SmartMoves Connections

A Regional Vision for Public Transit

SmartMoves Connections
Final Project Report

June 2021 | Pittsburgh, PA

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SPC විසින් කිසිදු ගාස්තුවක් අය කිරීමකින් තොරව භාෂා පරිවර්තන හා භාෂණ පරිවර්තන සේවාවන් සපයනු ඇත.
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Project Vision Statement

It is the Southwestern Pennsylvania Commission's vision for the SmartMoves Connections Project:

- To identify through an empirical methodology the best locations for future investments in Multimodal Hubs connected by Multimodal Corridors;
- To identify the best coordination strategies for operating these assets;
- To ensure that the next generation of planning for multimodal investment is based on the needs of transit riders and communities.

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A FRAMEWORK FOR THE REGION

1

SmartMoves Connections is a regional vision for multimodal transportation

For more than 100 years, southwestern Pennsylvania's transportation network was based on a pattern of hubs and spokes. The hubs were typically county seats or major activity center locations, and the spokes were interurban rail and trolley lines that connected the hubs. But over the years, population and real estate trends throughout the region changed and technologies advanced causing the transportation network to follow different rules.

Map of interurban Trolley Lines, circa 1914.
Source: fatherpitt.wordpress.com

To understand these new rules and prepare the region's transportation system for demographic, economic, environmental, and technological transformations, The Southwestern Pennsylvania Commission (SPC) undertook *SmartMoves for a Changing Region*. The overarching objective of this long range plan is to create "a world-class, safe and well maintained, integrated transportation system that provides mobility for all, enables resilient communities, and supports a globally competitive economy." From the long range plan transpired a specific effort, SmartMoves Connections, to produce a regional concept for public transportation, and regional connections and coordination among transit agencies.

PUBLIC TRANSIT STRATEGY
Develop a comprehensive regional plan for public transit connections, including the identification of a possible regional source for dedicated public transit funding to facilitate seamless linkages and cooperation across the region.

Strategy highlight from the SmartMoves for a Changing Region Long Range Plan[1]

What was determined from SmartMoves Connections is that it is important to recognize the old hub and spoke system because it still forms the backbone of the regional transportation network, but more so to identify new and changing travel patterns that can inspire projects that modernize regional mobility. The backbone of the network is based on Downtown Pittsburgh as the main economic activity center but the current and changing network recognizes other critical clusters throughout the region that exhibit increased traffic and economic activity and therefore, increased demand. SmartMoves Connections recognizes these transformations and intends to advance the region's vision of modernized multimodal mobility by producing and prioritizing projects that are:

- Coordinated, convenient, and safe
- Multimodal, accessible, and transfer-capable
- Compatible with community character and subsystems
- TOD or supportive land use implementations

1 *https://www.spcregion.org/programs-services/transportation/smartmoves-long-range-plan-transportation-improvement-program*

SmartMoves Connections is the product of multi-agency and inter-disciplinary collaboration

Dozens of agencies and representatives lent their experience and expertise to accomplish SmartMoves Connections' regional vision for public transit and resultant priority projects. Perspectives from across the region's transportation spectrum - from mass transit to community transit to shared-ride to micro-transit and other mobility modes - were gathered during meetings, workshops, and an online survey. Their input was tightly coupled with the Project's work plan for identifying the full scope of "what is possible," which consequently led to a list of priority multimodal hub and corridor projects.

Before SmartMoves Connections got fully underway, comprehensive and vision plans from the region's counties and transit agencies were examined for principles upon which to compile and build the regional vision for public transit. Relating these important plans to SmartMoves Connections ensured that strategies from multiple agencies and across the region's counties formed and guided the plan. Sources examined consisted of regional and county comprehensive plans, transit development plans (TDPs) and institutional master plans. Data examined included open-source statistical reports from SPC, Pennsylvania Department of Transportation (PennDOT) and the National Transit Database (NTD). All in all, 19 publications authored by 13 agencies were examined to inform how transportation investments and transit service coordination can lead to a modernized regional multimodal transportation network.

More than 450 agencies and representatives were contacted during the outreach phase of SmartMoves Connections to obtain input and perspective. First, a Steering Committee comprised of eight agencies representing a range of transportation modes was formed to oversee the Project, give strategic direction, and identify stakeholders to lend their voices to the plan. Three Steering Committee meetings were held throughout the Project, including one in-person and two conducted virtually because of COVID-19.

The most significant perspectives presented by the committee focused on:

- Validation of the work plan
- Locations of potential hubs
- Features that should be implemented at hub types
- Important travel corridors
- Service delivery modes and connectivity
- Approaches to land use and TOD

The Steering Committee supplied a list of more than 420 Stakeholders they felt might be interested in affecting the plan and its outcome. Originally, the plan called for conducting two in-person Stakeholder Workshops; however, the strategy was streamlined to one Workshop because of COVID-19. Twenty-seven agencies were represented at the Stakeholder Workshop at which the group was asked to respond to a series of poll questions intended to discern what makes a good hub, what makes an effective corridor and their top priorities for enhancing the region's multimodal network.

Top Priorities

- Making sure service solutions come first
- Acknowledging and understanding the different needs of rural and urban transportation
- "Inclusion" at each hub location, especially Downtown Pittsburgh
- Recognition that corridors should not create physical, functional, or socioeconomic barriers
- Reducing emissions by minimizing vehicle miles traveled
- Economic development near transit
- Opportunity to generate return on investment

1

SmartMoves Connections is a data-driven approach to identify trends and opportunities

In addition to qualitative input from subject matter experts and the public, SmartMoves Connections was grounded significantly in the accumulation and examination of data and forecasts of regional trends. Categories of data essential to verifying current travel trends, comparing historic travel patterns, recognizing barriers, and determining opportunities was comprised of population, employment, land use and traffic volumes and patterns. This data was used to distinguish where in the region people are going, how they are moving, where they want to go and where they would go given better multimodal infrastructure and connections.

Data sources and technologies utilized for this effort were:

- Data from *SmartMoves for a Changing Region*
- Open-source Street Map (OSM) data extract for the SPC region loaded into a PostgreSQL database
- OSM extract stored as a PGRouting topology in PostgreSQL via OSM2PGRouging
- Djikstra routing algorithm (via PGRouting)
- StreetLight travel patterns from an amalgamation of cell phone GPS data

An analysis of density was performed to discover whether and where unique "clusters" of transit supportive activities exist throughout the region. An algorithm was developed using demographic data, particularly population, employment, and land use; to detect locations and intensities of activity, in other words, verify the region's key origins and destinations. The algorithm was impartial to local and county boundaries and, instead, used the datasets as perspective on where people live, work, and play in the region. The algorithm was then calibrated to expand or contract to determine the sizes of "clustering" areas. What emerged from this process were types of clusters based on size and residential and employment densities.

Crossroads: a cluster of activity in an area less than ½-square mile like along the Route 8 corridor between Allegheny and Butler counties

Commercial Corridor: a long and narrow area greater than ½-square mile with less than 4,500 jobs like the Route 30 corridor

District: an area greater than ½-square mile that is not a Commercial Corridor with residential, population, and job densities like Canonsburg

Major District: an area greater than ½-square mile with sum of residents and jobs greater than 30,000 like the North Shore or Strip District

County Seat: an area distinguished by significance to its county and central to the county's jobs and transportation network

Employment Center: an area greater than ½-square mile with a sizable number of jobs like Southpointe and Cranberry

Cluster locations, or hub typologies, were then merged with StreetLight data displaying travel patterns to, from and between cluster locations. Layering these two datasets enabled an interpretation of the intensity of travel between each cluster by time of day and comparative number of people traveling between clusters. This approach was augmented by a network criticality analysis, which distinguished the most critical roads and road segments relative to facilitating movement between clusters. Results of the analysis were then illustrated in maps and layers of data that were assessed to pinpoint which corridors should be recommended to undergo multimodal installations and upgrades to existing infrastructure. Priority projects emerging from this analysis require prudent investments to the region's road and highway infrastructure that significantly improve the speed and convenience of transit, integrate multimodal and micro-transit options, and create seamless transfers between counties and public transit systems, thereby achieving a regional multimodal transportation network.

SmartMoves Connections is a framework for our region's planners and transit agencies

Priority Multimodal Hub Sites

- Commercial Corridor Hub at Cranberry
- Commercial Corridor Hub in the I-376 Airport Corridor
- District Hub at New Kensington
- Improved hubs at Rochester, New Castle, Washington, and Uniontown
- Improved inter-county transfer locations at Ambridge, Mt. Pleasant, Vandergrift, and Blairsville

Chapter 4: Multimodal Hubs

Priority Multimodal Corridors

- Highway-based Bus Rapid Transit on I-376 from the West Busway to the Airport
- Connection from the East Busway to Bus Rapid Transit on I-376, Route 22, and Route 30
- Bus Rapid Transit on I-279 and McKnight Road from Pittsburgh to Cranberry
- Bus Rapid Transit from Homestead to McKeesport
- Transit and multimodal enhancements on key corridors throughout the region

Chapter 5: Multimodal Corridors

2

Introduction to the Project

PROJECT BACKGROUND

PROJECT APPROACH

PLANNING COORDINATION

HOW TO USE THIS PLAN

Project Goals

IDENTIFY LOCATIONS FOR MULTIMODAL TRANSIT HUBS

Multimodal transit hubs are centralized facilities that are well-connected to local roadways, trails, and communities. They enable coordinated and interconnected transit service. They could include:

- Facilities for passengers such as waiting areas or park-and-rides
- Facilities for transfers between modes and transit providers
- Pick up and drop off areas
- Facilities to support transit operations
- Integrated or adjacent Transit-oriented Development

IDENTIFY CORRIDORS FOR MULTIMODAL IMPROVEMENTS

A multimodal corridor is the connector between a pair or series of multimodal hubs and includes facilities that prioritize pedestrians, cyclists, and public transit. Corridors between multimodal transit hubs could see improvements to enable smooth transit service. Corridor improvements could include:

- Technology and signalization improvements to traffic lights
- Partial or complete dedicated transit lanes on existing rights-of-way
- New transit rights-of-way for bus rapid transit (BRT) or rail

IMPROVE REGIONAL TRANSPORTATION COORDINATION

Policies and resources could allow transit operators to coordinate their existing and potential transit services to make it easier for riders to make connections between transit providers. Policies and resources could include:

- Timetable and schedule alignment for well-timed transfers
- Coordinated fare payment systems and policies
- Coordinated project implementation for multi-agency hubs and corridors

INVOLVE RIDERS AND STAKEHOLDERS IN PLANNING

The success of any planning effort is dependent upon the quality of the planning process. An inclusive planning process incorporates the input of a broad range of both technical and non-technical stakeholders to ensure that concerns are well understood and that solutions are well supported. This project's coordination and outreach process included:

- Input received during the development of the region's long range plan, *SmartMoves for a Changing Region*;
- A broad stakeholder focus group of planners, advocates, residents, and businesses;
- A technical focus group of transit operators and service planners;
- A SPC staff project team of planners and engineers;
- An online survey based on a public engagement planning tool.

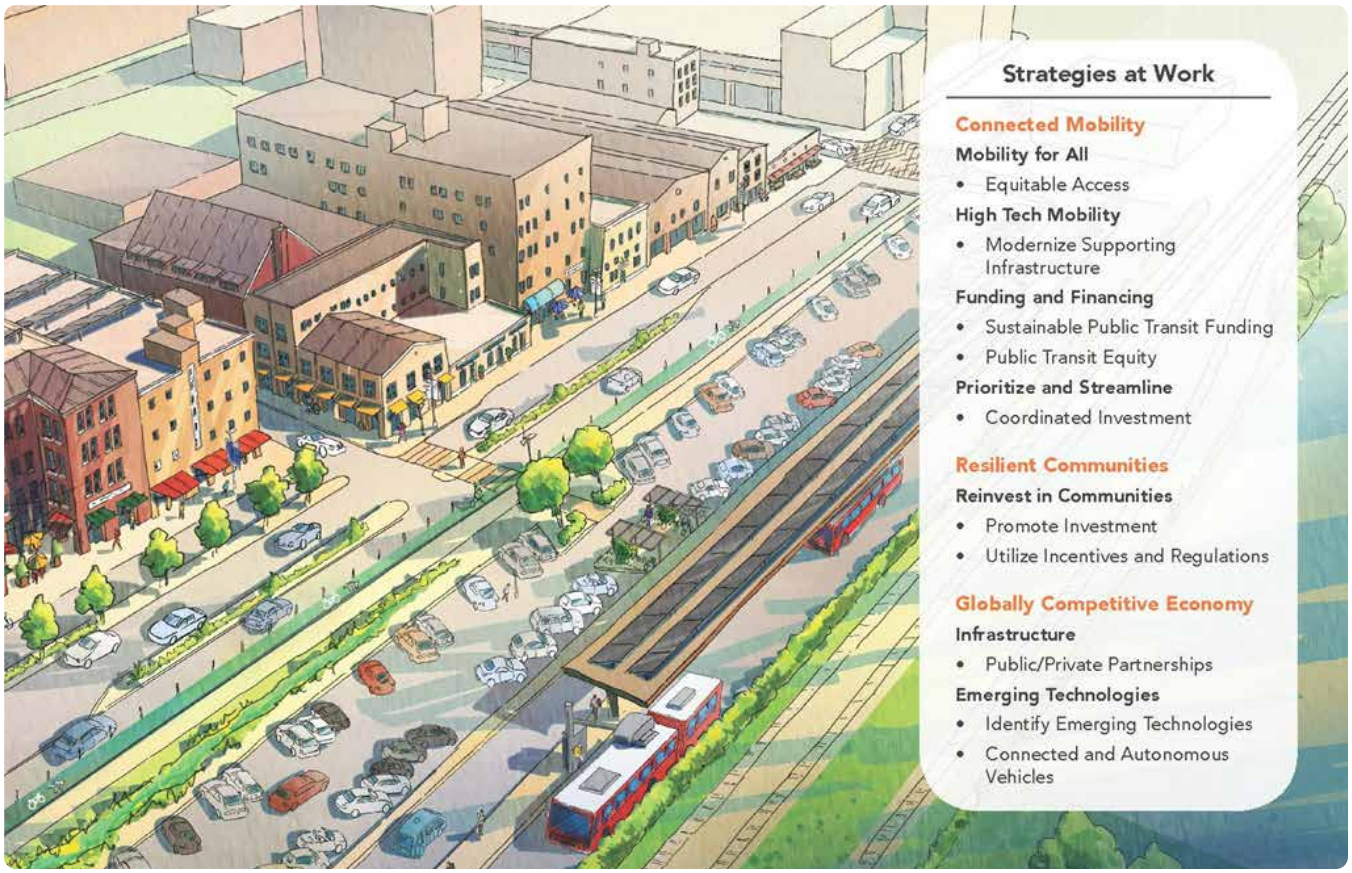
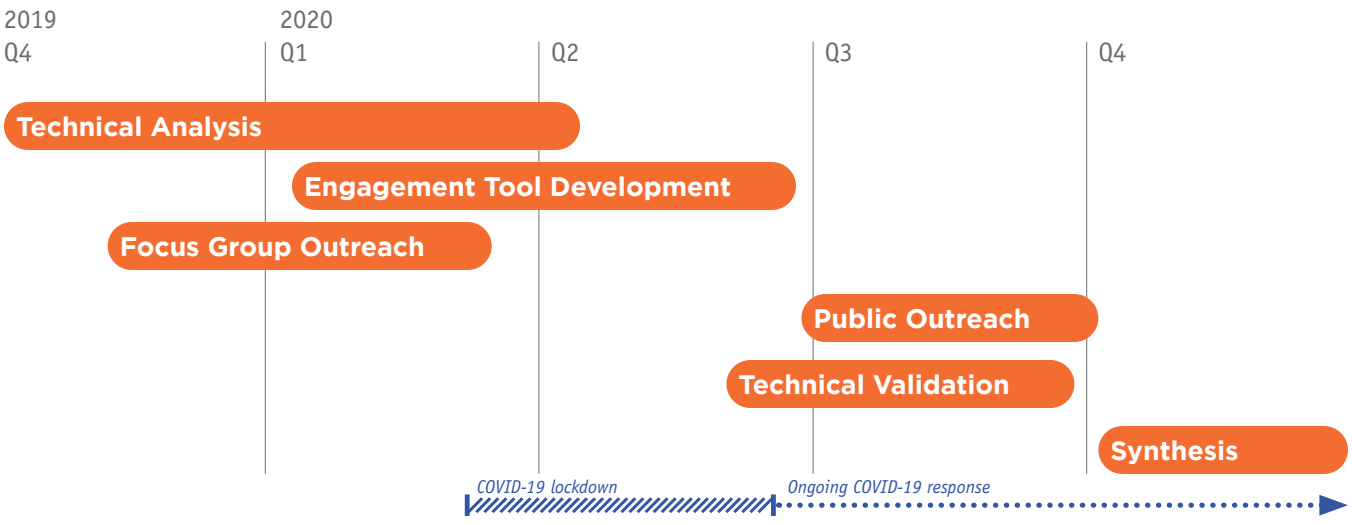


Illustration of a Mulimodal Transit Hub from the SmartMoves Story Map: https://arcg.is/1LezXn

PROJECT TIMELINE



Building Upon Previous Plans

"In June 2019 SPC adopted the region's official long range transportation plan—*SmartMoves for a Changing Region*—which includes over $22 billion for the region's transportation priorities over 25 years. SmartMoves prioritizes programs and projects that advance the Regional Vision of a world-class, safe and well maintained, integrated transportation system that provides mobility for all, enables resilient communities, and supports a globally competitive economy."[1]

1 https://www.spcregion.org/programs-services/transportation/smartmoves-long-range-plan-transportation-improvement-program/

The Southwestern Pennsylvania Commission's (SPC) 2019 *SmartMoves For a Changing Region* long range transportation plan (*SmartMoves*) established the region's goals and identified key projects and programs for further study and implementation. The SmartMoves plan envisioned "a world-class, safe and well maintained, integrated transportation system that provides mobility for all, enables resilient communities, and supports a globally competitive economy."[2] [3] This vision included projects for transit, active transportation, and roadways to advance significant strategies in support of the region's goals.

Subsequent planning projects include:

- Regional Operations Plan
- Public Transit - Human Services Coordinated Transportation Plan
- Active Transportation Plan
- Transportation Demand Management Strategic Action Plan

The *SmartMoves Connections* project was created to advance specific *SmartMoves* goals related to improving regional transit connectivity and creating multimodal transportation hubs and corridors. Among those, the SmartMoves Connections project seeks to build upon:

- Establish Regional Transit Centers at Key Locations throughout the Region
- Expanded Regional Park-and-ride Capacity
- Corridor upgrades and improvements

2 https://www.spcregion.org/programs-services/transportation/smartmoves-long-range-plan-transportation-improvement-program/

3 SmartMoves Story Map: https://arcg.is/1LezXn

SmartMoves For a Changing Region goals.

Advancing the Vision: Projects

Our Regional Vision

A world-class, safe and well maintained, integrated transportation system that provides mobility for all, enables resilient communities, and supports a globally competitive economy.

Example Projects for: Transit

- Downtown to Oakland Bus Rapid Transit (BRT)*
- West Busway BRT Extension to Pittsburgh International Airport
- East Busway Extension to the East Suburbs and Mon-Valley
- Establish Regional Transit Centers at Key Locations throughout the Region
- Expanded Regional Park-n-Ride Capacity*

Strategies Advanced:

- Equitable Access
- Emerging Technology
- Public Transit

Example Projects for: Active Transportation

- I-579 CAP*
- Three Rivers Heritage Trail to Freeport*
- Sheepskin Trail from Mon-River Trail to Great Allegheny Passage (GAP)*
- Westmoreland Heritage Trail to GAP*
- Hoodlebug Trail to Blairsville*
- Ohio River Trail from McKees Rocks through Beaver County to Ohio

Strategies Advanced:

- Reinvest in Communities
- Sustainability
- Clean Air

Example Projects for: Roadways

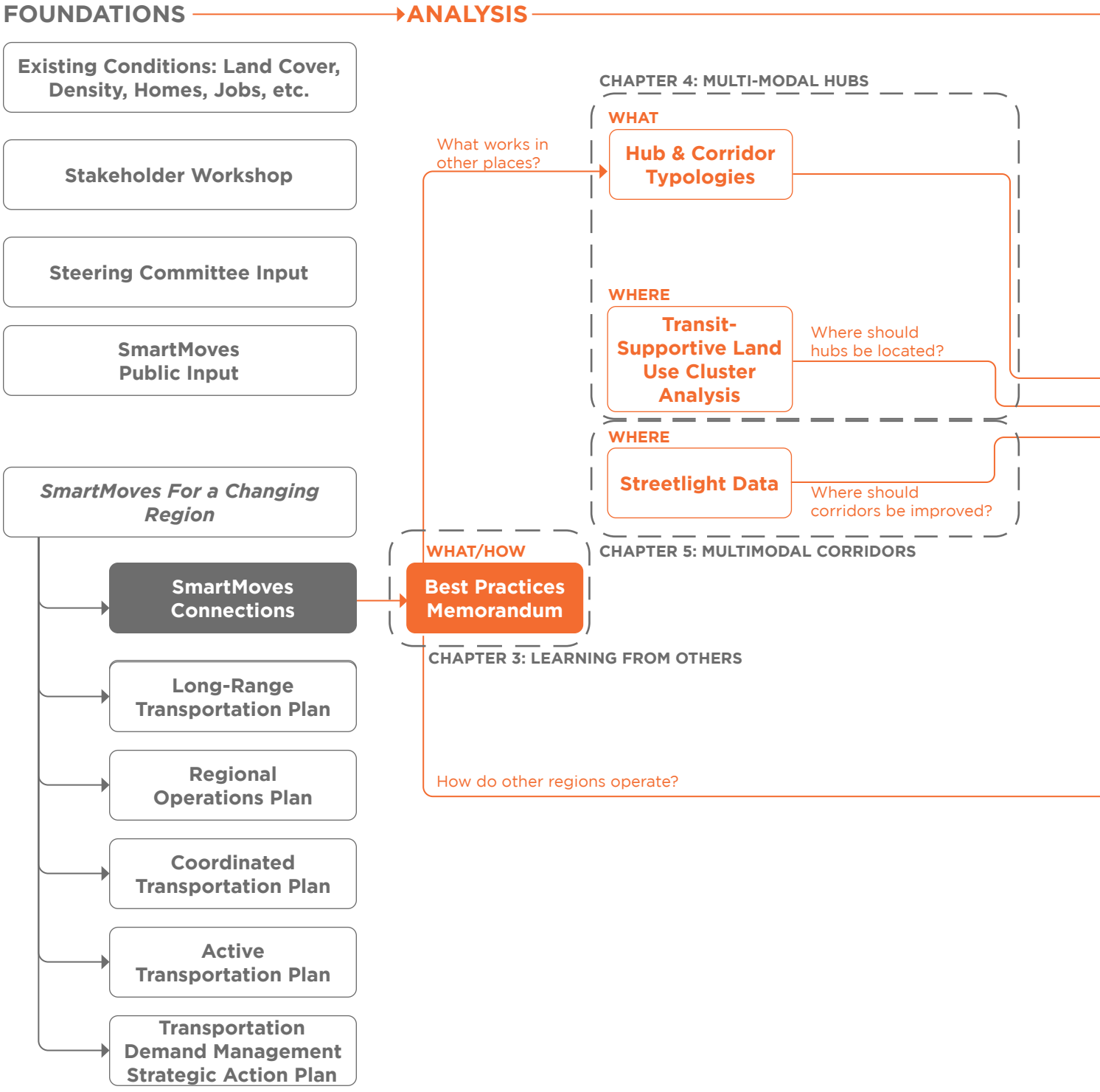
- U.S. Route 30 Modernization*
- PA Turnpike Cashless Tolling Interchanges (Routes 130, 981, 910)
- State Route 228 Modernization and Capacity Upgrades*
- State Route 885/Second Ave Corridor Improvements
- Monaca Gateway Corridor Improvements*
- East Carson Street Mobility and Safety Improvements*

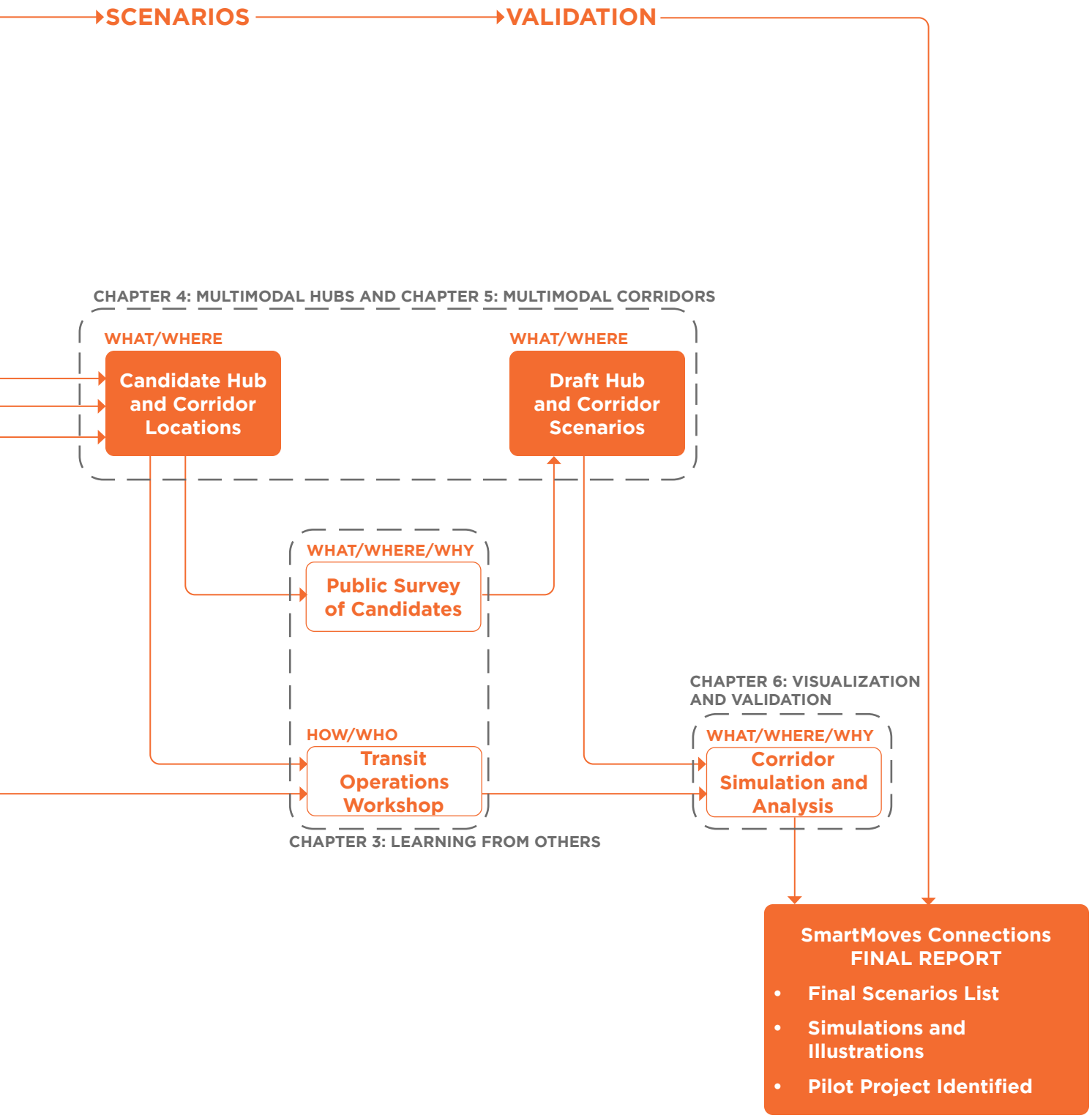
Strategies Advanced:

- Infrastructure
- Prioritize and Streamline
- Smart Technology

SmartMoves Story Map: https://arcg.is/1LezXn

Project Routemap

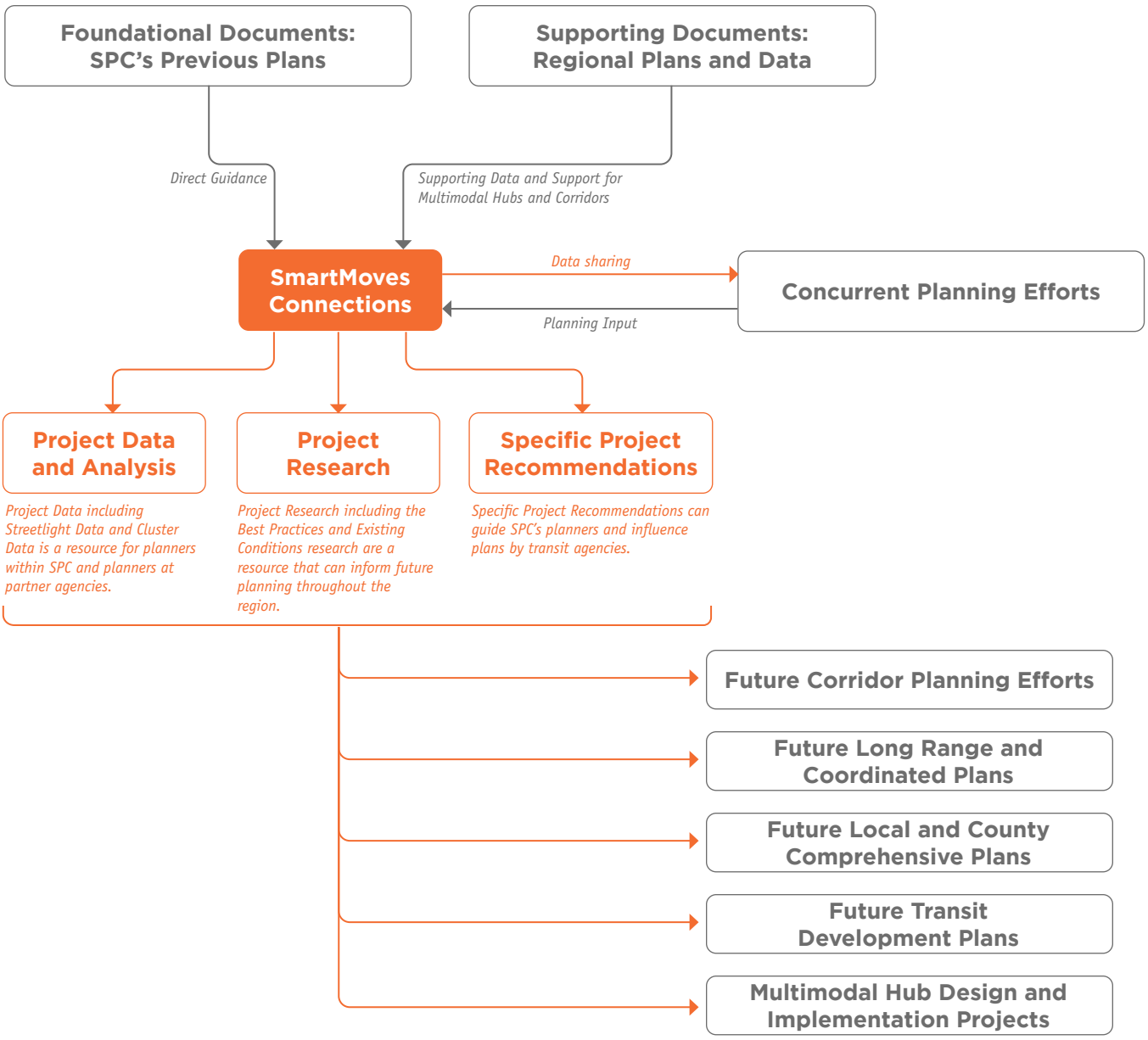



SCENARIOS
VALIDATION
CHAPTER 4: MULTIMODAL HUBS AND CHAPTER 5: MULTIMODAL CORRIDORS
WHAT/WHERE
Candidate Hub and Corridor Locations
WHAT/WHERE
Draft Hub and Corridor Scenarios
WHAT/WHERE/WHY
Public Survey of Candidates
HOW/WHO
Transit Operations Workshop
CHAPTER 3: LEARNING FROM OTHERS
CHAPTER 6: VISUALIZATION AND VALIDATION
WHAT/WHERE/WHY
Corridor Simulation and Analysis
SmartMoves Connections FINAL REPORT
Final Scenarios List
Simulations and Illustrations
Pilot Project Identified

Planning Coordination

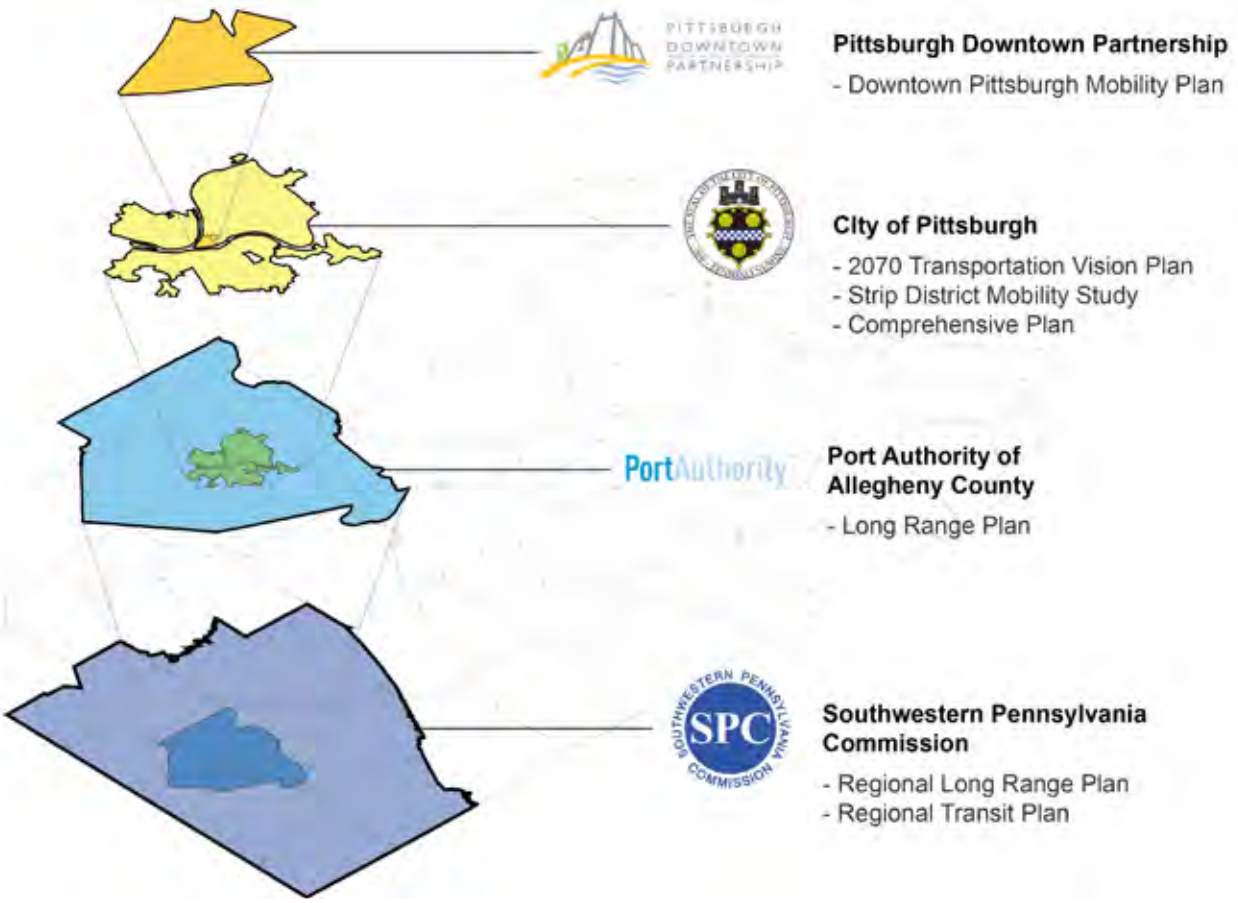
Smartmoves Connections builds upon previous plans, coordinates with concurrent plans, and supports future planning efforts.

SEE CHAPTER 3: LEARNING FROM OTHERS: EXISTING CONDITIONS ASSESSMENT FOR COMPLETE SUMMARIES OF REGIONAL PLANS AND DATA.



PREVIOUS PLANS THROUGHOUT THE REGION

In addition to building upon SPC's previous plans, in particular the *SmartMoves for a Changing Region* long range plan, this project references plans throughout the region. Early in the Project, the project team examined past reports, institutional master and comprehensive plans, transit development plans, traffic data and open-source statistical reports. With SPC's previous plans serving as a foundation that provided direct guidance to this plan, the regional plans provided reference data as well as support for multimodal hubs and corridors.



Relationship between planning efforts at four scales.
Source: Pittsburgh Downtown Partnership.

How to Use this Plan

GENERAL PUBLIC

- ☐ Much of the content of this report is also available online in the form of an online Story Map at https://tinyurl.com/8z9z6pvx . Meanwhile, detailed maps and information are also presented as a map. This makes it possible to directly access SmartMoves Connections and bring it to the table for planning and projects in neighborhoods and corridors around the region.

SPC STAFF

- ☐ Promote planning and project development for multimodal hubs and corridors among regional planners and transit agencies.
- ☐ Assess funding opportunities at the federal and state level for applicability to planning and implementing multimodal hub or corridor projects.
- ☐ Incorporate multimodal hub and corridor planning principles in SPC-led projects, especially for corridor studies of non-limited-access state routes.
- ☐ Anticipate future multimodal hubs in SPC-led projects even in places where a hub planning or implementation project is not imminent.
- ☐ Share project data with planning partners and among SPC staff.

TRANSIT AGENCIES

- ☐ Coordinate transit services and fare payment systems with adjacent transit agencies to enable better regional connectivity.
- ☐ Assess places where a multimodal hub can provide a better quality experience for transit riders and expand mobility options.
- ☐ Assess places where a multimodal hub can enable more efficient operations and a better quality experience for transit operators.
- ☐ For key locations within your jurisdiction, identify opportunities where partner agencies can connect with your services.
- ☐ Apply for capital funds to improve or add new multimodal hubs.

REGIONAL PLANNERS

- ☐ Identify and prioritize specific locations for multimodal hubs within the significant clusters identified by this plan.
- ☐ Refer to SmartMoves Connections recommendations for your jurisdiction to determine the kind of hubs that may be appropriate.
- ☐ Using the online cluster map at https://tinyurl.com/ppamhyj9 , regional planners can find information about a study area to get specific recommendations for multimodal hubs and corridors.
- ☐ Identify improvements to the pedestrian and cyclist networks that can connect to potential multimodal hub locations.

ELECTED REPRESENTATIVES

FEDERAL

- ☐ Allocate resources for public transit and multimodal improvements and capital infrastructure projects. The multimodal corridor improvements recommended by this report are highly cost effective because they make better use of existing infrastructure.
- ☐ Encourage the DOT and FTA to prioritize public transportation and to update best practices policies accordingly.

STATE

- ☐ Create reliable funding for public transit operations that is resilient in the long term.
- ☐ Allocate resources for public transit and multimodal improvements and capital infrastructure projects. The multimodal corridor improvements recommended by this report are highly cost effective because they make better use of existing infrastructure.
- ☐ Encourage PENNDOT to be active and involved in implementation of transit projects on existing roadways and to prioritize public transportation through dedicated bus lanes, transit signal priority (TSP), and other transit priority solutions.

COUNTY

- ☐ Encourage county planning efforts to identify specific locations for multimodal hubs within the significant clusters identified by this plan.
- ☐ Advocate for operations and capital funding for public transit.

LOCAL

- ☐ Participate in transit planning and design projects in your community.
- ☐ Identify and implement local improvements that can make getting to and from transit easier in your community.
- ☐ Advocate for operations and capital funding for public transit.

3

Learning from Others

SYNOPSES OF REGIONAL PLANS AND DATA

STUDY OF BEST PRACTICES

PROJECT PLANNING INPUT

Overview of Regional Plans

Early in the Project, the Study Team examined past reports, institutional master and comprehensive plans, transit development plans, traffic data and open-source statistical reports. The purpose of this analysis was to:

- Familiarize the Study Team with transportation and land use conditions, recommendations of past studies and plans, and problems and opportunities associated with multimodal connectivity;
- Illustrate how commuters are currently making connections between origins and key destinations throughout the 10-county region;
- Update and verify the Study Team's knowledge and intuition about mobility and possibilities in the region; and
- Organize data and information to build from and benefit subsequent Project tasks.

The assessment culminated in an Existing Conditions Summary Memorandum, a synopsis of the counties' and region's plans that inform transportation investments and transit service coordination along with impressions about those plans as they relate to the region's multimodal transportation network and this Project. The contents of the Existing Conditions Summary Memorandum are inserted here as the Synopses of Regional Plans and Data in Chapter 3: Learning from Others.

COMPREHENSIVE, LONG-RANGE AND COORDINATED PLANS

Even though the region's counties and transit agencies are extraordinarily diverse, all declare similar desires according to their guiding plans and principles: a cohesive regional transportation network; increased mobility options; and better integration of transit and land use. The project team also reviewed the multimodal projects underway at the time of this study, finding a number of good examples that provided a reference point for the recommendations. These projects are shown on page 22.

Nearly all the plans examined assert that the region consists of unrelated transportation networks and needs to improve connections. Many emphasized that transit – through greater investment and coordination – would result in regionally connected corridors and networks. Some specifically cited establishing key transit center hubs with significantly sized park-and-rides to encourage connectivity with and between local and regional networks. A few, like Washington and Butler, even described specific locations where these types of transit investments would increase activity and employment by connecting neighborhoods with commercial centers.

The region's transportation system, according to all plans, should be improved to meet the mobility needs of modern travelers. The region desires mobility options such as better fixed-route transit, micro-transit, ride-share, walking and biking. Areas that have park-and-ride lots address mode shift between automobiles and fixed-route transit but rarely incorporate alternative modes and inter-connections between them. These key locations are absent mode-shift infrastructure and smarter service integration. These plans significantly stress how the lack of various modes and linkages negatively impact equity and access for all.

Nearly all the plans express a greater need to integrate multimodal transportation policies with land use policies to make them mutually supportive. Most acknowledge that Transit-oriented Development (TOD) facilitates economic activity while reducing congestion on area roadways. At minimum, there is an appeal in most of the plans to encourage mixed-use development with pedestrian access and concentrated development to make multimodal transportation more feasible and efficient. The integration of transit with land use is called in one of the plans "a smart technique and strategy to economically achieve goals." Beaver County's comprehensive plan and Butler Transit Authority's (BTA) Transit Development Plan (TDP) went as far as to identify suitable locations within their jurisdictions for TOD specifically citing Rochester and Ambridge, and Cranberry, respectively.

TRANSIT DEVELOPMENT PLANS

SPC worked with two of the region's transit agencies – Butler Transit Authority (BTA) and Washington County Transit Authority (Freedom Transit) - to undertake TDPs, which resulted in identification of several demonstration projects that coincide with the work being undertaken on this Project.

The most significant finding from Butler's TDP, relative to SmartMoves Connections, was the potential demand for commuter service between Butler and Pittsburgh, the location where most Butler County residents work. The TDP recommended a demonstration project that would initially establish commuter service between Cranberry and Pittsburgh and then, after monitoring use and performance, establish a multimodal hub in Cranberry where services from Butler, New Castle, Beaver County and Allegheny County could convene. According to the TDP, "The hub, with passenger amenities, could provide an opportunity for customers to transfer to a variety of coordinated services to reach their final local or out-of-county destination."

The TDP for Freedom Transit examined transit services and opportunities from the perspective of a balanced and integrated multimodal system. Several locations in Washington County were pinpointed as potential multimodal transit hub locations consisting of downtown Washington, Canonsburg and a park-and-ride lot at Racetrack Road at Pike Street. The TDP examined the opportunity to establish key corridors, referred to as "service spines" between the City of Washington and Canonsburg, and expanding into Allegheny County. The TDP identified the types of amenities that should be incorporated into potential hub facilities such as shelters, customer waiting areas, seating, lighting, indoor and outdoor heating lamps, real-time schedule information and maps.

TRANSIT AGENCY STATISTICS

This review of previous relevant reports also consisted of examination of the regional transit agencies' performance statistics as reported annually to the Bureau of Public Transit (BPT) and the Federal Transit Administration's (FTA) National Transit Database (NTD). (Please refer to page 35 for tables and detailed statistics.) This data confirms that the Port Authority of Allegheny County (PAAC) is the largest in size and budget, highest in ridership and most efficient relative to cost per passenger. However, a few other statistics stand out as illuminating.

- Freedom Transit has the largest service area, 857 square miles in Washington County, and the third highest population (207,820) behind Allegheny (1,415,244) and Westmoreland (296,066) counties.
- Behind (PAAC), Beaver County Transit Authority (BCTA) carries the most passengers annually – 818,633 – with New Castle Area Transit Authority (NCATA) next at 579,120 annual passengers.
- PAAC has 768 buses and the rest of the transit agencies combined have 187 buses.
- The range of base cash fares is extremely disparate ranging from NCATA's $1.00 to PAAC's $2.75.
- Fayette Area Coordinated Transit (FACT) has the lowest cost per revenue mile ($3.26) and PAAC has the highest ($14.90).
- Except for PAAC, which carries 2.37 passengers per revenue mile, none of the other agencies carry more than one passenger per revenue mile; other transit agencies combined average passenger per revenue mile is .53.

Size and capacity of the region's transit agencies could be important mitigating factors when considering opportunities and determining capabilities of coordinating and connecting the region's transit network.

Overall, the region and its member counties and transit agencies are actively encouraging, as cited in relevant reports and plans, a regional transportation network connected by multiple modes and service coordination with land uses that create activity centers at hubs along the network. There was nothing identified in this review that conflicts with SmartMoves Connections. In fact, the region's plans and principles are perfectly congruent with the Project.

Institutional Plans

2021-2024 TRANSPORTATION IMPROVEMENT PROGRAM (TIP)[1]

Highway, bridge and transit projects on the region's most recent Transportation Improvement Program in effect at the time of the research (FFY2019-2022) were reviewed to look for examples of multimodal projects that were underway or planned. These examples show the then-current state of planning for Multimodal Hubs and Corridors by project sponsors such as transit operators, counties, cities and the Pennsylvania Department of Transportation. Since the research for SmartMoves Connections was conducted, the TIP has been updated, but the team was informed by this work being done to advance multimodal integration in southwestern Pennsylvania.

County	Item
Allegheny	ADA curb ramp project
	Brownsville Road (Mt. Oliver) streetscape improvements
	Carnegie Park-and-Ride (West Busway station)
	Downtown-Oakland-East End Bus Rapid Transit
	Gap to the Point
	I-79 cap project
	Millvale-Shaler-Etna Three Rivers Heritage Trail connection
	PA 837 pedestrian bridge
	Port Authority fixed facility improvement program
	Port Authority Transit Signal Priority
	Ride ACTA Shuttle last-mile service
	SPC SMART Transportation Program
	SPC Transportation Alternatives Program
	Washington Boulevard (Pittsburgh) multimodal path
	Millvale-Shaler-Etna TRHT Connection
	Washington Boulevard Multimodal Path
Beaver	Expressway Travel Center renovations
Butler	Multimodal Center in the City of Butler
	PA 68 Park-and-Ride facilities: Forward Twp. and Evans City
Fayette	Ohiopyle multimodal gateway bike and pedestrian project
Indiana	Facility Planning
Lawrence	New Castle Multimodal Regional Riverwalk
Washington	Mid-Mon Valley Park-and-Ride Improvements

1 https://www.spcregion.org/programs-services/transportation/smartmoves-long-range-plan-transportation-improvement-program/

SMARTMOVES FOR A CHANGING REGION: TRANSPORTATION & ECONOMIC DEVELOPMENT STRATEGY[2]

SmartMoves for a Changing Region: Transportation and Economic Development Strategy, Southwestern Pennsylvania Commission, 2019 (*SmartMoves*) serves as the foundation for this Project. *SmartMoves* was developed using over 22,000 points of engagement to develop specific transportation and economic strategies and actions. The extensive research, outreach and stakeholder involvement resulted in three overarching goals - connected mobility, resilient communities and globally competitive economy – all of which are interrelated. Achieving "a world-class, safe and well-maintained, integrated transportation system that provides mobility for all" includes investments, connectivity, walkable neighborhoods, green infrastructure, infrastructure investments, technologies and innovation.

This project, ***SmartMoves Connections: A Regional Vision for Public Transit***, is one step in implementing strategies outlined in *SmartMoves*. A primary relevant public transit strategy as described in the regional vision is to "develop a comprehensive regional plan for public transit connections" that includes "sustainable funding, seamless linkage and regional collaboration."

Additional and related transit approaches called out in *SmartMoves for a Changing Region* are:

- New transit investments in key corridors and networks
- Improve regional transit
- Invest in regionally connected, equitable and seamless linkages between the region's public transit services
- Systems need to be integrated as compared to unrelated networks
- Establish regional transit centers at key locations throughout the region
- Expand regional park-and-ride capacity
- Equitable access
- Emerging technologies
- Projects that maintain existing systems while also enhancing safety, accessibility, mobility, and connectivity across the region
- Consider every mode and user group when planning for new or improved transportation infrastructure, services and facilities
- Use technology for transit operations, mobility for all and integration of services
- Holistic planning for mobility and accessibility
- Prioritize programs and projects that work to reduce vehicle miles traveled (VMT) and decrease greenhouse gas emissions
- Increase cooperation, coordination and linkages between regional transit providers
- Coordinate private/personal mobility services with traditional public transit to provide first-mile/last-mile services
- Prioritize projects based on safety, connectivity and efficiency
- Complete streets improvements and landuse design standards to support public transit

2 *https://spcregion.org/pdf/SmartMoves/SM_Plan.pdf*

Institutional Plans

SOUTHWESTERN PENNSYLVANIA PUBLIC TRANSIT-HUMAN SERVICES COORDINATED TRANSPORTATION PLAN FY 2019-2022[3]

3

The Southwestern Pennsylvania Public Transit-Human Services Coordinated Transportation Plan (CTP), Fiscal Year 2019-2022 is an important component to state and federal transportation planning because it assesses transportation needs and gaps and prioritizes transportation solutions. The CTP is a requirement for projects seeking funds from the Federal Transit Administration's (FTA) Section 5310 Program (Enhanced Mobility for Individuals and Individuals with Disabilities), which provides funds to private nonprofit groups to meet transportation needs of senior citizens, low-income individuals, and individuals with disabilities. The CTP is a 4-year blueprint for implementation of public transit and human services transportation solutions throughout the SPC region.

SPC's CTP indicates that the "ideal transportation system" needs to include mobility-related services for all ages and levels of need as well as a "broad range of mobility options, including: walking, carpools/vanpools, micro-mobility, fixed-route transit, carsharing, micro-transit, non-fixed-route transportation, ride-hailing and personal vehicle." The CTP's framework was based on a regional transportation goal to develop a regional multimodal transportation network which, through the use of robotics, automation, and shared mobility, can create seamless travel chains in urban, suburban, and rural environments for in-county and cross-county trips that anyone, regardless of ability or income, can take advantage of in order to access healthcare, jobs, education, quality nutrition, and social activities.

The CTP's three strategies to accomplish this goal are:
1. Embracing change
2. Greater access
3. Smarter service delivery

Consistent with the regional transportation goal, the CTP's primary areas of focus are:
1. Multimodal transportation network
2. Seamless travel chains
3. Urban, suburban and rural environments
4. Equity

A seamless travel chain describes features that can relate to *SmartMoves Connections* such as: "fully integrated with smartly-placed connection hubs; open data sharing; effectively coordinated services and schedules among the varied modes; and common method of payment utilized across the entire system." Access for all regardless of race, age, income or disability as stated in the CTP is an important policy for *SmartMoves Connections* as well. Other relevant examples from the CTP are: consider changing attitudes as it relates to mobility; public/private partnerships for first-mile/last-mile services; multi-mode seamless travel; regional cooperation to foster connectivity; best practice transportation landuse policies; integrated fares and schedules; and multi-agency marketing.

3 *https://www.spcregion.org/pdf/lrpdraft/human/CTPReport.pdf*

REGIONAL ACTIVE TRANSPORTATION PLAN[4]

The ***Regional Active Transportation Plan for Southwestern Pennsylvania (ATP)***, Southwestern Pennsylvania Planning Commission, 2018, "is intended to provide not only a cohesive vision for primarily non-motorized travel across the region, but also technical guidance to local governments seeking to achieve their respective local active transportation goals." The ATP was developed with extensive public participation and built upon other relevant plans including *SmartMoves for a Changing Region*, PennDOT Connects, and Mapping the Future. ATP's objectives are to: strengthen communities; improve transportation safety and security; enhance multimodal accessibility and connectivity; improve public health; and enhance the environment.

ATP Objectives

- Promote integration of transportation and land use policies
- Support initiatives to create walkable neighborhoods and business districts
- Provide guidance and educational resources to create and maintain vibrant communities and integrated transportation networks
- Improve travel ability and options for under-served populations
- Enhance travel and tourism by promoting safe and connected multimodal networks
- Reduce bicycle and pedestrian fatalities and injuries
- Create safe and comfortable multimodal transportation networks for all users
- Support regional collaboration for active transportation corridors
- Encourage connectivity with and between local and regional networks, including multi-state networks
- Improve the transportation network to allow for increased mode choices as well as first-mile/last-mile connections to transit
- Encourage collaboration between education, public health and transportation agencies to promote active transportation
- Encourage infrastructure improvements to increase access to open spaces and recreational facilities
- Promote strategies that increase air quality and incorporate sound environmental mitigation principles
- Reduce motor vehicle trips

According to the ATP, advancing active transportation networks throughout the region to create more bikeable and walkable communities requires incorporating one or more of the following guiding principles, referred to as the "six Es":

1. Engineering
2. Education
3. Evaluation
4. Enforcement
5. Encouragement
6. Equity

The ATP provides resources and technical design elements as well as steps to create active transportation networks, which include plans, policies and procedures, design, funding, implementation, maintenance and evaluation.

A principle from the ATP that relates directly to *SmartMoves Connections* is the need for integrating multimodal transportation networks with land use policies; such as creating transportation hubs based on active transportation goals and TOD. Components such as sidewalks and safe and convenient crossings are important for bicycling and walking as well as public transit and are essential hub elements.

4 *https://spcregion.org/pdf/ATP%20For%20Southwestern%20PA_final.pdf*

County Comprehensive Plans

Several of the county comprehensive plans call for multimodal infrastructure, including the creation of hubs and multimodal improvements to existing corridors.

ALLEGHENY PLACES[5]

Allegheny Places, The Allegheny County Comprehensive Plan (2018), provides a "framework for the strategic use of public resources to improve the quality of life for all residents." Four transportation visions identified in Allegheny Places are: 1) all residents have equitable access to opportunities and benefits of our ongoing economic revitalization; 2) TOD stimulates economic activity and relieves congestion on area roadways; 3) a highly efficient transportation system links Oakland, Downtown and Pittsburgh International Airport and major economic centers; and 4) extensive greenways connect our communities with parks, trails, riverfronts and other natural amenities. Other concepts from the plan consist of future land use plans to support transit, desire for TOD and implementation of complete streets in applicable corridors.

Specific to transportation, an Allegheny Places goal is for a multimodal transportation network integrated with future land use plans that:

- Efficiently connects people
- Improves mobility to and around existing communities
- Provides efficient access to proposed development
- Facilitates movement of people, services and freight
- Is cost effective and well-maintained
- Utilizes smart techniques and strategies to economically achieve goals

Public transit challenges are identified in Allegheny Places that specifically cite:

- Difficult circulation in and around Oakland
- Lack of direct fixed guideway connection between Downtown and Oakland
- Lack of direct fixed guideway transit connection between Downtown Pittsburgh and the Airport
- Inadequate transit funding
- Negative public attitude toward transit
- Missing intermodal connections
- Absence of a system that meets current needs
- Insufficient fare box recovery ratio

Two specific recommendations from Allegheny Places are pertinent to *SmartMoves Connections*.

1. Provide full range of integrated transportation alternatives that include bikeways and sidewalks and promote TOD at key transit stations and along transit corridors.
2. Increase the number of important connections for intermodal and multimodal hubs by integrating park-and-ride with transit stops, developing HOV lanes and ridesharing opportunities, and implementing sidewalks and bikeways that create multiple mobility options.

ARMSTRONG COUNTY COMPREHENSIVE PLAN[6]

Armstrong County Comprehensive Plan (ACCP) (2005), assesses existing conditions in the County and establishes a vision with goals and strategies to achieve the vision. Multimodal transportation objectives cited in the Plan are:

- Maintain and improve transportation networks
- Improve public transit
- Link various modes of travel
- Integrate transportation policies with land use policies to make them mutually supportive
- Collaborate with surrounding counties to investigate the feasibility of increased/improved public transit access to Pittsburgh, Allegheny County, and other counties
- Work with the Mid-County Transit Authority to increase/improve public transit within Armstrong County
- Promote concentrated development to make public transit more feasible

5 *http://www.alleghenyplaces.com/comprehensive_plan/comprehensive_plan.aspx*

6 *https://co.armstrong.pa.us/images/departments/planning/plansdocs/accp2005.pdf*

BEAVER COUNTY COMPREHENSIVE PLAN[7]

Beaver County Comprehensive Plan's (BCCP)(2010) main goal "is to provide the County with realistic, achievable steps that build upon past successes and create new paths to prosperity." The county views itself as having "a well-developed transportation network" consisting of highways, bridges, railways, public transit and pedestrian-oriented downtown areas.

Beaver County cites two main transportation goals in its Comprehensive Plan.

1. Ensuring that the county's employment and commercial centers and neighborhoods are well connected through roads and public transit routes; and
2. Providing alternative transportation options through pedestrian and multi-use trails.

Specific multimodal transportation initiatives identified in the BCCP are:

- Rochester TOD
- Ambridge TOD
- Evaluation of expanded transit services to Cranberry, Pittsburgh International Airport and Midland
- Implementation of alternative transportation options through pedestrian and multi-use trails
- Expansion of regional transit in coordination with Port Authority to provide coordinated services like the "Smart Card" fare system, regional trip planner and regional website

BUTLER COUNTY COMPREHENSIVE PLAN[8]

The ***County of Butler Comprehensive Plan (COBCP) (2002)***, Phase II, The Plan Recommendations, identifies objectives concerning the location, character and timing of future urban, suburban and small town development and green space. Relative to multimodal transportation, the COBCP recognized the following:

- Cranberry's economic role in Butler County should be linked by transportation
- Areas outside the path of growth should be linked through coordinated transportation improvements
- Public transit connections should focus on linking small towns to the county's two urban areas - Butler City and Cranberry
- At least 30 percent of the county-wide workforce is working outside Butler County with 90 percent working in Allegheny County
- Need for regional planning agreements that link the issues of land use policy and transportation
- Need to make suburbs safe and feasible to walk to key destinations
- Cranberry Township, City of Butler, Interstate 79, Route 68, Route 228 and Route 356 corridors are areas of economic growth in Butler County

FAYETTE COUNTY COMPREHENSIVE PLAN[9]

The public transit section in ***Fayette County's Comprehensive Plan (FCCP) (1999)*** is more than 20-years old; however it indicated that fixed-route service is concentrated in the City of Uniontown and the Uniontown-Connellsville-Brownsville corridor. The FCCP went on to recognize that two private vendors at that time operated the fixed-route service and cited a need for those providers to better coordinate service and schedules. Otherwise, it focused primarily on roadway network needs and improvements.

7 *http://www.beavercountypa.gov/Depts/Planning/Documents/BC_ComprehensivePlan_May2010.pdf*

8 *https://www2.co.butler.pa.us/planning/compplan.pdf*

9 *https://www.fayettecountypa.org/263/Fayette-County-Comprehensive-Plan*

County Comprehensive Plans

GREENE COUNTY COMPREHENSIVE PLAN[10]

Greene County Comprehensive Plan (GCCP) (Draft, 2019) is an "official statement of its vision, goals and objectives as well as the guide for future development." One of the six pillars of the GCCP is "mobility, infrastructure and transportation." Greene County does not operate fixed-route public transit but does provide medical assistance transportation and shared-ride services for senior citizens and persons with disabilities. Greene County identified the I-79 Technology Corridor at Kirby and Ruff Creek interchanges as an important growth corridor.

INDIANA COUNTY[11]

Indiana County does not have a Comprehensive Plan. However, while researching Indiana's comprehensive plan, several other plans were found that might provide relevance to *SmartMoves Connections*.

- Indiana Multimodal Corridor Project (IMMC)[12] is a project intended to guide development of a 2.7-mile biking and walking corridor that connects the Hoodlebug Trail, Indiana University of Pennsylvania (IUP), Main Street (Downtown Indiana) and the White Township Recreation Complex.
- Indiana County Transit Authority's (IndiGO) FY 2012-2016, Strategic Plan (SP)[13] identifies a few important regional transit coordination initiatives such as reviewing new service opportunities and working with SPC and surrounding transit agencies to implement regional transportation projects. A possible partnership between Wyo-Tech and IUP was identified as a potential way for IndiGO to increase transit ridership.
- Indiana Community University, District Master Plan, January 2016[14] focuses on IUP's campus and areas surrounding Downtown Indiana. The District Master Plan identifies the need for better non-motorized facilities and improved walkability, and improved sidewalks and pedestrian experience. IUP students and faculty, according to the SP, use a variety of transportation modes including cars, transit, walking and bicycling.

LAWRENCE COUNTY COMPREHENSIVE PLAN UPDATE[15]

The Lawrence County Comprehensive Plan Update (LCCP) (2016) sets forth "basic policies concerning physical development and social and economic goals" within the county and provides specific recommendations. One LCCP vision is to have "connected communities" which can be achieved through one of the LCCP's transportation objectives "to improve the convenience and safety of its travel network, including roads as well as routes for walking and cycling."

The following are a few of the multimodal transportation recommendations from the LCCP.

- Advance equity in access by ensuring that development decisions respect alternatives to driving
- Encourage a complete streets approach to the design of roadways and corridors
- Encourage "core" communities to develop their own municipal biking and walking plans
- Explore whether New Castle Area Transit Authority's (NCATA) services should be expanded county-wide (particularly to provide access to industrial and business parks throughout the county)
- Explore connecting service with Western Reserve Transit Authority (WRTA) in Youngstown, Ohio

WASHINGTON COUNTY COMPREHENSIVE PLAN[16]

The Washington County Comprehensive Plan (WCCP) (2005) contains strategies for "future land use, housing, economic development, natural, cultural and historic features, transportation, community facilities, services and parks, and recreation and open space." Discussions about transportation in the WCCP include all modes - roadways, waterways, air travel, sidewalks, trails and public transit.

The WCCP discusses the significance of several corridors that connect Washington County with the rest of the state and region: two interstate highways (I-70 and I-79) and principal arterial highways like US Route 19, US Route 22, PA Route 88, and PA Route 837.

10 https://www.co.greene.pa.us/resources/2613

11 https://www.indianacountypa.gov/departments/planning-and-development/comprehensive-plan-information/

12 https://www.icopd.org/indiana-multimodal-corridor.html

13 https://www.indigobus.com/indiGO_Strategic_Plan_jan_27.pdf

14 https://www.icopd.org/indiana-community-university-district-master-plan.html

15 http://co.lawrence.pa.us/wp-content/uploads/2015/04/Lawrence-County-Comprehensive-Plan_FINAL-OCTOBER-2016.pdf

16 https://www.co.washington.pa.us/DocumentCenter/View/167/Washington_County_Comprehensive_Plan?bidId=

Washington is the only county that features two fixed-route public transit providers - Washington County Transportation Authority (a.k.a. Freedom Transit) and Mid Mon Valley Transit Authority (MMVTA).

The WCCP cites recommendations, which are illustrated below, that coincide with regional coordination and multimodal transportation principles:

- Publicly acknowledge municipalities who plan from a regional approach
- Develop a multimodal approach to transportation planning
- Include bicycle-friendly concepts in planning and design such as "wider shoulders, bicycle actuated traffic signals, bike lanes and extensions of existing trail systems"
- Create viable trails
- Acquire rights-of-way and abandoned rail lines for trails
- Establish policy that promotes public transit and pedestrian access
- Install attractive and highly visible crosswalks and sidewalks in all new high-density developments
- Integrate park-and-ride areas along roadways with high levels of motor vehicle travel or when new intersections are constructed
- Increase park-and-ride in the northwest near Southpointe
- Develop alternative transportation systems for inter-connections
- Create a transit system that serves the entire Mon River Valley
- Encourage TOD
- Encourage developers and municipal officials to connect communities and encourage pedestrian and bicycle circulation
- Capitalize on the regional significance of Pittsburgh International Airport
- Extend the "T" to Southpointe and Canonsburg

REIMAGINING OUR WESTMORELAND[17]

Reimagining Our Westmoreland (2018) is the county's comprehensive plan, which comprises regional coordination and multimodal strategies throughout. Here are the most notable and pertinent to *SmartMoves Connections*.

- Identify suitable locations for TOD including existing and proposed rail lines and bus stops and near college campuses
- Enhance biking and walking trails
- Work with municipal partners to identify areas that are best suited for senior housing based on proximity to related services and transit options
- Encourage mixed-use development with pedestrian connections
- Establish a complete streets model for dense neighborhood centers, town centers and regional urban cores
- Major traffic corridors I-70, I-76, US Route 30 and US Route 22
- Promote TOD
- Explore micro-transit
- Develop strategic park-and-ride facilities
- Increase walkability and biking options
- Improve passenger rail service
- Implement bikesharing services

17 https://www.co.westmoreland.pa.us/DocumentCenter/View/15778/FINAL-ADOPTED-Reimagining-Our-Westmoreland-with-Resolution_20181220-compressed

Transit Development Plans

BUTLER TRANSIT DEVELOPMENT PLAN 2017[18]

The primary purpose of the ***Butler Transit Development Plan (BTDP) (2016)***, Memo 1 was to determine the "need and required resources for enhancing service to effectively plan, fund and implement public transit." BTDP described current conditions of the Butler Transit Authority's (BTA) fixed-route and shared-ride services. Public outreach efforts conducted during development of the TDP resulted in short-, mid- and long-term transit service plans.

Three key findings emerged from BTDP:

1. Constituents stated the need for evening transit service
2. There is potential demand for additional commuter trips to downtown Pittsburgh
3. Most Butler County commuters travel to Pittsburgh for work

Other important destinations cited in BTDP are Oakland, Pittsburgh International Airport, Slippery Rock, Grove City and Cranberry.

BTDP had several recommendations that relate directly to the SmartMoves Connections Project. The TDP recommended a Butler/Cranberry transit service demonstration project. A long-term (greater than 5-years) recommendation was for creation of a regional multimodal hub where services from multiple transit agencies (New Castle and Beaver County) could convene. The hub, with passenger amenities, could provide an opportunity for customers to transfer to a variety of coordinated services to reach their final local or out-of-county destination. Cranberry was identified as a possible location for the hub and, specifically suggested consideration of the Route 228/Route 19/I-79 corridors. Any potential hub site would need to be studied further to evaluate potential Transit Revitalization Investment District (TRID), the potential of TOD and best ways to integrates transit, pedestrian and bicycle connections.

18 https://spcregion.org/pdf/ButlerTDPMemo1.PDF

WASHINGTON COUNTY TRANSPORTATION AUTHORITY TRANSIT DEVELOPMENT PLAN 2018[19]

The Washington County Transportation Authority's (Freedom Transit) ***5-year Transit Development Plan (WCTATDP) (2018)*** identified ways to improve public transportation that specifically improve access for more people in Washington County and increase Freedom Transit's system ridership.

Potential opportunities from the WCTATDP that are consistent with SmartMoves Connections consist of:

- Providing mid-day service to South Hills Village, allowing customers to connect to the light rail line into Downtown Pittsburgh
- Adding routes to connect City of Washington and the eastern side of Washington County referred to as the Mon Valley
- Serving less densely populated areas by demand-response micro-transit services
- Adding local service between Canonsburg and Southpointe
- Developing the "Service Spine" between the City of Washington and Canonsburg
- Implementing a new Transit Center in Canonsburg and new park-and-ride on Racetrack Road
- Expanding service on County Line routes to McDonald, Monongahela and Charleroi with potential extensions to Burgettstown and Claysville

WCTATDP recommended coordinating services between Freedom Transit and Mid Mon Valley Transit Authority (MMVTA), which both operate fixed-routes in Washington County, and provide service to downtown Pittsburgh. There may be additional coordination opportunities with Fayette Area Coordinated Transportation (FACT) and Mountain Line Transit Authority (Morgantown, WV), which provides limited service into Washington County.

The following are additional hub, corridor and TOD highlights that were presented in the WCTATDP:

- Place housing developments near fixed-routes
- Modify land use regulations to encourage walkable communities
- Support and integrate all transportation modes
- Promote a balanced multimodal transportation system
- Provide pedestrian, greenway, and sidewalk improvements to make public transit service more accessible and efficient
- Expand regional services to Allegheny County
- Implement new service in I-79 corridor north of the City of Washington
- Connect McDonald to City of Washington via Canonsburg
- Promote TOD

Three locations in Washington County were presented as potential hubs with specific recommendations to invest in customer waiting facilities, seating, lighting, heating (indoor or outdoor heat lamps), real-time and/or schedule information and maps. One location, Downtown Washington Transit Center, located at 50 East Chestnut Street, already contains such amenities but could benefit from upgrades like real-time information and lighting/heat lamps at the outdoor shelter. Two other proposed locations include Downtown Canonsburg Transit Center near the intersection of Pike Street and Central Avenue and a park-and-ride lot on Racetrack Road at Pike Street.

19 https://www.spcregion.org/pdf/Washington%20County%20TDP%2008-08-2018%20Final.pdf

Transit Development Plans

WESTMORELAND COUNTY TRANSIT AUTHORITY TRANSIT DEVELOPMENT PLAN[20]

Westmoreland County Transit Authority's (WCTA) Transit Development Plan (WCTATDP) is a 5-year plan to improve public transportation in the county and consider a broader regional context for WCTA's service. The TDP consists of two main parts: a Strategic Business Plan that identifies actionable tasks; and Service Guidelines that define parameters for current and future transit services. Service goals cited in the WCTATDP include:

- Mobility – ensuring WCTA takes people where they want to go and when they want to get there
- Usability – enabling customers to understand how the service works and how to use it
- Quality – making sure customers have a good experience and think that WCTA provides value and is a responsible steward of taxpayers' dollars

Approximately 10 opportunities to improve transit services were called out in the TDP; one relates directly to SmartMoves Connections' objectives. WCTA is interested in "strengthening intra-county connections through regional routes;" thereby, making Westmoreland County's communities more accessible to the region.

Geographically, the County is in a good location to accomplish that objective. Westmoreland County sits at the nexus of three highways - U.S. Route 22, U.S. Route 30, and U.S. Route 199 – and has State Route 66, which is a limited access highway between New Stanton and Delmont and major regional thoroughfare.

