler Township Local Destinations and Event Spaces



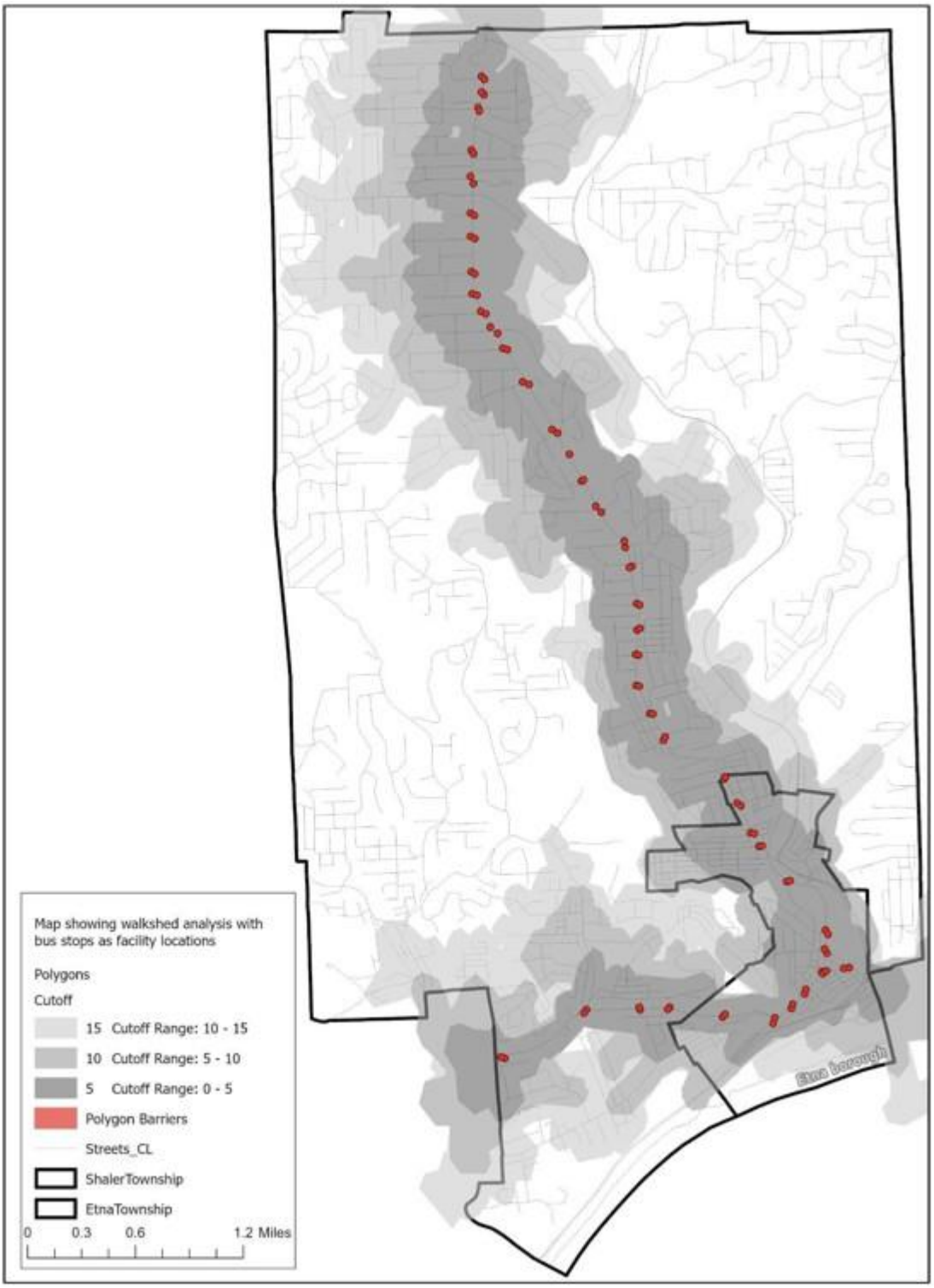
Shaler Township Off-Street Parking by Parcel



