Central Corridor
Transit Access Study

Citizens for Modern Transit

Metro

BERNARDIN LOCHMUELLER & ASSOCIATES

ENGINEERING • SURVEYING • PLANNING • ENVIRONMENTAL SERVICES

Final Report
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Prepared For:
Citizens for Modern Transit

Central Corridor Transit Access Study

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Table of Contents

Acknowledgements ii
Project Management Team ii
Advisory Committee ii
Technical Committee ii
List of Figures v
List of Tables vi
Executive Summary vii
Introduction 1
Study Process 3
Evaluation Criteria 5
Alternative 1 – No Build 6
Ridership 6
Alternative 2 – New MetroLink Station in Cortex 9
Concept Development 9
Recommended Station Design 13
Ridership 18
Transit Operations 23
Capital and Operating Costs 24
Alternative 3 – Relocate Transit Center to Cortex 27
Concept Development 27
Transit User Experience 29
Capital and Operating Costs 31
Ridership 36
Alternative 4 – Upgrade Central West End Station 39
Concept Development 40
Ridership 44
Transit User Experience 44
Capital and Operating Costs 47

Findings and Conclusion 49
Comparative Evaluation 49
Goal 1 49
Goal 2 50
Increased Ridership 51
Transit User Experience/Transit Operational Impacts 51
Non-Quantifiable Benefits 51
Conclusion 52
APPENDIX 54
Appendix A: Population and Employment Forecasting Methodology 55
Employment & Population Data Sources 55
Assumptions 56
Determining Net New Employment Growth 58
Employment Projections 61
Population Projections 64
Employment and Population Projection Summary 68
Comparisons with Regional Employment Patterns 71
Appendix B: Transit Ridership Forecasting Methodology 73
Calibration Targets 73
Model Inputs 75
Ridership Calibration 78
Study Area Calibration 81
Final Calibration Results 82
Appendix C: Cost Estimates 87
Appendix D: Financing 88

List of Figures

Figure 1: Project Study Area 2
Figure 2: Central West End Transit Center Boardings 6
Figure 3: Central West End Transit Center Boardings by MetroBus Route 7
Figure 4: Cortex Station Platform Locations Considered 9
Figure 5: Forecasted 2035 Employment Density 12
Figure 6: Proposed Cortex Station Schematic Design 15
Figure 7: Proposed Cortex Station Parcel Map 16
Figure 8: 2015 Forecasted MetroLink Walk Access Weekday Boardings by Origin/Destination 20
Figure 9: Potential Transit Center Sites 28
Figure 10: Post-Screening Cortex Transit Center Sites 29
Figure 11: MetroBus Route Deviations Site 1 35
Figure 12: MetroBus Route Deviations Site 3 36
Figure 13: Alternative 4 Option 1 Concept to Add a Second (Westbound) Platform 41
Figure 14: Alternative 4 Option 2 Concept to Extend Existing Platform 43
Figure 15: Central West End MetroLink Platform Level of Service 47
Figure 16: Alternative 2 Potential Implementation Timeline 53

List of Tables

Table 1: Alternative 1 Central West End MetroLink Station Forecasted Weekday Boardings 8
Table 2: Alternative 2 Cortex Station Forecasted Weekday Boardings... 18
Table 3: Alternative 2 Forecasted Net New MetroLink Weekday Boardings Systemwide 22
Table 4: Alternative 2 Cortex Station Walk Access Weekday Boardings Forecast Comparison 23
Table 5: Proposed Cortex Station Opinion of Probable Capital Costs 24
Table 6: Proposed Cortex Station Estimated Annual Operating Costs ... 26
Table 7: Walking Environment Between Potential Transit Center Sites and Cortex MetroLink Station 30
Table 8: Diverted MetroBus Service Increased Operating Costs 33
Table 9: Diverted MetroBus Service Changes in Travel Time..... 35
Table 10: Central West End Transit Center Weekday Ridership Survey 38
Table 11: Alternative 3 Forecasted Weekday Boardings 38
Table 12: Alternative 4 Ridership Projections..... 44
Table 13: Platform Level of Service Criteria 45
Table 14: Central West End MetroLink Platform Level of Service..... 46
Table 15: Capital Cost of CWE Options 47
Table 16: Summary Evaluation of Alternatives..... 50

Executive Summary

The purpose of the Central Corridor Transit Access Study is to identify the role of transit and the feasibility of expanded service options to support continued growth and development in the study area. Specific study requirements and objectives include:

- Objectively evaluate the merits of multiple transit enhancement alternatives;
- Adhere to a Federal Transit Administration study process for considering modifications to Federal assets;
- Present regional leaders with the information and analyses needed to support decision-making; and
- Deliver a recommended transit enhancement solution and identify a clear path forward for implementing that particular solution.

Emphasis is placed on the area immediately adjacent to the existing MetroLink alignment between the Grand and Central West End Stations. Inclusive within the study area is Cortex, which is a legally defined Chapter 353 redevelopment district.

The study evaluates four distinct alternatives for enhancing transit in the Central Corridor:

- Alternative 1: No Build
- Alternative 2: Build New MetroLink Station in Cortex
- Alternative 3: Build New MetroLink Station in Cortex AND Relocate Central West End Transit Center (Bus Transfers) to Cortex
- Alternative 3: Upgrade Existing Central West End MetroLink Station

The study emphasizes a rigorous, data-driven analysis to provide quantitative metrics for considering the advantages and disadvantages of each alternative. Future population and employment are forecasted. They serve as key indicators of activity levels and the demand for trips into and out of the study area and are referenced as inputs to transit ridership projections – which are considered the critical justification criteria for transit enhancements.

Additional quantitative and qualitative analyses address anticipated capital and operating costs, transit operational impacts, and the transit

user experience. These analyses are heavily predicated on input and data provided by Metro.

The study's technical elements are balanced by a robust stakeholder engagement effort that included:

- Individual meetings with various stakeholder, community, and residential organizations to gather input;
- Formation of an Advisory Committee (see Page ii) to provide guidance and direction; and
- Formation of a Technical Committee (see Page ii) to review assumptions, data, and analyses.

The selection of a preferred alternative is determined from the results of a comparative evaluation that references the data and quantitative analyses presented in the preceding sections, coupled with qualitative assessments re-introduced in this section. Each alternative is considered in the context of the following two overarching project goals:

- Stimulate regional economic development by expanding high-performance transit service to connect Cortex with major regional destinations
- Alleviate over-crowding at the Central West End MetroLink Station

These goals are established from stakeholder input participating in the Advisory Committee and they reflect stakeholder objectives for transit and its role in shaping the future of the Central Corridor.

The comparative evaluation also relies ridership, costs, operational impacts, and user experiences criteria, coupled with several qualitative metrics focusing on broad community and quality of life benefits, such as neighborhood revitalization and access to opportunity (jobs) for low income populations.

In considering the first goal, it is concluded that **Alternative 2 – a new MetroLink Station in Cortex – would best stimulate economic development** and help facilitate continued growth and development in Cortex. Stakeholders indicate that high-frequency light rail service is necessary to attract entrepreneurs and innovators accustomed to high-performance transit in other cities.

Alternative 2 would maximize the number of new transit riders, attracting approximately 900 weekday boardings in 2015 and by as many as 2,000 by 2035. Alternative 2 also provides an exceptional user experience, while minimizing adverse impacts to the system. Existing MetroLink services would incur 1 additional minute of travel time and 20 seconds of dwell time stopping at the Cortex Station. This extra time would have a nominal effect on existing riders and could be accommodated without adding operators or light rail vehicles and without affecting system safety or timed transfers at key transit nodes.

The capital costs of Alternative 2 is estimated at $9.7 Million. The preferred capital financing strategy relies upon a Federal Grant through the TIGER program to provide the majority of the funding. Local funds provided by Cortex, Great Rivers Greenway, and the City of St. Louis complete the financing package.

The incremental operating cost of Alternative 2 amounts to $835,000 annually. A financing package consisting of farebox and incremental sales tax revenues generated by committed Cortex developments provide $755,000 or 90 percent of the cost. The remaining $80,000 would be funded by BJC Healthcare and Washington University through an escrow account funded by a one-time $400,000 deposit. This amount is expected to satisfy operating deficits until such time that farebox and sales tax revenues increase to cover the full operating cost.

It is recommended that Alternative 2 – New MetroLink Station in Cortex – be advanced for implementation. Next steps include the pursuance of environmental clearances and abandonment of freight rail spurs to prepare the site for the station. Then, design and engineering of the station can proceed followed by construction.

With regards to the second goal, Alternative 2 would not provide sufficient relief to platform congestion at the Central West End MetroLink Station. It would shift only 300 to 600 daily boardings to the Cortex Station, which would not have a meaningful impact on platform level of service. Therefore, **in order to satisfy both overarching goals, a combination of Alternative 2 and one of Alternative 3 or Alternative 4 would be necessary**. It is recommended to defer a decision as to which of Alternative 3 or 4 should be advanced. Further study is needed to more carefully consider the merits of each alternative and a final site cannot be identified for Alternative 3 until further notice.

Introduction

The Central Corridor – defined for purposes of this study as the area adjacent to the existing MetroLink line between the Grand and Central West End Stations – represents one of the St. Louis region's strongest opportunities for economic development. The corridor is anchored by several prominent institutions, including the Washington University School of Medicine, Barnes-Jewish and St. Louis Children's Hospitals, and Cortex. These institutions are growing and their growth is expected to continue well into the future.

Cortex, in particular, is developing as an innovation and technology community and is seeking to attract world-class researchers and entrepreneurs to Midtown St. Louis. The district was recently bolstered by the completion of the @4240 Building and BJC at the Commons and by the announcement that retailer IKEA will open a store in Cortex in 2015. Additional development projects are imminent, including several that would bring residential uses to the district.

The prospects for continued development would be amplified by enhanced transit service. In fact, access to high-performance transit may very well be essential for maximizing the potential of Cortex. The Central Corridor is already the region's biggest transit marketplace, so an enhancement of service would present an exceptional opportunity for increasing ridership.

The purpose of the Central Corridor Transit Access Study is to identify the role of transit and the feasibility of expanded service options to support continued growth. Specific study requirements and objectives include:

- Objectively evaluate the merits of multiple transit enhancement alternatives;

- Adhere to a Federal Transit Administration study process for considering modifications to Federal assets;
- Present regional leaders with the information and analyses needed to support decision-making; and
- Deliver a recommended transit enhancement solution and identify a clear path forward for implementing that particular solution.

The project study area is defined in **Figure 1** below. The study area is approximately bounded by Vandeventer Ave to the east, Lindell Blvd to the north, Kingshighway to the west, and the Union Pacific Railroad to the south and southeast. Emphasis is placed on the area immediately adjacent to the existing MetroLink alignment between the Grand and Central West End Stations. Inclusive within the study area is Cortex, which is a legally defined Chapter 353 redevelopment district identified in **Figure 1**.

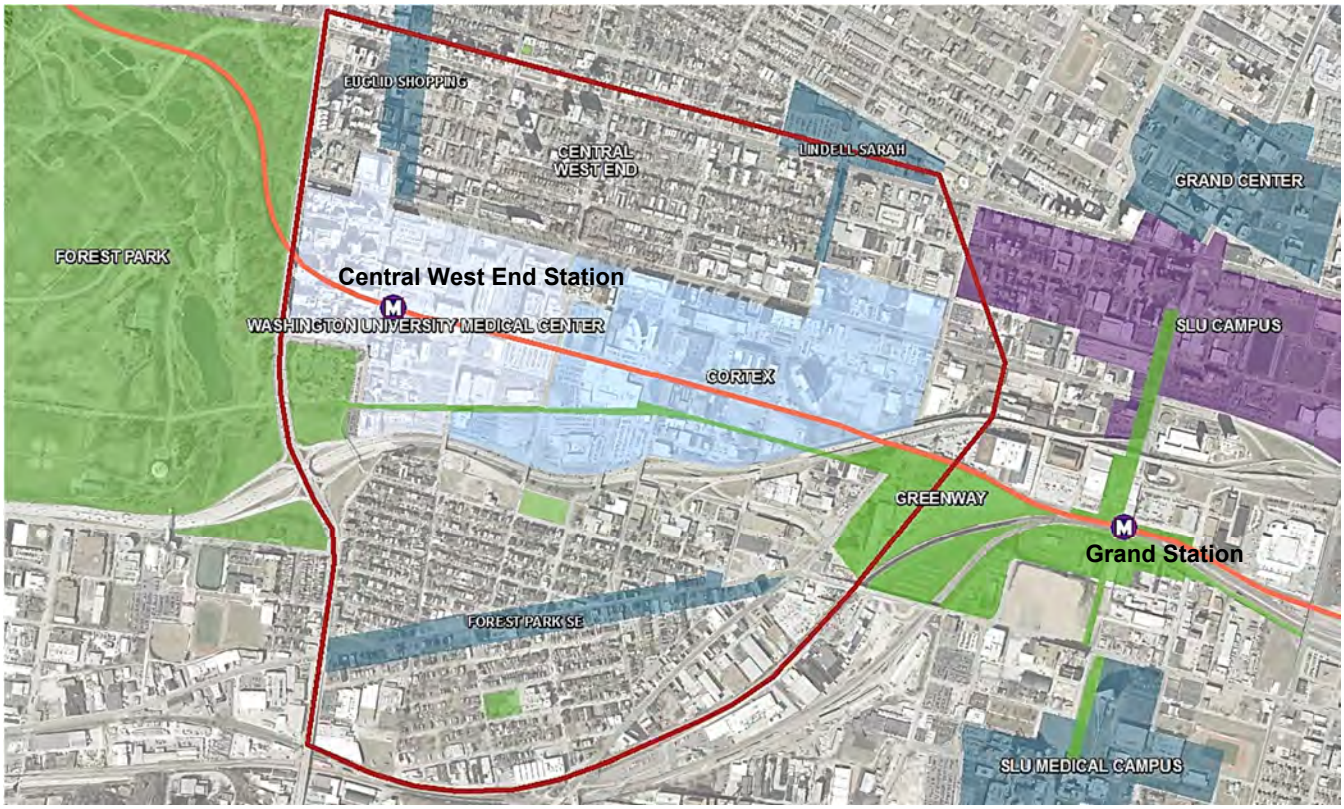


Figure 1: Project Study Area

Study Process

The study evaluates four distinct alternatives for enhancing transit in the Central Corridor:

- Alternative 1: No Build
- Alternative 2: Build New MetroLink Station in Cortex
- Alternative 3: Build New MetroLink Station in Cortex AND Relocate Central West End Transit Center (Bus Transfers) to Cortex
- Alternative 3: Upgrade Existing Central West End MetroLink Station

The study emphasizes a rigorous, data-driven analysis to provide quantitative metrics for considering the advantages and disadvantages of each alternative. Future population and employment are forecasted. They serve as key indicators of activity levels and the demand for trips into and out of the study area and are referenced as inputs to transit ridership projections – which are considered the critical justification criteria for transit enhancements.

Transit ridership projections are prepared using the regional travel demand model, maintained by the East-West Gateway Council of Governments. The ridership forecasts were accepted by Metro and East-West Gateway. Projections are provided for several future time horizons, including an opening year, 10-year, and 20-year, as is commonly stipulated by the Federal Transit Administration.

Additional quantitative and qualitative analyses address anticipated capital and operating costs, transit operational impacts, and the transit user experience. These analyses are heavily predicated on input and data provided by Metro.

The study's technical elements are balanced by a robust stakeholder engagement effort that included:

- Individual meetings with various stakeholder, community, and residential organizations to gather input;
- Formation of an Advisory Committee (see Page ii) to provide guidance and direction; and
- Formation of a Technical Committee (see Page ii) to review assumptions, data, and analyses.

Stakeholder meetings were held with the following organizations:

- BJC Healthcare
- Citizens for Modern Transit Board of Directors
- City of St. Louis Alderman Roddy
- City of St. Louis Development Corporation
- City of St. Louis Mayor's Office
- City of St. Louis Planning & Urban Design Agency
- Cortex
- Forest Park Southeast Community Improvement District
- Grand Center Inc.
- Great Rivers Greenway
- Metro
- Pace Properties
- Park Central Redevelopment
- St. Louis University
- Washington University

The collective feedback from these organizations is that a MetroLink Station in Cortex is vital for economic development and the continued success of that district. Moreover, transit, in general, is complementary to the desired "car optional" district that was advocated by several organizations. And as one of the few at-grade stations located within the City of St. Louis, a MetroLink station in Cortex presents a unique opportunity to be a bicycle hub. The station also provides at-grade access for pedestrians and the disabled.

In addition to the individual stakeholder meetings, an Advisory Committee comprised of some of the same stakeholders was formed and met on four occasions to provide strategic direction and guidance to the study and inform key decisions. For example, the Advisory Committee identified candidate sites for potential transit enhancements, provided feedback on suggested transit amenities, and helped facilitate consensus on the financing strategies for the preferred alternative.

The Technical Committee, organized to review data and assumptions, met on five occasions and provided valuable feedback that supported the development of accurate and reliable projections for future population and employment as well as transit ridership.

Evaluation Criteria

To evaluate the alternatives and the options within each alternative, a set of evaluation criteria was developed as follows, in no particular order:

- Ridership – Identify net new transit riders for each alternative;
- Financing – Develop capital and operating cost strategies for the preferred alternative;
- Transit Operations – Consider scheduling impacts, transfers, staffing, fleet size, and route deviation;
- Transit Service Quality – Emphasize the experience of the transit user and address travel time impacts, convenience and accessibility, transfer connections, and existing shortcomings;
- Safety – Ensure that riders can safely access transit and that safe connections between MetroLink and MetroBus can be provided, focusing on street crossings, track crossings, and station area safety;
- Multi-Modal Integration – Identify proximity and potential connections to other modes of transportation, including pedestrian, bicycle, and other forms of transit;
- Economic Development – Determine potential of the transit investment to stimulate development, job creation, and area revitalization;
- Quality of Life – Incorporate broad community benefits such as air quality, traffic and parking reductions, and access to opportunity for disadvantaged populations; and
- Compatibility with Future Development – Ensure transit investments can be accommodated and are feasible to construct.

Alternative 1 – No Build

This alternative consists of no change to the transit system and represents the impact of no action.

Ridership

Existing transit ridership serves as the foundation for the ridership forecasts. From Metro's Fiscal Year 2013 ridership counts, the Central West End Station averages 5,695 weekday boardings and the Grand Station averages 2,372 weekday boardings.

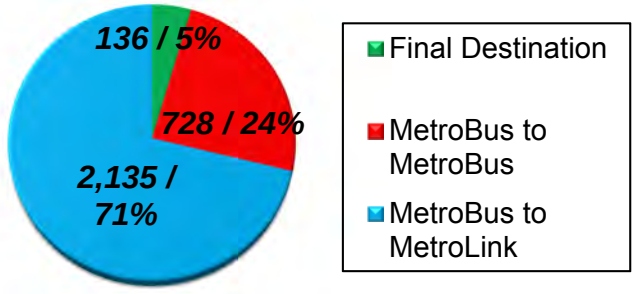
In addition to MetroLink ridership, MetroBus ridership was surveyed at the Central West End Transit Center in March of 2012. The Transit Center is an important node in the Metro system connecting north-south MetroBus routes with MetroLink running east and west. It is served by the following routes:

- #1 Gold
- #10 Gravois-Lindell
- #13 Union
- #18 Taylor
- #42 Sarah
- #59 Dogtown
- #80 Park Shaw
- #95 Kingshighway
- MetroLink Red Line
- MetroLink Blue Line

Routes currently serving the center that are not in the survey are the #14 Botanical Garden and the #57X Clayton Rd.

The survey determined how many passengers transfer to MetroLink, how many transfer to another bus, and how many consider the Transit Center to be their final destination. This data is summarized in **Figure 2**. On an average weekday, a total of 3,000 MetroBus passengers de-board with 71% transferring to MetroLink, 24% transferring to another bus, and just 5%

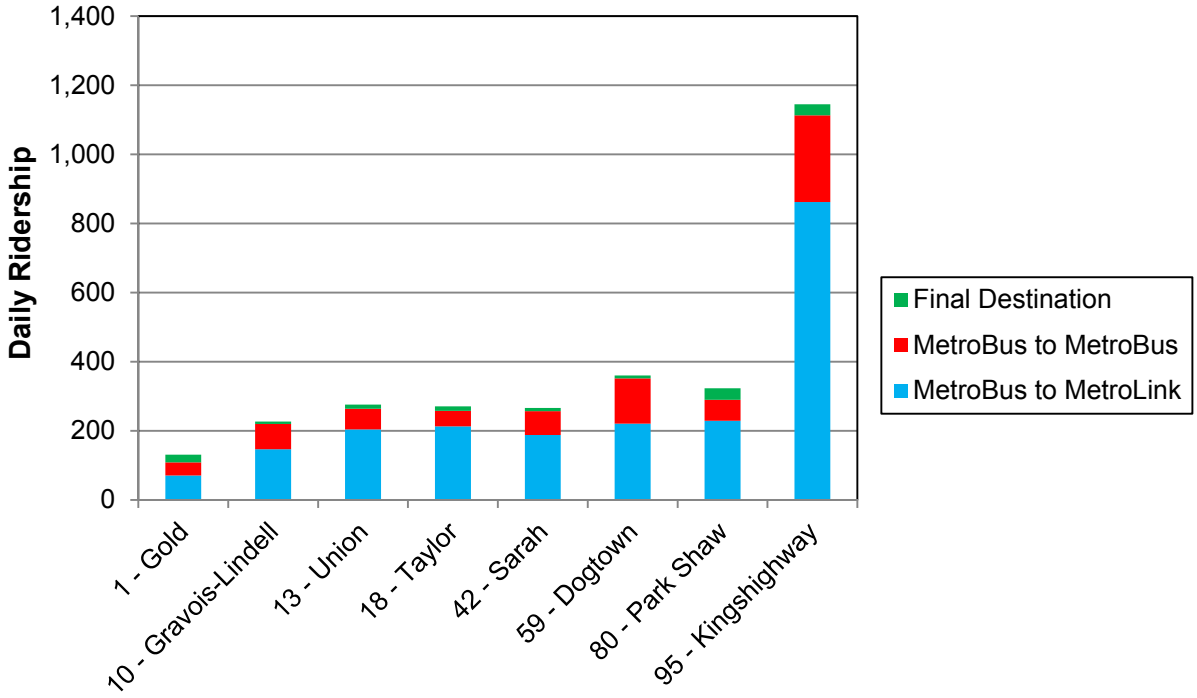
Figure 2: Central West End Transit Center Boardings



walking to their final destination. This confirms that nearly all MetroBus riders arriving at Central West End transfer to another transit service.

The survey also identified the volume of passengers by route. As shown in **Figure 3**, the #95 Kingshighway accounts for nearly 40 percent of the MetroBus ridership and is the most significant route serving the Central West End Transit Center.

Figure 3: Central West End Transit Center Boardings by MetroBus Route



Transit ridership forecasts are presented for the following planning horizons and scenarios:

- 2015
- 2025 Low Growth
- 2025 High Growth
- 2035 Low Growth
- 2035 High Growth

The 2015 horizon represents the station's opening year and includes development projects defined as committed based on ongoing construction, secured financing, or pursuance of entitlements. 2025 and

2035 are representative 10-year and 20-year planning horizons. Low and High Growth scenarios are provided for each horizon to reflect a range of development that could occur in the future. The scenario planning methodology is described in more detail in the Appendix.

Table 1: Alternative 1 Central West End MetroLink Station Forecasted Weekday Boardings

Observed	2015	2025 Low	2025 High	2035 Low	2035 High
5,695	6,550	6,545	6,644	6,649	6,763

Alternative 2 – New MetroLink Station in Cortex

This alternative consists of a new light rail station on the existing MetroLink alignment located between Boyle Ave and Sarah St in the Cortex Innovation District, hereby referenced as the Cortex Station.

Concept Development

Initial design concepts included two platform configurations (single center versus double side) and three platform locations illustrated in **Figure 4**:

- East of Boyle Ave
- Midway between Boyle Ave and Sarah St
- West of Sarah St

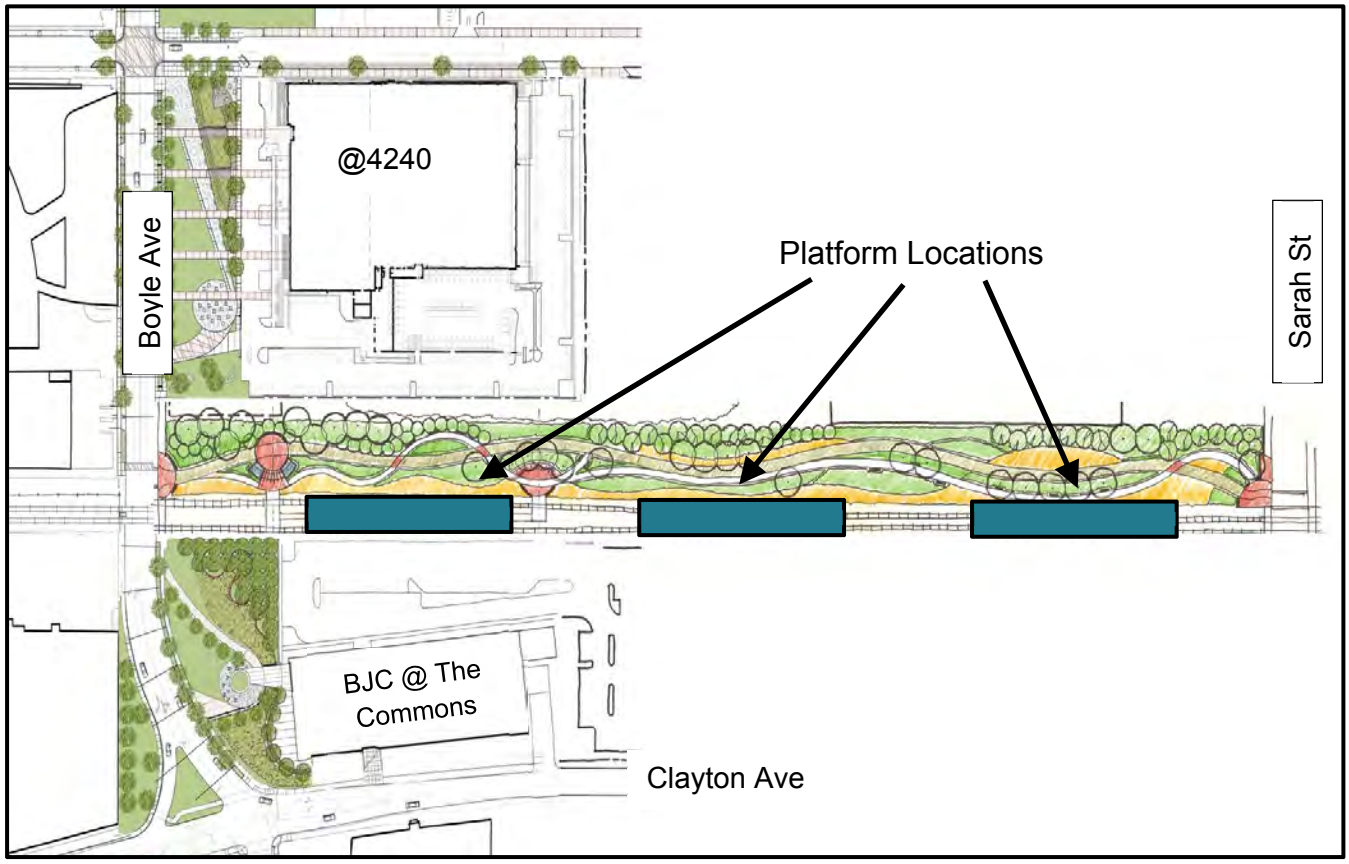


Figure 4: Cortex Station Platform Locations Considered

The single center platform configuration offers numerous advantages over the double side platform configuration:

- Platform amenities (canopy, lighting, benches, etc.) are consolidated in one location and can serve passengers waiting to travel in both directions, whereas side platforms feature the duplication of these amenities. As a result, platform capital costs and station operating costs, including security and maintenance, are commonly lower with the single center platform configuration.

- The center platform is considered safer. Pedestrians cross one track at a time instead of two. This crossing maneuver is simpler and benefits from "Z-crossings", which physically turn passengers towards approaching trains at crossings to facilitate a direct line of sight.

- The center platform enables misdirection passengers to transfer in the opposite direction without leaving the platform and without crossing tracks. Accommodating these passengers is important given the station's location on the combined Red and Blue Lines.

The advantage of the double side platform configuration is its compatibility with the existing track alignment. The single center platform requires realigning one direction of track. However, there is ample right-of-way between Boyle Ave and Sarah St for the track realignment and the center platform can be accommodated.

The criteria deemed most important for the platform location includes:

- Potential ridership capture
- Transit operational impacts
- Multi-modal connectivity
- TOD opportunity
- Proximity to Cortex Commons

Potential ridership capture measures the number of residents and jobs within a reasonable walking distance of the station as a representation of the market of possible transit riders. Given the nature of Cortex as an employment destination, emphasis was placed on the locations of future employees, which are illustrated by the employment density map in **Figure 5**. As can be seen, the highest concentration of employment is centered on Boyle Ave, and so the platform location adjacent to Boyle maximizes potential ridership capture.

The mid-block and Sarah St platform locations have smaller transit capture potentials. The mid-block location is reduced because riders must walk east or west (to either Boyle or Sarah) before they are able to walk north or south. Likewise, the capture potential adjacent to Sarah St is limited by lower employment densities to the east.

The station location adjacent to Boyle Ave maximizes multi-modal connectivity as follows:

- The Boyle Ave/Tower Grove Ave corridor is popular for cycling and is identified as a primary route by Bike St. Louis;
- The proximity of the Boyle Ave platforms to I-64 (and its reconfigured interchange at Tower Grove Ave/Boyle Ave) could maximize access for park-and-ride users; and
- The St. Louis Rapid Transit Connector Study identified Boyle Ave as being part of the I-64 BRT preferred route, which offers the opportunity for transfers between MetroLink and BRT at the Cortex Station.

Also note that Great Rivers Greenway District (GRG) intends to construct an east-west multi-use trail (adjacent to MetroLink and within Metro right-of-way) that would serve each of the platform locations equally.

Figure 5: Forecasted 2035 Employment Density

Employment density shown in green
Residential developments shown in orange

The Cortex Transit Oriented Development (TOD) Study identified Sarah St as a focal point for residential TOD. TOD opportunities arise from existing multi-family developments in the corridor (West End Lofts and 6 North), the street's character as an urban neighborhood street, and the availability of redevelopment parcels. However, portions of Sarah St nearest MetroLink may be precluded from residential TOD by future BJC, Cortex, and IKEA developments, the silo property (located at Sarah St and Duncan Ave), and I-64 itself. Hence, less credence was placed on this criterion during the concept development process.

With respect to Cortex Commons, the platform location adjacent to Boyle Ave is closest and maximizes the station's ability to complement the programmed events, dining opportunities, and other amenities planned for that public space.

The effect of platform location upon transit operations is consistent across all three locations. Specifically, the proposed station adds 1 minute of travel time to existing MetroLink service on both the Red and Blue Lines and 20 seconds of dwell time to load and unload passengers regardless of platform location.

Recommended Station Design

Based upon the preceding evaluations, adjacent to Boyle Ave is the preferred station location. The west platform edge should be located

approximately 250 feet from the centerline of Boyle Ave. The proposed station design concept is illustrated in **Figure 6**.

The station may be accessed from Boyle Ave via either the proposed GRG trail (which has been incorporated into the station conceptual design) or the station plaza itself, which is located north of the platform extending westward to Boyle. Access from Sarah St is facilitated by the GRG trail.

