BRT Feasibility Study

Feasibility Report – January 2024

Reimagine METRO

FOREWORD

"As METRO and our community partners look towards the future, we see a thriving metro area connected by ***fast, reliable, and comfortable transit***. A major player in that vision is the implementation of a Bus Rapid Transit system. Having just completed our successful BRT feasibility study, our team is looking forward to taking the next steps to make that vision a reality.

I would like to personally thank our BRT feasibility study team, appointing authorities, and METRO board members for their support and engagement throughout this process. I would also like to thank our METRO Planning and Marketing teams for all their effort in our outreach events as well as our consultants at Kimley-Horn for all their hard work. There is challenging work ahead of us to make our vision come true, but with our METRO team and our community partners, I am positive BRT will become a reality in our region."

– Dawn Distler
Chief Executive Officer, METRO RTA

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EXECUTIVE SUMMARY

The Akron Metropolitan Regional Transit Authority (METRO) Strategic Plan identified this study to evaluate bus rapid transit (BRT) feasibility on nine corridors aligning with higher frequency service planned with the Reimagine METRO Network. This study seeks to prioritize and advance the strongest corridors for BRT and achieve METRO's vision for BRT (see image right).

Bus rapid transit (BRT) is a mode of fixed-route bus service that includes enhancements resulting in faster, more reliable service than local bus service. BRT is highly adaptable and can include a variety of enhancements based on the corridor context. There is no one-size- fits-all BRT solution, and each community takes a different approach to planning and implementing this transit investment.

The study builds on previous METRO and regional planning initiatives and prioritizes BRT corridors that advance the region's commitment to racial and socioeconomic equity and the following goals:

METRO's Vision for BRT

*BRT successfully delivers **frequent service** with **enhanced infrastructure** and **improved amenities**, and advances racial and socioeconomic equity to strengthen regional vitality.*

Source: METRO Strategic Vision (2020)

Goal 1. Advance Feasible and Implementable Solutions
Smart investments lead to stronger community support for BRT with sustainable growth.

Goal 2. Expand Mobility and Access
Increased travel choice and connectivity better links people with jobs, services, and opportunities.

Goal 3. Create Economic Opportunity
Enhanced mobility encourages public and private investment in transportation and development, which promotes local and regional economic vibrancy.

Goal 4: Improve Safety
Safer walking and biking access to transit enhances mobility.

Goal 5: Support Climate Resiliency and Environmental Sustainability
Increased mobility options lowers automobile dependence leading to a reduction in greenhouse gas emissions and air pollution. Frequent transit can also support compact development and help conserve land.

The project team evaluated nine corridors in the region and identified 14 initial alternatives that consisted of distinct corridor segments. Using initial screening criteria that qualitatively assessed feasibility and mobility, five alternatives were advanced to the next stage of evaluation. The Preliminary Report, released in January 2023, details the corridor screening, alternative development, and Step 1 evaluation of the initial alternatives. The Step 2 and 3 evaluation was based on the five above goals, ridership forecasting and analysis, NEPA red flag analysis, and cost feasibility. The following three alternatives were advanced from this evaluation as priorities for implementation:

1. **Alternative A4** – West Market St. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.
2. **Alternative B4** – State Rd. – Howard St./North Main St. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.
3. **Alternative C6** – Wooster Rd. – Kenmore Blvd. – Lake Shore Blvd. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.

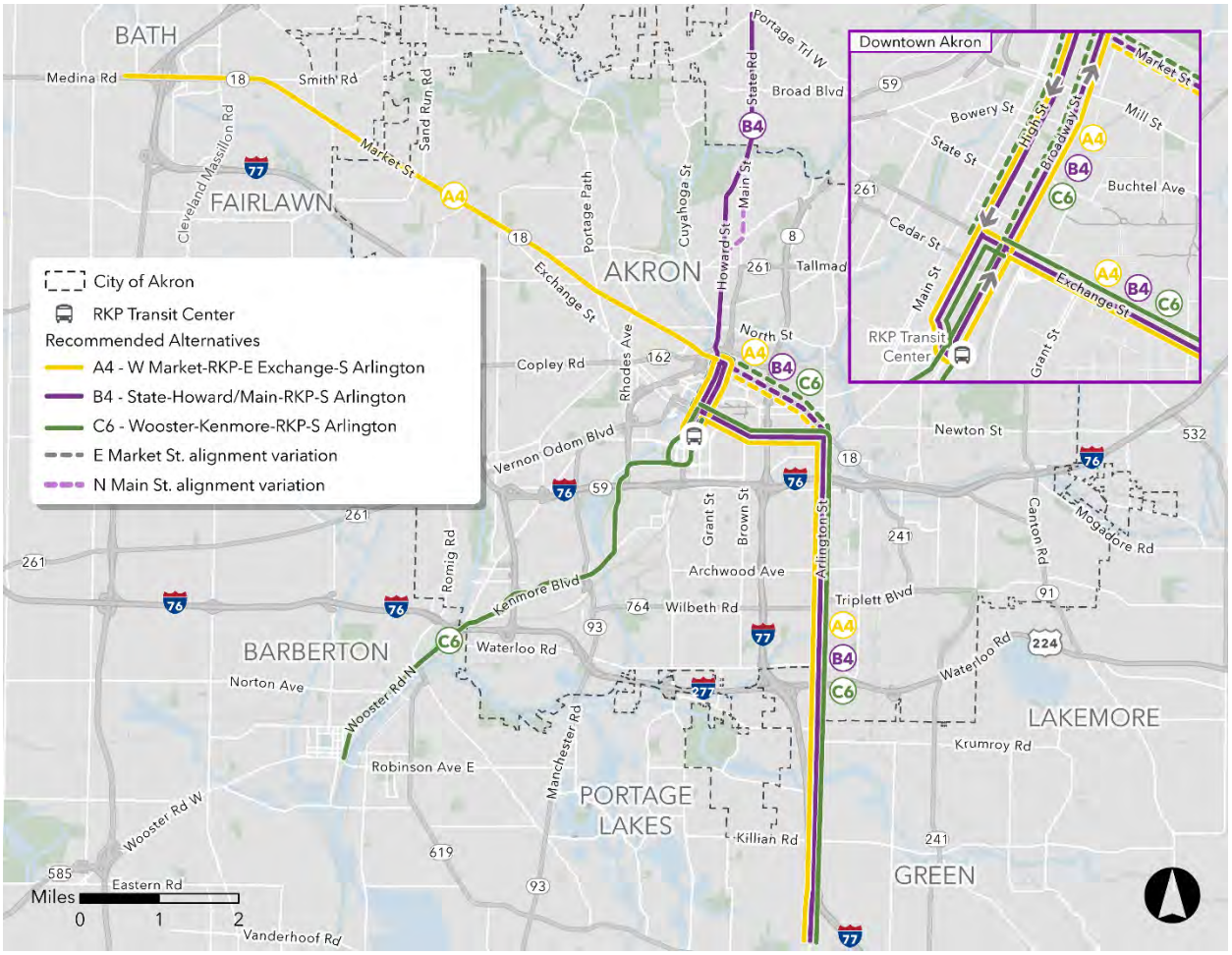


Figure 1 Alternatives Selected for Advancement

The project team and stakeholders will continue to evaluate these three alternatives and ultimately select one alternative to proceed to concept design. One round of public engagement, focusing on the basics of BRT and prioritization of the three alternatives, has concluded as of the writing of this report. Continued stakeholder and public engagement are essential to the next phases in this feasibility study. METRO-specific design standards for BRT have been developed and will be applied in the design phase.

OVERVIEW OF THE EVALUATION PROCESS

EVALUATION FRAMEWORK

A framework was developed to align project goals, objectives, evaluation criteria, and metrics with METRO's vision for BRT. The project team used the framework (Figure 2) to evaluate the nine initial corridors and develop alternatives based on both qualitative and quantitative evaluation criteria. An emphasis was placed on criteria and metrics that were readily accessible, easy to understand, differed between alternatives, and could be easily replicated. Prioritization of criteria and metrics was informed by the Study Advisory Committee (SAC) – a group of stakeholder agencies, organizations, and local governments that regularly coordinated with the project team on the study progress.

Figure 2 Evaluation Framework

EVALUATION PROCESS

The evaluation process consisted of three distinct steps, each with different purposes and emphasized goals (Table 1). In Step 1, alternatives were evaluated based on corridor characteristics only. Advanced analyses performed in Steps 2 and 3 were evaluated based on more specific alternative alignments, preliminary station locations, ridership forecasting, service patterns, and other characteristics. The full results of Step 1 are included in the Preliminary Report; a brief overview is available in the next section. The results of Steps 2 and 3 are included in this report.

Table 1 Evaluation Process

Step	Purpose	Emphasized Goals
1. Screen Corridors and Initial Alternatives	• Review 9 corridors • Identify alternatives based on corridor segments • Screen alternatives and remove those that do not meet priority goals	• Implementation • Mobility & Access
2. Screen Refined Alternatives	• Review alternatives with technical analysis (including STOPS ridership)	• Mobility & Access
3. Evaluate & Prioritize Alternatives	• Review alternatives with focus on technical feasibility, environmental context, and implementation • Advance preferred alternative(s)	• All 5 Goals

STEP 1 EVALUATION: SCREEN INITIAL ALTERNATIVES

The purpose of the Step 1 review was to screen the initial nine corridors, develop alternatives, and remove those that do not meet the emphasized goals of *Advance Feasible and Implementable Solutions* and *Expand Mobility and Access*. In Step 1, the evaluation used a simple set of questions, framed so that they do not require significant data collection or analysis to answer. Screening criteria are based on existing or readily available data and reflect regulatory or policy imperatives that the project must adhere to. The objectives, evaluation criteria, and metrics for the emphasized goals in Step 1 are shown in Table 2.

Table 2 Emphasized Goals and Objectives for Step 1 of Evaluation Process

Goal	Objective	Evaluation Criteria	Metric / Question
1. Advance Feasible and Implementable Solutions 	A. Advance BRT alternatives that are generally compatible with local plans and/or priorities	General compatibility with local plans and/or priorities	To what degree does improved transit service support or complement project goals, local plans, or community priorities? (High/Medium/Low)
2. Expand Mobility and Access 	A. Serve major regional destinations (employment centers, schools, and services)	Major regional destinations and employers	Does the alternative serve corridor(s) with many major regional destinations and employers (defined as Summit Co. Major Destinations, Summit County Job Hubs/Major Employers, and clusters of employment from LEHD)? (High/Medium/Low)
	B. Serve a corridor in a strong transit market*	Projected Ridership	Alternative serves corridor(s) with top 5 strongest transit market based on market assessment (Y/N)
	C. Serve and benefit existing transit-loyal riders*	Total Ridership on Existing Routes	Alternatives serves corridor(s) with top 5 highest existing ridership routes (Y/N)
	D. Does the alternative serve Historically Disadvantaged Communities (HDCs)?	HDC and non-HDC population served	To what degree does the population served by corridor are residents of an HDC? (High/Medium/Low)

*Evaluation criteria for objectives 2B and 2C were not included as part of the corridor screening. These criteria were included in the Step 1 alternative screening and evaluated through the transit ridership analysis.

METHODOLOGY

Through the corridor screening process, 14 alternatives were identified for preliminary screening. All initial nine corridor segments were included in at least two alternatives. The alternatives were organized into three groupings: West Market St., North-South, and Southwest. These alternatives and groupings were selected based on the corridor screening process and preliminary findings from the transit market assessment.

Step 1 screening involved ridership forecasting to evaluate potential ridership on the BRT alternatives. Strong ridership forecasts provide justification to stakeholders and to the public for investment in BRT. Ridership is also important for receiving federal grant support as it is heavily weighted in the Federal Transit Administration (FTA) Capital Investment Grant (CIG) scoring criteria, as of December 2023.

This screening also involved a qualitative analysis of the alternatives based on Step 1 evaluation criteria, shown above in Table 2. The evaluation criteria were weighted based on study priorities expressed by the SAC with Objective 2B (Projected Ridership) weighted highest and Objective 2A (Major Destinations) weighted lowest. For objectives with high/medium/low metrics, the alternatives were ranked relative to one another.

RESULTS OF STEP 1 AND ALTERNATIVES ADVANCED

Based on the alternatives screening results in Step 1, the following five alternatives were determined to best meet METRO's goals and were recommended by the SAC for advanced analysis (Figure 4):

1. **Alternative A3** – West Market St. – RKP Transit Center – East Exchange St./East Market St. – Canton Rd.
2. **Alternative A4** – West Market St. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.
3. **Alternative B4** – State Rd. – Howard St./North Main St. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.
4. **Alternative C4** – Wooster Rd. – Kenmore Blvd. – Lake Shore Blvd. – RKP Transit Center – West Market St.
5. **Alternative C6** – Wooster Rd. – Kenmore Blvd. – Lake Shore Blvd. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.

Alternative B4 was advanced with the intention of studying the potential for the alternative to terminate at the northern end of the North Hill neighborhood. At this stage, the project team elected to route Alternative B4 on Howard St. instead of North Main St. to align with the Reimagine METRO network.

Alternative C4 was one of the strongest alternatives in the Southwest corridor as it serves HDC populations and provides a link between known origin-destination pairs between the Southwest corridor and West Market St. The Alternative C4 routing is a more linear than some of the other alternatives that connect the Southwest corridor to Arlington St. and West Market St.

See the Preliminary Report for the full discussion of the Step 1 screening process.

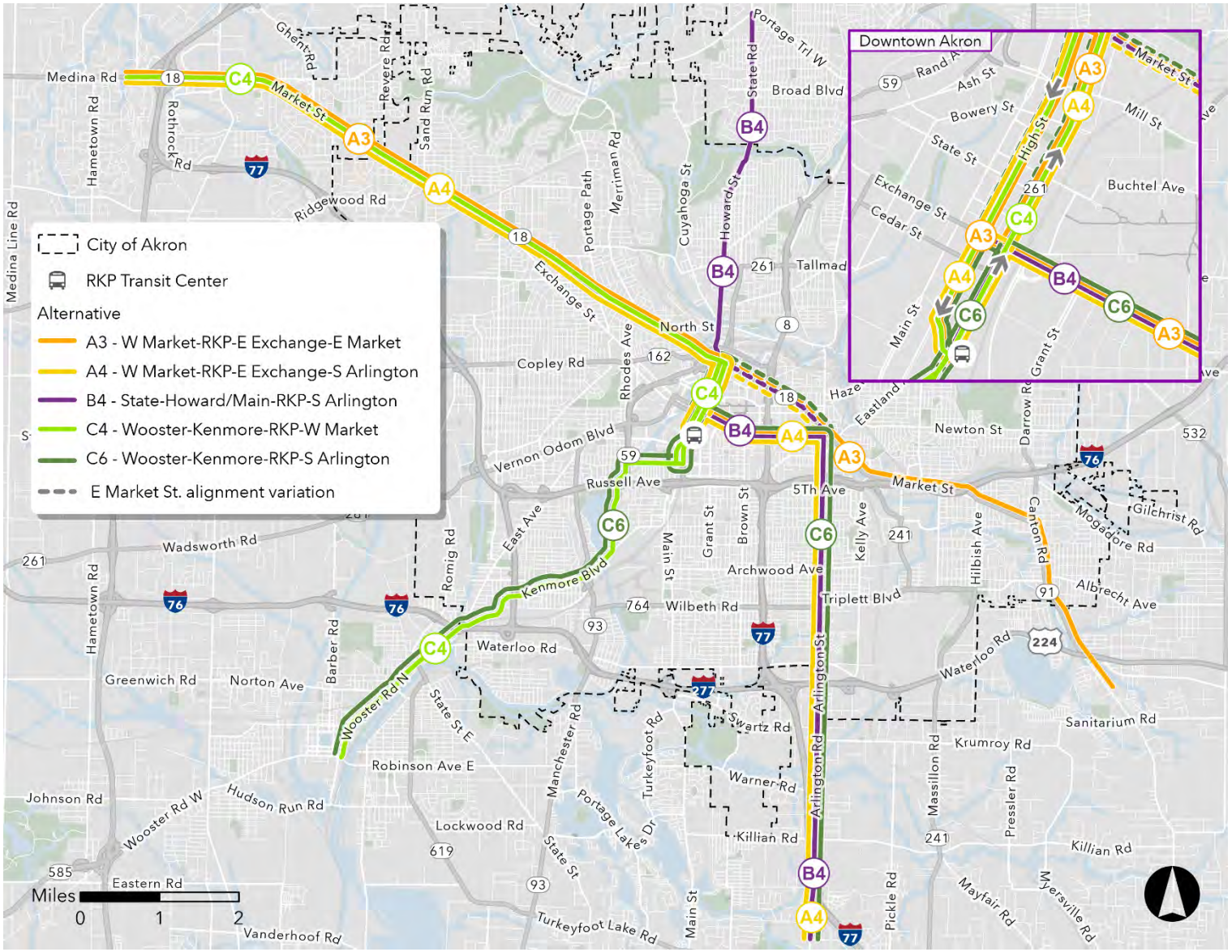


Figure 3 Recommend Alternatives to Advance from Step 1 Evaluation

STEP 2 EVALUATION METHODOLOGY: SCREEN REFINED ALTERNATIVES

PURPOSE

This section focuses on the ridership modeling methodology that was completed as part of the BRT corridor evaluation. Ridership is an important consideration in evaluating the feasibility of BRT alternatives and is also heavily weighted in the FTA CIG scoring criteria.

The project team performed the Step 2 and Step 3 evaluations simultaneously, incorporating results from the model used in Step 2 into Step 3. The project team and the SAC determined that the five alternatives advanced from Step 1 should not be evaluated by ridership alone before narrowing down the alternatives. Ridership is emphasized separately in Step 2 because of its broader importance to the evaluation of Step 3 objectives. Table 3 shows the Step 3 objectives that are dependent on ridership evaluation in gray shading.

The five alternatives analyzed in the Step 2 evaluation are:

1. **Alternative A3** – West Market St. – RKP Transit Center – East Exchange St. – East Market St.
2. **Alternative A4** – West Market St. – RKP Transit Center – East Exchange St. – South Arlington St.
3. **Alternative B4** – State Rd. – Howard St./North Main St. – RKP Transit Center – East Exchange St. – South Arlington St.
4. **Alternative C4** – Wooster Rd. – Kenmore Blvd. – RKP Transit Center – West Market St.
5. **Alternative C6** – Wooster Rd. – Kenmore Blvd. – RKP Transit Center – South Arlington St.

*Table 3 Step 3 Evaluation Objectives Dependent on Step 2 Results**

Goal	Objective
1. Advance Feasible and Implementable Solutions	B. Ability to phase a BRT alternative over time, if needed
	C. Ability of BRT service to increase access to HDCs in the near-term
	D. Ability to fit a BRT alternative within existing roadway footprint and right-of-way (ROW) while minimizing impacts to extent possible
	E. Advance cost-effective BRT alternatives
2. Expand Mobility & Access	B. Serve a corridor in a strong transit market (projected)
	G. Serve and benefit existing transit-loyal riders
3. Create Economic Opportunity	A. Provide businesses access to more workers
	B. Increase access to schools, facilities, and centers that support workforce advancement and economic vibrancy
	C. Supports existing economic development projects and provides access to areas with land redevelopment opportunity (overall and in HDCs)
	D. Supports community-led placemaking initiatives
4. Improve Safety	A. Provide service to stations conducive to safe pedestrian and bicycle access
	B. Address identified transportation safety issues along the corridor
5. Support Climate Resiliency and Environmental Sustainability	B. Reduce GHG emissions and fine air particles from SOV trips
	C. Preserve and provide opportunities to mitigate urban heat island impacts in HDCs

*Step 3 evaluation objectives shown in gray are dependent on Step 2 evaluation results.

METHODOLOGY

The ridership modeling provides an order-of-magnitude estimate of the ridership potential in the BRT corridors in the Akron region. The project team used FTA's Simplified Trips-on-Project Software (STOPS) model to perform this analysis. The level of analysis is appropriate for this feasibility study and provides valuable information to the project team in making recommendations for the feasibility of the BRT corridors in the region.

The team used the Reimagine METRO network (implemented in June 2023) as the "No Build" scenario. Stations were identified for each of the five BRT alternatives. For ridership modeling purposes, a BRT station was located at approximately half-a-mile average spacing. Stations were assumed at key intersections and existing high ridership activity stops.

Assumptions of the ridership analysis include:

- **BRT service runs 30 percent faster** than underlying local buses.
    - Station-to-station travel times are equal to the local bus travel times multiplied by 0.7.
- A **2-minute layover at RKP Transit Center** to allow for transfers between BRT and other bus routes.
- **15-minute all-day frequencies** for BRT service and 60-minute all-day frequencies for underlying local buses.

These assumptions resulted in end-to-end BRT average speeds between 18 and 20 miles per hour and an effective 12-minute frequency for bus service in the corridor served by the BRT alternatives. Table 4 summarizes transit service for the five alternatives.

Table 4 Transit Service Overview for Modeled Scenarios

	Alternatives				
Service Assumption	**A3**	**A4**	**B4**	**C4**	**C6**
Route miles (one-way)	17.3	18.8	15.1	15.9	15.6
BRT Travel Time (one-way in minutes)	56	58	47	52	47
BRT Travel Speed (in miles per hour)	18.4	19.5	19.2	18.2	20.0
Local Bus Travel Time (one-way in minutes)	78	77	61	68	61

It should be noted that as this is a feasibility study, detailed operating plans (the station locations, access to the stations, and detailed operating characteristics) of the BRT services are not available. These assumptions are typically developed during the subsequent phases of a study.

See Appendix A-2 for maps of the preliminary station locations for each alternative. Results of the ridership evaluation are presented with the Step 3 evaluation results.

STEP 3 EVALUATION METHODOLOGY: EVALUATE AND PRIORITIZE ALTERNATIVES

PURPOSE

In the Step 3 evaluation, the five selected alternatives from Step 1 were screened further to identify three alternatives to move forward. This more detailed and intensive screening evaluated the alternatives from a variety of perspectives, including implementation and feasibility, ridership and mobility, economic development, safety, and sustainability. Assessment of traffic volumes, NEPA red flag analysis, evaluation of cost estimates, and a scoring matrix based on the identified evaluation criteria were included this step. This section documents the methodologies for each of these pieces.

As previously mentioned, the project team performed the Step 2 and Step 3 evaluations simultaneously, incorporating results from the model used in Step 2 into this step. The scoring matrix developed for Step 3 included two Step 2 evaluation criteria that evaluated both projected and existing ridership.

The alternatives evaluated in this step are the same as those evaluated in Step 2.

TRAFFIC VOLUMES AND VEHICULAR CONGESTION

The project team reviewed existing and future traffic volumes and vehicular congestion for the five alternatives. This review was not formally a part of Step 2 or Step 3, though it was an important consideration in discussions with the project team and SAC. The project team obtained geospatial traffic volume data for 2021 and 2045 from the Ohio Department of Transportation (ODOT) for the Akron Metropolitan Area Transportation Study (AMATS) geography. Traffic volumes were divided by the number of lanes for each roadway segment to obtain a vehicular congestion value. The data was originally split by travel direction but combined as bi-directional for this analysis.

NEPA RED FLAG ASSESSMENT

METRO will likely seek federal funding for a future BRT corridor through the FTA CIG program. If CIG funding is awarded, the project would be subject to federal environmental regulations, including the National Environmental Policy Act (NEPA) process. This assessment identifies potential environmental “red flags” that may need to be evaluated further in the NEPA process when field studies are conducted and impacts are considered.

The project team mapped previously recorded environmental resources within 200 feet of these corridors in ArcGIS. When reviewing these resources, the project team focused on environmental resources within 200 feet of the proposed station locations, based on the assumption that future BRT corridors would largely be built within the existing right-of-way footprint and that the primary impacts would be from station-area enhancements. The following environmental resources were reviewed:

- Historic and archaeological resources
- Water resources (bodies of water, floodplains, and wetlands)
- Section 4(f) resources, including parks and trails

COST ESTIMATES

The primary goal of capital cost estimates is to provide an order-of-magnitude estimate of project costs based on the preferred alternatives. The project team developed cost estimates for the five alternatives under evaluation in Step 2 and Step 3. These alternatives range from 15 to 19 miles long and are assumed to run primarily in mixed traffic. Station locations identified in the Step 2 ridership modeling were used to estimate associated costs. Each

alternative was assumed to have eight "downtown"— or "enhanced"— stations that are more expensive than the "neighborhood" stations along the remainder of the routes.[1]

Capital cost estimates for the project were prepared using the format and procedures currently required for evaluation by the FTA. The FTA includes the use of Standard Cost Categories (SCC) that group costs as follows:

- Category 10: Guideway and Track Elements
- Category 20: Stations, Stops, Terminals and Intermodal
- Category 30: Support Facilities: Yards, Shops, and Administrative Buildings
- Category 40: Sitework and Special Conditions
- Category 50: Systems
- Category 60: Right of Way, Land, and Existing Improvements
- Category 70: Vehicles
- Category 80: Professional Services
- Category 90: Unallocated Contingency
- Category 100: Finance Charges

The cost estimate was developed by calculating quantities for proposed work and applying weighted average historical bid prices from the Minneapolis-Saint Paul Metropolitan Statistical Area (MSA), provided by the Minnesota Department of Transportation. Construction costs for Greater Akron are generally comparable to construction costs in Minneapolis-Saint Paul MSA.[2] The unit prices were refined based on estimates for Metro Transit's arterial BRT projects operating in mixed traffic in the Minneapolis-Saint Paul MSA and on supplemental pricing research of other Metro Transit projects. The unit price assumptions from these sources were reviewed to determine applicability to the project and compatibility with the methodology and format being used.

See Appendix D for further detail on exclusions, assumptions, and scope of work for each SCC category.

EVALUATION MATRIX

The five alternatives were evaluated against 13 objectives from the five project goals, consisting of 20 different metrics. These metrics were developed to best reflect available information and the feasibility study goals. The project team evaluated both the East Market St. and East Exchange St. options for each alternative except for Alternative C4, which does not have a routing option through those corridors.

Objectives 2B and 2C of the ***Expand Mobility and Access*** goal were included in this evaluation to screen the alternatives holistically. These objectives were previously evaluated under Step 1 with different metrics and in Step 2 with the STOPS model. The updated metrics measure projected and existing ridership and were weighted higher due to the importance of ridership to BRT feasibility and current FTA CIG scoring criteria. See Appendix A for further information on how the values were calculated.

Step 3 evaluation included the objectives listed in Table 5. These objectives and their respective metrics were evaluated through a largely quantitative analysis using ArcGIS and other geospatial resources, STOPS modeling results, and relevant planning documents from the region. The metrics were weighted according to the project goal prioritization, with Objective 1B (Phasing Potential) weighted the highest and 5C (Urban Heat Island

[1] See the BRT Design Standards for more detail on "enhanced" and "neighborhood" BRT stations.
[2] RSMeans Data. City Cost Index (July 2023). https://www.rsmeans.com/2023-construction-cost-indexes-july

Mitigation) weighted the lowest. Objectives 2B (Projected Ridership) and 2C (Existing Ridership) were weighted more than all other objectives.

Table 5 Step 2 and 3 Evaluation Objectives

	Goal	Final Weight	Objective
Step 2	*2. Expand Mobility and Access*	7	B. Serve a corridor in a strong transit market (projected)
		7	C. Serve and benefit existing transit-loyal riders
Step 3	*1. Advance Feasible and Implementable Solutions*	5	B. Ability to phase a BRT alternative over time, if needed
		5	C. Ability of BRT service to increase access to HDCs in the near-term
		5	D. Ability to fit a BRT alternative within existing roadway footprint and right-of-way (ROW) while minimizing impacts to extent possible
		5	E. Advance cost effective BRT alternatives
	3. Create Economic Opportunity	3	A. Provide businesses more access to workers
		3	B. Increase access to schools, facilities, and centers that support workforce advancement and economic vibrancy
		3	C. Supports existing economic development projects and provides access to areas with land redevelopment opportunity (overall and in HDCs)
		3	D. Supports community-led placemaking initiatives
	4. Improve Safety	5	A. Provide service to stations conducive to safe pedestrian and bicycle access*
		2	B. Address identified transportation safety issues along the corridor
	5. Support Climate Resiliency and Environmental Sustainability	1	B. Reduce GHG emissions and fine air particles from SOV trips
		1	C. Preserve and provide opportunities to mitigate urban heat island impacts in HDCs

*Objective 4A was moved under Goal 1 for the final evaluation to focus on implementation, as station areas with limited pedestrian connectivity would require greater capital investment.

Evaluating Equity

The guiding principle of this feasibility study is racial and socioeconomic equity. It is a key factor in the alternative evaluation and recommendation process. Rather than creating a dedicated goal to evaluate the overall impact of each alternative on disadvantaged populations, equity-oriented objectives and metrics were woven throughout the evaluation framework. This ensures that equity is considered in all aspects of the study and from a variety of perspectives.

Consequently, several of the evaluation objectives have two dimensions: an “overall” metric and an equity metric. Equity metrics were generally weighted higher when calculating the total score.

The Step 2 and 3 evaluation framework was revised after one round of scoring following discussion with the SAC. The initial evaluation results were presented to the SAC, and upon discussion, the group decided the results did not best capture the study's priorities. The project team explored new data sources and standardized the complicated scoring methodology.

Changes to the methodology included:

- Addition of existing ridership data
- Adjusted breaks in the "best," "good," and "okay" rating system
- Exclusion of redundant metrics
- Revisited the selected horizon year (2030)[3]
- Adjustment to how weighting was distributed across objectives and metrics

The project team also revised the equity areas used in the evaluation. Previously, USDOT Historically Disadvantaged Communities (HDCs) were utilized in other evaluation steps. The SAC recommended a switch to USDOT Equitable Transportation Community Explorer (ETCE) census tracts, released in spring 2023. The ETCE census tracts better represent the transportation-disadvantaged communities in the region. All HDCs identified in the study area are also ETCE census tracts. Figure 5 depicts the ETCE census tracts (black hash) compared to the HDCs (blue).

Defining USDOT Equitable Transportation Community Explorer Census Tracts

The ETCE uses 2020 Census data to identify tracts that experience burdens brought on by underinvestment in transportation. The five components factored into the analysis are: transportation insecurity, climate and disaster risk burden, environmental burden, health vulnerability, and social vulnerability. Tracts are scored according to the five components, then combined into an overall score. Tracts with an overall score that is above the 65th percentile are considered "disadvantaged" (USDOT).

See Appendix E-1 for the full documentation of the Step 2 and 3 evaluation criteria methodology, including the initial results and revisions.

[3] Following review, the horizon year of 2045 was not changed after the first round of scoring. The project team determined that the ridership results were not significantly different between 2030 and 2045.

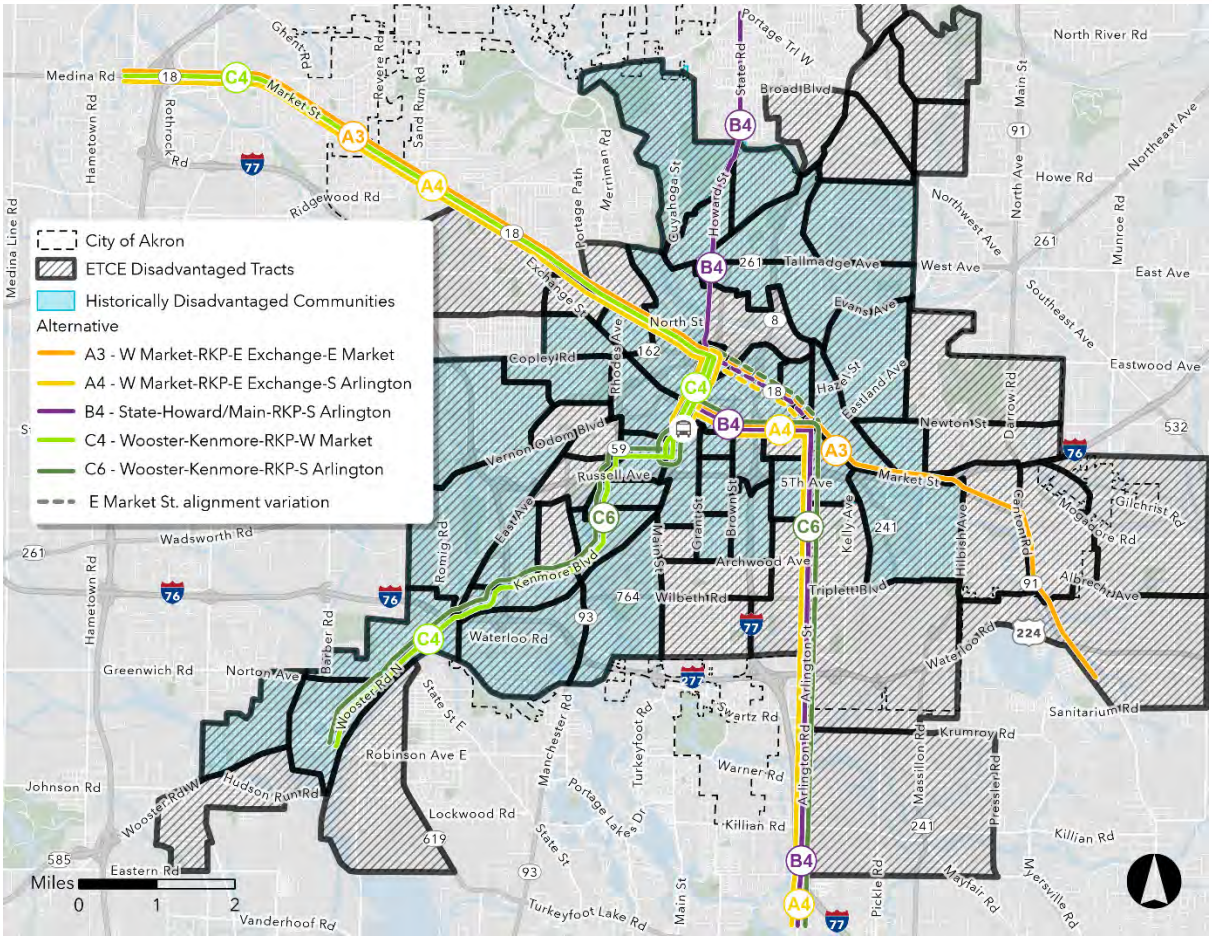


Figure 4 ETCE Census Tracts and HDCs in Greater Akron

STEP 2 AND 3 EVALUATION RESULTS

The results of the ridership evaluation (Step 2) and traffic volumes assessment, capital cost estimates evaluation, NEPA red flag analysis, and scoring matrix (Step 3) are presented below. The findings from these combined evaluation steps informed the prioritization of the alternatives discussed in the following section.

RIDERSHIP EVALUATION

The ridership forecasts suggest that average daily boardings in the corridors range from 4,000 to 5,000 passengers (Year 2045 estimates). All corridors show an increase in boardings compared to the existing scenario. The analysis also showed that in terms of total boardings, Alternatives A4, C4, and C6 perform better than the other two alternatives. These results are summarized in Table 6.

This analysis also confirms that all five BRT alternatives show net positive accessibility benefits compared to the No Build service. The full Ridership Evaluation can be found in Appendix A.

Table 6 Horizon Year 2045 Ridership Forecasts

	Alternatives				
Performance Measure	**A3**	**A4**	**B4**	**C4**	**C6**
Total Corridor Average Daily Boardings (BRT + underlying local bus)	4,200	4,900	4,100	4,900	4,900
BRT Average Daily Boardings	3,500	4,200	3,300	4,100	4,000
BRT Average Daily Boardings from 0-Car Households	690	640	850	820	870
Average Daily New Transit Trips	450	210	180	390	260
Average Daily Vehicle Miles Traveled (VMT) Savings	3,600	1,900	1,270	2,600	1,300

TRAFFIC VOLUMES AND VEHICULAR CONGESTION

Generally, the same areas that are currently congested are projected to remain congested in 2045. These areas include the I-77 and I-76 interchanges with West Market St., Canton Rd., and South Arlington St., as well as high-activity areas along West Market St. and Wooster Rd. where the roadway is more constrained. West Market St. is the most congested corridor, and is served by Alternatives A3, A4, and C4. These findings are consistent with congested areas identified in the 2021 AMATS Annual Report on Roadway Congestion.

Traffic congestion is lower along East Exchange St. compared to East Market St. The main thoroughfares of High St. and Broadway in Downtown Akron have four through lanes and low traffic volumes and are not often congested. Exclusive or semi-exclusive bus-only lanes in Downtown Akron may be feasible and merit further study in concept design.

The project team determined that congestion is not a significant differentiator between the alternatives. However, as the recommended alternatives move toward concept design, areas of relatively high traffic congestion will need to be considered to ensure efficient and reliable BRT service.

Figure 6 and Figure 7 depict traffic congestion for all five alternatives in 2021 and 2045. Appendix B contains maps of each alternative produced as part of this analysis.

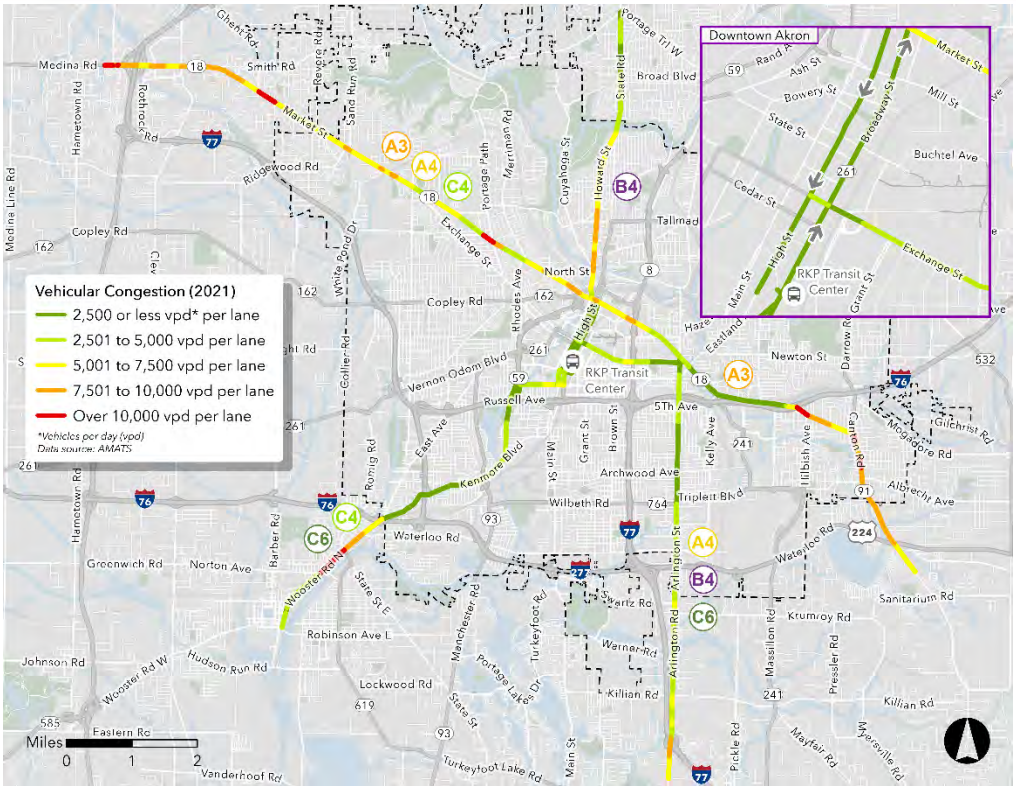


Figure 5 Vehicular Congestion for Advanced Alternatives, 2021

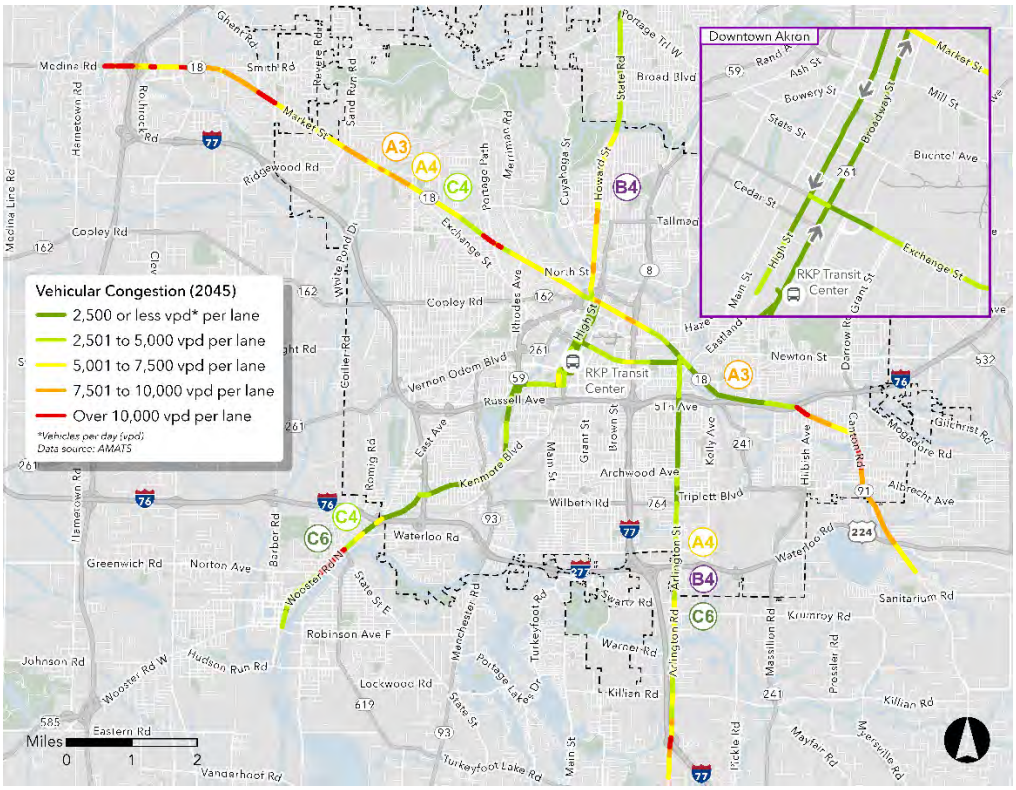


Figure 6 Vehicular Congestion for Advanced Alternatives, 2045

NEPA RED FLAG ASSESSMENT

Based on the assessment of historic, archaeological, water, and Section 4(f) resources, there are environmental resources along the study corridors that will need to be evaluated further through the NEPA process. However, there is a not a disproportionate number of red flags in any one alternative to differentiate the corridors based on environmental concerns. Table 7 summarizes the potential impacts of each alternative.

Table 7 Summary of Potential Impacts to Environmental Resources by Alternative

Alternative	Historic and Archaeological Resources	Water Resources	Section 4(f) Resources
A3	5 station pairs with potential impacts to National Register listed/eligible sites	3 station pairs with potential impacts to multiple water resources (wetlands, rivers, floodplains)	2 station pairs adjacent to small parks
A4	4 station pairs with potential impacts to National Register listed sites	1 station pair with potential impact to floodplain	1 station pair adjacent to a small park
B4	4 station pairs with potential impacts to National Register listed sites	1 station pair with potential impact to floodplain	1 station pair adjacent to a small park
C4	6 station pairs with potential impacts to National Register listed/eligible sites	1 station pair with potential impact to floodplain	2 station pairs adjacent to small parks
C6	6 station pairs with potential impacts to National Register listed/eligible sites	1 station pair with potential impact to floodplain	1 station pair adjacent to a small park

Most of the potential impacts relate to historic properties that are listed or are eligible for listing on the National Register of Historic Places. Many of these resources are in Downtown Akron, along a segment that is common to all alternatives. While these resources in Downtown Akron will require further analyses during the NEPA and design phases, these potential impacts do not serve to differentiate the five alternatives because each alternative would use the same stations and routing along Broadway and High St. in Downtown Akron.

Next Steps

As planning and design advance for the selected alternative, METRO should consult the findings from this analysis and the maps of resources to minimize or avoid impacts to these resources where possible. Formal coordination with the Ohio State Historic Preservation Office will be required during the NEPA study to determine the level of potential impacts and the mitigation required, if any. If METRO considers BRT-related improvements that would have impacts outside of the station area, the project team should consult the mapping analysis done in this analysis for potential NEPA red flags related to those actions.

See Appendix C for the full NEPA Red Flag Assessment results.

COST ESTIMATES

The results of the estimates show a base total cost that ranges from approximately $85M to $115M (Year of Expenditure 2028). Alternative B4 – East Exchange St. has the lowest estimated capital cost, and Alternative A4 – East Market St. has the highest. Generally, the alternatives that operate on East Market St. are more expensive than those that operate on East Exchange St. The East Market St. alternatives use longer routes that include more stations, resulting in higher estimated costs. Table 8 summarizes the cost estimates for the five alternatives.

Table 8 Cost Estimates for the Advanced Alternatives

	A3		A4		B4		C4	C6	
	Exchange	Market	Exchange	Market	Exchange	Market	Market	Exchange	Market
Construction Subtotal	$60 - 70	$65 - 75	$60 - 70	$65 - 75	$50 - 60	$55 - 65	$60 – 70	$55 – 65	$60 – 70
Total Project Cost	$100 - 110	$105 - 115	$100 – 110	$105 - 115	$85 – 95	$90 – 100	$100 – 110	$95 – 105	$100 - 110

Costs in 2028$ million.

Several primary cost drivers are present throughout all alternatives. Those cost drivers include:

- **Stations.** Alternatives with a greater number of stations have higher estimated costs.
- **Buses.** Alternatives with longer routes and travel times require a greater number of buses to maintain BRT service frequency.
- **Contingency.** Each alternative carries both allocated and unallocated contingency, driving up costs in the nearer term.
- **Inflation.** The cost of materials, labor, and resources will rise with inflation as construction progresses.

Appendix D details the cost estimates for each advanced alternative; Appendix D-1 includes the cost estimates workbook.

EVALUATION MATRIX

The best-performing alternatives in the Step 3 evaluation matrix are, in order:

1. **Alternative A4** – West Market St. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.
2. **Alternative C6** – Wooster Rd. – Kenmore Blvd. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.
3. **Alternative B4** – State Rd. – Howard St./North Main St. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.

With the revised evaluation framework, Alternative A4 performed the best, followed by C6 and B4. Generally, the East Exchange St. options performed better than the East Market St. options due to lower capital costs. Alternatives A3 and C4 did not perform as well in this round of evaluation. Table 9 presents the qualitative results of the analysis. Note that this section only presents the results of the revised evaluation framework; see Appendix E for the initial evaluation results.

Alternatives B4, C4, and C6 performed well on metrics that are equity oriented as these alternatives serve more disadvantaged populations. These alternatives also have lower capital, maintenance, and operations costs as well as stronger projected ridership. Alternatives C4 and C6 continued to perform well on job access metrics because they serve the growing southwest region—the Kenmore Blvd. and Wooster Rd. corridor. Alternatives A4 and B4 performed well on existing ridership metrics because they serve corridors with METRO's current highest-ridership routes. The top-scoring alternatives also all serve South Arlington St., which is currently served by the high-ridership Route 2. Appendix E-2 contains a detailed narrative of the results of the final evaluation for each metric.

Table 9 Step 2 & 3 Revised Evaluation Results

	Alternative	A3		A4		B4		C4	C6	
	Objective (highest to lowest weight)	E Exchange	E Market	E Exchange	E Market	E Exchange	E Market	E Market	E Exchange	E Market
Step 2	**Obj. 2B** Serve a corridor in a potential strong transit market.	Okay	Okay	Good	Good	Good	Good	Good	Best	Best
Step 2	**Obj. 2C** Serve and benefit existing transit-loyal riders.	Good	Good	Best	Best	Best	Best	Okay	Good	Good
Step 3	**Obj. 1B** Ability to phase a BRT alternative over time.	Best	Best	Best	Best	Good	Good	Okay	Good	Good
Step 3	**Obj. 1C** Ability of BRT service to increase (job) access to ETCE census tracts.	Best	Best	Good	Good	Okay	Okay	Good	Good	Good
Step 3	**Obj. 1D** Ability to fit a BRT alternative within existing roadway and ROW.	Best	Best	Good	Good	Best	Best	Okay	Good	Good
Step 3	**Obj. 1E** Advance cost-effective BRT alternatives (Capital and O&M).	Good	Okay	Good	Okay	Best	Best	Good	Best	Good
		Okay	Okay	Best	Best	Good	Good	Good	Good	Good
Step 3	**Obj. 4A** Provide service to stations conducive to safe pedestrian and bicycle access.	Good	Good	Good	Good	Best	Best	Good	Okay	Okay
Step 3	**Obj. 3A** Provide businesses more access to workers.	Best	Best	Best	Best	Best	Best	Best	Best	Best
Step 3	**Obj. 3B** Increase access to schools and services that support workforce advancement.	Best	Best	Best	Best	Best	Best	Okay	Best	Good
Step 3	**Obj. 3C** Supports existing economic development projects and access to land redevelopment opportunities.	Good	Good	Good	Good	Best	Best	Okay	Good	Good
Step 3	**Obj. 4B** Address identified transportation safety issues along the corridor.	Good	Good	Good	Good	Best	Best	Okay	Good	Good
Step 3	**Obj. 5B** Reduce GHG emissions and fine air particles from SOV trips.	Best	Best	Good	Good	Okay	Okay	Good	Okay	Okay
Step 3	**Obj. 5C** Preserve and provide opportunities to mitigate urban heat island impacts.	Best	Best	Best	Best	Best	Best	Best	Best	Best

BRT DESIGN STANDARDS

BRT design standards were developed to ensure uniform development and delivery of a BRT system in Greater Akron. These standards were used to identify BRT facilities envisioned in the evaluation process and were used in the development of the capital cost estimates that were part of the Step 3 evaluation.

Key elements of the METRO BRT design standards are:

- **Mixed traffic or semi-exclusive running ways.** BRT service largely operates in travel lanes shared with general-purpose traffic. Dedicated transit lanes could be implemented in Downtown Akron with further study and engagement.
- **10-minute frequencies.** BRT service operates with 10-minute headways during peak periods and minimum 15-minute headways during off-peak periods.
- **Standard 40-foot and articulated buses with amenities.** Amenities aboard buses should include bike racks, in-vehicle information displays, mobile device chargers, and Wi-Fi. Electric vehicles should be considered.
- **Neighborhood stations.** These stations are characterized by a smaller station size or footprint, a neighborhood land use context, and lower projected ridership. Amenities include:
    - A shelter with seating and leaning rail/seat wall
    - Textured warning strips
    - Real-time service information
    - Trash/recycling receptacles
    - Off-board fare payment
    - Lighting and emergency phones/call buttons
    - ADA-required elements (ramps, braille, printed information, etc.)
- **Enhanced stations.** These stations are characterized by a larger station footprint, higher-activity or mixed-use land use contexts, and higher projected ridership. Amenities include those listed for the neighborhood stations as well as:
    - Bicycle/micro-mobility parking
    - Station heaters
    - Landscaping/trees
    - Public art

Neighborhood station example. MetroTransit (MN) A Line station (Source: Kimley-Horn)

Enhanced station example. GRTC (VA) Pulse station (Source: Kimley-Horn)

Figure 7 Station Typology Examples

These standards are shaped by existing METRO policies and standards, including METRO's Strategic Plan, the Reimagine METRO Transit Service Plan, and agency standard operating procedures; local and state roadway design standards; current FTA requirements for the CIG program; transit industry best practices; METRO staff and SAC input; and considerations of capital and operating and maintenance costs.

See the BRT Design Standards document for more details.

RECOMMENDED ALTERNATIVES TO ADVANCE

Based on the Step 2 and 3 evaluation and stakeholder discussions, the following three alternatives were determined to best meet METRO's goals and are recommended for advancement:

Alternative A4 West Market St. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.	**Alternative B4** State Rd. – Howard St./North Main St. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.	**Alternative C6** Wooster Rd. – Kenmore Blvd. – Lake Shore Blvd. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.
This alternative serves: • Corridors with the highest performing and highest frequency METRO routes today (Routes 1 and 2) • Communities with greater transportation needs • Corridors with more transit-supportive land uses, such as higher-density residential and commercial uses • Several key destinations, including Downtown Akron, Summit Mall, Highland Square, Middlebury, and Arlington Plaza	This alternative serves: • Corridors poised for population and job growth • Corridors with well-connected sidewalk networks that support BRT station access • Corridors with more transit-supportive land uses, such as higher-density residential and commercial uses • Several key destinations, including Downtown Akron, Portage Crossing, North Hill, Middlebury, and Arlington Plaza	This alternative serves: • Corridors poised for population and job growth • Communities with greater transportation needs • Areas with recent community investments and transportation safety projects • Several key destinations, including Downtown Akron, Downtown Barberton, Kenmore, Middlebury, and Arlington Plaza

Alternative A3 was tabled at this stage due to comparatively low ridership (existing and projected), particularly in the East Market St./Canton Rd. portion of the alternative. Alternative C4 was tabled for a similar reason, along with having generally less BRT-supportive infrastructure along most of the route, such as sidewalk gaps. Alternatives A3 and C4 may be considered for future phases of BRT implementation. The project team concluded that the alternatives did not differ significantly based on traffic volumes, vehicular congestion, or potential environmental and historic resource impacts.

Both East Market St. and East Exchange St. routing options will continue to be evaluated for the three recommended alternatives. Additionally, a new option for Alternative B4 will be considered: routing on Howard St. from Downtown Akron to Cuyahoga Falls Ave., then on Cuyahoga Falls Ave. to North Main St., and continuing on North Main St. to State Rd. This option would better serve riders in Cascade Valley as well as serve the commercial corridor along North Main St. in the North Hill neighborhood.

Figure 8 depicts the recommended alternatives.