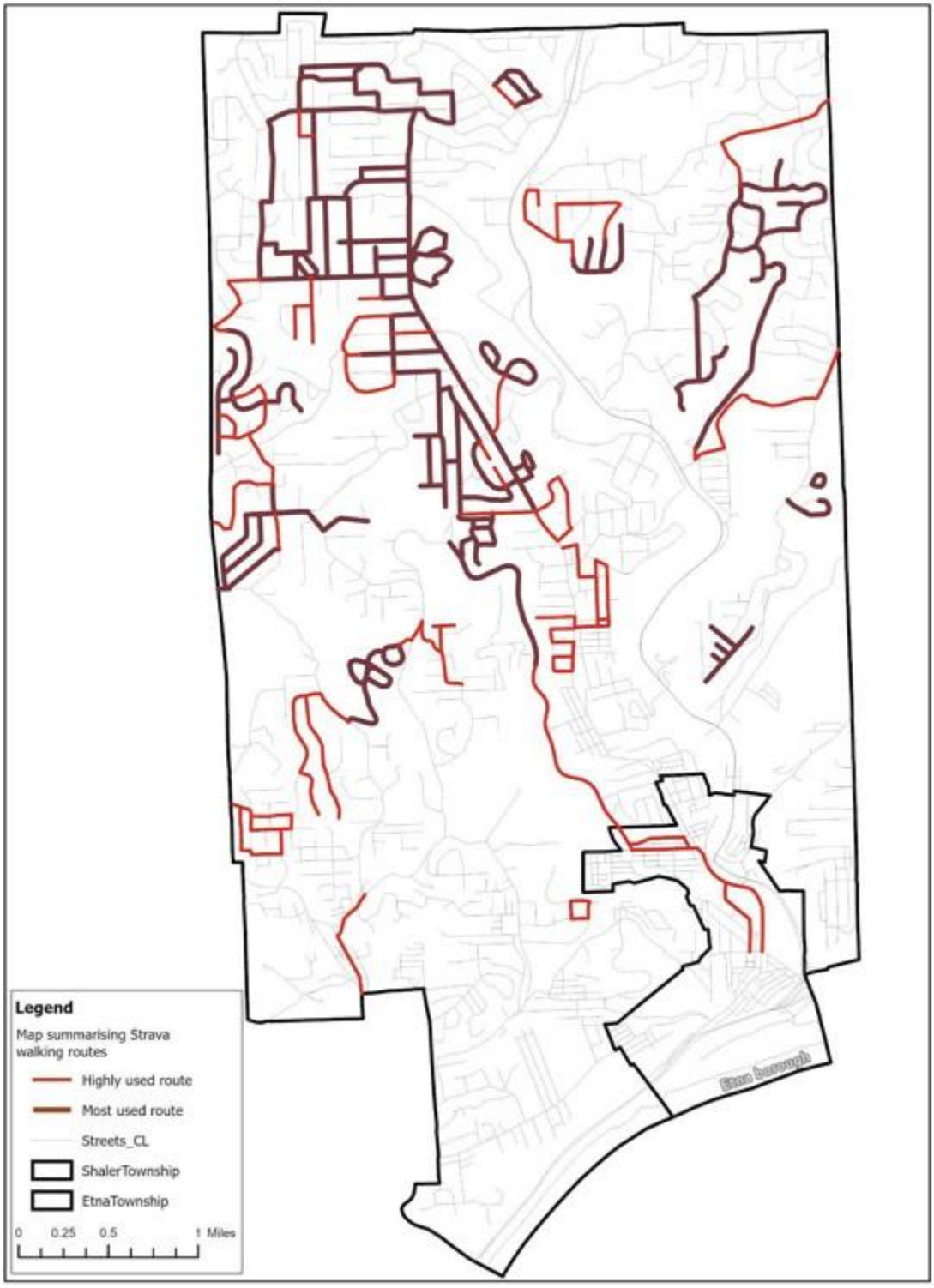
Shaler Township Bus Stops (Pittsburgh Regional Transit)