Pedestrian access to the platform is provided at both the east and west ends via at-grade track crossings. Access to Cortex Commons to the south is provided at the west end of the platform, whereas the proposed plaza space and GRG trail to the north (and by extension Cortex Commons) can be accessed from both sides of the platform.

The property needed to accommodate the station design concept illustrated in **Figure 6** is owned and controlled by Metro, as depicted in **Figure 7**. No right-of-way acquisition is anticipated.

The proposed plaza space is intended to host a variety of amenities that will enhance the user experience and complement Cortex Commons, including:

- **Public Art:** Opportunities for public art include sculptural elements within the landscape, environmental graphics on the café building, canopy wind screens and fencing. The plaza spaces also afford the opportunity for performance art to occur on site.

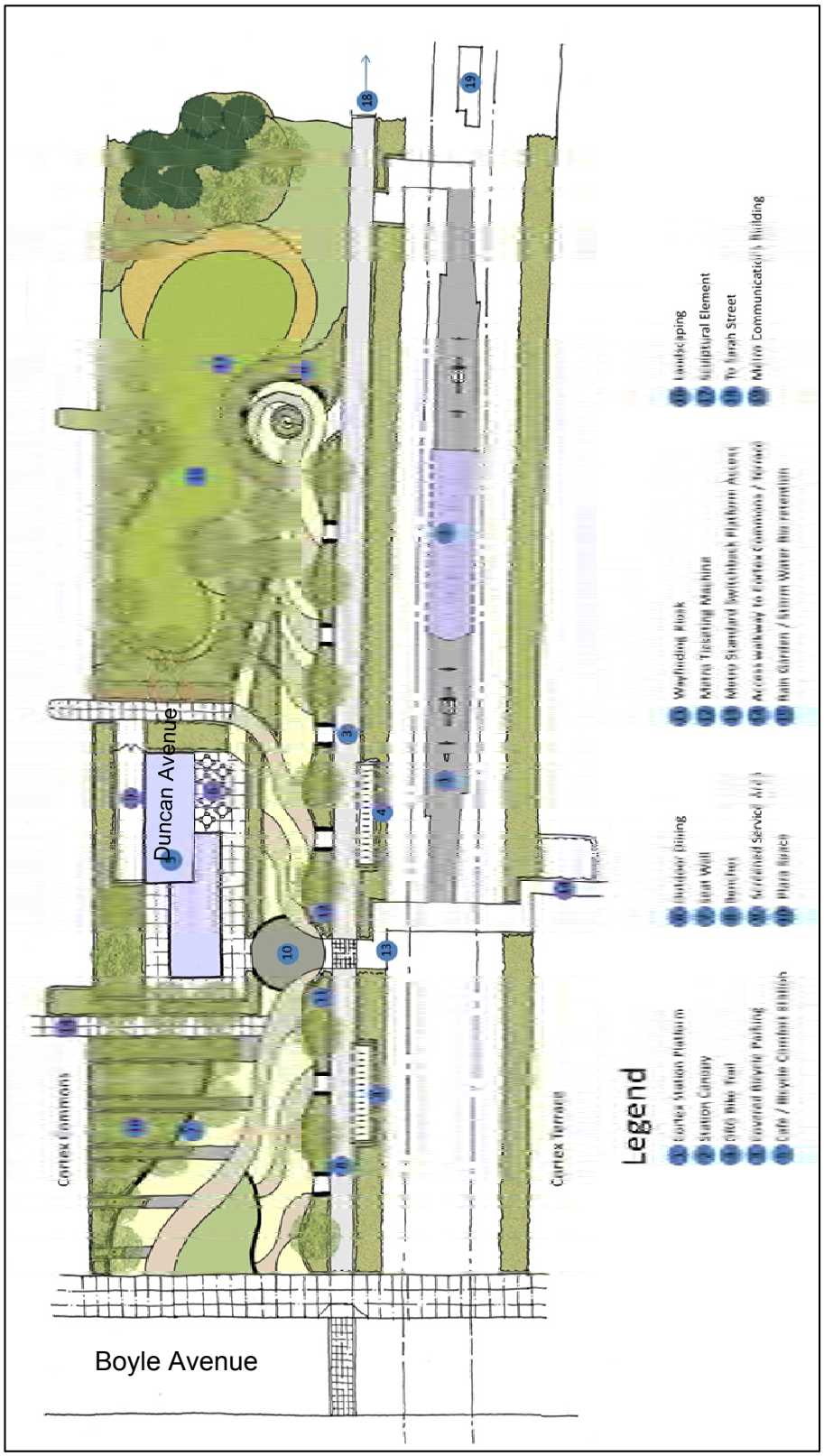


Figure 6: Proposed Cortex Station Schematic Design

Figure 7: Proposed Cortex Station Parcel Map

- **Bike Parking:** Two sheltered bike parking areas are proposed along the GRG trail. Established "best practices" should be incorporated into the final design of these areas, including locating parking in close proximity to the platform; providing low perimeter landscaping; ensuring parking is in plain view but segregated from pedestrian and bicycle circulation areas; and sizing racks, lighting, and shelters to accommodate anticipated demands and operational requirements.

- **Landscaping:** Vegetation is proposed throughout the station site, including a variety of woody and perennial plantings. Selected plantings should be low maintenance and tolerant of drought and urban conditions. Perimeter planting beds along the GRG trail and MetroLink track should be 4 feet or less to promote visibility. Shade tree masses are concentrated near the plaza spaces for pedestrian comfort; they are avoided near the tracks to prevent conflicts with catenary wires. A rain garden is proposed to capture and infiltrate storm water run-off.

- **Seating:** Seating opportunities are proposed throughout the plaza space, including seat-walls and benches. Seating is organized in a variety of configurations to promote both conversation and quiet reflection.

- **Café / Bicycle Comfort Building:** This facility could be provided as part of a future phase, once an owner and operator can be identified. The center could house public restrooms, indoor and outdoor dining, bicycle sales and repair, concessionaire, and station maintenance space.

- **Pedestrian Spaces:** These spaces accommodate pedestrian movements to and from the station separate from cyclists and others using the multi-use trail. The proposed layout directs pedestrians through a central node that includes ticketing machines and wayfinding signage. Recommended design features include decorative pavements (i.e. pavers and colored and imprinted concrete), porous pavers and planting beds to promote storm water infiltration and minimize run-off, and pedestrian-scale lighting throughout.

Ridership

Transit ridership forecasts are presented for the same 5 scenarios as Alternative 1: 2015; 2025 Low Development; 2025 High Development; 2035 Low Development; and 2035 High Development.

Average weekday boardings for each scenario are summarized in **Table 2**. Boardings are identified separately by mode of access (walk, drive, and bike). The walk access boardings are based on output from the regional travel demand model, whereas the drive and bicycle boardings are estimated manually.

Conservatively estimated at 200 riders per day, the park-and-ride boardings are consistent with parking capacity (approximately 200 spaces) desired by stakeholders planning for parking in the Cortex District. Park-and-ride boardings may exceed 200 per day, particularly if special events generate evening ridership. Ridership based on the transit user's origin-destination around both the Cortex and Central West End Stations is illustrated in **Figure 8**.

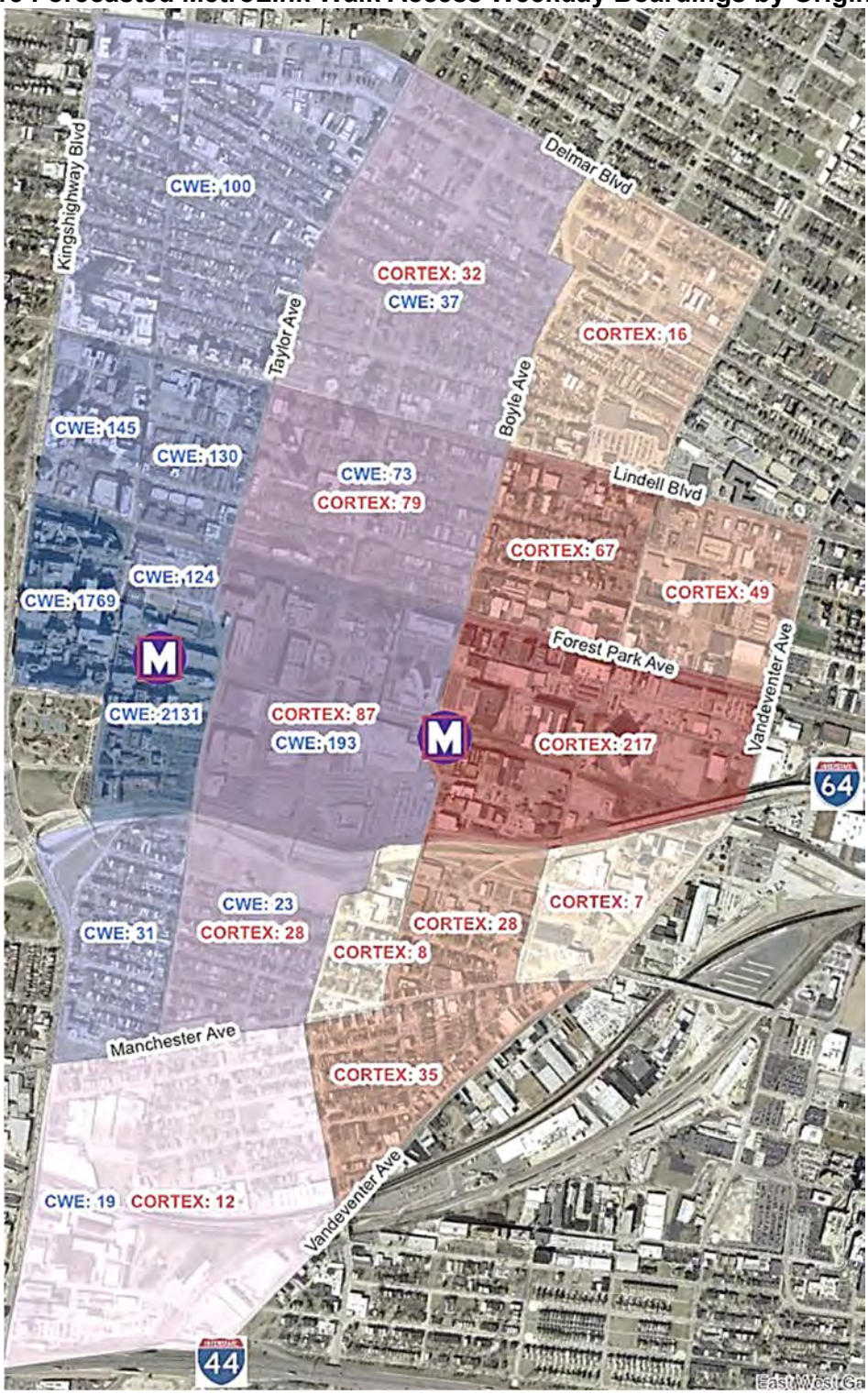
Table 2: Alternative 2 Cortex Station Forecasted Weekday Boardings

Mode of Access	2015	2025 Low	2025 High	2035 Low	2035 High
Walk[1]	665	951	1,347	1,169	1,632
Park-N-Ride[2]	200	200	200	200	200
Bicycle[2]	25	25	50	50	75
Total Boardings	**890**	**1,176**	**1,597**	**1,419**	**1,907**

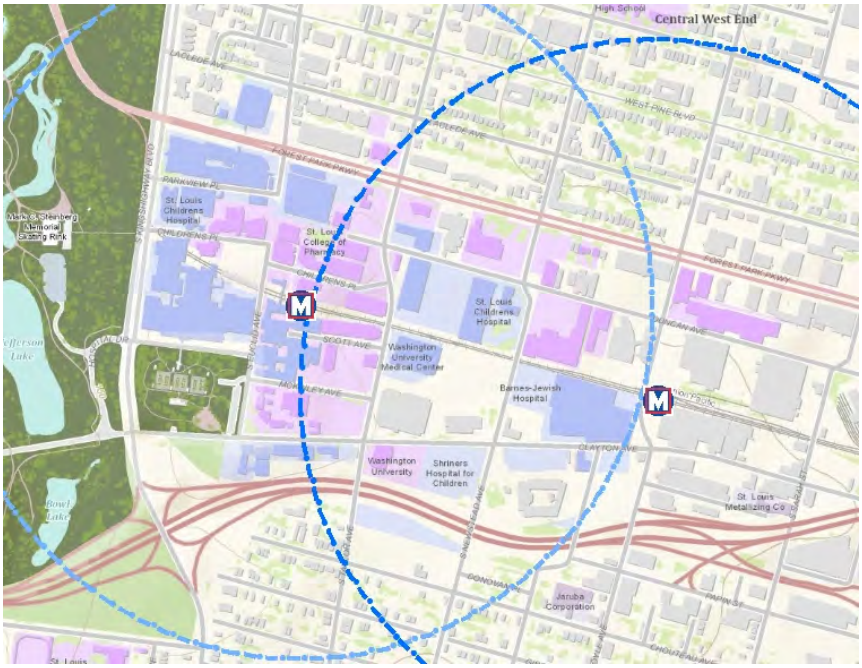
[1]Ridership based on output from regional travel demand model
[2]Ridership determined from manually stakeholder input

As one of the only at-grade stations within the City of St. Louis, the station is expected to attract cyclists seeking to ride transit but avoid stairs and escalators and it may be the preferred station of pedestrians and the disabled for the same reasons. The station is also connected to residential neighborhoods to the north and south via the Tower Grove Ave corridor – a popular bicycle route identified by Bike St. Louis. Ridership from cyclists is expected to increase over time, bolstered by the growing popularity of bicycle transportation and future east-west connections via the planned Midtown Loop Trail.

Figure 8: 2015 Forecasted MetroLink Walk Access Weekday Boardings by Origin/Destination



It is important to identify the number of new riders to the MetroLink system as a measure of ridership growth and increased farebox revenue. This includes accounting for ridership changes at other stations in the system.



Stopping at the Cortex Station adds approximately 1 minute of travel time to existing MetroLink service, which results in a minor decrease in ridership. Moreover, a portion of the boardings at the Cortex Station comprises existing transit riders diverting from other stations, most notably the Central West End Station. Collectively, the resulting decrease in ridership at other stations is summarized in **Table 3**.

The new riders boarding at the Cortex Station also board at another station in the system as part of their roundtrip travel on a typical weekday. The resulting increase in ridership at other stations is also summarized in **Table 3**. Combining the boardings at the Cortex Station with increases and decreases elsewhere in the system yields an estimate of net new MetroLink riders.

Table 3: Alternative 2 Forecasted Net New MetroLink Weekday Boardings Systemwide

	2015	2025 Low	2025 High	2035 Low	2035 High
Cortex Station Boardings	890	1,176	1,597	1,419	1,907
Ridership Increases Other Stations	491	692	1,003	870	1,193
Ridership Decreases Other Stations	(603)	(1,000)	(1,153)	(1,166)	(1,356)
Net New Boardings	**778**	**869**	**1,447**	**1,123**	**1,644**

To validate the preceding ridership forecasts (which are based largely on output from the regional travel demand model), separate forecasts are developed using a manual procedure. This dual forecasting approach is intended to provide greater confidence in the results and help garner the support of stakeholders.

The manual process defines transit shed areas around the Cortex Station to establish the population of potential transit users from which a portion is "captured" as projected riders. Since this process identifies riders that walk to/from transit, industry standards typically set transit shed boundaries at ¼ mile and ½ mile walking distances from the station. The shed boundaries are manually adjusted where needed to account for physical barriers, pedestrian connectivity, and land use characteristics.

Transit ridership is then estimated by applying capture rate percentages to the residential population and employment within the shed areas. Capture rates based on national benchmarks and observed ridership at other MetroLink stations are then tailored to conditions surrounding the Cortex Station, as follows:

- A capture rate of 10 percent is applied to the transit shed area within ¼ mile walking distance of the station.
- A capture rate of 5 percent is applied to the area between ¼ mile and ½ mile walk of the station.

These rates yielded the ridership projections summarized in **Table 4**.

Table 4: Alternative 2 Cortex Station Walk Access Weekday Boardings Forecast Comparison

Method	2015	2025 Low	2025 High	2035 Low	2035 High
Travel Model	665	951	1,347	1,169	1,632
Manual	535	899	1,261	1,069	1,620

As can be seen, the manual forecasting process generates ridership forecasts nearly identical to the travel demand model. This lends confidence to the results and helps broaden support for the study's findings.

Transit Operations

The Cortex Station is not expected to have a significant impact on operations of the system. The incremental travel time due to the additional stop at the Cortex Station is approximately 1 minute and 20 seconds. The current schedule includes 1 additional minute to compensate for delays at the Eads Bridge, which is currently operating as a single-track due to an ongoing rehabilitation project.

Once the Eads Bridge project is complete, the same schedule could be retained to operate MetroLink service with the Cortex Station in place. Therefore, the Cortex Station should not affect the number of light rail vehicles or vehicle operators needed to maintain existing service levels. Likewise, mandated operator layover times; safety factors relative to track crossovers, single-track sections, and pocket track operations; and other system constraints should not be impacted.

Capital and Operating Costs

The capital costs to design and construct the Cortex Station are estimated at $9.73 Million in 2014 dollars. Included in this amount are costs to realign the westbound track to accommodate a center platform, costs for the platform and station, costs for the amenities proposed to the north of the platform, and costs for planning and design. In addition, costs to secure environmental clearances (a Categorical Exclusion is expected) and abandon the former freight spur within the station footprint are also included, although these tasks seem likely to proceed in advance of a full funding agreement for the remainder of the station project.

Costs to construct the portion of the proposed multi-use trail between Boyle Ave and Sarah St are also included. MetroLink service will be disrupted during two weekends to facilitate the track relocation and replacement bus service will be provided at a cost of $150,000, which is also included in the total capital cost estimate. A 20% contingency is assumed for all cost items. Capital costs are summarized in **Table 5**.

Table 5: Proposed Cortex Station Opinion of Probable Capital Costs

Cost Component	Design	Construction	Total Costs
Freight Track Abandonment	$130,870	$239,597	$370,467
Environmental Assessment	$90,000	N/A	$90,000
Platform & Station Area	$167,143	$911,532	$1,136,010
Track Realignment	$756,666	$4,126,553	$4,825,883
Amenities & Landscaping	$234,921	$2,349,213	$2,584,134
Trail & Bicycle Storage	$49,230	$492,304	$541,534
Weekend Closure Bus Service	N/A	$180,000	$180,000
Total Capital Costs	**$1,413,829**	**$8,299,199**	**$9,728,029**

A construction timeline of approximately 9 months is anticipated to complete the station.

The costs to operate the Cortex Station are subdivided into the following cost categories:

- Station Security
- Station Maintenance
- Transit Service

Annual security costs for the MetroLink system amount to approximately $3,700,000 per the final year of Metro's contract with its private security contractor. Assuming these costs are evenly distributed across the 37 existing stations, the annual security cost per station is about $100,000.

Station maintenance costs include cleaning and maintenance services, supplies, and utilities, and average about $200,000 per station based on current maintenance levels.

Additional transit service operating hours are incurred over the course of a year due to the time associated with stopping trains at an additional station. These hours result in additional operating costs to the system manifested in two ways:

- One is a net increase in operating hours system-wide. Based on scheduling provided by Metro, the Cortex Station adds 221 annual MetroLink service hours. At an operating cost of $497 per hour, the net increase in annual service costs amounts to $110,000.

- Two is the allocation of MetroLink overhead amongst state taxing jurisdictions. This is based on the proportion of service hours within each state. Adding service hours in Missouri increases the proportional split between Missouri and Illinois, resulting in $425,000 in additional annual costs to Missouri and reduced costs to Illinois of the same amount.

Annual operating costs are summarized in **Table 6**.

Table 6: Proposed Cortex Station Estimated Annual Operating Costs

Cost Component	Annual Costs
Security Costs	$100,000
Maintenance Costs	$200,000
Increased Service Hours Costs	$110,000
Overhead Allocation Costs	$425,000
Total Operating Costs	**$835,000**

Alternative 3 – Relocate Transit Center to Cortex

This alternative consists of relocating the existing Central West End Transit Center from Taylor Ave to Cortex. It assumes Alternative 2 is implemented as the Transit Center would not be relocated unless a MetroLink station is nearby.

Concept Development

Initial design concepts were prepared for multiple site locations identified as candidate sites by the study team, as follows:

- **Site A:** Existing Central West End Transit Center
- **Site B:** Clean Cities Site located at the southeast corner of Newstead Ave and Duncan Ave
- **Site C:** Clayton Ave Building located between Clayton Ave, Boyle Ave, Newstead Ave, and MetroLink
- **Site D:** BJC Surface Parking Lot located between Clayton Ave, Boyle Ave, Tower Grove Ave, and I-64
- **Site E:** Custom Steel located at the southwest corner of Sarah St and Duncan Ave
- **Site F:** BJC At The Commons Surface Parking Lot located at the northwest corner of Sarah St and Clayton Ave
- **Site G:** Vacant site located at the northeast corner of Sarah St and Clayton Ave

These sites, illustrated in **Figure 9**, include surface parking lots, identified future development parcels, and buildings to be replaced. Legacy buildings and more recent developments are avoided.

Figure 9: Potential Transit Center Sites

These sites were presented to the Advisory Committee and Sites B, E, and G were rejected. Sites north of MetroLink were deemed in conflict with the Cortex Master Plan, which identifies Duncan Ave as the primary east-west pedestrian corridor in the Cortex district. Therefore, it was concluded that the frontage along Duncan Ave should be reserved for future buildings and designated as a pedestrian realm not suitable for a ground-level transit center. Site G was identified by Cortex as a future development parcel and was also dismissed from further consideration.

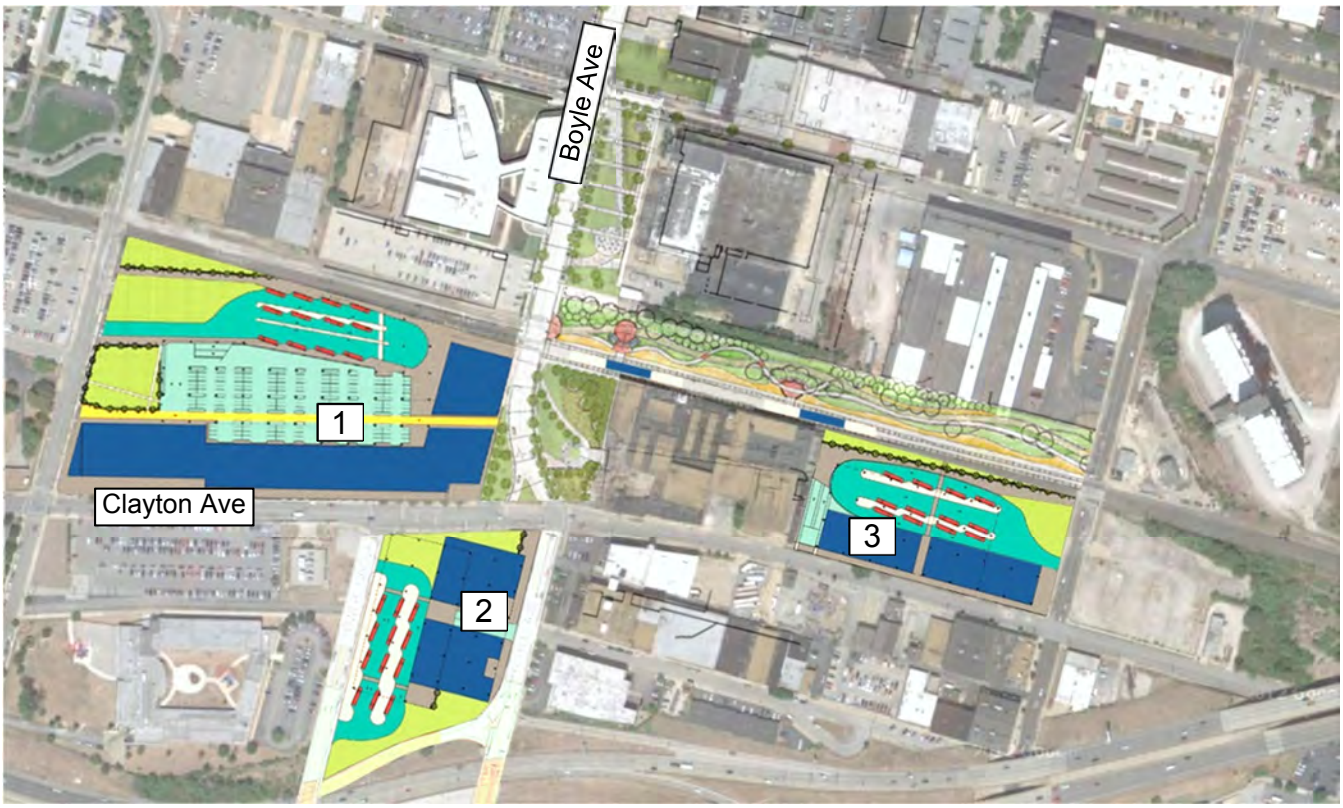
Site A was retained as the Alternative 1 No Build option for a transit center. Sites C, D, and F were retained for further analysis as Alternative 3 Sites 1, 2, and 3, as conceptually shown in **Figure 10**. Each of these sites are privately owned by BJC Healthcare. An agreement between Metro and BJC would need to be in place before any of the sites could host a transit center.

Given the land values and momentum for development in Cortex, these sites are imagined as multi-use, with transit centers occupying the ground level and parking and/or building space positioned around or vertically above the transit centers. It is unlikely that any one site would be designated exclusively as a transit center without co-existing with another use.

The massing shown in dark blue in **Figure 10** depicts potential building areas and the light blue illustrates parking. These schematics do not reflect specific development plans or proposals but rather are intended to demonstrate potential multi-use development concepts.

A total of 12 bays are proposed for the transit center itself to serve up to 9 MetroBus routes. This would represent a 33 percent increase in the number of bays compared to the existing transit center on Taylor Ave, which has approximately 9 bays and is crowded during peak periods.

Figure 10: Post-Screening Cortex Transit Center Sites



Transit User Experience

The 3 transit center sites are evaluated in further detail, focusing on the transit user experience. The criteria that most heavily factored into this evaluation are as follows:

- Wayfinding and visual line of sight between the transit center and Cortex MetroLink Station;

- Walkability and pedestrian safety between the transit center and Cortex MetroLink Station;
- Walking distance between the transit center and Cortex MetroLink Station; and
- Site suitability, including safe and efficient MetroBus ingress and egress.

Based on the preceding criteria, Site 2 is rejected. Located south of Clayton Ave, Site 2 offers inadequate wayfinding and poor line of sight to the Cortex MetroLink Station. Transfer passengers would need to cross the busy Clayton Ave/Boyle Ave intersection, prompting safety concerns. The walking distance is nearly 1,100 feet, which surpasses the transfer distance at the Central West End Station by 300 feet as summarized in **Table 7**. Lastly, heavy traffic along Boyle Ave and along Tower Grove Ave traveling to and from I-64 may impede the flow of buses in and out of Site 2, resulting in unnecessary delays and potentially hazardous conditions.

Table 7: Walking Environment Between Potential Transit Center Sites and Cortex MetroLink Station

	Existing	Site 1	Site 2	Site 3
Walk Distance	675 feet	715 feet	1085 feet	885 feet
Street Crossings	0	1	2	0

Site 1 and Site 3 have adequate pedestrian connectivity to the Cortex MetroLink Station. Walk distances are comparable to the transfer distance at the Central West End Station and both sites offer direct lines of sight to the platform. Transfer passengers from Site 1 would need to cross Boyle Ave to access MetroLink, and while not an ideal circumstance, the street crossing is not a fatal flaw.

Both sites provide for suitable bus ingress and egress via Newstead Ave and via Sarah St, away from the busiest intersections. In fact, Newstead Ave is generally accepted as being one of the few north-south corridors in the immediate area with a traffic flow emphasis that would be appropriate for MetroBus traffic.

Capital and Operating Costs

The capital cost to design and construct a new MetroBus Transit Center is approximately $6 Million. This cost provides for a 12-bay facility and a small building with space for transit operators and customer amenities. Costs to ready the site for a multi-use, vertical development either above or around the transit center are not included.

With regards to operating costs, it is assumed that costs to operate the new transit center will be approximately the same as those to operate the existing transit center on Taylor Ave. Moreover, any new passenger amenities will be self-sustaining or supported by a third party such that no additional costs will be incurred by Metro. Hence, moving the transit center will not have a meaningful effect on costs for maintenance, utilities, security, etc. that are associated with operating the center itself.

Instead, the operating cost calculation herein focuses on the MetroBus routes that connect to the transit center and the additional mileage and service hours that Metro will incur as a result of the center's relocation. Costs for MetroBus service are separated into costs computed on a per mile basis, such as gasoline and vehicle maintenance, and those calculated per hour, such as operator costs, as follows:

- MetroBus Operating Costs per Mile = $3.08
- MetroBus Operating Costs per Hour = $64.26

The increase or decrease in operating costs are calculated for each MetroBus route using the preceding unit costs supplied by Metro. Route adjustments are minimized to ensure adequate coverage of all existing service areas. A more comprehensive redeployment of service, if pursued by Metro, could result in a more efficient cost structure than assumed for this analysis. For example, routes such as the #10 Lindell could be diverted to Site 3 via Sarah St, but at the expense of no longer serving Lindell Blvd west of Sarah St or Kingshighway. Assessments of service trade-offs at this level of detail are beyond the scope of this study.

Changes in service mileage and service hours are estimated for each MetroBus route separately for Site 1 and for Site 3 using a spreadsheet tool that estimates travel time considering anticipated stops, traffic delays, and bus vehicle acceleration and deceleration rates. This tool is calibrated to scheduled travel times along existing routes for accuracy.

The change in travel time and travel distance for a single trip along each route is then converted into totals for weekdays, Saturdays, and Sundays/Holidays reflecting different schedules and service frequencies. The amounts are then annualized as summarized in **Table 8** based on the number of weekdays, Saturdays, and Sundays/Holidays per year.

Table 8: Diverted MetroBus Service Increased Operating Costs

Option	Site 1	Site 3
Reroute All Except #95 Kingshighway	16,064 miles	76,730 miles
	-350 Hours	4,732 Hours
	$26,986 Annually	**$540,407 Annually**
Reroute All Including #95 Kingshighway	27,180 miles	118,281 miles
	-57 Hours	7,845 Hours
	$80,052 Annually	**$868,425 Annually**

Costs are calculated two ways – one assuming the #95 Kingshighway is diverted to the relocated transit center and a second assuming the #95 retains its current route and transfers to MetroLink continue to occur at the Central West End Station. As the only route serving the Central West End Transit Center that does not terminate there, passengers on the #95 would incur additional time traveling both into and out of a relocated center as part of the same trip, amplifying the effects. Secondly, the #95 is the busiest route serving the transit center by a sizable margin. Care must be taken to minimize disruptions to this important route.

As can be seen from **Table 8**, increased operating costs of relocating the transit center to Site 3 vastly exceed those of Site 1 due to the additional travel time and travel distance to shift buses from Taylor Ave to Sarah St. Conversely, the additional costs of operating a transit center at Site 1 would be less than $100,000 per year. In fact, Site 1 may yield an aggregate reduction in travel times due to improved levels of service, fewer stops, and fewer pedestrian impedances on Newstead Ave as compared to Taylor Ave. However, a net increase in costs would be realized due to additional travel distances.

The anticipated round trip travel time ramifications are summarized for each MetroBus route for both Site 1 and Site 3 in **Table 9**. The modified routes are illustrated in **Figure 11** for Site 1 and **Figure 12** for Site 3.