The roadway network is complemented by service from three other public transit agencies that operate bus routes in Westmoreland County: Mid Mon Valley Transit Authority (MMVTA), Fayette Area Coordinated Transportation (FACT), and Port Authority of Allegheny County (PAAC). Some of these transit agencies along with a few others provide shared-ride services in Westmoreland County. Shared-ride providers operating in the County consist of:

- ACCESS by PAAC (limited service in Westmoreland)
- TACT Shared Ride by Town & Country Transit (TACT)
- Reserve-A-Ride by CamTRAN (Johnstown, Cambria County)
- FACT Shared Ride by FACT
- Freedom Transit Shared Ride by Washington County Transit Authority (Freedom Transit)

There are 10 official park-and-rides in Westmoreland County, which is relevant to SmartMoves Connections because park-and-ride locations could be considered for hub locations. Seven of the lots are served primarily by transit and three of the lots are for carpooling. One of the lots, Rostraver Airport, is served by both WCTA and FACT.

Throughout the WCTATDP's public outreach process, WCTA consistently and overwhelmingly heard from the community that Downtown Pittsburgh is the most important and priority destination for WCTA to serve.

20 https://www.spcregion.org/wp-content/uploads/2019/09/Westmoreland-County-TDP-Final-web.pdf

Data and Statistical Reports

It is important to know where a region has been to understand where a region is going and to be able to measure performance when it gets there. The transit data presented in this section serves as a baseline – consisting of mode type, service area demographics, operating indicators, revenues and expenditures – against which future improvements can be measured and evaluated. Data reported to the Federal Transit Administration (FTA) and PennDOT by the region's transit agencies is a logical starting point because the FTA and PennDOT make funding decisions based on these types of indicators.

PENNDOT STATISTICAL REPORTS[21]

The Pennsylvania Department of Transportation's (PennDOT), Bureau of Public Transit (BPT) annually reports performance statistics for the public transit agencies it funds, except for two small transit providers in Allegheny County. The two providers are: Airport Corridor Transportation Association (ACTA) and Heritage Community Transportation (HCT). ACTA and HCT are not included in PennDOT's report because each are considered an "orphan project" that is not technically funded with formula funds. Table 1 summarizes each transit agency in SPC's region and the types of transportation services that each offers.

The transit agencies in SPC's region are quite diverse: exemplified by TACT's service area of 24 square miles to Freedom Transit's 857 square miles. The number of annual passengers range from TACT's 40,422 to PAAC's more than 62 million. Base fares range from NCATA with $1.00 to BCTA and PAAC with $2.75 (when not using a ConnectCard). The total number of fixed-route buses range from TACT's nine to PAAC's 768. TACT has the lowest annual operating expense ($646,000) and PAAC has the highest ($392,373,000).

21 https://www.penndot.gov/Doing-Business/Transit/InformationandReports/Documents/BPT%20Annual%20Report%202017-18_06.05.2019.pdf

Data and Statistical Reports

Table 1: SPC Region's Public Transit Providers

Agency	County	Urban Fixed Route	Rural Fixed Route	Community Shared-Ride
Port Authority of Allegheny County (PAAC)	Allegheny	X		x
Mid County Transit Authority/Town and Country Transit (TACT)	Armstrong		X	X
Beaver County Transit Authority (BCTA)	Beaver	X	X	X
Butler Transit Authority (BTA)	Butler	X	X	
Fayette Area Coordinated Transportation (FACT)	Fayette	X		X
Greene County Transportation Department	Greene			X
Indiana County Transit Authority (IndiGO)	Indiana		X	X
New Castle Area Transit Authority (NCATA)	Lawrence		X	
Washington County Transit Authority (Freedom)	Washington	X		X
Mid Mon Valley Transit Authority (MMVTA)	Washington / Westmoreland	X		
Westmoreland County Transit Authority (WCTA)	Westmoreland	X	X	X

Table 2: Transit Agencies' Fixed Route Statistics

Agency	Service Area Sq. Miles	Population	Passengers	Revenue Miles	Revenue Hours	Base Cash Fare
BCTA	440	170, 596	818,633	902,240	52,481	$2.50
BTA	25	31,084	202,000	233,817	16,809	$1.25
FACT	790	136,606	150,515	575,563	30,613	$1.50
IndiGO	504	65,500	384,189	481,537	36,457	$1.35
Freedom Transit	857	207,820	103,775	424,052	26,603	$1.50
MMVTA	45	66,086	283,560	773,135	42,950	$2.00
NCATA	178	74,880	579,120	1,104,873	53,996	$1.00
PAAC	775	1,415,244	62,414,729	26,349,298	2,012,014	$2.75
TACT	24	17,610	40,422	116,668	8,679	$1.25
WCTA	668	296,066	449,078	1,072,397	53,098	$2.00

Table 3: Transit Agencies' Vehicles, Expenses, and Revenues

Agency	# of Buses	Total Vehicles	Annual Operating Expenses	Annual Operating Revenues
BCTA	24	47	$6,017,000	$1,692,000
BTA	12	12	$2,015,000	$266,000
FACT	11	41	$1,878,000	$315,000
Freedom Transit	10	88	$1,873,000	$230,000
IndiGO	16	28	$2,719,000	$725,000
MMVTA	30	30	$3,967,000	$662,000
NCATA	34	34	$5,938,000	$747,000
PAAC	768	1,189	$392,473,000	$97,812,000
TACT	9	20	$646,000	$37,000
WCTA	41	89	$5,745,000	$1,289,000

Data and Statistical Reports

Cost per passenger statistics vary widely from PAAC's at $6.29 per passenger to Freedom Transit's at $18.05. Freedom Transit has the lowest passenger per revenue hour (3.9) and PAAC has the highest (31.02). Cost per revenue hour ranges from FACT ($61.35) to PAAC ($195.06).

Table 4: Transit Agencies' Annual Operating Statistics

Fixed Route	Cost per Passenger	Revenue per Passenger	Cost per Revenue Hour	Cost per Revenue Mile	Passenger per Revenue Hour	Passenger per Revenue Mile
BCTA	$ 7.35	$ 2.07	$ 114.65	$ 6.67	15.60	0.91
BTA	$ 9.98	$ 1.32	$ 119.88	$ 8.62	12.02	0.86
FACT	$ 12.48	$ 2.09	$ 61.35	$ 3.26	4.92	0.26
Freedom Transit	$ 18.05	$2.22	$ 70.41	$ 4.42	3.90	0.24
IndiGO	$ 7.08	$ 1.89	$ 74.58	$ 5.65	10.54	0.80
MMVTA	$ 13.99	$ 2.33	$ 92.36	$ 5.13	6.60	0.37
NCATA	$ 10.25	$ 1.29	$ 109.97	$ 5.37	10.73	0.52
PAAC	$ 6.29	$ 1.57	$ 195.06	$ 14.90	31.02	2.37
TACT	$ 15.98	$ 0.92	$ 74.43	$ 5.54	4.66	0.35
WCTA	$ 12.79	$2.87	$ 108.20	$ 5.36	8.46	0.42

Shared-ride statistics vary as well. The average shared-ride fare ranges from $15.61 (ACTS) to $26.02 (WCTA). ACTS has the lowest shared-ride cost ($10.32) and TACT has the highest ($31.12).

Table 5: Transit Agencies' Annual Operating Statistics

Community	Total Shared-Ride Trips	Non-Public Trips[22]	Average Shared-Ride Fare	Average Shared-Ride Cost per Trip	Vehicles in Maximum Operations	Operating Expense	Passenger Fares
ACCESS/PAAC	888,645	34,568	$ 22.94	$ 27.70	178	$27,234,000	7%
ACTS /NCATA	50,197	28,854	$15.61	$ 10.32	28	$1,576,000	3%
BART/BTA	54,491		$ 16.82	$ 16.29	17	$1,088,000	3%
BCTA	73,703	95,146	$ 21.50	$ 26.87	16	$3,961,000	3%
FACT	101,213	420	$17.16	$ 21.44	20	$2,420,000	2%
Freedom Transit[23]	189,740	2,207	$21.99	$ 25.03	60	$4,998,000	4%
Greene County	42,288	778	$26.44	$ 24.97	16	$1,307,000	2%
IndiGO	24,928	16,639	$ 21.08	$ 27.42	11	$1,331,000	1%
TACT	25,342		$19.22	$ 31.12	10	$789,000	4%
WCTA	173,471	60,044	$ 26.02	$ 25.57	54	$4,987,000	4%

22 Non-Public Trips are trips that are provided for an exclusive group of passengers at a negotiated rate.

23 Freedom operates Community Transportation services for all of Washington County

Data and Statistical Reports

NATIONAL TRANSIT DATABASE[24]

The FTA compiles transit agency data and reports that information in the National Transit Database (NTD). Transit agencies that receive federal operating assistance are required to report data annually to the FTA. The size of the agency as well as whether the agency has been designated as a rural or urban provider determines the level of information each agency is required to report. Information illustrated in this section is from NTD's Fiscal Year 2017 Agency Profiles. The letter "X" depicted in any table indicates the data is not available for that specific agency.

For bus mode, the cost per passenger ranges from $5.64 (PAAC) to $15.92 (TACT). Cost per revenue mile ranges from a low of $3.45 (FACT) to a high of $14.43 (PAAC).

Table 6: Transit Agencies' NTD Statistics

FY 2017	Cost per Revenue Mile	Cost per Revenue Hour	Cost per Passenger Mile	Cost per Passenger	Passengers per Revenue Mile	Passengers per Revenue Hour
BCTA	$ 6.77	$ 116.22	$ 0.53	$ 6.36	1.1	18.3
BTA	$ 10.69	$ 127.86	X	$ 9.82	1.1	13
FACT	$ 3.45	$ 70.31	$ 1.31	$ 12.76	0.3	5.5
Freedom	$ 3.82	$ 65.63	$ 1.18	$ 15.48	0.20	4.20
IndiGO	$ 5.88	$ 71.53	$ 7.40	X	0.80	9.70
MMVTA	$ 5.22	$ 92.72	$ 0.88	$ 13.40	0.40	6.90
NCATA	$ 6.74	$114.57	x	$ 10.09	0.70	11.40
PAAC	$ 14.43	$ 187.02	$ 1.34	$ 5.64	2.5	33.2
TACT	$ 4.59	$ 62.13	X	$ 15.92	0.30	3.90
WCTA	$ 5.83	$ 119.77	$ 0.78	$ 11.73	0.50	10.20

24 https://www.transit.dot.gov/ntd/ntd-data

In FY 2017, the cost per revenue hour for demand-response service ranged from a high of $120.73 (BART/BTA) to a low $24.39 (ACTS/NCATA). The cost per passenger ranged from $13.15 (ACTS/NCATA) to $31.31 (BART/BTA).

Table 7: Demand Response NTD Statistics

FY 2017	Cost per Revenue Mile	Cost per Revenue Hour	Cost per Passenger Mile	Cost per Passenger	Passengers per Revenue Mile	Passengers per Revenue Hour
ACCESS/PAAC	$ 3.80	$ 56.80	$ 2.99	$ 23.69	0.2	2.4
BART/BTA	$ 5.45	$ 120.73	X	$ 31.41	0.2	3.8
BCTA	$ 4.10	$ 63.29	$ 2.15	$ 23.53	0.2	2.7
FACT	$ 2.51	$ 50.99	$ 1.23	$ 17.26	0.1	3.0
IndiGO	$ 3.29	$ 70.32	X	$ 27.02	0.10	2.60
MMVTA[25]	$ 5.53	$ 93.34	$ 5.53	$ 31.26	0.20	3.00
NCATA	$ 2.92	$ 24.39	X	$ 13.15	0.20	1.90
TACT	$ 2.86	$ 56.65	X	$ 25.53	0.10	2.20
Washington Rides/Freedom Transit	$ 2.60	$ 45.52	$ 2.29	$ 22.95	0.10	2.00
WCTA	$ 2.41	$ 45.43	$ 2.25	$ 23.49	0.10	1.90

25 MMVTA's shared-ride services are provided by Freedom Transit/Washington Rides

Overview of Best Practices

It's important to examine examples from other cities and regions to ascertain methods, techniques and policies that are generally identified as best practices. *SmartMoves Connections* consisted of identifying cities that do multi-county, multimodal transportation planning particularly well and examining in greater detail sample projects that demonstrate best practice tactics. These best practices, relative to multimodal, hub and corridor implementations, offer ways and guidelines that represent efficient courses of action and project implementations that can, in many cases, be applied here in southwestern Pennsylvania.

Best practice peers were selected based on SPC staff and Consultant team knowledge of projects implemented in other cities and regions along with input from the Project's Steering Committee.

Reviewing best practices "for regional multi-county, multimodal transportation planning with special attention to strategies detailed in *SmartMoves For a Changing Region* and how these strategies have been used successfully…" was the main element of Task 2 of the SmartMoves Connections project. Each case study, eight in all, examined and summarized the background or problem that prompted the project, planning and public input that developed the project and partnerships and collaborations necessary to implement the project. The resultant outcome of this review illustrated an array of ideas and possibilities for multimodal transit hubs, corridors, TOD and coordinated operations, which are detailed in the Best Practices Summary Memorandum. The contents of the Best Practices Summary Memorandum are inserted here as the Study of Best Practices in Chapter 3: Learning from others.

Land Use, Hub, and Corridor Best Practices

- Alexandria, Virginia for successful TOD implementations
- Denver, Colorado for its highway-based Bus Rapid Transit (BRT) corridors with multimodal hubs
- Kansas City, Missouri for its transit corridors
- Portland, Oregon for Tilikum Crossing, the nation's first transit, bike and pedestrian-only bridge
- St. Louis, Missouri for integration of transit and land use

Operations and Structure Best Practices

- Columbus, Ohio for Central Ohio Transit Authority's (COTA) downtown worker free fare program and multimodal hub app
- Raleigh-Durham, North Carolina Research Triangle for Triangle Transit's multi-agency coordination and co-marketing efforts
- San Francisco Bay Area, California for multi-agency fare sharing

TOD in Alexandria, VA

Alexandria, Virginia, located on the edge of the Potomac River, was originally formed by a 6,000-acre land grant, approximately seven miles south of downtown Washington, D.C. Known for its Old Town with well-preserved 18th and 19th century buildings and trendy shops, Alexandria is the epitome of a vibrant multimodal friendly urban community. Outside of Old Town, modern Alexandria has been influenced by its proximity to the U.S. Capitol, largely populated with professionals working in federal civil services. Following the grand opening of Washington Metro's (heavy rail transit) King Street Station in 1983, Alexandria's residents were directly connected with D.C. In the decades that passed, areas immediately adjacent to Alexandria's Metro stations have grown to become high density Transit-oriented Development (TOD) districts. By coordinating market rate new development with public transit investment, the pressures of Alexandria's new growth have been accommodated without widening arterial roads, which helped preserve the city's mature urban landscape and historic building stock. Increased density and urban renewal efforts combined with compact and walkable neighborhoods have made Alexandria an attractive and less-expensive alternative to downtown D.C. living.

Alexandria's TOD growth is the result of planning and infrastructure investments near Metrorail stations and the urban street grid, both a result of public and private investments. The City is ranked number one in the region for up-zoning near Metrorail, which has led to more sustainable methods of TOD. In 1987, the City implemented a Transportation Management Plan (TMP) Special Use Permit (TMPSUP) Program to limit increases in traffic congestion without limiting new development. This program, which codified the City's Zoning Ordinances, required any development project exceeding a designated size to submit a special use permit application, traffic impact analysis, and a Transportation Management Plan (TMP). The Zoning Ordinance is a key regulatory tool and is used to direct the size, character, use, and location of development throughout the City. North Potomac Yards and the Braddock neighborhood are two contiguous areas that have seen robust TOD and have significantly spurred TOD throughout this region.[26]

POTOMAC YARD HISTORY

In its prime, the Potomac Yard site was one of the busiest rail yards in the eastern United States. Following several corporate mergers of various railroad companies, the 400-acre yard was decommissioned and immediately declared a Superfund site. Starting in 1987, around the same time the City began updating the 1974 Master Plan for the Potomac Yard/Potomac Greens portion of the site, RF&P Railroad began to explore development alternatives for the Yard because it was no longer being used for the classification of trains. Alexandria 2020 was the first proposal for the Yard, and consisted of a mixed-use, neighborhood development, continuing the street grid of the adjacent neighborhoods and replicating typical setbacks, heights, and architectural styles. The plan encompassed a tree-lined boulevard, parks, and unique pedestrian gathering places. A significant aspect of the plan included a new Metrorail station near the center of the Yard with the potential for commuter rail service and bus connections. However, densities in the 2020 plan were larger than the currently adopted plan. While the 2020 plan was never formally submitted to the City for approval, the City did approve new zoning for the site by adding a Small Area Plan (SAP) component in their Master Plan update in 1992.[27]

Small Area Plan – Zoning

The SAP component created a common vision for the future of Alexandria and was developed through a community-based planning process. The SAP served as the basis for future policy initiatives and actions affecting land use, zoning, capital improvements, and programs in the Potomac Yard/Potomac Greens area. New Coordinated Development District (CDD) zoning was established for large areas that have significant development related impacts on the City and promoted development consistent with the master plan. However, properties such as Potomac Yard that utilized CDD zoning were required to apply for a Development Special Use Permit (DSUP). The intent of the CDD was to create a mixture of uses with appropriate open space, recreation amenities, and encouraged land assemblage and/or cooperation, and joint planning with multiple owners in CDD zoned areas.

26 https://www.washingtonpost.com/realestate/alexandrias-rapid-urbanization/2013/01/10/579a8836-59ad-11e2-beee-6e38f5215402_story.html

27 https://www.alexandriava.gov/uploadedFiles/planning/info/masterplan/City_Master_Plan_Map/NorthPotomacYardSAPCurrent.pdf

Finally, the framework established a review process to ensure that such developments exhibited a proper integration of uses, high quality of urban and architectural design, and were harmonious with other areas of the City. The purpose the DSUP assured that development proposed for individual parcels was consistent with the master plan and zoning.[28]

In 1999, City Council approved the Potomac Yard/Potomac Greens Small Area Plan and Coordinated Development District (CDD #10), including an Alternative Concept Plan and associated conditions. The Concept Plan delineated total acreage, proposed uses, maximum densities, and minimum open space requirements for each land-bay. The approved development levels were as followed:

- 1.9 million sq. ft. of office space
- 735,000 sq. ft. of retail space
- 625 hotel rooms (an estimated 456,250 sq. ft. @ 650 sq. ft./room +50,000 sq. ft.)
- 2,200 residential units (an estimated 3.3 million sq. ft. @ 1,500 sq. ft./unit)
- Total development: about 6.4 million sq. ft.

The total site was a 296-acre tract of land that was divided into the two main parcels – Potomac Yard and Potomac Greens – by a 120' wide railroad corridor running through the tract. In early 2005, Pulte Homes and Centex Homes teamed to establish Potomac Yard Development, LLC, and purchased the 165-acre site on the south side of Potomac Yard from Crescent Resources. Pulte and Centex were national developers and builders and constructed the mixed-use development as originally proposed: 1.9 million square feet of office; 135,000 square feet of retail (in addition to the existing 600,000 square foot Potomac Yard Retail Center); and 1,700 residential units. Potomac Greens, a 33-acre residential neighborhood consisting of 244 residential units and approximately 20 acres of open space was constructed by Eakin/Youngentob and Associates (EYA) and Craftmark Homes. Since the original adoption of the Potomac Yard SAP, it has been amended to include the Four Mile Run Restoration Master Plan and the Waterfront Plan.[29] The development of Potomac Yard/Potomac Greens was a catalyst for future development and led to significant investments in the area.

NORTH POTOMAC YARD

In 2010, the largest landowner at Potomac Yard approached the City with a request to redevelop a retail shopping center into a 7.5 million square-foot transit-oriented town center including residential, retail, hotel, and office space. The City was well-positioned to negotiate for funding from the developer, securing an exaction of $10 per square foot in contributions for all development within ¼ mile of the proposed Potomac Yard Metrorail station on the WMATA heavy rail system's Blue and Yellow Lines. In return, the City approved a rezoning plan that would allow conversion of the existing 600,000 square-foot "big-box" development into a 7.5 million square-foot mixed-use development. Assuming 4.9 million square feet of gross floor area, this exaction translated into $49.0 million in developer contributions in 2010 dollars. At the outset of deliberations, the City reiterated a need to fund the station without tapping into existing tax base and without any capital assistance from WMATA. Given these funding constraints, the City committed to enacting two special assessment districts in the project area: a high-density redevelopment district where a special assessment of $0.20 per $100.00 of assessed value would be levied on commercial properties; and a low-density tax district where a special assessment of $0.10 per $100.00 of assessed value would be levied on all properties. The high-density special assessment was established in 2011 and is currently funding the project's planning costs. The low-density special assessment will be established once the station opens. The City has also dedicated net new tax revenues to the project.[30]

According to the approved North Potomac Yard (NPY) Small Area Plan, "The Plan envisions North Potomac Yard as an environmentally and economically sustainable and diverse 21st century urban, transit-oriented, mixed-use community that is compatible with adjacent neighborhoods. The Plan sought to create a regional destination with diverse built and natural spaces where people want to spend time in a wide variety of pursuits."[31] The Plan guided public and private investment and development decisions in the northern portion of Potomac Yard and focused on the creation of dynamic urban forms, a complementary mix of land uses, community amenities, and a range of housing opportunities.

28 https://www.alexandriava.gov/uploadedFiles/planning/info/PY6SAPCDDDSUPHandouts.pdf

29 https://www.alexandriava.gov/potomacyard/default.aspx?id=46422

30 https://www.fhwa.dot.gov/ipd/project_profiles/va_potomac_metrorail_station.aspx

31 https://www.alexandriava.gov/uploadedFiles/planning/info/masterplan/City_Master_Plan_Map/NorthPotomacYardSAPCurrent.pdf

The plan recommended an Environmental Sustainability Master Plan (ESMP) as part of the submission of the first Development Special Use Permit (DSUP) to identify ways to implement phased recommendations on an area-wide basis. The development of the NPY district utilized an urban design framework to ensure there were interconnected series of streets, blocks, and parks. The proposed Metrorail station served as the focal design element for the Metro Square neighborhood and connected existing streets with the rest of Potomac Yard.

A defining element for Alexandria was their distinct neighborhoods such as Old Town, and the emerging Eisenhower East Neighborhood. Consistent with the City's urban tradition of interconnected, distinctive neighborhoods, the NYP Small Area Plan required three unique and identifiable neighborhoods with the development:

1. Metro Square Neighborhood
2. Market Neighborhood
3. Crescent Gateway Neighborhood

Metro Square Neighborhood

This neighborhood was defined as the transit hub for NPY, where the Metrorail station, dedicated high-capacity Metroway, local and regional bus services, and bike lanes would all converge. Characterized by a mix of uses, this neighborhood was predominantly office space with ground floor retail. The typology encouraged entertainment and live performances to encourage an "Entertainment District" that would embody a unique identity for the neighborhood and differentiate this new town from others in the region. This area was defined by two open spaces: Metro Plaza and Metro Square.

Market Neighborhood

Considered the heart of NPY, this neighborhood was defined as the location for significant retail and restaurants to create an exciting regional destination. Development plans for this neighborhood offered a wide variety of housing and office uses above ground floor retail near the Metrorail station. One block was also planned to feature internal pedestrian walkways and connections.

Crescent Gateway Neighborhood

The northern portion of this site was defined as the gateway to the City, and primarily consists of residential uses with other users such as a hotel or possibly a school. Also referred to "Crescent Park," the development plans capitalized on surrounding land uses and took advantage of the adjacent Four Mile Run and parks. Buildings in this neighborhood were situated to enjoy views of the Potomac River and D.C. skyline. A required signature element of the neighborhood included curved building facades adjacent to Crescent Park. Taller buildings would be located within the central portion of the neighborhood and step-down in height commensurate with existing smaller-scale neighborhoods to the west and George Washington Memorial Parkway to the east.

Neighborhood Land Use Strategy

The land use strategy employed in the SAP capitalized on significant monetary investment in the Metrorail station and additional investment in the dedicated high capacity transit corridor (Metroway), local bus, and potential shuttle services, which were planned to accommodate NPY. The proposed blocks in NPY were all located within a ½-mile radius of the Metrorail station, and more than half the blocks were located within a ¼ mile. The proximity of these blocks to the Metrorail station provided a unique opportunity to integrate land use with transit and create TOD at Potomac Yard. The Plan's overall goal was to maximize development, particularly office development near the Metrorail station, while other land uses were based on creating community and reinforcing the character of each neighborhood.

Additional land use strategies the plan employed included requiring that buildings nearest the Metrorail station and adjacent to transit stops provide retail on the ground floor. Office uses were also required for the upper levels of buildings located in blocks closer the Metrorail station, which was intended to increase transit use and benefit existing offices planned in adjoining blocks.

Land Use Zoning: CDD

Like Potomac Yard, the Land Use Plan for NPY depicted principal land uses for each block. It also established Design Standards and Guidelines (including a definitive plan agreed to by property owners and the City regarding financing the proposed Metrorail station and included approval of a CDD concept plan).

Retail Use

Required retail uses were an integral part of the development and land use for NPY. The Plan intended for retail use to provide residents and employees with basic needs and products while also attracting visitors. Predicted retail uses were categorized for each neighborhood type. Large format retail tenants that would serve the regional market were to be concentrated in the Market Neighborhood while convenience retail to serve transit users was concentrated in the Metro Square Neighborhood. The SAP also created a new east-west retail street and new north-south retail street on the eastern portion of the site which connected to the Metrorail station and expanded the TOD district. Comprehensive Retail Strategies were also required that addressed coordination, management, and maintenance issues. Establishment of a Business Improvement District (BID) was also recommended to ensure that retail was comprehensively managed, neighborhood open spaces were programmed, and marketing was properly coordinated.

INNOVATIVE STRATEGIES

To discourage single occupancy vehicle (SOV) travel, the NPY Plan employed an innovative approach that was previously implemented in Eisenhower East Plan and created a separate TOD district in Alexandria. Rather than utilizing minimum parking requirements, maximum parking ratios were assigned by land use type. Conventional parking minimums force developers to build maximum capacity resulting in either seas of surface parking that subsidize driving while punishing transit with long distances and congestion or necessitate expensive garages that inflate construction costs. The amount of parking intended for NYP was planned to meet the economic and programmatic demands of the Plan while also enhancing TOD.

CONCLUSION

TOD has been a popular development strategy in Alexandria and other suburban Washington, D.C. areas long before TOD became trendy. The key influence that greatly impacted Alexandria's TOD projects is not only transit but Alexandria's unique implementation of land use and urban planning. According to the American Conservative, "Alexandria is a model for New Urbanism to reinstitute a more traditional town structure while utilizing Transit-oriented Development techniques."[32] The appeal of Alexandria's planning is the tight knit neighborhood designs that plan shops, housing, offices, and apartments all within walking distance of transit. Collaboration and support of key public figures, champions if you will, have also impacted the success of TOD in Alexandria. City Councilor Tim Lovain, for example, dedicated more than a decade helping the City expand its transit service and promote more multimodal TOD. He also founded the Northern Virginia Streetcar Coalition in 2010 to champion streetcar projects that would connect Alexandria with Arlington County, chairs the Washington Area Transit Industry Representatives Task Force and serves on the Alexandria Transportation Commission. With Potomac Yard Development being one of Alexandria's greatest TOD and redevelopment success stories, an increasing number of leaders and residents are embracing and encouraging the value of multimodal transportation investments for the future.[33] Overall, implementing TOD at a regional scale is a complex process, almost invariably involving coordinating multiple agencies and levels of government, as well as the public, non-profit and private sectors. This situation makes it critical to have reliable points of contact between stakeholders in the TOD promotion process, and to establish a group of interested parties that continue dialogue and mutual coordination as the process of implementing TOD to move the region forward. [34]

HOW THIS CASE STUDY RELATES TO SMARTMOVES CONNECTIONS

The Alexandria case study shows the level of cooperation and coordination necessary to accomplish station area or district-wide TOD. Theirs makes the case that the following standards should be established to accomplish TOD projects: comprehensive regulations; distinct definitions of neighborhoods that dictate development density, uses and character; champions that need to stay in the project over the long haul (sometimes decades); and multiple agency commitment.

Alexandria, acknowledging funding constraints relative to building new transit infrastructure and participating in development, committed to enacting two special assessment districts to offset capital costs. SPC's region experiences financial limitations as well that preclude construction of new transit infrastructure and contributions to economic development projects. Would implementation of special assessment districts along key corridors enhance opportunities for transit and economic investments? Perhaps examination of special districts as a concept is warranted to determine whether such an approach could work in this region.

An important element of Alexandria's TOD program approach was the delineation of neighborhood typologies - Metro Square Neighborhood, Market Neighborhood and Crescent Gateway Neighborhood, which identified the main characteristic around which to build each neighborhood and types of land uses that support each neighborhood's key attribute. SPC's region features not only very diverse counties, but also distinct neighborhoods within each county that would lend to a typology approach like Alexandria's to guide development.

32 https://www.theamericanconservative.com/articles/the-battle-of-alexandria/

33 https://smartgrowthamerica.org/city-councilor-tim-lovain-on-promoting-transit-oriented-development-in-alexandria-va/

34 https://www.researchgate.net/figure/Alexandria-Virginia-TOD-has-been-a-popular-development-strategy-in-suburban-Washington_fig7_242685186

Highway-based BRT Corridor with Multimodal Hubs in Denver

Denver is experiencing rapid growth with over 7,000 people moving to the region every year, and 189,000 more people and 136,000 new jobs projected by 2040. While this new growth presents many opportunities, it also poses significant transit challenges to a region that is already struggling to provide adequate transportation. Denver's Regional Transportation District (RTD), has been actively exploring and implementing transportation system investments by providing more reliable, connected, and safe mobility options to move the growing population while averting increased congestion and traffic delays.

In 2004, RTD developed "FasTracks" which was the largest in the nation, voter-approved, multi-billion-dollar public transportation expansion plan, that has been transforming transportation through the Denver metro region. The plan consisted of new commuter rail, light rail, and express bus services known as Bus Rapid Transit (BRT). The FasTracks plan included constructing six new light rail, electric commuter rail, and diesel commuter rail lines and expanded on previous transportation projects to include 57 new transit stations and stops, 21,000 new parking spaces, 18 miles of bus services between Denver and Boulder, and the renovation of Denver Union Station as a multimodal transportation hub.[35]

FasTracks was funded through a combination of funding sources including a voter-approved sales tax increase of 0.4 percent (4 cents on every $10), passed in 2004. There are also several ongoing efforts that help ensure FasTracks maximizes the use of taxpayer dollars including sales tax bonds, Transportation Infrastructure Finance and Innovation Act (TIFIA) loans, Certificates of Participation (COPs), Federal New Starts and other federal sources, local contributions, and Public-Private Partnerships. Public-Private Partnerships greatly benefit FasTracks by allowing a public agency to contract with a team of partners that RTD selects and contracts. The partners then provide design, construction, financing, and operation and maintenance of the projects. RTD also proactively seeks opportunities to apply for federal money to help off-set costs to local taxpayers and funds approximately one-fifth of the overall project cost. RTD also conducts value engineering by reviewing technical aspects of a project to find ways to improve efficiency and cost-effectiveness.

35 http://www.rtd-fastracks.com/us36_1

RTD's investments in the regional transit system over the past decade have made significant impacts on commuter rail and light rail transit. However, Denver residents, businesses, and visitors voiced their desires for more frequent, reliable, and convenient connections to jobs, neighborhoods, schools, and services. The public's desires challenged the City and regional agencies to find a sustainable approach to expand and improve transit in Denver, which ultimately led to the Denveright Comprehensive Plan for 2040.

DENVERIGHT COMPREHENSIVE PLAN 2040

The Comprehensive Plan 2040 is the 20-year vision for Denver and its people and reflects the voice of thousands who shared their hopes, concerns and dreams for the future. The key concepts found during public outreach planning phase resulted in four, more detailed plans:

1. Denver Moves: Transit Plan
2. Blueprint Denver Plan
3. Denver Moves: Pedestrian & Trails Plan
4. Game Plan for a Healthy City

DENVER MOVES: TRANSIT PLAN

Denver Moves: Transit Plan was the first city-wide transit vision guide aimed at improving the quality of transit options throughout the City and was part of the Denveright: Comprehensive Plan for 2040. In coordination with RTD and other key partners, the main goal was to make transit more reliable, more frequent, and more convenient for daily use. The plan established near-and long-term local transit visions and identified transit-supportive strategies and actions to meet Denver's mobility needs and promoted transit-supportive land use and development at transit stations and stops throughout the region. The project team gathered community input over 18 months to ensure the plan reflected the vision, values, and mobility needs of the people who live, work, and play in Denver. Input was received from thousands of residents, commuters, and visitors and four major themes were identified:

1. Higher-quality and more reliable and frequent transit
2. Improved access and connections to transit
3. Safer and more comfortable stops and stations
4. More accessible and equitable transit

With this input, Denver Moves: Transit Plan created a local transit vision to provide more frequent, reliable, connected, and high-quality transit services in Denver. Future transit systems were planned to enhance connections between communities, improve the experience for riders, improve access to the transit systems to protect pedestrians, and make public transit a first choice for more trips. To successfully implement this plan, coordination, investment, and participation from partners including local and regional agencies, advocacy and non-profit organizations, employers, and neighborhood organizations was critical.[36]

DENVER MOVES: TRANSIT CAPITAL INVESTMENT CORRIDORS

Recommendations for the Transit Capital Investment Corridors were organized into three tiers: Speed and Reliability, High-Capacity Transit, and Medium-Capacity Transit. Speed and Reliability Corridors included improvements such as transit signal priority to help transit move through corridors faster and more reliably. High- and Medium-Capacity Transit Corridors were designed to serve higher-capacity modes, such as BRT, and included improvements such as dedicated transit lanes, enhanced stops, and stations. These corridors also informed Blueprint Denver's Transit Priority Streets, which prioritize transit over other modes when making decisions about how to design or operate the right-of-way. Transit Capital Investments are direct expenditures by the City (and its partners) on corridors that are or aspire to be mixed-use, transit supportive places. The design and operation of transit priority streets prioritized transit through the following investments:

1. Dedicated transit lanes or grade separation: Transit runs in exclusive lanes or in dedicated guideways (e.g., rail). This helps transit to move the most people reliably and efficiently
2. Operational: Improvements, such as transit signal priority, prioritize transit at traffic signals, reducing travel time and improving reliability
3. Advanced, higher-capacity vehicles: High-capacity vehicles, such as rail or BRT, can carry more people and increase person-throughput of a corridor
4. Enhanced stops/stations: Stops with shelters that protect riders from the elements, provide real-time transit information, and offer off-board ticket stations are amenities that should be expected on transit priority streets

Speed and Reliability Corridors

These corridors benefit from investments such as transit-priority signals that are intended to make transit faster and more reliable in mixed traffic lanes and can include dedicated transit lanes at key locations. Denver envisioned these corridors as queue jumps or bypass lanes and Transit Signal Priority (TSP) to help transit move past traffic congestion at busy intersections. TSP is a tool used to modify traffic signal phases to advance transit vehicles through intersections. Queue jumps and bypass lanes are short segments of dedicated transit lane with TSP, which allows easier entrance into a flow of traffic in a priority position. These corridors were also planned to consolidate stops or longer stops (spaced along portions of corridors) to improve speed and efficiency. However, in doing this, upgrading connection to, from, and around stops and stations was essential to ensure that accessing the transit was safe and easy. Therefore, these corridors also included complete sidewalks, enhanced crosswalks, bicycle facilities, and pedestrian bridges.

IMPLEMENTATION OF SPEED AND RELIABILITY CORRIDORS

36 https://www.denvergov.org/content/denvergov/en/denveright/comprehensive-plan.html

High-Capacity Corridors

High-Capacity Corridors (HCT) have high levels of passenger capacity, very frequent service, and high-quality design. HCT Corridors make transit more reliable and faster on major arteries, providing connections between the regional rail and local bus network. In the Denver Moves: Transit plan, HCT Corridors have full BRT designated lanes which provide a cost-effective mode of travel with high quality amenities. Denver's HCT Corridors were envisioned to improve service frequency, with transit arriving every 5 to 10 minutes, have transit only reserved lanes in the middle of the street or next to the curb to separate transit vehicles from general-purpose traffic, and special branding to establish HCT as a distinct service. Their plan also included enhanced stops and stations to improve passenger comfort and convenience, including shelter and real-time arrival and fare collection technologies. Unlike the Speed and Reliability Corridors, HCT Corridors dedicate parking spaces for car-share vehicles and designated pick-up areas for ride-hailing services and conduct major streetscape improvements to encourage integration of transit into community gathering places and adjacent land uses, including the developing of mobility hubs.[37]

37 https://www.denvergov.org/content/denvergov/en/denveright/transit.html

Medium-Capacity Corridors

The last corridor-type described in Denver's plan is Medium-Capacity Corridors (MTC) which feature elements that help move buses through traffic in key locations, as well as improved stops for pedestrians and bicycle connections. These corridors are also served by BRT with bus-only lanes in key locations. These corridors include a mix of improvements from the Speed and Reliability and HCT corridors such as queue jumps or bypass lanes, TSP, BRT, enhanced stops, and upgraded connections to improve accessibility and safety.[38]

Blueprint Denver: Integrated Land Use and Transportation Plan

Blueprint Denver provides the foundation for citywide policies and recommendations related to land use, transportation, design and growth. Like Denver Moves: Transit Plan, the Blueprint Denver plan was an adopted supplement to Comprehensive Plan 2040. This plan guides where new jobs and homes should go, how the transportation system will improve, how to strengthen neighborhoods and where and how Denver should invest in their communities with new infrastructure and amenities. The plan uses neighborhood contexts, places and street types to provide a framework to evaluate proposed rezoning and informed changes to regulations, including the Denver Zoning Code and Public Works' street design rules and regulations. The recommendations from this plan formed a comprehensive list of policies and strategies to guide implementation of the plan and organized the three key elements of the Complete Neighborhoods Context:

1) Land Use and Built Form
2) Mobility
3) Quality-of-Life Infrastructure

38 https://commutingsolutions.org/transit/flatiron-flyer/

Land-Use and Built Form

This element of the plan includes where and how to encourage growth and presents policies and strategies for implementing Blueprint Denver Vision. For Complete Neighborhoods, the plan implements a context-based approach and sets guidelines for character-compatible development ranging from suburban areas to downtown development plans.[39] The intensity and mix of uses, density, scale of buildings, lot sizes, block pattern, parking and types of green space all vary by neighborhood largely due to the preferred transportation options available at the time of development. Neighborhood contexts are a way to understand differences in land use and built form, mobility options, and quality-of-life infrastructure between different neighborhoods. Recommendations were also provided to direct growth areas where new housing is closely linked to services and quality transportation.[40]

39 https://www.denvergov.org/content/dam/denvergov/Portals/646/documents/planning/blueprintdenver/BlueprintDenver.pdf

40 https://www.denvergov.org/content/dam/denvergov/Portals/646/documents/planning/blueprintdenver/BlueprintDenver.pdf

Mobility

Policies and strategies included in this section aimed to help create well-connected places throughout the city. Recommendations acknowledge the relationship between land use and transportation by considering context-sensitive street design and the role of the Denver Moves: Transit Plan in achieving the city's growth strategy. These recommendations advance Denver's vision for a more complete multimodal transportation system, with an emphasis on safety, moving people, and creating attractive, sustainable public spaces. Several transportation modes that connect people to places were identified consisting of walkways, bikeways, transit facilities, travel lanes, green infrastructure, and associated amenities.

Quality-of-Life Infrastructure

Quality-of-life infrastructure refers to the places, trees, plants, waterways, parks and outdoor spaces that stitch together communities and contribute to the health, needs, comfort, environmental resilience and social connectedness of Denver. Quality-of-life infrastructure supports the need for individuals to connect with nature, community, history, access healthy food systems and enjoy a clean environment.

U.S. 36 CORRIDOR IMPROVEMENT PROJECT (A.K.A. FLATIRON FLYER)

A notable project that utilized concepts of Denver Moves: Transit Plan and strategies and policies included in Blueprint Denver was the BRT project on U.S. 36 connecting Denver with Boulder. While this BRT project was a part of RTD's FasTracks Program and developed prior to release of the 2040 Comprehensive Plan, the strategies found in Denver Moves: Transit Plan and Blueprint Denver are reflected in this project. Denver-Boulder BRT was a two-phase project with highway-based BRT, fully-featured BRT stations, bikeways, intentional Transit-oriented Development (TOD) at station areas, and redevelopment of Denver's Union Station Hub. The BRT project began in 2001 as part of the U.S. 36 Major Investment Study on BRT and commuter rail technologies. The BRT project's first phase was an element from the FasTracks program and included improvements for new bus pull-outs and a pedestrian bridge at U.S. 36 to improve accessibility and safety for riders to RTD park-and-ride locations.

Corridor Improvements

In 2013, Colorado Department of Transportation (CDOT) in partnership with RTD started the second phase of the BRT project, which encompassed a large range of highway improvements along U.S. 36. At the time, U.S. 36 was a four-lane divided highway that experienced signification congestion and had been targeted for improvements by CDOT since the late 1990s. This phase of the BRT project included one express, high occupancy toll (HOT) lane in each direction, reconstruction of general-purpose lanes, express lane extensions, and queue jumps at highway ramps. It also included replacement of five bridges. New shoulders were built that bypassed slow-moving traffic allowing RTD's new BRT service (called Flatiron Flyer) to provide more reliable, frequent, and predictable services.

Realignments to the highway shoulder consisted of implementing 12-foot lanes that buses could use during congested periods when highway speeds in the general lanes were less than 35 miles per hour. (For safety reasons, maximum allowable speed for bus operations on the shoulder lanes was set at 15 miles per hour above the traveling speed of traffic in the general lanes with the maximum speed set at 35 miles per hour.) This implementation resulted in BRT service that enabled 92 more runs during the week and 42 more weekend runs and increased the frequency of runs from 3 to 15 minutes, depending the time of day and location.

Quality of Service Improvements

The second phase of the BRT project also included improvements for passenger amenities with several elements that provide higher quality service intended to increase ridership. Six new RTD stations were constructed that featured off-board fare collection intended to accelerate dwell times at the stations. New upgraded stations included canopies and windscreens to provide weather protection for passengers, large digital monitors with bus arrival information, ticket vending machines, and free Wi-Fi. To accommodate those driving or peddling to the BRT stations, 4,200 parking spaces and over 200 bike racks were installed, respectively. A major feature of the BRT project was establishing a unique name for RTD's bus service using the corridor. With input from RTD and its stakeholder group, Flatiron Flyer, consisting of a unique blue-and-sunrise-orange paint scheme, was launched.

Flatiron Flyer service consisted of 59 newly branded buses with capacity for 57 passengers, 120-volt outlets and USB ports for changing laptops, tablets, and smartphones, reclining seats, footrests, overhead reading lights, and individual air vents. The buses were also designed to carry up to eight bicycles.

Transit-Oriented Development

The BRT project was also planned and designed to stimulate significant economic growth based on TOD by identifying landuse opportunities at each station location. RTD achieved its development goals by designing transit stations with connectivity of all modes and accessibility for all user-types, establishing partnerships with private sector developers, and supporting local jurisdictions with developing TOD station area plans. RTD had a level of confidence that TOD along the BRT would result in a reasonable return on investment because: BRT was more economical than other transit solutions like light rail; industry publications such as the Institute of Transportation and Development Policy (ITDP) showed that BRT performs as well as light rail and streetcars at leveraging TOD; and the BRT corridor exhibited a strong real estate market. The quality of RTD's transit investment (Flatiron Flyers' frequency and speed) would only lend to the ability to attract private investment and implement TOD.

DENVER UNION STATION

Denver Union Station is the multimodal hub of RTD's transit system and Flatiron Flyer terminus, and a transit-oriented community at the heart of Downtown Denver. The region's investment into this station in 2014 catalyzed over a million of square feet of new development. Redevelopment around Union Station included a $500 million investment in transit infrastructure, redevelopment of the historic Union Station building, and substantial private TOD adjacent to the station. Denver Union Station was originally laid out in the 2004 Denver Union Station Master Plan. A supplement to the original plan was adopted in 2008 and included more concrete plans for station area redevelopment. Denver Union Station Project Authority (DUSPA), City and County of Denver, CDOT, and RTD actively collaborated on planning, designing and constructing the project.

In addition to Denver Union Station Master Plan, the immediate station was zoned "Transit-Mixed Use" by the City of Denver, allowing for a wide variety of residential, commercial, and civic uses. Private development in and around the station has included nearly 1.9 million square feet of office, 250,000 square feet of retail, 2,800 residential units, and 750 hotel rooms. [41]

TRANSIT VILLAGE AREA PLAN: BOULDER JUNCTION

Boulder Junction at Depot Square Station, the northwest terminus of the Flatiron Flyer, is an innovative TOD that supports mixed-use, pedestrian-friendly neighborhoods with access to regional transit connections. This development was part of a 160-acre Transit Village redevelopment area that included the RTD transit center, a Hyatt Hotel with 150 rooms, Depot Square apartment complex with 71 affordable housing units, and a parking garage with 386 spaces, 75 of which are reserved for RTD patrons.

RTD and the City of Boulder worked together with stakeholders for over 10 years to develop the Transit Village Area Plan, which was first issued in 2007. The vision of this plan was to create a lively, mixed-use, pedestrian-oriented place where people would want to live, work, shop, and easily access regional transit. Following the launch of RTD's BRT and U.S. 36 project in 2016, this site became the primary regional bus terminal in East Boulder. Boulder Junction's transit facilities are located beneath apartments and a parking garage with pedestrian access called the Paseo from Pearl Parkway. The transit center includes a 45,655 square-foot bus facility with six bus bays, ticket sales and customer information booths.

Development of Boulder Junction achieved the City's goals of improving jobs-housing balance and increased workforce and affordable housing within walking distance of the area's amenities and transportation choices. The City's plan ultimately supported the addition of about 2,000 new housing units, more than 3,500 new residents, and over 3,500 new jobs. In 2017, the first phase of a new Google campus opened at Pearl Place and 30th Street adjacent to Boulder Junction. This 330,000 square-foot campus is estimated to employ 1,500 people. Anticipating regional growth and taking proactive steps by implementing key transportation infrastructure enabled Boulder and subsequently the region to overcome challenges and prepare for future generations.[42]

41 https://www.rtd-denver.com/projects/union-station-tod-project

42 https://www.rtd-denver.com/projects/tod/boulder-junction

CONCLUSION

Following implementation of the U.S. 36 improvement and BRT project which prompted significant regional TOD, the Minneapolis-based Metropolitan Council published a Transit Oriented Development Guide[43], suggesting Boulder Junction and RTD's project could serve as a model for suburban communities. What they called a "Bold Vision" was ultimately the works of, "sustained planning, regulations, and coordinated public and private investments to support transforming the area from its automobile-orientation into a higher density, mixed-use, walkable place."[44] The City of Denver also highly regarded these improvements during the planning phase for the Comprehensive Plan of 2040 because of associated benefits reflecting what the community had shared as their "future visions" for Denver.

HOW THIS CASE STUDY RELATES TO SMARTMOVES CONNECTIONS

The Denver case study offers regions that are trying to understand what it takes to segue from a long-range transit vision to implementable strategies and projects a blueprint for success. For Denver, the transition from long range planning to real, implementable projects was based on sustained planning, regulations and coordinated public and private investments. Starting with their overall vision, Denveright Comprehensive Plan 2040, Denver established four supporting initiatives that emerged from publicly expressed top priorities: Denver Moves: Transit Plan; Blueprint Denver Plan; Denver Moves: Pedestrian & Trails Plan; and Game Plan for a Healthy City. Several supporting plans are relevant to *SmartMoves Connections* in the following ways:

- Denver Moves: Transit Plan focuses on strategies for making public transit a first choice for more trips, particularly by making transit more convenient, reliable, faster and frequent and promoting and integrating transit-supportive land uses at station and major stop locations.
- Blueprint Denver Plan, based on neighborhood contexts, places and street types, guides how the transportation system supports, improves and strengthens neighborhoods, determines types of capital investments and amenities targeted for each community and identifies regulatory and zoning modifications necessary to accomplish each neighborhood plan.

An off-shoot of Denver Moves: Transit Plan, called Transit Capital Investment Corridors, resulted in an investment strategy and approach directly analogous to *SmartMoves Connections'* objective to identify key priority corridors for new transit investments. Denver categorized its corridors into three tiers relative to levels and types of investments for each corridor type.

- Speed and Reliability are corridors that target transit signal priority to move transit through corridors faster and more reliably.
- High-Capacity Transit are corridors that prioritize transit over cars, warrant higher-capacity modes, like BRT, and incorporate a variety of features such as dedicated transit lanes, enhanced stops, and stations.
- Medium-Capacity Transit are corridors like High-Capacity that prioritize transit over cars; however these corridors are less voluminous.

The SPC region might benefit from an approach like Denver's Integrated Land Use and Transportation Plan called Blueprint Denver. This plan is heavily a policy piece that directs recommendations related to the integration of land use and transportation based on neighborhood growth and commensurate with neighborhood character. The plan's purpose is to devise strategies, projects and investments that strengthen neighborhoods. Blueprint Denver, like some of the other best practice cities, focuses on neighborhood contexts – land use and built form, mobility and connections, and quality of life infrastructure - to guide implementations.

43 https://metrocouncil.org/Communities/Planning/TOD.aspx

44 https://metrocouncil.org/Communities/Planning/TOD/Files/Case-Study-Boulder-Junction.aspx

Kansas City Transit Corridors

Located in America's heartland, Kansas City is a crossroads of rail, highways, and rivers. In the 21st century, Kansas City has undergone extensive redevelopment with over $6 billion in improvements to the downtown area. From 2007 to 2017, Kansas City's downtown residential population quadrupled, continues to grow and is one of the fastest-growing downtown in America. Today, the City has a promising job market with an unemployment rate below the national average. As a center for employment, downtown Kansas City features technology, financial, legal, medical, and government jobs. The tremendous growth experienced by Kansas City in the past decade was spurred from targeted investments in corridors and various transportation projects.

REGIONAL TRANSIT VISION: SMART MOVES 3.0

The Regional Transit Vision was developed jointly between area residents, local cities, the Mid-America Regional Council (MARC), Kansas City Area Transportation Authority (KCATA), Unified Government Transit (UGT), and Johnson County Transit (JCT) to coordinate planning and development around a dynamic regional transit system. Smart Moves 3.0 is Kansas City's regional 20-year plan for transit and mobility. The Smart Moves 3.0 initiative, originally developed in 2002 and adopted in 2005, articulated a vision for how transit should serve the Kansas City metropolitan area in the years and decades ahead. Building on the foundation of prior transit and mobility plans, policies, projects, and services, Smart Moves 3.0 outlines specific recommendations for the near-term and provides a combined vision and plan for continued decision-making for an ever-changing environment. During the summer of 2016, numerous engagement activities were conducted that incorporated community feedback resulting in four major recommendations and strategies:

1. Focus on High-Demand Corridors
2. Enable Vibrant Places
3. Create Mobility Hubs
4. Deliver Mobility Innovations

Process Overview and Public Participation

Initial technical work began with the review of underlying assumptions and data used in the original SmartMoves effort, including demographic, employment, and land use information. In addition to identifying where individuals who need transit were located, the technical team revisited assumptions about destinations including current employment and activity centers.

The region had a large central employment area, but other employment centers were continuing to expand outside the central business district. These emerging employment centers had the propensity to be much less dense than the downtown area with sites spread along corridors. While the technical analysis was underway, a supporting initiative began for planning integration meetings with communities all over the region.[45]

Integration meetings included city planners, council members, and managers. The focus of each meeting was to gain a mutual understanding of recent and current planning activities - both local and regional - and identify opportunities for more integrated planning. With a grant from the Federal Transit Administration (FTA), MARC contracted with One KC Voice citizens engagement program to develop a multiphase process for involving the region's residents and local governments in the SmartMoves update. The public's highest priorities from the update effort confirmed that many corridors from the original SmartMoves vision should be retained. However, some corridors in the original SmartMoves plan were not selected by the public as high-priority ones in the current public workshops. Plus, previously identified priority corridors failed to connect several growing areas of the region. A detailed final analysis was undertaken to identify all priority corridors and how to address gaps by overlaying technical analysis on results of current public input.

45 http://www.kcsmartmoves.org/

REGIONAL NETWORK ELEMENTS

Corridors in the regional concept were developed from public engagement, Smart Moves 3.0 vision statement and goals, location of activity and employment centers, concentrations of transit-dependent populations, and areas with planning initiatives in place that support transit operations. The plan update focused on corridors where transit implementation made sense; however, it did not assign a specific mode to the type of transit solution in any given corridor. The exact type of transit solution was discussed and decided by the community at the onset of the design process. Operations decisions were made based upon current conditions and future landuse plans in the corridor and, as more intense land uses developed, the update plan assumed that transit service would also evolve by implementing more intensive delivery systems such as bus rapid transit (BRT) or light rail. Based on differences in development potential, current built forms and access to the corridors, regional corridors were categorized into three tiers: Urban Service, Commuter Service, and Major Fixed-Route Service.[46]

Urban Service Corridors

Urban Service Corridors represent transit that runs on-street. These street-running corridors offered opportunities for urban revitalization and increased density through TOD and other locally planned initiatives. These were designed to move people across long corridors while also providing access to local destinations and activity centers along the route with limited stops to increase speed. When possible, these services are intended to operate in dedicated lanes with signal priority, real-time signs, and Wi-Fi connections. Service standards were planned to feature minimal wait times between vehicles, longer service hours, and more days of service. The preferred mode in Urban Service Corridors include light rail and BRT. The purpose of this strategy was to improve and expand services in existing transit markets while also encouraging increased density and revitalization of the corridor.

Commuter Service Corridors

Unlike Urban Service Corridors, Commuter Service Corridors were designed to offer less local access along the corridor with restricted stops to increase speed. These high-speed commuter corridors parallel major commuter routes along an arterial road, run in a separate right-of-way, and operate within interstate or expressway rights-of-way. Services are designed to reduce congestion, connect residential and employment centers to the suburbs, reduce wait times, provide longer spans and more days of service. Additionally, public comments indicated that providing mid-day service made transit more attractive for choice riders and those employees working non-traditional schedules. When possible, these services also operate in a dedicated lane and consist of express bus, commuter rail, or light rail. Commuter Corridors served by buses also have special facilities so service can bypass congested sections of roadways. Accommodations for buses could be in the form of an HOV/HOT lane or signage on the roadway to inform motorists that a bus will be passing them on the shoulder. With Commuter Service traveling on arterial streets, vehicles have a dedicated lane and signal priority as well. Primary intentions of Commuter Service Corridors are to connect community-based transit systems and activity centers together while reducing congestion along heavily used roadways and providing services comparable to an automobile trip and attractive to more transit users.[47]

Major Fixed Route Service Corridors

Major Fixed-Route Service Corridors represent services that help connect communities and counties together through a mix of arterial and highway facilities. In general, these corridors are routes that can't support rail transit investment due to access issues and activity center locations. These services were designed similarly to Commuter Corridors aimed at reducing congestion and providing important connections between residential developments, activity centers, and employment centers. Major Fixed Route Service on arterial streets are intended to enhance access with limited stops to improve trip speed and on highways are intended to operate like Commuter Service Corridors, providing opportunities to connect employment sites, activity centers, and communities where transit users live with limited local access along the corridor. Service standards were designed to be the same as the other two corridor types. Operational characteristics, such as days and hours of service, throughout major Fixed Route Service Corridors are dictated by local community needs and networks in place to circulate customers at the ends of each route. Other enhancements are like the Commuter Service Corridor; however, these major Fixed Route Service Corridors were recommended to include internet access, signal priority, and stop information. Primary modes for this corridor type are BRT, Express Bus, and standard Fixed-Route to provide connections to and extensions of urban and commuter corridors.[48]

46 https://www.eenews.net/assets/2016/03/31/document_pm_06.pdf

47 https://kcciviccouncil.org/media/1032/sasaki-plan-ii.pdf

48 https://kcciviccouncil.org/media/1032/sasaki-plan-ii.pdf

COMMUNITY-BASED NETWORK ELEMENTS

Community-Based Networks are the foundation of the regional public transportation concept in Kansas City. This network of services allows and supports access to local goods, services, and employment locations. The community network comprises all services excluded from the regional system through Subregional Connectors and Community-Based Mobility Services.

Subregional Connectors

Subregional Connectors provide a higher level of local access along corridors that have routes that travel longer distances between communities and a limited number of stops to decrease travel time associated with longer trips. The main goals for Subregional Connectors are to minimize wait times and offer service spans that ideally operate seven days a week. Subregional Connectors incorporate traditional transit services with reduced stops (or as express-type services) and operational characteristics defined by the circulation system available at each end of the connector. These corridors also include real-time signs, bus shelters, benches, connection/transfer points, map information, and other customer information. The Connectors are served by Express Bus or standard Fixed Route services that provide connections between local communities and circulation to destinations within a community.[49]

Community-Based Mobility Services

These systems are customized to meet diverse local needs and typically consist of taxi services, mass transit, residential shuttles, program-specific transportation, and other transportation providers. Ideally, Community-Based Mobility Services are built around transit centers that collect and distribute passengers from mainline services or between routes and modes to destinations within communities. These services are tailored to local needs and personal mobility.

TARGETED DEVELOPMENT ALONG KEY CORRIDORS: MOBILITY HUBS

Smart Moves 3.0 recommended that local communities develop TOD overlay districts or zones in a half-mile radius around mobility hubs and other major activity centers along transit corridors to enable higher density and mixed-use development. The plan encouraged communities to review existing land use plans within mobility hub vicinities and, when appropriate, update planning and public work standards to include corridor-centric, mixed-use development policies.

Furthermore, it is recommended that the built environment of these corridors incorporate Complete Streets principles to accommodate all modes of transportation and enhance the public realm. It is recommended that form-based codes be implemented to retain community character while achieving desired transit-supportive built-environment outcomes.[50]

Recommendations

Recommendations provided in this plan were designed to help local governments update existing plans and create new ones that facilitate sustainable growth along corridors. Most of the recommendations were intended to be implemented by local governments, however, some of the suggestions were also a responsibility of MARC and other agencies.

Corridor Planning

An important recommendation of the plan encouraged "Continued regional discussions and educational programming regarding the benefits of corridor planning."[51] Categorized as a "MARC responsibility," the plan suggested partnering with the Urban Land Institute (ULI) and the APA-Kansas City Chapter to deliver educational programming to constituencies in the region. This was done through Creating Sustainable Places and Planning Sustainable Places Program and through periodically hosted training on TOD. Moving forward, the plan suggested that MARC continue to facilitate regional discussion specifically focused on corridor planning.

Review Land Use Plans and Zoning Ordinances

Local governments, with assistance from MARC, were encouraged to perform review of existing land use plans within a half-mile radius of transit routes and one-mile radius around mobility hubs. It was recommended that following this review local governments develop plans that include corridor-centric development policies that promote increasing density and mixed-use development. During this process, it was also recommended that local agencies review current zoning ordinances to ensure regulations encourage this type of dense mixed-use development. MARC continually convenes meetings with local officials and provide maps of the current/planned routes and hub locations that fall within their boundaries and discuss local development plan recommendations for these areas.

49 https://kcciviccouncil.org/media/1032/sasaki-plan-ii.pdf

50 https://www.eenews.net/assets/2016/03/31/document_pm_06.pdf

51 http://www.kcsmartmoves.org/

Economic Development

Economic development tools and incentives were recommended within the half-mile and mile radius vicinities to foster development along corridors. Convening Economic Development Corporations (EDC), creating taxing districts such as Community Improvement Districts (CID), and Transportation Development Districts (TDD) were suggested as ways to advance and fund new projects and development at hubs and along corridors.

IMPLEMENTING SMARTMOVES

Kansas City's Smart District began to take shape in 2013 when the City started formulating plans to install a $100 million streetcar line. Cisco, the IT and networking giant, approached the City in 2014 to determine whether they were interested in partnering to implement Smart City technology in the renovations and redevelopments as part of the new downtown transit system. Kansas City agreed and over the next few years a $15.7 million system of sensors and information kiosks (funded by a public-private partnership between Cisco, Sprint, and the city) were designed and deployed on Main Street along the streetcar line.[52]

KC Streetcar: Comprehensive Smart City Corridor

Utilizing strategies and initiatives from Smart Moves 3.0, KC Streetcar was the first transit project to achieve Envision recognition from the Institute for Sustainable Infrastructure and the 10th to receive Platinum verification. It also earned an American Public Works Association Project of the Year award in the Transportation (more than $75 million) category. Funded by a TDD, the $102 million investment infrastructure serves 16 stops from River Market to Union Station and is free for all riders. The city issued $64 million in special obligation bonds to be repaid via a one-cent sales tax levied within the TDD. Three federal grants, including a $20 million Transportation Investment Generating Economic Recovery (TIGER) discretionary grant, provided $37 million for the project.[53]

Completed in 2016, the streetcar runs along the Downtown corridor and covers 54 square blocks. KC Streetcar operates in mixed traffic with semi-exclusive services in portions throughout the corridor. The corridor contains several institutional and commercial uses, quickly growing activity centers, and supports economic development with efficient, reliable, and effective transit services.

The KC Streetcar project was consistent with the Transit-Supportive Corridor Policies, which were included in the district plan and applied to most of the corridor. This policy recommended high residential densities in most of the corridor and mixed-use development along Main Street with centers of activity located closest to transit stations. The streetcar corridor also encompasses four existing tax increment financing (TIF) districts that are primarily supporting housing improvements and commercial development.

The streetcar showcases a network of connected technological devices meant to enhance sustainability, engagement, and security. Throughout the corridor are 25 community kiosks developed by CityPost, which feature transportation information, city services and announcements, emergency alerts, and information about local amenities. The city also deployed 200 "smart" cameras on lamp posts that support transportation safety and efficient energy. The cameras, operated by Sensity, register the presence of pedestrians and adjust the brightness of the lights to ensure safety while conserving energy when the streets are empty. Cameras also track streetcars and other vehicles traveling along the corridor and provide ongoing, real-time data used to understand traffic flows, optimize smart traffic signals, and allow streetcar operators to anticipate road conditions.[54]

Since its inception, the KC Streetcar has increased activity and driven revenue throughout the downtown area. Residents can travel downtown easier with the added benefits of reducing traffic congestion, boosting spending at local businesses, and providing greater mobility and flexibility. Furthermore, the KC Streetcar project has spurred over $400 million of private investment. KC Streetcar and corridor improvements were programmed as part of Phase I of Smart Moves 3.0, were also part of Phase I in the RTP 2050 Plan and have ultimately led to the city seeking ways to expand the streetcar to serve even more neighborhoods.

HOW THIS CASE STUDY RELATES TO SMARTMOVES CONNECTIONS

Like the Denver case study, Kansas City utilized feedback gathered during its regional 20-year plan effort, Smart Moves 3.0, to develop four major strategies that emerged from public input. Those four strategies were based on the foundation of Smart Moves 3.0 plus prior transit and mobility projects and demonstrated a willingness to coordinate planning and development of a regional transit system that prepares for "an ever-changing environment."

52 http://www.kcsmartmoves.org/implementdocuments.htm

53 https://www.kcmo.gov/programs-initiatives/emerging-technology

54 https://www.kcmo.gov/programs-initiatives/emerging-technology

The four major recommendations were:

- Focus on High-Demand Corridors
- Enable Vibrant Places
- Create Mobility Hubs
- Deliver Mobility Innovations

Identification of corridors was based on a data-driven approach. Technical work started with examination of data from Smart Moves 3.0 plan and determined what, if any, data – such as demographic, employment and land use density - could be used to determine priority corridors. The effort focused on identifying locations of individuals that need transit while collecting data on current and future employment and activity centers. Like the Pittsburgh region, Kansas City has a central downtown business district but was experiencing growth of employment and activity centers spread along corridors outside the CBD. After plotting locations of transit users, employment/ activity centers and land use densities, transit services and public input were over-laid to identify priority corridors and corridor gaps.

Kansas City illustrates a model that defined High-Demand Corridors by service types and organized them into three tiers, i.e. Urban Service Corridors, Commuter Service Corridors and Major Fixed Route Service Corridors. The approach focused on corridors where transit implementation made sense; however, it did not assign a specific mode in any given corridor; the transit mode was discussed and decided by the community. Features of each corridor type are summarized below.

- Urban Service Corridor: Characterized by transit that runs on-street and designed to move people across long corridors while providing access to local destinations/activity centers. Service in this corridor type is intended to have longer service hours and days, minimal wait times, limited stops, dedicated lanes, signal priority, higher speed between stops, and real-time signs and information. Urban Service Corridors are intended to facilitate urban revitalization through TOD implementation and increased density.
- Commuter Service Corridor: Characterized by transit that has restricted stops and increased speed designed to offer less local access. Commuter Service Corridors typically parallel major commuter routes on arterial roads, run in separate right-of-way like dedicated lanes and operate with interstate roadways. Service in this corridor type is intended to reduce congestion and wait times and provide longer spans and days of service. Input from the public showed that service in this type of corridor would be more attractive if it also ran during mid-days. Service types identified for this corridor consist of express bus, commuter rail or light rail and feature facilities that allow service to bypass congested areas. Another intention is to integrate community-based transit systems throughout Commuter Service Corridors.
- Major Fixed Route Service Corridor: Characterized by transit that either runs on arterial streets with limited number of stops and increased speed or on highways featuring operations like Commuter Service Corridors with increased connections to employment/activity centers and communities where there is limited local access. These are typically corridors that can't support rail investments due to topography, geography or other barriers. Service in this corridor type is intended to connect communities and counties and is dictated by local community needs and networks. Primary modes for this corridor type are BRT, express bus and standard fixed-route.

To address services excluded from its regional corridor-based system, Kansas City devised a "Community Network" approach by establishing Subregional Connectors and Community-Based Mobility Services concepts. Subregional Connectors are intended to travel between communities and circulate to destinations within a community (express bus or standard fixed-route). Community-Based Mobility Services are intended to be customized to meet local needs with services such as taxi, residential shuttles, program-specific transportation and other personalized transportation.

Identified in Smart Moves 3.0, the strategy for implementing "Mobility Hubs" was left to local communities to decide whether to establish TOD overlay districts or zones within a half-mile radius around mobility hubs and other major activity centers along transit corridor types. This corridor-centric approach encouraged mixed-use development policies, Complete Streets principles and form-based codes to retain community character while achieving desired transit-supportive built-environment outcomes.

Tilikum Crossing Multimodal Bridge in Portland

In 2015, Portland, Oregon celebrated the grand opening of Tilikum Crossing, Bridge of the People, the first new bridge built across the Willamette River in 42 years. While the Tilikum Crossing currently holds the record for the nation's longest multimodal bridge, it is also the first transit, bike, and pedestrian-only bridge in the U.S., marking a new era in transportation. The bridge was strategically designed to express the values and culture that were central to the Portland region. The new structure also embraced the beauty of the cityscape by implementing innovative designs intended to create a resilient built environment. The construction of this bridge was one phase of TriMet's $1.49 billion Portland Milwaukee Light Rail Project (PMLR). This project was intended to bring economic, environmental, and social benefits to the Portland metropolitan region. These benefits include more travel choices, economic development, environmental leadership, active transportation connections, road and freight movement improvements, redevelopment, and public art. The bridge represents a direct link between the east and west side of the Willamette River to important destinations such as Portland's South Waterfront area, home to Oregon Health & Science University (OHSU) Waterfront Campus, Portland's Aerial Tram, and Portland State University; completing the "innovation quadrant." According to the Acting Administrator of the Federal Transit Authority, "Tilikum Crossing, Bridge of the People is more than just a transportation project, it's a full, multimodal, city wide development that integrates landuse and various transportation planning strategies." This project demonstrates the power of public transportation to help transform a major American City and bring 21st century transportation options to a growing population and future generations. [55]

BACKGROUND: 2010 REGIONAL TRANSPORTATION PLAN

In 1973, Oregon took a pioneering step in land use planning, creating an institutional structure for statewide planning. Urban growth boundaries (UGB) were a central tenet of the Land Use Planning Program and has ultimately led to a denser, more urban city within a state that strongly prioritizes protecting both the environment and agriculture. Over the years, the diverse communities of Portland metropolitan area have continued to take a collaborative approach to planning centered on regional policy discussions which led to the adoption of the region's long range plan, the 2035 Growth Concept. The plan reflected shared community values and desired outcomes that continue to resonate today. In June 2010, amendments were made to the Regional Transportation Plan (RTP) to reflect the changing times which ultimately lead to the PMLR project and the Tilikum Crossing, Bridge of the People. Significant future growth was anticipated, and the city planners believed their transit services should expand with the growing population. The 2035 RTP laid out the priorities for road, transit, freight, bicycle and pedestrian improvements, and strategies to pay for them. It also sought to increase the use of public transit, improve safety and convenience, appeal to bicycling and walking, and reduce miles traveled and emissions by cars and trucks.[56]

55 https://www.transit.dot.gov/about/news/us-department-transportation-celebrates-opening-max-orange-line-expanding-transit-options

56 https://www.oregonmetro.gov/regional-transportation-plan

METRO COUNCIL'S (METRO) ROLE IN TRANSPORTATION PLANNING

Metro's transportation planning activities are guided by federally mandated decision-making framework called the Metropolitan Transportation Planning Process, which facilitates the planning through four advisory committee bodies – the Joint Policy Advisory Committee on Transportation (JPACT), the Metro Policy Advisory Committee (MPAC), the Transportation Policy Alternatives Committee (TPAC), and the Metro Technical Advisory Committee (MTAC). In addition, the Metro Committee for Citizen Involvement (MCCI) advises Metro Council on ways to engage residents in regional planning activities.

In 2009, the Oregon Legislature passed a house bill which required Metro to develop land use and transportation scenarios designed to reduce greenhouse gas emissions (GHGs). It also called for a statewide GHG emission reduction strategy for the light-duty vehicle emissions sector. While Metro is responsible for long-range transportation planning, TriMet is the public agency that provides the region's mass transit.

INFLUENCES IN THE PMLR TRANSIT EXPANSION AND MULTI-MODAL BRIDGE

The 2035 RTP emphasized the need to update and construct new infrastructure, particularly bridges. The Oregon Department of Transportation (ODOT), cities, and counties devote nearly all existing state and federal gas tax revenues to operations and maintenance of the existing road system. Despite limited resources, maintenance of the region's bridges was a high priority due to congestion and growing demand for accessible public transit. The RTP mentioned how "travel time reliability" was a growing interest for future investments because it is an important measure of mobility and, currently, congestion poses significant economic challenges for the economy and commuters. Interest in the connection between urban planning and active living was a growing, which led to a movement of integrating land use, transportation, and public health into the RTP.

While several Metro-initiated activities were aimed at restoring habitat or mitigating effects of the transportation system on air quality, safety fears arose as a primary concern due to disjointed active transportation networks that deterred many residents from choosing to walk or bike. The RTP provided several strategies to address these issues including, "The promotion of walking, bicycling, and transit use to decrease congestion, mitigate environmental damages, and the growing health and safety concerns for the metropolitan region." [57]

MOVING FORWARD: THE VISION FOR THE TRANSPORTATION SYSTEM

Reduced resources increased the competition for transportation funds which reduced Portland's ability to expand, improve, and maintain existing transportation infrastructure. The updated RTP developed new funding strategies, emphasized the importance on enhanced public and private collaboration, and provided interim steps to build stronger public support for major system investments.

