STATEWIDE INTERSTATE AND PARKWAY PLAN (SWIPP)

Linking Kentucky

Final Report

Prepared for
Kentucky Transportation Cabinet

Prepared by
The Corradino Group

May 2024

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

1.1 STUDY BACKGROUND

The Kentucky Transportation Cabinet (KYTC) initiated a study, known as *Linking Kentucky*, to build on the success of the Strategic Highway Investment Formula for Tomorrow (SHIFT) and begin meaningful long-term planning that supports the new Long-Range State Transportation Plan (LRSTP) (https://transportation.ky.gov/Planning/Pages/Long-Range-Statewide-Transportation-Plan.aspx) and future Six-Year Highway Plans. The main purpose of *Linking Kentucky* is to identify current and future statewide mobility, accessibility, and safety needs for vital transportation corridors throughout Kentucky, which drive the state's economy, connect citizens to jobs, and attract businesses as well as investment.

The Statewide Corridor Plan (SWCP), Phase 1 of *Linking Kentucky*, kicked-off in the fall of 2019. The SWCP prioritized statewide and regional major arterial corridors which have great potential for improved safety, reduced travel time, improved system reliability, and economic benefits to Kentucky through better transportation services to people and goods. The SWCP was completed in the fall of 2021.

The Statewide Interstate and Parkway Plan (SWIPP), Phase 2 of *Linking Kentucky*, started immediately upon the completion of the SWCP. The SWIPP had the same purposes and needs as SWCP but focused on interstates and parkways throughout Kentucky. More comprehensive planning aspects and strategies were considered in the SWIPP due to the nature and higher standards of interstates and parkways as well as their importance in the state's transportation system.

1.2 STUDY METHODOLOGY

The SWIPP was accomplished by following a detailed work program consisting of the following activities:

- Develop study goals and objectives.
- Collect and analyze a variety of data, including census, land use, roadway facilities, traffic counts/forecasts, freight, speed/travel time, infrastructure conditions (e.g., pavement, bridge), crashes, equity-focused communities (EFC), environmental concerns, transit services, Transportation Systems Management and Operations (TSMO)/Intelligent Transportation Systems (ITS), connected and autonomous vehicles (CAV), costs, recent and planned studies/projects, etc.
- Develop methodology for identifying needs, including mobility, reliability, equity/accessibility, safety, freight/logistics, infrastructure, and economy.
- Develop a Communication Plan and provide visuals/materials to support plan messaging.
- Engage state legislators, FHWA, KYTC Central Office and Highway Districts, planning partners (e.g., MPOs, ADDs, and TRIMARC), public agencies, and grasstops (e.g., state legislators, Chambers of Commerce, county judge/executives, mayors and city managers, sheriff/police/fire/EMS, Kentucky Cabinet for Economic Development).
- Establish the interstate and parkway corridor network for analysis.
- Develop evaluation criteria and rating systems for identifying and prioritizing corridor segments with greatest potential for impact.
- Perform planning-level corridor scoping to summarize corridor conditions and issues, and recommend potential improvement concepts which consider both traditional capacity improvement strategies and innovative TSMO solutions where appropriate. Prioritize corridors with greatest potential for impactful improvements.
- Conduct a planning-level funding and fiscal analysis to ensure reasonable recommendations.
- Develop practical corridor visions, including intermediate and long-term improvement strategies, potential impacts, and planning-level cost estimates.
- Develop a GIS Online Tool to interactively integrate corridor visioning data, and present background and history of the study.

Using a data-driven approach, the SWIPP was unrolled in two tiers to identify the most impactful corridors based on existing (2019), intermediate (2030), and long-term (2045) transportation needs. Tier 1 started with 60 interstate and parkway segments (aka SWIPP Network) and narrowed them to 30 segments that had the greatest potential to better link Kentucky's regions and improve safety, mobility, reliability, accessibility, and freight/logistics. Tier 2 included planning-level corridor scoping efforts to recommend practical improvement strategies. More detailed analysis was conducted to select 21 priority segments that are anticipated to achieve the greatest benefits from proposed improvements, by accounting for comprehensive, quantitative, and qualitative factors. Then, practical visions were developed for those 21 priority corridor segments, outlining possible improvements to address the needs and also propose possible implementation strategies. An interactive GIS Online Tool was also developed to assemble, display, and disseminate corridor visions to the general public and stakeholders.

It is noted that the Brent Spence Bridge (BSB) Approach Corridor (Corridor 3I – I-75 from I-275 to Ohio State Line) was not included in corridor visioning per KYTC's guidance, while it ranked high in Tier 2 analysis. Improvements of this corridor have been under development as part of the full BSB project. This corridor is discussed separately in **Appendix J**.

1.3 STAKEHOLDER ENGAGEMENT

A three-level hierarchy of target stakeholders was established at the beginning of the SWIPP to provide guidance and input throughout the study. Table 1.1 summarizes the targeted stakeholders and their roles. **Appendix A** provides details of the extensive stakeholder communication efforts that were made in the lifecycle of the SWIPP.

Table 1.1 – Target Stakeholders in SWIPP

TARGET AUDIENCES	GROUPS INCLUDED [1]	PROJECT PHASE ENGAGED
Project Team	• KYTC Central Office • KYTC District personnel • MPO/ADD representatives	• Study Goals • SWIPP Network • Tier 1 • Tier 2 • Visioning
Planning Partners	• All other MPO and ADD planners • All KYTC Chief District Engineers • All KYTC District Project Development Branch Managers • All KYTC District Planners • TRIMARC	• SWIPP Network • Tier 1 • Tier 2 • Visioning
Key Stakeholders ("Grasstops")	• State legislators (senators and representatives) • County judge-executives; county road supervisors • Mayors and city managers • Sheriffs and police chiefs • KY Board of Emergency Medical Services; local EMS officials • Paid and volunteer fire chiefs • KY Cabinet for Economic Development • Chambers of Commerce • KY Manufacturers Association • KY Trucking Association • Kentuckians for Better Transportation • KY Association of Counties • KY League of Cities • KY Magistrates and Commissioners Association • Kentucky Public Transit Association • Public transit agencies with interstate/parkway routes (i.e., TANK, TARC) • Greyhound	• Tier 1 • Tier 2 • Visioning

[1] *See Appendix A – Communication Plan for details.*

1.4 ORGANIZATION OF REPORT

The remainder of the report is organized by the following chapters.

- **Chapter 2 – Data Collection.** Description of data, tools, and systems collected and used in the study.
- **Chapter 3 – Study Goals.** Overview of the development of study goals.
- **Chapter 4 – Interstate and Parkway Study Network.** Overview of the procedure used to establish the SWIPP Network.
- **Chapter 5 – Tier 1 Corridor Screening.** Tier 1 corridors analyzed, explanation of Tier 1 performance criteria and rating system, summary of Tier 1 scores, and corridor selection for Tier 2 prioritization.
- **Chapter 6 – Tier 2 Corridor Prioritization.** Tier 2 corridor scoping, explanation of Tier 2 performance criteria and rating system, and summary of Tier 2 scores and visioning corridor selection.
- **Chapter 7 – Corridor Visions.** Overview of corridor visioning elements and description of the development of the GIS Online Tool.

The report also includes appendices which provide detailed information of activities and results that were completed as part of the study.

CHAPTER 2: DATA COLLECTION

KYTC has a variety of databases, tools, and asset management systems in place utilized to support the SWIPP. KYTC tools and systems usually serve as stand-alone entities, providing useful information for a single function or division within KYTC. One of the SWIPP's goals is to set up a system to pull information from various places within KYTC, and to use the integrated information to support the decision-making process. This allows future corridors to be analyzed in a consistent fashion to quickly determine where each should fit within KYTC's overall priorities. One of KYTC's most powerful and valuable planning tools, the Kentucky Statewide Traffic Model (KYSTM), provides information regarding roadway capacities, traffic flows, future growth patterns, socio-economic benefits of proposed corridor improvements, etc. An enhanced version of the KYSTM (the SWIPP Model) was developed and used in tandem with KYTC's asset management systems, such as Highway Information System (HIS), Pavement Management System (PMS), Bridge Data Miner System, and Strategic Highway Investment Formula for Tomorrow (SHIFT), to provide well-rounded and consistent information for decision making in the SWIPP. Supporting data collected from supplemental sources such as recent KYTC corridor studies, U.S. Census Bureau, MPOs, ADDs, and Kentucky Geography Network (https://kygeonet.ky.gov) were also used in corridor analysis. The subsections below briefly describe the major tools and systems used in the SWIPP. A relatively detailed description of the SWIPP Model is provided due to its complex nature.

2.1 KYSTM

The KYSTM has its roots in mainframe computer software dating from the early 1970's. The current TransCAD-based model stems from a version developed in 2005. Since that time, it has been modified and enhanced extensively. The KYSTM has been used to support a wide variety of statewide transportation studies. **Appendix B** includes details of the KYSTM and additional efforts that were made to improve the model and integrate new modeling features to meet the needs of the SWIPP.

v8_KYSTMv19 was the latest model version when the SWIPP started. While the v8_KYSTMv19 provided good statewide traffic estimates, it might be less accurate than desired in specific corridors, including interstates and parkways, because of the great expanse (statewide) and diversity of the areas covered by the model. Thus, an enhanced version of the v8_KYSTMv19 (the SWIPP Model) was developed and used as a primary analysis tool for the study. The SWIPP Model greatly improved traffic estimates on all links, especially on interstates and parkways. The SWIPP Model has a 2019 base year to avoid the COVID-19 impact on traffic patterns. The SWIPP Model has a 2045 future year that incorporates KYTC's major existing and committed (E+C) projects (see **Appendix C**) and the growth from identified large-scale imminent developments (see **Appendix D**) in addition to default background growth estimated by the original v8_KYSTMv19.

Additional modeling capabilities were developed and integrated in the SWIPP Model to allow reasonable traffic forecasts and analysis of various Transportation Systems Management and Operations (TSMO) strategies recommended by the SWIPP.

2.2 HIGHWAY INFORMATION SYSTEM (HIS)

KYTC maintains the road centerline network and a Highway Information System (HIS) for Kentucky's state highways and local roads system. The HIS covers comprehensive roadway inventory data in GIS and tabular formats, including the following major categories.

- Highway System (e.g., functional class, National Highway System, National Highway Freight Network, truck network)
- Roadway Information (e.g., access control, speed limit)
- Roadway Features (e.g., number of lanes, shoulders, medians, bike/pedestrian facilities, horizontal/vertical curves)
- Traffic Counts

- Route Log
- Non-Highway Modes

2.3 PAVEMENT MANAGEMENT SYSTEM

KYTC utilizes its Pavement Management System (PMS) to identify preservation, repair, rehabilitation, and replacement actions that will sustain a state of good repair over the lifecycle of the pavements. Pavement data includes automated pavement distress, rutting, cross slope, International Roughness Index (IRI), faulting, curve and grade, GPS data, and roadway images. To meet the study needs, KYTC provided the Pavement Distress Index (PDI), year of next treatment, and year of the *Highway Plan* when improvements were programmed for all roadway sections of study corridors.

2.4 BRIDGE MANAGEMENT SYSTEM

KYTC inventories and inspects over 14,000 bridges in accordance with the National Bridge Inspection Standards (NBIS). Over 250 data items are collected and maintained on each bridge. The data is managed through KYTC's Bridge Data Miner system. To meet the study needs, KYTC provided a complete list of bridges and culverts throughout the state along with key attributes such as structure ID, NBIS classification (poor/fair/good), sufficiency rating, substructure rating, superstructure rating, deck rating, vertical/horizontal clearance, etc. The file contains latitude/longitude of each structure, so the bridges/culverts can be geocoded and attached to each study corridor.

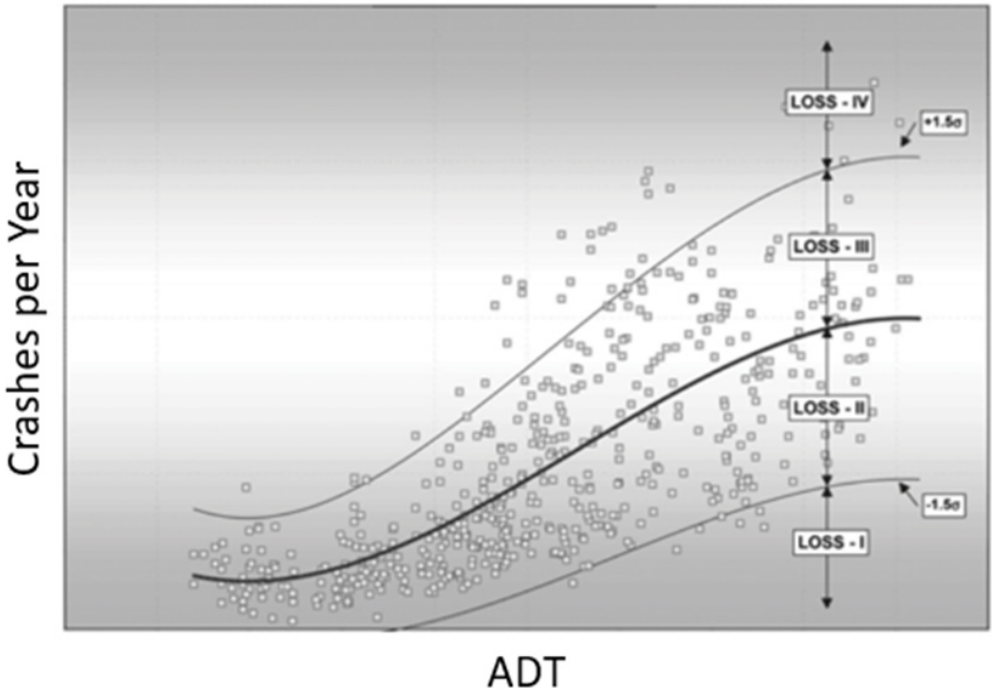
2.5 CRASH DATA

KYTC provided statewide crash data in a GIS format to support safety analysis in the study. The dataset includes Excess Expected Crashes (EEC) and Level of Service of Safety (LOSS) based on 2015-2019 crash data in Kentucky. Definitions of EEC and LOSS are provided below.

