

K-10 Capacity Improvements

Transit Analysis Memo

February 2024



Table of Contents

Contents

1.0 Introduction	1
2.0 Existing Conditions.....	1
2.1 Existing Plans Review	2
2.2 Existing Service Providers.....	8
2.3 Case Studies	15
3.0 Needs Assessment	18
3.1 Demand.....	19
3.2 Unmet Needs.....	22
3.3 Conclusions and Recommendations	24
4.0 Alternatives Analysis	25
4.1 Tier 1 Transit Analysis and Screening	25
4.2 Tier 1 Evaluation.....	26
4.3 Tier 2 Evaluation.....	29
4.4 Conclusions and Recommendations	37

1.0 Introduction

Highway systems must accommodate a number of different mode types, including freight transport, private automobiles, and public transportation systems to enhance access to communities along the corridor. The K-10 corridor, connecting suburban communities of the Kansas City metro area to communities such as Lawrence, De Soto and Eudora, is no exception. As land uses change along the corridor, there is a need to better understand the role of multimodal transportation in and around the corridor and nearby communities. Understanding whether or not public transportation can be used to address future travel demand in the corridor, or if public transportation should play a supporting role to address future demand were key considerations of this study.

The following objectives were established to guide the development of alternative approaches to multimodal transportation in the corridor:

- Service must provide an alternative to single occupant private auto for employees of the Astra Enterprise Park.
- Service must provide transit options for persons without access to autos for work and non-work trips within the study area.
- Service must enhance mobility in the area.
- Service must provide linkages among existing transit services and facilities in the study area.

As part of this study, a high level analysis was conducted on a number of potential multimodal public transportation alternatives for the K-10 corridor. These alternatives were evaluated through two tiers to determine their feasibility. The results of this analysis will determine if multimodal approaches should be part of the larger K-10 Corridor Capacity improvements Project. All **Figures** referenced in this document can be found in **Appendix A**.

2.0 Existing Conditions

Existing plans, service providers, and case studies provided a baseline for the needs assessment and alternatives analysis. These existing conditions helped determine if multimodal public transportation could be utilized in the K-10 corridor.

2.1 Existing Plans Review

Kansas Active Transportation Plan (KDOT 2023)¹

This plan was produced in conjunction with the Kansas Department of Transportation (KDOT) *Long Range Transportation Plan* (LRTP) and the Kansas *Strategic Highway Safety Plan* (SHSP), which identifies the vulnerability of active transportation users and discusses strategies to reduce frequency and severity of crashes involving bike/pedestrian users. An analysis of crash data across the state prompted the production of this plan to guide the creation of policies that reduce crash risk to active transportation users. Active transportation is a term for primarily human-powered modes of transportation such as walking, bikes, scooters, wheelchairs, and includes both motorized and non-motorized modes. The plan's goals are stated as:

- Improve safety by reducing the frequency and severity of crashes.
- Invest in underserved communities and prioritize the needs of populations that rely on active transportation.
- Increase regular use of active transportation.
- Promote active transportation to support health and improve quality of life.
- Normalize active transportation within the overall transportation system.
- Maintain and preserve sources of investment and funding.

Strategies to implement these goals that pertain to the K-10 corridor study include:

- Identify opportunities for long-distance route connections between communities and facilitate the development of side paths, traditional trails, and rail-trail connections.
- Promote micromobility programs that provide equitable access to transportation options.
- Use mode split data for all trip purposes (not just work) to better understand trends in active transportation.
- Promote and support state bicycle routes, trails, scenic & historic byways, and the communities along them.

¹ https://www.ksdot.gov/Assets/wwwksdotorg/KansasATP/documents/Kansas_Active_Transportation_Plan.pdf

Transportation 2050 (Lawrence-Douglas County Metropolitan Planning Organization (MPO), 2023)²

This plan identifies future multimodal transportation needs, goals, and strategies within the Lawrence-Douglas County region. The specific objectives relevant to the K-10 corridor study include:

- Provide a transportation system that supports multimodal options that are affordable, sustainable, efficient, safe, and easy to use.
- Elevate equity in transportation planning and investments by prioritizing the fair and just distribution of benefits and burdens related to transportation and by ensuring traditionally underrepresented communities participate in decision making.
- Increase the percentage of trips made using active, shared, and low carbon transportation modes to reduce vehicle miles traveled.
- Strive for equitable outcomes when maintaining existing infrastructure and designing new facilities by considering mobility needs for all ages and abilities.

Strategies to achieve these and the other objectives include a variety of transit related strategies that include:

- Expanding bike/pedestrian routes regionally
- Improve/expand multimodal transit options with a focus on equity and transit disadvantaged communities.
- Improvement of transit amenities and expansion of park and rides to connect modes.
- Addressing barriers to access
- Improvement of wayfinding infrastructure
- Exploration of new technologies
- Maintain considerations of safety and sustainability in the planning processes

The plan recommends several multimodal transit options such as vanpool, employee shuttle programs, active transportation, and car share. The City of Lawrence is in the process of implementing a new transit transfer center at Bob Billings Parkway and Crestline Drive, with seven local routes and two regional routes now being routed to this location instead of the downtown location. Phase 2 of the plan includes a Sunday Microtransit service as well as a system-wide fare free service. Future projects planned

² <https://assets.lawrenceks.org/mpo/T2050/T2050.pdf>

along the project corridor are minimal but include the expansion of K-10 to six lanes from Lawrence to the Johnson County line.

Comprehensive Plan for Unincorporated Douglas County 2040 (Lawrence-Douglas County MPO 2023)³

This plan dictates visions and goals for Douglas County, with an emphasis on maintaining the separation between urban and rural areas. Transportation goals for the region align with the goals laid out in other plans, specifically enhancing the multimodal network and connectivity with a special emphasis on transit dependent and senior users. They also specify the importance of safety, sustainability, and technological advancement within the transit network.

L RTP 2020-2045 (KDOT 2021)⁴

KDOT's *L RTP* pledges a commitment to improving safety and technology, promotion of alternative fuels, and continued development of the multimodal transportation network across the state.

KDOT supports local active transportation efforts through project coordination, funding, and technical assistance, to help reduce gaps in state-owned transportation facilities that pose a negative effect on active transportation efforts. One of these efforts is the establishment of funding through the Eisenhower Legacy Transportation Program (IKE) that goes towards paying for low-cost improvement measures for active transportation crossings at uncontrolled highway intersections. Kansas houses a robust bicycle network across the state that connects to various national routes including United States Bicycle Routes 66 and 76, the American Discovery Trail, the Lewis & Clark Trail, and the TransAmerica Trail.

The *L RTP* states that the state is divided into Coordinated Transit Districts (CTD), with the project area being in the Urban Corridor (CTD-1). The plan states that 145 transit and paratransit operators operate within 82 counties in the state, as of 2019, with the largest number of trips taking place in the four largest metropolitan cities. Kansas City and Lawrence are two of these cities and are located on either end of the study area.

Comprehensive Plan (City of Eudora 2020)⁵

The City of Eudora is located east of the City of Lawrence, on the north side of the K-10 corridor. During public outreach, Eudora residents expressed that bike/pedestrian and transit facilities are lacking and/or need improvement. The plan highlights several sidewalk priority areas within the city. Specific to this study is the sidewalk connecting to and crossing the K-10 corridor at Church Street, marked as a priority in the plan. Similarly, an expansion of the City's bike network will follow this same sidewalk

³ <https://assets.lawrenceks.org/pds/planning/plan-2040/Plan-2040.pdf>

⁴ https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burTransPlan/Documents/KDOT_LRTP.pdf

⁵ https://www.cityofeudoraks.gov/DocumentCenter/View/1508/Eudora-Comprehensive-Plan_w-Appendix_2020-12-19?bidid=

connection at Church Street and cross the corridor. This bike network expansion will add many other planned bike routes in addition. The City is not currently served by the K-10 Connector route, operated by Johnson County Transit between Lawrence and Overland Park. A short-term goal of the plan is to include a K-10 Connector stop near east Eudora. Conversations should be continued with RideKC (the shared brand identity for the transit systems operating in the Kansas City region) and KDOT regarding service expansion options.

Urban Corridor Coordinated Public Transit – Human Service Transportation Plan- CDT 1 (KDOT 2018)⁶

This plan was developed with the purpose of identifying needs and a framework for local and regional transit agencies to advance mobility in the region. The plan identifies goals and strategies for each county in the region and general timelines for accomplishment. Based on an analysis of demographic data for transit disadvantaged populations (elderly/seniors, poverty populations, transit dependent), Douglas County was ranked as Medium Priority with Shawnee and Johnson, being ranked as High Priority. Douglas County is considered to be a support to its neighbors with a higher priority. The implementation plan for Douglas County identifies key themes for the plan, strategies, and estimated time frames for implementation. Notable strategies include several regional transit initiatives that involve coordination with regional transit providers and with key employment and activity centers.

Smart Moves 3.0 Kansas City Regional Transit Plan (Mid-America Regional Council 2017)⁷

Smart Moves 3.0 is the Kansas City region's 20-year plan for transit and mobility. It builds on a solid foundation of prior planning and prepares the region for greater choices in the rapidly evolving transportation environment.

The Smart Moves 3.0 plan envisions a mobility landscape that includes efficient, high-ridership transit service linked by well-located mobility hubs where riders can transfer from one fixed route to another or connect with mobility services to get where they need to go. This plan also recognizes that efficient transit thrives on density.

The Smart Moves plan does not include service in the K-10 corridor in its specific recommendations. However, the plan does list goals that include the expansion of transit modes, connecting people to goods and services, and maximizing the existing transit system.

Commuter Park & Ride Study (Lawrence-Douglas County MPO 2013)⁸

This study was part of a series of Multimodal Planning Studies conducted by the Lawrence-Douglas County MPO. The goal of the study was to identify potential

⁶ https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burTransPlan/pubtrans/CTD_1_Urban_Corridor.pdf

⁷ <http://www.kcsmartmoves.org/>

⁸ <https://assets.lawrenceks.org/assets/mpo/study/reports/park.pdf>

locations for park and rides within the county. The recommended park and ride locations pertinent to this study are as follows:

- South Lawrence
- Eudora
- Baldwin City
- Additional exploration is needed for a location in east Lawrence.

5 County Regional Transportation Study (KDOT, MARC, Lawrence-Douglas County MPO 2010-2013)

This study was conducted in cooperation with KDOT, The Mid-America Regional Council (MARC), and the Lawrence-Douglas County MPO, to identify multimodal transportation needs and to develop strategies to address these needs.

Phase 1 (2010)⁹

Phase 1 assesses the multimodal transportation needs for the five County study area.

K-10 was identified as a corridor with transportation deficiencies and opportunities. Recommendations that resulted from the completion of Phase 1 include:

- Increase transit-oriented development in the region.
- Create safer and connected pedestrian and bicycle facilities.
- Expand park and ride locations and facilities.
- Expand pedestrian networks to better connect to transit facilities.
- Better serve lower density areas with public transit.
- Provide service that is more competitive to auto travel and are accessible/meet the needs of aging, rural, or transit disadvantaged communities.

Phase 2 (2013)¹⁰

Phase 2 prioritizes the needs identified in Phase 1 and develops strategies to address the needs. Phase 2 established a framework for decision making regarding transit projects and lists out recommended and not recommended

⁹ https://kdotapp.ksdot.gov/5CountyStudy/get_more_info/reports.aspx

¹⁰ https://kdotapp.ksdot.gov/5CountyStudy/get_more_info/reportsPhase2.aspx

improvements along various corridors with time frames and cost estimates. Several transit-oriented strategies were identified along the K-10 corridor:

- Expand operating hours/service for the K-10 Connector Service (2020-2030).
- Construct bicycle path across K-7 on Prairie Star Parkway to connect existing paths (2020-2030).
- Expand park and ride facilities at KTA Lecompton Toll Plaza (2020-2030).
- Construct park and ride facilities near Eudora and De Soto (2020-2030).
- Bicycle/Pedestrian facilities: Consider on all new or reconstructed bridges of K-10 (2020-2030).
- Construct park and ride facilities near US-59 and near E. 1750 Street (2020-2030).

The study also reports that 53% of surveyed residents in the area would choose public transportation if the system in the area was more robust. The survey also reported that there is a greater need/desire for bike/pedestrian infrastructure and for public transportation that will meet the needs of populations that are aging in place.

Kansas Statewide Intercity Bus Study (KDOT 2012)¹¹

This study examined intercity bus service in Kansas, determined whether there were additional needs in the state, and developed recommendations to address those needs. Intercity bus (ICB) service is a unique mode of transportation, able to cover long distances comparable to those of domestic air or rail travel but using a non-exclusive right-of-way: the public highway system. The Federal Transit Administration (FTA) defines ICB as – Regularly scheduled bus service for the general public, using an over-the-road bus, that:

- Operates with limited stops over fixed routes connecting two or more urban areas not in close proximity or connecting one or more rural communities with an urban area not in close proximity.
- Has the capacity for transporting baggage carried by passengers.
- Makes meaningful connections with scheduled intercity bus service to more distant points.

Over-the-road travel gives intercity buses flexibility unavailable to other modes, allowing them to serve more remote, rural destinations. Consequently, intercity buses have the

¹¹<https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burTransPlan/pubtrans/pdf/Kansas%20Intercity%20Bus%20Study%20Final%20Report.pdf>

potential to serve many populations that might not otherwise have long-distance travel options. The study did not include a specific recommendation for the K-10 corridor. Furthermore, transit service in the Johnson County – Lawrence corridor may not meet the FTA definition of intercity bus service because it would not connect nonurbanized areas with the intercity bus network.

K-10 Transportation Study (KDOT 2005)¹²

This study was sponsored by KDOT, MARC, and the Lawrence-Douglas County MPO, to identify needed improvements to the K-10 corridor. In section 6.2 of this report, transit service on the corridor is discussed with a multitude of potential future routes and services. According to this report a potential fixed-route service along the corridor, to be jointly developed by Lawrence Transit and Johnson County Transit, would include stops with supporting park & ride facilities at the following locations:

- KU Edwards Campus
- Johnson County Community College
- K-10/I-435 industrial area
- Woodland Road area
- K-10/K-7 industrial area
- Lexington Avenue in De Soto
- Church Street in Eudora
- KU Lawrence Campus (Student Union)
- Downtown Lawrence (9th/Massachusetts)

This report notes that any form of transit service along the K-10 corridor would require that both Johnson County Transit and Lawrence Transit step up to advocate for such service.

2.2 Existing Service Providers

Intercity Bus Services

Intercity bus services carry passengers long distances between cities or towns. Unlike local transit services, intercity routes do not have frequent stops, and typically have one stop per city/town. Intercity bus services, especially for those in more rural areas, is a more accessible form of long-range travel. A map showing intercity bus terminals and routes can be seen in **Figure A-1** in **Appendix A**.

¹² <https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burTransPlan/pdf/K10/K10FinalReport.pdf>

Greyhound

Greyhound Lines operates the largest intercity bus service in North America, operating approximately 1,700 coaches and serving thousands of destinations across the continent. Their mission statement is: “Greyhound is dedicated to giving millions of customers a safe, comfortable, affordable, and convenient way to travel”. Near the K-10 corridor study area, Greyhound has a stop at the Lawrence Station located Downtown at Vermont Street & W 7th Street. Tickets and passes cannot be purchased at the station and must be purchased online. Popular destinations from this stop, according to Greyhound’s website, include:¹³

- Kansas City, KS
- Kansas City, MO
- Des Moines, IA
- Fort Dodge, IA
- Columbia, MO

Greyhound also has a stop in Kansas City, Kansas located at the 47th Street Transit Center. Tickets are not sold at this station and must be purchased online. Popular destinations from this station include:¹⁴

- Oklahoma City, OK
- St. Louis, MO
- Russellville, MO
- Phoenix, AZ
- Shreveport, LA
- Dallas, TX

Greyhound has a third stop located in downtown Kansas City, Missouri at the 1101 Troost Avenue bus station. Tickets can be purchased at kiosks in-person at this station. Popular destinations from this station include:¹⁵

- St. Louis, MO
- Springfield, MO
- Dallas, TX

¹³ Greyhound website, Lawrence bus station, <https://www.greyhound.com/en-us/bus-station-600270>

¹⁴ Greyhound website, Kansas City, KS station, <https://www.greyhound.com/en-us/bus-station-600259>

¹⁵ Greyhound website, Kansas City, MO station, <https://www.greyhound.com/en-us/bus-station-590546>

- Houston, TX
- Tulsa, OK
- Lewisville, TX
- Lincoln, Nebraska
- Chicago, Illinois

Jefferson Lines

Jefferson Lines is a regional intercity bus company similar to Greyhound. Their mission statement is: “From our home in America’s heartland, we connect people with places. Our transportation company provides scheduled service and a full range of group travel sources. We earn our customer’s business by understanding what they value and require when they travel with us. Then we provide service that exceeds their expectations”. Jefferson Lines provides travel to 14 states including Kansas, and limited charter services in Minnesota and Montana. They currently have a station in Kansas City, Missouri at the 1101 Troost Avenue bus station, shared with Greyhound. Tickets may be purchased in-person.¹⁶

Other Regional Routes

In 2014, the KDOT Regional Transit Business Model proposed several regional routes to address needs to link local services and inter-regional services. Based on these recommendations, four regional routes have been implemented and are operated by various agencies throughout the State, such as the 81 Connection operated by OCCK between Belleville and Salina. None of these regional routes created based on the KDOT model operate near the K-10 corridor.¹⁷

Fixed-Route Transit Services

Fixed-route transit services include local bus service, express bus services, commuter bus services, and Bus Rapid Transit (BRT) services. These services generally form the core transit service of an agency/city. The fixed-route services operated by the various agencies in the study corridor area can be seen in **Figure A-2**.

Kansas City Area Transportation Authority (KCATA)

The KCATA connects the greater Kansas City region to transit opportunities through several services and is part of the RideKC service umbrella.