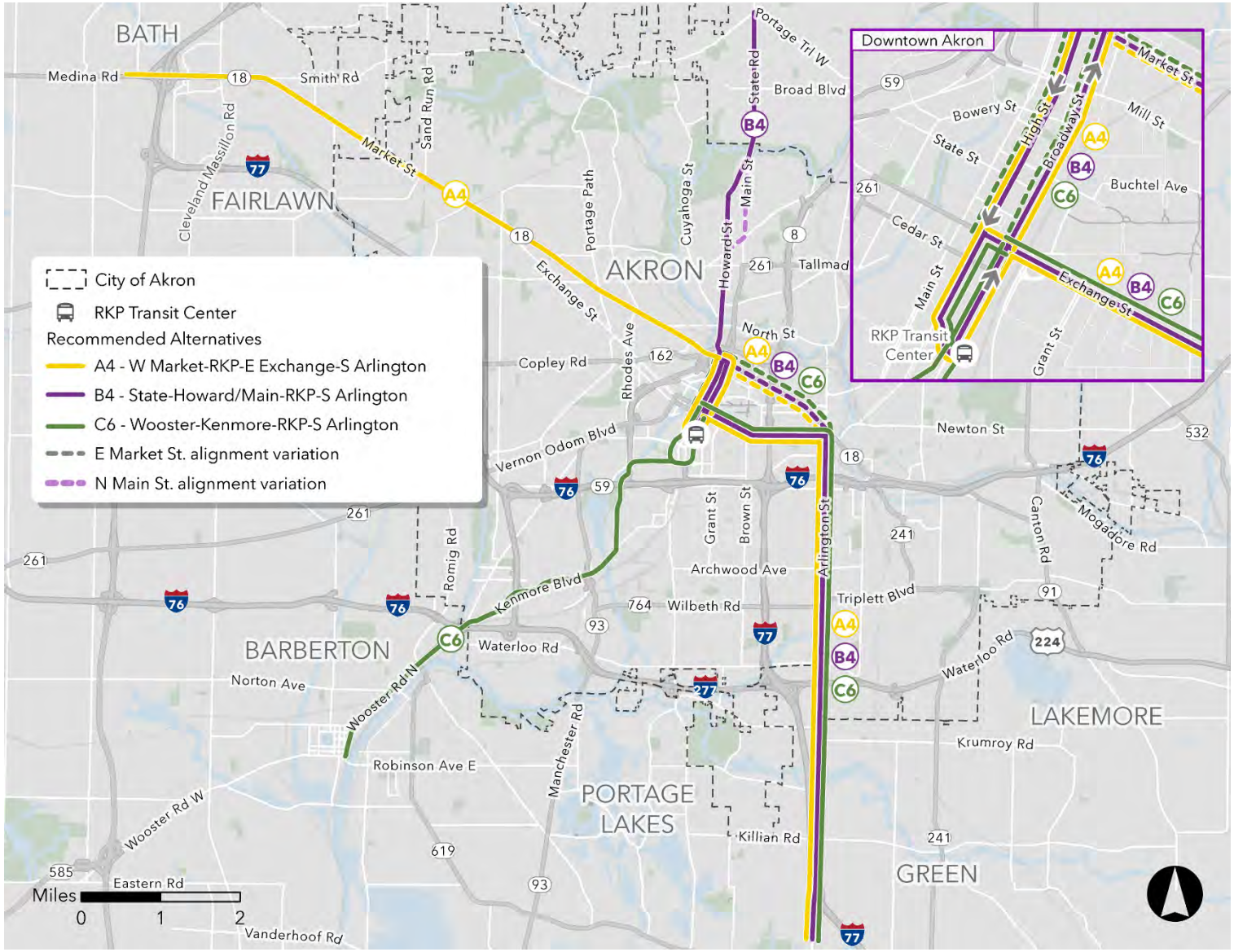


Figure 8 Recommended Alternatives

ENGAGEMENT

Public engagement was, and will continue to be, central to the selection of a BRT alternative to implement in Greater Akron. At the writing of this report, two rounds of engagement are complete. These rounds focused on introducing BRT to the public and receiving initial feedback on station amenities and three recommended alternatives. The project team conducted engagement through a variety of activities and methods, described in the following section.

As mentioned, the first phase of public engagement involved two rounds. These rounds had different, but related, goals that reflected the concurrent stage of the study. The purpose of the first round of engagement was to educate the public on BRT and gather feedback on BRT amenities. The second round of engagement aimed to gather feedback on personal travel routes and a preferred route option. Educating the public on BRT continued to be important in the second round of engagement.

OVERVIEW OF ENGAGEMENT ACTIVITIES

Both rounds of engagement consisted of the same type of activities: an open house, tabling at RKP Transit Center, and social media posts.

OPEN HOUSES

Two public open houses were held in the late fall and early winter of 2023. Exhibit boards at the open houses served as the focal point of the meeting; participants engaged with educational materials and shared their thoughts around the topics of BRT amenities and provided feedback on their personal travel routes and preferred routes. During the open houses, participants had the option of a printed comment form to provide feedback to the project team.

Figure 9 Open House at Akronym Brewing on November 1, 2023

The first open house was held on November 1, 2023, at Akronym Brewing in Downtown Akron. A total of 24 participants signed in at the meeting, excluding members of the project team and other presenters. As several people did not sign in, actual attendance may have been higher.

Specific activities at this open house include:

- **Preferred BRT amenities board.** The project team displayed an exhibit board with images of various BRT amenities, such as offboard fare collection, real-time passenger information, and level boarding. Participants were asked to place a sticker on the amenities they would most like to see.
- **Personal travel destinations map activity.** This activity asked participants to place a sticker on destinations they frequently travel to on a map of the corridors under study. The map also included existing METRO routes and noted some key regional destinations like Summit Mall and the University of Akron.

- **Mentimeter poll.** To collect information on what drew attendees to the event, the project team used a Mentimeter poll with the prompt "What brought you here today?" Mentimeter collects real-time responses to a prompt that is displayed to the room on a screen. Attendees were asked to select from responses such as "Learning more about Bus Rapid Transit," "Interested in this project," and "I was walking by," among others.

The second open house was held on December 5, 2023, at the Kenmore Branch of the Akron-Summit County Public Library in the Kenmore neighborhood. Six participants signed in at the meeting, excluding project team members, though several attendees may not have signed in.

Figure 10 Open House at Kenmore Branch Library on December 5, 2023

Activities at this open house included the BRT amenities and destinations board activities from Round One, as well as:

- **Recommended alternative informational boards.** Each of the three recommended alternatives had one board that displayed information about key destinations and the advantages of implementing BRT service on the proposed route. Participants were asked to share their general feedback on the alternatives.
- **Prioritization of alternatives activity.** A separate board asked participants to rank the three recommended alternatives with numbered stickers based on their priorities for implementation. For example, if a participant thought Alternative A4 should be METRO's highest priority and Alternative C6 the next highest, they would place a "1" sticker under Alternative A4 and a "2" under Alternative C6.

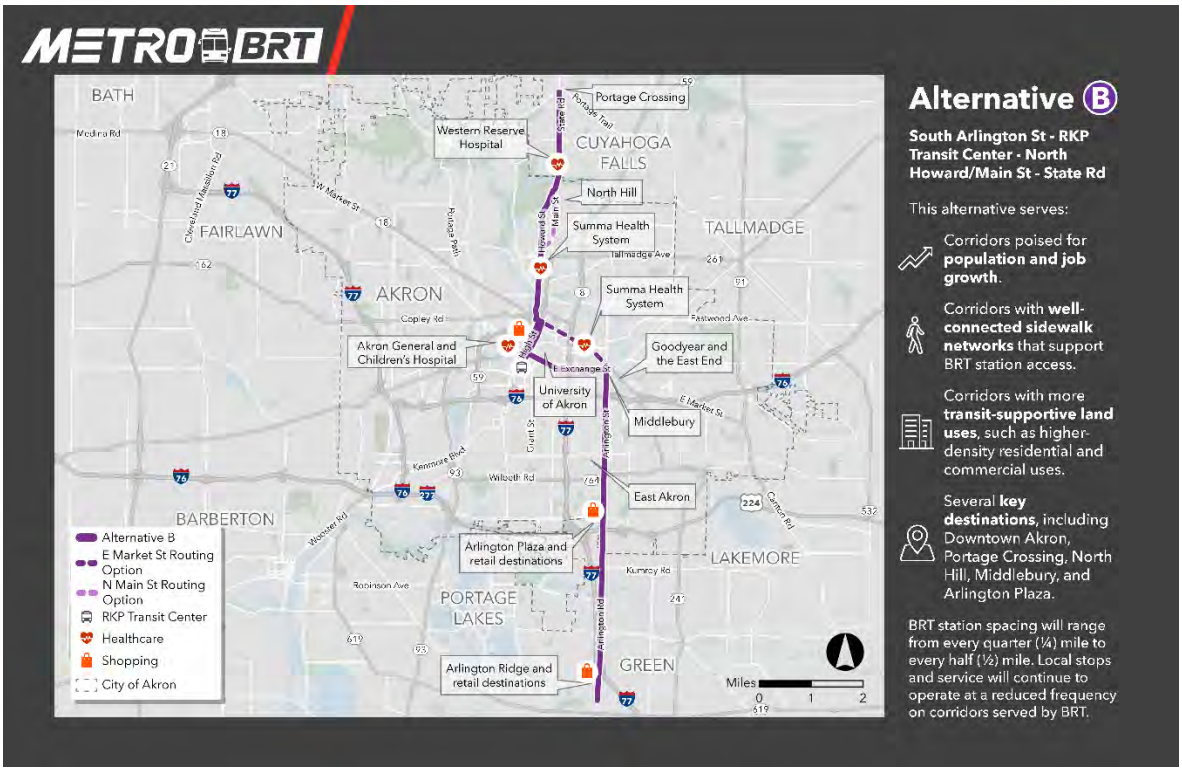


Figure 11 Alternative board displayed at the December 5, 2023, open house.

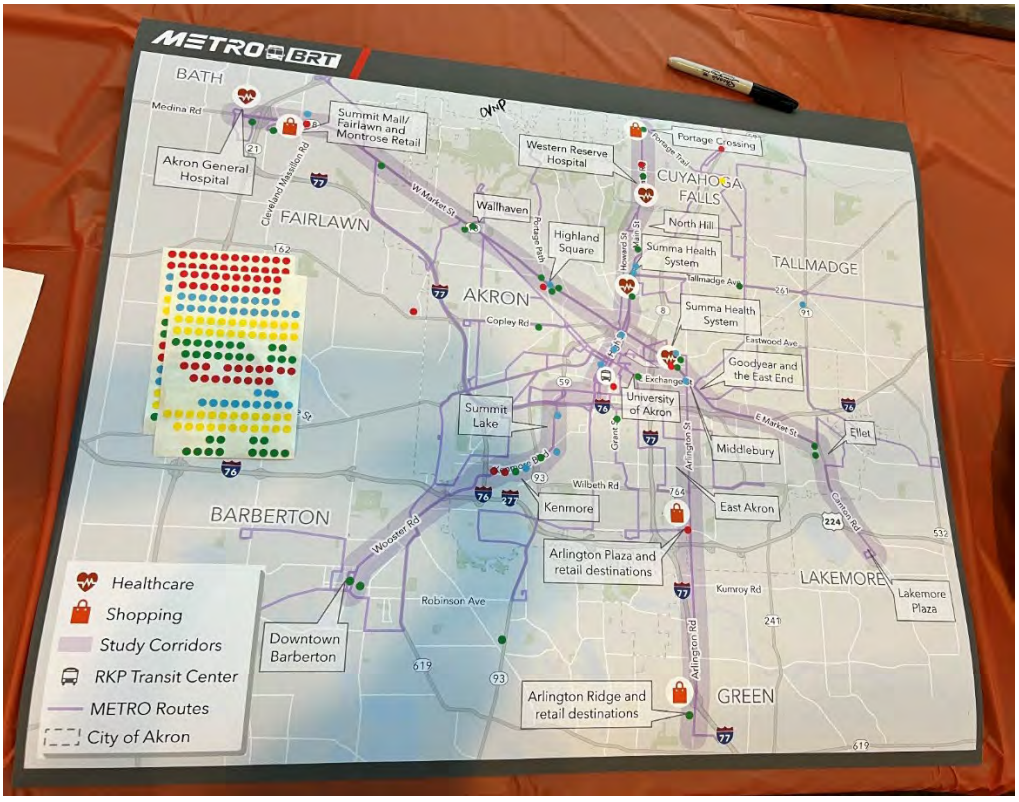


Figure 12 Travel Destination Map Activity

TABLING

To reach current riders, METRO staff set up an informational booth at RKP Transit Center to engage with riders about BRT. Tabling occurred on November 6 and 9 (Round One) and December 6 and 7 (Round Two), 2023. Exhibit boards and activities used at the open houses were re-used for tabling. METRO staff engaged with an estimated 30 to 40 people between both rounds of tabling.

SOCIAL MEDIA

In addition to the in-person open houses and tabling events, METRO conducted a BRT-focused social media campaign beginning in October 2023. Posts centered on educating the public about BRT and encouraging them to view further information on METRO's website, attend any of the in-person engagement events, or provide feedback in another form. METRO shared posts on Facebook and Instagram, including two ads that reached approximately 45,000 people combined; about 1,300 people clicked on the ads and viewed the linked information.

A total of 13 posts were shared between October and December of 2023. Table 10 summarizes key engagement metrics as of the writing of this report.

Table 10 Key Social Media Engagement Metrics

Post	Date	Number of Reactions	Number of Comments	Number of Shares
1	October 2, 2023	27	4	6
2	October 6, 2023	9	0	2
3	October 13, 2023	13	8	3
4	October 18, 2023	11	2	1
5	October 21, 2023	13	0	2
6	October 26, 2023	5	1	2
7	October 31, 2023	7	6	1
8	November 17, 2023	8	1	2
9	November 23, 2023	18	1	0
10	November 27, 2023	10	0	2
11	December 7, 2023	5	3	0
12	December 12, 2023	6	0	2
13	December 17, 2023	8	0	2

Figure 13 Social media post shared October 18, 2023

WHAT DID WE LEARN?

Key takeaways from engagement are:

- **West Market St., Kenmore, Middlebury, Highland Square, and North Hill are major destinations for participants.** These locations were frequently mentioned by attendees as key retail and neighborhood destinations. This finding aligns with existing METRO ridership data and projected ridership trends.
- **High-priority BRT station amenities include raised platforms, comfortable seating, and real-time passenger information.** These amenities highlight the desire for an easy, comfortable, and accessible transit trip amongst attendees. Other favored amenities include enhanced station lighting and offboard fare collection.
- **There is excitement about bringing BRT to the region, though many people expressed confusion about what BRT is.** Several commenters on social media were enthusiastic about BRT and excited to see it coming to Greater Akron. However, many questions remained about the details of BRT service, highlighting the need for continued public education on BRT.
- **Funding and agency partnership conversations should be a key focus in the next phase of the study.** Members of the SAC expressed the need to further explore funding strategies for BRT in the region, including coordination amongst local jurisdictions.
- **Alternative A4 was the highest priority for participants, followed by Alternative C6, then B4**.[4] This is consistent with the results of the Step 2 & 3 evaluation.

Reimagine METRO service changes had recently been implemented when public engagement was conducted, eliciting several responses about future local service or general complaints about the service changes. The project team recognizes that these service changes were likely front of mind for riders, so obtaining feedback specific to

[4] Alternative names were simplified for engagement: Alternative A4 became "A," B4 became "B," and C6 became "C." These simplified names will likely continue to be used in the next phase of the study.

BRT in some situations was difficult. However, this is important context to consider as more engagement is conducted.

STAKEHOLDER ENGAGEMENT

Stakeholder engagement primarily took place through the regular Stakeholder Advisory Committee (SAC) meetings, where local agencies and organizations provided guidance on the study. These meetings began in the late summer of 2022 and continued throughout the project duration; nine SAC meetings have occurred as of the writing of this report. Additionally, the SAC participated in a tour of the three remaining alternatives led by the project team, as well as a tour of the GRTC Pulse, a BRT system in Richmond, VA. Agencies and organizations that participated in the SAC include:

- METRO RTA
- Akron Metropolitan Area Transportation Study (AMATS)
- City of Akron
- City of Barberton
- City of Cuyahoga Falls
- City of Green
- Summit County
- Downtown Akron Partnership

Conversations with the SAC guided the goals of the study, alternative and design standards development, the evaluation framework and results, and ultimately the recommendation of preferred alternatives. One-on-one conversations with stakeholder agencies, including members of the SAC and beyond, will be a focus of the next round of engagement to further explore agency goals for BRT and potential partnerships.

NEXT STEPS

In the next study phase, the project team and stakeholders will continue to evaluate the three recommended alternatives and ultimately select one alternative to proceed to concept design. Routing options on both East Market St. and East Exchange St. will be further explored, as well as a potential routing option on North Main St. for Alternative B4. The project team will continue to carry out evaluation of ridership, infrastructure, and costs and will engage with stakeholders and the public throughout the selection process.

As mentioned, stakeholder conversations regarding agency goals and partnerships will be a focus for the project team. Further conversations on funding will be important as well when the updated FTA CIG guidelines are released in early 2024. Public engagement on the preferred alternatives and BRT amenities will continue into spring 2024, with the selection of one alternative scheduled for early summer 2024.

BRT Feasibility Study

Appendix A: Ridership Evaluation Memo – June 2023

Reimagine METRO

Table of Contents

INTRODUCTION

Akron Metropolitan Regional Transit Authority (METRO), the public transportation provider for Summit County, operates an array of fixed route and demand response services. METRO has identified potential bus rapid transit (BRT) corridors extending from Downtown Akron along key routes in Summit County. This study seeks to prioritize and advance the strongest BRT corridors to achieve METRO's vision for a high-quality rapid transit system that connects key destinations in Greater Akron.

This memo focuses on the ridership modeling that was completed as part of the BRT corridor evaluation. A step-wise evaluation approach was used in order to recommend a BRT alternative that is technically feasible, implementable, and meets the goals of the community. The project team utilized the technical analyses done during Reimagine METRO, held preliminary discussions with stakeholders, and reviewed data to develop a universe of potential BRT alternatives. Step 1 of the evaluation process recommended five alternatives for further analyses evaluation during Step 2 evaluation.

The five alternatives recommended for analysis in the Step 2 evaluation are:

1. Alternative A3 – West Market St. – RKP Transit Center – East Exchange St. – East Market St.
2. Alternative A4 – West Market St. – RKP Transit Center – East Exchange St. – South Arlington St.
3. Alternative B4 – State Rd. – Howard St./North Main St. – RKP Transit Center – East Exchange St. – South Arlington St.
4. Alternative C4 – Wooster Rd. – Kenmore Blvd. – RKP Transit Center – West Market St.
5. Alternative C6 – Wooster Rd. – Kenmore Blvd. – RKP Transit Center – South Arlington St.

Figure 1 shows the five alternatives.

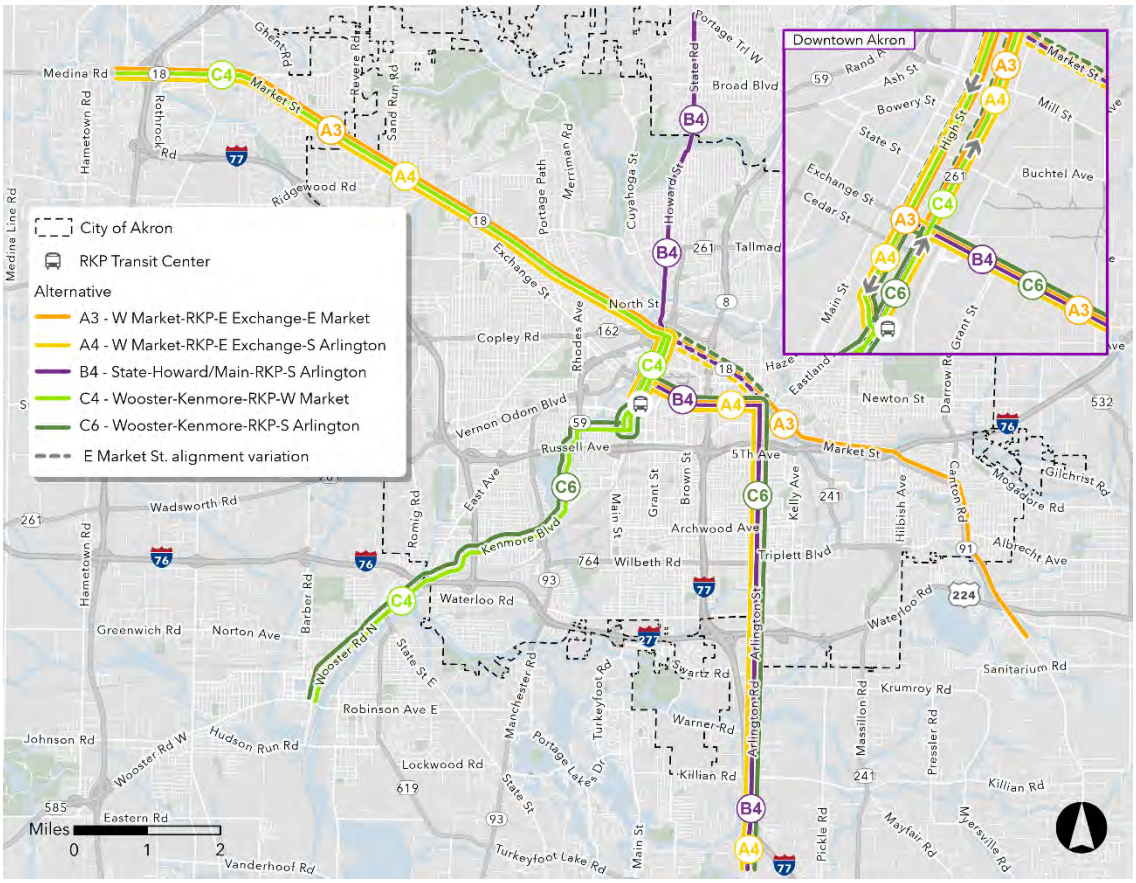


Figure 1 BRT Alternatives Analyzed in Step 2

Ridership is an important consideration in evaluating the feasibility of BRT alternatives. Several Step 2 evaluation criteria rely on ridership or ridership-related measures. Ridership is also heavily weighted in the Federal Transit Authority (FTA) Capital Investment Grant (CIG) scoring criteria. The ridership potential of the alternatives was evaluated using FTA's Simplified Trips-on-Project Software (STOPS) model. STOPS has successfully been used for similar studies across the country. It provides detailed evaluation measures that help select and/or refine the recommended alternative(s). Some of the ridership-related measures that STOPS provides are stop/segment-level activities, route-level impacts on competing/connecting routes, overall transfer activities, new transit trips, and vehicle miles traveled (VMT) impacts. An Akron area STOPS model was developed specifically for this BRT study. Details of the ridership methodology and assumptions are included in Appendix A-1.

MODELED ALTERNATIVES AND SERVICE PLAN ASSUMPTIONS

The team used the Reimagine METRO network (implemented in June 2023) as the "No Build" scenario. Stations were identified for each of the five BRT alternatives, station locations were identified. For ridership modeling purposes, a BRT station was located at approximately half-mile average spacing, and stations were assumed at all key intersections and high ridership activity stops. The BRT alignment and station location map for each alternative is shown in Appendix A-2. These station locations are not final and are purely conceptual at this stage of the feasibility study.

The BRT is assumed to run 30 percent faster than the underlying local buses. Station-to-station travel times were developed by factoring the local bus travel times on that segment by 0.7. A 2-minute layover was assumed at the RKP Transit Center, to allow for transfers between the BRT service and the other bus routes. Overall, this resulted in end-to-end BRT average speed between 18 to 20 miles per hour.

Further, all BRT services were coded at 15-minute frequency all-day service, and the frequency on the underlying local bus was reduced to 60-minute all day service. This results in an effective bus service of 12-minute frequency in the corridor served in each of the five BRT alternatives.

Table 1 Transit Service Overview for Modeled Scenarios

	Alternatives				
	A3	A4	B4	C4	C6
Route miles (one-way)	17.3	18.8	15.1	15.9	15.6
BRT Travel Time (one-way in minutes)	56	58	47	52	47
BRT Travel Speed (in miles per hour)	18.4	19.5	19.2	18.2	20.0
Local Bus Travel Time (one-way in minutes)	78	77	61	68	61

It should be noted that since this is a feasibility study, detailed operating plans (the location/access of the stations and detailed operating characteristics) of the BRT services are not available. These assumptions are typically developed during the subsequent phases of a study.

RIDERSHIP RESULTS

Several sensitivity analyses were run to understand the ridership impacts of these service plans and modeling assumptions. The analyses provided estimates for both existing year (2019) and horizon year (2045).

EXISTING YEAR FORECASTS

The STOPS results suggest that the five alternatives are generally similar to each other in terms of order of magnitude of ridership, which ranges from 2,800 to 3,800 average daily boardings on the BRT service and 3,800 to 4,600 average daily boardings in the corridor (BRT service and underlying local bus). Table 2 summarizes the ridership and related measures for the existing year.

Table 2 Existing Year (2019) Ridership Forecast

	Alternatives				
	A3	A4	B4	C4	C6
Total Corridor Average Daily Boardings (BRT + underlying local bus)	3,952	4,370	3,765	4,512	4,421
BRT Average Daily Boardings	3,299	3,801	2,843	3,729	3,591
BRT Average Daily Boardings from 0-Car Households	653	569	922	783	830
Average Daily New Transit Trips	450	177	129	266	173
Average Daily VMT Savings	3,474	1,535	863	2,238	1,244

HORIZON YEAR FORECASTS

The STOPS results suggest that the 2045 ridership estimates for the five alternatives ranges from 3,300 to 4,200 average daily boardings on the BRT service and 4,100 to 4,900 average daily boardings in the corridor. The year 2045 ridership is 5-10 percent higher than the year 2019 forecasts. Table 3 summarizes the ridership and related measures for the horizon year.

Table 3 Horizon Year 2045 Ridership Forecasts

	Alternatives				
	A3	A4	B4	C4	C6
Total Corridor Average Daily Boardings (BRT + underlying local bus)	4,160	4,872	4,103	4,942	4,882
BRT Average Daily Boardings	3,467	4,236	3,255	4,120	4,017
BRT Average Daily Boardings from 0-Car Households	693	636	848	822	865
Average Daily New Transit Trips	454	214	176	386	256
Average Daily VMT Savings	3,571	1,911	1,268	2,597	1,310

Overall, these ridership estimates represent a 40-90 percent increase in boardings in the corridors compared to the pre-pandemic ridership. Within each corridor, 80+ percent of the corridor boardings occur on the BRT service.

ANALYSIS OF THE MARKETS SERVED BY THE BRT

Table 4 shows the key markets served by the BRT corridors. The numbers shown in this table are based on the horizon year model. The percentages are calculated using the total BRT trips in the denominator. The key findings include:

- One-third of the BRT trips are home-based work trips.
- Downtown Akron is not a key destination on the BRT routes; it is not a "final destination" for transit riders and instead a point of transfer between existing routes.
- A small percentage of the BRT trips are new to transit. This means that most of the BRT ridership is from existing local bus riders switching to the BRT route. This is not atypical of BRTs in mixed traffic.

Table 4 Key Markets Served by the BRT Corridors (2045)

	BRT Market				
	Alt A3	Alt A4	Alt B4	Alt C4	Alt C6
% Home-Based Work	33%	36%	36%	35%	33%
% Walk Trips	96%	97%	96%	97%	97%
% BRT Trips from 0-Car Households	69%	72%	72%	73%	76%
% Trips to downtown Akron	7%	7%	12%	7%	9%
% New Trips on Transit	13%	5%	5%	9%	6%

RIDERSHIP SENSITIVITY ANALYSIS

Because of several unknowns at this stage of the feasibility study, the team conducted a few sensitivity model runs to understand the impact of varying levels of BRT service frequencies, changes in underlying local bus service

assumptions, BRT travel time, and investment in BRT guideway facility. The result of these tests on ridership is summarized in Table 5. These tests were done using Alternative A4, but similar sensitivities can be expected for the other alternatives.

Table 5 Sensitivity Analysis Results

Sensitivity Scenarios	Impact on Corridor Ridership (Average Weekday)
BRT at 10/10 frequency	+350 (+8%)
BRT at 10/15 frequency	+150 (+3%)
Underlying local bus at 30/30 frequency	+150 (+3%)
No underlying local bus	-150 (-3%)
20% additional reduction in BRT travel time	+400 (+9%)
BRT running on a fixed guideway for the majority of the alignment	+1,900 (+40%)

ACCESS TO JOBS MEASURE

The accessibility methodology used for this BRT feasibility study is similar to the one developed by the University of Minnesota's Accessibility Observatory. This accessibility measure accounts for transit service coverage, frequency of service, time period, transfer opportunities, accessibility to transit stops, and bus speeds.

For its application in this study, TAZs from the STOPS model are used as the geography for analysis (as opposed to Census blocks used in the University of Minnesota method). The demographics data is obtained from the 2017 AMATS regional model (employment) and the 2006-2010 ACS CTPP (workers). The pedestrian network is represented by the TIGER street layer used in STOPS, and the transit network is represented by the GTFS network for each alternative. The travel time components (walk time, wait time, in-vehicle time, and transfer time) are obtained from the METRO STOPS output files.

AVERAGE NUMBER OF JOBS ACCESSIBLE TO EACH WORKER WITHIN 30-, 45- AND 60 MINUTES

This measure provides the average number of jobs accessible to each worker in the region by transit within specified travel time (30, 45, and 60 minutes used in this analysis). The travel time includes walk time, wait time, transfer time, and in-vehicle time during the AM peak as obtained for each TAZ pair from STOPS. The average is weighted by the number of workers in each TAZ.

Table 6 provides the estimated number of jobs (obtained from AMATS's TAZ level employment estimates for the year 2017) accessible to each worker (obtained from 2006-2010 ACS CTPP data) for No Build conditions and the five BRT alternatives. It shows that the build alternatives show a slight increase in job accessibility over the No Build conditions. All five alternatives are similar in terms of job accessibility.

Table 6 Average Number of Jobs (2017 Employment) Accessible to Each Worker by Transit

Alternative	# Jobs Accessible within 30 minutes	# Jobs Accessible within 45 minutes	# Jobs Accessible within 60 minutes
No Build	9,982	27,440	48,427
Alt A3	10,578	29,044	50,645

Alternative	# Jobs Accessible within 30 minutes	# Jobs Accessible within 45 minutes	# Jobs Accessible within 60 minutes
Alt A4	10,360	28,482	49,876
Alt B4	10,385	28,362	49,708
Alt C4	10,539	29,511	51,108
Alt C6	10,630	29,296	50,826

WEIGHTED ACCESSIBILITY INDEX

Weighted accessibility measure is an index that gives more weightage to destinations/jobs reachable in shorter travel times compared to destinations/jobs reachable in longer times. In other words, the alternative that provides access to more destinations/jobs in a shorter travel time performs better than the other alternatives. This index is unitless and can be used for comparative purposes only. The detailed methodology on Weighted Accessibility Ranking is available at here.

Table 7 presents the index value for the No Build and the five BRT alternatives. The build alternatives show a slight increase in the weighted accessibility measure and the five alternatives are similar to each other.

Table 7 Weighted Accessibility Index by Alternative

Alternative	Weighted Accessibility Index
No Build	1,410
Alt A3	1,503
Alt A4	1,441
Alt B4	1,446
Alt C4	1,482
Alt C6	1,481

60-MINUTE ACCESSIBILITY VALUES AT TAZ LEVEL

Figure 2 through Figure 6 show the change in the number of jobs (2017 employment) accessible within 60 minutes of transit during the AM peak for the five BRT alternatives in comparison to the No Build network. All five figures indicate a significant improvement in accessibility along the BRT alignments, which provide enhanced service. Some locations show reduced accessibility because of a small reduction in overall service due to the decreased frequency of the local bus service or due to the location of BRT stations. These localized TAZs shown in the red colors should be investigated further in the next phase of the study.

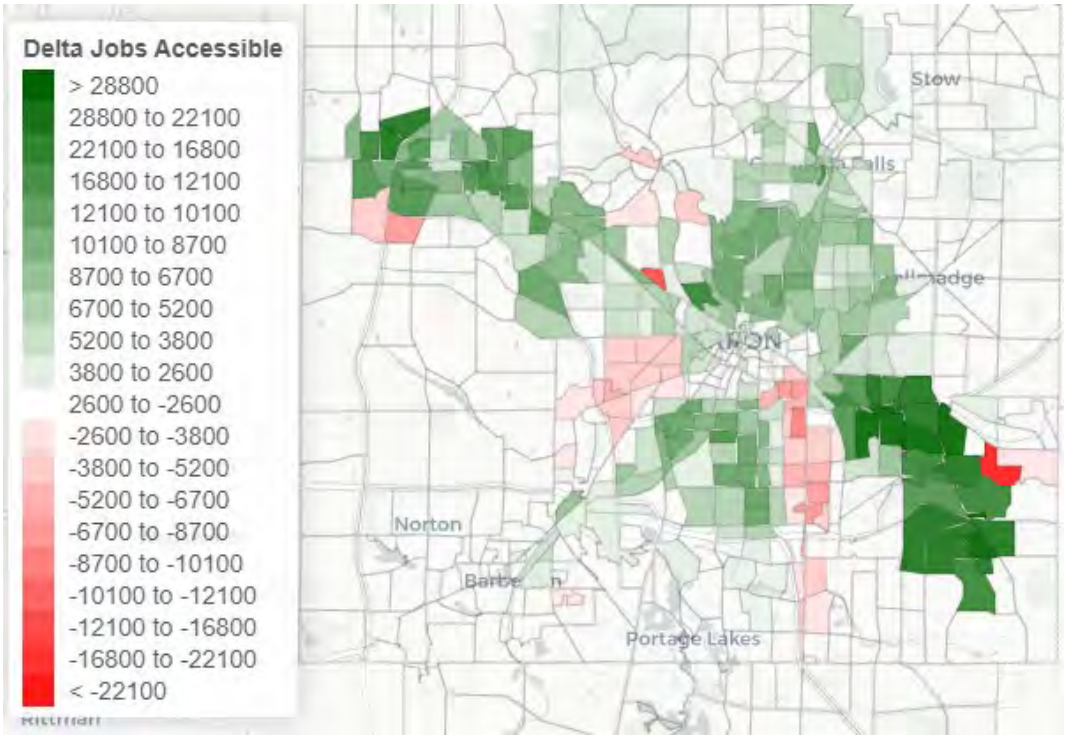


Figure 2 Alternative A3 – Change in Number of Jobs Accessible within 60 minutes for each TAZ

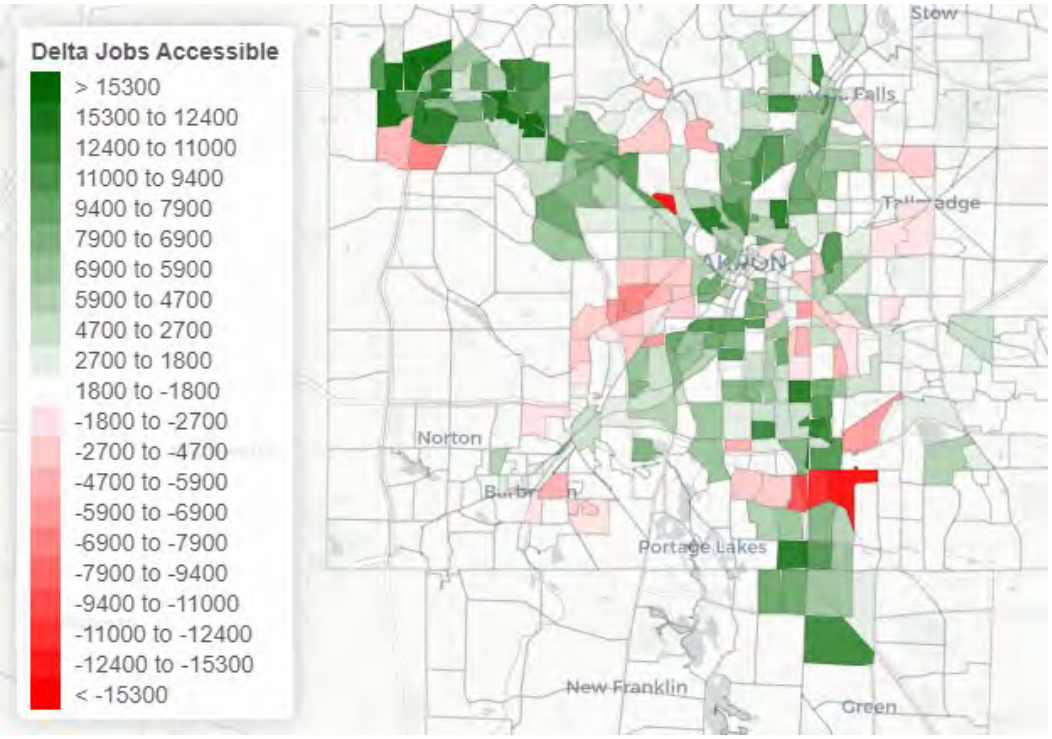


Figure 3 Alternative A4 – Change in Number of Jobs Accessible within 60 minutes for each TAZ

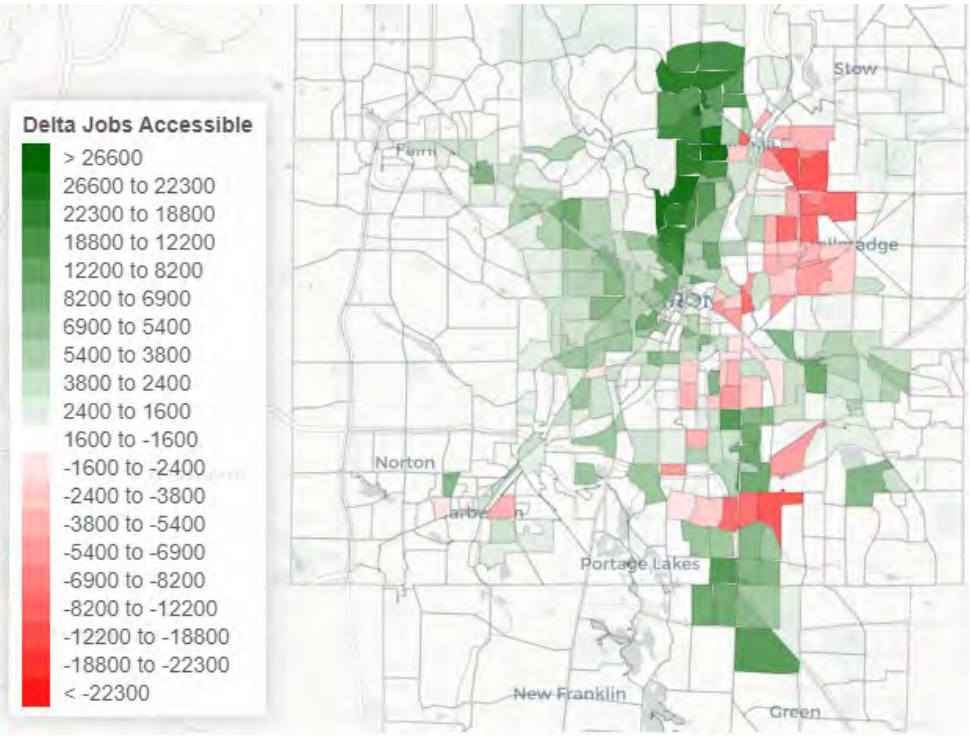


Figure 4 Alternative B4 – Change in Number of Jobs Accessible within 60 minutes for each TAZ

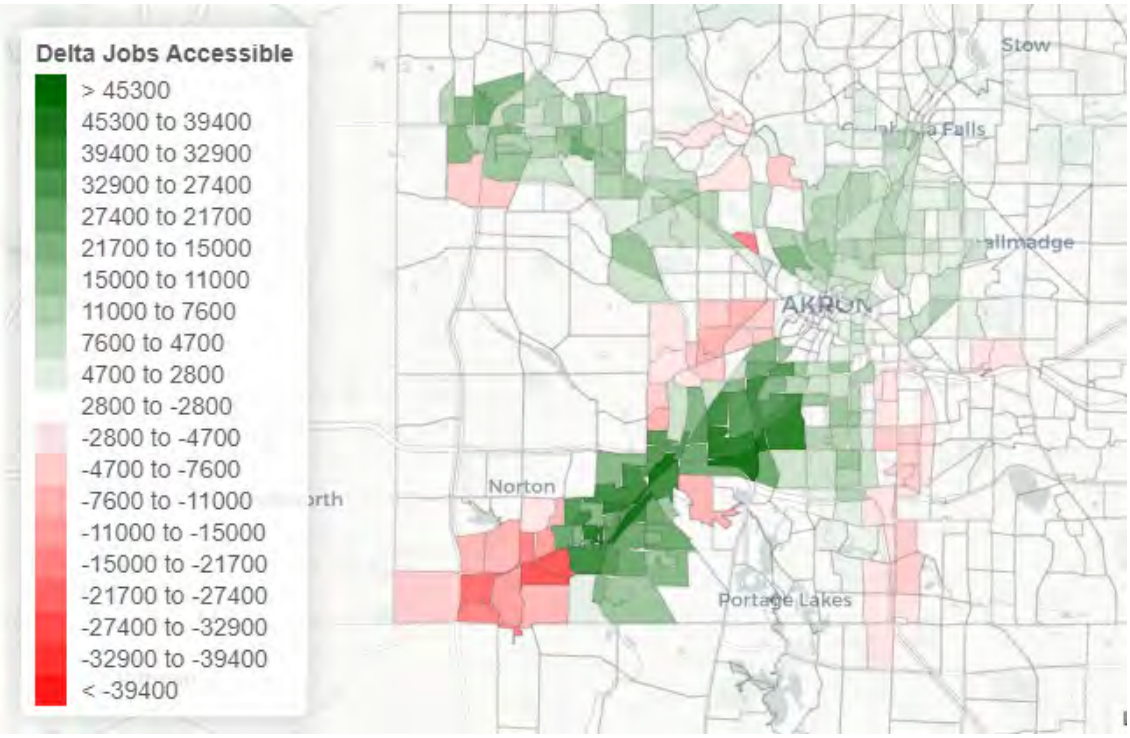


Figure 5 Alternative C4 – Change in Number of Jobs Accessible within 60 minutes for each TAZ

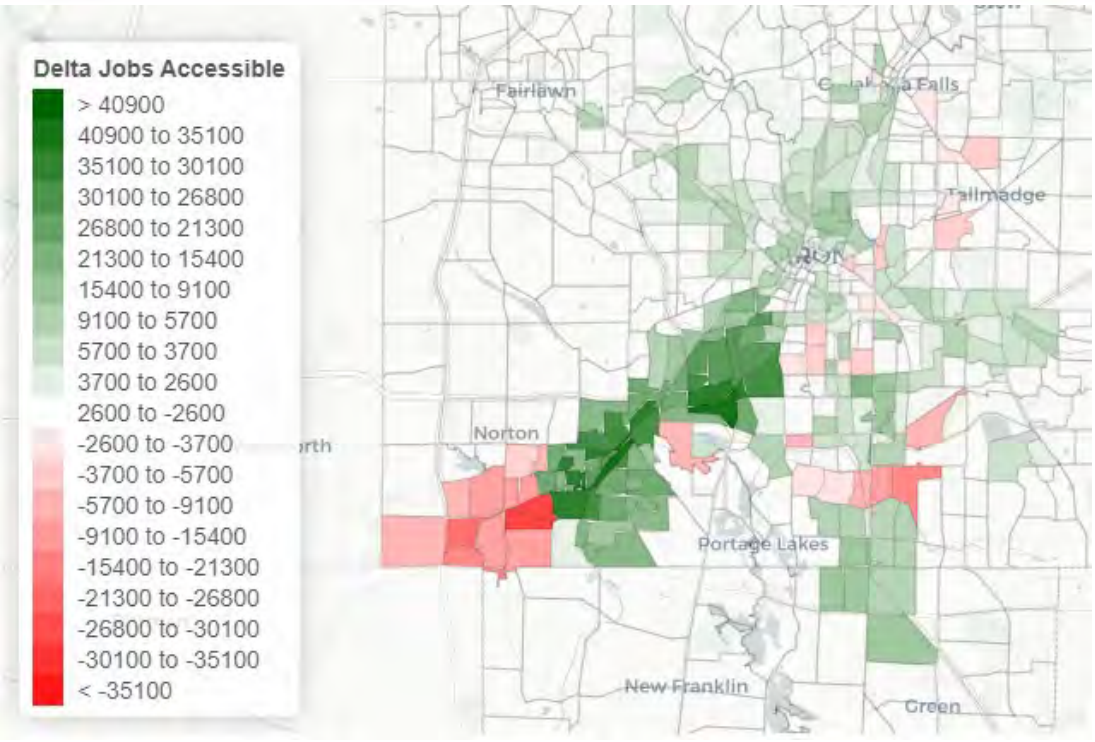


Figure 6 Alternative C6 – Change in Number of Jobs Accessible within 60 minutes for each TAZ

SUMMARY

The ridership modeling provides an order-of-magnitude estimate of the ridership potential in the BRT corridors in the Akron region. The level of analysis is appropriate for this feasibility study and provides valuable information to the project team in making recommendations for the feasibility of the BRT corridors in the region.

The ridership forecasts suggest that average daily boardings in the corridors range from 4,000 to 5,000 (Year 2045 estimates). All corridors show an increase in boardings compared to the existing scenario. The analysis also showed that in terms of total boardings, Alternatives A4, C4, and C6 perform better than the other two alternatives.

This analysis also confirms that all five BRT alternatives show net positive accessibility benefits compared to the No Build service.

APPENDIX A-1: RIDERSHIP MODEL METHODOLOGY AND ASSUMPTIONS

An Akron area STOPS model was developed specifically for this BRT study. The model utilizes version v2.51 of STOPS (release date: 2/25/2022) and is based on the 2020 METRO systemwide on-board survey. The survey was conducted on all METRO routes between mid-January to early February 2020. The modeling years are 2019 (Existing Year) and 2045 (Horizon Year) and represents an average weekday travel. The modeling approach used in the Akron STOPS is called the incremental approach, which is described later in this report.

Simplified Trips on Project Software (STOPS)

STOPS was developed by FTA in 2013 and is used widely across the country for transit ridership forecasting. The modeling software uses statistical and mathematical techniques to estimate ridership. It does this by reflecting local conditions today, incorporating expected changes to demographics and the transportation system, and reflecting the experience of BRT implemented across the country. This software was considered the best available tool for ridership forecasting for this feasibility study. The METRO STOPS model was developed by the team specifically for this BRT feasibility study.

MODEL INPUTS

The details of the model inputs and parameters are described below.

Model Coverage

The model's geographical coverage includes the whole of Summit County.

Modeling Approach

STOPS has four model approaches by default. For this effort, the modeling team used the incremental approach since a well-designed system-wide on-board survey was available to the team. In this approach, the user provides an import file containing transit trip table information from the on-board survey. STOPS uses this information to develop person trips and transit trips that closely match the input transit trips for the existing scenario. Forecasts for different years and transit scenarios represent the impact that incremental changes in population, employment, and transit levels-of-service have on transit ridership.

The survey was used to develop zone-to-zone transit trip flow data and for calibrating the model. The survey data obtained by the modeling team was already expanded to the average weekday ridership in Fall 2019. The survey records were filtered to include only weekday records, and express bus Routes 60 and 61 (route names reflect the 2020 service) that serve Cleveland were removed from this analysis, since only Summit County is included in the modeling area. As a result, a total of 2,055 records were used in the analysis.

Census Data

The 2006-2010 American Community Survey (ACS) data for the state of Ohio, which includes the Census Transportation Planning Package (CTPP) zonal shapefile and the trip-making characteristics in the form of the CTPP Journey-to-Work (JTW) data sets, were obtained from FTA. Large zones along the five BRT corridors were subdivided into smaller zones to better reflect walk access to transit.

Analysis Years

STOPS users can define up to four analysis years: current year, opening year, a 10-year horizon, and a 20-year horizon.

- The current year is the year for which the most recent information is available, and the model is calibrated to this year.
- The horizon years represent long-term future years. Typically, the 20-year horizon year is the same year as the region's Long Range Transportation Plan (LRTP).

For this model, the current year represents the year 2019. The 20-year horizon year is set to the year 2045. The horizon year 2045 aligns with Aktron Metropolitan Area Transportation Study's (AMATS) LRTP year.

MPO Data

STOPS requires transportation analysis zone (TAZ)-level population and employment data and zone-to-zone auto travel times and distances as inputs. These are usually obtained from the regional travel demand model.

STOPS uses the Metropolitan Planning Organization's (MPO) current and forecasted population and employment data to grow the CTPP JTW data to the current and horizon years. The modeling team obtained the TAZ level population and employment estimates from the AMATS model, the regional travel demand model for the Akron area. STOPS requires population and employment data for the CTPP year (2008) and the current year (2019). AMATS model data for 2010 was used as a proxy of the CTPP year and data from 2017 was used for the current year (2019 data is not available in the model). Population and employment data forecasts for the horizon year (2045) were directly used from the AMATS model.

STOPS uses zone-to-zone current year peak period automobile travel times from the regional travel demand forecasting model. The "STOPS_PATH_Auto_Skim.csv" file used in this model was obtained from the peak period AMATS skim trip table. The year 2017 model skims were used for both the 2019 and 2045 models. This file contains production and attraction TAZ numbers from the travel demand model, automobile distance (in miles), and automobile time (in minutes).

District System

STOPS uses districts to define a logical grouping of TAZs both within the project corridor and throughout the region. Districts are used by STOPS to scale the CTPP JTW trips to the MPO population and employment forecasts and for reporting STOPS outputs within a logical and concise framework.

The modeling team developed 23 districts both within the existing transit corridors and throughout the region. Smaller districts were specified in areas with high transit usage. Figure 7 shows the districts defined in this model.

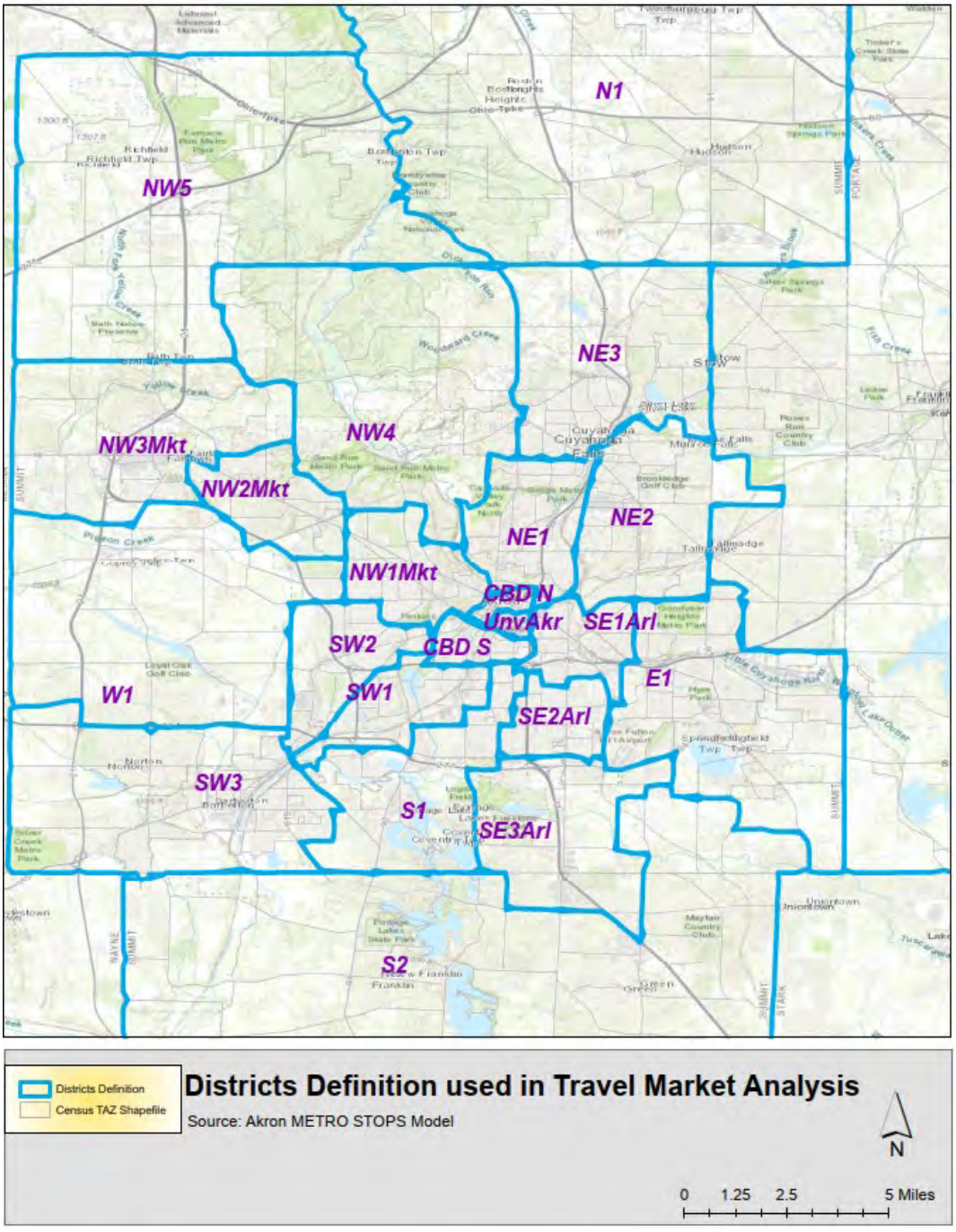


Figure 7 Districts in the Modeling Area for the Akron METRO STOPS Model

Transit Network

The General Transit Feed Specification (GTFS) format is used by STOPS to represent all transit routes. It is a set of files containing the transit schedules and service information for a transit agency. METRO RTA provided the GTFS files for 2019 (pre-pandemic) and 2023 (Reimagine METRO implementation) conditions.