- **EEC and LOSS.** KYTC uses AASHTO's 2010 Highway Safety Manual (HSM) methodologies to measure the safety performance of roadways allowing for more informed decisions during the project development process. The Excess Expected Crashes (EEC) is a measurement which estimates the number of crashes above what is predicted by a crash prediction model of roadways or intersections of similar type, length, and characteristics in Kentucky. A negative EEC means the roadway or intersection is experiencing fewer crashes than is predicted by the models. EECs are then grouped into one of four categories, identified as the Level of Service of Safety (LOSS). Summarized graphically in **Figure 2.1**, LOSS categories I and II represent sites with fewer than anticipated crashes, up to category IV which has more than 1.5 standard deviations more crashes than expected. While LOSS I, II, and III indicate low, low to moderate, and moderate to high potential for crash reductions respectively, LOSS-IV sites experience such elevated crash rates and have the highest probability that safety countermeasures at these locations will result in larger improvements.

In addition to the data provided by KYTC, crash data from the Kentucky State Police database was collected for each of the study area roadways to provide a data-informed safety approach. Five years of data (2017 to 2021) were used and geographically referenced to the parkways and interstates so that crash trends such as locations, crash types, and conditions in which the crashes occurred could be examined.

Figure 2.1 – Level of Service of Safety (LOSS)



2.6 SHIFT

The Strategic Highway Investment Formula for Tomorrow (SHIFT) is KYTC's data-driven, objective approach to compare capital improvement projects and prioritize limited transportation funds. SHIFT allows policy makers to see just how far down the priority list the limited funds will go and which other projects could be funded if additional funds were generated. Based on five key attributes (i.e., safety, asset management, congestion, economic growth, and benefit/cost), SHIFT uses measurable data to assess the need for and benefits of planned projects and compares them to each other. The SHIFT formulas were obtained from KYTC and reviewed by the Project Team to ensure consistent performance measures were used for corridor analysis in the study.

2.7 FREIGHT AND LOGISTICS

2.7.1 TranSearch

KYTC purchased a TranSearch database which includes freight commodity flows for 2018 and 2045 that was used in the SWIPP study. The database reports freight flows by:

- Counties in Kentucky and regions in other states
- Standard Transportation Commodity Classification (STCC) – 762 categories (at 4-digit level)
- Modes – 6 modal groups (truck, rail, air, water, pipeline, and other) and 15 sub-groups
- Tonnage
- Value

This level of detail results in over 12 million records reported as Year-Origin-Destination-Commodity-Mode. **Figure 2.2** and **Figure 2.3** illustrate 2018 county-level freight tonnage and value by highway mode in Kentucky. This dataset was used in the SWIPP and supported freight and logistics analysis of study corridors.

Figure 2.2 – Highway Commodity Tonnage by County (2018 TranSearch)

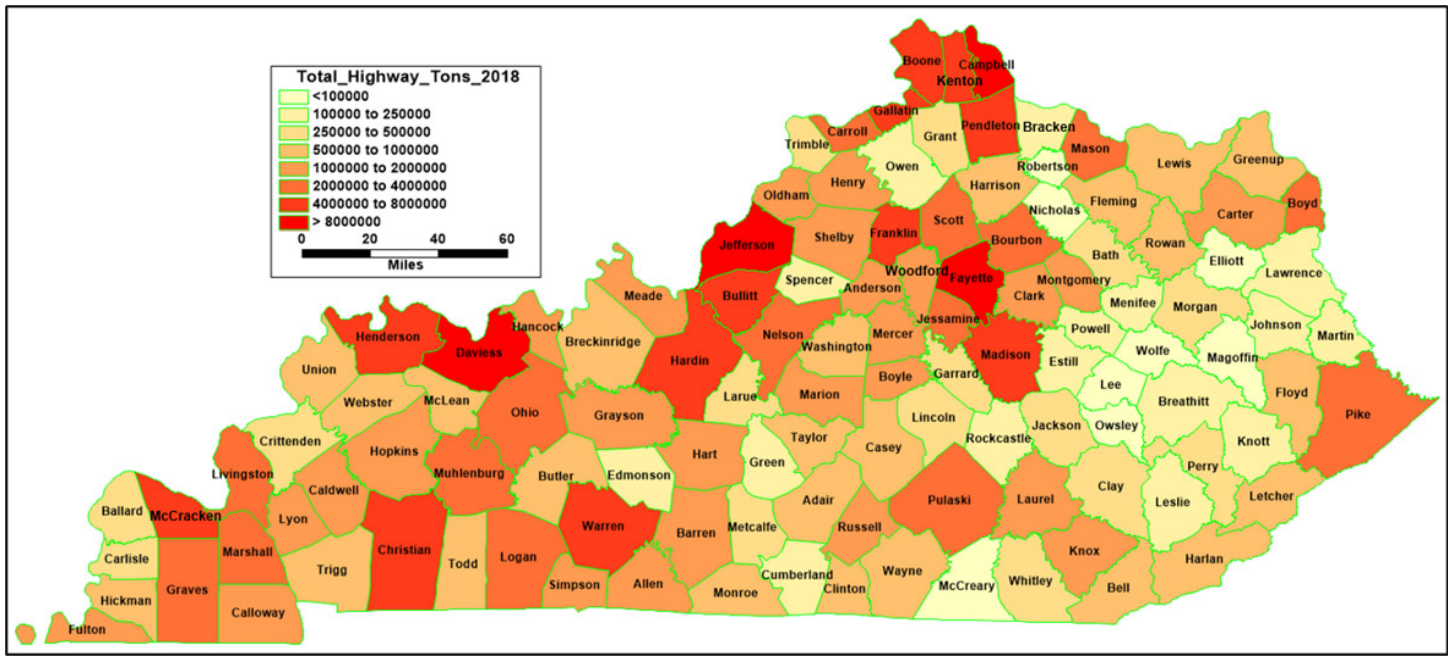
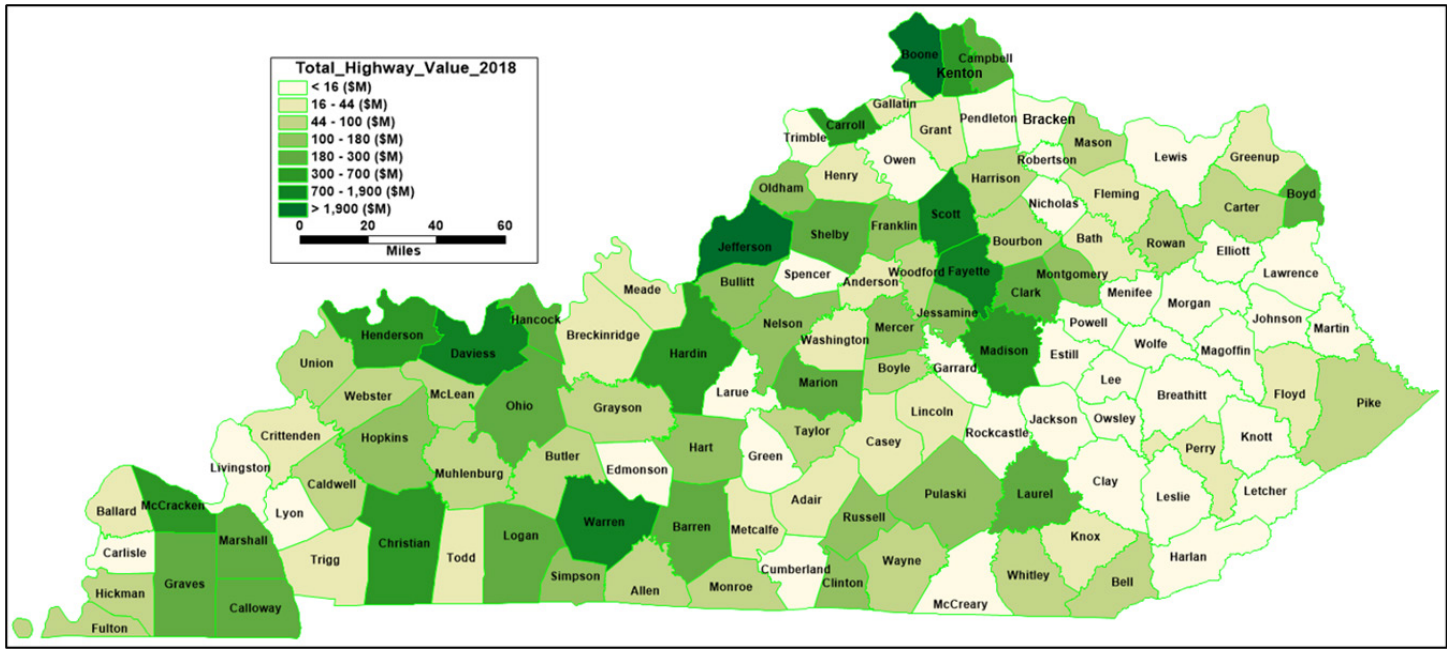


Figure 2.3 – Highway Commodity Value by County (2018 TranSearch)



2.7.2 Freight Analysis Framework (FAF)

The Freight Analysis Framework (FAF), produced through a partnership between Bureau of Transportation Statistics (BTS) and the Federal Highway Administration (FHWA), integrates data from a variety of sources to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation. The latest FAF version (FAF5) provides estimates for tonnage and value by regions of origin and destination, commodity type, and mode for a base year of 2017 and a future year of 2050. The FAF5 also include estimates of truck flow on its highway network. The FAF5 data, along with the TranSearch data mentioned above, was used for freight and logistics analysis in the SWIPP.

2.7.3 Major Freight Generators and Facilities

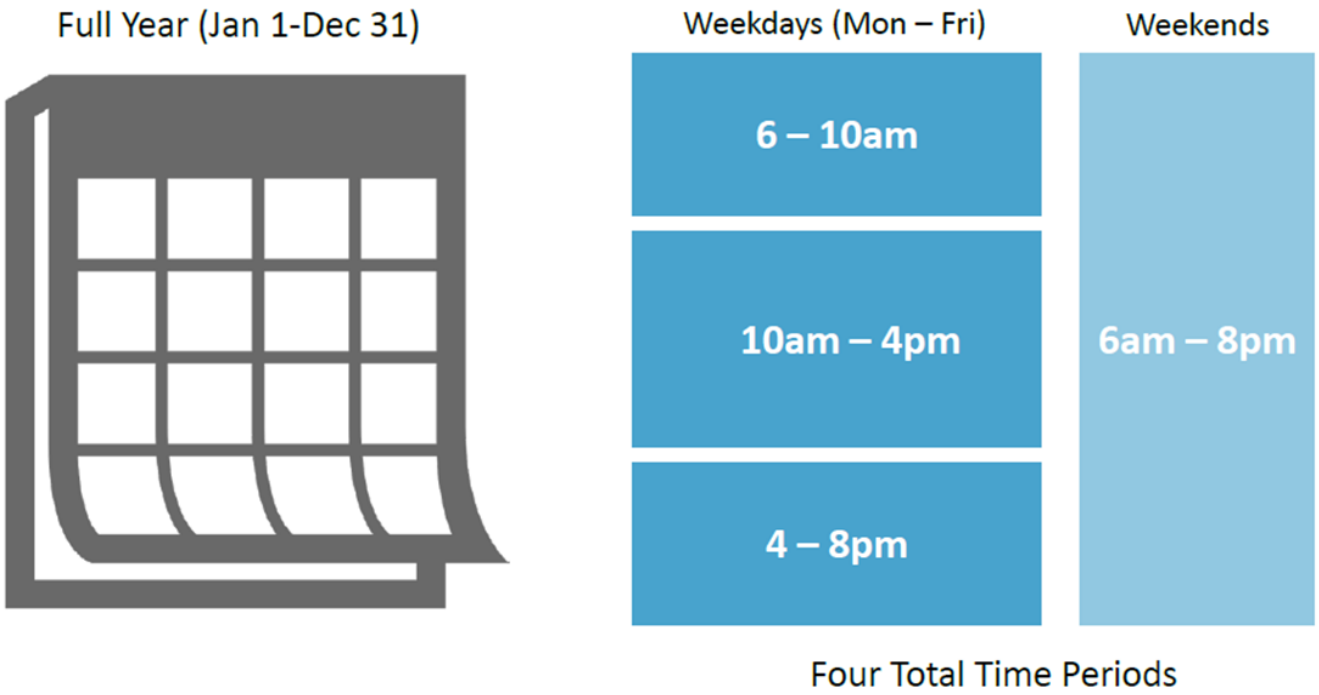
KYTC maintains a GIS database of key freight generators and facilities in Kentucky, including major cargo airports, riverports, rail yards, and freight generators. Intermodal freight connectors identified by FHWA National Highway System (NHS) and Primary Highway Freight System (PHFS) were also considered in the SWIPP.

2.8 SPEED AND TRAVEL TIME

KYTC provided directional speed data for all SWIPP corridors, based on 2017-2019 data from the National Performance Management Research Data Set (NPMRDS). The dataset also includes the Level of Travel Time Reliability (LOTTR) and Truck Travel Time Reliability (TTTR) Index values that KYTC derived and used for FHWA reporting.

As part of the FHWA's System Performance Measure Final Rule, LOTTR is a required measurement of travel time reliability on the interstate and non-interstate National Highway System (NHS). According to FHWA's Transportation Performance Management (TPM) framework, LOTTR is defined as the ratio of the longer travel times (80th percentile) to a "normal" travel time (50th percentile), using data from FHWA's NPMRDS or equivalent dataset (e.g., INRIX, HERE). Data are collected in 15-minute segments during all four required time periods (see **Figure 2.4**). The reporting corridor segment is considered reliable when LOTTR is less than 1.50 for all time periods, otherwise it is classified as unreliable.