Table 9: Diverted MetroBus Service Changes in Travel Time

Incremental Travel Time (Round Trip)	Route	Site 1	Site 3
	#1 Gold	2 min	6.5 min
	#10 Gravois/Lindell	2 min	6.5 min
	#13 Union	1 min	6.5 min
	#14 Botanical Garden	-4 min	-2 min
	#18 Taylor	2 min	6.5 min
	#42 Sarah	-2.5 min	-7.5 min
	#59 Dogtown	-30 sec	4 min
	#80 Park/Shaw	-4 min	-2 min
	#95 Kingshighway	1 min	10 min
	#57x Clayton Road	-30 sec	4 min
	Aggregate	**0 min**	**4 min**

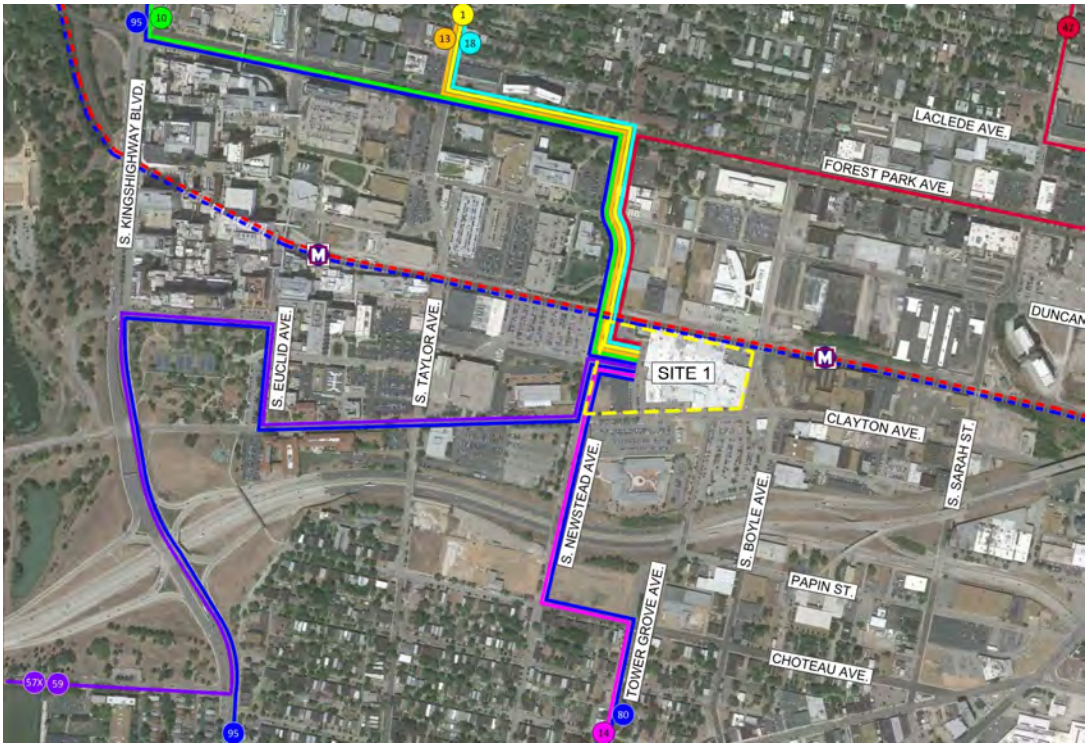


Figure 11: MetroBus Route Deviations Site 1

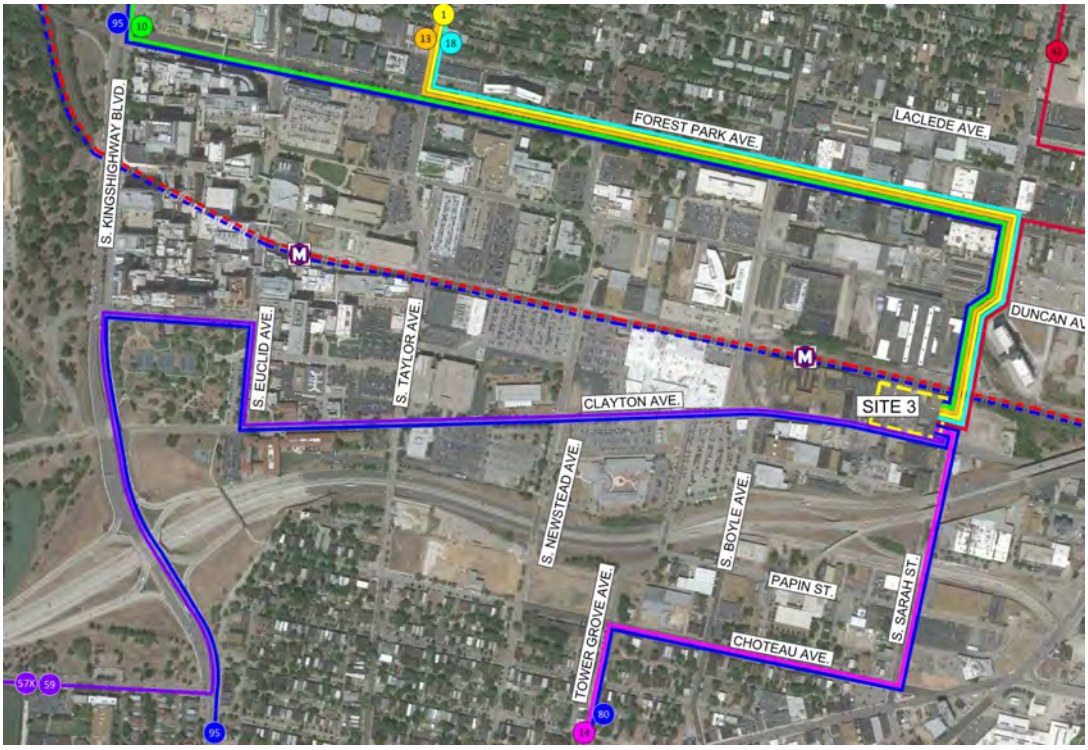


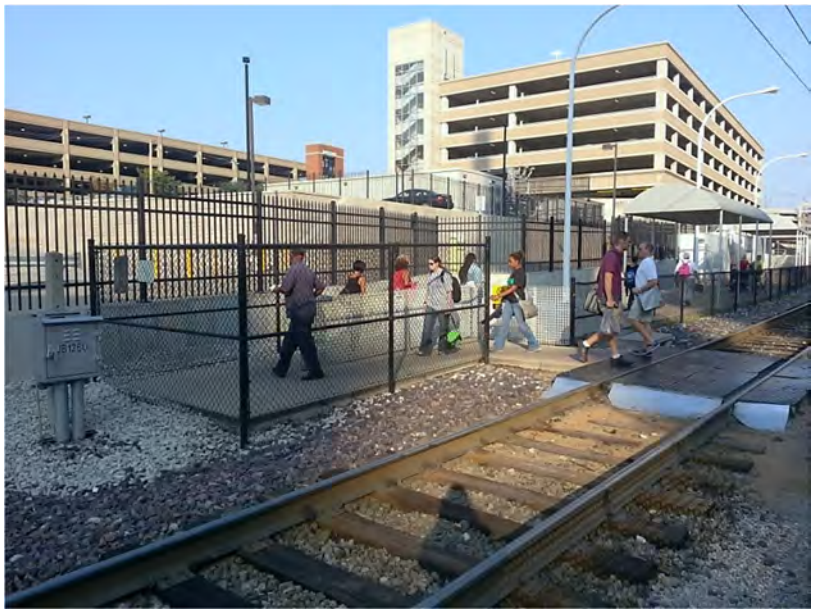
Figure 12: MetroBus Route Deviations Site 3

Ridership

Relocating the Central West End Transit Center may affect existing MetroBus ridership. This study considered two primary effects:

- The new transit center will increase and decrease travel times along MetroBus routes, triggering a ridership response.
- The new transit center's geographic location will offer proximity advantages or disadvantages that may result in increases or decreases in ridership.

Localized trip modeling is needed to quantify the first effect, as research from other transit systems suggests a wide range of ridership changes may occur as a result of travel time changes. The regional travel demand model was considered but was found to not be an effective tool for this particular exercise. Its regional emphasis limits its ability to accurately assess the micro-level ridership effects on individual routes with marginal changes in travel time. Therefore, this study does not quantify changes in MetroBus ridership due to increases or decreases in travel time.



Secondly, the survey of existing boardings at the Central West End Transit Center reveals that 95 percent of riders transfer to MetroLink or a different MetroBus. Very few riders use the transit center as the origin or destination of their trip. This implies the second effect will be minimal. To that end, the transit center's proximity to population or employment centers should be considered secondary. Instead, a location that minimizes MetroBus route deviation and maximizes connectivity to MetroLink for transferring passengers should be emphasized.

Consistent with the survey, this analysis assumes that MetroBus ridership will not be affected by development in the study area and will remain stable over time in an effort to be conservative. Ridership by route at the Central West End Transit Center is summarized in **Table 10** below.

The preceding assumptions and conclusions limit the Alternative 3 ridership analysis to assessing the implications of relocating all routes to a new transit center versus all routes except the #95 Kingshighway, which would remain integrated with the Central West End MetroLink Station in that scenario. This assessment also has ridership implications for both the Central West End and Cortex MetroLink Stations based on the number of MetroBus transfers. **Table 11** summarizes the ridership for Alternative 3 with and without the #95 Kingshighway route deviated to the relocated transit center.

Table 10: Central West End Transit Center Weekday Ridership Survey

MetroBus Route	Total Ridership	Transfers to MetroBus	Transfers to MetroLink
#1 Gold	131	38	71
#10 Gravois/Lindell	227	73	147
#13 Union	276	60	204
#14 Botanical Garden	Not Surveyed	Not Surveyed	Not Surveyed
#18 Taylor	271	45	213
#42 Sarah	266	69	188
#59 Dogtown	360	131	221
#80 Park/Shaw	323	61	229
#95 Kingshighway	1,145	251	862
#57x Clayton Road	Not Surveyed	Not Surveyed	Not Surveyed
Aggregate	**3,000**	**728**	**2,135**

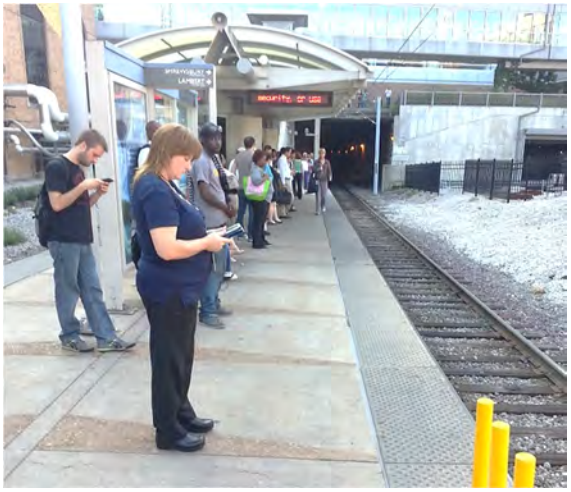
Table 11: Alternative 3 Forecasted Weekday Boardings

Station	2015	2025 Low	2025 High	2035 Low	2035 High
Relocate All MetroBus Routes To New Transit Center					
Relocated Transit Center	3,000	3,000	3,000	3,000	3,000
Cortex MetroLink Station	2,990	3,276	3,697	3,519	4,007
Central West End MetroLink Station	4,151	4,061	4,050	4,100	4,049
Relocate All MetroBus Routes To New Transit Center EXCEPT #95 Kingshighway					
Relocated Transit Center	1,855	1,855	1,855	1,855	1,855
Cortex MetroLink Station	2,130	2,416	2,837	2,659	3,147
Central West End MetroLink Station	5,011	4,921	4,910	4,960	4,909

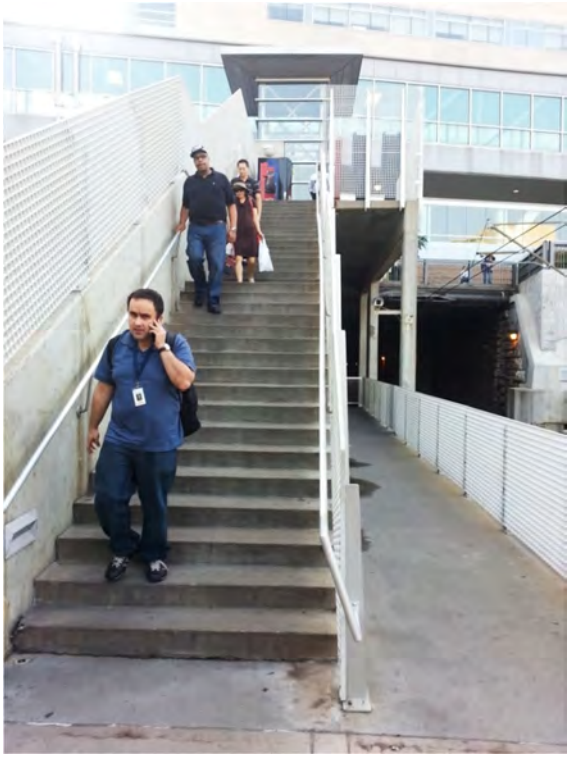
From **Table 11**, it can be concluded that relocating all MetroBus routes to the new transit center would provide the most relief to ridership at the Central West End MetroLink Station and, by the same token, maximize ridership of the Cortex MetroLink Station.

Alternative 4 – Upgrade Central West End Station

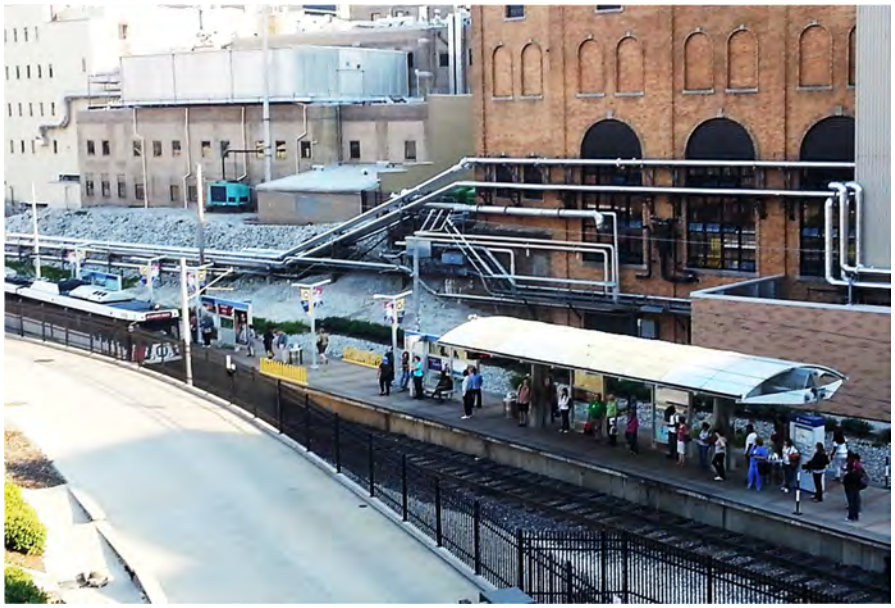
This alternative consists of enhancing the existing Central West End MetroLink Station. The motivation for improvements stems from the station's role as the busiest in the MetroLink system with 5,625 weekday boardings. In addition to its location adjacent to one of the region's largest employment centers (Washington University Medical Center), the station is also a major transfer hub between north-south MetroBus service and east-west MetroLink service.



The heavy usage tends to saturate the station area during peak periods. Platform crowding, impeded circulation, and ingress/egress congestion on the west stairwell and east pathway are typical. The west stairwell, which connects the station to the medical center and Euclid Ave, is narrow and pedestrian movements are limited to single-file in each direction (up and down). The east pathway, which connects the station to the transit center for MetroBus transfers, is similarly narrow and congested.



In addition to periodic over-crowding, the station also suffers from a "back of house" appearance that is a by-product of its location in a depressed former freight rail corridor adjacent to the medical center's steam plant. Other enhancements to the station meriting consideration include improved wayfinding from Euclid Ave, improved pedestrian connectivity to Taylor Ave, and direct pedestrian linkage to the medical center's "link" system of sky bridges.



Concept Development

In an effort to alleviate safety concerns associated with platform crowding, the design concepts prioritize expanding platform capacity. Three initial design concepts are developed for consideration:

- Option 1: New westbound platform
- Option 2: Extend existing center platform
- Option 3: Install platform screen gates

Option 1 relocates the existing service drive on the north side of the tracks to accommodate a new westbound platform and a pedestrian promenade connecting to the transit center and Taylor Ave. The service drive is proposed to be relocated to Children's Place. A new elevator and stairway would connect the westbound platform to Euclid Ave. Platform and pedestrian ingress/egress capacity would be effectively doubled. Additional features include extensive landscaping, façade screening, and a dedicated bicycle parking area. Option 1 is illustrated in **Figure 13**.

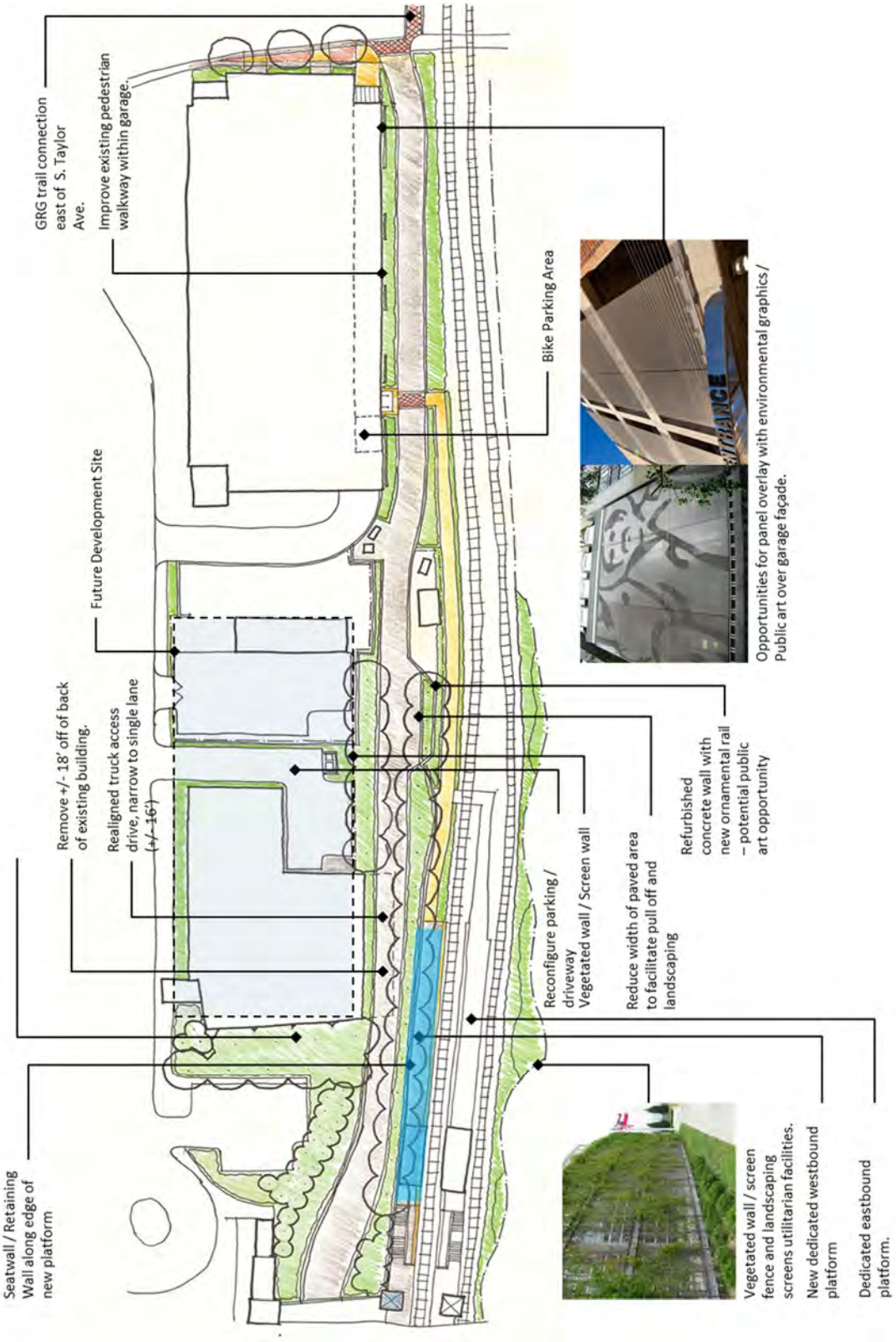


Figure 13: Alternative 4 Option 1 Concept to Add a Second (Westbound) Platform

Option 2 extends the existing center island platform approximately 200 feet to the east. While MetroLink trains cannot be lengthened without addressing other stations in the system, this concept would enable eastbound and westbound trains to stagger their stop at Central West End. Eastbound trains would use the eastern two-thirds of the platform and westbound trains would use the western two-thirds.

With Option 2, the service drive along the north side of the tracks is retained. The distance between the platform and transit center is shortened, although the pathway connection to the transit center remains as presently configured. The platform extension requires a minor realignment and radius modification to the eastbound track. Depending upon the ultimate design, the track changes could impact the service area for the Scott Ave Building and potentially necessitate property acquisition, although information available from the City Assessor's Office suggests that Metro controls the majority of the service area. Option 2 with the Metro-owned property boundary highlighted in yellow, is depicted in **Figure 14**.

Option 3 adds platform screen gates to the existing station, effectively preserving its current platform and ingress/egress configurations. The screen gates expand the platform's capacity by enabling passengers to stand closer to the platform edge. They also serve as a safety barrier between the platform and tracks.

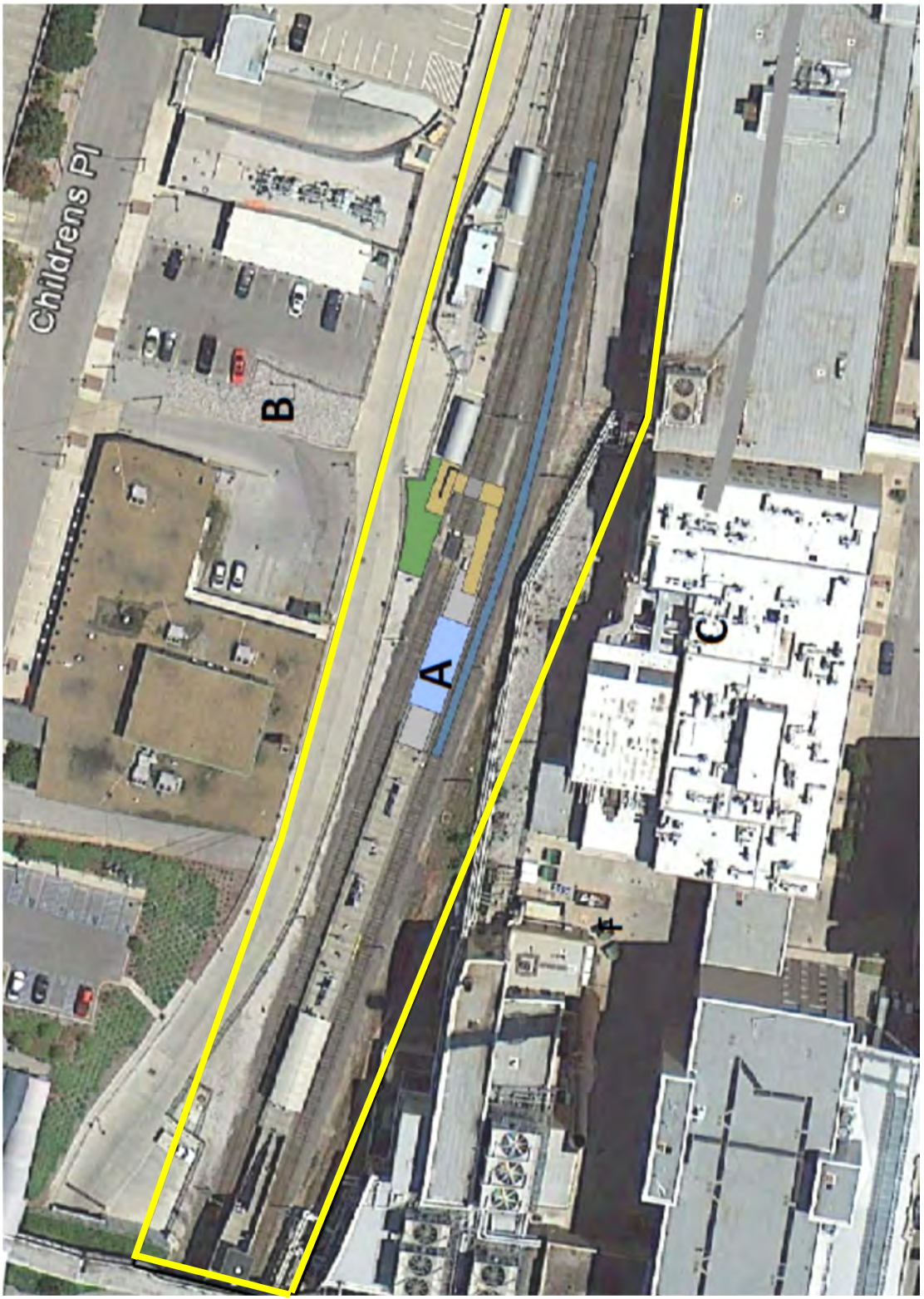


Figure 14: Alternative 4 Option 2 Concept to Extend Existing Platform

Based on feedback from the Advisory Committee, Option 1 was eliminated from further consideration due to potential conflicts with redevelopment plans for the property located north of the station and west of the transit center. Option 2 and Option 3 are retained for more detailed analysis.

Ridership

Ridership projections for Alternative 4 are presumed to be identical to those generated for the Alternative 1 No Build scenario. In other words, the platform levels of service are not viewed as having an impact on ridership either positive or negative. The existing platform configuration is not detracting riders and, by extension, an expanded or enhanced platform is not expected to attract new riders. The ridership forecasts are based entirely on anticipated development and the growth of employment and population near the station.

Table 12: Alternative 4 Ridership Projections

Observed	2015	2025 Low	2025 High	2035 Low	2035 High
5,695	6,550	6,545	6,644	6,649	6,763

Transit User Experience

Option 2 and Option 3 emphasize additional platform capacity by either physically increasing the size of the platform or increasing the usable area of the existing platform by implementing a screen gate system. To quantify the anticipated effects of each option, a platform level of service metric as defined in the *Transit Capacity and Quality of Service Manual, Third Edition* is employed. Platform level of service is determined from the average standing area per person measured in square feet.

The standing area criteria for each level of service are summarized in **Table 13**. Level of service 'C' is an appropriate target for acceptable conditions. The threshold between level of service 'D' and level of service 'E' (3 ft^2/person) is typically considered to be a critical capacity that should not be exceeded.

Table 13: Platform Level of Service Criteria

Level of Service	Standing Area Per Person (ft^2)	Avg. Inter-person Spacing (ft)
A	> 13	> 4
B	10 - 13	3.5 - 4
C	7 - 10	3 - 3.5
D	3 - 7	2 - 3
E	2 - 3	< 2
F	< 2	

Platform level of service and the average standing area per person account for the effective useable space of the platform, excluding platform "furniture" such as signs, benches, trash cans, etc. Also excluded are platform edge warning strips, space between trains not proximate to boarding doors, and linear circulation pathways along the platform. Deducting for these items, the existing platform at the Central West End Station has approximately 750 square feet of effective standing area. This represents approximately 25 percent of the platform's 3,200 square feet total area.

Secondly, the number of standing passengers on the platform during the peak period is estimated from daily ridership. It is assumed that 10 percent of the daily ridership is served during the busiest hour of the day. An additional peaking factor is applied recognizing that passenger arrivals within the peak hour do not occur uniformly. Moreover, passenger arrivals transferring from MetroBus are calculated directly from schedules to reflect timed transfers and the influx of passengers within brief time windows.

The maximum number of passengers waiting on the platform at a given time is estimated based on the longest headway between arriving MetroLink trains. The preceding methodology conservatively estimates up to 150 passengers on the platform during a single train arrival and departure sequence. This number is inclusive of standing passengers waiting to board and passengers de-boarding.

With 750 square feet of standing space and 150 peak passengers, it is estimated that the Central West End Station today provides an average of

5 square feet per passenger, which equates to a platform level of service 'D'. Extending the platform (Option 2) and installing platform screen gates will increase the effective standing area, as summarized in **Table 14**.

Table 14: Central West End MetroLink Platform Level of Service

Platform Alternative	Effective Standing Area	Standing Area Per Person (ft^2)	Platform Level of Service
Existing	750	5	D
Option 2	1,400	7.75	C
Option 3	1,550	8.5	C

Option 2 will provide an 85 percent increases, whereas Option 3 will facilitate a 100 percent increase. Both options will improve the platform level of service from 'D' to 'C' based on existing passenger loadings.

As ridership increases over time, square feet per passenger is expected to decrease marginally, as illustrated in **Figure 15**. However, the platform level of service is expected to remain a 'C' provided that Option 2 or Option 3 is implemented or a 'D' if no changes are made and the existing platform configuration is retained.

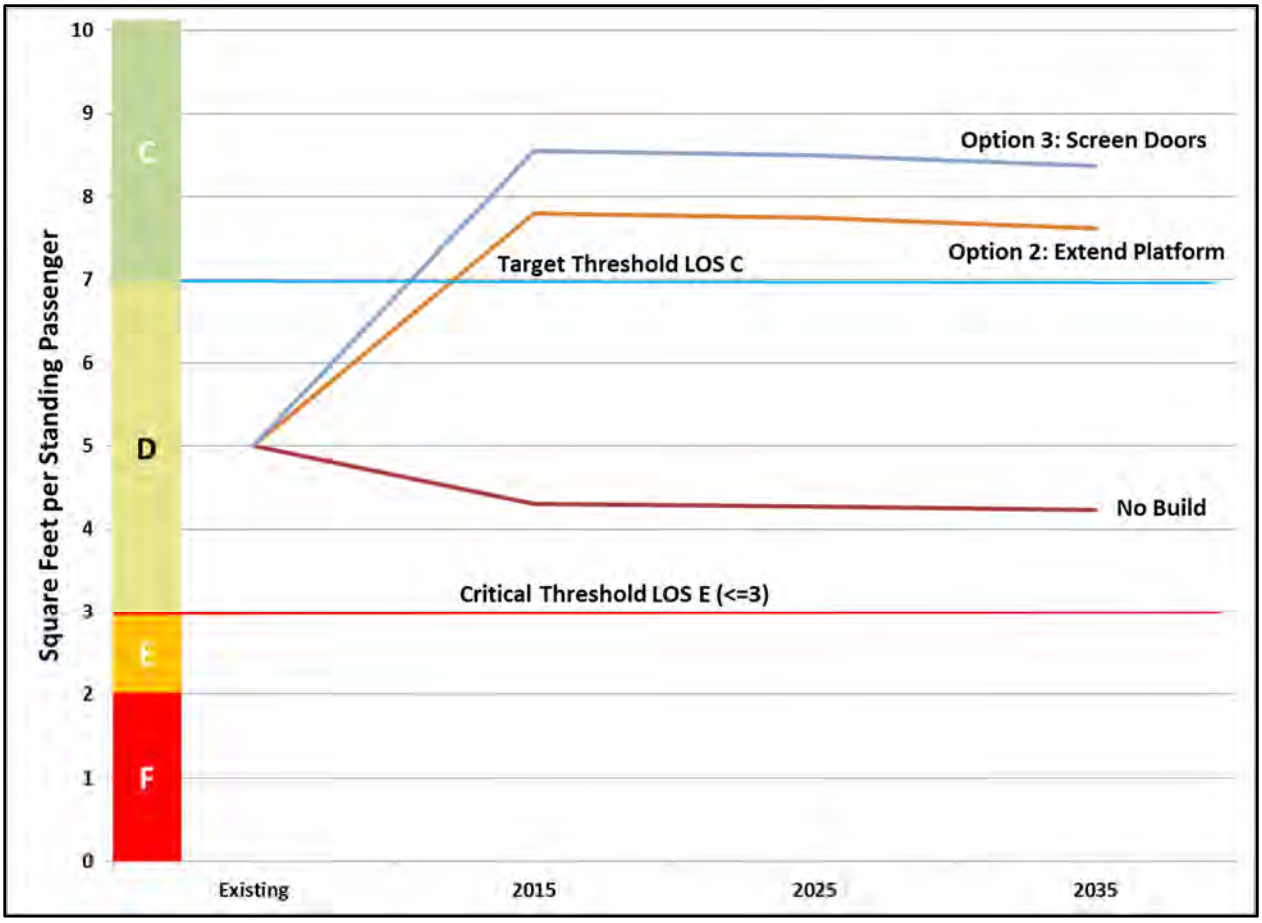


Figure 15: Central West End MetroLink Platform Level of Service

Capital and Operating Costs

The capital costs to construct Option 2 and Option 3 are summarized in **Table 15**. Cost ranges are provided for both options due to uncertainty regarding the ultimate designs and configurations. The range for Option 2 primarily depends on the extent of track modifications needed and the level of impact upon the Scott Ave Building service area. The range for Option 3 depends on the type of screen doors installed and whether full height doors or partial height doors are chosen.