STOPS requires transit networks for "Existing", "No Build" and "Build" scenarios. STOPS is calibrated to the "Existing" scenario and the transit services should reflect the observed ridership being used for calibration. The

"No Build" and "Build" scenarios usually represent transit services that will exist in the future without the project (for a transit corridor study) and when the project is in operation, respectively. The GTFS files for the "existing" scenario represent the transit services in Fall 2019 to align with the time period when the METRO systemwide transit on-board survey was conducted. GTFS transit routes for the "No Build" uses the GTFS from Reimagine network service. The "Build" GTFS reflects project-specific changes to the "No Build" service along with the project BRT service.

GTFS files from transit agencies do not include the park-and-ride (PNR) locations in the region, but STOPS requires users to code all the PNR locations in a separate pnr.txt file. The team coded four PNR lots (James Fisher, ODOT PNR, Creekside Dr, and Cuyahoga Falls) in this file. PNRType 3 was coded at these four lots, which reflects an officially designated PNR lot in a shared facility, attracting trips from up to six miles away. METRO's park-and-ride market is limited on local bus routes and hence these lots are not heavily used.

Existing Ridership Data

The primary source of ridership was the 2020 system-wide on-board survey. The average weekday total unlinked trip target is set to 16,947. This target is obtained using the National Transit Database (NTD) profile and removing estimated on-demand trips (not modeled within STOPS) and the estimated trips on express buses serving downtown Cleveland (services not modeled in the Akron STOPS model).

The survey transit trip table input to STOPS is summarized by trip purpose (Home Based Work - HBW, Home Based Other - HBO, and Non-Home Based - NHB) and market segment (i.e., 0-car, 1-car, and 2+car owning households) in Table 8.

Table 8 Linked Transit Trip by Purpose and Market Segment

Trip Purpose	Auto Ownership			Total	Total %
	0-Car	1-Car	2+ Car		
HBW	2,586	854	376	3,816	34%
HBO	3,989	1,005	699	5,692	51%
NHB	1,175	317	168	1,660	15%
Total	7,749	2,176	1,243	11,168	100%
Total %	69%	19%	11%	100%	

Other Input Files

This section describes other input files used in STOPS, some of which are more recent features of the software.

Route Count File

The route count text file contains the route level average daily weekday ridership. The route count file can be used to adjust the STOPS model so that it replicates ridership on a route-by-route basis. The modeling team developed this file for all the routes in the "Existing" scenario using the on-board transit survey.

Walk Links File

The path building component of STOPS can generate zone-to-walk connector links using two different techniques – straight line distances (the default) or by walking over a street network. The modeling team developed and

prepared a street links shapefile for the STOPS model to allow for a more realistic representation of access to the transit system. This file is based on the Census Tiger/Line shapefiles.

Fare Structure File

In order to represent the free fare on the DASH route, a simple fare file was created where the fare on all local bus routes is set at $0.75 (average fare paid by the customers estimated using the on-board survey) and is set to $0 for the DASH route.

Parameters and Settings

STOPS allows the users to calibrate transfer penalty, which accounts for the general difficulty when transferring between transit routes. This penalty is determined by running the STOPS model and adjusting its value so that the estimated linked transit trips generally match the observed values. The “Fraction to Transfer Penalty to Apply” was set to 0.1, which means that every transfer adds 0.5 minutes of penalty in the model. This is on the low side compared to the default value of five minutes of transfer penalty. The reason for the lower transfer penalty is because the METRO system caters to a high percentage of transit riders who don’t have a car and their propensity of making a transfer is high.

STOPS v2.51 uses two Fixed Guideway Settings (FGS), denoted as “Partial FGS” and “Full FGS”, that approximate the perceived differentiation between fixed-guideway alternatives and regular bus services. Both FGS settings can vary between 0.0 and 1.0. Smaller FGS values imply that the fixed-guideway mode is not perceived by riders to be meaningfully different from traditional bus services beyond headway and travel time characteristics. Larger FGS values imply that riders perceive the benefits of fixed-guideway systems beyond headway and travel time.

The Partial FGS is generally applied to streetcars and Bus Rapid Transit (BRT) systems, whereas the Full FGS is generally applied to heavy rail and commuter rail services. Full FGS is not used in the Akron model. The typical recommended setting for BRT systems is between 0-0.30 based on many newer BRT systems across the country which have limited exclusive right-of-way. In this model, the “Partial (Type 0) Fixed Guideway Settings” is set to 0.0, which is representative of a mixed-use BRT system.

Figure 8 shows the STOPS parameter settings used in this model.

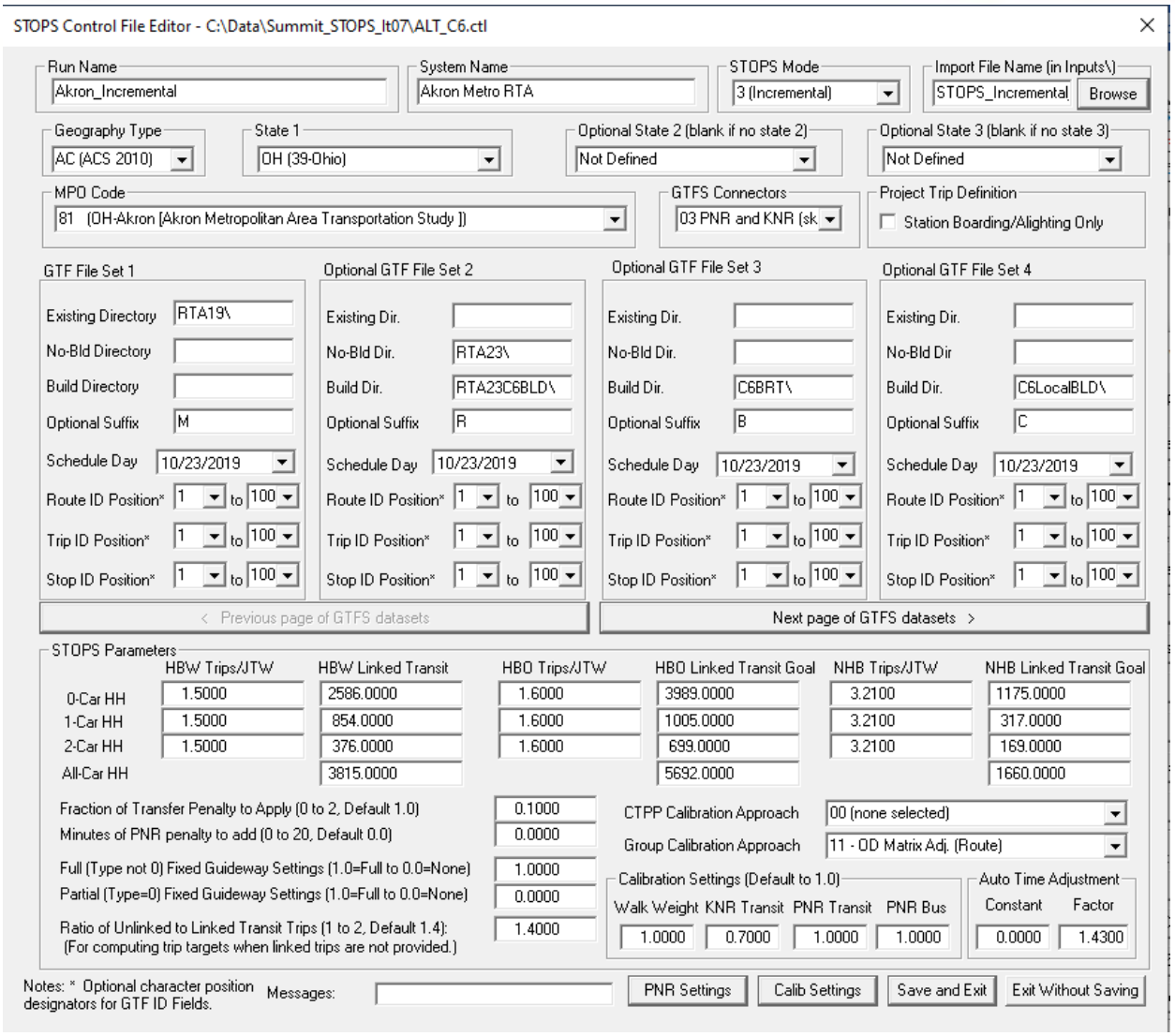


Figure 8 STOPS Parameter Settings

MODEL CALIBRATION

STOPS must be calibrated for each local application so that the model has a coherent grasp of the transportation system in the region and transit usage patterns. Typically, this process occurs with the implementation of STOPS with the existing transit system. This section describes the adjustments made to the model inputs and parameters to calibrate the estimated travel patterns to the observed conditions and describes the final STOPS estimates after the calibration adjustments were implemented.

Calibration Adjustments

- STOPS allows users to calibrate transfers by adjusting a boarding penalty setting, which reflects the general difficulty when transferring between transit routes. This penalty is determined by running the STOPS model and adjusting its value so that the observed linked transit trips generally match the estimated values. The transfer penalty is set to 0.5 minutes for this model, in order to estimate a very high transfer rate of 51 percent for the METRO system.

- The 'KNR Transit' setting affects how much of the nationally calibrated KNR constants are applied to KNR trips in the mode choice element of STOPS. The 'PNR Transit' setting scales the nationally calibrated effect of employment density on PNR utilization up or down. For this model, 'KNR Transit' is set to 0.70 (default value is 1.0), and 'PNR Transit' is set to the default value of 1.0 to match observed data from existing reports and surveys.
- The 'Auto Time Factor' is a multiplicative scaling factor that adjusts the zone-to-zone automobile time from the region's travel demand model to reflect highway travel time more accurately. The 'Auto Time Factor' was changed based on the spreadsheet calculations to 1.43 to normalize the MPO travel times to Google online automobile travel time estimates.
- The 'GTFS Connectors' setting was changed from its default value to '03 PNR, and KNR'. This option uses MPO skims to develop a better estimate of Kiss-and-Ride and Park-and-Ride travel times.
- All other STOPS parameters are set to their default values.

In addition to the previously described changes to the calibration parameters and settings, the modeling team also modified some of the input files. These changes are summarized as follows:

- In STOPS, large zones can be subdivided into smaller zones to better reflect walk access to transit. For this model, during the calibration process, over 140 additional zones were created by subdividing large zones. The zone splits were mainly in and around the five BRT corridors.
- In addition to the above changes, the route type coding in the GTFS files that best describes the type of transit mode has an impact on ridership. Routes that do not see the Partial or Full FGS are coded with route type = 3 (bus) in the GTFS file. Routes that see the Partial FGS are coded with route type = 0 in the GTFS file. These are the BRT routes included in the "Build" network.

Group Calibration Approach

STOPS provides the option of reading station/stop or route level count data and uses this information to refine the model calibration. The standard practice is to initially calibrate the STOPS model without using any of these group calibration approach options, and then, if needed, turning on the appropriate option depending on the availability of data, to fine-tune some of the station or route level boardings. In this model, Group Calibration approach 11 was used, where observed route level counts were provided and STOPS makes adjustments to its raw estimates to match these counts.

CALIBRATION RESULTS

For the STOPS model, the available existing ridership was available from the 2020 METRO on-board survey. Therefore, the calibration results presented in this section are for the 2019 current year and reflect ridership on an average weekday in 2019. Note that the STOPS estimates presented in this section are from a model run where the group calibration approach is not used (i.e., it is set to "00-None Selected").

For the current year, the observed boardings target is 16,947, and STOPS matches it by estimating 16,920 boardings, a regional calibration factor of 1.00 (the ratio of observed to raw unlinked trips). The acceptable range for the regional calibration factor is 0.97-1.03, but the preferred range is 0.99-1.01. This falls within the preferred range. The observed region-wide transfer rate is 51.7 percent, which STOPS closely estimates with 52.9 percent transfer rate.

Table 9 and Table 10 show a detailed comparison of linked transit trips by purpose and auto ownership. The observed splits by trip purpose and auto ownership are closely matched by the model estimates. This shows that the model is well-informed about observed travel patterns by trip purpose and auto-ownership.

Table 9 Linked Trips by Purpose

Trip Purpose	Observed	Estimated	Difference
HBW	3,816	3,777	-39
HBO	5,692	5,756	64
NHB	1,660	1,812	152
Total	11,168	11,345	177

Table 10 Linked Trips by Auto Ownership

Auto Ownership	Observed	Estimated	Difference
0-car	7,749	8,048	299
1-car	2,176	2,084	-92
2+-car	1,243	1,213	-30
Total	11,168	11,345	177

Table 11 shows a comparison of linked transit trips by access mode. The total observed and estimated trips are similar to each other. This shows that the model is well-informed about observed travel patterns by access mode.

Table 11 Linked Trips by Mode of Access

Access Mode	Observed	Estimated	Difference
Walk	10,860	10,906	46
KNR	234	388	154
PNR	74	50	-24
Total	11,168	11,345	670

Route level observed ridership and STOPS estimation before and after group calibration is turned on is shown in Table 12. Before group calibration, the DASH route is high in ridership, while Route 1 is low.

Table 12 Route Level Observed vs. Estimated Boardings

Route_ID	Route Name	Route #	Observed	STOPS Estimation (Before Group Calibration)	STOPS Estimation (After Group Calibration)
147&M	1-West Market	1	1,641	1,226	1,641
81&M	2-Arlington	2	1,672	1,641	1,671
142&M	3-Copley Road/hawkins	3	917	709	917
143&M	4-Delia / North Hawkins	4	489	532	489
96&M	5-Joy Park/gilchrist	5	407	499	407
145&M	6-East Market/lakemore	6	930	718	930
93&M	7-Cuyahoga Falls Avenue	7	506	791	506
127&M	8-Kenmore/barberton	8	882	1,078	882
144&M	9-Vern Odom Blvd/east Avenue	9	662	701	662
136&M	10-Howard/portage Trail	10	768	513	768
130&M	11-South Akron	11	143	330	165
118&M	12-Tallmadge Hill	12	632	442	632
119&M	13-Grant/firestone Park	13	628	236	471
140&M	14-Euclid / Barberton Expres	14	927	840	928
141&M	17-Brown/inman	17	709	671	709
79&M	18-Thornton/manchester	18	634	837	634
121&M	19-Eastland	19	594	513	594
131&M	21-South Main	21	131	194	131
82&M	24-Lakeshore	24	236	201	236
83&M	26-West Exchange/white Pond	26	282	514	281
122&M	28-Merriman Valley	28	217	251	217
124&M	30-Goodyear/darrow	30	438	551	437
125&M	33-State/wyoga Lake	33	256	267	257
135&M	34-Cascade Valley/uhler	34	798	473	798
148&M	50-Montrose Circulator	50	40	26	40
91&M	51-Stow Circulator	51	74	168	84
100&M	53-Portage/graham	53	118	271	136
103&M	54-Dash	54	498	838	498
92&M	59-Chapel Hill Circulator	59	42	14	29
70&M	101-Richfield/bath	101	62	94	61
115&M	102-Northfield	102	169	291	168
116&M	103-Stow/hudson	103	194	239	194
73&M	104-Twinsburg/creekside	104	146	143	146
117&M	110-Green/springfield	110	103	135	103
	Total		**16,945**	**16,947**	**16,822**

APPENDIX A-2: BRT STATION LOCATON MAPS

The following maps depict the station locations used for each BRT corridor in the ridership model. Station locations are conceptual at this stage in the feasibility study and are subject to change.

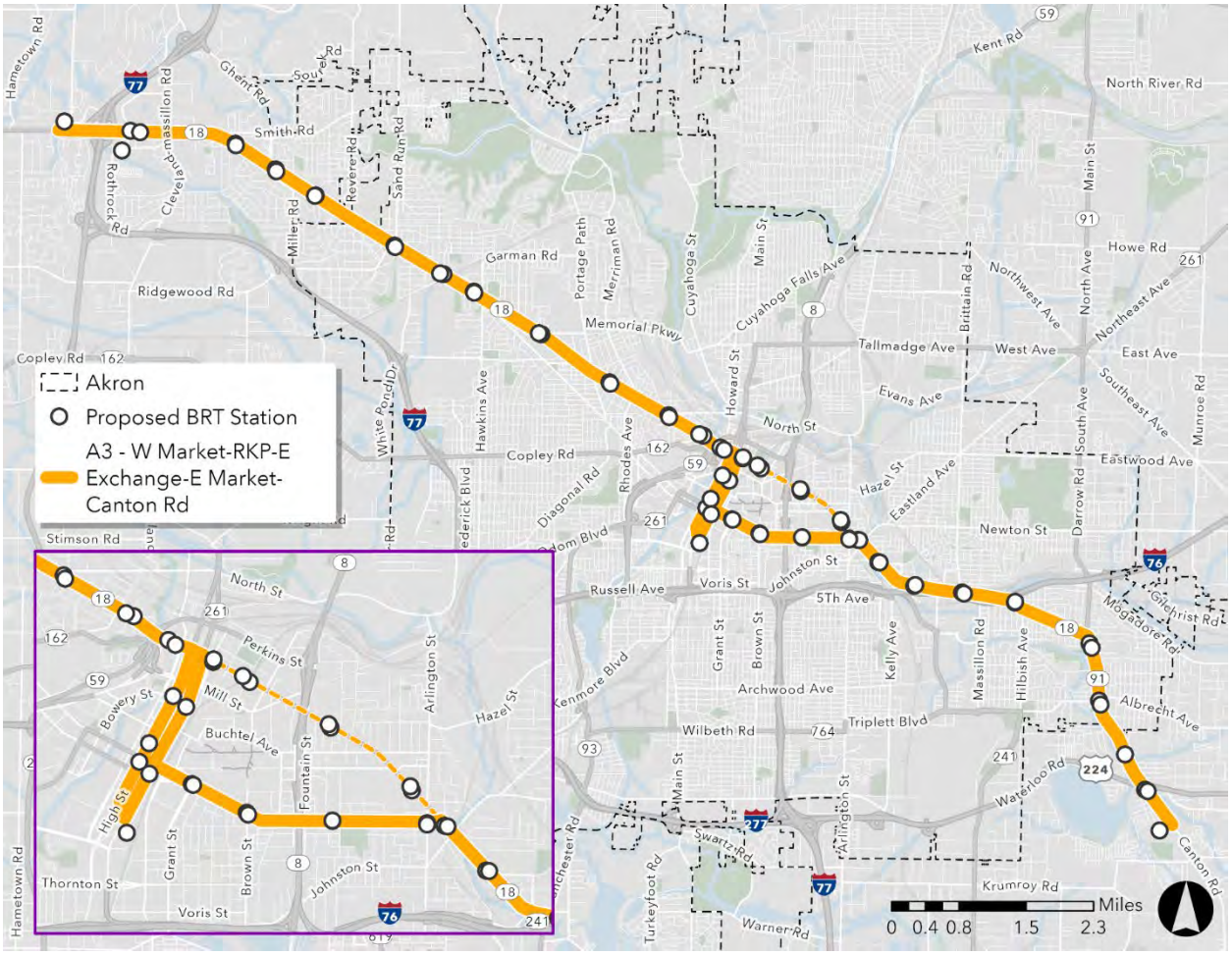


Figure 9 Alternative A3 – W Market St. – RKP Transit Center – E Exchange St./E Market St. – Canton Rd.

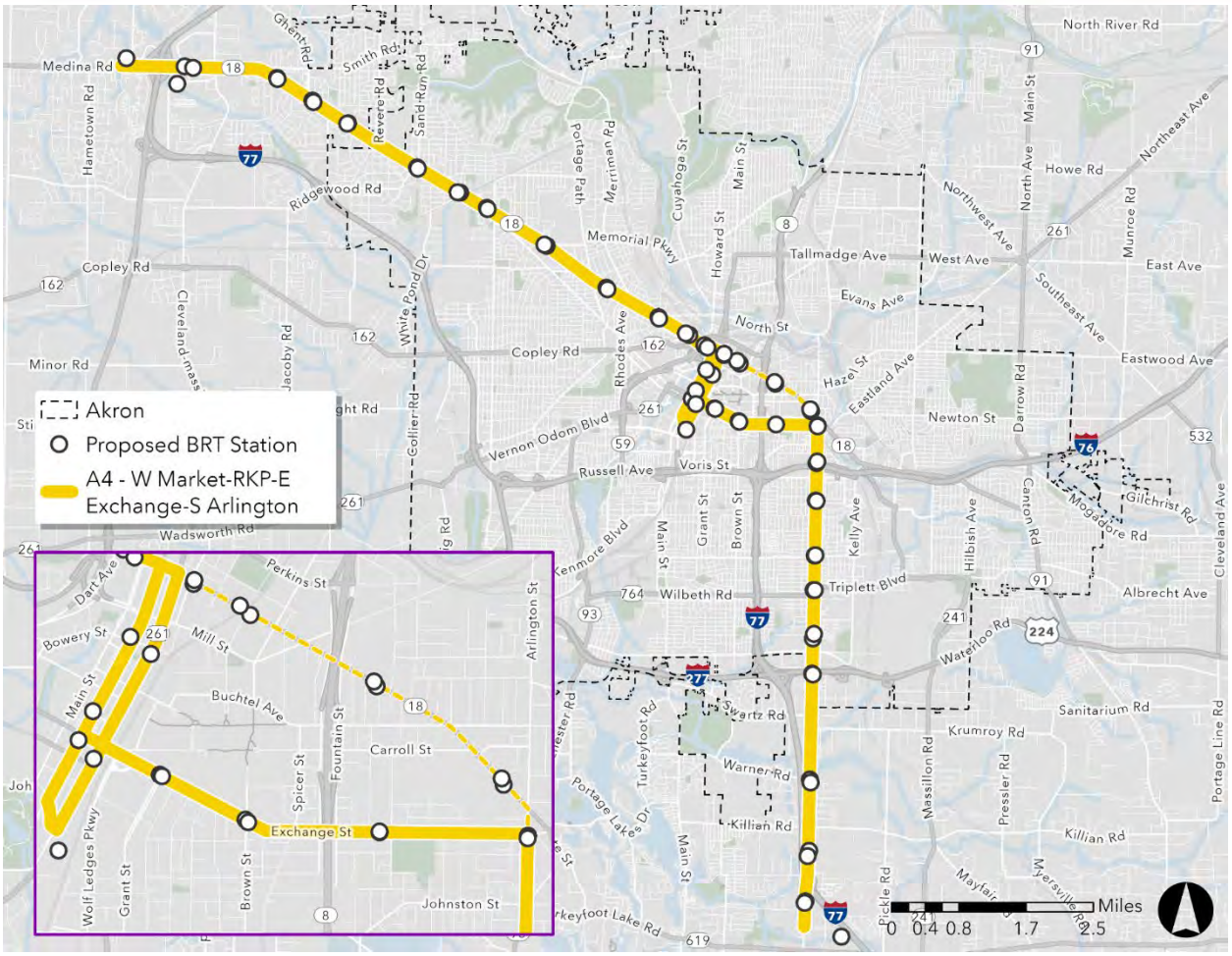


Figure 10 Alternative A4 – W Market St. – RKP Transit Center – E Exchange St./E Market St. – S Arlington St.

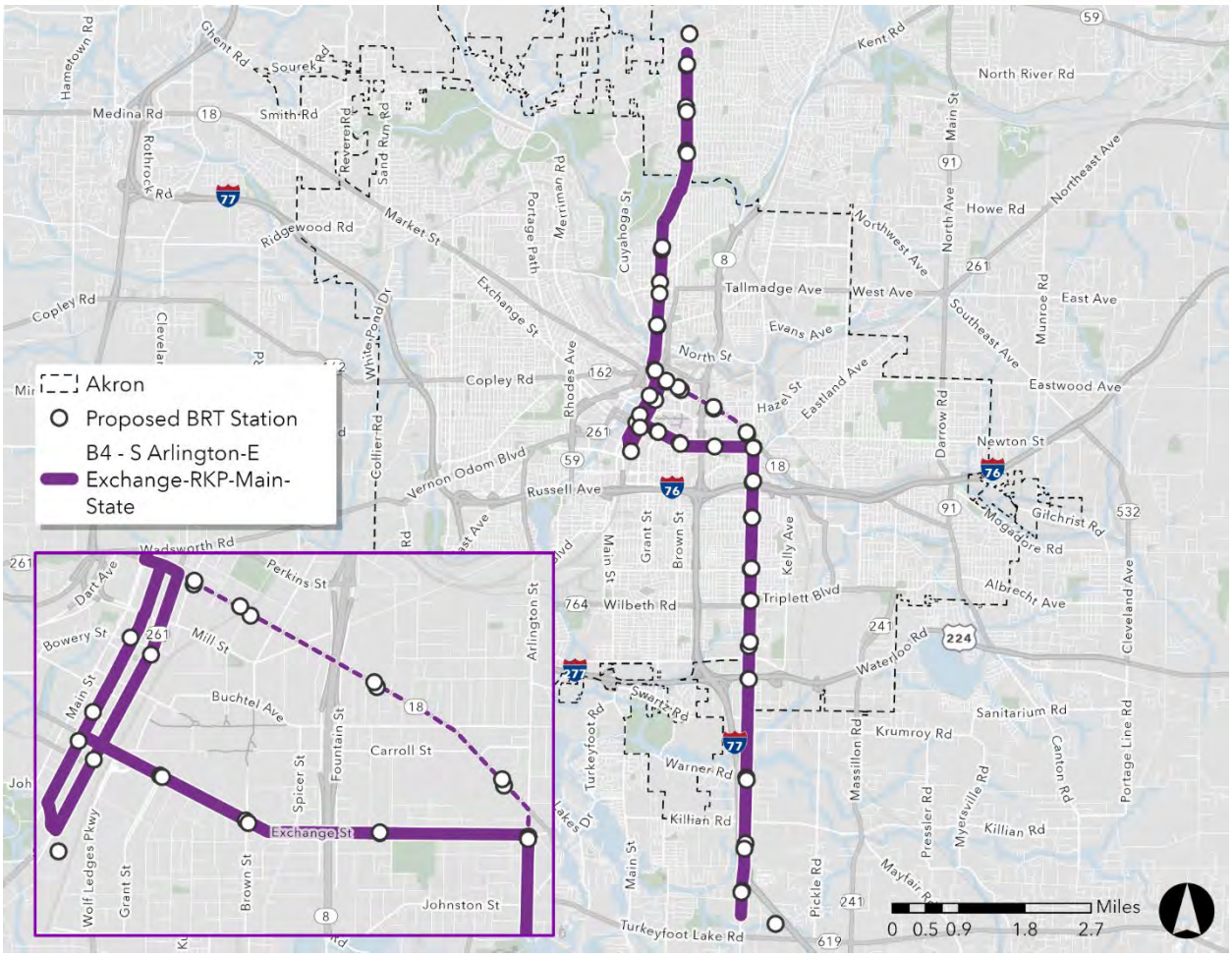


Figure 11 Alternative B4 – S Arlington St. – E Exchange St./E Market St. – RKP Transit Center – Main St. – State Rd.

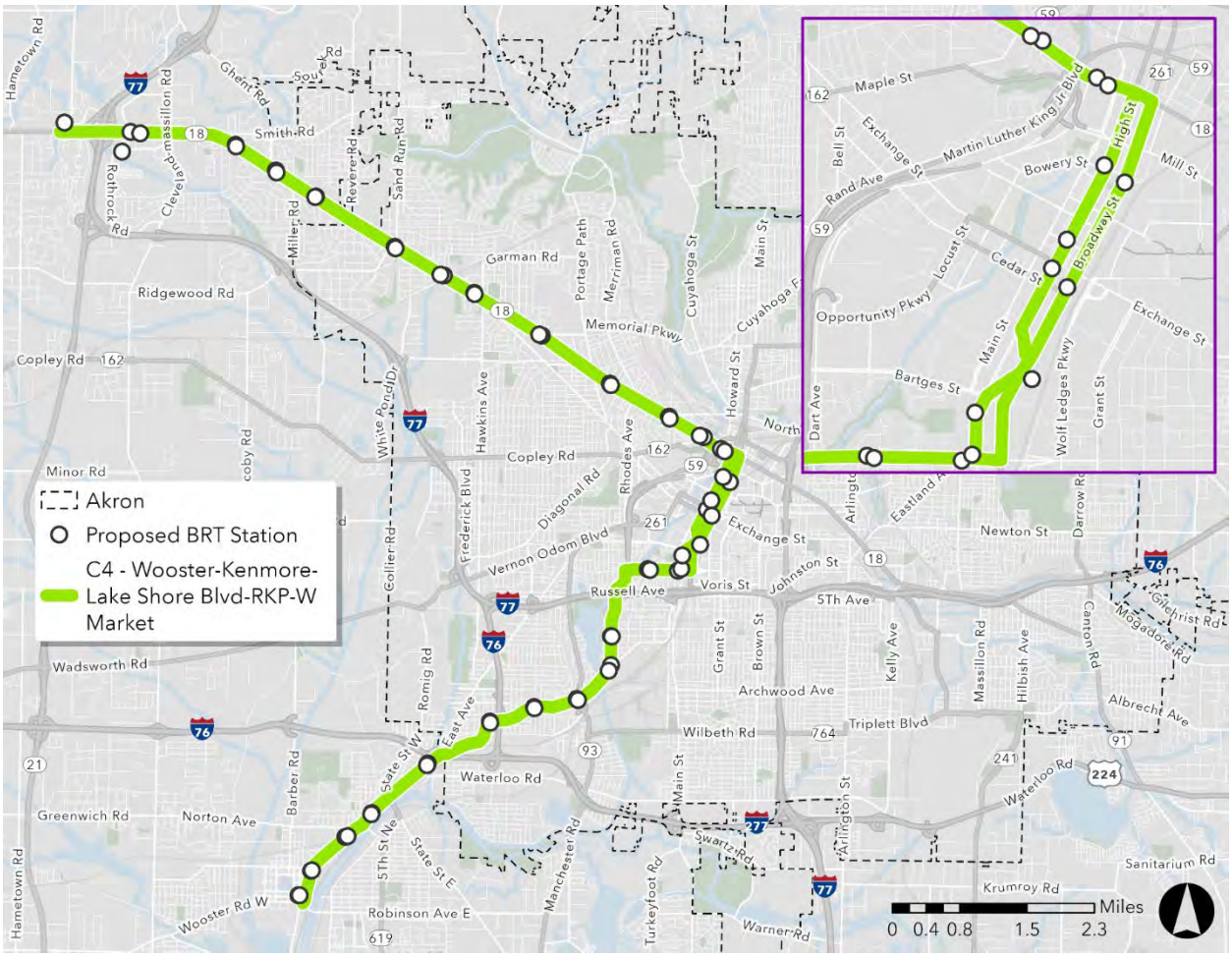


Figure 12 Alternative C4 – Wooster Rd. – Kenmore Blvd. – Lake Shore Blvd. – RKP Transit Center – W Market St.

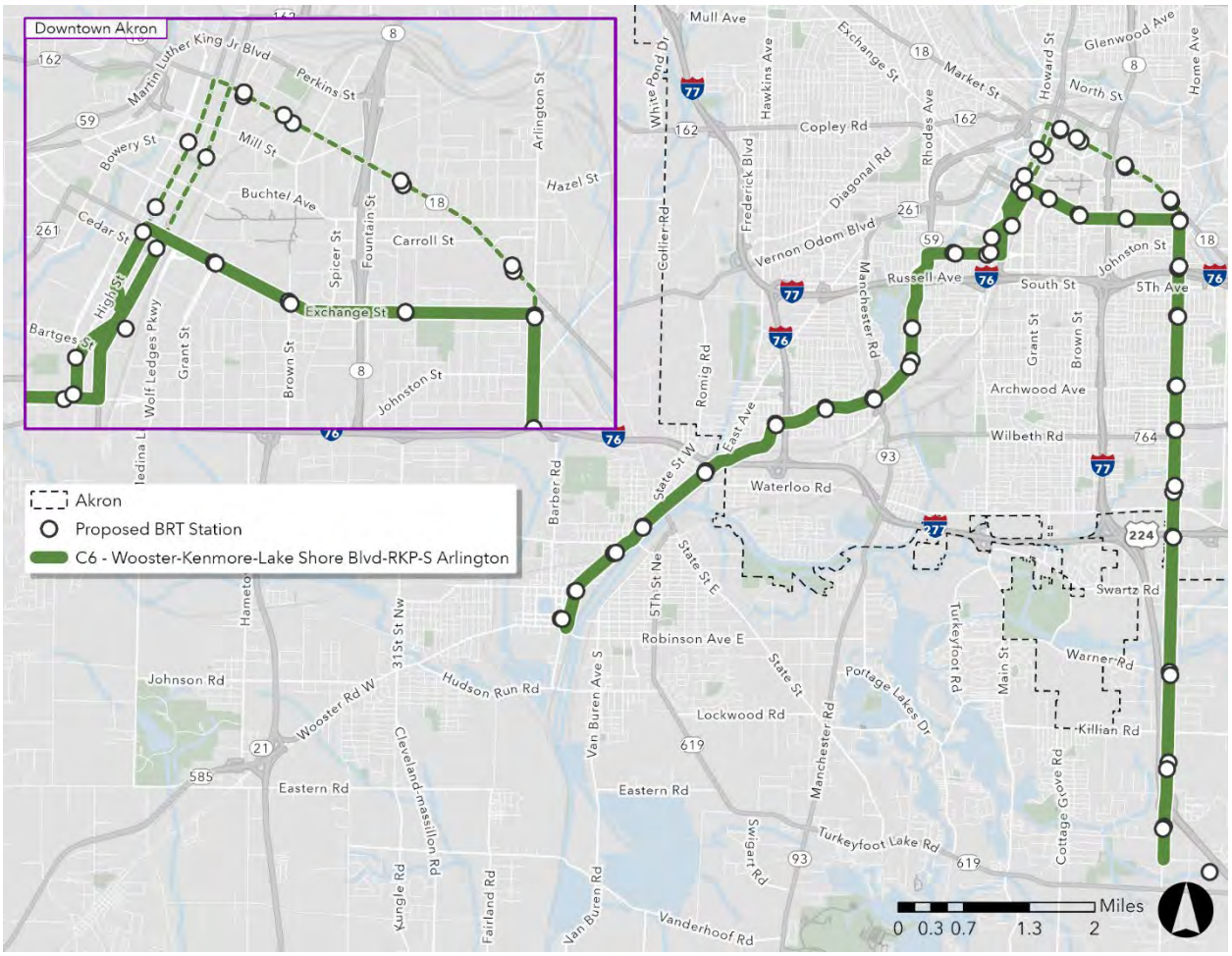


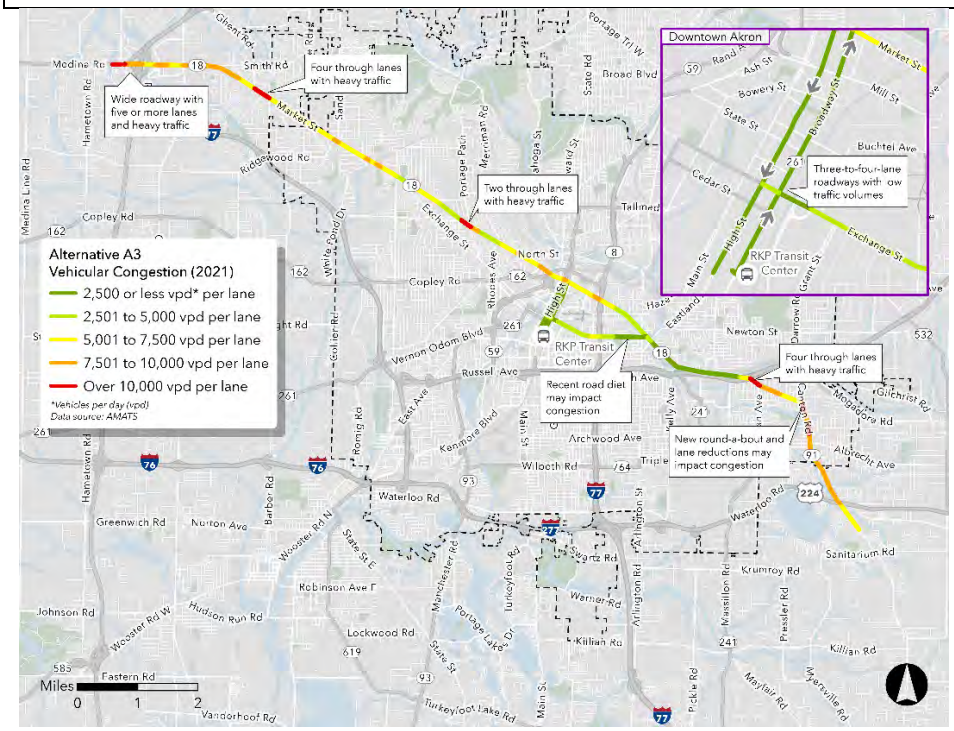
Figure 13 Alternative C6 – Wooster Rd. – Kenmore Blvd. – Lake Shore Blvd. – RKP Transit Center – S Arlington St.

BRT Feasibility Study

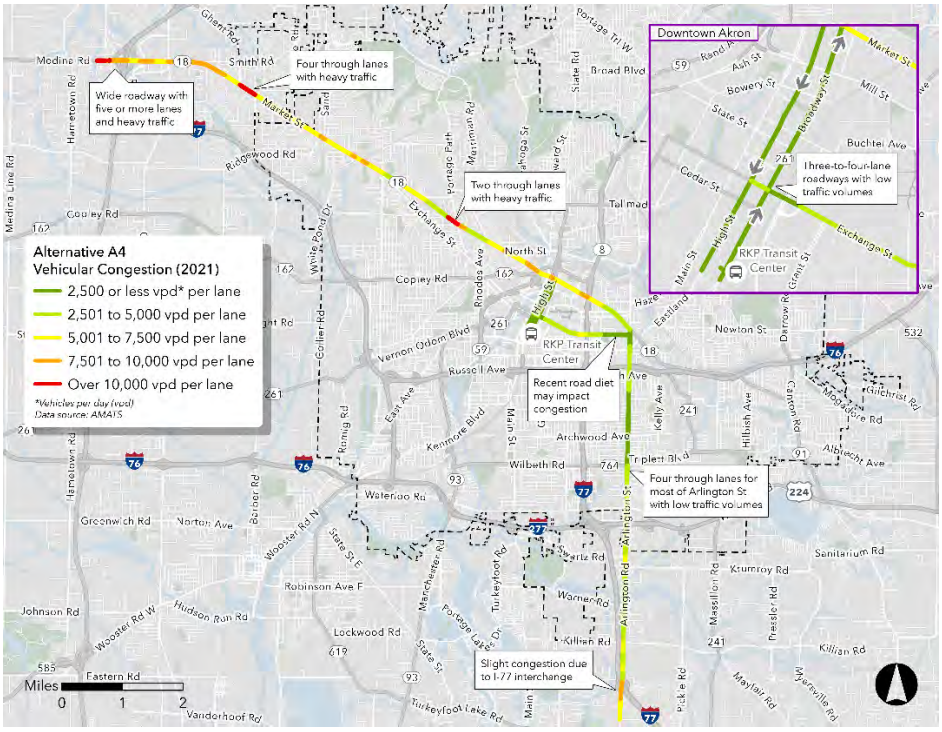
Appendix B: Vehicular Congestion Maps – October 2023

Reimagine METRO

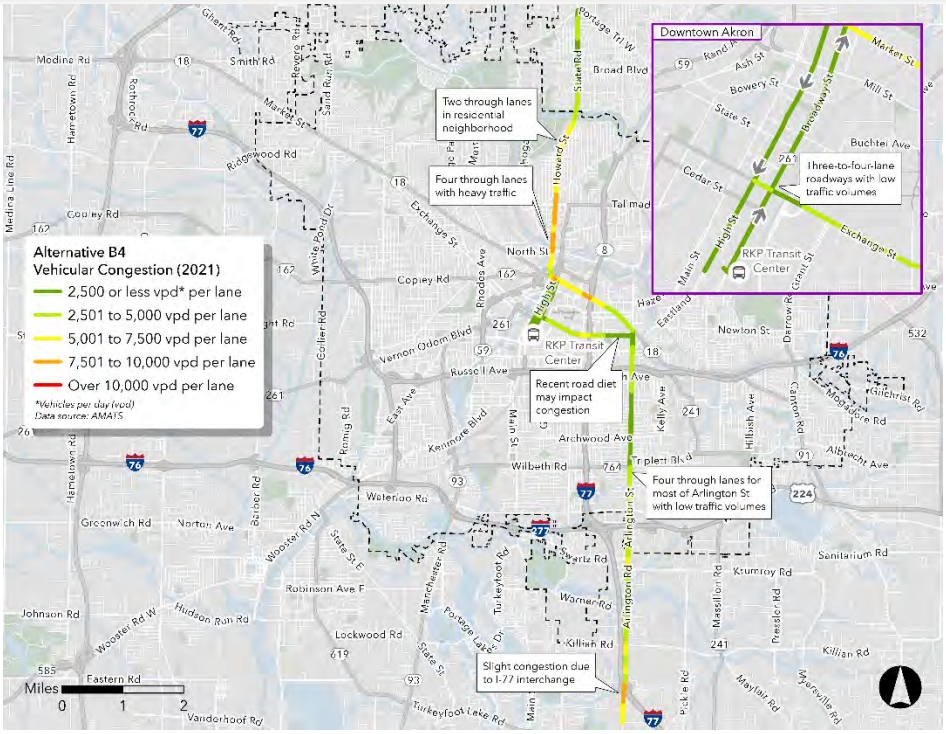
VEHICULAR CONGESTION IN 2021



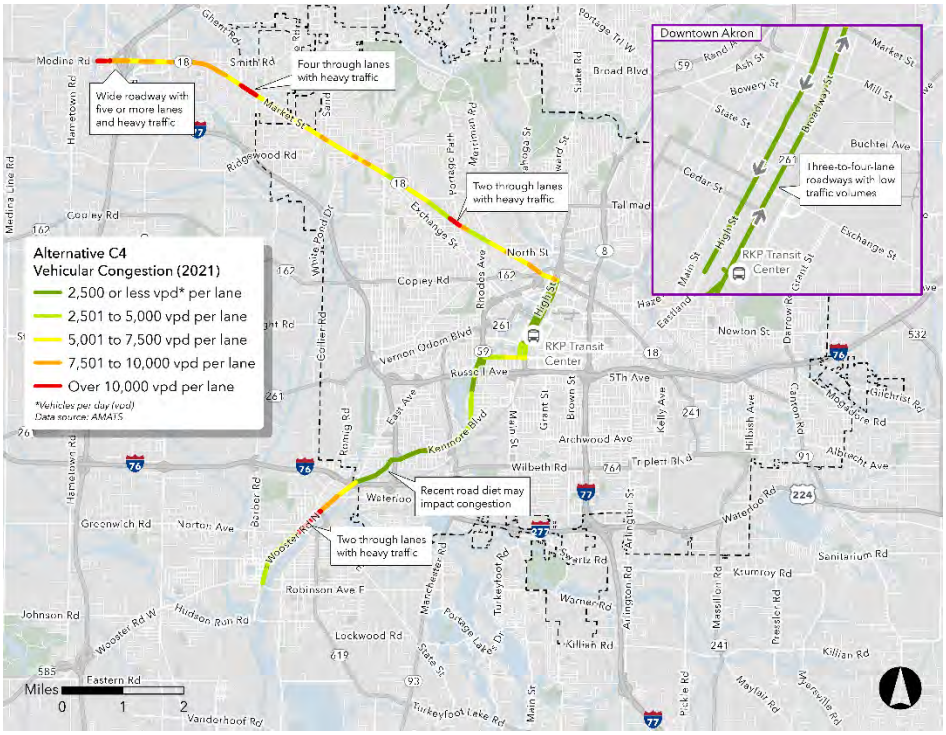
Vehicular congestion (2021) for Alternative A3



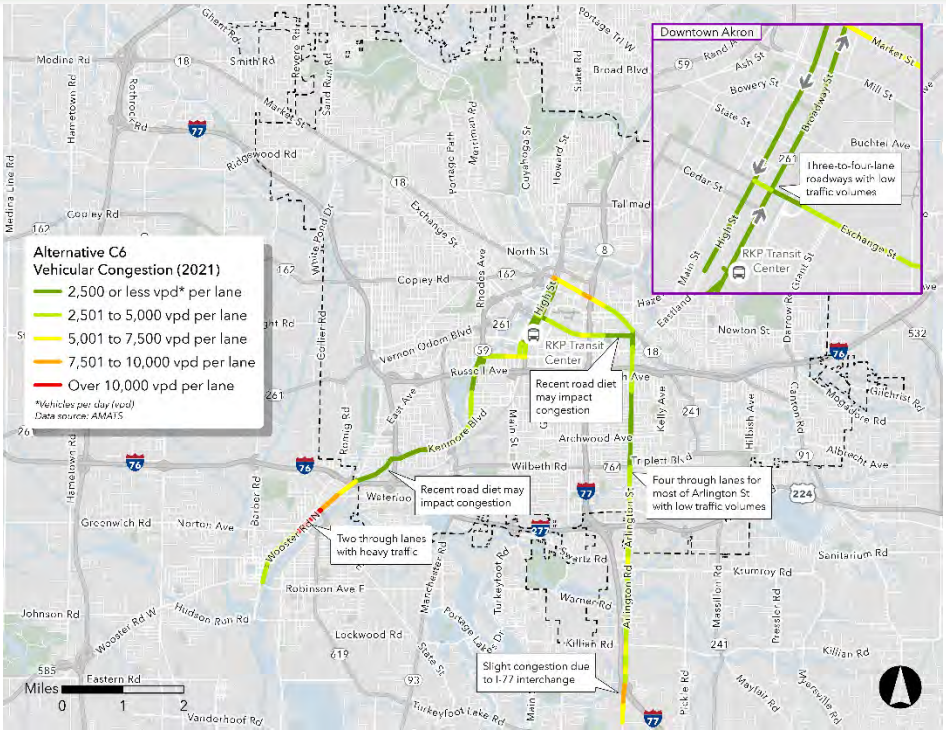
Vehicular congestion (2021) for Alternative A4



Vehicular congestion (2021) for Alternative B4

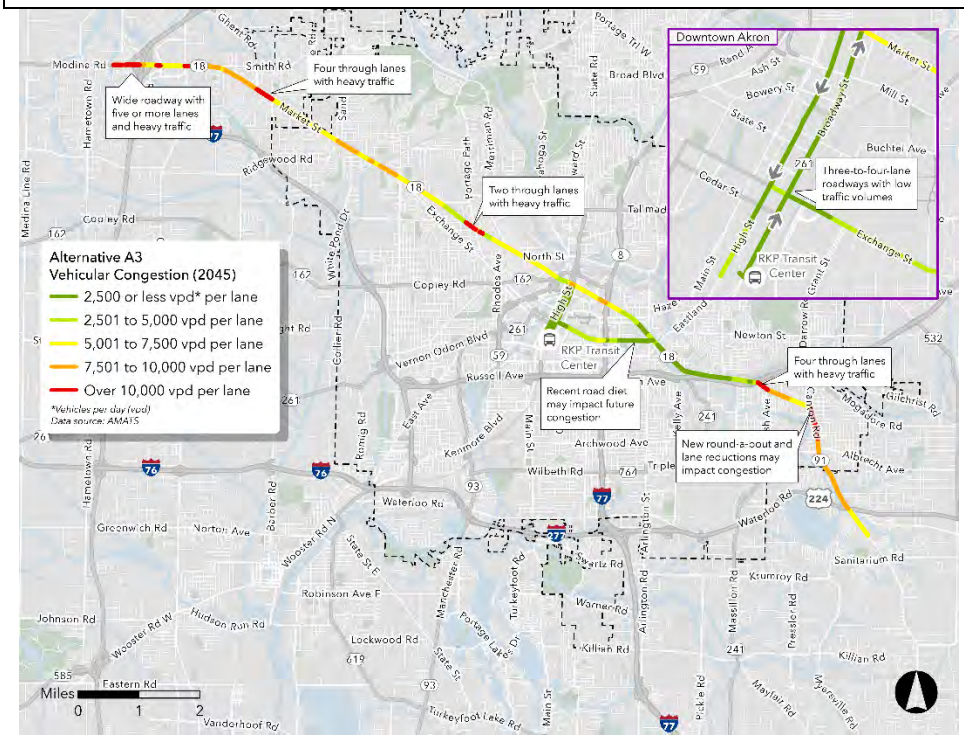


Vehicular congestion (2021) for Alternative C4

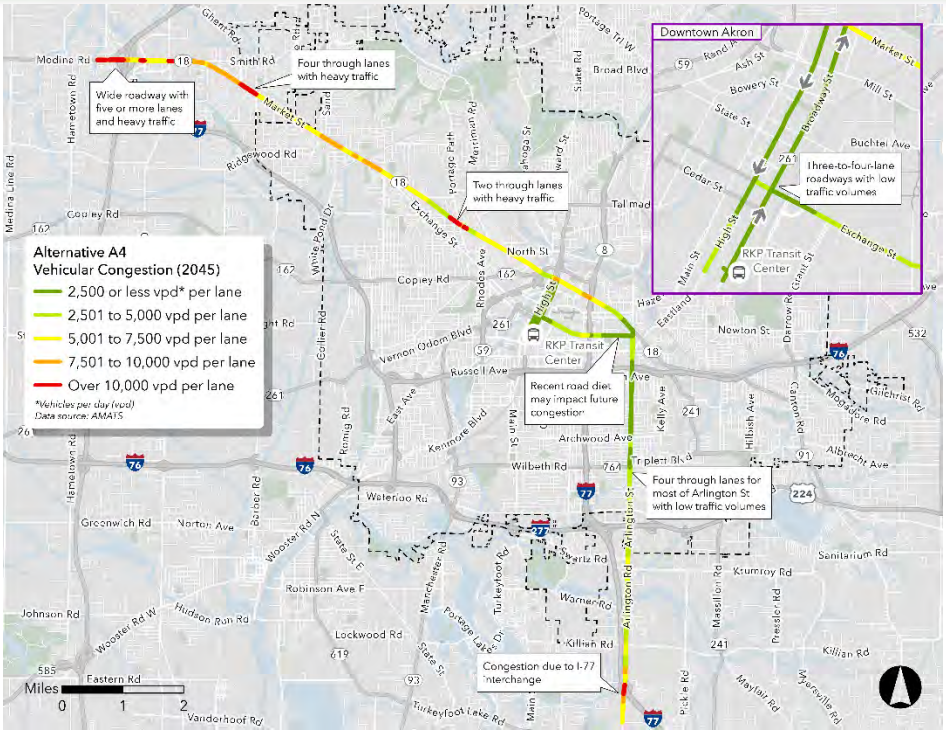


Vehicular congestion (2021) for Alternative C6

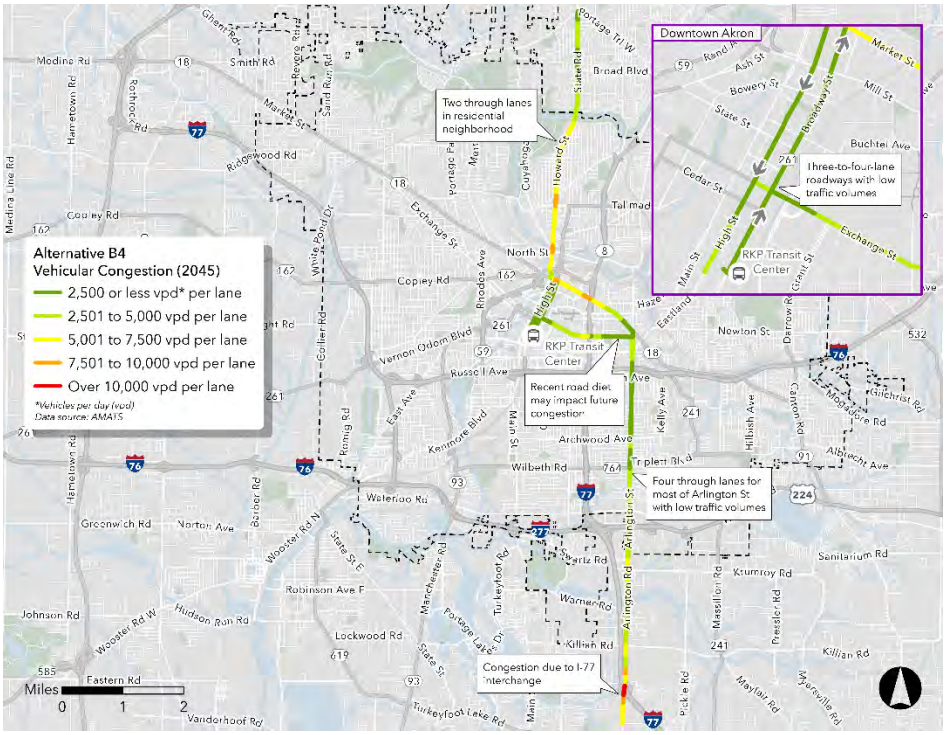
VEHICULAR CONGESTION IN 2045



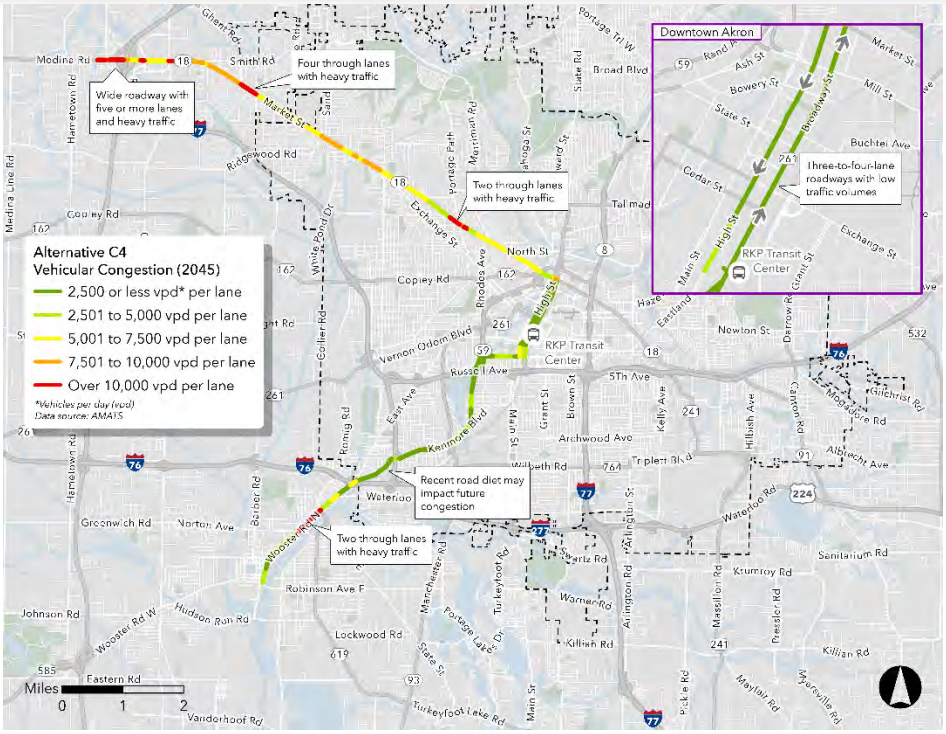
Vehicular congestion (2045) for Alternative A3



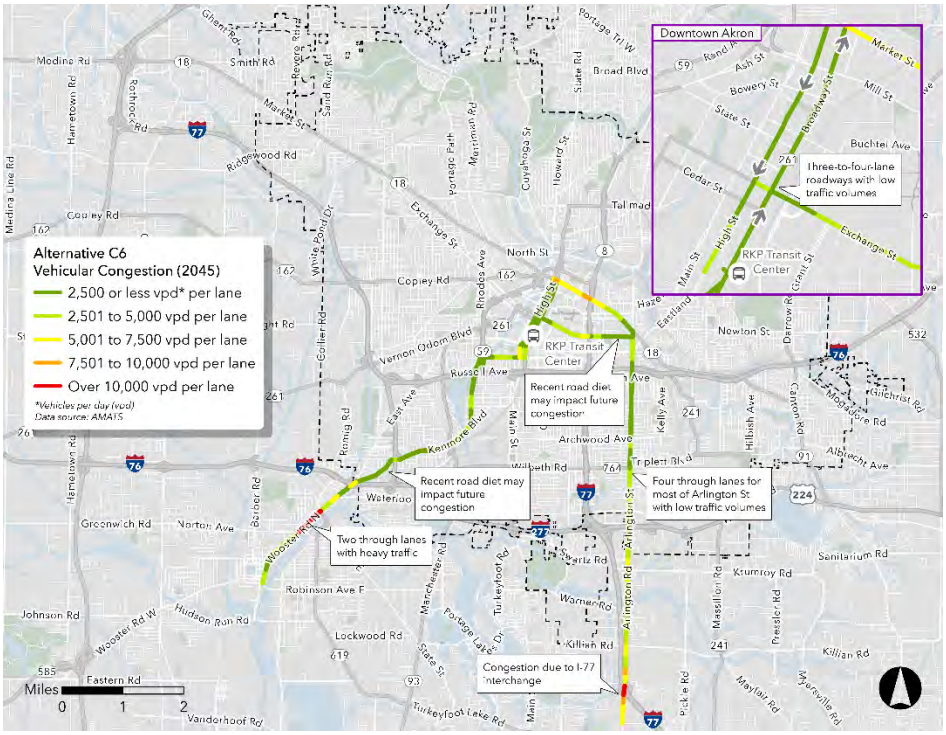
Vehicular congestion (20450 for Alternative A4



Vehicular congestion (2045) for Alternative B4



Vehicular congestion (2045) for Alternative C4



Vehicular congestion (2045) for Alternative C6

BRT Feasibility Study

Appendix C: NEPA Red Flag Memo – August 2023

Reimagine METRO

Table of Contents

INTRODUCTION

METRO is conducting a Bus Rapid Transit (BRT) Feasibility Study to assess potential BRT routes in the Akron metropolitan area. This Study is part of the Reimagine METRO plan to improve transit service within the Akron region. The Study began with "Discover" phase, which involved establishing a vision and corresponding goals for the BRT system, from which evaluating criteria were defined. A total of nine route segments and 14 route alternatives were evaluated for residential and employment densities, historically disadvantaged communities, opportunities for economic development, and physical suitability. From this group, five alternatives were selected for higher level analysis in the second "Refine" phase of the project. The "Refine" phase includes ridership modeling, operational concepts/design, high-level operational and capital costs, and FTA Capital Improvement Grant (CIG) program eligibility. In the last phase, "Select", METRO and its partners will advance priority alternatives(s), develop BRT design standards, and advance the alternative(s) to conceptual design.