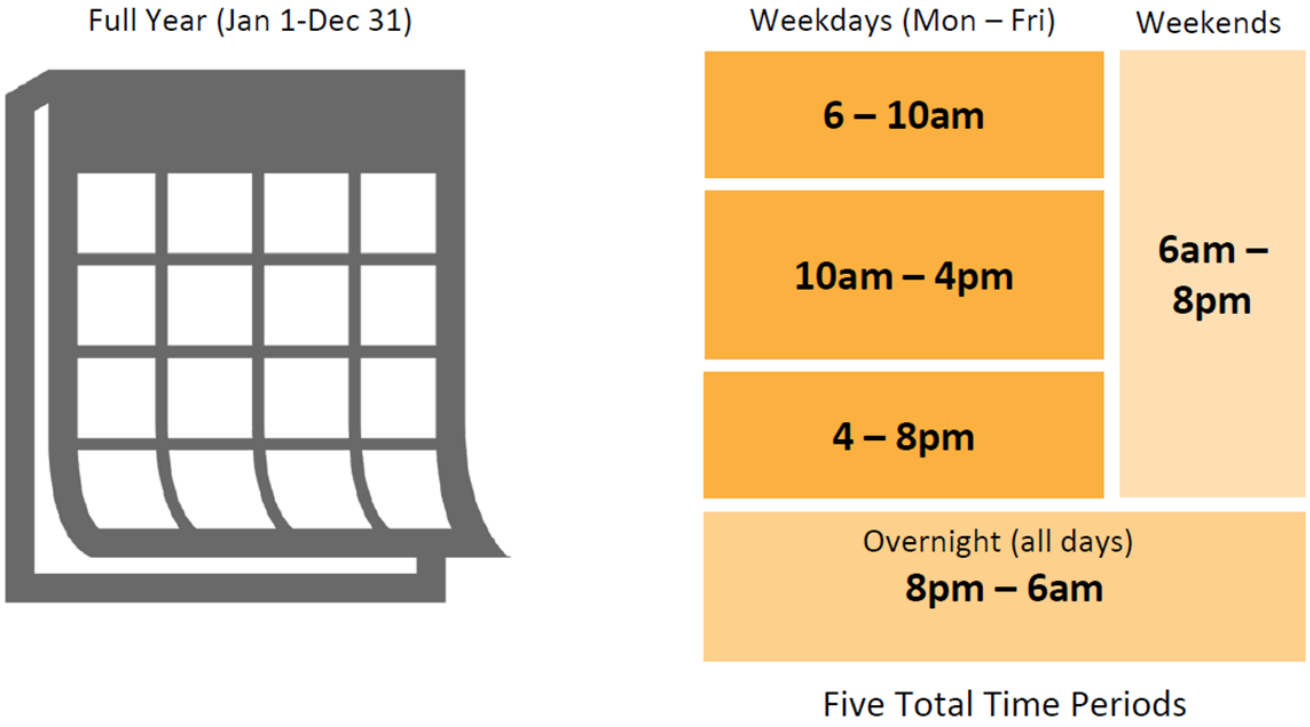
Figure 2.4 – Data Requirements for LOTTR



Source: FHWA TPM

TTTR is also a required measurement of travel time reliability for freight movements on the interstates, according to the FHWA's System Performance Measure Final Rule. TTTR is defined as the ratio of congested truck travel times (95th percentile) to "normal" truck travel times (50th percentile), using data from FHWA's NPMRDS or equivalent dataset (e.g., INRIX, HERE). Data are collected in 15-minute segments during all five required time periods (see **Figure 2.5**). It is noted that the federal guidelines do not establish a TTTR threshold for unreliable truck travel time. For each reporting interstate segment, the maximum value of TTTR from all time periods is used.

Figure 2.5 – Data Requirements for TTTR



Source: FHWA TPM

The KYTC dataset also provided the Traffic Message Channel (TMC) records corresponding to the SWIPP Model network link IDs, so the LOTTR and TTTR values can be efficiently attached to each section of SWIPP study corridors.

2.9 TREDIS

KYTC purchased access to the Transportation Economic Development Impact System (TREDIS) for Kentucky. TREDIS is a predictive impact model. It uses information about future travel patterns, market access, and construction spending to estimate the costs, benefits, and economic impacts that flow from them. As such, results are based on comparisons between two alternative futures. In most cases, TREDIS results are shown as differences in benefits, costs, and economic activity between the "no-build" and "build" scenarios in a given year.

TREDIS is dependent upon certain outputs from KYTC's transportation demand models (e.g., KYSTM):

- Scenarios ("no-build" and "build") and years (current and future)
- Mode type (freight, auto, others)
- Geographic extent (TREDIS only allows analysis at the level of single or multiple counties. Partial county analysis is not possible.)
- Total vehicle miles traveled (VMT) by mode type, scenario, and year
- Total vehicle hours traveled (VHT) by mode type, scenario, and year

Once the information is fed into TREDIS, the model can be run, and results can be analyzed. Example results from TREDIS are the estimated totals of net societal benefit of a project (including user benefits, logistics benefits, indirect benefits) and the number of jobs that a project is estimated to create over the lifetime of the project. It should be noted that TREDIS shows benefits that are based on travel time savings and VMT savings from KYSTM, which provides a very general level of analysis for economic benefits. If the project does not significantly change any of the conditions, then TREDIS may not show a significant economic impact or benefits from a transportation project alone.

2.10 KENTUCKY GEOGRAPHY NETWORK

The Kentucky Geography Network (https://kygeonet.ky.gov) is the Geospatial Data Clearinghouse for the Commonwealth of Kentucky. A variety of datasets can be located and downloaded, static map products can be reviewed, and many web mapping applications and services are easily accessible. Using the powerful search capabilities offered by the Kentucky Geoportal in the Kentucky Geography Network, various GIS point layers were collected for colleges/universities, industrial sites, hospitals, etc. These layers were used to identify major special generators and support corridor accessibility analysis in the study.

2.11 U.S. CENSUS

The SWIPP took advantage of the recently published 2020 Census data. The following 2020 data was collected at census tract level for the entire state of Kentucky and mainly used to identify the Equity-Focused Communities (EFCs) as part of the accessibility analysis in the study.

- Population
- Household
- Minority
- Income/Poverty

2.12 KYTC RECENT PLANS AND STUDIES

KYTC's recent and current planning documents, such as the 2014-2035/2022-2045 Kentucky Long-Range Statewide Transportation Plan (LRSTP), 2017/2022 Kentucky Freight Plan, 2015 Kentucky Statewide Rail Plan, and 2019 Transportation Asset Management Plan, were reviewed and used to gather base-line information for the SWIPP.

Kentucky's 2022 Enacted Highway Plan became available while the SWIPP was under way. The Project Team reviewed the document and available GIS data of project listings while corridor improvement concepts were developed. In addition, information from the following recent studies provided by KYTC was reviewed and used to support developing improvement concepts for relevant study corridors.

- Brent Spence Bridge Corridor (KYTC Item No.: 6-17)
- I-Move Kentucky (KYTC Item No.: 5-537 & 5-483 & 5-549.00)
- I-69 Ohio River Crossing (KYTC Item No.: 2-1088)
- I-65/I-264 Interchange Planning Study (KYTC Item No.: 05-559)
- I-65 Corridor Study from I-264 to East Jefferson Street (KYTC Item No.: 5-569)
- I-65 Conceptual Improvements Study in Bullitt & Jefferson County (KYTC Item No.: 5-550)
- I-65 at KY 480 Interchange Improvements (KYTC Item No.: 5-391.3)
- I-71/75 and I-275 Interchange Scoping Study (KYTC Item No.: 6-79.00)
- I-71/I-264 Interchange Study (KYTC Item No.: 5-557.00)
- KY 236/KY 3076 Improvements (KYTC Item No.: 6-444.00 & 6-445.00)
- Mountain Parkway Expansion (KYTC Item No.: 10-168.0 & 10-126.7 & 10-126.6 & 10-126.5 & 10-126.4 & 10-167 & 10-126.12 & 10-140 & 10-166 & 10-169 & 12-1.20 & 12-1.30 & 12-1.40)
- Pennyrile Parkway Upgrade Study
- I-265 Programming Study

CHAPTER 3: STUDY GOALS

A set of goals were developed to guide the SWIPP through a collaborative process between the KYTC Project Management team (KYTC), KYTC Central Office, KYTC Highway Districts, and representatives from MPOs and ADDs (Project Team), and the consultants. These goals support the KYTC's mission, performance targets, current and future Long Range Statewide Transportation Plan (LRSTP), and future Six-Year Highway Plans.

Five draft goals were developed by KYTC and the consultants to comply with general long-range planning requirements and procedures as well as KYTC expectations of the study. The draft goals also addressed comments and suggestions from the Project Team and Planning Partners based on the team's experience gained from the recently completed Statewide Corridor Plan (SWCP). An on-line survey was used to effectively distribute the draft goals to the Project Team and solicit their input and feedback. 25 members of the Project Team completed the initial survey. The survey results indicated the Project Team strongly supported the draft goals in general, which provided a solid foundation for continuous and productive discussion amongst the team. **Appendix E** includes details of the survey. A series of Project Team Meetings were held to review, revise, and finalize the study goals. The final study goals were determined:

Goal 1. *To identify current and future statewide needs regarding interstate and parkway corridor performance, including safety, mobility, reliability, accessibility, and system preservation.*

Goal 2. *To prioritize statewide interstate and parkway corridors with the greatest potential to improve safety, provide equitable mobility benefits, improve system reliability and linkage, promote freight movement and economic vitality, improve resiliency, integrate appropriate multimodal options, and deploy innovative practices and technologies.*

Goal 3. *To develop practical visions for KYTC's priority interstate and parkway corridors. These visions will identify intermediate (2030) and long-term (2045) transportation performance and preservation needs, possible improvement types that address the needs, logical construction sections, as appropriate, and improvement strategies for staged implementation (intermediate and long-term) based on expected corridor performance.*

Goal 4. *To gather and utilize input from key stakeholders and planning partners.*

Goal 5. *To present study goals, methods, and findings throughout the planning process in a transparent and straight-forward manner and support the Long-Range Statewide Transportation Plan and SHIFT prioritization.*

CHAPTER 4: INTERSTATE AND PARKWAY STUDY NETWORK

The SWIPP study network represents a strategic network of statewide interstate and parkway corridors that is the target of potential investment in Kentucky. It is one of the most important elements of ***Linking Kentucky*** and provides a foundation for subsequent Tier 1 screening, Tier 2 prioritization, as well as corridor visioning in the SWIPP. These study corridors are described below.

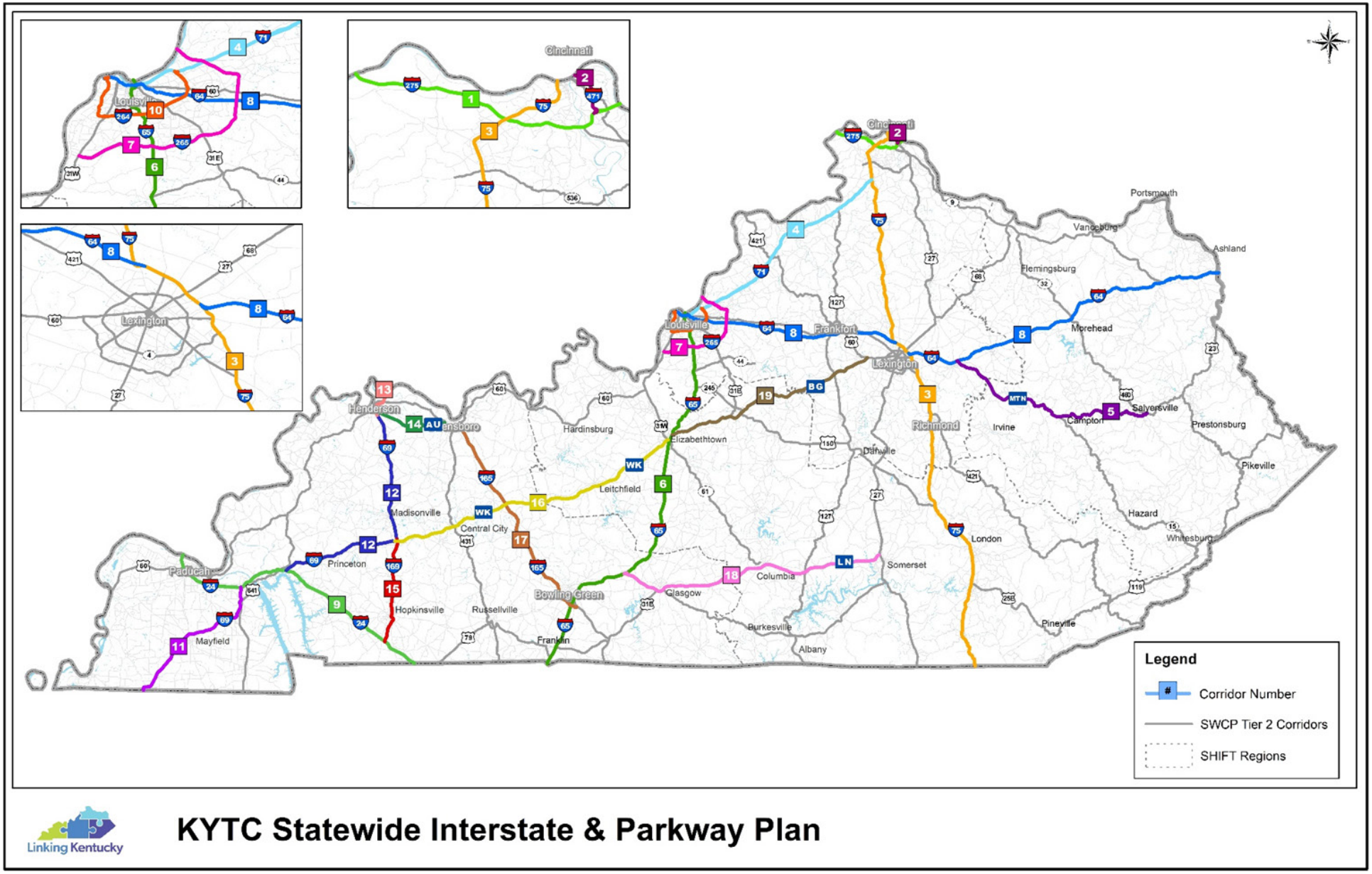
4.1 INTERSTATE AND PARKWAY STUDY CORRIDORS

KYTC identified statewide interstates and parkways for study in the SWIPP, as shown in **Figure 4.1** and listed in **Table 4.1**. This network is composed of 19 corridors that include a total of approximately 1,390 centerline miles. These study corridors were analyzed to identify those with the greatest potential to improve mobility, reliability, equitable accessibility, safety, and system preservation. It is noted that Hal Rogers Parkway was not included in the study network, as it has been studied in the Statewide Corridor Plan (SWCP) (https://transportation.ky.gov/linkingkentucky/Pages/Home.aspx) recently completed by KYTC.