The outcomes trying to be accomplished were:

- Vibrant Communities – where people can choose to walk for pleasure and to meet their everyday needs
- Economic Prosperity – sustained economic competitiveness
- Safe and Reliable Transportation – that will enhance residents quality of life
- Leadership on Climate Change – minimize contributions to global warming
- Clean Air and Water – ensure future generations enjoy clean air and water and healthy ecosystems
- Equity – ensure the benefits of growth and change are distributed equally[58]

The RTP had to respond to these six desired outcomes in order for the region to be a responsible steward of public investment. This meant local, regional, and state governments had to partner with the private sector in making transportation investment decisions based on achieving the multiple outcomes rather than a single focus on addressing traffic congestion.[59]

57 https://trimet.org/history/orangeline/library/index.htm

58 https://www.energy.gov/sites/prod/files/2016/03/f30/Portland%20Case%20Study.pdf

59 https://www.portlandoregon.gov/transportation/67263

TriMet's planning is grounded in the RTP. Their strategies and programs to meet the RTP as well as livability goals are through focused investment in service, capital projects and customer information as laid out in their Transit Investment Plan (TIP). Their TIP is a rolling, five-year plan that relies on long-term goals and strategies developed by Metro, including the RTP. These plans direct development to regional centers, town centers and key corridors and led to the PMLR project and ultimately the creation of the Tilikum Crossing, Bridge of the People.

TRIMET: TRANSPORTATION PLANNING STRATEGIES

Situated on a former brownfield site, the City's South Waterfront District was the centerpiece in Portland's ongoing effort to reduce sprawl in 2009. In recent years, the area had experienced significant expansions in mixed residential and commercial neighborhoods and had become home to a new riverfront campus for Oregon Health & Science University. With a growing population, the district needed a connection to the rest of the city to flourish. This connection could not be accomplished with new roads due to existing highway configurations; public transit was the only option to connect this district to the rest of the city. Therefore, TriMet proposed placing the western terminus of their $1.49 billion Orange Line light rail extension project in the South Waterfront Area. The eastern terminus was planned to be constructed in the Central Eastside District, which was being rezoned for mixed-use development, and would link west-side institutions like Oregon Health & Science University (OHSU) and Portland State University with the east side's Oregon Museum of Science and Industry (OMSI) and Portland Community College.

TriMet hosted an early project workshop with VIA Architects to integrate triple-bottom-line principles (which assign equal importance to social, environmental and financial considerations) into the light rail project that would respond to Metro's updated RTP. The result was 28 sustainability strategies that would be supported and tracked throughout project design, construction and operation. In addition to these, hundreds more were added as the project moved forward. The following strategies were emphasized in TriMet's Commitment to Sustainability.

The Possibilities Project

During the project design phase, TriMet formed a diverse team of creative design professionals to expand the urban design work, explore opportunities for development, and identify new sustainability practices and renewable energy partnerships. This effort was called the Possibilities Project. It embraced the needs of the community, positioned residents to leverage the new line for their own goals and led to many of the sustainability actions undertaken during the project, including connections to neighborhoods, planting patterns, solar energy, and electric vehicle charging stations.

Minimizing Pollution

The project selected materials to minimize the possibility of paint toxins falling into the Willamette River. For example, transit bridge structures were built with unpainted concrete and the main body of Tilikum Crossing is unpainted concrete flanked by stainless steel railings and cables. No pesticide-treated wood was installed below the typical high-water levels and, during on-site removal of old, pesticide-treated wood piers, no debris could fall into the water.

Sustainability Matrix and Report

The full scope of the sustainability effort was captured in a "Sustainability Practices Matrix." More than 300 sustainability-focused practices, considerations and materials were identified and cataloged. The matrix is an important reference tool, providing a basis for tracking impacts and effectiveness and serving to inspire those inside and outside TriMet to learn from and advance sustainability efforts on future projects. "Making the MaX Orange Line Green"[60] is a report published by the project that highlights key sustainability practices captured in the Sustainability Practices Matrix.

60 https://trimet.org/history/orangeline/pdf/sustainability-report.pdf

Measuring Sustainability

Two rating systems were informally applied to the project: the Envision Sustainable Infrastructure Rating System and the Infrastructure Voluntary Evaluation Sustainability Tool (INVEST) 1.0. This work is significant given the absence of a singular, exhaustive set of sustainability metrics or indicators for the transit industry. TriMet hopes that the knowledge gained by informally applying these rating systems will begin to develop an industry-wide standard.

TriMet also worked with an extensive array of community partners, including members of the Citizens Advisory Committee. The lead partners consisted of the Federal Transit Authority, Clackamas County, Metro, City of Milwaukee, Multnomah County, City of Oregon City, Oregon Department of Transportation, City of Portland, Portland Development Commission, and had over 20 additional project partners.

The project received the required approval from both the Portland and Milwaukee city councils and Oregon's Metro regional government agency in 2008. TriMet approved a $127 million control to build the bridge in December 2010. On-site engineering of the TriMet design was handled by the HNTB Corporation with primary contracting performed by Kiewit. The construction of the bridge was estimated to cost $134.6 million, and to be paid for by federal grants, Oregon Lottery revenue and TriMet.[61]

BUILDING TILIKUM CROSSING, BRIDGE OF THE PEOPLE

The dilemma TriMet faced while planning how to strategically connect the two former industrial sites was the need for an alternative route to cross over the Willamette River that did not rely on the Hawthorne Bridge. While this would have been the cheapest option, the frequent drawbridge lifts would have been problematic and with the growing population, there were significant safety concerns about adding to the already over-congested bridge. TriMet and city planners realized a transit bridge would be the best solution. However, neither neighborhoods had the road infrastructure to support the increased traffic that would have come with an additional auto bridge. Following a three-year design and planning process, TriMet received the required approval from both the Portland and Milwaukee city councils and Oregon's Metro regional governmental agency and signed a contract in 2010 to construct a first-of-its-kind multimodal bridge that would only carry Portland Streetcar, the MAX Orange Line, TriMet buses, cyclists and pedestrians.[62]

The strategy was to encourage and facilitate desirable commuter traffic that would help reduce carbon emissions. With the Orange Line and Tilikum crossing, travel times have been reduced by an estimated 40 percent and decreased commuter pressures on the other bridges. Residents also have improved connections to already existing, state-of-the-art transportation infrastructure such as: the Portland Tram, Gibbs Street Pedestrian Bridge, the Eastside Esplanade, and over 319 miles of bikeway through the city. The project also catalyzes redevelopment. Two new mixed-use developments are planned on the south side and over 480,000 square feet of research and education space at OHSU, Portland State University, and the OMSI is made more accessible by this transit loop. The new access to Tilikum Crossing sets the stage for future development on both sides of the river as well.

61 https://trimet.org/meetings/board/pdfs/2017-08-09/regional-transpo-plan.pdf

62 https://www.governing.com/columns/transportation-and-infrastructure/gov-portland-bridge-tilikum-crossing.html

To strategize innovate designs that would complement Portland's cityscape, the height of the towers on the bridge were designed to balance with surrounding buildings to ensure that aesthetic appeal of the waterfront was not compromised. The design strategy also prioritized employing a visually holistic approach to represent the landscape. The angles of the towers were designed to be reflective of Mount Hood while the angles of the cables were reflective of the trees. As part of TriMet's public art program, artists were chosen to create an aesthetic lighting program. Lights were focused on the cables and piers and designed to fluctuate in response to a stream flow monitor placed within the river, echoing the river moment. The lights were designed to change colors based on the river's speed, height, and water temperature.[63]

The name "Tilikum" derived from the international language, Chinook Wawa, and spoken by the first Oregonians, was ultimately chosen after the public was invited to suggest names for the bridge in the summer of 2013. According to Chet Orloff, the naming committee chairman and historian, "Tilikum means people, tribe and relatives and evolved to be used to describe friendly people and friends – Tilikum symbolizes coming together. It conveys connections, in not only the relationship between people, but in the connections, we will make as we ride, walk, run, and cycle across this beautiful new bridge."[64]

The new bridge was not only designed to increase efficiency and be visually appealing but to endure and minimize any potential negative impacts. According to the American Planning Association (APA), "The new bridge offers the latest in seismic stability, which is the legacy of resilience the Tilikum Crossing will leave for future generations." The outcropping swerve of the deck design is intended to reduce the effects of the wind for pedestrians and bicyclist to ensure safe travel across the bridge. The cable-stayed design, beautiful in its execution, is also eminently practical. It allowed a thin bridge that maximized river clearance, still met at-grade intersections at both sides of the river, and only required two piers in the water.[65]

LESSONS LEARNED

Regional collaboration and coordination across multiple jurisdictions, each with different political realities, posed one of the biggest challenges. However, the longstanding history of collaboration and partnership between TriMet and the City of Portland Bureau of Transportation (PBOT), kept this project in good stead. Trust and experience helped these two agencies support each other and gain mutually desired outcomes over the long project duration. Regarding land use, one of the major issues the region encountered when considering Transit-oriented Development (TOD) was the alignment running through an industrial employment district. A key land use planning goal for Portland is to maintain industrial land to ensure middle-wage jobs remain for individuals without college degrees. Most of Portland's TOD projects focus on residential and commercial land use and, because this was an industrial district, ensuring gentrification didn't occur was more challenging.[66]

The project managers also reported several major lessons learned that other communities may benefit from if undertaking similar projects. First, the project developed a "Conduct of Construction" guide that was incorporated into the contract specifications. The guide specified City and TriMet expectations of contractors around a host of construction-related issues including, noise, dust, crosswalk, and holiday closures. Another innovative idea implemented that the project managers believed could be valuable to other communities was the specialized permitting process created among City of Portland's agencies and TriMet, because most long-linear transit projects tend to "hop in and out of" public right-of-way. To ensure a smooth process, PBOT worked collaboratively with its sister City agency, the Bureau of Development Services, to create a very detailed permit process and share inspection responsibilities across public and private lands. This worked well and streamlined what otherwise would have been a difficult and lengthy permitting process because the City does not own its transit agency.[67]

63 https://trimet.org/tilikum/

64 https://trimet.org/tilikum/

65 https://www.energy.gov/sites/prod/files/2016/03/f30/Portland%20Case%20Study.pdf

66 http://www.oregonapa.org/bridging-over-challenges-to-make-new-connections-tilikum-crossing-bridge-of-the-people/

67 http://www.aspirebridge.com/magazine/2015Spring/Project-TilikumCrossing-Spring2015.pdf

HOW THIS CASE STUDY RELATES TO SMARTMOVES CONNECTIONS

The Tilikum Crossing, Bridge of the People is the first and longest multimodal – transit, bike and pedestrian - bridge in the U.S. and was strategically designed to express the values and culture that are central to the Portland region. It is a direct link between the east and west side of the Willamette River and connects to destinations such as Portland's South Waterfront, Oregon Health & Science University Waterfront Campus, Portland's Aerial Tram and Portland State University. The Bridge is viewed as more than a transportation project; it is considered a powerful tool of transformation that resulted in benefits other than increased travel choices, most notably economic development, environmental and pollution improvements, redevelopment and public art installations.

Construction of the bridge was included in a phase of TriMet's $1.49 billion Portland Milwaukee Light Rail Project. Portland's South Waterfront District was experiencing significant growth, however, it was disconnected from the rest of the city. Assessment of possible connections revealed that linkages could not be accomplished with new roads; public transit was the only option to link South Waterfront to the rest of the city. TriMet proposed an idea to place the western terminus of the Orange Line light rail extension in the South Waterfront District. The eastern terminus was planned in the Central Eastside District, which would link west-side institutions like OHSU and Portland State University with the east side's OMSI and Portland Community College. TriMet worked with more than 20 community partners, including the Citizens Advisory Committee, Federal Transit Authority, Clackamas County, Metro, City of Milwaukee, Multnomah County, City of Oregon City, Oregon Department of Transportation, City of Portland and Portland Development Commission to finalize the plan. Construction of the bridge was estimated to cost $134.6 million, with financial contributions from the FTA, Oregon Lottery revenue and TriMet. In 2010, TriMet received approval to include and construct the multimodal bridge that would only carry Portland Streetcar, the MAX Orange Line, TriMet buses, cyclists and pedestrians.

TriMet's planning is grounded in the RTP and guided by a federally mandated decision-making framework called the Metropolitan Transportation Planning Process, which facilitates planning through four advisory committee bodies. The advisory entities are: Joint Policy Advisory Committee on Transportation, Metro Policy Advisory Committee, Transportation Policy Alternatives Committee, and Metro Technical Advisory Committee. Their strategies and programs to meet the RTP are through focused investments in service, capital projects and customer information as laid-out in their TIP. These plans direct development to regional centers, town centers and key corridors and led to the PMLR project and ultimately creation of the Tilikum Crossing, Bridge of the People. The RTP focuses on the importance of making investment decisions based on achieving multiple outcomes rather than a single focus on addressing traffic congestion. Financial investment in any project has to meet the following criteria:

1. Vibrant Communities – where people can choose to walk for pleasure and meet every day needs
2. Economic Prosperity – sustained economic competitiveness
3. Safe and Reliable Transportation – that enhances residents quality of life
4. Leadership on Climate Change – minimizes global warming
5. Clean Air and Water – ensures future generations enjoy clean and healthy ecosystems
6. Equity – ensures benefits of growth and change are distributed equally.

Integrated Planning of Land Use and Transit in St. Louis

The relationship between transportation and land use serves a critical link for sustainable development. Misguided investments in transportation inevitably leads to spread-out development where people are dependent on automobiles. The ultimate role of transportation is to connect people with goods, activities, and people that they need to make exchanges with. Therefore, transportation investment policies and programs must be coupled with land use policies and programs to be successful. St. Louis, Missouri has been successful at achieving sustainable development through strategically integrating land use when planning transportation investments.

ST. LOUIS COMPREHENSIVE PLAN: STRATEGIC LAND USE PLAN

In 2005, the City of St. Louis adopted a Strategic Land Use Plan. The city's Planning and Urban Design Agency proposed the new plan, which was prepared by professional land use planners based on continued consultations with the city's 28 aldermen, who were all closely connected with the aspirations and dreams of the people who lived in the city's neighborhoods and businesses that supported the local economy. The Strategic Land Use Plan was intended to improve the quality of life for those who live and work in St. Louis by encouraging appropriate types of development and preservation in clearly defined locations. The plan had two main purposes:

1. Provide direction for those who want to make investments in the city and;
2. Provide stability and opportunities for those who already live, work, and build their businesses in the city.

This new plan, which identified innovative approaches to development, enabled the City to offer amenities and ultimately a lifestyle that was once only found in the suburbs and the set the stage for City initiatives to raise development standards throughout the region. Intended to provide a foundation and a road map for positive change, the plan continued to evolve as new development initiatives emerged. The Strategic Land Use Plan is an interactive tool for collaboration among City officials, neighborhood residents, businesses, and developers to ensure future investments in each part of the City are conducted with a clear and well-considered vision for a secure future.[68]

Land Use Designations

Included in the Plan, the Strategic Land Use Map component assigned land use designations to each block throughout the city that showed current conditions and existing opportunities within each area. Strategically incorporating various colors in the map conveyed what type of future development was intended in each focus area. The foundation of the city was built around residential neighborhoods, so two residential neighborhood designations were cited in the plan: Neighborhood Preservation and Neighborhood Development. Pre-existing Neighborhood Preservation areas would be enhanced while preserving existing character, and Neighborhood Development areas were permitted and encouraged to create their own character while complementing adjoining neighborhoods and blocks. These existing, emerging, and future neighborhoods would then be connected and served by Neighborhood Commercial areas/corridors. The goal was to encourage investment in corridors that provided essential services to the surrounding community. Strategic locations within the city were then designated as Regional Commercial activity sites.[69]

Similar designations were given to businesses. Business/Industrial Preservation area designations were assigned to businesses already in the city. Areas where new businesses were seeking to enter the market were given the designation Business/Industrial Development areas and received encouragement from the city. The last three designations given were: Institutional, where properties such as universities, churches, and hospitals were located; Specialty Mixed-Use, where businesses, residents, arts, and other forms of entertainment already co-existed and thrived together; and Opportunity Areas, which were under-utilized areas where opportunity existed; however, it was unclear as to what activity was best suited to turn the opportunity into a development plan. The Strategic Land Use Plan and Map were intended only as a road map, and therefore, did not provide a specific implementation strategy. However, zoning designations remained problematic for new development. It was the intention, after the plan was adopted, to modify zoning designations that conform to the plan to encourage and promote future development and economic growth.

68 https://www.ewgateway.org/about-us/what-we-do/planning-initiatives/

69 https://www4.uwm.edu/cuts/trb/conf/papers/donnaday.pdf

Land use, economic development, and transportation, according to the plan, are intimately related. Effective landuse planning promotes economic growth, and strategic investments in transportation are critical to ensure efficient connectivity between the development areas. To be successful, St. Louis and its partners continually try to build on the community's strengths, anticipate and adapt to change, and take collective action to ensure growth and a prosperous future. Building on existing assets and adapting to changes of the 21st century has become the foundation of St. Louis's growth and development. Every five years, St. Louis officials review the plan, consider conditions and trends affecting the area and reshape policy, guide decision-making, and direct resources for the benefit of St. Louis's citizens.

ST. LOUIS STRATEGIC PLAN: IMAGINING TOMORROW FOR ST. LOUIS

The process of developing the 2013 Strategic Plan, "Imagining Tomorrow for St. Louis" was intentionally data-driven and augmented with considerable spatial analysis utilizing mapping software. It was also substantially grounded in public policy research with the intention of creating a new narrative for St. Louis as it changes and matures. While the 2013 plan was created with high aspirations, it was grounded in the reality that achieving outcomes through effective implementation would make tangible differences throughout the community.[70]

Generational Shifts: The Importance of Integrated Land-Use Planning and Transportation

The strategic planning process found two major generational shifts within St. Louis that indicated a significant need for more transit services and walkable alternatives to driving for communities and neighborhoods. First, baby boomers (born between 1946 and 1964) were nearing retirement and the presence of the millennial generation (born between 1980 and 2000) was emerging. With the size of these two generations making up 55 percent of St. Louis's population, the Strategic Plan determined that the ability to retain and attract both boomers and millennials was vital for future growth.[71]

The impact of aging baby boomers put various demands on local communities to provide a variety of housing and local travel options that were accessible to alternative modes and public transit. Throughout St. Louis, many areas with concentrated numbers of seniors are characterized by traditional suburban development patterns – low density, separated uses, and auto-dependent. Lower densities and separated nature of the land uses meant that walkability of neighborhoods and communities was limited. The emergence of the interstate highway system significantly shaped boomers' auto-oriented mindset. Low-density suburbs meant public transit was limited and driving was the primary mode of transportation for commuting from home to commercial and employment centers. Therefore, having a car and the ability to drive were the primary indicators of independence for this generation. The Strategic Plan determined accessibility to transit was vital for retaining the baby boomer population, especially older non-driving residents.

Due to the 20-year generational span of the millennials, the Strategic Plan divided this emerging generation into two distinct age groups – adolescent youth and young professionals. Retaining and attracting millennials was viewed as an important component of St. Louis's future workforce and economic vitality. Many young millennials at the time were living below the federal poverty level. Being raised in economically unstable situations, preparing the younger generation for continued learning and eventually employment was highly prioritized in the Strategic Plan. For younger people to succeed, it was determined access to healthy, active lifestyle choices and accessibility to future employment was critical. While the nation continued to recover from the Great Recession, young professionals were struggling to launch their careers and adult lives in a contracted economy. Interestingly, it was determined that a significant number of young graduates were moving back in with their parents and even fewer were buying cars. Surveys conducted found this age group preferred alternative modes of transportation such as public transit and Uber and were looking for mixed-use neighborhoods that were connected to shopping, services and employment opportunities.[72]

Ultimately, many millennials were looking for housing choices that were like what many baby boomers wanted – mixed-use development, public transportation, and walkability to daily needs and amenities. St. Louis was challenged to meet these needs.

70 https://www.stlouis-mo.gov/government/departments/planning/planning/adopted-plans/strategic-landuse/

71 https://www.stlouisco.com/Portals/8/docs/document%20library/planning/StrategicPlan2013/Imagining%20Tomorrow_STLCO%20Strategic%20Plan%202013.pdf

72 https://www.stlouis-mo.gov/planning/

Comprehensive Strategies to Address a Changing Population

Key demographic drivers in St. Louis suggested the need for greater adaptability and strategies aligned in response to current and emerging population trends. To meet challenges and capitalize on opportunities presented by the changing population, new approaches to providing programs and services as well as a new philosophy for investing in infrastructure were critical. With the implementation of a collective set of strategies, St. Louis provided a cohesive narrative for framing the issues at hand and supplied a foundation for guiding policy and decision-making. The holistic strategy to create an age-friendly community for older generations looked at various roles these individuals played in the community and ensured opportunities existed that connected rather than isolated people as they age. The strategy consisted of four components:

- Linking seniors with health and social services, and providing infrastructure and amenities that promote a healthy, active lifestyle.
- Providing adequate housing and neighborhood options for people regardless of whether they choose to live in their existing home or relocate within their communities.
- Providing infrastructure that enhances mobility vital to supporting the independence of an aging population.
- Ensuring continued social, civic, and economic engagement of an aging population.

Meeting the challenges of millennials also enabled St. Louis to embrace opportunities created by attracting and retaining highly educated, diverse, creative, and connected segments of the population. St. Louis' strategy for millennials enabled a two-part approach, one for youth and one for young professionals:

- The focus for youth was on creating communities that provide stable, safe environments for raising children, with the support youth needed to succeed at each stage of development from early childhood to early adulthood.
- The focus on young professionals was about creating vibrant places with attractive opportunities for young adults to establish themselves in their communities and careers.

The Policy Framework: Imagining Tomorrow for St. Louis

The Policy Framework section of the Strategic Plan set goals and outcomes for the plan, organized tactics and established a structure for implementation. The Framework is organized into three components:

- Healthy, Engaged Residents: Ensure the well-being of residents by meeting their physical, emotional, and social needs
- Desirable, Connected Communities: Preserve and develop well-maintained communities with quality options for all
- Accessible, Attractive Opportunities: Create financial viability through educational and economic opportunities

Each component had specific policies and goals, with transportation being a policy incorporated in each. For many residents, transportation choices were about connecting with their community, social interaction, physical health, and living an active lifestyle as much as it was about getting from one place to another. The Framework Policies, intended to create vibrant neighborhoods, were supported by policies based on a dynamic transportation system. Pedestrian amenities were a vital link for children and seniors who could not drive and for those with limited mobility. St. Louis had some policies and plans previously in place that supported pedestrian amenities but believed these could be enhanced by adopting and implementing a Complete Streets Policy as well as walkability audits to target investments of scarce resources.[73]

Transit as an enhancement to the region's transportation system was another key piece included in the Framework. Community leaders were looking to capitalize on significant investments in the transit system by concentrating development around transit stations. The mix of land use and transportation modes presented St. Louis the opportunity to capitalize on Transit-oriented Development (TOD) to create resilient nodes that allowed the community to respond to changing market demands. While St. Louis did not directly run the transit system, they believed Metro (the local transit agency) was an important partner in their success. As such, the Strategic Plan emphasized the importance of Metro's transit system through planning and advocating model ordinances that supported TOD around existing employment centers and inner-ring suburbs.

73 https://www.stlouisco.com/Portals/8/docs/document%20library/Planning/strategicplan2013/Plan_Final_Framework.pdf

Part of Metro's services include MetroLink, the agency's light rail transit system. It is around MetroLink's light rail stations that Metro has been able to be a catalyst for economic development. Since 2011, more than $7.9 billion in commercial development has been completed, is currently under construction, or is reasonably committed to within a half-mile of MetroLink light rail transit stations. Metro considered various landuse patterns and populations around its light rail stations when planning the types of investments to make in its station areas.

To achieve desired outcomes of increased investment in TOD and expanding on-demand, non-profit, and private transportation options, the Strategic Plan mentioned various tactics in its implementation. These tactics included supporting expansion of MetroLink light rail services and working with Metro to enhance Call-A-Ride services and increase access to various facilities. Working with local, regional, and state partners was important to fund, maintain, and expand critical infrastructure to connect St. Louis to state, regional, national, and global markets. Furthermore, it was determined that it would be essential to St. Louis' future to develop, adopt and implement a sustainability plan.

METRO REIMAGINED

St. Louis officials recognize a safe, reliable and thriving public transit system plays a key role in stimulating economic development, attracting and retaining business, establishing healthier, sustainable communities, connecting individuals to job opportunities, and furthering equality. Unfortunately, ridership on St. Louis's public transit system had experienced more than a 22-percent decline over recent years; therefore, a new vision for the Metro transit system was implemented in 2018. Following a shift in the market, Metro conducted research and talked with riders to determine why ridership had declined and what they needed from the public transit system. This planning strategy ultimately led Metro to launch Metro Reimagined, a plan to enhance the current bus system. The new strategy included more frequent service, faster trips, new technology, new vehicles, and innovative new services like on-demand transportation and micro-transit. The new plan was intended to not only serve Metro customers better for today but allow the transit system to grow and adapt to the region's changing mobility needs.[74]

METROPOLITAN TRANSPORTATION PLANNING PROCESS

The East-West Gateway Council of Governments (EWG) is the metropolitan planning organization (MPO) for the St. Louis region. As a Council of Governments (COG), EWG provides a forum where local governments in the bi-state region can coordinate and work together to address and solve problems that cross jurisdictional boundaries. EWG facilitates cooperative planning and problem-solving and is responsible for development and adoption of short- and long-range regional transportation plans. Transportation projects within St. Louis that are wholly or partially funded with federal dollars must be contained in one of EWG's transportation plans. EWG's transportation planning activities range from long range planning to very focused corridor or sub-area planning, from MetroLink planning to non-motorized mobility planning, and from freight planning to human services planning. Regardless of the planning effort, the goal is to provide accessibility and mobility in a safe, efficient, and effective manner.

Roadway Functional Classification

EWG is also responsible, in cooperation with the Illinois Department of Transportation (IDOT) and Missouri Department of Transportation (MoDOT), for maintaining and updating the St. Louis region's Roadway Functional Classification System mandated under federal law. Roadways are classified according to their urban or rural setting and the type of service they provide based on considerations such as: connectivity, mobility, accessibility, vehicle miles traveled, average annual daily traffic, and abutting land use. The purpose of roadway functional classification is to describe how travel is channelized through the region's roadway network and to determine project eligibility for inclusion in EWG's Long-Range Transportation Plan and the short-range Transportation Improvement Program (TIP). A roadway must already be classified, at minimum, as a planned or existing Minor Collector in an urban area or Major Collector in a rural area to be eligible for federal funds. EWG periodically revises the functional classification system in the St. Louis region to reflect the changing conditions brought on by regional development, changes to urban boundaries, and FHWA guidelines updates.

74 https://www.metrostlouis.org/reimagined/

CONCLUSION

Overall, the success St. Louis and the surrounding region experienced with integrating transportation and landuse was 25-years in the making. Detailed landuse codes, continual updates to strategic plans, and partnerships between the City, Metro transit agency, the MPO and EWG council of government was and still are the key ingredients of the St. Louis model.

HOW THIS CASE STUDY RELATES TO SMARTMOVES CONNECTIONS

St. Louis' planning efforts identified land use typologies based on existing, emerging and future neighborhoods and assigned designations to areas throughout the City. St. Louis wasn't focused on just "current" land use designations; it identified areas/neighborhoods that were in flux economically and forecasted future areas where change was likely to occur. Because the City was originally built around residential neighborhoods, if focused first on two residential neighborhood types that were identified in St. Louis' 2005 Land Use Plan. "Neighborhood Preservation" designation is intended to enhance neighborhoods while preserving existing character and "Neighborhood Development" is intended to permit and encourage neighborhoods to create their own character while complementing adjoining neighborhoods and blocks. This approach, regardless of land use designation/type, was to focus on creating investment in the corridors that link these neighborhoods.

Similar designations were then given to businesses: "Business/Industrial Preservation" designations were assigned to businesses already in the City; "Business/Industrial Development" was assigned to areas where new businesses were trying to enter the market; "Institutional" was assigned to properties such as universities, churches, and hospitals; "Specialty Mixed-Use" was for businesses, residents, arts, and other forms of entertainment; and "Opportunity Areas" was assigned to under-utilized areas where opportunity existed but was unclear how to turn the opportunity into a implementable plan.

During the process of developing their 2013 Strategic Plan, Imagining Tomorrow for St. Louis, the City specifically examined population demographics focusing on generational types including baby boomers and millennials, which ultimately comprised most of the population (55 percent). This data-driven approach was grounded in public policy and supplemented by data, spatial analysis and mapping. Results indicated St. Louis was having two major generational shifts – baby boomers and millennials – who needed transit and walking alternatives to driving and expressed similar housing needs. St. Louis then built their plan and implementation strategies around these commonalities.

The 2013 Strategic Plan consisted of a "Policy Framework" that set goals and desired outcomes for the plan and a structure for implementation based on:

- Healthy, Engaged Residents: Ensures the well-being of residents by meeting their physical, emotional, and social needs
- Desirable, Connected Communities: Preserves and develops well-maintained communities with quality options for all
- Accessible, Attractive Opportunities: Creates financial viability through educational and economic opportunities

The overarching goal of their framework was to create vibrant communities supported by these policies and based on a dynamic transportation system. The plan mentioned various tactics that support expansion and reach of MetroLink light rail services such as Call-A-Ride and micro-transit. St. Louis recognized the importance of supporting first-mile/last-mile type solutions at light rail stations/hubs. Their work recognized that a successful hub is one that incorporates alternative, local first-mile/last-mile modes to enhance sustainability of the fixed guideway system, and station area and corridor development. Community leaders felt that it would be important to capitalize on significant investments in the transit system by concentrating development around transit hubs. The mix of land use and transportation modes presented an opportunity to capitalize on TOD to create resilient nodes that allowed the community to respond to changing market demands.

Downtown Worker Free Fares and App in Columbus

BACKGROUND

The Federal Transit Administration's (FTA) fiscal year 2017 data shows Central Ohio Transit Authority (COTA) as the country's 34th largest transit agency by ridership, which was 18.7 million. COTA directly operates fixed-route service and contracts its demand-response service. The service area is greater Columbus and Central Ohio with a population of 1,060,666. COTA's fare revenues comprised 13.2 percent of total revenues. The number of fixed-route vehicles during maximum service periods was 297. Operating costs per fixed-route passenger was $7.29 and demand-response was $34.64. COTA operates service seven days a week and has a $2.00 fixed-route base fare. The agency has a guaranteed ride home program.

A press release issued August 17, 2018 identified that COTA received the 2018 Outstanding Public Transportation Achievement Award from the American Public Transportation Association (APTA) for its redesigned fixed-route system. The redesigned system was based on public input and was implemented in conjunction with a robust strategic marketing plan. The redesign was based on achieving the following objectives: simplified routes; consistent seven day a week schedules; increased number of high frequency routes; improved reliability; and, reduced congestion in downtown.

COTA offers it riders a variety of transit services. The following information from the agency's website[75] highlights the agency's key services. In 2018, COTA introduced Bus Rapid Transit (BRT) called CMAX. CMAX has limited stops, dedicated lanes during rush hours, traffic signal priority, new bus stations, a new transit center, an upgraded park-and-ride lot, real-time bus information screens and USB ports for riders. In 2020, COTA and the City of Columbus are planning to add four smart mobility hubs along this BRT line. The hubs will bring bus service, bikes, scooters, car share companies, ride-hailing and other community services together. Amenities at the smart hubs will include: interactive kiosks with trip-planning across multiple transportation options; real-time bus information; and systems that allow users to pay for transportation offered by multiple providers.

In addition to traditional fixed-route and paratransit services, COTA provides the following:

- AirConnect – 30-minute service from downtown Columbus to the Airport from 6 a.m. to 9 p.m. seven days a week.
- CBUS – free downtown circulator available seven days a week; Monday through Thursday 7 a.m. to 10 p.m., Friday 7 a.m. to midnight, Saturday 9 a.m. to midnight and Sunday 10:30 a.m. to 6:00 p.m.
- CMAX – BRT line
- COTA Plus – Pilot micro-transit with a technology program that is an on-demand service in Grove City, a central Ohio community. Customers in this service area can request a ride using the COTA Plus mobile app and within 15 minutes, a 6-person vehicle will arrive to pick-up the passenger and transport them within a pre-defined service area. Customers can also call customer service to book a trip. Another app, called "Via", enables customers to pay their fares, plan their trips and request services. The Via app uses algorithms to efficiently schedule multiple riders to use the same vehicle. The app shows nearby bus stops and walking distances to pick-up and drop-off locations. Base fare for COTA Plus is $3.00; however, there is no charge if the rider connects to COTA's bus system. Service is available weekdays 5:30 a.m. to 8:00 p.m.
- C-Pass – A trial program for eligible downtown workers that provides free transportation on COTA's entire system. The program is supported by Capital Crossroads Special Improvement District (SID), a private entity with approximately 500 businesses and property owners.[76]

75 https://www.cota.com/

76 https://downtownservices.org/

DOWNTOWN WORKER FREE FARES

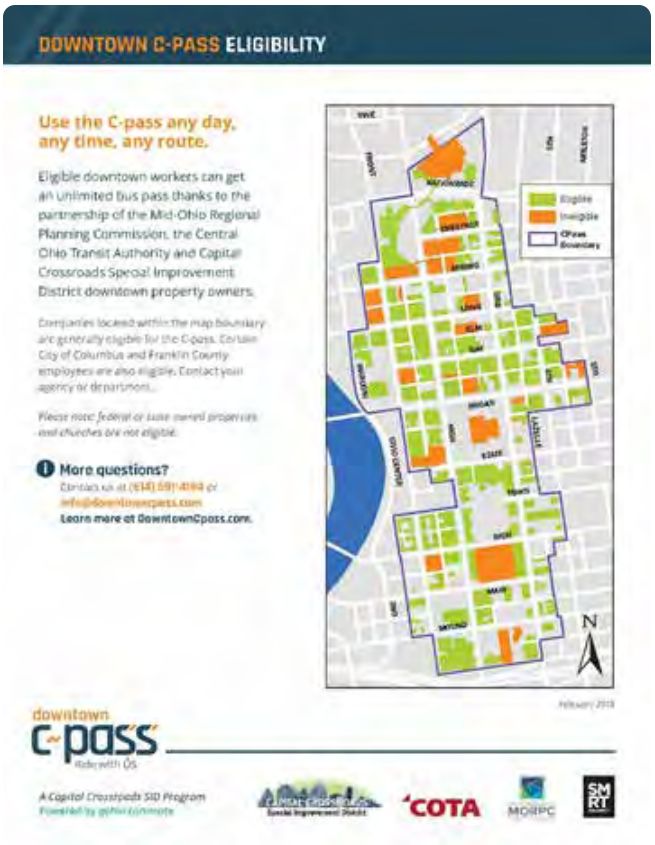
Mid-Ohio Regional Planning Commission Partnership Trial Program

The C-Pass trial program is a result of partnerships with Mid-Ohio Regional Planning Commission (MORPC), COTA and SID's downtown property owners. C-Pass is a COTA fare mechanism that is available for eligible downtown workers and provides unlimited access to COTA's entire bus network including ADA paratransit services. There's no cost for an employer or employee to participate. According to an August 2, 2017 article[77] in the Columbus Dispatch, a successful C-Pass program is expected to free up about 2,400 downtown parking spaces[78]. Other benefits are cleaner air and cost-savings of about $120 a month for employees that switch to transit.

The trial program began in June 2018 and was implemented to address the lack of parking spaces and cost to park in downtown Columbus and offset the trend of businesses moving to the suburbs. The project is scheduled to end December 31, 2020.

Prior to implementing the C-Pass trial program, four employers conducted a test for an 18-month period and, according to an August 9, 2017 Columbus Business First article[79], the test was considered successful based on the 844 employees that participated in the trial. The percentage of bus commuters went from 6.4 percent to 12.2 percent. The success of the test resulted in downtown SID members (business and property owners) voting to pay a fee of 3 cents per square foot of occupied space to pay for employee passes. The SID has approximately 43,000 workers who are eligible for passes.

Most employees in the SID are eligible as are some City of Columbus and Franklin County employees. Federal and state owned properties as well as churches are not eligible for the C-Pass program.



Employees who are interested in C-Pass can enroll by contacting their Human Resource Managers who will register the employee and create an employee C-Pass account. Employees have a choice to select the fare mechanism to be a COTA photo identification card or the COTA Connector mobile app. C-Pass is valid through the end of calendar year 2020. Passes are deactivated for workers whose employment is terminated.

Employers adjacent to the C-Pass area can buy into the program paying $40.50 a year for each eligible employee. Developers or owners of residential buildings can opt-in by paying $56.70 per unit. The unit cost is based on downtown Columbus' average which is 1.4 residents per unit.

77 https://www.dispatch.com/news/20170802/program-approved-to-give-free-bus-passes-to-downtown-workers

78 https://www.dispatch.com/news/20170802/program-approved-to-give-free-bus-passes-to-downtown-workers

79 https://www.bizjournals.com/columbus/news/2017/08/09/could-free-bus-passes-help-ease-downtown-office.html

A February 21, 2018 Columbus Business First article[80] indicated the following program costs:

- COTA receives $40.54 each year for each employee in the SID district regardless of whether or not the employee registers for C-Pass. The $40.54 is based on what Ohio State University pays COTA for each student's pass. COTA's non-discounted annual pass is $730.
- The program budget is over $5 million and SID's expenses are $460,000. SID raised $5.5 million with extra funds being used to reimburse MORPC. Breakdown of the funding sources is as follows:
  - MORPC: $2.84 million
  - Property assessment: $1.3 million (over 2½ years)
  - Downtown business philanthropy: $600,000
  - Employers outside district buying into the program: $750,000

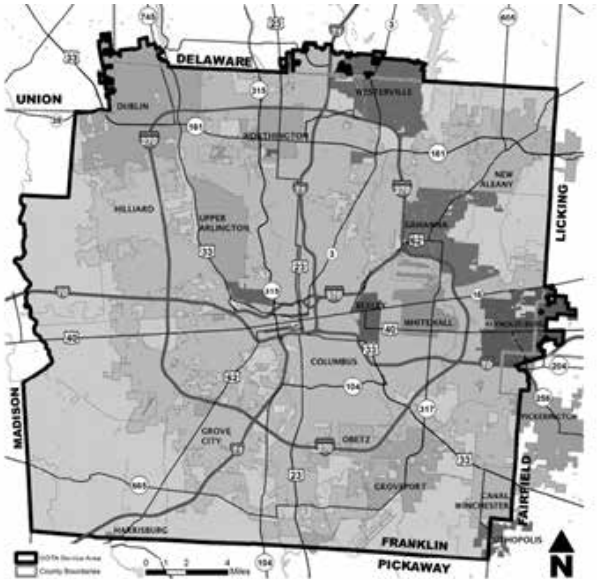
Another article[81] in Columbus Business First on August 15 2019 reported statistics showing that the C-Pass program had been successful.

- Ridership doubled in one-year from June 2018 to June 2019
- More than 14,800 downtown employees registered for C-Pass
- C-Pass users accounted for 25,000 weekly rides
- C-Pass users accounted for more than 1 million rides in the first year of the program
- Ridership during rush hour increased 24 percent
- 430 downtown companies were enrolled in the program, including the 50 largest eligible employers
- 129 companies were surveyed
- 52 percent reported knowing employees had relinquished parking to use COTA buses
- 34 percent indicated that C-Pass helped to recruit and retain employees
- 17 companies reported that C-Pass impacted their decision to renew or sign a lease in C-Pass eligible downtown area
- 83 percent of C-Pass users surveyed indicated that saving money was a big motivator even though 93 percent of new riders have access to a private vehicle

MULTI-MODAL TRIP PLANNING APPLICATION AND COMMON PAYMENT SYSTEM

Pivot Overview

Through a public-private partnership, Smart Columbus and COTA are developing a comprehensive app called "Pivot" to plan and pay for trips using car, transit, bike-sharing, taxis, limousines, paratransit, car and van pools, ride-hail, and/or scooters in COTA's service area. According to information on COTA's website[82], the project is funded with $50 million in grants ($40 million from the Department of Transportation and $10 million grant from Paul G. Allen's Vulcan Inc.) A September 6, 2017 Columbus Chamber of Commerce newsletter indicated that the $50 million in grants resulted in "aligned investments totaling more than $500 million in commitments have been made by the private, public and academic institutions in the region to support technology and infrastructure investments that upgrade Columbus' transportation network and help make Columbus the model connected city of the future."[83]



Source: Multimodal Trip Planning Application/Common Payment System, Concept of Operations, Smart Columbus, August 10, 2018 Final Report

80 https://www.bizjournals.com/columbus/news/2018/02/21/cpass-starts-rolling-downtown-workers-getting-free.html

81 https://www.bizjournals.com/columbus/news/2019/08/14/all-aboardfree-downtown-bus-program-doubles.html

82 https://smart.columbus.gov

83 https://smart.columbus.gov/node/576

The app will show all travel options and costs and include scheduling and payment systems for services such as Lyft, CoGo, COTA as well as autonomous shuttles. The user will be able to select preferences such as schedule, travel options, wheelchair accessibility and budget. The user will be able to load funds onto one account enabling them to pay for the entire trip in one easy payment across multiple modes of transportation. Riders who want to pay with cash will be able to pay for their trips using a PayNearMe location (CVS and Family Dollar).

The transportation app, atypical to industry practices, will be managed by the City of Columbus and not a transit agency. According to the program description, administration of the program by the city will encourage participation by non-transit modes/providers and, in some instances such as bike-sharing, improve permitting processes and approvals.

Current Status[84]

Andrew Wolpert, Deputy Program Manager for Smart Columbus, provided the following information about Pivot:

- The City of Columbus conducted a soft-launch of Pivot in August 2019.
- Pivot enables the user to plan a trip using one or multiple modes. Available modes include: fixed-route transit, scooter, bike-share, ride-hail, local taxis and van pools. Future modes will include Lyft and paratransit.
- COTA's free standing kiosks offer trip planning using Pivot and, hopefully in the future, will integrate the payment system. At this time there are technical and security issues with the payment feature at kiosks.
- The payment feature is expected to be launched in the first quarter of calendar year 2020 and full integration of all features by the end of 2020.
- The next challenge is implementing a robust marketing program and getting people familiar with using the app.
- TriMet in Portland was helpful providing Smart Columbus guidance throughout the project.
- Organizations considering similar projects should consider using "open trip planner". This open source software is used by major transit agencies in the United States and ultimately can lead to integration of other transportation systems. Using proprietary software can lead to challenging agreements and expensive maintenance costs.

84 Interview with Andrew Wolpert, Smart Columbus Deputy Program Manager on 11/15/2020

HOW THIS CASE STUDY RELATES TO SMARTMOVES CONNECTIONS

The Columbus case study shows many of the potential benefits of policies and investments in key elements of successful Multimodal Hubs and Multimodal Corridors. The C-Pass program to provide free transit fares to eligible downtown workers demonstrates the effectiveness of reducing or eliminating fares. However, the program's unique funding as a pilot project makes it difficult to replicate. The Pivot program to develop a trip-planning and fare-collection app shows promise, but is too new to evaluate for SmartMoves Connections. The experience with Smart Columbus developing the app should be examined for more lessons, should the SPC region ever consider something similar.

Triangle Transit Multi-Agency Coordination & Co-Marketing

BACKGROUND

The Research Triangle Regional Public Transportation Authority (GoTriangle, formerly Triangle Transit) in North Carolina is a regional transit planner, transit taxing authority and transit operator. A fiscal year 2020 budget and capital investment plan indicated that the agency was formed in 1989 to serve Durham, Orange and Wake counties. Its service area includes the cities of Raleigh, Durham and Chapel Hill. See Map 1, an illustration of GoTriangle's system map, at the end of this synopsis.

GoTriangle's website[85] indicates that the agency provides the following services: regional bus, shuttle service, paratransit, ride matching, vanpools, commuter resources, emergency ride home program and a regional information call center. The regional information call center is a "single-source of information for public transportation"[86] in GoTriangle's service area.

According to GoTriangle fiscal year 2018 Comprehensive Annual Financial Report[87], the agency was formed in 1989 and is funded in part from a $5 vehicle registration fee, 5% tax on car rental receipts and one-half cent local sales tax in Durham, Orange and Wake counties. Seventy-one percent of its revenues are derived from vehicle registration taxes. Chart 1 illustrates the Agency's fiscal year 2020 budget.

GoTriangle's fiscal year 2018 Annual Report[88] indicated that it contracts with GoRaleigh, GoDurham and Chapel Hill Transit agencies to operate service on behalf of GoTriangle. GoTriangle manages GoDurham's fixed-route and ACCESS services as well as its route planning, marketing and transit amenities.

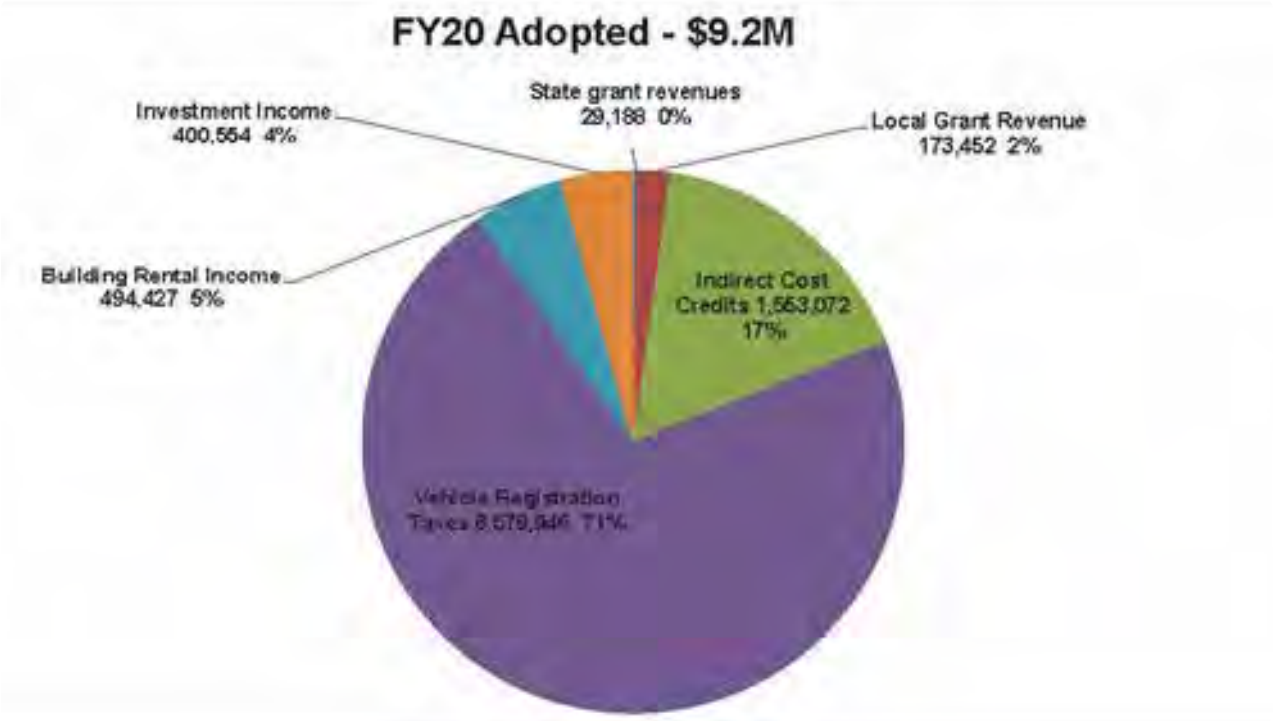


Chart 1: FY 2020 Budget
Source: https://gotriangle.org/sites/default/files/publications/fy20_budget_book_-_revised_10-15-19.pdf

85 https://gotriangle.org/

86 https://gotriangle.org/

87 https://gotriangle.org/sites/default/files/publications/2018_research_triangle_regional_public_transp._authority_cafr_final_10.31.2018.pdf

88 https://gotriangle.org/sites/default/files/publications/2018_research_triangle_regional_public_transp._authority_cafr_final_10.31.2018.pdf

GoTriangle has transit agency and university partners that are located in the tri-city (Raleigh, Durham and Chapel Hill) area commonly referred to as the "Triangle". Map 1 illustrates the geography and jurisdiction of the Triangle.

Here is a description of transit and university partners that cooperate on the Triangles transit services and initiatives. The information below summarizes the transit and university partners.

Transit Partners

- Chapel Hill Transit[89]: A public transit agency that operates fixed-route and demand-response services in Chapel Hill, Carrboro and University of North Carolina at Chapel Hill located in the southeastern section of Orange County. Local and express routes in Chapel Hill and Carrboro are fare-free. Services operate seven days a week.
- GoCary[90]: A public transit agency operating primarily in the Town of Cary. Fixed-route and demand-response services are operated weekdays and Saturdays. Base fare is $1.50.
- GoDurham[91]: A public transit agency providing fixed-route and shared-ride services in the City of Durham as well as regional routes that include services available seven days a week with a base fare of $2.25.
- GoRaleigh[92]: A public transportation system providing local routes in Raleigh, regional routes and a free downtown circulator, and a local circulator in Wake Forest. Service is seven days a week with a base fare of $1.25.

University Partners

- Duke University[93]: Provides transportation services throughout the university and health system. Services include parking, shuttles and alternative transportation consisting of GoPass (students and eligible employees ride free on GoDurham, GoRaleigh and GoTriangle), carpool, vanpool, bicycling, car share, scooters, walking, emergency ride home, telecommute, occasional parking and mobile app.
- North Carolina State University[94]: Provides parking and shuttle bus services (Wolfline) in and around the Raleigh campuses of North Carolina State University. Service is free and open to the public. Service is tailored to the university's class schedules. Alternative transportation includes bicycling, scooter share, walking and electric charging stations.
- The University of North Carolina at Chapel Hill[95]: Provides free fare fixed-route and on-demand service in an around the Chapel Hill Campus. Fixed-route services include shuttle and express buses as well as airport service. Services offered include a Commuter Alternatives Program (CAP) that rewards faculty, staff and students who commute by bus, ride-share, walking or bicycling. Rewards include discount, prize drawings, Zip Car discount, free one-day parking, weeknight parking passes, emergency ride home and bus or vanpool subsidies.
- Wake Tech[96]: Encourages students and employees to use alternative forms of transportation such as: GoRaleigh GoPass that Wake Tech provides free; bicycling in the Wake Campus's bike friendly community; preferred parking for student carpoolers; prizes for employee carpoolers; emergency ride home program; and low emission vehicle priority parking.

Six agencies provide over 20 million annual rides in the Triangle's service area. These agencies vary in capacity from $4.2 million to $34.9 million in operating budgets. Table 1 provides a summary of the Federal Transit Administration (FTA) National Transit Database fiscal year 2017 data for the agencies.

For the same comparison period, the number of fixed-route buses ranged from 3 to 90 and the cost per fixed-route passenger ranged from $2.56 to $10.85.

89 https://www.townofchapelhill.org/town-hall/departments-services/transit/about-chapel-hill-transit

90 https://gocary.org

91 https://godurhamtransit.org

92 https://goraleigh.org

93 https://parking.duke.edu/buses

94 https://transportation.ncsu.edu

95 https://move.unc.edu/transit

96 https://www.waketech.edu/about-wake-tech/green-trek

Map 1: Tri-City Area
Source: USGS - http://nationalmap.gov/, Public Domain, https://commons.wikimedia.org/w/index.php?curid=37900410Surce

MARKETING AND COORDINATION

UrbanTran[97], an urban and transportation planning and social marketing firm, worked with GoTriangle and its transit agency and university partners to develop a marketing and communications plan based on branding GoTriangle. The plan resulted in a brand identity, redesigned website, marketing campaigns and social media strategy.

Four of the five transit agencies (GoCary, GoDurham, GoRaleigh, GoTriangle) have similarly designed websites. Each website links to partner agencies' sites and all system maps show multiple agency connecting points.

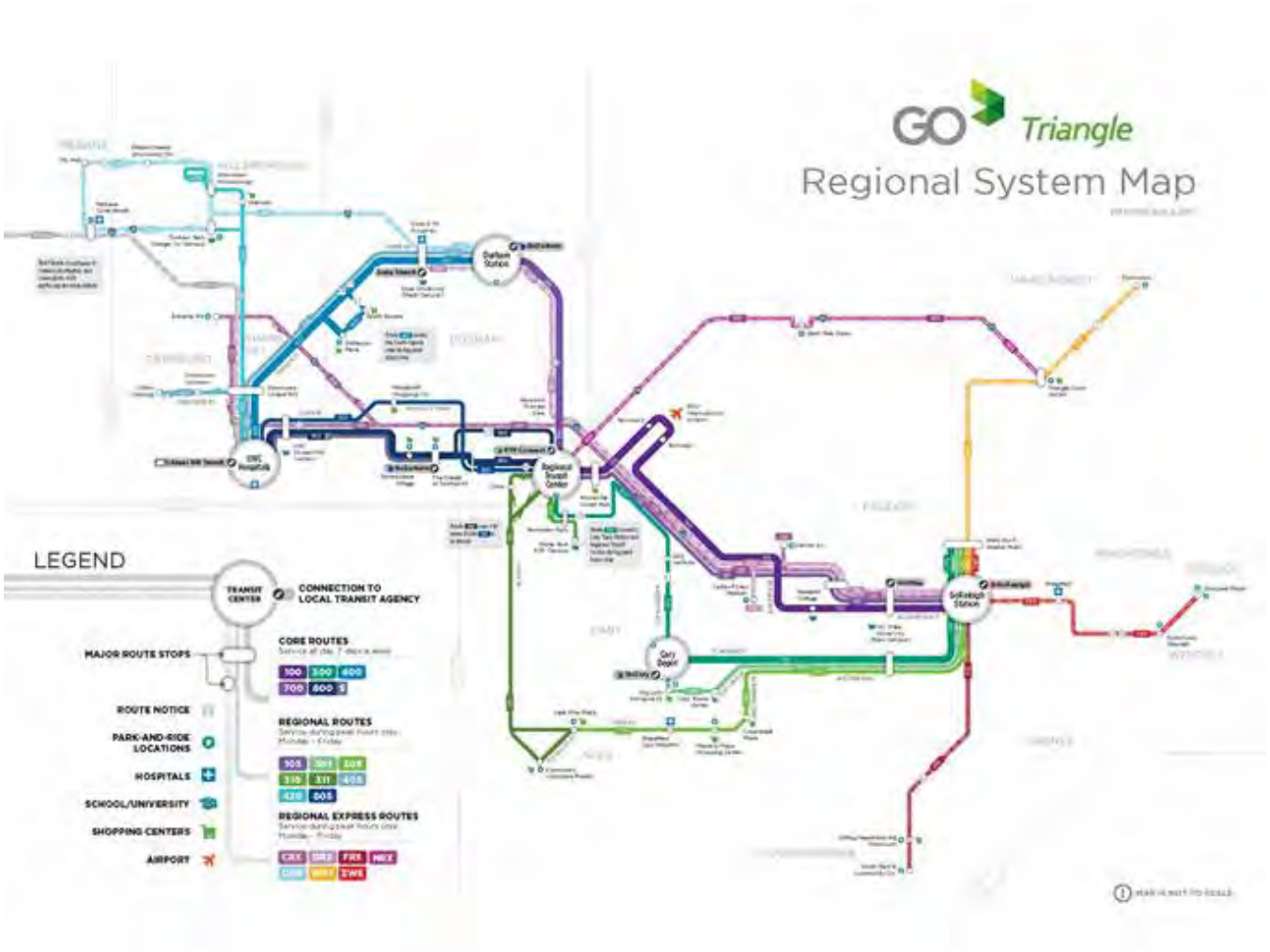
TransLoc, a real-time bus location[98] app, provides fixed-route vehicle location, stop and schedule information for all five partnering transit agencies as well as the four university partners.

Each transit agency has its own fare structure, pricing and fare instruments. The partnering transit agencies' base fares are:

- Chapel Hill Free
- GoGary $1.25
- GoDurham $1.00
- GoRaleigh $1.25
- GoTriangle $2.25

All partnering transit agencies except Chapel Hill offer Value Cards and Regional Passes. Value Cards provide a 20 percent discount over face value costs and are available in denominations of $50, $25 and $13.50. The Regional 1-Day Pass is $4.50, a 7-Day Pass is $16.50 and a 31-Day Pass is $76.50. The Regional Passes provide unlimited rides on GoTriangle's regional routes as well as all fixed-routes on GoCary, GoDurham and GoRaleigh.

97 https://urbantrans.com/
98 https://triangle.transloc.com



Map 2: GoTriangle System Map
Source: https://gotriangle.org/sites/default/files/publications/ fy20_budget_book_-_revised_10-15-19.pdf

Transit Agency	Operating Costs	Ridership	Fares	Fares as a Percent of Total Revenues
Chapel Hill Transit	18,681,132	6,154,280	$ 7,525,274	40.3%
GoCary	4,208,517	224,136	$ 290,303	6.9%
GoDurham	25,514,733	6,515,720	$ 2,838,871	11.1%
GoRaleigh	34,944,418	5,189,043	$ 4,029,958	11.5%
GoTriangle	27,311,373	1,925,839	$ 2,872,027	10.5%

Table 1: Agencies NTD
Source: FY 2017, Federal Transit Administration, National Transit Database

Transit Agency	Buses	Fixed Route Cost per Passenger Trip	Demand Response Vehicles	Demand Response Cost per Passenger Trip	Van Pool	Van Pool Cost per Passenger Trip
Chapel Hill Transit	74	$ 2.56	14	$ 44.20		
GoCary	9	$ 10.85	15	$ 43.09		
GoDurham	90	$ 3.17	45	$ 24.98		
GoRaleigh	65	$ 5.26	224	$ 11.80		
GoTriangle	77	$ 9.70	14	$ 73.42	53	$ 14.00

Table 2: Agencies Vehicles and Cost per Passenger
Source: FY 2017, Federal Transit Administration, National Transit Database

HOW THIS CASE STUDY RELATES TO SMARTMOVES CONNECTIONS

Triangle Transit's recent success demonstrate the value of an approach that deepens coordination across transit agencies in a region. The coordination includes joint marketing, but also services such as ride matching, vanpool, and Emergency Ride Home. In addition to transit operators, GoTriangle partners with regional universities to coordinate marketing and communication, presenting a unified message to the transit riding public. This could be an effective approach for Southwestern Pennsylvania.

Bay Area Fare Sharing

The San Francisco Bay Area consists of nine counties that surround San Francisco. The counties are: San Francisco, Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, Santa Clara and San Mateo. Each county has at least one major public transit agency. Public transit services include heavy rail, light rail, commuter bus, ferries, demand-response and demand-response taxis.

There are over 25 transit agencies in the Bay area; twenty-two (22) are participating in Clipper, a transit card that enables riders to travel seamlessly using multiple transportation companies. Clipper is a reloadable contactless smart-card. All participating transit providers have a reader on their vehicles, typically located on the fare box. A rider boards a vehicle and when they are in proximity of the reader, Clipper will interact with the reader enabling the appropriate fare to be registered and accounted for on the smart-card.

Clipper is managed by the Metropolitan Transportation Commission (MTC), the transportation planning agency for the San Francisco Bay area 9-county region. A memorandum of understanding (MOU) between each agency and MTC includes a provision for a Clipper Executive Board that "works by consensus to establish goals, a budget and work plan, and provide policy, oversight, direction, and authorization of significant business matters for the Clipper® fare payment system."[99] According to MTC's website, the Executive Board is comprised of representatives from MTC, Alameda-Contra Costa Transit District, Bay Area Rapid Transit District, Golden Gate Bridge Highway and Transportation District, San Francisco Municipal Transportation Agency, San Mateo County Transit District, Santa Clara Valley Transportation Authority and two representatives from other partnering transit agencies.

A September 26, 2018 MTC News Release[100] described the magnitude of the Clipper fare payment system as follows:

- 22 transit agencies;
- Over 3,500 bus, rail, light-rail, cable car and ferry trips;
- Over 21 million monthly payments;
- 6,875 payment validators on buses, stations and terminals; and
- 600 ticket machines.

Map: San Francisco Bay Area Counties
Source: Bay Area Council Economic Institute

MTC dedicates a website to Clipper that allows consumers to obtain a card, add value to the card, find retail locations, setup auto-load, register a card, use online pre-tax transit benefits as well as add value to the card using employer transit vouchers and commuter cards. Employers can use the Clipper website to manage its transit benefit program. The Clipper card can also be linked to a user's multi-county Bay Wheels bike share account that acts as an access key to unlock a bike. The user pays for bike usage from their Bay Wheels account. Riders can use Clipper to pay for parking at BART's parking facilities.

Even though the participating transit agencies have different fare collection equipment, fare policies and business rules, they all accept Clipper. MTC's Clipper website provides agency specific instructions on how to use the card on respective transit vehicles. The website provides links to the participating agencies' fare structures and policies.

99 https://mtc.ca.gov/tags/clipper-program-california

100 https://mtc.ca.gov/whats-happening/news/clipper-update-wins-commission-approval

The list below shows the current transit agencies that accept Clipper in the Bay area:

1. AC Transit (Alameda-Contra Costa Transit District)
2. BART (San Francisco Bay Area Rapid Transit District)
3. Caltrain (Part of Santa Clara Valley Transportation Authority)
4. City Coach (City of Vacaville)
5. County Connection (Central Contra Costa Transit Authority)
6. FAST (City of Fairfield - Fairfield and Suisun Transit)
7. Golden Gate Transit and Ferry (Golden Gate Bridge, Highway and Transportation District)
8. Marin Transit (Marin County Transit District)
9. MUNI (San Francisco Municipal Transportation Agency/ San Francisco Municipal Railway)
10. Petaluma Transit
11. SamTrans (Sam Mateo County Transportation Authority)
12. San Francisco Bay Ferries (San Francisco Bay Area Water Emergency Transportation Authority)
13. Santa Rosa CityBus (City of Santa Rosa)
14. SMART (Sonoma-Marin Area Rail Transit District): 43 miles of the 70-mile passenger rail system opened June 29, 2017. Multi-use pathway (bicycle, pedestrian) is also partially completed and connects stations through the corridor.
15. SolTrans (Solano County Transit)
16. Sonoma County Transit
17. Tri-Delta Transit (The Eastern Contra Costa Transit Authority)
18. Union City Transit (City of Union City Transit Division)
19. Vine (Napa Valley Transportation Authority
    Part of Vine – Flex Routes -American Canyon Transit, the Calistoga Shuttle and the St. Helena Shuttle also accept Clipper
20. VTA (Santa Clara Valley Transportation Authority)
21. WestCAT (Western Contra Costa Transit Authority)
22. Wheels/Tri-Valley (Livermore/Amador Valley Transit Authority)

The Federal Transit Administration's (FTA) National Transit Database 2017 Transit Agency Profiles[101] show the diversity of the agencies that participate in Clipper:

- Annual passengers range from 298,577 to 226,261,960
- Transit modes include: bus, commuter bus, trolley bus, cable car, demand-response, demand-response taxi, ferryboat, heavy-rail, light-rail, streetcar-rail and monorail
- Daily number of vehicles in maximum service range from 3 to 556
- Annual fare revenues range from $264,875 to $477,663,117

According to an MTC News Release dated November 16, 2016[102], the Clipper card was launched as TransLink in 2006. It began as fare-payment method for AC Transit, Golden Gate Transit and Ferry routes. In 2010, the system was renamed Clipper.

Clipper was designed for multiple agency usage with varying degrees of internet access. Without internet access, calculating the current card value is delayed. MTC plans to enhance the functions of Clipper to include mobile app and digital wallets.

101 https://www.transit.dot.gov/ntd/transit-profiles-summary-reports

102 https://mtc.ca.gov/whats-happening/news/clipperr-turns-10

MTC's News Release dated September 26, 2018[103] indicated the Board approved a $461 million dollar contract with Cubic Transportation Services, Inc. to "design, develop and operate a comprehensive update" to Clipper. The breakdown of the costs consist of: $165 million for capital items; $222 million for Cubic to operate and maintain the system through 2032; and $74 million for contingency and taxes. The current version of Clipper is obsolete as it lacks mobile phone integration and the ability to add value to the card using phone or internet. Planned enhancements include:

- Account-based system allowing users to reload value using a variety of methods
- Integration with other transportation providers such as bike-share and paratransit
- Mobile app to reload account and pay fare
- Improved compatibility with transit agencies' special programs (colleges, universities, employers, promotion, etc.)

The new Clipper mobile payment is expected to be operational in 2020 followed by a new redesigned system in 2021. All customers are expected to be using the new system in 2023.

Helise Cohn[104], Clipper Program Coordinator for MTC, believes that the transit agencies are satisfied with the Clipper program. Some of the transit agencies encourage riders to use Clipper by offering discounts and other agencies like BART are eliminating some of the fare instruments such as tickets. Ms. Cohn indicated that the biggest challenge was the significant differences among the transit agencies fare systems, equipment, policies and rules.

MTC is interested in conducting a study on how to better integrate fares, however, transit agencies have been reluctant to advance this initiative. Their reluctance is based primarily on concerns that they will lose revenue as well as the ability to define their fare structure and fare operations. Clipper's Executive Board, in September 2019, approved[105] a fare coordination business case study for which a special committee/task force including transit agencies will develop the scope of work and parameters of the study.

HOW THIS PROJECT RELATES TO SMARTMOVES CONNECTIONS

The Bay Area's success in implementing a single fare card for 22 transit agencies shows that it is possible to solve the difficult issues around sharing fare revenue in a complex region. The success of Multimodal Hubs would be much more likely in Southwestern Pennsylvania if riders had access to a single fare card.

103 https://mtc.ca.gov/whats-happening/news/clipper-update-wins-commission-approval

104 Via Phone interview in December 2019.

105 https://mtc.ca.gov/whats-happening/meetings/meetings-archive/clipper-executive-board-2019-sep-16

Project Planning Input

INVOLVE RIDERS AND STAKEHOLDERS IN PLANNING

The success of any planning effort is dependent upon the quality of the planning process. An inclusive planning process incorporates the input of a broad range of both technical and non-technical stakeholders to ensure that concerns are well understood and that solutions are well-supported. This project's coordination and outreach process included:

- Input received during the development of the region's long range plan, SmartMoves for a Changing Region;
- A broad stakeholder focus group of planners, advocates, residents, and businesses;
- A technical focus group of transit operators and service planners;
- A SPC staff project team of planners and engineers;
- An online survey based on a public engagement planning tool.

A TOOL FOR RIDER-DRIVEN PLANNING

Survey Development

An online public engagement planning tool was developed to help the public understand the technical concepts being studied and to elicit feedback and validation. The tool used a guided set of survey questions to understand:

- How do people move?
- How do they want to move?
- Where are people going?
- What are the barriers?

Survey Promotion

SPC and several of its partners distributed the survey via email and social media over the course of two months. In addition, SPC purchased geographically-targeted advertisements to encourage greater participation. The team also reached out to community leaders and garnered earned media. Additional outreach was targeted to low-response areas based on initial returns. One-week bus passes were donated by several transit agencies through a random drawing as an additional incentive.

ONLINE ENGAGEMENT RESULTS

Survey Reach and Response

The survey yielded 242 complete responses. Although this number of responses was too small for a statistical analysis at the regional level, survey responses were used to help guide, inform and validate the hub and corridor recommendations. Some examples include:

- A large cluster of responses selected the Butler/Allegheny County Route 8 corridor as a place they might take transit from. This corridor was also identified as an important connection. Furthermore, the Butler Transit Authority commuter routes were identified as important by respondents;
- Another connection that received a large number of favorable responses was between the cities of Greensburg and Pittsburgh;
- A point of strong consensus among respondents was that the cost of public transit is the most important consideration for whether or not it is helpful in their day-to-day lives. This helped inform concepts about how to balance issues such as transfers versus trip cost. For example, if transfers between routes or between transit providers cost the rider additional fares, those connections will not be well-utilized by the target customers. Also, fare-coordination and fare-sharing might enhance the usability of the overall transit system.
- Many of the open-ended comments provided validation or ideas for the project. For example, a comment from a Pittsburgh respondent about their desire to use transit to visit their family in Gibsonia not only suggests the importance of the Route 8 corridor, but also validates the need for Multimodal Hubs to allow transfers between the Butler Transit Authority and Port Authority of Allegheny County networks. Other comments validated the recommendations for Multimodal Hub elements.
- Details, including survey questions and screens as well as the full survey results, can be found in Appendix A.2 of this document.

Steering Committee Input

Prior to Project kick-off, SPC identified formation of a Steering Committee as an important element of the Project. Participants, which were comprised of management level and subject matter experts with vested interest in delivery of the Project and its outcome. Committee members, who are also listed in the acknowledgment of this report, represented the following agencies:

- Southwestern Pennsylvania Commission staff/team
- Port Authority of Allegheny County
- Pittsburgh Community Reinvestment Group
- Pittsburgh Downtown Partnership
- Butler County
- Washington County Transit Authority
- Westmoreland County
- City of Pittsburgh, Department of Mobility & Infrastructure

The Steering Committee's role was to oversee the Project's work plan, schedule, and deliverables, give strategic direction and identify Stakeholders to lend their "vital community voices" to the Project. Steering Committee members provided a list of Stakeholders and contact information to the Consultant team that was used to set up several workshops, conduct ancillary one-on-one discussions and disseminate a survey tool to their constituents.

The Steering Committee met three times during the Project, once in person (SPC's conference room at Two Chatham Center) and two by video/phone conference due to COVID-19 pandemic restrictions.

STEERING COMMITTEE MEETING #1

Tuesday, October 15, 2019; 10:00 a.m. to 11:30 a.m.

This meeting was typical of a project kick-off, consisting primarily of the Project's description, objective and desired outcome and the roles and responsibilities of Project team and Steering Committee. During the meeting, the Consultant team presented components of the work plan and the intention to culminate the Project with the following distinct products.

1. Short-Term (implemented < 1 year) recommendations for:
   a. Tactical projects
   b. Pilot projects
   c. Examples:
      Schedule adjustment/alignment between transit operators
2. Medium-Term (implementation 5-15 years) recommendations for:
   a. Strategic projects: initiatives that lead to other initiative
   b. Land Use
   c. Examples:
      Fare sharing
      Minor legislative changes
      Change in shared-ride legislation
      Design and implementation of a multimodal hub or improvements to a corridor.
3. Long-Term recommendations (implementation 15-25 years) recommendations for:
   a. Policies
   b. Example:
      Major legislative changes

A unique aspect of Meeting #1 was an exercise called "Hub & Corridor Mapping" during which the Consultant led Steering Committee members through a discussion about locations and features of logical hubs/corridors in the region. The notable hub locations offered by the Steering Committee are:

- Pittsburgh International Airport
- McKeesport Transportation Center
- Homestead/Waterfront (or similar shopping centers)
- Robinson Township/Town Center area
- Vandergrift
- New Kensington
- Greensburg
- Southpointe
- Bridgeville
- Waynesburg (where an interface with Mountain Line – Morgantown, WV can occur)
- City of Washington
- California
- Cranberry (specifically the Cranberry Springs/Cranberry Woods area)

Other important comments consisted of:

- When comparing parallel corridors, make sure equity is considered
- Reverse commute is an important aspect of the service and hub destination
- First-mile/Last-mile connections are critical, like with the Airport Corridor Transportation Association (ACTA) and Heritage Community Transportation (HCT)

STEERING COMMITTEE MEETING #2

Friday, January 10, 2020; 10:00 a.m. to 11:30 a.m.