The KCATA operates 38 local bus routes that serve Kansas City and the greater metro area. These services include three MAX high frequency bus routes in addition to the local routes. Most local routes operate from approximately 5:00 AM through midnight,

¹⁶ Jefferson Lines Website, <https://www.jeffersonlines.com/about-jefferson-lines/mission-and-history/>

¹⁷ KDOT CTD 1 Coordinated Public Transportation Plan, KDOT, https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burTransPlan/pubtrans/CTD_1_Urban_Corridor.pdf

Monday through Friday, with a frequency of 30 minutes to an hour. The MAX high frequency routes share the same service span as local service, but at a frequency of 20 minutes.¹⁸ In 2021 the KCATA provided 9,468,338 unlinked passenger trips, most of these trips (9,138,447, or 96.5% of all trips) being provided by either their local or MAX bus services. As part of the RideKC service umbrella, these bus services are fare free as of December 2023. KCATA revenue comes from a mix of local, state, and federal funding.

Johnson County Transit (JCT)

JCT provides public transit services to Johnson County, KS.

JCT operates 13 local bus routes and falls under the RideKC service umbrella. These services typically operate from 5:00 AM through 10 PM Monday through Friday. Most of these routes have an hourly frequency.¹⁹ The K-10 Connector that runs along the K-10 corridor is operated by JCT. JCT provided 232,561 unlinked passenger trips in 2021. Approximately 62.5% of all trips were served using their fixed-route bus service. As part of RideKC, fixed route service is fare free as of December 2023.

Lawrence Transit

Lawrence Transit is provided by the City of Lawrence and local bus service serves the City and the University of Kansas. Their stated mission is “Together, the City of Lawrence and the University of Kansas will provide safe, affordable, reliable, and responsive public transportation services to enhance the social, economic, and environmental well-being of the community”.²⁰

Lawrence Transit operates 19 routes providing access throughout the City and University. These routes operate from 6:00 AM to 8:00 PM Monday through Friday, with a few routes operating on Saturdays. Most of the service has a frequency of 30 or 60 minutes.²¹ Most routes stop service over the summer (May – Mid August), following the University schedule and resume services at the beginning of the Fall semester.²² In 2021, Lawrence Transit provided 639,527 unlinked passenger trips on their services, with 90.9% of all trips utilizing fixed-route services. As of January 1, 2023, Lawrence Transit has transitioned to a fare free service.

Microtransit

Microtransit is a technology-enabled demand response service that fills a niche between traditional fixed-route transit services and ride hailing services. Microtransit offers flexible scheduling of vehicles (which can be buses, vans, sedans, etc.) to meet the

¹⁸ RideKC Routes, <https://ridekc.org/routes>

¹⁹ RideKC Routes, <https://ridekc.org/routes/category/johnson-county>

²⁰ Lawrence Transit Website, <https://lawrencetransit.org/routes/>

²¹ Lawrence Transit website, Route redesign Study, <https://lawrencetransit.org/wp-content/uploads/2022/05/Task-1-Market-Analysis.pdf>

²² Lawrence Transit website, Service calendar, <https://lawrencetransit.org/service-calendar/>

demand of riders. These services are used to extend/enhance the efficiency and accessibility of nearby local transit services. A map of microtransit services nearby the K-10 corridor study area can be seen in **Figure A-3**.

Johnson County Microtransit

JCT provides a microtransit service that covers an approximately 180 square mile segment of Johnson County along I-35. This service area extends from Mission and Shawnee in the North to Edgerton and Gardner in the south. The service is split into a North and South zone, with the two zones containing an overlapping area (this can be seen in **Figure A-3** as the darker pink area). The service operates from 6:00 AM to 8:00 PM seven days a week. Fares were \$3 for a trip within a zone, or \$5 for trips that cross zones or go to either Ward Parkway or the Country Club Plaza.²³ Payments can be made on the RideKC Microtransit app or with cash in the vehicle. As of January 1, 2024, fares for the microtransit service are \$5 for the first five miles, and \$2 per each additional mile.²⁴

On-Demand, Demand-Response, and Paratransit Services

On-demand, Demand-Response, and paratransit services are similar transit services provided by cities and agencies where a vehicle will pick up passengers within a specific service area. These services can be reserved in advance or they can be requested for immediate service. These services can be public or private and only cater to specific clientele such as seniors or disabled persons associated with a specific residential facility or care provider.

RideKC Freedom

RideKC Freedom is the KCATA's paratransit service that provides transit service to qualifying seniors, persons with a disability, and low-income riders. Service is provided throughout Johnson and Wyandotte Counties in Kansas, and the Cities of Kansas City and Independence in Missouri. RideKC Freedom is split into two services: RideKC Freedom, and RideKC Freedom On-demand. **Table 1** showcases the differences between the two services.²⁵

²³ Johnson County Microtransit, RideKC, <https://ridekc.org/assets/uploads/route-schedules/499swk.pdf>

²⁴ Fare Increase for Johnson County Microtransit, Johnson County Government, <https://www.jocogov.org/newsroom/fare-increase-johnson-county-micro-transit>

²⁵ RideKC Freedom On-Demand, RideKC, <https://ridekc.org/mobility-services/ridekc-freedom-ondemand#map>

Table 1: RideKC Freedom Services

Freedom On-Demand	Freedom
No advance reservations required	Schedule at least 24-hours in advance
Curb-to-curb service	Door-to-door service
Booking a trip: Use app or call (816) 842-9070	Booking a trip: Call (816) 842-9070
Pay with cash, credit/debit, or use the mobile app	Pay cash
\$5 for the first mile, \$2 per mile after	ADA \$3 per trip Non-ADA cost based on total miles traveled.
Up to 60 subsidized one-way trips per month	Unlimited daily trips
Book a trip for friend or family members	Book a trip for friend or family members

RideKC Vanpool

The RideKC vanpool service has partnered with Enterprise to bring a vanpool service to the Kansas City area, available in the Counties of Jackson, Johnson, Wyandotte, Clay, Cass, Platte, and Leavenworth. Interested riders can sign up online, detailing where their daily commute starts and originates, and if there are any matches for a vanpool in the area you will be added to that group. Members of this vanpool service pay a monthly fee via an online payment app to access the service.²⁶

Lawrence Transit On-Demand

Lawrence Transit On-Demand is a shared ride service that operates within the city limits of Lawrence. The service provides door-to-door service that operates from 8:00 PM to 6:00 AM Monday through Friday, and from 8:00 PM to midnight on Saturday. As of January 1, 2024, the service will extend Saturday hours to 6:00 AM, and introduce Sunday services from 8:00 PM to midnight. Trips can be reserved up to five days in advance and can be booked using the mobile app. Reservations can be made at any time. As part of the Lawrence Transit system, this service is fare free as of 2023.²⁷

Private Service Providers

There are several private companies and agencies that provide on-demand, demand-response, or paratransit services near the K-10 corridor study area. These services, and the areas that they operate within, can be found in **Table 2**.

²⁶ RideKC Vanpool, RideKC, <https://ridekc.org/rider-guide/vanpool>

²⁷ Lawrence Transit On-Demand, Lawrence Transit, <https://lawrencetransit.org/on-demand/>

Table 2: Private Service Providers

Organization	Clientele	Service Area	Hours of Operation	Fares	Funding	Notes
Bert Nash Community Mental Health Center ²⁸	Elderly, disabled	Douglas County	9:00 AM to 5:00 PM seven days per week	Free	Section 5310	Bert Nash clients only
Cottonwood Inc. ²⁹	Disabled	Douglas County	7:00 AM to 10:00 PM Monday - Friday	Free	Section 5310	
Independence Inc. ³⁰	General public	Douglas County	8:00 AM to 5:00 PM Monday – Friday	In-Town - \$3 Douglas County - \$5 Out-of-Town Medical - \$30	N/A	
Presbyterian Manors Inc. ³¹	Elderly	City of Lawrence	8:30 AM to 4:00 PM Monday – Friday	Free	Section 5310	Presbyterian Manor clients only
Senior Resource Center for Douglas County ³²	Elderly	Douglas County	7:00 AM to 3:30 PM Monday – Friday	Within Lawrence - \$4 Rural – Lawrence - \$6	Section 5310	

Ride-Hailing Companies

Ride-hailing companies offer similar services to taxis to pick up riders. Riders request a pick-up online using a mobile app or website that matches them with a nearby driver that accepts the request. Unlike taxis, these vehicles cannot legally be hailed from the street. Uber and Lyft provide services within the K-10 corridor study area.

²⁸ Bert Nash Community Mental Health Center, KU Transit Center, <https://kutc.ku.edu/bert-nash-community-mental-health-center>

²⁹ Cottonwood Inc., KU Transit Center, <https://kutc.ku.edu/cottonwood-inc>

³⁰ Independence Inc. General Public Transportation, Independence Inc, <https://independenceinc.org/transportation/>

³¹ Presbyterian Manor, KU Transit Center, <https://kutc.ku.edu/presbyterian-manor-lawrence>

³² Senior Resource Center for Douglas County, KU Transit Center, <https://kutc.ku.edu/senior-resource-center-douglas-county-inc-formerly-douglas-county-senior-services-inc>

Rail

Rail Owners

The two main rail owners near the K-10 project study area are BNSF and Union Pacific (UP). UP owns most rail north of the Kansas River and BNSF owns most track south of the river. In addition, an abandoned US Army rail spur, currently severed at Commerce Drive in De Soto, leads directly to the Astra Enterprise Park, potentially connecting the area directly to the freight rail network. These rail networks can be seen in **Figure A-4**.

Amtrak

Amtrak operates their services in the area on BNSF-owned rail. They service one station within the City of Lawrence and are open 24 hours a day seven days a week. Tickets and passes cannot be purchased at the station and must be purchased online. This station offers service to the Southwest Chief train and takes approximately one hour to get to Kansas City Union Station heading East, or 40 minutes to get to Topeka heading West.³³

2.3 Case Studies

The following case studies provide KDOT with examples of intercity and regional transit service from other states. Three case studies were selected to offer lessons learned and best practices regarding transit service design in the K-10 corridor study area.

Table 3 provides a high-level overview of each case study.

Table 3: Case Studies

Type	Existing Service	Case Study		
	K -10	I-25	I-35	I-380
Corridor	Kansas	Colorado	Oklahoma	Iowa
State	Kansas	Colorado	Oklahoma	Iowa
Cities	Overland Park to Lawrence	Denver to Colorado Springs	Oklahoma City to Norman	Cedar Rapids to Iowa City
Service Name	K-10 Connector	Bustang South Line	Norman Express – Route 024	380 Express
Service Type	Commuter Bus	Commuter Bus	Commuter Bus	Commuter Bus
Operator	Johnson County Transit, Transdev	CDOT, Ace Transportation	EMBARK, Oklahoma City	East Central Iowa COG, Windstar Lines
Fare	Fare-Free	\$5.00-\$12.00	\$3.00	\$3.50
Trips per Day	M-TH: 21 EB, 22 WB Friday: 19 EB/WB	8	9	22
Operating Days	Monday - Friday	Seven days per week	Monday - Friday	Monday – Friday
Number of Stops	4	10	9	8

³³ Lawrence, Kansas, Amtrak Website, <https://www.amtrak.com/stations/lrc>

Colorado – I-25 Commuter Bus

The Colorado Department of Transportation (CDOT) began an intercity bus program in 2015 initially with services connecting Denver to Colorado Springs, Fort Collins and Glenwood Springs. The program, known as Bustang, has since been expanded to over 20 routes. In Fiscal Year (FY) 2022, Bustang carried approximately 28,000 riders or on average approximately 2,300 riders monthly. Ridership increased in FY 2023 with approximately 40,000 riders annual and approximately 3,300 riders monthly.

CDOT Bustang administers and funds the program, no local funding is used. CDOT initiated the interregional transit program and collaborates with municipalities along the routes to provide input on local stops and connections with other transit. In FY 2023 Bustang had operating costs of approximately \$1.8 million and a monthly average of \$154,000. For the case study, the focus was on the I-25 corridor between Denver and Colorado Springs, the Bustang south line.

CDOT contracts with a private contractor for operations although CDOT owns the buses, a fleet of 29 over the road coaches with many passenger amenities. The program has been very popular and is regarded as successful. The strategy is to provide an attractive high-level service to compete with personal vehicle travel. The service operates with limited stops along the route and with eight trips southbound and northbound each day. The service operates on weekends with a reduced schedule.

The Bustang fare is based on distance traveled, with a single trip ranging from \$5 to \$12. CDOT has plans to expand the program and the fleet to 50 buses as funding permits.

Oklahoma – I-35 Commuter Bus

In Oklahoma, the I-35 corridor is served by a commuter bus service (Norman Express Route 024³⁴) between downtown Oklahoma City, the University of Oklahoma's Medical Center, the State Capitol, and the City of Norman. The Norman Express is funded and operated by Embark, Oklahoma City's transit agency. No funding is received from the state or Norman.

The Norman Express operates nine round trips per day with somewhat irregular frequencies between 5:30 a.m. and 7:16 p.m. The route does not operate on weekends. The route averages 83 passengers per weekday and charges a single trip fare of \$3.00 but also offers a variety of weekly, daily, and monthly passes. EMBARK owns and operates one transit style bus for the Norman Express. These buses do not have the same amenities as other regional bus services (wi-fi, restrooms etc.) and often does not provide competitive commute times as compared to a passenger vehicle.

In December 2023, the Norman Express underwent changes to its route. The route was simplified in Oklahoma City and remained unchanged in Norman. This simplified

³⁴ <https://embarkok.com/use/schedules>

alignment focuses on providing service to the University of Oklahoma Health Center and the Downtown Oklahoma City Transit Center. The changes provide more direct service to the highest ridership destinations along the route.

Iowa – I-380 Commuter Bus

The Iowa Department of Transportation (Iowa DOT) Public Transit Bureau administers federal and state transit grants and provides technical assistance to Iowa's 19 urban public transit systems and 16 regional public transit systems.

In Iowa, the I-380 corridor is served by a commuter bus service (380Express³⁵) that connects Cedar Rapids to Iowa City. The 380Express is managed by Corridor Rides (Corridor Rides is administered by the East Central Iowa Council of Governments (ECICOG)) and operated by Windstar Lines, Inc. (Windstar). The 380Express was originally a traffic mitigation measure to relieve congestion along the I-380 corridor during reconstruction beginning in 2018. The service was championed by a state legislator which was key to initiating the service. While reconstruction is mainly complete, the service has been so successful that Iowa DOT extended the contract with the bus operator Windstar until 2026. Instrumental in the program's success was Iowa DOT helping ECICOG navigate the various jurisdictional and agency boundaries along the route. The service focuses on commuters to the University of Iowa Medical Center but is open to the public which strengthens ridership.

The service is fully funded through Iowa DOT state highway funds, has an operating cost of approximately \$1.5 million per year, and earns approximately \$250,000 in revenue from passenger fares. Iowa DOT contributes some of the success of the service to high quality bus service that draws riders. The 380Express utilizes charter buses that provide Wi-Fi, comfortable seats, and access to a restroom.

The service operates at a high level of service with 22 trips per day in either direction. The 380Express operates at 30-minute headways during peak hours and one-hour headways at off-peak, Monday through Friday. Over the road coaches with passenger amenities such as reclining seats, luggage racks and Wi-Fi add to the attractiveness of the service, a key to its success. The route charges a single trip fare of \$3.50, but also offers monthly passes for \$125. As of 2023, the 380Express had an average of 305 riders per day, surpassing ridership prior to 2020.

Additionally, a vanpool program is available through Corridor Rides. The vanpool program is operated by Enterprise. In FY 2023 the program had approximately 19,000 riders. The 380Express is not considered "intercity" and is not eligible for Federal Transportation Administration (FTA) 5311 funding. To be eligible a service must provide a connection between nonurbanized areas. There is no dedicated funding for the 380Express.

³⁵ <https://www.380express.com/schedule.php>

2.3.1 Lessons Learned

After reviewing peer cities interregional commuter transit services there are several lessons learned that can be used in the assessment of transit service in the K-10 Corridor.

- Interregional services have been successful, demonstrating there is a need for these services to augment the transportation system. While ridership is modest compared to intracity transit, the services do provide both a means for transportation among individuals without access to private automobiles and an option to private automobile travel for individuals with auto access.
- A recurring theme was the importance of fast, frequent, and high-quality service to draw sustainable ridership. Amenities such as Wi-Fi, comfortable seats, and access to a restroom can help make the service more enticing than driving in a personal vehicle. A commuter service needs to operate quickly and frequently. The service needs to be competitive (speed, price, etc.) compared to the passenger vehicle.
- State involvement is an important factor for success. Interregional services by their nature require coordination among multiple agencies. For example, in Iowa, the state DOT helped navigate the complicated jurisdictional and agency boundaries. Colorado is an example of a successful statewide interregional transit program that was initiated by CDOT to address transportation objectives beyond local transit jurisdictions.
- State funding can be the key to a successful venture that addresses limitations of local support for interjurisdictional transit service.
- Another key theme was the need for a strong champion for a service and to ensure that there is a strong existing ridership pool to support the service. Programs need to have a strong champion who will advocate for intercity service.
- Commuter service needs to serve a larger population than just one employer, which will help ridership. All three services in the case studies are available to the public.

3.0 Needs Assessment

A transit need assessment was conducted to better understand the transportation needs of the populations within the K-10 corridor study area. The transit needs assessment determined if there is a significant market along the K-10 corridor that can be supported by transit. It identified if residents along the K-10 corridor have any unmet transit needs and if so, identify what type of transit service would be appropriate for the population.

This section discusses the various “indicators of demand” which measure the potential for a transit market. Indicators include the following and are discussed in detail below:

- Population density
- Employment density
- Activity density
- Zero-vehicle household density
- Low-Income household density
- Density of residents under the age of 18 (school-age youth)
- Density of senior residents (65+)

Another important factor in this needs assessment is civil rights and economic justice. Minority populations have historically been transportation disadvantaged and ensuring equitable and supportive levels of service to these individuals can be an important goal for a transit system.

3.1 Demand

The following sections discuss the indicators of demand that supported the transit market assessment. These factors examined the socio-economic situation for the people of an area and act as “indicators” of potential need for transportation services. Analyzing demand provided an accurate understanding of the transit needs of the population by examining who the people are and what life situation they are in. The data used in these analyses comes from MARC (population and employment data, at the Traffic Analysis Zone (TAZ) level) and from the 2021 5-Year American Community Survey (ACS) (All other data, at the census block level).

