



Appendix H: Tier 2 Evaluation Methodology and Results

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OVERVIEW

The Central Ohio Transit Authority (COTA) is undertaking a planning effort, COTA Next Generation 2050 (“NextGen”), to explore central Ohio’s future public transportation needs. The planning process began in January 2015 and is designed to create a long-term perspective on transit investment opportunities, guiding transit development through 2050.

The NextGen evaluation framework is split into two phases. The Tier 1 screening phase (completed in December 2015) evaluated a broad list of potential high capacity transit corridors and recommended a smaller subset for Tier 2 evaluation. The Tier 2 evaluation phase began with more detailed project definition for each corridor (alignment, frequency, mode), followed by a more detailed analysis of the potential for high capacity transit to be successful in each Tier 2 corridor as defined by the community goals. This report presents the methods and results of the Tier 2 evaluation.

Community Transit Priorities

Through the outreach process, an initial list of eight values was drafted. In subsequent outreach activities, the team worked with community members and stakeholders to refine and prioritize these values. The process resulted in identification of five values or priorities for how transit investment should be directed and measured. See the NextGen Evaluation Framework (October 2015) for detailed discussion of the refinement of community values and development of metrics.

The following five values create the structure of the evaluation framework.

1. Make Better Connections – Extend transit’s reach further into the communities it already serves.
2. Invest in Underserved Communities – Direct transit investment to specific corridors and neighborhoods.
3. Coordinate with Growth – Encourage inward growth and serve existing neighborhoods. Strengthen fast-growing areas.
4. Build on Success – Make existing transit service more compelling.
5. Sustainability – Protect the environment and reduce greenhouse gas emissions.

TIER 2 EVALUATION METHODOLOGY

Evaluation Corridors

The corridors considered in the Tier 2 evaluation were identified through the Tier 1 screening as alignments with the highest potential for high capacity transit. Seventeen of the 26 original corridors were recommended for Tier 2 analysis as a result of the Tier 1 screening. In addition, Corridor 26 – Newark Commuter Rail, was brought forward from the Tier 1 screening for further analysis. Because of its wider regional alignment and peak commuter market, Corridor 26 was not evaluated or compared to other corridors using the Tier 2 evaluation methodology. Instead, costs and ridership estimates were developed and the project will be considered independent of the other high capacity transit corridors (Figure 1).

Through discussions with COTA Staff, Connect Columbus, and MORPC, the specific endpoints and alignments of each corridor were defined. Most alignments were revised slightly; however there were several major revisions, described below.

Five of the Tier 2 corridors (Corridor 6, 7, 8, 9, and 22) shared identical alignments between downtown Columbus, Short North, and OSU. It was determined that all five corridors performed well in the Tier 1 screening because of the high level of transit demand that exists in this segment, and that these corridors should be evaluated further in order to identify which “extensions” beyond OSU have the most potential to support high capacity transit. Segments of corridors 6, 7, and 9 that are outside of the dense downtown Columbus, Short North, and OSU area did not perform as well against the Tier 1 screening criteria as the segments of Corridors 8 and 22 that are north of OSU. As a result, the five corridors were consolidated into two corridors:

- Downtown-Polaris via High Street (with an alternative alignment using 3rd Avenue between Spring and 11th)
- Downtown-Polaris via North Corridor (Rail Right of Way)

The alignment of the High Street corridor was further refined during the Tier 2 evaluation process. An examination of the initial ridership and cost estimates suggested that the extension from Worthington to the Polaris area was underperforming. The alignment’s terminus was shortened to Worthington to better match the areas that could support high capacity transit, as shown in Figure 2. The two corridors serving downtown Columbus, Short North and OSU considered during the Tier 2 analysis were:

- Downtown-Worthington via High Street (with an alternative alignment using 3rd Avenue between Spring and 11th)
- Downtown-Polaris via North Corridor (Rail Right of Way)

Figure 1 Tier 1 High Capacity Transit Corridors

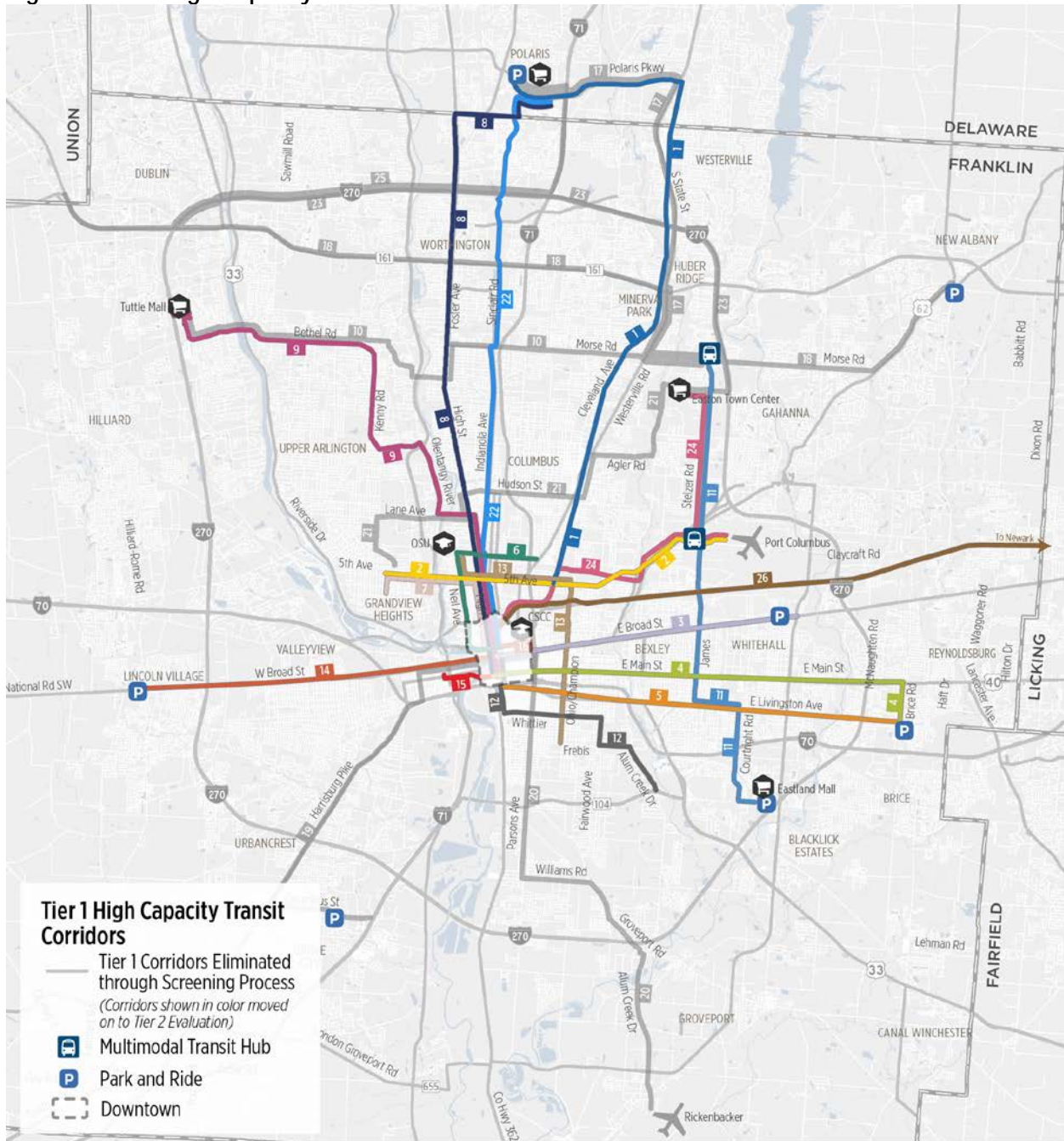
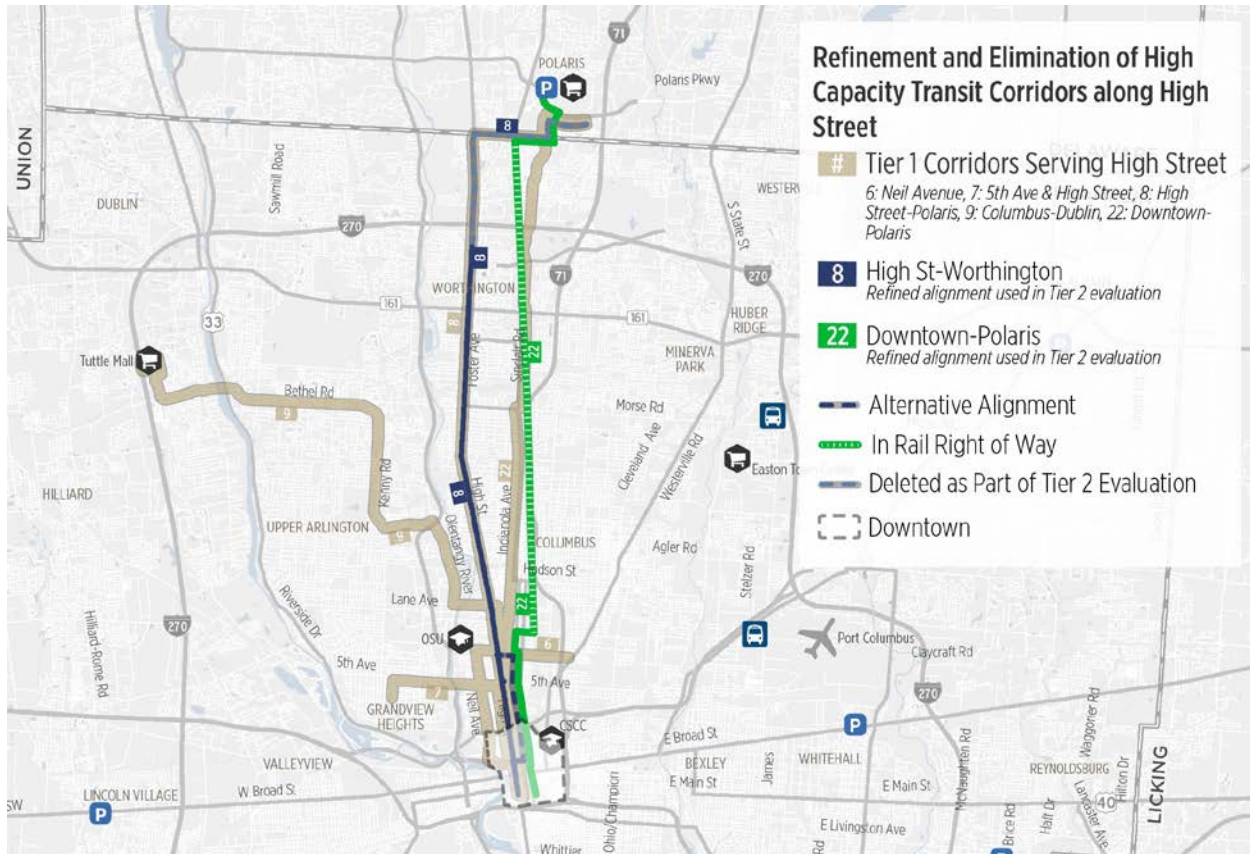