The second Steering Committee meeting was as a phone meeting, however some participants joined in-person at SPC's office for the last time before the COVID-19 crisis emerged.

The main objective of this meeting was to present the Steering Committee with the Best Practices Summary Memo, obtain their feedback and discuss key hub, corridor and TOD approaches employed by other cities and agencies around the country. Participants discussed outcomes of the best practice research and examination of how eight peer regions have addressed regional transit through hub and corridor strategies, or through agency cooperation/coordination.

Secondarily, the Consultant illustrated and discussed with the Committee methodologies that would be implemented in the next parts of the Project, which consisted of:

- Cluster Analysis.
  A mapping exercise that identifies transit supportive land uses around candidate hub and corridor locations. The outcome will result in origins/destinations analysis using StreetLight travel data.
- Hub and Corridor Typology.
  Using results from the Best Practices Summary Memo and other input sources, the Consultant will create a typology of multimodal hubs and corridors. To classify land use clusters into transit hub types, the team would consider factors such as employment, population, and cluster morphology to sort clusters into distinct types or classes.
- Public Survey Tool.
  The Consultant described its development of a map-based tool to gather public input on multimodal hub and corridor typologies and locations.

STEERING COMMITTEE MEETING #3

Monday, November 2, 2020; 10:00 a.m. to 11:30 a.m.

The third and final Steering Committee meeting, which was held by video conference due to COVID-19, was intended to review and discuss the draft Final Report. Overall, the report was described as "a regional vision for public transit" intended to identify transit supportive land uses, categorize areas with transit potential, and connect them with multimodal hub and corridor project implementations. The result of the work, culminating in this report, offers places where multimodal improvements might make sense and ideas of what improvements might work in types of places throughout the region.

Steering Committee members lent their advice on the types of report formats that would be most useful to users and best ways to present the work. Focus was paid to ensuring that the final product would serve as a resource for action and not simply a report.

Stakeholder Input

More than 400 Stakeholders were identified by the Steering Committee as important to providing their ideas on seamless transportation links and coordination of multimodal solutions across the 10-county region. Originally, the plan was to convene Stakeholders by conducting two workshops: one workshop to introduce the Project and get input; and a second to review multimodal scenarios focusing on specific, future multimodal hub and corridor locations. But due to COVID-19 impacts, only one Stakeholders' workshop was able to be conducted.

STAKEHOLDERS GROUP WORKSHOP

Monday, November 18, 2019; 10:00 a.m. to 2:00 p.m.

Stakeholders Workshop #1 was held pre-COVID-19 at SPC's office. Twenty-seven people attended in-person and others participated by way of video/phone conference. The goal of the workshop was to obtain input from regional transit stakeholders to help answer important questions about multimodal hubs and corridors. Agencies represented at the workshop included:

- Airport Corridor Transportation Association (ACTA)
- Allegheny Conference on Community Development (ACCD)
- Allegheny County Economic Development (ACED)
- Allegheny County Health Department (ACHD)
- Allegheny League of Municipalities (ALOM)
- Beaver County Corporation
- Bike PGH
- Butler County
- Butler Transit Authority (BTA)
- Carnegie Mellon University (CMU)
- CONNECT
- Cranberry Township
- Freedom Transit
- Friends of the Riverfront
- Healthy Ride
- Housing Authority of the City of Pittsburgh (HACP)
- K2 Strategies
- Pittsburgh Community Reinvestment Group (PCRG)
- Pittsburgh Downtown Partnership
- Pittsburghers for Public Transit (PPT)
- Port Authority of Allegheny County (PAAC
- Quaker Valley Council of Governments (QVCOG)
- Sierra Club
- Sustainable Pittsburgh
- Tarquin Core
- Westmoreland County

After briefing Stakeholders on the Project's purpose and desired outcomes, the Consultants led the group through a series of poll questions to determine what they think makes a good hub and corridor, and priority hub/corridor locations and potential projects. A summary of Stakeholders' input includes the following:

What Makes a Good Hub?

- Having good connections is requisite for a hub
- Transfer capability
- Unified fare payment system
- Mobility as a service
- Equitable service and transfers
- Adequate access, i.e., sidewalks, curb space
- Transit supportive land uses
- Conveniently located (near affordable housing)

What Makes a Good Corridor?

- Trail networks and bike lanes
- Inter-community connectors
- Major road-based BRT
- Fixed guideways

What Are Your Top Priorities?

- Making sure service solutions come first because doing so addresses equity
- Acknowledging and understanding the divide between rural/urban transportation
- "Inclusion" at each hub location, especially Downtown Pittsburgh
- Recognition that corridors should not create a physical, functional, or socioeconomic barriers
- Reducing emissions by minimizing vehicle miles traveled
- Acknowledgment that transit is not cost-effective; it is a long-term capital and operational investment
- Economic development near transit
- Opportunity to generate return on investment

Transit Operator Input

TRANSIT OPERATIONS WORKSHOP

Virtual Workshop with Breakout Session, October 21, 2020

The COVID-19 pandemic impacted the timing and format of the Transit Operations Workshop, an essential element of SmartMoves Connections to obtain input from transit agencies' operations' personnel and verify the Project's process and outcome. The Workshop was conducted as a way to verify work accomplished to that point, review best practices, discuss hub and corridor infrastructure, and identify challenges and opportunities to implement and coordinate hub/corridor projects in Southwestern Pennsylvania.

Besides SPC, agencies represented at the Transit Operations Workshop consisted of:

- Airport Corridor Transportation Association
- Allegheny County
- Beaver County Transit Authority
- Butler County
- Butler Transit Authority
- City of Pittsburgh (Department of Mobility & Infrastructure)
- Freedom Transit
- Heritage Community Initiatives
- Indiana County
- Oakland Transportation Management Association
- PennDOT (Bureau of Public Transit)
- Pittsburgh Community Reinvestment Group (PCRG)
- Pittsburgh Downtown Partnership
- Port Authority (and Michael Baker International, their consultant for the NEXTransit Long Range Transportation Plan)
- Pittsburghers for Public Transit
- Westmoreland County

Breakout Session

The most enlightening segment of the Workshop was the breakout session, in which Cranberry Township was utilized as an example hub/corridor scenario, and participants were asked to deliberate:

- How a hub like one in Cranberry (a suburban automobile-based community) could function to coordinate multiple transit agencies and service types such as commuter, fixed-route, community, first mile/last mile and shared-ride?
- What facilities or amenities would make this hub most useful to riders and to transit operators?
- Where else in the region should a hub like this be implemented?
- How could fare payment systems be coordinated and how could processes be implemented so that payment is seamless and fair to transit riders and transit agencies?
- Who should coordinate, plan, design, construct, pay for and own a hub/corridor project like this?

At the end of the breakout session, each group reconvened for a whole group discussion, in which representatives from each breakout group presented highlights of their deliberations.

Hub Transit Service

- Cranberry is a pass-through location for commuters from the north going to Pittsburgh by car on I-79 or bus on New Castle Area Transit Authority (NCATA), and for commuters that might need to go to Cranberry or destinations north of Pittsburgh.
- Five of the region's transit agencies, consisting of Butler Transit Authority (BTA), Port Authority (PAAC), NCATA, Beaver County Transit Authority (BCTA) and Town & Country Transit (TACT), could potentially convene at a Cranberry hub and disperse riders throughout the region.
- Local, commuter, frequent, and express type services are all possible at this location.
- Transit agencies that provide commuter service like NCATA do not want to inconvenience their riders or assume additional operating costs to leave the highway to enter congested areas like Cranberry.
- Three primary types of transit service that could be implemented at a Cranberry transit hub consist of:
  - Commuter: Emphasizing speed, convenience, and price. Adding a freeway hub stop would not add to the travel time and could attract new riders that are destined for Cranberry. Existence of an under-capacity freeway gives this type of service the same level of infrastructure as a commuter rail or a freeway median BRT but with less cost.
  - Express: A Route 19 BRT system could have more frequent stops than Commuter service while increasing speed over current service and possibly being faster than automobile travel. Express service could facilitate TOD along Route 19 and could operate from Pittsburgh to Wexford and possibly to Zelienople. A stop at a Cranberry hub would offer Cranberry riders one-transfer access to destinations along Route 19.
  - First Mile/Last Mile (FMLM): Both Commuter and Express service would need a connector type service to get to local destinations in Cranberry. This FMLM service should be adaptable to changes in fixed-route service and changes throughout the community (such as new commercial and residential development) RideACTA provides a prototype for what FMLM could look like in Cranberry. The question, as always, is how would this new community service be paid for?
- An opportunity with the Cranberry scenario is to connect Cranberry to the west (i.e., Shell cracker plant near Monaca in Beaver County) by transit.
- There's also potential along Route 19, especially in terms of looking at this roadway in a new and different way.
- Integrated and improved scheduling software will give transit agencies tremendous flexibility coordinating and organizing trips for greater efficiency including an innovative feature that can shift a bus from one route to another on the fly.

Hub Land Use

- The predominant landuse in Cranberry is 'freeway interchange."
- While landuse in Cranberry is not particularly dense, the area benefits from continuous growth (i.e., growth mentality).
- Development is still occurring in and around Cranberry, which means there are opportunities for TOD and reasons for optimism.
- Cranberry is a destination that people from surrounding areas need to access for jobs, healthcare, and other reasons.
- Hub locations need to be near or integrated into places and destinations where riders want to go.
- Priority hubs should be constructed in communities that are economically stable and have key destinations (i.e., reasons people want or need to go there).

Hub Features

- Hubs should be located as close to the highway as possible; otherwise, there are too many intersections and delays that negatively impact operations.
- Hubs need to have mobility networks, accessways such as sidewalks, bike lanes and paths that enable connectivity from the hub to destinations throughout the local community.
- For riders, hubs should have bus shelters, restrooms, seating areas, food and beverage opportunities, lighting, safety including cameras, and destinations like grocery stores, childcare, healthcare, and other services nearby.
- For operations and operators, transit hubs should have comfort facilities with break room and restrooms, vehicle layover spaces, bus boarding areas.
- Comfortable amenities at hubs like ticket machines, snack vending machines, Wi-fi, charging plugs and heating and air conditioning are important.
- Every hub should have customer information like real time bus arrivals and departures, route maps, and system maps.
- Having Amazon package delivery and exchange lockers is a good idea.
- Bike share facilities and bike lockers should be standard hub features.
- It needs to be recognized that some people will access the hub by car, which might need to be accommodated with park-and-ride spaces.

Other Considerations

- What is the premise for needing or considering any multimodal hub?
  - Is it reactive in response to unmet demand? Or is it proactive to generate demand?
  - If unmet demand, does that demand stem from new commercial development; in other words, because of new employment opportunities or new residential development?
- It might be possible to locate a highway-based BRT station/hub on the Turnpike's property near Cranberry if the Turnpike relinquishes toll plazas after converting to cashless tolling.
- Another hub location might be the Beaver County Mall or under-used surface parking lots in that same area.
- The Cranberry hub and corridor concept could be implemented in Washington County in Freedom Transit's service area.
- Does Southwestern Pennsylvania have the type of development and highway infrastructure to implement hub/corridor solutions like the Flatiron Flyer in Denver?
- Should all/most corridors like Route 19 be equipped with Traffic Signal Prioritization (TSP) to improve operational efficiency?
- Should corridors that have existing development on both sides of the highway be evaluated for buses-only lanes with TSP?
- Are there benefits or trade-offs in trying to take advantage of the HOV lanes between Pittsburgh and the North Hills?
- Should hubs have off-board fare collection, which would offer more efficient loading and unloading?

Who "Owns" Any Particular Hub Project?

- Cranberry is in Butler County, so maybe it should be a Butler-led project.
- This is a difficult question to answer for the agencies outside Butler County without knowing current conditions in Cranberry or Butler County, resources available or what the future looks like.
- Maybe the most intelligent way to move regional hub/corridor projects forward is have an agency like SPC lead planning including preliminary design and operation concepts that examine different ways to serve a Cranberry (or other) hub.
- Contemplate other scenarios by identifying the pros and cons of other agencies like BTA or PAAC taking the lead.
- Without knowing the costs, benefits, resources, trade-offs, what cannot be accomplished without implementing a priority hub, and how it aligns with local, county, and regional goals, the transit agencies do not feel comfortable taking ownership or risks without due diligence and feasibility planning.
- During the workshop's summary exchange, transit agency participants identified SPC as the logical entity to take the next steps to advance Multimodal Hub and Corridor projects across the region. SPC's CEO indicated that this would be consistent with the agency's role.

4

Multimodal Hubs

OVERVIEW AND EXAMPLES

WHERE SHOULD HUBS BE LOCATED?

WHAT FACILITIES SHOULD HUBS HAVE?

MULTIMODAL HUB OPPORTUNITIES

What is a Multimodal Hub?

A multimodal hub is a public transportation facility that accommodates transfers between different modes of travel to provide improved access and selection to residents and commuters.

A bus stop in Uppsala, Sweden with a safe and welcoming sidewalk connecting to the broader community.
Image credit: Tony Mazzella

For Riders...

- Multimodal hubs provide a streamlined, comfortable, and welcoming experience.
- Multimodal hubs provide new connections between transit services that otherwise wouldn't be easy or accessible.
- Multimodal hubs provide connections to new places throughout the region, especially in concert with connected regional hubs.
- Multimodal hubs enhance accessibility and mode choice for all transit users.
- Multimodal hubs are integrated into a pedestrian and bicycle network to support active transportation options.

For Operators...

- Transfer platforms at multimodal hubs make it easier to coordinate services within a transit agency and with other agencies.
- Layover facilities and operator relief facilities at multimodal hubs make it easier to schedule service near where it is needed most.
- Multimodal hubs can be designed for ease of expansion to enable scalability over time.
- Multimodal hubs include facilities that enable integration with new transportation models including micro-transit and mobility as a service.

Planning for Multimodal Hubs

THERE ARE TWO DRIVING QUESTIONS FOR MULTIMODAL HUBS:

1: Where should hubs be located?

This project performed a detailed land use and density analysis that identifies unique "clusters" of transit-supportive activity. The cluster analysis uses a consistent dataset across the region and ignores jurisdiction and other artificial boundaries to provide a data-driven perspective about the places people live, work, and play.

Each of the clusters identified could be home to a multimodal hub facility, scaled to the kind of cluster type it has been assigned.

This analysis provides a comprehensive and regional overview of places where hubs could be located and it's up to regional planners, local authorities, and transit operators to decide where specific facilities should be built based on this new dataset.

2: What facilities should hubs have?

The kinds of facilities at a hub should be reflective of the kinds of activity that is anticipated to occur there. This anticipated activity is correlated to the kind of cluster in which a hub is located within.

For example, a hub in a county seat cluster will likely serve as the center of the county's transportation activity and would need facilities to accomodate transfers between local and regional routes; whereas a hub in a sprawling employment center cluster would need facilities to accomodate transfers from local transit to last-mile services to get people to their jobs.

This document provides guidance for the kinds of facilities appropriate for different types of places throughout the region.

Hubs in Our Region

Rochester, PA

Location:

Downtown Rochester, PA: a County Seat

Facility Highlights:

- Transfer platforms for local and regional routes
- Covered bus stop area with benches, lighting, and signage
- Easily recognizable facility with highly visible branding and signage
- Park-and-ride lot on site

Beaver County Transportation Authority (BCTA)[1] Connections to:

- Localities throughout Beaver County
- Downtown Pittsburgh via BCTA Route 1 and Route 4

Potential Enhancements:

Being in a county seat cluster, a hub in this kind of location could include additional rider comfort facilities and operational enhancements. Some of these could include:

- Real time arrival signage
- Climate-controlled waiting and ticketing areas
- Nearby places for food, drink, or other conveniences

Potential Connections:

- Connections to the Airport Corridor Employment Center Cluster
- Connections to a hub in Cranberry, enabling transfers to connect to New Castle, Butler, or the McKnight Road Commercial Corridor

1 *https://bcta.com/*

New Castle, PA

Location:

East Washington Street in New Castle, PA: a County Seat

Facility Highlights:

- Transfer platforms for local and regional routes
- Covered bus stop area with benches, lighting, and signage
- Park-and-ride lot on site

New Castle Area Transit Authority (NCATA)[2] Connections to:

- Localities throughout Lawrence County
- Downtown Pittsburgh and Pittsburgh North Shore

Potential Enhancements:

Being in a county seat cluster, a hub in this kind of location could include additional rider comfort facilities and operational enhancements. Some of these could include:

- High visibility branding and signage
- Real time arrival signage
- Climate-controlled waiting and ticketing areas
- Nearby places for food, drink, or other conveniences

Potential Connections:

- Connections to a hub in Cranberry, enabling transfers to connect to Rochester, Butler, the McKnight Road Commercial Corridor, or other routes to Pittsburgh
- Connections to Youngstown via NTC or another operator

2 *https://newcastletransit.org/*

Hubs in Other Places

Flatiron Flier: Denver, CO to Boulder, CO

The Flatiron Flier[3] is a highway-based Bus Rapid Transit service connecting Denver, CO and Boulder, CO and provided by the Regional Transportation District (RTD). Flatiron Flier Station areas between Denver and Boulder are integrated within the U.S. Route 36 highway right-of-way, allowing buses to provide service along the way with minimal impact to overall route speed and efficiency.

Station areas along the way and at each end of the route were developed in concert with local planning and redevelopment authorities to create dense and mixed-use transit-oriented communities.

Chapter 2 of this report goes into greater detail about this example under the heading "Highway-based BRT Corridor with Multimodal Hubs in Denver" (see page 46).

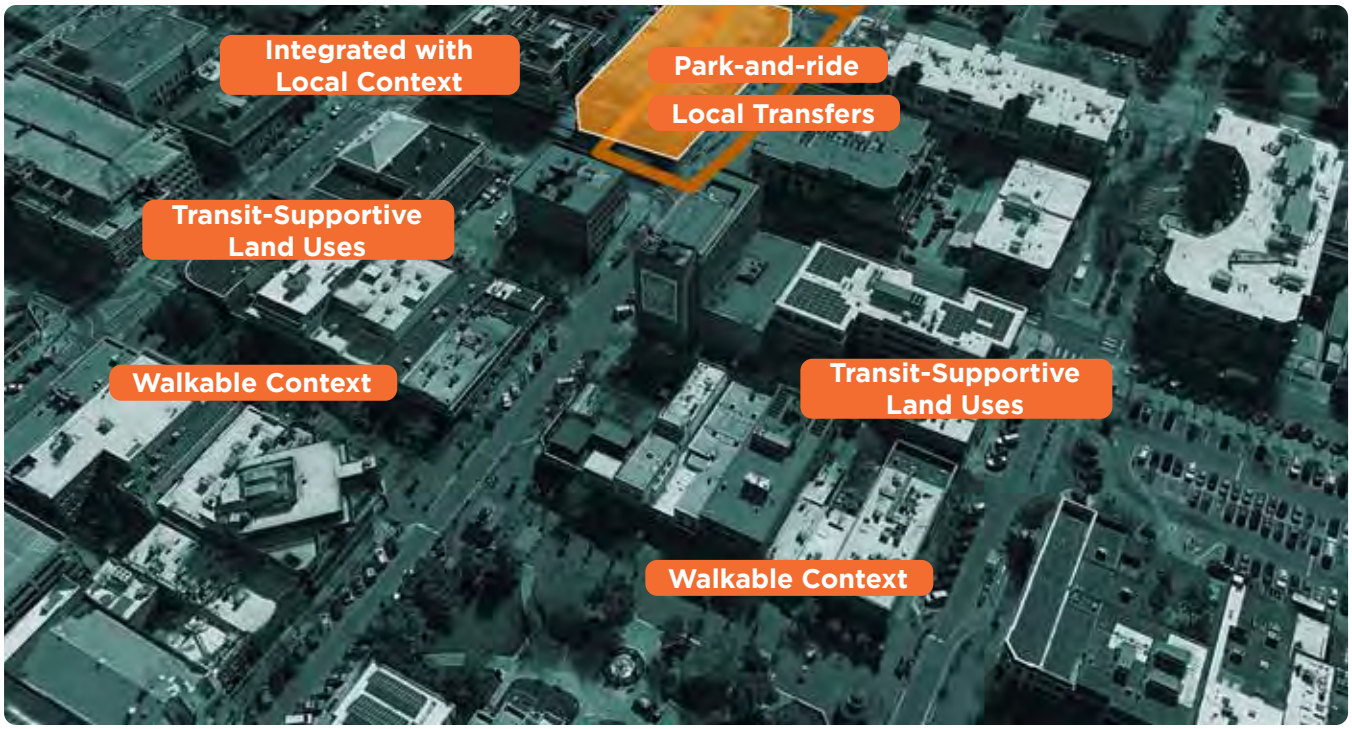
3 *https://www.rtd-denver.com/services/flatiron-flyer*

Highlights:

- Strong branding makes the Flatiron Flier easily identiable and an attractive alternative to other modes
- Transfer platforms for local and regional routes
- Transfer platforms for pick-up and drop-off
- Covered bus stop area with benches, lighting, and signage
- Station areas integrated with dense, walkable, and mixed use context, including newly developed sites
- Park-and-ride facilities integrated with station areas
- Each station area includes enhancements to local pedestrian and bicycle connectivity with bridges over the highway and connection to a bikeway running parallel to Route 36

Broomfield Station, Broomfield, CO

Boulder Transit Center, Boulder, CO



Transit-Supportive Land Use Cluster Analysis

STEP 1: ANALYZE

SPC Land Cover Data

Urban Footprint Land Use Data

Filter to medium and high density uses

STEP 2: CLASSIFY

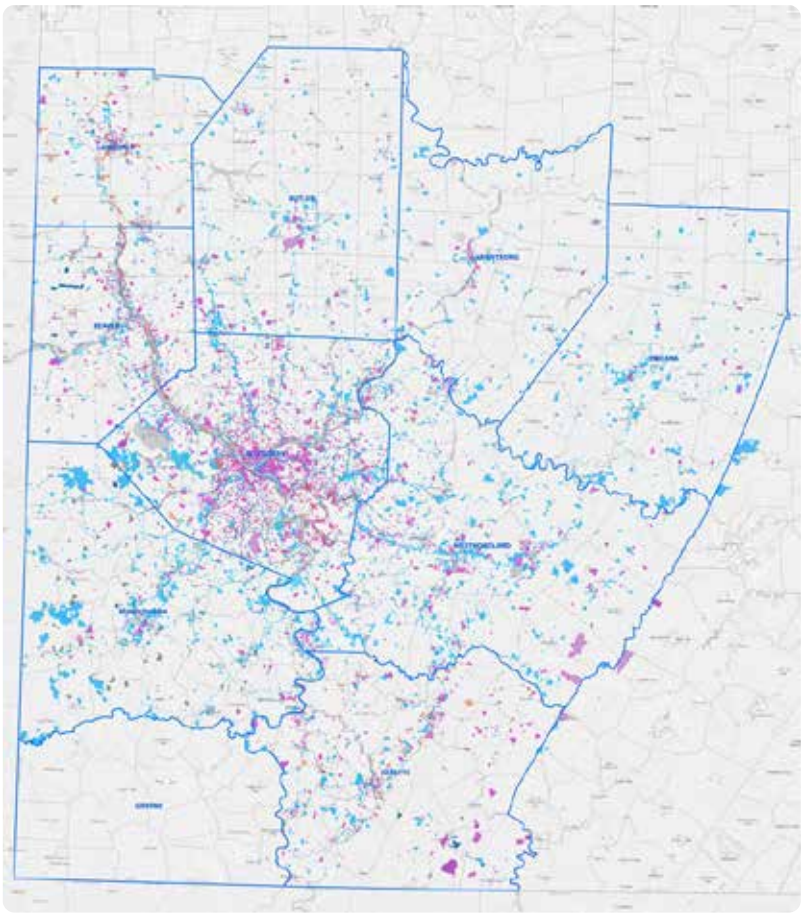
Census Data for Jobs and Population

Known Future Development Sites

Combine and align land cover and land use datasets to ensure consistent classification across the SPC region.

Overlay Census data to quantify the number of jobs and residents to the tract level. This will also be used to identify areas of relatively higher activity that could be hub locations outside of the identified urbanized areas.

Add in SPC's list of known future development sites, some of which may exist outside of the identified urbanized areas.



Raw land use data from Urban Footprint.

STEP 3: IDENTIFY

Combine Land Use Datasets

Correlate Buildings with Land Use

Open Street Maps Building Footprint Data

Correlate building locations with known land use overlays to affiliate buildings with use.

Identify Clusters

Use a cluster identification algorithm to computationally identify centers of commerce and activity. This algorithm operates agnostic of jurisdictional boundaries, instead looking for naturally occurring clusters and applying consistent analysis across the complete 10-county region. The algorithm takes into account existing buildings and known future development sites.

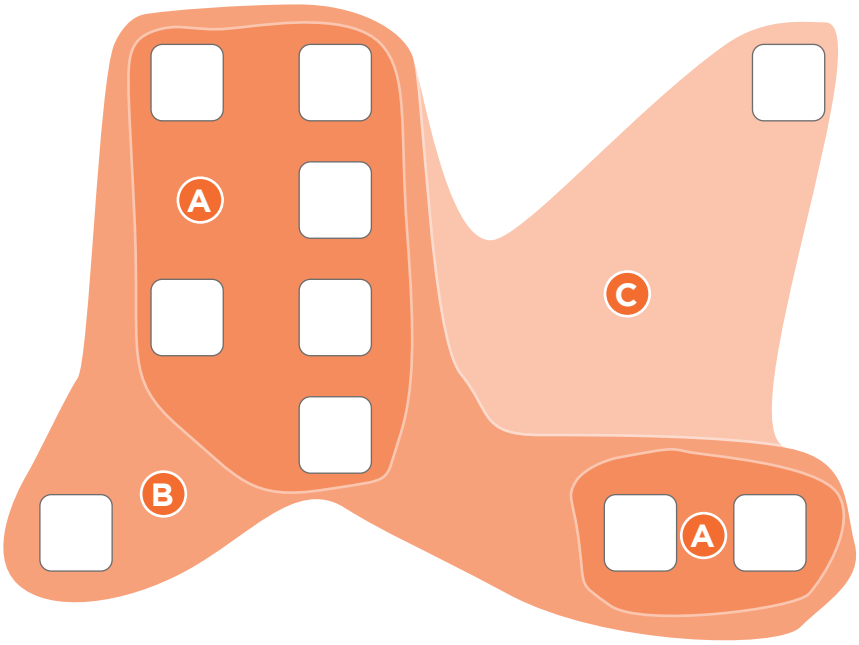
Calibrate Cluster Tightness

The cluster identification algorithm is then calibrated to expand or contract, determining the size of the areas of clustering. This impacts the number of clusters, the size of clusters, and the tolerance of inclusiveness of sites that are far from the center of the cluster. Calibration will consider the census-based demographics of the areas created to ensure that protected groups are being appropriately included in this analysis.

Cluster Map

A multimodal hub could be located in or near an identified cluster.

EXAMPLE:



Cluster Calibration:

A: Tightest Clusters
At a tight setting, the software identifies more and smaller clusters. This could be a business district where gaps between busy areas are not included in the cluster. A single downtown area could be broken into multiple smaller areas of activity.

B: Medium Tightness [Optimal]
At a medium setting, multiple smaller clusters are joined into one larger cluster. This setting is more inclusive of areas of activity such as job centers, businesses, or residential communities that might otherwise not be included, while still distinguishing between distinct activity areas.

C: Most Inclusive
At the most inclusive (i.e.: least tight) clustering setting, areas of activity that are further away would also be considered to be within a cluster. This can be especially helpful to achieving a roster of potential multimodal hub locations that appropriately serve protected groups.

Transit-Supportive Land Use Cluster Analysis

DETAILED METHODOLOGY

SUMMARY

For the purpose of identifying potential network hub locations for *SmartMoves Connections*, evolveEA developed a methodology for sorting and clustering land in the 10-county SPC region. The methodology makes use of Tax Parcel Land Use data provided by the vendor UrbanFootprint and Building Footprint data made available by Microsoft. These two layers were processed in ArcGIS Pro in order to highlight likely transit hub locations and this memo documents that process for reference or replication.

INPUT LAYERS

Tax Parcels by UrbanFootprint

The primary data used in this process is furnished by UrbanFootprint's Basemap Layer[4].

Building Footprints by Microsoft

For building footprint data the team used Microsoft's U.S. Building Footprint Dataset[5].

LAYER PROCESSING

1: Isolate Priority Land Use Types

The team determined that a subset of land use types are indicators for possible transit hub locations. These types were focused on mixed use, commercial, and office land uses and high density urban development.

Query Process:
The following land use types were queried to reduce the cluster search area:
Land Development | urban
Land Development | compact
L3 | mixed_use_commercial
L3 | mixed_use_residential
L3 | mixed_use
L3 | wholesale_warehousing
L3 | commercial
L3 | commercial_centers
L3 | office
L3 | accommodation
L3 | civic_facilities
L3 | hospitals
L3 | primary_secondary_education
L3 | emergency_services
L3 | special_use
L3 | military
L4 | bt__transit_station
L4 | bt__transportatoin_facility
L4 | bt__parking_structure
L4 | bt__parking_structure_mu
L4 | bt__parking_surface_lot
L4 | bt__airport

Output: SPC Parcels with Transit Oriented Use Types

4 *https://urbanfootprint.com/wp-content/uploads/2019/05/Parcel-Canvas-Creation-Methodology.pdf*

5 *https://github.com/microsoft/USBuildingFootprints*

2: Select Building Footprints for Priority Land Use Types

While land use indicates potential service hub regions, some parcels can be classified with desired use types while also having large portions of undeveloped land. In order to narrow the areas of interest, the team focused on buildings or structures that have desired use types. In order to identify buildings with use types of interest, a regional building footprints layer was trimmed down to only buildings that are sited within the parcels output in step one.

Query Process:
A spatial join between the Microsoft Building Footprints for Pennsylvania and SPC Parcels with Transit Oriented Use Types.

Output: SPC Buildings with Transit Oriented Use Types

3: Group Transit Oriented Buildings by Distance

The team determines that in order for a region to be suitable for transit hub consideration, there should be a density of transit oriented buildings greater than five within 1000ft of their nearest neighbor. To implement this requirement and generate the final cluster geometry, Density Based Clustering was used on the transit oriented buildings and the resulting clusters were buffered by 1000ft. These clustered and buffered buildings were then smoothed with a PEAK smoothing algorithm and holes were removed to finalize contiguous land use cluster polygons.
Query Process:

1. Density Based Clustering of Buildings using a DBSCAN method with a search distance of 1000 feet and a minimum feature count of 5.
2. Buffer clustered buildings by 1000 feet.
3. Smooth building buffer polygons with Polynomial Approximation with Exponential Kernel (PEAK) smoothing algorithm with a tolerance set to 3,000 feet.
4. Remove holes from smoothed polygons.
5. Manually split oversized clusters and divergent cluster geometries where necessary to disaggregate regions known to be dis-contiguous.

Output: SPC Transit Oriented Land Use Clusters

KEY TERMINOLOGY

Cluster

A geographic area identified in the cluster analysis that fits into one of six hub typologies. A multimodal hub should be carefully located within a cluster to meet the needs of that community and of the transit operators who might use the multimodal hub.

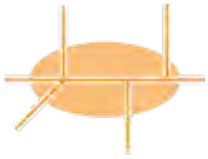
Cluster Analysis

This is the analysis used to identify possible hub locations. The cluster analysis looks for groupings of buildings and land uses to automatically generate geographic boundaries that may be transit-supportive. The cluster analysis then tabulates the number of residents, jobs, and buildings within the generated geographic boundaries to determine their hub typology.

Cluster Typologies and Classification

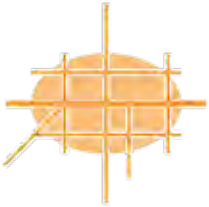
CROSSROADS

A "Crossroads" is a cluster with an area less than 0.5 square miles.
Examples: Most intersections along Route 8, Freeport, Trafford



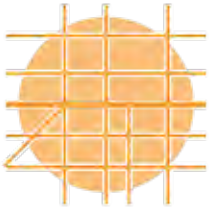
COMMERCIAL CORRIDOR

A "Commercial Corridor" is a cluster with an area greater than 0.5 square miles with an area-to-perimeter ratio of less than 0.2 (making it long and skinny) and either an estimated number of jobs less than 4,500 or an estimated employment density less than 5,000 estimated jobs per square mile.
Examples: Route 30, Oakmont, Tarentum-Brackenridge



DISTRICT

A "District" is a cluster with an area greater than 0.5 square miles that is not identified as a "Commercial Corridor" and has a ratio of estimated population to estimated number of jobs of greater than 0.4 or greater than 4 estimated residents per 10 estimated jobs.
Examples: Canonsburg, New Kensington, Kittanning



MAJOR DISTRICT

A "Major District" is a cluster with an area greater than 0.5 square miles that also has a sum of residents and jobs totaling more than 30,000.
Examples: North Shore, Strip District, Oakland, McKeesport

COUNTY SEAT

A "County Seat" is distinguished by its significance to the area around them. Often, county seats have established, walkable downtowns. County seats are central to their counties and their counties' transportation networks.

EMPLOYMENT CENTER

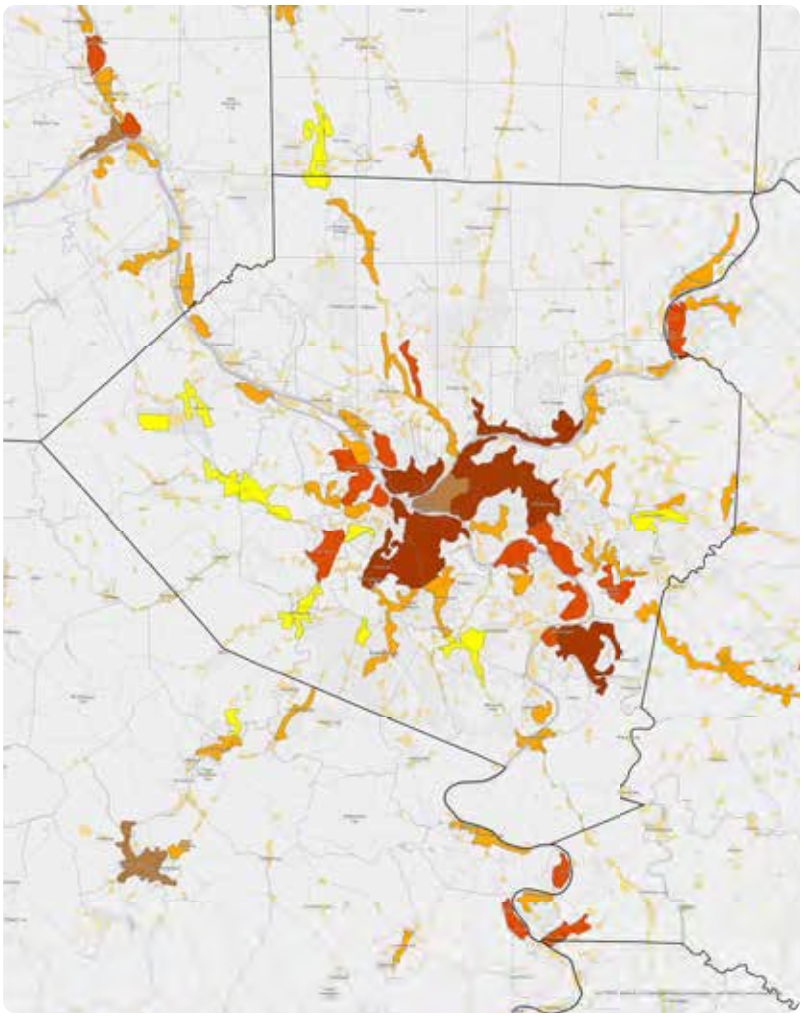
An "Employment Center" is a cluster with an area greater than 0.5 square miles that is not identified as a "Commercial Corridor" and has a ratio of estimated population to estimated number of jobs of less than 0.4 or less than 4 estimated residents per 10 estimated jobs.
Examples: Southpointe, Pittsburgh International Airport, Cranberry, Monroeville

In order to classify each land use cluster into transit hub type, the team considered factors of employment, population, and cluster morphology. These factors sorted out clusters into the following classes: Crossroads, Commercial Corridor, District, Major District, County Seat, and Employment Center. Some clusters required manual classification based on lack of data or jurisdictional considerations.

Classification Function:

```
#    KEY
# m   = Manual Class
# a   = Area
# apr = Area-Perimeter Ratio
# e   = Employment
# ed  = Employment Density
# pe  = Population and Employment Sum
# per = Population to Employment Ratio

# Classification Function
def code(m, a, apr, e, ed, pe, per):
    if m:
        return m
    if a< 0.5:
        return “Intersection”
    elif apr<0.2 and (e<4500 or ed<5000):
        return ‘Commercial Corridor’
    elif pe> 30000:
        return ‘Major District’
    elif per< 0.4:
        return ‘Employment Center’
    else:
        return ‘District’
```



Clusters by typology near Allegheny County.

Type	Quantity (visible)
Crossroads	649
Commercial Corridor	46
District	19
Major District	8
County Seat	3
Employment Center	10

Designing a Multimodal Hub

Cluster typologies not only inform where multimodal hubs should be prioritized, they also inform the types of features that should be included when a multimodal hub is designed. Different contexts have different applicability of features depending on operational and rider needs.

The Multimodal Hub Feature Applicability Matrix is a guide for designers to reference when considering the program for a new transit facility. For existing transit assets, the Matrix provides guidance for what features should be added or enhanced. For new transit assets, the Matrix sets a minimum standard for what features a hub should have depending on its type.

OPERATIONS FEATURES

Depending on its location relative to the overall transit network and depending on its typology, a multimodal hub can serve an important back-of-house role for transit agencies. Facilities to support operations such as layover areas and electric bus charging facilities can not only make current operations more efficient but can also make it easier for transit operators to add expanded or new kinds of service in the future. Facilities for operators themselves or for route coordination staff can enable greater flexibility in route scheduling.

Crucially, transfer platforms enable local services to access direct services and vice-versa. When micro-transit and on-demand services are considered in concert with traditional transit service, transfer platforms can expand the reach of local and regional bus routes in areas with multimodal hubs.

PUBLIC FEATURES

Public-facing features at multimodal hubs can make using transit and other mobility means easier and more attractive to riders whether they are making short trips within their area, commuting over longer distances, or are looking to connect to places across the 10-county region. The Multimodal Hub Feature Applicability Matrix sets a baseline of recommended features for hubs across typologies, ensuring that user expectations are met or exceeded at each stage of a rider's journey.

Accessibility

Across all typologies, standard and emerging accessibility features must be a principal consideration for designers. Multimodal hubs can play an important role in the daily lives of people with physical, sensory, and cognitive disabilities by ensuring a consistent quality of experience at every stage of their journey, in addition to providing expanded access to places served by accessible transit services.

Beyond regulatory compliance, our region's transportation assets should demonstrate a state of the art accessible user experience at every opportunity. Public transportation provides lifeline connections for people with disabilities who often have limited alternatives to access jobs, businesses, and services. With new accessibility technologies continuing to be developed and refined, multimodal hubs can be among the first civic facilities to adopt them and demonstrate their efficacy.

The FY2019-FY2022 Southwestern Pennsylvania Public Transit and Human Services Coordinated Transportation Plan was developed by SPC with support from the Alliance for Transportation Working in Communities. The coordinated plan's purpose was to enhance overall access, especially for transportation-disadvantaged populations, to public, private, and non-profit transportation services available in the region and to improve the efficiencies of these services through smart integration and effective utilization of resources.

Multimodal hubs can provide infrastructure that enables fixed-route, non-fixed-route, and human services transportation to function as a cohesive and integrated network.

Multimodal Hub Feature Applicability Matrix

	Category	Multimodal Hub Features	Crossroads	Commercial Corridor	District	Major District	County Seat	Employment Center
								
Operations Features	Operations	Layover area		○	●	●	●	○
	Operations	Electric bus charging		○	○	○	○	○
	Operators	Operator Restrooms		○	●	●	●	●
	Operators	Lunch room			●	●	●	○
	Operators	Operations Control Room			○	○	○	
	Operators	Operations Meeting Room			○	○	○	
	Safety	Security Cameras	○	○	●	●	●	○
	Transfer	Transfer: Micro-transit loading platforms		○	●	●	●	●
	Transfer	Transfer: Multiple bus loading platforms		○	●	●	●	○
	Transfer	Transfer: Facilities for accessible transportation	●	●	●	●	●	●
Public Features	Accessibility	Bluetooth Low Energy beacons	●	●	●	●	●	●
	Accessibility	ADA accessible sidewalks, crosswalks, curb ramps, and parking.	●	●	●	●	●	●
	Bicycles	Bike Racks	○	●	●	●	●	●
	Bicycles	Bike share	○	○	●	●	●	●
	Bicycles	Connectivity to a local bicycle network	○	○	●	●	●	●
	Bicycles	Connectivity to a regional bicycle network	○	○	●	●	●	○
	Bicycles	Electric scooter or electric bike share	○	○	●	●	●	●
	Comfort	Shelter	○	●	●	●	●	●
	Comfort	Seating and lean rails	○	○	●	●	●	○
	Comfort	Rider Restrooms			○	●	●	○
	Comfort	Indoor waiting area			○	○	○	○
	Convenience	Park-and-ride	●	●	○	○	○	○
	Convenience	Trash and Recycling	○	●	●	●	●	●
	Convenience	Ticket Vending Machine (TVM)	○	○	●	●	●	○
	Convenience	Grocery or convenience store		○	●	●	●	○
	Convenience	Passenger vehicle pick-up and drop-off		○	●	●	●	●
	Convenience	Visitor Information			○	●	●	
	Lifestyle	Transit-Oriented Development		○	●	●	●	○
	Lifestyle	Cafe or restaurant		○	○	●	●	○
	Lifestyle	Play area or features			○	○	○	
	Safety	Lighting	●	●	●	●	●	●
	Safety	Paved bus stop connected to sidewalks	●	●	●	●	●	●
	Signage	Branding	●	●	●	●	●	●
	Signage	Timetables and routes	●	●	●	●	●	●
	Signage	Wayfinding	○	●	●	●	●	○
	Signage	Real time arrival information	○	○	●	●	●	○

○ *Optional Features* ● *Recommended Features*

Designing a Multimodal Hub

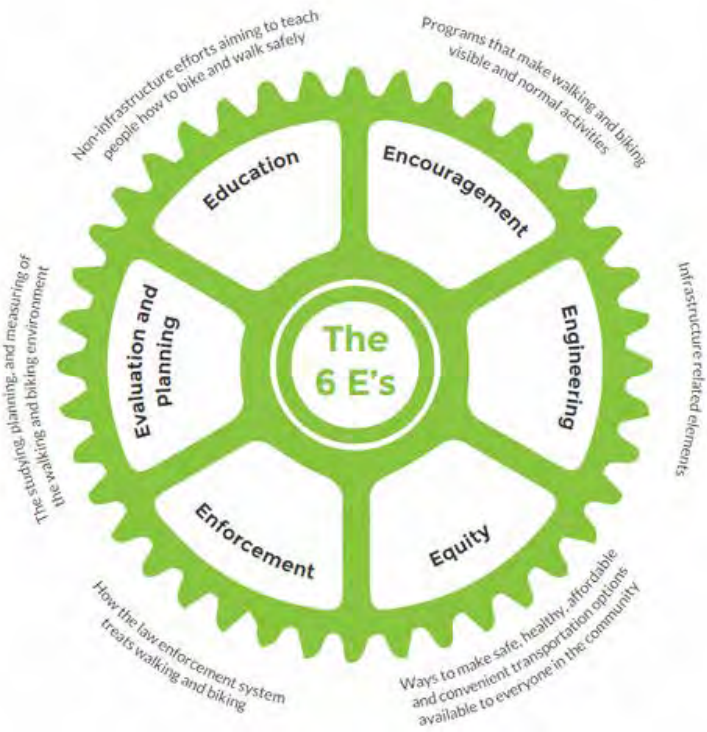
Walkability & Safe Cycling

Pedestrian paths and areas are essential within the hub as well as connection points to neighboring residential or commercial districts. While ¼ to ½ mile is the generally the distance a person will choose to walk to access transit, that distance can increase for premium modes like rail or express bus. Crime Prevention Through Environmental Design (CPTED[6]) should be followed to ensure that factors like lighting and landscaping are added with the pedestrian's safety in mind. Lastly, space for pedestrians to wait (and potentially crowd at peak travel times) should be planned for to avoid conflicts between vehicles and passengers waiting too close to the curb or in the lane.

Bicyclists should also have a connected network to enter, exit and travel throughout the hub. When possible, bike lanes should be separated from pedestrian facilities. While it may be safest for bicycles to share the vehicle travel lane in a slow-speed hub, signage (i.e., "Bicycles sharing lane") and sharrows should communicate that design to all users. In areas where bicyclists must use a pedestrian space, policy and signage should support the bicyclist walking their bicycle within that area.

SPC's Active Transportation Resource Center provides the public and planners with resources for active transportation throughout the region, including the Regional Active Transportation Map and the Regional Sidewalk Inventory. Their policies, programs, and initiatives work to address the "Six E's" to create more walkable and bike-able communities throughout the region.

Active transportation is an important consideration when planning for multimodal hubs as a well developed pedestrian and cyclist network can make it easier for people to move from the hub to their home, job, or other destination.



6 https://www.cpted.net/

Signage

Digital signage provides plenty of great uses in the transportation industry and is no longer just about wayfinding and scheduling solutions. Today, LED bus destination displays and other forms of digital signs found outdoors—particularly in transit depots, pedestrian areas, and even on-board public transportation vehicles (for example, the ubiquitous bus destination sign) are extremely useful for all kinds of public information. Established transit sign companies like Transign have witnessed great developments in the role of digital signage displays within the transportation industry. They supply various products in the form of passenger information systems and other types of transit signs to transportation companies and public transit operators.

Beyond their typical use as informational displays, LED signs can be utilized in the transportation industry in many creative ways. No longer are LED bus destination displays only used for destination information. New uses include:

- In-transit communication
- Waiting area displays
- Branding tools
- News feed displays
- Travel experience optimizers
- Advertising

Creating a connected hub means that the user can receive and provide feedback through their personal device as well as physical electronic signage. Utilizing available cell phone data or directly surveying users can help identify what trips users are making and what alternatives they would consider taking.

Technology also opens the door for advertising revenue or cross-promotional opportunities with area businesses. Using a simple Bluetooth beacon, for instance, allows marketing messages to be sent across various apps and platforms based on proximity to that beacon. In addition to the revenue opportunity, this technology could be used for user navigation as well. Creating a comprehensive communications plan that includes the transit partners would allow for a user to become engaged with hub messaging even before they arrive at the station.

Supporting a Transit Lifestyle

Multimodal hub features that focus on comfort and convenience are important to making transit and other non-single-occupancy-vehicle modes a well loved part of the daily lives of people throughout the region. In particular for hubs where transfer activity is expected and encouraged, indoor waiting areas and restrooms can make a positive impact. Co-locating multimodal hubs with convenient amenities such as grocery stores, coffee shops, pharmacies, or restaurants can make it easier for riders to conduct essential business while engaging in multimodal transportation. For this reason, locating hubs convenient to existing community amenities should be a key consideration in the hub planning process. Where such amenities are not walkable to the multimodal hub, a Transit-oriented Development plan should be developed that includes a mix of retail, commercial office or light industrial, and residential.

Safety

Safety at and near multimodal hubs should be taken for granted by riders and operators alike. Safety features should address three goals:

1. Ensure safety of vehicles utilizing facility with safe intersections, driveways, crosswalks, and sidewalks to prevent collisions between vehicles and especially with pedestrians. As much as possible, eliminate vehicle-pedestrian conflicts by creating a contiguous and dedicated pedestrian area that accesses all site features.
2. Ensure personal safety from petty or violent crime. Crime Prevention Through Environmental Design (CPTED[7]) should be followed to ensure that site design elements create a space that both discourages crime and feels safe to users.
3. Ensure security of the facilities themselves. Designers should select robust materials that resist tampering, vandalism, graffiti, or theft.

7 https://www.cpted.net/

Designing a Multimodal Hub

Planning for Future Mobility Needs

Multimodal hubs are often defined as areas where a variety of sustainable transportation modes connect seamlessly. As such, hubs present an opportunity to integrate mobility options that utilize new transportation technology to help enhance user experience and travel resiliency to help cover first-mile/last-mile travel. Based on these existing definitions, the core components of mutlimodal hubs include being near a major transit station, providing a variety of sustainable transportation options, and being surrounded by areas with high residential and employment density.

There is a great opportunity to plan for the latest trends in mobility, from Transportation Network Companies (TNCs) to scooters, from the start without having to retrofit existing facilities to deal with this relatively new source of congestion and safety concerns. In addition to planning for today, it is important to be ready for tomorrow. This could include making spatial accommodations for additional data and electric wiring capacity. Parking should be laid out in a way that potentially allows for repurposing if capacity needs decrease over time. The hub can also be made more resilient in the design process by avoiding drastic prioritization of a specific mode or choosing public art and themes that are not overly attached to today's preferences.

Micro-mobility

A fast-growing set of services are challenging "gigantism" in transportation in the form of personal, often single-occupant cars and championing the virtues of smallness. Electric scooters, docked and dock-less shared bikes, and other vehicle types are shrinking the physical footprint needed to move people over relatively short distances. Collectively dubbed micro-mobility, these services have resonated with consumers, as evidenced by their rapid adoption over just the past year. They have the potential to better connect people with public transit, reduce reliance on private cars, and make the most of existing space by "right-sizing" the vehicle, all while reducing greenhouse gas emissions.

To combat consumer preference to park a bike or scooter close to their next mode of transport, mandating vendors that provide for physical docking or are able to utilize a geo-fence to incentivize users to park their vehicle in a designated area would be essential to maintain safety and access.

For users that may arrive on their own personal bicycle or scooter, lockers should be made available for secure storage. Traditionally, users provide their own lock and capacity is first-come, first-serve, but e-lockers are a newer option that allow users to leave their own lock at home and open up the opportunity for revenue and data collection. Lastly, access to charging stations would be an amenity for users arriving on personal electric micro-mobility vehicles.

Transportation Network Companies (TNCs)

Creating a separate area for all shared-mobility options (including carpool and vanpool) that feature frequent pick-ups and drop-offs would be helpful. Signage for wayfinding, staging, and safety messaging will continue to be important when facilitating loading opportunities among TNC vehicles.

Outside of the built environment, consideration for investments in wireless internet and data services as well as regulation around curb space usage and potential revenue-sharing opportunities should be included in the planning process.

Car-share and Ride-share

Car-share is an amenity that allows users to access a vehicle on a short term basis (usually by the hour). In most markets, car-share vendors require that the vehicle be returned at its starting point, which makes it a solution for short round-trips, but not a competitive option for first or last mile needs. Parking stalls reserved for car-share vehicles should be clearly signed.

Traditional ride-share, including carpools and vanpools should be planned for in multiple ways. A kiss-and-ride lane would plan for pick-up and drop-offs at the hub. For groups that may be using a shared vehicle as a last-mile (from transit to a worksite for instance), dedicated parking should be considered. Coordination with any local ride-matching or transportation demand management services should be done to promote ridesharing as an alternative for users that are arriving in their own vehicle through signage or on-site promotions.

SPC's CommuteInfo program helps commuters and employers find alternative options for getting to work or school by promoting carpooling, public transit, vanpooling, cycling, or walking.

Multimodal hubs can make it easy for commuters to find a commuting alternative that fits their needs by providing park-and-ride facilities at key locations, providing dedicated support facilities for vanpooling, and by providing well-coordinated transit services between regional operators.

commuteinfo.org
a better way to work

Multimodal Hubs Prepare Us for the Future

The opportunity here is worth restating: Create a transit hub that accounts for all of the latest mobility options and is adaptable to what is coming next. Incorporating partners and vendors that are able and directed to share data regarding user behavior and preferences will be the key to staying on top of a quickly-changing environment. Combining data sets like scooter routes taken or ride-share inquiries made with direct consumer surveys or appropriate cell phone tracking can assist not only in making the hub a relevant and convenient service, but can also assist in planning at a local and regional level. The hub's potential to reduce congestion, improve air quality and save residents money should be celebrated and shared with all stakeholders.

Allegheny County

County Highlights

4

Allegheny County is largest in number of jobs and population, has the most developed transportation network in the region, and is the center of the region geographically, economically, and for cultural amenities.

Within the core of the county, the City of Pittsburgh features the highest density clusters in the region with the downtown area identified as a County Seat cluster and with the East End, North Shore, and South Hills being identified as Major District clusters. These areas are already well-served by Port Authority's bus and light rail transit routes, which includes express, rapid, local, and feeder routes.

Amtrak and national bus services are centered in Downtown Pittsburgh and Pittsburgh International Airport is in the western part of the county.

Hub Opportunities

1

County Seat: Downtown Pittsburgh

As the center for the majority of the region's transit activity, downtown Pittsburgh is an ideal candidate for an upgraded multimodal hub. Many transit routes from regional operators already serve downtown in the Penn Station area. Investment in an easily-identifiable and fully-featured multimodal hub at this location is recommended.

2

Major District: Oakland and East End

As the second largest jobs center, this is a key location for commuters within and outside of Allegheny County. It is well-served by Port Authority and the new BRT will make connections to the region possible via downtown. However, operators may consider serving Oakland directly without transfers in downtown.

3

Major District: McKeesport

Further investment in the McKeesport Transportation Center could enable greater connectivity to Allegheny County for the Mon Valley and for parts of Westmoreland County.

4

District: New Kensington

A hub in New Kensington, though in Westmoreland County, could serve the Allegheny Valley, enabling better connectivity for communities in Allegheny, Butler, Armstrong, and Westmoreland counties.

5

District: Carnegie

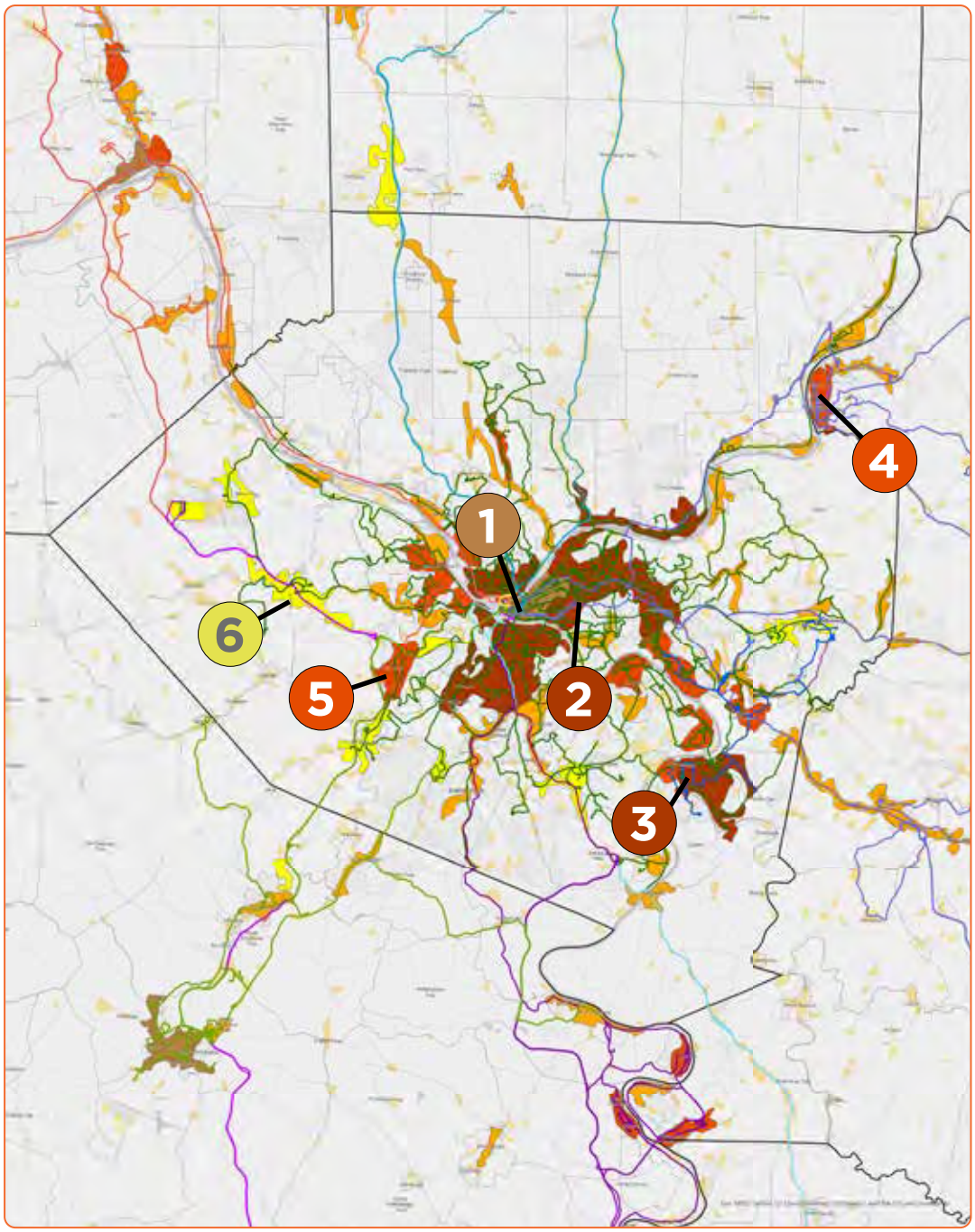
Planned renovations to the Carnegie Park-and-ride include new layover capacity that could support coordination of routes from Beaver and Washington Counties with Port Authority's West Busway service.

6

Employment Center: Airport Corridor

A highway-based multimodal hub on I-376 could enable transfers from high-speed PAAC and BCTA buses to ACTA's local vehicles without requiring buses to exit the highway.

Allegheny County Hub Opportunities



Clusters by typology with existing transit routes highlighted.

Armstrong County

County Highlights

Armstrong County is comprised of a County Seat cluster at Kittanning and a few commercial corridors near Kittanning and along the Kiskiminetas River. Town and Country Transit (TACT) serves the Kittanning area, but there is limited connectivity with the adjacent counties.

Hub Opportunities

1

County Seat: Kittanning

An improved multimodal hub in Kittanning could enable transfers to transit service reaching Allegheny County, Westmoreland County, and Indiana County.

2

Commercial Corridor: Leechburg

Transit facilities in the commercial core of Leechburg could enable new service either by Town and Country Transit (TACT) or by Westmoreland County Transit (WCTA). Such service should be connected to the District cluster at Vandergrift on the other side fo the river.

3

Commercial Corridor: Apollo

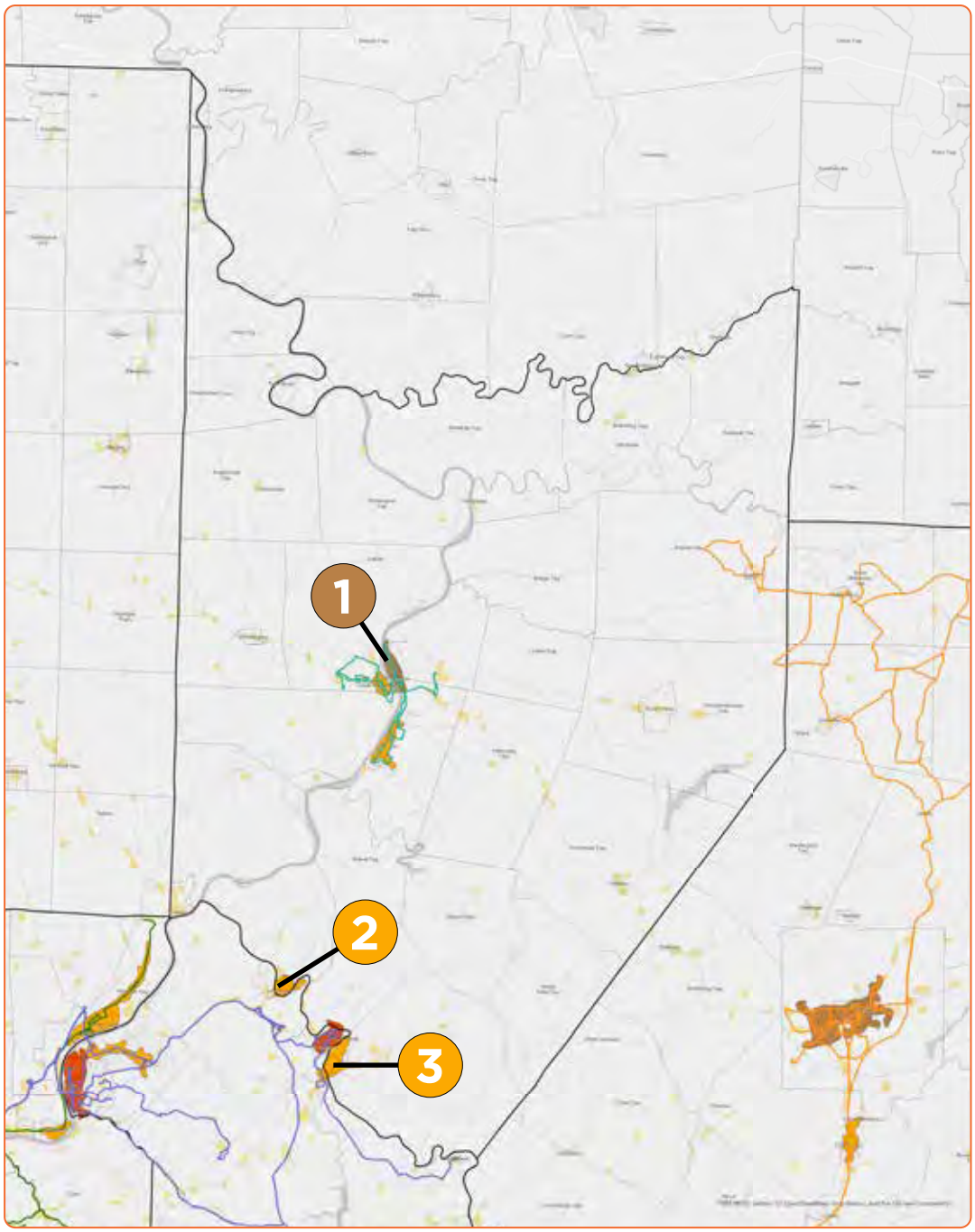
Transit facilities in the commercial core of Apollo could enable new service either by Town and Country Transit (TACT) or by Westmoreland County Transit (WCTA). Such service should be connected to the District cluster at Vandergrift on the other side of the river.

4

Crossroads: Wherever there is Service

Crossroads clusters with transit service in Armstrong County should be improved to meet the minimum standards recommended in the Multimodal Hub Feature Applicability Matrix.

Armstrong County Hub Opportunities



Type

- Crossroads
- Commercial Corridor
- District
- Major District
- County Seat
- Employment Center

Clusters by typology with existing transit routes highlighted.

Beaver County

County Highlights

Beaver County is comprised of a County Seat cluster at Beaver, District clusters at Rochester and Beaver Falls, and Commercial Corridor clusters along the Beaver River and Ohio River.

In Beaver County, transit service is centered not in the County Seat cluster of Beaver, but in the adjacent District cluster of Rochester where Beaver County Transit Authority's main transit center is located.

Hub Opportunities

1

District: Rochester

As shown in the example on page 94 in this chapter, Beaver County's center of transit operations is in Rochester at a well-established transit center. This transit center could be improved to include the recommended features of a hub in this location. Future connections could include Cranberry and New Castle via Ellwood City.

2

County Seat: Beaver

As the county seat and a cluster of notable size for the county, Beaver should see improved transit facilities wherever there is service.

3

District: Beaver Falls

A district of notable size, Beaver Falls has seen recent improvements to walkability, including a road diet. Further improvements to transit facilities would capitalize on this trend.

4

Commercial Corridor: Ambridge

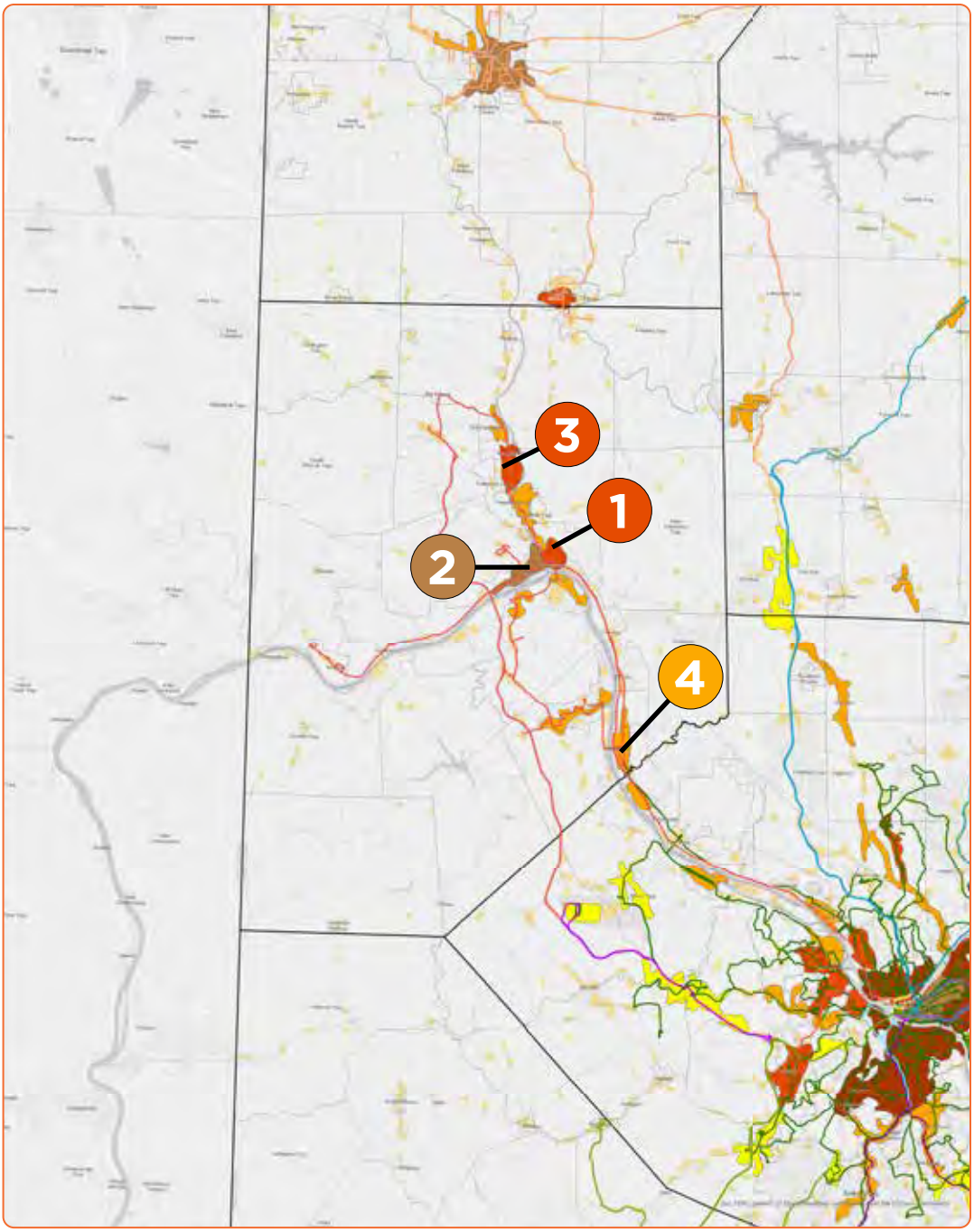
At the edge of Beaver and Allegheny counties, the existing park-and-ride facility in Ambridge could be the focus for an improved hub that enables transfers between BCTA and PAAC services.

5

Commercial Corridors and Crossroads: Wherever there is Service

Commercial Corridors and Crossroads with transit service in Beaver County should be improved to meet the minimum standards recommended in the Multimodal Hub Feature Applicability Matrix.

Beaver County Hub Opportunities



Type
- Crossroads
- Commercial Corridor
- District
- Major District
- County Seat
- Employment Center

Clusters by typology with existing transit routes highlighted.

Butler County

County Highlights

Butler County is comprised of a County Seat cluster at Butler, a regionally significant Employment Center cluster at Cranberry, and Commercial Corridor Clusters at Zelienople, Meridian, and Mars.

In Butler County, Butler Transit Authority (BTA) operations are centered at Butler with longer routes connecting Butler to Cranberry via State Route 68 and to Pittsburgh via State Route 8.

Hub Opportunities

1

Employment Center: Cranberry

A multimodal hub at this location, implemented with direct access to I-79 and State Route 19, could allow Cranberry to act as a hub with regional connectivity to Butler, Allegheny, Lawrence, and Beaver counties. Such a hub should be planned in concert with Transit-oriented Development. The hub should be designed with ample transfer and layover capacity to enable both high-speed and local transit routes to serve the facility.

2

County Seat: Butler

Recently, improvements have been made to the transit center in Downtown Butler and to the Pullman Center, including a project that will extend sidewalk connections. More investment in other recommended features will enhance the usability of these Multimodal Hubs.

3

Commercial Corridor: Zelienople

Transit facilities in Zelienople could enable transit service from Lawrence County to make a quick stop in the community and could enable transit service to Cranberry and Butler.