Table 4.1 – Interstate and Parkway Study Corridors

CORRIDOR ID	CORRIDOR NAME	FROM	TO
1	I-275	IN state line	OH state line
2	I-471	I-275	OH state line
3	I-75	TN state line	OH state line
4	I-71	I-64	I-75
5	Mountain Pkwy	I-64	US 460 in Salyersville
6	I-65	TN state line	IN state line
7	I-265/KY 841 (Gene Snyder Fwy)	US 31 W	IN state line
8	I-64	IN state line	WV state line
9	I-24	IL state line	TN state line
10	I-264 (Watterson Expwy)	I-64 (West)	I-71
11	I-69/Purchase Pkwy	TN state line	I-24 in Marshall County
12	I-69	I-24 in Lyon Co.	Henderson Bypass/KY 425
13	I-69 Henderson Bridge	Henderson Bypass/KY 425	Ohio River
14	Audubon Pkwy (Future I-369)	I-69	US 60 in Owensboro
15	Pennyrile Pkwy (Future I-169)	I-24	I-69/Western KY Pkwy
16	Western KY Pkwy	I-69/Pennyrile Pkwy	I-65
17	I-165/Natcher Pkwy	US 231 in Bowling Green	US 60 in Owensboro
18	Cumberland Expwy	I-65	US 27 near Somerset
19	Bluegrass Pkwy	I-65	US 60 in Woodford Co.

Figure 4.1 – Interstate and Parkway Study Corridors



4.2 INTERSTATE AND PARKWAY CORRIDOR SEGMENTS

The 19 study corridors were divided into 60 segments of logical termini and independent utilities (e.g., volume changes, level of congestion, truck percentages, area and terrain types, major junctions, etc.) based on the consensus of the Project Team. The corridor segmentation avoided very long segments (no more than 50 miles) to achieve more comparable results between segments. The shorter segment length allowed more specific corridor scoping and improvement concept development, as well as more detailed analysis of corridor performance.

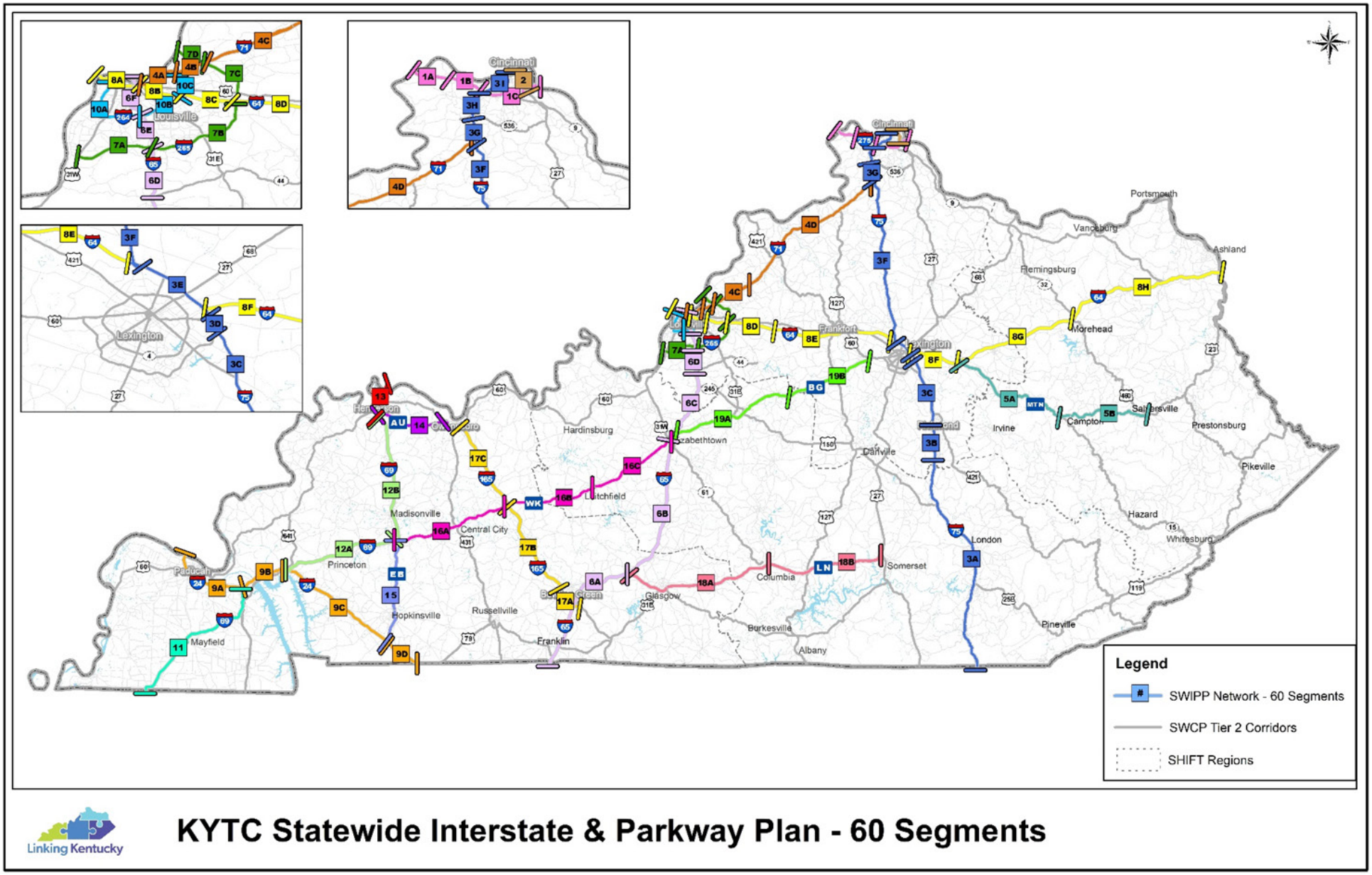
The Project Team shared the draft corridor segments with the Planning Partners and adjusted termini of a few corridors based on the collected inputs. **Figure 4.2** illustrates the final corridor segments. **Table 4.2** lists the segments, limits, and segment IDs, used throughout the study. All identified corridor segments were evaluated in Tier 1 screening.

Table 4.2 – Interstate and Parkway Corridor Segments

SEGMENT ID	CORRIDOR NAME	FROM	TO
1A	I-275	Indiana state line	KY 237 in Boone Co.
1B	I-275	KY 237 in Boone Co.	I-71
1C	I-275	I-71	Ohio state line
2	I-471	Ohio state line	I-275
3A	I-75	Tennessee state line	KY 21 in Berea
3B	I-75	KY 21 in Berea	KY 876 in Richmond
3C	I-75	KY 876 in Richmond	Man O War Blvd
3D	I-75	Man O War Blvd	I-64/I-75 south split
3E	I-75	I-64/I-75 south split	I-64/I-75 north split
3F	I-75	I-64/I-75 north split	I-71
3G	I-75	I-71	KY 536 in Boone Co.
3H	I-75	KY 536 in Boone Co.	I-275
3I	I-75	I-275	Ohio state line
4A	I-71	I-64	I-264
4B	I-71	I-264	I-265
4C	I-71	I-265	KY 53 in La Grange
4D	I-71	KY 53 in La Grange	I-75
5A	Mountain Pkwy	I-64	KY 15 in Wolfe Co.
5B	Mountain Pkwy	KY 15 in Wolfe Co.	US 460 in Salyersville
6A	I-65	Tennessee state line	Cumberland Expressway
6B	I-65	Cumberland Expressway	Western KY Pkwy
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville
6D	I-65	KY 44 in Shepherdsville	I-265
6E	I-65	I-265	I-264
6F	I-65	I-264	Indiana state line
7A	I-265/KY 841 (Gene Snyder Fwy)	US 31 W	I-65

SEGMENT ID	CORRIDOR NAME	FROM	TO
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71
7D	I-265/KY 841 (Gene Snyder Fwy)	I-71	Indiana state line
8A	I-64	Indiana state line	I-65
8B	I-64	I-65	I-264
8C	I-64	I-264	I-265
8D	I-64	I-265	KY 53 in Shelbyville
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split
8F	I-64	I-64/I-75 south split	Mountain Pkwy
8G	I-64	Mountain Pkwy	KY 32 in Morehead
8H	I-64	KY 32 in Morehead	West Virginia state line
9A	I-24	Illinois state line	I-69 in Marshall Co.
9B	I-24	I-69 in Marshall Co.	I-69 in Lyon Co.
9C	I-24	I-69 in Lyon Co.	Pennyrile Pkwy
9D	I-24	Pennyrile Pkwy	Tennessee state line
10A	I-264 (Watterson Expy)	I-64 (west)	I-65
10B	I-264 (Watterson Expy)	I-65	I-64 (east)
10C	I-264 (Watterson Expy)	I-64 (east)	I-71
11	I-69/Purchase Pkwy	TN state line	I-24
12A	I-69	I-24 in Lyon Co.	Western KY Pkwy
12B	I-69	Western KY Pkwy	Henderson Bypass/KY 425
13	I-69 Henderson Bridge (ORX)	Henderson Bypass/KY 425	Ohio River
14	Audubon Pkwy	I-69	US 60 in Owensboro
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy
16A	Western KY Pkwy	I-69/Pennyrile Pkwy	I-165
16B	Western KY Pkwy	I-165	KY 259 in Leitchfield
16C	Western KY Pkwy	KY 259 in Leitchfield	I-65
17A	I-165/Natcher Pkwy	US 231 (south)	US 231 (north) in Bowling Green
17B	I-165/Natcher Pkwy	US 231 (north) in Bowling Green	Western KY Pkwy
17C	I-165/Natcher Pkwy	Western KY Pkwy	US 60 in Owensboro
18A	Cumberland Expwy	I-65	KY 55 in Columbia
18B	Cumberland Expwy	KY 55 in Columbia	US 27 near Somerset
19A	Bluegrass Pkwy	I-65	KY 555 in Washington Co.
19B	Bluegrass Pkwy	KY 555 in Washington Co.	US 60 in Woodford Co.

Figure 4.2 – Interstate and Parkway Corridor Segments



CHAPTER 5: TIER 1 CORRIDOR SCREENING

As described in Chapter 4, 60 corridor segments from the SWIPP study corridor network were included in the data-driven Tier 1 corridor screening. The Tier 1 analysis uses quantitative performance measures to score each corridor segment and identify the 30 segments with the greatest needs of potential improvements in terms of safety, mobility, reliability, accessibility, and freight/logistics. Tier 1 scores range from 0 to 100, with 100 being the highest possible score.

5.1 PERFORMANCE MEASURES AND RATING SYSTEM

Early in this task, the Project Team developed a performance-based decision-making process to support the Tier 1 screening. Based on discussions within the Project Team, it was decided to limit the Tier 1 performance measures to Safety, Mobility, Reliability, Accessibility, and Freight/Logistics. These are all needs-based performance measures and closely correlate to measures used in KYTC's SHIFT process. An on-line survey was also conducted to gather input from the Project Team, Planning Partners, and key stakeholders on the importance of each of the five performance measures. The Tier 1 survey was live for two weeks from January 14 through 31, 2022. Detailed data gathered from the survey are shown in **Appendix F**. A Tier 1 rating system was developed using the rounding weights derived from survey results.

The five Tier 1 corridor-level performance measures were used for Tier 1 analysis and screening to determine which corridors would advance to more detailed analysis in Tier 2. They are listed in **Table 5.1**. Each performance index is assigned a value ranging from 0 to 5 points, with the latter indicating the highest need or deficiency for the corresponding performance measure. The safety, mobility, reliability, accessibility, and freight/logistics scores are combined to create an overall score that ranges from 0 to 100. A higher score indicates the greater need of improvement for the corridor and greater statewide/regional benefits expected from the corridor improvement.

Table 5.1 – Tier 1 Performance Measures

Scoring Factor Number	Tier 1 Corridor Performance Measures	Score Range	Score Weight	Max. Possible Weighted Score
#1	Safety Index	0 – 5	6	30
#2	Mobility Index	0 – 5	4	20
#3	Reliability Index	0 – 5	4	20
#4	Accessibility Index	0 – 5	3	15
#5	Freight & Logistics Index	0 – 5	3	15
				Sum = 100

Each of the five performance indices was derived from unique criteria and weights, based on the Project Team's discussion and the survey results as mentioned above. A detailed description of each performance index follows.

5.2 SAFETY

The safety index measures the existing safety performance along each corridor, by using EEC and LOSS, described in Section 2.5. KYTC provided 2015-2019 safety data in GIS format which included measures of EECs, LOSS, and KABCO (Fatality (K), Disabling Injury (A), Evident Injury (B), Possible Injury (C), and Property Damage Only (O)) counts.

Table 5.2 summarizes the safety index and its performance criteria. Note that the weights of the safety criteria (CRF and EEC) were not directly weighted by the survey. They were assigned 50% each based on discussion with the Project Team.

- **% Corridor VMT with Safety Issue (EEC > 0).** This measures the existing percentage of corridor vehicle miles traveled (VMT) that has safety issues (EEC > 0). It is a ratio of the summation of VMT for all sections with EEC > 0 to the total VMT of the corridor. VMT was calculated by v8_KYSTMv19 model data for base year 2019.
- **Corridor LOSS.** This provides an average LOSS for the corridor. It is a ratio of the summation of VMT for each segment multiplied by the LOSS value (1 through 4), to the weighted average by VMT of the corridor. VMT was calculated by v8_KYSTMv19 model data for base year 2019.