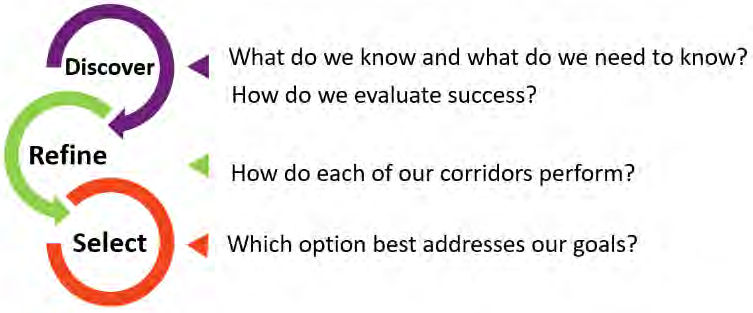


Figure 1 Graphic of BRT Feasibility Study Phases

REPORT PURPOSE

Based on a review of secondary source documents and databases, this NEPA Red Flag Assessment report identifies potential environmental resources within each of the five study corridor alternatives that METRO is evaluating in the "Refine" phase of this BRT Feasibility Study. METRO will likely seek federal funding through the CIG program for a future BRT corridor, meaning that the project would be subject to federal environmental regulations, including the National Environmental Policy Act (NEPA) process. This report identifies potential environmental "red flags" that may need to be evaluated further in the NEPA process when field studies are conducted, and impacts are considered. This early screening for NEPA red flags is an input for the broader evaluation that METRO RTA is completing for the five alternatives.

STUDY AREA

The study area for this analysis is the area within a 200' buffer of the five alternatives that the project team is evaluating in the "Refine" phase of this project. These alternatives—A3, A4, B4, C4, and C6—are shown in the map in Figure 2. All alternatives, except Alternative C4, include variants on East Market Street and Exchange Street. For routes with routing variants under study, both East Market Street and Exchange Street were included in this analysis.

The project team mapped previously recorded environmental resources within 200' of these corridors in ArcGIS. When reviewing these resources, the project team focused on environmental resources within 200' of the proposed station locations, based on the assumption that future BRT corridors would be built within the existing right-of-way footprint and that the main impacts would be from station-area enhancements. Appendix C-1 - Environmental Resources by Alternative includes a series of maps of environmental resources by alternative, showing the 200' study area around each corridor. The findings in this report focus on resources within the proposed station areas.

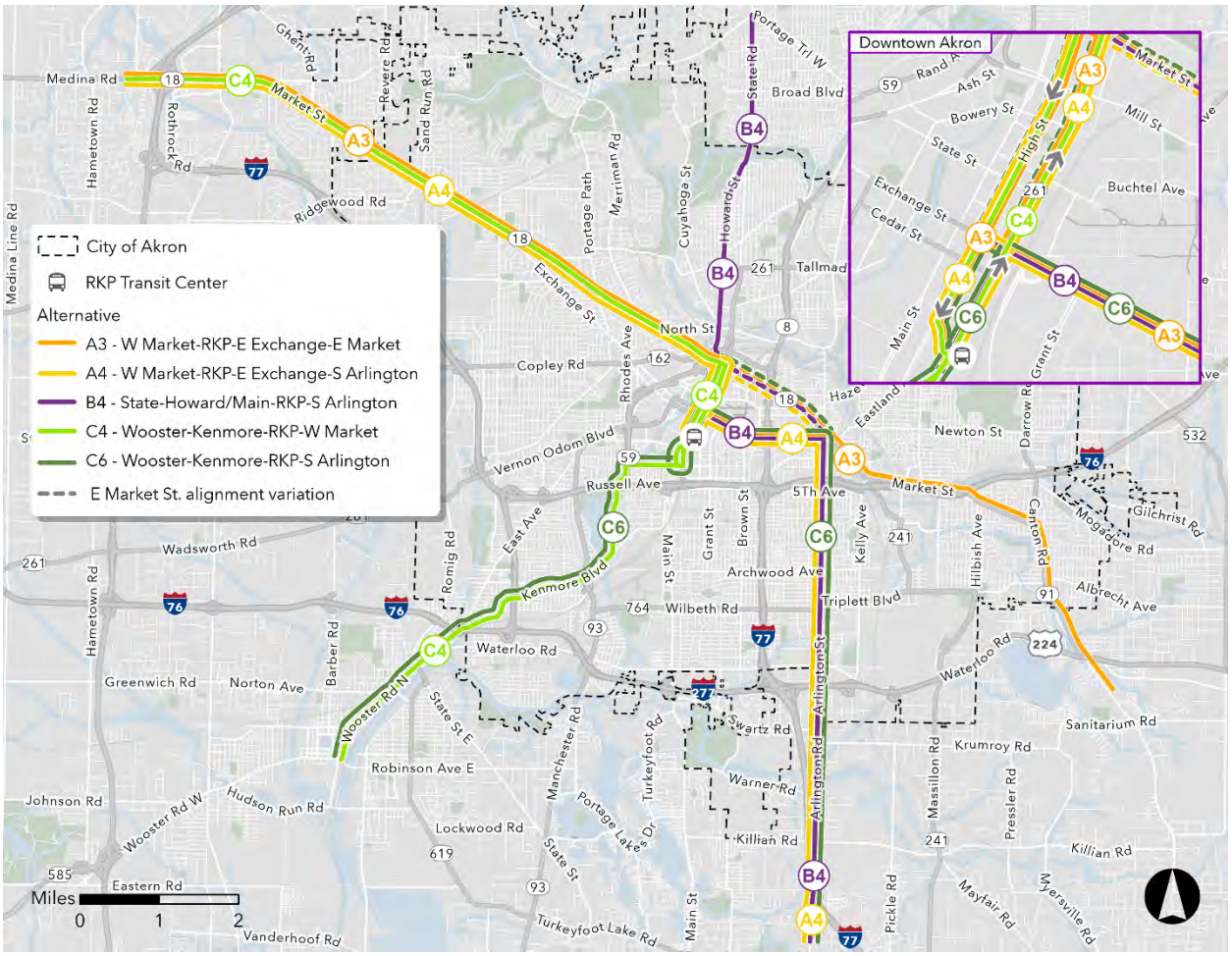


Figure 2 Map of Alternatives

ENVIRONMENTAL RESOURCES

For this analysis, the following environmental resources were reviewed:

- Historic and archaeological resources
- Water resources (bodies of water, floodplains, and wetlands)
- Section 4(f) resources, including parks and trails

These resources were included in this assessment because these were determined to environmental resources that may be adversely impacted by a typical arterial BRT project.

DATA SOURCES

The National Historic Preservation Act of 1966 requires all federal agencies to consider the effects of their undertakings on properties eligible for or listed in the National Register of Historic Places. Known historic and archaeological resources were reviewed based on data from the Ohio State Historic Preservation Office (SHPO). This dataset includes resources that are eligible or listed on the National Register of Historic Places, the Ohio

Archaeological Inventory (OAI), and in the Ohio Historic Inventory. Resources from the Ohio Historic Inventory that are not designated as eligible or listed in the National Register of Historic Places were excluded from this analysis.

The Clean Water Act of 1972 is the primary federal law governing water pollution in the U.S. For the analysis of water resources, the project team used GIS data on bodies of water from Summit County's Water Features dataset, data on floodplains from FEMA's National Flood Hazard Layer dataset, and wetlands data from the U.S. Fish & Wildlife Service's National Wetlands Inventory.

"Section 4(f) resources" refers to Section 4(f) of the Department of Transportation Act of 1966. This regulation states that U.S. Department of Transportation (USDOT) agencies, including the Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA), may not approve the use of, "… a significant publicly owned park, recreation area or wildlife and waterfowl refuge or any significant historic site, unless there is no feasible and prudent alternative to the use of land from the property and the action includes all possible planning to minimize harm to the property resulting from the use." To evaluate impacts to parks and trails, the project team used parks data from Summit County and trails data from the City of Akron and the Akron Metropolitan Area Transportation Study (AMATS), the region's Metropolitan Planning Organization.

FINDINGS

Based on this assessment of historic and archaeological resources, water resources, and Section 4(f) resources, there are environmental resources along these corridors that will need to be evaluated further through the NEPA process. While there are environmental red flags in each alternative that will need to be considered during NEPA, there is a not a disproportionate number of red flags in any one alternative to differentiate the corridors based on environmental concerns.

As planning and design advance for a selected alternative, stations locations could be refined and/or designed to minimize or avoid impacts to resources. For example, where a station is adjacent to a small neighborhood park, the station could be sited on the opposite corner of the intersection to avoid Section 4(f) impacts or impacts to a small wetland area. Table 1 summarizes these potential impacts. A full description of potential station-area impacts for each alternative is detailed in Appendix C-1 - Environmental Resources by Alternative.

Table 1 Summary of Potential Impacts to Environmental Resources by Alternative

Alternative	Historic and Archaeological Resources	Water Resources	Section 4(f) Resources
A3	5 station pairs with potential impacts to National Register listed/eligible sites	3 station pairs with potential impacts to multiple water resources (wetlands, rivers, floodplains)	2 station pairs adjacent to small parks
A4	4 station pairs with potential impacts to National Register listed sites	1 station pair with potential impact to floodplain	1 station pair adjacent to a small park
B4	4 station pairs with potential impacts to National Register listed sites	1 station pair with potential impact to floodplain	1 station pair adjacent to a small park
C4	6 station pairs with potential impacts to National Register listed/eligible sites	1 station pair with potential impact to floodplain	2 station pairs adjacent to small parks

C6	6 station pairs with potential impacts to National Register listed/eligible sites	1 station pair with potential impact to floodplain	1 station pair adjacent to a small park

Most of the potential impacts relate to historic properties that are listed on or are eligible for listing on the National Register of Historic Places. Many of these resources are in Downtown Akron, along a segment that is common to all alternatives (Figure 3). While these resources in Downtown Akron will require further analyses during the NEPA and design phases, these potential impacts do not serve to differentiate the five alternatives because each alternative would use the same stations and routing along Broadway and High Street in Downtown Akron.

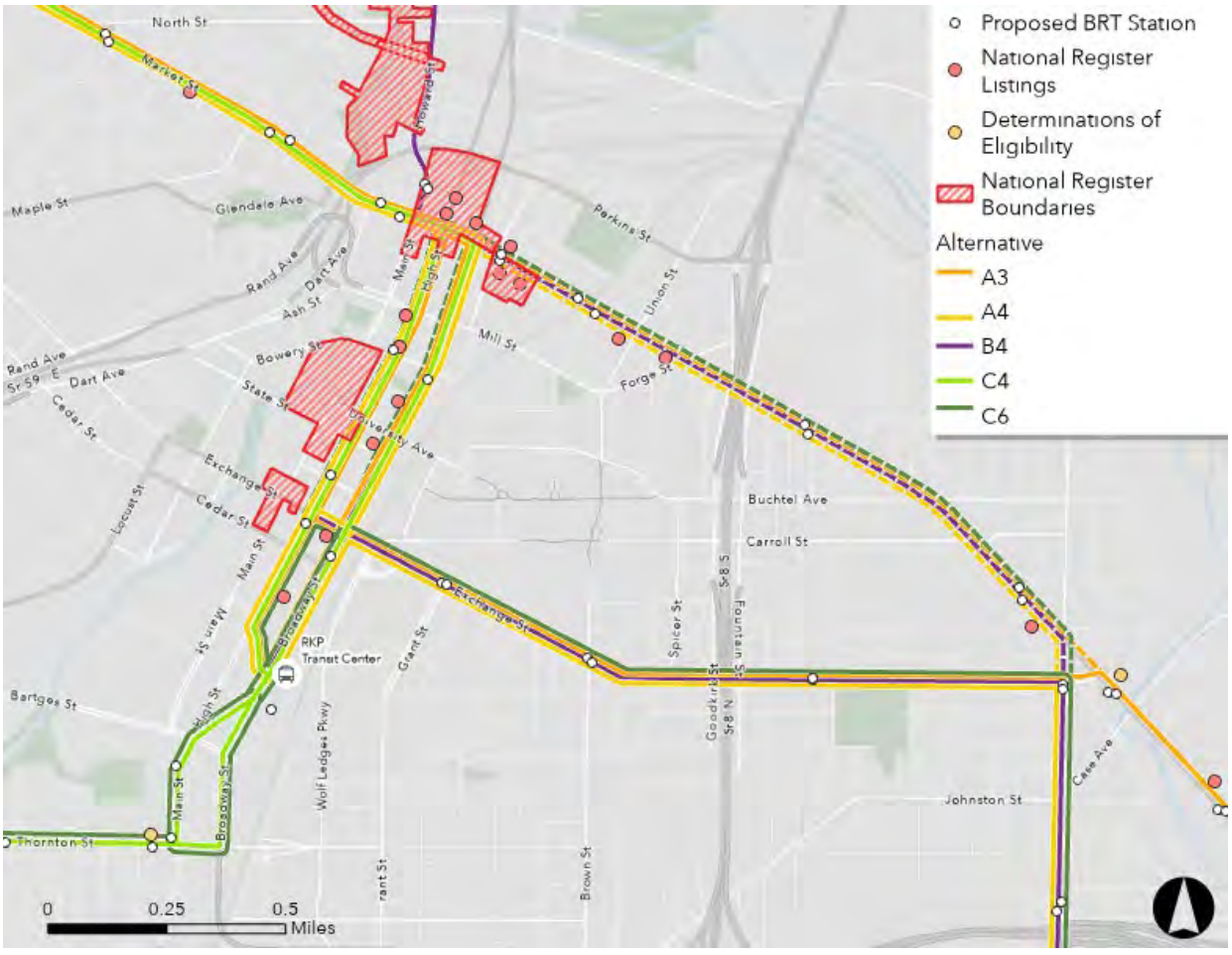


Figure 3 National Register Listed Sites in Downtown Akron

NEXT STEPS

As planning and design advance for the selected alternative(s), METRO should consult the findings from this analysis and the maps of resources in Appendix C-1 to minimize or avoid impacts to these resources where

possible. Formal coordination with the Ohio SHPO will be required during the NEPA study to determine the level of potential impacts and mitigation required, if any. If METRO considers BRT-related improvements that would have impacts outside of the station area, the project team should consult the mapping analysis done in this analysis for potential NEPA red flags related to those actions.

APPENDIX C-1: ENVIRONMENTAL RESOURCES BY ALTERNATIVE

This appendix documents all resources that are within 200' from each alternative for the following environmental resource types: historic and archaeological resources, water resources, and Section 4(f) resources.

ALTERNATIVE A3

HISTORIC AND ARCHAEOLOGICAL RESOURCES

The following proposed station areas for alternative A3 are within 200' of historic resources. There are previously recorded archaeological sites along the A3 corridor; however, these sites are not within the station areas and likely would not be impacted by the project.

- **West Market Street**
  - Station pair on West Market St between Dart St and Main St is adjacent to the Main-Market Historic District, which is on the National Register of Historic Places (Figure 5).
- **Downtown Akron**
  - Station pair on High/Broadway between Exchange St and Cedar St is adjacent to Main-Exchange Historic District, which is on the National Register of Historic Places (Figure 6).
  - Southbound station on High St at Bowery St is adjacent to the South Main Street Historic District and one National Register listed property outside of that historic district (Figure 6).
- **East Market Street**
  - Station pair on East Market at Summit St is within Main-Market Historic District and in front of two National Register listed properties within that historic district (Figure 6).
  - Station pair on East Market St at Exchange St is adjacent to a property that is eligible for the National Register of Historic Places (Figure 6).

Formal coordination with the Ohio SHPO will be required during the NEPA study to determine the level of potential impacts and mitigation required, if any.

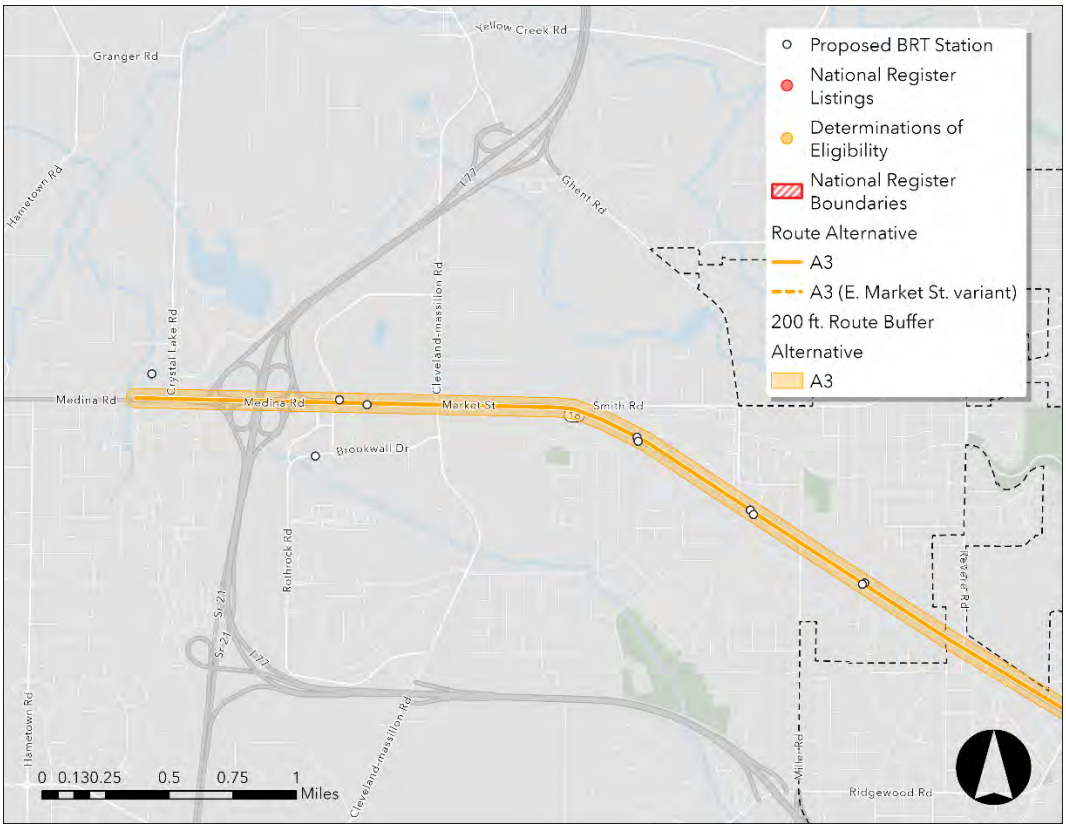


Figure 4 Alternative A3, Historic and Archaeological Resources, Western End of West Market Street Segment

Figure 5 Alternative A3, Historic and Archaeological Resources, Eastern End of West Market Street Segment

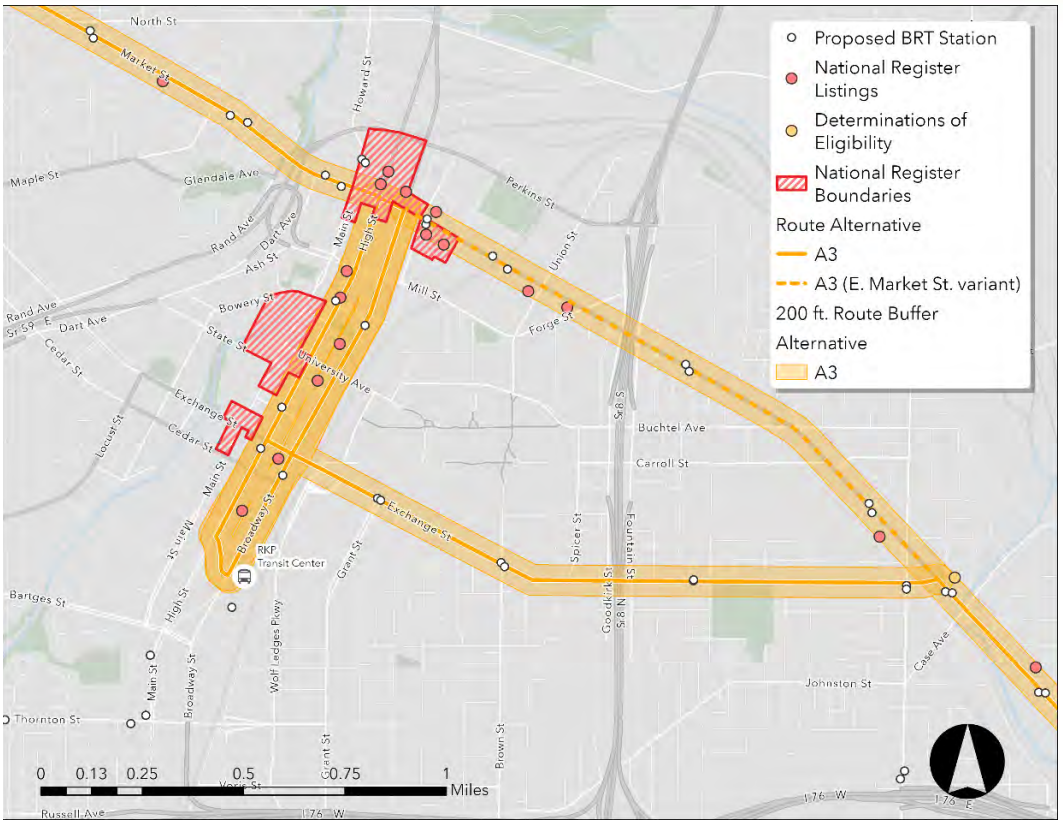


Figure 6 Alternative A3, Historic and Archaeological Resources, Downtown Akron and Exchange/East Market Segments

Figure 7 Alternative A3, Historic and Archaeological Resources, Western End of East Market/Canton Rd Segment

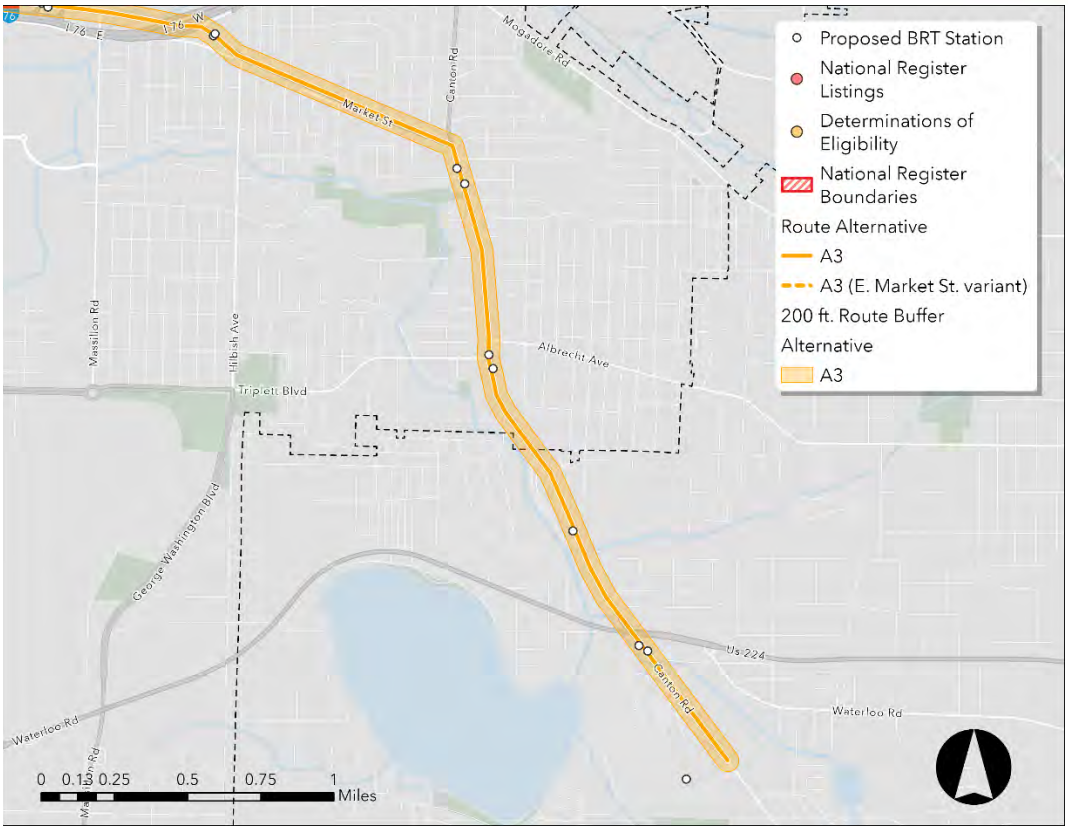


Figure 8 Alternative A3, Historic and Archaeological Resources, Western End of East Market/Canton Rd Segment

WATER RESOURCES

The following proposed station areas for alternative A3 are within 200' of water resources:

- Station pair at Market St and Exchange is adjacent to Little Cuyahoga River, a wetland, and a 1% Annual Chance (100-year) floodplain. However, the station area is developed and has sidewalks. Upgrading these stations to BRT stations would likely have minimal water resource impacts (Figure 10).
- Station pair on Market St at Goodyear Blvd is near a narrow patch identified as a wetland. However, the station area is developed and has wide sidewalks and existing bus shelters. Upgrading these stations to BRT stations would likely have minimal water resource impacts (Figure 11).
- Station pair on Canton Rd at East Waterloo Rd is near a creek and wetland. There is development in the area but no sidewalks, so constructing BRT stations may have more impacts. The wetland area is small, and stations could be sited farther from the wetland area to avoid water resource impacts (Figure 12).

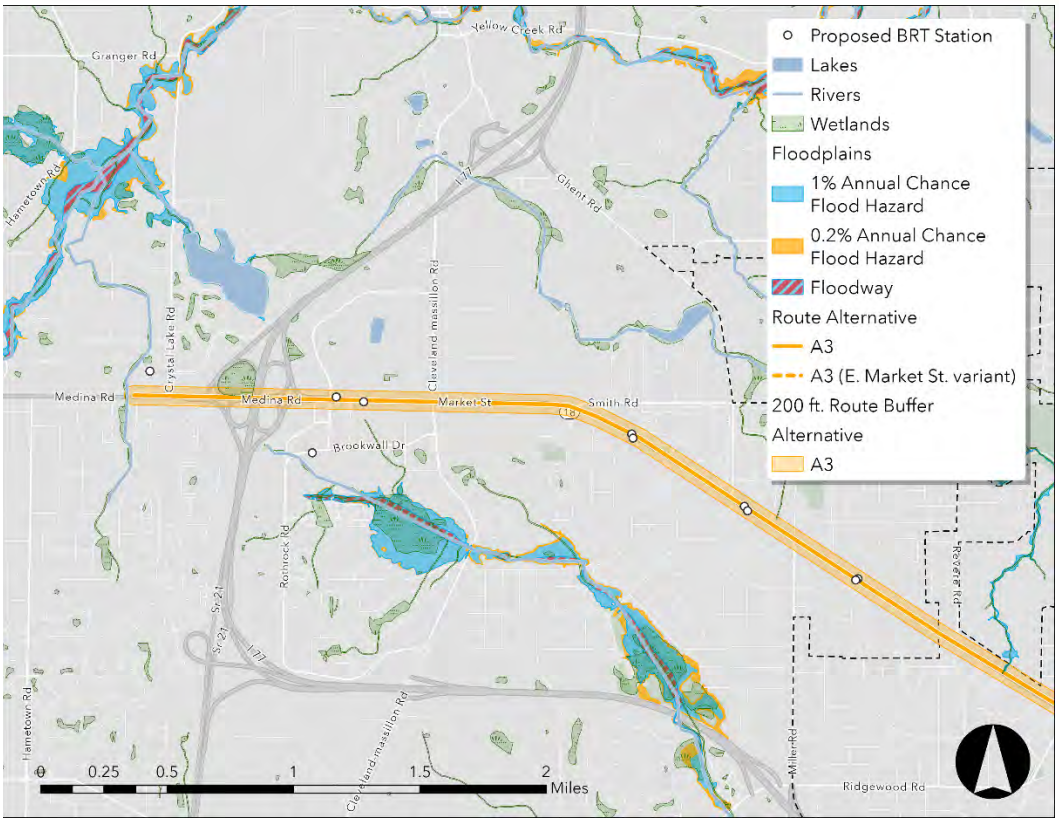


Figure 9 Alternative A3, Water Resources, Western End of West Market Street Segment

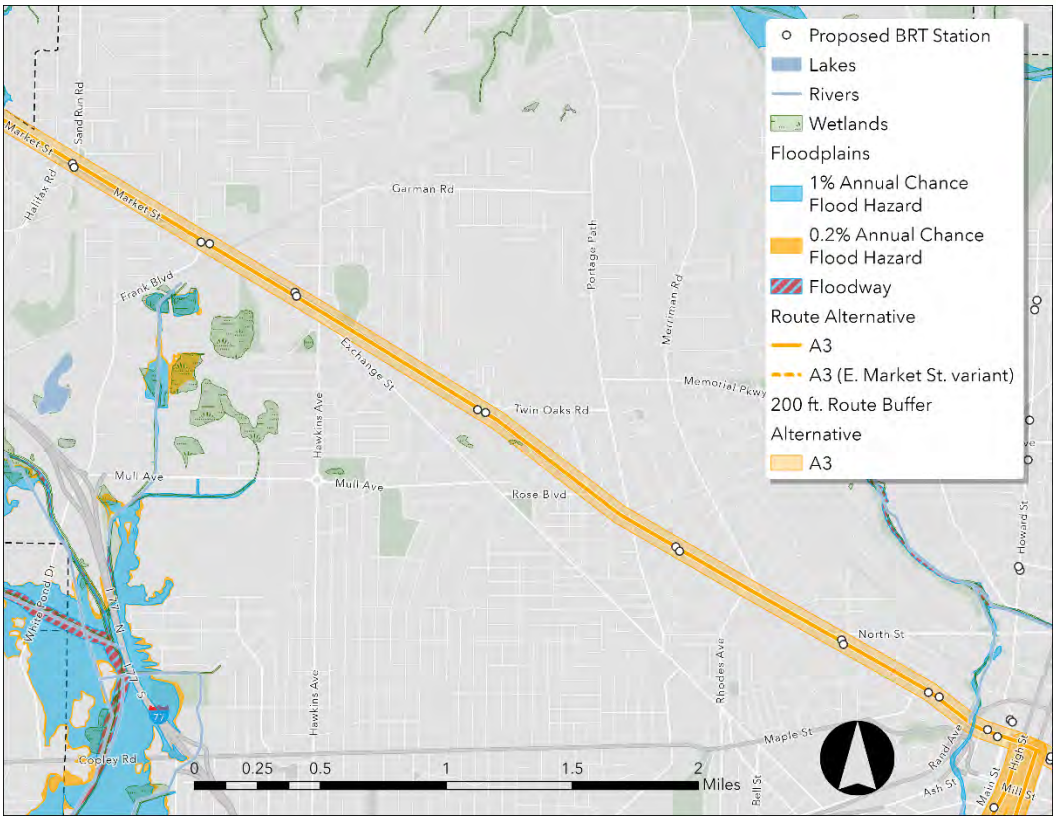


Figure 10 Alternative A3, Water Resources, Eastern End of West Market Street Segment

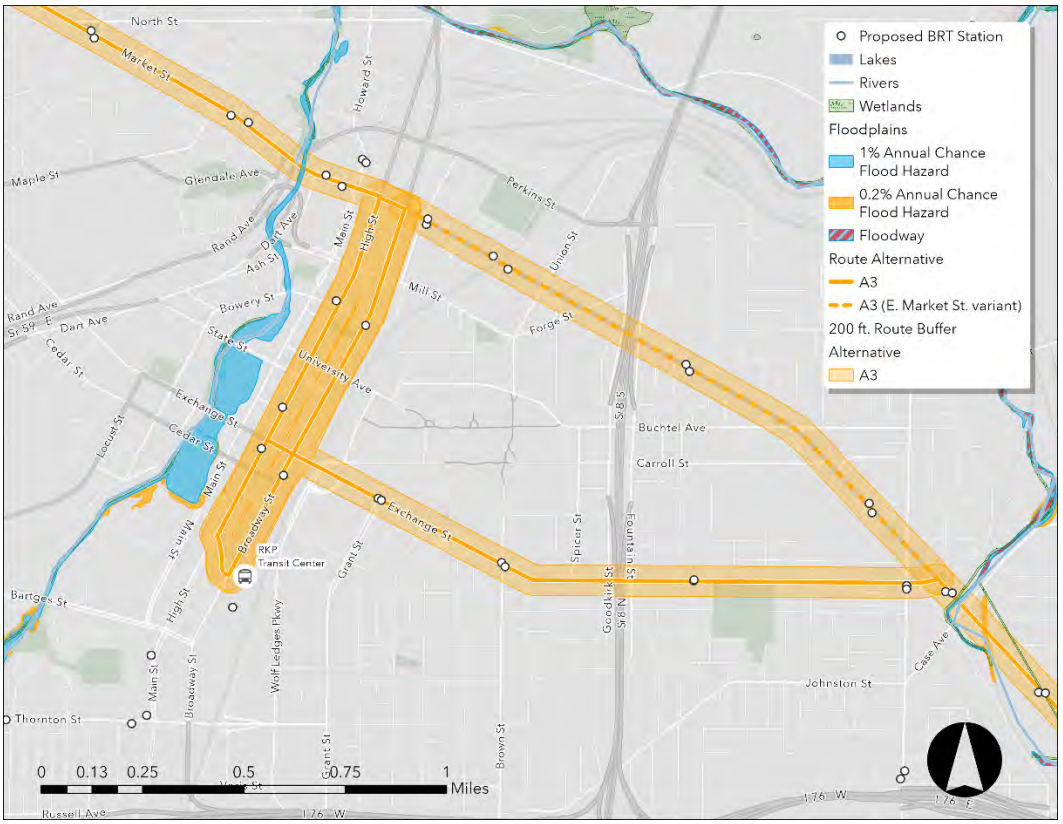


Figure 11 Alternative A3, Water Resources, Downtown Akron and Exchange/East Market Segments

Figure 12 Alternative A3, Water Resources, Western End of East Market/Canton Rd Segment

Figure 13 Alternative A3, Water Resources, Western End of East Market/Canton Rd Segment

SECTION 4(F) RESOURCES

The following proposed station areas for alternative A3 are within 200' of Section 4(f) resources:

- Westbound station on West Market at West North Street is adjacent to a small park (Shady Park). Station could be sited to avoid park impacts (Figure 15).
- Station pair on East Market and Exchange is near a few plazas that are identified as parks. Station could be sited to avoid park impacts (Figure 16).

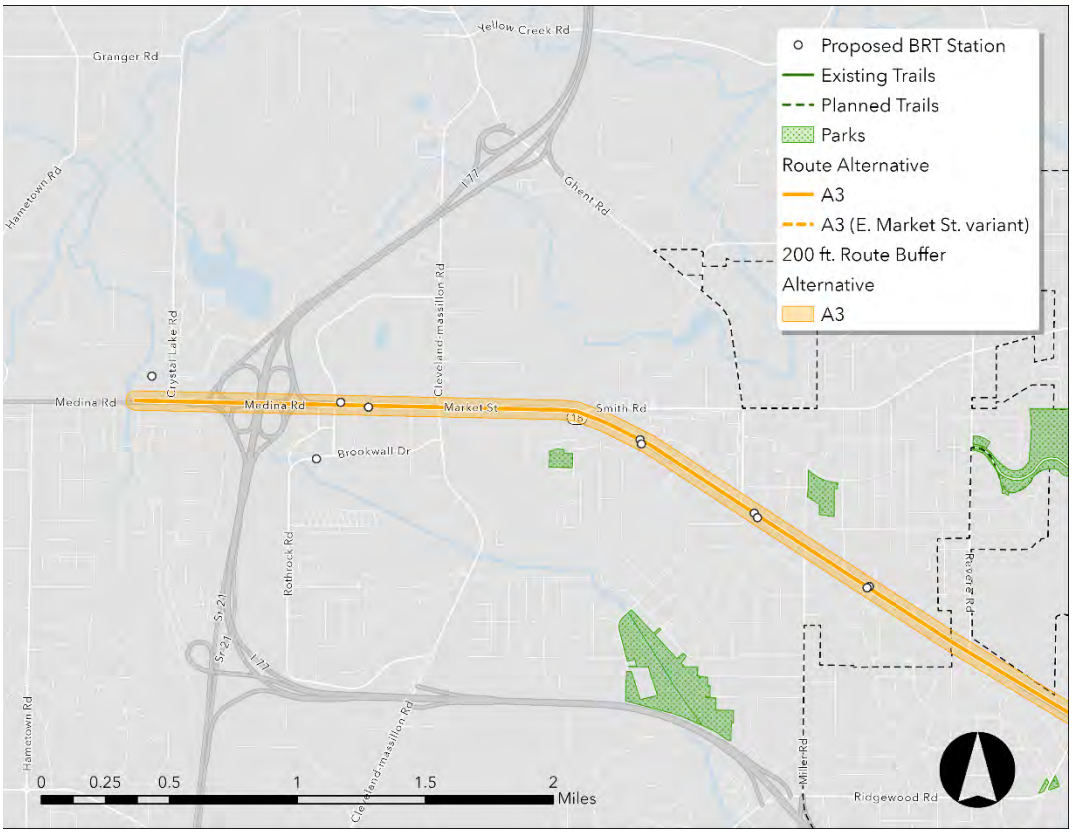


Figure 14 Alternative A3, Section 4(f) Resources, Western End of West Market Street Segment

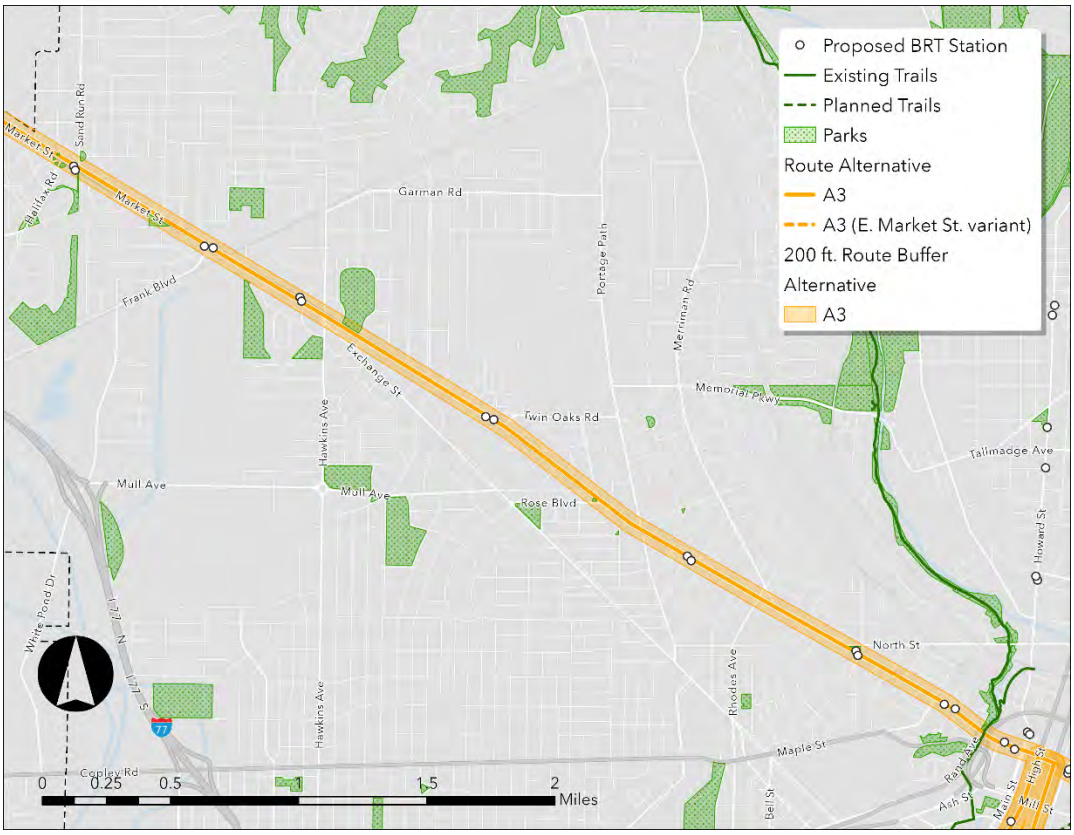


Figure 15 Alternative A3, Section 4(f) Resources, Eastern End of West Market Street Segment

Figure 16 Alternative A3, Section 4(f) Resources, Downtown Akron and Exchange/East Market Segments

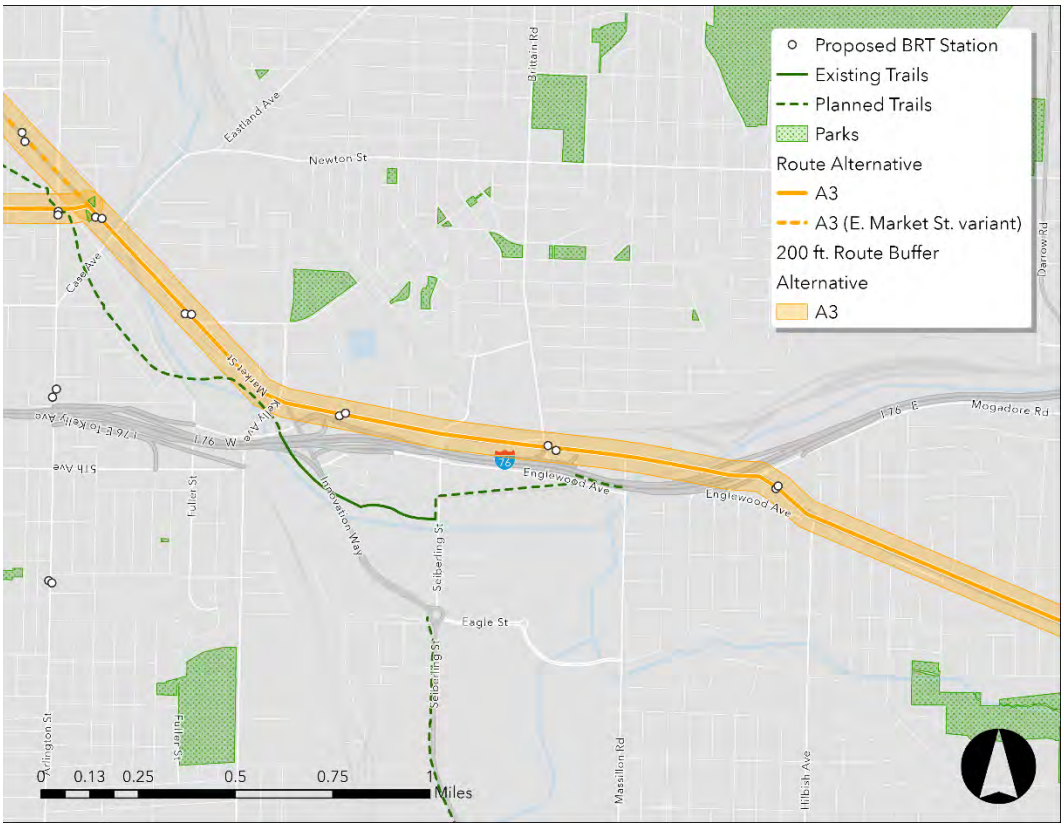


Figure 17 Alternative A3, Section 4(f) Resources, Western End of East Market/Canton Rd Segment

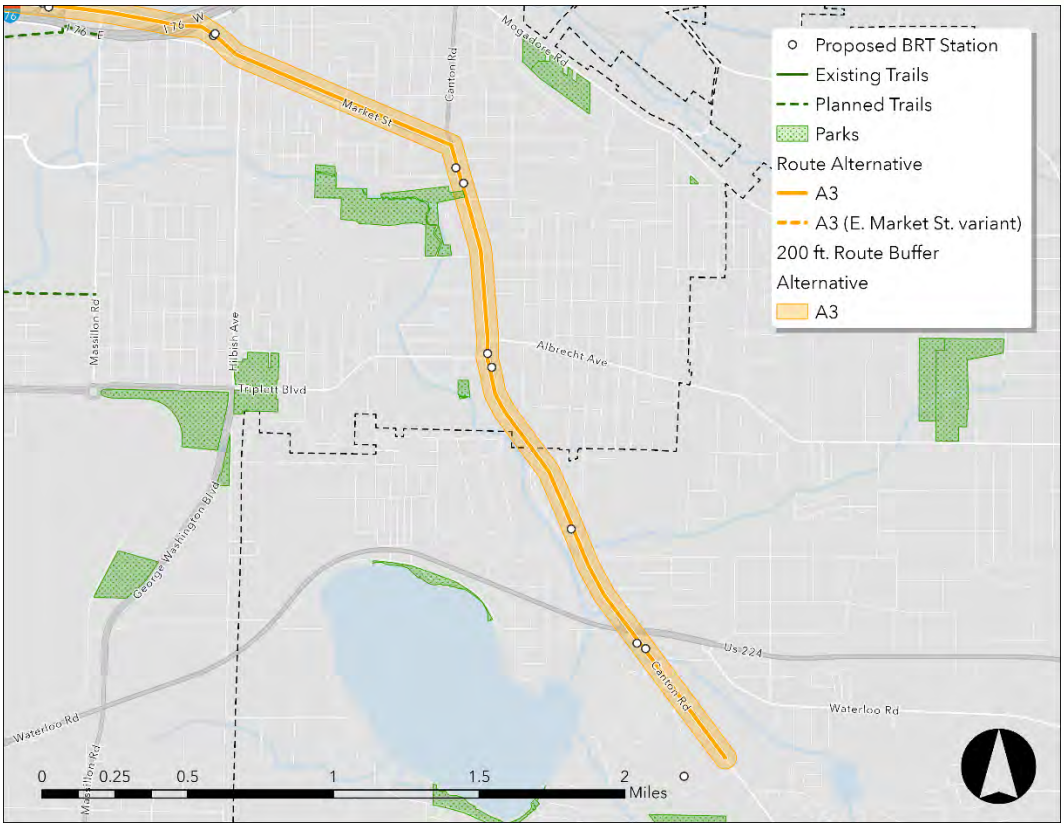


Figure 18 Alternative A3, Section 4(f) Resources, Eastern End of East Market/Canton Rd Segment

ALTERNATIVE A4

HISTORIC AND ARCHAEOLOGICAL RESOURCES

The following proposed station areas for alternative A4 are within 200' of historic resources. There are previously recorded archaeological sites along the A4 corridor; however, these sites are not within the station areas and likely would not be impacted by the project.

- **West Market**
  - Station pair on West Market St between Dart St and Main St is adjacent to the Main-Market Historic District, which is on the National Register of Historic Places (Figure 19).
- **Downtown Akron**
  - Station pair on High/Broadway between Exchange St and Cedar St is adjacent to Main-Exchange Historic District, which is on the National Register of Historic Places (Figure 21).
  - Southbound station on High St at Bowery St is adjacent to the South Main Street Historic District and one National Register listed property outside of that historic district (Figure 21).
- **East Market Street**
  - Station pair on East Market at Summit St is within Main-Market Historic District and in front of two National Register listed properties within that historic district (Figure 21).

Formal coordination with the Ohio SHPO will be required during the NEPA study to determine the level of potential impacts and mitigation required, if any.