3.1.1 Indicator of Demand: Population Density

Population density is a key metric in assessing the overall strength of transit markets as most individual’s trips start and end at their homes. **Figures A-5 and A-6** show population density at the TAZ level around the K-10 corridor study area in 2019 and 2050. In 2019, the major population densities were in Lawrence, Eudora, De Soto, Olathe, Lenexa, and Overland Park. In 2050, these population centers remain much the same as 2019, with the greater Kansas City metro area experiencing a general increase in density, particularly in areas of Olathe, Overland Park, and Lenexa. Outside of these areas, density is relatively low. These low-density areas cannot support most forms of public transit except for on-demand services.

3.1.2 Indicator of Demand: Employment Density

Figures A-7 and A-8 show employment density at the TAZ level along the K-10 corridor study area in 2019 and 2050. Employment density denotes where people work as well as important travel destinations. Particularly in areas with high amounts of retail and

service industries, employment density can also be an indicator of places that are likely to have high amounts of economic activity. The largest concentrations of employment are locations in the downtown and university areas of Lawrence, portions of Overland Park and Leawood between I-435 and US-69, Mission, and downtown Olathe. Employment concentrations in 2050 are expected to remain in the same areas, but with additional growth in employment density in northeastern Olathe and eastern Lenexa along I-35 in the area’s industrial parks. Additionally, the Astra Enterprise Park, located south of De Soto, is expected to add approximately 15,000 jobs. While this did not significantly alter the density of the TAZ due to its large area, it is a not insignificant addition to the area.

3.1.3 Indicator of Demand: Activity Density

Figures A-9 and A-10 show a bivariate map of employment and population densities for 2019 and 2050 using the data obtained from MARC. Population is shown in shades of pink, and employment in shades of blue. Areas high in both employment and population are shades of purple. The darker the color, the greater the amount of population or employment in an area. This map shows which areas have a mix of land uses, which can contribute to potential ridership. Transit routes serving these mixed-use areas generally have higher transit ridership than those with single uses. Some corridors that connect between high employment and high population areas can also see a higher potential ridership. Using these maps, the current highest density activity areas along the K-10 corridor are large parts of Lawrence and portions of Olathe, Lenexa, and Overland Park along the I-35 corridor. There are large areas of high employment/low population density in Lenexa around the interchange of I-35 and K-10, and in southwestern Olathe leading to Gardner. Alternatively, there are not high concentrations of high population/low employment density in any specific place, and instead are scattered throughout the area.

As seen in **Figure A-10**, much of the major activity densities in 2050 are the same as in 2019. The major difference for the K-10 corridor study area is a large employment increase at the Astra Enterprise Park (which is expected to employ 15,000 individuals according to the K-10 Land Use report).

3.1.4 Indicator of Demand: Zero-vehicle Households

The availability of personal vehicles is another factor that affects transit demand in an area. While people who do not own personal vehicles do not use transit by default, they have much fewer options than those who do. As a result, transit is an incredibly useful option of reaching areas they need to go. If transit does not present a realistic way of getting to their destination, they will find other means such as cycling, walking, or getting a ride from family/friends. **Figure A-11** shows the density of households with zero vehicles as of 2021. Areas in bright yellow represent a high concentration of households without access to a personal vehicle. Along the K-10 corridor study area, the highest density of households without a personal vehicle are areas around KU in Lawrence (likely due to the student population) and in scattered portions of the greater Kansas

City metro area, but areas outside of these have access to at least one personal vehicle.

3.1.5 Indicator of Demand and Equity: Low-Income Households

Identifying low-income households is an indicator of demand as these populations are less likely to own a personal vehicle or may have difficulty with the cost of owning and maintaining a personal vehicle and may utilize transit in lieu of a personal vehicle. Understanding where low-income populations are located is also a civil rights consideration for transit systems, as transit is often a key lifeline for these individuals to access employment opportunities, healthcare, education, food, and other necessities. Without this lifeline, low-income households are effectively barred from accessing these opportunities. **Figure A-12** shows concentrations of low-income populations along the K-10 corridor as of 2021. Lawrence has many areas of high low-income density around the KU campus (likely due to the student population), and there are also high concentrations of low-income individuals focused around the downtown Olathe area and eastern Lenexa.

3.1.6 Indicator of Demand: Residents under 18

Residents under 18 are also an indicator of transit demand as a large portion of the population under 18 cannot drive and can rely on transit. **Figure A-13** shows the density of residents under the age of 18 as of 2021. The highest concentrations of youth are in portions of central and southeast Olathe, Overland Park, and portions of southwest Lawrence.

3.1.7 Indicator of Demand: Senior Residents

Senior residents (those over the age of 65) are another indicator of demand as they are less likely to own cars than the general population, a potential advantage for transit. **Figure A-14** shows the density of senior residents along the K-10 corridor study area as of 2021. Most senior residents are located in the same areas as those under the age of 18, notably southwest Lawrence, central and southeast Olathe, and Overland Park.

3.1.8 Indicator of Equity: Minority Population

Another indicator of demand is the number of minority (non-white) populations. The objective is to ensure equitable access to transit services for these communities. As shown in **Figure A-15**, areas of dense minority populations along the K-10 corridor as of 2021 include southern Lawrence, central and southeastern Olathe, eastern Lenexa, and central Overland Park.

3.1.9 Indicator of Equity: Environmental Justice Populations

Environmental Justice populations are comprised of both low-income and minority populations. As some of the most vulnerable populations, communities of low-income minority populations have the highest need for transit services. These populations, shown in **Figure A-16** as the areas in dark shades of purple, must be considered when

discussing potential transit services to prevent disproportionately high adverse effects from transportation projects. Large portions of Lawrence, Olathe, and northern Overland Park have high concentrations of these communities.

3.1.10 Indicator of Demand: Commute Flows

Another indicator of transit demand are the flows of commuters in the K-10 corridor study area. By analyzing commuting patterns potential transit routes that can serve residents can be identified. **Table 4** shows the commute flows between Johnson and Douglas Counties according to 2020 5-Year American Community Survey data.

Table 4: Commute flows between Johnson and Douglas Counties.

County of Residence	County of Workplace	# of Commuters
Johnson County	Douglas County	2,779
Douglas County	Johnson County	7,088

As shown, there are approximately three times as many commuters entering Johnson County as there are commuters entering Douglas County. Work trips tend to be more consistently timed and transit may be a useful tool to serve these commuters. While peak time-only routes may be attractive to serve these commuters, it leaves a gap in service during off-peak hours. If a service does not provide off-peak service, commuters will find an alternate way to travel rather than use transit services.

3.2 Unmet Needs

The following section highlights the unmet transit needs of the populations in and surrounding the K-10 corridor that were identified from the transit needs analysis (Section 3.1). Many of the unmet needs identified below do not impact the K-10 Corridor Study Area directly but affect areas adjacent to or nearby the K-10 Corridor Study Area.

3.2.1 Zero-Vehicle Households

Current transit services from the KCATA, Lawrence Transit, and Johnson County Transit provide service to the majority of areas identified as having high densities of zero-vehicle households. The Johnson County Transit microtransit zone covers all zero-vehicle households identified in the analysis for Johnson County. To this end, the needs of this demographic can be seen as being met, although the service is limited in most of these areas.

3.2.2 Low-Income Individuals

The current routes and microtransit zones provide service to most areas identified as having high densities of low-income individuals. There are some areas with higher densities of low-income individuals in eastern Lenexa and Shawnee, just north of the corridor study area, that are not served by transit service. These groups are all covered by the Johnson County microtransit system and the RideKC Freedom paratransit system.

3.2.3 Residents Under 18

Lawrence Transit covers most areas with high densities of under 18 residents in Douglas County. While Johnson County Transit's routes and microtransit zones cover many areas with a high density of residents under 18, there are many areas that remain without transit service. Areas with high densities of residents under 18 without access to public transit include northern Shawnee, west Olathe, southeast Olathe, and areas of Gardner.

3.2.4 Seniors (65+)

Most areas with high densities of senior residents are covered by either Lawrence Transit's and Johnson County Transit's fixed-route or microtransit services. All other areas have access to the RideKC Freedom services that provide paratransit service within Johnson County. These needs are being met, but service levels are limited.

3.2.5 Minority Populations

Most areas identified as having large densities of minority populations are served by either Lawrence Transit or Johnson County Transit services, but there are areas without access to traditional transit services. These areas include northern Shawnee, northern Lenexa, southeast Olathe, and areas of Gardner. While not served by traditional transit services, these populations are still served by RideKC Freedom paratransit and the Johnson County microtransit services. These needs are being met, but service levels are limited.

3.2.6 Environmental Justice Populations

The majority of areas identified as having higher densities of potential environmental justice populations are covered by existing fixed route systems but there are a number of areas that are not currently served by traditional transit services. These areas include Eudora, central Lenexa, portions of central and southern Olathe, and areas of Overland Park south of 135th Street. The option of RideKC Freedom or Johnson County microtransit service remains for these populations. These needs are being met, but service levels are limited.

3.2.7 Astra Enterprise Park

The most significant change affecting transportation demand in the corridor is the Astra Enterprise Park. The Panasonic plant, scheduled to open in 2025, is expected to employ 4,000 and a total of 15,000 jobs are anticipated over time in the entire Astra Enterprise Park. While it is not known where these employees will reside, it is reasonable to anticipate that they will be dispersed throughout the area, including areas outside the K-10 corridor. With these types of developments existing population centers usually provide a significant portion of the employees. Population centers in Douglas and Johnson counties are likely to have concentrations of Astra Enterprise employees. De Soto and other communities in western Johnson County and eastern Douglas

County are preparing for an increase in new housing to accommodate the growth in employment.

This type of employment is difficult to serve with transit for several reasons. The dispersal of origins results in a lack of employee concentration necessary to support transit or other forms of ridesharing. Shift work further reduces concentrations of employees and requires transit to have longer service spans making transit less cost effective. Transit service to light industrial and distribution employment areas has not been effective in the Kansas City region.

3.3 Conclusions and Recommendations

The K-10 Corridor study area and its surroundings are not high potential transit markets even with the growth in employment at the Astra Enterprise Park due to low population densities and a lack of continuous corridors with employment and population densities sufficient to support transit.

Eudora and De Soto do not have general purpose transit although they do have paratransit service for mobility limited populations. The corridor in Johnson County does have transit and/or paratransit service. But the service levels are relatively low in most areas, which means access to the service is limited and possible destinations are limited. These communities do not have significant unmet transit needs, although transit service is at minimal levels. The potential for additional employment at the Astra Enterprise Park is an opportunity to improve and expand transit service in the corridor in the future. Decisions on additional transit service will be more a matter of policy rather than addressing absolute needs. Current transit service will not serve the commuter market.

Due to the large increase in employment expected at the Astra Enterprise site, some form of transit could be deployed to serve work trips. This is a policy decision and not an absolute need required for the functioning of the Astra Enterprise site.

Transit and ridesharing could be a complement to roadway improvements and would enhance mobility in an area with very limited transit options.

It is recommended that any future transit projects along the K-10 corridor take these conclusions into account:

- To address the general need for transit in the area some form of on-demand transit would be best suited to serve the low-density areas.
- To address the objective of addressing employment related transportation demand some form of transit specifically tailored to the market would have the greatest likelihood of success.
- Some form of interregional service seems warranted to connect communities that do not have outside transit connections.

4.0 Alternatives Analysis

Based on the results of the transit needs assessment an initial list of transit alternatives was developed to potentially serve the K-10 corridor. This list of alternatives was evaluated at a high level and screened using a set of criteria based on the study objectives.

A set of objectives were established to guide the development of alternative approaches to multimodal transportation in the corridor:

- Service must provide an alternative to single occupant private auto for employees of the Astra Enterprise Park site.
- Service must provide transit options for persons without access to autos for work and non-work trips within the study area.
- Service must enhance mobility in the area.
- Service must provide linkages among existing transit services and facilities in the study area.

4.1 Tier 1 Transit Analysis and Screening

Based on the needs assessment performed, seven alternatives were identified that may benefit the corridor and the industries at the Astra Enterprise Park. These transit options were:

Passenger Rail

Amtrak currently operates the Southwest Chief train service between Los Angeles and Chicago, with stops in Lawrence and Kansas City, Missouri. While a new stop at De Soto for that service is unlikely, a new short-line passenger railroad with a stop in De Soto, immediately north of the Astra Enterprise Park, and other cities such as Lawrence and Kansas City, Kansas could provide passenger rail service to the city and the industrial park. Kansas City, Kansas has a concentration of potential employees for the firms in Astra Enterprise Park. This service would utilize the currently abandoned US Army rail spur leading into the Astra Enterprise Park to provide a direct connection to industrial sites at the Astra Enterprise Park.

Microtransit

The nearby Johnson County Transit microtransit zone could be expanded to serve the K-10 corridor, including De Soto and the Astra Enterprise Park. The current zones extend as far west as Renner Boulevard in the north zone and K-7 in the south zone. This could either entail the creation of a new zone in combination with the two existing zones, or an extension of an existing zone.

K-10 Connector Improvements

The existing K-10 Connector, providing bus service between Lawrence and Overland Park, could have a bus stop located in De Soto along its route to provide service to the city and the Astra Enterprise site with minimal modifications to the service plan.

Redesign K-10 Connector into Interregional Route

An extension of the previous alternative, the K-10 Connector could be redesigned to become like the original vision for the route from the *2005 K-10 Transportation Study*, with several stops located between the present stops in Lawrence and Overland Park, becoming an interregional service.

Manhattan – Downtown Kansas City Interregional Line

An East-West interregional bus line could be developed serving communities between the Manhattan area and downtown Kansas City, Missouri that would travel along the K-10 corridor.

Private Shuttle Service

A privately operated and funded dedicated shuttle service could be operated exclusively for employees of the Astra Enterprise site. This shuttle service could transfer individuals from their communities and the industrial park.

Vanpool Service

The RideKC vanpool service could be utilized by the Astra Enterprise Park to provide employees transit service on the Johnson County side of the K-10 corridor. Lawrence Transit could assist on the Douglas County side by implementing a vanpool service of their own.

4.2 Tier 1 Evaluation

After the development of the list of service alternatives, a series of meetings with local transit providers were held to gather more information and to gain their input on the proposed services. Based on these meetings initial evaluation criteria were developed to screen the seven potential alternatives. These initial criteria are:

1. Consistency with local plans and input from local agencies.
2. Does the proposed service connect to other transit services?
3. Would the service be conveniently accessible to employees at the Astra Enterprise Park?
4. Would the service connect to existing and/or future employment and population centers?
5. Cost effectiveness of proposed alternative.
6. Does the service make sense for the context of the corridor?

These criteria were ranked on a scale of 1 to 5 based on the following:

- 1 – Alternative did not meet the objective/criteria
- 2 – Alternative barely met the objective/criteria
- 3 – Alternative somewhat met the objective/criteria
- 4 – Alternative mostly met the objective/criteria
- 5 – Alternative fully meets the objective/criteria

Table 5 shows the results of the Tier 1 evaluation, with following sections explaining the justification for the rankings.

Table 5: Table showing qualitative rankings of initial alternatives.

Updated Criteria	Rail	Microtransit	K-10 Improvement	Interregional Short Line	Interregional Line	Private Shuttle	Vanpool Service
Consistency with local plans and input from local agencies	2	3	2	2	3	4	3
Does the proposed service connect to other transit services?	2	4	4	4	4	2	2
Would the service be accessible to workers at the Astra Enterprise Park?	2	5	4	4	4	5	5
Would the service connect to existing/future employment/population centers?	1	5	3	3	3	5	5
Cost effectiveness of proposed alternative	1	2	4	2	2	5	5
Does the service make sense for the context of the corridor?	2	3	4	2	2	4	4
Composite Ranking:	1.7	3.7	3.5	2.8	3.5	4.2	4.0

Based on the Tier 1 evaluation two of the alternatives were screened out due to low composite rankings and the likelihood that they were not a viable solution for the corridor. These alternatives were:

Passenger Rail

While passenger rail was considered due to the nearby Amtrak route and the potential reactivation of the US Army spur line leading into the Astra Enterprise site, it was not considered to be feasible. Passenger rail service is expensive compared to all other options that were investigated. Additionally, the alternative would be inflexible, and likely would not serve the potential employee base of industries based in the Astra Enterprise site. If rail service is to be provided, it would likely be freight rail to the Astra Enterprise site to directly link the industries there to the freight network. The high cost and inability to provide direct service between likely employee concentrations and the industrial site make this alternative infeasible.

Redesign K-10 Connector into Interregional Line

The original vision for the K-10 Connector, as outlined in the *2005 K-10 Corridor Study*, had many more stops along its route. This would be much more costly than adding a stop at De Soto and would require additional planning for the route to succeed. Some of the transit agency staff interviewed said that some form of transportation connection between Lawrence and downtown Kansas City is warranted but were not sure if the K-10 Connector was the place to focus those efforts since the route is an education/student focused route.

Five transit alternatives were found to be potentially viable. These alternatives are:

Microtransit

As a county that already serves much of its area with microtransit service, it would make sense to further expand that service to additional users. However, Johnson County Transit staff felt that this is not an attractive option. The current microtransit system is very expensive for the number of riders served and is directly competing with their fixed-route service. Based on this analysis, microtransit would fit the character of the corridor but would be an expensive approach.

Interregional Bus Line

As an alternative to modifying the K-10 Connector, the implementation of a new interregional line was discussed to connect downtown Kansas City with cities as far west as Manhattan. Such a service would be costly to implement and operate compared to other options, but state-level support is possible, as staff from KDOT expressed an interest in interregional transit service. While an interregional service would make sense for the corridor as a whole, it would have the same drawback as other fixed route systems when servicing the Astra Enterprise Park and would likely require a first-mile last-mile solution extending the coverage of fixed route transit.