4

Crossroads: Route 8

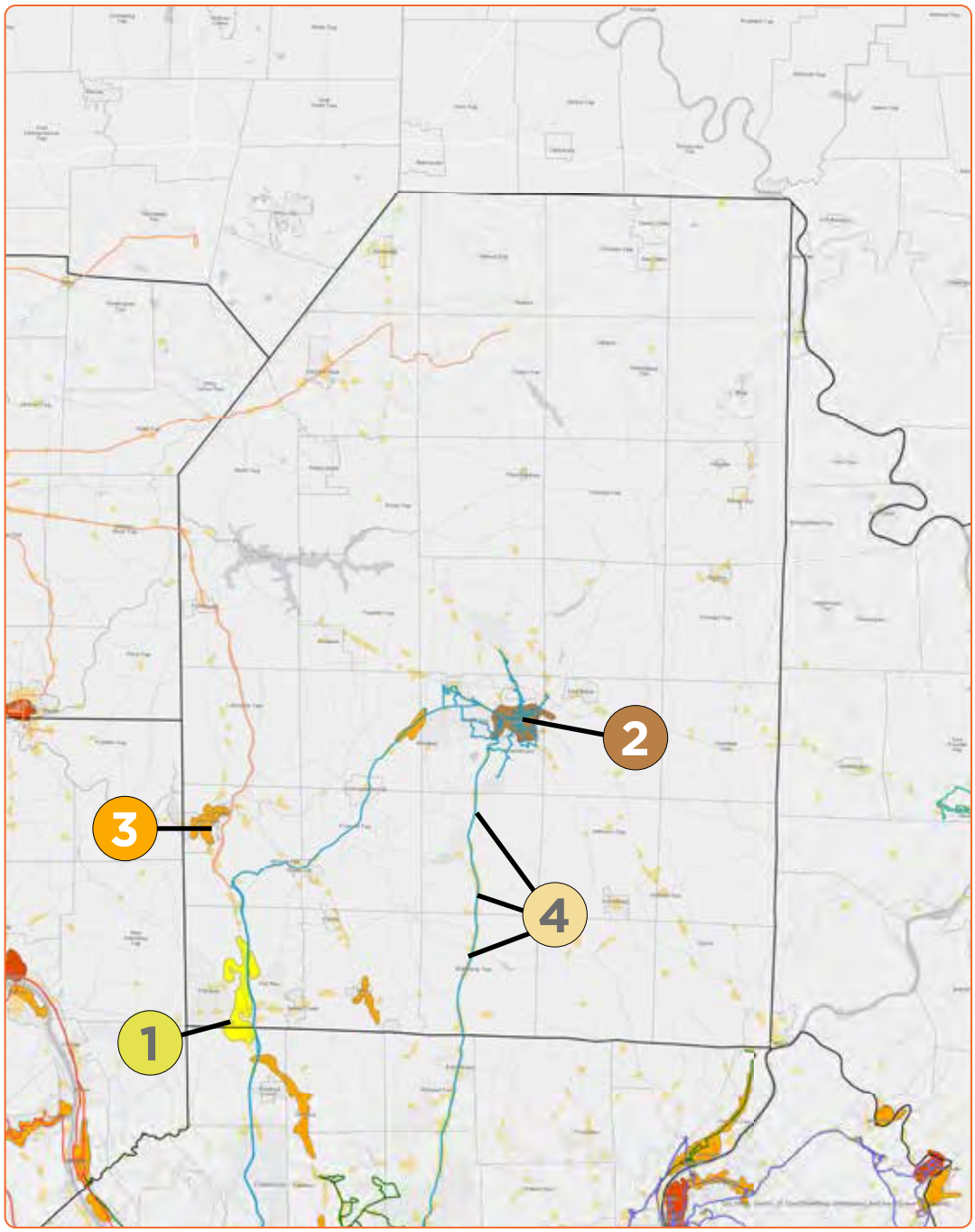
Though not large contiguous clusters of activity were identified along State Route 8, there is a consistent array of Crossroads clusters along this route. Survey respondents from Butler County selected these places as being important for them to connect to. Each of these Crossroads should include bus stops that meet the recommendations in the Multimodal Hub Feature Applicability Matrix.

5

Commercial Corridors and Crossroads: Wherever there is Service

All other Commercial Corridors and Crossroads with transit service in Butler County should be improved to meet the minimum standards recommended in the Multimodal Hub Feature Applicability Matrix. In particular, a hub in Mars could enable service that is currently not available.

Butler County Hub Opportunities



Clusters by typology with existing transit routes highlighted.

Fayette County

County Highlights

4

Fayette County is comprised of a County Seat cluster at Uniontown, a District cluster at Connellsville, and Commercial Corridor clusters at Wheeler, Brownsville, and Masontown.

In Fayette County, Fayette Area Coordinated Transportation (FACT) is centered at Uniontown with routes that reach throughout the county.

Hub Opportunities

1

County Seat: Uniontown

A multimodal hub in Uniontown with all of the recommended hub features would serve as the center for the county's operations and enable connections to Washington, Westmoreland, and Allegheny counties.

2

District: Connellsville

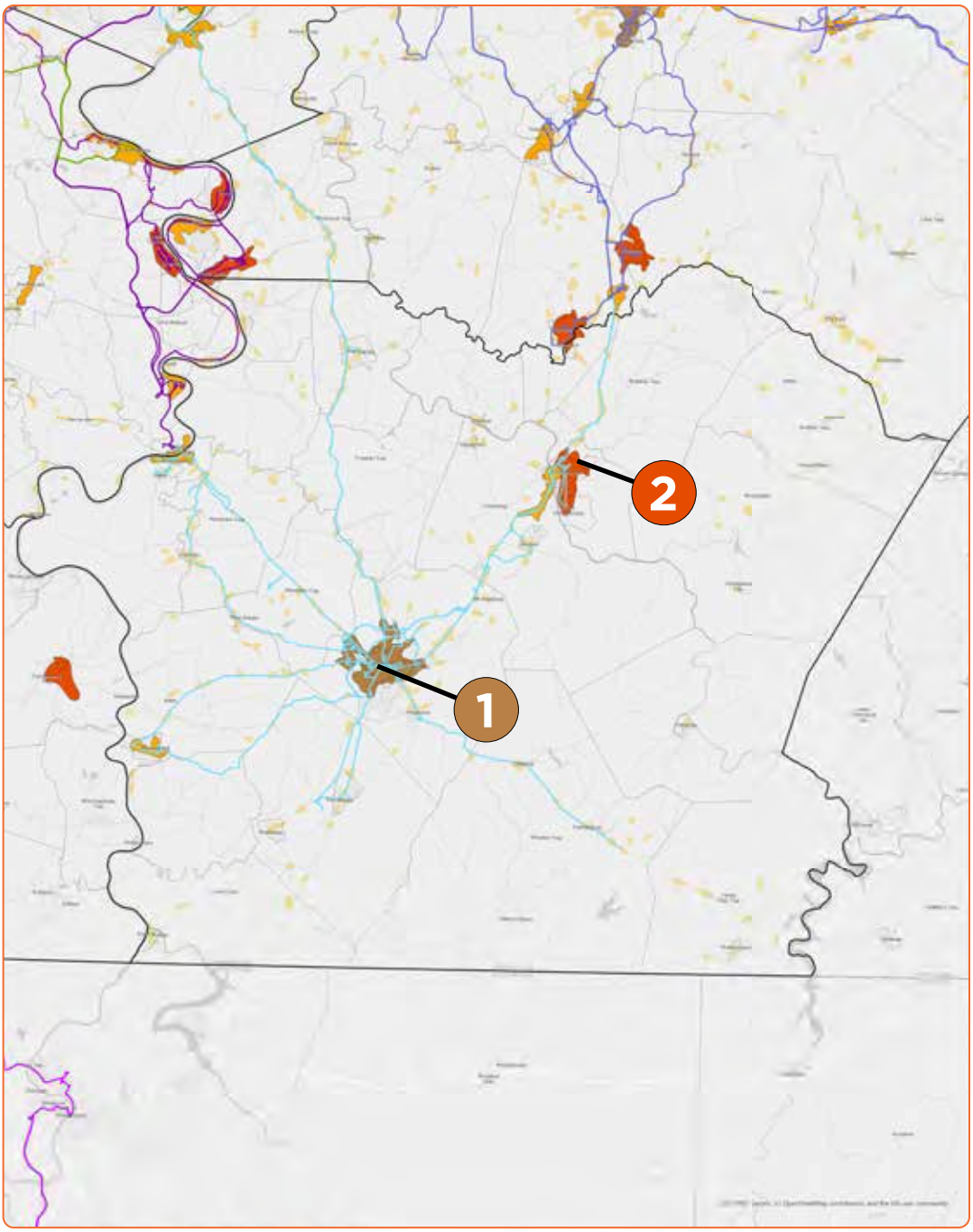
A multimodal hub in Connellsville would better enable connectivity between Fayette and Westmoreland counties. A hub co-located with the existing Amtrak station could enable better connections across the region and outside of the region, especially if passenger rail service were to be expanded.

3

Commercial Corridors and Crossroads: Wherever there is Service

All other Commercial Corridors and Crossroads with transit service in Fayette County should be improved to meet the minimum standards recommended in the Multimodal Hub Feature Applicability Matrix.

Fayette County Hub Opportunities



Type

- Crossroads
- Commercial Corridor
- District
- Major District
- County Seat
- Employment Center

Clusters by typology with existing transit routes highlighted.

Greene County

County Highlights

4

Greene County is the region's most rural and does not have its own transit operator. There is a County Seat cluster at Waynesburg and District clusters at Mt. Morris and Carmichaels.

Though the Mountain Line from Morgantown to Pittsburgh passes through Green County, it makes no stops. There could be an opportunity for this route to make stops in Waynesburg and Mt. Morris if facilities were created to enable that route to make a stop with minimal disruption.

Hub Opportunities

1

County Seat: Waynesburg

A multimodal hub near Waynesburg along I-79 could enable buses on I-79 such as the Mountain Line to make a stop and connect with park-and-ride users.

2

District: Mt. Morris

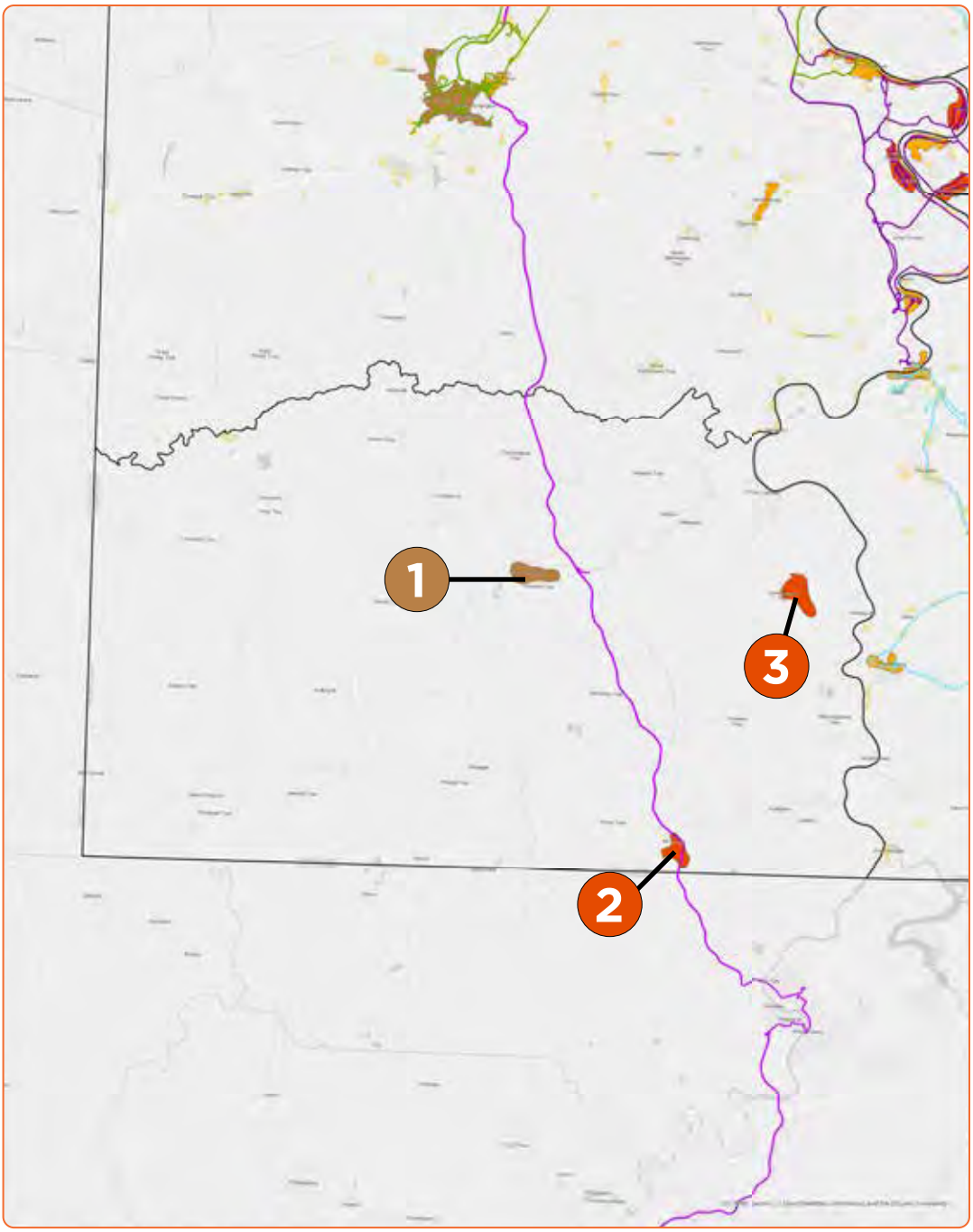
A multimodal hub near Mt. Morris along I-79 could enable buses on I-79 such as the Mountain Line to make a stop and connect with park-and-ride users.

3

District: Carmichaels

A multimodal hub in Carmichaels could enable buses from Fayette County to serve this location via the commercial corridor cluster at Masontown.

Greene County Hub Opportunities



Type
- Crossroads
- Commercial Corridor
- District
- Major District
- County Seat
- Employment Center

Clusters by typology with existing transit routes highlighted.

Indiana County

County Highlights

4

Indiana County has a County Seat cluster at Indiana and Commercial Corridor clusters at Homer City and Blairsville.

Indiana County Transit Authority's (IndiGO) operations are centered at Indiana, PA with a route to Greensburg via State Route 119 and routes reaching throughout rural parts of the county.

Hub Opportunities

1

County Seat: Indiana

A multimodal hub in Indiana with all of the recommended hub features would serve as the center for the county's operations and enable connections to Westmoreland and Allegheny counties. Indiana is a dense and walkable cluster, especially close to Indiana University of Pennsylvania.

2

Commercial Corridor: Blairsville

Improved transit facilities in Blairsville should be located in a walkable location relative to the assets in the Borough's core while minimizing service impact on the pass-through transit routes. A hub in Blairsville could enable service between Indiana and Westmoreland counties.

3

Commercial Corridor: Homer City

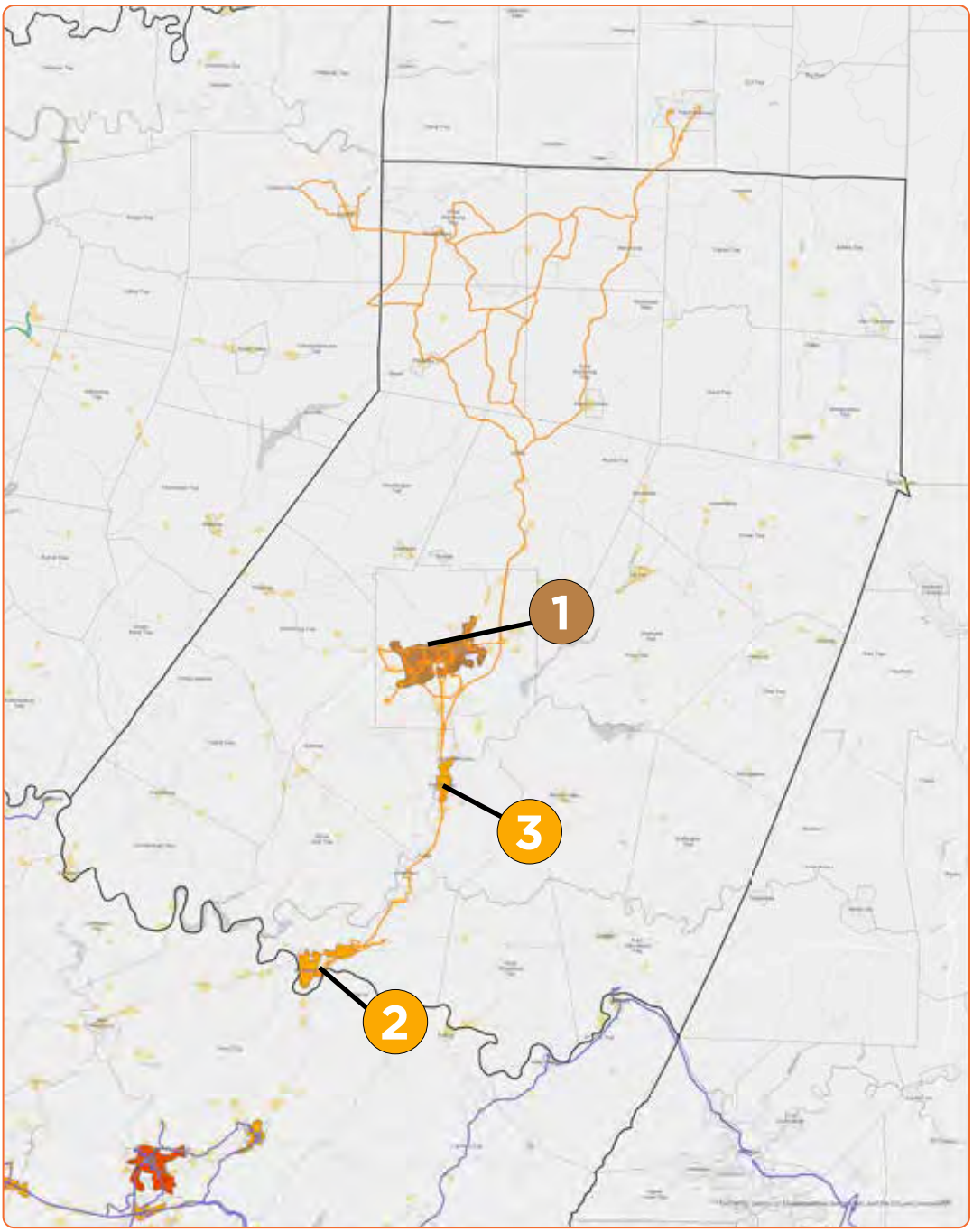
Improved transit facilities in Homer City should be located in a walkable location relative to the assets in the City's core while minimizing service impact on the pass-through transit routes.

3

Crossroads: Wherever there is Service

Crossroads clusters with transit service in Indiana County should be improved to meet the minimum standards recommended in the Multimodal Hub Feature Applicability Matrix.

Indiana County Hub Opportunities



Type
- Crossroads
- Commercial Corridor
- District
- Major District
- County Seat
- Employment Center

Clusters by typology with existing transit routes highlighted.

Lawrence County

County Highlights

Lawrence County has a County Seat cluster at New Castle, a District cluster at Ellwood City, and Commercial Corridor clusters to the north and west of New Castle.

New Castle Area Transit Authority's (NCATA) operations are centered at New Castle, PA with a regional route to Pittsburgh and radial routes serving rural areas of Lawrence County and reaching into adjacent Mercer and Butler counties.

To the west, the Ohio city of Youngstown is approximately 7 miles west of the county line and approximately 17 miles northwest of New Castle.

Hub Opportunities

1

County Seat: New Castle

As shown in the example earlier in this chapter, Lawrence County's center of transit operations is in New Castle at a well-established transit center. This transit center could be improved to include the recommended features of a hub in this location. Future connections could include Cranberry, Youngstown, OH, and Rochester via Ellwood City.

2

District: Ellwood City

A multimodal hub in Ellwood City could be a key feature of the City's downtown and be a key transfer point between services in Lawrence, Beaver, and Butler counties.

3

Commercial Corridors near New Castle

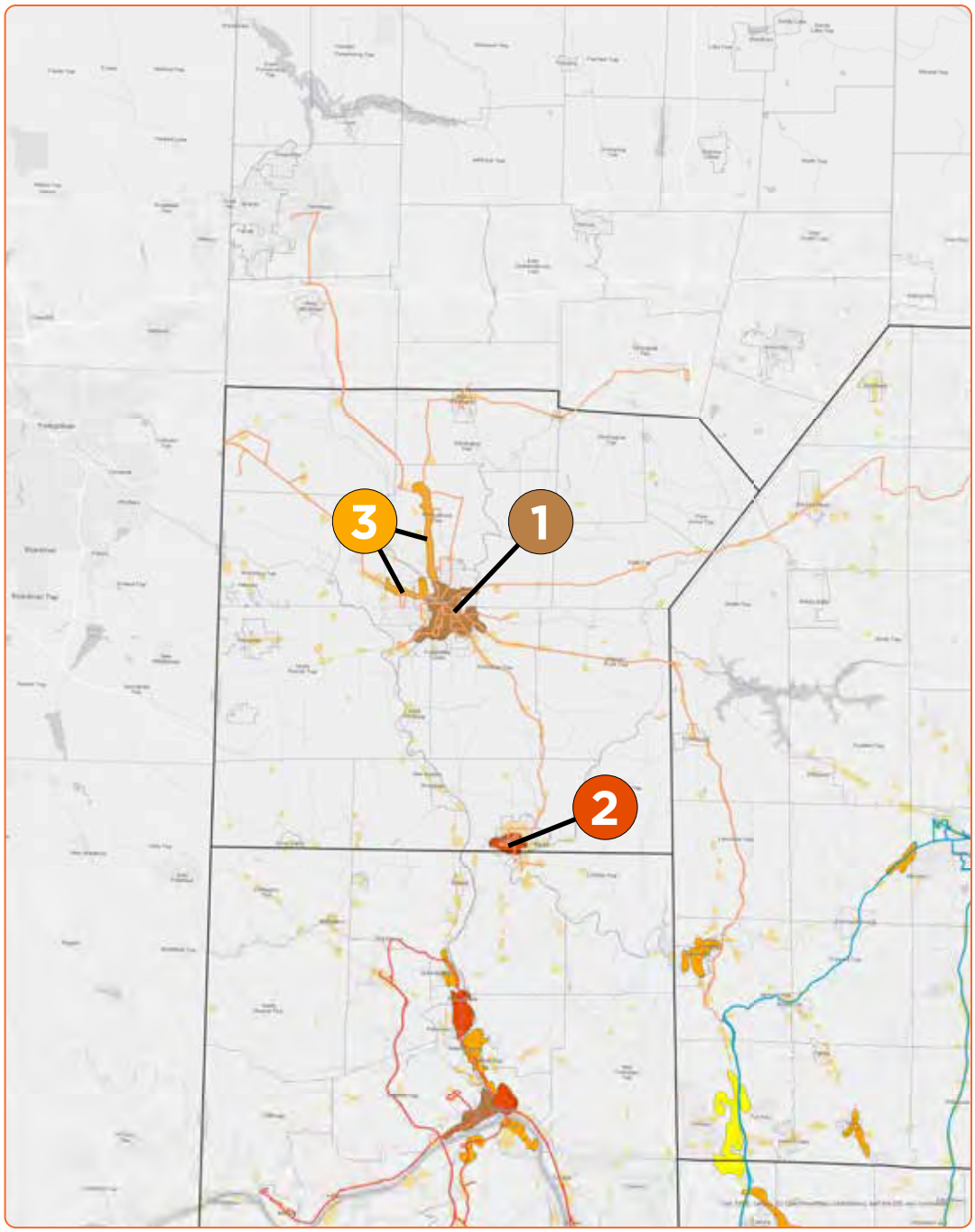
Improved transit facilities in and along these commercial corridors would enhance the quality of the user experience and special attention should be paid to improving the pedestrian and cyclist facilities in these areas.

4

Crossroads: Wherever there is Service

Crossroads clusters with transit service in Lawrence County should be improved to meet the minimum standards recommended in the Multimodal Hub Feature Applicability Matrix.

Lawrence County Hub Opportunities



Type

- Crossroads
- Commercial Corridor
- District
- Major District
- County Seat
- Employment Center

Clusters by typology with existing transit routes highlighted.

Washington County

County Highlights

4

Washington County has a County Seat cluster at Washington, a regionally significant employment center at Southpointe, Commercial Corridor clusters at Canonsburg, Thomsponville, and Bentleyville.

Freedom Transit's operations are centered at Washington, PA with routes primarily serving northern Washington County as well as connecting north to Pittsburgh.

Straddling the borders of Washington, Fayette, and Westmoreland counties are a series of District and Commercial Corridor clusters along the Monongahela River including Monongahela, Donora, Monessen, Chaleroi, North Belle Vernon, Stockdale, California, and Brownsville.

Mid Mon Valley Transit's operations are centered at Charleroi, PA with routes interconnecting the clusters along the Monongahela River and also connecting north to Pittsburgh.

Hub Opportunities

1

County Seat: Washington

The Washington Transportation Center could be improved to include the recommended features of a hub in this location. Future connections could include Cranberry, Youngstown, OH, and Rochester via Ellwood City.

2

Canonsburg and Southpointe

A multimodal hub near this location, with good connectivity to I-79 and State Route 19 could enable better north-south and east-west connectivity. At present, most transit demand is at Canonsburg but new transit facilities in Southpointe open up access to jobs for residents across the county and beyond. Scenarios could demonstrate a hub in either location or both depending on input from riders and transit operators, including the Mountain Line connecting Morgantown to Pittsburgh.

3

Mid Mon Valley Communities

A multimodal hub could become the new center of operations for these communities and could support improved connections between Washington, Westmoreland, Allegheny, and Fayette counties. Improved bus stop facilities in the other Districts and Corridors in this area should also be considered.

4

Commercial Corridor: Bentleyville

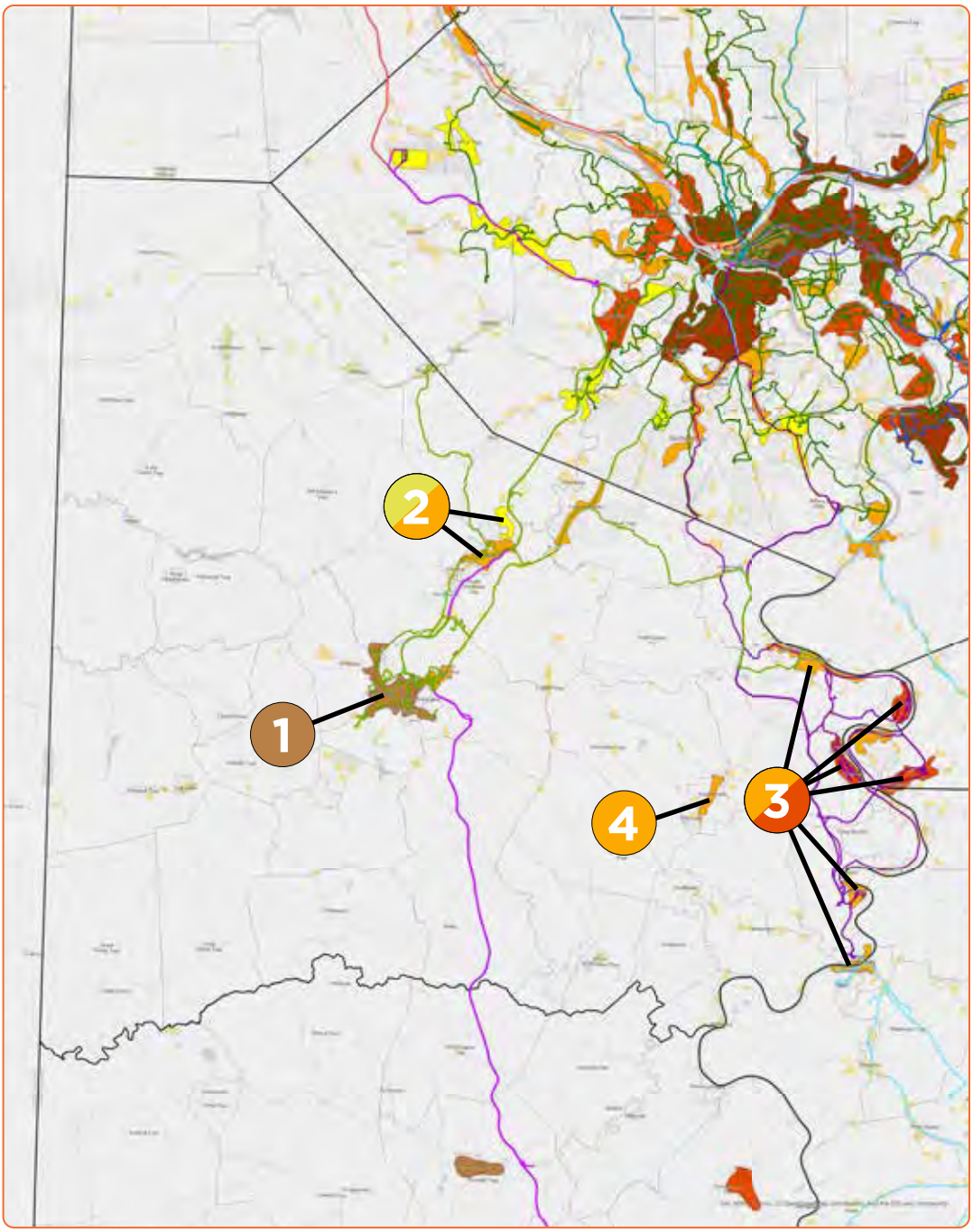
Addition of a multimodal hub at Bentleyville could enable new transit service from Washington and the Mid Mon Valley communities.

5

Crossroads: Wherever there is Service

Crossroads clusters with transit service in Washington County should be improved to meet the minimum standards recommended in the Multimodal Hub Feature Applicability Matrix.

Washington County Hub Opportunities



Type
- Crossroads
- Commercial Corridor
- District
- Major District
- County Seat
- Employment Center

Clusters by typology with existing transit routes highlighted.

Westmoreland County

County Highlights

Westmoreland County is the second largest in the region by population and number of jobs. It includes a County Seat cluster at Greensburg, District clusters at New Kensington, Vandergrift, Jeannette, Latrobe, Ligonier, Mt. Pleasant, and Scottdale. Route 30 is a long contiguous Commercial Corridor cluster stretching from the border of Allegheny County to Greensburg.

Westmoreland County Transit's (WCTA) operations are centered at Greensburg and radiate across the county to serve each of the Districts and Commercial Corridors identified by the cluster analysis as well as to the City of Pittsburgh. Interconnectivity between Westmoreland and Allegheny counties exists at Routes 30 and 22 as well as along the Allegheny River at New Kensington. Interconnectivity between Westmoreland and Fayette counties exists at Mt. Pleasant.

1

County Seat: Greensburg

The Greensburg Transit Center could be relocated to the Greensburg Amtrak station where adjacent parking areas would enable greater transfer and layover capacity than the existing transit center. This would also enable transfers between buses and rail should rail service be expanded in the future. This concept is simulated in Chapter 6 of this report.

2

Commercial Corridor: Route 30

Improvements along Route 30 to bus stops and stations should be paired with multimodal corridor improvements suggested in Chapter 5 and simulated in Chapter 6 of this report.

3

District: Vandergrift

A multimodal hub at Vandergrift could enable new service that interconnects the Kiskiminetas River valley communities of Leechburg, Apollo, and North Apollo.

4

Commercial Corridor: Mt. Pleasant

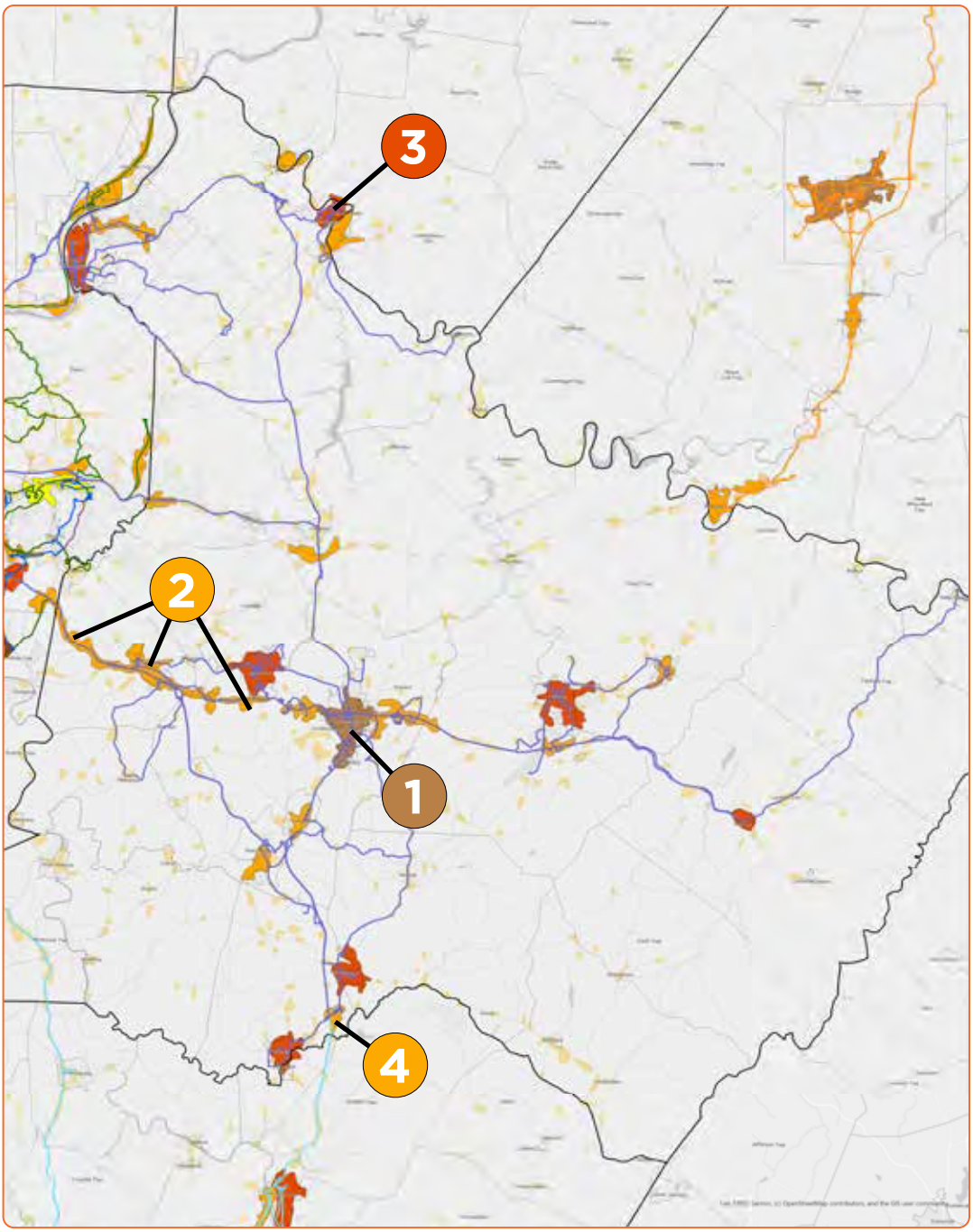
Between the District clusters of Mt. Pleasant and Scottdale is a Commercial Corridor cluster at the intersection of State Routes 119 and 819. The Countryside Shopping Center at this location is currently used for transfers between Westmoreland and Fayette county transit routes and a formal multimodal hub at this location would benefit both riders and operators.

5

All Clusters where there is Service

Each of the other clusters with transit service in Westmoreland County, which include Districts, Commercial Corridors, and Crossroads, should be improved to meet the minimum standards recommended in the Multimodal Hub Feature Applicability Matrix depending on the type of cluster.

Westmoreland County Hub



Type
- Crossroads
- Commercial Corridor
- District
- Major District
- County Seat
- Employment Center

Clusters by typology with existing transit routes highlighted.

5

Multimodal Corridors

What is a Multimodal Corridor?

A multimodal corridor is the connector between a pair or series of multimodal hubs and includes facilities that prioritize pedestrians, cyclists, and public transit.

A bus lane on Liberty Avenue in Pittsburgh, PA. Image credit: SPC

For Riders...

- Multimodal corridors enable speedier transit trips, making transit competitive compared to travel by single-occupancy vehicle.
- Multimodal corridors include improvements to pedestrian and cyclist network connectivity that make it possible to get to and from transit safely and easily.

For Operators...

- Multimodal corridors enable faster and more efficient transit service, freeing up resources to allow for new transit trips or routes.
- Multimodal corridors are designed with transit in mind, ensuring that transit vehicles can safely make stops and enter traffic.

Planning for Multimodal Corridors

THERE ARE TWO DRIVING QUESTIONS FOR MULTIMODAL CORRIDORS:

1: Which corridors should be improved for multimodality?

Building on the land use analysis in Chapter 4 of this report that identified clusters and types of clusters, the team analyzed how those clusters were connected to each other and the value of those connections.

Utilizing detailed origin and destination data from StreetLight and the US Census, the team created a map of the most critical connections between each and every pair of clusters.

2: What multimodal improvements should be made to corridors?

With significant corridors identified, specific improvements are recommended based on the hubs they connect and the condition of the existing infrastructure.

Our region has already invested billions in roads and highways. These corridors are the framework within which our communities and centers of commerce grow and evolve. Simple and affordable improvements to this existing infrastructure can stitch together a network of transit corridors that connect homes, workplaces, essential services, retail, and recreation to provide meaningful mobility alternatives to the entire region.

Characterizing Inter-Hub Connectivity and Corridors

Calibrated Map of Clusters

StreetLight Origin & Destination Data

Inter-Hub Intensity Mapping

Analyze the streetlight origin and destination data to determine the intensity of travel between all clusters. Perform this between every cluster pair. Streetlight Data utilizes aggregated cellphone location data to offer a detailed breakdown of time of day, mode of travel, and traveler demographics. Intensity of connectivity reflects the comparative number of people traveling between two locations.

INTER-HUB CORRIDOR CHARACTERIZATION

High Intensity

Corridors with high relative intensity are the highest priority for improvements. Improvements in a high intensity corridor would emphasize transit speed and efficiency, headways, and overall transit vehicle capacity. If the capacity of existing roadways or transit routes are not able to be expanded to meet the improved level of service goals, a new transit guideway could be proposed.

Possible improvement types:

- Grade-separated transit guideway (BRT/LRT)
- Dedicated lanes on existing rights-of-way (BRT/LRT)
- High-capacity, regionally-connected multimodal hubs
- Off-board fare collection
- Parallel express and local routing as appropriate

Medium Intensity

Corridors with medium relative intensity are also a priority for improvements, with an emphasis on enhancing capacity of existing assets.

Possible improvement types:

- Transit signal priority (BRT)
- Dedicated lanes on existing rights-of-way (BRT)
- Regionally-connected multimodal hubs

Low Intensity

Corridors with low relative intensity would not be a priority for service efficiency improvements; however, they could be recommended for an improved service plan.

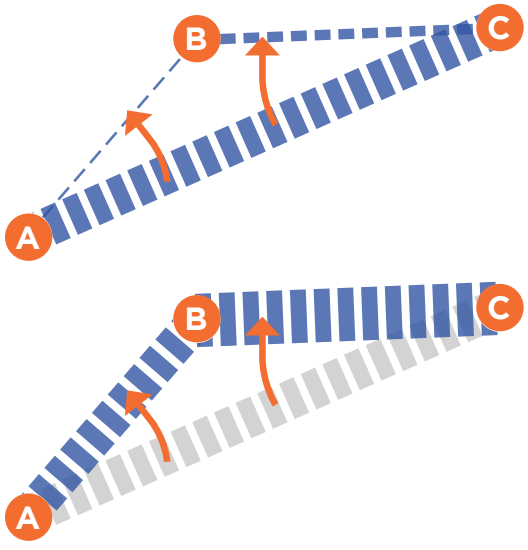
Possible improvement types:

- Smaller, locally-serving multimodal hubs
- Transit service to larger regional hubs

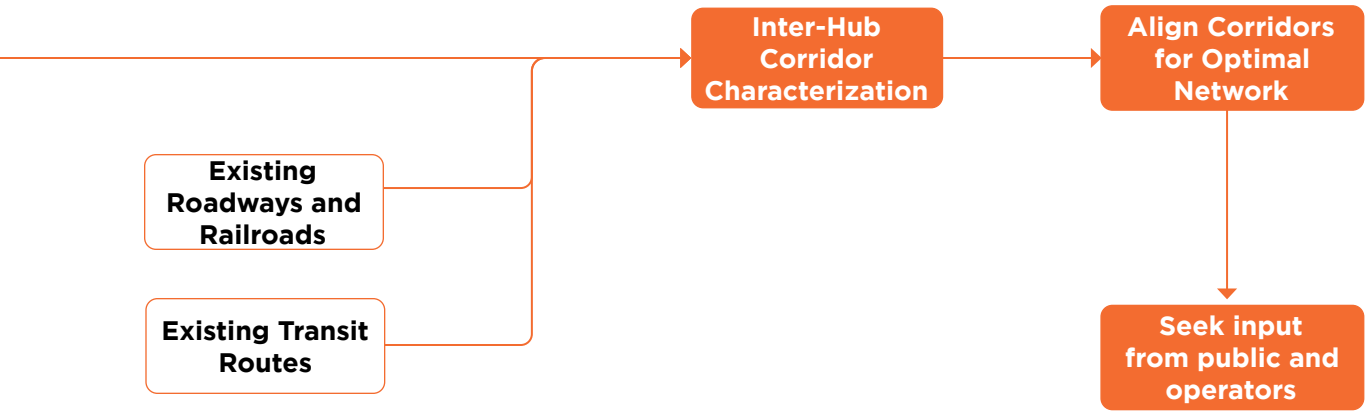
CORRIDOR ALIGNMENT

Nearly parallel corridors could be aligned and combined. As in the example, the A-C connection is high intensity but the A-B connection is low intensity. By aligning the connection of A-C with the A-B and B-C corridors, the A-B corridor is elevated to high intensity. Opportunities such as this can allow for focused investment that allows for improved level of service in places (such as hub B) where the suggested connections are not as strong.

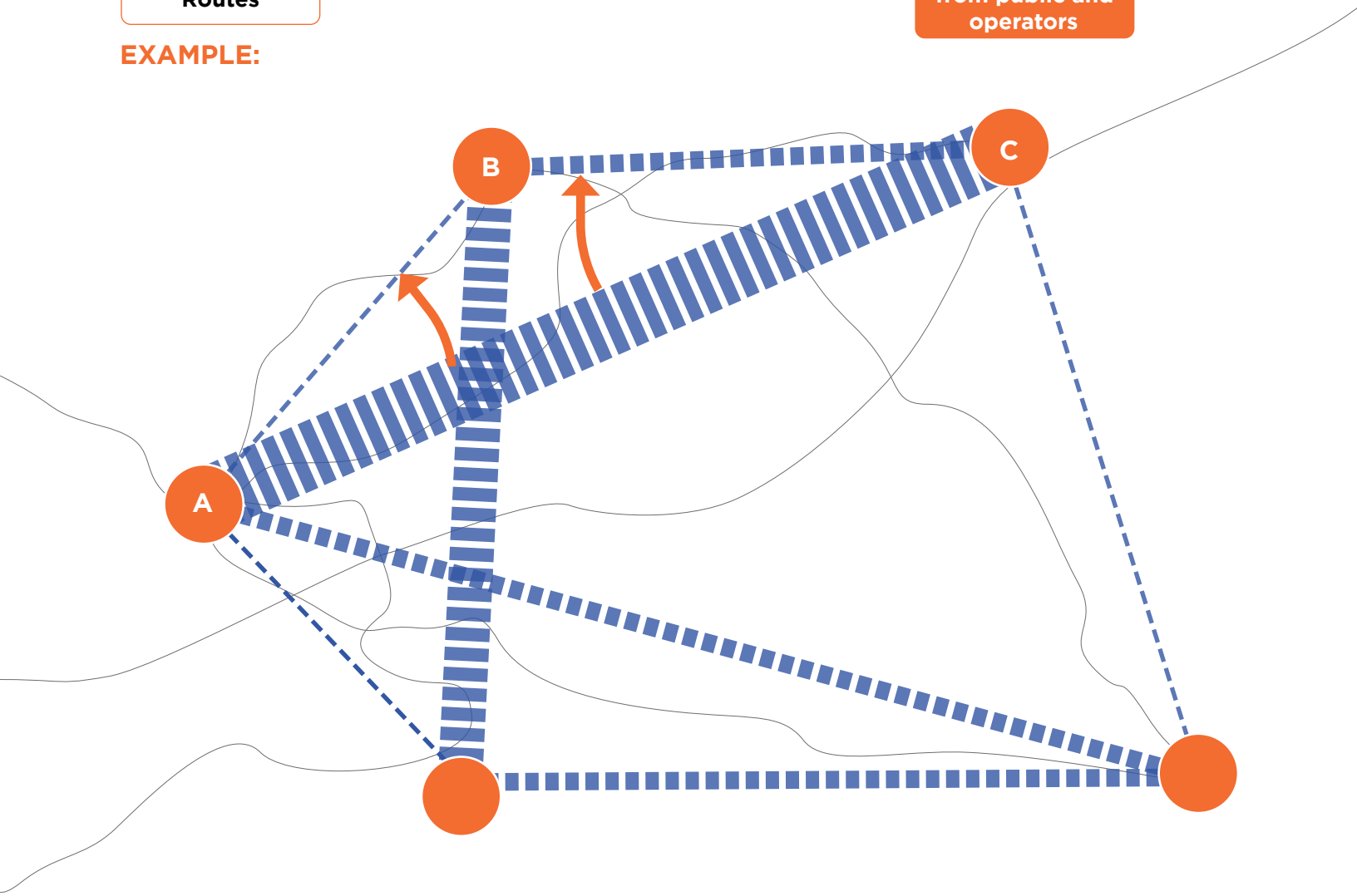
Census data would be compared in each corridor alignment scenario to improve quality of access for protected groups.



Characterize the intensity of the connections between hubs according to High, Medium, and Low relative intensity.



EXAMPLE:



Characterizing Inter-Hub Connectivity and Corridors

NETWORK CRITICALITY ANALYSIS

The network criticality analysis identifies road segments and land use clusters in the SPC region that are theoretically the most critical in facilitating movement between all land use clusters. The analysis produces an index for each road segment and land use cluster that is calculated by tallying the number of times a shortest path analysis uses the segment or passes through the cluster. The results of the analysis are map layers that can be used, along with other considerations (e.g., survey preferences, transit usage, travel patterns), to narrow down which corridors are of interest to further, more detailed analysis. The analysis is an application of the betweenness centrality index, which is designed to rank nodes or edges in a graph network according to their position in the network relative to others nodes.

DATA SOURCES AND TECHNOLOGY

- Open Street Map (OSM) data extract for the SPC region loaded into a PostgreSQL database
- OSM extract stored as a PGRouting topology in PostgreSQL via OSM2PGRouting
- Djikstra routing algorithm (via PGRouting)

METHODS

Construct a graph network from Open Street Map data

An OSM data extract for the SPC region provides a complete street network that can be converted to a network graph using off-the-shelf tools (Osm2PGRouting). Edges represent segments in the street network between intersections; nodes in the network represent intersections. This data is loaded into a PostGIS database for mapping.

Raw Open Street Map edges and nodes

Designate travel "costs"

Length and speed limit values from the OSM data are retained to support shortest and fastest routing, respectively. Additionally, travel cost multipliers are assigned to segments in the road network by OSM road type (Table 1.2).

The weighting ensures that the routing algorithm uses the appropriate roads; i.e., alleys ("service") and residential streets ("road") are selected as a last resort, and primary and secondary highways ("motorway" and "trunk") are given priority, with a spectrum in between. The figure on the facing page illustrates the OSM network with applied cost being used to set the symbology; note that darker routes (lower cost) show as main trunks, and lighter routes (higher cost) tend to be suburban residential areas and other roadways.

Table 1.2

Travel cost multipliers for OSM Road Types

OSM Road Type	Travel Cost Multiplier
LIVING_STREET	3
MOTORWAY	1
MOTORWAY_JUNCTION	1
MOTORWAY_LINK	1
PRIMARY	1.15
PRIMARY_LINK	1.15
RESIDENTIAL	2.5
ROAD	5
SECONDARY	1.5
SECONDARY_LINK	1.5
SERVICE	2.5
TERTIARY	1.75
TERTIARY_LINK	1.75
TRUNK	1.05
TRUNK_LINK	1.05
UNCLASSIFIED	3

Raw OSM network, symbolized by applied travel cost

Calculate routes

From each cluster, an origin/destination point is derived from the OSM network node that is closest to the centroid of the cluster polygon.

Using those points, we calculate routes from each cluster to every other cluster four ways:

- Fastest routing origin-destination
- Fastest routing destination-origin
- Shortest routing origin-destination
- Shortest routing destination-origin

Note that we calculate in both directions because not all network segments are bi-directional (e.g., divided highways, one-way streets).

With 1,561 clusters, this process results in +4.8 million routing calculations. Each route is comprised of 10s to 1000s of individual OSM street network segments.

Post-process routing results

The polyline geometry of each calculated route is used to identify the underlying OSM street segments that were used for it; the running total routes that use a given segment is then recorded on that edge in the graph network. This provides us with the edge betweenness centrality index. For nodes, the maximum edge betweenness centrality index of any edge connected to that node represents the node's betweenness centrality index. While this could be calculated for all nodes in the graph, we only calculate this for nodes in the network that correspond with the clusters—this helps to identify the relative criticality of a cluster to the connectivity of all other clusters.

Network Criticality Results

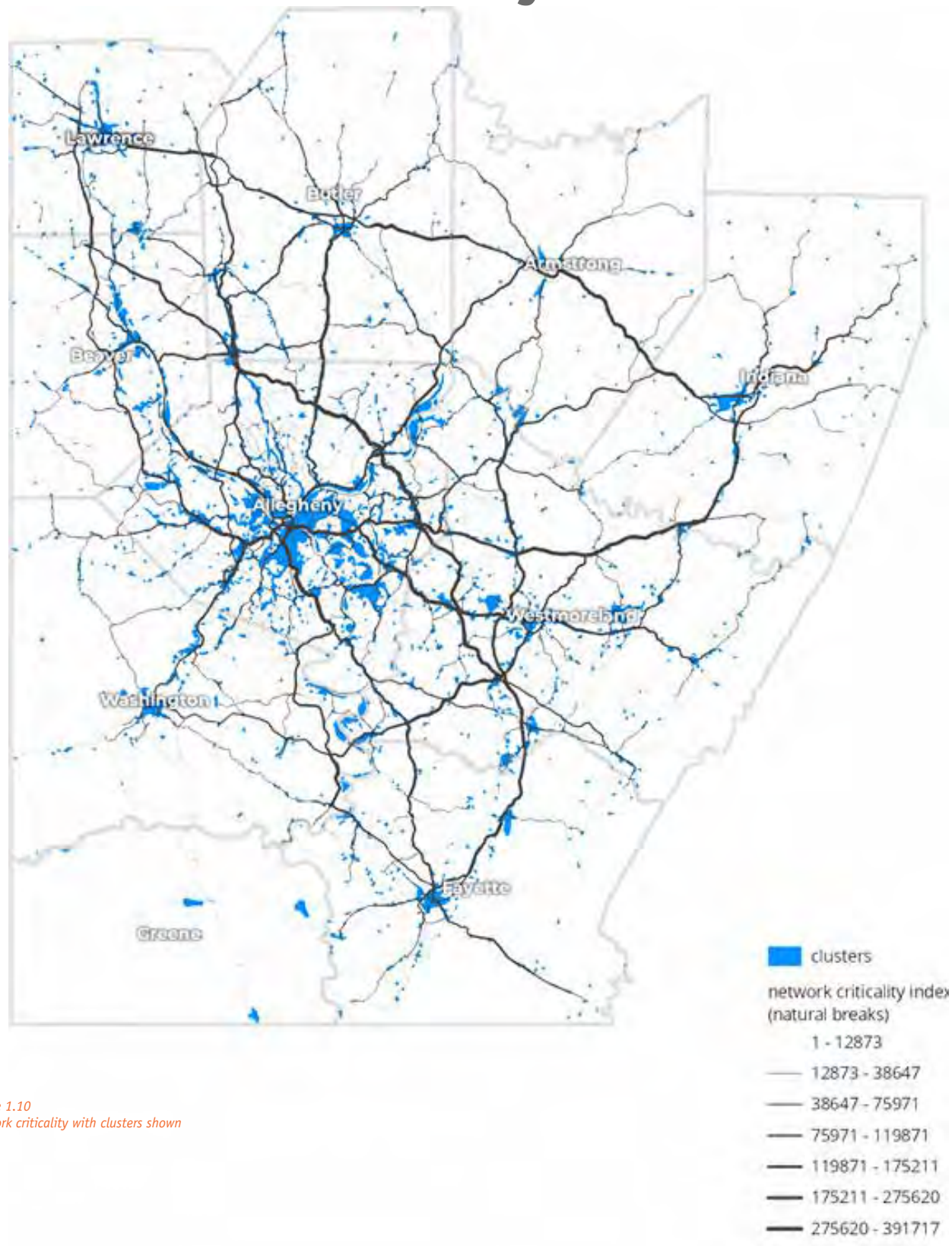


Figure 1.10
Network criticality with clusters shown

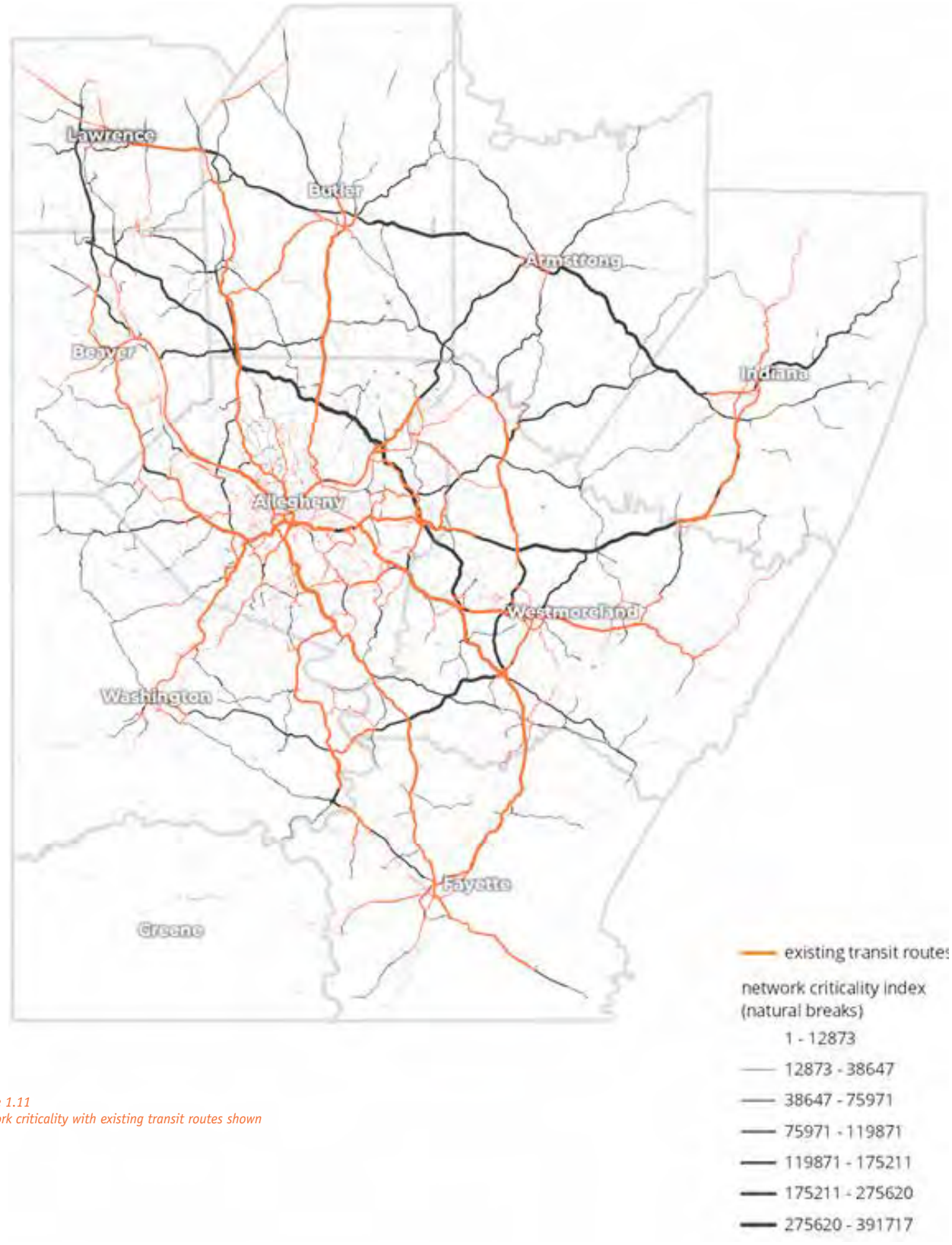


Figure 1.11
Network criticality with existing transit routes shown

Travel Analysis

In addition to network criticality, the data from Streetlight and from the US Census provide additional lenses to help identify locations for potential corridor improvements or new transit services.

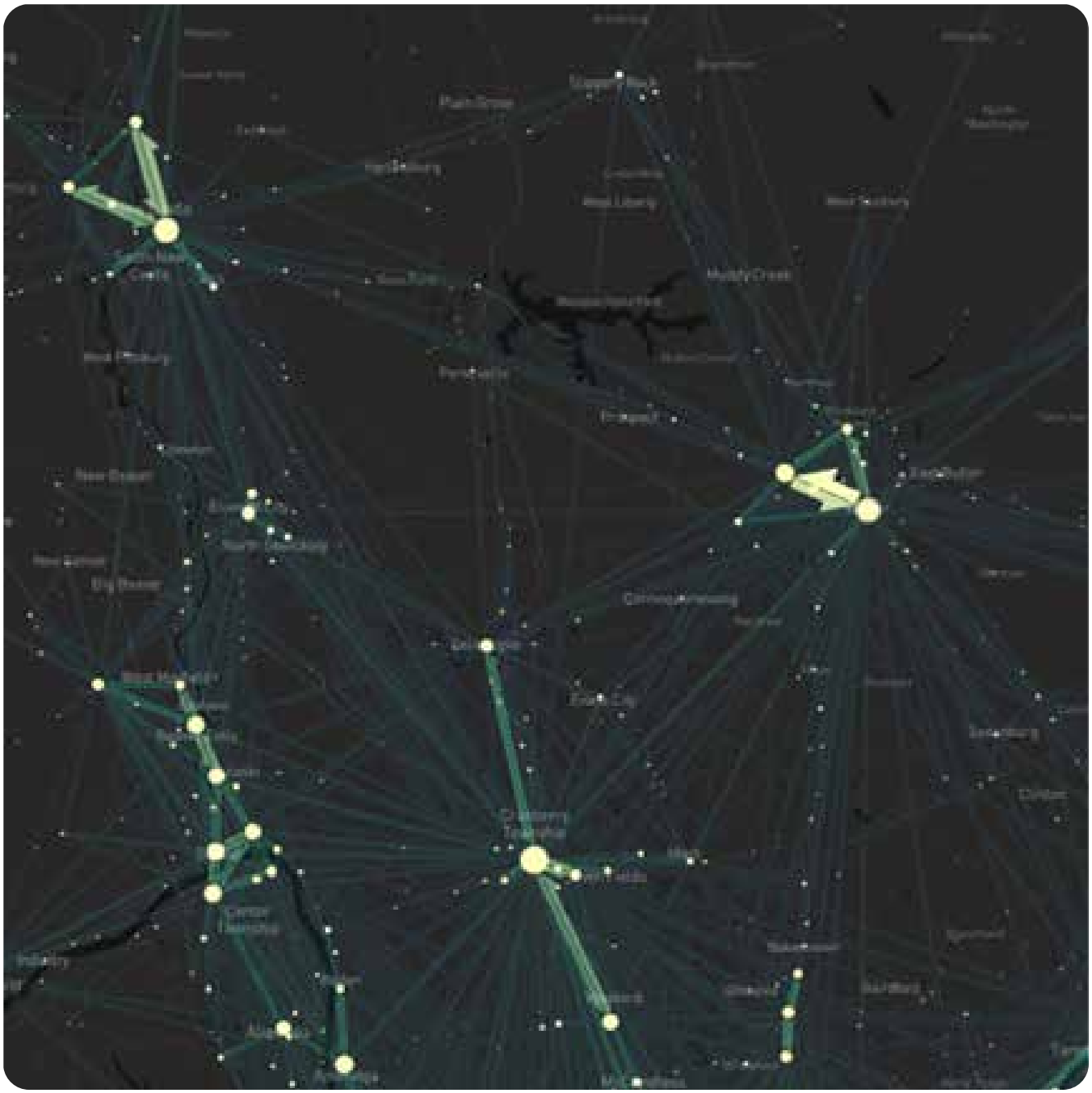


Figure 1.12
Travel patterns derived from Streetlight data show the magnitude of people traveling clusters in a portion of the SPC Region.

This map is interactive at:
https://bit.ly/SmartMovesConnections_StreetlightData

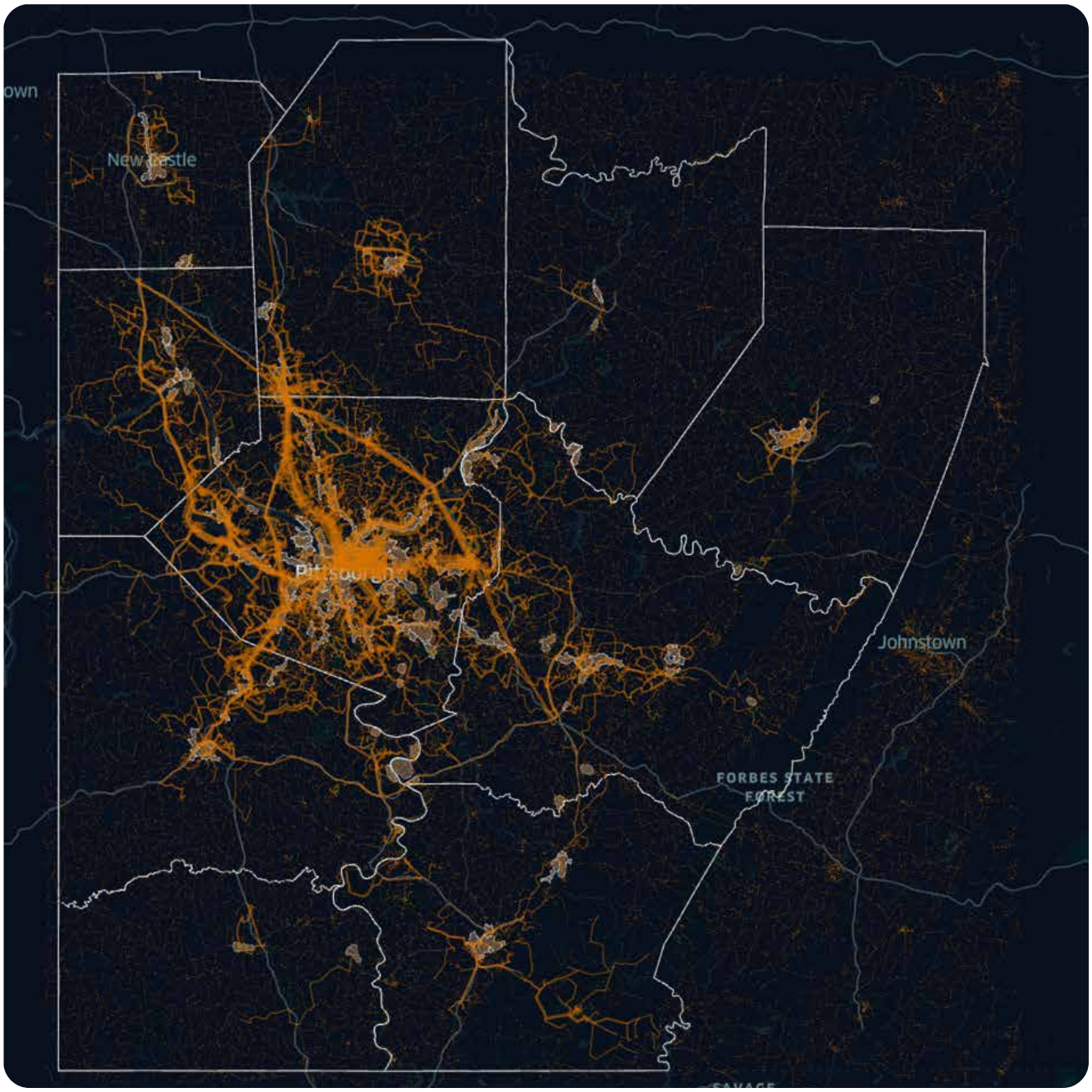


Figure 1.13
Travel patterns derived from Census commute data show the magnitude of people traveling clusters in the SPC Region, applied to shortest distance analysis using major roadways.

Corridor Strategies

TRANSIT PRIORITIZATION THROUGH RIGHT-OF-WAY DESIGN

By prioritizing buses over other modes, it is possible to achieve a high level of service quality and efficiency within existing rights-of-way. Often this prioritization can come with little to zero impact on other modes by tailoring intersections and travel lanes to the specific needs of the transit vehicles. Several strategies should be considered and a corridor can utilize different strategies for different segments depending on factors such as right-of-way width, typical traffic volumes, typical congestion conditions, speed, and local land use context.

Grade-Separated Exclusive Rights-of-Way

The gold standard for transit speed and reliability is to have an exclusive transit corridor that is sized and constructed appropriate to the volumes it needs to support. The Port Authority of Allegheny County owns and operates both light rail and bus rapid transit corridors in exclusive grade-separated rights-of-way and these routes serve as the backbone for Allegheny County's transit system. Creating these corridors from scratch is an expensive and time-intensive endeavor, but is worth the investment especially when the benefits for regional connectivity are considered in addition to local transit priorities and demand.

Exclusive rights-of-way can also host multiple modes. Regional precedent exists for this in Allegheny County where portions of the light rail network and South Busway share the same roadway and viaducts.

While the region is served by the Amtrak Pennsylvanian and Capitol Limited routes, these heavy rail connections are too infrequent at present to be useful for travel within the region. In addition, these Amtrak routes operate in mixed rail traffic with freight traffic that can cause or exacerbate delays as well as limit speeds such that these rail corridors are non-competitive with buses or other modes for regional travel.

Dedicated Bus-Only Arterial Lanes

Dedicating specific lanes just for transit is ideal for corridors with multiple overlapping routes with frequent trips where mixed-traffic congestion inhibits transit speed and reliability. Dedicated lanes ensure that transit vehicles are able to keep moving even when other traffic is crawling. Dedicated lanes can achieve a similar level of service to an exclusive right-of-way without the expense of creating a new corridor from scratch.

Dedicated lanes can be located on the outside or in the middle of a right-of-way. Narrower corridors generally have dedicated lanes on the outside so that station areas are outside of the right-of-way. Wider corridors can support center-running dedicated lanes that have the benefit of reduced conflicts and delays at intersections.

Dedicated lanes can be implemented on most roadways including highways, state routes, and downtown streets.

Regional precedent for dedicated lanes exists in downtown Pittsburgh on Wood Street and Smithfield Street as well as in Oakland on Fifth Avenue. Additional bus-only lanes are planned along the Fifth and Forbes corridor as part of the Port Authority's Downtown-Uptown-Oakland-East End Bus Rapid Transit Project[1].

1 https://www.portauthority.org/inside-Port-Authority/projects-and-programs/bus-rapid-transit/

Time-of-Day Bus-Only Lanes

Dedicated bus-only lanes can enable a similar level of service to exclusive rights-of-way but their benefits are mostly felt during high congestion times such as the morning and evening rush or for large events. Scheduling bus-exclusive times for specific lanes can ensure buses have priority when they need it most but travel in mixed traffic at other times.

Since the expectations for other drivers varies by time of day, signage and enforcement are especially important for time-of-day bus-only lanes.

Regional precedent for this exists in the City of Pittsburgh along Liberty Avenue.

Reversible Bus-Only Lanes

In places where dedicated lanes can offer meaningful benefit for transit but where the right-of-way width is too narrow to accommodate bus-only lanes in each direction, it is possible to create a reversible lane in the center of the roadway with active signage that changes the direction of travel by time of day.

Regional precedent for this exists in the City of Pittsburgh on the Smithfield Street Bridge.

Transit Priority in Mixed Traffic

Transit prioritization is possible even when buses are operating in mixed traffic. Intersections and bus stop areas are places where buses are slowed down within a corridor. Implementing transit prioritization of intersections can significantly reduce delay due to intersection congestion and the re-acceleration time for buses. Bus stops can also be designed to enhance transit efficiency in mixed traffic by being positioned such that buses do not have to exit and re-enter the lane of travel.

Improvements to facilitate transit priority in mixed traffic are planned as part of the Port Authority's Downtown-Uptown-Oakland-East End Bus Rapid Transit Project.

High-Occupancy Vehicle (HOV) Lanes

Dedicated high-occupancy vehicle (HOV) lanes not only encourage carpooling and vanpooling; they also ensure availability of free-flowing lanes of traffic that can be utilized by transit vehicles. Wherever HOV lanes on highways exist, transit is able to utilize them to move more easily through congested corridors.

Regional precedent for this exists on I-279 where reversible HOV lanes are utilized by express transit routes.

Use of Shoulders for Buses in Peak Periods

In congested highway corridors where dedicated transit lanes are not possible but are desired to meet service quality goals, it is possible to design a road shoulder that accommodates bus through traffic during peak periods of congestion. Shoulder-running BRT can be a quickly-implementable and cost-effective solution.

An example of how this could work on segments of I-376 was simulated as part of this project. A description of this exists in Chapter 6.

Corridor Strategies

TRANSIT PRIORITIZATION THROUGH INTERSECTION DESIGN

Intersections are a key corridor element that can slow or delay transit vehicles along their route. Slowing down for a red light, waiting in traffic queued at an intersection, and waiting for sometimes non-existent cross-traffic can all add time to a transit route. The following strategies can streamline intersections to prioritize transit.

Dedicated Transit Signals

Dedicated traffic signals for transit at intersections can enable a separate signal phase to allow transit through an intersection when no other vehicles have a green light. This is often used in places where streetcars or busways from dedicated lanes intersect with a mixed-traffic roadway. These can be helpful in instances where transit vehicles need to cross multiple lanes of traffic on a busy roadway.

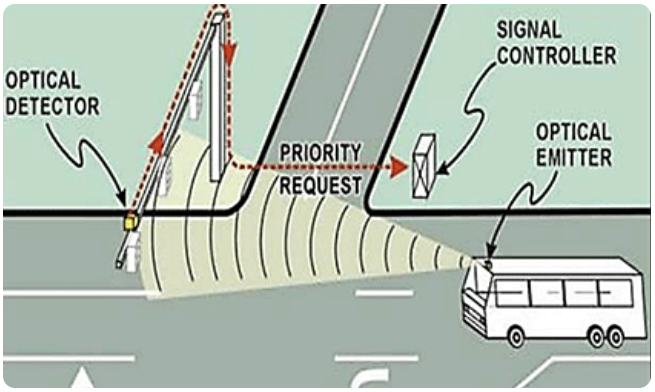
Transit Signal Priority (TSP) and Bus Signal Preemption

Transit signal priority, in conjunction with dedicated transit signals, can adaptively time the signal phases at an intersection to dynamically prioritize transit when that prioritization is most needed. Utilizing GPS, cellular signal, wireless internet, or optical transponders an intersection can "sense" an oncoming transit vehicle and automatically adjust the intersection signal phase to reduce the amount of time the transit vehicle waits for a green light.

Transit signal priority is especially effective when transit vehicles have dedicated lanes or are able to utilize a queue-jumper lane to bypass intersection congestion.

The degree to which transit vehicles are prioritized can be calibrated depending upon time of day, congestion conditions, or transit operator preference.

While dedicated transit signals don't necessarily require special vehicle-based hardware, transit-signal priority does require that vehicles be equipped with a compatible device.



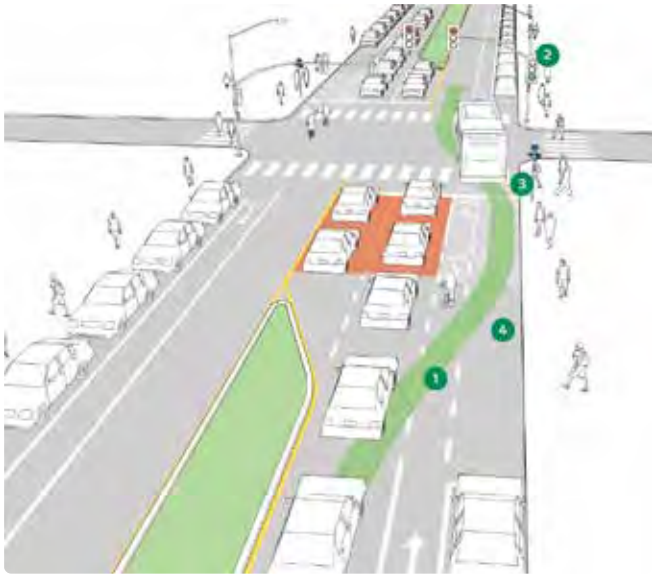
Queue Jumper Lanes

Queue jumper lanes effectively act as dedicated transit lanes at an intersection to enable transit traffic to bypass queued traffic waiting for a green light. When paired with dedicated transit signals and transit signal priority, queue jumper lanes can be quite effective at improving transit efficiency.