Table 15: Capital Cost of CWE Options

Alternative 4	Capital Cost
Option 2: Lengthen Platform	$1.5 - $3.2 Million
Option 3: Platform Screen Gates	$1.5 - $2.5 Million

The platform screen gates would require the platform edges to be reinforced structurally to support the loading of the gates themselves. This work is included in the capital cost estimate in Table 15.

The annual operating costs associated with Option 2 are assumed to be $25,000 annually and include costs for electricity, cleaning, maintenance, etc. These costs are incremental rather than proportional increases (based on platform square footage) in the overall cost of maintaining a station, which totals $200,000 annually. Station security costs, which separately average $100,000 annually, would not increase as a result of extending the platform.

The annual operating costs of Option 3 were researched extensively but found to vary by manufacturer, technology, and location-specific characteristics, such as frequency of use and weather. One operator purported to incur approximately $25,000 in annual costs per station for screen door preventative maintenance and failure abatement activities.

Findings and Conclusion

In concluding the Central Corridor Transit Access Study, the selection of a preferred alternative is determined from the results of a comparative evaluation that references the data and quantitative analyses presented in the preceding sections, coupled with qualitative assessments re-introduced in this section.

Comparative Evaluation

Each alternative is considered in the context of the following two overarching project goals:

- Stimulate regional economic development by expanding high-performance transit service to connect Cortex with major regional destinations
- Alleviate over-crowding at the Central West End MetroLink Station

These goals are established based upon input from stakeholders participating in the Advisory Committee and they reflect stakeholder objectives for transit and its role in shaping the future of the Central Corridor. The comparative evaluation also relies upon the criteria documented in the study's introduction and lead-in to the alternatives to identify ridership, costs, operational impacts, and user experiences. Lastly, several qualitative metrics focusing on broad community and quality of life benefits, such as neighborhood revitalization and access to opportunity (jobs) for low income populations, are comparatively assessed.

The comparative evaluation is summarized in **Table 16**. Note that Alternative 3 is evaluated on the basis of the incremental effect of relocating the Central West End Transit Center to Cortex. While Alternative 3 also includes a new MetroLink Station in Cortex, the ramifications of the station as a standalone project are evaluated as part of Alternative 2 and are not included under Alternative 3.

GOAL 1

In considering the first goal, it is concluded that Alternative 2 – a new MetroLink Station in Cortex – would best stimulate economic development and help facilitate continued growth and development in Cortex. Stakeholders indicate that high-frequency light rail service is

necessary to attract entrepreneurs and innovators accustomed to high-performance transit in other cities.

Table 16: Summary Evaluation of Alternatives

Criteria	Alternative 1 No Build	Alternative 2 Build Cortex Station	Alternative 3 Move Transit Center	Alternative 4 Upgrade CWE Station
Goal 1: Economic Development	**No**	**Yes**	**No**	**No**
Goal 2: CWE Congestion Relief	**No**	**No**	**Yes**	**Yes**
Increased Ridership	No net new	890 net new	No net new	No net new
Transit User Experience	Unchanged	Superior	Marginally enhanced	Enhanced
Transit Operational Impacts	None	Minimal	Yes	Minimal
Multi-Modal Connectivity	Good	Better	Best	Good
Residential TOD Growth Opportunity	No	Yes	No	No
Neighborhood Revitalization	No	Yes	No	No
Traffic/Parking Reduction Improved Air Quality	No	Yes	No	No
Expanded Access to Opportunity	No	Yes	No net change	No
Capital Cost	$0	$9.7 M	$6 M	$1.5 - $3.2 M
Annual Operating Cost	$0	$835,000	$80,000 - $875,000	$25,000 - Unproven

GOAL 2

With regards to the second goal, Alternative 2 would not provide sufficient relief to platform congestion at the Central West End MetroLink Station. It would shift only 300 to 600 daily boardings to the Cortex Station, which would not have a meaningful impact on platform level of service. Therefore, in order to satisfy both overarching goals, a combination of

Alternative 2 and one of Alternative 3 or Alternative 4 would be necessary. Alternative 1 – no build – does not address either goal.

INCREASED RIDERSHIP

Alternative 2 would maximize the number of new transit riders, boosting system ridership by approximately 900 riders per weekday in 2015 and by as many as 2,000 by 2035. Conversely, Alternative 3 would simply relocate existing MetroBus passengers from the existing Central West End Transit Center to a new one located in Cortex. Since most transit center users transfer to another transit service, relocating the transit center is unlikely to incite new riders. Likewise, as an upgrade to an existing station, Alternative 4 is not expected to attract new riders in a meaningful way.

TRANSIT USER EXPERIENCE/TRANSIT OPERATIONAL IMPACTS

Alternative 2 also provides an exceptional transit user experience for riders, while minimizing adverse impacts to the existing system. Existing MetroLink services would incur 1 additional minute of travel time and 20 seconds of dwell time as a result of stopping at the Cortex Station. This extra time would have a nominal effect on existing riders and could be accommodated without adding operators or light rail vehicles and without affecting system safety or timed transfers at key transit nodes.

The transit user experience provided by Alternative 3 would be improved by a new transit center that would presumably provide amenities as well as ambience and functionality superior to the existing center. However, these benefits may be somewhat offset by a longer walk for passengers transferring to MetroLink, which could also include a street crossing depending upon the transit center's ultimate location.

Also location dependent is the additional travel time that MetroBus riders may incur in getting to the new transit center and the extent of the operational impact upon Metro. Up to 10 minutes of roundtrip travel time could be added to select routes and Metro could incur up to $870,000 in additional operating costs on an annual basis. Alternative 3 has the greatest potential to disrupt the existing Metro system.

NON-QUANTIFIABLE BENEFITS

Several non-quantifiable benefits are also considered as follows:

- Multi-modal connectivity is maximized by Alternative 3, which would provide the opportunity to integrate pedestrian, bicycle, BRT,

MetroBus, and MetroLink at a single multi-modal hub in Cortex. Its location at the intersection of the north-south bicycle route along Tower Grove Ave/Boyle Ave, the planned Great Rivers Greenway trail running east-west, and the I-64 BRT corridor on Boyle Ave presents this opportunity. Alternative 2 would connect each of these modes except MetroBus, whereas Alternative 4 would generally not enhance multi-modal connectivity.

- The opportunity for residential TOD and neighborhood revitalization is maximized by the expansion of MetroLink service to Cortex provided by Alternative 2. The relocation of MetroBus service as proposed by Alternative 3 is not likely to encourage TOD, and since the Central West End Station is already in place, upgrading that station in Alternative 4 is also unlikely to spur new development or revitalization.
- As a result of attracting net new transit riders, Alternative 2 would discourage reliance on parking and vehicular transportation within Cortex. This would yield air quality benefits and also help lower development costs by reducing the need for parking and traffic infrastructure. Alternatives 3 and 4 would provide considerably less support for reduced parking and vehicular transportation.
- Lastly, Alternative 2 is the only alternative that provides a meaningful expansion of transit. As such, it is the only alternative that would expand access to opportunity and quality jobs for the adjacent neighborhoods (Forest Park Southeast and Central West End). Alternative 2 would also provide access to new jobs in Cortex for low income populations proximate to the existing MetroLink system.

Conclusion

It is recommended that Alternative 2 – New MetroLink Station in Cortex – be advanced for implementation. Alternative 2 best satisfies the first goal of transit – to stimulate economic development in Cortex. Next steps include the pursuance of environmental clearances and abandonment of freight rail spurs to prepare the site for the station. Then, design and engineering of the station can proceed followed by construction. Assuming the environmental and abandonment processes begin in earnest the second half of 2014, a possible timeline for implementing Alternative 2 is illustrated in **Figure 16**.

Figure 16: Alternative 2 Potential Implementation Timeline

Additional transit enhancements in the form of Alternative 3 or Alternative 4 are needed to address the study's second goal – to alleviate crowding at the Central West End MetroLink Station. It is recommended to defer a decision as to which of these alternatives should be advanced. Further study is needed to carefully consider the merits of each alternative and a final site cannot be identified for Alternative 3 until further notice pending due diligence and future development planning by the property owner.

Strategies for funding the incremental operating costs and capital costs of the recommended alternative (Alternative 2) are presented in **Appendix D**. In summary, the preferred capital financing strategy relies upon a Federal Grant through the TIGER program to provide the majority of the $9.7 Million in capital funding. Local funds provided by Cortex, Great Rivers Greenway, and the City of St. Louis complete the financing package.

To fund the incremental operating costs of Alternative 2, a financing package consisting of farebox and incremental sales tax revenues generated by committed Cortex developments provide $755,000 or 90 percent off the amount needed. The remaining $80,000 would be funded by BJC Healthcare and Washington University through an escrow account funded by a one-time $400,000 deposit. This amount is expected to satisfy operating deficits until such time that farebox and sales tax revenues increase to cover the full operating cost.

APPENDIX

Appendix A: Population and Employment Forecasting Methodology

Data-driven forecasts of population and employment growth in the Study Area were developed by applying a methodology that considered publically-available and proprietary data sources, plans for existing and future development, and historical trends as described herein.

EMPLOYMENT & POPULATION DATA SOURCES

The following employment and population data sources formed the basis of the future population and employment forecasts:

1. **Cortex Master Plan:** The Cortex Master Plan outlines an economic development program, land uses, development square footages, and employment projections for full build-out of the Cortex Chapter 353 Redevelopment District.

2. **Identified Projects:** Identified projects include tangible projects identified by stakeholders and were classified as follows:
    a. ***Committed Projects:*** Committed projects are under construction, have institutional financing in place, or are underway or soon to be underway through the regulatory entitlement process.
    b. ***Defined Future Projects:*** Defined future projects are not committed but are in various stages of planning and are reasonably certain to occur within the next 10 years.

3. **East-West Gateway 2013 Employment Database:** The East-West Council of Governments (EWG) maintains a database of existing employment by U.S. Census Block and comprises the entirety of the Study Area.

4. **U.S. Census data:** 2010 U.S. Census data establishes historic population growth trends.

5. **Bureau of Labor Statistics (BLS) North American Industry Classification System (NAICS) data:** BLS data establishes historic employment trends by industry classification.

ASSUMPTIONS

The following assumptions form the basis of the forecasting methodology:

1. **Square feet per employee**: In the absence of site-specific data, employment density was estimated using the following density ratios, which are consistent with regional benchmarks:
    a. **Wet lab research jobs:** 625 square feet per employee
    Wet labs are assumed for all research-type developments unless otherwise noted.
    b. **Dry lab research jobs:** 300 square feet per employee
    Dry labs are assumed for the following developments:
        i. Cofactors Genomics
        ii. Crescent
        iii. Clean Cities
    c. **Office/professional jobs:** 160 square feet per employee
2. **Employment sector classification and definitions:** Employees are classified according to the following four (4) sector classifications:
    a. **Research:** Incorporate lab-based biological, biomedical, life sciences, and other technology research jobs.
    b. **Office/Professional:** Encompass a variety of support, administrative, and professional service roles.
    c. **Retail:** Include all non-professional service jobs, such as retail sales and dining.
    d. **Other:** Consist of all other employment categories, namely non-research medical jobs and light industrial jobs.
3. **Employment sector distribution – new employees:** Unless specified, new employees are allocated to sectors based on percentages extrapolated from actual employment totals for the committed and defined future projects, as follows:
    a. **Research:** 15 percent
    b. **Office/Professional:** 50 percent
    c. **Retail:** 10 percent
    d. **Other:** 25 percent
4. **Employment sector distribution – BJC/Washington University Medical Center (WUMC) employees:** Unless otherwise specified,

these employees are allocated to sectors based on the following percentages.

a. **Research:** 25 percent
b. **Other (Medical):** 75 percent

5. **BJC/WUMC growth rate:** Data provided by BJC reveals a 1 percent annual growth rate. This rate was applied inclusive of all committed and identified projects, backfill, relocation, and other adjustments.

6. **Backfill of relocated employees:** A portion of the Study Area's employment growth includes existing jobs relocating from the BJC/WUMC Main Campus to developments such as BJC at the Commons and @4240. The vacated space will be backfilled with new medical and research-oriented positions. For select projects, the number of backfilled employees is known. In all other cases, backfill employees are assumed at 50% of the relocated employees. This recognizes the general trend to relocate administrative employees to accommodate medical-oriented functions, which support lower employee densities.

7. **Population per housing unit:** Unless specified, population per housing unit is 1.25 persons per unit in accordance with Census data.

8. **Residential vacancy rate:** A residential vacancy rate of 14.5 percent is applied to all residential projects in accordance with Census data.

9. **Study area average population growth rate:** A population growth rate of 0.30 percent annually is applied to the Study Area.

10. **Future Planning Horizons:** These horizons and their relationships to the Cortex Master Plan relative to employment growth are as follows:
    a. **Opening Year (2015):** Represents potential opening year of the transit alternatives and includes only committed projects assumed to occur by 2015 or shortly thereafter. This scenario accounts for 20 percent of the Cortex Master Plan full build-out.
    b. **Year 10 (2025):** Represents growth beyond 2015 until 2025 and includes Defined Future projects plus general growth (unspecified projects) that in total comprise 45 percent of the Cortex Master Plan full build-out.

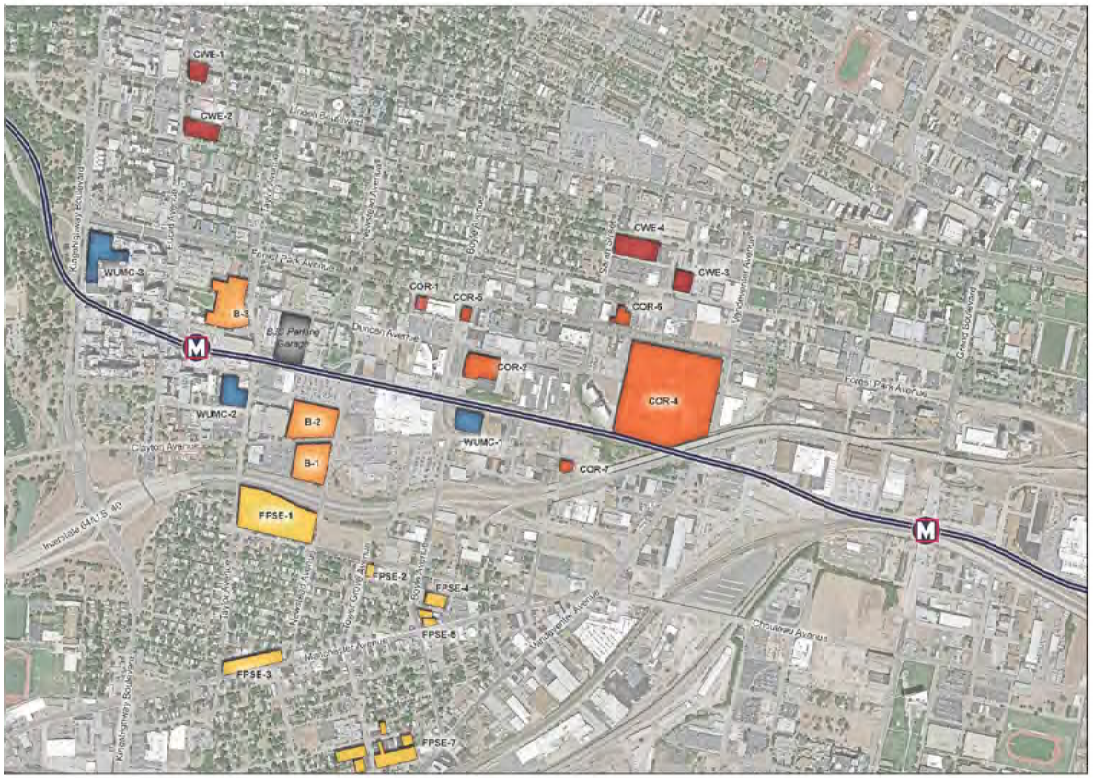
c. **Year 20 (2035):** Represents growth beyond 2025 until 2035 and includes the remaining Cortex Master Plan growth (after subtracting Opening Year and Year 10), which comprises 35 percent of the total Cortex Master Plan full build-out.

DETERMINING NET NEW EMPLOYMENT GROWTH

The Study Area currently contains nearly 26,000 jobs, with the vast majority located on the campus of BJC/WUMC Center. Approximately 3,700 jobs are located in Cortex and include a mixture of life sciences and research, office and professional, and light manufacturing positions. As the area redevelopments, light industrial jobs will be displaced to accommodate new research, office, and retail jobs.

In addition to the displaced jobs, employees from the BJC/WUMC Main Campus will be relocated to Cortex. Despite being new to Cortex, these positions will not constitute "new" jobs because they currently exist. However, the vacated spaces on the BJC/WUMC Main Campus will be renovated to support expanded medical and research functions. The backfill of those spaces will accommodate new jobs that do not exist today and represent net new employment growth.

The EWG employment database catalogs employees by Census Block and enables a project-by-project accounting of displaced jobs, relocated jobs, and new jobs.



2015 Developments

Projected Increases in Population, Employment & Visitors

Cortex Development

COR-1	Cortex 1	Research:	40,000 s.f.
		Employment:	64
COR-2	@4240	Research:	183,000 s.f.
		Employment:	550
COR-4	Project Sprint	Retail:	407,000 s.f.
		Employment:	400 (150 daily)
COR-5	Tech Shop	Research:	N/A
		Employment:	25
			1,200 Members
COR-6	Center for Emerging Technology	Research:	N/A
		Employment:	200
COR-7	Cofactor Genomics	Research:	10,000 s.f.
		Employment:	15

WUMC Development

WUMC-1	Administrative Office Building	Office:	220,000 s.f.
		Employment:	1,000
WUMC-2	WUSM Research Center	Research:	138,000 s.f.
		Employment:	220
WUMC-3	WUMC Campus Renewal, P1	Medical:	N/A
		Employment:	606
		Visitors:	450

Private Development

B-1	Shriner's Hospital	Medical:	85,000 s.f.
		Employment:	80
		Visitors:	128
B-2	Food & Drug Administration	Research:	70,000 s.f.
		Employment:	110
B-3	St. Louis College of Pharmacy	Institutional:	N/A
		Employment:	300 Students
			50 Staff
		Population:	50

Forest Park Southeast Development

FPSE-1	Aventura at Forest Park, P1	Residential:	150 units
		Population:	192
FPSE-2	Aventura Townhouses	Residential:	6 units
		Population:	10
FPSE-3	Urban Chestnut	Brewery/Retail:	75,000 s.f.
		Employment:	50 (19 daily)
FPSE-4	UIC/CDO Homes	Residential:	6
		Population:	13
FPSE-5	Ready Room	Venue/Retail:	6,000 s.f.
		Seats:	750
		Visitors:	320 Visitors
		Employment:	30 (11 daily)
FPSE-7	RHCDA Homes	Residential:	40 units
		Population:	86

Central West End Development

CWE-1	Dpus	Retail:	11,000 s.f.
		Employment:	20 (8 daily)
		Residential:	177 units
		Population:	175
CWE-2	CityWalk (Whole Foods)	Retail:	30,000 s.f.
		Employment:	50 (19 daily)
		Residential:	176 units
		Population:	235
CWE-3	Laclede Lofts	Residential:	21 (1-bed)
			25 (2-bed)
			4 (3-bed)
		Population:	86
CWE-4	West Pine Bottling Plant	Residential:	300 units
		Population:	385

Figure A1: Opening Year (2015) Developments

2025 Developments

Projected Increases in Population, Employment & Visitors

Cortex Development

COR-3: Cortex Mixed-Use	Retail:	12,000 s.f.
	Employment:	**20 (8 daily)**
	Residential:	225 units
	Population:	**291**
COR-8: Crescent	Research:	70,000 s.f.
	Employment:	**200**
COR-9: Clean Cities	Mixed-Use:	400,000 s.f.
	Employment:	**1,050**
COR-10:Custom Steel	Mixed-Use:	400,000 s.f.
	Employment:	**1,500**

WUMC Development

WUMC-4: Sarah Office Building	Office:	200,000 s.f.
	Employment:	**1,000**
WUMC-5: Clayton Avenue Building	Mixed-Use:	240,000 s.f.
	Employment:	**700**

Other Development

A-1: Pace Midtown Station	Retail:	170,000 s.f.
	Employment:	**200 (75 daily)**

Forest Park Southeast Development

FPSE-1: Aventura at Forest Park, P2	Residential:	60 units
	Population:	**77**
FPSE-6: Commerce Bank	Retail:	40,000 s.f.
	Employment:	**40 (15 daily)**
	Residential:	100 units
	Population:	**150**

Central West End Development

CWE-5: Sansone Student Housing	Residential:	9 (1-bed)
		25 (2-bed)
		26 (3-bed)
		115 (4-bed)
	Pop:	**510**

Figure A2: 2025 Developments

EMPLOYMENT PROJECTIONS

Due to future uncertainties, two employment growth scenarios were developed for Year 10 and Year 20 (note a single Opening Year scenario was developed):

1. **High Growth Scenario:** The high growth scenario assumes that the Cortex Master Plan will be implemented in its entirety. This scenario is understood to be achievable but aggressive.

2. **Low Growth Scenario:** The low growth scenario assumes that growth beyond the Opening Year committed projects will be implemented at a rate of 50 percent. This scenario is understood to be conservative yet probable.

Opening Year Employment Projections (2015)

The following development projects are included in the 2015 opening year projections. Daily and total employees (if different from daily) are identified for each development:

1.	Cortex 1 (backfill):	64	Daily Employees	
2.	@4240 (formerly Wexford Heritage):	550	Daily Employees	
3.	IKEA:	150	Daily Employees	
4.	Tech Shop:	25	Daily Employees	
5.	Center for Emerging Technology:	200	Daily Employees	
6.	Cofactors Genomics:	15	Daily Employees	
7.	BJC Administrative Office Building:	1,000	Daily Employees	
8.	WUSM Research Center:	220	Daily Employees	
9.	WUMC Campus Renewal, Phase 1:	606	Daily Employees	
10.	Shriner's Hospital:	80	Daily Employees	
11.	Food & Drug Administration:	110	Daily Employees	
12.	St. Louis College of Pharmacy:	30	Daily Employees	
13.	Urban Chestnut:	19	Daily Employees	(50 Total)
14.	Ready Room:	11	Daily Employees	(30 Total)
15.	Opus:	8	Daily Employees	(20 Total)
16.	CityWalk:	19	Daily Employees	(50 Total)

Opening year projections are classified by employment sector on a project-by-project basis in accordance with stakeholder input as follows:

1.	Research jobs (2015):	781	Daily Employees
2.	Office/Professional jobs (2015):	1,256	Daily Employees
3.	Retail jobs (2015):	192	Daily Employees

4.	Other jobs (2015):	888	Daily Employees
	GROSS TOTAL:	**3,117**	**Daily Employees**

A total of 675 jobs will be relocated from the BJC/WUMC Main Campus to Cortex and 350 jobs will be backfilled based on information provided by BJC and Washington University. This results in a net increase of 350 jobs, which as backfill are classified as 25 percent research and 75 percent other (medical). Furthermore, 482 existing jobs classified as "other" will be displaced due to redevelopment of existing sites. Accounting for these adjustments, the net opening year employment projections are as follows:

1.	Research jobs (2015):	700	Daily Employees
2.	Office/Professional jobs (2015):	1,256	Daily Employees
3.	Retail jobs (2015):	192	Daily Employees
4.	Other jobs (2015):	162	Daily Employees
	NET TOTAL:	**2,310**	**Daily Employees**

The net increase represents a total growth rate of 9 percent, or 4.5 percent annually from 2013 to 2015.

10-Year Employment Projections (2025) – High Growth Scenario

A total of 8 development projects are identified for the 10-Year 2025 High Growth Scenario. In addition, unspecified projects contributing 2,388 daily employees are also included, as follows:

1.	Cortex Mixed-Use:	8	Daily Employees	(20 Total)
2.	Crescent:	200	Daily Employees	
3.	Clean Cities:	1,050	Daily Employees	
4.	Custom Steel:	1,500	Daily Employees	
5.	BJC Sarah Office Building:	1,000	Daily Employees	
6.	WUMC Clayton Ave Building:	700	Daily Employees	
7.	Midtown Station:	75	Daily Employees	(200 Total)
8.	Commerce Bank Site:	15	Daily Employees	(40 Total)
	Unspecified Projects:	*2,388*	*Daily Employees*	

The 10-year gross employment projections are further classified by employment sector as follows:

1.	Research jobs (2015):	1,108	Daily Employees
2.	Office/Professional jobs (2015):	5,152	Daily Employees
3.	Retail jobs (2015):	403	Daily Employees

4.	Other jobs (2015):	938	Daily Employees
	GROSS TOTAL:	**6,937**	**Daily Employees**

A total of 1,710 jobs are expected to be relocated from the BJC/WUMC Main Campus to Cortex and 575 jobs will be backfilled. This results in a net increase of 575 jobs, which as backfill are classified as 25 percent research and 75 percent other (medical). Furthermore, 48 existing jobs classified as "other" will be displaced due to redevelopment of existing sites. Accounting for these adjustments, the net employment projections are as follows:

1.	Research jobs (2025):	824	Daily Employees
2.	Office/Professional jobs (2025):	5,152	Daily Employees
3.	Retail jobs (2025):	403	Daily Employees
4.	Other jobs (2025):	39	Daily Employees
	NET TOTAL:	**6,419**	**Daily Employees**

The net increase represents a total growth rate of 23 percent, or 2.3 percent annually from 2015 to 2025.

10-Year Employment Projections (2025) – Low Growth Scenario

The low growth scenario assumes a 50 percent implementation rate of the high growth scenario. The net employment growth is as follows:

1.	Research jobs (2025):	412	Daily Employees
2.	Office/Professional jobs (2025):	2,576	Daily Employees
3.	Retail jobs (2025):	202	Daily Employees
4.	Other jobs (2025):	(5)	Daily Employees
	NET TOTAL:	**3,186**	**Daily Employees**

The net increase represents a total growth rate of 11 percent, or 1 percent annually from 2015 to 2025.

20-Year Employment Projections (2035) – High Growth Scenario

Beyond the 10-year planning horizon, no specific development projects have been identified. The Cortex Master Plan outlines 12,645 gross total jobs to be created by 2035. Subtracting the Opening Year and 10-year jobs results in 4,613 gross employees added between 2025 and 2035 classified by sector as follows:

1.	Research jobs (2035):	637	Daily Employees
2.	Office/Professional jobs (2035):	2,124	Daily Employees

3.	Retail jobs (2035):	425	Daily Employees
4.	Other jobs (2035):	1,062	Daily Employees
	GROSS TOTAL:	**4,248**	**Daily Employees**

A total of 1,707 jobs are expected to be relocated from the BJC/WUMC Main Campus to Cortex and 837 jobs will be backfilled. This results in a net increase of 837 jobs, which as backfill are classified as 25 percent research and 75 percent other (medical). Furthermore, 242 existing jobs classified as "other" will be displaced due to redevelopment of existing sites. Accounting for these adjustments, the net employment projections are as follows:

1.	Research jobs (2035):	420	Daily Employees
2.	Office/Professional jobs (2035):	2,124	Daily Employees
3.	Retail jobs (2035):	425	Daily Employees
4.	Other jobs (2035):	168	Daily Employees
	NET TOTAL:	**3,136**	**Daily Employees**

The net increase represents a total growth rate of 9 percent, or 1 percent annually from 2025 to 2035.

20-Year Employment Projections (2035) – Low Growth Scenario

The low growth scenario assumes a 50 percent implementation rate of the high growth scenario. The net employment growth is as follows:

1.	Research jobs (2035):	**210**	**Daily Employees**
2.	Office/Professional jobs (2035):	**736**	**Daily Employees**
3.	Retail jobs (2035):	**212**	**Daily Employees**
4.	Other jobs (2035):	**289**	**Daily Employees**
	NET TOTAL:	**1,447**	**Daily Employees**

The net increase represents a total growth rate of 4.5 percent, or 0.5 percent annually from 2025 to 2035.

POPULATION PROJECTIONS

The Study Area comprises two residential neighborhoods: the Central West End neighborhood (north of I-64) and the Forest Park Southeast neighborhood (south of I-64). These neighborhoods each possess distinctive urban fabrics, amenities, and housing stock. As with employment, population growth projections were developed for Opening Year (2015), 10-Year (2025), and 20-Year (2035) horizons.

Neighborhood Population Trends – 2000 through 2010

The Central West End neighborhood was home to 14,471 residents in 2010, which represented growth of 327 residents since 2000, or 2.3 percent (0.2 percent annually). By contrast, the Forest Park Southeast neighborhood was home to 2,918 people in 2010, which represented a loss of 786 residents, or -21 percent (-2 percent annually).

To normalize these disparate growth rates, trends were examined within an area defined from Kingshighway to Grand Blvd and Lindell Blvd south to Folsom Ave. This boundary is approximately coterminous with the City of St. Louis 17th Ward and encompasses the Study Area. Within this "focus" area, population totals were as follows:

- Population (2000): **12,771 residents**
- Population (2010): **12,060 residents**

The nominal decrease in population from 2000 to 2010 amounts to a loss of 5.5 percent, or 0.5 percent annually. During the same period, the number of housing units increased:

- Number of Total Housing Units (2000): **7,491 units**
- Number of Total Housing Units (2010): **8,069 units**

This represents a total increase in housing units of nearly 8 percent, or 0.8 percent annually. Likewise, the number of vacant housing units and the vacancy rate both increased:

- Number of Vacant Housing Units (2000): **1,266 units**
- Number of Vacant Housing Units (2010): **1,429 units**

- Vacancy Rate (2000): **16.9 percent**
- Vacancy Rate (2010): **17.7 percent**

Population decrease and increased vacancy rates, coupled with an increase in housing units results in decreasing household size (number of residents per unit):

- Household Size (2000): **2.06 residents/unit**
- Household Size (2010): **1.81 residents/unit**

These trends are indicative of population de-densification in the focus area manifested as follows:

1. Overall household sizes are decreasing, which is consistent with City-wide, regional, and national trends;
2. Redevelopment of historic housing stock often involves consolidating smaller units into larger units (e.g. converting a 4-family flat into a 2-family attached townhome); and
3. Development and occupancy of new housing units is offset by continued vacancy of existing housing units, many of which are sub-standard and functionally obsolete.

Census data is not available to consider more recent population trends between 2010 and 2013. However, building permits, demolition permits, and other data on file with the City of St. Louis suggests that the pattern of de-densification has largely persisted since 2010. That said, the general character and strength of the area is improving with new residential developments and public infrastructure investments.