K-10 Connector Improvements

Improvements to the current K-10 Connector route may be feasible because the route is already in place and would not require substantial modifications. While this option appears to make sense, modifying the current route is not appealing to Johnson County Transit. Due to Lawrence discontinuing their portion of funding from the route earlier in 2023, the route is struggling financially and service reductions may need to be made in the future. Adding a new stop to the route in this situation may not be advisable. The K-10 Connector is a primarily student and education focused route, connecting the Lawrence KU campus to their KU Edwards campus in Overland Park. A new stop on this route at De Soto or the Astra Enterprise Park would be disruptive to the service. A modification to this route would be unlikely to connect the Astra Enterprise Park to the employment pool with such limited stops.

Private Shuttle Service

Other industrial sites like the Astra Enterprise Park use private shuttles to provide transit services for their employees. These systems are usually funded by the private firm, and either a local agency or contractor operate the service. Stakeholders interviewed agreed that this could be the best option to serve the Astra Enterprise Park, as it would go directly to where the expected employment pool is located instead of being constrained by a route also serving other destinations. It would be flexible enough to be able to change with demographics and other conditions, and it would be less expensive to operate than most other options considered. This service would not be available to the general public, as it would only be available to employees of the sponsoring company in the Astra Enterprise Park.

Vanpool Service

A vanpool service was also looked favorably upon by stakeholders as another inexpensive way to provide transit services to areas along the K-10 corridor. The downside to this system is that a sufficient number of individuals have to express interest in order for the service to be provided (a business must apply for a vanpool for their employees, or a number of people within the same area must register), whereas the private shuttle would be in service regardless. If employees were to utilize the existing RideKC vanpool service, this alternative would be able to serve employees including Douglas County residents because the destination of their trips, at the Astra Enterprise Park, lies within Johnson County.

4.3 Tier 2 Evaluation

Based on the results of the Tier 1 evaluation, five alternatives were identified for further evaluation.

- Microtransit

- Interregional Bus Line
- K-10 Connector Improvements
- Private Shuttle
- Vanpool Program

These alternatives are not mutually exclusive. They can be implemented in conjunction with other solutions to provide a more comprehensive transportation program for the K-10 corridor.

Methodology

The alternatives were developed at a conceptual level using the following methodology:

- Routes and service plans were developed to better define the service area and to provide a basis for cost and ridership potential estimates.
- Operating and capital costs were estimated using costs from other similar services.
- Ridership potential was estimated based on the service plan concept and the experience of other similar services. A detailed ridership assessment was not conducted.

Microtransit

Microtransit is most effective in serving short passenger trips. When microtransit is deployed in a large area allowing for longer trips (more than three to four miles) the cost per passenger increases substantially because vehicles are limited in the number of trips that can be served in a time period. Microtransit productivity is typically low, in the range of 3 to 6 passengers per revenue hour. The attractiveness of microtransit is a result of its high level of customer convenience, providing taxi-like service, with pick ups and drop offs at or near the passenger's destination at times requested by the passenger. For this analysis two approaches were evaluated; 1) a relatively small microtransit zone in De Soto which would serve short trips in the area, and a first-mile-last-mile function to supplement other transit service, such as fixed route service. 2) a larger zone that would operate either as an extension of the north Johnson County microtransit zone, or as a new zone entirely. For the purpose of this evaluation the large microtransit zone option is assumed. The small microtransit zone option does not have the ability to generate ridership and would only be used in conjunction with other alternatives to provide a first-mile-last-mile function.

Route and Stops

As an on-demand service, the microtransit system would be able to pick up and drop off passengers anywhere within the zone(s) of operation. The service could drop off Astra Enterprise Park employees adjacent to Park entrances.

Service Frequency and Span

The microtransit system would operate from 6:00 AM to 8:00 PM seven days a week on a demand basis.

Institutional Structure and Operations

The service would likely be the responsibility of Johnson County or another local jurisdiction. The preferred operating model would be to continue Johnson County's practice of contracting with a private operator.

Potential Ridership

Microtransit would be effective in generating ridership with an estimated 400 weekday passenger trips and 120 employees served.

Cost

Annual operating costs were estimated at \$4,216,000. There would be no capital cost because a turnkey contract is assumed whereby the contractor provides the vehicles.

Funding

Currently microtransit in Johnson County is provided by Johnson County as part of their transit program. Funding for additional microtransit service is not available. There are no other existing funding sources for microtransit. Additional funding would have to be authorized by the Johnson County Commission.

Interregional Bus Route

An alternative to modifying the K-10 Connector is the implementation of a new interregional bus route serving the corridor and connecting Kansas City metro area with cities to the west such as Topeka and Manhattan. An interregional service would enhance mobility in the corridor as a whole and fill a gap in the transportation system. However, it would have the same drawback as other fixed route services when servicing the Astra Enterprise Park. For the purpose of this evaluation only the portion of the route between Kansas City and Lawrence would be included. It is assumed that the K-10 Connector would continue to operate in the corridor.

Route and Stops

Figure A-17 shows the route concept. Stops would be located at intervals along the route including Kansas City, Olathe, De Soto and other communities. The stop in De Soto would likely not be located conveniently to the Astra Enterprise Park employee entrance and would require another means to transfer passengers between the interregional bus stop and the employee entrance. Microtransit is assumed for this purpose. As labeled in **Figure A-17**, the potential stops are:

1. Downtown Kansas City Union Station

2. Johnson County Community College
3. Downtown Olathe
4. De Soto
5. Eudora
6. Lawrence Transit Central Station
7. Lawrence Amtrak Station
8. Topeka Amtrak Station, adding a regional destination beyond the corridor.
9. Downtown Manhattan, adding a regional destination beyond the corridor.

It is assumed an interregional service would extend beyond the K-10 corridor.

Service Frequency and Span

The interregional bus would operate weekdays only from 6 AM to 9:30 PM with one-hour headways.

Institutional Structure and Operations

The service would likely be operated by the State of Kansas or a quasi-public agency. The service would be contracted to a private operator.

Potential Ridership

Ridership on the entire 140-mile route was estimated at 120 daily riders. Ridership was estimated at 40 for the Kansas City to Lawrence portion of the route with very limited usage by Astra Enterprise Park employees.

Cost

Annual operating costs on the entire 140-mile route was estimated at \$3.5 million. For the Kansas City to Lawrence portion of the route operating costs were estimated at \$1,524,000. The cost for a microtransit service within De Soto estimated at \$496,000 is an additional cost with this alternative. Capital cost would be \$3,750,000 for four buses.

Funding

There are no current funding sources for interregional bus service. Several states have interregional funding programs. The most likely funding source for this type of service would be a new state funding program that would likely require authorization by the Kansas Legislature for an interregional transportation program administered by KDOT.

K-10 Connector Improvements

With this service currently in place an option is to make improvements to the existing service to make it a more effective service for both employees of Astra Enterprise Park

and travelers in the corridor in general. The concept would add a stop in De Soto in the interchange area of K-10 and Edgerton Road. This new stop would be a quick-on, quick-off style to minimize the time required for this additional stop.

Service Area/Routing

This service would retain the same route that the K-10 Connector currently runs, from Lawrence to Overland Park, with the addition of a stop in De Soto. The route would serve the areas around the University of Kansas's Lawrence and Edwards campuses, De Soto, and the Johnson County Community College.

Stops/Pickup Points

Stops would remain the same as the existing K-10 Connector route with the addition of a stop in De Soto to provide access to the Astra Enterprise Park for future employees of the site.

Service frequency and Span

Three service improvement scenarios were developed. For purposes of this evaluation, it was assumed that the current "regular" service plan which is currently operated when classes at KU are in session would be operated seven days per week. Thus, the service would operate from 6 AM to 11 PM with 30-minute peak headways and 60-minute off peak headways.

Institutional Structure and Operations

The route would continue to be the responsibility of Johnson County Transit, with operations contracted to a private firm.

Cost

The addition of a stop in De Soto would require an additional bus to be added to the schedule with an estimated increase in annual operating costs of \$658,000. In addition, the capital cost for acquiring a new coach would be approximately \$1 million. The additional operating cost of increasing the service level throughout the year would increase annual operating costs to \$4,086,000 an increase of \$2,292,000 over the current service plan. Capital cost would be \$2,000,000 for two buses.

Funding

Currently the K-10 Connector is provided by Johnson County as part of their transit program. Funding for additional service is not available. There are no other existing funding sources for the K-10 Connector. Additional funding would have to be authorized by the Johnson County Commission. Other potential funding sources for this service are state funding through a new program, and funding from other jurisdictions. Because the K-10 Connector serves primarily KU students, funding from the University is another potential source. KU does have a transportation program that funds student transportation services.

Private Shuttle

Experience in other areas with large remote industrial sites shows that private transit service is an effective way of serving the employment market. This is due to the flexibility of the service which allows the routing to be designed specifically for the needs of employees and schedules can be tailored to employee shifts. This type of service can be provided as an employee benefit and can help address objectives such as workforce diversity. This type of service would not provide any mobility benefits to the general public.

Service Area/Routing

For this evaluation the service is assumed to consist of four routes serving distinct areas to the north, west, east, and south, such as Bonner Springs, Lawrence, Olathe, and Kansas City, Kansas. In actuality, the routes would be defined based on the location of employees and specific employment related objectives. These potential routes are shown in **Figure A-18**. The routes would use the fastest route between the pickup points and the Astra Enterprise Park using freeways as much as possible to minimize travel time.

Stops/Pickup Points

Stops in the community would be limited to one or two locations to minimize travel times. The stops could be collocated with stops for other transit services if available. For example, a route serving Kansas City, Kansas could have a stop at the 47th Street Transit Center with connections to six local transit routes. The stop at the Astra Enterprise Site would be as close to the employee entrance as possible to maximize passenger convenience. As a private dedicated shuttle, the vehicles could enter areas that public transit vehicles would not be able to access.

Service frequency and Span

As a dedicated private shuttle, the schedule would be dictated by employee shift times. For example, if the plant is operating on a traditional three-shift schedule, bus trips would be scheduled to arrive 15 minutes before shift times at 6:45 AM, 2:45 PM, and 10:45 PM. The same vehicle would be scheduled to leave the plant 15 minutes after shift ending times.

Institutional Structure and Operations

The shuttle operation would likely be contracted to a private transportation company by businesses within the Astra Enterprise Park.

Cost

Annual operating costs were estimated at \$783,000. There would be no capital cost because a turnkey contract is assumed whereby the contractor provides the vehicles.

Funding

Funding for this type of service is typically from the firm or firms that benefit from the service. Panasonic does fund transit services at other plants. This type of private shuttle service is not eligible for federal funding. Local funding, for example from Johnson County, would require a policy decision; funding for private shuttles is not currently in the County's transit program.

Vanpool Service

Vanpools are an effective way to serve employees at a location like the Panasonic plant. Vanpool is a form of ridesharing wherein seven to twelve people with similar residence, locations, and shift times, share the cost of commuting. There are several formalized programs in place in the Kansas City area, the largest of which is the RideKC Vanpool Program operated by KCATA which has about 40 vanpools. The concept would be for businesses within the Astra Enterprise Park to arrange with KCATA to establish a vanpool program for their employees. KCATA contracts with Enterprise for the operation and administration of the program which would facilitate the formation of vanpools for interested employees.

Service Area/Routing

The program would be available to any Panasonic employee regardless of residence location as long as at least seven employees would agree to ride together.

Service frequency and Span

The timing of the vanpools would be dictated by the employees that utilize the service, most likely being used around the shift changes at the Panasonic plant.

Institutional Structure and Operations

The vanpool program could be operated in one of two ways; by utilizing the existing RideKC vanpool program or by Panasonic implementing their own vanpool program. In the later scenario, the program would likely be contracted to a private rideshare company to provide the vehicles and program administration.

Cost

The annual cost of a vanpool program with 20 vans is \$309,000 which includes RideKC's subsidy of \$348 per van per month. The capital cost of van ownership is included in this figure.

Funding

Funding for this type of service is typically provided by the firm or firms benefitting from the program. KCATA does fund a portion of the cost for eligible vanpools. This funding represents about 20 percent of the cost. This funding is included in the cost estimate. Absent external funding the monthly cost per participant is in the range of \$120 to \$150.

Summary

The ridership potential and costs are summarized in **Table 6**.

Table 6: Table showing summary of ridership and cost characteristics of Tier 2 alternatives.

Alternative	Average Daily Ridership	Daily Panasonic Employees	Annual O&M Cost	O&M Cost per Passenger Trip	Initial Capital Cost
Microtransit	400	120	\$4,216,000	\$34.00	\$0
Interregional Bus Route	40	10	\$2,020,000	\$198.04	\$3,750,000
K-10 Connector	170	10	\$2,788,000	\$52.90	\$2,000,000
Private Shuttles	220	110	\$783,000	\$11.48	\$0
Vanpool Program	320	160	\$309,000	\$2.65	\$0

The results of the Tier 2 Analysis are summarized in **Table 7**.

Table 7: Table showing results of Tier 2 Analysis.

Updated Criteria	Microtransit	K-10 Connector Improvements	Interregional Line	Private Shuttle	Vanpool Service
Consistency with local plans and input from local agencies	3	2	3	4	3
Does the proposed service connect to other transit services?	4	4	4	2	2
Would the service be accessible to workers at the Astra Enterprise site?	5	4	4	5	5
Would the service connect to existing/future employment/population centers?	5	3	4	5	5
Cost effectiveness of proposed alternative	3	2	1	5	5
Does the service make sense for the context of the corridor?	3	4	3	2	2
Composite Ranking:	3.8	3.2	3.2	3.8	3.7

4.4 Conclusions and Recommendations

The following conclusions are based on the evaluation.

1. The K-10 corridor does not have compelling unmet transit needs. The densities and demographics indicate moderate needs in this auto oriented corridor. The eastern portion of the corridor is served by several JCT routes as well as JCT's microtransit. The western portion of the corridor is served only by paratransit service for persons with mobility limitations, seniors, and low-income individuals.
2. The K-10 Connector does little for mobility in the corridor outside of the student market. This route is designed to connect educational campuses in Johnson and Douglas counties and serves this function well.
3. As the corridor develops and grows in population and employment the need for transit enhancements will increase. Whether transit enhancements are implemented rests with policy decisions by local and state officials. The corridor will remain auto oriented for the foreseeable future.
4. Funding for transit service in the corridor is very limited and currently continued funding of existing services is a challenge. There is no readily available local funding for new services. Federal grant funding is typically limited to capital projects such as bus purchases or facility development. Additional state funds are not available.
5. Transportation improvements in the corridor will not be realized without a significant increase in transit funding. Consideration should be given to a state funding program that can address multijurisdictional and interregional transportation needs.
6. Employee transportation for Panasonic employees and other businesses in the Astra Enterprise Park can most effectively be met by program specific service like private shuttles and a vanpool program. The nature of the employment, the dispersal of employee origins, employee shift work and the limited density and development in the vicinity of De Soto limits the effectiveness of general-purpose public transit. Shift work spreads out demand over a longer period of time than traditional work schedules thereby effectively reducing employment trip density and requires a full service span (more trips in more time periods) increasing cost.
7. Microtransit has been demonstrated to be effective in serving travel needs in low density markets and it is very popular among the traveling public. However, it is costly on a per passenger basis and requires careful planning and policy making regarding the deployment of microtransit.

Recommendations

1. Civic and business leaders in the De Soto area should consider organizing to address current and future transportation issues. This organization can be formal or an informal agreement among interested parties to coordinate on matters of transportation. A more formal approach is to form a Transportation Management Association (TMA).
 - a. TMAs are non-profit, member-controlled organizations that provide transportation services in a particular area, such as an industrial park. They are generally public-private partnerships, consisting primarily of area businesses with local government support.
 - b. Through a TMA local leaders can more effectively advocate for transportation improvements and funding, better coordinate transportation services, and address traffic issues.
2. To address employee transportation needs Astra Enterprise Park officials should begin immediately to develop an employee commute program.
 - a. The program could start with a vanpool program which is relatively low cost and low risk but would provide an alternative to auto commuting as the Panasonic plant and industrial park initiate operations.
 - b. As employment grows the commute program would assess needs and determine whether additional commuting options like private shuttles should be added to the program.
3. To address mobility in the corridor it is recommended that the creation of a new interregional service should be considered. K-10 is one of the most highly trafficked corridors in the state and warrants consideration of a transit connection.
 - a. The service could extend beyond the K-10 corridor to Topeka and Manhattan with select stops in other communities.
 - b. The state is in the best position to conduct a more detailed assessment of this interregional service and possible implementation. A service could be implemented as a pilot project to test the feasibility of the concept.
 - c. The existing K-10 Connector route would continue at the discretion of Johnson County officials. The market served by the K-10 Connector is different from the market that the interregional bus route would serve.
4. Transit service in the northwestern portion of Johnson County, which includes De Soto and the Astra Enterprise Park, is the responsibility of Johnson County Transit. With limited funding, expansion of transit service is not an easy decision. The question of transit service in the northwestern portion of the County should be studied in a comprehensive review of Johnson County transit service. The County anticipates such a study in the next year. The study should assess the

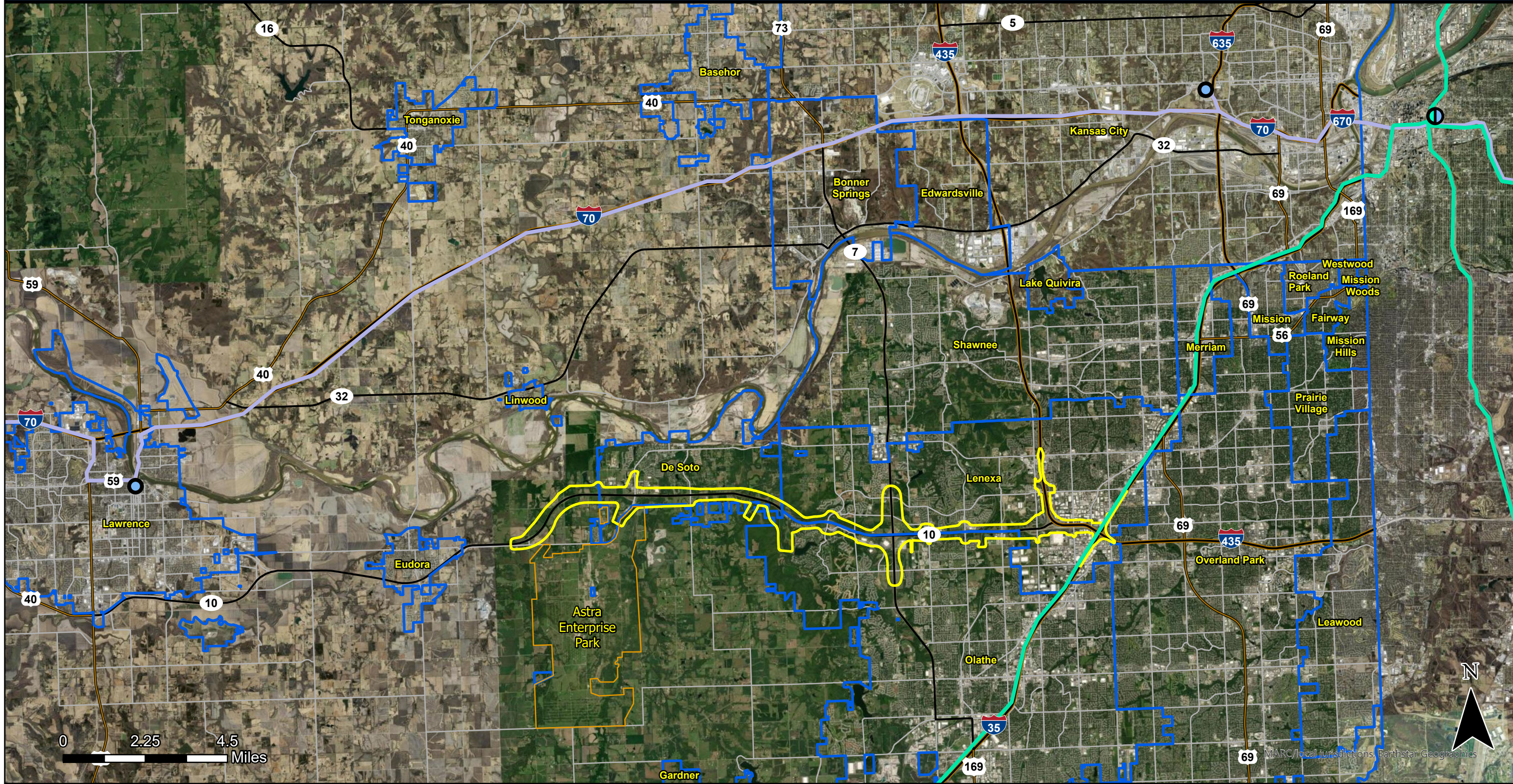
priority of service in the northwest compared to priorities in other parts of the County. The issue of funding levels also should be addressed.