Queue jumper lanes are especially useful in corridors with moderate congestion at intersections but where the corridors themselves are not congested. In such a corridor, dedicated transit lanes throughout would have minimal benefit because traffic is already moving freely.

Queue jumper lanes are also useful in corridors where limited right-of-way width prevents dedicated transit lanes throughout or where the cost of dedicated lanes outweigh the benefits.

An example of how this could work on segments of State Route 30 was simulated as part of this project. A description of this exists in Chapter 6.



CREATING MULTIMODAL CORRIDORS

Beyond prioritizing transit on our region's key corridors, these connections should also serve as the backbone for the walkable and bikeable communities those corridors support. When a key regional corridor is due for improvement, there is the opportunity to improve or establish sidewalks and bikeways that can connect to existing, nascent, or planned networks in communities along the way. Over time these networks will become more and more interconnected such that they are able to meaningfully expand the reach of transit services throughout the region.

Corridor Strategies

CORRIDOR IMPROVEMENT COSTS

For high-level planning purposes, these relative costs for pilot project add-ons are presented as industry-accepted rules-of-thumb. When integrated into the overall budgets of major capital projects they are often only a minor premium over base costs.

Walkability Enhancements

Pedestrian paths and areas are essential along a multimodal corridor and should emphasize connectivity to neighboring residential or commercial districts. While ¼ to ½ mile is the generally the distance a person will choose to walk to access transit, that distance can increase for premium modes like rail or express bus.

Bicycle lanes:

- $9,000/mile for bike lane markings and a solid white channelizing line to the left (no delineators)
- $33,000/mile for enhanced bike lanes, which also include flexible delineates spaced 8 feet apart with a buffer zone that involves additional pavement markings

Transit Signal Priority (TSP)

For TSP, one must consider the costs to the transit agency as well as the traffic signal maintaining agency. Approximate costs for both are outlined below. There will be a large initial cost for setup of TSP at an agency; this applies to both the transit agency and each jurisdiction that operates traffic signals that the buses will interface with.

Transit agency:

Will need to modify its CAD/AVL (bus location/ communications) system software and install some amount of central system hardware; cost will vary depending on how similar the chosen TSP system is to ones that the system supplier has installed for other transit agencies.

- Initial cost: $100-200k to system vendor
- Ongoing cost for support and tracking TSP usage: 1 half to full-time staff person (planner or engineer), depending on size of system

Cost per bus can vary widely, depending on the existing on-board equipment and its compatibility with chosen system.

- Initial cost: $0-3,000 per bus

Traffic signal agency:

Need for new firmware for TSP will vary depending on how modern the controllers are and the experience of the manufacturer with the chosen TSP system.

- Initial cost: $25-100k to controller vendor for system

New controller, if needed.

- Upfront for controllers: $10-15k each

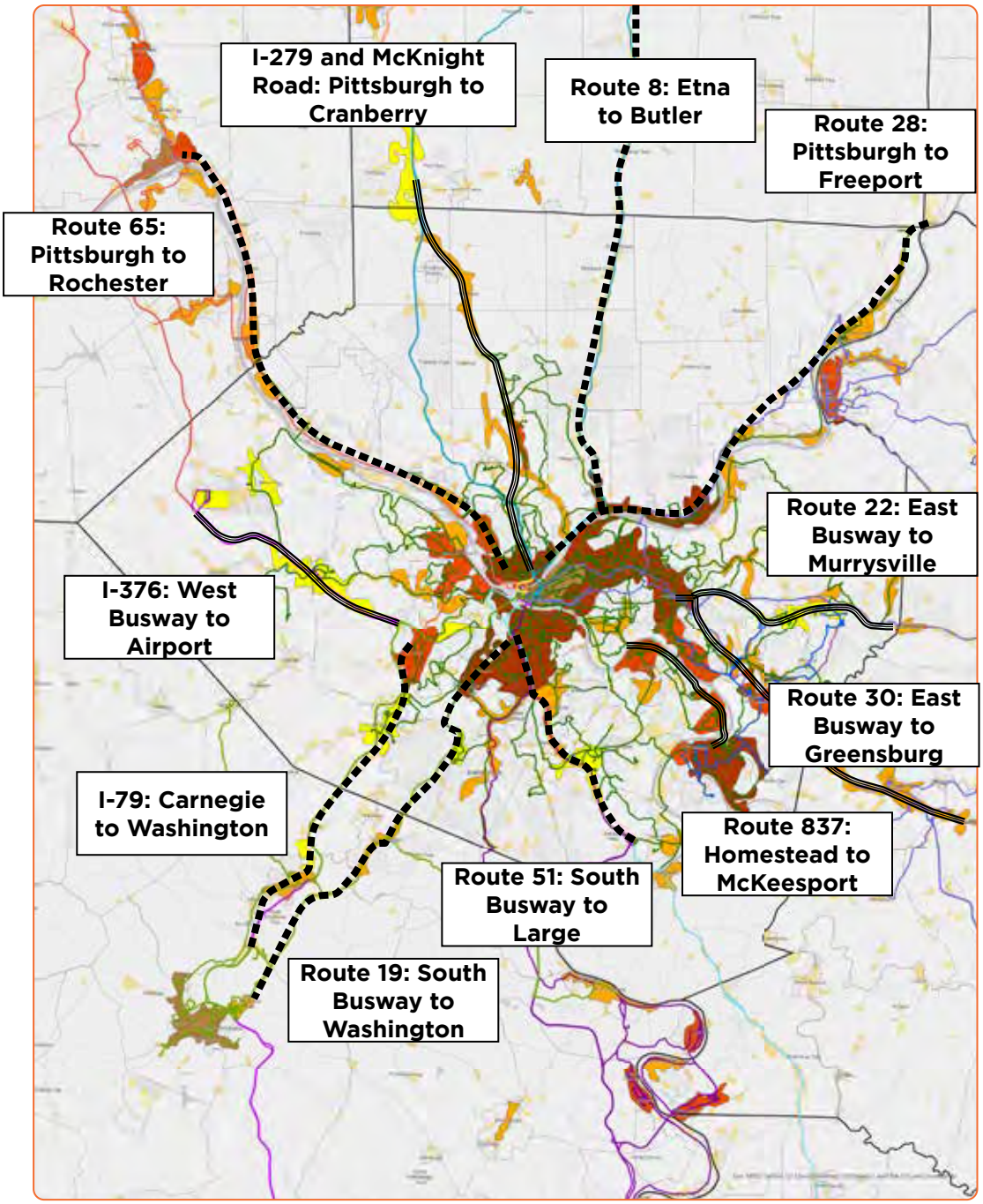
Data radio at intersection (for communication with buses)

- Initial cost: $1,500-3,000 (installed) each

Should install ethernet communication between intersections and a central traffic system.

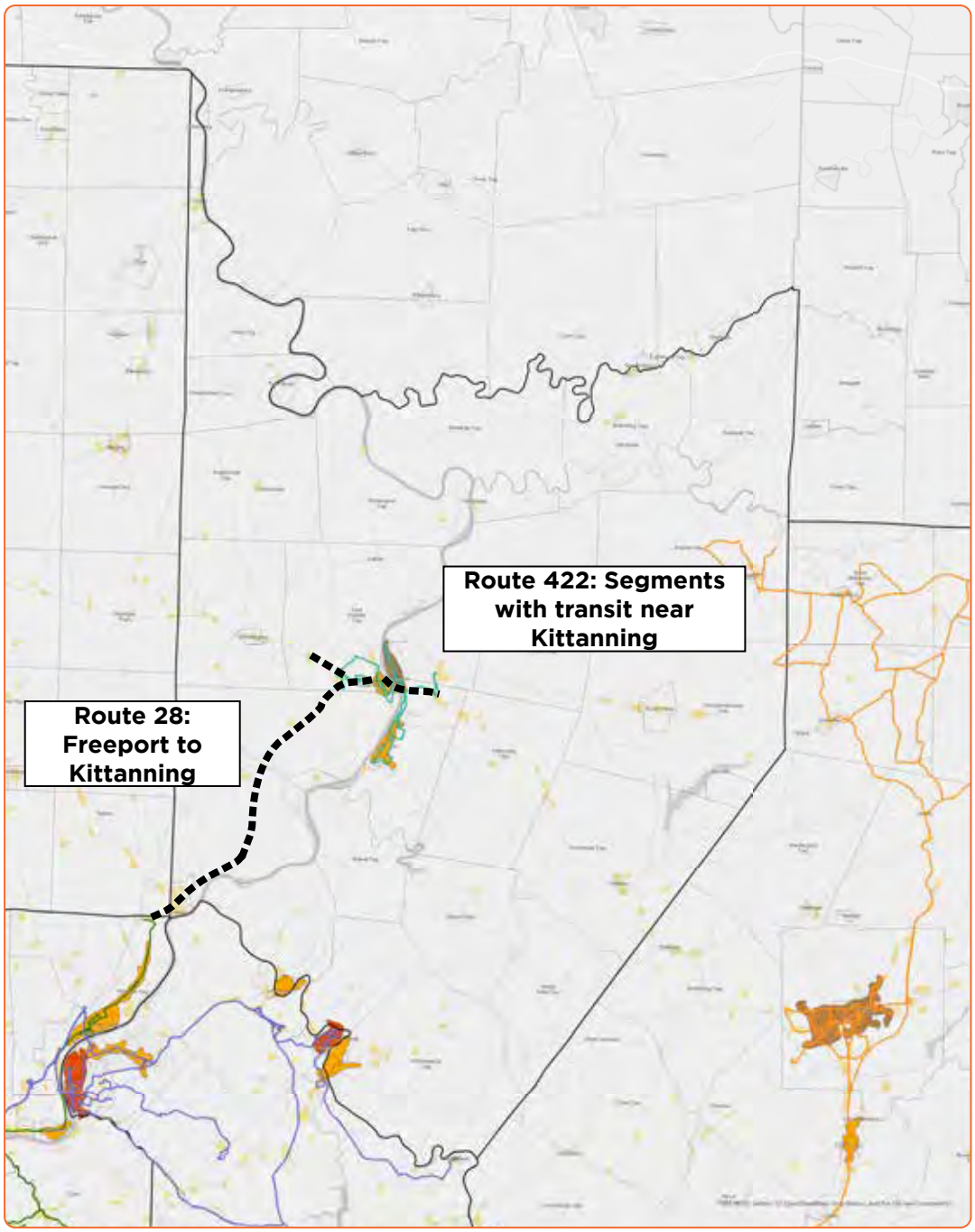
- Initial cost: $5,000-$7,500 each intersection (not including cost for central traffic system)
- Ongoing cost for maintenance, support and tracking TSP usage: 1 half to full-time staff person (technician or engineer), depending on size of system

Allegheny County



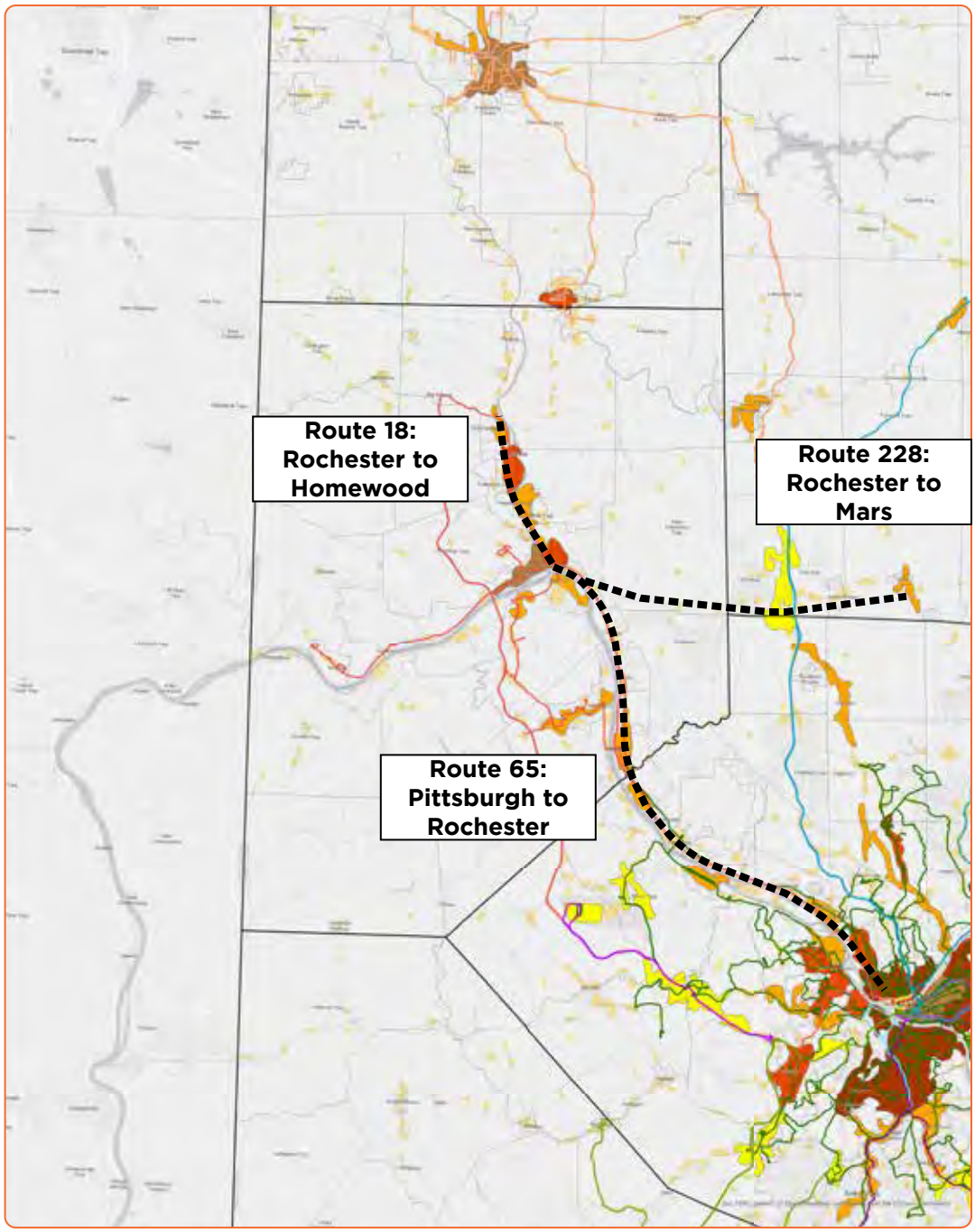
Clusters by typology with existing transit routes highlighted.

Armstrong County



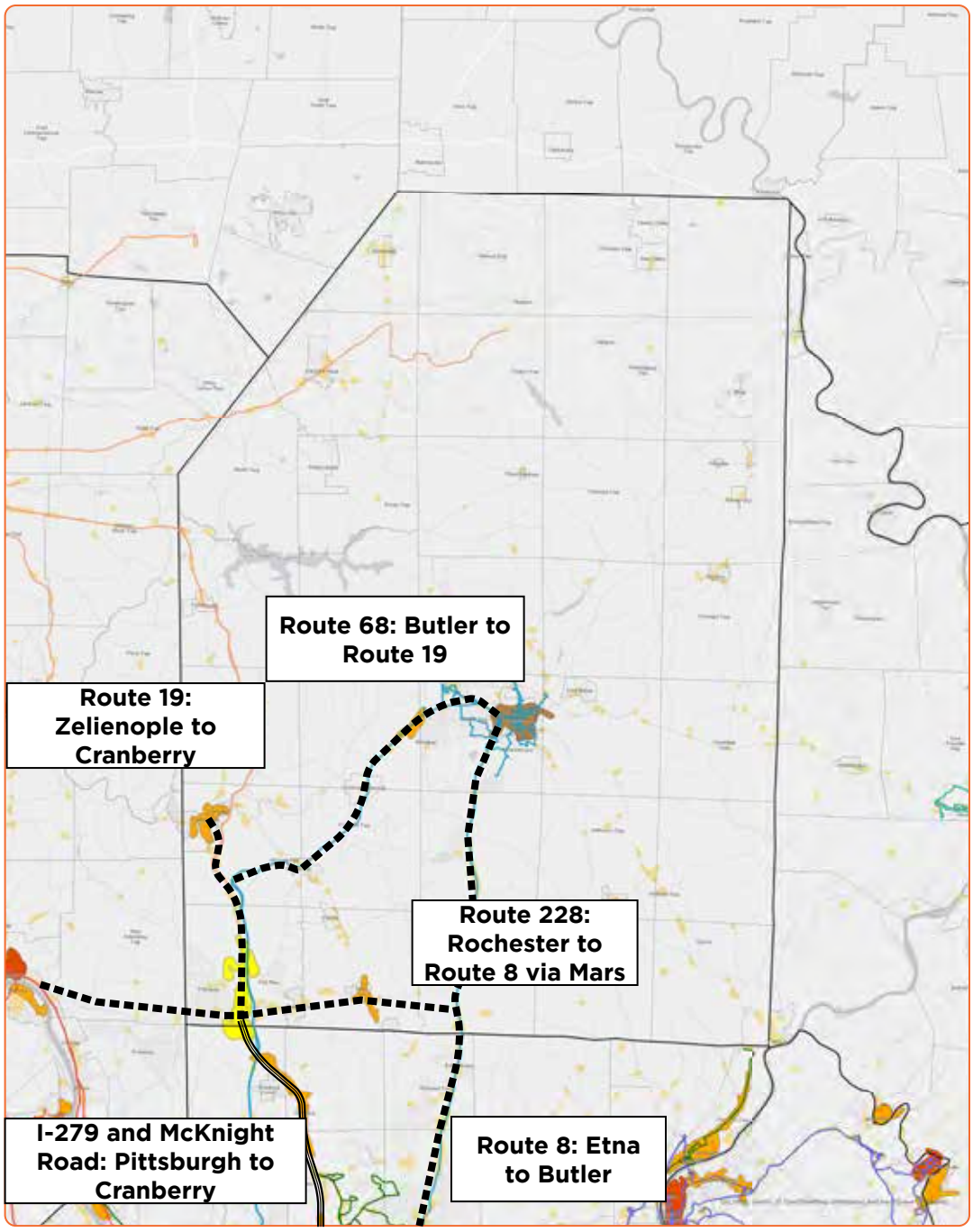
Clusters by typology with existing transit routes highlighted.

Beaver County



Clusters by typology with existing transit routes highlighted.

Butler County



Corridor Type

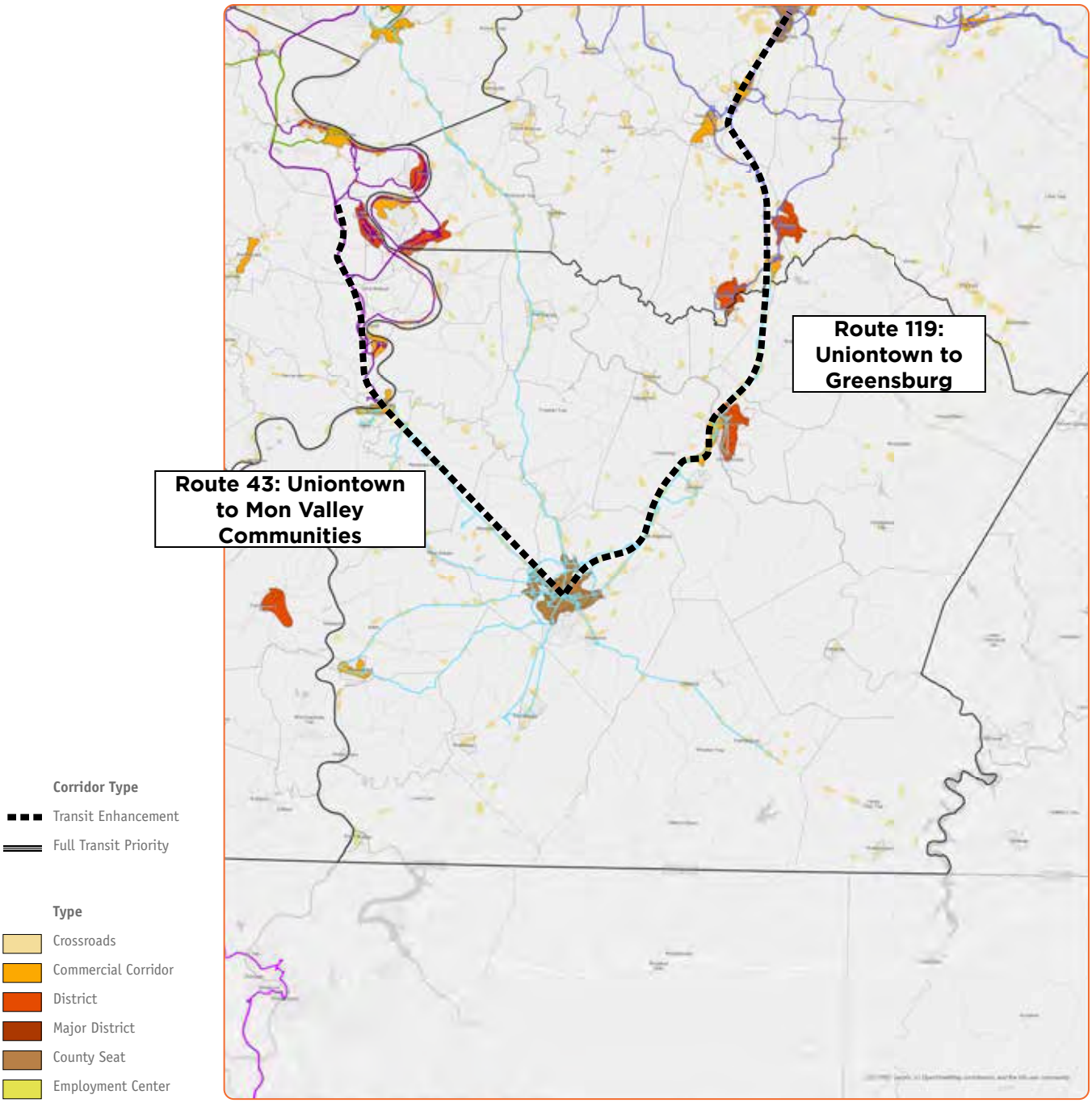
- Transit Enhancement
- Full Transit Priority

Type

- Crossroads
- Commercial Corridor
- District
- Major District
- County Seat
- Employment Center

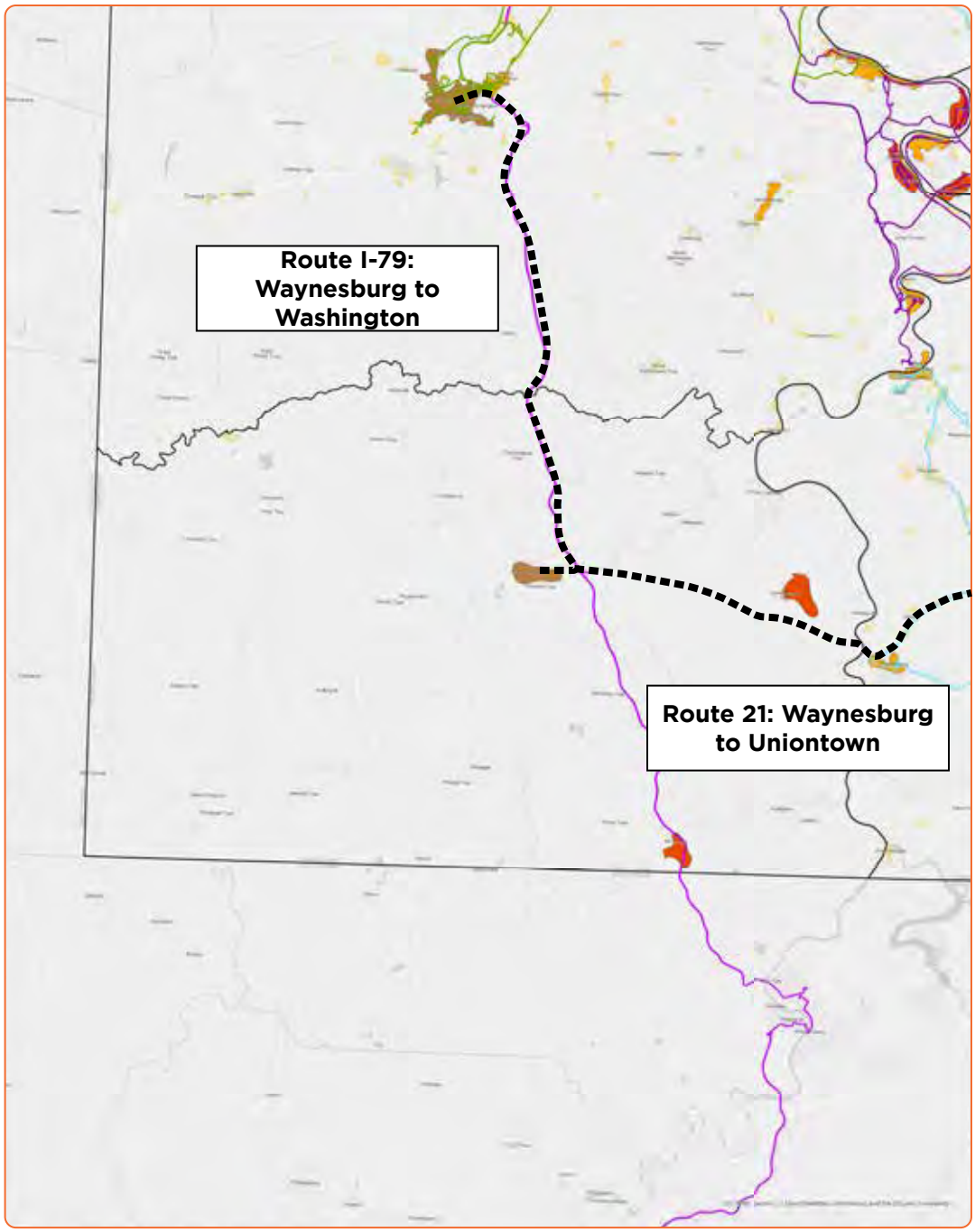
Clusters by typology with existing transit routes highlighted.

Fayette County



Clusters by typology with existing transit routes highlighted.

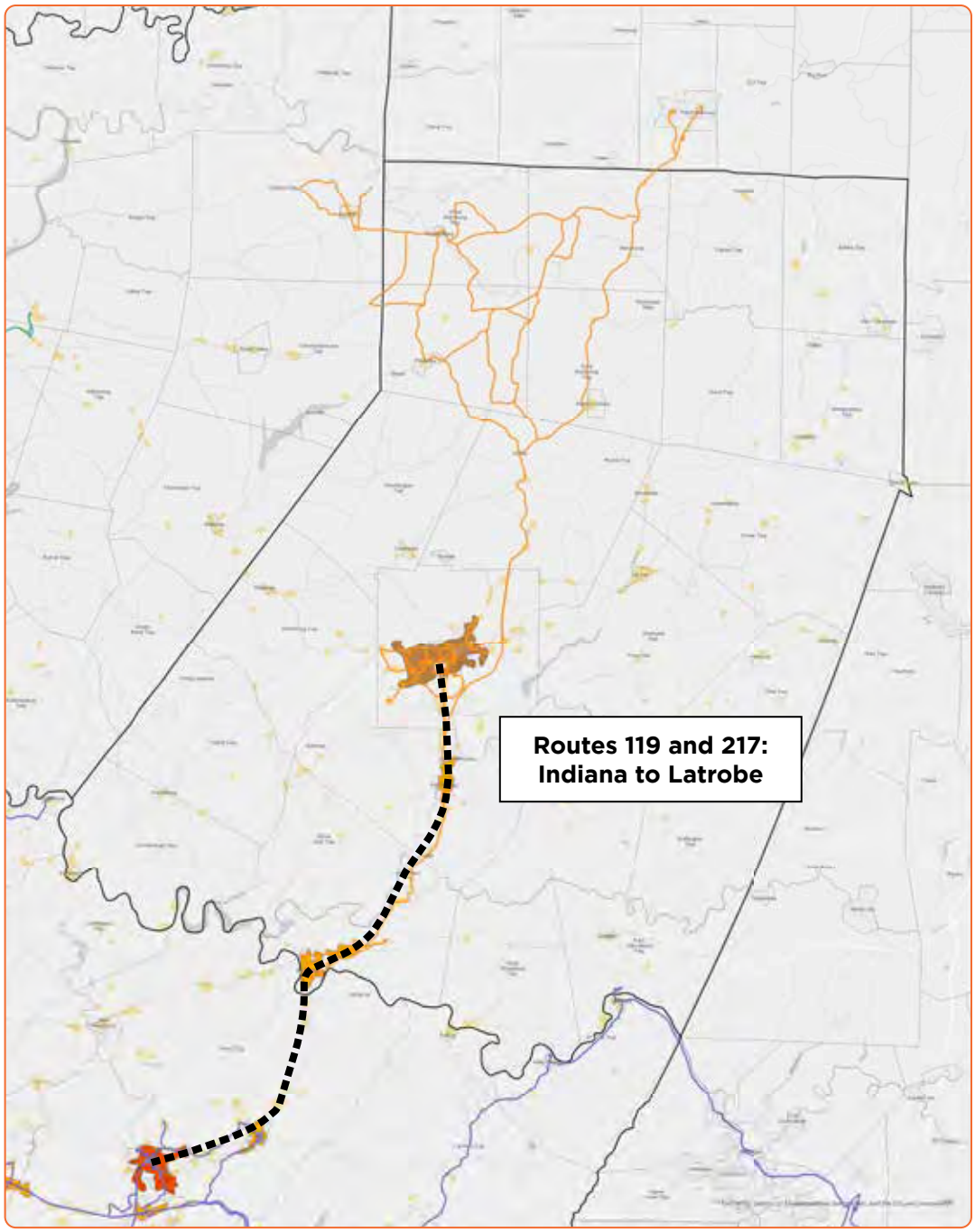
Greene County



Clusters by typology with existing transit routes highlighted.

Indiana County

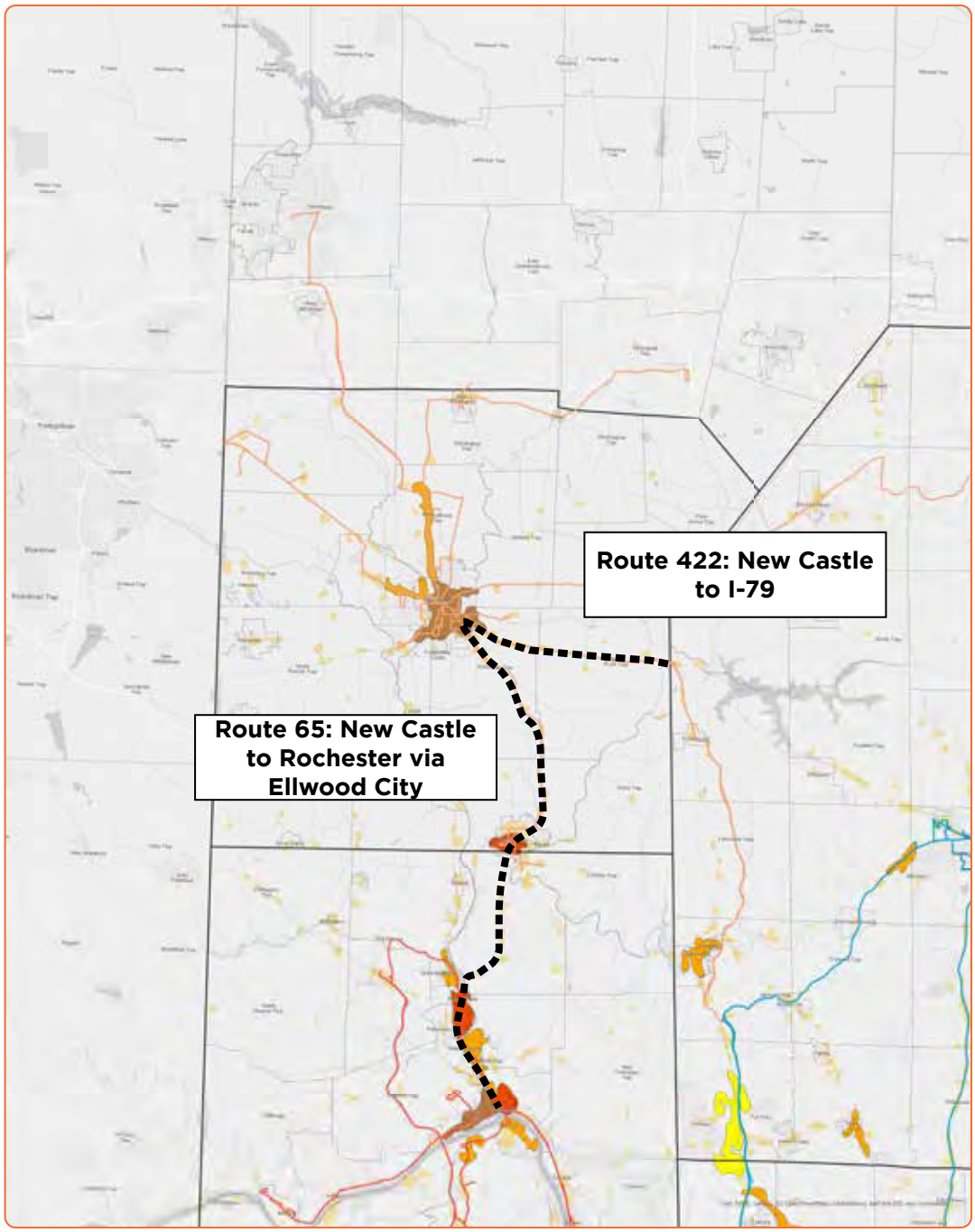
Indiana County Hub Opportunities



Clusters by typology with existing transit routes highlighted.

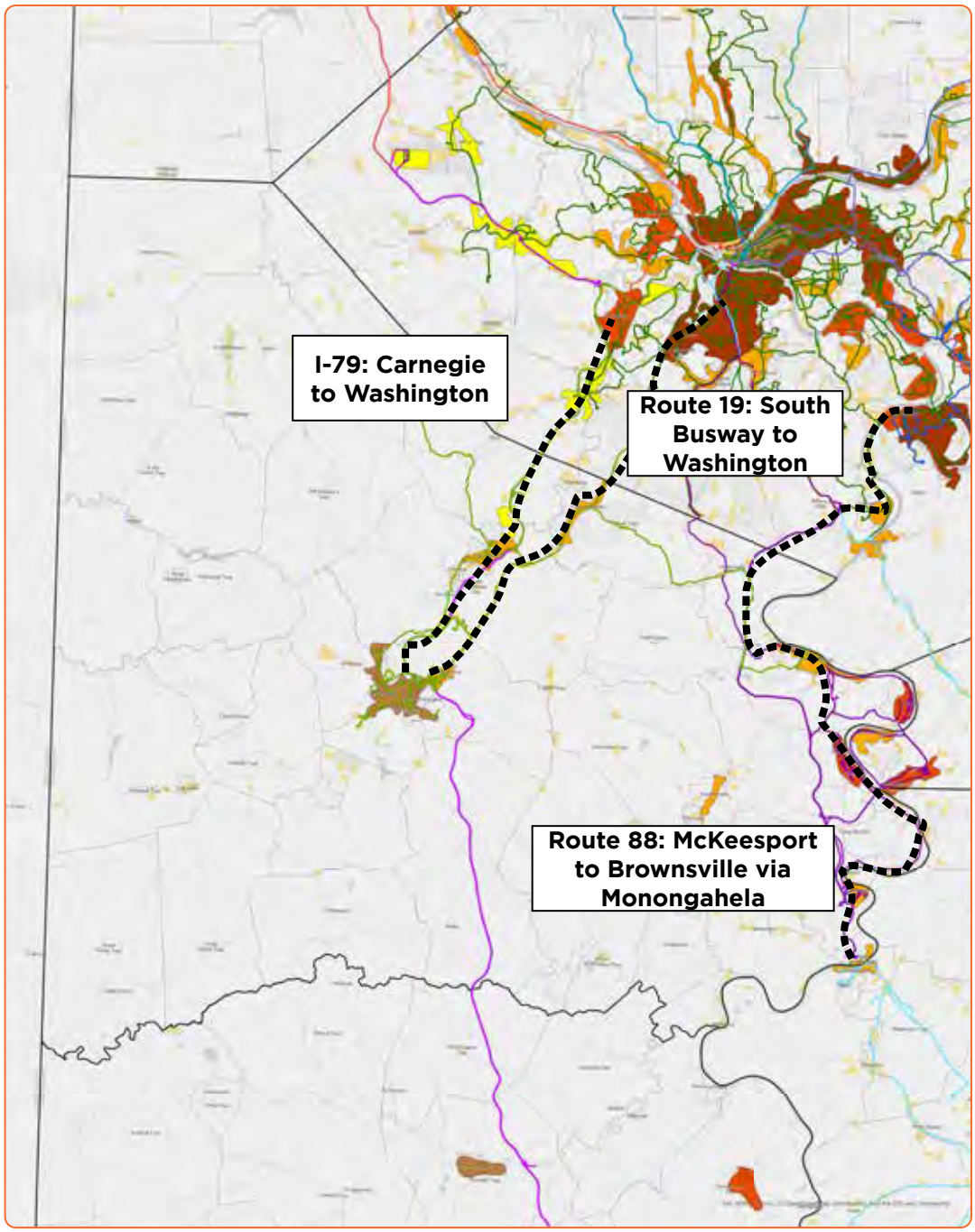
Lawrence County

Lawrence County Hub Opportunities



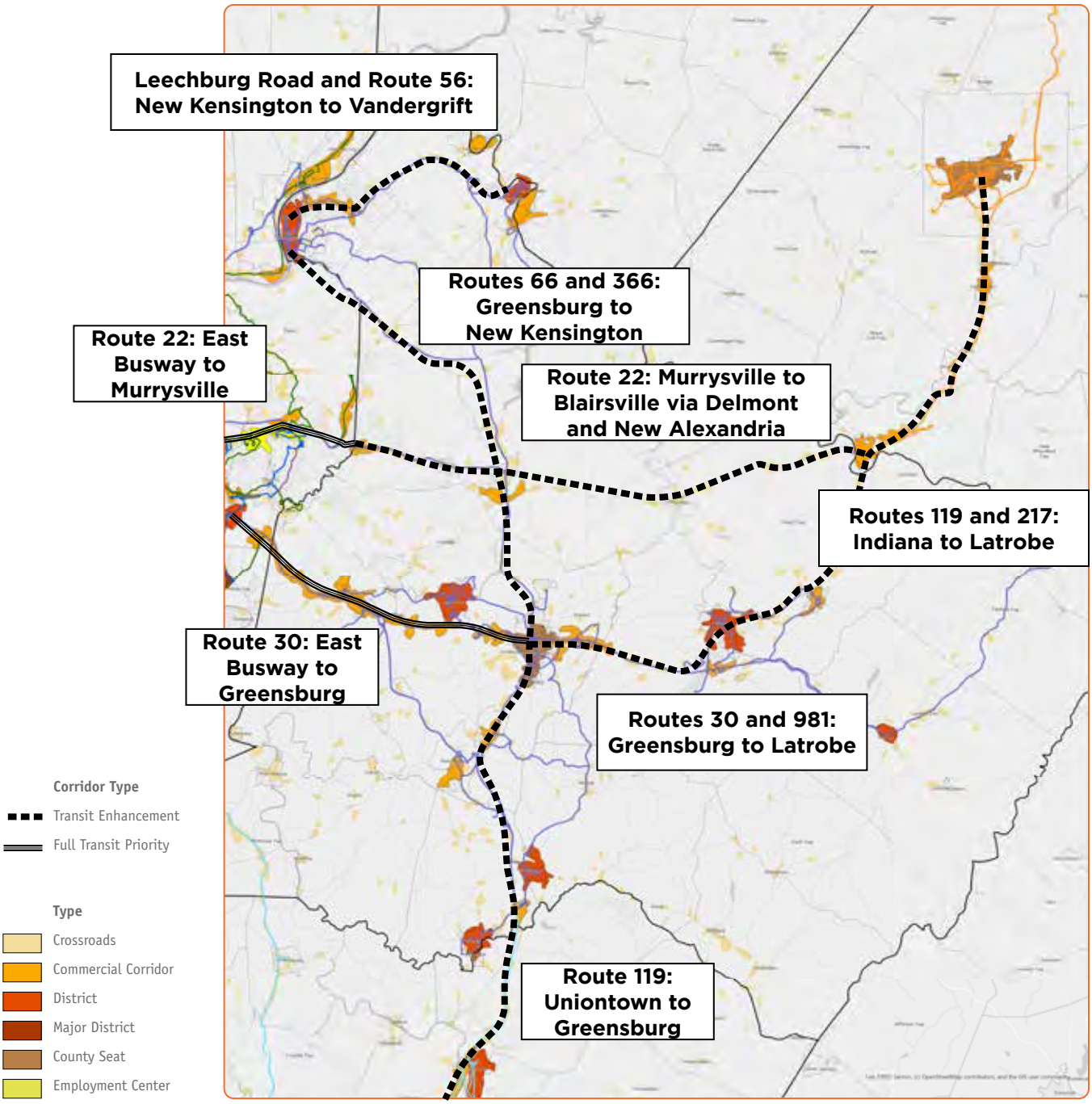
Clusters by typology with existing transit routes highlighted.

Washington County



Clusters by typology with existing transit routes highlighted.

Westmoreland County



Clusters by typology with existing transit routes highlighted.

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6

Visualization and Validation

TECHNICAL VALIDATION

CORRIDOR SIMULATION

Corridor Simulation

SIMULATION MEANS AND METHODS

Traffic modeling and simulation techniques were explored as a means to visualize hub and corridor operations, while demonstrating the integration of certain technologies and other concepts to support multimodal travel and maximize the potential to adapt individual roadways to meet these objectives. Traffic modeling was performed using Vissim, a program primarily used to model multimodal traffic flow in a 3-dimensional environment. The modeled locations were intended to be representative of diverse improvements that could be implemented throughout Southwest Pennsylvania; though they each show a specific location, they are meant to be examples, not completed designs. Further detailed analysis will be needed prior to design and implementation.

Traffic volumes, where available, were obtained from SPC's GIS hub. Bus volumes were based on existing routes and frequencies, then increased to show how transit-centric infrastructure can accommodate high numbers of buses. Bicyclists, commuter rail, and Transit-oriented Development were included to show multimodal interaction and the potential to attract private investment around transit centers.

SIMULATION SCENARIO

Included in the models are numerous techniques to improve bus travel times and reliability, as well as improve the traveler experience.

Corridor Site #1: I-376 and the East Busway

In the I-376 model, in addition to the bus-only ramps connecting to the MLK East Busway that eliminate the need for buses to compete with other traffic on Route 8, buses are shown running on the shoulder in order to bypass congestion on the freeway.

Corridor Site #2: Route 30 at North Versailles

In the Navy Marine Corps Way model, buses use special right turn lanes, detectors, and signal phasing to better serve improved transit stops and jump past queues in the through lanes. With these improvements, the travel time from Navy Marine Corps Way to Union Station in Pittsburgh would be 20 minutes, compared to up to 45 minutes by car, depending on time of day.

Corridor Site #3: Downtown Greensburg Hub

Finally, in the Greensburg hub model, improved intermodal connections are facilitated by upgraded stops and bus routing, bike share and bike storage with new on-street bicycle facilities to encourage active transportation, and bus parking is provided in order to allow schedule flexibility and improve service.

Corridor Site #1: I-376 and the East Busway

Simulation URL:
https://youtu.be/iUji-2y84pM

Signalized intersections with transit-signal priority at the East Busway and Edgewood Avenue allow bus traffic to move efficiently from the busway to new bus-only ramps to outbound I-376.

Dedicated bus-only shoulder lanes can be activated during peak rush hour to allow buses from routes 22 and 30 to bypass congestion on their way to and from the East Busway.

For inbound buses, a slip ramp allows buses to pre-merge with traffic entering from Ardmore Boulevard to make for more efficient traffic mixing before the beginning of the dedicated bus-only shoulder lanes.

Corridor Simulation

Corridor Site #2: Route 30 at North Versailles

Simulation URL:
https://youtu.be/y_mX6vY5fys

Sidewalks and bicycle lanes can be added to the Route 30 corridor in most places by simply narrowing travel lanes. Current travel lanes are wider than they need to be, encouraging speeding on the part of drivers.

Right turn lanes serve multiple purposes by including a bus stop and allowing buses to bypass the queue for pass-through traffic.

Transit signal priority allows buses in the combined queue jump and turning lane to re-enter traffic before pass-through traffic gets a green light.

Corridor Site #3: Downtown Greensburg Hub

Simulation URL:
https://youtu.be/yi0SvzQjQwo

A hub near the Greensburg Amtrak station could be well-connected to downtown Greensburg while enabling transfers between all modes. A hub in this location could also support more frequent passenger rail service.

Hub facilities could include transfer platforms between buses from multiple agencies as well as micro-transit vehicles and vanpooling vehicles. Bike share and pick-up and drop-off areas make using the station area easy and convenient.

Ample layover capacity provides transit operators with service planning flexibility.

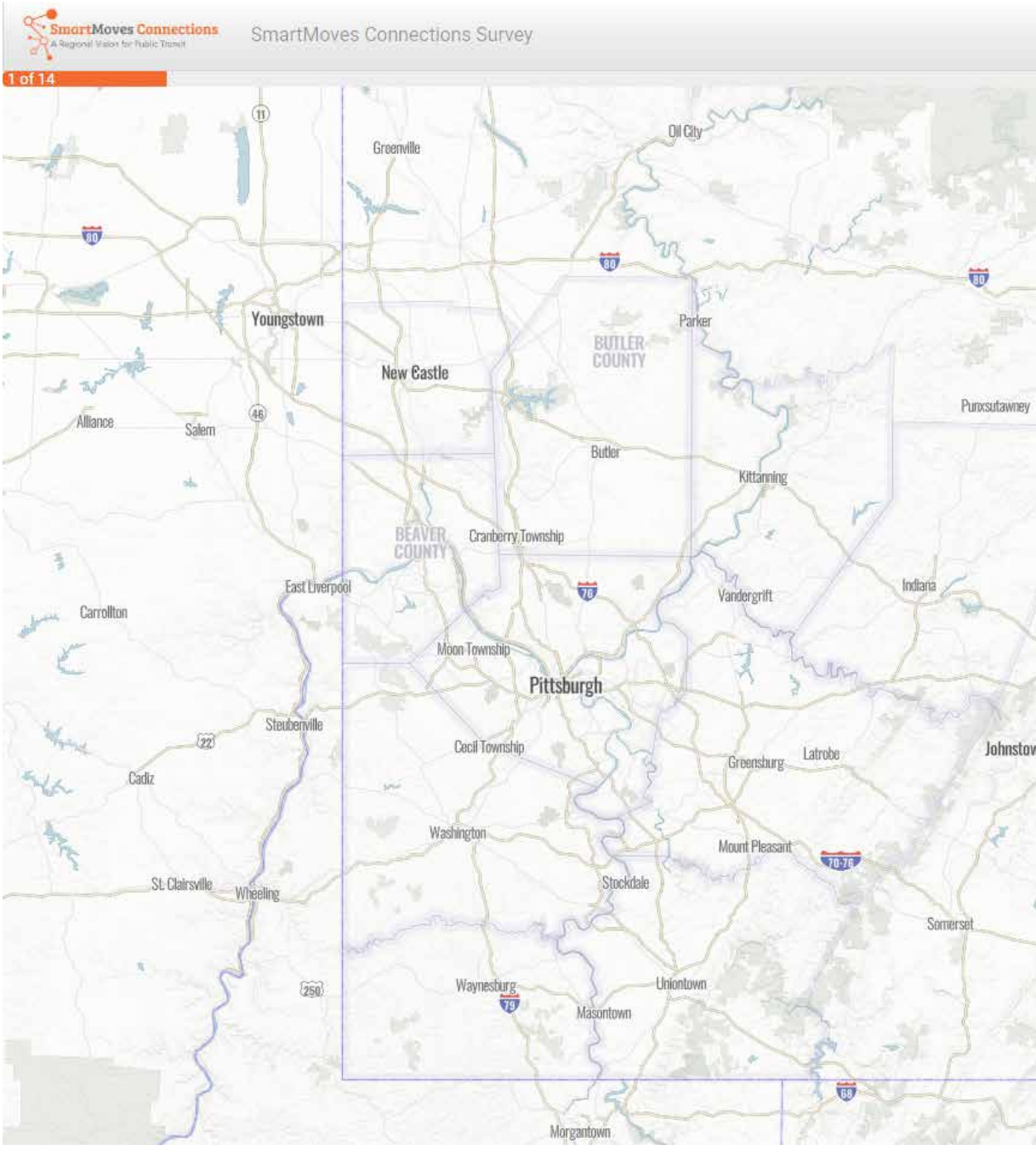
A.1

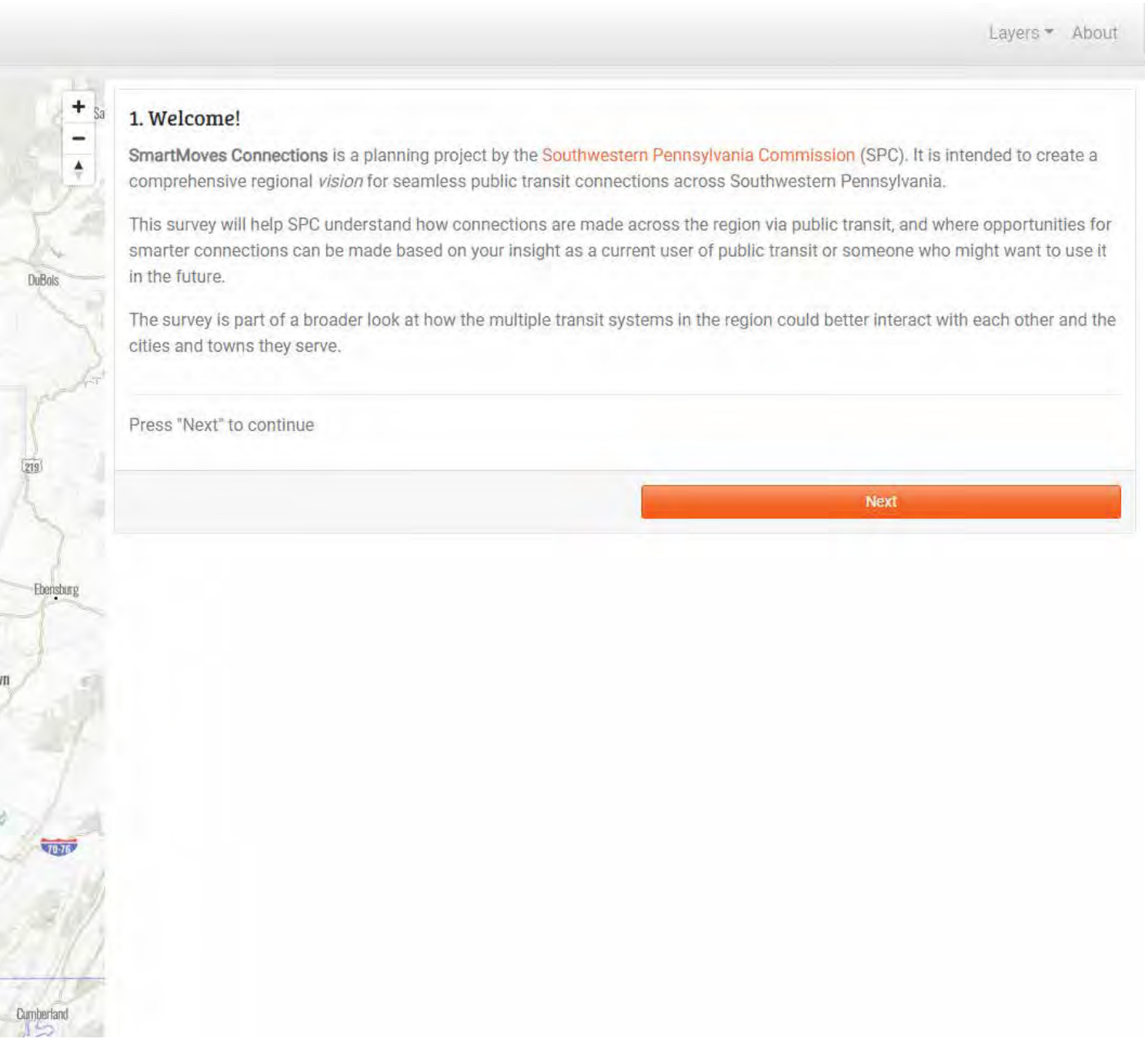
Online Public Engagement Tool

PUBLIC ENGAGEMENT

Participatory Planning Tool

STEP 1 OF 14

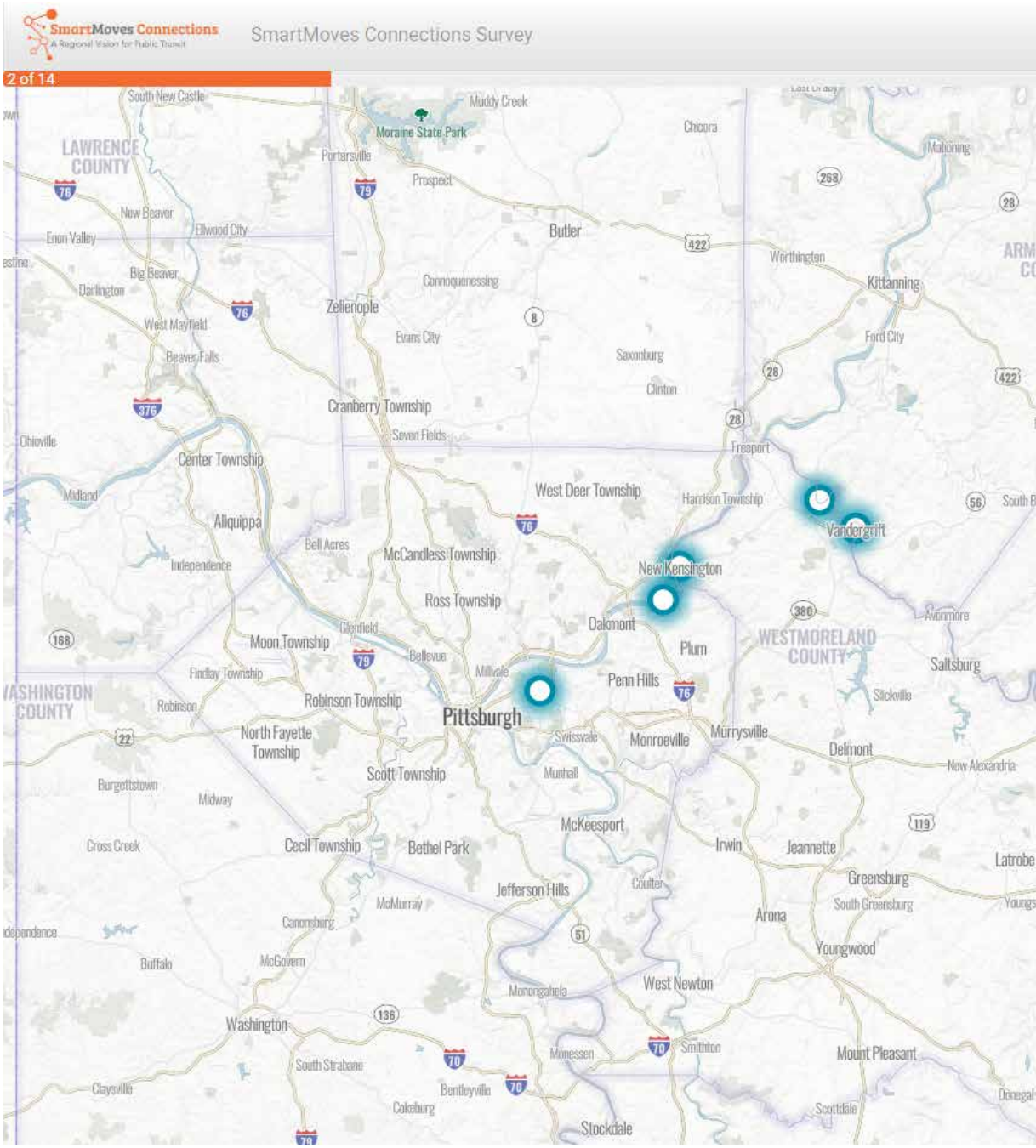


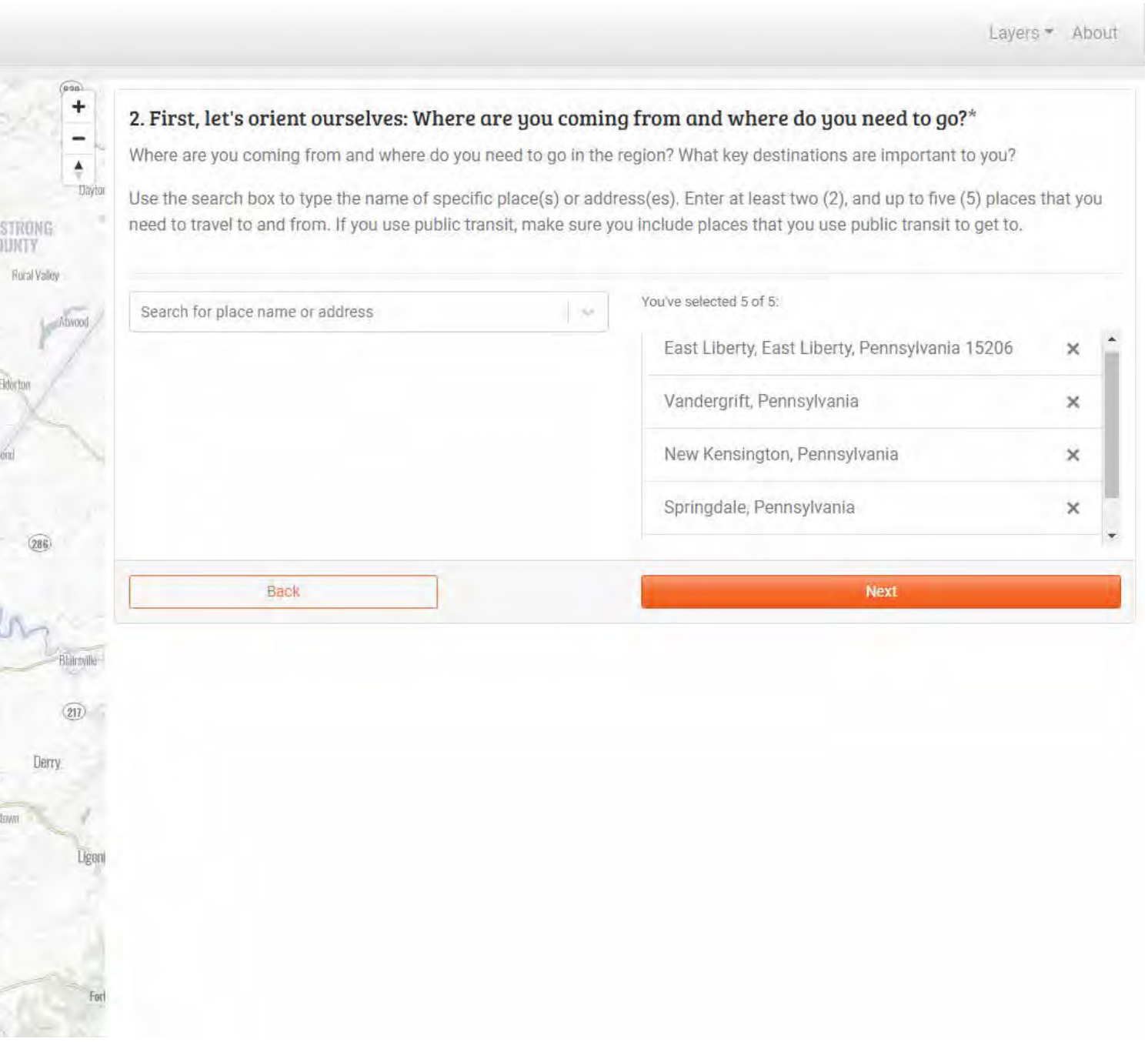

Layers
About
1. Welcome!
SmartMoves Connections is a planning project by the Southwestern Pennsylvania Commission (SPC). It is intended to create a comprehensive regional vision for seamless public transit connections across Southwestern Pennsylvania.
This survey will help SPC understand how connections are made across the region via public transit, and where opportunities for smarter connections can be made based on your insight as a current user of public transit or someone who might want to use it in the future.
The survey is part of a broader look at how the multiple transit systems in the region could better interact with each other and the cities and towns they serve.
Press "Next" to continue
Next
DuBois
Ebensburg
Cumberland

PUBLIC ENGAGEMENT

Participatory Planning Tool

STEP 2 OF 14

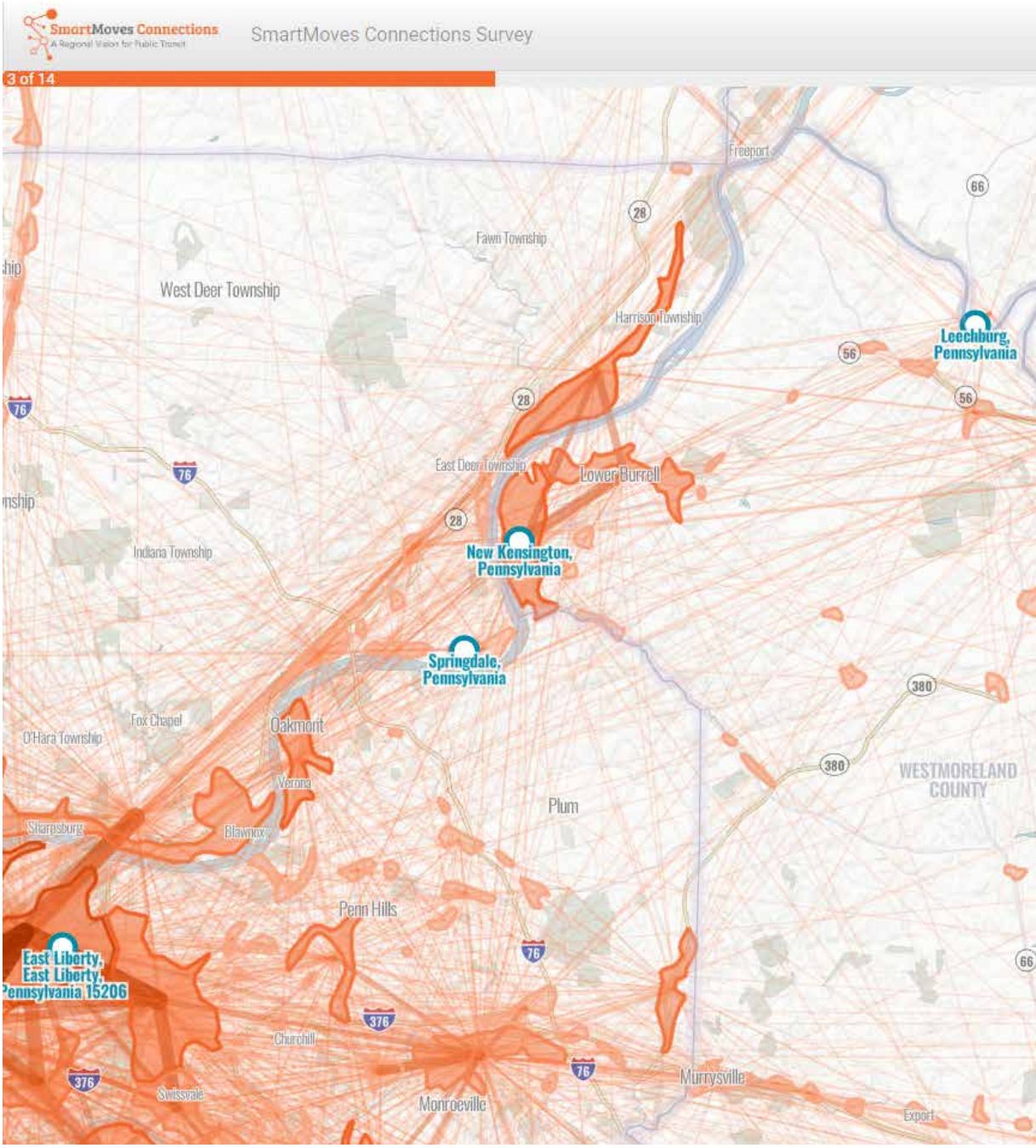


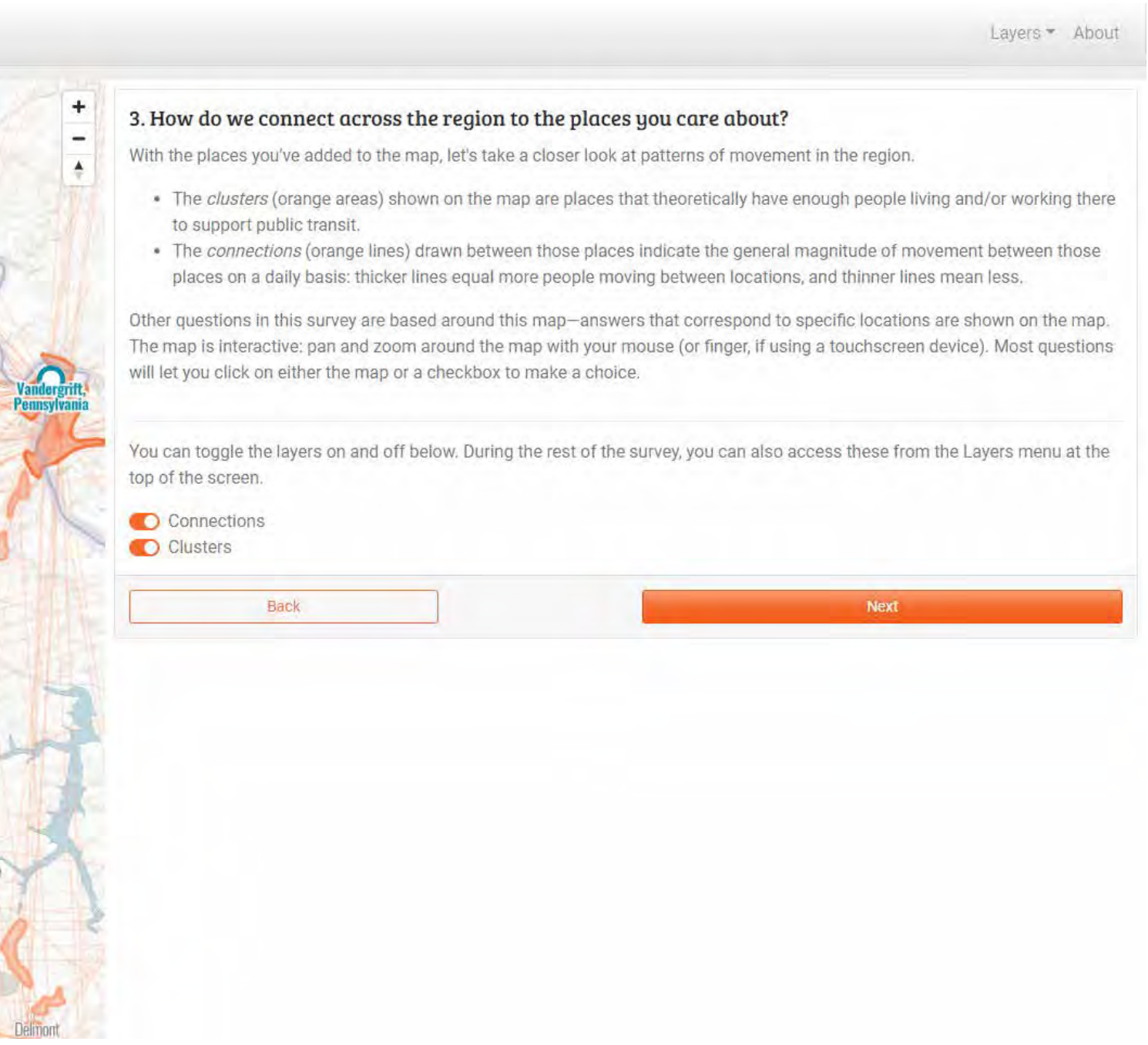

Layers
About
2. First, let's orient ourselves: Where are you coming from and where do you need to go?*
Where are you coming from and where do you need to go in the region? What key destinations are important to you?
Use the search box to type the name of specific place(s) or address(es). Enter at least two (2), and up to five (5) places that you need to travel to and from. If you use public transit, make sure you include places that you use public transit to get to.
Search for place name or address
You've selected 5 of 5:
East Liberty, East Liberty, Pennsylvania 15206
Vandergrift, Pennsylvania
New Kensington, Pennsylvania
Springdale, Pennsylvania
Back
Next
Rural Valley
Blairsville
Derry

PUBLIC ENGAGEMENT

Participatory Planning Tool

STEP 3 OF 14





3. How do we connect across the region to the places you care about?

With the places you've added to the map, let's take a closer look at patterns of movement in the region.

- The *clusters* (orange areas) shown on the map are places that theoretically have enough people living and/or working there to support public transit.
- The *connections* (orange lines) drawn between those places indicate the general magnitude of movement between those places on a daily basis: thicker lines equal more people moving between locations, and thinner lines mean less.

Other questions in this survey are based around this map—answers that correspond to specific locations are shown on the map. The map is interactive: pan and zoom around the map with your mouse (or finger, if using a touchscreen device). Most questions will let you click on either the map or a checkbox to make a choice.

You can toggle the layers on and off below. During the rest of the survey, you can also access these from the Layers menu at the top of the screen.