Shaler Township Walkshed Times / Distances from Bus Stops

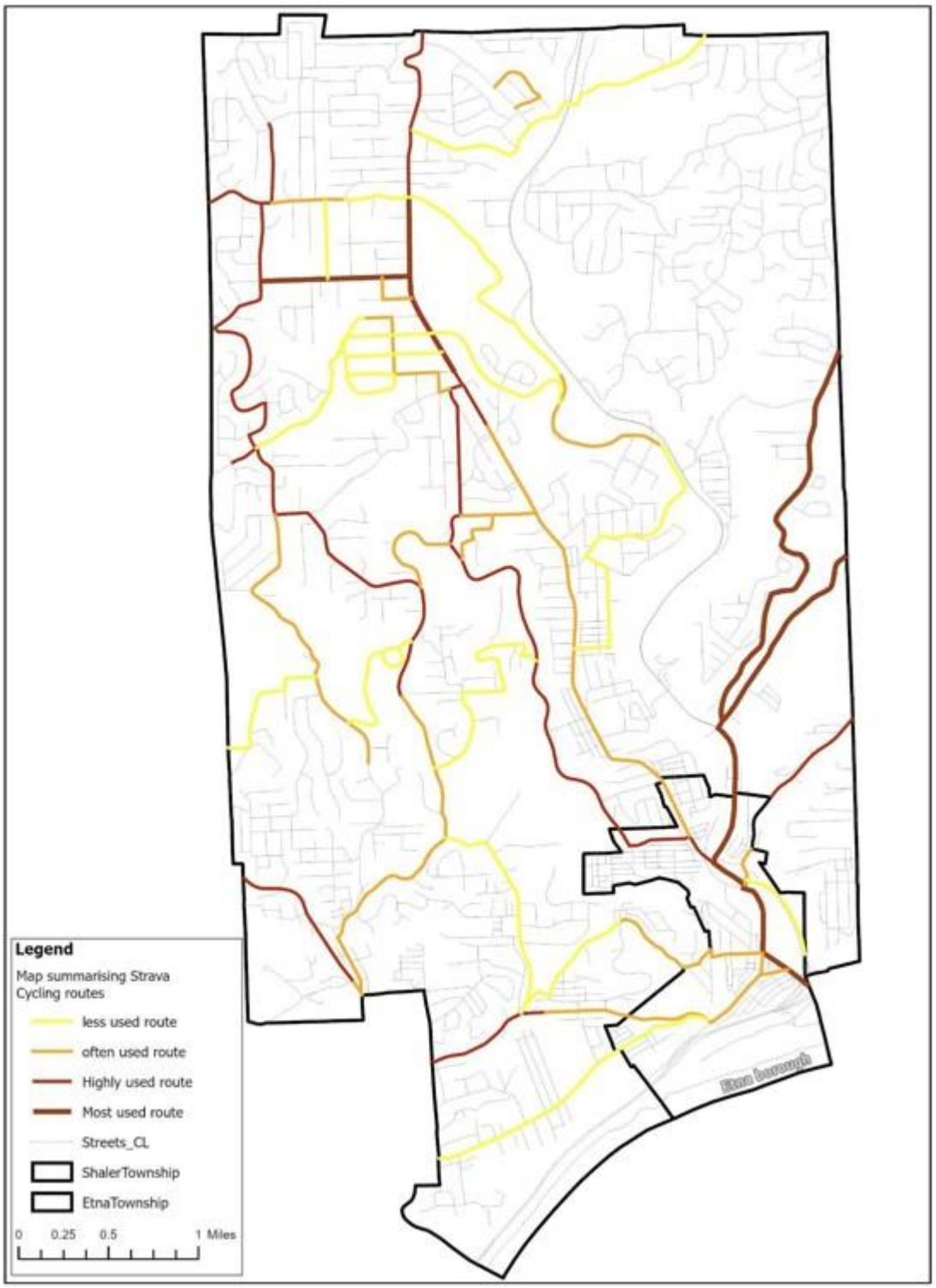


Shaler Township Walking Activity on Township Streets



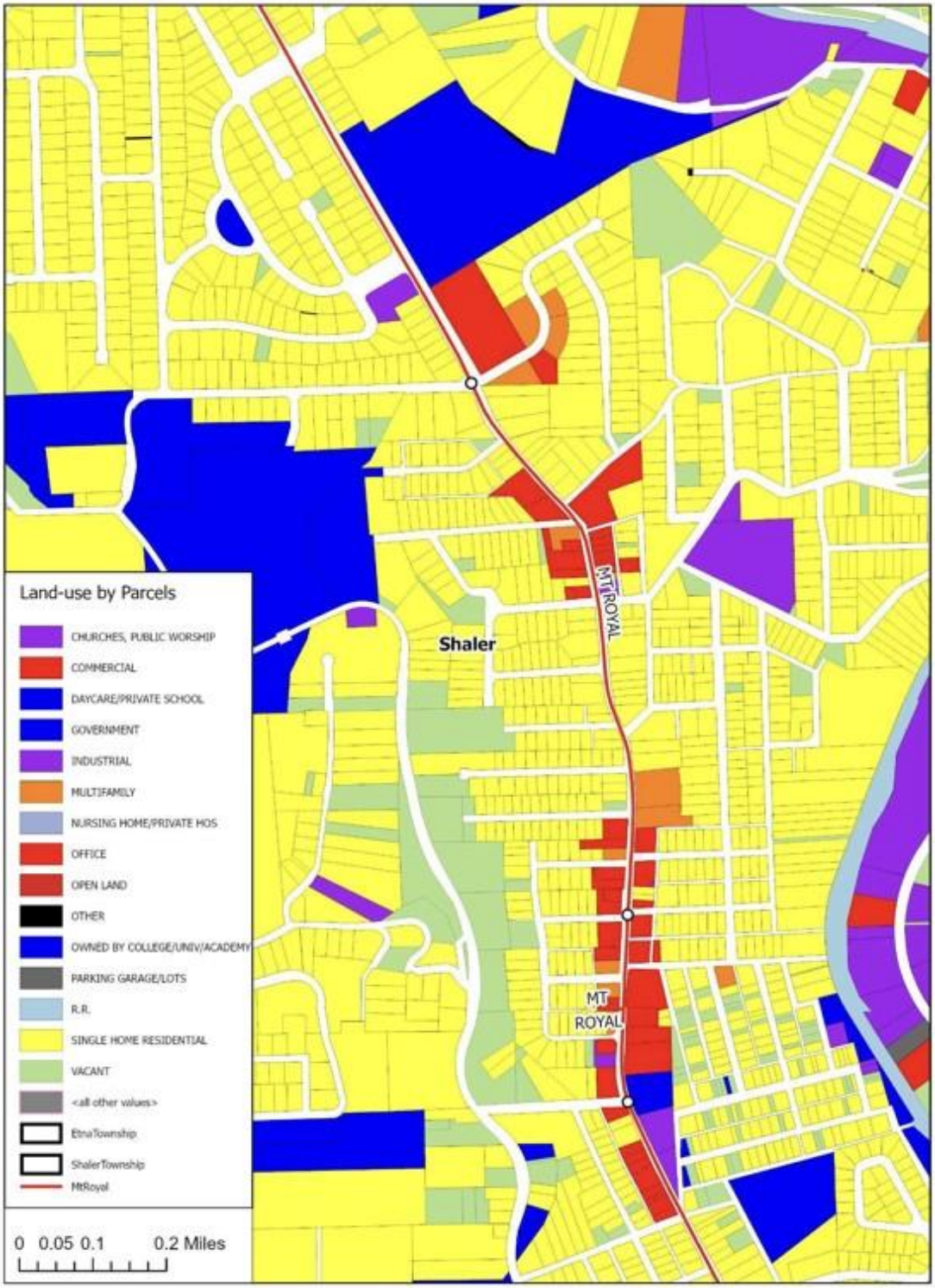
Heavier walking activity shown by darker colors. Source: Strava Heat Maps.

Shaler Township Bicycling Activity on Township Streets



Heavier bicycling activity shown by darker colors. Source: Strava Heat Maps.

Mount Royal Boulevard Commercial Shopping Areas by Parcel



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