Figure 19 Alternative A4, Historic and Archaeological Resources, Western End of West Market Street Segment

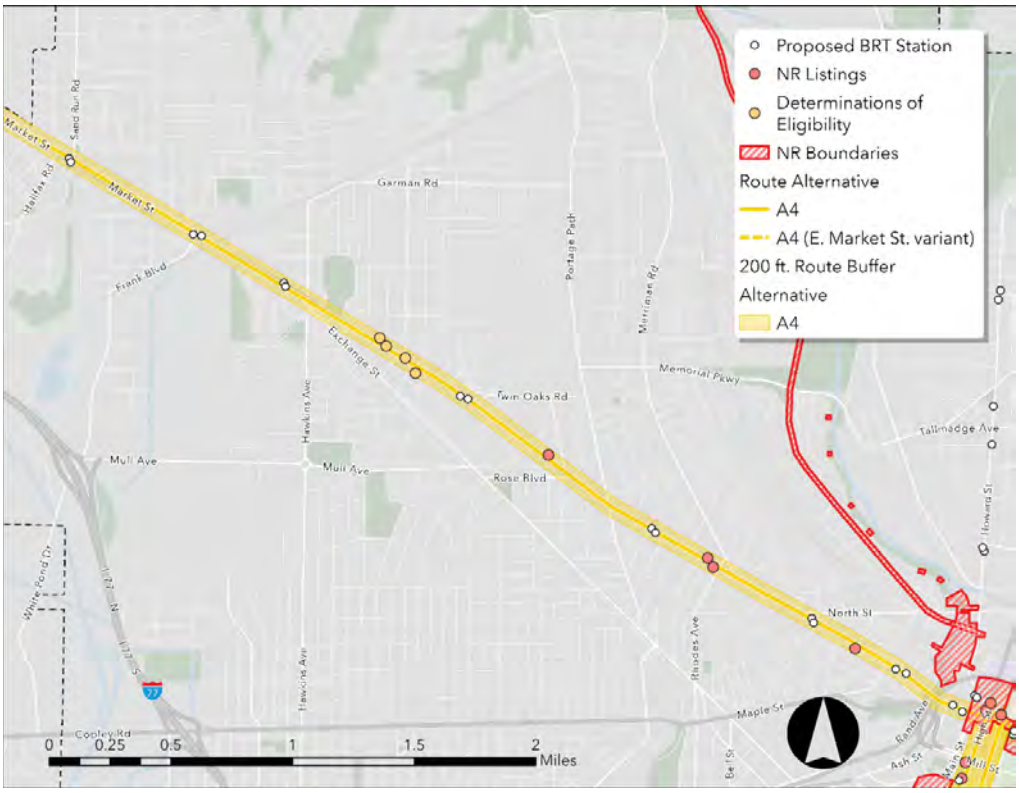


Figure 20 Alternative A4, Historic and Archaeological Resources, Western End of West Market Street Segment

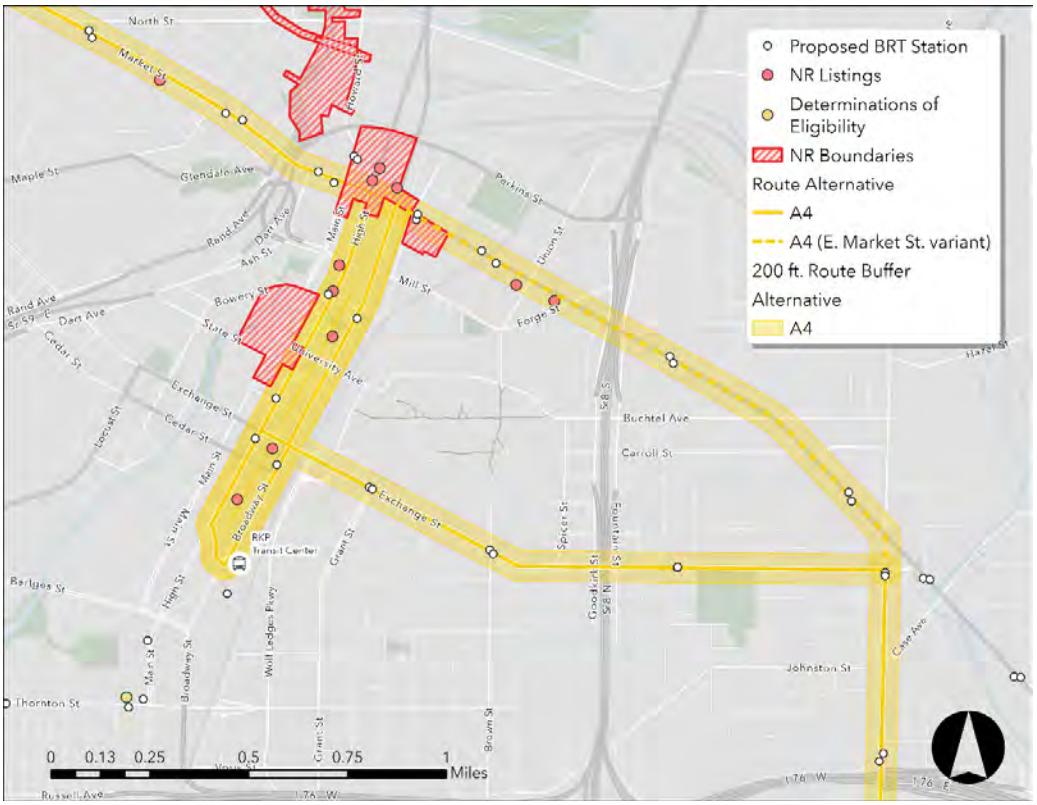


Figure 21 Alternative A4, Historic and Archaeological Resources, Downtown Akron and Exchange/East Market Segments

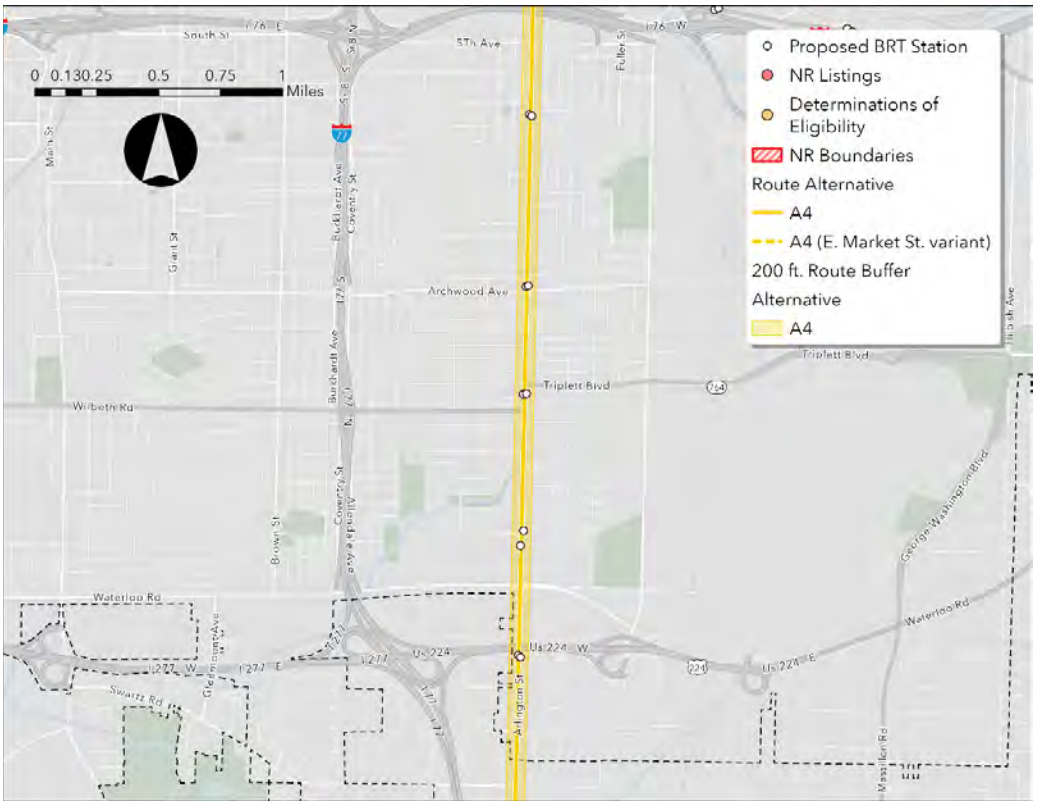


Figure 22 Alternative A4, Historic and Archaeological Resources, Northern End of South Arlington Street Segment

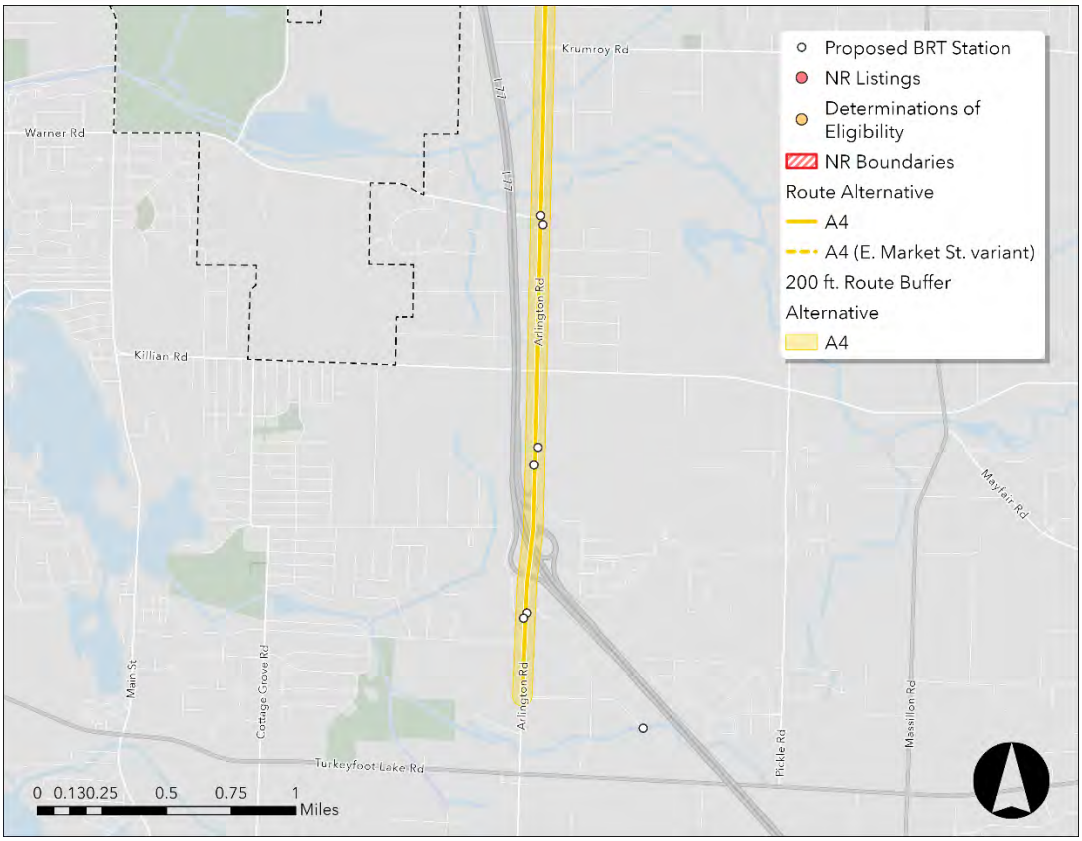


Figure 23 Figure 24 Alternative A4, Historic and Archaeological Resources, Southern End of South Arlington Street Segment

WATER RESOURCES

The following proposed station areas for alternative A3 are within 200' of water resources:

- Station pair on South Arlington St at Warner is in a 100-year floodplain, but there is existing development and sidewalks, and station could be sited to avoid water resource impacts (Figure 29).

Figure 25 Alternative A4, Water Resources, Western End of West Market Street Segment

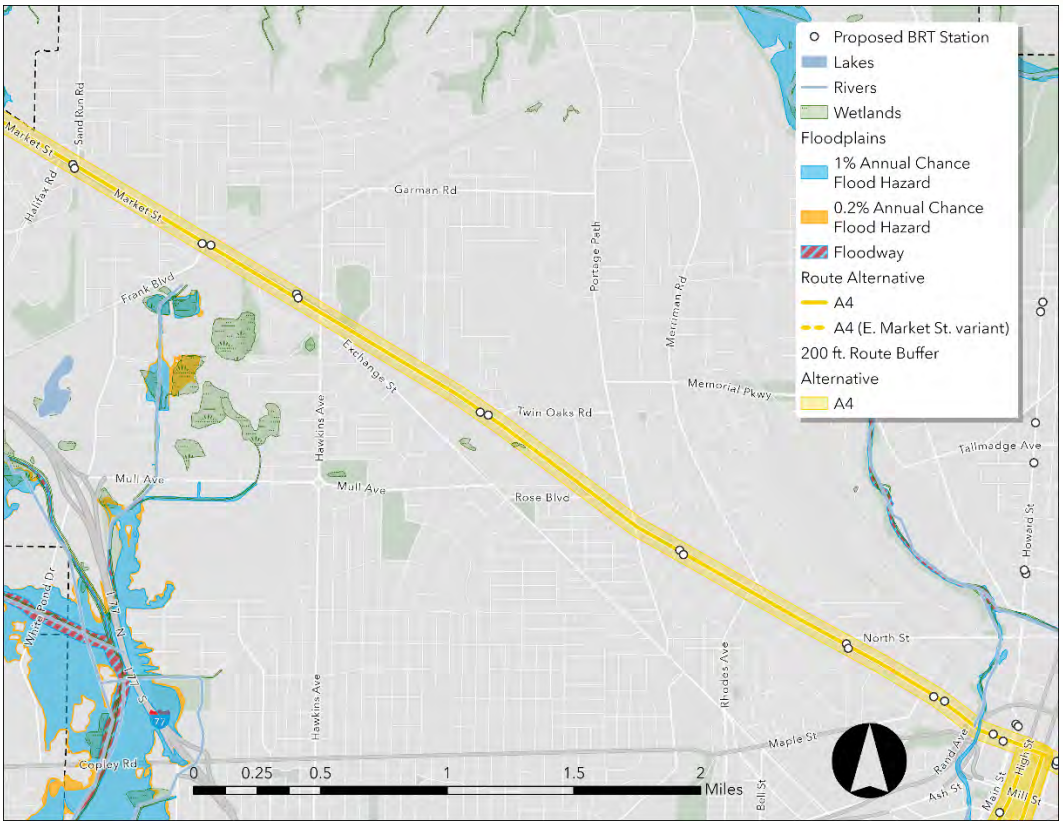


Figure 26 Alternative A4, Water Resources, Eastern End of West Market Street Segment

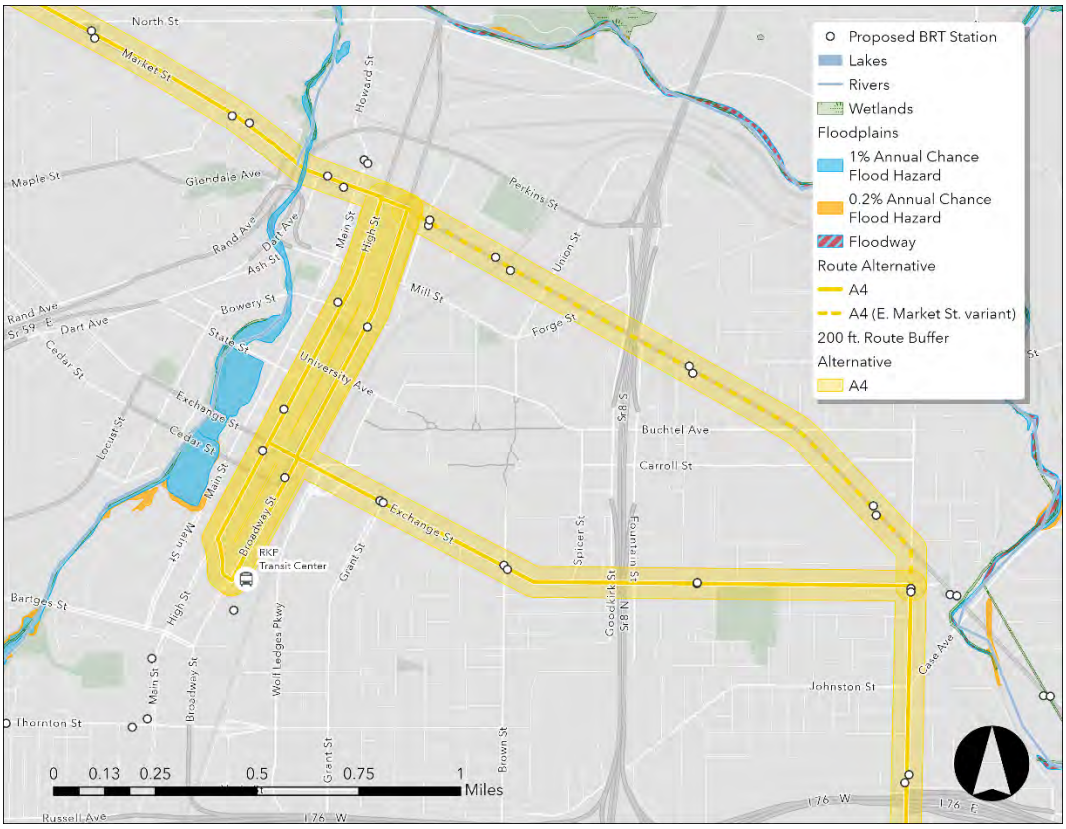


Figure 27 Alternative A4, Water Resources, Downtown Akron and Exchange/East Market Segments

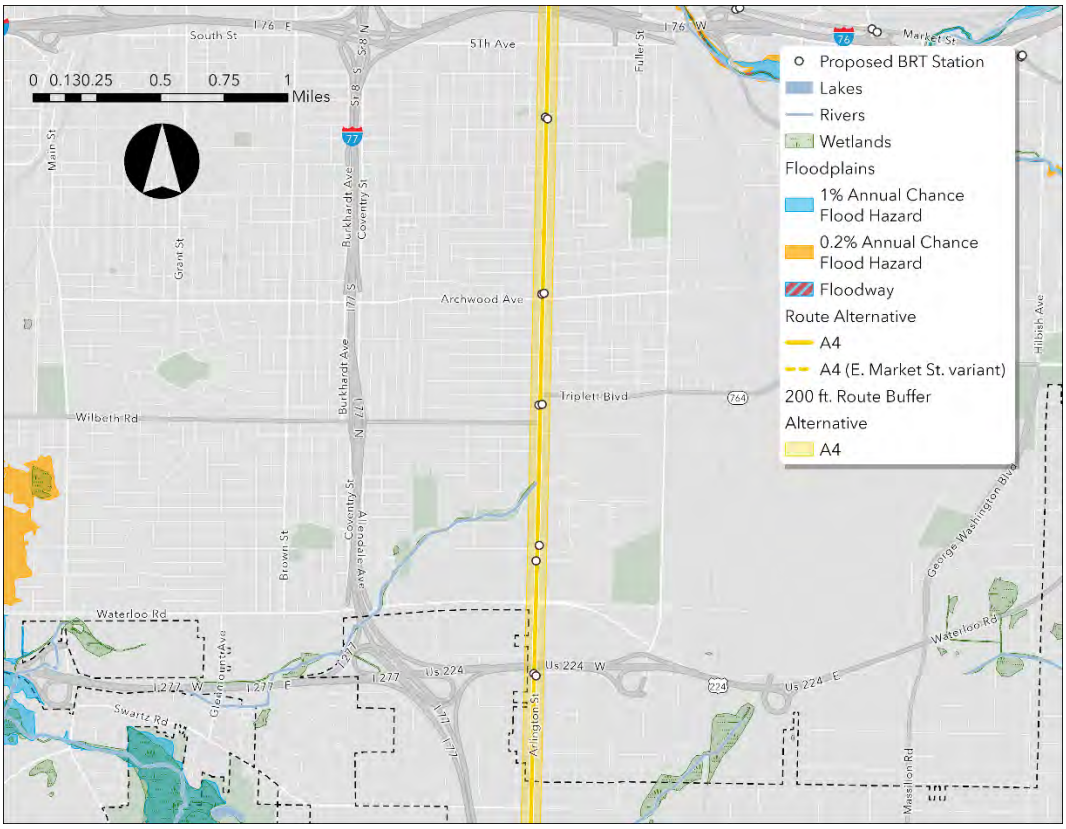


Figure 28 Alternative A4, Water Resources, Northern End of South Arlington Street Segment

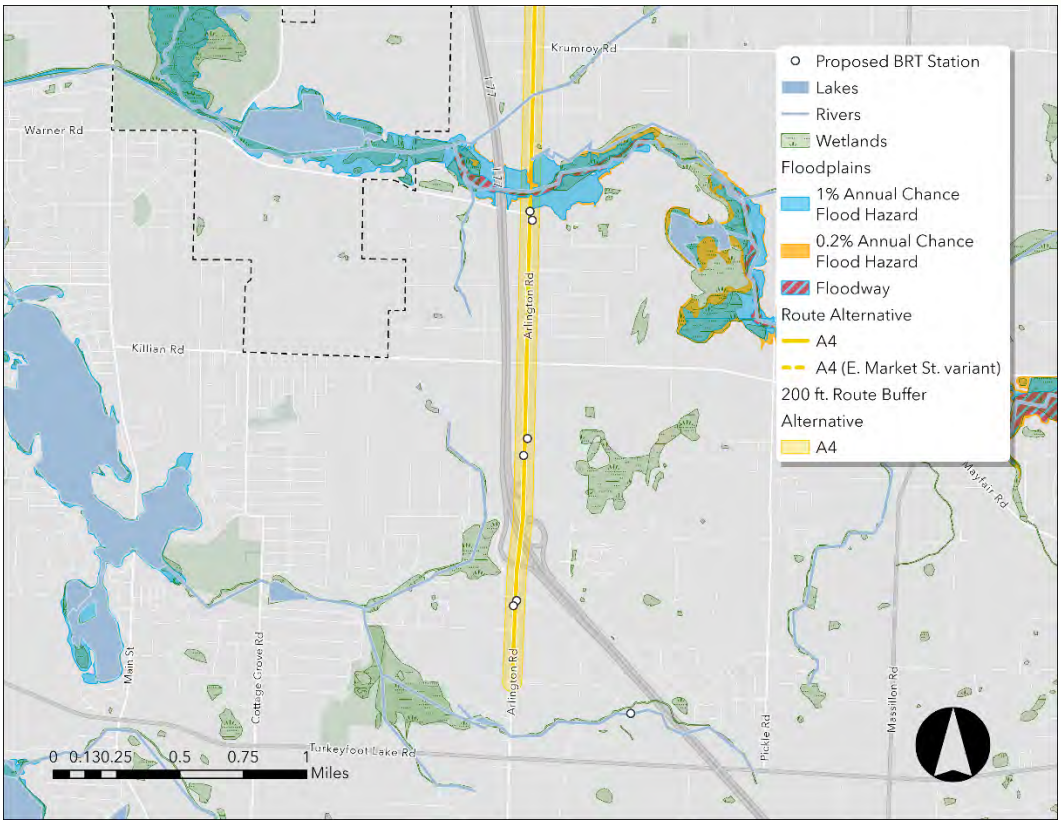


Figure 29 Alternative A4, Water Resources, Southern End of South Arlington Street Segment

SECTION 4(F) RESOURCES

The following proposed station areas for alternative A4 are within 200' of Section 4(f) resources:

- Westbound station on West Market at West North Street is adjacent to a small park (Shady Park). Station could be sited to avoid park impacts (Figure 31).

Figure 30 Alternative A4, Section 4(f) Resources, Western End of West Market Street Segment

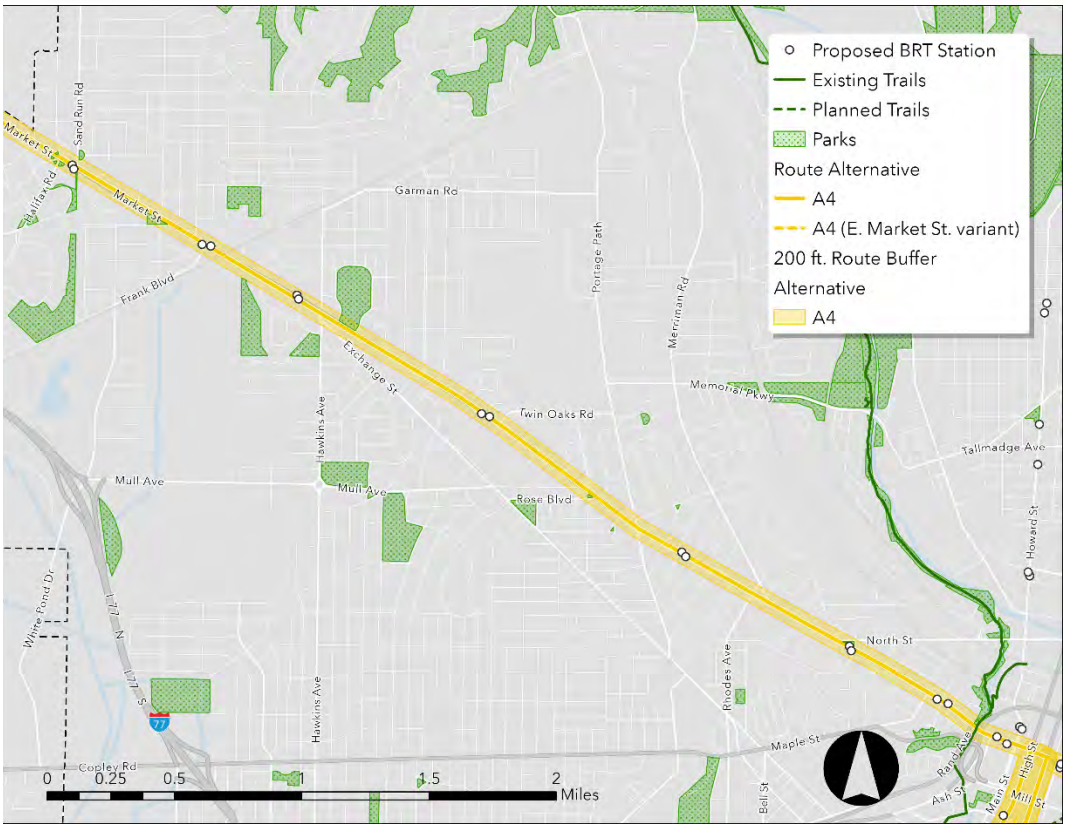


Figure 31 Alternative A4, Section 4(f) Resources, Eastern End of West Market Street Segment

Figure 32 Alternative A4, Section 4(f) Resources, Downtown Akron and Exchange/East Market Segments

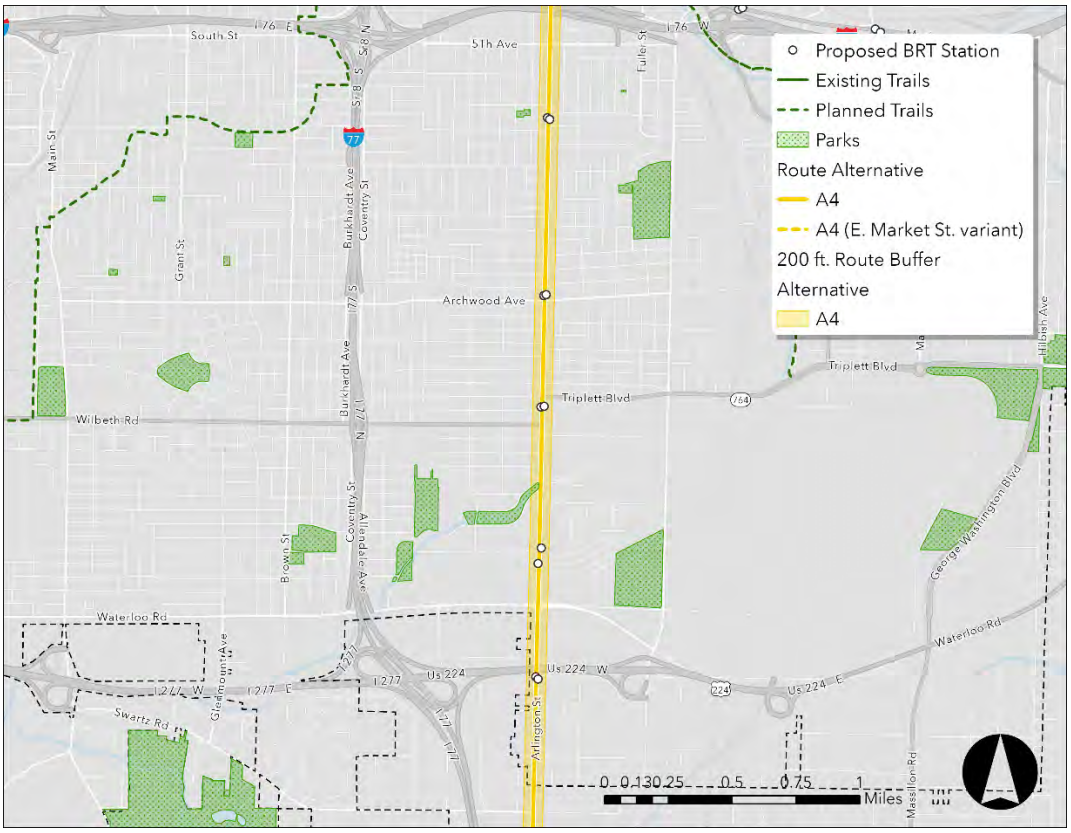


Figure 33 Alternative A4, Section 4(f) Resources, Northern End of South Arlington Street Segment

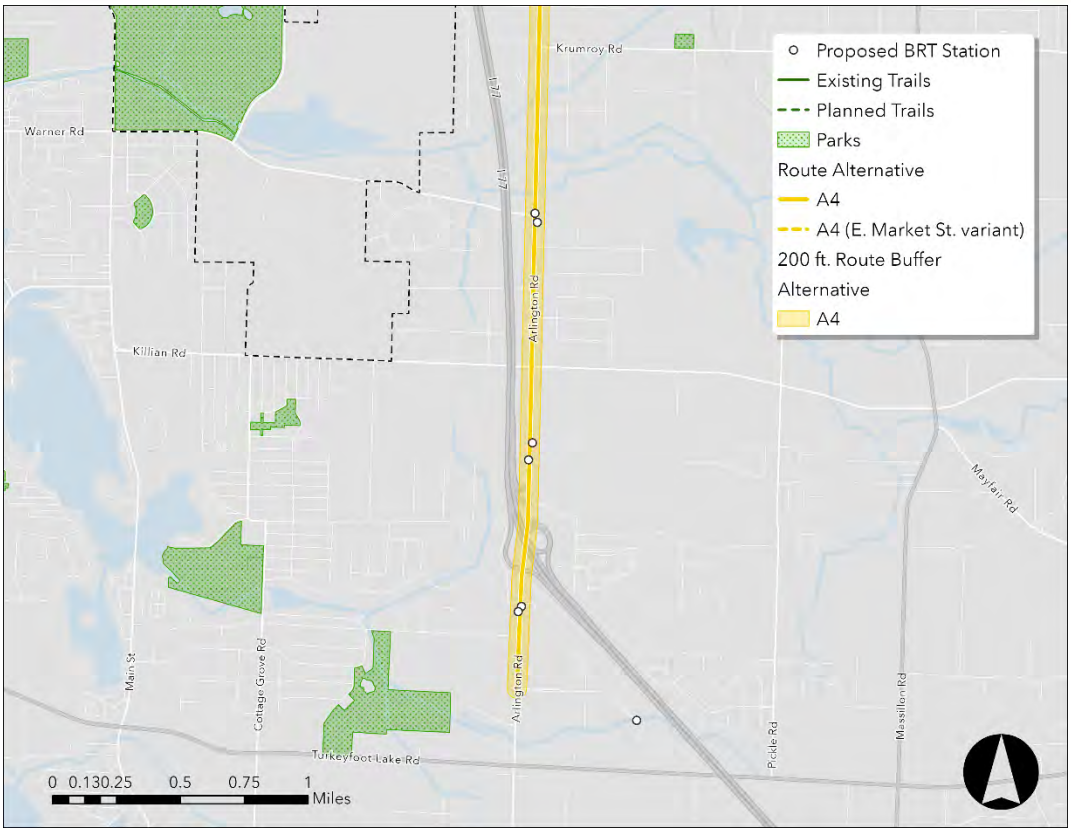


Figure 34 Alternative A4, Section 4(f) Resources, Southern End of South Arlington Street Segment

ALTERNATIVE B4

HISTORIC AND ARCHAEOLOGICAL RESOURCES

The following proposed station areas for alternative B4 are within 200' of historic resources. There are previously recorded archaeological sites along the B4 corridor; however, these sites are not within the station areas and likely would not be impacted by the project.

- **North Howard**
  - Station pair on North Main Street north of East Market Street is within the Main-Market Historic District (Figure 36).
- **Downtown Akron**
  - Station pair on High/Broadway between Exchange St and Cedar St is adjacent to Main-Exchange Historic District, which is on the National Register of Historic Places (Figure 37).
  - Southbound station on High St at Bowery St is adjacent to the South Main Street Historic District and one National Register listed property outside of that historic district (Figure 37).
- **East Market Street**
  - Station pair on East Market at Summit St is within Main-Market Historic District and in front of two National Register listed properties within that historic district (Figure 37).

Formal coordination with the Ohio SHPO will be required during the NEPA study to determine the level of potential impacts and mitigation required, if any.

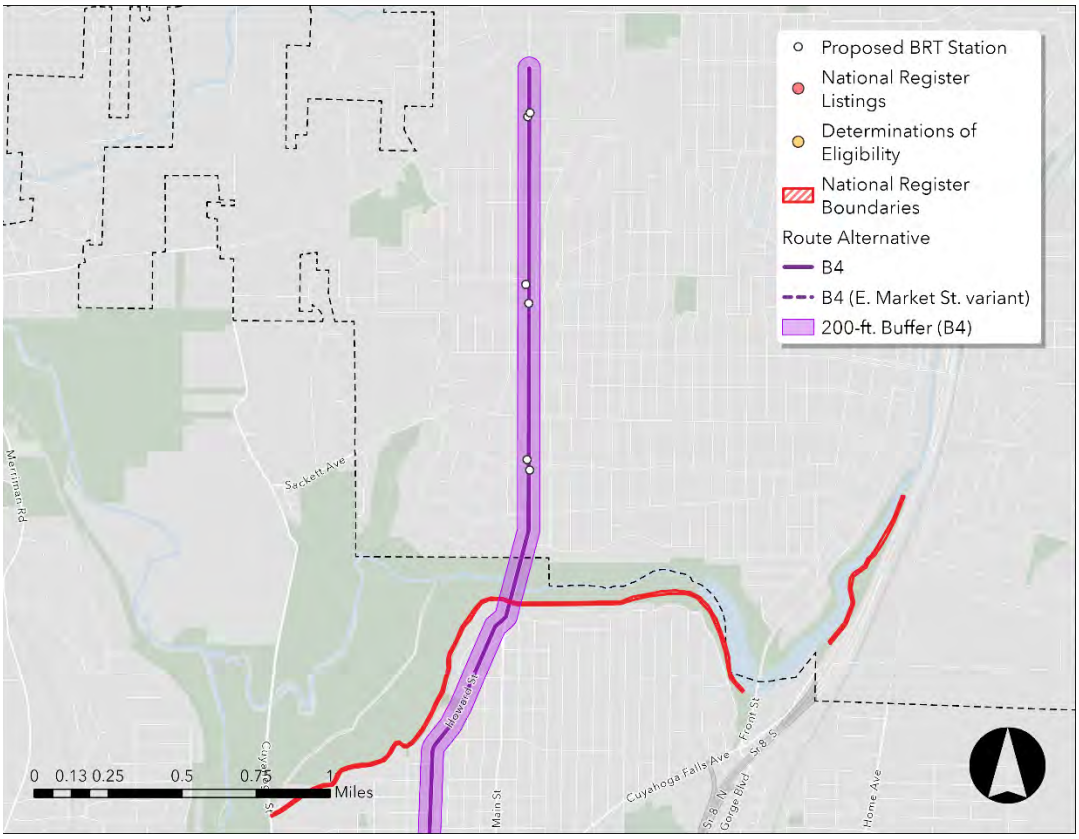


Figure 35 Alternative B4, Historic and Archaeological Resources, Northern End of State/North Howard Street Segment

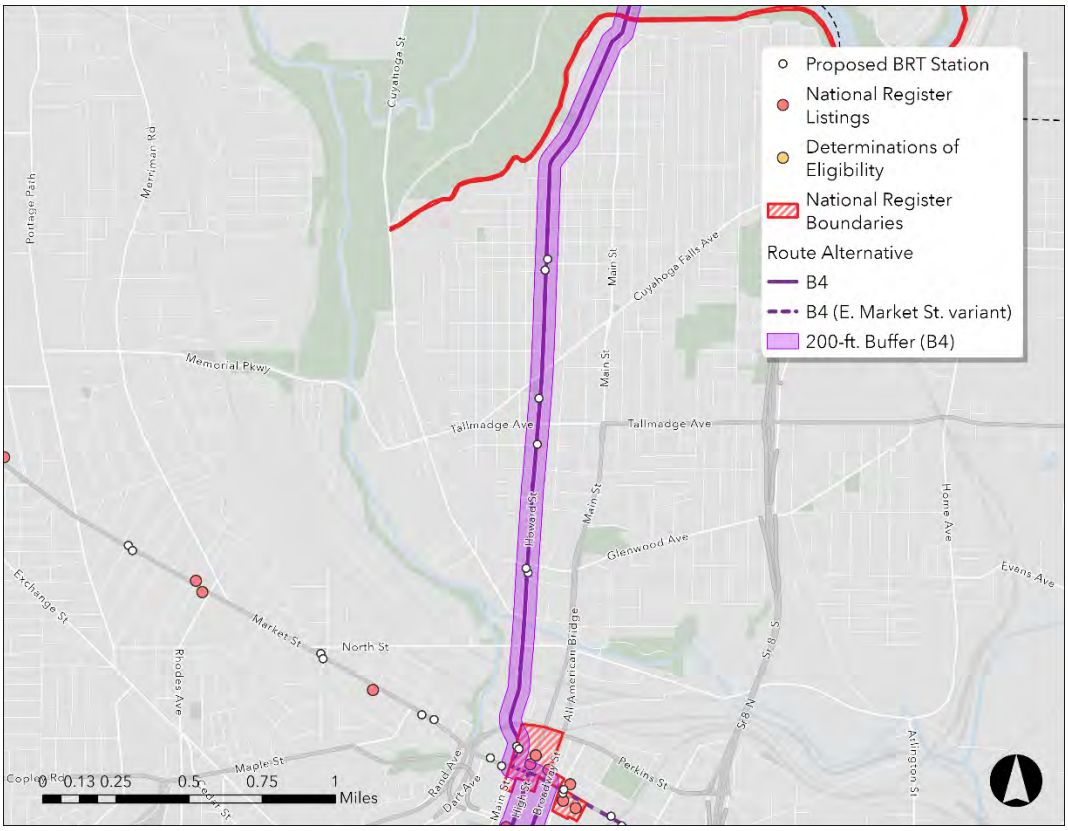


Figure 36 Alternative B4, Historic and Archaeological Resources, Southern End of State/North Howard Street Segment

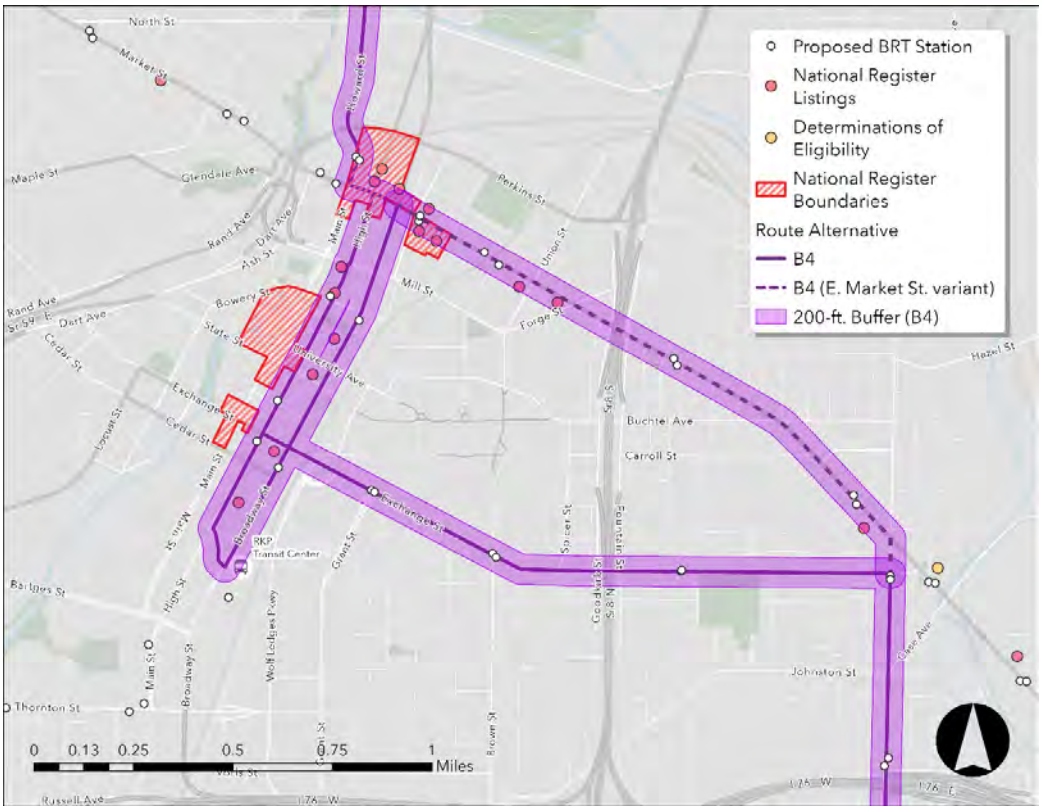


Figure 37 Alternative B4, Historic and Archaeological Resources, Downtown Akron and Exchange/East Market Segments

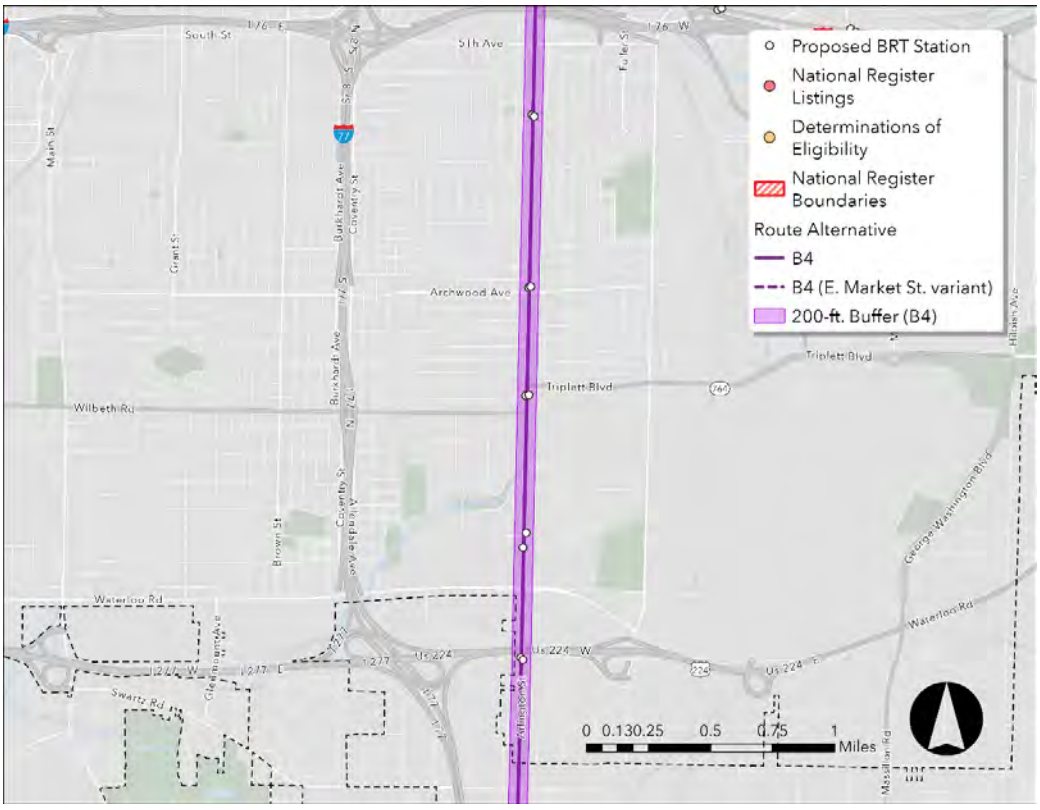


Figure 38 Alternative B4, Historic and Archaeological Resources, Northern End of South Arlington Street Segment

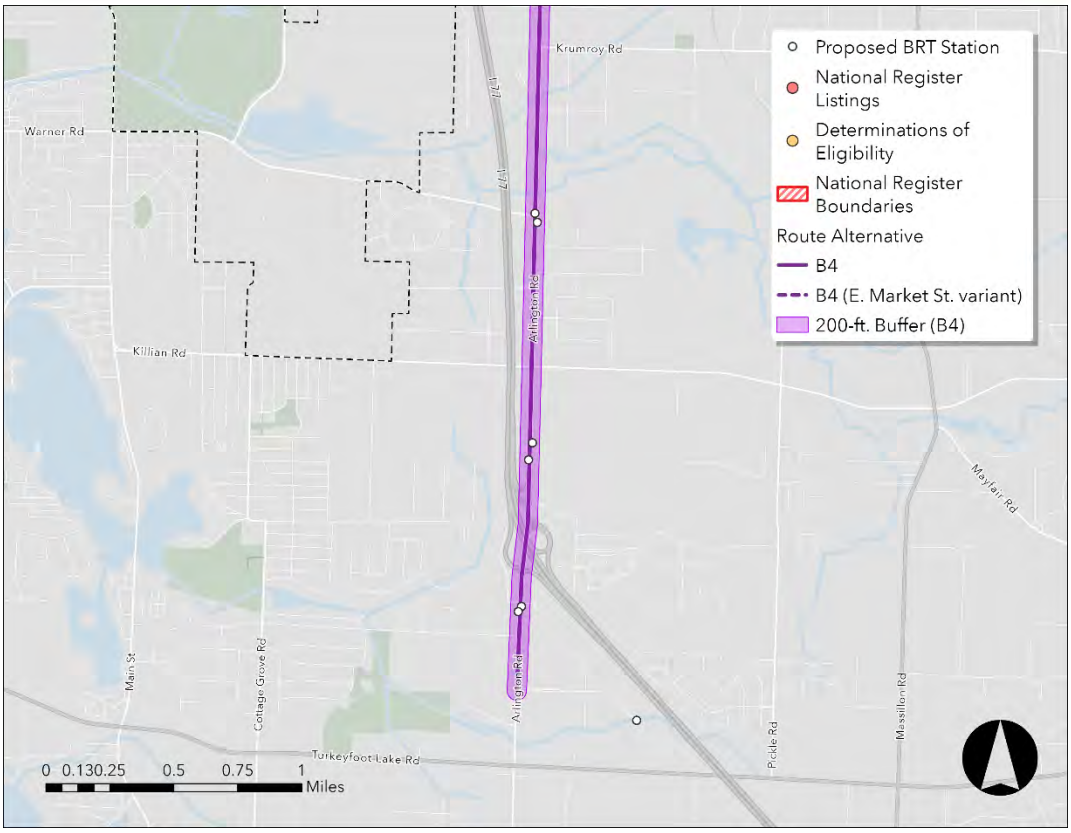


Figure 39 Alternative B4, Historic and Archaeological Resources, Southern End of South Arlington Street Segment

WATER RESOURCES

The following proposed station areas for alternative B4 are within 200' of water resources:

- Station pair on South Arlington St at Warner is in a 100-year floodplain, but there is existing development and sidewalks, and station could be sited to avoid water resource impacts (Figure 44).

Figure 40 Alternative B4, Water Resources, Northern End of State/North Howard Street Segment

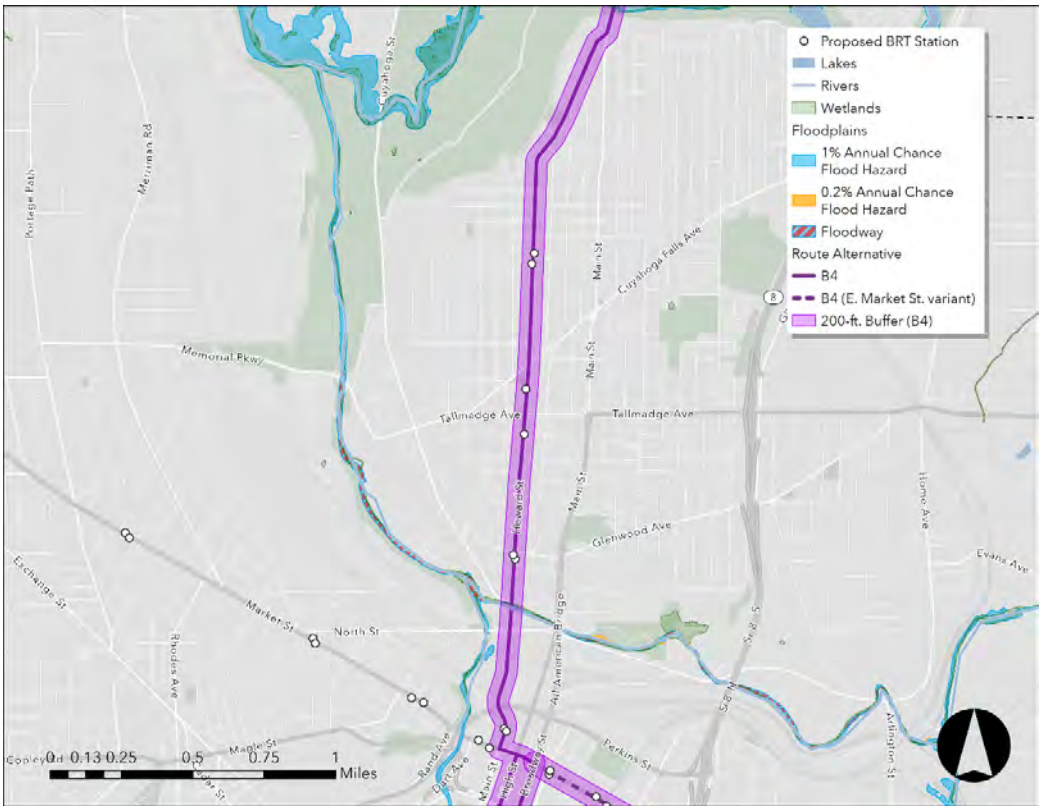


Figure 41 Alternative B4, Water Resources, Southern End of State/North Howard Street Segment

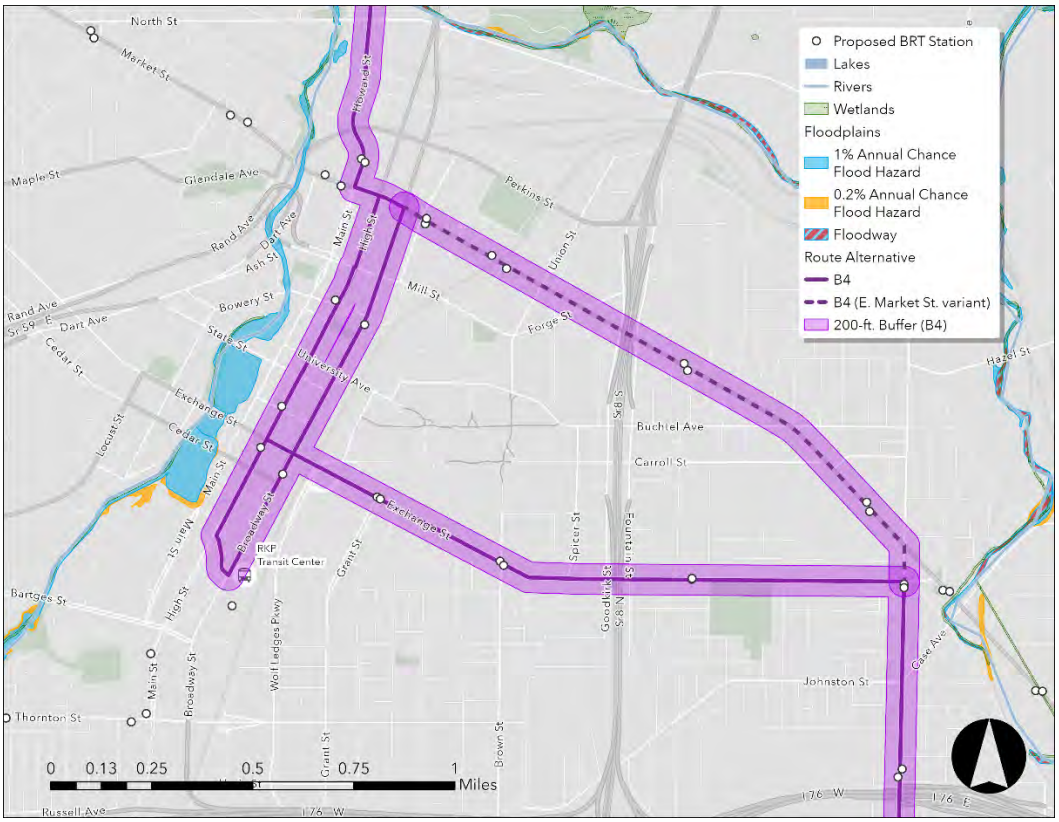


Figure 42 Alternative B4, Water Resources, Downtown Akron and Downtown Akron and Exchange/East Market Segments

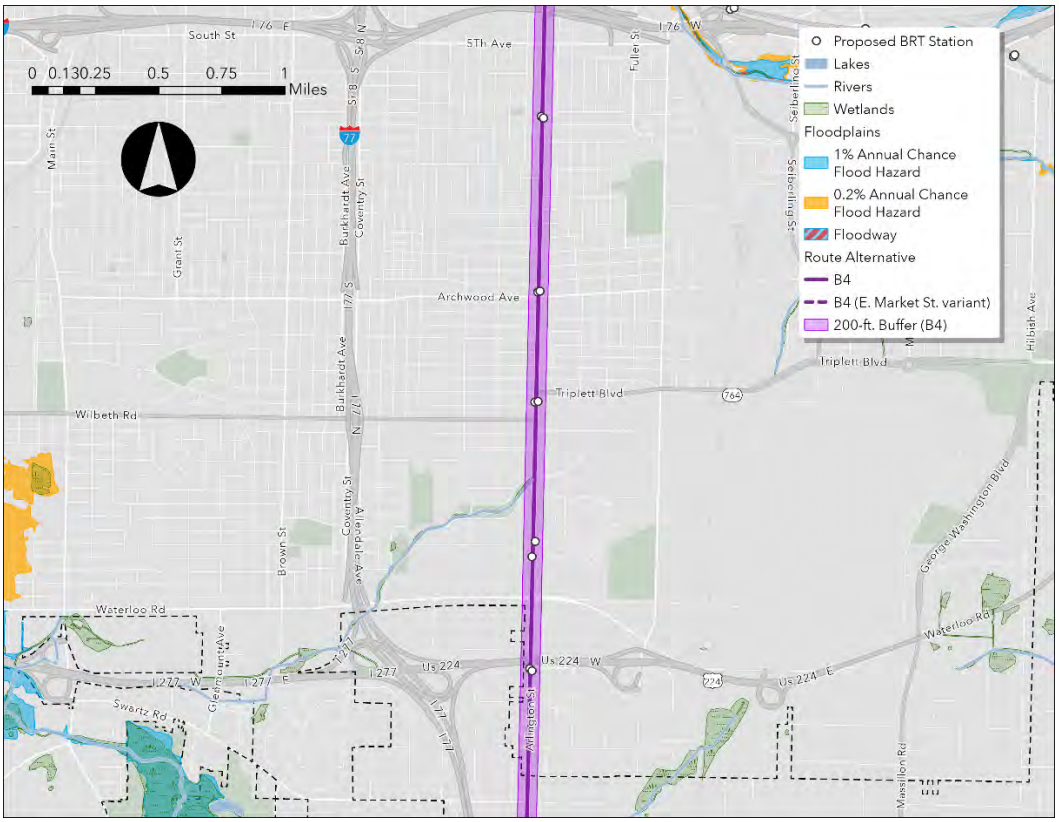


Figure 43 Alternative B4, Water Resources, Northern End of South Arlington Street Segment

Figure 44 Alternative B4, Water Resources, Southern End of South Arlington Street Segment

SECTION 4(F) RESOURCES

The following proposed station areas for alternative B4 are within 200' of Section 4(f) resources:

- Southbound station on North Howard St at Cuyahoga Falls Ave is adjacent to a small park (McLain Park) Station could be sited to avoid park impacts (Figure 46).