Table 5.2 – Tier 1 Safety Index

SAFETY INDEX				
% Corridor VMT With Safety Issue (EEC > 0) – X_1	**Score**		**Corridor LOSS – X_2**	**Score**
$X_1 < 20\%$	0		$X_2 < 2.0$	0
$20\% <= X_1 < 30\%$	1		$2.0 <= X_2 < 2.3$	1
$30\% <= X_1 < 40\%$	2		$2.3 <= X_2 < 2.5$	2
$40\% <= X_1 < 50\%$	3		$2.5 <= X_2 < 2.6$	3
$50\% <= X_1 < 60\%$	4		$2.6 <= X_2 < 2.8$	4
$X_1 >= 60\%$	5		$X_2 >= 2.8$	5
Safety Score = $0.5X_1 + 0.5X_2$				
Final Score Weight = 30%, Multiplier = 6				

Table 5.3 summarizes the Tier 1 safety scores. The following corridor segments have the highest scores:

- I-275 from Indiana state line to KY 237 in Boone County
- I-71 from I-64 to I-265
- I-65 from I-264 to Indiana state line
- I-65 from Cumberland Expwy to Western KY Pkwy
- I-64 from I-265 to KY 53 in Shelbyville
- Audubon Pkwy from I-69 to US 60 in Owensboro
- Pennyrile Pkwy from I-24 to I-69/Western KY Pkwy

Table 5.3 – Tier 1 Safety Scoring

CORRIDOR ID	CORRIDOR NAME	FROM	TO	% CORRIDOR VMT WITH EEC > 0	CORRIDOR LOSS	TIER 1 SAFETY SCORE (WEIGHTED)
1A	I-275	Indiana state line	KY 237 in Boone Co.	100%	3.29	30.0
1B	I-275	KY 237 in Boone Co.	I-71	26%	2.22	6.0
1C	I-275	I-71	Ohio state line	56%	2.49	18.0
2	I-471	Ohio state line	I-275	63%	2.04	18.0
3A	I-75	Tennessee state line	KY 21 in Berea	37%	2.49	12.0
3B	I-75	KY 21 in Berea	KY 876 in Richmond	32%	2.31	12.0
3C	I-75	KY 876 in Richmond	Man o' War Blvd	44%	2.54	18.0
3D	I-75	Man o' War Blvd	I-64/I-75 south split	9%	1.42	0.0
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	4%	1.82	0.0
3F	I-75	I-64/I-75 north split	I-71	49%	2.55	18.0
3G	I-75	I-71	KY 536 in Boone Co.	0%	2.04	3.0
3H	I-75	KY 536 in Boone Co.	I-275	23%	1.73	3.0
3I	I-75	I-275	Ohio state line	73%	2.58	24.0
4A	I-71	I-64	I-264	70%	3.03	30.0
4B	I-71	I-264	I-265	100%	3.28	30.0
4C	I-71	I-265	KY 53 in La Grange	46%	2.49	15.0
4D	I-71	KY 53 in La Grange	I-75	51%	2.65	24.0
5A	Mountain Pkwy	I-64	KY 15 in Wolfe Co.	38%	2.76	18.0
5B	Mountain Pkwy	KY 15 in Wolfe Co.	US 460 in Salyersville	42%	2.67	21.0
6A	I-65	Tennessee state line	Cumberland Expressway	8%	2.03	3.0
6B	I-65	Cumberland Expressway	Western KY Pkwy	80%	3.05	30.0
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	42%	2.57	18.0
6D	I-65	KY 44 in Shepherdsville	I-265	0%	1.86	0.0
6E	I-65	I-265	I-264	23%	1.80	3.0
6F	I-65	I-264	Indiana state line	90%	3.00	30.0
7A	I-265/KY 841 (Gene Snyder Fwy)	US 31 W	I-65	2%	2.31	6.0

CORRIDOR ID	CORRIDOR NAME	FROM	TO	% CORRIDOR VMT WITH EEC > 0	CORRIDOR LOSS	TIER 1 SAFETY SCORE (WEIGHTED)
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	24%	2.01	6.0
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	17%	1.87	0.0
7D	I-265/KY 841 (Gene Snyder Fwy)	I-71	Indiana state line	94%	2.62	27.0
8A	I-64	Indiana state line	I-65	44%	2.55	18.0
8B	I-64	I-65	I-264	31%	2.31	12.0
8C	I-64	I-264	I-265	54%	2.40	18.0
8D	I-64	I-265	KY 53 in Shelbyville	63%	2.89	30.0
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	58%	3.01	27.0
8F	I-64	I-64/I-75 south split	Mountain Pkwy	24%	2.50	9.0
8G	I-64	Mountain Pkwy	KY 32 in Morehead	14%	2.44	6.0
8H	I-64	KY 32 in Morehead	West Virginia state line	46%	2.66	21.0
9A	I-24	Illinois state line	I-69 in Marshall Co.	20%	2.28	3.0
9B	I-24	I-69 in Marshall Co.	I-69 in Lyon Co.	35%	2.43	12.0
9C	I-24	I-69 in Lyon Co.	Pennyrile Pkwy	22%	2.33	9.0
9D	I-24	Pennyrile Pkwy	Tennessee state line	45%	2.59	18.0
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	38%	2.54	15.0
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	46%	2.33	15.0
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	20%	1.69	3.0
11	I-69/ Purchase Pkwy	TN state line	I-24	11%	2.20	3.0
12A	I-69	I-24 in Lyon Co.	Western KY Pkwy	56%	2.66	24.0
12B	I-69	Western KY Pkwy	Henderson Bypass/ KY 425	20%	2.20	6.0
13	I-69 Henderson Bridge (ORX)	Henderson Bypass/ KY 425	Ohio River	28%	2.04	6.0
14	Audubon Pkwy	I-69	US 60 in Owensboro	65%	2.91	30.0
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	63%	2.88	30.0

CORRIDOR ID	CORRIDOR NAME	FROM	TO	% CORRIDOR VMT WITH EEC > 0	CORRIDOR LOSS	TIER 1 SAFETY SCORE (WEIGHTED)
16A	Western KY Pkwy	I-69/Pennyrile Pkwy	I-165	58%	2.65	24.0
16B	Western KY Pkwy	I-165	KY 259 in Leitchfield	32%	2.66	18.0
16C	Western KY Pkwy	KY 259 in Leitchfield	I-65	45%	2.69	21.0
17A	I-165/ Natcher Pkwy	US 231 (south)	US 231 (north) in Bowling Green	2%	1.82	0.0
17B	I-165/ Natcher Pkwy	US 231 (north) in Bowling Green	Western KY Pkwy	53%	2.61	24.0
17C	I-165/ Natcher Pkwy	Western KY Pkwy	US 60 in Owensboro	72%	2.76	27.0
18A	Cumberland Expwy	I-65	KY 55 in Columbia	37%	2.52	15.0
18B	Cumberland Expwy	KY 55 in Columbia	US 27 near Somerset	26%	2.51	12.0
19A	Bluegrass Pkwy	I-65	KY 555 in Washington Co.	55%	2.81	27.0
19B	Bluegrass Pkwy	KY 555 in Washington Co.	US 60 in Woodford Co.	39%	2.54	15.0

Note: Corridor #13 (I-69 Henderson Bridge) only considers the existing US 41 section, as the bridge section is not built yet.

5.3 MOBILITY

The mobility index measures each corridor segment's overall congestion. **Table 5.4** summarizes the mobility index and its performance criteria. The weight of each criterion was determined from data collected from the Tier 1 on-line survey. The mobility score was weighted as 45% for existing delay, and 55% for future delay.

- **Existing Vehicle Hour Delay (2019).** This measures the level of congestion along a corridor in the base year 2019. Link-level vehicle hour delay was calculated as the link traffic volume multiplied by the delay (i.e., free-flow time minus congested time) from a 2019 model run of v8_KYSTMv19. The total delay of a corridor is a sum of all link-level delays in the corridor.
- **Future Vehicle Hour Delay (2045).** This forecasts the level of congestion along a corridor in the future year 2045. It was calculated in the same way as the existing vehicle hour delay mentioned above but used results from a 2045 model run of v8_KYSTMv19.

Table 5.4 – Tier 1 Mobility Index

MOBILITY INDEX				
Existing Vehicle Hour Delay (2019) - X_1	Score		Future Vehicle Hour Delay (2045) - X_2	Score
$X_1 < 150$	0		$X_2 < 150$	0
$150 <= X_1 < 500$	1		$150 <= X_2 < 500$	1
$500 <= X_1 < 1{,}500$	2		$500 <= X_2 < 1{,}500$	2
$1{,}500 <= X_1 < 3{,}500$	3		$1{,}500 <= X_2 < 3{,}500$	3
$3{,}500 <= X_1 < 7{,}000$	4		$3{,}500 <= X_2 < 7{,}000$	4
$X_1 >= 7{,}000$	5		$X_2 >= 7{,}000$	5
Mobility Score = $0.45X_1 + 0.55X_2$				
Final Score Weight = 20%, Multiplier = 4				

Table 5.5 summarizes the Tier 1 mobility scores. Many segments of I-64, I-65, I-75, I-264, and I-265 in the metropolitan areas of Louisville, Lexington, and northern Kentucky have the highest scores, because most delays are caused by greater congestion in these areas. The rest of I-65 and I-75 throughout Kentucky also have higher mobility scores, as they are major statewide corridors carrying heavy traffic with growing congestion.

Table 5.5 – Tier 1 Mobility Scoring

Corridor ID	Corridor Name	From	To	Vehicle Hour Delay (2019)	Vehicle Hour Delay (2045)	Tier 1 Mobility Score (Weighted)
1A	I-275	Indiana state line	KY 237 in Boone Co.	581	1,109	8.0
1B	I-275	KY 237 in Boone Co.	I-71	815	4,030	12.4
1C	I-275	I-71	Ohio state line	2,171	3,985	14.2
2	I-471	Ohio state line	I-275	746	964	8.0
3A	I-75	Tennessee state line	KY 21 in Berea	3,023	9,734	16.4
3B	I-75	KY 21 in Berea	KY 876 in Richmond	675	2,715	10.2
3C	I-75	KY 876 in Richmond	Man o' War Blvd	2,261	10,599	16.4
3D	I-75	Man o' War Blvd	I-64/I-75 south split	582	4,206	12.4
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	2,644	9,278	16.4
3F	I-75	I-64/I-75 north split	I-71	2,288	13,519	16.4
3G	I-75	I-71	KY 536 in Boone Co.	2,084	7,965	16.4
3H	I-75	KY 536 in Boone Co.	I-275	5,726	20,999	18.2

Corridor ID	Corridor Name	From	To	Vehicle Hour Delay (2019)	Vehicle Hour Delay (2045)	Tier 1 Mobility Score (Weighted)
3I	I-75	I-275	Ohio state line	10,765	9,434	20.0
4A	I-71	I-64	I-264	1,117	2,980	10.2
4B	I-71	I-264	I-265	1,614	6,194	14.2
4C	I-71	I-265	KY 53 in La Grange	3,594	5,468	16.0
4D	I-71	KY 53 in La Grange	I-75	2,853	6,534	14.2
5A	Mountain Pkwy	I-64	KY 15 in Wolfe Co.	72	140	0.0
5B	Mountain Pkwy	KY 15 in Wolfe Co.	US 460 in Salyersville	106	63	0.0
6A	I-65	Tennessee state line	Cumberland Expressway	2,652	11,203	16.4
6B	I-65	Cumberland Expressway	Western KY Pkwy	2,085	8,778	16.4
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	2,653	9,742	16.4
6D	I-65	KY 44 in Shepherdsville	I-265	6,563	20,632	18.2
6E	I-65	I-265	I-264	2,910	6,569	14.2
6F	I-65	I-264	Indiana state line	4,967	9,217	18.2
7A	I-265/KY 841 (Gene Snyder Fwy)	US 31 W	I-65	986	2,650	10.2
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	4,908	9,491	18.2
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	2,817	8,176	16.4
7D	I-265/KY 841 (Gene Snyder Fwy)	I-71	Indiana state line	85	424	2.2
8A	I-64	Indiana state line	I-65	862	1,690	10.2
8B	I-64	I-65	I-264	3,557	5,666	16.0
8C	I-64	I-264	I-265	4,446	9,984	18.2
8D	I-64	I-265	KY 53 in Shelbyville	1,798	7,726	16.4
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	3,793	13,401	18.2
8F	I-64	I-64/I-75 south split	Mountain Pkwy	463	2,738	8.4
8G	I-64	Mountain Pkwy	KY 32 in Morehead	290	1,425	6.2
8H	I-64	KY 32 in Morehead	West Virginia state line	191	510	6.2
9A	I-24	Illinois state line	I-69 in Marshall Co.	1,031	3,189	10.2
9B	I-24	I-69 in Marshall Co.	I-69 in Lyon Co.	326	1,453	6.2

Corridor ID	Corridor Name	From	To	Vehicle Hour Delay (2019)	Vehicle Hour Delay (2045)	Tier 1 Mobility Score (Weighted)
9C	I-24	I-69 in Lyon Co.	Pennyrile Pkwy	354	1,623	8.4
9D	I-24	Pennyrile Pkwy	Tennessee state line	767	3,511	12.4
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	1,237	2,648	10.2
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	4,734	9,041	18.2
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	822	2,757	10.2
11	I-69/Purchase Pkwy	TN state line	I-24	103	186	2.2
12A	I-69	I-24 in Lyon Co.	Western KY Pkwy	41	75	0.0
12B	I-69	Western KY Pkwy	Henderson Bypass/ KY 425	109	792	4.4
13	I-69 Henderson Bridge (ORX)	Henderson Bypass/KY 425	Ohio River	50	649	4.4
14	Audubon Pkwy	I-69	US 60 in Owensboro	51	143	0.0
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	158	1,063	6.2
16A	Western KY Pkwy	I-69/Pennyrile Pkwy	I-165	124	244	2.2
16B	Western KY Pkwy	I-165	KY 259 in Leitchfield	79	177	2.2
16C	Western KY Pkwy	KY 259 in Leitchfield	I-65	173	371	4.0
17A	I-165/Natcher Pkwy	US 231 (south)	US 231 (north) in Bowling Green	74	427	2.2
17B	I-165/Natcher Pkwy	US 231 (north) in Bowling Green	Western KY Pkwy	102	195	2.2
17C	I-165/Natcher Pkwy	Western KY Pkwy	US 60 in Owensboro	67	142	0.0
18A	Cumberland Expwy	I-65	KY 55 in Columbia	86	180	2.2
18B	Cumberland Expwy	KY 55 in Columbia	US 27 near Somerset	38	78	0.0
19A	Bluegrass Pkwy	I-65	KY 555 in Washington Co.	178	496	4.0
19B	Bluegrass Pkwy	KY 555 in Washington Co.	US 60 in Woodford Co.	304	740	6.2

Note: Corridor #13 (I-69 Henderson Bridge) only considers the existing US 41 section, as the bridge section is not built yet.