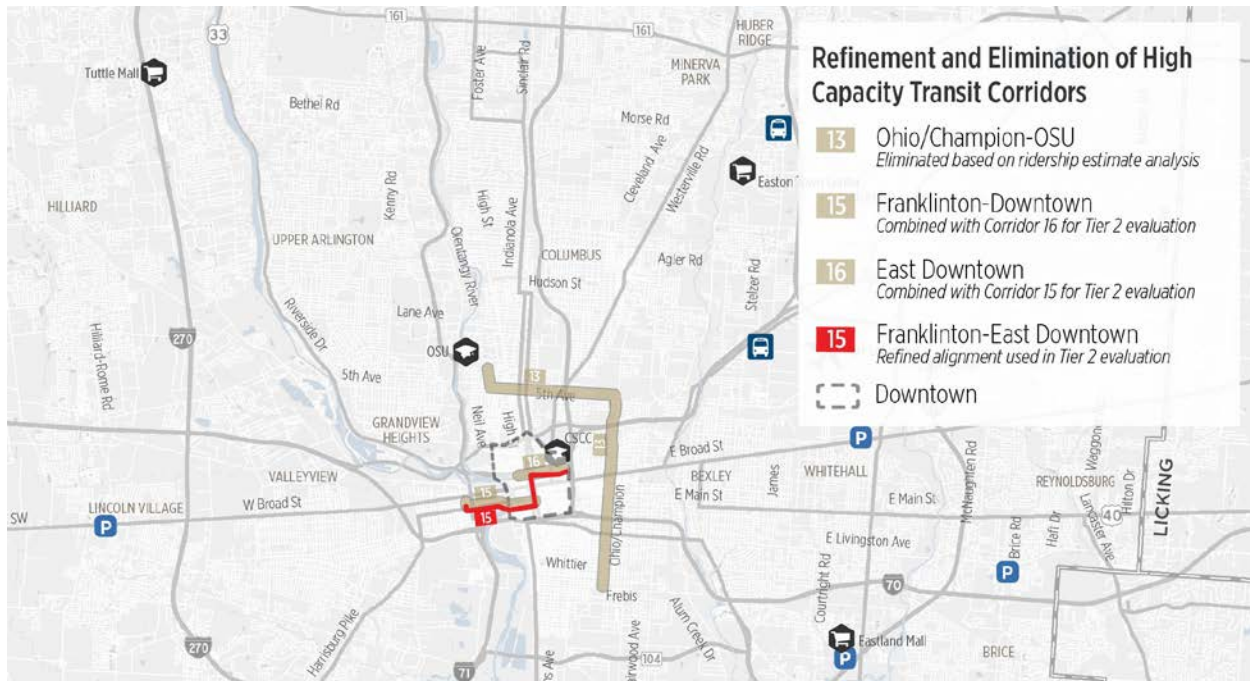
Figure 2 Refinement of High Capacity Transit Corridors (1 of 2)



In addition, two short corridors serving connections between Downtown and Franklinton and Downtown and East Downtown were combined into one corridor serving both destinations.

Once the specific alignments of each corridor had been determined, existing ridership within each corridor was estimated using stop-level ridership data in order to get a baseline understanding of the existing market for transit. Existing ridership is an important factor in the Federal Transit Administration (FTA) Capital Investment Grant (CIG) application process. Ridership in the corridor was defined as trips starting and ending within one half mile of the proposed Tier 2 corridor. Through this analysis it was determined that the Ohio/Champion-OSU corridor should not be further evaluated in Tier 2 due to an existing ridership market that was significantly smaller than the other corridors.

Figure 3 Refinement of High Capacity Transit Corridors (2 of 2)



Through the processes described above the original seventeen Tier 2 corridors were reduced to 12 corridors, plus Corridor 26 – Newark Commuter Rail, described in Figure 4 and shown in the map in Figure 5.

Figure 4 Potential High Capacity Transit Corridor Descriptions

Corridor Description	Analysis	Project Genesis
<p>1 CMAX Upgrade Re-align CMAX service to utilize former Mt. Vernon PRR line between E 5th Ave and Ferris Rd. Extend alignment to Polaris.</p>	<p>Forecasts show significant population and employment growth in Westerville and Polaris. Serving these areas with a faster connection to downtown Columbus would facilitate and support that growth. In addition, technology investments in the Linden neighborhood corridor that are planned as part of Smart Columbus potentially provide an opportunity to coordinate with high capacity transit investments.</p>	<p>CMAX on Cleveland Avenue represents a major transit investment in Northeast Columbus. As demand grows, an alternative alignment that upgrades CMAX is identified. Using the railroad right-of-way allows for creation of a busway or railway with minimal impacts on existing and proposed roadways. The dedicated right of way would reduce travel times, making transit connections over long distance more competitive with auto travel. In addition, Polaris, already a large job center, is expected to develop further, making this corridor a potential connection between high need areas and jobs.</p>
<p>2 5th Avenue Grandview-Airport Connects Grandview, Short North, and the</p>	<p>Between Grandview Heights and High Street, existing and projected population and employment densities</p>	<p>The TSR identified a portion of this corridor as a frequent transit network route. The redevelopment possibilities between High Street and Cleveland</p>

Corridor Description		Analysis	Project Genesis
	Milo Grogan neighborhood to the Airport using 5th Avenue	can support higher levels of transit service.	Avenue were identified by stakeholders as able to support higher capacity transit as well. This corridor could also potentially be supported by predicted growth surrounding OSU. An extension to the airport was added onto this segment to provide a destination at the eastern end of the corridor.
3	East Broad Connects downtown Columbus, Bexley, and Whitehall via East Broad Street	The existing and projected population and employment densities can support higher levels of transit service.	The TSR identified this corridor as a frequent transit network route. This corridor was one of the most frequently requested from the public outreach process and serves nodes where growth is expected to occur just east of James Street and just east of Interstate 270. The Connect Columbus team has also identified this as a potential high capacity transit corridor.
4	East Main Connects Reynoldsburg and downtown Columbus via East Main Street	The existing and projected population and employment densities can support higher levels of transit service.	The TSR identified this corridor as a frequent transit network route. Existing transit service on East Main is more frequent than any other single route operated by COTA (as frequent as every 7.5 minutes), warranting investigation of potential upgrades to high capacity transit. In addition, this corridor presents an opportunity to serve lower income communities between downtown and Nelson Road as well as east of James Rd with enhanced service.
5	East Livingston Connects Reynoldsburg and downtown Columbus via Livingston Avenue	The existing and projected population and employment densities can support higher levels of transit service.	The TSR identified this corridor as a frequent transit network route. South Columbus, which is partially served by this corridor, was identified by the public as a needing additional transit service.
8	High Street - Worthington Connects downtown Columbus, OSU, and Polaris via High Street (with alternative alignment)	Between OSU and downtown Columbus, the existing and projected population and employment densities can support higher levels of transit service. North of OSU, there are pockets of density that are supportive of high capacity transit.	The TSR identified this corridor as a frequent transit network route between downtown and Morse Road. The Downtown Columbus Strategic Plan called for high capacity transit linking downtown with OSU. The public process identified High Street as one of the corridors needing transit enhancements. Development and

Corridor Description		Analysis	Project Genesis
	via 3 rd Street through the Short North)		densification is expected to occur along High Street between Downtown, through the Short North, and around OSU, creating strong mixed use neighborhoods that support transit.
11	Eastland Mall – Easton Connects Eastland Mall, the Airport and Easton Town Center via Stelzer Road	Existing and projected population and employment densities along this corridor include segments that can support higher levels of transit.	The TSR identified this corridor as a frequent transit network route. It serves an area of high need and connects to a major regional employment center. Easton Town Center is a regional destination with an existing mix of residential, commercial, and retail that will develop more housing and jobs in the future, creating an increasingly dense anchor for the northern terminus of the corridor.
12	Alum Creek-Whittier Connects downtown Columbus to Alum Creek Drive via Whittier and 3rd	Existing and projected population and employment densities along this corridor include segments that can support higher levels of transit.	The TSR identified this corridor as a frequent transit network route. It serves an area of high need, and was identified in the public process as an area needing enhanced service.
14	West Broad Connects Lincoln Village with downtown Columbus via West Broad Street	Existing and projected population and employment densities along most of this corridor can support high capacity transit.	The TSR identified this corridor as a frequent transit network route. It serves an area of high need, and was identified in the public process as an area needing enhanced service. Several predicted growth areas on West Broad such as the East Franklinton neighborhood and existing commercial areas near the Hollywood Casino present potential for transit investment to support development. Additionally, existing COTA service on West Broad performs well, with high ridership and productivity.
15	Franklinton-East Downtown Connects Franklinton to east downtown via West Town, High Street, and East Spring Street	Existing and projected population and employment densities along this corridor can support high capacity transit.	The TSR identified a frequent transit network route between Mt. Carmel West Hospital and downtown and to East Downtown via the Spring/Long Street pair. The Connect ColumbUS effort has identified Franklinton as a high growth area that can support higher levels of service. Previous work by local streetcar planning advocates includes connections to East Downtown and

Corridor Description		Analysis	Project Genesis
			select downtown stakeholders, in particular Columbus State, strongly desire enhanced services linking East Downtown with downtown. The proposed alignment assumes future bi-directional street configuration on Spring street.
22	<p>Downtown-Polaris via North Corridor</p> <p>Connects downtown Columbus and Polaris via High Street, 3rd Street/Summit Street and the North Corridor.</p>	<p>Polaris, parts of Worthington, and all of the alignment south of Hudson St. show the existing and projected population and employment densities to support higher levels of transit. However, between Worthington and Hudson St, only pockets of higher densities exist.</p>	<p>This corridor connects Polaris with Downtown in the most direct alignment, using 3rd Street through the Short North and the North Corridor rail right of way to Polaris. This corridor would likely provide faster travel times than the High Street connection to Polaris due to the dedicated right of way. However, there is less density along this corridor than the High Street alignment. Phase I outreach indicated support for facilitating this connection. It does not serve OSU directly.</p>
24	<p>Downtown-Airport-Easton</p> <p>Connects downtown Columbus, the Airport, and Easton Town Center with a direct high-speed service</p>	<p>Linking downtown with the Airport was one of the most requested improvements in the outreach process.</p>	<p>The Jobs, Employment, and Transportation (JET) Task Force and the Downtown Columbus Strategic Plan called for high capacity transit linking downtown with the Airport. Easton Town Center is a regional destination with an existing mix of residential, commercial, and retail that will develop more housing and jobs in the future, creating an increasingly dense anchor for the northern terminus of the corridor.</p>
26	<p>Newark Commuter Rail</p> <p>This corridor was not fully analyzed in Tier 2, but costing and ridership estimating were completed.</p>	<p>Downtown Columbus has the population and employment density to support peak-commute time regional services. Between Blacklick, Reynoldsburg, and Newark, population and employment densities are limited.</p>	<p>Traffic congestion on I-70 from the east is projected to increase in Franklin, Licking, and Fairfield Counties. In order to provide an alternative to the freeway, a regional connection between Newark is proposed. This connection is being evaluated separately from the Tier 2 analysis, as it has different characteristics (regional, peak only) than the other high capacity transit corridors.</p>

Modal Assumptions

Based on passenger experience, the ability to stimulate development, ridership growth, the projected people carrying capacity needs, and estimated capital costs, an initial analysis mode for each corridor was selected. An analysis mode does not preclude an alternative mode in the federal project development process – any subsequent alternatives analysis will finalize the appropriate mode.

Based on the initial analysis, bus rapid transit was the appropriate mode for the majority of corridors. A rail mode was considered for five corridors.