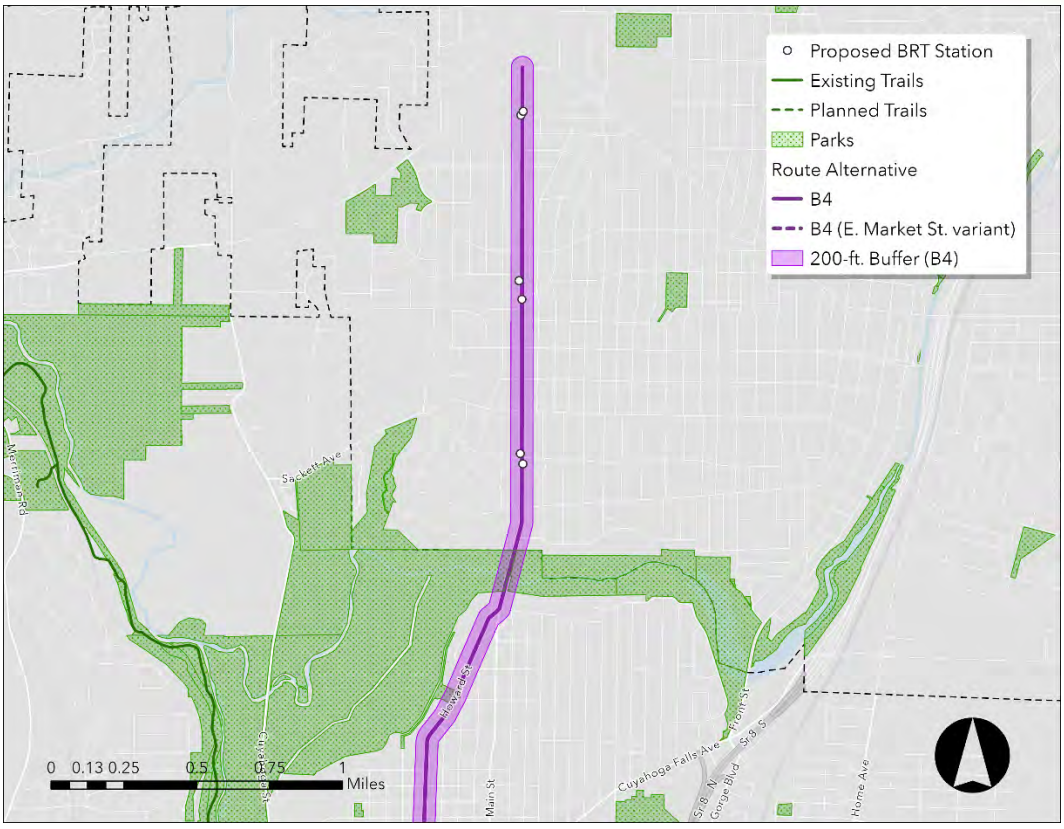


Figure 45 Alternative B4, Section 4(f) Resources, Northern End of State/North Howard Street Segment

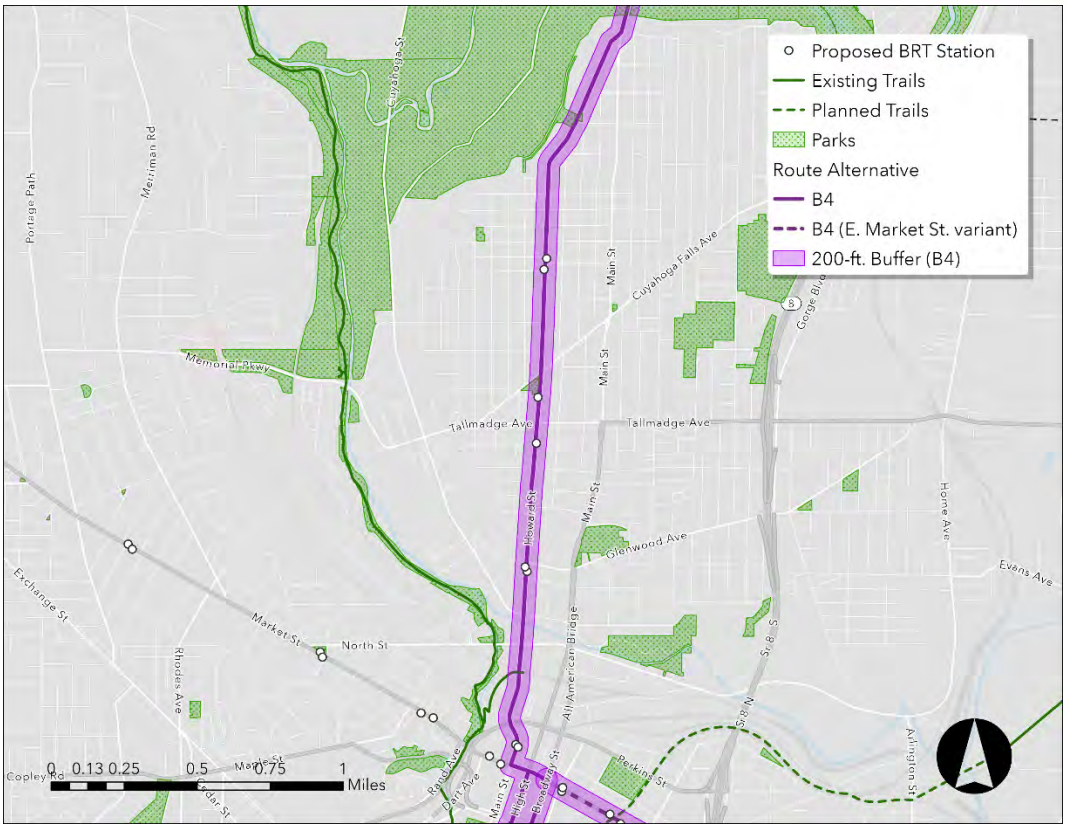


Figure 46 Alternative B4, Section 4(f) Resources, Southern End of State/North Howard Street Segment

Figure 47 Alternative B4, Section 4(f) Resources, Downtown Akron and Downtown Akron and Exchange/East Market Segments

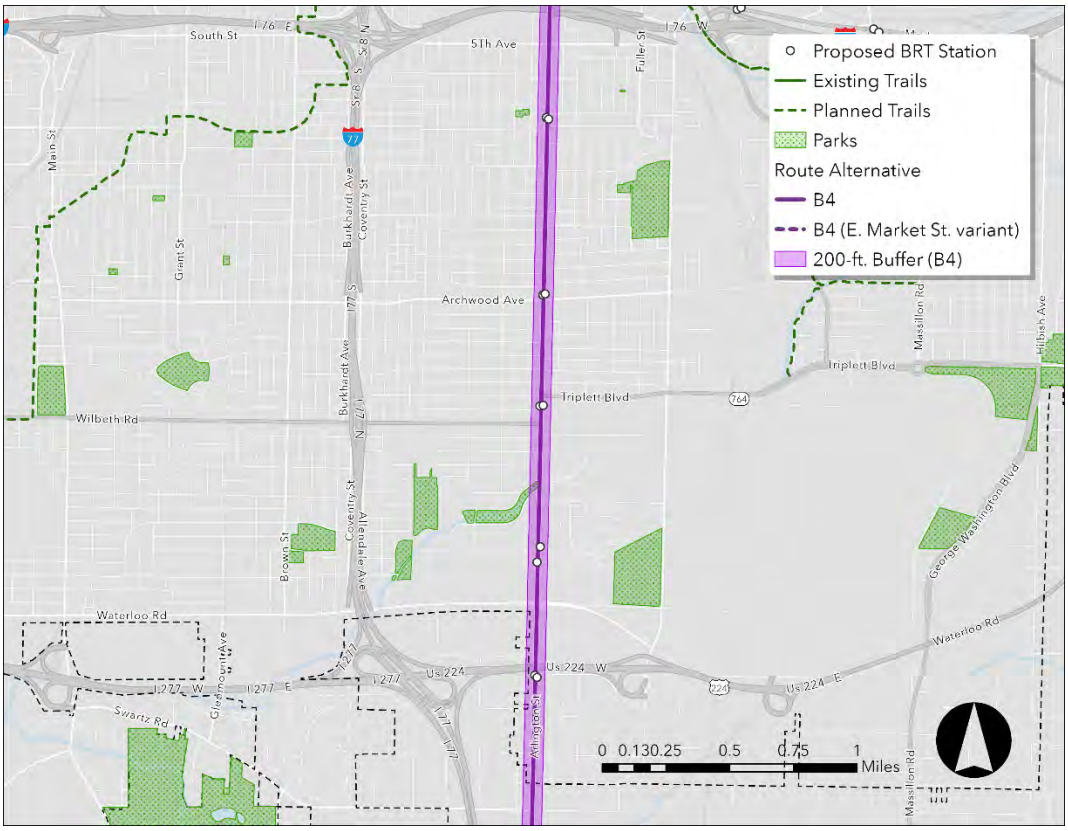


Figure 48 Alternative B4, Section 4(f) Resources, Northern End of South Arlington Street Segment

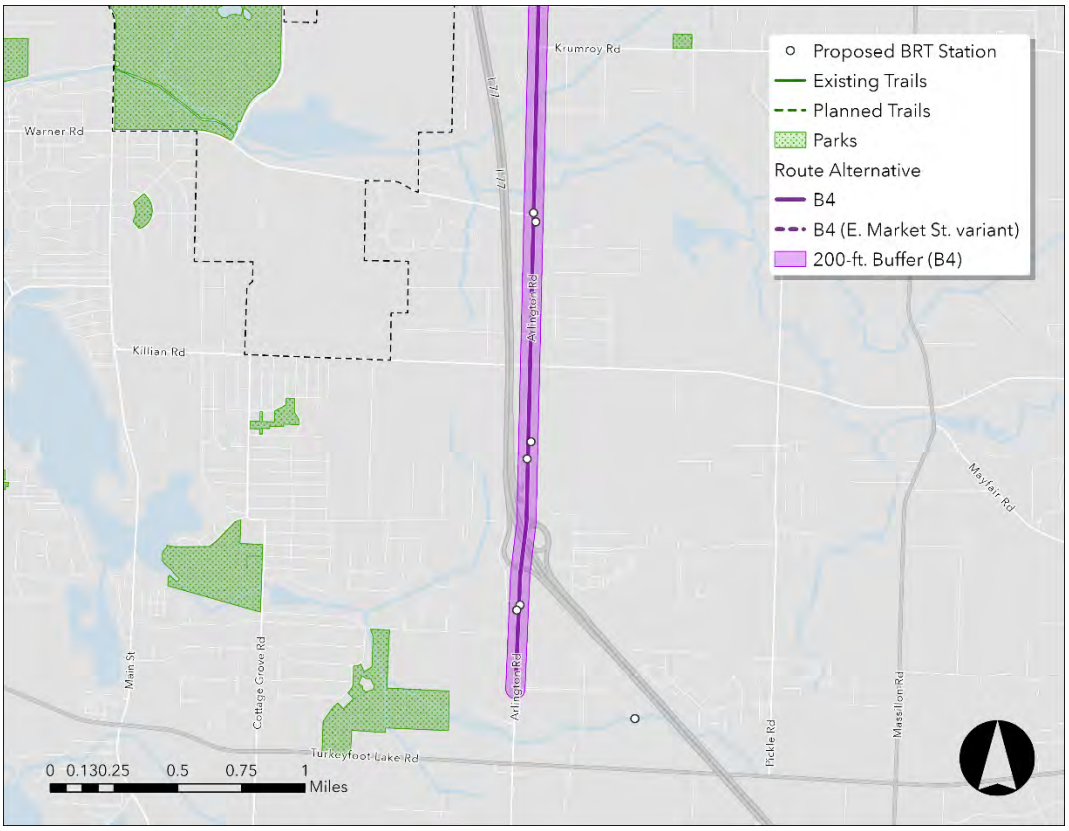


Figure 49 Alternative B4, Section 4(f) Resources, Southern End of South Arlington Street Segment

ALTERNATIVE C4

HISTORIC AND ARCHAEOLOGICAL RESOURCES

The following proposed station areas for alternative C4 are within 200' of historic resources. There are previously recorded archaeological sites along the C4 corridor; however, these sites are not within the station areas and likely would not be impacted by the project.

- **West Market**
  - Station pair on West Market St between Dart St and Main St is adjacent to the Main-Market Historic District, which is on the National Register of Historic Places (Figure 51).
- **Downtown Akron**
  - Station pair on High/Broadway between Exchange St and Cedar St is adjacent to Main-Exchange Historic District, which is on the National Register of Historic Places (Figure 52).
  - Southbound station on High St at Bowery St is adjacent to the South Main Street Historic District and one National Register listed property outside of that historic district (Figure 52).
- **Lake Shore/Kenmore Blvd/Wooster Rd**
  - Station pair on Thornton St between Main St and Coburn St is adjacent to a National Register eligible property (Figure 53).
  - Station pair on Kenmore Blvd at 13th St SW is within the National Register listed Kenmore Boulevard Historic District (Figure 53).

- Station pair on 2nd St SE between Tuscarawas Ave W and Park Ave W is in the National Register listed Barberton Downtown Historic District (Figure 54).

Formal coordination with the Ohio SHPO will be required during the NEPA study to determine the level of potential impacts and mitigation required, if any.

Figure 50 Alternative C4, Historic and Archaeological Resources, Western End of West Market Street Segment

Figure 51 Alternative C4, Historic and Archaeological Resources, Eastern End of West Market Street Segment

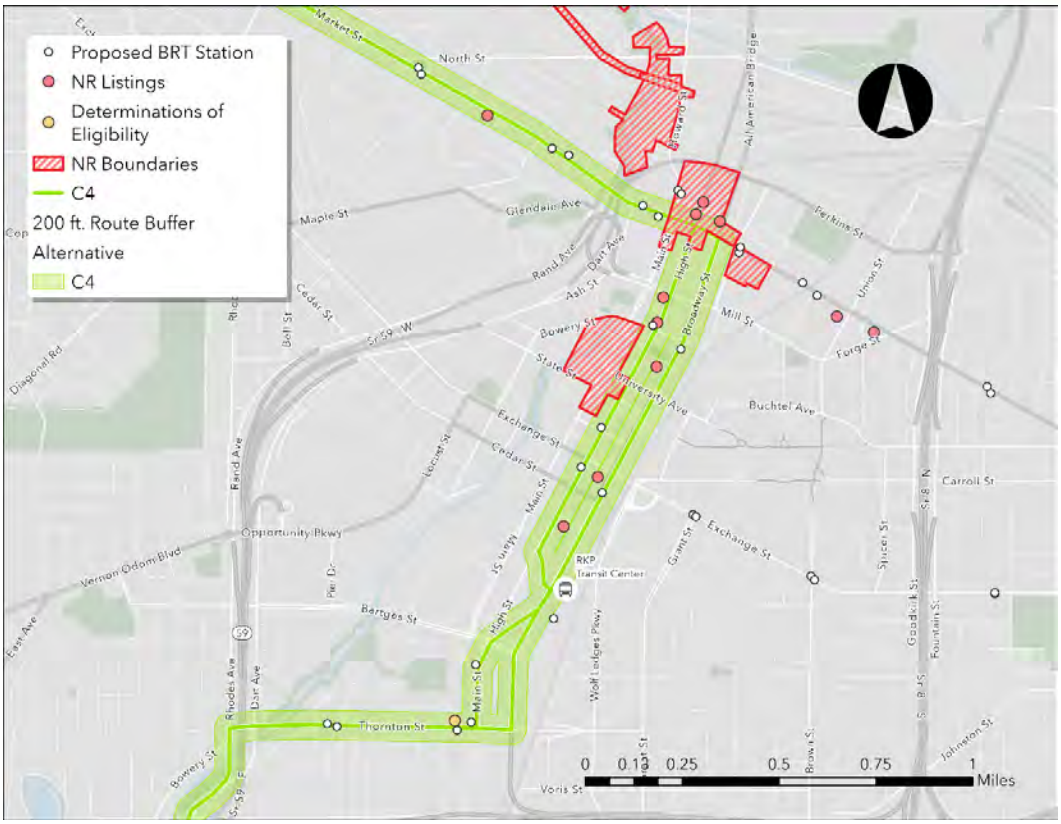


Figure 52 Alternative C4, Historic and Archaeological Resources, Downtown Akron

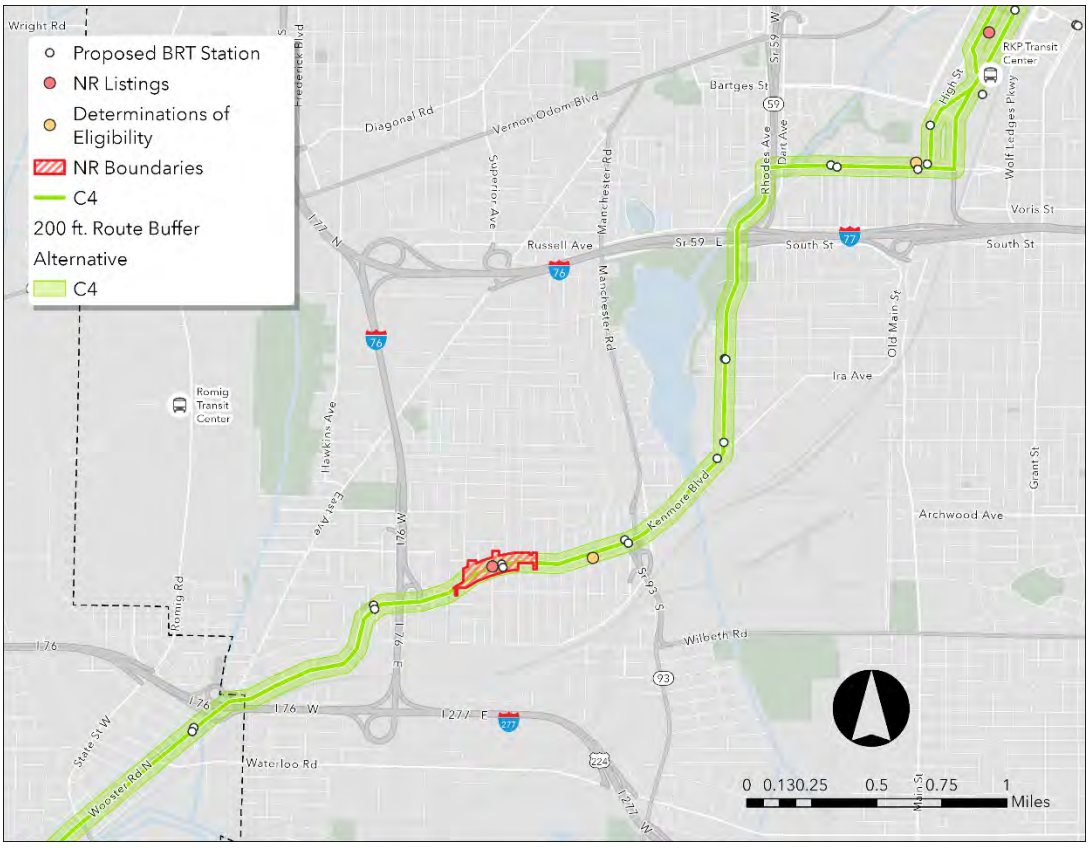


Figure 53 Alternative C4, Historic and Archaeological Resources, Eastern End of Lake Shore/Kenmore/Wooster Segment

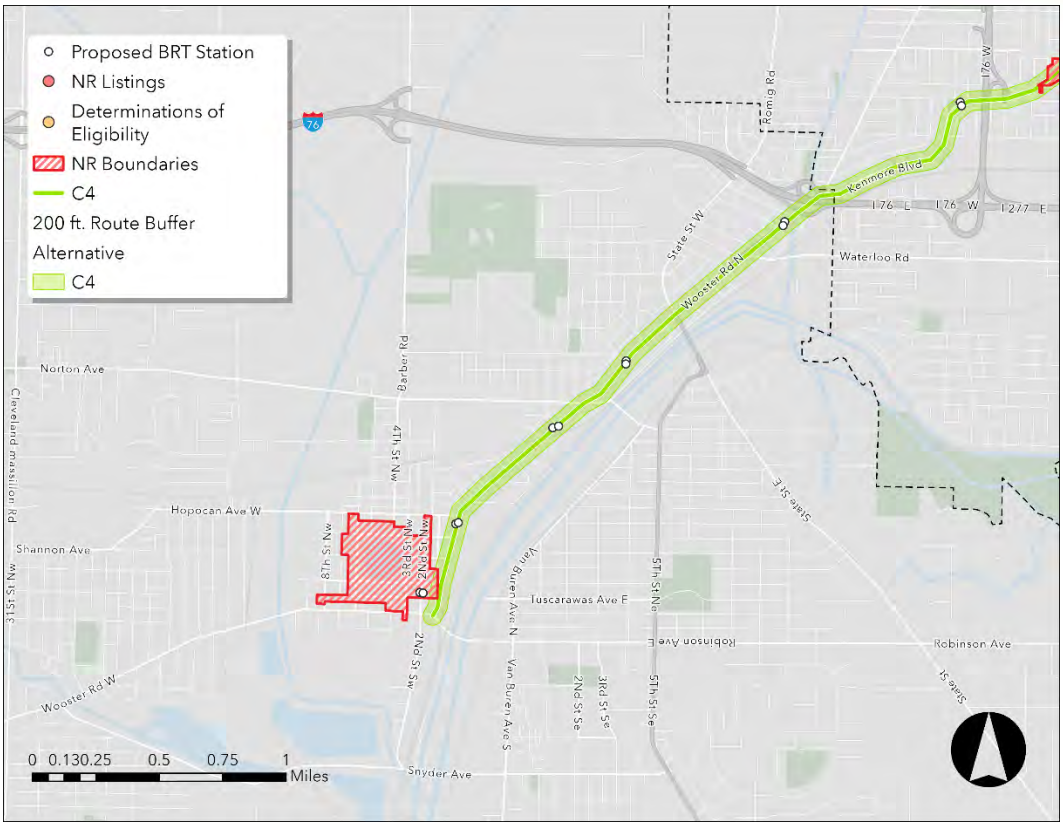


Figure 54 Alternative C4, Historic and Archaeological Resources, Western End of Lake Shore/Kenmore/Wooster Segment

WATER RESOURCES

The following proposed station areas for alternative C4 are within 200' of water resources:

- Station pair on Wooster Rd at I-76 is in a 100-year floodplain, but there is existing development and sidewalks, and station could be sited to avoid floodplain impacts (Figure 59).

Figure 55 Alternative C4, Water Resources, Western End of West Market Street Segment

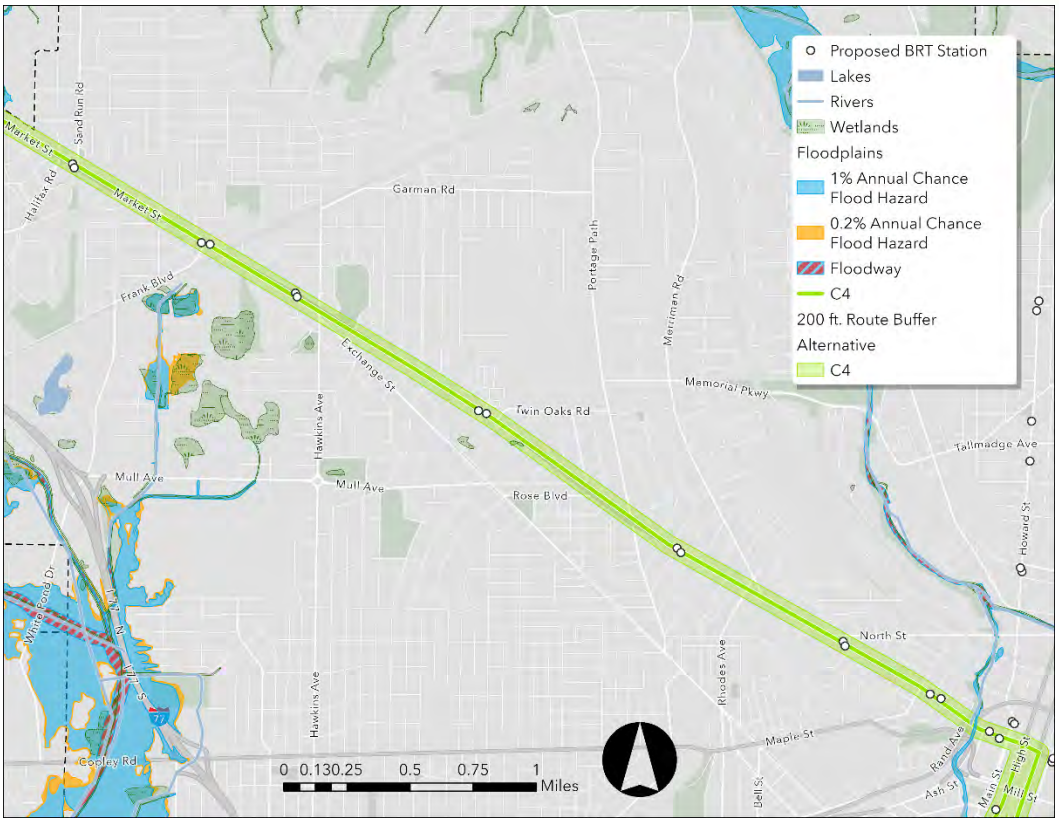


Figure 56 Alternative C4, Water Resources, Eastern End of West Market Street Segment

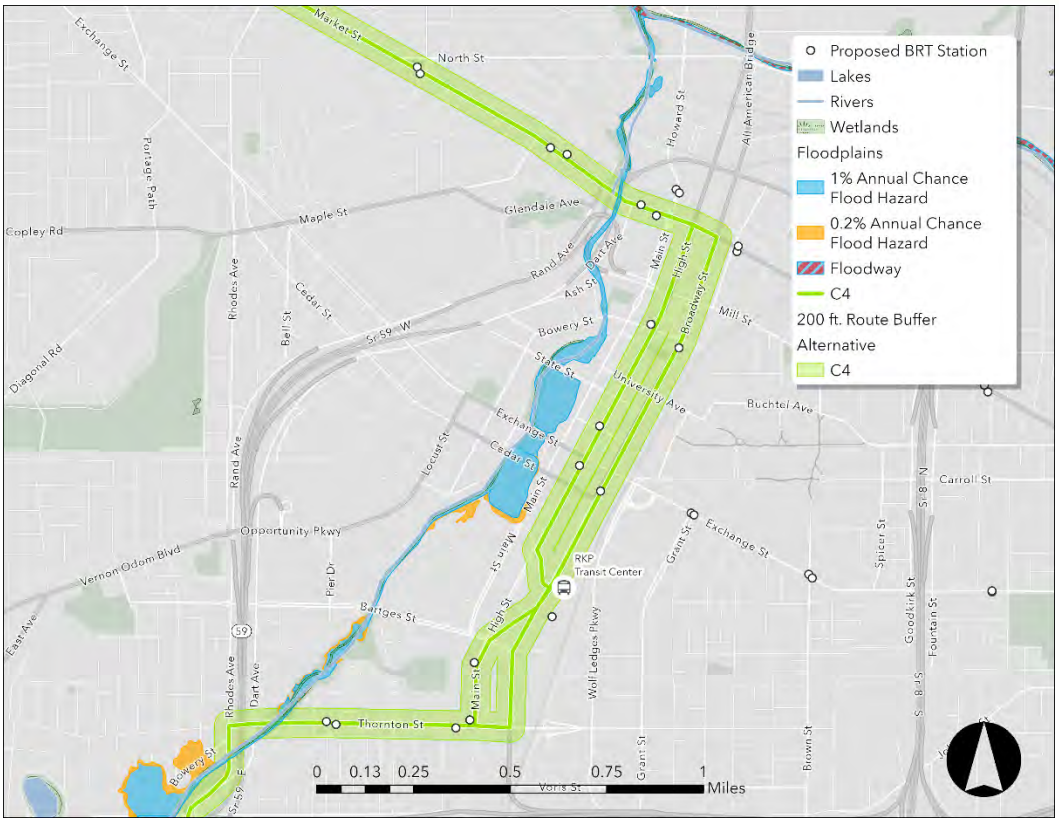


Figure 57 Alternative C4, Water Resources, Downtown Akron

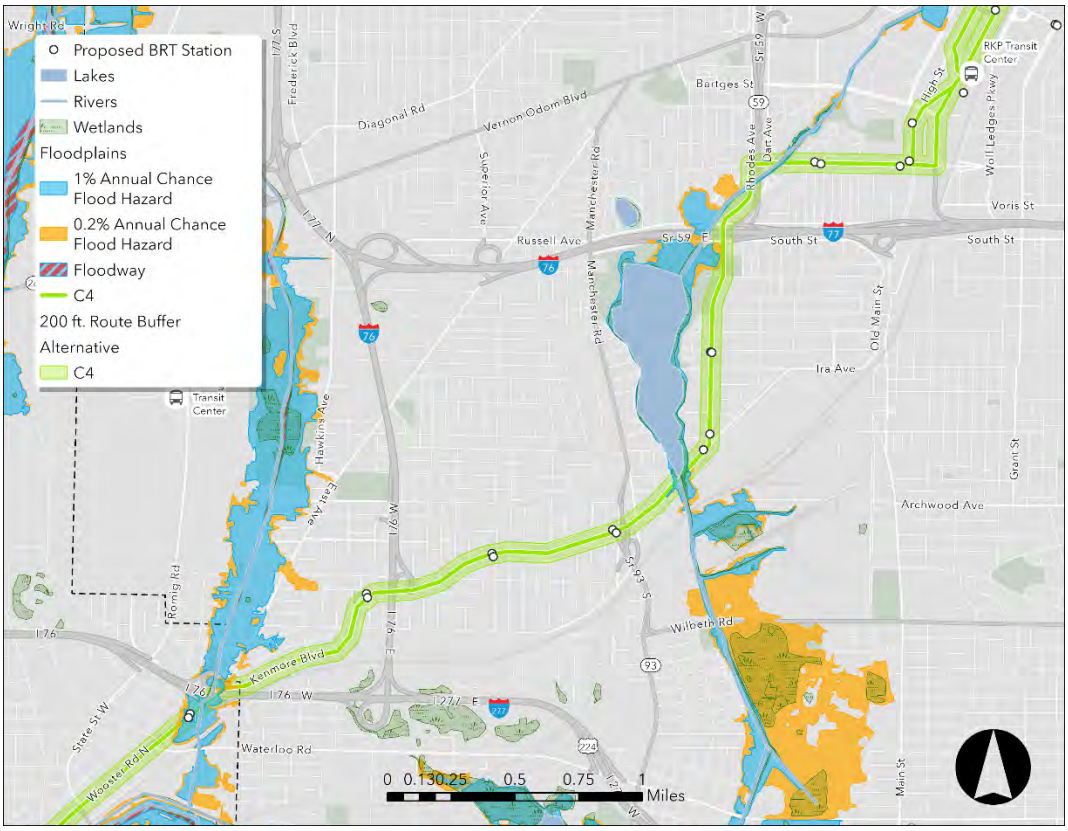


Figure 58 Alternative C4, Water Resources, Eastern End of Lake Shore/Kenmore/Wooster Segment

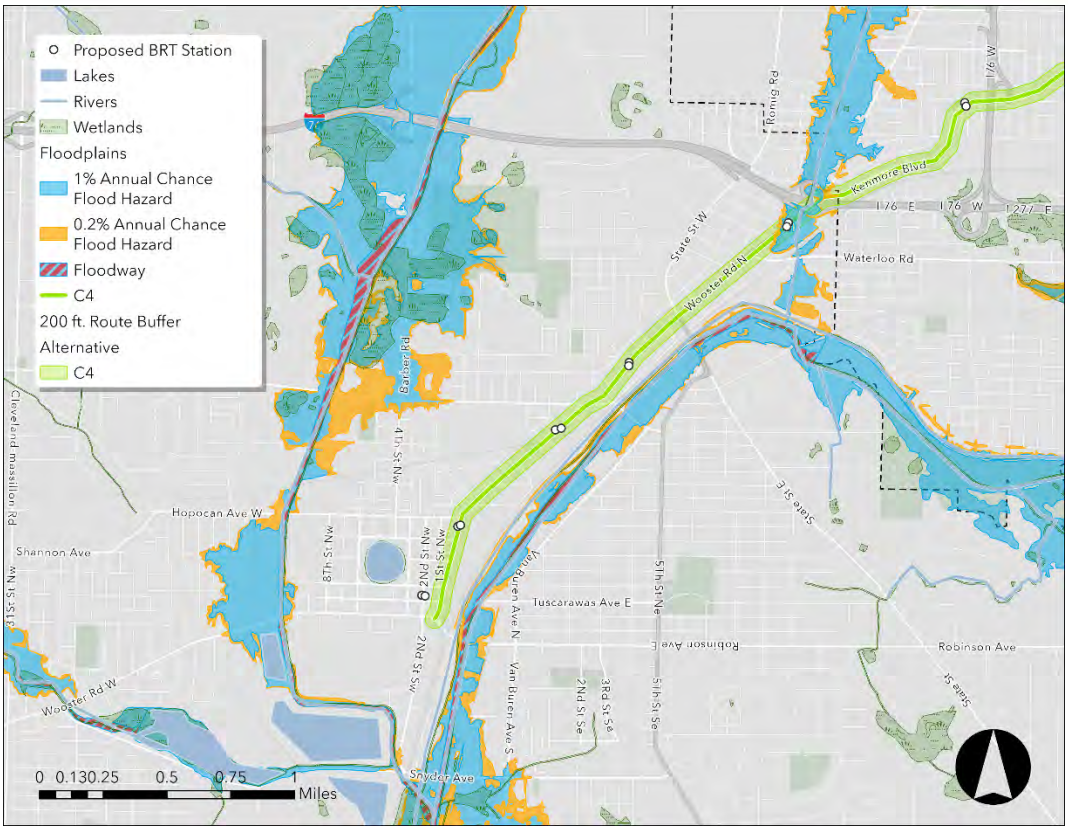


Figure 59 Alternative C4, Water Resources, Western End of Lake Shore/Kenmore/Wooster Segment

SECTION 4(F) RESOURCES

The following proposed station areas for alternative C4 are within 200' of Section 4(f) resources:

- Westbound station on West Market at West North Street is adjacent to a small park (Shady Park). Station could be sited to avoid park impacts (Figure 61).
- Southbound station on Kenmore Blvd at 22nd St SW is adjacent to a small park (Shadyside Park). Station could be sited to avoid park impacts (Figure 63).

Figure 60 Alternative C4, Section 4(f) Resources, Western End of West Market Street Segment

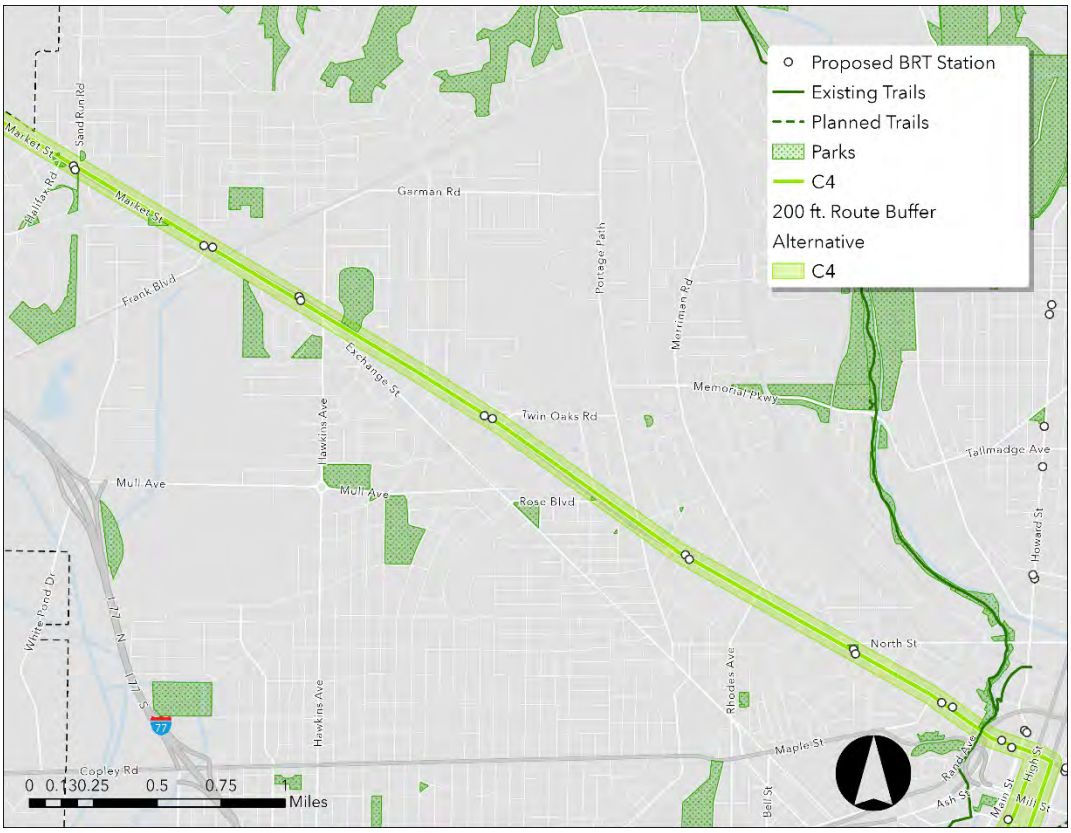


Figure 61 Alternative C4, Section 4(f) Resources, Eastern End of West Market Street Segment

Figure 62 Alternative C4, Section 4(f) Resources, Downtown Akron

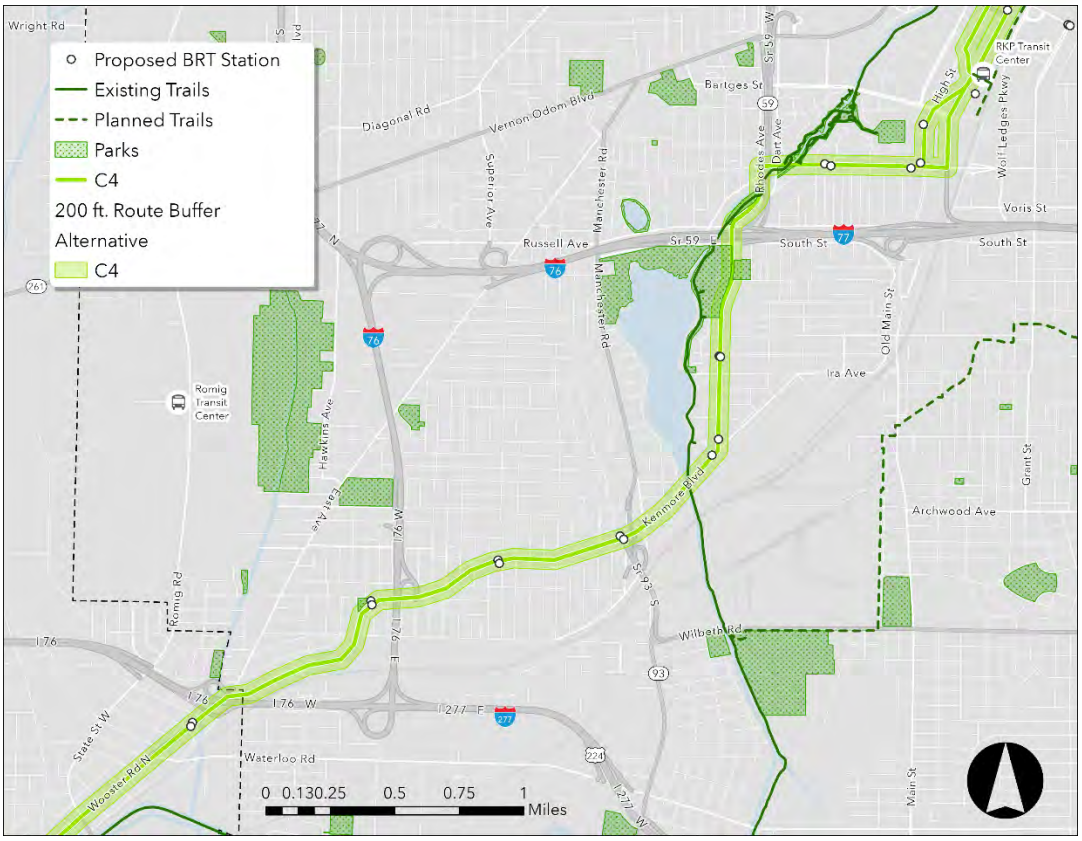


Figure 63 Alternative C4, Section 4(f) Resources, Eastern End of Lake Shore/Kenmore/Wooster Segment

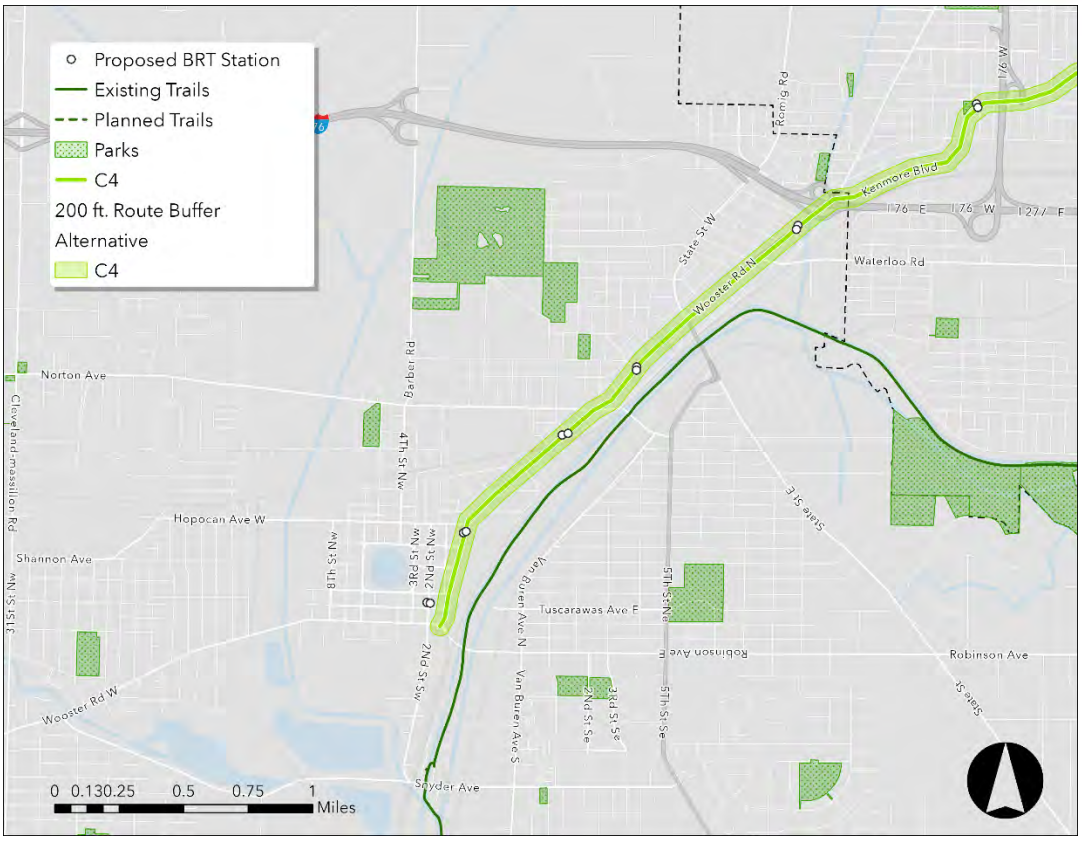


Figure 64 Alternative C4, Section 4(f) Resources, Western End of Lake Shore/Kenmore/Wooster Segment

ALTERNATIVE C6

HISTORIC AND ARCHAEOLOGICAL RESOURCES

The following proposed station areas for alternative C6 are within 200' of historic resources. There are previously recorded archaeological sites along the C6 corridor; however, these sites are not within the station areas and likely would not be impacted by the project.

- **Lake Shore/Kenmore Blvd/Wooster Rd**
  - Station pair on Thornton St between Main St and Coburn St is adjacent to a National Register eligible property (Figure 66).
  - Station pair on Kenmore Blvd at 13th St SW is within the National Register listed Kenmore Boulevard Historic District (Figure 66).
  - Station pair on 2nd St SE between Tuscarawas Ave W and Park Ave W is in the National Register listed Barberton Downtown Historic District (Figure 65).
- **Downtown Akron**
  - Station pair on High/Broadway between Exchange St and Cedar St is adjacent to Main-Exchange Historic District, which is on the National Register of Historic Places (Figure 67).
  - Southbound station on High St at Bowery St is adjacent to the South Main Street Historic District and one National Register listed property outside of that historic district (Figure 67).

Formal coordination with the Ohio SHPO will be required during the NEPA study to determine the level of potential impacts and mitigation required, if any.