Assumed Population Growth Rate

Despite the historic population trends, the focus area is enjoying renewed interest in residential development bolstered by an improving economy. Based on feedback from this study's Technical Committee, it is assumed that continuing development activities will attract new residents at levels that exceed ongoing population losses due to de-densification. In other words, a net increase in population is assumed.

The net increase in population represents the combination of gross population increases due to development and de-densification population losses. The growth resulting from Opening Year (2015) and 10-Year residential development projects served as a benchmark for future gross population increases. These projects will add 2,260 gross new residents by 2025, representing an overall population increase of almost 19 percent or 1.5 percent annually.

There was debate as to whether that amount of growth is an outlier and not part of a broader trend or whether it can continue and effectively be duplicated from 2025 to 2035. High and Low Growth scenarios were established for Year 20 to reflect these different outcomes.

The High Growth scenario assumes that the growth occurring from 2015 to 2025 due to Opening Year and 10-Year residential developments will continue beyond 2025 at a commensurate rate. The resulting population

increase when averaged over the full planning horizon produces the following gross population rate:

- High Growth Gross Population Rate: **1.2 percent annually**

The Low Growth scenario assumes the Opening Year and 10-Year residential developments represent the 20-year market capacity of the Study Area. The population increase distributed over the full planning horizon results in a gross average rate (0.82 percent annually) nearly identical to the increase in residential units from 2000 to 2010 (0.77 percent annually):

- Low Growth Gross Population Rate: **0.8 percent annually**

In either event, population de-densification is assumed to continue at a rate consistent with past trends (-0.5 percent annually). Decreasing household sizes, persistent vacancy rates, and consolidation of residential units will offset gross population increases, resulting in the following net population rates:

- High Growth Net Population Rate: **0.7 percent annually**
- Low Growth Net Population Rate: **0.3 percent annually**

Both rates are inclusive of Opening Year and 10-Year developments.

Opening Year Population Projections (2015)

The following development projects are included in the 2015 Opening Year projections:

1.	St. Louis College of Pharmacy	50	Residents	
2.	Aventura at Forest Park (Phase 1):	192	Residents	(150 Total Units)
3.	Aventura Townhomes:	10	Residents	(6 Total Units)
4.	UIC/CDO Homes:	13	Residents	(6 Total Units)
5.	RHCDA Homes:	86	Residents	(40 Total Units)
6.	Opus:	175	Residents	(177 Total Units)
7.	CityWalk:	235	Residents	(176 Total Units)
8.	Laclede Lofts:	86	Residents	(50 Total Units)
9.	West Pine Bottling Plant:	385	Residents	(300 Total Units)
10.	*De-Densification Loss:*	*(133)*	*Residents*	
	TOTAL:	**1,099**	**Residents**	(905 Total Units)

10-Year Population Projections (2025)

The following development projects are included in the 2025 10-Year

1.	Cortex Mixed-Use:	291	Residents	(225 Total Units)
2.	Aventura at Forest Park (Phase 2):	77	Residents	(60 Total Units)
3.	Commerce Bank:	150	Residents	(100 Total Units)
4.	Sansone Student Housing:	510	Residents	(175 Total Units)
5.	*De-Densification Loss:*	*(665)*	*Residents*	
	TOTAL:	**362**	**Residents**	(560 Total Units)

20-Year Population Projections (2035) – High Growth Scenario

As previously noted, the High Growth Scenario assumes residential development continues beyond the projects identified for Opening Year and 2025. Accounting for continued de-densification, the net population increase between 2025 and 2035 amounts to 406 new residents.

20-Year Population Projections (2035) – Low Growth Scenario

As previously noted, the Low Growth Scenario assumes no additional residential development beyond the identified projects. Therefore, this scenario only includes continued residential de-densification, resulting in 665 fewer residents by 2035. This reflects a negative growth rate of 0.5 percent annually from 2025 to 2035.

EMPLOYMENT AND POPULATION PROJECTION SUMMARY

The preceding employment projections are summarized in Table X. In total, nearly 12,000 net new jobs are projected to be added by 2035 in the High Growth Scenario and nearly 7,000 net new jobs would be added by 2035 based on the Low Growth Scenario.

Table A1: Employment Projection Summary

Employment Category	High Growth Scenario			Low Growth Scenario		
	2015	2025	2035	2015	2025	2035
New - Research	781	1,108	637	781	554	319
New - Office	1,256	5,152	2,124	1,256	2,576	1,062
New - Retail	192	403	425	192	202	212
New - Other	888	938	1,062	888	469	531
WUMC Relocate	(325)	(1,135)	(869)	(325)	(568)	(435)
Displaced Existing	(482)	(48)	(242)	(482)	(48)	(242)
Net New Jobs	**2,310**	**6,418**	**3,137**	**2,310**	**3,185**	**1,447**

More detailed tabulations of the employment and population projections are provided in **Table A3** for Low Growth and **Table A4** for High Growth.

Figure A3: High Growth Employment and Population Projections Summary

Horizon	Project	Employment Sector: Research	Office/ Professional	Retail	Other	Visitors	Population
Opening Year	Cortex 1	51	13				
	"at"4240	150	175		225		
	Cortex Sprint			150			
	Techshop				25		
	CET/CIC	50	30		120		
	Cofactor Genomics				15		
	BJC AOB		1000				
	WUMC Research	220					
	WUMC Campus Renewal, P1	212			394	450	
	Shriner's Hospital		16		64	128	
	Food & Drug Administration	88	22				
	St. Louis College of Pharmacy	10			30	300	50
	Aventura at Forest Park, P1						192
	Aventura Townhouses						10
	Urban Chestnut			4	15		
	UIC/CDO Homes						13
	Ready Room			11		320	
	RHCDA Homes						86
	Opus			8			175
	CityWalk (Whole Foods)			19			235
	Laclede Lofts						86
	West Pine Bottling Plan						385
	Opening Year Sub-Totals:	**781**	**1256**	**192**	**888**	**1198**	**1232**
	Less Employees Relocated from WUMC:	*81*			*244*		
	Less Existing Employees Displaced:				*482*		
	Less Population De-Densification						*133*
	Opening Year Net Totals:	**700**	**1256**	**192**	**162**	**1198**	**1099**
10 Year	Crescent	50	100		50		
	Clean Cities	225	700		125		
	Custom Steel	375	1125				
	Cortex Mixed Use			8			291
	BJC Sarah Office Building		1000				
	BJC Clayton Avenue Building		700				
	Pace Midtown Station			75			
	Aventura at Forest Park, P2						77
	Commerce Bank			15			150
	Sansone Student Housing						510
	BJC/WUMC Growth	100	332	66	166		
	Unallocated Projects	*358*	*1194*	*239*	*597*		
	Year 10 Sub-Totals:	**1108**	**5152**	**403**	**938**	**0**	**1028**
	Less Employees Relocated from WUMC:	*284*			*851*		
	Less Existing Employees Displaced:				*48*		
	Less Population De-Densification						*665*
	Year 10 Net:	**824**	**5152**	**403**	**39**	**0**	**362**
20 Year	Full Build-Out	537	1792	358	896		
	Residential Population Growth						406
	BJC/WUMC Growth	100	332	66	166		
	Year 20 Sub-Totals:	**637**	**2124**	**425**	**1062**	**0**	**406**
	Less Employees Relocated from WUMC:	*217*			*652*		
	Less Existing Employees Displaced:				*242*		
	Less Population De-Densification						*0*
	Year 20 Net:	**420**	**2124**	**425**	**168**	**0**	**406**
	TOTALS BY SECTOR:	**1944**	**8532**	**1020**	**369**	**1198**	**1866**

Figure A4: Low Growth Employment and Population Projections Summary

Horizon	Project	Employment Sector: Research	Office/ Professional	Retail	Other	Visitors	Population
Opening Year	Cortex 1	51	13				
	"at"4240	150	175		225		
	Cortex Sprint			150			
	Techshop				25		
	CET/CIC	50	30		120		
	Cofactor Genomics				15		
	BJC AOB		1000				
	WUMC Research	220					
	WUMC Campus Renewal, P1	212			394	450	
	Shriner's Hospital		16		64	128	
	Food & Drug Administration	88	22				
	St. Louis College of Pharmacy	10			30	300	50
	Aventura at Forest Park, P1						192
	Aventura Townhouses						10
	Urban Chestnut			4	15		
	UIC/CDO Homes						13
	Ready Room			11		320	
	RHCDA Homes						86
	Opus			8			175
	CityWalk (Whole Foods)			19			235
	Laclede Lofts						86
	West Pine Bottling Plan						385
	Opening Year Sub-Totals:	**781**	**1256**	**192**	**888**	**1198**	**1232**
	Less Employees Relocated from WUMC:	*81*	*244*				
	Less Existing Employees Displaced:				*482*		
	Less Population De-Densification						*133*
	Opening Year Net Totals:	**700**	**1012**	**192**	**406**	**1198**	**1099**
10 Year	Crescent	25	50		25		
	Clean Cities	113	350		63		
	Custom Steel	188	563				
	Cortex Mixed Use			4			291
	BJC Sarah Office Building		500				
	BJC Clayton Avenue Building		350				
	Pace Midtown Station			38			
	Aventura at Forest Park, P2						77
	Commerce Bank			8			150
	Sansone Student Housing						510
	BJC/WUMC Growth	50	166	34	83		
	Unallocated Projects	*179*	*597*	*119*	*299*		
	Year 10 Sub-Totals:	**554**	**2576**	**202**	**469**	**0**	**1028**
	Less Employees Relocated from WUMC:	*142*			*426*		
	Less Existing Employees Displaced:				*48*		
	Less Population De-Densification						*665*
	Year 10 Net:	**412**	**2576**	**202**	**(5)**	**0**	**362**
20 Year	Full Build-Out	269	896	179	448		
	BJC/WUMC Growth	50	166	33	83		
	Year 20 Sub-Totals:	**319**	**1062**	**212**	**531**	**0**	**0**
	Less Employees Relocated from WUMC:	*109*	*326*				
	Less Existing Employees Displaced:				*242*		
	Less Population De-Densification						*665*
	Year 20 Net:	**210**	**736**	**212**	**289**	**0**	**-665**
	TOTALS BY SECTOR:	**1322**	**4323**	**607**	**690**	**1198**	**795**

COMPARISONS WITH REGIONAL EMPLOYMENT PATTERNS

To assess the veracity of the employment projections, existing employment totals and historic trends were researched for comparison. Data for the following employment sectors were deemed most relevant to the Study Area employment:

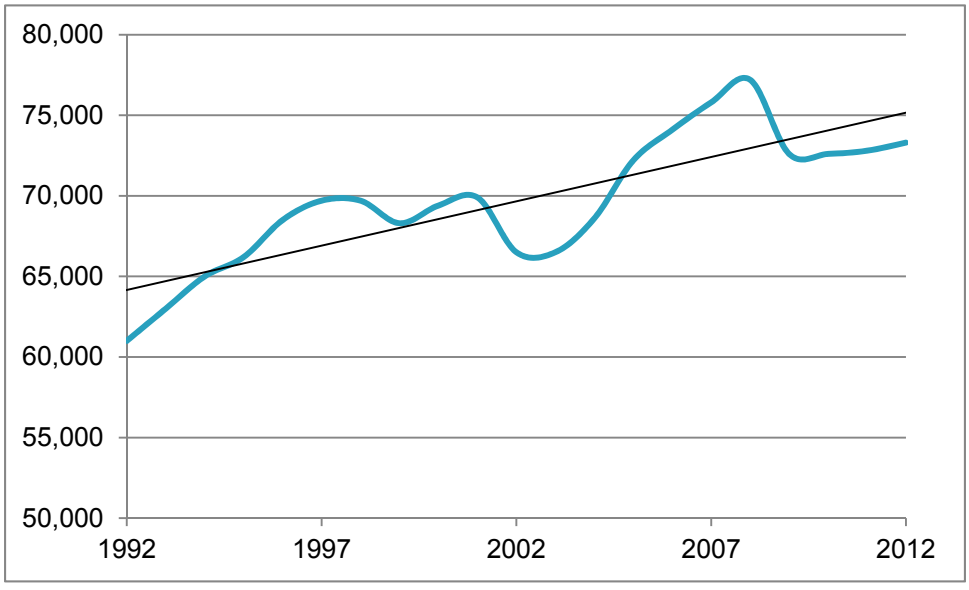
- Professional and technical services (NAICS 54)
- Scientific research and development services (NAICS 5417)

Comparisons emphasized the magnitude of the projected employment increases relative to the existing employment basis for the St. Louis Metropolitan Statistical Area (MSA). The projected annual rates of increase were also compared to historic trends.

Professional and Technical Services (NAICS 54)

This sector had about 73,000 employees in the St. Louis MSA in 2012. Historic trends beginning in 1992 have demonstrated a mostly consistent rate of increase that averaged 1 percent annually over the previous 10-year period as illustrated in **Figure A5** below.

Figure A5: Historic Employment: Professional and Technical Services



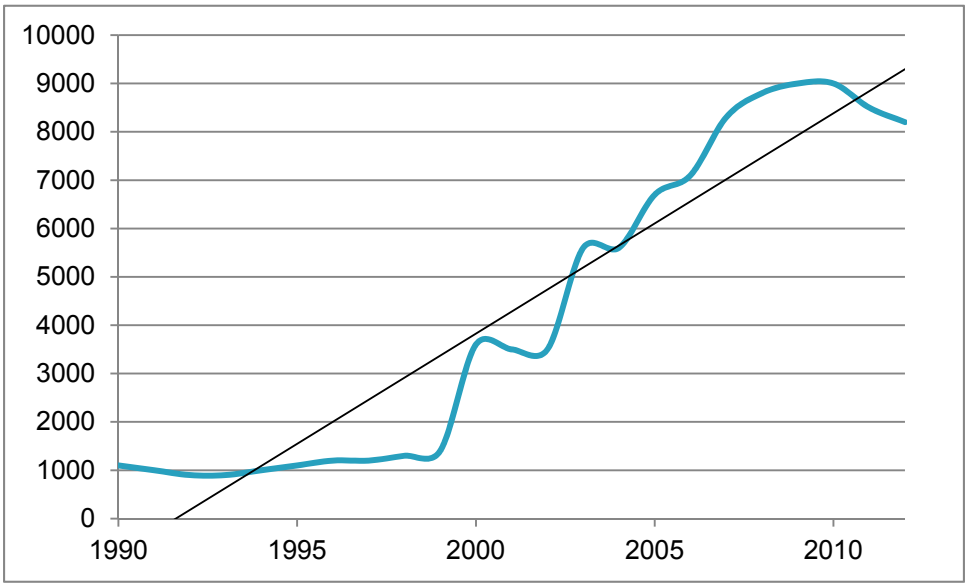
This sector was determined to be most analogous to the office/professional category for the projected employment growth. In total, a net increase of 8,532 jobs is projected for this sector by 2035

assuming the High Growth Scenario. That represents a modest 11.5 percent increase above the 2012 total, which amounts to less than a 0.5 percent increase annually. Under the Low Growth Scenario, the resulting increases would be reduced in half.

Scientific Research and Development Services (NAICS 5417)

This sector had about 8,200 employees in the St. Louis MSA in 2012. Historic trends beginning in 1990 have demonstrated a rapid rate of increase that averaged 9 percent annually over the previous 10-year period as illustrated in **Figure A6** below.

Figure A6: Historic Employment: Scientific Research and Development Services



This sector was determined to be most analogous to the research category for the projected employment growth. In total, a net increase of 1,944 jobs is projected for that sector by 2035 assuming the High Growth Scenario. This represents a 24 percent increase above the 2012 total and amounts to a 1 percent increase annually. Considering this sector has grown regionally at a rate of 9 percent annually, a 1 percent rate of increase would be achievable for the Study Area. Under the Low Growth Scenario, the resulting increases would be reduced by about one third.

Appendix B: Transit Ridership Forecasting Methodology

One of this study's primary objectives is to develop transit ridership forecasts for the alternatives under consideration. The regional travel demand model, maintained by the East-West Gateway Council of Governments (EWG), is the primary tool used to support the forecasting process. The application of the model and the model enhancements and refinements implemented as part of this study are summarized in this section.

This modeling effort started with the version of the regional travel demand model applied on the Rapid Transit Connector Study. That model showed an improved ability to reproduce existing transit boardings systemwide as compared to versions used previously and a recent EWG version. However, since this study is an evaluation of alternatives in the Central Corridor, additional model enhancements were necessary to improve the model's representation of localized conditions.

Specifically, the model improvements implemented as part of the 2012 Cortex TOD Study were imported to capitalize on that previous work. Additional updates addressed MetroBus and underlying issues contributing to the under-prediction of transit boardings at the Central West End Station.

CALIBRATION TARGETS

As an initial step in improving the model, targets for key model statistics such as transit boardings and transfer rates were established. While the model's demographic data reflects 2010, model adjustments were made relative to the most recent transit data available (Metro Fiscal Year 2013) in lieu of prior years, which were affected by service reductions and restorations, fare changes, and reconstruction of the Grand Station.

MetroLink Ridership Target

The MetroLink ridership target reflects ridership populations included in the regional model. The following observed ridership components were excluded from the target to facilitate an equitable comparison with model output:

- Visitors from outside the region (except airport arrivals/departures)
- Special events spectators (primarily evening and weekend riders)

Additionally, un-modeled behavioral circumstances also affect observed boardings. For example, a misdirection rider that boards twice is reflected in the observed data but not in the model. Similarly, a passenger that boards a Blue Line train and transfers later to the Red Line later instead of waiting longer for a Red Line train at their origin counts as two boardings in the observed data but is modeled as a single boarding.

Collectively, the excluded populations and aforementioned behavioral circumstances comprise an estimated 2,500 riders per weekday when averaged throughout the year based on transit survey data from 2002 and 2008. The MetroLink ridership target was set by reducing observed boardings accordingly.

Bus Ridership Target

It was assumed that bus ridership does not fluctuate meaningfully with special events and is relatively unaffected by the un-modeled populations. Therefore, the bus ridership target equals the observed boardings as shown in **Table B1**.

Table B1: Observed Transit Boardings vs. Model Ridership Targets

Mode	Observed Boardings	Model Ridership Target
MetroLink	53,119 (FY13 weekday avg.)	50,500
MetroBus	93,160 (FY13 weekday avg.)	101,000
MCT Bus	8,339 (FY11 weekday avg.)	

Transfer Targets

Targets for passenger transfers between MetroBus and MetroLink were established from 2002 and 2008 transit surveys depicted in **Table B2**. The 2008 survey is more current, but the 2002 survey is more comprehensive. The targets reflect both surveys with heavier emphasis on the 2008 data.

Table B2: Surveyed and Model Target Transit Transfer Rates

Mode	2002 Transit Survey	2008 Transit Survey	Selected Targets
MetroBus	1.11	1.58	1.45
MetroLink	1.26	1.42	1.32

Transfers are expressed as the average number of transit boardings per person trip from origin to destination. The transfer rates reported for MetroBus include bus to bus transfers only and exclude trips utilizing MetroLink. The transfer rates for MetroLink include transfers between light rail and bus as well as light rail to light rail transfers (i.e., Red Line to Blue Line).

Mode of Access Targets

Lastly, targets for mode of access (walk/bike or drive) to transit were established from the 2002 and 2008 surveys. Both surveys are similar and the corresponding targets for MetroLink and MetroBus are summarized in **Table B3**.

Table B3: Model Mode of Access Targets

Transit Mode	Walk/Bike to Transit	Drive to Transit
MetroLink	43%	57%
MetroBus	89%	11%

MODEL INPUTS

Primary model inputs include transportation networks for each mode and population and employment measures geo-referenced to 2,600 analysis zones. Population and employment determine where people are located and where they want to travel, and the networks provide transportation levels of service attributes that help determine mode and route selection.

As part of this study, model inputs were revised and updated to accurately represent travel demands and transit services in the study area. Updates include employment near the Central West End Station and revisions to outdated MetroBus routes and schedules.

Employment Updates

Both the magnitude and spatial distribution of employees near the Central West End Station were updated. Employment was under-represented in the primary Washington University Medical Center (WUMC) zones and overstated in the campus' eastern parking areas. This allocation likely maximized the accuracy of traffic loadings in the model, but it understates the proximity of employees to transit. Employees were reallocated to zones best representing their actual job location.

Once reallocated spatially, employee totals were then compared to a database of 2013 employment provided by EWG. That database was augmented by employee data provided by institutions within WUMC, including Barnes-Jewish Hospital, Washington University School of Medicine, St. Louis Children's Hospital, and St. Louis College of Pharmacy. The comparison confirmed that employment totals in the model were short of actual employment.

The model's employment input files were updated to reflect an anticipated daily census of employees at WUMC serve as representative markets for potential transit users. The updates are summarized in **Table B4**. Additionally, university enrollment in the model was updated to correct under-reported totals for St. Louis College of Pharmacy and for the Goldfarb School of Nursing. University enrollment updates are depicted in **Table B5**.

Table B4: Updated Model Employment Inputs

Zone #	EWG Model	Employment Database	Adjustments per Institutions	Updated Model
904	822	1,063	-	1,063
898	1,008	973	-	973
1018	1,250	788	-	788
899	1,082	1,191	-	1,191
910	1,263	1,071	-	1,071
963	3,246	12,510	5,850*	5,850
1016	2,667	0	-	0
962	1,012	102	250*	250
959	4,650	4,069	6,582*	6,582
969	1,863	2,022	-	2,022
1031	1,736	639	-	639
1262	206	94	-	94
1153	248	145	-	145
1197	79	56	-	56
1307	142	373	-	373
1298	142	124	-	124

*Estimated daily employment census of WUMC institutions

Table B5: Updated Model University Enrollment Inputs

Institution	EWG Model	Actual	Updated Model
St. Louis College of Pharmacy	950	1,300	1,300
Goldfarb School of Nursing	413	807	807

Bus System Updates

The route alignments and frequencies of several MetroBus routes were corrected for consistency with current schedules. The bus route updates are documented in **Table B6**.

Table B6: Updated Model MetroBus System Inputs

Bus Route	Adjusted Alignment	Adjusted Headway	Original Headway	Updated Headway
#1 – Gold	Yes	Yes	18min (Peak) 18min (Off-Pk)	20min (Peak) 30min (Off-Pk)
#4 – Natural Brg.	Yes	No	-	-
#11 – Chippewa	Yes	No	-	-
#13 – Union	No	Yes	34min (Peak) 34min (Off-Pk)	40min (Peak) 40min (Off-Pk)
#14 – Botanical Garden	No	Yes	34min (Peak) 34min (Off-Pk)	40min (Peak) 40min (Off-Pk)
#18 – Taylor	Yes	Yes	30min (Off-Pk)	40min (Off-Pk)
#30 – Soulard	Yes	No	-	-
#32 – Chouteau	Yes	No	-	-
#41 – Lee	Yes	No	-	-
#42 – Sarah	No	Yes	43min (Peak) 60min (Off-Pk)	40min (Peak) 43min (Off-Pk)
#59 – Dogtown	No	Yes	30min (Off-Pk)	45min (Off-Pk)
#80 – Park/Shaw	Yes	No	-	-
#95 – Kingshwy	No	Yes	22min (Peak)	20min (Peak)
#97 – Delmar	Yes	No	-	-
#57X – Clayton	Yes	No	-	-

RIDERSHIP CALIBRATION

Efforts were undertaken at various scales to enhance the model's ability to reproduce observed transit boardings and to otherwise calibrate the transit model. This process implemented global calibration strategies focusing on targets for systemwide boardings; light rail station-level strategies seeking to induce an accurate combination of bus transfers, walk access, and drive access passengers; and route-level strategies aimed at more accurate bus ridership.

As previously noted, this study elected to apply the model version from the Rapid Transit Connector Study as the starting point. The predicted boardings more closely match the targets as compared to the most recent version obtained from EWG, as illustrated in **Table B7**.

Table B7: Model Predicted Boardings Compared to Targets

Mode	Rapid Transit Connector Study Model	EWG V2.1 Model	Target
Bus Boardings	118,885	138,883	101,000
MetroLink Boardings	53,015	63,424	50,500

System Boardings Calibration

Systemwide model calibration generally involves adjusting the model's mode choice components. Developed from local travel surveys (including the 2002 transit survey), mode choice considers the likelihood of each mode being selected for a particular trip, based on characteristics of the traveler and attributes of available modes (i.e., travel time).

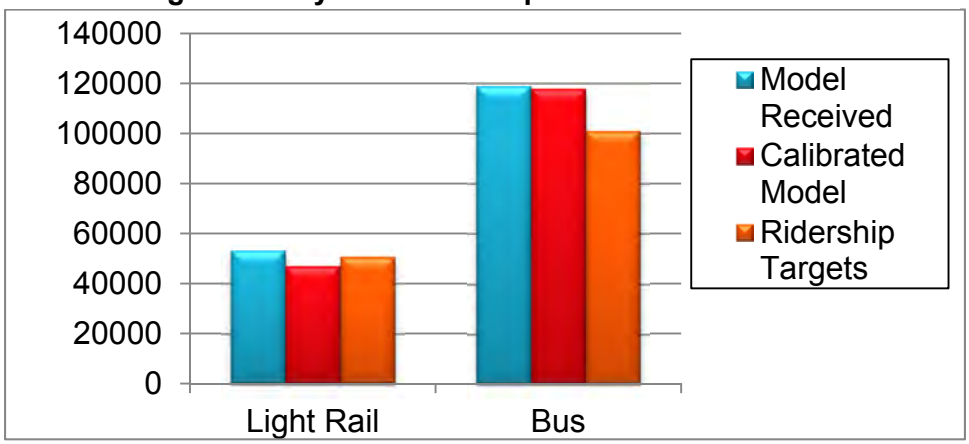
In addition, there are unquantifiable or intangible factors that influence mode choice, which are accounted for with parameter constants. These constants are commonly adjusted during calibration. It was determined in consultation with EWG that there was not sufficient justification for altering the constants. In fact, adjustments could result in increased scrutiny from the Federal Transit Administration.

Therefore, the mode choice parameters as applied in the Rapid Transit Connector Study were retained. That said, maintaining the constants did preclude meaningful reductions in the modeled bus boardings, thereby ensuring a sizable variance between modeled and target bus boardings persists.

Light Rail Station Calibration

Individual MetroLink stations were reviewed and ridership contributions by mode of access – walk, drive, bus transfer – were quantified based on Metro data and each station's functional role in the system. Links established by the model or manually determine the connectivity of each station to adjacent neighborhoods, park-n-ride lots, and bus routes. Impedances on these links signify the quality of connectivity (accounting for factors such as distance, comfort, safety, etc.) and are commonly adjusted during the calibration process.

Figure B1: System Ridership Calibration Results



Walk access links connect stations with neighborhoods and effectively act as "conduits" for passengers walking between stations and their origin or destination. These links are created manually so that obstructions and barriers to pedestrian connectivity can be reflected. However, further adjustments were warranted to better account for highway barriers, absence of pedestrian facilities, etc. For example, the Brentwood Station has nominal pedestrian connectivity to the north of I-64, despite walk access links to those areas. Walk access link adjustments were instituted throughout the MetroLink system as summarized in **Table B8**.

Table B8: Summary of Model Walk Link Impedance Adjustments

Station	Adjustment	Justification
College	Reduced distance to SWIC zone	Overestimated due to centroid position too far east of station
Sunnen	Increased impedance to residential zones to the south and west	Lack of connectivity due to railroad tracks and Deer Creek
Forest Park	Reduced distance to residential zones north of the station	High percentage of transit-dependent residents and Crossroads School
UMSL North & UMSL South	Adjusted walk impedances for the zone that contains the UMSL campus	All boardings from campus were going to UMSL North instead of distributed between the two stations
Big Bend & Skinker	Adjusted walk impedances for the zone that contains the Washington University campus	All boardings from campus were going to Skinker instead of distributed between the two stations
Brentwood	Increased impedance to residential zones to the north and south	I-64 limits access from the north and lack of St connectivity reduces access from the south
Swansea	Increase impedance to residential zones to the west	Station access and no pedestrian facilities on major roads make access from the west extremely limited

Similar to walk access links, bus transfer links connect MetroLink stations and bus routes enabling passengers to transfer between modes. Likewise, link impedances signify the quality of the connectivity and are commonly adjusted as needed to reflect the characteristics of the transfer environment at each station. At select stations, adjustments were made to increase or decrease bus transfers to more closely resemble observed or anticipated transfers.

Park-n-ride lot links connect MetroLink stations with park-n-ride lots on the vehicular network, enabling transit users to drive to stations and then

board MetroLink. Impedances on the lot links quantify the relative attractiveness of the lot's connectivity to the station. For example, the Clayton MetroLink station has a large park-n-ride lot link impedance to reflect the inconvenience of parking in a pay, multi-story garage across the St from the station.

Impedances were adjusted in an effort to generate realistic park-n-ride usage consistent with observed data. Metro provided space occupancies from a 2011 count as well as the total number of spaces at each park-n-ride facility. However, occupancies were based on a single observation and did not reflect daily usage. Therefore, order of magnitude anticipated park-n-ride utilization was targeted for calibration purposes.

STUDY AREA CALIBRATION

Additional model scrutiny was applied within the study area to maximize the model's ability to reproduce observed boardings and yield accurate forecasts. The implications of fare subsidies and parking costs received particular attention.

Select employers in the study area offer reduced fare passes. Barnes-Jewish Hospital and St. Louis Children's Hospital offer employees a $20 subsidy on monthly passes, reducing their cost to $52 per month. Washington University offers free Metro passes to employees and students. The model contains the framework for incorporating free and reduced fare passes and their effects on mode choice. Model updates were applied to better correlate each institution's daily census with the applicable subsidy level.

Parking costs in the model were found to be lower than actual rates. Hourly parking at WUMC was raised to $1 and daily parking to $5 in today's dollars. These costs were then converted to 2002 dollars for consistency with the model. While employee parking in certain remote areas of the campus may be free, costs were applied uniformly to account for the inconvenience of walking or traveling by shuttle from those areas.

Calibration also focused on MetroBus, namely the routes connecting to the Central West End Transit Center. In 2012, Metro surveyed bus riders at that center and identified the number of arrivals per bus route and whether they transferred to another bus or to MetroLink. Surveyed and modeled bus riders de-boarding at the Central West End Transit Center are summarized for comparison in the next section. The vast majority (95%) of passengers transfer to another bus or to MetroLink.

FINAL CALIBRATION RESULTS

Incorporating the preceding model adjustments, observed and modeled MetroLink boardings by station proximate to the study area (Forest Park, Central West End, and Grand) are summarized in **Table B9**. Boardings by station for the system are summarized in **Table B10**.

Table B9: Observed and Modeled MetroLink Boardings by Station

Station	Initial Boardings	Calibrated Boardings	Observed Boardings
Forest Park	2,586	2,040	4,308
Central West End	3,109	4,223	5,695
Grand	2,503	2,139	2,372

Table B10: Observed and Modeled MetroLink Boardings by Station

Station	Observed Boardings	Modeled Boardings
Lambert – Main Terminal	1,489	1,274
Lambert – East Terminal	461	125
North Hanley	3,695	4,255
UMSL North	628	805
UMSL South	748	908
Rock Road	1,720	1,597
Wellston	1,012	1,406
Delmar Loop	2,066	1,814
Forest Park	4,308	2,040
Central West End	5,695	4,223
Grand	2,372	2,139
Union Station	1,892	1,145
Civic Center	3,144	2,490
Stadium	1,430	1,170
8th & Pine	1,784	1,860
Convention Center	1,891	1,710
Arch – Lacledes Landing	970	97
East Riverfront	745	569

5th & Missouri	1,720	1,659
Emerson Park	1,241	1,241
JJK Center	550	401
Washington Park	607	712
Fairview Heights	2,104	2,319
Memorial Hospital	445	382
Swansea	538	499
Belleville	727	854
College	915	742
Shiloh – Scott	816	629
Shrewsbury	2,046	2,315
Sunnen	175	152
Maplewood – Manchester	819	666
Brentwood – I64	999	1,110
Richmond Heights	718	810
Clayton	1,000	1,357
Forsyth	413	363
University City – Big Bend	455	259
Skinker	783	690
Total	**53,121**	**46,771**

As illustrated in **Table B9**, modeled boardings at the Forest Park station are significantly lower than observed. This variance is the result of un-modeled visitor and special events passengers traveling to/from Forest Park combined with observed boardings overstating transfers between the Red and Blue Lines. After discounting for these circumstances, modeled boardings would be closer to targets.