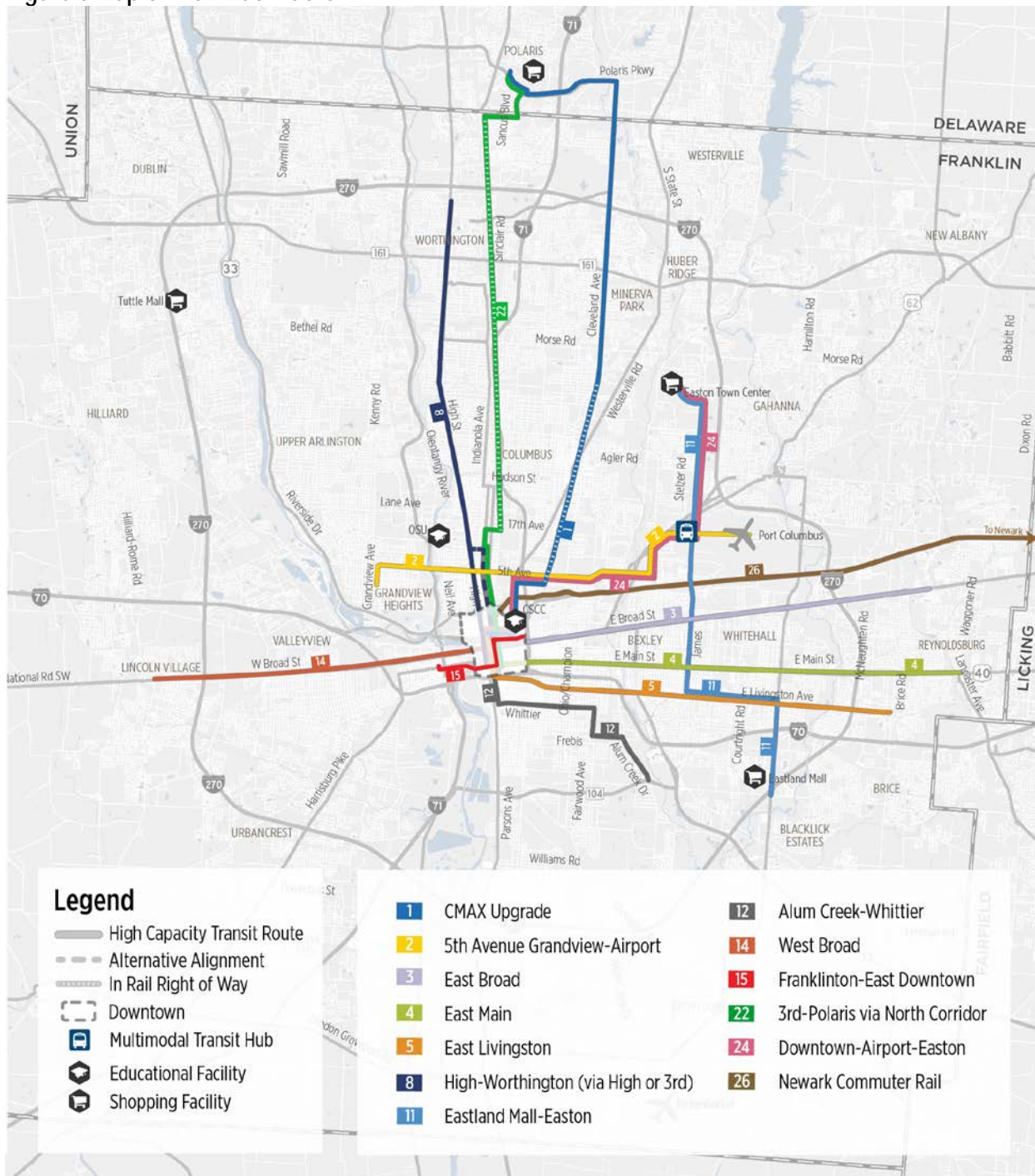
- Corridor 15 Franklinton-East Downtown was assumed to be a streetcar.
- Corridor 8 Downtown-OSU-Polaris,
- Corridor 22 North Corridor to Polaris, and
- Corridor 24 Downtown-Airport-Easton were all assumed to be the light rail mode.
- Corridor 26 Newark Commuter Rail was assumed to be commuter rail. Costs and ridership estimates were developed for this corridor. No other Tier 2 metrics were used to evaluate it, nor was it compared to other Tier 2 corridors in the evaluation process due to its intended peak-only commuter market.

Initial LRT ridership results and costs prompted a second look at the assumed mode in Corridor 8 on High Street. The Tier 2 Evaluation of Corridor 8 was completed for both light rail and bus rapid transit modes.

In developing costs, speeds, and ridership projections associated with each corridor, the following assumptions were used for all modes (BRT, Light Rail, Streetcar, Commuter Rail):

- Dedicated Right of Way
- Off-board fare payment
- Dedicated stations with enhanced amenities (shelters and seating)
- Transit Signal Priority
- Dedicated vehicle fleet (for BRT, branded vehicles)

Figure 5 Map of Tier 2 Corridors



Tier 2 Evaluation Criteria

The evaluation criteria for Tier 2 shown in Figure 6 were developed by the NextGen team and discussed with staff from COTA, the City of Columbus, and MORPC. These criteria are meant

to allow potential high capacity transit corridors to be compared to one another. Several of the criteria, such as projected ridership, are based on outputs that will be generated from the FTA's STOPS ridership model.

Some of the criteria are related or identical to FTA Capital Investment Grant (CIG) funding criteria. This ensures that projects that are prioritized as part of the NextGen process have characteristics that are required for Small Starts or New Starts funding. However, in keeping with the values of the community which drove the development of the evaluation framework, not all measures described below are a part of the FTA funding process. The goal of this process is to prioritize projects that address the community's goals and desires, and are also well positioned to be realized through the FTA funding process.

The Tier 2 criteria were initially presented in the Evaluation Framework (draft published October 2015). As the project progressed several changes to the criteria were discussed and implemented, described in Figure 7.

Figure 6 Tier 2 Evaluation Criteria

Value	Evaluation Measure	Measurement
Make Better Connections	Transit Service Speed	Estimated average service speed
	Quality of Connections	Number of TSR frequent routes intersecting the corridor
	Intersection Density	Intersection density within ½ mile of the corridor
Invest in Underserved Communities	Transit dependency along corridor	Ratio of zero vehicle households to all households located within ½ mile of corridor
	Minority residents along corridor	Ratio of minority residents to all residents living within ½ mile of corridor
	Affordable housing	Ratio of legally binding affordability restricted housing units to all housing units within ½ mile of corridor
Build on Success	Change in corridor transit ridership	Projected ridership based on forecasting model
	Operating Costs	Estimated operating cost per projected passenger on proposed service
	Capital cost per passenger	Estimated capital cost per projected passenger on proposed service
Coordinate with Growth	Key community anchors, civic centers, and cultural assets	Number of high trip generators within ½ mile of corridor
	Transit supportive land uses	Total population and employment in 2040 within ½ mile of corridor
	Transit supportive land use density	Population and employment per corridor mile in 2040 within ½ mile of corridor
	Redevelopment potential	Number of identified and potential redevelopment nodes intersected by corridor
Sustainability	Reduction in Vehicle Miles Travelled (VMT)	VMT reduction (based on model forecast)
	Congestion Mitigation	Corridor vehicle to capacity ratio in 2040

Figure 7 Summary of Changes to Evaluation Framework

Initial Metric	Final Metric	Explanation
Quality of Service	Quality of Connections	The initial metric was based on the frequency of the proposed service and has been changed to the frequency of connecting routes. This better captures the ease with which a rider can travel through the system with minimal wait times, and indicates where there are opportunities to build upon the Transit Service Redesign (TSR) frequent transit network that will be implemented in 2017. The initial metric, which would require the study team to assign a proposed frequency to each high capacity corridor, also presented a conflict because a less-frequent service would automatically result in lower performance in the metrics.
Connectivity with bicycle and pedestrian infrastructure	Intersection Density	While bicycle infrastructure is important in connecting cyclists to transit, the vast majority of transit riders access transit on foot. The study team opted to focus on pedestrian access in this metric. Intersection density was chosen as a better indicator of pedestrian access because it captures barriers such as freeways, railroad tracks, and large parcel development that can impede pedestrian access. While sidewalks are important in creating a safe environment for pedestrians, it was determined that connectivity in the street network (as indicated by intersection density) was more important in evaluating potential high capacity transit corridors, especially since pedestrian facilities could be built in the future to support planned station areas.
Low income households along corridor	Transit dependency (zero vehicle households)	Low income households often indicate transit dependency. However, a more direct indicator of the lack of transit choices is the presence of zero vehicle households. The FTA CIG application process uses zero vehicle households. As a result the study team chose to change this metric.
Developable land along corridor	Affordable housing	The study team determined that developable land was redundant with the metric “vacant, redevelopable, and underdeveloped land”, and was not a good fit for the community value of “invest in underserved communities”. Instead the portion of legally binding affordability restricted housing units on the corridor was proposed. This criterion is used in the FTA CIG application process.
Vacant, redevelopable, and underdeveloped land	Redevelopment Potential	Initially this metric was based on county assessor’s parcel data, however due to inconsistencies with the data, which did not accurately depict patterns and trends in development that had been identified by COTA staff and City of Columbus staff, the study team opted to build on work completed by Connect Columbus, which identified development nodes. These nodes were identified by City of Columbus Planning and Economic Development staff, and supplemented with input from COTA staff. Corridors that intersect multiple nodes are considered as having more redevelopment potential than those that do not.

Initial Metric	Final Metric	Explanation
Redevelopable sites around corridor	deleted	The study team was unable to gather a reliable data source for this metric. While there is some data available indicating the location of Superfund sites, it was determined that this did not necessarily align with the community's goals for sustainability. This metric was removed.
Reduction in fossil fuel	Reduction in Vehicle Miles Travelled (VMT)	The FTA STOPS model will be used to predict VMT reduction, which is a more directly derived metric. Reduction in fossil fuel can be calculated based on VMT reduction, but the study team chose to reduce the complexity of the metric.
Reduction in GHG	Congestion Mitigation	Through discussions with MORPC's modeling staff it was determined that the model would not be able to produce a reliable figure for reduction in Greenhouse Gas emissions (GHG). The impact of one transit project on the entire region would be insignificant in the model, producing unreliable figures. Instead, the potential for congestion mitigation in the corridor served by each high capacity transit line will be used, based on the predicted Volume/Capacity ratio in that corridor using the baseline 2040 scenario in the model.

ANALYSIS RESULTS

Goal: Make Better Connections

Service Speed

The speed of the transit service, particularly along high capacity corridors, can significantly impact ridership. Passengers want to know that the service will allow them to quickly reach their destination, particularly compared to other travel options. This measure evaluates each corridor’s expected operating speeds.

Measure: Transit Service Speed

For each proposed corridor, it was determined which type of high capacity transit would best be accommodated. Streetcar and LRT speeds were determined based on a comparison to national peers while BRT speeds were calculated as 15% over the assumed TSR corridor speed. There was one exception to the assumed BRT travel speeds. In order to better compare BRT with LRT on Corridor 8: High Street-Worthington, an improvement of more than 15% was assumed for BRT speeds. In this corridor, LRT speeds were assumed to be more than 17 mph, while BRT speeds were assumed to be more than 15 mph.

Figure 8 Transit Service Speed Rating System

Transit Service Speed	Rating
More than 15 mph	High
10 to 15 mph	Medium
Less than 10 mph	Low

Findings

Seven corridors had estimated service speeds higher than 14mph, including 22: Downtown - Polaris via North Corridor, 1: CMAX Upgrade, 11: Eastland Mall-Easton, 8 LRT: High Street - Worthington, 3: East Broad, 14: West Broad, and 8 BRT: High Street – Worthington. Five corridors were estimated to operate at service speeds between 10 and 17 mph: 2: 5th Ave Grandview-CMH, 12: Alum Creek-Whittier, and 24: Downtown-Airport-Easton. As a streetcar, Corridor 15 Franklinton-East Downtown was the only ‘low’ speed service.

Figure 9 Transit Service Speed by Alternative

Map ID	Corridor Name	Speed (mph)	Rating
1	CMAX Upgrade BRT	20.1	High
2	5 th Avenue Grandview-Airport BRT	15	Medium
3	East Broad BRT	17.1	High

Map ID	Corridor Name	Speed (mph)	Rating
4	East Main BRT	13.6	Medium
5	East Livingston BRT	14.1	Medium
8 LRT	High-Worthington	17.5	High
8 BRT	High-Worthington	15.6	High
11	Eastland Mall-Easton BRT	18.2	High
12	Alum Creek-Whittier BRT	15	Medium
14	West Broad BRT	17.1	High
15	Franklinton-East Downtown Streetcar	8	Low
22	3 rd -Polaris via North Corridor LRT	24	High
24	Downtown-Airport-Easton LRT	15	Medium

Quality of Connections

High capacity transit functions best if the investment will create and strengthen connections and access to the frequent transit network. A complete transit network that is integrated seamlessly with interconnected frequent corridors and minimal transfer times make using transit a much more attractive option for all users.