Appendix A

Maps

Existing Intercity Bus Service Map

Figure A-1



K-10 Capacity Improvements
 KDOT # 10-46 KA-6549-01

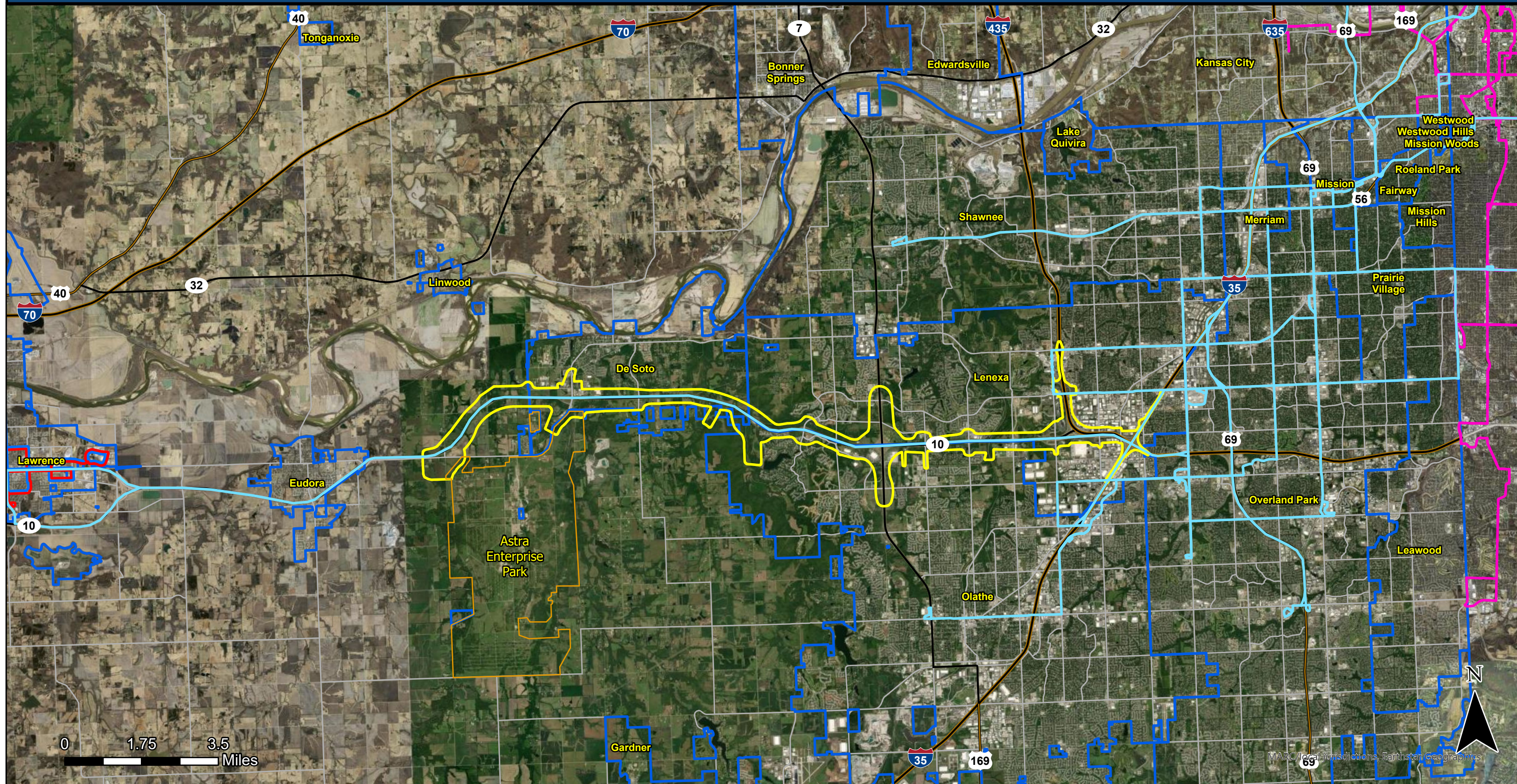
Legend

Astra Enterprise Park	Bus Stations	Routes
Study Area	Greyhound	Greyhound
City Boundary	Greyhound/Jefferson Lines	Jefferson Lines



Existing Fixed Route Service Map

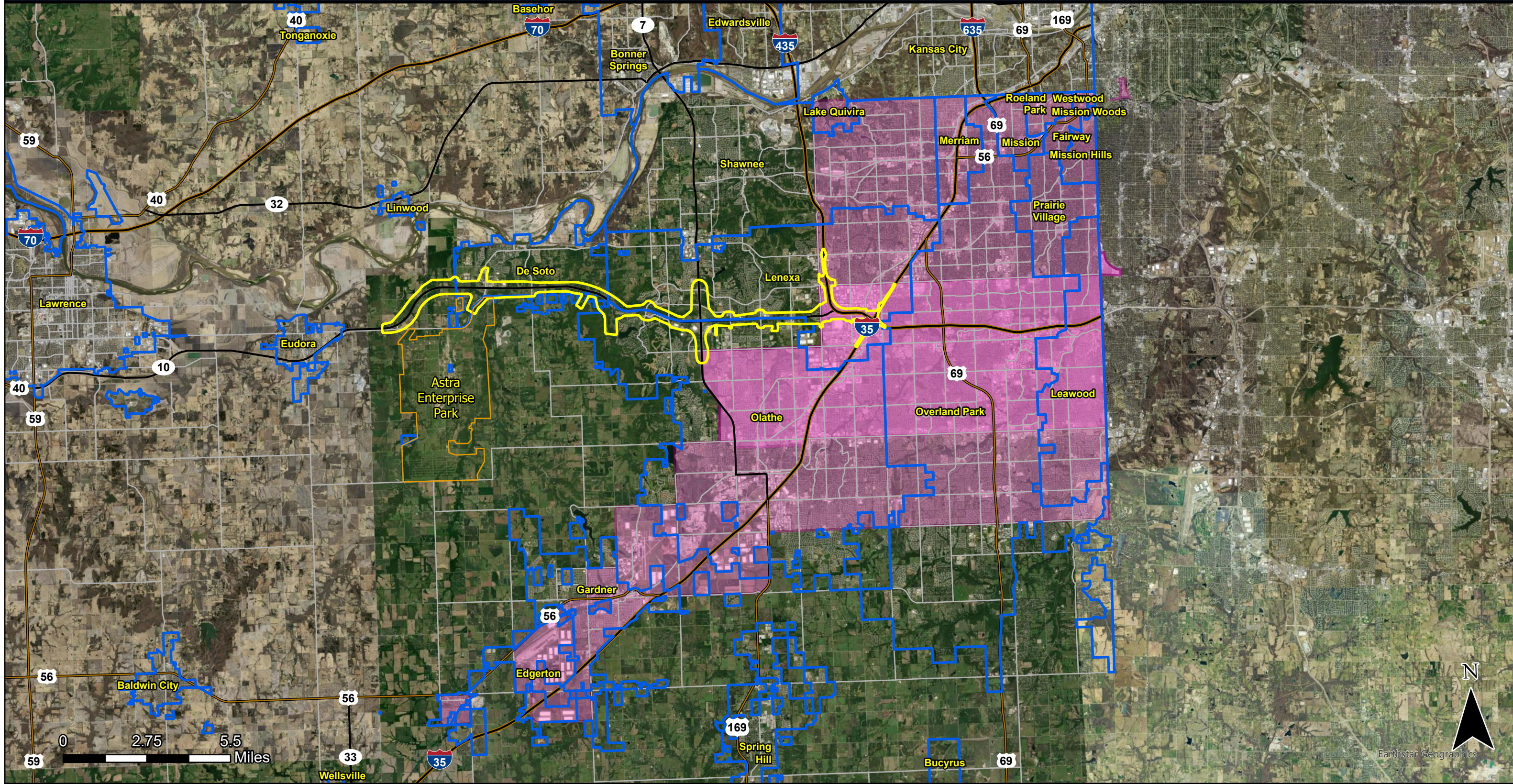
Figure A-2



K-10 Capacity Improvements
KDOT # 10-46 KA-6549-01

- | | |
|-----------------------|------------------------|
| Astra Enterprise Park | Johnson County Transit |
| Study Area | KCATA |
| City Boundary | Lawrence Transit |

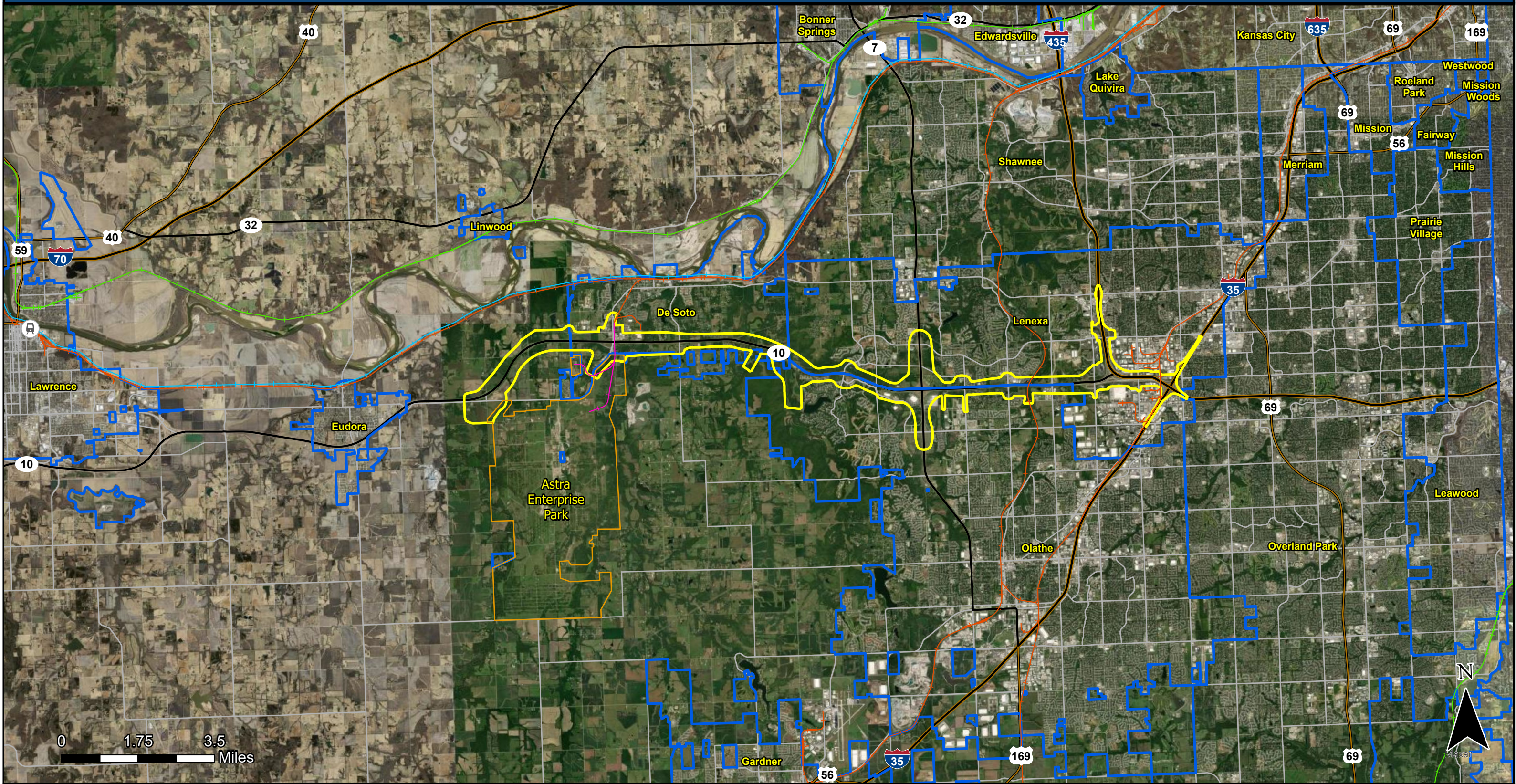




K-10 Capacity Improvements
KDOT # 10-46 KA-6549-01

- Legend**
- Astra Enterprise Park
 - Study Area
 - City Boundary
 - Johnson County Microtransit





K-10 Capacity Improvements

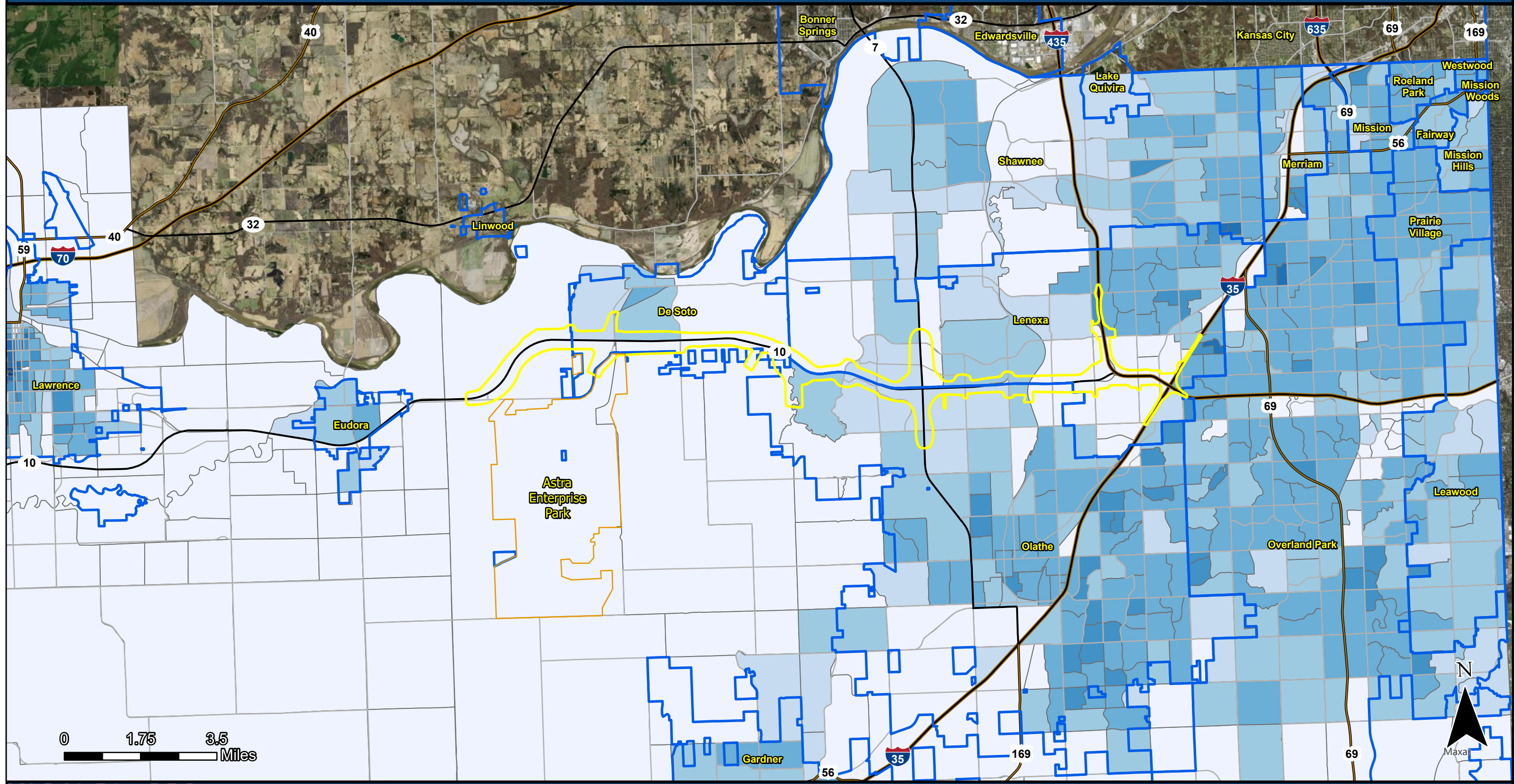
KDOT # 10-46 KA-6549-01

- | Legend | | Rail Owner |
|-----------------------|-----------------------------|------------|
| Astra Enterprise Park | Amtrak Stations | BNSF |
| Study Area | Abandoned US Army Rail Spur | UP |
| City Boundary | Amtrak Routes | |