The calibration process facilitated more accurate boardings at the Central West End MetroLink Station. In fact, modeled and observed boardings of passengers walking to and from the station are nearly identical. Hence, the capacity of study area employment and population to produce MetroLink riders is accurately represented. That said, modeled boardings

remain lower than observed at the Central West End due to under-prediction of MetroBus-to-MetroLink transfers.

Since the initial development of the EWG model, Metro has expanded the transit system's reliance on hub-and-spoke operations emphasizing timed transfers. The model's ability to accurately represent this system is limited. Intended as a regional model, the model also struggled to precisely model multiple transit route choices in a confined area. For example, the model overstated riders' preferences for higher frequency services (i.e., #1 Gold) over low frequency services (i.e., #42 Sarah). Significant efforts were undertaken to rectify these issues but they proved unsuccessful.

Ultimately, this resulted in 500 fewer bus riders arriving at the Central West End Transit Center in the model as compared to the observed data from the Metro 2012 survey. By extension, the number of transfers to MetroLink and the number of MetroBus-to-MetroBus transfers were also under-predicted, as summarized in **Table B11**. Overall passenger volumes and transfers at the Central West End Transit Center by bus route are summarized in **Table B12**.

Table B11: Observed and Modeled Bus Alightings at Central West End Transit Center

	Observed Alightings	Modeled Alightings
Transfer to MetroBus (Bus-to-Bus)	717	1,185
Transfer to MetroLink (Bus-to-Rail)	2,080	854
Final Destination: WUMC	57	381
Final Destination: Other	76	
Total	**2,930**	**2,420**

Table B12: Observed and Modeled MetroBus Ridership by Route Serving CWE

Bus Route	Observed Ridership	Modeled Ridership
#1 – Gold	876	2,619
#10 – Gravois/Lindell	3,167	3,574
#13 – Union	824	177
#14 – Botanical Garden	176	359
#18 – Taylor	830	197
#42 – Sarah	1,141	211
#59 – Dogtown	1,142	1,704
#80 – Park/Shaw	785	337
#95 – Kingshighway	4,543	4,397
#57X – Clayton Road	297	408
Total	**13,781**	**13,983**

Final model results compared to the targets established at the beginning of the calibration process are summarized in **Table B13**. **Table B14**, and **Table B15**.

Table B13: Transit Boardings Summary

Transit Mode	Initial Boardings	Calibrated Boardings	Targets
MetroLink	53,015	46,771	50,500
Bus	118,885	117,842	101,000

Table B14: Transit Transfer Rates Summary

Transfer Type	Initial Transfers	Calibrated Transfers	Targets
MetroBus Transfers	1.32	1.33	1.45
MetroLink Transfers	1.63	1.61	1.35

Table B15: Transit Mode of Access Summary

Mode of Access	Initial Results	Calibrated Results	Targets
Walk/Bike to MetroLink	49%	52%	43%
Drive to MetroLink	51%	48%	57%
Walk/Bike to MetroBus	89%	87%	89%
Drive to MetroBus	11%	13%	11%

Overall, the model adjustments resulted in improved performance. The model-predicted bus and MetroLink ridership is very accurate relative to targets and represents a significant enhancement from the Rapid Transit Connector Study model used as the starting point. Transfer rates remain effectively unchanged, and so the calibrated model marginally under-predicts bus-to-bus transfers and overstates bus-to-MetroLink transfers, notwithstanding the Central West End Transit Center. The model's transit mode of access percentages for bus were improved by the calibration process and closely resemble targets. The percentages for MetroLink changed slightly and despite not improving, remain reasonably accurate.

In conclusion, the calibration process achieved significant model improvements, particularly regarding overall bus ridership and walk access/egress transit boardings at the Central West End MetroLink station. While the calibrated model remains imperfect, it provides a solid foundation for the Central Corridor Transit Study ridership forecasting process that is to follow.

Appendix C: Opinions of Probable Cost

ALTERNATIVE 2: OPINION OF PROBABLE COST CORTEX METROLINK STATION

Item	Qty	Unit	Unit Cost	Total Cost
EXCAVATION & FILL				
Excavation	561.2	CY	$ 35.00	$ 19,640.83
Rock Base under Footers	177.5	CY	$ 30.00	$ 5,323.89
				$ 24,964.72
PLATFORM				
Concrete Platform	209.6	CY	$ 625.00	$ 130,971.67
Precast Concrete Warning Strip	733.3	SF	$ 82.00	$ 60,133.33
Security Camera	2.0	EA	$ 1,000.00	$ 2,000.00
Pole Lighting	4.0	EA	$ 2,500.00	$ 10,000.00
Windscreen with Bench	4.0	EA	$ 1,000.00	$ 4,000.00
Waste Receptacle	1.0	EA	$ 650.00	$ 650.00
Info Kiosk	1.0	EA	$ 2,500.00	$ 2,500.00
Canopy Column Pier - Concrete	2.8	CY	$ 500.00	$ 1,393.84
Additional Reinforcement for Canopy Column	30.2	LB	$ 1,000.00	$ 30,247.00
Light Sandblast Pattern	430.2	SF	$ 20.00	$ 8,604.40
Light Broom Finish	2,028.2	SF	$ 1.00	$ 2,028.18
				$ 252,528.42
RAMP				
4ft Double Gate	2	EA	$ 306.00	$ 612.00
Concrete Ramp	167.0	CY	$ 500.00	$ 83,490.16
				$ 84,102.16
CANOPY				
Gutter Assembly	150.0	LF	$ 20.00	$ 3,000.00
Roof Frames	520.3	LF	$ 40.00	$ 20,812.80
Concrete Encased Steel Tube Columns	3.17	CY	$ 500.00	$ 1,585.00
Roofing Metal Panel	1,507.8	SF	$ 15.00	$ 22,616.73
				$ 48,014.53
COMMUNICATIONS BUILDING				
CMU Walls	514.7	SF	$ 10.00	$ 5,146.67
Exterior Light Fixtures	2	EA	$ 125.00	$ 250.00
1/4" Aluminum Curved Perforated Roofing Panel	756	SF	$ 15.00	$ 11,340.00
Exterior Doors	2	EA	$ 575.00	$ 1,150.00
Chain Link Fence (8' high) with 2'6" Gate	7.3	LF	$ 550.00	$ 4,033.33
Perforated Screen	20.0	SF	$ 27.00	$ 540.81
600CFM HVAC System	1.0	EA	$ 15,000.00	$ 15,000.00
Electronic Equipment	1	LS	$ 62,539.19	$ 62,539.19
				$ 100,000.00
TRACK REALIGNMENT				
Demolition Track	1,000.0	LF	$ 50.00	$ 50,000.00
Construct New Track	1,098.0	LF	$ 500.00	$ 549,000.00
Railroad Signals	4.0	EA	$ 250,000.00	$ 1,000,000.00
Direct Fixation Track at Station Concrete	98.0	CY	$ 650.00	$ 63,700.00
Direct Fixation Track at Station	1.0	LS	$ 200,000.00	$ 200,000.00
Earth Backfill	711.1	CY	$ 6.50	$ 4,622.22
Switches	4.0	EA	$ 300,000.00	$ 1,200,000.00
Crossing Modifications	1.0	LS	$ 200,000.00	$ 200,000.00
				$ 3,267,322.22

Item	Qty	Unit	Unit Cost	Total Cost
OCS CATENARY SYSTEM				
OCS Catenary Foundation Concrete	27.5	CY	$ 650.00	$ 17,871.39
Tapered Tubular Pole	7.0	EA	$ 14,000.00	$ 98,000.00
Contact Wire	1,098.0	LF	$ 945.00	$ 10,376.10
Cantilever Assembly	7.0	EA	$ 3,000.00	$ 21,000.00
Messenger Wire	1,098.0	LF	$ 1,525.00	$ 16,744.50
Downguy Wire, Anchors, & Hardware	4.0	EA	$ 1,775.00	$ 7,100.00
Guy Guard (8ft length)	4.0	EA	$ 95.00	$ 380.00
				$ 171,471.99
MISCELLANEOUS				
Electrical System	1	LS	$ 100,000.00	$ 100,000.00
Telecom System	1	LF	$ 100,000.00	$ 100,000.00
Ticketing Machine	2	LF	$ 25,000.00	$ 50,000.00
				$ 250,000.00
STATION AMENITIES				
Landscape	7903	SY	$ 40.00	$ 316,120.00
Trees	65	LF	$ 350.00	$ 22,750.00
Buildings	2142	SF	$ 500.00	$ 1,071,001.65
Concrete - Walkways	9440	SF	$ 10.00	$ 94,400.00
Segmental Block Wall	727.595	LF	$ 25.00	$ 18,189.88
8ft Ornamental Screen Gate	1	LS	$ 2,000.00	$ 2,000.00
Stormwater Rain Garden	676.399	LF	$ 50.00	$ 33,819.94
Scupltural Element	1	LF	$ 30,000.00	$ 30,000.00
Decorative Pavement	9800	SF	$ 12.00	$ 117,600.00
Seat Walls	150	LF	$ 100.00	$ 15,000.00
Wayfinding Kiosk	1	LF	$ 25,000.00	$ 25,000.00
Benches, Misc Furnishings	1	LS	$ 30,000.00	$ 30,000.00
Irrigation	71127	SF	$ 1.15	$ 81,796.05
Pedestrian Lighting	20	EA	$ 5,000.00	$ 100,000.00
				$ 1,957,677.52
GRG TRAIL				
Bike Rack	12	EA	$ 720.00	$ 8,640.00
Bike Shelter	604.487	SF	$ 150.00	$ 90,672.98
Concrete - Trail	1480	SF	$ 10.00	$ 14,800.00
Trail Heads (pavers)	800	SF	$ 12.00	$ 9,600.00
Bollards	2	EA	$ 1,000.00	$ 2,000.00
Signs	4	EA	$ 1,800.00	$ 7,200.00
Fence (36in Decorative)	1270	LF	$ 40.00	$ 50,800.00
Handicamp Ramp	2	EA	$ 2,000.00	$ 4,000.00
Decorative Crosswalk	1600	SF	$ 12.00	$ 19,200.00
Trees	30	EA	$ 350.00	$ 10,500.00
Pedestrian Lights	25	EA	$ 5,000.00	$ 125,000.00
Landscape	1696	SY	$ 40.00	$ 67,840.00
				$ 410,252.98
FREIGHT TRACK ABANDONMENT				
Disconnect Utilities	1	LS	$ 9,561.60	$ 9,561.60
Remove Crossing Gates	1	LS	$ 4,310.40	$ 4,310.40
Remove Gate Foundations	1	LS	$ 2,544.00	$ 2,544.00
Remove Cantilevers	1	LS	$ 4,540.80	$ 4,540.80
Remove Cantilever Foundations	1	LS	$ 4,828.80	$ 4,828.80

Item	Qty	Unit	Unit Cost	Total Cost
Remove Rail Track	150	LF	$ 24.00	$ 3,600.00
Remove Rail Crossing at Boyle and at Sarah	2	EA	$ 1,920.00	$ 3,840.00
Remove Pavement at Boyle and at Sarah	2	EA	$ 4,800.00	$ 9,600.00
Extend and Reconnect Utilities	1	LS	$ 20,620.80	$ 20,620.80
Install New Gate and Cantilever Foundations	1	LS	$ 7,564.80	$ 7,564.80
Reinstall Gate and Cantilever	1	LS	$ 9,100.80	$ 9,100.80
Install Signals	1	LS	$ 24,902.40	$ 24,902.40
Traffic Control	1	LS	$ 9,600.00	$ 9,600.00
Repave Boyle and Sarah	2	EA	$ 19,200.00	$ 38,400.00
Install Security Fencing	1000	LF	$ 33.60	$ 33,600.00
Grading	1800	CY	$ 7.25	$ 13,050.00
				$ 199,664.40

Construction Total	$ 6,765,998.95

DESIGN

AE Fees (10% of Construction)	$ 656,633.45
Environmental	$ 75,000.00
Permits	$ 10,000.00
Legal and Accounting	$ 190,000.00
Metro Force Account Work	$ 260,000.00
Bus Bridge (2 weekends)	$ 150,000.00
	$ 1,341,633.45

Subtotal		$ 8,107,632.40
Contingency	**20%**	$ 1,621,526.48
Total		**$ 9,729,158.88**

Appendix D: Project Funding and Financial Plan

Central Corridor Transit Access Study

Appendix D: Project Funding and Financial Plan

April 2014

Table of Contents

1.0 Introduction 3
2.0 Capital and Operating Cost Estimates 4
3.0 Funding Options 5
3.1 Federal Funding 5
3.2 STP-S and CMAQ Grant Program 5
3.3 State Funding 7
3.4 Local Funding 7
4.0 Funding Packages 19
4.1 Operating Funding Packages 19
4.2 Capital Funding Package 22
Appendix A: Case Studies 24
Metro Transit: Target Field Station 24
UTA: 900 South Station 25
UTA: Sandy Expo Station 25
BART: West Dublin/Pleasanton Station 26
MBTA: Assembly Square Station 27
MBTA: Boston Landing Station 28
WMATA: NoMa – Gallaudet Station 29
WMATA: Potomac Yard Station 30
Appendix B: Other Funding Options 31
Section 5307 Urbanized Area Formula Program 31
New Starts/Small Starts Program 31
Missouri State Funding 31
Joint Development 31
New Market Tax Credits 32
EB-5 Visa Program 32

PARSONS BRINCKERHOFF

1.0 Introduction

The purpose of this report is to document funding and financing approaches for the construction and operation of the proposed Cortex MetroLink Station. This report fulfills the financial planning element of the Central Corridor Transit Access Study. The study is proposing the addition of a Cortex MetroLink Station adjacent to Boyle Avenue.

The project funding and financial plan addresses gaps in the capital and operating funding of the Cortex MetroLink Station by identifying and quantifying potential revenue sources. This task included documentation of existing transit funding approaches in the St. Louis region and a review of potential sources that could be applied to fund the Cortex Station project. Eight transit center and infill station projects were researched and profiled to identify funding sources for projects elsewhere in the United States. These projects are summarized in Table 1.1 and detailed in Appendix A.

Table 1.1: Summary of Funding Sources for Selected U.S. Transit Center and Infill Station Projects

Transit Center/Infill Station Sponsor	Technology	Capital Cost	Funding
Target Field Station Metro Transit (Minneapolis)	Light Rail	$79.3 million	Federal TIGER grant, other federal grants, state bonds, state and local authority funding, local county and city funding
900 South Station Utah Transit Authority	Light Rail	$1.2 million	Tax increment financing, regional transit agency funding
Sandy Expo Station Utah Transit Authority	Light Rail	$2.1 million	Federal earmark, local hotel tax
West Dublin/Pleasanton Station Bay Area Rapid Transit	Heavy Rail	$106.0 million	Developer contributions, state grant, regional transit agency funding
Assembly Square Station Massachusetts Bay Transportation Authority	Heavy Rail	$53.7 million	Developer contributions, New Starts grant, state DOT funding, MPO funding, tax increment financing
Boston Landing Station Massachusetts Bay Transportation Authority	Commuter Rail	$16.0 million	Developer contributions
NoMa – Gallaudet Station District of Columbia/ Washington Metropolitan Area Transit Authority	Heavy Rail	$104.0 million	Federal earmark, city funding (property, income, and sales tax), and special assessment
Potomac Yard Station City of Alexandria/ Washington Metropolitan Area Transit Authority	Heavy Rail	TBD	Developer contributions, special assessments

A total of 21 potential funding mechanisms were identified for the Cortex Station project, summarized in Table 1.2. These funding sources were screened on the basis of general feasibility, project eligibility, and amount of available funding. Nine sources identified for further analysis are shown in **bold** in Table 1.2, and profiled in Section 3.0. A summary of the funding sources not selected for further consideration is included in Appendix B.

Table 1.2: Potential Funding Options

Federal Funding	State Funding	Local Funding	
Section 5307 Urbanized Area Formula Program	Missouri Department of Transportation (MoDOT) Funding	**Transit Sales Tax**	**Parking Fees**
Surface Transportation Program – Suballocated (STP-S) and Congestion Mitigation and Air Quality (CMAQ) Grant Program	State General Revenue or Transportation Fund Operating Assistance	Metro Operating Program	New Market Tax Credits
New Starts/Small Starts Program	**State Economic Development Funding**	**Incremental Fare Revenue**	Low Income Housing Tax Credits
Transportation Investment Generating Economic Recovery (TIGER) Program		**Tax Increment Financing**	Historic Structures Tax Credits
		Special Assessments	EB-5 Visa Program
		Development Impact Fees	**Partner Contributions/ Sponsorships**
		Joint Development	

Note: Funding options identified for further consideration are shown in **bold**

This report summarizes promising funding options and projects the range of potential capital and operating revenue for funding sources based on readily available data. A capital funding approach is discussed and two operating funding scenarios are presented. The report concludes with a series of recommendations for developing preferred capital and operating funding packages.

2.0 Capital and Operating Cost Estimates

Table 2.1 and Table 2.2 summarize the capital and operating and maintenance (O&M) cost estimates for the Cortex MetroLink Station in 2014 dollars. The objective of the funding and financial plan is to identify sufficient revenues to address the capital and operating cost of a Cortex infill station, summarized below.

Table 2.1: Cortex Station Capital Cost Estimate (2014 dollars)

Description	Capital Cost
Excavation and Fill	$24,965
Platform	$252,528
Ramp	$84,102
Canopy	$48,015
Communications Building	$100,000
Track realignment	$3,267,322
OCS Catenary System	$171,472
Miscellaneous	$2,207,677
Trail	$410,253
Freight Track Abandonment	$199,664
Planning, design, and legal	$1,341,633
Contingency (20 percent)	$1,621,527
Total Capital Cost	**$9,729,159**

Source: Bernardin, Lochmueller & Associates

Table 2.2: Cortex Station Annual Incremental Operating Cost Estimate (2014 dollars)

Description	Operating Cost
Station maintenance costs	$200,000
Station security costs	$100,000
Incremental transit service costs	$535,000
Annual Incremental Operating Costs	**$835,000**

Source: Bernardin, Lochmueller & Associates

This O&M cost estimate includes the allocation of MetroLink overhead costs between Missouri and Illinois, based on revenue hours of service operated in each state. One O&M funding scenario, described later in this report, assumes that the cost support for MetroLink between Missouri and Illinois is rebalanced to reduce the portion of MetroLink overhead attributable to Missouri due to the Cortex Station.

3.0 Funding Options

Nine funding options have been identified to address the capital and operating expenses of the Cortex Station. Some sources are more suitable for capital costs, others are more appropriate for operating costs, and others are appropriate for both. The funding options investigated for this study, as well as the applicability of each to cover capital and operating expenses, are summarized in Table 3.1.

Table 3.1: Identified Funding Options

Funding Option	Capital	Operations
STP-S and CMAQ Grant Program	✓	✓
TIGER Grant Program	✓	✗
State Economic Development Funding	✓	✗
Transit Sales Tax	✗	✓
Incremental Fare Revenue	✗	✓
Tax Increment Financing	✓	✗
Special Assessments	✓	✓
Parking Fees	✓	✓
Partner Contributions/Sponsorships	✓	

Each of these funding sources is detailed below. Federal funding options are described first, followed by state and local sources.

3.1 Federal Funding

Three federal grant programs serve as potential funding sources for Cortex Station: Surface Transportation Program – Suballocated funds (STP-S), the Congestion Mitigation and Air Quality Improvement Program (CMAQ), and the Transportation Investment Generating Economic Recovery (TIGER) program. Each program is summarized below. However, all of these funding sources are constrained. The likelihood of receiving grant funding is limited based on existing funding commitments, program requirements, and competition from other projects. In addition, nearly all federal grant programs require a non-federal match, so state or local funds would be required to cover at least a portion of project

3.2 STP-S and CMAQ Grant Program

Municipalities in Illinois and Missouri may apply for STP-S and CMAQ funding for local transportation projects through the East-West Gateway Council of Governments.

The Surface Transportation Program is a core component of the Federal Aid Highway Program, providing $10.1 billion in funding for fiscal year (FY) 2014. It provides flexible funding of state and local surface

transportation projects, including transit and pedestrian facilities. A portion of STP funds earned by Missouri are suballocated to metropolitan areas with a population greater than 200,000, including the St. Louis region. The East-West Gateway Council of Governments will program approximately $35 million to $40 million in STP-S funding for Missouri projects in FY 2016, FY 2017, and FY 2018.

CMAQ funds are designated for transportation projects that will contribute to attainment or maintenance of the National Ambient Air Quality standards for ozone, carbon monoxide, and particulate matter. Maintenance projects such as road resurfacing, reconstruction, and projects that add new capacity for single-occupant vehicles are not eligible. Eligible activities include bicycle and pedestrian facilities and transit vehicles and facilities, as well as operating assistance for new transit service for up to five years. Previous CMAQ grant awards in the region have supported transit projects, including construction of 18 miles of the MetroLink system. The program typically funds 80 percent of the estimated project cost, including a 20 percent local match. The East-West Gateway Council of Governments will program $15 million to $20 million in CMAQ funding for Missouri projects in FY 2015 and 2016.

In the 2013 application process for the STP-S and CMAQ program, 3 of the 4 transit projects that applied were selected for funding. The three transit projects received $21.1 million of $136.9 million in regional discretionary grants awarded (15 percent) by the East-West Gateway Council of Governments. The projects included MetroBus capital replacement and Metro transit capital improvements. Of the projects selected, 80 percent of the total estimated project cost was funded, with a 20 percent local match. The MetroBus replacements included two $7.5 million CMAQ grants. The Metro transit capital improvements included one $1.9 million CMAQ grant.

If the Cortex MetroLink Station were selected for funding, the project could receive a CMAQ or STP-S grant totaling up to 80 percent (or $7.0 million) of the estimated project cost of $9.4 million (in 2014 dollars). There is potential for either program to fund only a portion of project capital costs, which would decrease the total funding amount. The remaining project cost would be covered through local matching funds, including a mixture of the funding options documented in this report. Local matching funds must be identified in the grant application for the project to be considered competitive. If the matching funds are not identified or secured, the project will not be selected for funding. However, CMAQ funds available to the region are constrained, and any award to fund the capital cost of Cortex Station could occur at the expense of another Metro priority, such as MetroBus capital replacement.

CMAQ funds are eligible to support the full operating cost of transit projects for the first three years; these funds may be spread over a five-year period. However, CMAQ funds are not commonly applied to fund operating expenses in Missouri. If the Cortex Station project were chosen for start-up operating assistance in lieu of capital funding, CMAQ could fund a portion of operating costs over the first five years of operation.

3.2.1 TIGER Program

The Transportation Investment Generating Economic Recovery (TIGER) program is a highly competitive U.S. Department of Transportation (USDOT) grant program supporting the capital costs of road, rail, transit, and port projects that have a significant impact on the nation, a region, or a metropolitan area. To date, TIGER grants have provided over $3.0 billion in funding to transportation and transit projects that are multi-modal, multi-jurisdictional, or otherwise challenging to fund through existing programs. TIGER funds have supported at least one transit infill station, including the Target Center Station in Minneapolis profiled in Appendix A. However, during the latest round of TIGER grants in 2013, funding requests were more than 20 times available funding. Out of 585 applicants, only 52 received funding, 25 of which were in rural areas.

There is always the potential that the Cortex MetroLink Station could be funded by the TIGER program, but there is significant competition for available funds. Broad support and local consensus—including support from the business community, various interest groups (e.g., environmental, labor, economic development) and elected officials at the federal, state, and local levels—are key requirements to be

competitive for TIGER funding. USDOT also prefers projects that have performed considerable project development (e.g., completed environmental clearance) and secured commitments of non-federal funding. If a project cannot meet USDOT's high expectations but expects to do so in one to two years, many project sponsors will submit an application to make USDOT aware of the project and position the project for a future round of TIGER grants.

The 2014 TIGER Notice of Funding Availability specifies that TIGER discretionary grants may not be less than $10 million (except in rural areas). Like other federal grant programs, TIGER discretionary grants can provide up to 80 percent of the costs of a project in urban areas. However, projects that can demonstrate significant non-Federal contributions are more competitive in the process. Based on the 80 percent maximum and a minimum grant size of $10 million, the minimum total project size for a TIGER eligible project is $12.5 million. The Cortex MetroLink Station, as currently defined, is below this threshold and would be ineligible for TIGER funding.

The project would need to incorporate additional elements (such as improvements to the Central West End Station) to raise the project cost above the $12.5 million minimum to be eligible for TIGER grants. If the project can be redefined to be eligible, project sponsors should consider applying for TIGER funds. However, given acute competition, the likelihood of selection is low. Lessons may be applied from previous TIGER grant submittals to become more competitive over time.

3.3 State Funding

The state of Missouri provides operating assistance to urban public transit agencies. However, these sources (detailed in Appendix B) are fully committed or are unavailable for the Cortex MetroLink Station.

3.3.1 State Economic Development Funding

The technical and stakeholder committees are pursuing new economic development funding for transportation infrastructure projects from the State of Missouri. Any new funding source would require legislative action. Funds would likely target rail station capital costs and parking infrastructure in the Cortex area. There is precedence for state economic development funding in the Cortex area as well as for infrastructure development. Discussing project funding needs with state leaders, including legislators and MoDOT officials, would position the project for funding should this or other new funding sources become available.

3.4 Local Funding

Local funding sources represent the bulk of the funding options for the Cortex MetroLink Station. Possible local sources include the transit sales tax, tax increment financing, special assessments, parking fees, incremental fare revenue, and partner contributions. These funding sources are detailed below.

3.4.1 Transit Sales Taxes

St. Louis Metro is the beneficiary of the following transportation sales taxes totaling 1.0 percent in St. Louis City and St. Louis County:

- A base sales tax of 0.5 percent established in 1974 funds Metro capital and operations. In St. Louis City, revenues from this tax are fully dedicated to transit. In St. Louis County, half of this tax is applied to transit purposes and half is applied to road and bridge projects. Metro receives 98 percent of the transit revenues collected by these taxes, with 2 percent set-aside for the transportation of developmentally disadvantaged persons. These funds are used by St. Louis Metro as the local match for Federal funding for bus and non-bus capital projects located in the City and County, as well as to fund bus and rail operations in Missouri. Fifty percent of these revenues are subject to collection by any tax increment finance (TIF) district.

- Proposition M of 1994 established a 0.25 percent sales tax that is restricted to mass transit use and is forwarded to St. Louis Metro based upon annual appropriations from the City of St. Louis and St. Louis County. These funds are applied first to cover debt service requirements of the

Cross County MetroLink Extension bond issuance. After covering debt service requirements, a portion of the remaining funds may be used as the local match to fund specific capital projects in Missouri, after being approved by the City of St. Louis and St. Louis County. The revenues from this measure are not subject to collection by any tax increment finance district.

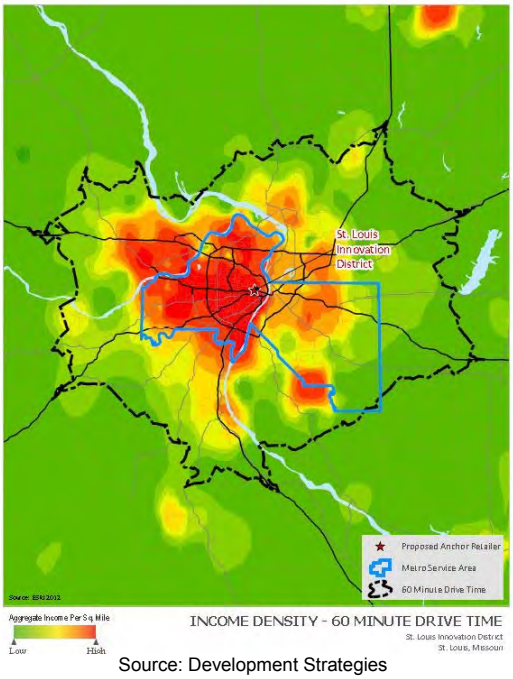
- Proposition A of 2010 established an additional 0.5 percent sales tax in St. Louis County to fund public transit capital and operating needs in the St. Louis region. A 0.25-percent sales tax in the City of St. Louis approved by voters in 1997 was contingent on the passage of a tax in St. Louis County. As with Proposition M, the revenues from this measure are not subject to collection by any tax increment finance district.

Incremental Transit Sales Tax Revenue

The stakeholder committee discussed applying a portion of the incremental sales tax revenues generated by the IKEA home furnishings store planned for the Cortex area to the Cortex Station project. Because of IKEA's unique mix of merchandise and status as a destination retailer, much of store's sales will represent a net increase in revenue to the St. Louis region. Incremental Proposition M and Proposition A sales tax revenues are not eligible for capture by the Tax Increment Financing district in the Cortex area, but could be applied to the project through a soft dedication by Metro. Half of the Metro base sales tax is subject to TIF collection, but the portion not eligible for TIF could also be applied to project through a soft dedication by the City of St. Louis.

According to estimates prepared by Development Strategies, IKEA sales are projected to total $115 million annually in 2014 dollars. Development Strategies estimates that $80.5 million (70 percent) of total sales will come from customers residing within a 60-minute travel time of the store. The remaining $34.5 million (30 percent) of sales will come from customers beyond the 60-minute radius. Figure 3.1 illustrates the 60-minute travel time calculated by Development Strategies.

Figure 3.1: 60-Minute Travel Time to IKEA Retail Store



Source: Development Strategies

Of the 70 percent of projected sales to customers living within a 60-minute radius of IKEA, Development Strategies estimates that 39.8 percent will come from outside the Metro service area (defined as St. Louis City, St. Louis County, and St. Clair County, Illinois), which represents 27.9 percent of total sales.

Coupled with the projected 30 percent of sales to customers beyond the 60-minute radius, 57.9 percent of IKEA sales are projected to be attributable to customers outside the Metro service area.

Given a combined tax rate of 0.5 percent in St. Louis City, incremental Proposition M and Proposition A sales tax revenue from customers outside the Metro service area is estimated to total $333,000 annually in 2014 dollars. If 100 percent of these revenues were applied to the Cortex Station project, annual proceeds for Cortex Station O&M costs could equal $333,000 (in 2014 dollars). Similarly, 50 percent of the incremental revenues generated by the Metro 0.5 percent base sales tax—the portion not eligible for capture by the Cortex TIF district—is estimated to total $166,500 annually (in 2014 dollars).

This arrangement will require agreement by Metro and other stakeholders, principally the City of St. Louis. Careful consideration must be given to the policy implications of this action, as it could establish precedent for narrowly applying funding from broad-based regional funding sources.

3.4.2 Incremental Fare Revenue

According to its FY 2012 Comprehensive Annual Financial Report, operating revenues for St. Louis Metro consisted primarily of passenger revenue, bus and shelter advertising, real property rental income, and miscellaneous capital project billings. In FY 2012, farebox recovery was 27.5 percent for MetroLink and 20.6 percent for MetroBus. Non-operating revenues consisted of Federal Section 5307 funds, Missouri and Illinois (St. Clair County Transit District) operating assistance, and sales tax revenues from the City of St. Louis and St. Louis County.