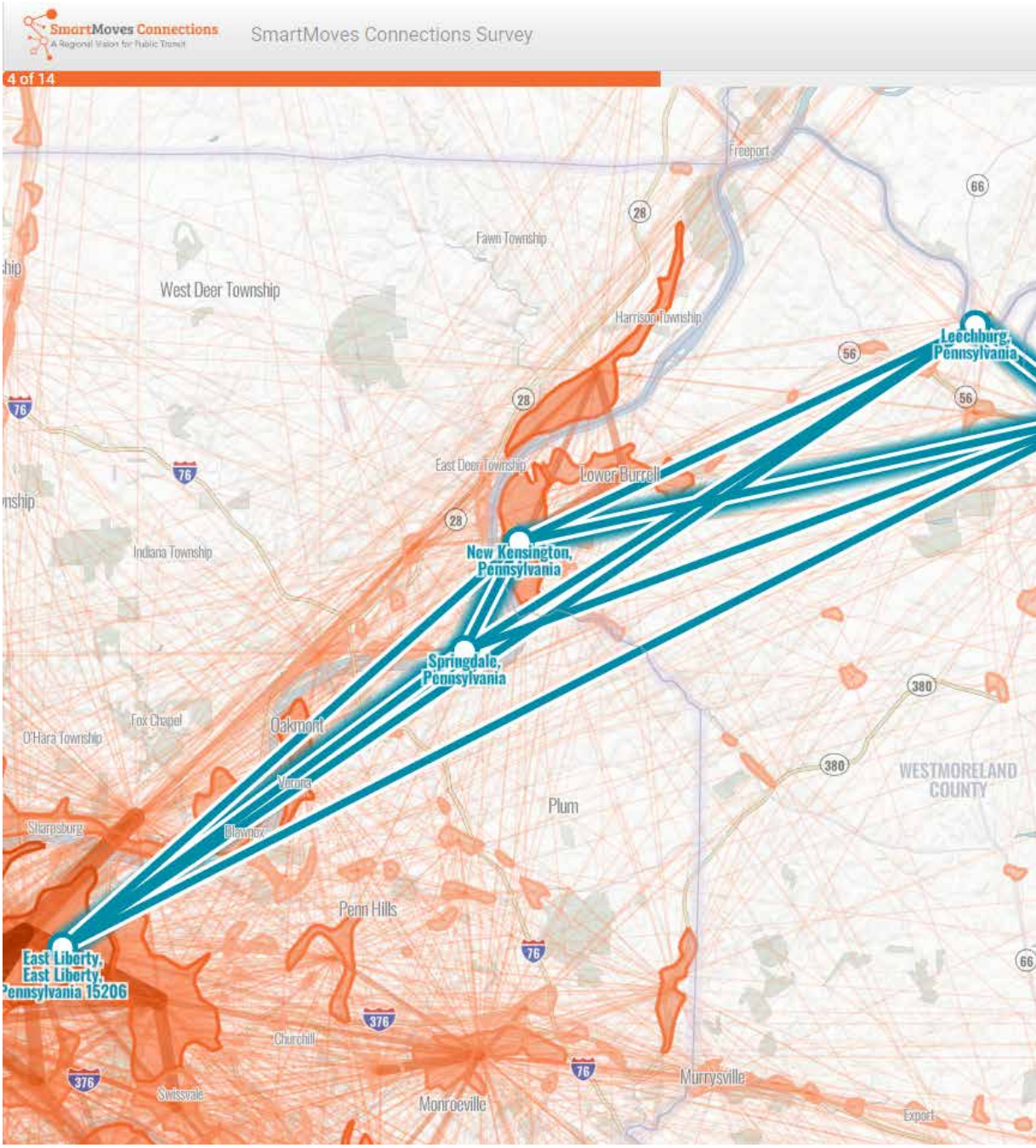
Connections
Clusters

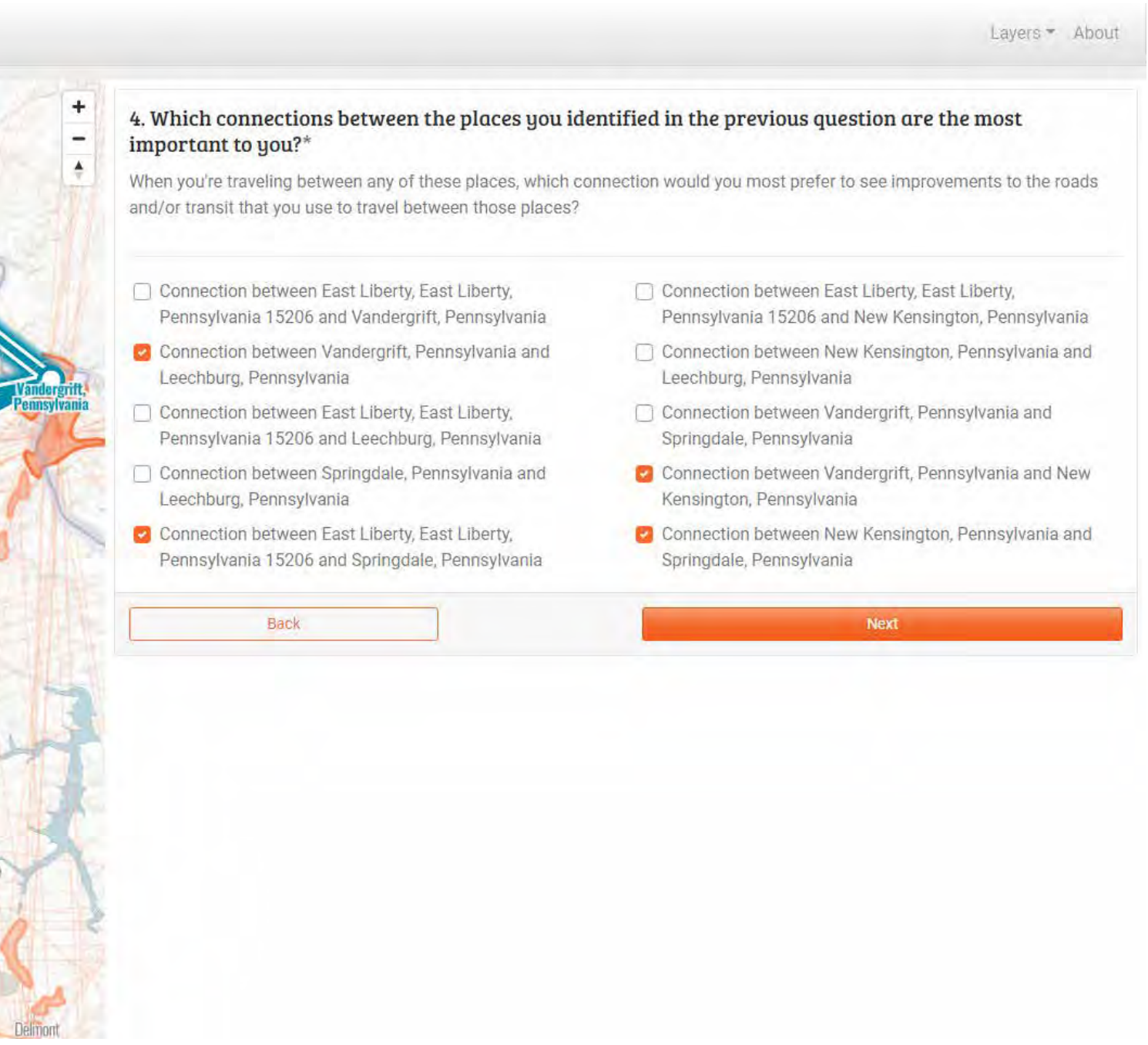
Back | Next

PUBLIC ENGAGEMENT

Participatory Planning Tool

STEP 4 OF 14





4. Which connections between the places you identified in the previous question are the most important to you?*

When you're traveling between any of these places, which connection would you most prefer to see improvements to the roads and/or transit that you use to travel between those places?

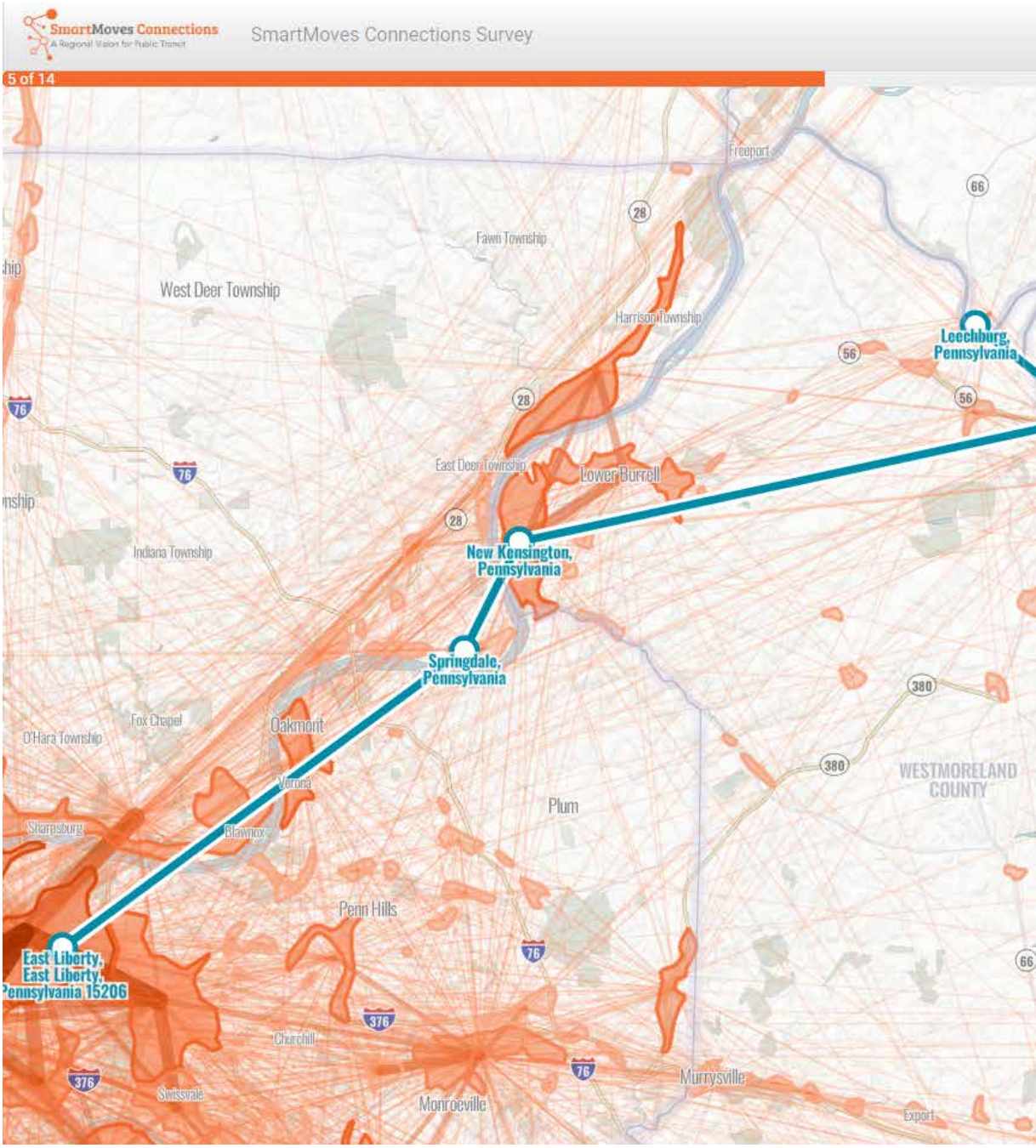
- [ ] Connection between East Liberty, East Liberty, Pennsylvania 15206 and Vandergrift, Pennsylvania
- [x] Connection between Vandergrift, Pennsylvania and Leechburg, Pennsylvania
- [ ] Connection between East Liberty, East Liberty, Pennsylvania 15206 and Leechburg, Pennsylvania
- [ ] Connection between Springdale, Pennsylvania and Leechburg, Pennsylvania
- [x] Connection between East Liberty, East Liberty, Pennsylvania 15206 and Springdale, Pennsylvania
- [ ] Connection between East Liberty, East Liberty, Pennsylvania 15206 and New Kensington, Pennsylvania
- [ ] Connection between New Kensington, Pennsylvania and Leechburg, Pennsylvania
- [ ] Connection between Vandergrift, Pennsylvania and Springdale, Pennsylvania
- [x] Connection between Vandergrift, Pennsylvania and New Kensington, Pennsylvania
- [x] Connection between New Kensington, Pennsylvania and Springdale, Pennsylvania

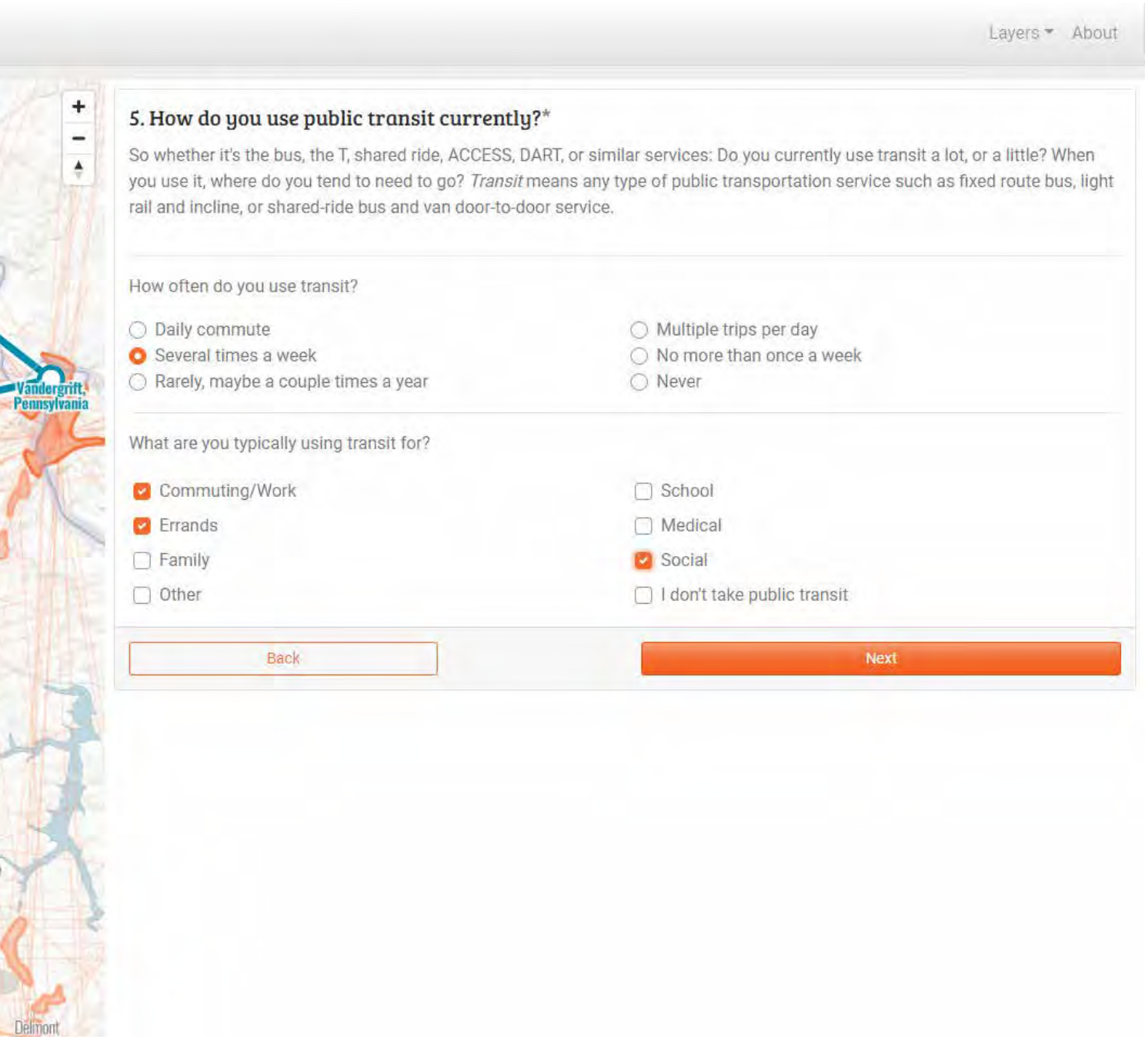
Back | Next

PUBLIC ENGAGEMENT

Participatory Planning Tool

STEP 5 OF 14

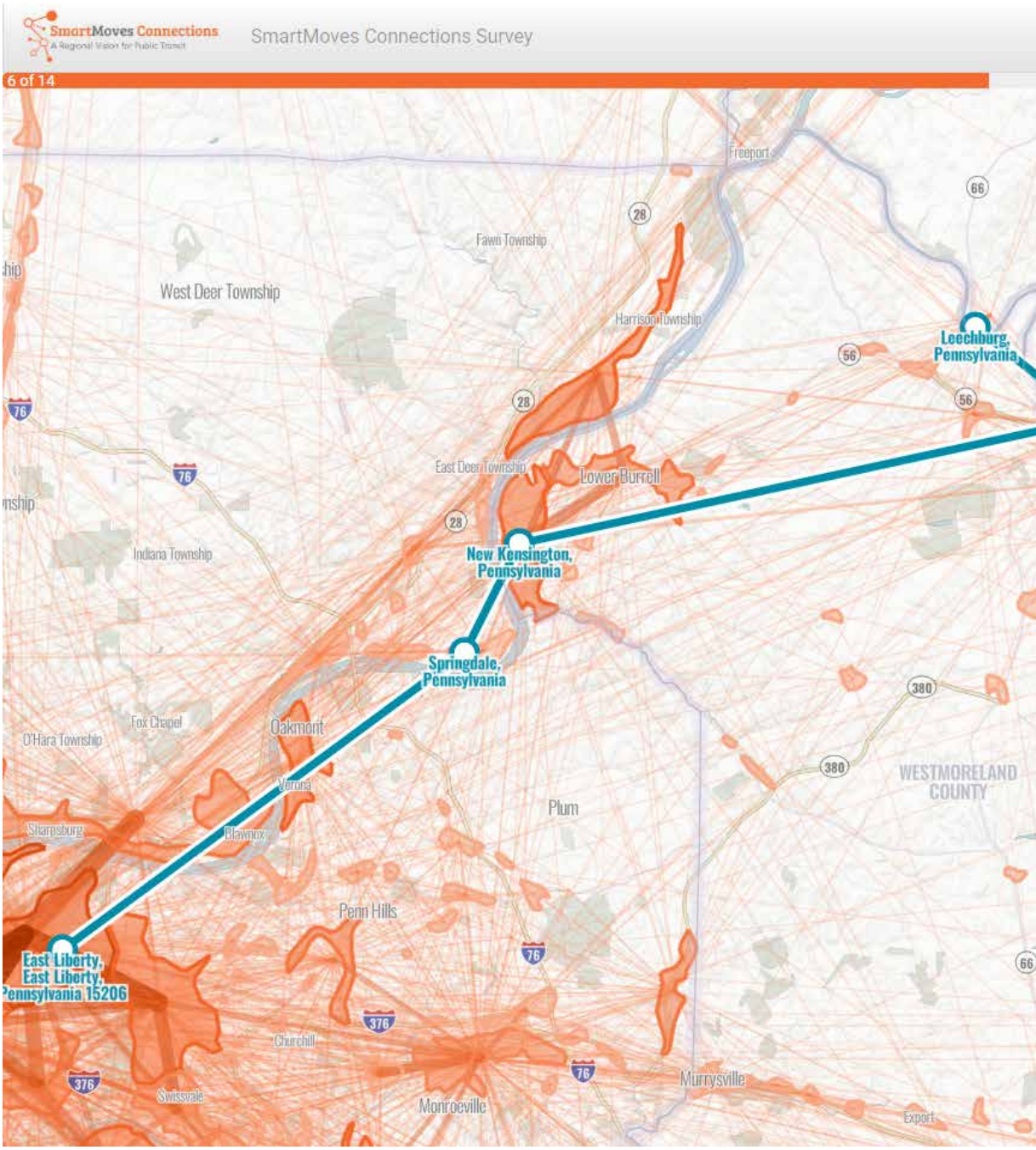


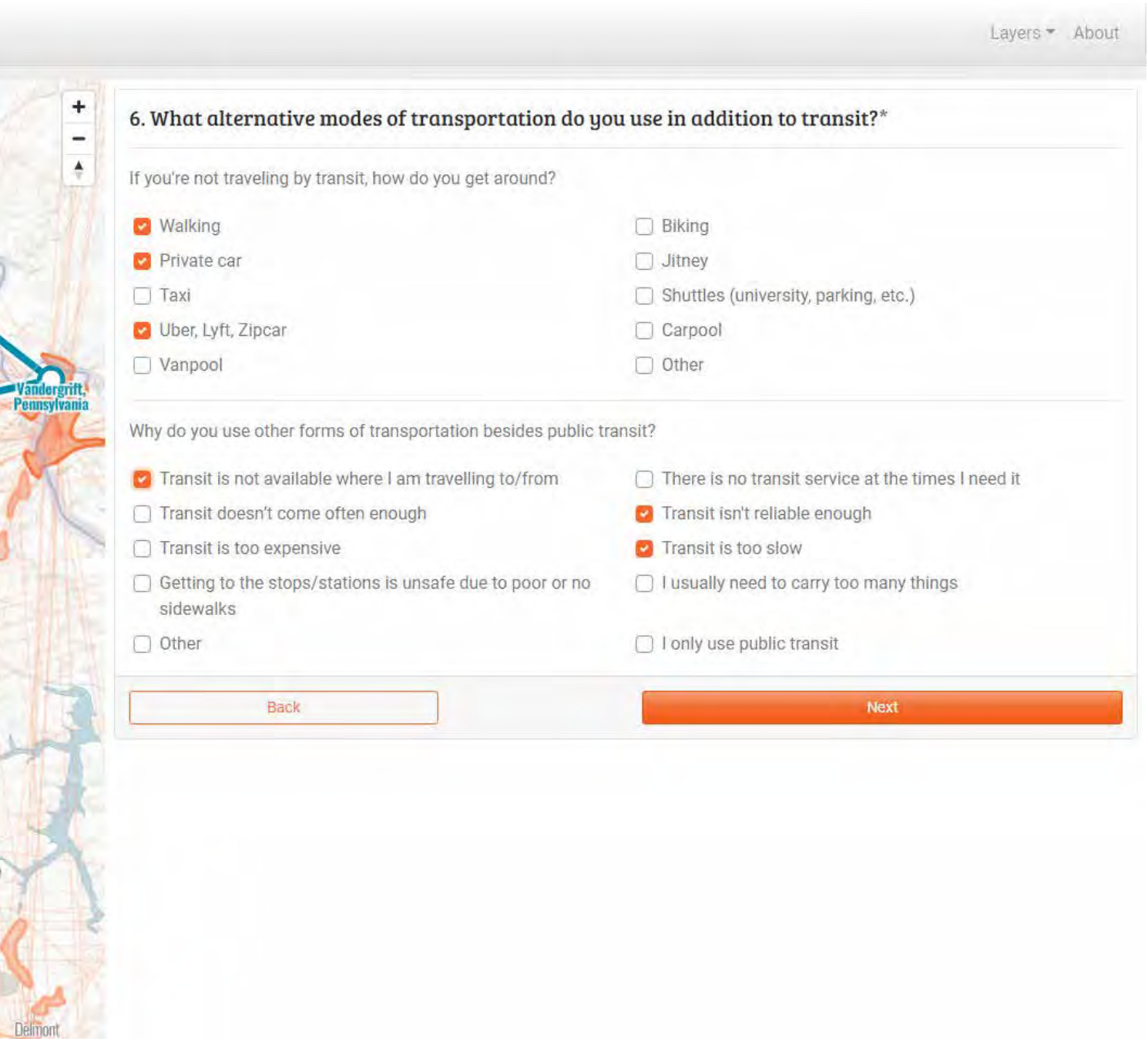

Layers
About
Vandergrift, Pennsylvania
Delmont
5. How do you use public transit currently?*
So whether it's the bus, the T, shared ride, ACCESS, DART, or similar services: Do you currently use transit a lot, or a little? When you use it, where do you tend to need to go? Transit means any type of public transportation service such as fixed route bus, light rail and incline, or shared-ride bus and van door-to-door service.
How often do you use transit?
Daily commute
Several times a week
Rarely, maybe a couple times a year
Multiple trips per day
No more than once a week
Never
What are you typically using transit for?
Commuting/Work
Errands
Family
Other
School
Medical
Social
I don't take public transit
Back
Next

PUBLIC ENGAGEMENT

Participatory Planning Tool

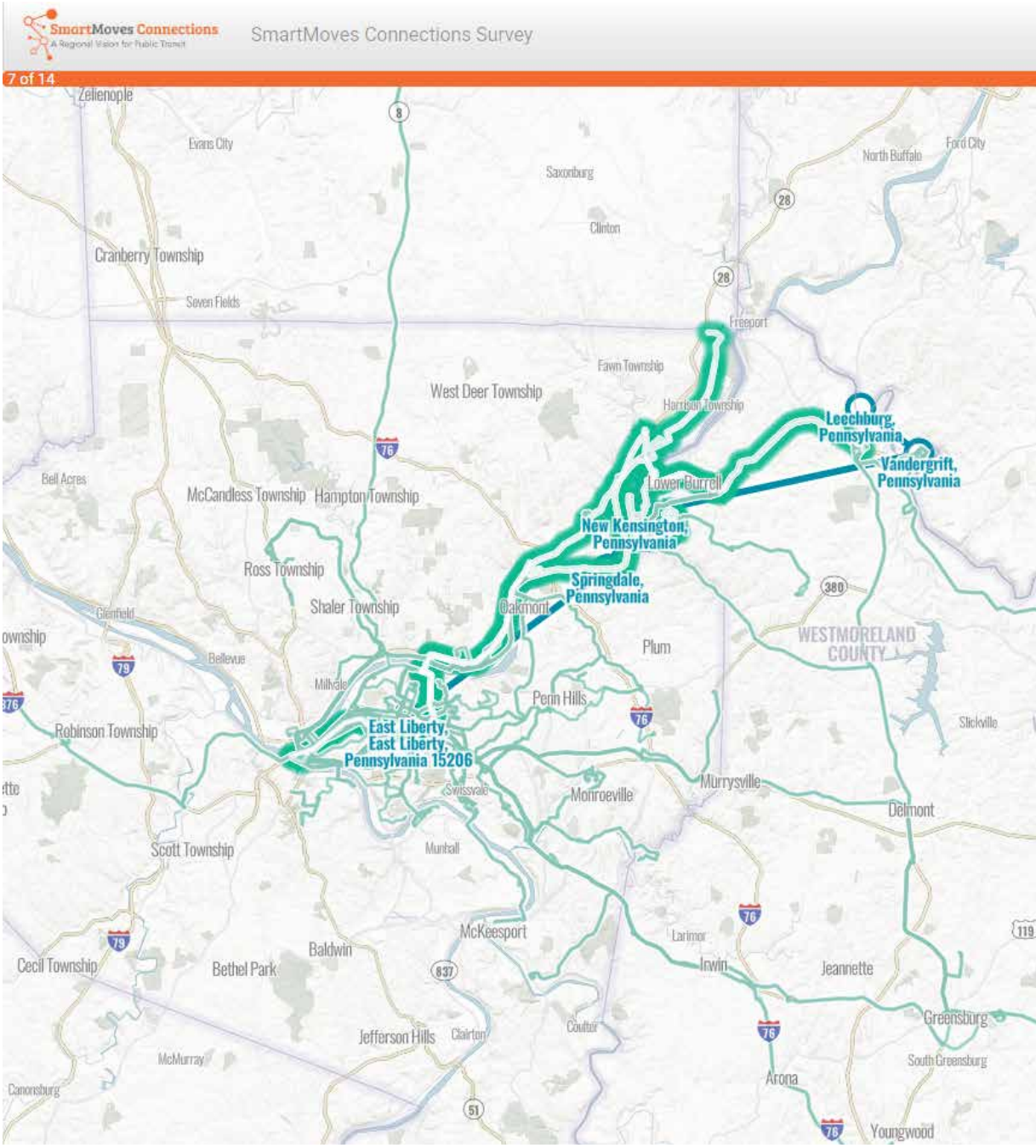
STEP 6 OF 14

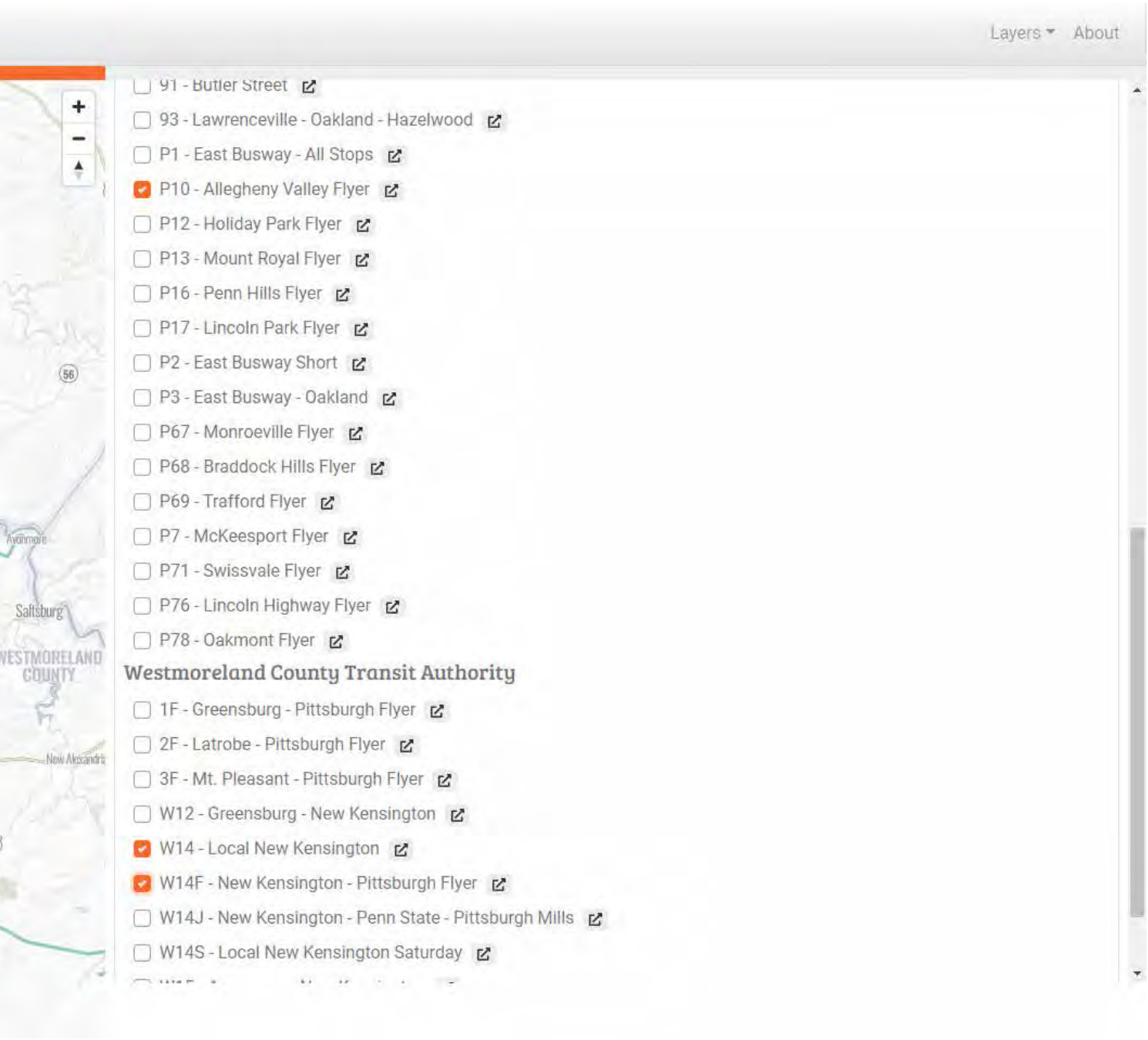



Layers
About
Vandergrift, Pennsylvania
Delmont
6. What alternative modes of transportation do you use in addition to transit?*
If you're not traveling by transit, how do you get around?
Walking
Private car
Taxi
Uber, Lyft, Zipcar
Vanpool
Biking
Jitney
Shuttles (university, parking, etc.)
Carpool
Other
Why do you use other forms of transportation besides public transit?
Transit is not available where I am travelling to/from
Transit doesn't come often enough
Transit is too expensive
Getting to the stops/stations is unsafe due to poor or no sidewalks
Other
There is no transit service at the times I need it
Transit isn't reliable enough
Transit is too slow
I usually need to carry too many things
I only use public transit
Back
Next

Participatory Planning Tool

STEP 7 OF 14

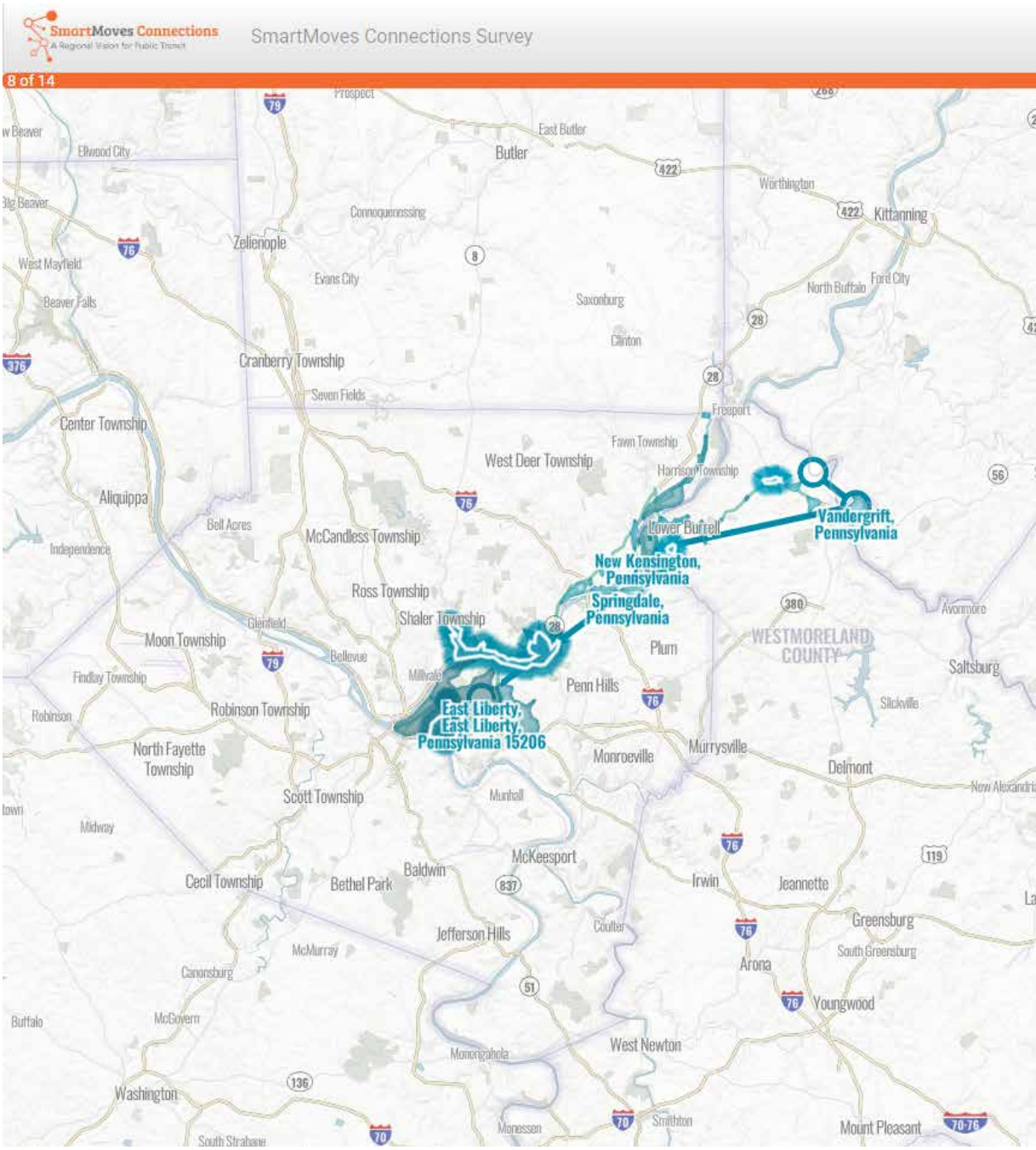


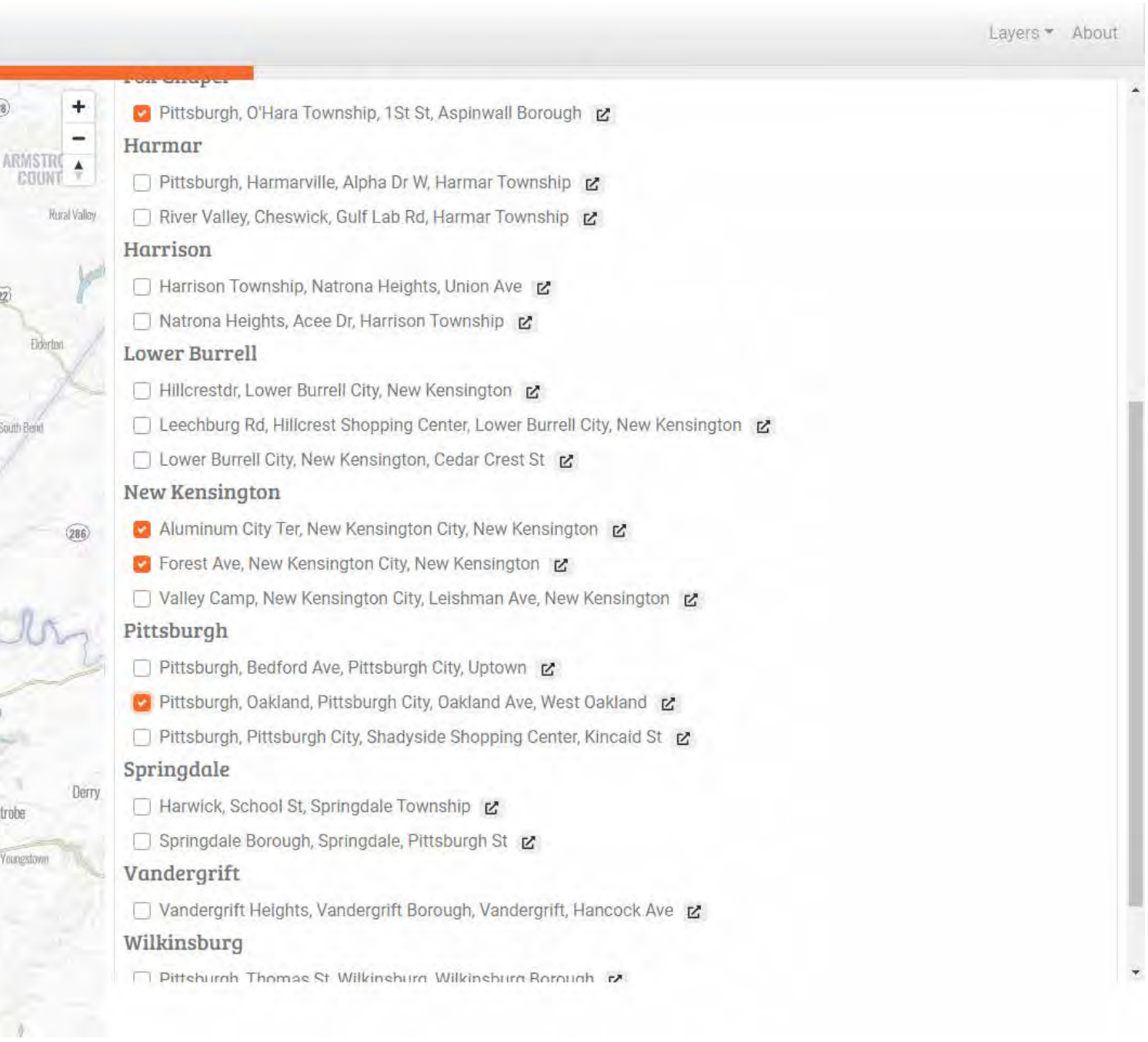

Layers
About
91 - Butler Street
93 - Lawrenceville - Oakland - Hazelwood
P1 - East Busway - All Stops
P10 - Allegheny Valley Flyer
P12 - Holiday Park Flyer
P13 - Mount Royal Flyer
P16 - Penn Hills Flyer
P17 - Lincoln Park Flyer
P2 - East Busway Short
P3 - East Busway - Oakland
P67 - Monroeville Flyer
P68 - Braddock Hills Flyer
P69 - Trafford Flyer
P7 - McKeesport Flyer
P71 - Swissvale Flyer
P76 - Lincoln Highway Flyer
P78 - Oakmont Flyer
Westmoreland County Transit Authority
1F - Greensburg - Pittsburgh Flyer
2F - Latrobe - Pittsburgh Flyer
3F - Mt. Pleasant - Pittsburgh Flyer
W12 - Greensburg - New Kensington
W14 - Local New Kensington
W14F - New Kensington - Pittsburgh Flyer
W14J - New Kensington - Penn State - Pittsburgh Mills
W14S - Local New Kensington Saturday
56
Saltsburg
WESTMORELAND COUNTY

PUBLIC ENGAGEMENT

Participatory Planning Tool

STEP 8 OF 14

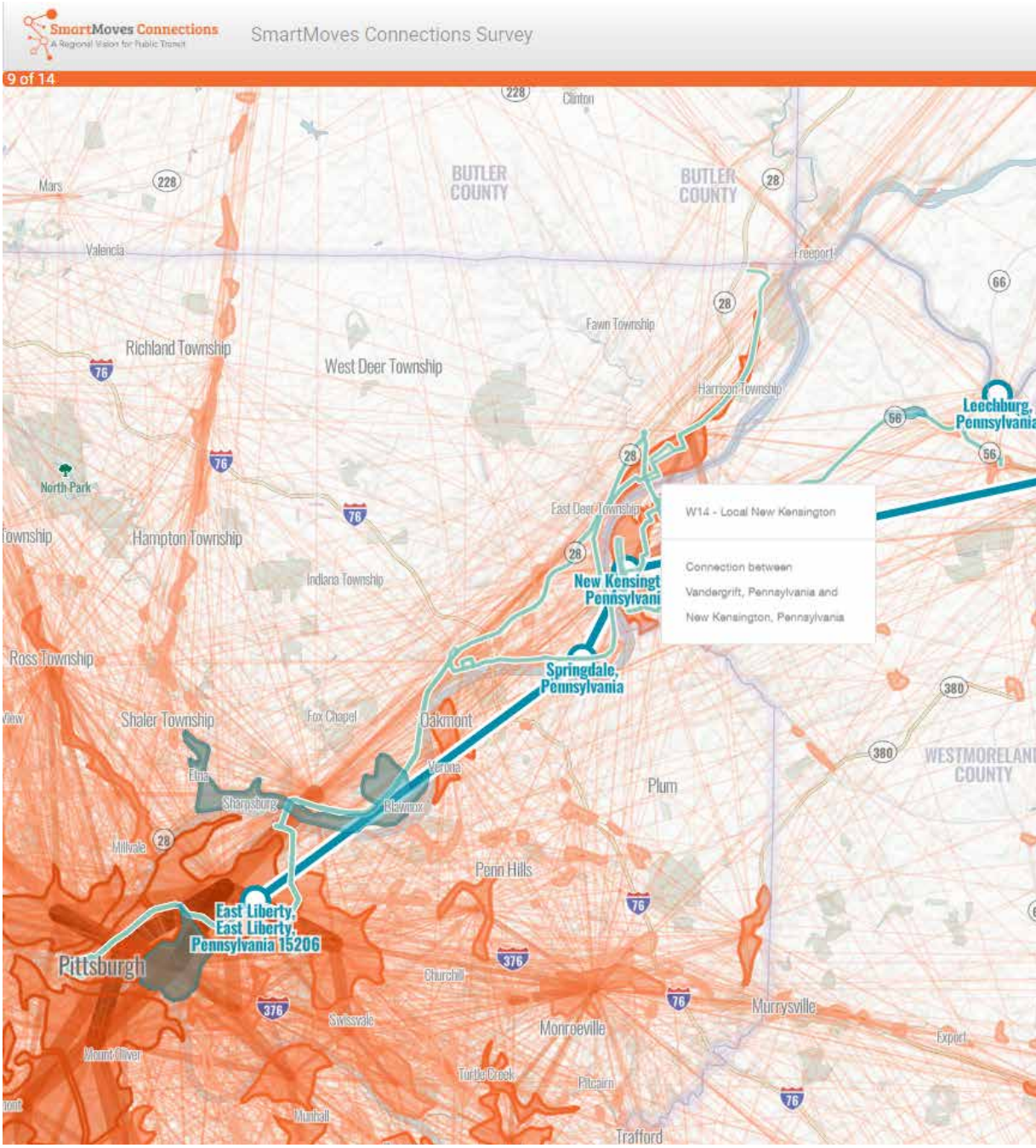


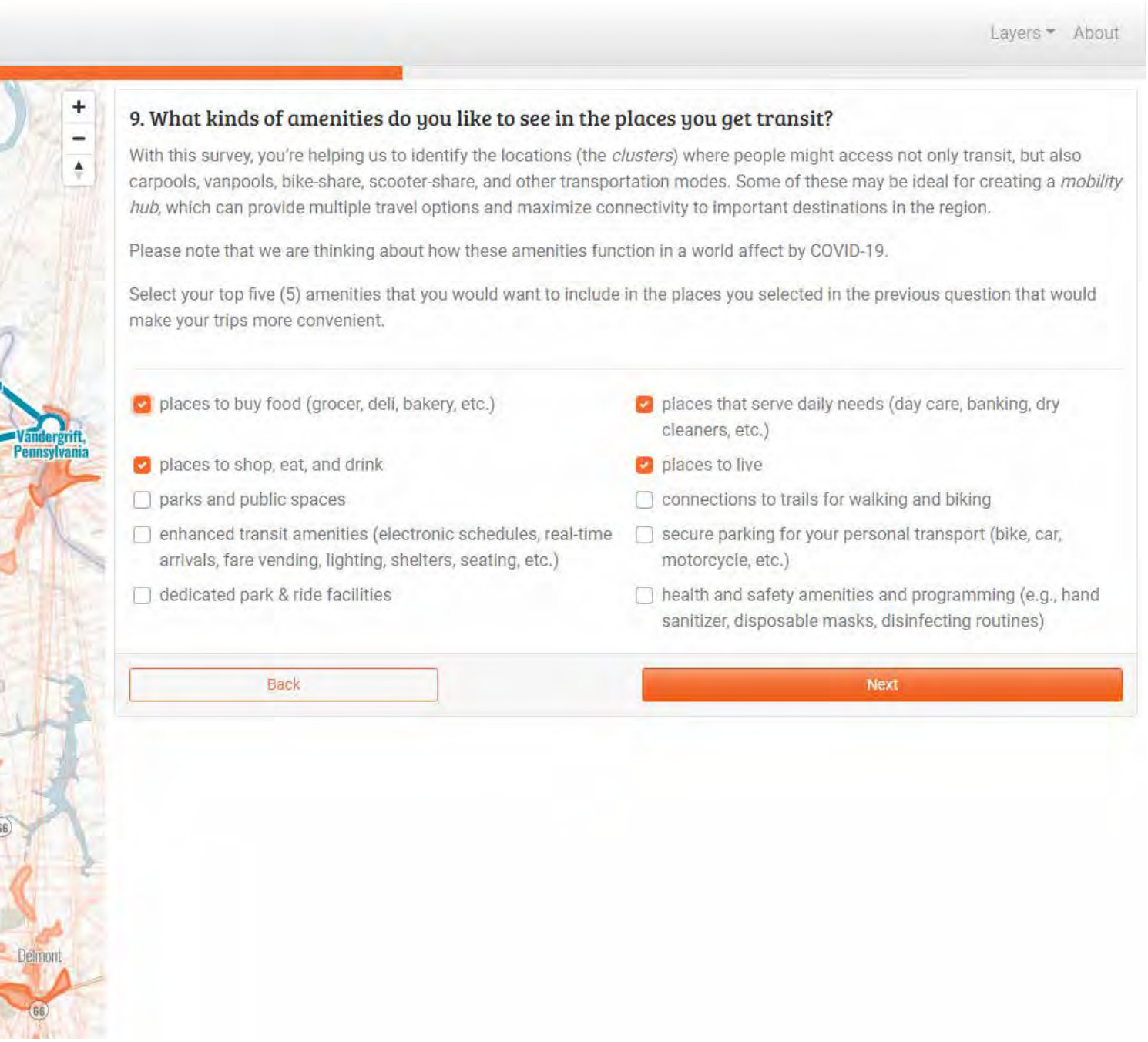

Layers
About
Pittsburgh, O'Hara Township, 1St St, Aspinwall Borough
Harmar
Pittsburgh, Harmarville, Alpha Dr W, Harmar Township
River Valley, Cheswick, Gulf Lab Rd, Harmar Township
Harrison
Harrison Township, Natrona Heights, Union Ave
Natrona Heights, Acee Dr, Harrison Township
Lower Burrell
Hillcrestdr, Lower Burrell City, New Kensington
Leechburg Rd, Hillcrest Shopping Center, Lower Burrell City, New Kensington
Lower Burrell City, New Kensington, Cedar Crest St
New Kensington
Aluminum City Ter, New Kensington City, New Kensington
Forest Ave, New Kensington City, New Kensington
Valley Camp, New Kensington City, Leishman Ave, New Kensington
Pittsburgh
Pittsburgh, Bedford Ave, Pittsburgh City, Uptown
Pittsburgh, Oakland, Pittsburgh City, Oakland Ave, West Oakland
Pittsburgh, Pittsburgh City, Shadyside Shopping Center, Kincaid St
Springdale
Harwick, School St, Springdale Township
Springdale Borough, Springdale, Pittsburgh St
Vandergrift
Vandergrift Heights, Vandergrift Borough, Vandergrift, Hancock Ave
Wilkinsburg
Rural Valley
Elderton
South Bend
Derry
Youngstown

PUBLIC ENGAGEMENT

Participatory Planning Tool

STEP 9 OF 14





9. What kinds of amenities do you like to see in the places you get transit?

With this survey, you're helping us to identify the locations (the *clusters*) where people might access not only transit, but also carpools, vanpools, bike-share, scooter-share, and other transportation modes. Some of these may be ideal for creating a *mobility hub*, which can provide multiple travel options and maximize connectivity to important destinations in the region.

Please note that we are thinking about how these amenities function in a world affect by COVID-19.

Select your top five (5) amenities that you would want to include in the places you selected in the previous question that would make your trips more convenient.

- [x] places to buy food (grocer, deli, bakery, etc.)
- [x] places that serve daily needs (day care, banking, dry cleaners, etc.)
- [x] places to shop, eat, and drink
- [x] places to live
- [ ] parks and public spaces
- [ ] connections to trails for walking and biking
- [ ] enhanced transit amenities (electronic schedules, real-time arrivals, fare vending, lighting, shelters, seating, etc.)
- [ ] secure parking for your personal transport (bike, car, motorcycle, etc.)
- [ ] dedicated park & ride facilities
- [ ] health and safety amenities and programming (e.g., hand sanitizer, disposable masks, disinfecting routines)

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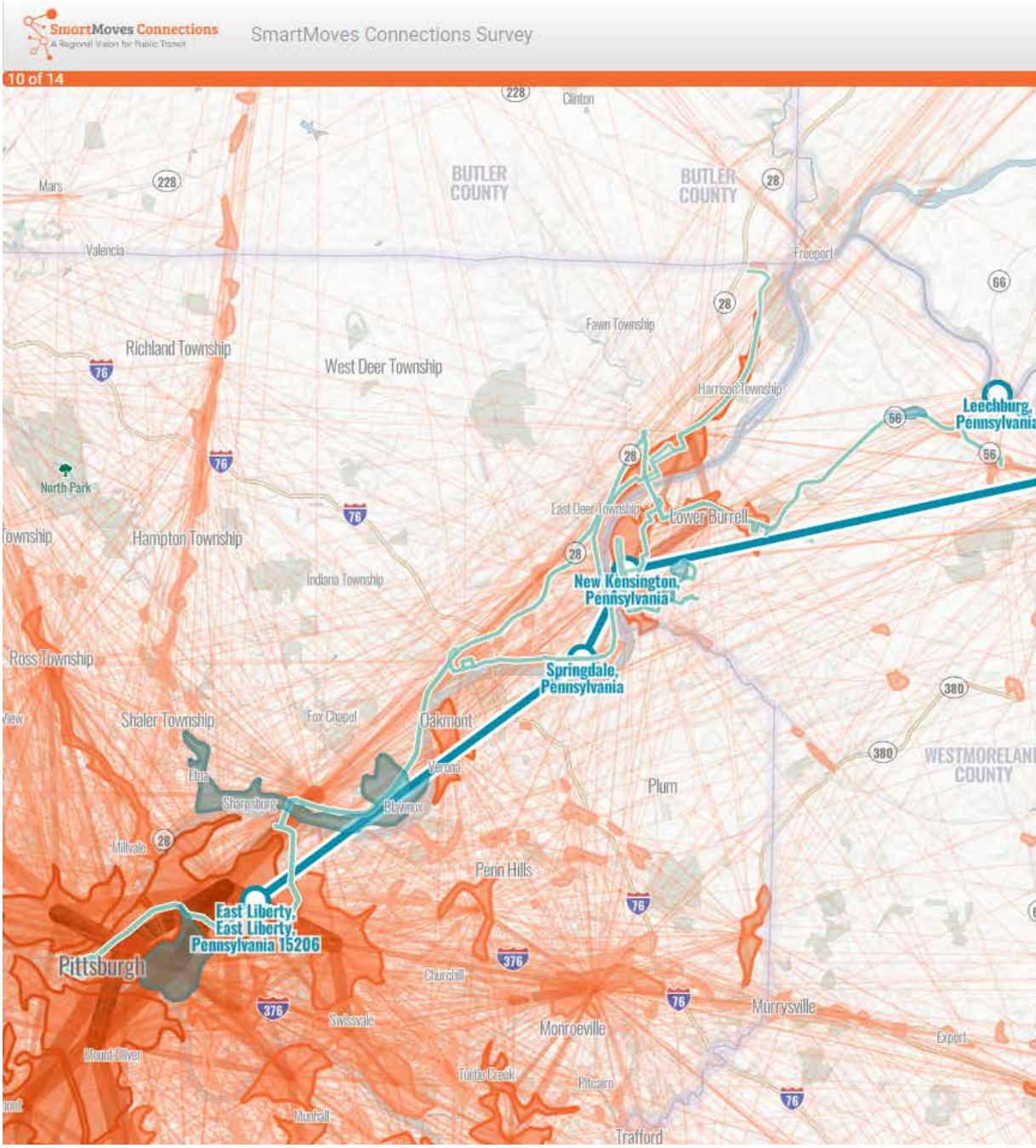
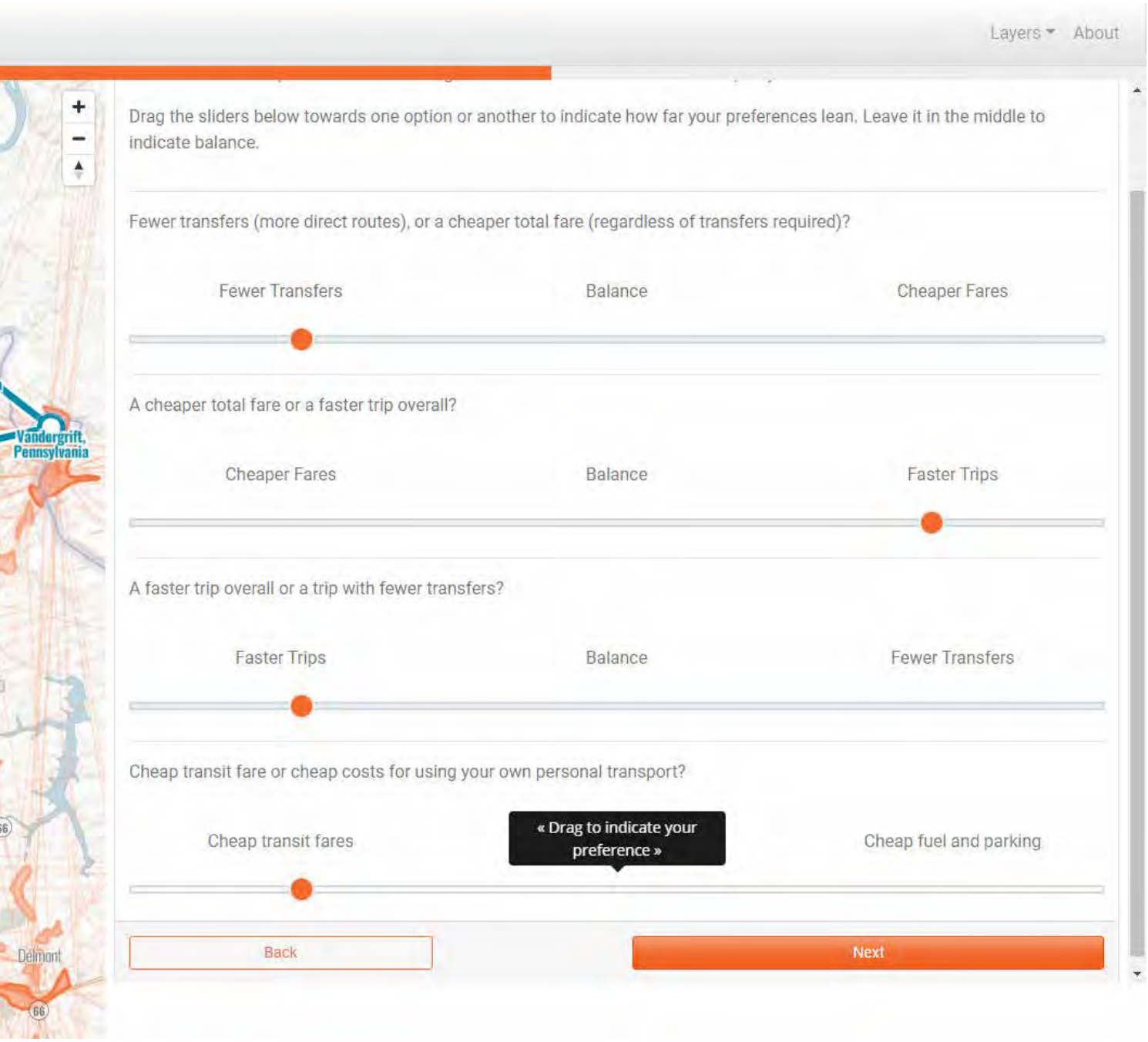
Participatory Planning Tool

STEP 10 OF 14




Layers
About
Drag the sliders below towards one option or another to indicate how far your preferences lean. Leave it in the middle to indicate balance.
Fewer transfers (more direct routes), or a cheaper total fare (regardless of transfers required)?
Fewer Transfers
Balance
Cheaper Fares
A cheaper total fare or a faster trip overall?
Cheaper Fares
Balance
Faster Trips
A faster trip overall or a trip with fewer transfers?
Faster Trips
Balance
Fewer Transfers
Cheap transit fare or cheap costs for using your own personal transport?
Cheap transit fares
« Drag to indicate your preference »
Cheap fuel and parking
Back
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Vandergrift, Pennsylvania
Delmont
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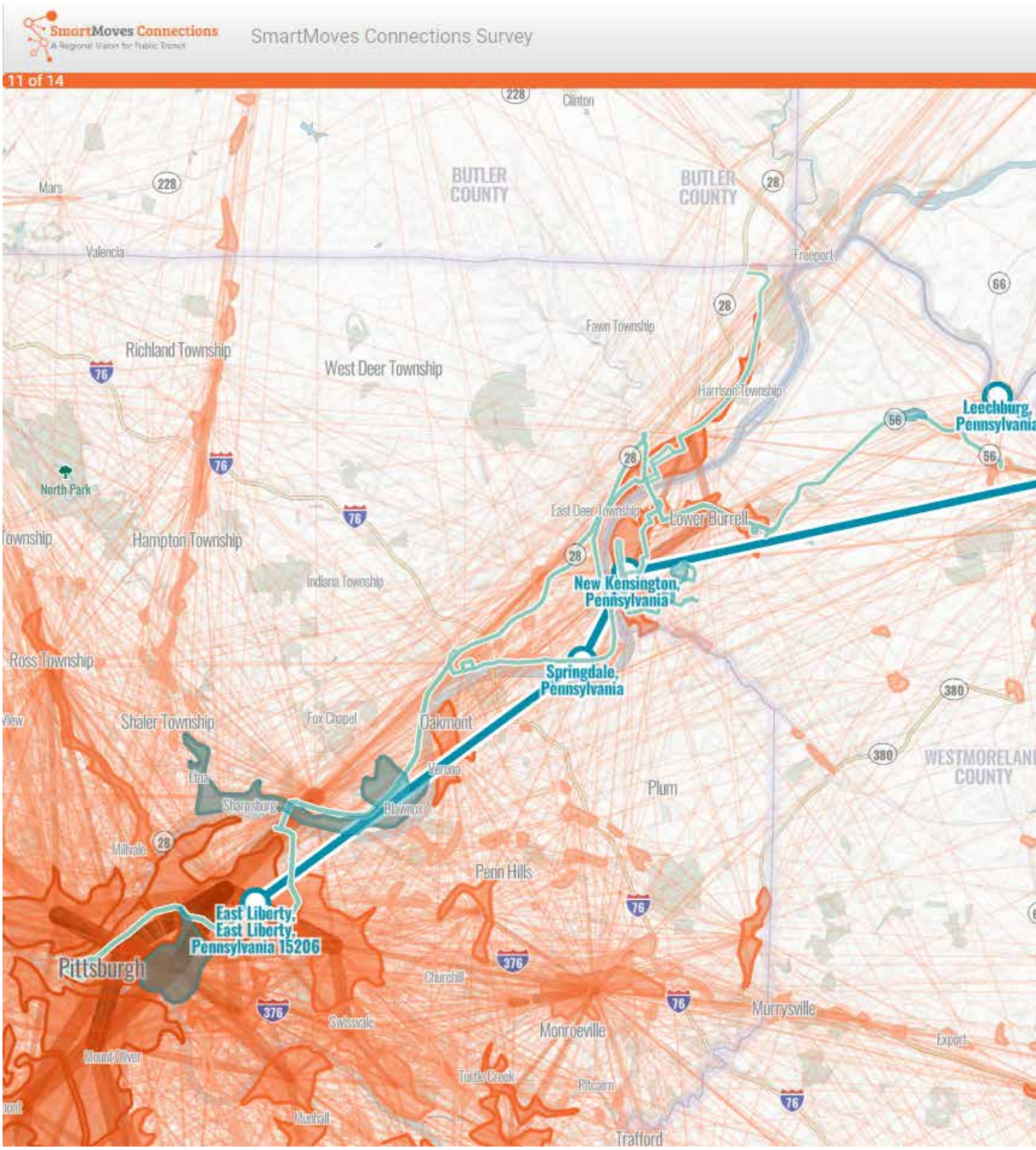
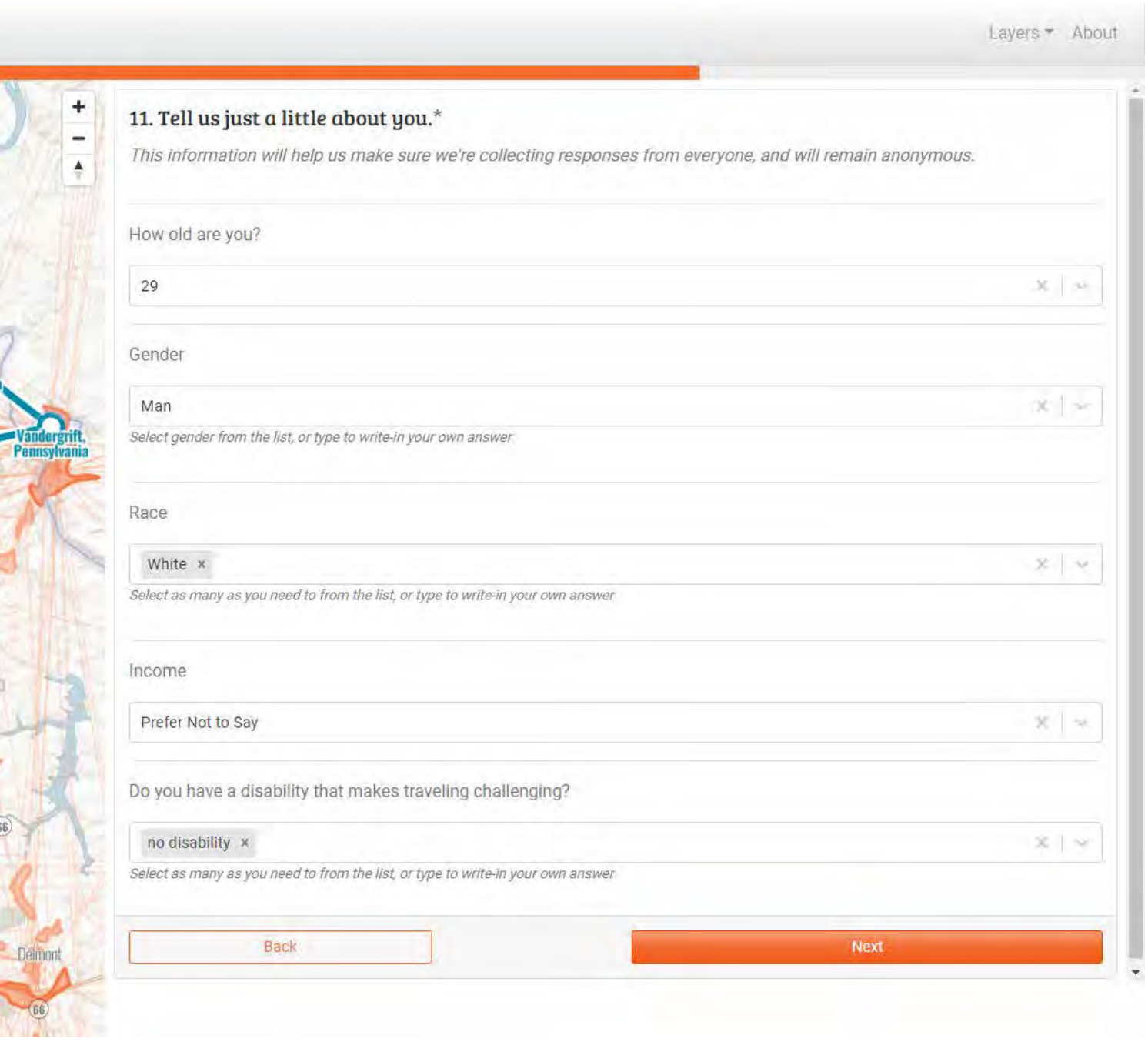
PUBLIC ENGAGEMENT

Participatory Planning Tool

STEP 11 OF 14




Layers
About
11. Tell us just a little about you.*
This information will help us make sure we're collecting responses from everyone, and will remain anonymous.
How old are you?
29
Gender
Man
Select gender from the list, or type to write-in your own answer
Race
White ×
Select as many as you need to from the list, or type to write-in your own answer
Income
Prefer Not to Say
Do you have a disability that makes traveling challenging?
no disability ×
Select as many as you need to from the list, or type to write-in your own answer
Back
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Delmont
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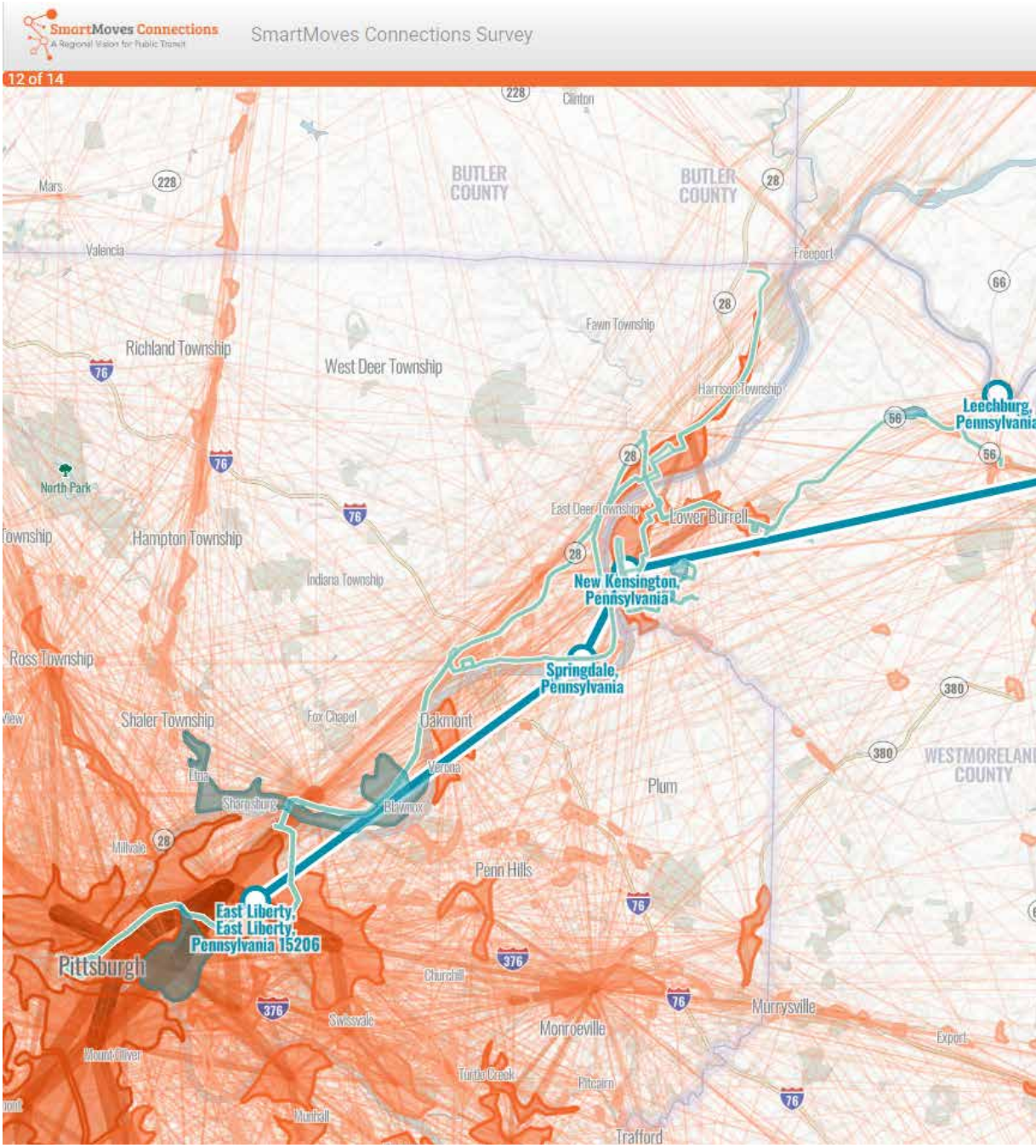
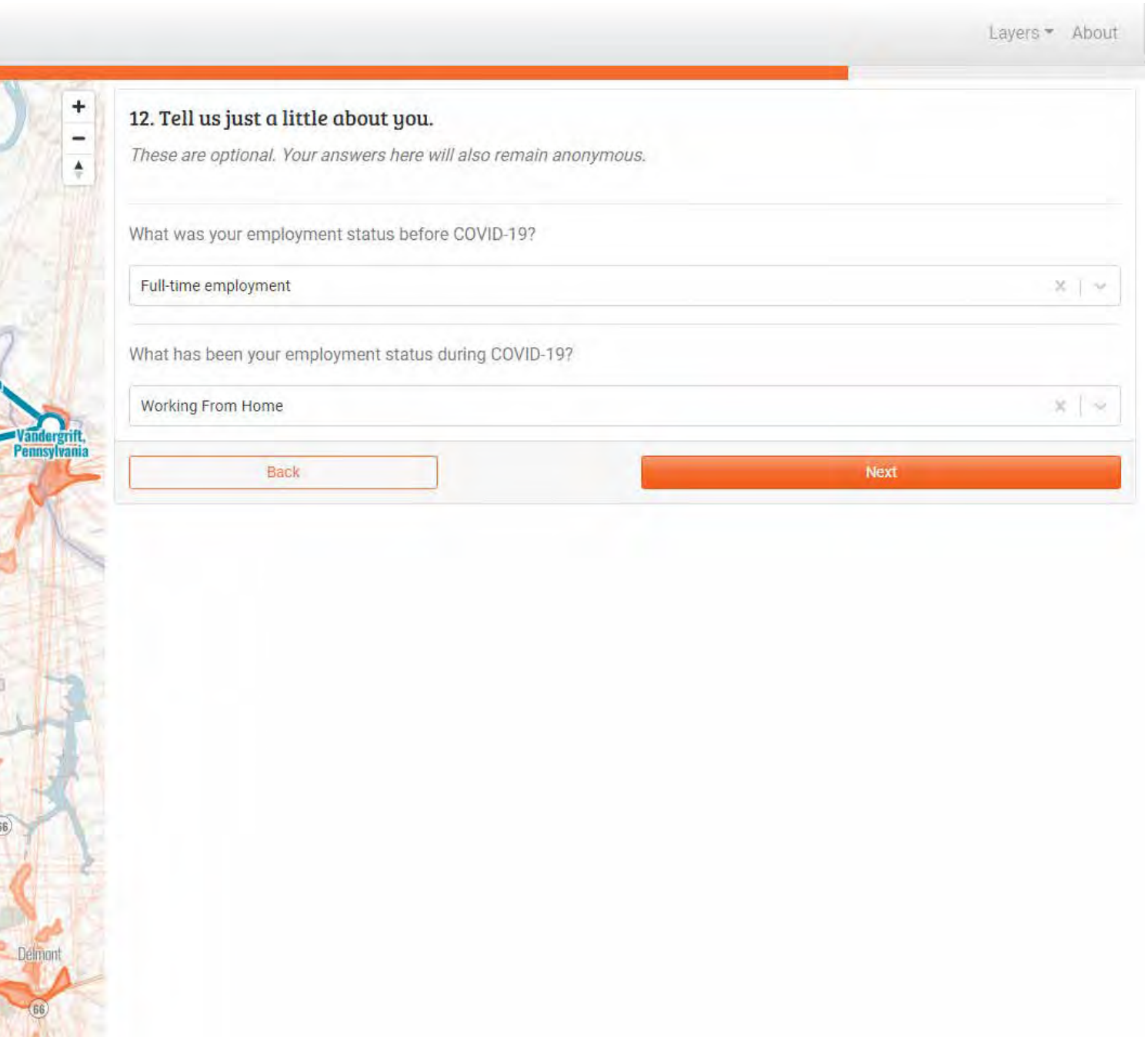
STEP 12 OF 14