Measure: Number of TSR Frequent Routes Intersected

For each proposed corridor it was determined how many of the 2017 Transit System Redesign (TSR) frequent bus routes intersect the corridor. TSR Frequent Routes are those that run every 15 minutes or less.

Figure 10 TSR Frequent Routes Intersected Rating System

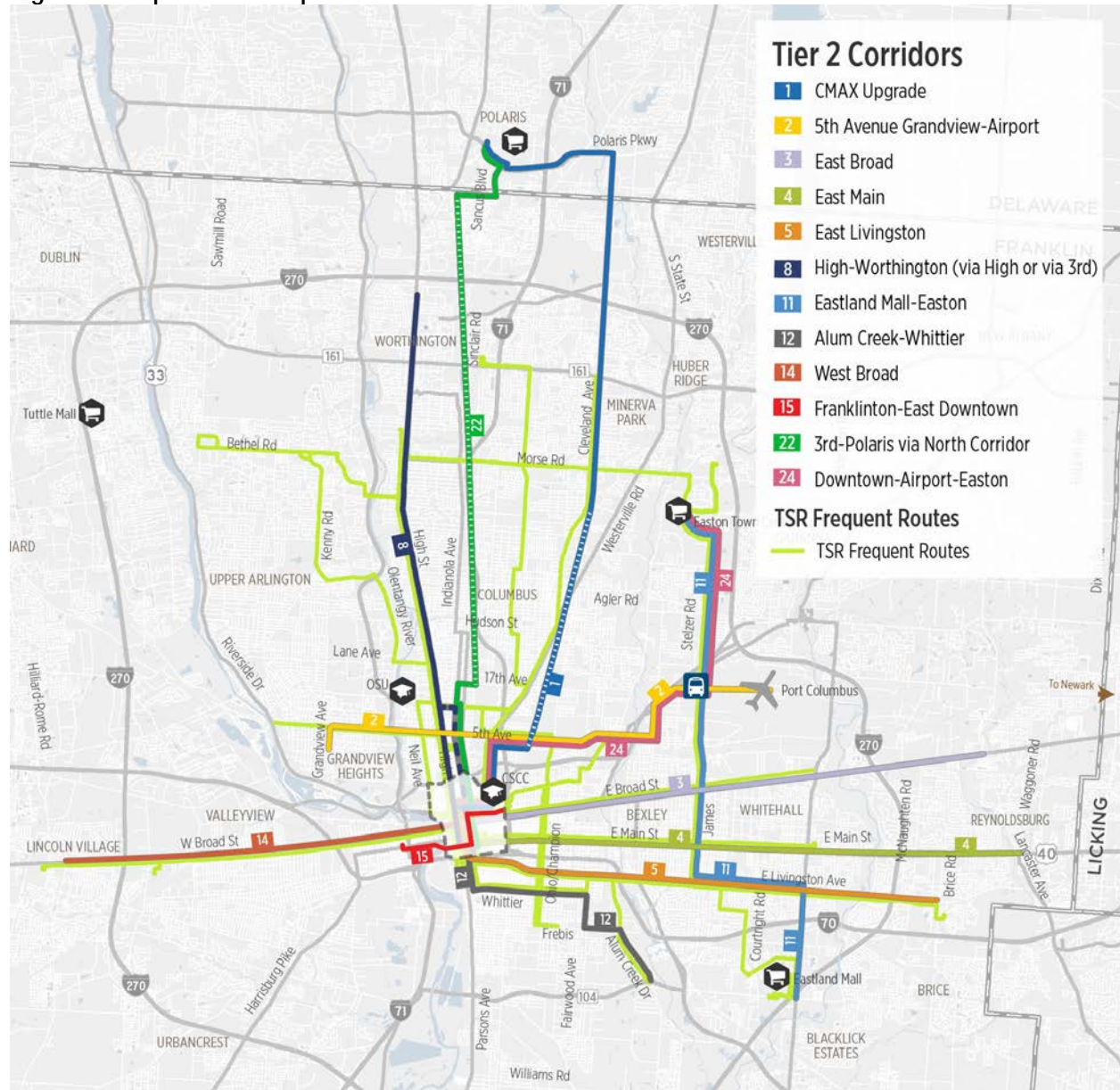
TSR Frequent Routes Intersecting Corridor	Rating
More than 10 routes	High
8 to 10 routes	Medium
Less than 8 routes	Low

Findings

Five corridors intersected between 11 and 14 TSR frequent routes. In descending order: 24: Downtown-Airport-Easton, 1: CMAX Upgrade, 22: Downtown - Polaris via North Corridor, 8 LRT: High Street - Worthington and 8 BRT: High Street - Worthington. Four corridors

intersected 8, 9, or 10 TSR frequent routes. In descending order: 12: Alum Creek-Whittier, 5: East Livingston, 4: East Main, and 15: Franklinton-East Downtown. Finally, four corridors intersected less than 8 TSR frequent routes. In descending order: 14: West Broad, 2: 5th Ave Grandview-CMH, 3: East Broad, and 11: Eastland Mall-Easton.

Figure 11 Map of TSR Frequent Route Network



Note: This analysis was conducted in 2016 and may not reflect the exact TSR network to be implemented in 2017.

Figure 12 TSR Frequent Routes Intersected by Alternative

Map ID	Corridor Name	Number of TSR Frequent Routes Intersected	Rating
1	CMAX Upgrade BRT	12	High
2	5 th Avenue Grandview-Airport BRT	6	Low
3	East Broad BRT	6	Low
4	East Main BRT	8	Medium
5	East Livingston BRT	9	Medium
8 LRT	High-Worthington	11	High
8 BRT	High-Worthington	11	High
11	Eastland Mall-Easton BRT	5	Low
12	Alum Creek-Whittier BRT	10	Medium
14	West Broad BRT	7	Low
15	Franklinton-East Downtown Streetcar	8	Medium
22	3 rd -Polaris via North Corridor LRT	12	High
24	Downtown-Airport-Easton LRT	14	High

Intersection Density

Ridership on high capacity transit is highest when people can easily and conveniently access the station from the surrounding neighborhood. Intersection density is a common way to measure the density of the road network surrounding the corridor and therefore the number of pedestrian and bicyclist connections.

Measure: Intersection density within ½ mile of the corridor

All roadways except interstate highways and on/off ramps were mapped and a point created for every intersection of two roadways. For each corridor, the number of intersection points located within a 1/2-mile buffer was divided by the area of the 1/2-mile corridor buffer to calculate the density.

Figure 13 Intersection Density Rating System

Intersection Density with ½ Mile of Corridor	Rating
More than 200 intersections per square mile	High

Intersection Density with ½ Mile of Corridor	Rating
150 to 200 intersections per square mile	Medium
Less than 150 intersections per square mile	Low

Findings

Three corridors had high intersection connectivity. Corridor 15, Franklinton-East Downtown had 283 intersections per square mile, while 14: West Broad had 227 and 12: Alum Creek-Whittier had 215. The majority of corridors had medium street connectivity between 161 and 195 intersections per square mile. In descending order: 5, 2, 4, 8 LRT, 8 BRT, 22, and 3. Three corridors had low levels of intersections per square mile, including: 1: CMAX Upgrade, 24: Downtown-Airport-Easton, and 11: Eastland Mall-Easton.

Figure 14 Intersection Density by Alternative

Map ID	Corridor Name	Intersection Density (per sq mi)	Rating
1	CMAX Upgrade BRT	142	Low
2	5 th Avenue Grandview-Airport BRT	192	Medium
3	East Broad BRT	161	Medium
4	East Main BRT	189	Medium
5	East Livingston BRT	194	Medium
8 LRT	High-Worthington	195	Medium
8 BRT	High-Worthington	195	Medium
11	Eastland Mall-Easton BRT	102	Low
12	Alum Creek-Whittier BRT	215	High
14	West Broad BRT	227	High
15	Franklinton-East Downtown Streetcar	283	High
22	3 rd -Polaris via North Corridor LRT	162	Medium
24	Downtown-Airport-Easton LRT	137	Low

Goal: Invest in Underserved Communities

Zero Vehicle Households

High capacity transit corridors can particularly benefit households that are lower income and those that do not have reliable or regular access to a vehicle.

Measure: Ratio of zero vehicle households to all households within ½ mile of corridor

Data are from the American Community Survey. To calculate this measure, all Census block groups whose center was located within a 1/2-mile buffer around each corridor were selected. Then the number of zero vehicle households and the total number of households within each block group was used to calculate the percent of households in each buffer that have zero vehicles.

Figure 15 Zero Vehicle Household Rating System

Ratio of Zero Vehicle Households to all Households within ½ Mile of Corridor	Rating
More than 19%	High
14% to 19%	Medium
Less than 14%	Low

Findings

Four corridors had a high ratio of zero vehicle households: 15: Franklinton-East Downtown, 14: West Broad, 24: Downtown-Airport-Easton, and 3: East Broad. Six corridors had a medium ratio of zero vehicle households between 12 and 19 percent: 12: Alum Creek-Whittier, 4: East Main, 1: CMAX Upgrade, 5: East Livingston, 11: Eastland Mall-Easton, and 2: 5th Ave Grandview-CMH. Three corridors had lower ratio of zero vehicle households, less than 14 percent: 22: Downtown - Polaris via North Corridor, 8 LRT: High Street - Worthington, and 8 BRT: High Street – Worthington.

Figure 16 Ratio of Zero Vehicle Households (ZVH) by Alternative

Map ID	Corridor Name	Ratio of ZVH	Rating
1	CMAX Upgrade BRT	16%	Medium
2	5 th Avenue Grandview-Airport BRT	15%	Medium
3	East Broad BRT	20%	High
4	East Main BRT	16%	Medium
5	East Livingston BRT	16%	Medium
8 LRT	High-Worthington	13%	Low
8 BRT	High-Worthington	13%	Low
11	Eastland Mall-Easton BRT	15%	Medium
12	Alum Creek-Whittier BRT	18%	Medium
14	West Broad BRT	21%	High

Map ID	Corridor Name	Ratio of ZVH	Rating
15	Franklinton-East Downtown Streetcar	45%	High
22	3 rd -Polaris via North Corridor LRT	11%	Low
24	Downtown-Airport-Easton LRT	21%	High

Minority Residents

The Columbus region is committed to investing in underserved neighborhoods to ensure regional equity and access to opportunities. Particularly in areas that have been overlooked or otherwise disenfranchised, investments in high capacity transit can help residents connect with jobs, educational opportunities, and social services throughout the region.

Measure: Ratio of minority residents to all residents within ½ mile of corridor

Data are from the 2010 Census. This measure was calculated by selecting all Census blocks whose center is located within a 1/2-mile buffer around each corridor. The number of non-white residents and the total population within each block group were compared to determine the percent of residents in each buffer that are minority.

Figure 17 Minority Rating System

Ratio of Minority Residents to all Residents within ½ Mile of Corridor	Rating
More than 50%	High
21% to 50%	Medium
Less than 21%	Low

Findings

Five corridors had high percentage of non-white residents: 11: Eastland Mall-Easton, 5: East Livingston, 24: Downtown-Airport-Easton, 1: CMAX Upgrade, and 12: Alum Creek-Whittier. These corridors ranged from 52% to 66%. Five corridors had medium percentage of non-white residents: 3: East Broad, 4: East Main, 15: Franklinton-East Downtown, 2: 5th Ave Grandview-CMH, and 14: West Broad. Just three corridors had a low ratio of non-white residents to all residents: 22: Downtown-Polaris via North Corridor; 8 LRT: High Street - Worthington, and 8 BRT: High Street - Worthington.