According to Metro's Infill Station Policy, the incremental fare revenue generated by passengers using the Cortex MetroLink Station is to be applied to the incremental operating cost of the station. Annual incremental operating revenue is estimated using the ridership projections presented in Table 3.2. This table summarizes the average daily net new MetroLink riders projected to use the Cortex Station, which is total station ridership less ridership by passengers who would otherwise use an existing station, such as Grand or Central West End. Both low growth and high growth forecasts of average daily ridership have been prepared for three benchmark years, 2015, 2025, and 2035. Annual ridership is estimated by interpolating between the benchmark year ridership forecasts and multiplying by an annualization factor of 300.

Table 3.2: Projected Average Daily Net New MetroLink Passengers from Cortex Station

	2015	2025	2035
Net New Riders (Low Growth)	778	869	1,123
Net New Riders (High Growth)	778	1,447	1,655

Source: Bernardin, Lochmueller & Associates

Fare revenue projections for the low and high growth scenarios are calculated by multiplying the net new riders by MetroLink's current average fare paid per passenger of $1.11. Projected incremental annual fare revenue (in 2014 dollars) for the Cortex MetroLink Station is summarized in Table 3.3.

Table 3.3: Cortex Station Projected Incremental Annual Fare Revenue (2014 dollars)

	2015	2025	2035
Fare Revenue (Low Growth)	$259,074	$289,377	$373,959
Fare Revenue (High Growth)	$259,074	$481,851	$547,452

Incremental fare revenue estimated by the low growth forecast is projected to cover between 31 and 45 percent of the $835,000 incremental annual operating cost of the Cortex MetroLink Station, with projected revenues ranging from $259,000 to $374,000 annually. Revenue estimated by the high growth forecast is projected to cover between 31 and 64 percent of incremental station costs, with projected revenues ranging from $259,000 to $547,000 annually.

3.4.3 Tax Increment Financing

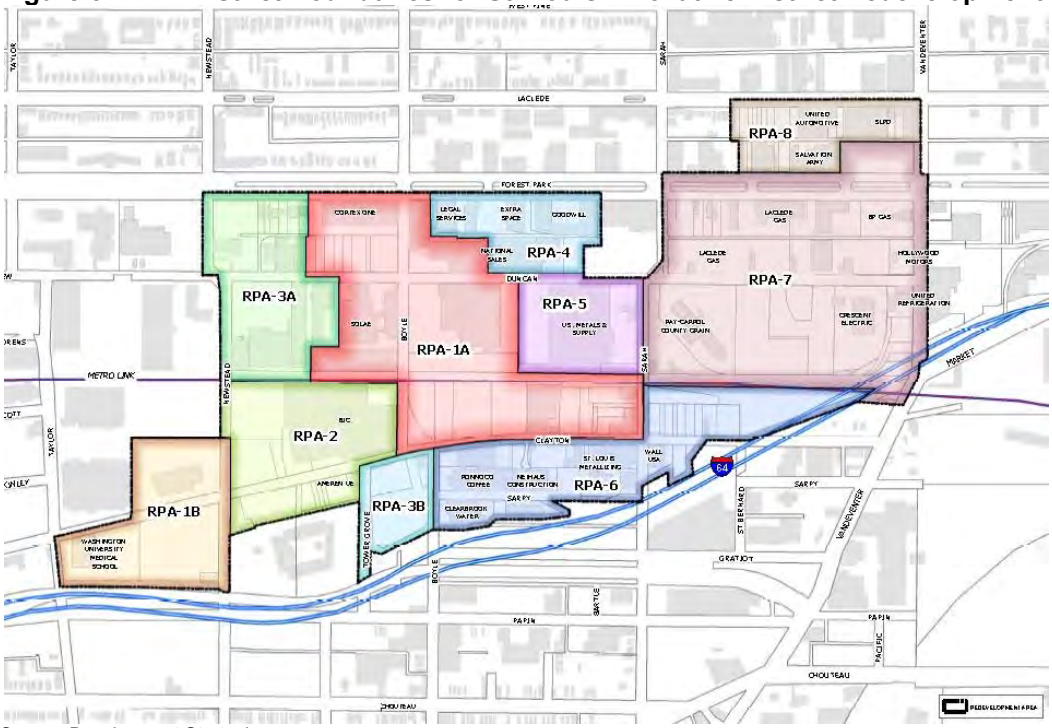
Tax Increment Financing (TIF) involves the creation of a special district to raise revenue for public improvements by capturing a portion of the additional assessed value generated by private-sector development. The tax base is frozen at predevelopment levels, and all or a portion of property tax revenues derived from increases in assessed values (the tax increment) are applied to a special fund created to retire bonds originally issued for development of the district. Some states, including Missouri, only permit TIF districts in blighted areas. The initial TIF revenue yield is relatively low. However, revenue generally increases over time as redevelopment and escalation leads to increased property values. TIFs are often applied for periods of 20 to 30 years. While most TIFs capture the incremental increase in property values, some states—including Missouri—allow the capture of other taxes as well.

TIF funds supported the capital cost of two projects profiled as case studies in Appendix A of this report: the Utah Transit Authority (UTA) 900 South Station and the Massachusetts Bay Transportation Authority (MBTA) Assembly Square Station. The 900 South Station was funded entirely with TIF funds. TIF funds can be used as a reliable source of revenue for areas that expect a future development and property value growth. However, these sources are heavily reliant on growth in real property values in the TIF district.

The Missouri Real Property Tax Increment Redevelopment Act (TIF Act) authorizes the capture of 100 percent of the incremental increase in property taxes above the property taxes generated by the property prior to redevelopment, also known as “payments in lieu of taxes” (“PILOTs”). In addition, 50 percent of new economic activity taxes (“EATs”) generated from the redevelopment project through sales taxes, earnings taxes, and utility taxes are collected as part of the TIF fund.

In 2012, the Cortex site was identified as a blighted area and a TIF district was established. Figure 3.2 illustrates the 10 Redevelopment Project Areas (RPAs) that comprise the St. Louis Innovative District Redevelopment Area. In general, revenue collected in each RPA will be reinvested in improvements in that RPA, although some revenue from all RPAs will be reinvested district-wide.

Figure 3.2: TIF District Boundaries for St. Louis Innovative District Redevelopment Area



Source: Development Strategies

The 2012 Redevelopment Plan identifies $10.0 million in TIF funding for the Cortex MetroLink Station from the $67.0 million funding for project costs common to all 10 RPAs within the Redevelopment Area. However, TIF funds for the Cortex MetroLink Station are presently limited because revenue from existing and committed development has been pledged to other investments. New development beyond currently planned development is required to generate additional revenue to support the station.

Based on projected development from 2013 to 2024, summarized in Table 3.4 below, the additional development needed to generate the $10 million eligible TIF revenues for the station is approximately 285,000 square feet. To cover the estimated capital cost of $9.4 million, approximately 268,000 square feet of development is required. These estimates are based on total district-wide TIF revenue of $160 million and 100-percent build-out of projected development, or 4.55 million square feet. These estimates illustrate the magnitude of development required to generate TIF revenues for the Cortex MetroLink Station; funding is highly dependent on timing and the scale of development. Additional funding sources should be considered to provide a backstop if TIF revenues do not meet projections.

Table 3.4: Cortex Area 2013-2024 Projected Development (thousands of square feet)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Annual Development	470.0	210.0	1,042.5	468.0	562.4	260.0	479.0	552.4	100.0	265.0	-	140.0
Cumulative Development	470.0	680.0	1,722.5	2,190.5	2,752.9	3,012.9	3,491.9	4,044.3	4,144.3	4,409.3	4,409.3	4,549.3

Source: Development Strategies
Note: Numbers may not sum due to rounding

3.4.4 Special Assessments

Special assessment districts are areas in which an additional property tax is applied to parcels of land that receive a special benefit from one or more public improvements funded by the special tax. Commercial and residential properties are often taxed at different rates. Special assessments are typically applied for a 20- to 30-year period and generate a consistent revenue stream. Two Washington Metropolitan Area Transit Authority (WMATA) case study projects profiled in Appendix B are funded by special assessment districts, the NoMa – Gallaudet Station and Potomac Yard Station.

The Cortex area qualifies for the creation of two special assessment districts: a Community Improvement District (CID) and a Transportation Development District (TDD). Each special assessment mechanism requires separate approval. However, there is precedence for coupling a CID and a TDD with a TIF district. Both mechanisms allow for a property tax increase and/or up to a 1 percent sales tax increase.

TDD/CID Sales Tax Revenues

TDD and CID sales taxes have been a successful means of funding improvements in the state of Missouri. As with any sales tax increase, a market value analysis should be conducted within the area to ensure that the tax increase would not put an unintentional burden on retail within the area or cause retail to choose an alternative location outside of the area. In the case of the Cortex MetroLink Station, the benefit of the station must outweigh the competitive disadvantage of the additional tax. The sales tax increase must be approved by the majority of property owners in the taxing district; the appetite to levy additional sales taxes in the district is very limited.

TID/CID sales tax revenue in the Cortex District is estimated based on projected development in the Cortex area, as well as the adjacent Midtown Station development, which is outside the Cortex district but will be near the proposed rail station. Cortex retail development has been estimated by Development Strategies (summarized in Table 3.5). The projections include anchor retail, inline retail, and restaurant. The Cortex area is assumed to include 55 percent inline retail and 45 percent anchor retail development, including the IKEA store. The assumed square footage of Midtown Station development is based on published reports and is assumed to include 80 percent anchor retail, 10 percent inline retail, and 10 percent restaurant development. Retail development is assumed to remain constant from 2024 to 2035.

Table 3.5: Cortex Area and Midtown Station 2013-2024 Projected Retail Development (thousands of square feet)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cortex Anchor Retail	2.8	-	401.0	0.8	1.6	-	0.2	0.4	-	0.2	-	-
Cortex Inline Retail	197.2	-	71.5	57.2	110.9	-	13.8	32.0	-	14.8	-	-
Total Development (Without Midtown)	200.0	-	472.5	58.0	112.4	-	14.0	32.4	-	15.0	-	-
Cumulative Development (Without Midtown)	**200.0**	**200.0**	**672.5**	**730.5**	**842.9**	**842.9**	**856.9**	**889.3**	**889.3**	**904.4**	**904.4**	**904.4**
Midtown Anchor Retail	-	-	-	128.0	-	-	-	-	-	-	-	-
Midtown Inline Retail	-	-	-	16.0	-	-	-	-	-	-	-	-
Midtown Restaurant	-	-	-	16.0	-	-	-	-	-	-	-	-
Total Development (With Midtown)	200.0	-	472.5	218.0	112.4	-	14.0	32.4	-	15.0	-	-
Cumulative Development (With Midtown)	**200.0**	**200.0**	**672.5**	**890.5**	**1,002.9**	**1,002.9**	**1,016.9**	**1,049.3**	**1,049.3**	**1,064.4**	**1,064.4**	**1,064.4**

Source: Development Strategies (Cortex) and published reports (Midtown Station)
Note: Numbers may not sum due to rounding

Table 3.6 summarizes the estimated sales per square foot in the Cortex area based on the St. Louis Development Corporation Cortex Cost Benefit Analysis. As mentioned in Section 3.4.1, Development Strategies projected annual taxable sales of $115 million for the IKEA store, approximately $287.50 per square foot.

Table 3.6: Estimated Sales per Square Foot (2014 dollars)

Development Type	Sales Per Square Foot
Anchor Retail (excluding IKEA)	$215
Inline Retail	$200
Restaurant	$350

Source: Cortex Cost Benefit Analysis, St. Louis Development Corporation

Table 3.7 summarizes total estimated retail sales for planned development with and without the Midtown Station project, based on the square footage summarized in Table 3.5 and sales per square foot summarized in Table 3.6, and IKEA taxable sales estimated by Development Strategies.

Table 3.7: 2013 – 2024 Estimated Total Retail Sales (in millions) With and Without Midtown Station

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cortex Anchor Retail	$0.6	-	$0.2	$0.2	$0.3	-	$0.1	$0.1	-	$0.1	-	-
Cortex Inline Retail	$39.4	-	$14.3	$11.4	$22.2	-	$2.8	$6.4	-	$3.0	-	-
IKEA Development	-	-	$115.0	-	-	-	-	-	-	-	-	-
Total Development (Without Midtown)	$40.0	-	$129.5	$11.6	$22.5	-	$2.8	$6.5	-	$3.0	-	-
Cumulative Development (Without Midtown)	**$40.0**	**$40.0**	**$169.6**	**$181.2**	**$203.7**	**$203.7**	**$206.5**	**$213.0**	**$213.0**	**$216.0**	**$216.0**	**$216.0**
Midtown Anchor Retail	-	-	-	27.52	-	-	-	-	-	-	-	-
Midtown Inline Retail	-	-	-	3.20	-	-	-	-	-	-	-	-
Midtown Restaurant	-	-	-	5.60	-	-	-	-	-	-	-	-
Total Development (With Midtown)	$40.0	-	$129.5	$47.9	$22.5	-	$2.8	$6.5	-	$3.0	-	-
Cumulative Development (With Midtown)	**$40.0**	**$40.0**	**$169.6**	**$217.5**	**$240.0**	**$240.0**	**$242.8**	**$249.3**	**$249.3**	**$252.3**	**$252.3**	**$252.3**

Note: Numbers may not sum due to rounding

TDD/CID sales tax revenue is estimated by applying a 0.5-percent sales tax rate (of a 1-percent maximum) to taxable sales. Annual TDD/CID sales tax revenue in 2014 dollars for three benchmark years (2015, 2025, and 2035) is summarized in Table 3.8.

Table 3.8: Projected Cortex TDD/CID Sales Tax Revenue With/Without Midtown Station (2014 dollars)

	2015	2025	2035
With Midtown Station	$847,810	$1,261,474	$1,261,474
Without Midtown Station	$847,810	$1,079,874	$1,079,874

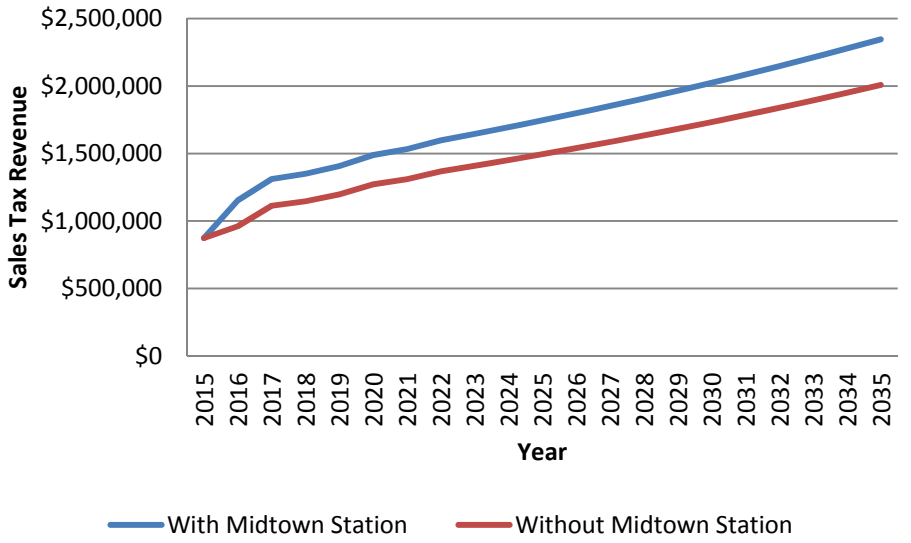
Annual TDD/CID sales tax revenue projected from a 0.5-percent sales tax increase is estimated to be greater than the estimated operating costs of the Cortex MetroLink Station. Therefore, one option is to apply the majority of proceeds from a 0.5-percent sales tax to cover the operating cost of the project.

Annual revenue is escalated at a 3.0 percent inflation rate, consistent with other consumer inflation assumptions applied in this report. Table 3.9 summarizes the projected annual sales tax revenue in Year of Expenditure (YOE) dollars for three benchmark years (2015, 2025, and 2035), while and Figure 3.3 summarizes annual projected sales tax revenue in YOE dollars.

Table 3.9: Estimated Annual TDD/CID Sales Tax Revenue With/Without Midtown Station (YOE dollars)

	2015	2025	2035
With Midtown Station	$873,245	$1,746,175	$2,346,714
Without Midtown Station	$873,245	$1,494,799	$2,008,884

Figure 3.3: Estimated Annual TDD/CID Sales Tax Revenue With/Without Midtown Station (YOE dollars)



Net debt proceeds from this revenue stream are summarized in Table 3.10. Proceeds are estimated by assuming a 6.5 percent interest rate over a 21-year period (2015-2035) and transaction and debt management costs equal to 10 percent of the gross issuance amount. A portion of the estimated $14 million (without Midtown Station) to $16 million (with Midtown Station) in net debt proceeds could be applied toward the $9.4 million capital costs of the station.

Table 3.10: Estimated Net Debt Proceeds from TDD/CID Sales Tax Revenue With/Without Midtown Station

	With Midtown	Without Midtown
Net Debt Proceeds	$16.2 million	$13.9 million

As with TIF revenues, TDD/CID sales tax revenues rely heavily on timing and the scale of development. Additional funding sources should be considered to provide a backstop if actual revenues do not meet projections.

TDD/CID Property Tax Revenues

Property taxes may be dedicated to specific purposes in a CID with majority approval of district property owners, or in a TDD with approval by at least four-sevenths (57.1 percent) of property owners. In addition, a property tax special assessment may be imposed in a TDD with majority approval. The maximum TDD property tax rate is $0.10 per $100 of assessed value. There is no maximum rate for a CID property tax, but the rate must be acceptable to district voters.

Projected TDD/CID property tax revenues are estimated based on square footage projections of Cortex retail development prepared by Development Strategies (summarized in Table 3.11), and from published reports of Midtown Station development. As with the projection of sales tax revenues, the property tax revenue is estimated for the Cortex area alone and for Cortex plus the Midtown Station area. Property taxes are separately projected for office, anchor retail, inline retail, and restaurant. The Cortex area is projected to include 45 percent inline retail and 55 percent anchor retail development, including IKEA. The Midtown Station is assumed to include 80 percent anchor retail, 10 percent inline retail, and 10 percent restaurant development. Office and retail development is assumed to remain constant from 2024 to 2035.

Table 3.11: Cortex Area and Midtown Station 2013-2024 Projected Development (thousands of square feet)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cortex Office	270.0	130.0	570.0	410.0	450.0	260.0	465.0	520.0	100.0	250.0	-	140.0
Cortex Anchor Retail	2.8	-	401.0	0.8	1.6	-	0.2	0.4	-	0.2	-	-
Cortex Inline Retail	197.2	-	71.5	57.2	110.9	-	13.8	32.0	-	14.8	-	-
Total Development (Without Midtown)	470.0	130.0	1,042.5	468.0	562.4	260.0	479.0	552.4	100.0	265.0	-	140.0
Cumulative Development (Without Midtown)	**470.0**	**600.0**	**1,642.5**	**2,110.5**	**2,672.9**	**2,932.9**	**3,411.9**	**3,964.3**	**4,064.3**	**4,329.4**	**4,329.4**	**4,469.4**
Midtown Anchor Retail	-	-	-	128.0	-	-	-	-	-	-	-	-
Midtown Inline Retail	-	-	-	16.0	-	-	-	-	-	-	-	-
Midtown Restaurant	-	-	-	16.0	-	-	-	-	-	-	-	-
Total Development (With Midtown)	470.0	130.0	1,042.5	628.0	562.4	260.0	479.0	552.4	100.0	265.0	-	140.0
Cumulative Development (With Midtown)	**470.0**	**600.0**	**1,642.5**	**2,270.5**	**2,832.9**	**3,092.9**	**3,571.9**	**4,124.3**	**4,224.3**	**4,489.4**	**4,489.4**	**4,629.4**

Source: Development Strategies (Cortex) and published reports (Midtown Station)
Note: Numbers may not sum due to rounding

Table 3.12 summarizes the estimated assessed value per square foot, based on the St. Louis Development Corporation Cortex Cost Benefit Analysis.

Table 3.12: Estimated Assessed Value per Square Foot (2014 dollars)

Development Type	Assessed Value Per Square Foot
Office/Lab/Research	$50
Anchor Retail (including IKEA)	$20
Inline Retail	$35
Restaurant/ Entertainment	$55

Source: Cortex Cost Benefit Analysis, St. Louis Development Corporation

Table 3.13 summarizes the total projected incremental assessed values with and without the Midtown Station development, derived by multiplying projected development by the estimated assessed values per square foot.

Table 3.13: 2013 – 2024 Estimated Incremental Assessed Value (in millions) With/Without Midtown Station (2014 dollars)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cortex Office	$13.5	$6.5	$28.5	$20.5	$22.5	$13.0	$23.3	$26.0	$5.0	$12.5	-	$7.0
Cortex Anchor Retail	$0.1	-	$0.1	$0.1	$0.1	-	$0.1	$0.1	-	$0.1	-	-
Cortex Inline Retail	$6.9	-	$2.5	$2.0	$3.9	-	$0.5	$1.1	-	$0.5	-	-
IKEA Development	-	-	$8.0	-	-	-	-	-	-	-	-	-
Total Development (Without Midtown)	$20.5	$6.5	$39.0	$22.5	$26.4	$13.0	$23.7	$27.1	$5.0	$13.0	-	$7.0
Cumulative Development (Without Midtown)	**$20.5**	**$27.0**	**$66.0**	**$88.5**	**$114.9**	**$127.9**	**$151.6**	**$178.8**	**$183.8**	**$196.8**	**$196.8**	**$203.8**
Midtown Anchor Retail	-	-	-	$2.6	-	-	-	-	-	-	-	-
Midtown Inline Retail	-	-	-	$0.6	-	-	-	-	-	-	-	-
Midtown Restaurant	-	-	-	$0.9	-	-	-	-	-	-	-	-
Total Development (With Midtown)	$20.5	$6.5	$39.0	$26.5	$26.4	$13.0	$23.7	$27.2	$5.0	$13.0	-	$7.0
Cumulative Development (With Midtown)	**$20.5**	**$27.0**	**$65.98**	**$92.5**	**$118.9**	**$131.9**	**$155.6**	**$182.8**	**$187.8**	**$200.8**	**$200.8**	**$207.8**

Note: Numbers may not sum due to rounding

Annual TDD/CID property tax revenue is estimated by applying the maximum allowable TDD property tax rate, $0.10 per $100 of assessed value. Annual property tax revenue in 2014 dollars for three benchmark years (2015, 2025, and 2035) is summarized in Table 3.14.

Table 3.14: Estimated Total TDD/CID Property Tax Revenue With/Without Midtown Station (2014 dollars)

	2015	2025	2035
With Midtown Station	$65,982	$207,797	$207,797
Without Midtown Station	$65,982	$203,797	$203,797

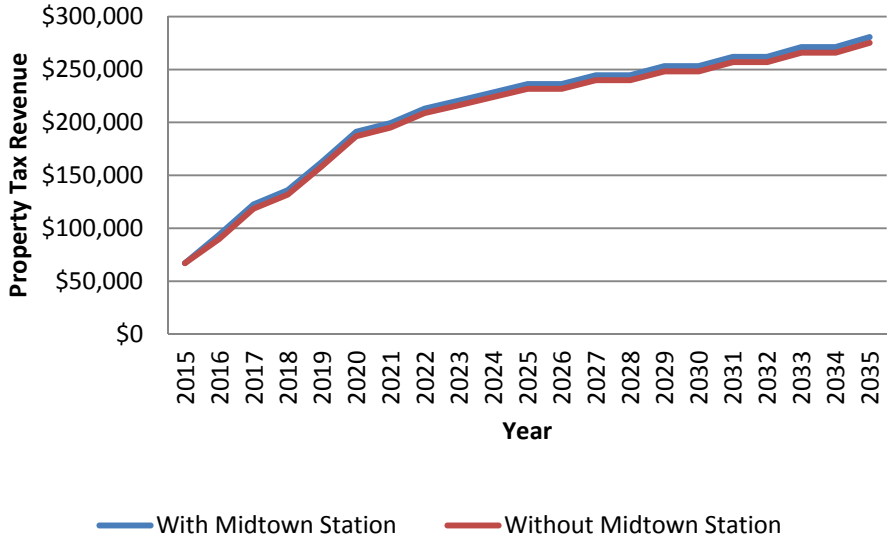
The projected TDD/CID property tax revenue is less than the estimated operating costs of the Cortex MetroLink Station. Other operating sources would be required to supplement property tax revenues.

TDD/CID property tax revenue is escalated to year-of-expenditure dollars consistent with assumptions documented in the St. Louis Development District Cortex Cost Benefit Analysis. Property tax values are expected to be reassessed every other year, growing 0.0 percent in 2013, 1.5 percent in 2015, 2017, 2019, and 2021, and 3.5 percent in 2023 and every two years thereafter. Projected property tax revenue in YOE dollars for three benchmark years (2015, 2025, and 2035) is summarized in Table 3.15 and Figure 3.4.

Table 3.15: Estimated Total TDD/CID Property Tax Revenue With/Without Midtown Station (YOE dollars)

	2015	2025	2035
With Midtown Station	$66,972	$236,257	$280,600
Without Midtown Station	$66,972	$231,709	$275,198

Figure 3.4: Estimated Total TDD/CID Property Tax Revenue With/Without Midtown Station (YOE dollars)



Net debt proceeds from this revenue stream are summarized in Table 3.16. Proceeds are estimated by assuming a 6.5 percent interest rate over a 21-year period (2015-2035) and transaction and debt management costs equal to 10 percent of the gross issuance amount. Net debt proceeds are projected to cover only a share of Cortex Station project capital costs.

Table 3.16: Estimated Net Debt Proceeds for TDD/CID Property Tax Revenue With/Without Midtown Station

	With Midtown	Without Midtown
Net Debt Proceeds	$ 1.93 million	$1.90 million

Special assessment revenues rely heavily on timing and the scale of development. Additional funding sources should be considered to provide a backstop if actual revenues do not meet projections.

Cortex and its developers are reluctant to accept additional tax levies/burdens because it hinders their ability to attract new businesses to the area. Existing mechanisms are already being used to subsidize development and level the playing field by mitigating competitive disadvantages.

3.4.5 Parking fees

Parking fees on surrounding facilities may be implemented to create a dependable revenue stream for capital and/or operating costs of the Cortex MetroLink Station. Parking fees may also increase transit ridership in the area by increasing the cost of driving and encouraging property owners to manage supply through pricing policies. Parking fees could be added to both existing and future parking supplies both within and immediately adjacent to the Cortex District, such as Washington University Medical Center.

The parking fee could include a tax or surcharge on paid parking, assessed as percentage of receipts or fixed cost per space. Property owners would be required to maintain daily records of usage by parking space. Prior to implementation, a market analysis should be conducted to develop a district-wide parking strategy and determine the optimal pricing policy to coordinate pricing of on- and off-street parking. This strategy would require buy-in from the district's major employers and property owners.

The potential range of parking fee revenue has been estimated for the Cortex area based on projected employment in the Cortex area estimated by Bernardin, Lochmueller & Associates (BLA). Projected

employment for three benchmark years, 2015, 2025, and 2035, is summarized in Table 3.17. The high growth forecast assumes that 100 percent of development planned for the Cortex areas is constructed by 2035, while the low growth forecast assumes that only 50 percent of planned development is constructed by 2035.

Table 3.17: Projected Cortex Area Employment

	2015	2025	2035
Employment (Low Growth)	1,712	5,111	6,782
Employment (High Growth)	1,712	8,510	11,851

Source: Bernardin, Lochmueller & Associates

Employee parking spaces, summarized in Table 3.18, were estimated by assuming 0.8 paid parking spaces per employee in the Cortex area.

Table 3.18: Estimated Employee Parking Spaces in Cortex Area

	2015	2025	2035
Employee Parking Spaces (Low Growth)	1,370	4,089	5,426
Employee Parking Spaces (High Growth)	1,370	6,808	9,481

Annual parking revenue was estimated for a $1.00 daily surcharge per space, assuming an average of 220 parking days per year. Revenues are projected in YOE dollars and deflated to 2014 dollars by applying an annual inflation rate of 3 percent. Projected revenue is summarized in 2014 dollars in Table 3.19 and in YOE dollars in Table 3.20 and Figure 3.5

Table 3.19: Estimated Annual Revenue for $1.00 Parking Surcharge (2014 dollars)

	2015	2025	2035
High Growth ($1.00 Surcharge)	$292,536	$1,082,014	$1,121,207
Low Growth ($1.00 Surcharge)	$292,536	$649,884	$641,636

Table 3.20 Estimated Annual Revenue for $1.00 Parking Surcharge (YOE dollars)

	2015	2025	2035
High Growth ($1.00 Surcharge)	$301,312	$1,497,760	$2,085,776
Low Growth ($1.00 Surcharge)	$301,312	$899,536	$1,193,632

Figure 3.5: Estimated Annual Revenue for $1.00 Parking Surcharge (YOE dollars)

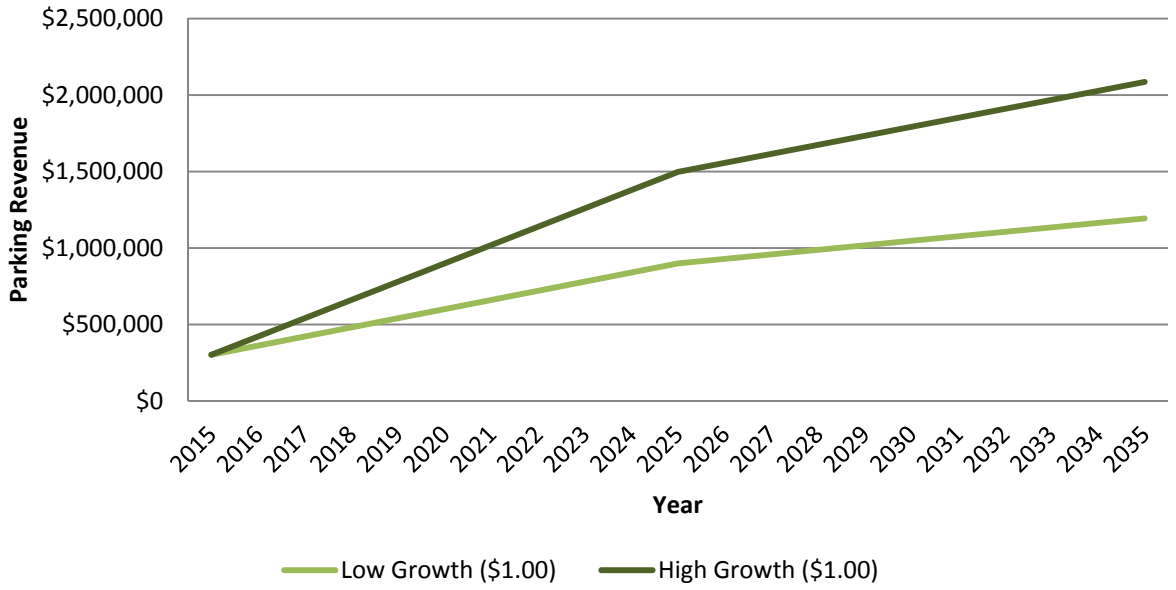


Table 3.21 summarizes estimated net debt proceeds for a $1.00 parking surcharge, assuming a 6.5 percent interest rate over a 21-year period (2015-2035) and transaction and debt management costs equal to 10 percent of the gross issuance amount.

Table 3.21: Estimated Net Debt Proceeds for $1.00 Parking Surcharge

	Net Debt Proceeds
High Growth ($1.00 Surcharge)	$11.5 million
Low Growth ($1.00 Surcharge)	$7.3 million

Parking surcharge revenue may be applied to capital or operating costs of the Cortex Station. Depending on the Cortex area growth, revenue from a $1.00 parking surcharge may cover all or most of the capital cost of the Cortex Station. Revenue may eventually be sufficient to cover a large share of operating costs of the station, but will require time to ramp up and must be supplemented with funding from other sources in the near term.