2019 Population Density Map

Figure A-5



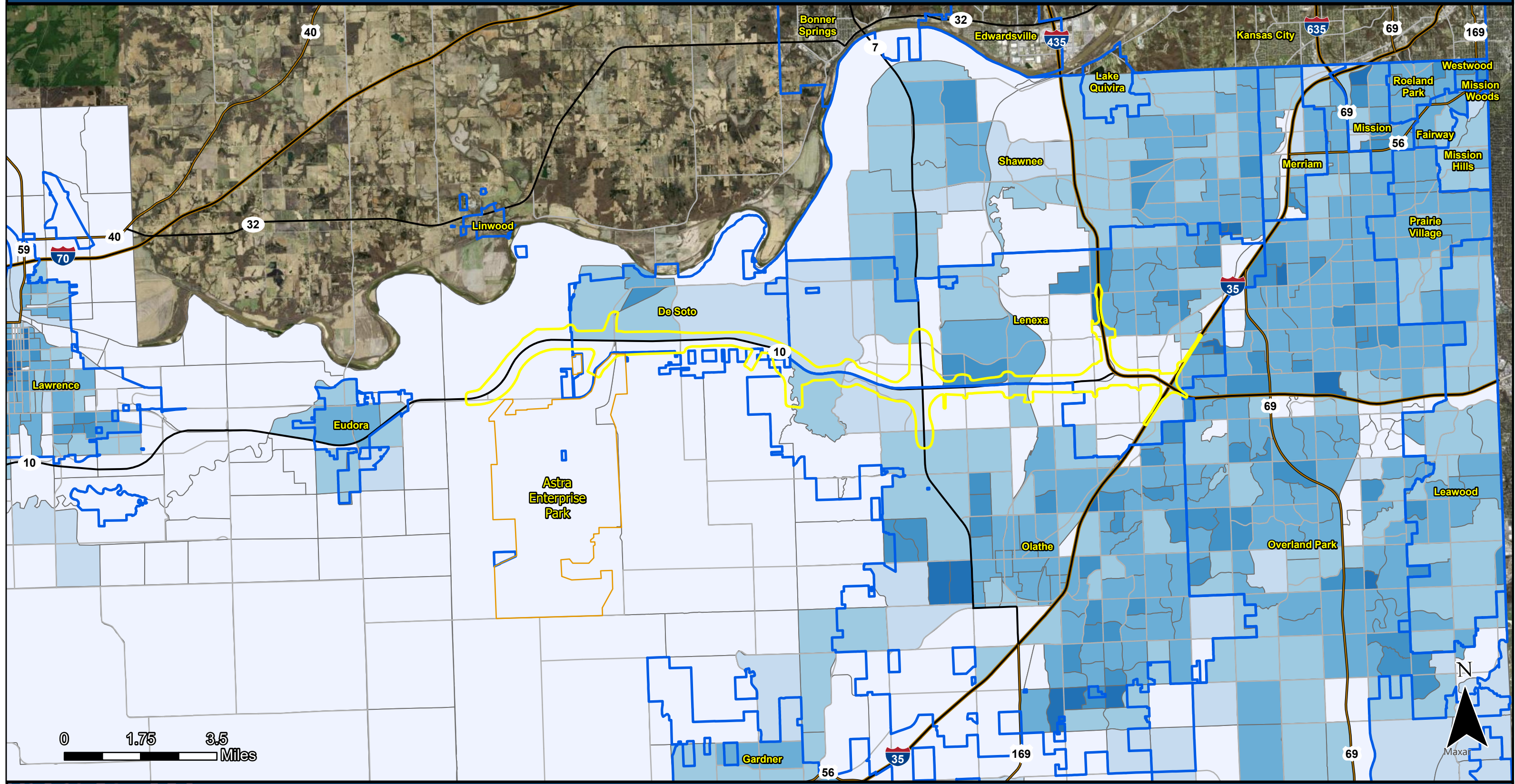
K-10 Capacity Improvements
 KDOT # 10-46 KA-6549-01

Astra Enterprise Park	Population Density (sq.mi.)	501 - 1000	6001 - 11000
Study Area	1001 - 3000	11001 - 30000	
City Boundary	3001 - 6000	30001 - 78000	
	0 - 500		



2050 Population Density Map

Figure A-6



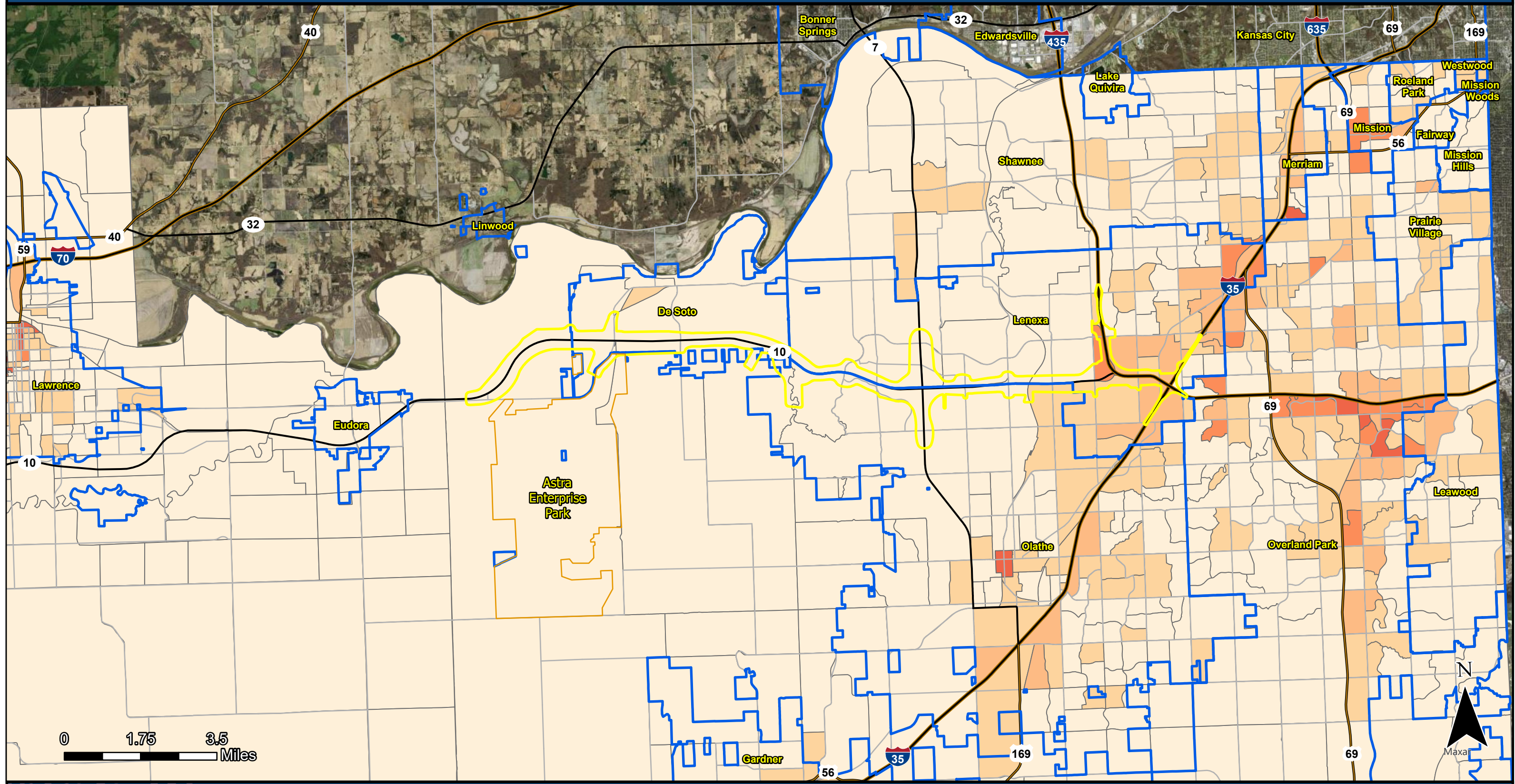
K-10 Capacity Improvements
 KDOT # 10-46 KA-6549-01

Astra Enterprise Park	Population Density (sq. mi.)	501 - 1000	6001 - 11000
Study Area		1001 - 3000	11001 - 30000
City Boundary	0 - 500	3001 - 6000	30001 - 78000



2019 Employment Density Map








Figure A-7



K-10 Capacity Improvements
 KDOT # 10-46 KA-6549-01

-  Astra Enterprise Park
-  Study Area
-  City Boundary

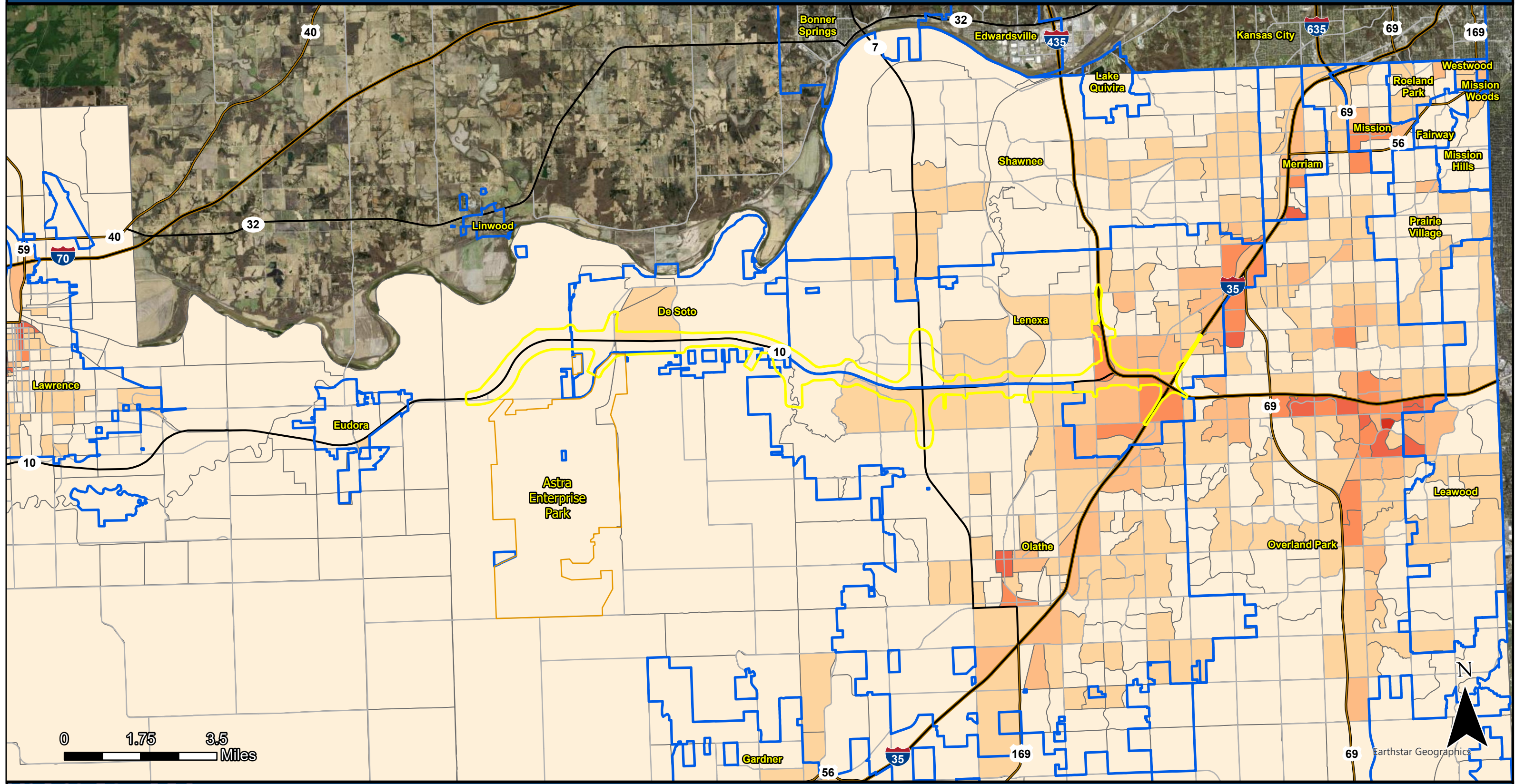
Legend

Employment Density (sq. mi.)		1001 - 5000		20001 - 50000
		5001 - 10000		50001 - 100000
		10001 - 20000		100001 - 201000
		0 - 1000		



2050 Employment Density Map

Figure A-8

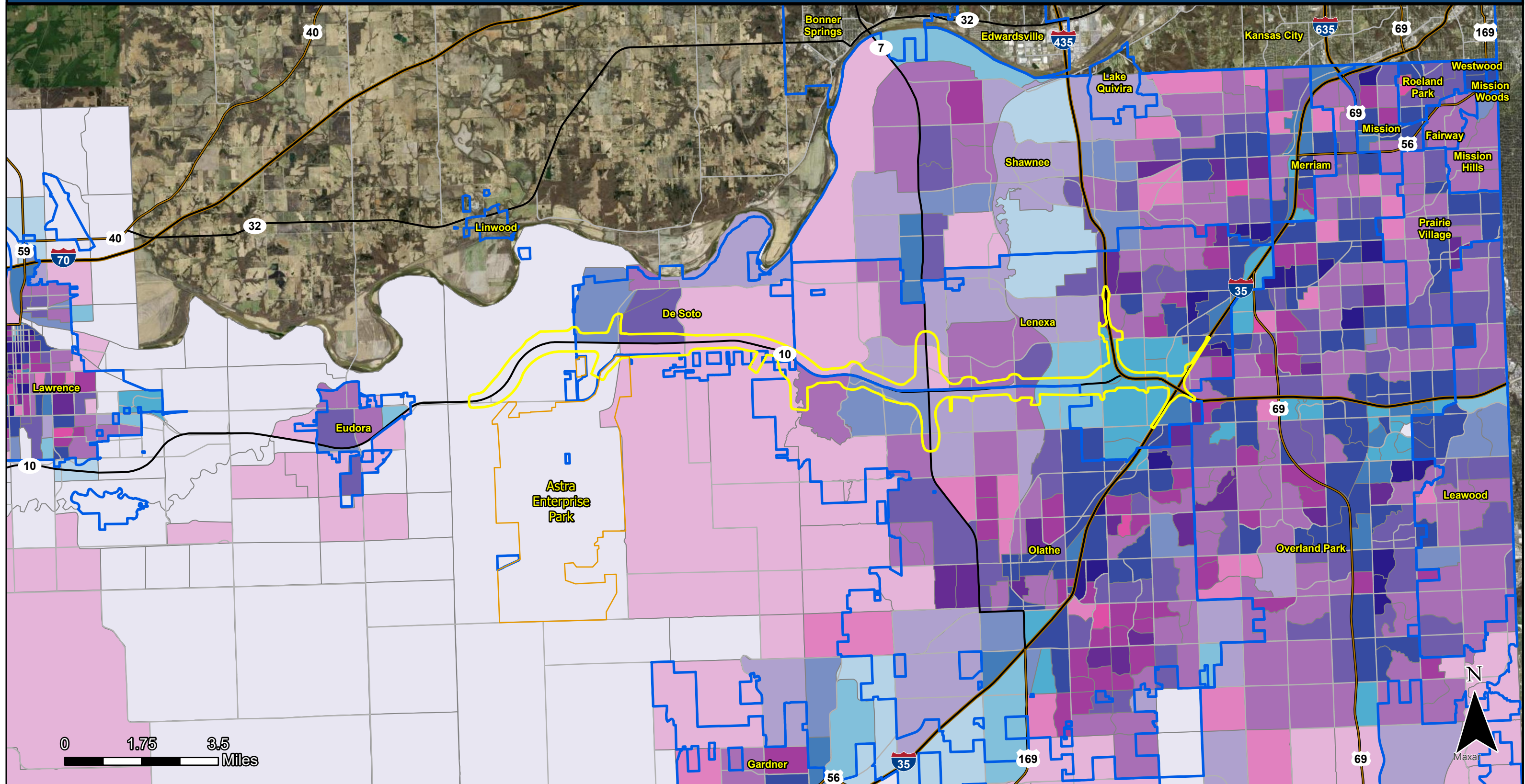


K-10 Capacity Improvements
 KDOT # 10-46 KA-6549-01

Astra Enterprise Park	Employment Density (sq. mi.)	1001 - 5000	20001 - 50000
Study Area		5001 - 10000	50001 - 100000
City Boundary		10001 - 20000	100001 - 201000
		0 - 1000	