5.4 RELIABILITY

The reliability index measures travel time reliability of passenger cars and trucks along each corridor segment. **Table 5.6** summarizes the reliability index and its performance criteria. The weight of each criterion was determined from data collected from the Tier 1 on-line survey. The reliability score was weighted as 50% for passenger car reliability, 50% for truck reliability.

- **% Passenger Car Vehicle Mile Travel (VMT) Unreliable.** This measures the level of travel time reliability for passenger cars along a corridor based on analysis of v8_KYSTMv19 and observed speed data provided by KYTC (see Section 2.8). It is a ratio of the summation of passenger car VMT for all unreliable sections to the total passenger VMT of the corridor. Unreliable locations were determined by the Level of Travel Time Reliability (LOTTR) value greater than 1.5 (see details in Section 2.8). A higher percentage of unreliable corridor VMT indicates the existing mobility has higher variability of operation speeds, which may be caused by capacity constraints, incidents, weather, maintenance, or short-term construction, and is more likely to benefit from proper improvements.
- **Truck Travel Time Reliability (TTTR) Index.** This measures corridor-level truck travel time reliability based on observed speed data. Link-level TTTR values were collected from corresponding Traffic Message Channel (TMC) records provided by KYTC (see details in Section 2.8). Then, a length-weighted average of TTTR values was calculated for the entire corridor segment. A higher value of this index indicates the existing truck movements have worse travel time reliability and have greater needs of improvements.

Table 5.6 – Tier 1 Reliability Index

RELIABILITY INDEX				
% Passenger Car VMT Unreliable - X_1	Score		Truck Travel Time Reliability Index - X_2	Score
$X_1 < 0.5\%$	0		$X_2 < 1.11$	0
$0.5\% <= X_1 < 1\%$	1		$1.11 <= X_2 < 1.13$	1
$1\% <= X_1 < 5\%$	2		$1.13 <= X_2 < 1.15$	2
$5\% <= X_1 < 10\%$	3		$1.15 <= X_2 < 1.29$	3
$10\% <= X_1 < 20\%$	4		$1.29 <= X_2 < 1.96$	4
$X_1 >= 20\%$	5		$X_2 >= 1.96$	5
Reliability Score = 0. $5X_1$ + 0.$5X_2$				
Final Score Weight = 20%, Multiplier = 4				

Table 5.7 summarizes the Tier 1 reliability scores. Corridors with the highest reliability scores include I-64 (from I-65 to I-265), I-65 (from KY 44 to I-265, from I-264 to Indiana state line), I-75 (from KY 536 to Ohio state line), I-264 (from I-65 to I-71), I-265 (from I-65 to I-71), and I-471. These segments are in urban areas with more congestion and safety issues as well as construction impacts.

Table 5.7 – Tier 1 Reliability Scoring

Corridor ID	Corridor Name	From	To	% Passenger Car VMT Unreliable	Truck Travel Time Reliability Index	Tier 1 Reliability Score (Weighted)
1A	I-275	Indiana state line	KY 237 in Boone Co.	0.0%	1.45	8.0
1B	I-275	KY 237 in Boone Co.	I-71	6.0%	1.70	14.0
1C	I-275	I-71	Ohio state line	8.6%	1.77	14.0
2	I-471	Ohio state line	I-275	31.8%	3.21	20.0
3A	I-75	Tennessee state line	KY 21 in Berea	0.0%	1.19	6.0
3B	I-75	KY 21 in Berea	KY 876 in Richmond	0.0%	1.07	0.0
3C	I-75	KY 876 in Richmond	Man o' War Blvd	0.0%	1.08	0.0
3D	I-75	Man o' War Blvd	I-64/I-75 south split	0.0%	1.09	0.0
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	0.0%	1.53	8.0
3F	I-75	I-64/I-75 north split	I-71	0.0%	1.13	2.0
3G	I-75	I-71	KY 536 in Boone Co.	0.0%	1.12	2.0
3H	I-75	KY 536 in Boone Co.	I-275	11.4%	2.02	18.0
3I	I-75	I-275	Ohio state line	45.7%	2.45	20.0
4A	I-71	I-64	I-264	6.3%	1.96	14.0
4B	I-71	I-264	I-265	0.0%	1.74	8.0
4C	I-71	I-265	KY 53 in La Grange	0.0%	1.28	6.0
4D	I-71	KY 53 in La Grange	I-75	0.0%	1.08	0.0
5A	Mountain Pkwy	I-64	KY 15 in Wolfe Co.	0.0%	1.20	6.0
5B	Mountain Pkwy	KY 15 in Wolfe Co.	US 460 in Salyersville	0.0%	1.39	8.0
6A	I-65	Tennessee state line	Cumberland Expressway	0.0%	1.06	0.0
6B	I-65	Cumberland Expressway	Western KY Pkwy	0.6%	1.16	8.0
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	0.0%	1.08	0.0
6D	I-65	KY 44 in Shepherdsville	I-265	11.6%	1.29	16.0
6E	I-65	I-265	I-264	0.0%	1.88	8.0

Corridor ID	Corridor Name	From	To	% Passenger Car VMT Unreliable	Truck Travel Time Reliability Index	Tier 1 Reliability Score (Weighted)
6F	I-65	I-264	Indiana state line	11.5%	2.34	18.0
7A	I-265/KY 841 (Gene Snyder Fwy)	US 31 W	I-65	0.0%	1.23	6.0
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	23.7%	2.06	20.0
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	25.9%	2.39	20.0
7D	I-265/KY 841 (Gene Snyder Fwy)	I-71	Indiana state line	0.0%	1.14	4.0
8A	I-64	Indiana state line	I-65	0.0%	1.54	8.0
8B	I-64	I-65	I-264	17.3%	2.18	18.0
8C	I-64	I-264	I-265	8.7%	1.98	16.0
8D	I-64	I-265	KY 53 in Shelbyville	1.8%	1.11	6.0
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	0.0%	1.11	0.0
8F	I-64	I-64/I-75 south split	Mountain Pkwy	0.0%	1.10	0.0
8G	I-64	Mountain Pkwy	KY 32 in Morehead	0.0%	1.11	2.0
8H	I-64	KY 32 in Morehead	West Virginia state line	0.0%	1.13	2.0
9A	I-24	Illinois state line	I-69 in Marshall Co.	0.0%	1.10	0.0
9B	I-24	I-69 in Marshall Co.	I-69 in Lyon Co.	0.0%	1.14	4.0
9C	I-24	I-69 in Lyon Co.	Pennyrile Pkwy	0.0%	1.09	0.0
9D	I-24	Pennyrile Pkwy	Tennessee state line	0.0%	1.11	2.0
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	0.0%	1.29	6.0
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	23.5%	1.97	20.0
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	13.3%	2.12	18.0
11	I-69/Purchase Pkwy	TN state line	I-24	1.0%	1.14	6.0

Corridor ID	Corridor Name	From	To	% Passenger Car VMT Unreliable	Truck Travel Time Reliability Index	Tier 1 Reliability Score (Weighted)
12A	I-69	I-24 in Lyon Co.	Western KY Pkwy	0.0%	1.12	2.0
12B	I-69	Western KY Pkwy	Henderson Bypass/KY 425	0.0%	1.12	2.0
13	I-69 Henderson Bridge (ORX)	Henderson Bypass/KY 425	Ohio River	0.0%	1.18	6.0
14	Audubon Pkwy	I-69	US 60 in Owensboro	0.0%	1.13	2.0
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	0.0%	1.15	4.0
16A	Western KY Pkwy	I-69/Pennyrile Pkwy	I-165	0.0%	1.15	4.0
16B	Western KY Pkwy	I-165	KY 259 in Leitchfield	0.0%	1.13	2.0
16C	Western KY Pkwy	KY 259 in Leitchfield	I-65	0.0%	1.15	6.0
17A	I-165/Natcher Pkwy	US 231 (south)	US 231 (north) in Bowling Green	0.0%	1.26	6.0
17B	I-165/Natcher Pkwy	US 231 (north) in Bowling Green	Western KY Pkwy	0.0%	1.14	4.0
17C	I-165/Natcher Pkwy	Western KY Pkwy	US 60 in Owensboro	0.0%	1.14	4.0
18A	Cumberland Expwy	I-65	KY 55 in Columbia	0.0%	1.18	6.0
18B	Cumberland Expwy	KY 55 in Columbia	US 27 near Somerset	0.0%	1.15	4.0
19A	Bluegrass Pkwy	I-65	KY 555 in Washington Co.	0.0%	1.13	4.0
19B	Bluegrass Pkwy	KY 555 in Washington Co.	US 60 in Woodford Co.	0.0%	1.15	4.0

Note: Corridor #13 (I-69 Henderson Bridge) only considers the existing US 41 section, as the bridge section is not built yet.

5.5 ACCESSIBILITY

The accessibility index measures the market (total trips) served by a corridor and corridor utilization (vehicle hours traveled (VHT) spent on corridor) when trips access the special generators identified by the Project Team. Special generators include hospitals or trauma centers, colleges or universities (campus/main campus only), and non-retail job centers (v8_KYSTMv19 zones with more than 200 non-retail jobs). Several trauma centers and large college/university campuses in neighboring states and adjacent to the Kentucky state line were also included in the analysis. **Figure 5.1** illustrates the special generators.

Figure 5.1 – Special Generators

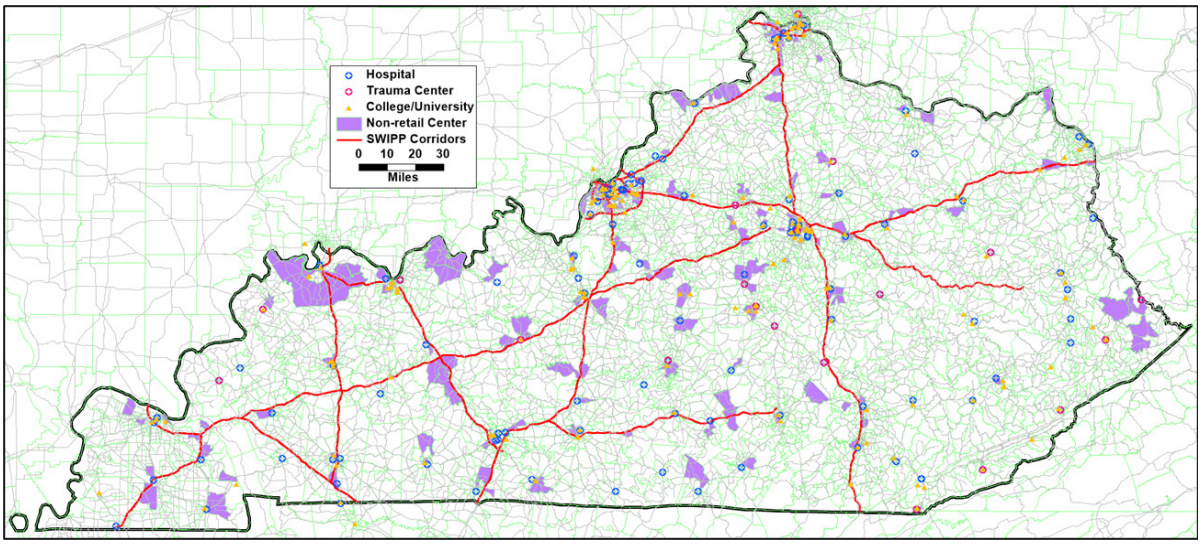


Table 5.8 summarizes the accessibility index and its performance criteria. Note that the weights of the accessibility criteria (market served by corridor and VHT spent on corridor) were not directly determined by the survey. They were assigned 50% each based on discussion with the Project Team.

- **Market Served by Corridor (2019).** This measures the total trips accessible to all special generators via a corridor using 2019 data from v8_KYSTMv19. The larger the market served by a corridor, the higher the score awarded to the corridor.
- **VHT Spent on Corridor (2019).** This measures the utilization of a corridor when trips travel to the closest special generator, using 2019 data from v8_KYSTMv19. It is calculated as the corridor travel time multiplied by origin-destination (OD) trips served by the corridor. The longer the time spent on a corridor or the higher the volume of traffic traveling on a corridor, the more important the corridor is to providing access to special generators, and the higher the score is awarded to the corridor.

Table 5.8 – Tier 1 Accessibility Index

ACCESSIBILITY INDEX				
Market Served by Corridor (2019) - X_1	**Score**		**VHT Spent on Corridor (2019) - X_2**	**Score**
$X_1 < 5{,}000$	0		$X_2 < 1{,}000$	0
$5{,}000 <= X_1 < 10{,}000$	1		$1{,}000 <= X_2 < 1{,}500$	1
$10{,}000 <= X_1 < 20{,}000$	2		$1{,}500 <= X_2 < 2{,}000$	2
$20{,}000 <= X_1 < 35{,}000$	3		$2{,}000 <= X_2 < 3{,}500$	3
$35{,}000 <= X_1 < 60{,}000$	4		$3{,}500 <= X_2 < 5{,}500$	4
$X_1 >= 60{,}000$	5		$X_2 >= 5{,}500$	5
Accessibility Score $= 0.5X_1 + 0.5X_2$				
Final Score Weight = 15%, Multiplier = 3				

Table 5.9 summarizes the Tier 1 accessibility scores. Corridor segments with the highest accessibility scores include I-64, I-65, I-264 (most sections), and I-265 (most sections) in Louisville; I-275 (from I-71 to Ohio state line) and I-75 (from KY 536 to Ohio state line) in northern Kentucky; I-75 (from I-64 to I-71). These segments either provide direct access to activity centers in populated urban areas or connect major cities.