3.4.6 Partner Contributions/Sponsorships

Developers often provide in-kind or monetary contributions to facilitate construction of infrastructure assets that have a positive impact on property values. Often these contributions are negotiated to reflect the benefit the developer derives from the project. If funding is negotiated, project sponsors often request the money during the early portion of the debt service period. This enables the project sponsor to better leverage other funding sources.

Existing institutions, such as universities or hospitals that are close to the project, may also make in-kind or monetary contributions. A transit project can reduce the number of auto-centric facilities the institution needs to develop and can make the area more accessible for transit-dependent populations. Similar to developer contributions, agencies can negotiate with existing institutions to reflect their benefit from the project. Five case study projects documented in the appendix were funded in part through partner contributions: Metro Transit's Target Field Station, BART's West Dublin/Pleasanton Station, MBTA's Assembly Square Station, MBTA's Boston Landing Station, and WMATA's Potomac Yard Station. In addition, there is precedent for partner contributions to support infrastructure capital costs in the vicinity of Cortex, where BJC Healthcare and Washington University School of Medicine recently contributed to the capital cost of a US-40/Interstate 64 interchange at Tower Grove Avenue.

Partner contributions are a promising funding source for Cortex Station given the corporate and institutional organizations located within close proximity to the station. Potential partners include that the Washington University Medical Center (the largest employer in the City of St. Louis and St. Louis region), Barnes-Jewish Hospital, BJC Healthcare, Washington University, DuPont, and Wexford Science and Technology. Further discussion with these institutions will help to determine the willingness of these organizations to provide direct funding support for the proposed station. Negotiations should highlight the benefit the partner will receive from the project, which might include receiving naming rights, improving access for patients, employees, customers, and students, reducing automobile traffic and parking, and providing access for transit dependent persons.

An alternative funding partner is the Great Rivers Greenway District, which levies a 0.1-percent sales tax in St. Louis City, St. Louis County, and St. Charles County to fund bicycle and pedestrian trails throughout the region. Great Rivers Greenway could potentially contribute to the capital cost of project elements that connect Cortex Station to the regional trails network.

An alternate type of partner contribution is the sale of naming rights. This is a common practice for sports stadiums and arenas and is beginning to be used for highways and transit. Transit corridors and stations, such as the TECO Streetcar line in Tampa and the Health Line Bus Rapid Transit in Cleveland, are now using naming rights as revenue sources. Naming rights are a form of advertising and can be treated as market transactions. Though it can be a significant revenue source during the initial stages of construction and operation, naming rights can be more difficult to secure later in the life of the line or station.

Partner contributions may be applied to fill the gaps in funding for both capital and operating costs of the Cortex MetroLink Station. Alternatively, partner contributions could serve as a backstop for TIF revenues. Any partner contributions for the station will likely serve as a supplement to other funding sources identified in this report.

4.0 Funding Packages

This section outlines the potential funding packages to support the capital and operating costs of the Cortex MetroLink Station. Two operating funding package scenarios are provided, illustrating two viable means of assembling funds to satisfy the operating expense of the Cortex Station. One capital funding package is presented. These packages represent feasible project funding approaches for consideration by regional decision-makers.

4.1 Operating Funding Packages

This section summarizes two operating funding packages for the Cortex MetroLink Station. Each scenario applies a mixture of fare revenues, sales taxes, and other funding to fulfill the complete operating cost needs.

4.1.1 Scenario 1: Incremental Sales Tax

Scenario 1 applies a mixture of farebox revenues and incremental sales tax revenues to fund operating costs. A small amount of funding in the form of partner contributions is necessary to supplement the farebox and taxing revenues to fulfill near-term funding deficits.

Farebox revenues are based on a midpoint estimate of high and low forecast ridership. Incremental Metro sales tax revenues from Prop A/Prop M contribute 100 percent of the incremental tax revenue from taxable sales at IKEA generated by the 58 percent of sales attributable to shoppers from outside the Metro sales tax district, consistent with the projection documented in Section 3.4.1. Incremental City transportation sales tax revenues are based on the same projection, and contribute 50 percent of revenue generated, which is the portion not captured by the TIF district. Any out year sales tax revenues in excess of annual operating needs are assumed to be applied to other purposes. Table 4.1 summarizes the projected range in annual funding and percent of total funding provided by each source in 2014 dollars.

Table 4.1: Scenario 1 Operating Funding Sources and Ranges (2016-2035)

Sources	Annual Range (2014 dollars)	Percent of Total
Farebox Revenue	$260,000 - $450,000	44%
IKEA-generated net new Metro sales tax (no TIF capture)	$333,000	40%
IKEA-generated net new City transportation sales tax (after TIF capture)	$166,000	15%
Partner Contributions	$6,000 - $76,000 (8 years)	2%

Figure 4.1 and Table 4.2 summarize the projected annual sources and uses of funds for Scenario 1 in YOE dollars. Partner contributions are needed to plug the operating cost gap for the first 8 years of operation until such time that the gap is eliminated by increasing farebox and tax revenues. BJC Healthcare and Washington University have each agreed to contribute a one-time amount of $200,000 for a total of $400,000 to an escrow account designated for fulfilling the operating cost deficit during the station's initial years of operation. The cumulative amount of the deficit once farebox and tax revenues have been accounted for is projected to be $326,000 in Year 2014 dollars or $370,000 in Year of Expenditure dollars. Consequently, the committed partner contribution amount is expected to satisfy the initial years' operating deficit.

Figure 4.1: Scenario 1 Projected Annual Sources and Uses of Funds (in YOE Dollars)

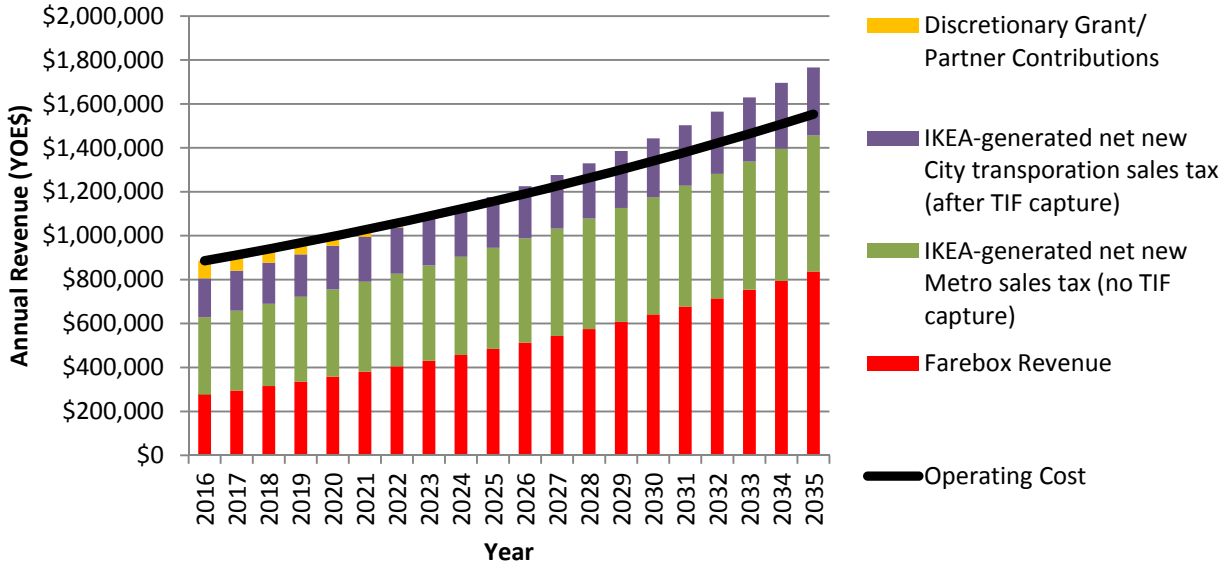


Table 4.2: Scenario 1 Projected Annual Sources and Uses of Funds (in millions YOE Dollars)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2035
Operating Cost	$0.89	$0.91	$0.94	$0.97	$1.00	$1.03	$1.06	$1.09	$1.12	$1.16	$1.55
Farebox Revenue	$0.28	$0.30	$0.32	$0.34	$0.36	$0.38	$0.41	$0.43	$0.46	$0.48	$0.84
Operating Gap	$0.61	$0.62	$0.62	$0.63	$0.64	$0.65	$0.65	$0.66	$0.67	$0.67	$0.72
IKEA-generated net new Metro sales tax (no TIF capture)	$0.35	$0.36	$0.37	$0.39	$0.40	$0.41	$0.42	$0.43	$0.45	$0.46	$0.62
IKEA-generated net new City transportation sales tax (after TIF capture)	$0.18	$0.18	$0.19	$0.19	$0.20	$0.20	$0.21	$0.22	$0.22	$0.23	$0.31
Operating Gap	$0.08	$0.07	$0.06	$0.05	$0.04	$0.03	$0.02	$0.01	($0.01)	($0.02)	($0.21)
Partner Contributions/ Sponsorships	$0.08	$0.07	$0.06	$0.05	$0.04	$0.03	$0.02	$0.01	$0.00	$0.00	$0.00
Operating Gap	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	($0.01)	($0.02)	($0.21)

Total Projected Partner Contributions (2016-2023): $370,000

4.1.2 Scenario 2: Incremental Sales Tax and Renegotiated MetroLink Overhead Allocation

Scenario 2 applies a mixture of farebox revenues and incremental sales tax revenues to fund operating costs. In this scenario, the cost support for MetroLink between Missouri and Illinois is rebalanced to reduce the portion of MetroLink overhead attributable to Missouri due to the Cortex Station. An annual O&M cost reduction of $425,000 is assumed.

Farebox revenues are based on a midpoint estimate of high and low forecast ridership. Incremental Metro sales tax revenues from Prop A/Prop M contribute a share of the incremental tax revenue from taxable sales at IKEA, consistent with the projection documented in Section 3.4.1. This funding package fulfills the entire O&M funding need. Table 4.3 summarizes the projected range in annual funding and percent of total funding provided by each source in 2014 dollars.

Table 4.3: Operating Funding Sources and Ranges (2014-2035)

Sources	Annual Range (2014 dollars)	Percent of Total
Renegotiated Overhead	$425,000	51%
Farebox Revenue	$260,000 - $450,000	42%
IKEA-generated net new Metro sales tax (no TIF capture)	$5,000 - $150,000 (13 years)	7%

Figure 4.2 and Table 4.4 summarize the projected annual sources and uses of funds for Scenario 2 in YOE dollars. In this scenario, farebox revenues are expected to satisfy the entire O&M cost need after 13 years of operation.

Figure 4.2: Scenario 2 Projected Annual Sources and Uses of Funds (in YOE Dollars)

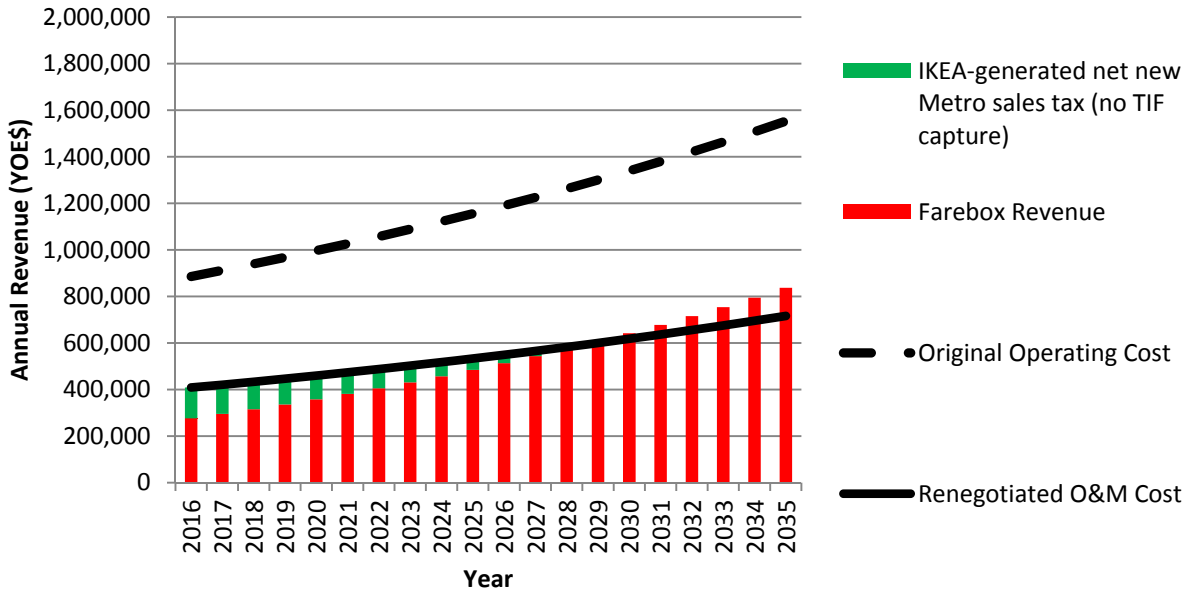


Table 4.4: Scenario 2 Projected Annual Sources and Uses of Funds (in millions YOE Dollars)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2035
Operating Cost	$0.89	$0.91	$0.94	$0.97	$1.00	$1.03	$1.06	$1.09	$1.12	$1.16	$1.55
Renegotiated Cost	$0.41	$0.42	$0.43	$0.45	$0.46	$0.47	$0.49	$0.50	$0.52	$0.53	$0.72
Farebox Revenue	$0.28	$0.30	$0.32	$0.34	$0.36	$0.38	$0.41	$0.43	$0.46	$0.48	$0.84
Operating Gap	$0.13	$0.13	$0.12	$0.11	$0.10	$0.09	$0.08	$0.07	$0.06	$0.05	($0.12)
IKEA-generated net new Metro sales tax (no TIF capture)	$0.13	$0.13	$0.12	$0.11	$0.10	$0.09	$0.08	$0.07	$0.06	$0.05	$0.00
IKEA-generated net new City transportation sales tax (after TIF capture)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Operating Gap	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	($0.12)

4.2 Capital Funding Package

Table 4.3 summarizes a capital funding package in 2014 dollars. A combination of sources will be required to fund the $9.4 million cost of the Cortex Station project.

Table 4.3: Capital Funding Sources and Ranges

Funding Source	Amount (2014 dollars)
TIGER Grant Program	$7,169,159
Cortex Tax Increment Financing	$2,000,000
Great Rivers Greenway	$550,000
City of St. Louis	$10,000
Total	**$9,729,159**

This funding package leverages local contributions from Cortex through tax-increment financing, Great Rivers Greenway, and the City of St. Louis for the Cortex Station's capital costs. These funding sources

are limited and fall well short of the full cost need. This project requires a Federal discretionary grant through the TIGER program to fulfill the complete capital costs need. Funds available through other Federal programs such as CMAQ and STP-S are committed to supporting ongoing transit system preservation and cannot be diverted to fund expansions without impacting the ability to maintain the existing transit system in a state of good repair. Similarly, Federal funding through the New Starts and Small Starts programs preclude funding for transit centers and infill stations as they do not meet FTA's expectations for new fixed guideway systems or extensions of an existing system. State funding is not presently available for transit capital costs.

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Appendix A: Case Studies

The following case studies summarize funding for light rail, heavy rail, and commuter rail transit centers and infill stations. Some of the projects are currently in operation while others are still in the planning phase. The capital costs and funding sources of these projects are equally diverse with capital costs ranging from a few million to hundreds of millions and funding sources ranging from federal government earmarks to developer contributions.

Metro Transit: Target Field Station

Sponsor	Technology	Capital Cost	Opening Year	Funding
Metro Transit (Minneapolis)	Light Rail	$79.3 million	2014	TIGER grant, other federal grants, state bonds, state and local authority funding, local county and city funding

This new transportation hub, to be called Target Field Station, will be Minnesota's version of New York City's Grand Central Terminal when it opens next year. The project is expected to revitalize downtown Minneapolis' North Loop area. A larger transit hub was required to accommodate Minnesota Twins baseball game ridership and to address the anticipated convergence of five rail lines — four light-rail and one commuter — at the site. Rather than a minimal, transit-only hub, the county developed the project to include retail, parking, a public plaza, and green space.
Funding sources from the project include $27.4 million (34.6 percent) from federal sources, $19.2 million (24.2 percent) from state appropriations, and $32.7 million (41.2 percent) from local sources. The project is funded by the following ten capital sources in particular:

Federal

- TIGER Grant, $10.0 million
- Federal Transit Formula Funds to Metropolitan Council, $10.0 million
- Federal Highway Administration, $6.9 million
- Federal Transportation Administration Grant, $500,000

State

- Minnesota State Appropriations Bonds, $17.2 million
- Minnesota Ballpark Authority, $1.5 million
- Mississippi Watershed Management Organization, $500,000

Local

- City of Minneapolis, $500,000
- Hennepin County, $21.4 million
- Hennepin County Regional Railroad Authority, $10.8 million

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UTA: 900 South Station

Sponsor	Technology	Capital Cost	Opening Year	Funding
Utah Transit Authority	Light Rail	$1.2 million	2005	Tax increment financing, local agency funding

The 900 South TRAX station was proposed as part of the Utah Transit Authority's (UTA) original plan for the North/South TRAX line, completed in 1999. When the North/South TRAX alignment and station locations were initially approved by Salt Lake City, UTA agreed to place a future station at the location when area demographics would support it. As a result, the tracks were "flared" in this corridor to accommodate a future station without the need for major track reconstruction.

The effort to build the station was the result of an analysis by UTA which indicated that changes in the area's demographics, associated developments, and increased community support had created a favorable environment for the proposed station. The station was built to serve low-income housing developments and spur redevelopment and Transit-Oriented Development (TOD) in the area. The 900 South TRAX station was the first infill station constructed on the existing TRAX system.

As the first TRAX station to be built in a residential neighborhood, the 900 South TRAX station provided a unique opportunity to encourage TOD throughout the project area. Several residential developments were built in anticipation of the station's construction and several others were planned after the station's opening in 2005.

The Salt Lake City Redevelopment Agency (RDA) used tax increment financing from the West Temple project area, one of seven project areas throughout Salt Lake City, to fund the $1.2 million capital cost of the 900 South TRAX station. In return, UTA provided construction management services and agreed to operate and maintain the station after completion.

UTA: Sandy Expo Station

Sponsor	Technology	Capital Cost	Opening Year	Funding
Utah Transit Authority	Light Rail	$2.1 million	2006	Federal earmark, local hotel tax

Each year, more than 4 million people visit the Expo Center and Jordan Commons. In addition, the Real Salt Lake Major League Soccer stadium is expected to bring another 1 million people to the area. The Sandy Expo station is nearly twice as large as the 900 South station (profiled above), and has a split platform instead of the typical center platform.

80 percent of the cost of the Sandy Expo station was earmarked as part of the 2005 federal transportation bill, the Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU). Salt Lake County contributed the other 20 percent, in part by reallocating hotel tax revenues.

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BART: West Dublin/Pleasanton Station

Sponsor	Technology	Capital Cost	Opening Year	Funding
Bay Area Rapid Transit	Heavy Rail	$106.0 million	2011	Developer contributions, state grant, local agency funding

West Dublin/Pleasanton San Francisco Bay Area Rapid Transit (BART) station is in the median of I-580, near the freeway's junction with I-680. It is the first infill station for the system and fills what had been a 10-mile gap between Castro Valley and Dublin/Pleasanton stations in the far southeast section of the region.

In November 1999, the BART Board of Directors approved a public/private venture between BART and Orix Real Estate Equities, Inc. and Jones Lang LaSalle to leverage private development on BART land to build the West Dublin/Pleasanton station.

The station, with a total cost of $106.0 million, was expected to attract 4,300 daily users. The following funding sources were identified:

- $20.0 million of the construction funds were sponsored by the development company, Jones Lang LaSalle, who planned to construct 210 housing units, office space, and a hotel within walking distance of the station
- $4.0 million through a grant from the Tri-Valley Transportation Council
- $6.9 million programmed by the Alameda County Congestion Management Agency for construction of the public improvements
- $20.0 million developer contribution

BART issued bonds for construction of the station and ancillary facilities, including the BART parking garages. Repayment of the bonds will come from a combination of private funds including a long-term lease of BART's property, contributions from the cities of Dublin and Pleasanton from tax revenues generated by private development on BART land, and BART fare and parking revenues generated by the station.

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MBTA: Assembly Square Station

Sponsor	Technology	Capital Cost	Opening Year	Funding
Massachusetts Bay Transportation Authority	Heavy Rail	$53.7 million	2014	Developer contributions, New Starts grant, state DOT funding, MPO funding, tax increment financing

The Massachusetts Bay Transportation Authority's (MBTA) Orange Line is on its way to receiving its 20th station. The MBTA board approved an agreement with a developer, Federal Realty Investment Trust, which will enable construction of a station at Somerville's Assembly Square, roughly halfway between existing stops at Sullivan Square in Charlestown and Wellington in Medford. MBTA estimates that 4,800 to 5,400 riders will board daily at the new stop, including 1,400 to 2,000 who would otherwise have driven a vehicle. The agreement gives the Authority the power to build the station and entrances and realign track. The project is expected to cost $53.7 million and is scheduled to open in fall of 2014.

The station is seen as a key selling point in the redevelopment of the windswept Assembly Square into a riverfront complex on the Mystic River with 2,100 residential units, 1.15 million square feet of retail space, and 1.75 million square feet of office space.

The funding for this project will include the following sources:

- $15.0 million developer contribution
- $25.0 million in earmarked federal New Starts, but Congress has released only $1.0 million to date. To prevent funding from stalling the project, the state Department of Transportation and the Boston Region Metropolitan Planning Organization are redirecting federal highway funds.
- $25.0 million recently approved by the city of Somerville in District Improvement Financing to keep the development moving forward

MBTA: Boston Landing Station

Sponsor	Technology	Capital Cost	Opening Year	Funding
Massachusetts Bay Transportation Authority	Commuter Rail	$16.0 million	2014	Developer contributions

Boston Landing is a planned commuter rail station on MBTA's Framingham/Worcester Line. The station will be located in Brighton, Massachusetts on Everett Street as part of a planned $500.0 million, 1.45 million square foot development. The development will include the headquarters of New Balance, an athletic apparel company. In addition, the 14 acre development will include a sports complex, hotel, up to three office buildings, retail, restaurants, and a recreation space. New Balance created a limited liability company, Boston Landing, LLC, for the purpose of leading the area's development. Boston Landing Station is expected to cost $14.0 to $16.0 million and is scheduled to open in 2014. The development is scheduled to open in phases from 2015 to 2017.

In May 2013, the MBTA board approved an agreement with Boston Landing, LLC, which will enable construction of the station. Under the agreement, New Balance will pay 100 percent of the capital and operating costs of the station for the first 10 years after the station is opened. Boston Landing, LLC is responsible for design and construction with the oversight of MBTA and state officials. After 10 years of operations, New Balance will reassess O&M cost payments.

New Balance did not purchase naming rights and name the station accordingly, as is common for this type of private investment. The Boston Landing Station will also not be exclusively used by New Balance employees. However, New Balance identified a benefit to building the commuter rail station that met or exceeded providing between $14.0 to $16.0 million in capital costs and additional operating costs for a period of 10 years. This is the third time in MBTA's recent history that private companies have made a significant contribution to help build and renovate public transit stations, one being the Assembly Square Station profiled above.

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WMATA: NoMa – Gallaudet Station

Sponsor	Technology	Capital Cost	Opening Year	Funding
District of Columbia/Washington Metropolitan Area Transit Authority	Heavy Rail	$104.0 million	2004	Federal earmark, city funding (property, income, and sales tax), and special assessment

The New York Avenue-Florida Avenue-Gallaudet University station, since renamed NoMa – Gallaudet, was the first infill station constructed on the Washington Metropolitan Area Transit Authority (WMATA) Metrorail system. The area immediately surrounding the infill station previously consisted of railroad yards, warehouses, and other industrial uses. Initially, there was little reason place a station in the area. Later, the station was proposed as part of an economic development strategy for the area. A multi-party agreement brought together the District of Columbia municipal government, WMATA, and area landowners, who formed a representative group. The District of Columbia entered into an agreement with the New York Avenue Metro Special Assessment District Subcommittee in June 1999. The station opened in November 2004.

The major key to the success of the project was the combination of funding from federal, local, and private sector sources; all three were necessary to fund the project. In addition, several major property owners agreed to donate land needed for portions of the station, reducing the project cost. The total project cost of $104.0 million was funded by the following sources:

- $25.0 million through a federal earmark
- $54.0 million from the District of Columbia capital budget, which is primarily funded by revenues from property, income, and sales taxes
- $25.0 million was derived from a creative solution proposed by the area landowners: a dedicated tax district for the project (special assessment).

This special assessment district was based on the landowners' perception that the land values around the station would increase as a result of the station. Therefore, the property owners invested in the station with the understanding that the new station would increase the value of their land. The landowners agreed to a pay a special assessment over the period of 30 years to raise the funds. This special assessment would be an additional charge on top of usual property taxes that the District would collect along with the property taxes. The District of Columbia issued bonds to cover capital costs. The bonds are being repaid with the funds collected through the special assessment district.

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WMATA: Potomac Yard Station

Sponsor	Technology	Capital Cost	Opening Year	Funding
City of Alexandria/Washington Metropolitan Area Transit Authority	Heavy Rail	TBD	2016	Developer contributions, special assessments

In the mid 1980s, the City of Alexandria, Virginia began a comprehensive planning effort to support the redevelopment of Potomac Yard – a 295-acre former rail yard on the banks of the Potomac River. In 2010, the largest landowner at Potomac Yard approached the City with a request to redevelop a "big-box" retail shopping center into 7.5 million square feet of transit-oriented residential, retail, hotel, and office uses. Prepared with a clear policy tying, high-density development to fund transit, the City was well-positioned to negotiate for funding from the developer. The City of Alexandria approved a rezoning plan in return for the developer's equity contribution of $10 per square foot for all development within ¼-mile of the Metrorail station. Based on 4.9 million square feet of gross floor area this translates into a cumulative amount of $49.0 million in 2010 dollars – one of the largest direct equity investments in a U.S. transit station to date.

At the outset of its deliberations, the City's policymakers reiterated that the existing tax base could not be tapped to pay for the new station. Given this guiding principle, the City committed to enacting two special assessment districts in the study area: a high-density redevelopment district where a special assessment of $0.20 per $100.00 of assessed value would be levied on commercial properties; and a low-density tax district where a special assessment of $0.10 per $100.00 of assessed value would be levied on all properties.

The City committed to issuing $275.0 million in bonds to finance the costs associated with the station, most likely backed by the full faith and credit of the City of Alexandria to obtain the most favorable financing rates. The revenue stream is generated by the net new taxes generated by the development. That is, all tax revenue above the cost of providing services to the development is used for debt service.

Linking the private sector to the development of the Metrorail station substantially reduced the amount of City funds required for the project. However, the City recognized that once it issued bonds it would be obligated to service the debt or risk adversely impacting its bond ratings. To reduce this risk during the development ramp up period, the City's agreement with the North Potomac Yard landowner also provides for a cumulative financing shortfall guarantee of $32.0 million that will be funded by the developer.

The financial plan for a new Metrorail station at Potomac Yard relies on value capture, an approach that uses increased property values and other economic benefits produced by a new transit station. The plan also demonstrates that unlocking increased values around transit stations can, under the right conditions, lead to significant upfront developer contributions for station construction.

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Appendix B: Other Funding Options

This appendix summarizes other sources considered as funding options for the Cortex Station project. As described below, these funding sources were screened out on the basis of general feasibility, project eligibility, and amount of available funding.

Section 5307 Urbanized Area Formula Program

Several federal grant programs, including the Section 5307 Urbanized Area Formula program, provide federal funds to transit capital projects on a formula basis. In the St. Louis region, however, these funds are generally committed to existing projects and are not available to support transit improvements in the Corridor.

New Starts/Small Starts Program

New Starts/Small Starts is a discretionary grant program administered by the Federal Transit Administration (FTA) that provides federal capital grants to major transit capital investments. The Small Starts program provides grants of up to $75.0 million to eligible projects with a capital cost of less than $250.0 million, while New Starts provides support for projects greater than $250.0 million in cost or seeking more than $75.0 million in federal grants. There is significant competition for these funds, and projects must meet stringent eligibility criteria. In general, New Starts and Small Starts program requirements preclude funding for transit centers and infill stations as they do not meet FTA's expectations for new fixed guideway systems or extensions of an existing system.

Missouri State Funding

The Missouri Department of Transportation (MoDOT) allocates several different pots of federal transit funding received by the state, aimed primarily at transit providers in rural and non-urban areas and to programs assisting the mobility of senior citizens and persons with disabilities. This amount of funding available from this source is limited, and is fully consumed by Metro's existing program.

The state does provide a limited amount of operating assistance to urban public transit agencies. This includes funding from the general revenue fund and/or state transportation fund to defray a portion of the transit operating costs. This amount of funding available from this source is also limited, and is fully consumed by Metro's existing program.

St. Louis Metro Operating Program

According to its fiscal year (FY) 2012 Comprehensive Annual Financial Report, operating revenues for St. Louis Metro consisted primarily of passenger revenue, bus and shelter advertising, real property rental income, and miscellaneous capital project billings. In FY 2012, farebox recovery was 27.5 percent for MetroLink and 20.6 percent for MetroBus. Non-operating revenues consisted of Federal Section 5307 funds, Missouri and Illinois (St. Clair County Transit District) operating assistance, and sales tax revenues from the City of St. Louis and St. Louis County. These sources are fully committed to funding Metro's existing operating program.

Development Impact Fees

When a landowner requests a permit for a land use change (such as a building permit or certificate of occupancy) that places a burden on existing infrastructure, local government or another public agency may require that the landowner pay a Development Impact Fee (DIF) as a condition of issuance. DIFs generally are applied for capital improvements and are not used for ongoing operations and maintenance costs. In addition, DIFs are not typically applied to resolve existing infrastructure deficiencies. This type of value capture mechanism will help generate revenues right away, but is not well-suited for yielding a multi-year cash flow.

Joint Development

Joint Development is a partnership between a public entity and a private developer created to develop certain assets. According to FTA guidance, the development and the property must have a physical and a

functional relationship. Joint Development can occur when an agency owns land that can be leased to the developer for a long period of time. This will enable the developer to build on the land with a low risk of losing the capital investment. In exchange, rents are paid to the agency, creating a revenue stream that can be bonded against to support the development of a transit improvement. Joint Development was applied to finance the Bay Area Rapid Transit (BART) West Dublin/Pleasanton Station. There are limited opportunities to apply joint development at the Cortex Station site.

New Market Tax Credits

The New Markets Tax Credits (NMTC) program was established by Congress in 2000 to spur new or increased investment in operating businesses and real estate projects located in low-income communities. This program permits individual and corporate investors to receive federal tax credits in exchange for their investment in projects that will have a significant impact on areas with economically disadvantaged populations. This program has limited relevance to the development proposed in the Cortex Station area.

EB-5 Visa Program

The EB-5 visa program provides a method of obtaining a green card for foreign nationals who invest money in the United States. To obtain the visa, individuals must invest $1,000,000 (or at least $500,000 in a "Targeted Employment Area" with high unemployment or a rural area), creating or preserving at least 10 jobs for U.S. workers excluding the investor and their immediate family. This type of investment might potentially help fund the capital costs of a transit center or infill station. The St. Louis region—including St. Louis City, St. Louis County, and St. Charles County—won approval from the U.S. State Department in March 2013 to apply the EB-5 visa program to attract investors to the projects in the region. However, the program has reportedly been unsuccessful in other regions, and was therefore ruled out as a potential funding source for Cortex Station.

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