2019 Activity Density Map

Figure A-9

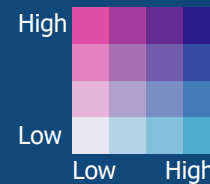


K-10 Capacity Improvements
KDOT # 10-46 KA-6549-01

- Astra Enterprise Park
- Study Area
- City Boundary

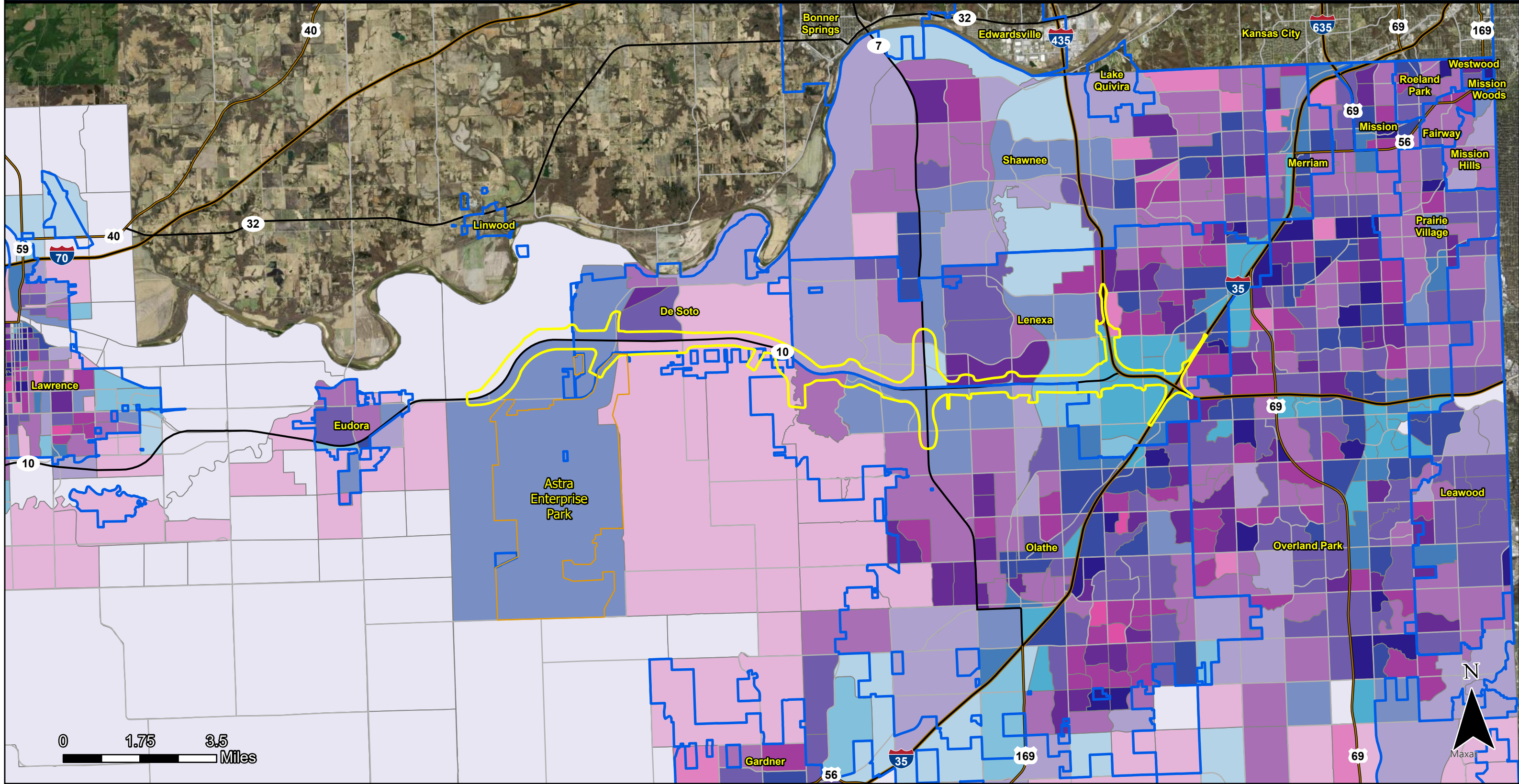
Legend

- Population Density
- Employment Density



2050 Activity Density Map

Figure A-10

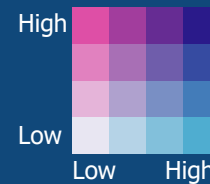


K-10 Capacity Improvements
KDOT # 10-46 KA-6549-01

- Astra Enterprise Park
- Study Area
- City Boundary

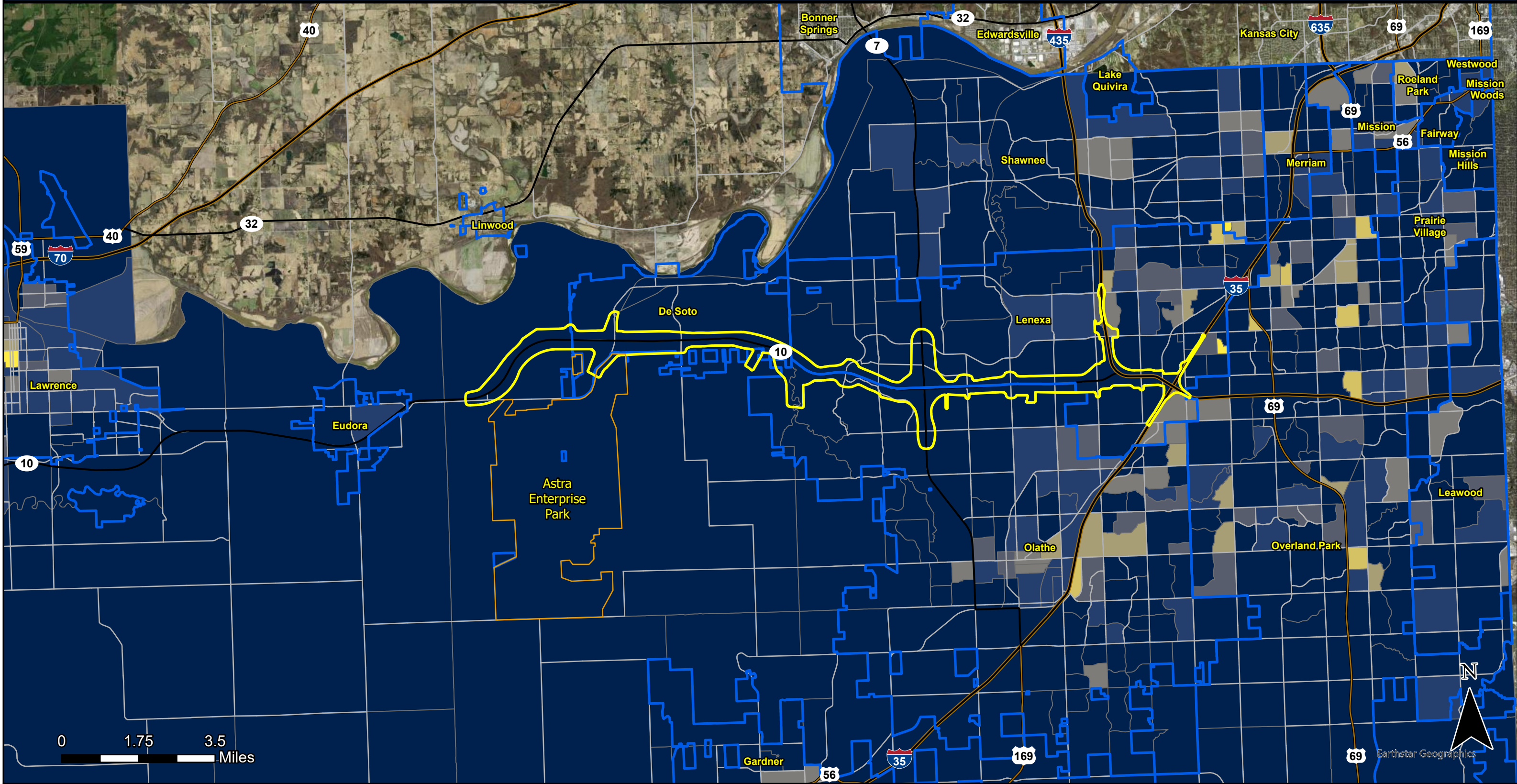
Legend

- Population Density
- Employment Density



Zero Vehicle Household Density Map

Figure A-11



0 1.75 3.5 Miles



Earthstar Geographics

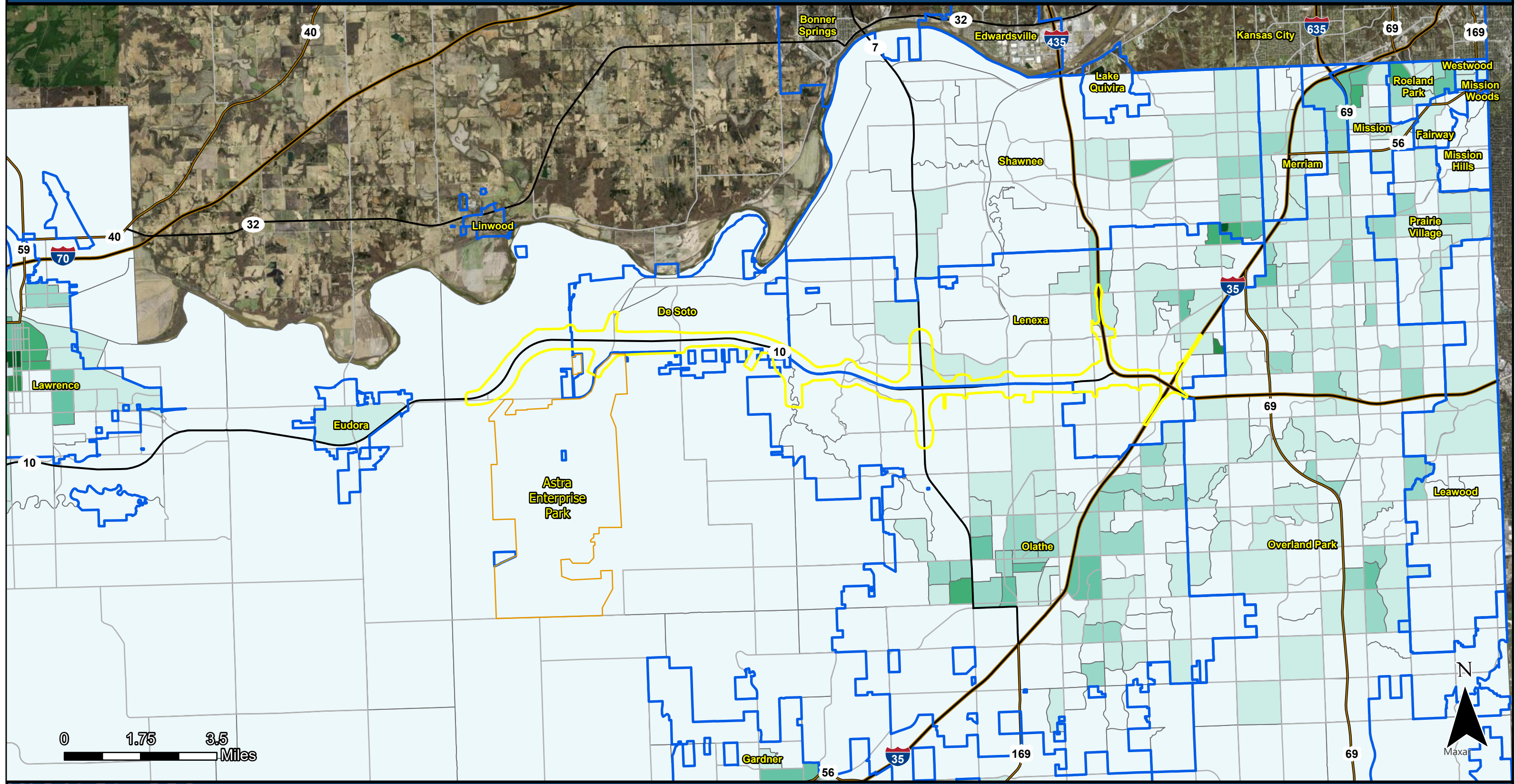
K-10 Capacity Improvements
 KDOT # 10-46 KA-6549-01

Astra Enterprise Park	0 - 25	26 - 80	251 - 400
Study Area	81 - 150	401 - 700	701 - 1700
City Boundary	151 - 250		
	Zero Vehicle Household Density (Sq. Mi.)		



Low-Income Household Density Map

Figure A-12



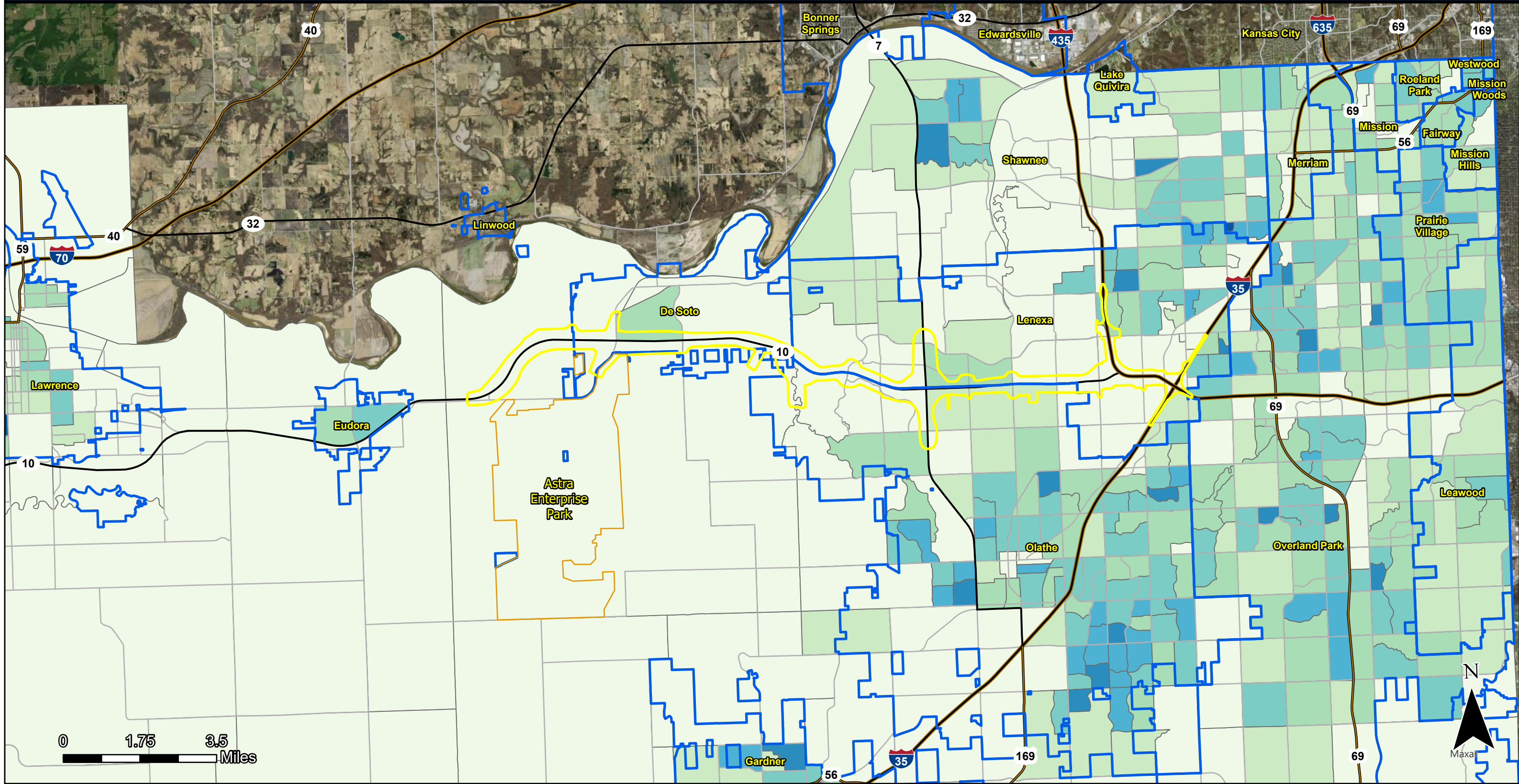
K-10 Capacity Improvements
 KDOT # 10-46 KA-6549-01

Astra Enterprise Park	Poverty Density (Sq. Mi.)	101 - 400	1501 - 3000
Study Area		401 - 750	3001 - 6000
City Boundary		751 - 1500	6001 - 11000
		0 - 100	



Youth (Under 18) Density Map

Figure A-13



K-10 Capacity Improvements
 KDOT # 10-46 KA-6549-01

- Astra Enterprise Park
- Study Area
- City Boundary

Young Resident
 Density (Sq. Mi.)