Figure 18 Ratio of Minority Residents by Alternative

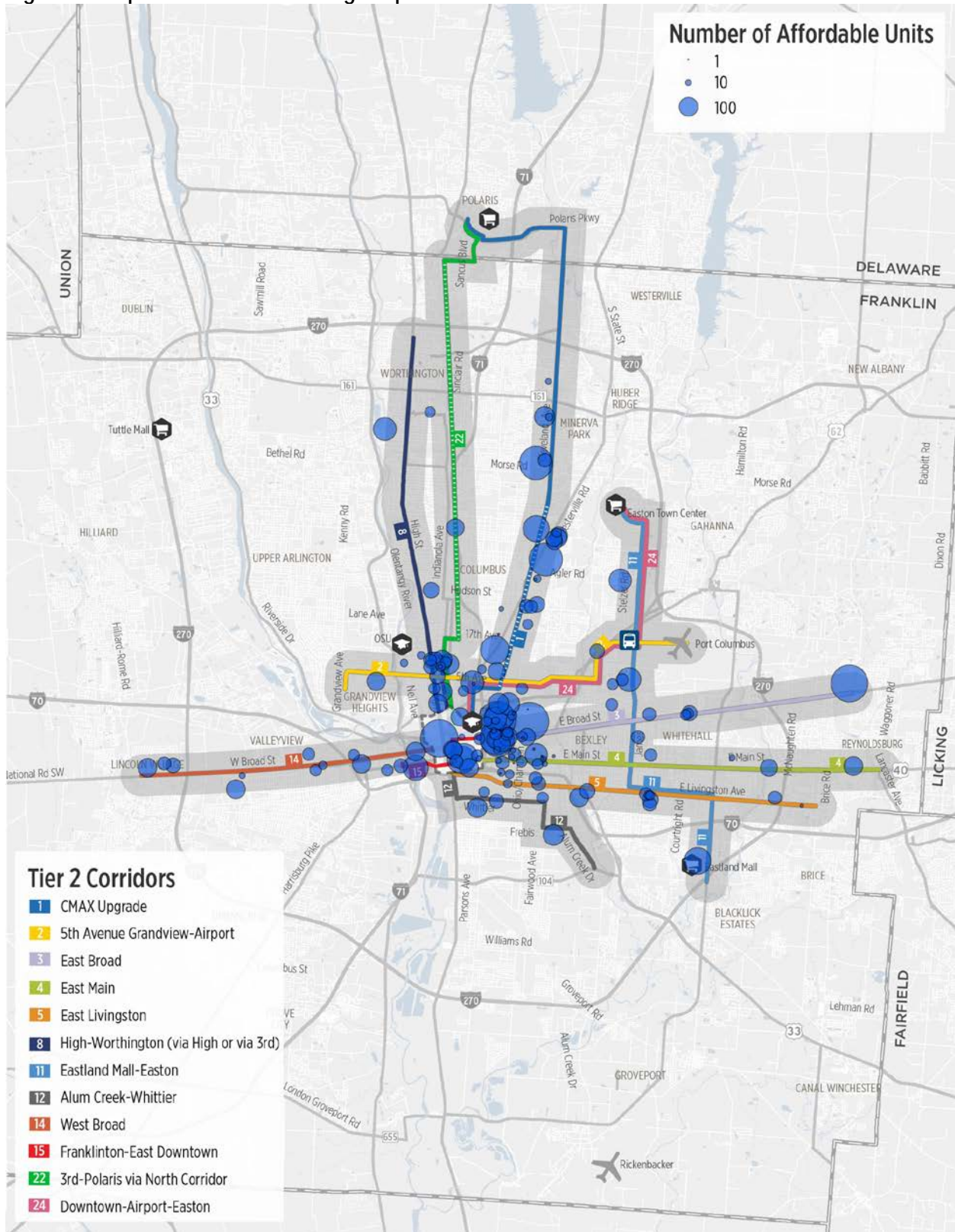
Map ID	Corridor Name	Ratio of Minority Residents	Rating
1	CMAX Upgrade BRT	53%	High
2	5 th Avenue Grandview-Airport BRT	35%	Medium

Map ID	Corridor Name	Ratio of Minority Residents	Rating
3	East Broad BRT	47%	Medium
4	East Main BRT	43%	Medium
5	East Livingston BRT	59%	High
8 LRT	High-Worthington	15%	Low
8 BRT	High-Worthington	15%	Low
11	Eastland Mall-Easton BRT	66%	High
12	Alum Creek-Whittier BRT	52%	High
14	West Broad BRT	31%	Medium
15	Franklinton-East Downtown Streetcar	36%	Medium
22	3 rd -Polaris via North Corridor LRT	21%	Low
24	Downtown-Airport-Easton LRT	55%	High

Affordable Housing

Locating high capacity transit near affordable housing units can have significant long-term benefits for residents, lowering their transportation costs and connecting them to greater regional job accessibility. The FTA [Guidelines for Land Use and Economic Development Effects](#) refer to “legally binding affordability restricted housing” as units with a lien, deed of trust, or other legal instrument attached to a property and/or housing structure that restricts the cost of the housing units to be affordable to renters and/or owners with incomes below 60 percent of the area median income for a defined period of time. The Guidelines direct project sponsors to either consult with their local housing authorities for data on “legally binding affordability restricted housing,” or use statistics on affordable housing in the National Housing Preservation Database (<http://www.preservationdatabase.org/>).

Figure 19 Map of Affordable Housing Properties



Source: Ohio Housing Finance Agency and National Housing Preservation Database

Measure: Ratio of legally binding affordability restricted housing to all housing units within ½ mile of corridor

Data on affordable housing for the COTA service area was drawn from the Ohio Housing Finance Agency and the National Housing Preservation Database for Franklin and Delaware Counties. There were 80 properties within ½ mile of the Tier 2 corridors from the Ohio database and 121 properties from the national database. Of these, 50 duplicate records were removed and a total of 151 properties were included in the analysis.

Data on the total number of housing units is from the American Community Survey table B25001. The ACS defines a housing unit as a house, an apartment, a mobile home, a group of rooms or a single room that is occupied (or, if vacant, intended for occupancy) as separate living quarters. To calculate this measure, all Census block groups whose center was located within a 1/2-mile buffer around each corridor were selected. Based on this selection, the total number of housing units was compared to the number of affordable housing units within the 1/2-mile buffer to calculate the ratio of affordable housing to total housing.

Figure 20 Affordable Housing Rating System

Ratio of Housing Units that are Legally Binding Affordability Restricted within ½ Mile of Corridor	Rating
More than 20%	High
10% to 20%	Medium
Less than 10%	Low

Findings

Just one corridor had very high percentage of affordable housing units. 32% of all housing units within ½ mile of corridor 15: Franklinton-East Downtown were identified as affordable. Three corridors had medium levels of affordability between 12% and 18%. In descending order these are: 3: East Broad, 24: Downtown-Airport-Easton, 1: CMAX Upgrade. The majority of corridors had lower levels of housing affordability as a percentage of all housing units. In descending order these are: 14: West Broad, 12: Alum Creek-Whittier, 4: East Main, 2: 5th Ave Grandview-CMH, 22: Downtown - Polaris via North Corridor, 5: East Livingston, 8 LRT: High Street - Worthington, 11: Eastland Mall-Easton, and 8 BRT: High Street - Worthington.

Figure 21 Percent of Legally Binding Affordability Restricted Housing by Alternative

Map ID	Corridor Name	Percent Affordable Housing	Rating
1	CMAX Upgrade BRT	12%	Medium
2	5th Avenue Grandview-Airport BRT	7%	Low
3	East Broad BRT	18%	Medium
4	East Main BRT	9%	Low

Map ID	Corridor Name	Percent Affordable Housing	Rating
5	East Livingston BRT	6%	Low
8 LRT	High-Worthington	6%	Low
8 BRT	High-Worthington	6%	Low
11	Eastland Mall-Easton BRT	5%	Low
12	Alum Creek-Whittier BRT	9%	Low
14	West Broad BRT	9%	Low
15	Franklinton-East Downtown Streetcar	32%	High
22	3 rd -Polaris via North Corridor LRT	6%	Low
24	Downtown-Airport-Easton LRT	13%	Medium

Goal: Build On Success

Ridership Change

The change in corridor transit ridership is a predictor of the success of high capacity transit.

Measure: Projected Ridership

The FTA STOPS ridership model was used to estimate average daily ridership for each corridor. The increase in ridership for each corridor was then calculated based on current ridership and projected ridership on the corridor.

Figure 22 Projected Daily Increase in Ridership Rating System

Projected Daily Increase in Ridership	Rating
More than 7,000 passenger trips	High
4,000 to 7,000 passenger trips	Medium
Less than 4,000 passenger trips	Low

Findings

Four corridors would carry more than 7,000 additional trips. 8 LRT: High Street - Worthington would carry the highest number of additional trips (11,012), followed by 22: Downtown - Polaris via North Corridor, 8 BRT: High Street - Worthington, and 4: East Main. Six corridors would carry between 4,000 and 7,000 additional trips: 5: East Livingston, 12: Alum Creek-Whittier, 3: East Broad, 15: Franklinton-East Downtown; 1: CMAX Upgrade, and 14: West Broad. Just three

corridors carry less than 4,000 additional trips: 2: 5th Ave Grandview-CMH, 24: Downtown-Airport-Easton, and 11: Eastland Mall-Easton.

Figure 23 Projected Daily Increase in Ridership by Alternative

Map ID	Corridor Name	Daily Ridership Increase	Rating
1	CMAX Upgrade BRT	4,941	Medium
2	5 th Avenue Grandview-Airport BRT	3,027	Low
3	East Broad BRT	5,374	Medium
4	East Main BRT	7,854	High
5	East Livingston BRT	6,541	Medium
8 LRT	High-Worthington	9,025	High
8 BRT	High-Worthington	11,012	High
11	Eastland Mall-Easton BRT	2,581	Low
12	Alum Creek-Whittier BRT	5,787	Medium
14	West Broad BRT	4,053	Medium
15	Franklinton-East Downtown Streetcar	5,332	Medium
22	3 rd -Polaris via North Corridor LRT	9,456	High
24	Downtown-Airport-Easton LRT	2,934	Low

Operating Cost per Passenger

High capacity transit can achieve higher ridership levels, increasing the productivity of transit service and reducing the operating costs per passenger.

Measure: Estimated operating cost per projected passenger on proposed service

The FTA STOPS ridership model was used to estimate daily ridership for each corridor. Estimated daily ridership for each corridor was coupled with anticipated operating costs for HCT in that corridor in order to develop an estimated operating cost per passenger.

Figure 24 Estimated Operating Cost per Project Passenger Rating System

Estimated Operating Cost per Projected Weekday Passenger (2040)	Rating
Less than \$4	High
\$4 to \$7	Medium
More than \$7	Low

Findings

Eight corridors would have an operating cost per passenger of less than \$4. In descending order these are: 15: Franklinton-East Downtown, 8 BRT: High Street - Worthington, 4: East Main, 12: Alum Creek-Whittier, 14: West Broad, 3: East Broad, 5: East Livingston, and 1: CMAX Upgrade. Four corridors would have an operating cost per passenger between \$4 and \$7: 8 LRT: High Street - Worthington, 11: Eastland Mall-Easton, 22: Downtown - Polaris via North Corridor, and 2: 5th Ave Grandview-CMH. Only one corridor would have an operating cost per passenger greater than \$7, 24: Downtown-Airport-Easton.