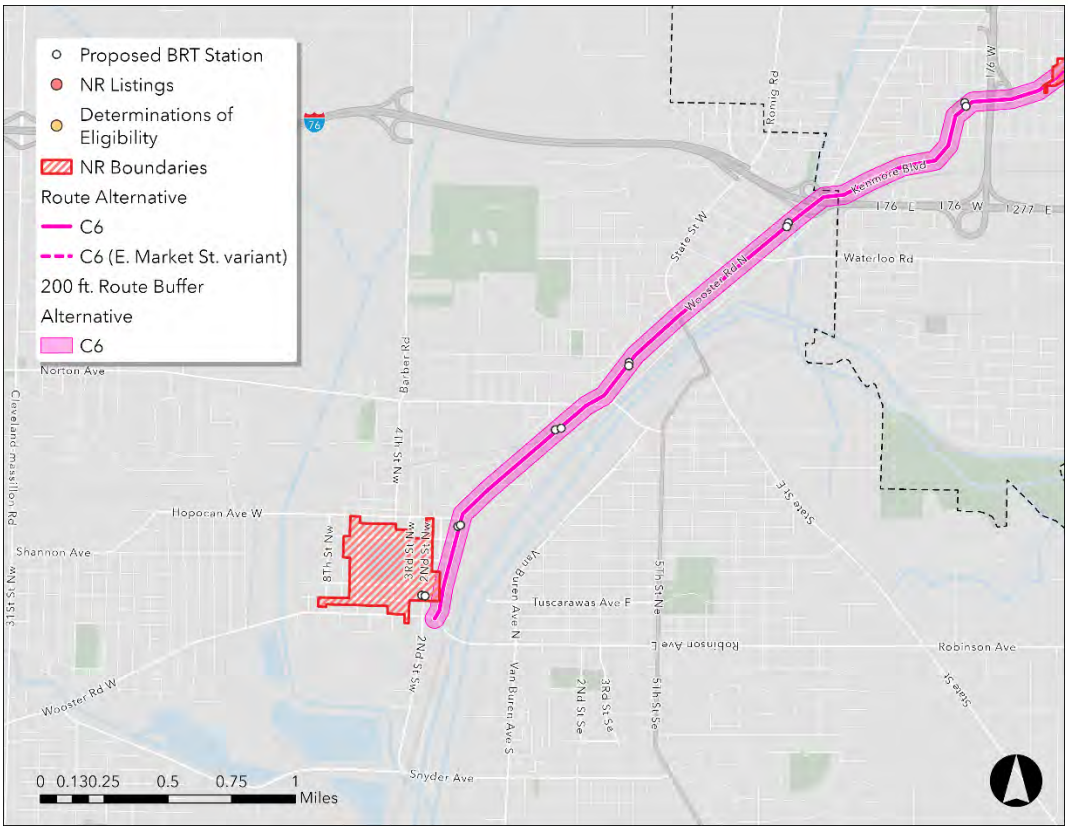


Figure 65 Alternative C6, Historic and Archaeological Resources, Western End of Lake Shore/Kenmore/Wooster Segment

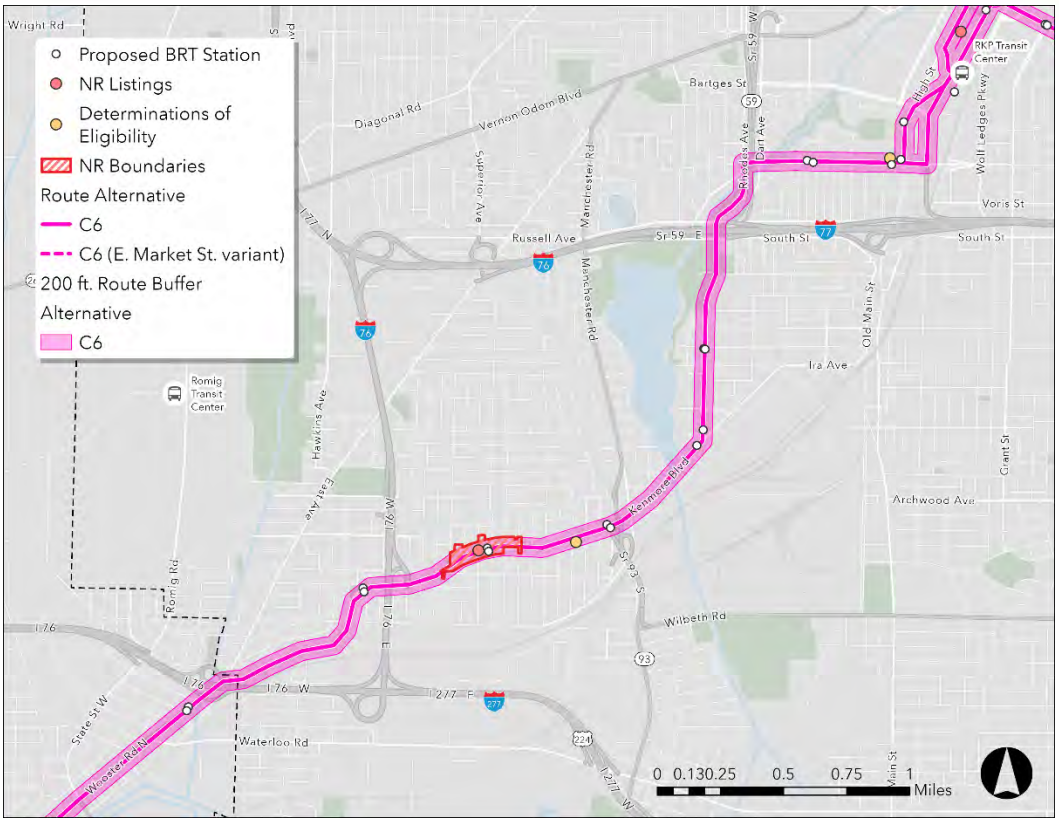


Figure 66 Alternative C6, Historic and Archaeological Resources, Eastern End of Lake Shore/Kenmore/Wooster Segment

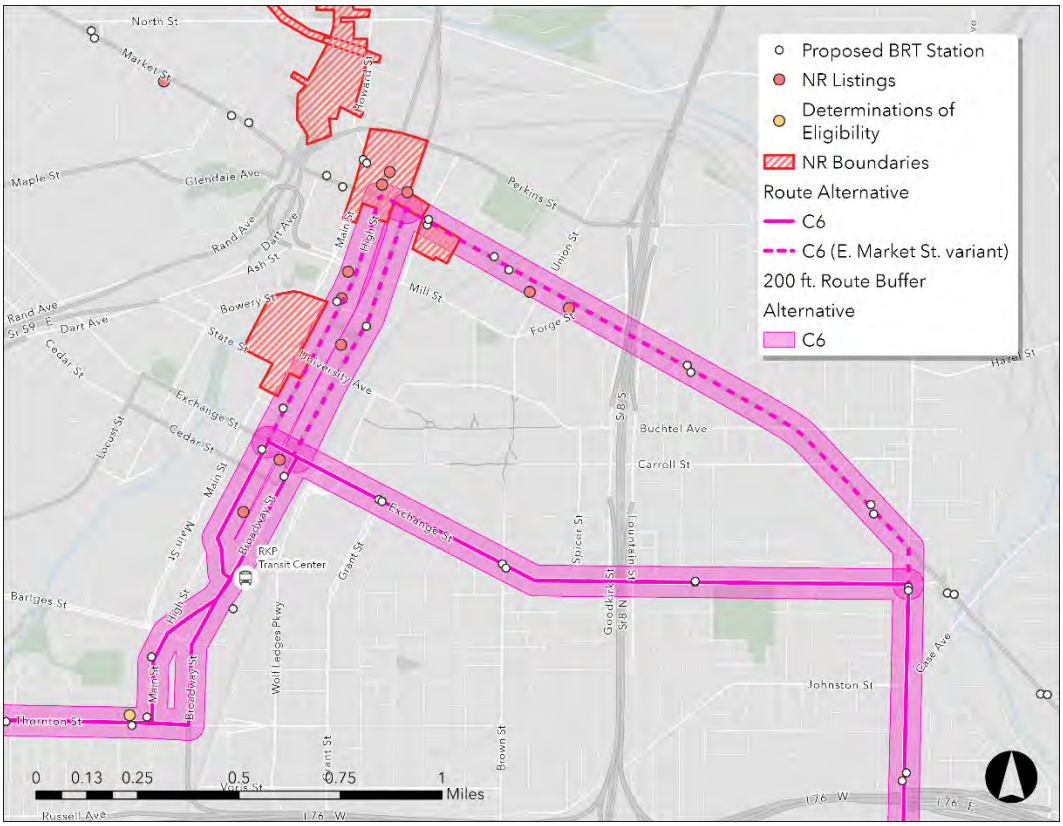


Figure 67 Alternative C6, Historic and Archaeological Resources, Downtown Akron and Exchange/East Market Segments

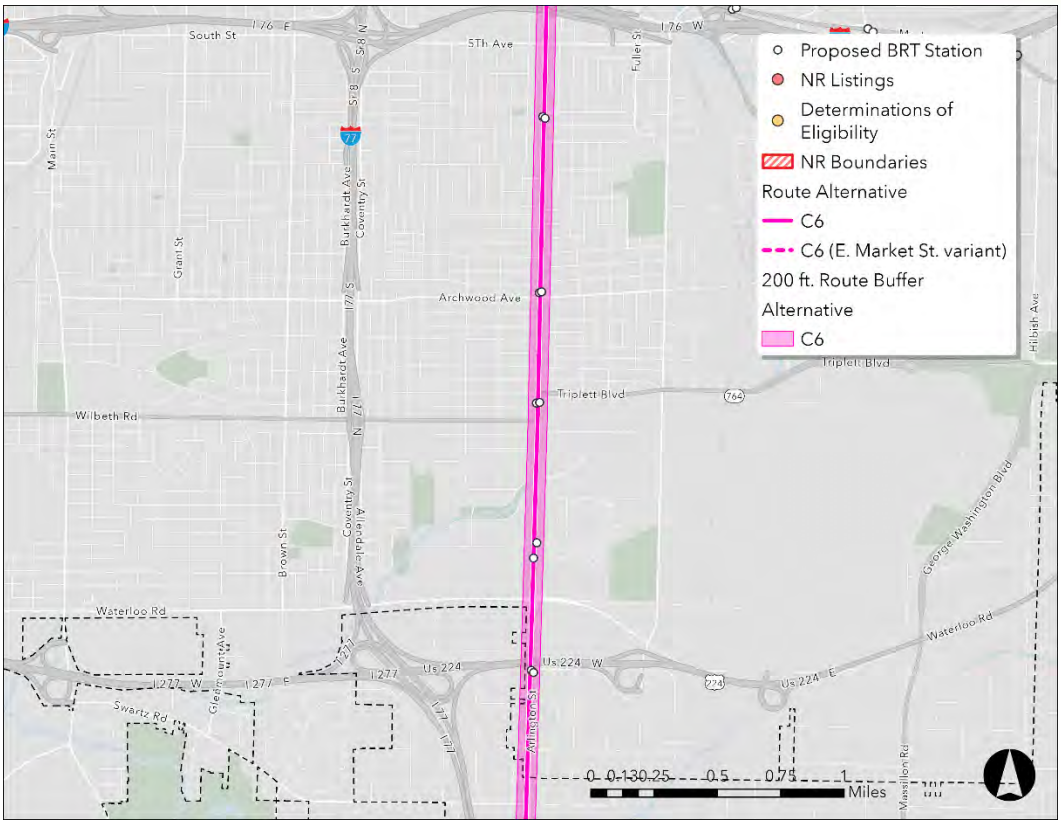


Figure 68 Alternative C6, Historic and Archaeological Resources, Northern End of South Arlington Street Segment

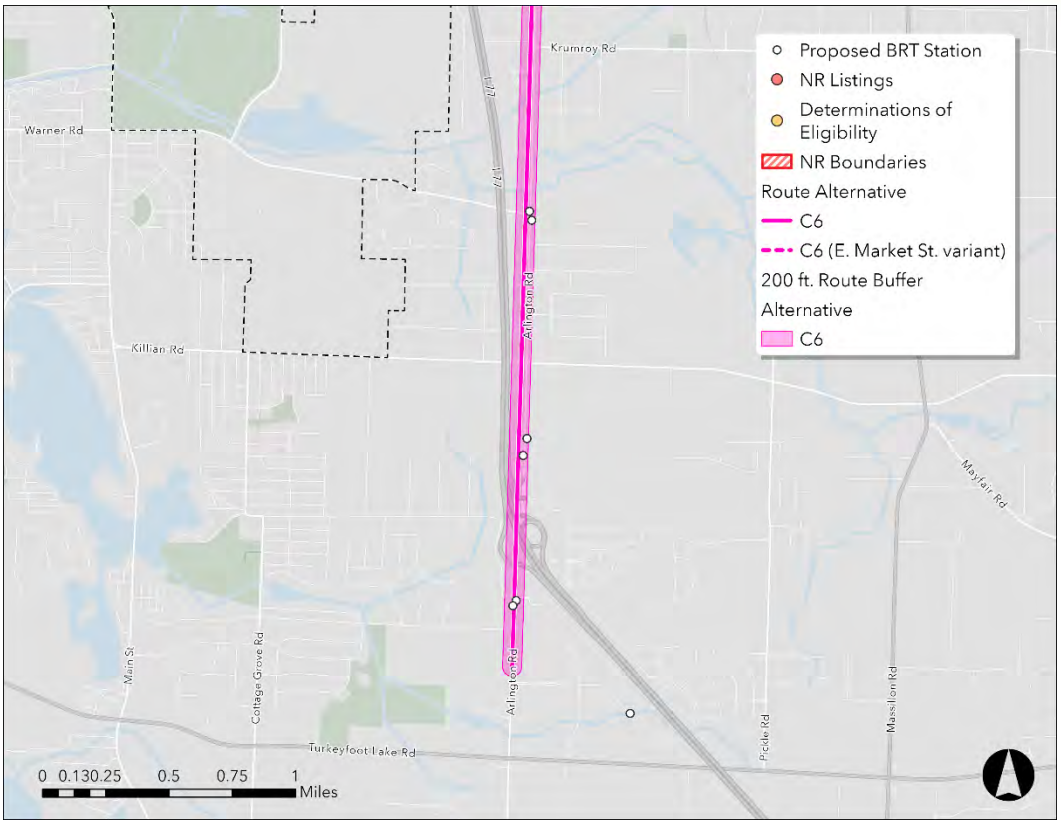


Figure 69 Alternative C6, Historic and Archaeological Resources, Southern End of South Arlington Street Segment

WATER RESOURCES

The following proposed station areas for alternative C6 are within 200' of water resources:

- Station pair on Wooster Rd at I-76 is in a 100-year floodplain, but there is existing development and sidewalks, and station could be sited to avoid floodplain impacts (Figure 70).
- Station pair on South Arlington St at Warner is in a 100-year floodplain, but there is existing development and sidewalks, and station could be sited to avoid floodplain impacts (Figure 74).

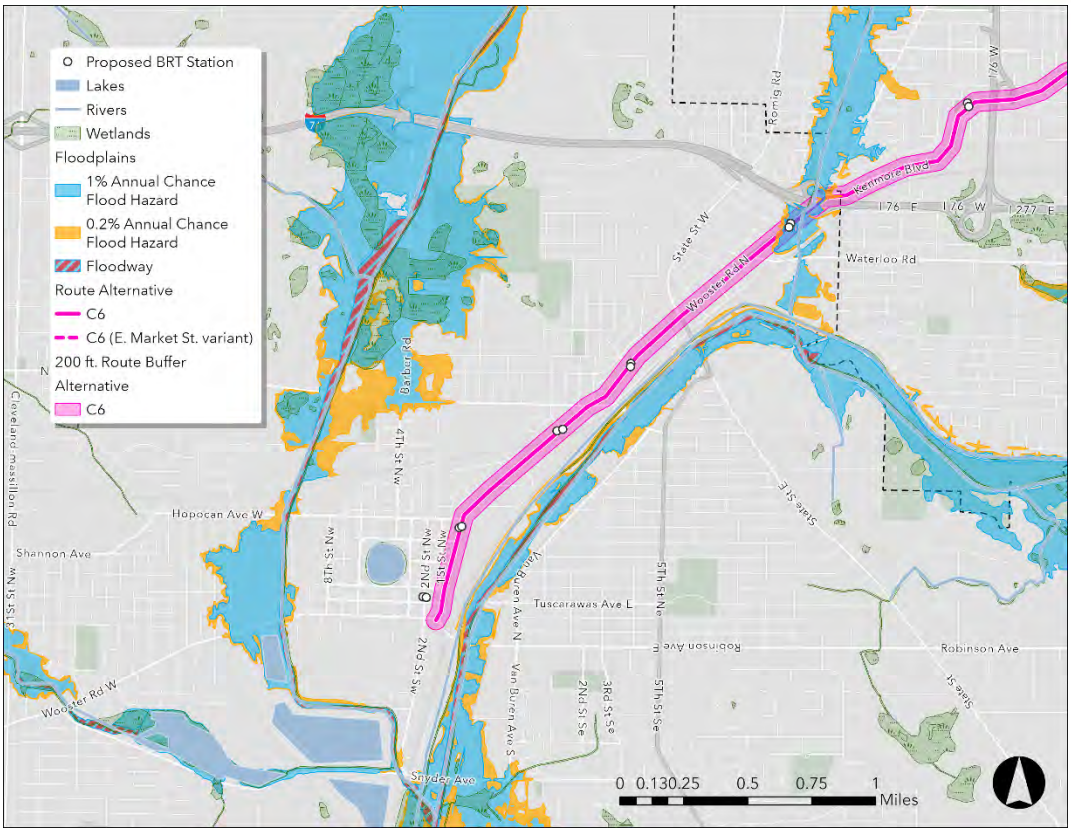


Figure 70 Alternative C6, Water Resources, Western End of Lake Shore/Kenmore/Wooster Segment

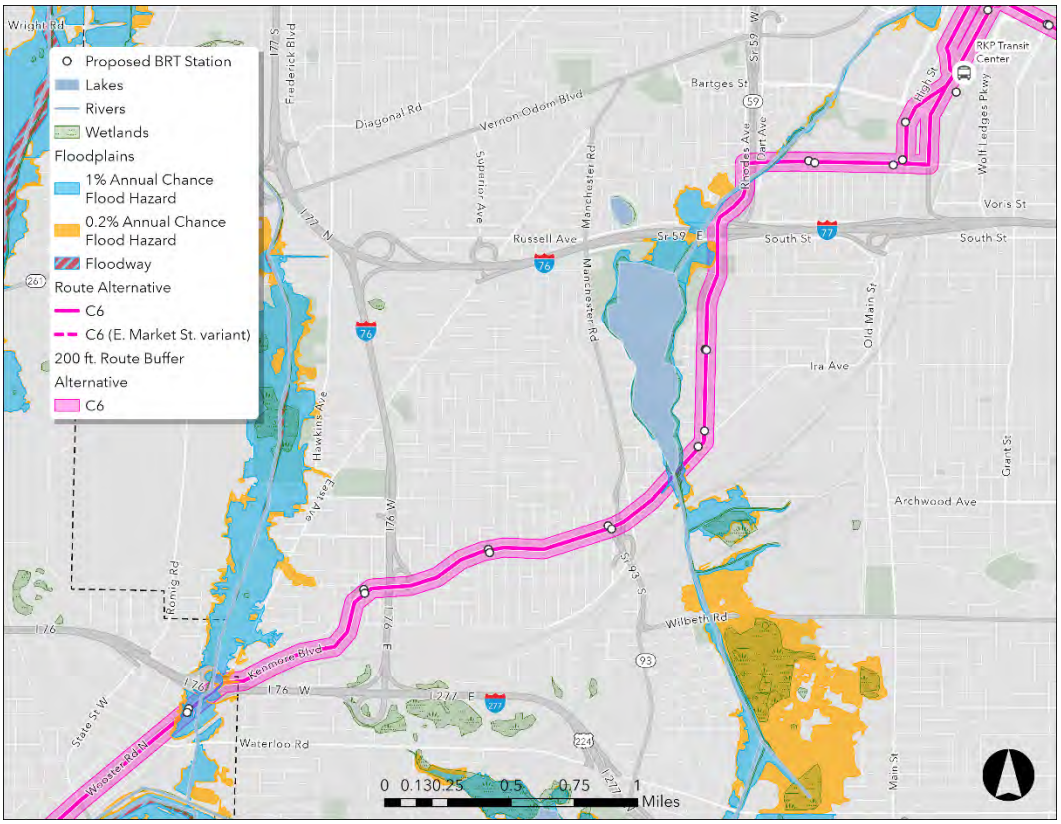


Figure 71 Alternative C6, Water Resources, Eastern End of Lake Shore/Kenmore/Wooster Segment

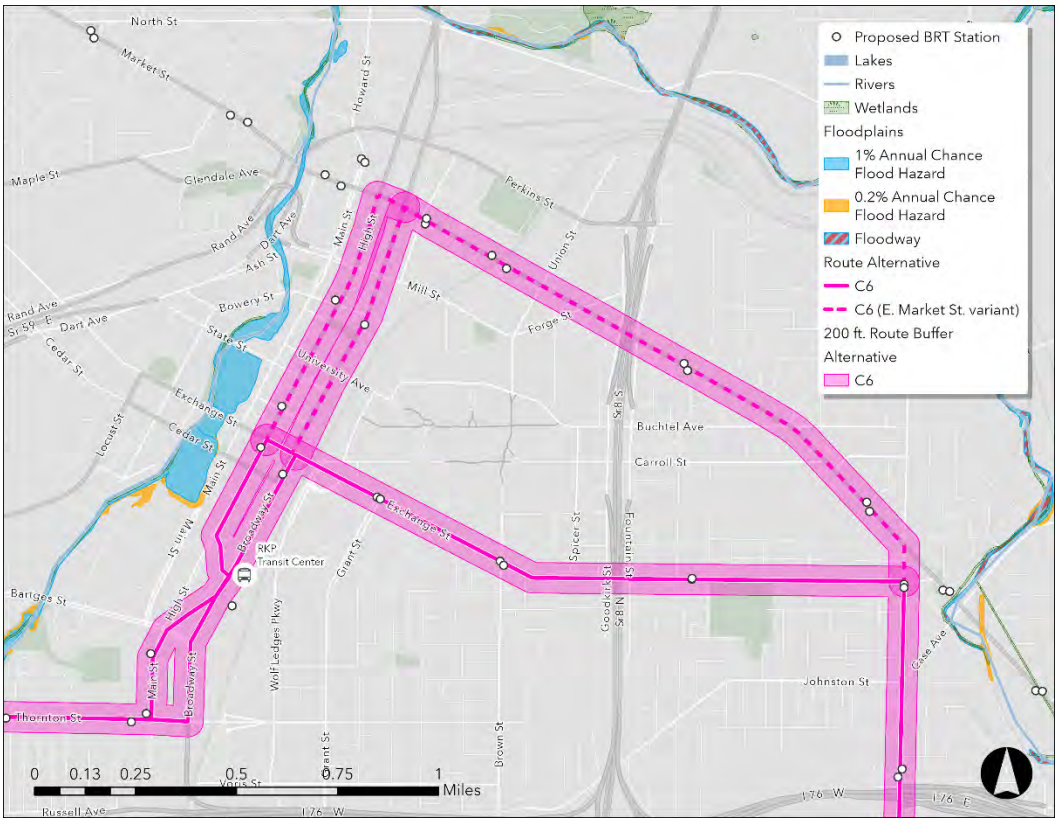


Figure 72 Alternative C6, Water Resources, Downtown Akron and Exchange/East Market Segments

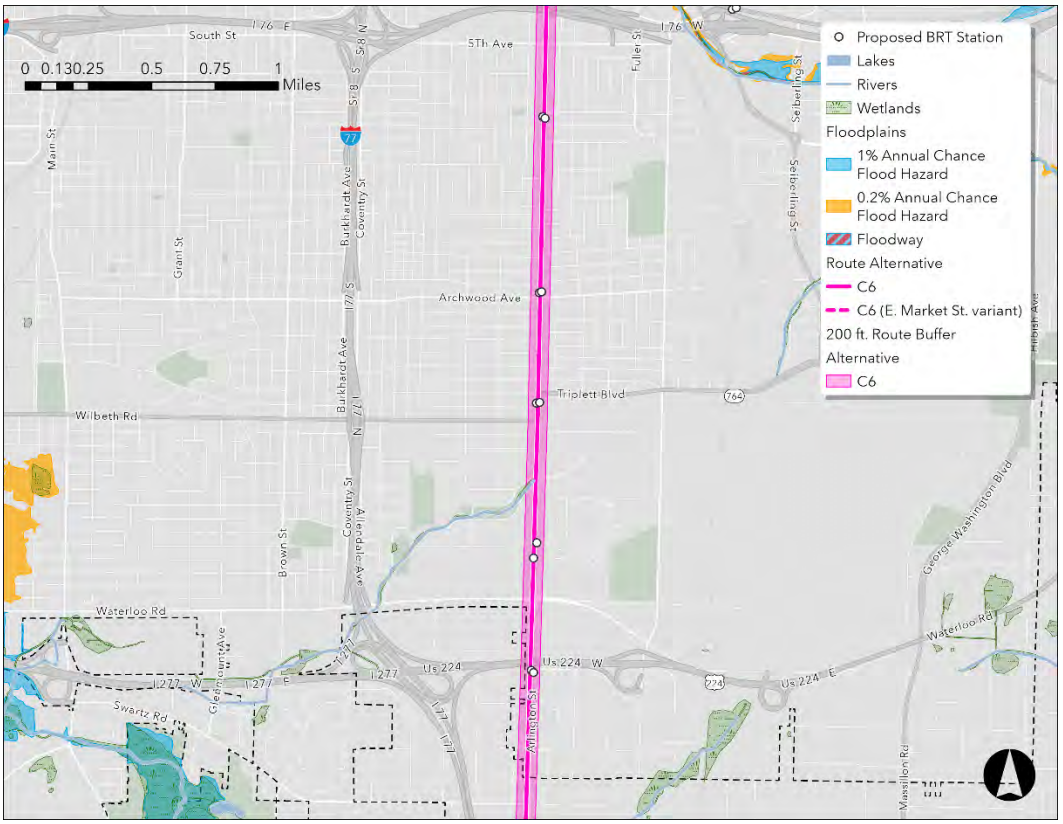


Figure 73 Alternative C6, Water Resources, Northern End of South Arlington Street Segment

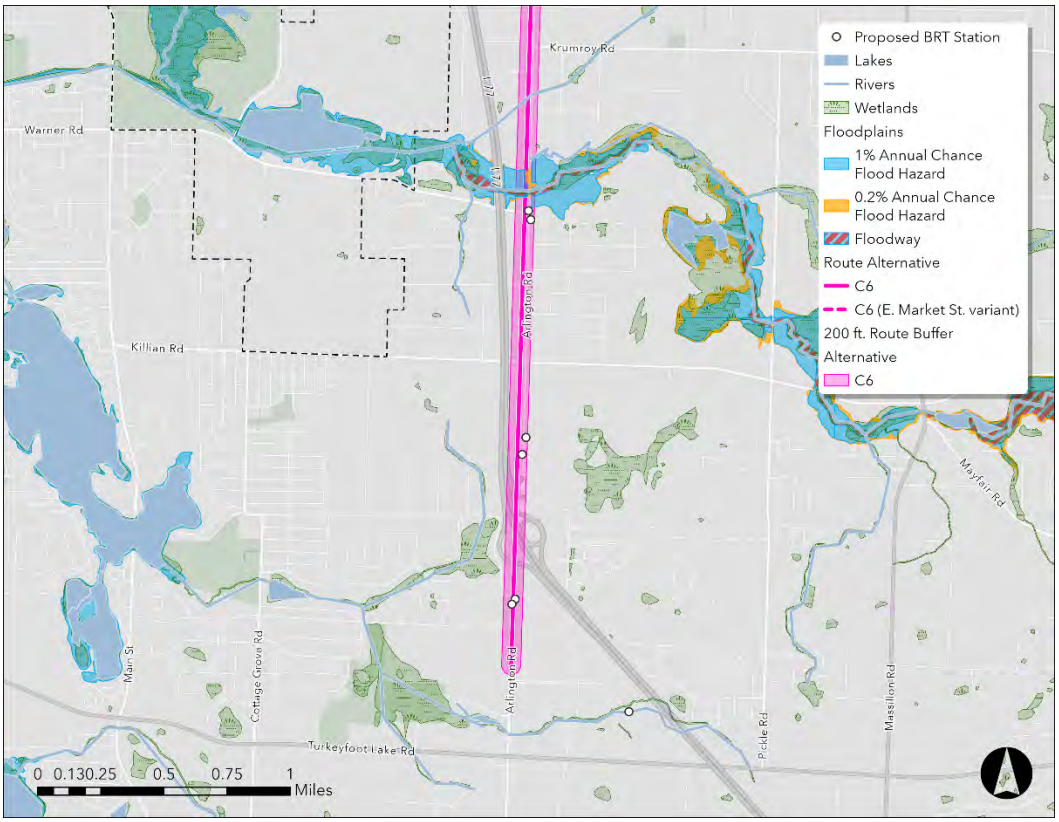


Figure 74 Alternative C6, Water Resources, Southern End of South Arlington Street Segment

SECTION 4(F) RESOURCES

The following proposed station areas for alternative C6 are within 200' of Section 4(f) resources:

- Southbound station on Kenmore Blvd at 22nd St SW is adjacent to a small park (Shadyside Park). Station could be sited to avoid park impacts (Figure 75).

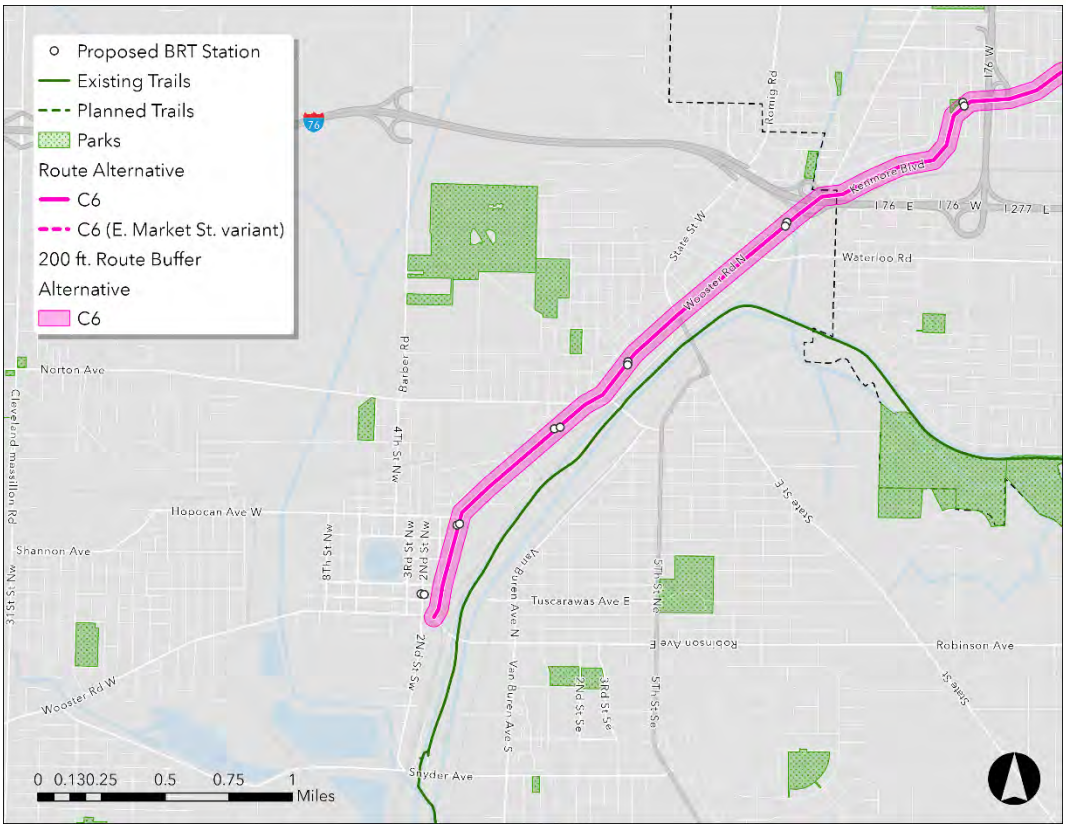


Figure 75 Alternative C6, Section 4(f) Resources, Western End of Lake Shore/Kenmore/Wooster Segment

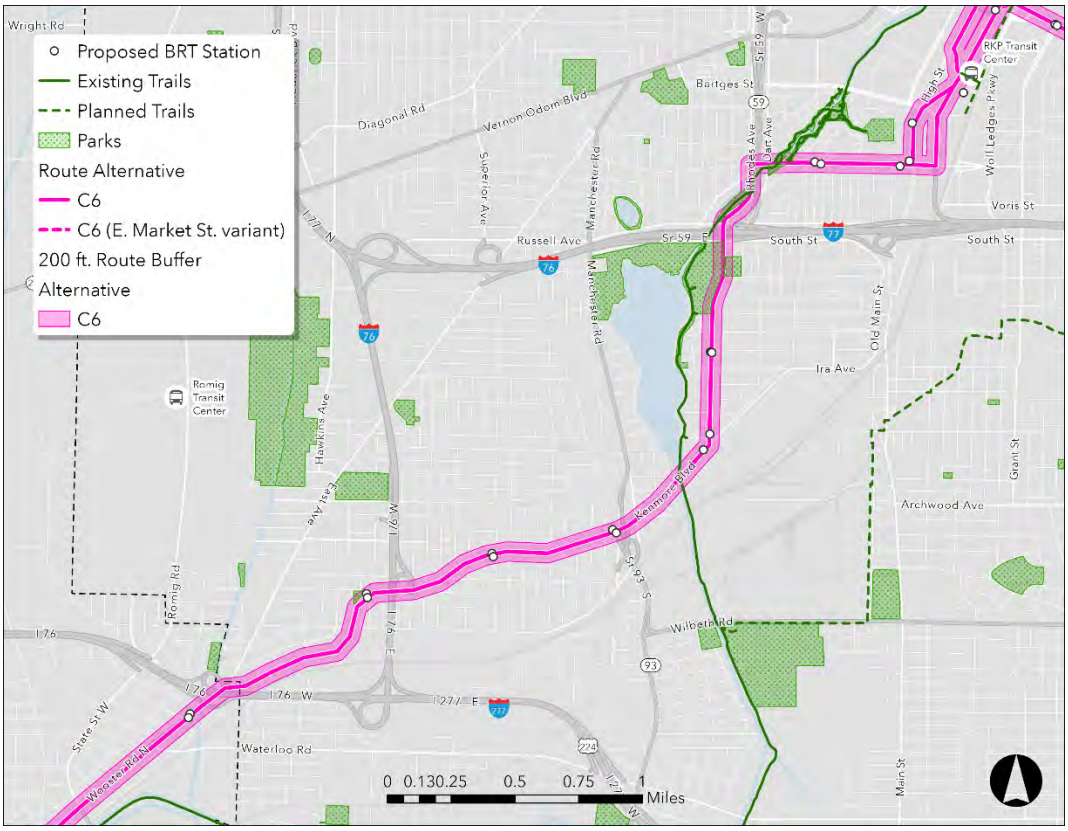


Figure 76 Alternative C6, Section 4(f) Resources, Eastern End of Lake Shore/Kenmore/Wooster Segment

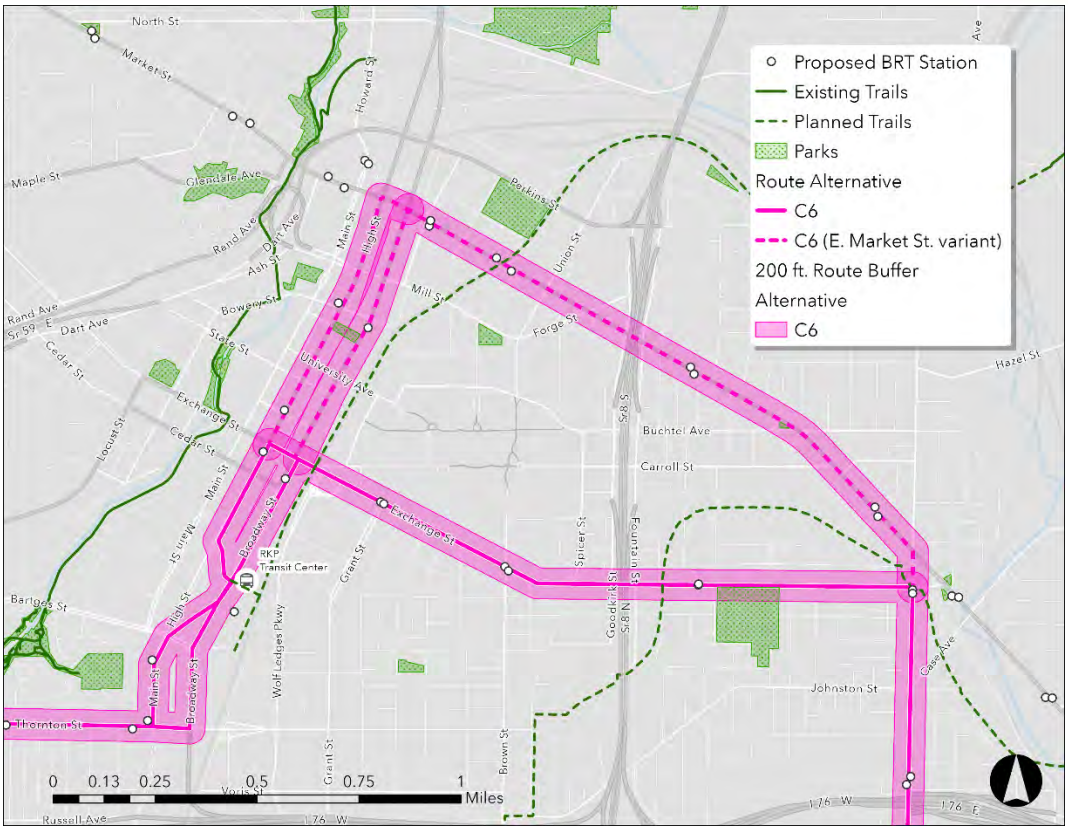


Figure 77 Alternative C6, Section 4(f) Resources, Downtown Akron and Exchange/East Market Segments

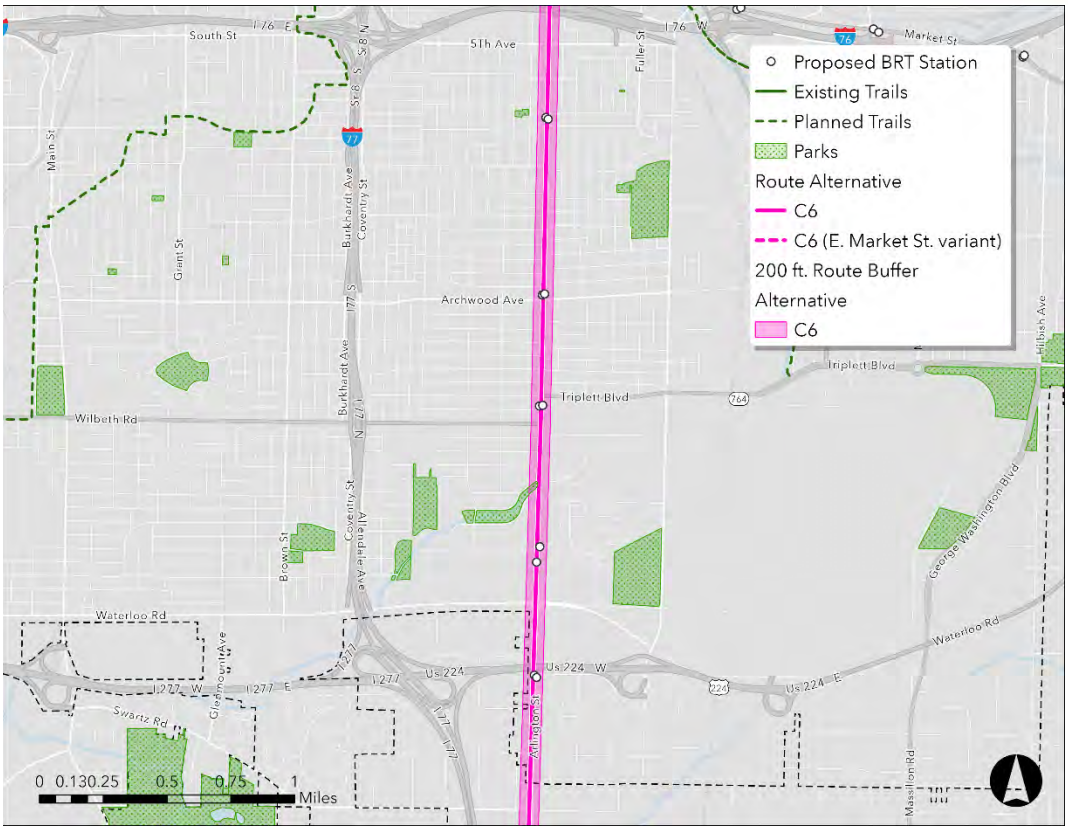


Figure 78 Alternative C6, Water Resources, Northern End of South Arlington Street Segment

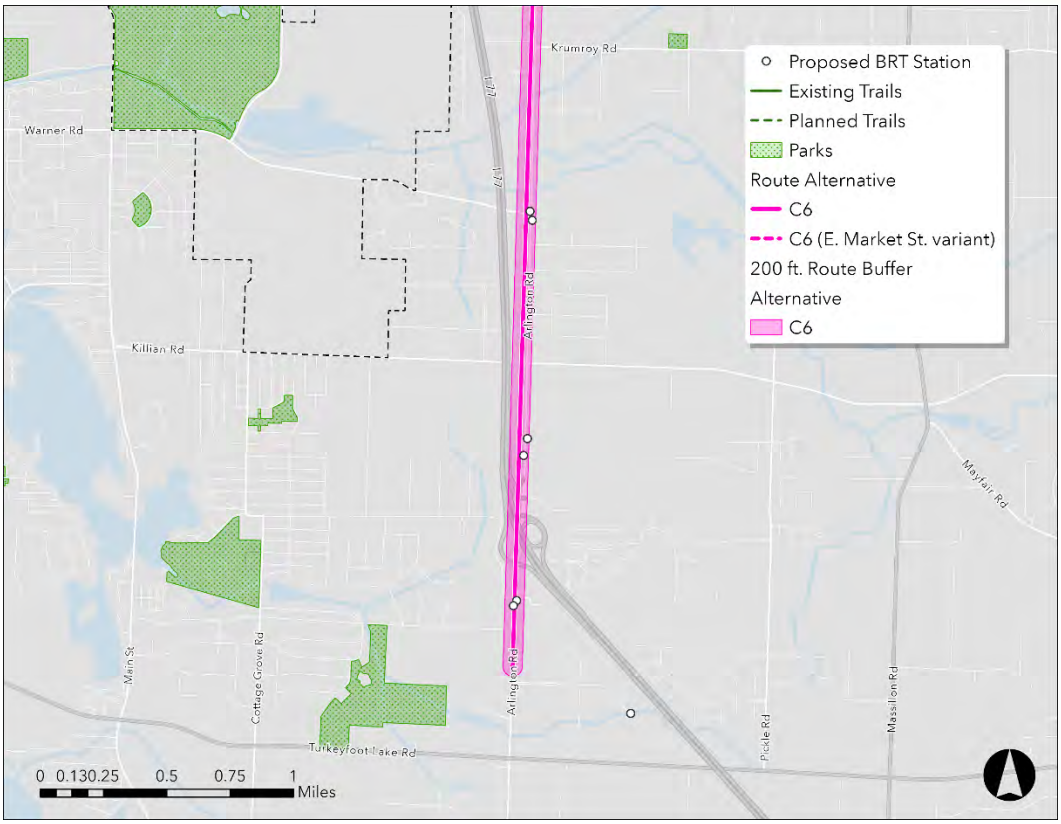


Figure 79 Alternative C6, Water Resources, Southern End of South Arlington Street Segment

BRT Feasibility Study

Appendix D: Cost Estimates & Timeline Memo – October 2023

Reimagine METRO

Table of Contents

INTRODUCTION

METRO is conducting a Bus Rapid Transit (BRT) Feasibility Study to assess potential BRT routes in the Akron metropolitan area. This Study is part of the Reimagine METRO plan to improve transit service within the Akron region. The Study began with "Discover" phase, which involved establishing a vision and corresponding goals for the BRT system, from which evaluating criteria were defined. A total of nine route segments and 14 route alternatives were evaluated for residential and employment densities, historically disadvantaged communities, opportunities for economic development, and physical suitability. From this group, five alternatives were selected for higher level analysis in the second "Refine" phase of the project. The "Refine" phase includes ridership modeling, operational concepts/design, high-level operational and capital costs, and FTA Capital Improvement Grant (CIG) program eligibility. In the last phase, "Select," METRO and its partners will advance priority alternative(s), develop BRT design standards, and advance the alternative(s) to conceptual design.

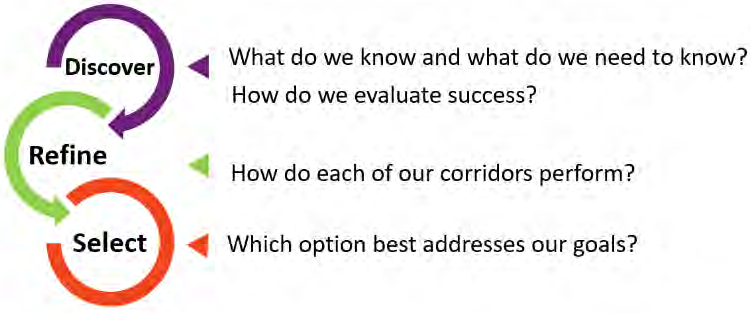


Figure 1 Graphic of BRT Feasibility Study Phases

REPORT PURPOSE

This document describes the methodology, scope of work, exclusions, assumptions, and results of the capital cost estimates developed for the BRT Feasibility Study. The primary goal of this work is to provide an order-of-magnitude estimate of project costs based on the preferred alternatives.

The project team developed cost estimates for the five alternatives under evaluation in the "Refine" phase of this project. These alternatives—A3, A4, B4, C4, and C6—are shown in the map in Figure 2. All alternatives, except Alternative C4, include routing options on East Market St. and East Exchange St. For routes with routing options under study, both East Market St. and Exchange St. were included in the analysis of cost estimates. The proposed alternatives range from approximately 15 to 19 miles long and are assumed to run primarily in mixed traffic.

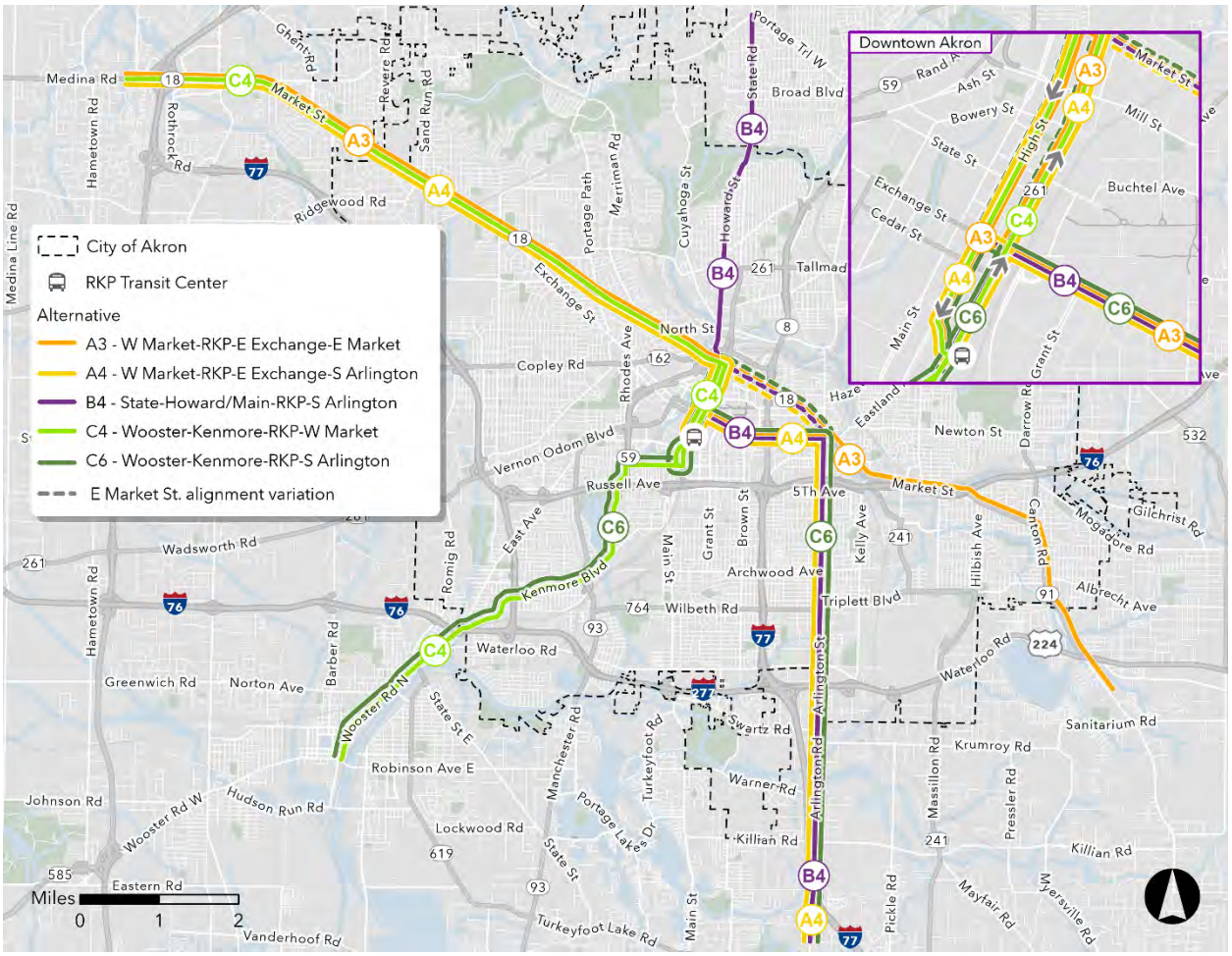


Figure 2 Map of Alternatives

METHODOLOGY

Capital cost estimates for the project were prepared using the format and procedures currently required for evaluation by the Federal Transit Administration (FTA). The FTA includes the use of Standard Cost Categories (SCC) that group costs as follows:

- Category 10: Guideway and Track Elements
- Category 20: Stations, Stops, Terminals and Intermodal
- Category 30: Support Facilities: Yards, Shops, and Administrative Buildings
- Category 40: Sitework and Special Conditions
- Category 50: Systems
- Category 60: Right of Way, Land, and Existing Improvements
- Category 70: Vehicles
- Category 80: Professional Services
- Category 90: Unallocated Contingency
- Category 100: Finance Charges

CAPITAL COST ESTIMATE PARAMETERS

The following assumptions were used to develop the project capital cost estimates:

SCHEDULE AND ESCALATION

The base year of this estimate is 2023. To estimate the cost in future years, an annual escalation rate of 4.5% for 2023, 4% for 2024, and 3.5% for subsequent years was used.

Table 1 is the basis used to calculate the project escalation based on the project schedule and percentage of assumed expenditures by year, by category. The high-level project schedule is:

- 2024: Grant Applications
- 2025: Project Development and Environmental Review
- 2026: Final Engineering
- 2027–2028: Construction
- 2028: Revenue Operations

Table 1 Bases for Project Escalation Calculations

SCC	2024	2025	2026	2027	2028	2029	2030	TOTAL
10				95%	5%			100%
20				95%	5%			100%
30				95%	5%			100%
40				95%	5%			100%
50				80%	20%			100%
60		5%	80%	15%				100%
70				35%	65%			100%

SCC	2024	2025	2026	2027	2028	2029	2030	TOTAL
80		23%	22%	43%	8%	4%		100%
90		2%	4%	76%	18%			100%

ALLOCATED CONTINGENCY

Allocated contingency is added to the base cost of the project based on the level of design information available for individual category items. As design advances in the subsequent project phases the level of design will further inform the allocated contingency used to address design uncertainty and variability in quantities, developing unit costs, and project scope. Allocated contingencies address uncertainties in the estimated construction, right-of-way (ROW) and vehicle costs. The percentage of allocated contingency for SCC 10-80 is shown in Table 2 to recognize the anticipated contingency needed within each category of work.

Table 2 Percentage of Allocated Contingency

FTA Cost Category	Description	Allocated Contingency Percentage
SCC 10	Guideway & Track Elements	35%
SCC 20	Station/Stops	30%
SCC 30	Support Facilities	20%
SCC 40	Sitework and Special Conditions	30%
SCC 50	Systems	35%
SCC 60	ROW, Land, Existing Improvements	50%
SCC 70	Vehicles	35%
SCC 80	Professional Services	10%

UNALLOCATED CONTINGENCY

The unallocated contingency is applied as an allowance for unknowns and uncertainties beyond what can be estimated due to the level of project development completed to date. The unallocated contingency is typically broader in nature compared to the allocated contingency, and often used to address potential changes in the project scope and/or schedule. Unallocated contingency is calculated and applied as a percentage of the total base year cost with allocated contingency (SCC 10-80). An unallocated contingency of 12% is used in this estimate.

The combination of allocated and unallocated contingencies results in an overall contingency of 40%.

FINANCE CHARGES

Finance charges (SCC 100) are not anticipated and therefore not included in this estimate.

SCOPE OF WORK

QUANTITY TAKEOFFS

The task of quantity takeoffs involves preparation of estimated quantities either by direct measurement and calculation of construction elements that are shown in conceptual design drawings and sketches, electronically calculated from conceptual design CADD files, or by establishing an allowance quantity based on professional experience and judgment.

No specific methodology was prescribed for estimating quantities for this conceptual design level, rather the estimate used appropriate source and methodology for quantity takeoffs. The estimate uses both analogous estimating to compare past similar projects, and parametric estimating to establish a relationship between known variables (i.e., a unit cost/duration and the number of units) to develop the estimate.

UNIT COST DEVELOPMENT

The development of individual or composite estimated unit costs is accomplished using historical bid data and by unit cost analysis, as appropriate. Unit costs used in this estimate assume the work items are furnished and installed, and include costs associated with labor, equipment, and raw material rates.

The cost estimate was developed by calculating quantities for proposed work and applying weighted average historical bid prices from the Minneapolis-Saint Paul Metropolitan Statistical Area (MSA), provided by the Minnesota Department of Transportation. Construction costs for Greater Akron are generally comparable to construction costs in Minneapolis-Saint Paul MSA.[1] The unit prices were refined based on estimates for Metro Transit's arterial BRT projects operating in mixed traffic in the Minneapolis-Saint Paul MSA and supplemental pricing research with other Metro Transit projects. The unit price assumptions from these sources were reviewed to determine applicability to the project and compatibility with the methodology and format being used.

All average bid prices for each line item are stated in 2023 base year dollars for input to the FY22 FTA SCC Workbook and Small Starts templates.

ESTIMATE STRUCTURE (SCC 10-100)

The following sections provide detail on the scope of work per each SCC category (if applicable) that helped inform the cost estimate.

SCC 10 – GUIDEWAY

10.01 **Guideway: At-grade Exclusive:** Not used.

10.02 **Guideway: At-grade Semi Exclusive:** Scope includes improvements to signing, striping, and red pavement at designated Business Access and Transit (BAT) lanes.

10.03 **Guideway: At-grade Mixed Traffic:** Scope includes earthwork, pavement, and curb and gutter.

[1] RSMeans Data. City Cost Index (July 2023). https://www.rsmeans.com/2023-construction-cost-indexes-july

SCC 20 – STATIONS

20.01 **At-grade Stations:** Scope includes platforms and platform amenities.

20.02 **Aerial Station:** Not used.

20.03 **Underground Station:** Not used.

20.04 **Other Stations:** Not used.

20.05 **Joint Development:** Not used.

20.06 **Automobile Parking Multi-Story Structure:** Not used.

20.07 **Elevators, Escalators:** Not used.

SCC 30 – SUPPORT FACILITIES

30.01 **Administration Building (office, sales, storage, revenue counting):** Not used.

30.02 **Light Maintenance Facility:** Not used.

30.03 **Heavy Maintenance Facility:** Scope includes improvements to the existing maintenance facilities for electric bus chargers.

30.04 **Storage or Maintenance of Way Building:** Not applicable.

30.05 **Yard and Yard Track:** Not used.

SCC 40 – SITEWORK AND SPECIAL CONDITIONS

30.01 **Administration Building (office, sales, storage, revenue counting):** Not used.

40.01 **Demolition, Clearing, Earthwork:** Not used, reconstruction of roadway pavement, sidewalks, and curbs are included in 40.06 and 40.07.

40.02 **Site Utilities, Utilities Relocation:** Utilities at each proposed station were reviewed on a conceptual basis. Allowances were applied based on-site conditions and available utility data.

40.03 **Hazardous Materials, Contaminated Soil, Ground Water Treatment:** Not used.

40.04 **Environmental Mitigation:** Not used.

40.05 **Site Structures:** Not used.

40.06 **Pedestrian/Bike Access and Accommodation, Landscaping:** Scope includes all fencing, concrete sidewalks, and landscaping.

40.07 **Automobile, Bus, Van Access Ways including Roads, Parking Lots:** Scope includes a proposed lighting allowance, signing, and striping.

40.08 **Temporary Facilities and Other Indirect Costs:** Scope includes mobilization, temporary erosion control, and temporary traffic control during construction (intersection and linear, roadway lane closures and shifts, etc.).

SCC 50 – SYSTEMS

50.01 **Train Control and Signals:** Not used.

50.02 **Traffic Signals and Crossing Protection:** Scope includes the construction of construction of new traffic signals and modifications to existing signals.

50.03 **Traction Power Supply: Substations:** Not used.

50.04 **Traction Power Distribution: Catenary and Third Rail:** Not used.

50.05 **Communications:** Scope includes the construction of communication systems at proposed station platforms along the corridor. Includes fiber cabling and copper cabling, communications house, and communication conduits. Communications equipment at each station includes signboard readers, audio/speakers, and security cameras.

50.06 **Fare Collection System and Equipment:** The estimate includes the procurement and installation of fare collection systems for the stations. The fare collection system includes TVMs and smart card validators.

50.07 **Central Control:** Scope includes an allowance for upgrades to equipment such as workstations and servers at central control at the rail operations center.

SCC 60 – ROW, LAND, EXISTING IMPROVEMENTS

60.01 **Purchase or Lease of Real Estate:** Includes costs associated with purchasing ROW that is necessary to construct and operate the bus, includes full acquisitions (for the OMF), partial acquisitions, and temporary construction easements.

60.02 **Relocation of Existing Households and Businesses:** Not used.

SCC 70 – VEHICLES

70.01 **Light Rail:** Not used.

70.02 **Heavy Rail:** Not used.

70.03 **Commuter Rail:** Not used.

70.04 **Bus:** Includes scope for 40-ft compressed natural gas (CNG) buses.

70.05 **Other:** Not used.

70.06 **Non-revenue vehicles:** Not used.

70.07 **Spare Parts:** Includes an allowance for spare bus parts.

50.01 **Train Control and Signals:** Not used.

SCC 80 – PROFESSIONAL SERVICES

80.01 **Project Development:** 3% of construction

80.02 **Engineering:** 0% of construction

80.03 **Project Management for Design and Construction:** 7% of construction.

80.04 **Construction Administration & Management:** 8% of construction.

80.05 **Professional Liability and other Non-Construction Insurance:** 1% of construction.

80.06 **Legal; Permits; Review Fees by Other Agencies, Cities, Etc.:** 1% of construction.

80.07 **Survey, Testing, Investigation, Inspection:** 1% of construction.

80.08 **Start-up:** 1% of construction.

22% Total of SCC 10-50.

SCC 90 – UNALLOCATED CONTINGENCY

The estimate included a 12% unallocated contingency factor applied to the Base Year SCC 10-80 (with allocated contingency) categories.

SCC 100 – FINANCE CHARGES

The Finance Charges (SCC 100) are not included.