- 0 - 250

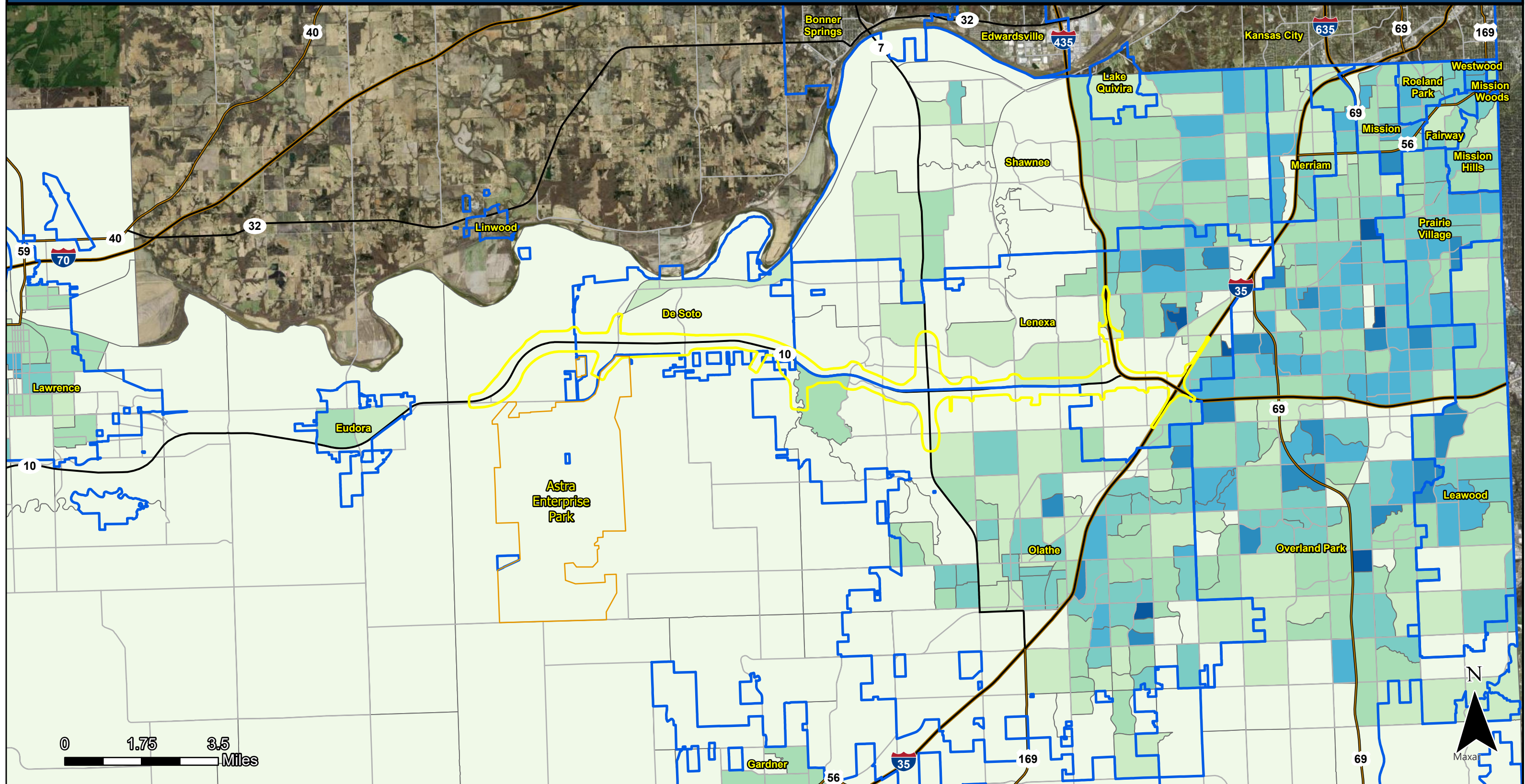
Legend

- 251 - 500
- 501 - 900
- 901 - 1500
- 1501 - 2000
- 2001 - 4000
- 4001 - 8000



Senior (Over 65) Density Map






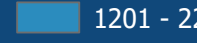

Figure A-14



K-10 Capacity Improvements
 KDOT # 10-46 KA-6549-01

-  Astra Enterprise Park
-  Study Area
-  City Boundary

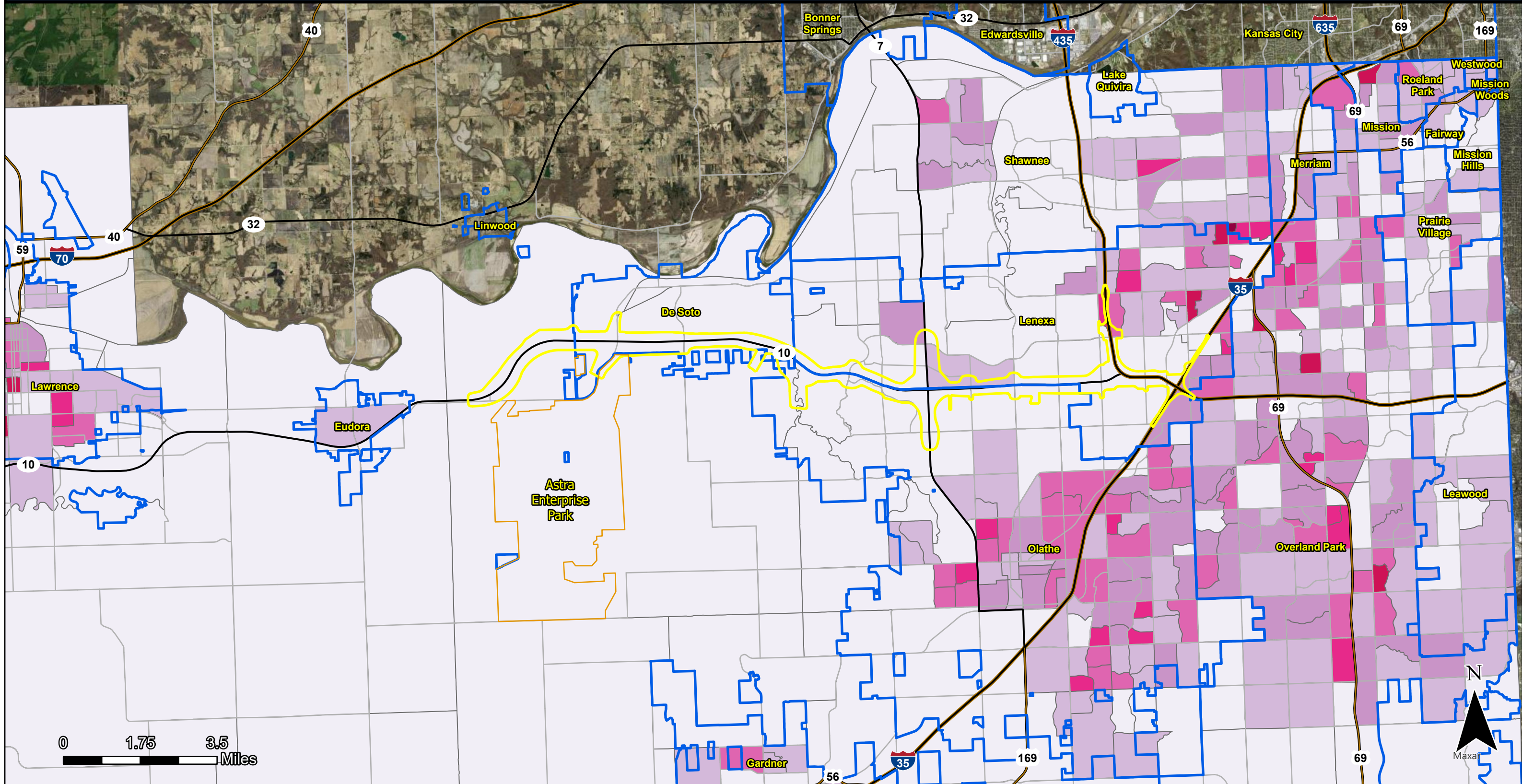
Legend

Senior Density (Sq. Mi.)	Color
0 - 150	
151 - 300	
301 - 500	
501 - 800	
801 - 1200	
1201 - 2200	
2201 - 5000	



Minority Population Density Map

Figure A-15



K-10 Capacity Improvements
KDOT # 10-46 KA-6549-01

- Astra Enterprise Park
- Study Area
- City Boundary

Minority Population Density (Sq. Mi.)

- 0 - 200

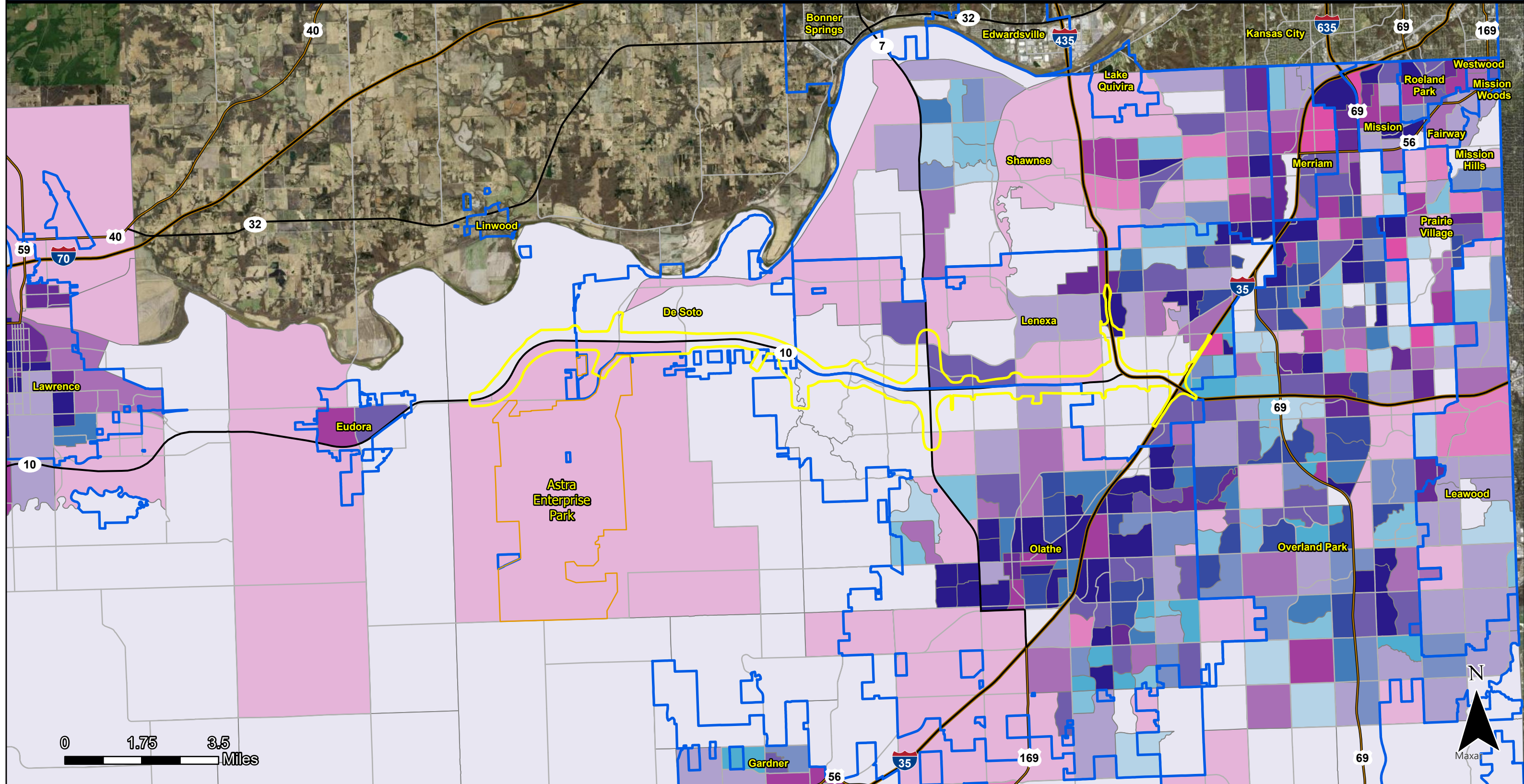
Legend

- 201 - 600
- 601 - 1000
- 1001 - 2000
- 2001 - 4000
- 4001 - 9000
- 9001 - 19000



Environmental Justice Population Density Map

Figure A-16

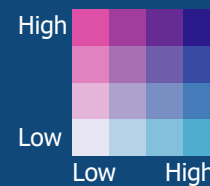


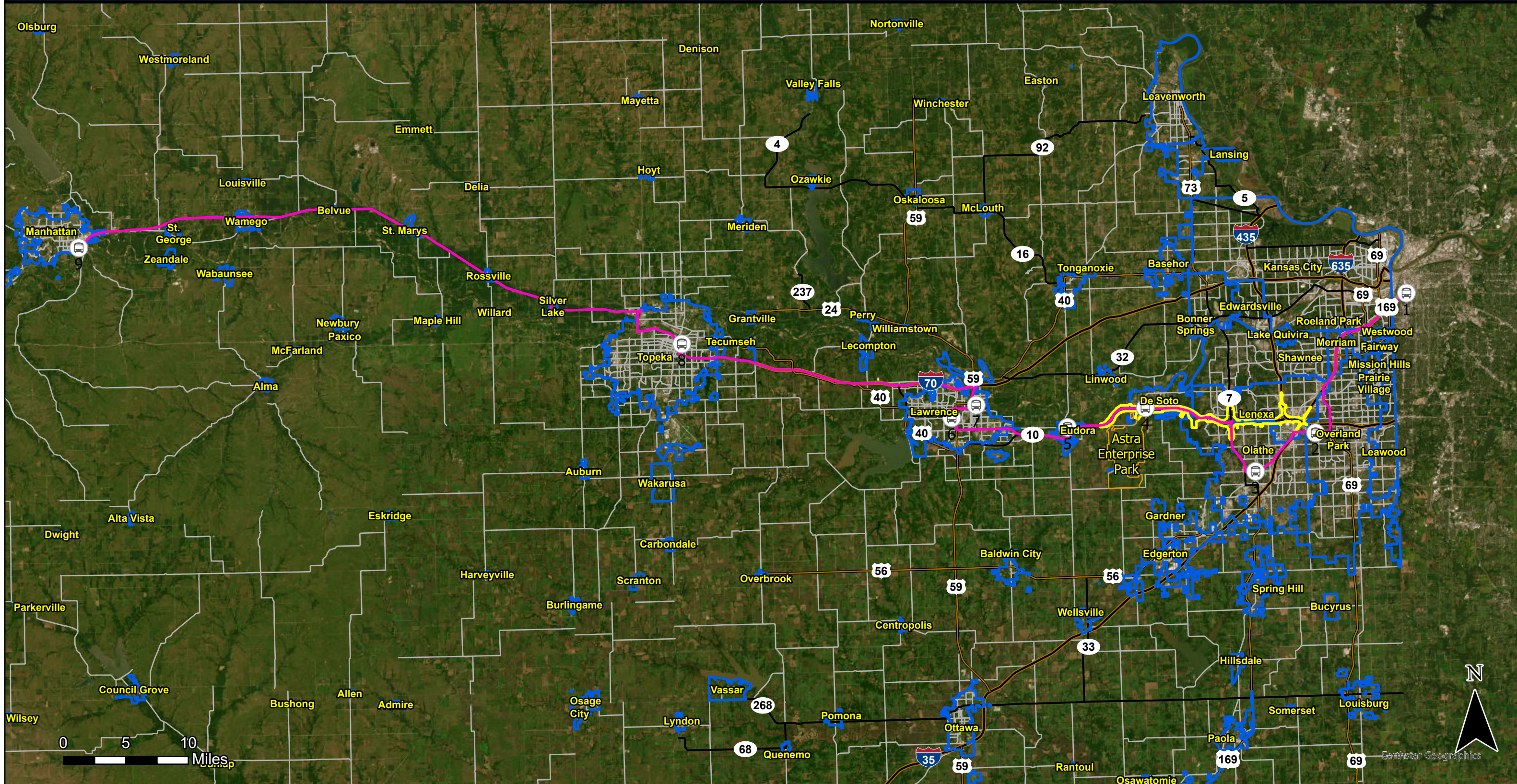
K-10 Capacity Improvements
KDOT # 10-46 KA-6549-01

- Astra Enterprise Park
- Study Area
- City Boundary

Legend

- Low-Income Population Density
- Minority Population Density

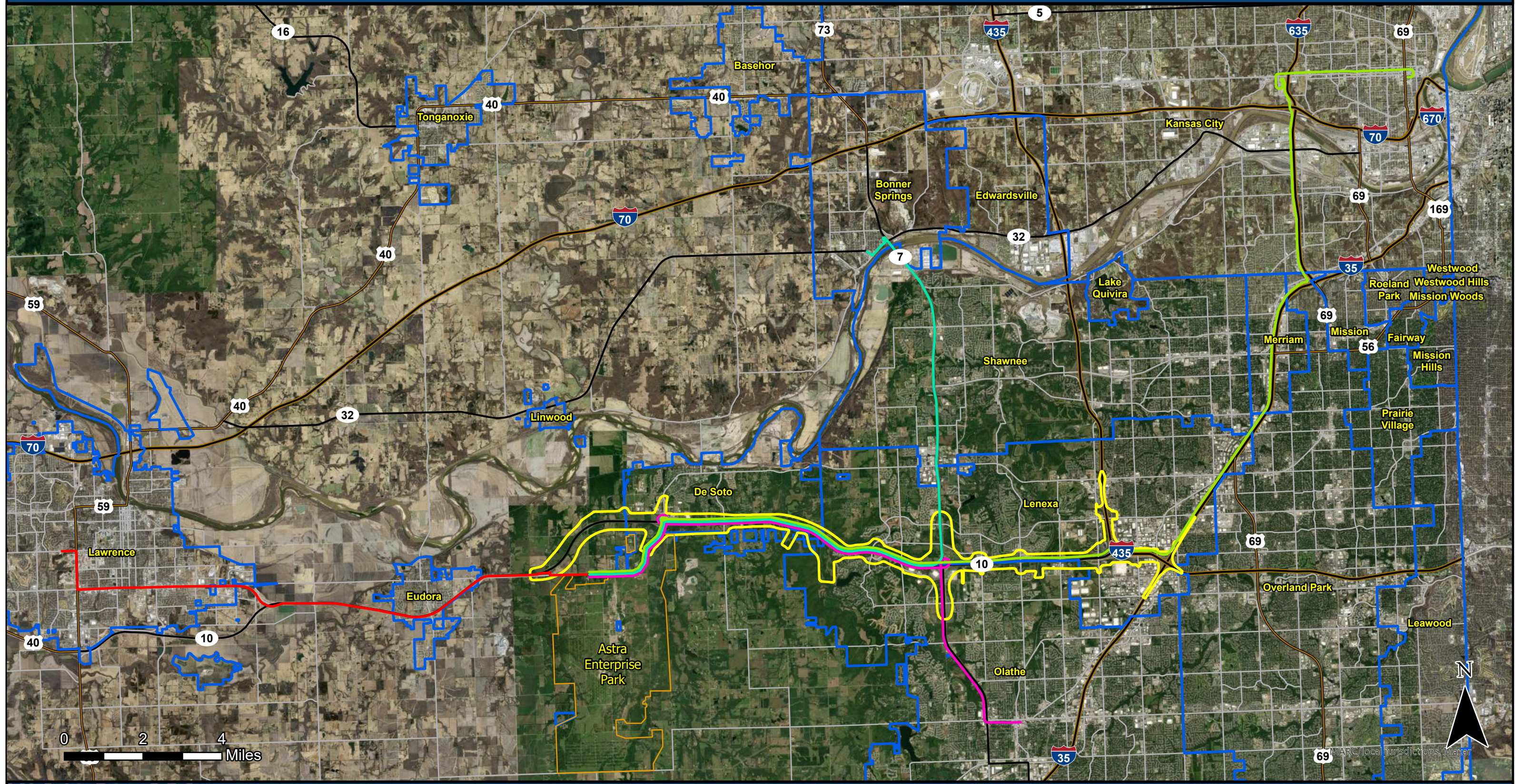




K-10 Capacity Improvements
KDOT # 10-46 KA-6549-01

- Legend**
- Astra Enterprise Park
 - Study Area
 - City Boundary
 - Potential Stations
 - Interregional Line





K-10 Capacity Improvements
 KDOT # 10-46 KA-6549-01

Legend

Astra Enterprise Park	Potential Shuttle Routes	Lawrence
Study Area	Bonner Springs	Olathe
City Boundary	Kansas City, KS	