Table 5.9 – Tier 1 Accessibility Score

Corridor ID	Corridor Name	From	To	Market Served by Corridor (2019)	VHT Spent on Corridor (2019)	Tier 1 Accessibility Score (Weighted)
1A	I-275	Indiana state line	KY 237 in Boone Co.	11,489	1,122	4.5
1B	I-275	KY 237 in Boone Co.	I-71	42,234	2,247	10.5
1C	I-275	I-71	Ohio state line	70,520	4,409	13.5
2	I-471	Ohio state line	I-275	40,780	1,089	7.5
3A	I-75	Tennessee state line	KY 21 in Berea	18,217	6,220	10.5
3B	I-75	KY 21 in Berea	KY 876 in Richmond	14,023	1,709	6.0
3C	I-75	KY 876 in Richmond	Man o' War Blvd	27,832	5,330	10.5
3D	I-75	Man o' War Blvd	I-64/I-75 south split	30,255	746	4.5
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	37,951	2,224	10.5
3F	I-75	I-64/I-75 north split	I-71	38,813	6,898	13.5
3G	I-75	I-71	KY 536 in Boone Co.	41,950	2,403	10.5
3H	I-75	KY 536 in Boone Co.	I-275	95,579	5,109	13.5
3I	I-75	I-275	Ohio state line	64,336	6,715	15.0
4A	I-71	I-64	I-264	26,200	1,665	7.5
4B	I-71	I-264	I-265	30,907	1,689	7.5
4C	I-71	I-265	KY 53 in La Grange	21,037	4,071	10.5
4D	I-71	KY 53 in La Grange	I-75	15,833	6,829	10.5
5A	Mountain Pkwy	I-64	KY 15 in Wolfe Co.	4,051	1,541	3.0
5B	Mountain Pkwy	KY 15 in Wolfe Co.	US 460 in Salyersville	2,004	549	0.0
6A	I-65	Tennessee state line	Cumberland Expressway	25,800	5,120	10.5
6B	I-65	Cumberland Expressway	Western KY Pkwy	10,539	3,651	9.0

Corridor ID	Corridor Name	From	To	Market Served by Corridor (2019)	VHT Spent on Corridor (2019)	Tier 1 Accessibility Score (Weighted)
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	34,002	5,129	10.5
6D	I-65	KY 44 in Shepherdsville	I-265	36,319	5,318	12.0
6E	I-65	I-265	I-264	74,087	3,831	13.5
6F	I-65	I-264	Indiana state line	85,926	5,522	15.0
7A	I-265/KY 841 (Gene Snyder Fwy)	US 31 W	I-65	23,347	1,696	7.5
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	60,005	4,644	13.5
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	69,179	3,613	13.5
7D	I-265/KY 841 (Gene Snyder Fwy)	I-71	Indiana state line	8,906	381	1.5
8A	I-64	Indiana state line	I-65	46,750	2,012	10.5
8B	I-64	I-65	I-264	70,346	5,727	15.0
8C	I-64	I-264	I-265	86,256	6,032	15.0
8D	I-64	I-265	KY 53 in Shelbyville	38,758	5,466	12.0
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	28,169	8,212	12.0
8F	I-64	I-64/I-75 south split	Mountain Pkwy	24,486	2,881	9.0
8G	I-64	Mountain Pkwy	KY 32 in Morehead	13,055	3,326	7.5
8H	I-64	KY 32 in Morehead	West Virginia state line	7,542	2,129	6.0
9A	I-24	Illinois state line	I-69 in Marshall Co.	10,239	1,427	4.5
9B	I-24	I-69 in Marshall Co.	I-69 in Lyon Co.	4,365	713	0.0
9C	I-24	I-69 in Lyon Co.	Pennyrile Pkwy	2,830	852	0.0
9D	I-24	Pennyrile Pkwy	Tennessee state line	10,381	1,146	4.5
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	94,558	4,572	13.5
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	161,697	8,945	15.0
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	57,764	1,501	9.0

Corridor ID	Corridor Name	From	To	Market Served by Corridor (2019)	VHT Spent on Corridor (2019)	Tier 1 Accessibility Score (Weighted)
11	I-69/Purchase Pkwy	TN state line	I-24	12,279	1,433	4.5
12A	I-69	I-24 in Lyon Co.	Western KY Pkwy	4,057	1,152	1.5
12B	I-69	Western KY Pkwy	Henderson Bypass/ KY 425	16,786	2,653	7.5
13	I-69 Henderson Bridge (ORX)	Henderson Bypass/ KY 425	Ohio River	11,830	208	3.0
14	Audubon Pkwy	I-69	US 60 in Owensboro	5,511	1,579	4.5
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	18,075	2,269	7.5
16A	Western KY Pkwy	I-69/Pennyrile Pkwy	I-165	5,592	1,852	4.5
16B	Western KY Pkwy	I-165	KY 259 in Leitchfield	3,009	1,166	1.5
16C	Western KY Pkwy	KY 259 in Leitchfield	I-65	14,013	2,559	7.5
17A	I-165/Natcher Pkwy	US 231 (south)	US 231 (north) in Bowling Green	14,418	555	3.0
17B	I-165/Natcher Pkwy	US 231 (north) in Bowling Green	Western KY Pkwy	6,180	1,676	4.5
17C	I-165/Natcher Pkwy	Western KY Pkwy	US 60 in Owensboro	3,526	1,278	1.5
18A	Cumberland Expwy	I-65	KY 55 in Columbia	10,381	2,070	7.5
18B	Cumberland Expwy	KY 55 in Columbia	US 27 near Somerset	3,464	823	0.0
19A	Bluegrass Pkwy	I-65	KY 555 in Washington Co.	4,747	1,747	3.0
19B	Bluegrass Pkwy	KY 555 in Washington Co.	US 60 in Woodford Co.	10,104	2,031	7.5

Note: Corridor #13 (I-69 Henderson Bridge) only considers the existing US 41 section, as the bridge section is not built yet.

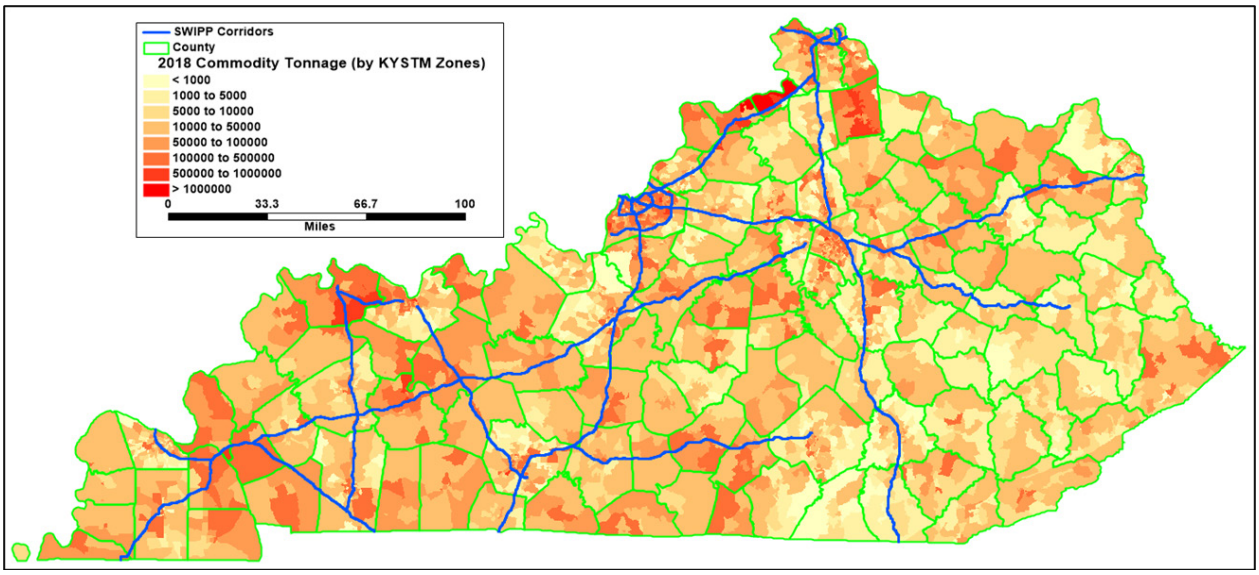
5.6 FREIGHT AND LOGISTICS

The freight and logistics index evaluates the corridor's importance in support of statewide freight mobility and the logistics industry, in terms of freight truck volume, freight market served, and truck hour delays. **Table 5.10** summarizes this index and its performance criteria. The weight of each criterion was determined by data collected from the Tier 1 on-line survey and further adjustments made by the Project Team. The score was weighted as 45% for freight truck volume, 35% for freight market directly served by corridor, and 20% for truck delay.

- **Corridor Truck Volume (2019).** This measures the overall daily truck flows carried by the corridor in the base year 2019, using v8_KYSTMv19 data.

- **Freight Market Directly Served by Corridor (2018).** This evaluates the magnitude of commodities (by tonnage) served by corridors, using 2018 TranSearch county-level data (see Section 2.7.1). TranSearch highway commodity tonnages were disaggregated to v8_KYSTMv19 zones, based on zonal truck traffic estimated by the model. **Figure 5.2** illustrates commodity tonnages at zone level. Zonal commodity tonnages were then aggregated to a 20-minute buffer of each corridor, which was assumed to be the freight market directly served by the corridor.

Figure 5.2 – 2018 TranSearch Highway Commodity Tonnages (Disaggregated at Zone Level)



- **Corridor Truck Delay (2019).** This estimates the level of congestion for freight trucks along a corridor in the base year 2019. Link-level truck hour delay was calculated as the link truck volume multiplied by the delay (i.e., free-flow time minus congested time) from a 2019 model run of v8_KYSTMv19. The total delay of a corridor is a sum of all link-level delays in the corridor.

Table 5.10 – Tier 1 Freight and Logistics Index

FREIGHT & LOGISTICS INDEX							
Corridor Truck Volume (2019) – X_1	Score		Freight Market Directly Served by Corridor (2018) – X_2	Score		Corridor Truck Delay (2019) – X_3	Score
X_1 < 1,000	0		X_2 < 5,000	0		X_3 < 40	0
1,000 <= X_1 < 1,500	1		5,000 <= X_2 < 8,000	1		40 <= X_3 < 80	1
1,500 <= X_1 < 3,000	2		8,000 <= X_2 < 12,000	2		80 <= X_3 < 120	2
3,000 <= X_1 < 4,500	3		12,000 <= X_2 < 18,000	3		120 <= X_3 < 300	3
4,500 <= X_1 < 6,500	4		18,000 <= X_2 < 25,000	4		300 <= X_3 < 700	4
X_1 >= 6,500	5		X_2 >= 25,000	5		X_3 >= 700	5
Freight & Logistics Score = $0.45X_1 + 0.35X_2 + 0.20X_3$							
Final Score Weight = 15%, Multiplier = 3							

Table 5.11 summarizes the Tier 1 freight and logistics scores. Corridor segments with the highest scores include:

- I-64/I-75 overlapped section in Lexington
- I-75 from KY 536 in Boone County to Ohio state line
- I-71 from I-264 to I-75
- I-65 from KY 44 in Shepherdsville to Indiana state line
- I-264 (Watterson Expwy) from I-65 to I-64 (east)

In addition, the I-64 section connecting Louisville and Lexington, I-75 section connecting Lexington and northern Kentucky, and the rural section of I-65 (from Tennessee state line to Louisville) have relatively high freight and logistics scores.