ESTIMATE EXCLUSIONS AND ASSUMPTIONS

COST ESTIMATE EXCLUSIONS

Industry standards and knowledge of past transit corridor construction projects suggest that the project is likely to accrue costs in several areas for which cost estimates are not presently feasible due to the limitations of existing documents. Accordingly, the following areas are excluded from the cost estimate:

- All concurrent Non-Project Activities (CNPA) for locally requested scope additions identified by project partners (assumed to be non-FTA eligible and funded by others).
- Extensive construction dewatering is assumed to be excluded based on known geotechnical information and reduced scope of construction.
- Any private utility-related costs of providing power to stations, or larger substation improvements at the Bus Facility for charging positions.
- Non-Functional Landscape Elements (landscape elements installed solely for visual or aesthetic appeal) and Public Art.
- Unit costs include materials and labor but do not allow for any special construction conditions (i.e., acceleration and nighttime work).

ENGINEERING ASSUMPTIONS

STATIONS

- Proposed stations consist of side platforms integrated into existing sidewalks.
- 12’ x 60’ platforms with a shelter and passenger amenities including lighting, seating, leaning rails, bicycle racks, trash receptacles, station pylon and signage, fare collection, and passenger information systems components.

OPERATIONS AND MAINTENANCE FACILITY

- No work included in the estimate; assumes project has an existing maintenance facility and adequate space for proposed buses.

SITE UTILITIES

- Utilities at each proposed station were reviewed on a conceptual basis and an allowance (per station) was applied based on site conditions, available utility data, and proposed alignments.

SITE/CIVIL

- Site work including removals, utility relocation, localized station landscaping, and area lighting were determined on a conceptual basis and are represented by an allowance (per station).
- Temporary facilities and other indirect costs such as erosion control, mobilization, traffic control, and miscellaneous temporary facilities are calculated as a percentage of based year construction costs of SCC 10-50.

SYSTEMS/TRAFFIC SIGNALS

- Minor modifications for Transit Signal Priority (TSP) costs at each signalized intersection are included in the traffic signal estimate.
- Traffic signal improvements assume the addition or replacement of three to five traffic signal systems.

VEHICLES

- The number of buses per alternative was calculated assuming 10-minute peak period headways and including driver layover time.
- 40’ CNG bus vehicles are assumed for all alternatives.
- A 20% spare vehicle ratio was assumed for all alternatives.
- SCC 70 costs assume no charging infrastructure.

FINDINGS

The results of the estimates show a base total cost that ranges from $89.6M to $111.5M. Alternative B4 – East Exchange St. has the lowest estimated capital cost, and Alternative A4 – East Market St. has the highest. Generally, the alternatives that operate on East Market St. are more expensive than those that operate on East Exchange St. This is due to the East Market St. alternatives proposing a longer route that includes more stations. The same relationship can be observed when comparing overall alternatives from most to least costly, as shown in Table 3.

Table 3 Capital Cost Estimates for Advanced Alternatives, Most to Least Expensive

Alternative	Proposed Stations	Number of Buses	Base Project Total Cost
A4 – East Market St.	30	13	$111,513,419
A3 – East Market St.	30	13	$110,643,319
C6 – East Market St.	30	11	$106,212,596
A4 – East Exchange St.	28	13	$105,953,131
C4	29	12	$105,334,577
A3 – East Exchange St.	27	13	$102,942,821
C6 – East Exchange St.	27	11	$98,596,756
B4 – East Market St.	25	11	$95,262,276
B4 – East Exchange St.	23	11	$89,603,599

Table 4 provides the Standard Cost Category (SCC) breakdown of the capital cost estimates for each alternative at the conceptual design level in Year of Expenditure (YOE) dollars. The YOE is assumed to be 2028. Appendix C-1 contains the full cost estimates workbook.

Table 4 Cost Estimates by SCC for Advanced Alternatives (YOE 2028$)

	A3		A4		B4		C4	C6	
Base Project Definition	**Exchange**	**Market**	**Exchange**	**Market**	**Exchange**	**Market**	**Market**	**Exchange**	**Market**
SCC 10 Guideway	$3,324,439	$3,562,086	$3,403,655	$3,562,086	$3,007,577	$3,166,008	$3,482,871	$3,324,439	$3,562,086
SCC 20 Station/Stops	$27,028,976	$29,281,391	$27,779,781	$29,281,391	$24,025,757	$25,527,366	$28,530,586	$27,028,976	$29,281,391
SCC 30 Support Facilities	$0	$0	$0	$0	$0	$0	$0	$0	$0
SCC 40 Sitework and Special Conditions	$10,990,983	$11,887,398	$11,304,355	$11,935,684	$9,673,604	$10,375,880	$11,468,225	$10,823,429	$11,715,146
SCC 50 Systems	$23,076,016	$25,225,109	$24,098,050	$25,805,097	$19,464,726	$21,171,773	$23,324,314	$21,455,497	$23,548,158
Construction Subtotal (SCC 10-50)	**$64,420,416**	**$69,955,985**	**$66,585,842**	**$70,584,259**	**$56,171,663**	**$60,241,028**	**$66,805,996**	**$62,632,342**	**$68,106,782**
SCC 60 ROW, Land, Existing Improvements	$226,403	$251,559	$234,788	$251,559	$192,862	$209,632	$243,174	$226,403	$251,559
SCC 70 Vehicles	$11,987,101	$11,987,101	$11,987,101	$11,987,101	$10,314,384	$10,314,384	$11,150,742	$10,314,384	$10,314,384
SCC 80 Professional Services	$15,268,083	$16,579,845	$15,780,999	$16,728,311	$13,313,884	$14,278,043	$15,834,232	$14,845,510	$16,142,827
SCC 90 Unallocated Contingency	$11,040,818	$11,868,829	$11,364,401	$11,962,190	$9,610,806	$10,219,189	$11,300,432	$10,578,117	$11,397,045
SCC 100 Finance Charges	$0	$0	$0	$0	$0	$0	$0	$0	$0
Base Project Total Cost	**$102,942,821**	**$110,643,319**	**$105,953,131**	**$111,513,419**	**$89,603,599**	**$95,262,276**	**$105,334,577**	**$98,596,756**	**$106,212,596**

COST DRIVERS

Several primary cost drivers are present throughout all alternatives. Those cost drivers include stations, buses, contingency, and inflation to year of expenditure.

STATIONS

Costs associated with stations include features such as platform, shelter, pylon, general site work, landscaping amenities, fare collection, and communication installations. Routes that included a greater number of stations coincided with larger base project costs due to the features listed above.

BUSES

The number of buses associated with each alternative varies based on route length, travel time, and assumed headway. Alternatives that consisted of longer routes required a larger fleet of buses to meet operational needs, which resulted in higher costs.

CONTINGENCY

Each alternative carries both allocated and unallocated contingency that combines for an overall contingency of 40%. This contingency is based on the level of design and Federal Transit Administration requirements. As design progresses, the required contingency will decrease.

INFLATION

Inflation impacts the overall project cost of materials, labor, and resources throughout construction of the project based on the year of expenditure. Escalation rates of 4.5% for 2023, 4% for 2024, and 3.5% for subsequent years was in the development of each cost estimate alternative.

APPENDIX D-1: COST ESTIMATES WORKBOOK

Akron BRT Feasibility Study

1% Design — Recommended Route Alternatives

Date: 10/23/2023
Revision: 00

	FTA SCC Code	Description	$2023 EXTENSIONS ONLY (NO APPLIED CONTIGENCIES)								
			Option A3 - E Exchange	Option A3 - E Market	Option A4 - E Exchange	Option A4 - E Market	Option B4 - E Exchange	Option B4 - E Market	Option C4	Option C6 - E Exchange	Option C6 - E Market
10 GUIDEWAY & TRACK ELEMENTS			**$ 2,131,920**	**$ 2,284,320**	**$ 2,182,720**	**$ 2,284,320**	**$ 1,928,720**	**$ 2,030,320**	**$ 2,233,520**	**$ 2,131,920**	**$ 2,284,320**
1	10.01	Guideway: At-grade exclusive right-of-way	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	10.02	Guideway: At-grade semi-exclusive (allows cross-traffic)	$ 2,131,920	$ 2,284,320	$ 2,182,720	$ 2,284,320	$ 1,928,720	$ 2,030,320	$ 2,233,520	$ 2,131,920	$ 2,284,320
3	10.03	Guideway: At-grade in mixed traffic	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
4	10.04	Guideway: Aerial structure	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5	10.05	Guideway: Built-up fill	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
6	10.06	Guideway: Underground cut & cover	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
7	10.07	Guideway: Underground tunnel	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	10.08	Guideway: Retained cut or fill	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
9	10.09	Track: Direct fixation - LRT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	10.10	Track: Embedded - LRT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
11	10.11	Track: Ballasted - LRT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
12	10.12	Track: Special (switches, turnouts) - LRT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
13	10.13	Track: Vibration and noise dampening - LRT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
20 STATIONS, STOPS, TERMINALS, INTERMODAL			**$ 18,000,000**	**$ 19,500,000**	**$ 18,500,000**	**$ 19,500,000**	**$ 16,000,000**	**$ 17,000,000**	**$ 19,000,000**	**$ 18,000,000**	**$ 19,500,000**
14	20.01	At-grade station, stop, shelter, mall, terminal, platform	$ 18,000,000	$ 19,500,000	$ 18,500,000	$ 19,500,000	$ 16,000,000	$ 17,000,000	$ 19,000,000	$ 18,000,000	$ 19,500,000
15	20.02	Aerial station, stop, shelter, mall, terminal, platform	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
16	20.03	Underground station, stop, shelter, mall, terminal, platform	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
17	20.04	Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
18	20.05	Joint development	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
19	20.06	Automobile parking multi-story structure	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
20	20.07	Elevators, escalators	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS			**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
21	30.01	Administration Building: Office, sales, storage, revenue counting	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
22	30.02	Light Maintenance Facility	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
23	30.03	Heavy Maintenance Facility	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
24	30.04	Storage or Maintenance of Way Building	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
25	30.05	Yard and Yard Track	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
40 SITEWORK & SPECIAL CONDITIONS			**$ 7,319,467**	**$ 7,916,436**	**$ 7,528,158**	**$ 7,948,592**	**$ 6,442,156**	**$ 6,909,838**	**$ 7,637,287**	**$ 7,207,884**	**$ 7,801,725**
26	40.01	Demolition, Clearing, Earthwork	$ 249,830	$ 288,700	$ 256,120	$ 288,700	$ 161,200	$ 237,250	$ 262,410	$ 229,830	$ 268,700
27	40.02	Site Utilities, Utility Relocation	$ 675,000	$ 750,000	$ 700,000	$ 750,000	$ 575,000	$ 625,000	$ 725,000	$ 675,000	$ 750,000
28	40.03	Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
29	40.04	Environmental mitigation, e.g. wetlands, historic/archeologic, parks	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
30	40.05	Site structures including retaining walls, sound walls	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
31	40.06	Pedestrian / bike access and accommodation, landscaping	$ 997,580	$ 1,086,200	$ 1,027,120	$ 1,086,200	$ 879,420	$ 938,500	$ 1,056,660	$ 997,580	$ 1,086,200
32	40.07	Automobile, bus, van accessways including roads, parking lots	$ 1,377,000	$ 1,482,000	$ 1,412,000	$ 1,482,000	$ 1,237,000	$ 1,307,000	$ 1,447,000	$ 1,377,000	$ 1,482,000
33	40.08	Temporary Facilities and other indirect costs during construction	$ 4,020,057	$ 4,309,536	$ 4,132,918	$ 4,341,692	$ 3,589,536	$ 3,802,088	$ 4,146,217	$ 3,928,474	$ 4,214,825
50 SYSTEMS			**$ 14,721,200**	**$ 16,092,200**	**$ 15,373,200**	**$ 16,462,200**	**$ 12,417,400**	**$ 13,506,400**	**$ 14,879,600**	**$ 13,687,400**	**$ 15,022,400**
34	50.01	Train control and signals - LRT	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
35	50.02	Traffic signals and crossing protection	$ 2,540,000	$ 3,065,000	$ 2,550,000	$ 3,075,000	$ 1,945,000	$ 2,470,000	$ 2,540,000	$ 1,955,000	$ 2,480,000
36	50.03	Traction power supply: substations	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
37	50.04	Traction power distribution: catenary and third rail	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
38	50.05	Communications	$ 4,644,000	$ 5,160,000	$ 4,780,000	$ 5,124,000	$ 3,956,000	$ 4,300,000	$ 4,952,000	$ 4,644,000	$ 5,124,000
39	50.06	Fare collection system and equipment	$ 2,970,000	$ 3,300,000	$ 3,080,000	$ 3,300,000	$ 2,530,000	$ 2,750,000	$ 3,190,000	$ 2,970,000	$ 3,300,000
40	50.07	Central Control	$ 4,567,200	$ 4,567,200	$ 4,963,200	$ 4,963,200	$ 3,986,400	$ 3,986,400	$ 4,197,600	$ 4,118,400	$ 4,118,400
SUBTOTAL - INFRASTRUCTURE (SCC 10-50)			**$ 42,172,587**	**$ 45,792,956**	**$ 43,584,078**	**$ 46,195,112**	**$ 36,788,276**	**$ 39,446,558**	**$ 43,750,407**	**$ 41,027,204**	**$ 44,608,445**
60 ROW, LAND, EXISTING IMPROVEMENTS			**$ 135,000**	**$ 150,000**	**$ 140,000**	**$ 150,000**	**$ 115,000**	**$ 125,000**	**$ 145,000**	**$ 135,000**	**$ 150,000**
41	60.01	Purchase or lease of real estate	$ 135,000	$ 150,000	$ 140,000	$ 150,000	$ 115,000	$ 125,000	$ 145,000	$ 135,000	$ 150,000
42	60.02	Relocation of existing households and businesses	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
70 VEHICLES			**$ 8,383,000**	**$ 8,383,000**	**$ 8,383,000**	**$ 8,383,000**	**$ 7,201,000**	**$ 7,201,000**	**$ 7,792,000**	**$ 7,201,000**	**$ 7,201,000**
43	70.01	Light Rail	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
44	70.02	Heavy Rail	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
45	70.03	Commuter Rail	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
46	70.04	Bus	$ 7,683,000	$ 7,683,000	$ 7,683,000	$ 7,683,000	$ 6,501,000	$ 6,501,000	$ 7,092,000	$ 6,501,000	$ 6,501,000
47	70.05	Other	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
48	70.06	Non-revenue Vehicles	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
49	70.07	Spare Parts	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000
SUBTOTAL (SCC 10-70)			**$ 50,690,587**	**$ 54,325,956**	**$ 52,107,078**	**$ 54,728,112**	**$ 44,104,276**	**$ 46,772,558**	**$ 51,687,407**	**$ 48,363,204**	**$ 51,959,445**
		Alternative	**Option A3 - E Exchange**	**Option A3 - E Market**	**Option A4 - E Exchange**	**Option A4 - E Market**	**Option B4 - E Exchange**	**Option B4 - E Market**	**Option C4**	**Option C6 - E Exchange**	**Option C6 - E Market**
		Total Project Cost (2028$)	**$ 102,942,821**	**$ 110,643,319**	**$ 105,953,131**	**$ 111,513,419**	**$ 89,603,599**	**$ 95,262,276**	**$ 105,334,577**	**$ 98,596,756**	**$ 106,212,596**
		Annualized Cost (2023$)	**$ 3,208,807**	**$ 3,415,803**	**$ 3,290,332**	**$ 3,440,808**	**$ 2,778,065**	**$ 2,930,041**	**$ 3,232,475**	**$ 3,015,581**	**$ 3,219,164**
		Contingency	**41%**	**42%**	**42%**	**42%**	**41%**	**42%**	**42%**	**42%**	**42%**

BRT Feasibility Study

Appendix E: Step 2 and 3 Evaluation Matrix – October 2023

Reimagine METRO

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STEP 2 & 3 EVALUATION MATRIX

METHODOLOGY

The five advanced alternatives were evaluated against 13 objectives from all five project goals, consisting of 20 different metrics. These metrics were developed to best reflect available information and the feasibility study goals. Both East Market St. and East Exchange St. options were evaluated for each alternative except for C4, which does not have a routing option. The alternatives evaluated in this step include:

1. **Alternative A3** – West Market St. – RKP Transit Center – East Exchange St./East Market St. – Canton Rd.
2. **Alternative A4** – West Market St. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.
3. **Alternative B4** – State Rd. – Howard St./North Main St. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.
4. **Alternative C4** – Wooster Rd. – Kenmore Blvd. – Lake Shore Blvd. – RKP Transit Center – West Market St.
5. **Alternative C6** – Wooster Rd. – Kenmore Blvd. – Lake Shore Blvd. – RKP Transit Center – East Exchange St./East Market St. – South Arlington St.

Step 2 evaluation criteria included Objectives 2B and 2C of the *Expand Mobility and Access* goal, which were previously evaluated under Step 1 with different metrics. These objectives measure projected and existing ridership and were weighted highest due to the importance of ridership to BRT feasibility and FTA CIG scoring criteria. See Appendix A for further details on how the ridership values were calculated.

Step 3 evaluation included Objectives 1B-E, 3A-D, 4A-B, and 5B-C. Some objectives were tabled following revisions to better reflect study priorities. Objectives not included in this evaluation were tabled due to lack of available data, a need for advanced design, or redundancy with Step 1 or other objectives. Evaluation of the tabled objectives was carried out qualitatively and through discussions with the project team and Stakeholder Advisory Committee (SAC).

A largely quantitative analysis was performed using ArcGIS and other geospatial resources, STOPS modeling results, and relevant planning documents from the region. The quantitative results for each alternative were rated as “best,” “good,” or “okay” as compared to one another under each metric. To create a composite score for each alternative, a score of 1 was assigned to “okay,” 3 to “good,” and 5 to “best.” The score for each objective was multiplied by the objective’s weight, which was based on prioritization of the study goals. Prioritization was informed by the SAC. Scores were totaled for the alternatives and ranked to inform the selection of alternatives for recommendation. Of the composite score, Step 2 objectives made up 40% of total points and Step 3 objectives made up 60%. Metrics that contributed the most to the composite scores evaluated ridership, cost, job access, and equity.

REVISIONS TO THE EVALUATION FRAMEWORK

The Step 2 and 3 evaluation matrix framework was revised after one round of scoring. The initial evaluation results were presented to the SAC, and upon discussion the group decided the results did not best capture the study’s priorities. The project team consequently explored new data sources suggested by the SAC and adjusted the scoring methodology. Changes included:

Criteria

- Moved Objective 4A (existing pedestrian network near station) under Goal 1 (***Advance Feasible and Implementable Solutions***). This reflects a greater focus on implementation as stations with a limited existing pedestrian network would require more capital investment.
- Added Existing Transit Ridership per Mile to Step 2 evaluation criteria. Projected ridership alone does not reflect the reality of implementing BRT; the BRT should have a strong existing base to be feasible.

Breaks

- Reassessed okay/good/best breaks in the data. Values within 10% of the maximum value for each metric were rated "best." Values within 10% of the minimum for each metric fell into the "good" or "okay" rating, depending on how many rating categories were needed to cover the spread of data.

Weighting

- Standardized point scales across the objectives to a 5-3-1 scale and applied weighting when composite scores were calculated. The initial point scale differed between objectives based on their respective weight. For example, an "okay" rating earned one point for Objective 1B (weighted higher) but earned no points for Objective 5C (weighted lower). With the revised point scale, an "okay" rating earned one point regardless of the objective.
- Weighted equity metrics higher than their "overall" counterparts. Equity is the guiding principle of this study and thus should be given more priority in the weighting.
- Redistributed weighting within objectives that have multiple metrics. This change better reflects the study's priorities.

Data Sources

- Evaluated USDOT ETCE census tracts dataset in lieu of HDCs (discussed below).
- Considered Horizon Year 2030. The SAC and project team were concerned that Horizon Year 2045 was too distant to accurately assess successful implementation. Upon review, the project team found that Horizon Year 2030 was not significantly different, so no change was made.

Table 3 in Appendix D-1 details the specific adjustments made to each metric.

EVALUATING EQUITY

As the guiding principle of this study, equity metrics were included throughout the evaluation framework. To evaluate these metrics, the project team initially used the USDOT Historically Disadvantaged Communities (HDCs) geographies.[1] These areas were used to evaluate equity in all previous phases of this feasibility study. However,

Defining USDOT Equitable Transportation Community Explorer Census Tracts

The ETCE uses 2020 Census data to identify tracts that experience burdens brought on by underinvestment in transportation. The five components factored into the analysis are: transportation insecurity, climate and disaster risk burden, environmental burden, health vulnerability, and social vulnerability. Tracts are scored according to the five components, then combined into an overall score. Tracts with an overall score that is above the 65th percentile are considered "disadvantaged" (USDOT).

[1] More information on HDCs can be found in the Preliminary Report and on the USDOT website.

with the release of the USDOT Equitable Transportation Community Explorer (ETCE) in spring 2023 and upon suggestion from the SAC, the project team revisited the selection of HDCs as the appropriate equity geographies.

The ETCE census tracts cover more of the alternatives compared to the HDCs and will be used in USDOT grants going forward. While the expanded coverage suggests that any of the alternatives will serve and benefit disadvantaged populations, it also makes it more difficult to differentiate between the alternatives. Ultimately, the project team elected to move forward with the ETCE census tracts because these are the most updated equity geographies. To evaluate the equity metrics with these updated geographies, the project team calculated the percentage of the alternative length within the ETCE census tracts, then multiplied this percent by the "overall" or "region" counterpart metric.

RESULTS

Initial Evaluation Framework

The initial evaluation results were presented to the SAC, but upon discussion, the group decided they did not best capture the study's priorities. The project team adjusted the evaluation framework accordingly and recalculated the results. The initial results are presented here as part of the evaluation methodology documentation.

Under the initial scoring methodology and evaluation framework, the top three alternatives were, in order: C6, C4, and B4. These three alternatives performed well on equity metrics because they better serve HDCs. They also had generally lower costs and high projected ridership. Alternatives C6 and C4 also performed well on job metrics because they serve the southwest region, which is expected to grow by 2045.

Table 1 displays the initial evaluation results and displays the values behind these results.

Table 1 Initial Step 2 and 3 Evaluation Results

	Alternative	A3		A4		B4		C4	C6	
	Objective (highest to lowest weight)	E Exchange	E Market	E Exchange	E Market	E Exchange	E Market		E Exchange	E Market
Step 2	**Obj. 2B** Serve a corridor in a potential strong transit market.	Okay	Okay	Good	Good	Good	Good	Good	Best	Good
Step 3	**Obj. 1B** Ability to phase a BRT alternative over time.	Best	Best	Best	Best	Good	Good	Okay	Good	Good
	Obj. 1C Ability of BRT service to increase (job) access to HDCs.	Good	Good	Okay	Okay	Okay	Okay	Best	Best	Best
	Obj. 1D Ability to fit a BRT alternative within existing roadway and ROW.	Best	Best	Good	Good	Best	Best	Okay	Good	Good
	Obj. 1E Advance cost-effective BRT alternatives (Capital and O&M)	Good	Okay	Good	Okay	Best	Best	Good	Best	Good
		Okay	Okay	Best	Best	Good	Good	Good	Good	Good
	Obj. 3A Provide businesses more access to workers.	Best	Best	Okay	Okay	Okay	Okay	Good	Best	Best
	Obj. 3B Increase access to schools and services that support workforce advancement.	Best	Best	Good	Good	Best	Best	Okay	Good	Good
	Obj. 3C Supports existing economic development projects and access to land redevelopment opportunities.	Good	Good	Good	Good	Best	Best	Okay	Okay	Okay
	Obj. 3D Supports community-led placemaking initiatives.	Good	Good	Good	Good	Good	Good	Best	Best	Best
	Obj. 4A Provide service to stations conducive to safe pedestrian and bicycle access.	Good	Good	Good	Good	Best	Best	Good	Okay	Okay
	Obj. 4B Address identified transportation safety issues along the corridor.	Okay	Okay	Good	Good	Best	Best	Okay	Good	Good
	Obj. 5B Reduce GHG emissions and fine air particles from SOV trips.	Best	Best	Good	Good	Okay	Okay	Best	Okay	Okay
	Obj. 5C Preserve and provide opportunities to mitigate urban heat island impacts.	Okay	Okay	Best	Good	Best	Best	Best	Good	Good
	Composite Score (out of 100)	**64.5**	**62.5**	**65.75**	**58.5**	**71.5**	**71.5**	**73.5**	**85.75**	**78.75**

Revised Evaluation Framework

With the revised evaluation framework, Alternative A4 performed the best, followed by C6 and B4. Generally, the East Exchange St. options performed better than the East Market St. options due to lower capital costs. Alternative C4 did not perform as well in this round of evaluation and Alternative A3 continued to perform poorly. Table 2 presents the qualitative results of the analysis and Appendix D-1 contains the numbers behind these results.

Alternatives B4, C4, and C6 performed well on metrics that are equity oriented as these alternatives serve more disadvantaged populations. These alternatives also have lower capital and maintenance/operations costs and strong projected ridership. Alternatives C4 and C6 continued to perform well on job metrics because they serve the southwest region, an area poised to grow by 2045. Alternatives A4 and B4 performed well on existing ridership metrics because they serve corridors with METRO's current highest-ridership routes. The top-scoring alternatives also all serve South Arlington St., which is currently served by the high-ridership Route 2.

Appendix D-2 contains a detailed narrative of the results of the final evaluation for each metric.

Table 2 Revised Step 2 and 3 Evaluation Results

	Alternative	A3		A4		B4		C4	C6	
	Objective (highest to lowest weight)	E Exchange	E Market	E Exchange	E Market	E Exchange	E Market		E Exchange	E Market
Step 2	**Obj. 2B** Serve a corridor in a potential strong transit market.	Okay	Okay	Good	Good	Good	Good	Good	Best	Best
Step 2	**Obj. 2C** Serve and benefit existing transit-loyal riders.	Good	Good	Best	Best	Best	Best	Okay	Good	Good
Step 3	**Obj. 1B** Ability to phase a BRT alternative over time.	Best	Best	Best	Best	Good	Good	Okay	Good	Good
Step 3	**Obj. 1C** Ability of BRT service to increase (job) access to ETCE census tracts.	Best	Best	Good	Good	Okay	Okay	Good	Good	Good
Step 3	**Obj. 1D** Ability to fit a BRT alternative within existing roadway and ROW.	Best	Best	Good	Good	Best	Best	Okay	Good	Good
Step 3	**Obj. 1E** Advance cost-effective BRT alternatives (Capital and O&M).	Good	Okay	Good	Okay	Best	Best	Good	Best	Good
		Okay	Okay	Best	Best	Good	Good	Good	Good	Good
Step 3	**Obj. 4A** Provide service to stations conducive to safe pedestrian and bicycle access.	Good	Good	Good	Good	Best	Best	Good	Okay	Okay
Step 3	**Obj. 3A** Provide businesses more access to workers.	Best	Best	Best	Best	Best	Best	Best	Best	Best
Step 3	**Obj. 3B** Increase access to schools and services that support workforce advancement.	Best	Best	Best	Best	Best	Best	Okay	Best	Good
Step 3	**Obj. 3C** Supports existing economic development projects and access to land redevelopment opportunities.	Good	Good	Good	Good	Best	Best	Okay	Good	Good
Step 3	**Obj. 4B** Address identified transportation safety issues along the corridor.	Good	Good	Good	Good	Best	Best	Okay	Good	Good
Step 3	**Obj. 5B** Reduce GHG emissions and fine air particles from SOV trips.	Best	Best	Good	Good	Okay	Okay	Good	Okay	Okay
Step 3	**Obj. 5C** Preserve and provide opportunities to mitigate urban heat island impacts.	Best	Best	Best	Best	Best	Best	Best	Best	Best
	Composite Score (out of 410)	**238**	**228**	**318**	**308**	**302**	**302**	**228**	**312**	**276**

APPENDIX E-1: STEP 2 & 3 EVALUATION SUPPORTING TABLES

Table 3 Step 2 and 3 Evaluation Objectives, Metric Revision, and Methodology

Goal	Objective	Evaluation Criteria	Original Metric	Initial Revised Metric	Initial Weight	Revised Metric	Revised Weight	Methodology
1. Advance feasible and implementable solutions	B. Ability to phase a BRT alternative over time, if needed	Phasing potential	Proportion (%) of corridor by segment that could support phased bus prioritization	Qualitative assessment of logical terminations of the alternative that could support phased bus prioritization. Original metric required advanced design.	5	No change.	5	Based on existing ridership, origin-destination trip patterns, and local bus service for each alternative.
	C. Ability of BRT service to increase access to HDCs in near-term	Constructability	Ability of BRT service to increase access to HDCs by 2030	Increase in jobs accessible by 2045. Revised metric reflects the horizon year used in the STOPS model.	5	No change to metric. Adjusted rating breaks and decreased weighting to be relatively less than equity metric. Horizon year 2030 was reconsidered but tabled because it was not significantly different.	3	Based on STOPS modeling.
				Increase in jobs accessible by 2045 in HDCs.	5	Used ETCE census tracts in lieu of HDCs. Horizon year 2030 was reconsidered but tabled because it was not significantly different.	5	Calculated the percentage change in the number of jobs accessible in ETCE census tracts between 2021 and 2045.
	D. Ability to fit a BRT alternative within existing	Impacts to ROW, roadway uses, and other modes	Requires additional ROW (Y/N)	Number of stations that are unpaved and would require more	5	No change.	5	Counted how many stations per alternative are

Goal	Objective	Evaluation Criteria	Original Metric	Initial Revised Metric	Initial Weight	Revised Metric	Revised Weight	Methodology
	roadway footprint and right-of-way (ROW) while minimizing impacts to extent possible		Magnitude of on-street parking and loading removal	investment/space to build a station. Original metrics required advanced design but were considered in recommendation discussions.				unpaved, took that sum as a percent of total number of stations on each alternative.
			Conflicts with existing or proposed bike facilities (Y/N)					
	E. Advance cost effective BRT alternatives	Planning-level cost estimates	Capital costs	No change.	5	No change.	5	Based on cost estimates.
			Net operations and maintenance costs	No change.	5	No change.	5	Based on cost estimates.
2. Expand mobility and access	B. Serve a corridor in a strong transit market	Projected ridership	Alternative serves corridor(s) with top 5 strongest transit market based on market assessment (Y/N)	Projected ridership. Revised metric uses results from the STOPS model.	10	No change to metric. Adjusted rating breaks and decreased weight relative to ridership per mile metrics.	6	Based on STOPS modeling.
				Projected ridership per mile.	10	No change to metric. Adjusted rating breaks.	7	Projected total ridership divided by alternative length.
				Percent of projected trips from HDCs.	10	Number of projected trips from ETCE census tracts. Adjusted rating breaks and decreased weight relative to ridership per mile metrics.	6	Projected trips multiplied by percentage of each alternative length within ETCE census tracts.

Goal	Objective	Evaluation Criteria	Original Metric	Initial Revised Metric	Initial Weight	Revised Metric	Revised Weight	Methodology
				Projected ridership per mile from HDCs.	10	Projected trips per mile from ETCE census tracts. Adjusted rating breaks.	7	Projected trips from ETCE census tracts divided by alternative length.
	C. Serve and benefit existing transit-loyal riders	Total ridership on existing routes	Alternative serves corridor(s) with top 5 highest existing ridership routes (Y/N)	Not included in the initial revision.	-	Existing ridership per mile. Revised metric uses results from the STOPS model.	7	Based on STOPS modeling.
	F. Provide travel time savings across all service periods	Travel time	Reduction in estimated transit travel time for weekday peak, weekday off-peak, and weekend	Metric was tabled because it did not differentiate the alternatives.	-	-	-	-
	G. Provide reliable transit service	Reliability	Reduction in variability of estimated transit travel time	Metric was tabled because it required advanced design.	-	-	-	-
3. Create economic opportunity	A. Provide businesses access to more workers	Median job access	Median job access for residents in 30-minute transit and walk travel times.	No change.	3	Metric was tabled because it did differentiate the alternatives.	-	-
			See above, 45-minute travel times.	No change.	3	Metric was tabled because it did differentiate the alternatives.	-	-
			See above, 60-minute travel times.	No change.	3	No change to metric. Adjusted rating breaks.	3	Based on STOPS modeling.
	B. Increase access to schools, facilities, and	Access for students to major schools, facilities,	% of population (16 y/o +) with access to major schools, facilities, and	Number of major schools, facilities, and training centers within a	3	No change to metric. Adjusted rating breaks.	3	Counted how many schools and services (VA office, child

Goal	Objective	Evaluation Criteria	Original Metric	Initial Revised Metric	Initial Weight	Revised Metric	Revised Weight	Methodology
	centers that support workforce advancement and economic vibrancy	and training centers	training centers along corridor via 30-minute transit commute.	half mile of the alternative per mile. Revised metric reflects available data.				services, etc.) were within a half mile of each alternative. Normalized by alternative length.
			See above, 45-minute transit commute.					
			See above, 60-minute transit commute.					
	C. Supports existing economic development projects and provides access to areas with land redevelopment opportunity (overall and in HDCs)	On-going development projects, future land use and re-developable land	% of future land use is transit-supportive within a buffer distance	No change.	3	No change to metric. Adjusted rating breaks and decreased weight relative to equity metric.	2	Assigned Y/N values to land use zones if they are transit-supportive. Summed transit-supportive area within a half mile for each alternative, took that sum as a percent of total area within a half mile.[1]
			% of future land use is transit-supportive within a buffer distance in HDCs	No change.	3	Used ETCE census tracts in lieu of HDCs. Adjusted rating breaks.	3	Multiplied the percentage of each alternative length within ETCE census tracts by the amount of transit-supportive land within a half mile and calculated the percent of total area within a half mile.

Goal	Objective	Evaluation Criteria	Original Metric	Initial Revised Metric	Initial Weight	Revised Metric	Revised Weight	Methodology
			On-going development projects within a buffer distance On-going development projects within a buffer distance in HDCs	On-going development projects with a half mile. Equity metric was tabled because it did not differentiate the alternatives.	3	No change to metric. Decreased weight because it did not significantly differentiate the alternatives.	1	Counted number of Great Streets Akron districts within a half mile of each alternative.[2]
	D. Supports community-led placemaking initiatives	Generally compatible with community-led initiatives	Alternative is supportive of existing community plans or corridor has recent community support for placemaking	No change.	3	Metric was tabled because it did not differentiate the alternatives.	-	-
4. Improve safety	A. Provide service to stations conducive to safe pedestrian and bicycle access	Ped/bike connectivity	Cumulative 10-minute walk/roll shed based on the street network and cumulative half-mile straight line	Number of sidewalk gaps within a half mile of station areas. Revised metric reflects available data.	2	No change to metric. Increased weight and moved under Goal 1 to focus on implementation.	5	Counted how many stations per alternative had a sidewalk gap within a half mile on the corridor, took that sum as a percent of total number of stations on each alternative.
	B. Address identified transportation safety issues along the corridor	High crash locations (top 100 for region)	# of high crash locations on corridors (overall and in HDCs)	% of alternative that is on the AMATS High Injury Network (HIN). Revised metric reflects available and recent data.	2	No change to metric. Adjusted rating breaks.	2	Calculated mileage for each HIN segment. Summed HIN mileage for each alternative, took as a percent of total alternative length.[3]

Goal	Objective	Evaluation Criteria	Original Metric	Initial Revised Metric	Initial Weight	Revised Metric	Revised Weight	Methodology
5. Support climate resiliency and environmental sustainability	A. Increase transit mode share and reduce dependence on cars for trips	Transit mode split	% change in transit mode split	Metric was tabled because of a lack of available data.	-	-	-	-
	B. Reduce GHG emissions and fine air particles from SOV trips	GHG emissions	% change in GHG emissions and fine air particles within a half mile of corridor	% change in vehicle miles traveled (VMT). Revised metric reflects available data.	1	No change to metric. Adjusted rating breaks.	1	Based on STOPS modeling.
	C. Preserve and provide opportunities to mitigate urban heat island impacts in HDCs	Existing/potential tree canopy	Impacts to mature tree canopy (Y/N) Potential space for additional tree canopy (Y/N)	Number of stations that are located in areas with severe urban heat island effect. Revised metric reflects available data.	1	No change to metric. Adjusted rating breaks.	1	Counted number of stations per alternative in areas with severe UHI effect, took that as a percent of total number of stations on each alternative.[4]

[1] Transit-supportive land uses were defined as parcels currently zoned as high-density or multi-family residential, retail, and institutional uses. Based on zoning data published by Summit County.

[2] Information on Great Streets Akron is available here.

[3] The HIN was developed as part of the AMATS Safe Streets 4 All Action Plan (2023).

[4] Evaluation for this metric was based on the Trust for Public Land's 2019 UHI effect image service.

Table 4 Initial Evaluation Values

	Alternative	A3 - E Exchange	A3 - E Market	A4 - E Exchange	A4 - E Market	B4 - E Exchange	B4 - E Market	C4	C6 - E Exchange	C6 - E Market
	Length (mi)	17.65	17.52	18.66	18.6	14.69	14.62	17.93	15.94	17.29
	Total Number of Stations	58	58	59	61	48	50	57	55	60
Obj. 2B	Projected Total Ridership	4700	4300	5600	5200	4700	4300	5600	5600	5200
	Projected Ridership per mi	266	245	300	280	320	294	312	351	301
	% of projected trips from HDCs	58.4%	58.4%	58.9%	58.9%	68.1%	68.1%	67.3%	67.1%	67.1%
	Projected HDC ridership per mi	114	114	135	135	152	152	156	171	171
Obj. 1B	Ability to phase	Best	Best	Best	Best	Good	Good	Okay	Good	Good
Obj. 1C	Increase in number of jobs accessible by 2045 - Region	4.5%	4.5%	3%	3%	3%	3%	5%	6%	5%
	Increase in number of jobs accessible by 2045 - HDC	4%	4%	2%	2%	2%	2%	7%	7%	7%
Obj. 1D	% of station areas that are unpaved	22.4%	22.4%	30.5%	29.5%	22.9%	22.0%	38.6%	32.7%	30.0%
Obj. 1E	Capital costs	$ 102,942,821.00	$ 110,643,319.00	$ 105,953,131.00	$ 111,513,419.00	$89,603,599.00	$ 95,262,276.00	$ 105,334,577.00	$ 98,596,756.00	$ 106,212,596.00
	Net change in operations/ maintenance costs	$ 2,500,000.00	$ 2,400,000.00	$ 1,000,000.00	$ 900,000.00	$ 1,600,000.00	$ 1,500,000.00	$ 1,700,000.00	$ 1,900,000.00	$ 1,800,000.00
Obj. 3A	Number of jobs accessible - 30-minute travel time	10600	10600	10400	10400	10400	10400	10500	10600	10600
	Number of jobs accessible - 45-minute travel time	29000	29000	28500	28500	28400	28400	29500	29300	29300
	Number of jobs accessible - 60-minute travel time	50600	50600	49900	49900	49700	49700	51100	50800	50800
Obj. 3B	Number of schools and services (within a 1/2 mi) per mi	0.40	0.40	0.38	0.38	0.41	0.41	0.28	0.38	0.35
Obj. 3C	% of transit-supportive land use within a 1/2 mi - Overall	23.3%	23.3%	25.9%	25.8%	28.2%	28.1%	20.5%	18.2%	18.3%
	% of transit-supportive land use within a 1/2 mi - HDC	6.6%	6.4%	6.1%	6.0%	8.6%	8.4%	7.0%	8.3%	8.7%
	Number of development projects within a 1/2 mi	4	4	4	4	4	4	3	3	3
Obj. 3D	Number of community plans	3	3	3	3	3	3	4	4	4
Obj. 4A	Number of stations with sidewalk gaps within a 1/2 mi	18	18	19	19	15	15	22	27	28
Obj. 4B	% of alternative on HIN	30.6%	26.5%	43.9%	39.9%	59.2%	54.2%	18.1%	46.9%	38.9%
Obj. 5B	Annual VMT savings compared to Reimagine METRO	1,110,000	1,110,000	595,000	595,000	395,000	395,000	805,000	405,000	405,000
Obj. 5C	% of stations with severe UHI effect	51.7%	51.7%	55.9%	54.1%	58.3%	56.1%	57.1%	52.7%	53.3%

Table 5 Revised Evaluation Values

	Alternative	A3 - E Exchange	A3 - E Market	A4 - E Exchange	A4 - E Market	B4 - E Exchange	B4 - E Market	C4	C6 - E Exchange	C6 - E Market
	Length (mi)	17.65	17.52	18.66	18.6	14.69	14.62	17.93	15.94	17.29
	Total Number of Stations	58	58	59	61	48	50	57	55	60
Obj. 2B	Projected Total Ridership	4700	4300	5600	5200	4700	4300	5600	5600	5200
	Projected Ridership per mi	266	245	300	280	320	294	312	351	301
	Projected Trips from ETCE tracts	2004	2004	2527	2527	2235	2235	2789	2730	2730
	Projected Trips per mi from ETCE tracts	142	142	163	163	188	189	169	246	227
Obj. 2C	Existing Ridership per mi	175	175	225	225	225	225	150	200	200
Obj. 1B	Ability to phase	Best	Best	Best	Best	Good	Good	Okay	Good	Good
Obj. 1C	Increase in number of jobs accessible by 2045 - Region	4.5%	4.5%	3%	3%	3%	3%	5%	6%	5%
	Increase in number of jobs accessible by 2045 - ETCE tracts	4%	4%	2%	2%	0%	0%	2%	2%	2%
Obj. 1D	% of station areas that are unpaved	22.4%	22.4%	30.5%	29.5%	22.9%	22.0%	38.6%	32.7%	30.0%
Obj. 1E	Capital costs	$ 102,942,821.00	$ 110,643,319.00	$ 105,953,131.00	$ 111,513,419.00	$ 89,603,599.00	$ 95,262,276.00	$ 105,334,577.00	$ 98,596,756.00	$ 106,212,596.00
	Net change in operations/ maintenance costs	$ 2,500,000.00	$ 2,400,000.00	$ 1,000,000.00	$ 900,000.00	$ 1,600,000.00	$ 1,500,000.00	$ 1,700,000.00	$ 1,900,000.00	$ 1,800,000.00
Obj. 4A	Number of stations with sidewalk gaps within a 1/2 mi	18	18	19	19	15	15	22	27	28
Obj. 3A	Number of jobs accessible - 60-minute travel time	50600	50600	49900	49900	49700	49700	51100	50800	50800
Obj. 3B	Number of schools and services (within a 1/2 mi) per mi	0.40	0.40	0.38	0.38	0.41	0.41	0.28	0.38	0.35
Obj. 3C	% of transit-supportive land use within a 1/2 mi - Overall	23.3%	23.3%	25.9%	25.8%	28.2%	28.1%	20.5%	18.2%	18.3%
	% of transit-supportive land use within a 1/2 mi - ETCE tracts	16.9%	16.9%	18.3%	18.2%	23.8%	23.6%	15.0%	17.5%	17.6%
	Number of development projects within a 1/2 mi	4	4	4	4	4	4	3	3	3
Obj. 4B	% of alternative on HIN	30.6%	26.5%	43.9%	39.9%	59.2%	54.2%	18.1%	46.9%	38.9%
Obj. 5B	Annual VMT savings compared to Reimagine METRO	1,110,000	1,110,000	595,000	595,000	395,000	395,000	805,000	405,000	405,000
Obj. 5C	% of stations with severe UHI effect	51.7%	51.7%	55.9%	54.1%	58.3%	56.1%	57.1%	52.7%	53.3%

APPENDIX E-2: STEP 2 & 3 EVALUATION RESULTS NARRATIVE

Objective 2B. Serve a corridor in a strong transit market (potential)

In the Step 2 Ridership and Accessibility Evaluation, the average weekday ridership (2045) was estimated using the STOPS modeling tool. Metrics that include an equity dimension were based on areas identified by the USDOT Equitable Transportation Community Explorer (ECTE). The length of the alternative within the ETCE census tracts was divided by the total alternative length to produce an "equity factor," which was used to approximate the equity metrics. The evaluation determined the following:

Projected Total Ridership

- The projected ridership across options ranges from 4,300 to 5,600 riders per day.
- Ridership for Alternative **A3** and **B4** is generally less than the other alternatives, which range from 4,300 to 4,700 riders per day.
- The East Exchange St. option for Alternatives **A3**, **A4**, **B4**, and **C6** has higher ridership compared to the East Market St. option.

Projected Ridership per Mile

- When projected ridership is normalized per mile, to account for varying lengths of alternatives, Alternative **C6** (East Exchange) performs the best.
- Alternative **A3** had the lowest projected ridership per mile.

Projected Total Trips from ETCE Census Tracts

- Alternatives **A4**, **C4**, and **C6** have the highest number of trips from ETCE census tracts, and Alternative **A3** has the lowest number of trips. Alternatives serving the City of Barberton and the southwest area of the region perform well.

Projected Total Trips from ETCE Census Tracts per Mile

- Alternative **C6** has the highest total trips per mile from ECTE census tracts and Alternative **A3** has the lowest total trips per mile. Alternatives serving the City of Barberton and the southwest area of the region perform well.

Objective 2C. Serve and benefit existing transit loyal riders

Existing Ridership per Mile

In the Step 1 Ridership Assessment, the existing ridership for all corridors was under consideration. When reviewing the existing ridership by alternative, the assessment determined the following:

- Alternatives **A4** and **B4** have the highest existing ridership per mile on high-performing routes.
- Alternative **C4** has the lowest existing ridership per mile.

Objective 1B. Ability to phase a BRT alternative over time, if needed

Ability to Phase

Based on a qualitative review of existing ridership, origin-destination trip patterns, and local bus service the project team determined the following:

- Alternatives **A3** and **A4** have the greatest ability for phased implementation. Segments near the termini of these alternatives (West Market St., South Arlington, and East Market St.) have existing high-frequency local bus service and high ridership.
- The ability to phase the implementation of other alternatives (**B4**, **C4**, and **C6**) is limited. These alternatives do not have existing high-frequency local bus service and high ridership on one or more

segments located near the termini. Therefore, phased implementation of these alternatives would not have strong ridership in earlier phases.

Objective 1C. Ability of BRT service to increase access to ETCE census tracts

In the Step 2 Ridership and Accessibility Evaluation, the change in job accessibility compared to the Reimagine service in the peak period (2045) was estimated for the region and ETCE census tracts. This criterion was revised from 2030 to use the horizon year (2045) in the STOPS ridership model. The evaluation determined the following:

Increase in number of jobs accessible by 2045 - Region

- Alternatives **C6**, **C4**, and **A3** have the greatest percentage increase in the number of jobs accessible in 2045 for the region. These alternatives serve areas with forecasted job growth in the region.

Increase in number of jobs accessible by 2045 – ETCE census tracts

- Alternative **A3** has the greatest percentage increase in the number of jobs accessible in 2045 for ETCE census tracts.

Objective 1D. Ability to fit a BRT alternative within the existing right-of-way

% of station areas that are unpaved

This criterion evaluates the impacts to right-of-way (ROW), roadway uses, and other modes. The alternatives are assumed to primarily run in mixed-traffic guideways in the Build Year. Therefore, any new BRT stations may have the greatest relative impact on ROW. To quantify the relative impacts of the stations, the number of potential stations that are unpaved and would require more investment and space to build a station was identified. This was used to determine the percentage of the total number of station areas that are unpaved.

This evaluation determined the following:

- Alternative **C4** would require the greatest investment in station areas with the potential for the greatest impacts and highest costs.
- Alternatives **A3** and **B4** would require a lesser level of investment in station areas as more potential station areas have existing infrastructure (sidewalks, bus stops, and paved areas).
- Alternatives **A4** and **C6** would require investment in station areas, but not as much as **C4**.

Objective 1E. Advance cost-effective BRT alternatives

Capital Costs

Capital cost estimates were developed with the following key assumptions:

- 40’ long compressed natural gas (CNG) buses
- Mix of different station typologies for alternatives (enhanced and neighborhood stations)
- Annual inflation
- Contingency
- Construction beginning in 2027 and revenue operations beginning in late 2028

The evaluation of capital cost estimates determined the following:

- Capital cost estimates (year of expenditure, in 2028$) range from $85 million to $115 million.
- Alternatives **B4** and **C6** – East Exchange options have generally lower capital cost estimates as they are shorter routes with fewer stations.
- Alternatives **A3** and **A4** have generally higher capital cost estimates as they are longer routes with more stations.

Net change in operations/ maintenance costs

As part of the Step 2 Ridership and Accessibility Evaluation, the preliminary operations and maintenance costs were developed for each of the alternatives and compared to Reimagined service along these alternatives. The evaluation of the net change in annual operation and maintenance costs determined the following:

- Alternative **A4** has the smallest net change in annual operations and maintenance costs ($900,000 to $1,000,000. This alternative has the highest frequency service in the system and would require a comparatively lesser incremental increase in investment to operate future BRT services.
- All other alternatives would require more to operate and maintain compared to Alternative **A4**. Alternative **A3** would require the greatest net change in annual operations and maintenance costs ($2,400,000 to $2,500,000) as it is among the longest routes with segments that do not currently have higher-frequency local bus service.

Number of stations with sidewalk gaps within a 1/2 mi

All stations require supporting pedestrian infrastructure. Not all the potential station areas along the alternatives have connecting sidewalks. Improving pedestrian access to stations has implications for capital costs. To quantify the potential level of investment, the number of stations per alternative with a sidewalk gap was counted within the walkshed of the corridor, defined as a half mile from the corridor. The number of stations with sidewalk gaps was then summed as a percent of the total number of stations on each alternative. The evaluation determined the following:

- Alternative **B4** had the least number of stations with sidewalk gaps within a ½ mile of the corridor as it is among the shortest alternatives and serves neighborhoods with existing pedestrian infrastructure.
- Alternative **C6** had the greatest number of stations with sidewalks gaps within a ½ mile of the corridor. This alternative serves suburban neighborhoods with sidewalks gaps in existing pedestrian infrastructure.

Objective 3A. Provide businesses more access to more workers

Number of jobs accessible – 60 min. travel time

In the Step 2 Ridership Evaluation, the estimated median job access within a 60-minute transit travel time was developed for all 9 options using the STOPS modeling tool. Median job access within 30- and 45-minute transit travel times were originally considered but tabled in this revision because they did not differentiate the alternatives. The evaluation determined the following:

- The alternatives were not significantly different in the number of jobs accessible within a 60-minute transit travel time. The number of jobs accessible ranges from 49,700 to 51,100. This suggests that any of the alternatives will provide sufficient access to jobs.

Objective 3B. Increase access to schools, facilities, and centers

Number of schools and services (within a ½ mile) per mile

The number of schools and services (VA office, child services, etc.) within a half mile were counted for each alternative. This number was divided by each alternative length. The evaluation determined the following:

- Alternatives **A3**, **A4**, and **B4** have around the same number of schools and services per mile. These alternatives serve the West Market and South Arlington corridors where most of the schools and services are located.
- The southwest alternatives (**C4** and **C6**) have a lower number of schools and services per mile.

Objective 3C. Supports (re)development projects and opportunities

% of transit supportive land use within a ½ mile – Overall

Based on zoning data published by Summit County, values were assigned to each zone if they were considered "transit-supportive" (mixed-use, high-density residential, institutional, etc.). The transit-supportive land area within a half mile of each alternative was summed and divided by the total land area within a half mile of the alternative. The evaluation determined the following:

- Alternative **A4** and **B4** have the most transit-supportive land within a half mile. These alternatives serve areas that are denser and have more mixed-use zoning.
- Alternative **C6** has the least transit-supportive land within a half mile. This alternative serves an area that is largely industrial, which is not considered transit-supportive.

% of transit supportive land use within a ½ mile – ETCE Census Tracts

The transit-supportive land area within a half mile of each alternative was multiplied by the corresponding "equity factor," then divided by the total land area within a half mile of the alternative. The evaluation determined the following:

- Alternative **B4** has the most transit-supportive land within a half mile that is also in an ETCE census tract. This alternative has a significant amount of transit-supportive land (see above) and serves the ETCE census tracts well.
- Alternatives **A3** and **C4** have the least transit-supportive land within a half mile that is also in an ETCE census tract.

Number of development projects within a ½ mile

Based on Great Streets Akron districts, the number of development districts within a half mile of each alternative was counted. The evaluation determined the following:

- The southwest alternatives (**C4** and **C6**) do not have as many development districts within a half mile. The Great Streets Akron districts are predominantly located to the northwest and east.

Objective 4B. Improve transportation safety

% of alternative on HIN

Based on the High Injury Network (HIN) recently developed by AMATS, the percent of each alternative on the HIN was calculated. The evaluation determined the following:

- Alternative **B4** has the largest percentage of its length on the HIN. The HIN covers a long segment of South Arlington St. This suggests that the implementation of Alternative **B4** stands to bring more safety improvements to the region compared to other alternatives.
- Alternative **C4** has the smallest percentage of its length on the HIN.

Objective 5B. Supports climate resiliency and environmental sustainability

Annual VMT savings compared to Reimagine METRO

In the Step 2 Ridership Evaluation, the estimated annual VMT (vehicle miles traveled) savings compared to Reimagine METRO was developed for all 9 options using the STOPS modeling tool. The evaluation determined the following:

- Alternative **A3** has the largest amount of annual VMT savings compared to Reimagine METRO. This alternative is projected to generate the largest amount of *new* transit trips, resulting in greater VMT savings.

- Alternatives **B4** and **C6** have the lowest amount of annual VMT savings.

Objective 5C. Mitigate urban heat island impacts in equity priority areas

% of stations with severe urban heat island effect

Based on the Trust for Public Land's 2019 Urban Heat Island (UHI) effect image service, the number of stations per alternative in areas with severe UHI effect was counted, then taken as a percentage of total stations on each alternative. The evaluation determined the following:

- The alternatives were not significantly different in the percent of stations with severe UHI effect. Percentages ranged from 51.7% to 58.3%. Any of the alternatives stand to improve UHI impacts upon implementation.