Layers
About
12. Tell us just a little about you.
These are optional. Your answers here will also remain anonymous.
What was your employment status before COVID-19?
Full-time employment
What has been your employment status during COVID-19?
Working From Home
Back
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Delmont
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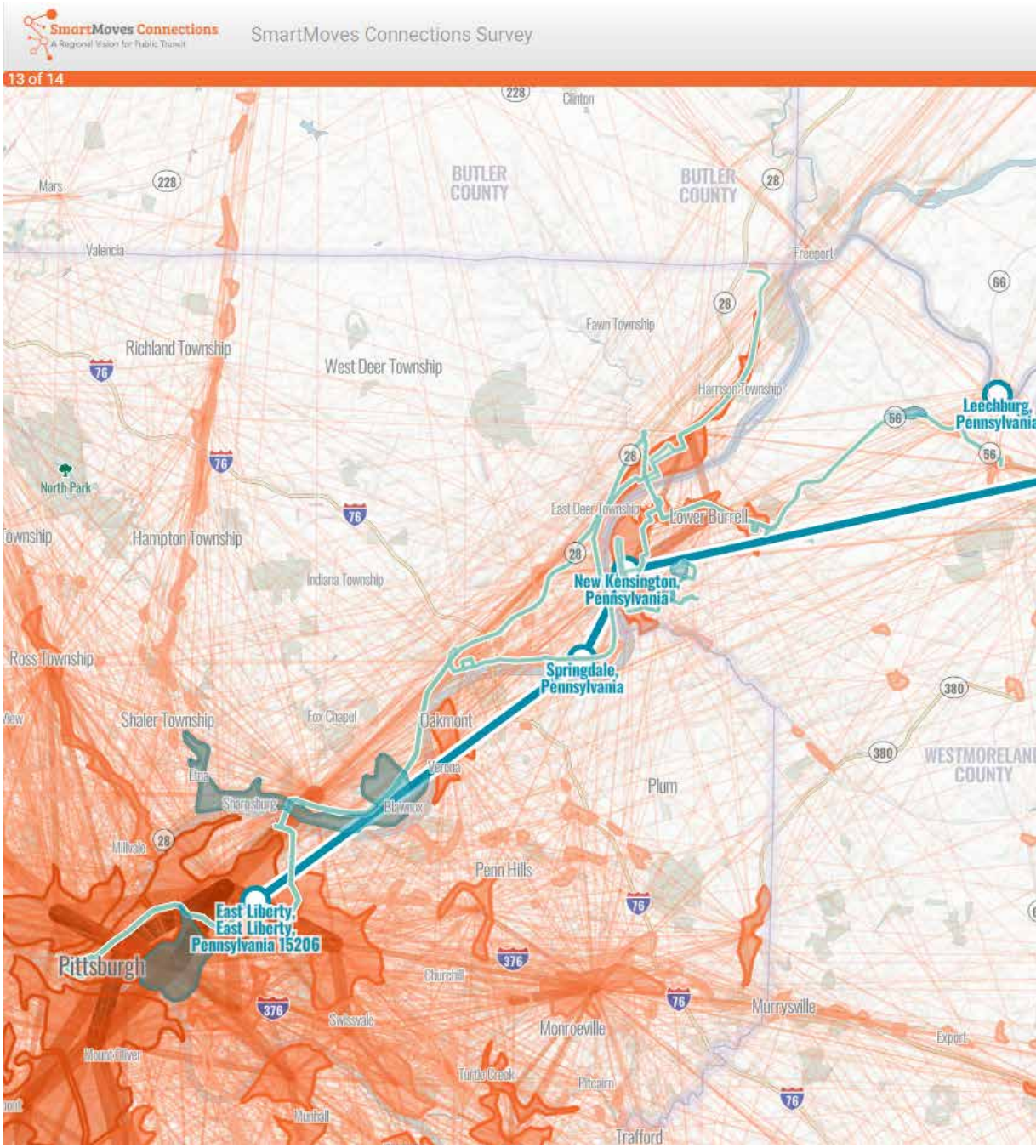
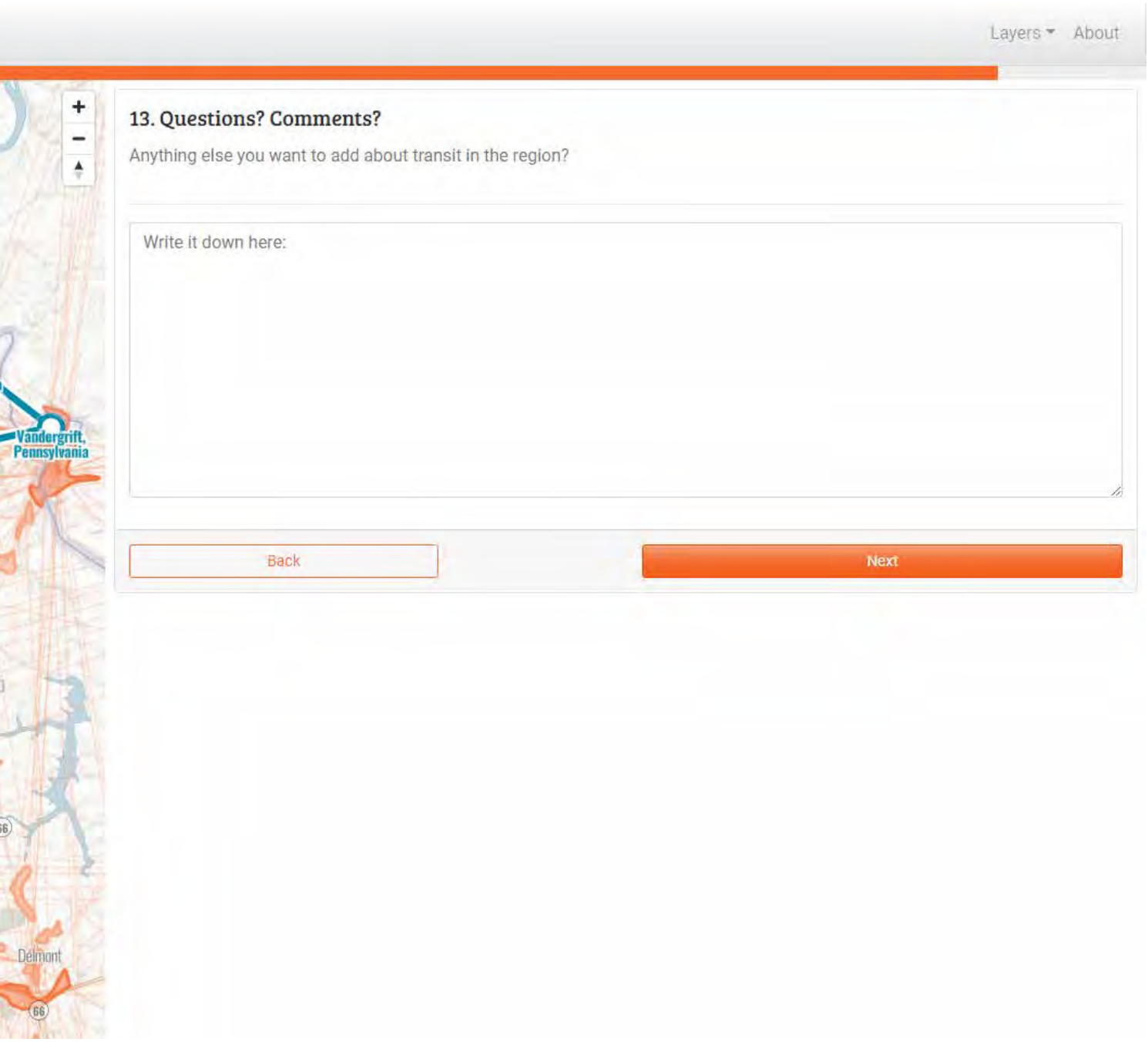
PUBLIC ENGAGEMENT

Participatory Planning Tool

STEP 13 OF 14




Layers
About
13. Questions? Comments?
Anything else you want to add about transit in the region?
Write it down here:
Back
Next
Vandergrift, Pennsylvania
Delmont
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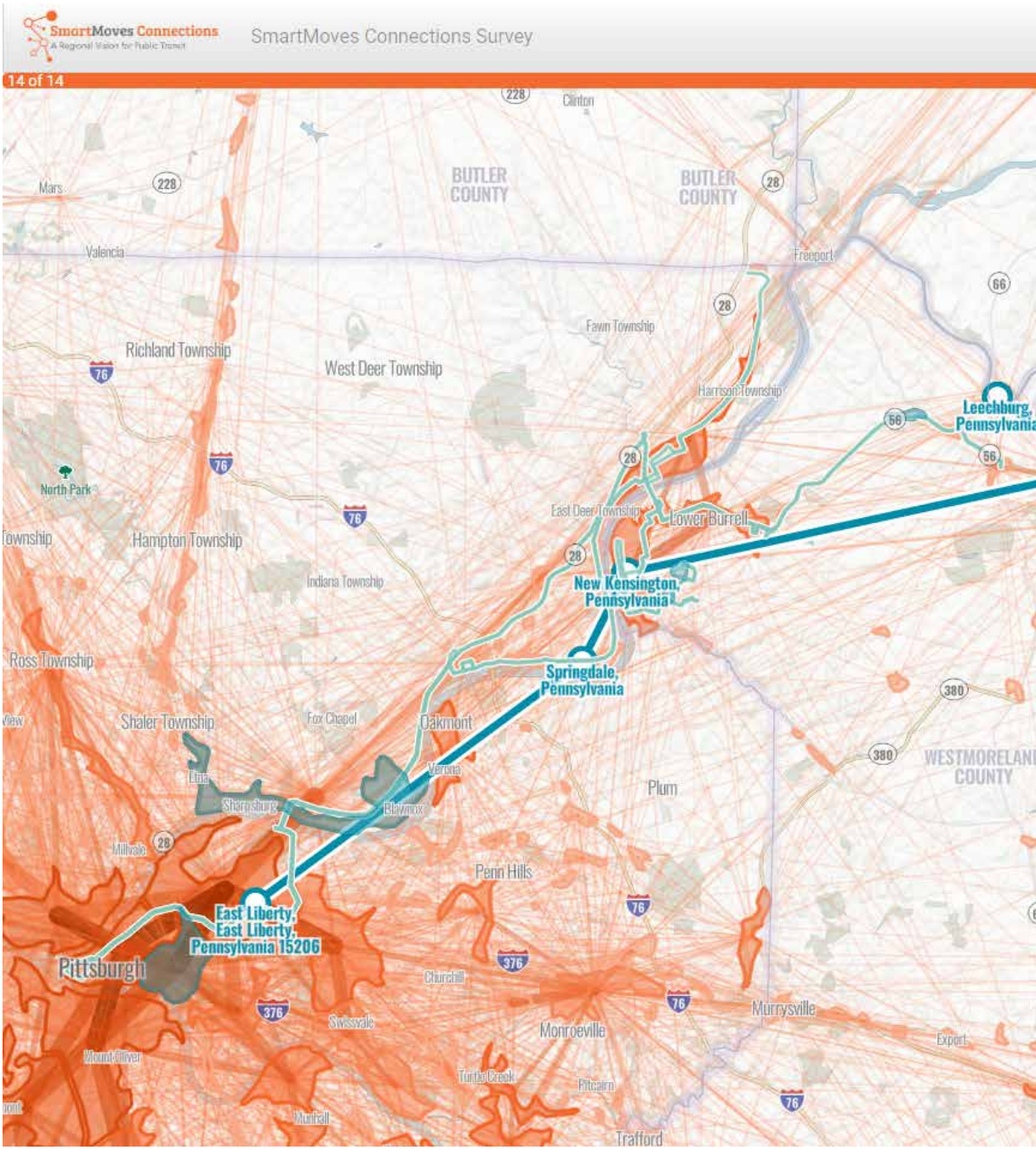
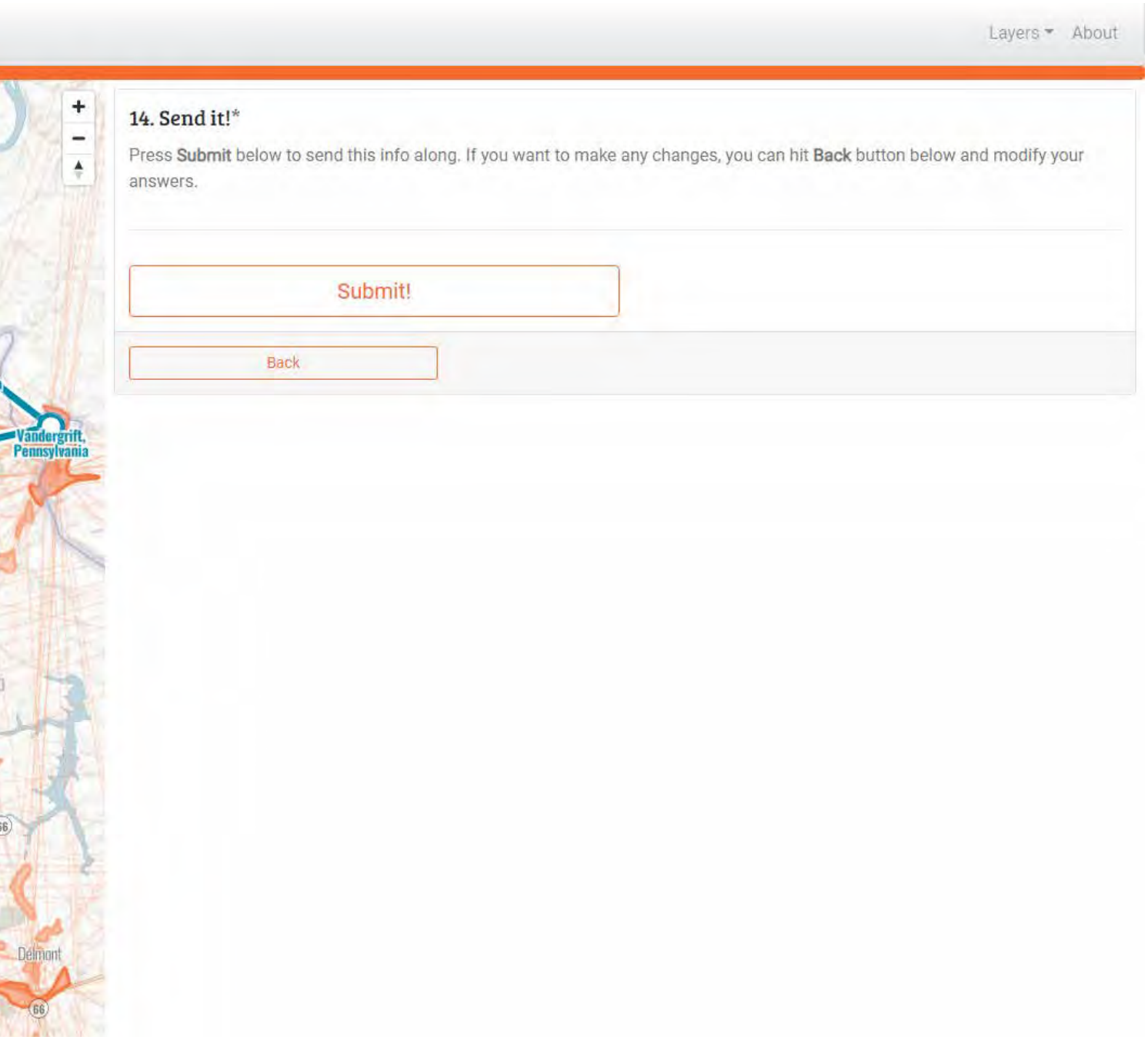
PUBLIC ENGAGEMENT

Participatory Planning Tool

STEP 14 OF 14




Layers
About
14. Send it!*
Press Submit below to send this info along. If you want to make any changes, you can hit Back button below and modify your answers.
Submit!
Back
Vandergrift, Pennsylvania
Delmont
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A.2

Survey Results

SmartMoves Connections Public Survey Results Digest
November 5, 2020

I. Utilization

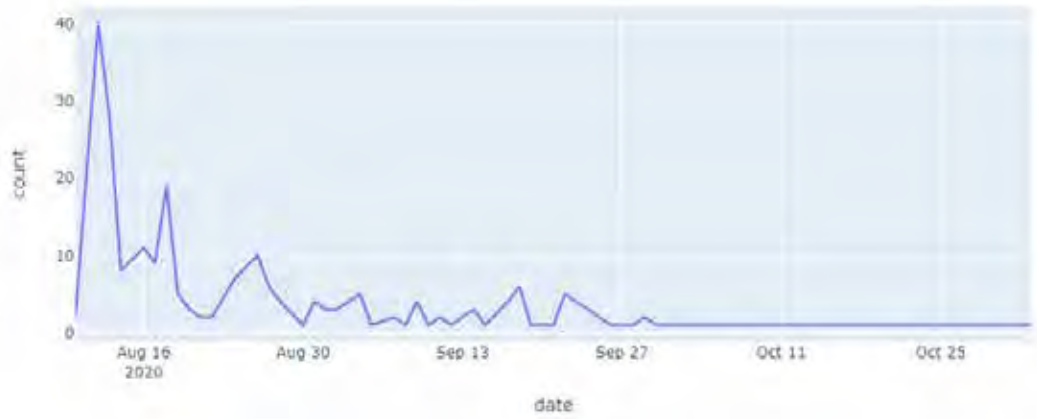
Response Count

242

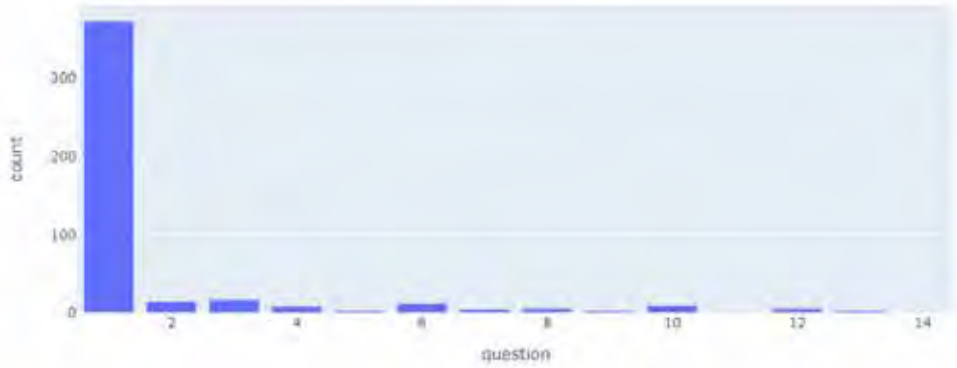
Average Time to Complete

13.0 minutes

Responses Per Day



Incomplete surveys: user dropped off after screen #

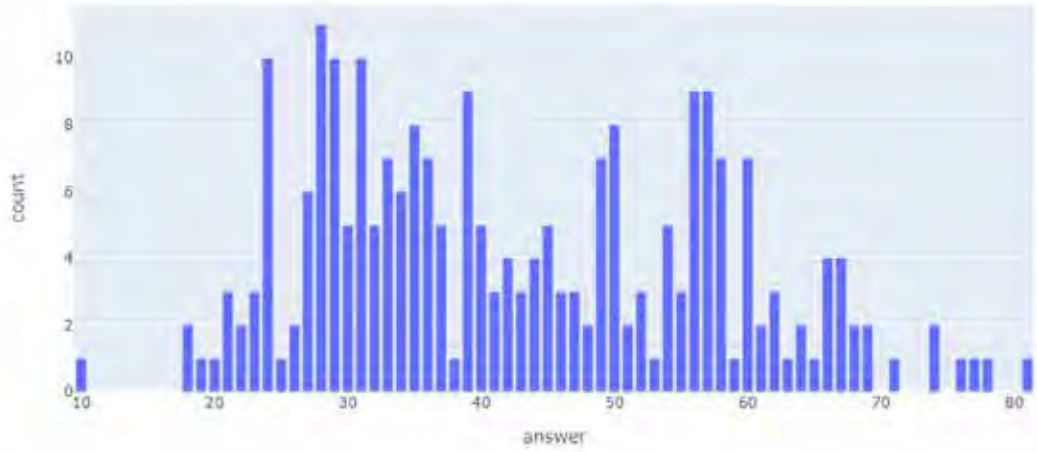


This chart shows the screen after which a survey was left incomplete. For example: a user who visits screen 1 and clicks 'next' to get to screen 2--but doesn't interact with the survey any further--gets tallied here under screen 1.

II. Demographics

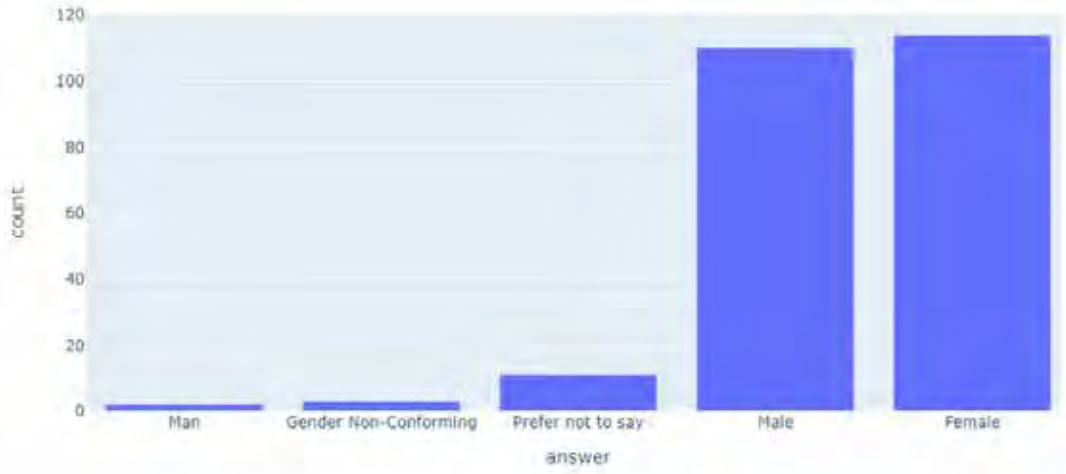
Age

q-11-0



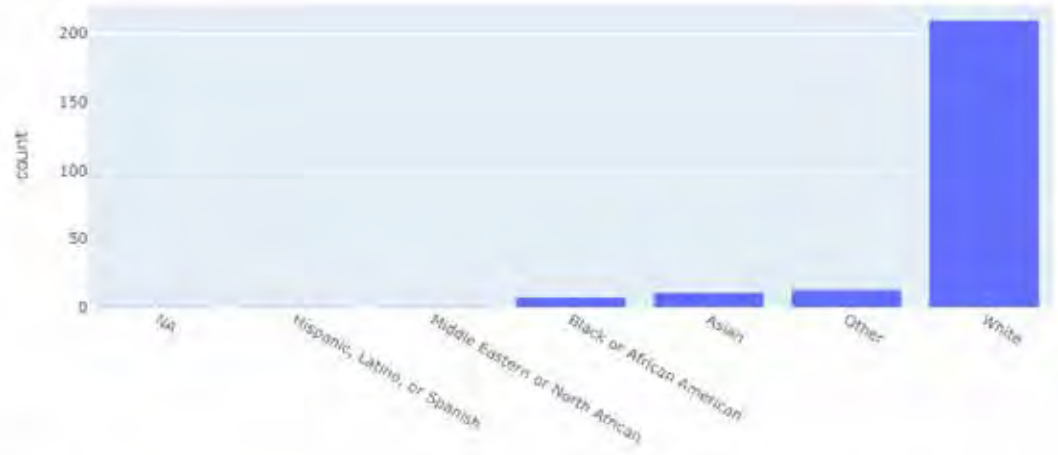
Gender

q-11-1



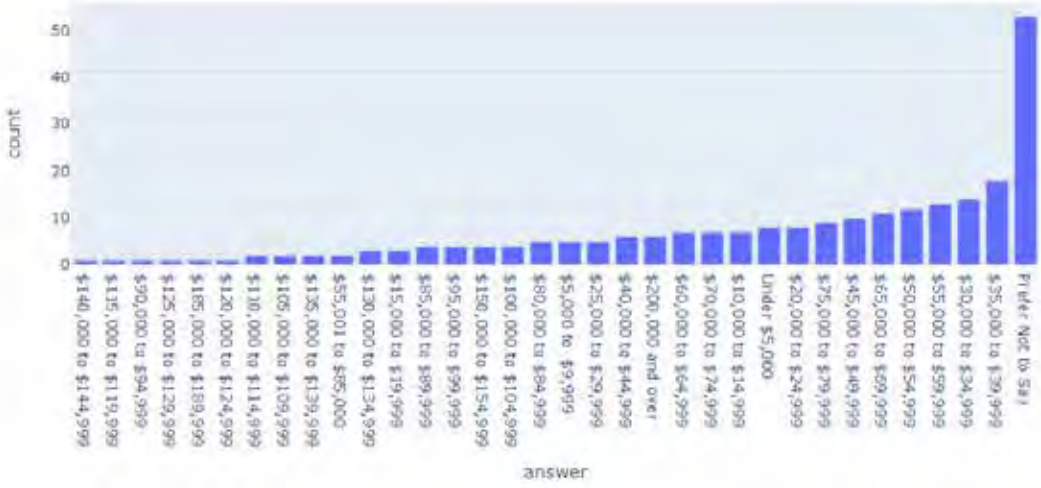
Race

q-11-2



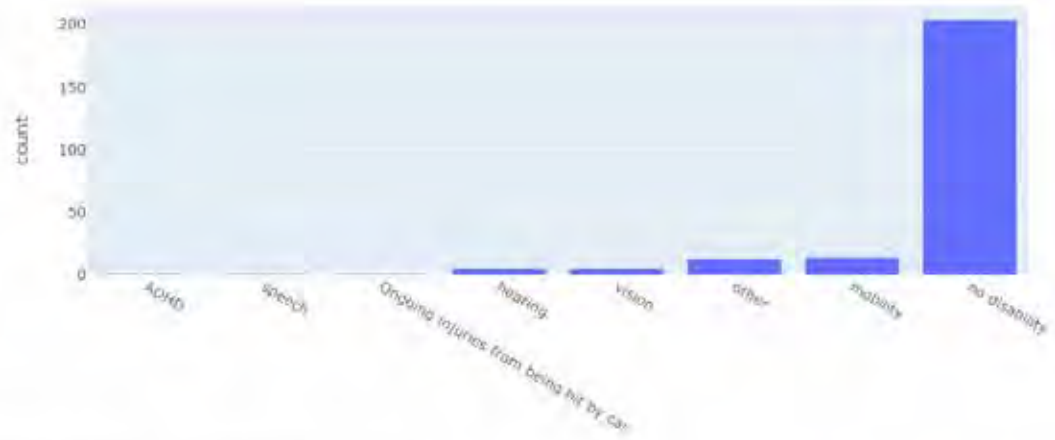
Income

q-11-3



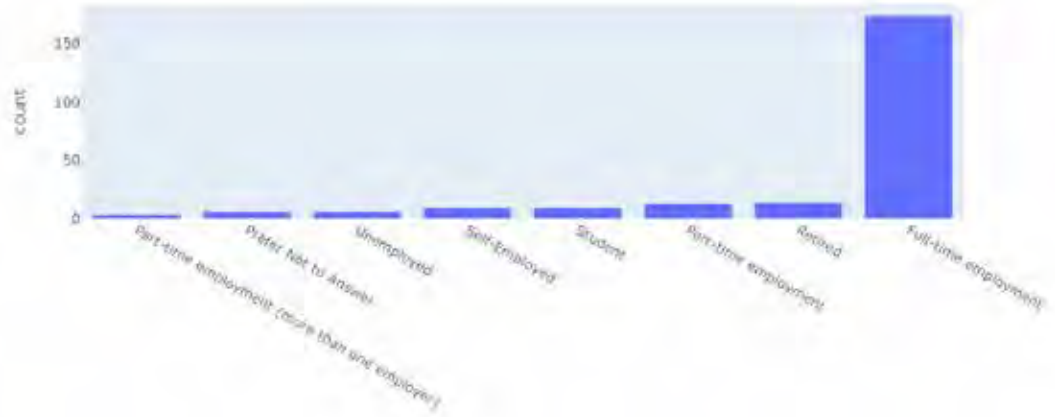
Do you have a disability that makes traveling challenging?

q-11-4



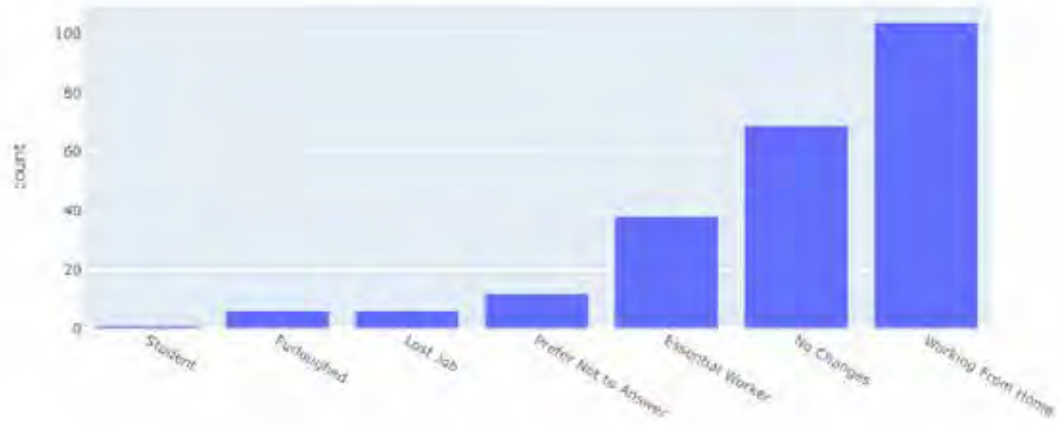
What was your employment status before COVID-19?

q-12-0



What has been your employment status during COVID-19?

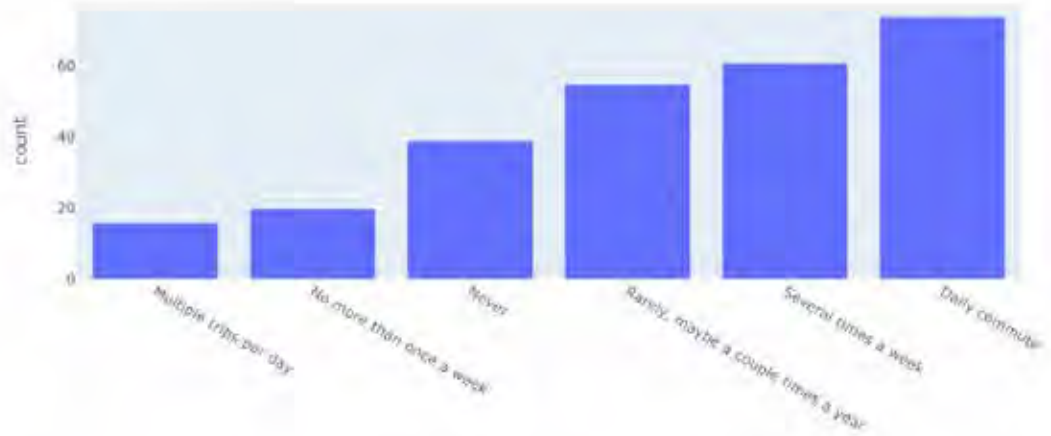
q-12-1



III. Transit

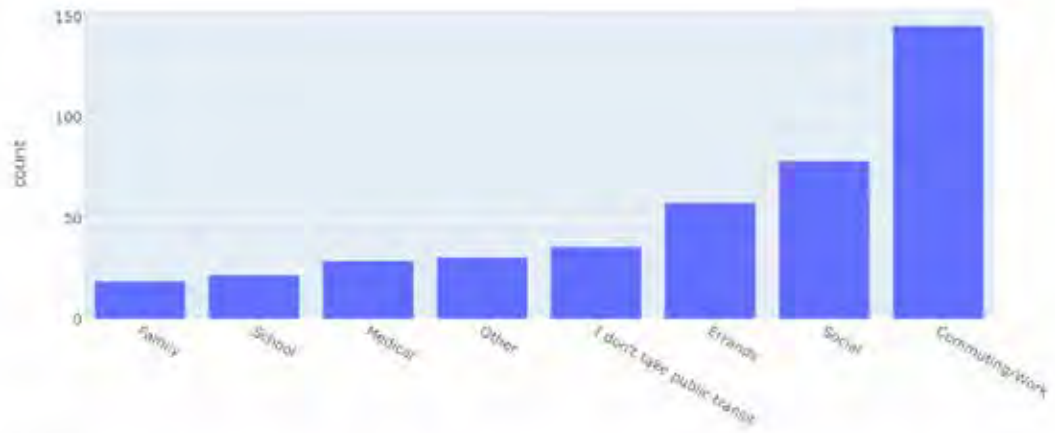
How often do you use transit?

q-5-0



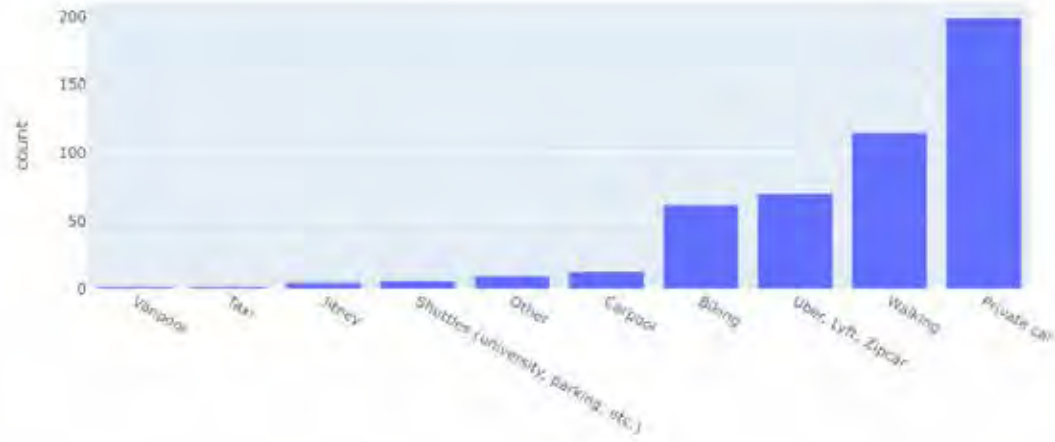
What are you typically using transit for?

q-5-1



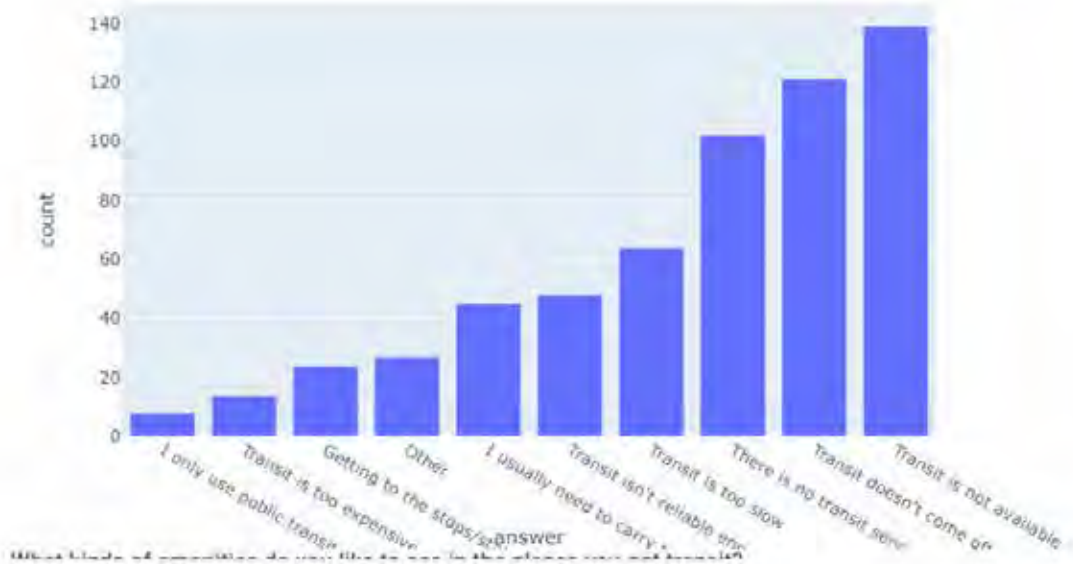
If you're not traveling by transit, how do you get around?

q-6-0



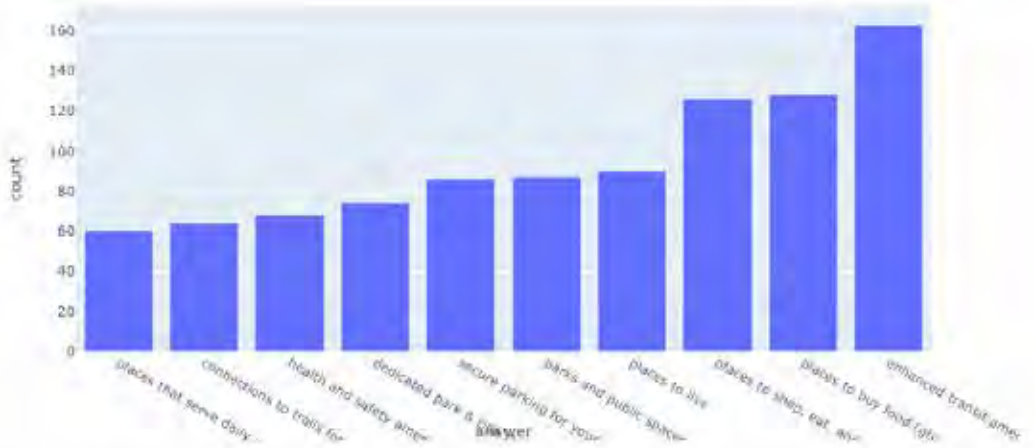
Why do you use other forms of transportation besides public transit?

q-6-1



What kinds of amenities do you like to see in the places you get transit?

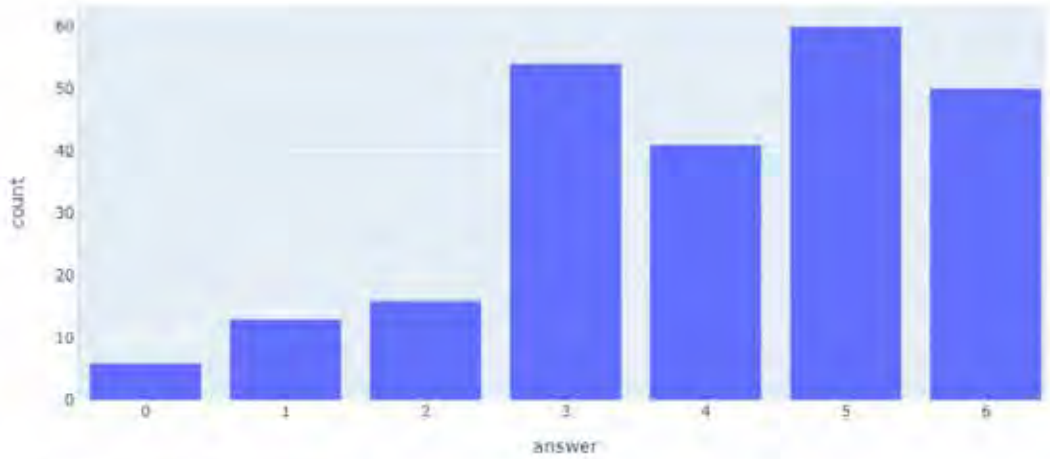
q-9-0



IV. Tradeoffs

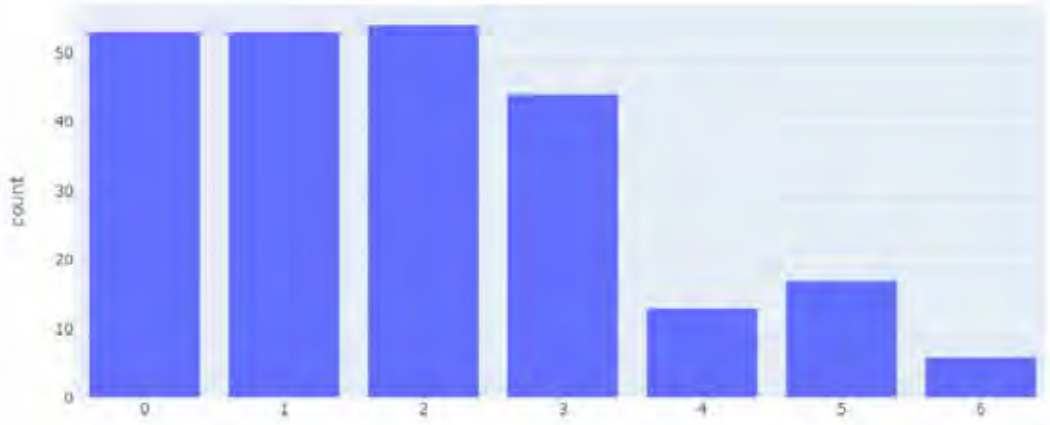
Fewer transfers (more direct routes), or a cheaper total fare (regardless of transfers required)?

q-10-0



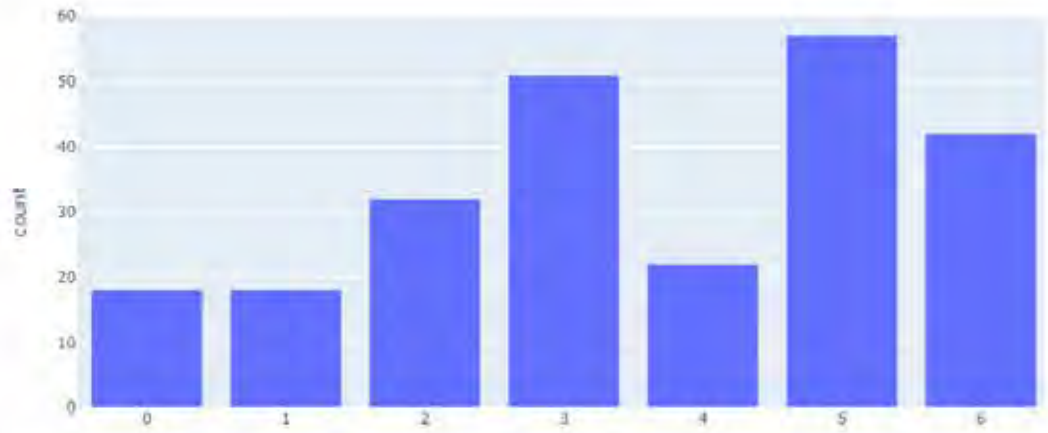
A cheaper total fare or a faster trip overall?

q-10-1



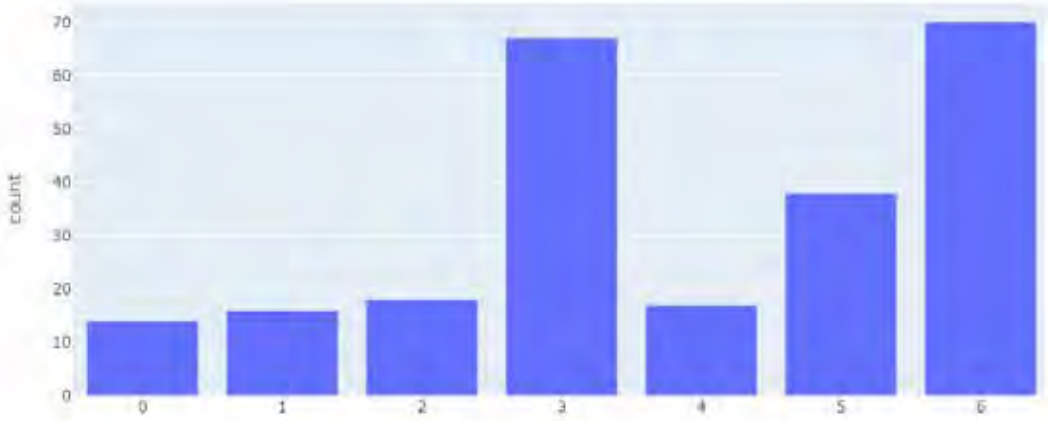
A faster trip overall or a trip with fewer transfers?

q-10-2



Cheap transit fare or cheap costs for using your own personal transport?

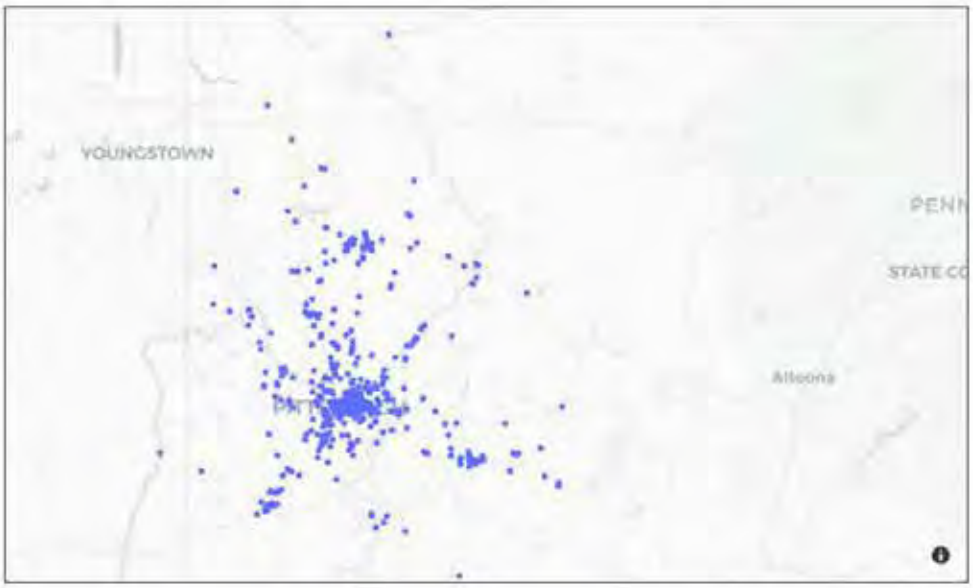
q-10-3



V. Connections

First, let's orient ourselves: Where are you coming from and where do you need to go?

q-2-0

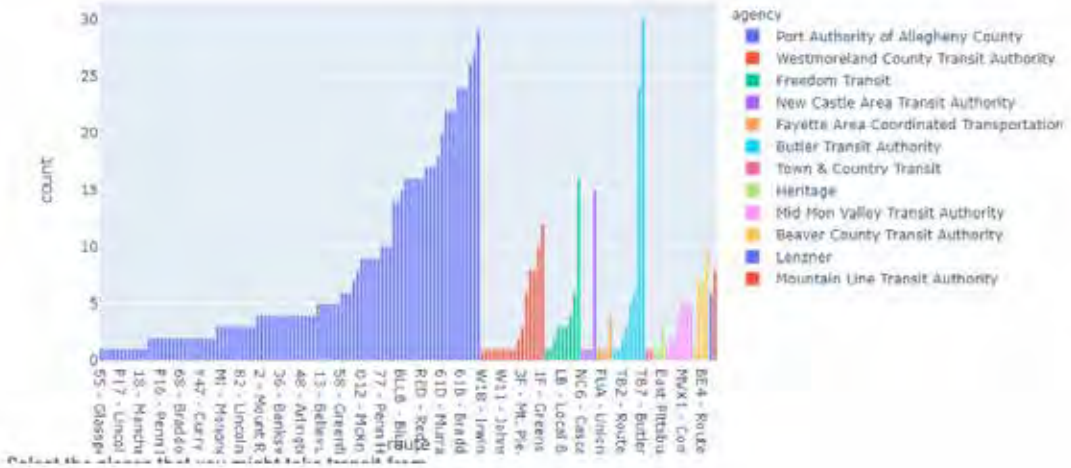


Which connections between the places you identified in the previous question are the most important to you?

q-4-0

Let's take a look at the transit routes serving the places important to you.

q-7-0



Select the places that you might take transit from.

VI. Comments

1. Comments

2. There is NO rural transportation just south of the City of Butler. It does NOT EXIST. North of the City there is NOT transportation either.
3. The region must offer more pleasurable alternatives to buses, which many dislike. For example, the region needs more subways and light rail trains, especially stretching east to and from downtown. I would rarely use my own car if I had access to these more attractive public transportation options. Pittsburgh will not be a world-class region again unless it has a modern system that relies on more than buses.
4. I'm not sure how these clusters are defined--it feels as if you're saying that folks living in those areas wouldn't use/need transit if it was there, rather than the question being "how do we provide different modes of transit that meets the needs of different neighborhoods?" Even if a neighborhood is lower in population, they are still worth providing transit for if we think creatively about connecting points, micromobility, etc. Confused why Squirrel Hill, Point Breeze, Hazewlood/Glen Hazel, Lincoln-Lemington, Penn Hills, and more are not clusters. To me, a "demand for transit" means people are living there and need to go places.
5. integrated fare systems and marketing.
6. I would use public transit to the suburbs to visit my family with more information about the routes I could take, along with clear and safe waiting locations for the bus. I hadn't considered that I could take the bus to my family in Gibsonia, as it's on the Butler route, not city based service.
7. Direct route from Greensburg area to Pittsburgh airport or maybe direct flight from Latrobe airport to Pittsburgh airport
8. I'm pretty happy with my transit choices in Allegheny County, and choose to live where I do (Bellevue/Avalon/Emsworth area) because of the transit amenities. It has enabled me to save money towards a future home purchase much more quickly than if I still relied on a private vehicle. I would like to see some service restored to the northern suburbs, particularly to places like the CCAC North campus (Perry Hwy corridor), better service to regional shopping centers like Cranberry, maybe add a suburban loop around the county so that people don't have to follow the hub-and-spoke setup which adds time to what should be a short trip by car. Right now, I have to rent a car or take an Uber to visit my family in Hampton Township because there is no PAAC service to Hampton. The BTA bus only services commuter hours. The CCAC North route that was recently restored only services commuter hours. Things like that can be improved. Look at the ridership on the suburban routes from pre-2012 and see if any can be restored. Lastly, I think it'd be great if there

were a regional ConnectCard that would let people use it on any of the regional transit agencies. it could be in addition to the current ConnectCard - maybe an add-on for an extra fee, or something. I'd happily pay a little extra if I had more options for connections.

9. A light rail system could potentially benefit the region, especially since much of Appalachia was connected by rail lines in the past. While that would be expensive, it would be the best long-term development project. The next best alternative is a robust public transit system that is multi-modal, designed with equity in mind, and that utilizes existing infrastructure.
10. My son needs to go from Mars PA to Zelienople PA for work from 8:00 to 4:30 Monday to Friday. Some times he starts at 7:00 and sometimes he works until 5:30. I need to go from Mars to Pullman Square Monday to Friday. I work from 7:00 to3:30 and sometimes as late as 4:30. Public transportation is not available.
11. Too many transit agencies in the area and they aren't coordinating their schedules or routes. It takes a PHD to figure out the transfers from Greensburg to Uniontown. It's impossible to get from Greensburg to Monessen. And getting from Greensburg to New Kenn takes about 4 years. We have offices in all of those locations (actually plus Beaver but that's probably a 9 year journey) and it's impossible for workers to get to and from, let alone our clients. And then to get into and out of Pittsburgh for any kind of social event from Westmoreland County is impossible because the buses don't run late. Which really is a deterrent to young people and trying to keep them in the county rather than losing them to the city life. I know this is akin to a 'drunk bus' but sometimes that's the kind of thing needed because taking an uber from downtown Pittsburgh after a sporting event or concert just isn't feasible. Really though I'd like to see better coordination between Mid mon valley, FACT, WCTA, and the Port Authority. Why can't a Port Authority bus run into Westmoco while a WCTA bus runs into Pittsburgh thus doubling the service? Or, market connections that would allow someone to get on the bus in Jeannette and be able to end up at Pittsburgh airport for example. The marketing just isn't there across the board; the agencies need to do the thinking for the public to say if you are trying to get from A to B, these are the buses you need to take, the transfers, and the amount of cash you will need because since we have 84 transit agencies for a population of under 2 million (and that's the entire Pittsburgh 7 county region), coordinating payments would just be too much of a headache for public agencies to actually play nice with each other. And then forget about getting up to Beaver County from Westmoreland, or Washington County, because it's probably impossible to be done in under 4 hours using the buses. Let alone other far flung places like Erie or New Castle. I went to college in Erie and tried to take public transit back home to Greensburg once and it took 8 hours and some carpooling with sympathetic friends. With all the agencies between here and there, there surely should be a way even if it does require several transfers. Rant over, thanks for reading!
12. Ohio River Blvd from Emsworth to Downtown would be an excellent place for a dedicated rush hour bus lane or an extension of the T. The North Boros are great and deserve public transport access!
13. Fares should be adjusted by income for riders. People should be able to use their SNAP cards to get free or inexpensive rides
14. Public transit is nothing more than a scam to bilk taxpayer/road dollars to failing public authorities that are accountable to nobody for nearly anything they do. Do us a big favor and shut them all down. The sooner, the better.
15. I cannot take the bus as I would need to take the bus to downtown to take a transfer to campus and my classes start early morning and it by the time the first run would get me campus I would miss first classes. Not to mention I takes over an hour for a 10 min car trip that way. there really should be a BC3 route in the township residential area. There are many that use carpool and Uber that would use this service.
16. if i understand correctly, transit from counties outside of Allegheny cannot drop off riders into Allegheny County except in Pittsburgh. This does not make sense. Riders should be able to get off at other locations in Allegheny County if there are stops that make sense and are where people want to go. An example would be riding from Butler to Cranberry Township or riding from Cranberry to locations along McKnight Road in Northern Allegheny County. Most people can't use a bus because the bus does not go to where they need to go
17. Washington County transit goes nowhere that there is employment, Southpointe, for example.
18. BATHROOMS! We need access to BATHROOMS! Places of business are more and more restricting access to their bathrooms. Where is a commuter to "go"? Port-a-johns are better than nothing at all. PLEASE!
19. Would like better transportation from the Butler area. #1 priority is to the airport. There's almost no airport commuting option here. #2 is other transportation hubs such as Amtrak. #3 is to Pittsburgh-area shopping centers/areas (McKnight Rd., Strip District, etc.).
20. This usually my only mode of transportation due to not having a car. But since covid I am appalled at how many ppl will not wear a mask nor makes me feel safe. I care about my family and friends and wear a mask. It should be Mandatory. Due to the above I take the bus a lot less now. I also wish that the buses came more frequently.
21. We desperately need faster, more reliable, and generally more routes. And perhaps equally as important - safe transit stops! I'd take the bus to McKnight Road often, but it's incredibly dangerous to get on a bus along that road. It's honestly too dangerous.
22. More parking at larger T stops would be amazing
23. We had a direct route from North Hills to Oakland years ago. The bus number was the 13U. It was fast and on time. Very important to those who work in Oakland!!!!!! PLEASE BRING IT BACK. I would ride it 10 times a week!!!

1. Comments

24. The transit is never on time and there isn't enough seating and the fares are cheap but with no one being able to work due to covid a lot of people can't even afford the $1.25 per one way trip my self included
25. More bussing to the South Side from Oakland.
26. Get some help for rural areas!
27. I have used private bus service (LIncoln, Blue & White, & Myers) in the Rt. 8 corridor between Butler Twp & Downtown Pgh. as well as Vanpool for 9 yrs since 1986 on a daily basis for work. Butler County took over in Dec. of 2017, and I rode their service every day until COVID hit. Working from home temporarily now. Butler Co. bus is good, but has had problems when at first had to go to N Shore to get I-79 bus. Too much hassle & time. Business commuters are dependable regulars, and will drive in if the bus is too much hassle or can't get them to and from work on time. Switching to other rides or waiting for vans to meet the bus is negative, and this would turn off business commuters. Butler Co bus using Rt 8 is fine. Using 79 got better after switched to East Busway, but 5:20 a.m. trip to Pgh is too early for most people from Butler to ride in, especially when the bus does not you home very early. Makes for too long a day. The Butler bus service was very nice; buses are clean & nice; drivers are safe & courteous; office personnel & Butler Co. Commissioners have been very responsive. The times were getting better, and being able to get on all trips without transferring to a T to the N Shore was a big improvement. People would ride more & pay more to not have to waste their time. Now after COVID, safety is also very important to bring people back to riding
28. - Water taxis - Bus along Middle Road (stop at Hartwood Acres, St. Mary's Church, Middle Road Fire Hall)
29. Lack of transit in my area
30. Thank you for the transportation service.
31. It's not very comprehensive or frequent outside the city. Coverage should at least blanketAllegheny County. Also, there is a minimally used rail corridor near Route 8. Could that somehow be adapted for mixed use?
32. Dependable transportation is key. Sometimes a bus arrives on time every day until the "shift" change. The new driver is often times late or does not show up. Drivers who are consistent and show up on time and have a nice disposition should be rewarded. Yes, there are delays that happen but when one driver is consistent and then the new driver is not it is frustrating and makes transportation unreliable.
33. I would also like to travel to OTHER places! Cleveland! Chicago! Philly! New York! Easily and effectively! I would love to have those places not require a car! Please! Larger, faster, regional system. I would love to go to Ohiopyle by public transit! Allegheny National Forest! How can I get there now? I can't.
34. Bike connections are most important for me. Biking, with transit to supplement when weather is bad or the hills are too steep, is a sustainable way to travel through Pittsburgh.. I just wish it was safer.
35. It would be nice to have public transportation access rural places like the conoquenessing woodlands, businesses in prospect and on 422
36. I like Freedom Transit-
37. As Jarrett Walker says: "Frequency is freedom."
38. Adding service from Canonsburg to Finleyville would be wonderful! Also there was discussion about Freedom Transit adding mid-morning to mid-afternoon Services to South Hills Village instead of going all the way to downtown Pittsburgh, following the same route as the Saturday service to the Village. That would be very helpful not just for me but others I have talked to as well
39. Don't have any in northern butler co
40. It's tremendously frustrating to live no more than a few miles from somewhere, but for transit NOT to be the fastest option (or even connect those areas). At a bare minimum, all City residents should be able to get anywhere else in the City by transfer with no more than 10 minute walking time total and 1 transfer.
41. If there was a bus that left Pittsburgh before 3:45, I'd be very interested.
42. Public transportation is extremely important to this region
43. I live in Oakmont, it's along the Allegheny river. I want to go to downtown Pittsburgh, it's along the river so why not have a bus that goes from Oakmont to downtown along the river? Down Allegheny River Blvd, down Butler street to Penn avenue. There should be at least buses that start in Oakmont (or Harmar as it used to) and go straight down to Pittsburgh during rush hour at around 7am and 8 am and a straight shot for the ride home. I rode the bus to Pittsburgh in the early 80's. It would be full when we left Verona during rush hour and it started at the Harmar garage. Now with Lawrenceville so populated again it should have a lot of people that want to take the bus. It would be nice to have this several times a day. I would take the bus to shop in Lawrenceville at non-rush hour times but during rush hour would be great. Also, a direct bus to Oakland from Oakmont. Down Allegheny River Blvd to Washington Blvd to 5th Avenue at least during rush hour. There will be enough passengers. Why would you have the bus travel from Oakmont up Coal Hollow a rural road with few if any passengers to Wilkensburg just to take the Busway? Why have all that wear and tear on your vehicles and spend all that fuel to go half way around the county and not the short route following the river? If you have more direct routes you

spend less on maintenance and fuel and can keep fares low. I have passed up job opportunities in Pittsburgh and Oakland because there is no reasonable bus transportation and that's very frustrating.

44. Help people get where they're going. Help them to go quickly, conveniently, cleanly, cheaply, and safely. Give buses priority on their routes, make streets safe for biking and walking.
45. There is no direct transit from south hills to Oakland. Would love one
46. If there was an option for inexpensive one or two stop hops and more frequent service. I would take public transit much more often for work and shopping. At the current fare, it would cost me $5 a day to commute less than 2 miles each way for work and shopping. But I would easily hop on the bus to go a stop or two. The short walk to and from the bus would keep me in shape and be a pleasant change.
47. Add later hours for people who work evening shifts and graveyard shifts.
48. Many of us on the bus require a stop on Main Street-to get to the many stores. Lots of us being elderly can not walk from the Laffite stop. I can not use BART because 4X's they have left me at a doctors office/will not answer their phone/I've had to beg people to take me home. We could be left off on the side of Cunningham Street, next to the Motorcycle Shop. If I use the bus for a doctor appt-that requires at least 2 hrs one way-same going home. Butler really needs a taxi cab service-that's the true answer. When transit moved the terminal I called: your office, the mayors office, Downtown Small Business Associate, finally Rite Aid(main street)to voice my concerns ref: central main street stops-to no avail. Thank You
49. I'd like to see more transit options to Oakland from Butler County. It's expensive and time consuming to transfer from Butler Transit and New Castle Transit to the Port Authority. Also, It's not always easy getting from Oakland to downtown to catch the last Butler and New Castle buses in the evenings.
50. Some information on how it works to someone new to using it. Saturday service to Pgh would be great
51. Fare should be cheap and heavily subsidized through taxes.
52. I'd like to see more of our difficult movements become bus-only...for instance the left-side on ramp from Liberty Ave onto the Ft Pitt Bridge
53. My household would be using transit more if buses were more frequent and ran more regularly (e.g longer hours and consistent weekend hours). Also, none of the stops on the non-city end of my commute have shelters or any amenities at all which greatly discourages use. Additionally, in town, the bus that are going in my direction don't all stop in the same location meaning any coordinated frequency increase is eleiminated.
54. I ride the T mostly and appreciate that it is electric and non-polluting. We chose to live where the T is accessible. My hope is that our system can become more electrified and that the Port Authority does all it can to contribute to reversing climate change.
55. Bike sharing and other lightweight electric vehicles should be considered transit. Many Cities and regions invest in these options. With the pandemic, I would want single-occupancy safe options and I want funding toward those choices.
56. It is hard to get from Oakland to Carnegie. Carnegie has Cefalo's, which hosts a number of professional geosciences meetings that I'd like students to attend. The 28X actually has a stop and schedule that is pretty convenient, but the Port Authority does not want any riders who get off before Robinson or the airport. It would be great if the 28X could drop people off once the bus has left downtown. It seems like a waste of route to not allow this! I know it is hopeless for me to contact the Port Authority--they've never even acknowledged any email I sent them, and their drivers also feel completely ignored. But maybe you can get a result?
57. Go back to the routes before Harrisburg cuts!
58. It does not concern me as much but I know a lot of young people miss out on job opportunities and college choices because of transportation problems. I would like to see easier to follow routes and transfer information published or a really thorough app that provides up-to-date information. also paying fares by card or scanning is good.
59. Would be nice if businesses and sponsors of events would list transit services in their promotional material.
60. Expand the T to more regions
61. There is no way to get to a bus stop besides walking, and I can't figure out which bus to take. Why can you just say e Pittsburgh St (shop save) to mall?
62. please add transit flyer from rt 8/rt 910 in Gibsonia to downtown pittsburgh!!! or at least make the stop for the Butler commuter bus marked so people know that it exists!! many people in this area are interested in public transit but are under the impression that it is not easily accessible in this part of the county!
63. Go into work 1 or more times per week
64. Please look into partnering with Uber. They have done wonders for the Denver area public transit system.
65. Please consider more transit options in Monessen/Mid-Mon Valley, to surrounding county seats/hubs.
66. Moving to Pittsburgh from the Southern States I think Transit here is great! However the connections are not equally distributed. For

example at student/employee of Carnegie Mellon University is almost always forced to live in Squirrel Hill/Oakland/Uptown/Greenfield with a higher rent (considering safety of the area and condition of the building). This is due to the convenience of transit connections between these areas. Alternatively, a person working here living in Shadyside might have to use their personal vehicles and pay a high parking fee at the campus. But PITT students/employees have better connectivity to various regions around the city and have better options for choosing a reasonable rent but nice place to live.

67. Keep all routes while adding more regionalize service.
68. smaller vehicles with more frequent runs would be more helpful.
69. The bus company and the bus drivers are rude. The bus company started a detour I was kicked off the bus 2x after being told they would take me
70. More frequent transit between hubs and clusters and a combination of bus way, rapid bus and more light rail will reduce transit gap and increase public transit use.
71. Really appreciated the free rides for the pandemic.
72. Transit for people with disabilities is more and more essential. The wide area to cover makes that challenging. Electric vehicles that can support wheelchairs and electric mobility carts as needed, e.g. seats flip out if the way, flexible carrying formation. Smaller more flexible EVs could mean more jobs, and less costs over all from operating a large deisl fleet, with empty routes.
73. the thing to park at a park-n-ride is a ton of mixed use space and grassy park-land, vs asphalt or concrete to store sheet metal (aka cars); whether in the middle of city or 'burbs or out in cow town
74. You need bathrooms at transit stops (you forgot to include in "transit amenities") Would like to see more rapid transit lines and more cross sector commuting (IE lines just don't stop in downtown and turn around, rather travel through downtown to some other point outside the city)
75. Eastern Westmoreland County Technology Center was not listed as a potential transit stop
76. Listen to Pittsburghers for Public Transit!!!! Your goals need to be aligned with their goals: focus on access for poor people and people of color, free transfers, low or no fares (especially with cash), extend the East Busway to the Mon Valley.
77. I use multi-modal (with bicycle) transit for recreational access. Allegheny county parks belong to all residents of the county, but are underserved by transit, which generally aaaaalmost reaches them. The result is a racial disparity in user demographics. Connect the city to county parks! GOLDEN OPPORTUNITY: A stop on the New Castle Transit RT 71 (Pittsburgh) to provide access to McConnells Mill State Park. This bus goes right past McConnells Mill Rd on Route 422 already, it just needs a stop. Hundreds of people go to this park on the weekend, and this bus, which I have ridden but couldn't get off at the right place, is as fast as driving.
78. My biggest issue is with the Pittsburgh Port Authority. They won't let the Butler Commuter Buses pick up or drop off on the North Shore.
79. Improved mass transit and extensions of the existing T lines. Look into the possibility of regional rail services to Greensburg/Latrobe, Mon Valley, Allegheny Valley, and Ohio Valley using existing rail lines. Use the under utilized HOV lanes of I-279 to extend rapid transit to the northern suburbs and improve bus connections across the board.
80. We need light rail to/from airport. We need light rail to/from Cranberry Twp. Many cities of comparable size have vastly superior light rail service. Service to the airport would significantly increase business travel and tourism. Light rail service to Cranberry would significantly reduce traffic and would promote both regions. The right of ways should already exist for much of the route by way of old railroad and trolley lines. Many people will simply not get on a bus, but they would take light rail if it was clean and efficient.
81. I would love a T line that goes from the Airport to the south hills or from squirrel hill to the south hills.
82. The T should have been routed through the Convention Center, across the railroad bridge and through the East Ohio Street business district and Allegheny Center to the stadiums (and ultimately, the airport) rather than burrowing under the river. More people would have been better served on that route. Overall, the T needs to be extended further east and north. Buses need to be converted to more energy-efficient propulsion.
83. Please improve sidewalks and crosswalks. Slow down cars
84. I'd like to take the Evans city park and ride to downtown Pittsburgh the times are not convenient for me for the Butler transit authority I need a bus leaving at 3:30 PM from Pittsburgh
85. I have focused my responses here on places I *need* to go. In terms of wanting to go new places, it would be ideal to have better links between Pittsburgh city and the outlying recreation areas -- ski resorts, Ohiopyle, Laurel Highlands Trail, Great Allegheny Passage, etc. These important green areas are impossible to access right now without a private car.
86. A commuter bus stop on the north shore in Pitts. From Butler would be great.
87. The amount of people during rush hours should be addressed. Having more buses running more frequently would improve the commute and less stress on the drivers. Transportation is a barrier for a lot of people with health conditions.

1. Comments

88. Expand low floor lightrail system: " west to the airport " east to monroeville " north to Cranberry Go visit Salt Lake City's lightrail system. You can ride from airport to downtown in 15 minutes.
89. I wish we had a subway or commuter train that went more than a few places. Traffic and the lack of bus routes is a real barrier to travelling to the city for me.
90. Transit needs to be paired with density & development to support it much more than parking or open space.
91. Better transportation service needs to be given to the citizens of Allegheny County.
92. There is no transportation in southern Armstrong county. Leechburg apollo parks gilpin twp. Transit to city would be good for new family who works in city
93. Cheap transfer Faster
94. None
95. Thanks for doing this important work!
96. Would be nice to have a better back up for those drivers who call off. Often I am waiting for the next bus because one doesn't show up.
97. There should be some feedback you gather about the environment/sustainability. E.g. "Do you care about an electrified fleet?" Yes, I would like that.
98. Please tell Port Authority to stop getting rid of bus stops and provide an option to request to return ones they robbed from us. They took away a vital stop in my neighborhood and it has hurt me, my neighbors, and customers in our small business district in the 2300-2400 Arlington Ave.

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SmartMoves Connections

A Regional Vision for Public Transit

SOUTHWESTERN PENNSYLVANIA COMMISSION

SPC