Figure 25 Estimated Operating Cost per Projected Passenger by Alternative

Map ID	Corridor Name	Operating Cost per Weekday Passenger (2040)	Rating
1	CMAX Upgrade BRT	\$3.41	High
2	5 th Avenue Grandview-Airport BRT	\$5.71	Medium
3	East Broad BRT	\$3.05	High
4	East Main BRT	\$2.69	High
5	East Livingston BRT	\$3.34	High
8 LRT	High-Worthington	\$2.60	High
8 BRT	High-Worthington	\$4.29	Medium
11	Eastland Mall-Easton BRT	\$5.05	Medium
12	Alum Creek-Whittier BRT	\$2.88	High
14	West Broad BRT	\$2.88	High
15	Franklinton-East Downtown Streetcar	\$2.13	High
22	3 rd -Polaris via North Corridor LRT	\$5.13	Medium
24	Downtown-Airport-Easton LRT	\$15.37	Low

Capital Cost per Passenger

Depending on the level of amenities, HCT mode, and the existing constraints of a corridor, HCT can have different capital construction costs.

Measure: Estimated capital cost per projected passenger on proposed service

The FTA STOPS ridership model was used to estimate daily ridership for each corridor. Estimated daily ridership for each corridor was coupled with anticipated capital costs for HCT in that corridor in order to develop an estimated capital cost per passenger.

Figure 26 Estimated Capital Cost per Project Passenger Rating System

Estimated Capital Cost per Projected Weekday Passenger (2040)	Rating
Less than \$40,000	High
\$40,000 to \$100,000	Medium
More than \$100,000	Low

Figure 27 Estimated Capital Cost per Projected Passenger by Alternative

Map ID	Corridor Name	Capital Cost per Weekday Passenger (2040)	Rating
1	CMAX Upgrade BRT	\$57,439	Medium
2	5 th Avenue Grandview-Airport BRT	\$87,724	Medium
3	East Broad BRT	\$39,091	High
4	East Main BRT	\$26,386	High
5	East Livingston BRT	\$43,220	Medium
8 LRT	High-Worthington	\$24,926	High
8 BRT	High-Worthington	\$64,428	Medium
11	Eastland Mall-Easton BRT	\$73,437	Medium
12	Alum Creek-Whittier BRT	\$39,618	High
14	West Broad BRT	\$35,629	High
15	Franklinton-East Downtown Streetcar	\$30,348	High
22	3 rd -Polaris via North Corridor LRT	\$118,365	Low
24	Downtown-Airport-Easton LRT	\$443,621	Low

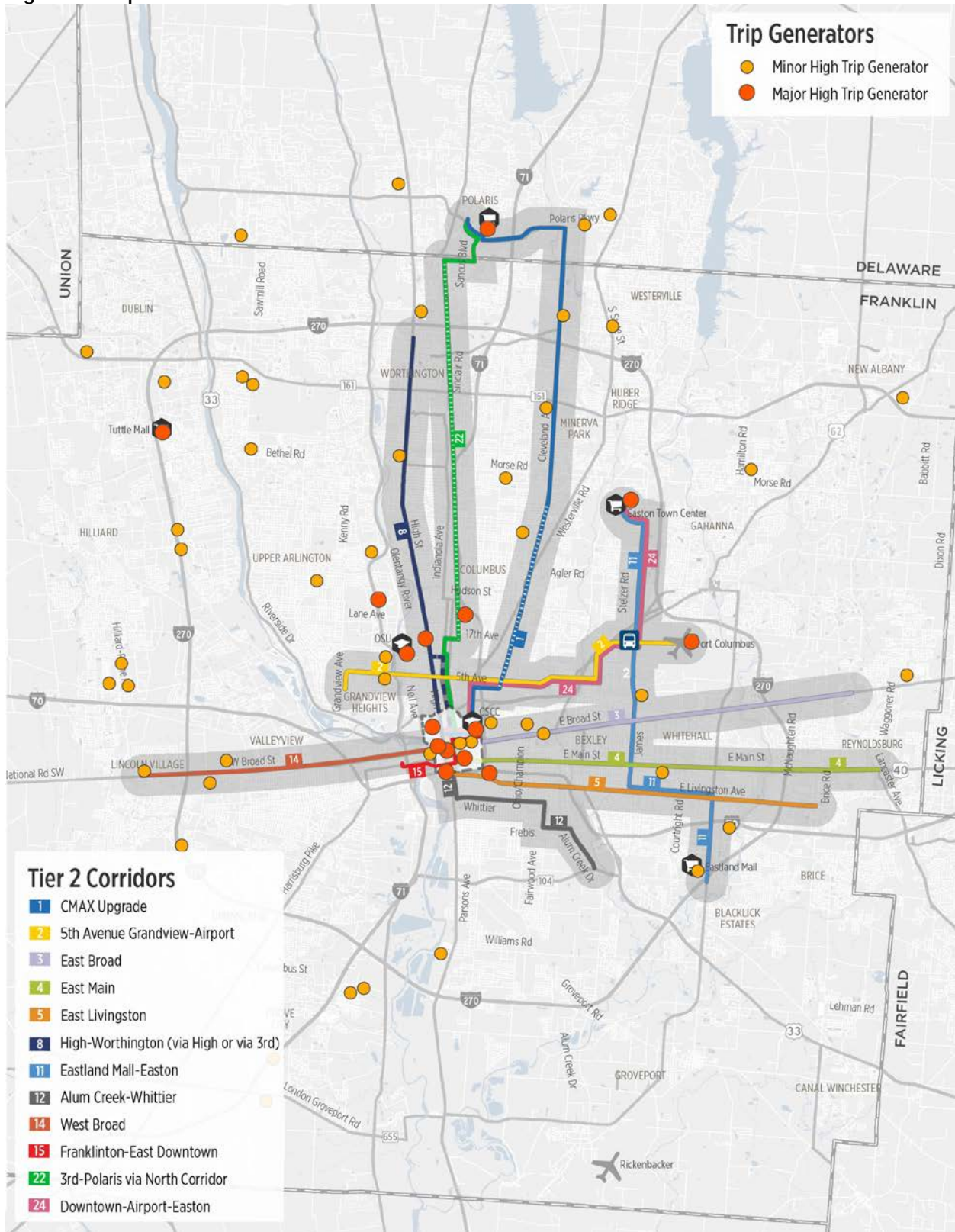
Goal: Coordinate with Growth

Key Community Anchors and Assets

High capacity transit that connects regional community destinations, such as cultural institutions, major hospitals, and shopping centers can have sustained ridership demand. Because these major institutions are likely to remain in place over time and continue to generate significant trips, key community anchors can be a good indicator of a corridor's potential. This metric also accounts for travel demand generated in the region that is not otherwise captured by

the transit supportive land uses measured by population and employment. The key community anchors include major shopping malls, universities, sports arenas, municipal buildings, and hospitals, as shown in Figure 28 and listed in Appendix H.1. Red points represent major high trip generators and orange points indicate minor high trip generators.

Figure 28 Map of Points of Interest



Measure: Number of high trip generators within ½ mile of corridor

The points of interest were divided into ‘minor’ and ‘major’ areas based on the relative size of the area and a qualitative assessment of the number of trips expected to be generated. Minor points were given a weight of 1 and major points a weight of 3. All locations within a 1/2-mile buffer around each corridor were summed to create the metric.

Figure 29 Key Trip Generators Rating System

Key Trip Generators within ½ mile of corridor (weighted by major and minor)	Rating
More than 22	High
12 to 22	Medium
Less than 12	Low

Findings

Three corridors have between 24 and 27 high trip generators within a ½ mile of the corridor: 1: CMAX Upgrade, 22: Downtown - Polaris via North Corridor, and 24: Downtown-Airport-Easton. Seven corridors had between 12 and 22 high trip generators: 4: East Main, 15: Franklinton-East Downtown, 8 LRT: High Street - Worthington, 8 BRT: High Street - Worthington, 5: East Livingston, 3: East Broad, and 12: Alum Creek-Whittier. Just three corridors had less than 12 high trip generators: 14: West Broad, 11: Eastland Mall-Easton, and 2: 5th Ave Grandview-CMH.

Figure 30 Key Trip Generators by Alternative

Map ID	Corridor Name	Key Trip Generator Score	Rating
1	CMAX Upgrade BRT	27	High
2	5 th Avenue Grandview-Airport BRT	2	Low
3	East Broad BRT	18	Medium
4	East Main BRT	22	Medium
5	East Livingston BRT	20	Medium
8 LRT	High-Worthington	21	Medium
8 BRT	High-Worthington	21	Medium
11	Eastland Mall-Easton BRT	6	Low
12	Alum Creek-Whittier BRT	17	Medium
14	West Broad BRT	11	Low

Map ID	Corridor Name	Key Trip Generator Score	Rating
15	Franklinton-East Downtown Streetcar	22	Medium
22	3 rd -Polaris via North Corridor LRT	27	High
24	Downtown-Airport-Easton LRT	24	High

Transit Supportive Land Use

The projected number of people living and working along transit corridors can indicate potential ridership levels and likelihood of sustaining the investment over time. Total population and employment in 2040 indicates the degree to which transit supportive land uses are expected to be in place in the coming decades.

Measure: Population and employment in 2040 within ½ mile of corridor

This measure was calculated by selecting all MORPC grids with their geographic center located within 1/2-mile buffer of each corridor. The measure is based on the sum of the population and jobs in the selected grids within the corridor buffer.

Figure 31 Population and Employment in 2040 Rating System

Population and Employment in 2040 within ½ mile of corridor	Rating
More than 200,000 residents + jobs	High
90,000 to 200,000 residents + jobs	Medium
Less than 90,000 residents + jobs	Low

Findings

Four corridors had high levels of total population and employment between 245,000 and 252,000. In descending order, these were: 22: Downtown - Polaris via North Corridor, 1: CMAX Upgrade, 8 LRT: High Street - Worthington, and 8 BRT: High Street - Worthington. The majority of corridors had high levels of total population and employment: 4: East Main, 24: Downtown-Airport-Easton, 5: East Livingston, 3: East Broad, 14: West Broad, 12: Alum Creek-Whittier, and 15: Franklinton-East Downtown. Two corridors had low levels of population and employment around 88,000. These were 2: 5th Ave Grandview-CMH and 11: Eastland Mall-Easton.

Figure 32 Population and Employment in 2040 by Alternative

Map ID	Corridor Name	Sum of Pop & Emp*	Rating
1	CMAX Upgrade BRT	248,859	High
2	5 th Avenue Grandview-Airport BRT	88,891	Low

Map ID	Corridor Name	Sum of Pop & Emp*	Rating
3	East Broad BRT	159,517	Medium
4	East Main BRT	191,527	Medium
5	East Livingston BRT	180,784	Medium
8 LRT	High-Worthington	245,781	High
8 BRT	High-Worthington	245,781	High
11	Eastland Mall-Easton BRT	88,657	Low
12	Alum Creek-Whittier BRT	140,317	Medium
14	West Broad BRT	141,780	Medium
15	Franklinton-East Downtown Streetcar	131,299	Medium
22	3 rd -Polaris via North Corridor LRT	252,374	High
24	Downtown-Airport-Easton LRT	186,092	Medium

*Calculated as the sum of population and employment within ½ mile buffer

Transit Supportive Density

By developing land at higher residential densities and a higher percentage of mix of uses, more origins and destinations become located within walking, bicycle and transit proximity. Zoning and planning for transit supportive densities are tools local governments can use to ensure future livable communities, reduced vehicle miles travelled (VMT) and high productivity transit corridors.

Measure: Population and Employment Density per Mile in 2040

This measure was calculated by selecting all MORPC ¼ mile grids with their geographic center located within 1/2-mile buffer of each corridor. The measure is the sum of the population and jobs in the selected grids within the corridor buffer, divided by the total length of that corridor.

Figure 33 Population and Employment Rating System

Population and Employment Density in 2040 within ½ mile of corridor	Rating
More than 20,000 residents + jobs per corridor mile	High
11,000 to 20,000 residents + jobs per corridor mile	Medium
Less than 11,000 residents + jobs per corridor mile	Low

Findings

Four corridors have high population and employment density expected in 2040. The highest was 15: Franklinton-East Downtown, with 48,305 jobs and residents per mile. Three other corridors with high population and employment density expected in 2040 were 12: Alum Creek-Whittier, 8 LRT: High Street - Worthington, and 8 BRT: High Street – Worthington. The majority of corridors were medium jobs and residents per mile. In descending order: 5: East Livingston, 4: East Main, 22: Downtown - Polaris via North Corridor, 3: East Broad, 24: Downtown-Airport-Easton, and 1: CMAX Upgrade. Two corridors have low population and employment density expected in 2040. These were 2: 5th Ave Grandview-CMH and 11: Eastland Mall-Easton.

Figure 34 Population and Employment Density in 2040 by Alternative

Map ID	Corridor Name	Pop & Emp Density*	Rating
1	CMAX Upgrade BRT	13,930	Medium
2	5 th Avenue Grandview-Airport BRT	10,939	Low
3	East Broad BRT	15,901	Medium
4	East Main BRT	17,082	Medium
5	East Livingston BRT	18,115	Medium
8 LRT	High-Worthington	21,986	High
8 BRT	High-Worthington	21,986	High
11	Eastland Mall-Easton BRT	7,444	Low
12	Alum Creek-Whittier BRT	24,431	High
14	West Broad BRT	19,126	Medium
15	Franklinton-East Downtown Streetcar	48,305	High
22	3 rd -Polaris via North Corridor LRT	16,873	Medium
24	Downtown-Airport-Easton LRT	15,221	Medium

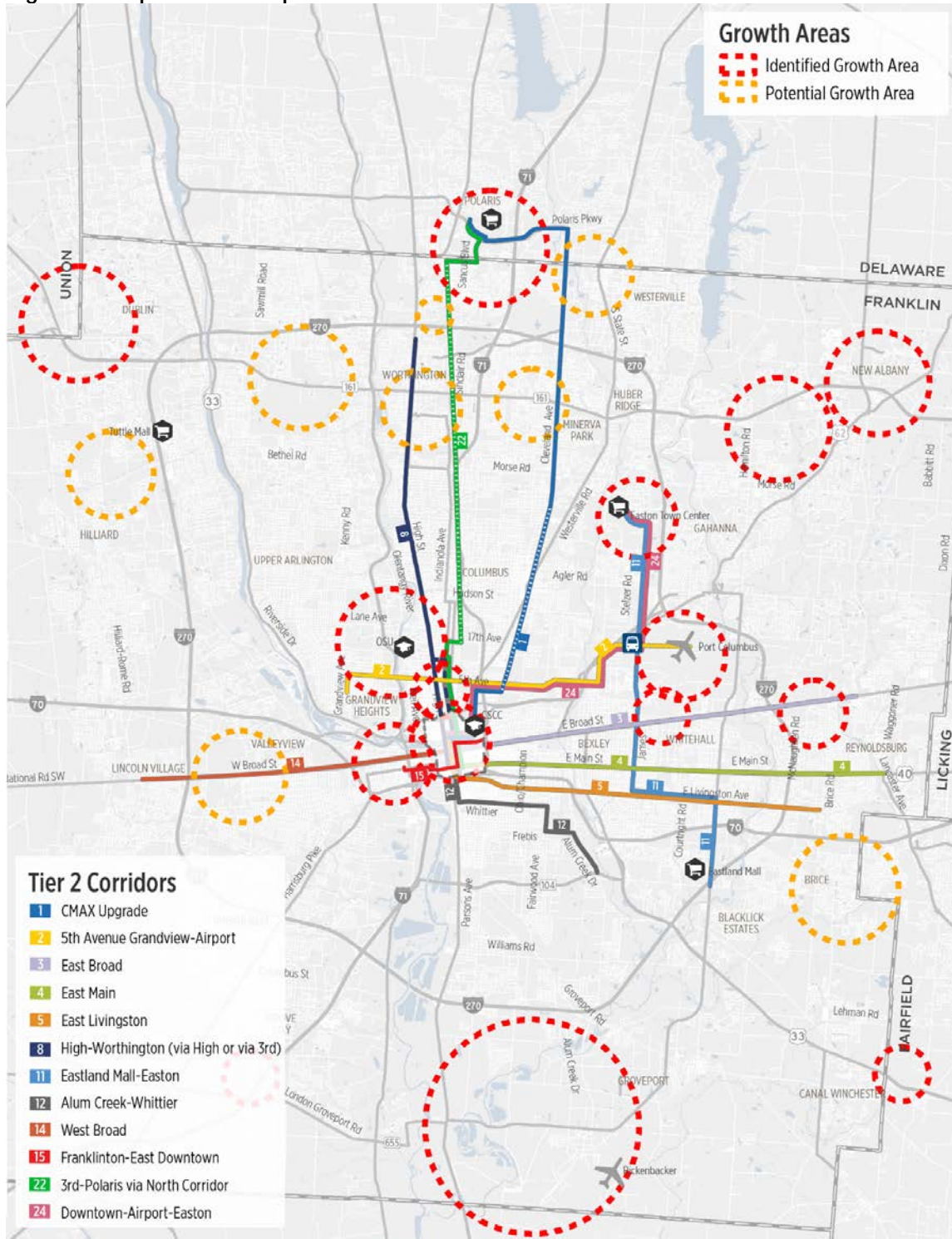
*Calculated as the sum of population and employment within ½ mile buffer, divided by the corridor length

Redevelopment Potential

High capacity transit has the potential to focus growth and development along key transit corridors, sparking economic development. This measure is an estimate of the potential for redevelopment to occur based on input from planning and economic development staff with the City of Columbus and input from COTA staff. Figure 35 shows a map of redevelopment nodes, which were identified during a workshop with the City of Columbus as part of its Connect Columbus long-range multimodal transportation plan and supplemented with input from COTA for areas outside of City of Columbus. The red circles are identified growth areas and the yellow circles are potential future areas. These nodes represent locations where development is

expected to occur or could potentially occur and were considered both by Connect Columbus and NextGen in their planning processes. Investment in high capacity transit in these areas could support and influence development patterns.

Figure 35 Map of Redevelopment Nodes



Measure: Number of Redevelopment Nodes

The development nodes were labeled as either identified or potential areas. Nodes where there is “identified” redevelopment were weighted 2, while nodes where this is “potential” redevelopment were weighted 1. The metric is the sum of the identified and potential nodes intersected by the corridor.

Figure 36 Redevelopment Nodes Rating System

Redevelopment Nodes within ½ mile of corridor	Rating
More than 6	High
4 to 6	Medium
Less than 4	Low

Findings

Three corridors scored well and will serve a high number of identified and potential redevelopment nodes. 22: Downtown - Polaris via North Corridor scored highest, followed by 8 LRT: High Street - Worthington, and 8 BRT: High Street - Worthington. Seven corridors scored medium: 1: CMAX Upgrade, 2: 5th Ave Grandview-CMH, 3: East Broad, 11: Eastland Mall-Easton; 14: West Broad, 15: Franklinton-East Downtown, and 24: Downtown-Airport-Easton. Three corridors scored low: 4: East Main, 5: East Livingston, and 12: Alum Creek-Whittier.

Figure 37 Redevelopment Nodes by Alternative

Map ID	Corridor Name	Number of Redevelopment Nodes	Rating
1	CMAX Upgrade BRT	6	Medium
2	5 th Avenue Grandview-Airport BRT	6	Medium
3	East Broad BRT	6	Medium
4	East Main BRT	2	Low
5	East Livingston BRT	2	Low
8 LRT	High-Worthington	7	High
8 BRT	High-Worthington	7	High
11	Eastland Mall-Easton BRT	6	Medium
12	Alum Creek-Whittier BRT	2	Low
14	West Broad BRT	5	Medium
15	Franklinton-East Downtown Streetcar	4	Medium
22	3 rd -Polaris via North Corridor LRT	8	High

Map ID	Corridor Name	Number of Redevelopment Nodes	Rating
24	Downtown-Airport-Easton LRT	6	Medium

Goal: Sustainability

VMT Reduction

Increased transit ridership due to service improvements can reduce the amount of vehicle miles travelled (VMT) by cars, resulting in reduced carbon emissions, release of particulates and other environmental benefits.

Measure: VMT Reductions

The FTA STOPS model was used to estimate transit passenger miles traveled on each corridor. The increase in transit passenger miles over current levels was used as a proxy for VMT reduction.

Figure 38 VMT Reduction Rating System

VMT Reduction	Rating
More than 12,000 miles per weekday	High
7,000 to 12,000 miles per weekday	Medium
Less than 7,000 miles per weekday	Low

Findings

Three corridors scored well and would result in the highest VMT reduction. 22: Downtown - Polaris via North Corridor scored highest, followed by 8 LRT: High Street - Worthington and 4: East Main. Six corridors scored medium: 1: CMAX upgrade, 5: East Livingston, 3: East Broad, 8 BRT: High Street - Worthington, 14: West Broad, and 12: Alum Creek-Whittier. Four corridors scored low: 15: Franklinton-East Downtown, 11: Eastland Mall-Easton, 2: 5th Avenue Grandview-CMH, and 24: Downtown-Airport-Easton.

Figure 39 Population and Employment Density in 2040 by Alternative

Map ID	Corridor Name	VMT Reduction (weekday miles)	Rating
1	CMAX Upgrade BRT	11,975	Medium
2	5 th Avenue Grandview-Airport BRT	5,216	Low
3	East Broad BRT	9,648	Medium
4	East Main BRT	16,218	High
5	East Livingston BRT	11,221	Medium

Map ID	Corridor Name	VMT Reduction (weekday miles)	Rating
8 LRT	High-Worthington	16,603	High
8 BRT	High-Worthington	9,641	Medium
11	Eastland Mall-Easton BRT	5,986	Low
12	Alum Creek-Whittier BRT	8,899	Medium
14	West Broad BRT	9,548	Medium
15	Franklinton-East Downtown Streetcar	6,828	Low
22	3 rd -Polaris via North Corridor LRT	26,542	High
24	Downtown-Airport-Easton LRT	4,961	Low

Congestion Mitigation

Providing high quality transit service in congested corridors can attract drivers out of their cars and improve environmental outcomes.

Measure: Volume to Capacity Ratio on the corridor (2040)

Along each corridor the modeled 2040 traffic volumes were identified. For each route the anticipated volume along the corridor was summed and divided by the summed corridor capacity. The V/C should be seen as a relative measure of congestion along any particular corridor. For the 1: CMAX Upgrade Corridor and the 22: Downtown to Polaris via North Corridor, each of which run for a substantial section within existing or abandoned rail corridors, corresponding street routes were used to estimate the volume/capacity along the corridor.

Figure 40 Volume to Capacity Ratio Rating System

Volume to Capacity Ratio Reduction	Rating
More than 0.7	High
0.6 to 0.5	Medium
Less than 0.5	Low

Finding

One corridor will have a high V/C ratio in 2040, 3: East Broad. The majority of corridors have medium V/C ration in 2040. In descending order these are: 22: Downtown - Polaris via North Corridor, 1: CMAX Upgrade, 8 LRT: High Street - Worthington, 8 BRT: High Street - Worthington, 11: Eastland Mall-Easton, 12: Alum Creek-Whittier, 4: East Main, 15: Franklinton-

East Downtown, 5: East Livingston, and 24: Downtown-Airport-Easton. Just two corridors have low V/C ratios: 2: 5th Ave Grandview-CMH and 14: West Broad.

Figure 41 Population and Employment Density in 2040 by Alternative

Map ID	Corridor Name	2040 V/C Ratio	Rating
1	CMAX Upgrade BRT	0.68	Medium
2	5 th Avenue Grandview-Airport BRT	0.59	Low
3	East Broad BRT	0.74	High
4	East Main BRT	0.65	Medium
5	East Livingston BRT	0.64	Medium
8 LRT	High-Worthington	0.68	Medium
8 BRT	High-Worthington	0.68	Medium
11	Eastland Mall-Easton BRT	0.66	Medium
12	Alum Creek-Whittier BRT	0.65	Medium
14	West Broad BRT	0.56	Low
15	Franklinton-East Downtown Streetcar	0.64	Medium
22	3 rd -Polaris via North Corridor LRT	0.69	Medium
24	Downtown-Airport-Easton LRT	0.62	Medium

CORRIDOR COMPOSITE ANALYSIS

Figure 42 and Figure 43 present the rating system and results of a composite analysis of the Tier 2 evaluation across the five community priority areas. Within each community priority area, the unweighted evaluation measures were averaged and rated as follows:

Figure 42 Composite Analysis Rating System

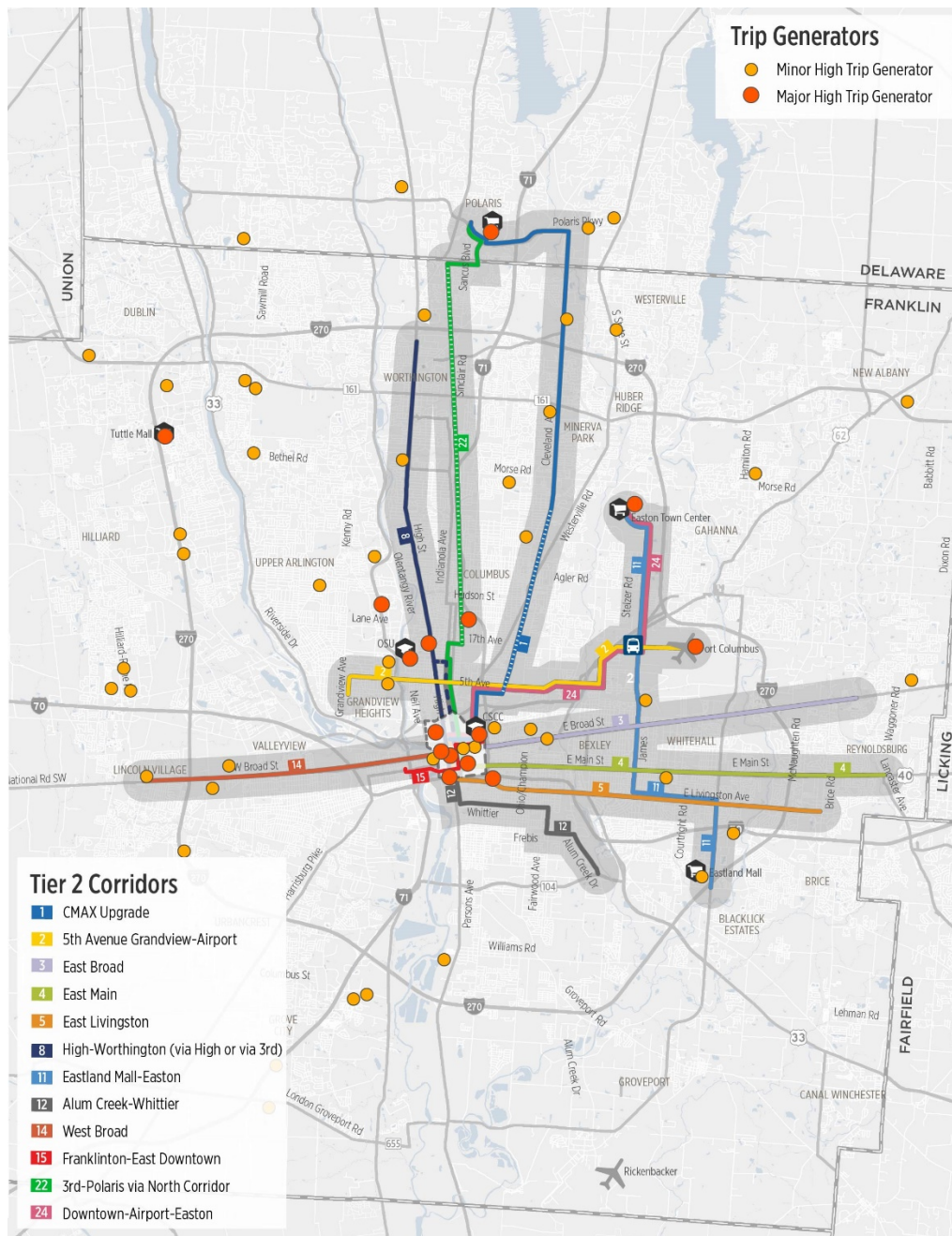
Composite Analysis	Rating
Corridors that have an average of “high” measures, typically, at least 2 “high” ratings	High
Corridors that have an average of “medium” measures or a mix of “low” and “high”.	Medium
Any corridor with an average of “low” measures, typically, at least 2 “low” ratings	Low

Figure 43 Tier 2 Evaluation Results

Map ID	Corridor Name	Make Better Connections	Invest in Underserved Communities	Build on Success	Coordinate with Growth	Sustainability
1	CMAx Upgrade BRT	Medium	Medium	High	High	Medium
2	5 th Avenue Grandview-Airport BRT	Medium	Medium	Medium	Medium	Low
3	East Broad BRT	Medium	Medium	High	Medium	High
4	East Main BRT	Medium	Medium	High	Medium	High
5	East Livingston BRT	Medium	Medium	Medium	Medium	Medium
8 LRT	High-Worthington	High	Low	Medium	High	High
8 BRT	High-Worthington	High	Low	High	High	Medium
11	Eastland Mall-Easton BRT	Medium	Medium	Medium	Low	Medium
12	Alum Creek-Whittier BRT	Medium	Medium	High	Medium	Medium
14	West Broad BRT	Medium	Medium	High	Medium	Medium
15	Franklinton-East Downtown Streetcar	Medium	High	High	Medium	Medium
22	3 rd -Polaris via North Corridor LRT	High	Low	Medium	High	High
24	Downtown-Airport-Easton LRT	Medium	High	Low	High	Medium

APPENDIX H.1 HIGH TRIP GENERATORS

High trip generators include major shopping malls, universities, sports arenas, municipal buildings, and hospitals. The points of interest were divided into 'minor' and 'major' areas based on the relative size of the area and the number of trips expected to be generated. Minor points are shown in orange in the map below and were given a weight of 1. Major are shown in dark orange in the map below and were given a weight of 3.



The following table lists all the major and minor high trip generators shown in the map.

Location	Type
Port Columbus International Airport	Major
Group Catco, Ohio Statehouse and Ohio Theater into Capitol Square location	Major
Group Municipal Court and Southern Theater into South Downtown	Major
Group City Hall with US Court of Appeals and Supreme Court of Ohio	Major
Group Nationwide, North Market, Huntington Stadium and LC Pavilion (New)	Major
Columbus State University	Major
Group Franklin University, Columbus Main Library (new) and Grant Medical center into Discovery District South	Major
Group OSU and Wexner Center into OSU	Major
OSU Hospital	Major
Group Nationwide Hospital and German Village (new) as German Village area	Major
Combine the Walmart at Tuttle and Tuttle Mall into Tuttle Mall Area	Major
Combine the Target, Walmart and Easton into Easton Town Center Area	Major
Combine the Target at Polaris and the Mall into Polaris Fashion Place	Major
Combine Mapfre Stadium and Ohio Fairgrounds and Ohio Historical Society (Add) into Mapfre/State Fairgrounds/Ohio Historical	Major
Create a point at OSU west of the Olentangy River to capture Value City Arena and the west campus	Major
Kingsdale Shopping Center	Minor
Crosswoods area	Minor
Grandview Yard	Minor
ITT Tech	Minor
OSU University Hospital East	Minor
Battelle	Minor
Ohio Health Westerville Medical Campus	Minor
King Arts Complex	Minor
Chalmers P. Wylie VA Clinic	Minor
St Ann's Hospital	Minor
New Albany Hospital	Minor
Dublin Hospital	Minor
Ohio Health Doctor's Hospital	Minor
Mt Carmel Grove City	Minor
Riverside Hospital	Minor
Eastland Mall	Minor
Northern Lights Shopping Center	Minor
Hollywood Casino	Minor

Location	Type
Franklin Park Conservatory	Minor
Walmart (7)	Minor
Target (9)	Minor
Meijer (6)	Minor
Franklin County Department of Job and Family Services	Minor
Franklin County Office on Aging	Minor
COSI	Minor
Group Columbus Museum of Art and CCAD into Discovery District north	Minor

APPENDIX H.2 DETAILED TIER 2 RESULTS

Figure 44 Tier 2 Evaluation Results

Map ID	Corridor Name	Make Better Connections			Invest in Underserved Communities			Build on Success			Coordinate with Growth			Sustainability		
		Transit Service Speed	Quality of Connections	Intersection Density	Proportion of Transit Dependency	Proportion of Minority Residents	Legally Binding Affordable Housing Units	Change in Ridership (2015-2040)	Operating Cost per Passenger (2040)	Capital Cost per Passenger (2040)	Key Community Anchors	2040 Population and Employment Served	Transit Supportive Density	Vacant Redevelopable & Underdeveloped Land	VMT Reduction (2040)	Congestion Mitigation
1	CMAX Upgrade BRT	20.1	12	142	16%	53%	12%	4,941	\$3.41	\$57,439	27	248,859	13,930	6	11,975	0.68
2	5 th Avenue Grandview-Airport BRT	15	6	192	15%	35%	7%	3,027	\$5.71	\$87,724	2	88,891	10,939	6	5,216	0.59
3	East Broad BRT	17.1	6	161	20%	47%	18%	5,374	\$3.05	\$39,091	18	159,517	15,901	6	9,648	0.74
4	East Main BRT	13.6	8	189	16%	43%	9%	7,854	\$2.69	\$26,386	22	191,527	17,082	2	16,218	0.65
5	East Livingston BRT	14.1	9	194	16%	59%	6%	6,541	\$3.34	\$43,220	20	180,784	18,115	2	11,221	0.64
8 LRT	High-Worthington	17.5	11	195	13%	15%	6%	9,025	\$2.60	\$24,926	21	245,781	21,986	7	16,603	0.68
8 BRT	High-Worthington	15.6	11	195	13%	15%	6%	11,012	\$4.29	\$64,428	21	245,781	21,986	7	9,641	0.68
11	Eastland Mall-Easton BRT	18.2	5	102	15%	66%	5%	2,581	\$5.05	\$73,437	6	88,657	7,444	6	5,986	0.66
12	Alum Creek-Whittier BRT	15	10	215	18%	52%	9%	5,787	\$2.88	\$39,618	17	140,317	24,431	2	8,899	0.65
14	West Broad BRT	17.1	7	227	21%	31%	9%	4,053	\$2.88	\$35,629	11	141,780	19,124	5	9,548	0.56
15	Franklinton-East Downtown Streetcar	8	8	283	45%	36%	32%	5,332	\$2.13	\$30,348	22	131,299	48,305	4	6,828	0.64
22	3 rd -Polaris via North Corridor LRT	24	12	162	11%	21%	6%	9,456	\$5.13	\$118,365	27	252,374	16,873	8	26,542	0.69
24	Downtown-Airport-Easton LRT	15	14	137	21%	55%	13%	2,934	\$15.37	\$443,621	24	186,091	15,221	6	4,961	0.62

- Low
- Medium
- High