Table 5.11 – Tier 1 Freight and Logistics Scoring

Corridor ID	Corridor Name	From	To	Corridor Truck Volume (2019)	Freight Market Served by Corridor (in 1,000 tons)	Corridor Truck Hour Delay (2019)	Tier 1 Freight & Logistics Score (Weighted)
1A	I-275	Indiana state line	KY 237 in Boone Co.	2,881	6,836	101	5.0
1B	I-275	KY 237 in Boone Co.	I-71	3,404	15,160	108	8.4
1C	I-275	I-71	Ohio state line	1,937	16,760	136	7.7
2	I-471	Ohio state line	I-275	1,652	11,189	43	5.4
3A	I-75	Tennessee state line	KY 21 in Berea	4,549	7,319	1,015	9.5
3B	I-75	KY 21 in Berea	KY 876 in Richmond	5,399	4,508	198	7.2
3C	I-75	KY 876 in Richmond	Man o' War Blvd	5,294	16,804	487	11.0
3D	I-75	Man o' War Blvd	I-64/I-75 south split	6,570	15,346	122	11.7
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	8,767	18,734	588	13.4
3F	I-75	I-64/I-75 north split	I-71	4,902	24,754	694	12.0
3G	I-75	I-71	KY 536 in Boone Co.	9,385	11,405	444	11.3
3H	I-75	KY 536 in Boone Co.	I-275	10,372	16,919	990	12.9
3I	I-75	I-275	Ohio state line	9,946	16,879	1,806	12.9
4A	I-71	I-64	I-264	1,618	26,887	75	8.6
4B	I-71	I-264	I-265	4,894	25,573	265	12.5
4C	I-71	I-265	KY 53 in La Grange	6,139	19,408	864	12.6

Corridor ID	Corridor Name	From	To	Corridor Truck Volume (2019)	Freight Market Served by Corridor (in 1,000 tons)	Corridor Truck Hour Delay (2019)	Tier 1 Freight & Logistics Score (Weighted)
4D	I-71	KY 53 in La Grange	I-75	5,289	18,625	1,114	12.6
5A	Mountain Pkwy	I-64	KY 15 in Wolfe Co.	411	3,952	21	0.0
5B	Mountain Pkwy	KY 15 in Wolfe Co.	US 460 in Salyersville	690	446	44	0.6
6A	I-65	Tennessee state line	Cumberland Expressway	7,281	11,187	1,012	11.9
6B	I-65	Cumberland Expressway	Western KY Pkwy	6,920	8,396	1,030	11.9
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	8,057	11,740	905	11.9
6D	I-65	KY 44 in Shepherdsville	I-265	9,819	24,784	1,379	14.0
6E	I-65	I-265	I-264	9,110	29,556	471	14.4
6F	I-65	I-264	Indiana state line	6,935	26,727	740	15.0
7A	I-265/KY 841 (Gene Snyder Fwy)	US 31 W	I-65	1,682	23,823	91	8.1
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	2,920	34,753	487	10.4
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	2,820	22,808	291	8.7
7D	I-265/KY 841 (Gene Snyder Fwy)	I-71	Indiana state line	1,226	18,571	10	5.6
8A	I-64	Indiana state line	I-65	3,093	22,353	87	9.5
8B	I-64	I-65	I-264	3,112	28,396	353	11.7
8C	I-64	I-264	I-265	3,158	28,760	350	11.7
8D	I-64	I-265	KY 53 in Shelbyville	3,859	15,223	299	9.0
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	4,146	21,582	1,045	11.3
8F	I-64	I-64/I-75 south split	Mountain Pkwy	2,196	16,599	91	7.1
8G	I-64	Mountain Pkwy	KY 32 in Morehead	1,937	4,919	111	3.9
8H	I-64	KY 32 in Morehead	West Virginia state line	1,831	5,662	119	5.0

Corridor ID	Corridor Name	From	To	Corridor Truck Volume (2019)	Freight Market Served by Corridor (in 1,000 tons)	Corridor Truck Hour Delay (2019)	Tier 1 Freight & Logistics Score (Weighted)
9A	I-24	Illinois state line	I-69 in Marshall Co.	3,737	10,508	304	8.6
9B	I-24	I-69 in Marshall Co.	I-69 in Lyon Co.	4,204	8,021	140	8.0
9C	I-24	I-69 in Lyon Co.	Pennyrile Pkwy	3,096	9,918	182	8.0
9D	I-24	Pennyrile Pkwy	Tennessee state line	4,720	5,549	230	8.3
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	1,764	26,428	93	9.2
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	5,045	30,373	378	13.1
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	3,720	27,816	141	11.1
11	I-69/Purchase Pkwy	TN state line	I-24	1,179	10,170	73	4.1
12A	I-69	I-24 in Lyon Co.	Western KY Pkwy	1,435	6,970	36	2.4
12B	I-69	Western KY Pkwy	Henderson Bypass/KY 425	1,715	6,900	60	4.4
13	I-69 Henderson Bridge (ORX)	Henderson Bypass/KY 425	Ohio River	1,617	4,101	12	2.7
14	Audubon Pkwy	I-69	US 60 in Owensboro	952	13,748	32	3.2
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	1,574	8,182	81	6.0
16A	Western KY Pkwy	I-69/Pennyrile Pkwy	I-165	1,428	8,134	69	4.1
16B	Western KY Pkwy	I-165	KY 259 in Leitchfield	1,247	3,673	49	2.0
16C	Western KY Pkwy	KY 259 in Leitchfield	I-65	1,217	5,525	60	3.0
17A	I-165/Natcher Pkwy	US 231 (south)	US 231 (north) in Bowling Green	1,255	8,308	22	3.5
17B	I-165/Natcher Pkwy	US 231 (north) in Bowling Green	Western KY Pkwy	1,039	9,246	49	4.1
17C	I-165/Natcher Pkwy	Western KY Pkwy	US 60 in Owensboro	1,081	12,189	43	5.1

Corridor ID	Corridor Name	From	To	Corridor Truck Volume (2019)	Freight Market Served by Corridor (in 1,000 tons)	Corridor Truck Hour Delay (2019)	Tier 1 Freight & Logistics Score (Weighted)
18A	Cumberland Expwy	I-65	KY 55 in Columbia	637	5,763	39	1.1
18B	Cumberland Expwy	KY 55 in Columbia	US 27 near Somerset	520	4,777	24	0.0
19A	Bluegrass Pkwy	I-65	KY 555 in Washington Co.	1,135	7,654	74	3.0
19B	Bluegrass Pkwy	KY 555 in Washington Co.	US 60 in Woodford Co.	1,528	6,001	91	5.0

Note:
1) Corridor #13 (I-69 Henderson Bridge) only considers the existing US 41 section, as the bridge section is not built yet.
2) Corridor truck volume represents average directional daily flow.

5.7 TIER 1 FINDINGS AND RECOMMENDATIONS

5.7.1 Screening Process and Recommendations

The Tier 1 overall scores and rankings were determined by combining the safety, mobility, reliability, accessibility, and freight/logistics scores on 100-point scales with allocated weights (safety – 30%, mobility – 20%, reliability – 20%, accessibility – 15%, and freight/logistics – 15%) outlined in Section 5.1. **Table 5.12** lists Tier 1 corridors in descending order of the overall score. The table also provides safety, mobility, reliability, accessibility, and freight/logistics scores. The top 30 corridor segments with the highest Tier 1 overall scores were selected to advance to Tier 2 analysis. These segments are concentrated in Louisville, Lexington, and northern Kentucky or provide connection between these regions. I-65 and I-75 rural sections and Pennyrile Parkway are also among the top 30. **Figure 5.3** illustrates recommendations of Tier 1 corridors.

5.7.2 Tier 1 Corridors Not Carried Forward to Tier 2

With regard to the corridors that are not being carried forward from Tier 1 to Tier 2 for further analysis, it is important to note that it does not mean that a particular corridor improvement would not be beneficial. Spot improvements on these corridors might provide significant local benefits, but the needs do not rise to the corridor level, and the benefits of the improvements might not be as significant statewide as other Tier 1 corridors. Additional study of some of the corridors not being carried forward for Tier 2 analysis might be warranted.

Table 5.12 – Tier 1 Scoring

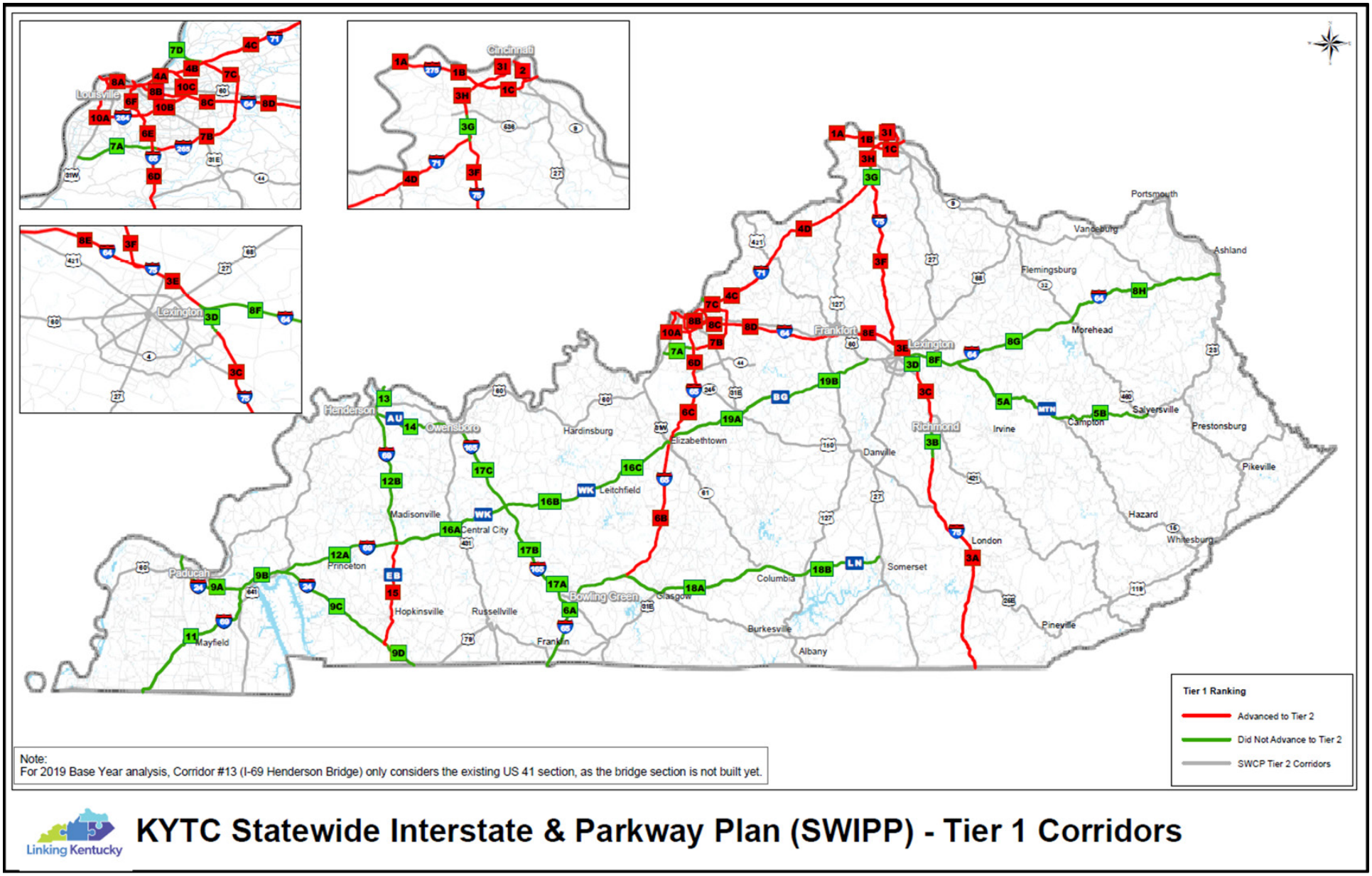
Corridor ID	Corridor Name	From	To	Safety	Mobility	Reliability	Accessibility	Freight & Logistics	Tier 1 Score	Tier 1 Rank	Recommendation
6F	I-65	I-264	Indiana state line	30.0	18.2	18.0	15.0	15.0	96.2	1	Advance to Tier 2
3I	I-75	I-275	Ohio state line	24.0	20.0	20.0	15.0	12.9	91.9	2	Advance to Tier 2
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	15.0	18.2	20.0	15.0	13.1	81.3	3	Advance to Tier 2
8C	I-64	I-264	I-265	18.0	18.2	16.0	15.0	11.7	78.9	4	Advance to Tier 2
6B	I-65	Cumberland Expressway	Western KY Pkwy	30.0	16.4	8.0	9.0	11.9	75.3	5	Advance to Tier 2
8D	I-64	I-265	KY 53 in Shelbyville	30.0	16.4	6.0	12.0	9.0	73.4	6	Advance to Tier 2
8B	I-64	I-65	I-264	12.0	16.0	18.0	15.0	11.7	72.7	7	Advance to Tier 2
4B	I-71	I-264	I-265	30.0	14.2	8.0	7.5	12.5	72.2	8	Advance to Tier 2
4A	I-71	I-64	I-264	30.0	10.2	14.0	7.5	8.6	70.3	9	Advance to Tier 2
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	27.0	18.2	0.0	12.0	11.3	68.5	10	Advance to Tier 2
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	6.0	18.2	20.0	13.5	10.4	68.1	11	Advance to Tier 2
1C	I-275	I-71	Ohio state line	18.0	14.2	14.0	13.5	7.7	67.4	12	Advance to Tier 2
3H	I-75	KY 536 in Boone Co.	I-275	3.0	18.2	18.0	13.5	12.9	65.6	13	Advance to Tier 2
3F	I-75	I-64/I-75 north split	I-71	18.0	16.4	2.0	13.5	12.0	61.9	14	Advance to Tier 2
4D	I-71	KY 53 in La Grange	I-75	24.0	14.2	0.0	10.5	12.6	61.3	15	Advance to Tier 2
6D	I-65	KY 44 in Shepherdsville	I-265	0.0	18.2	16.0	12.0	14.0	60.2	16	Advance to Tier 2
4C	I-71	I-265	KY 53 in La Grange	15.0	16.0	6.0	10.5	12.6	60.1	17	Advance to Tier 2

Corridor ID	Corridor Name	From	To	Safety	Mobility	Reliability	Accessibility	Freight & Logistics	Tier 1 Score	Tier 1 Rank	Recommendation
2	I-471	Ohio state line	I-275	18.0	8.0	20.0	7.5	5.4	58.9	18	Advance to Tier 2
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	0.0	16.4	20.0	13.5	8.7	58.6	19	Advance to Tier 2
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	18.0	16.4	0.0	10.5	11.9	56.8	20	Advance to Tier 2
8A	I-64	Indiana state line	I-65	18.0	10.2	8.0	10.5	9.5	56.2	21	Advance to Tier 2
3C	I-75	KY 876 in Richmond	Man o' War Blvd	18.0	16.4	0.0	10.5	11.0	55.9	22	Advance to Tier 2
1A	I-275	Indiana state line	KY 237 in Boone Co.	30.0	8.0	8.0	4.5	5.0	55.5	23	Advance to Tier 2
3A	I-75	Tennessee state line	KY 21 in Berea	12.0	16.4	6.0	10.5	9.5	54.4	24	Advance to Tier 2
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	15.0	10.2	6.0	13.5	9.2	53.9	25	Advance to Tier 2
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	30.0	6.2	4.0	7.5	6.0	53.7	26	Advance to Tier 2
6E	I-65	I-265	I-264	3.0	14.2	8.0	13.5	14.4	53.1	27	Advance to Tier 2
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	3.0	10.2	18.0	9.0	11.1	51.3	28	Advance to Tier 2
1B	I-275	KY 237 in Boone Co.	I-71	6.0	12.4	14.0	10.5	8.4	51.3	29	Advance to Tier 2
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	0.0	16.4	8.0	10.5	13.4	48.3	30	Advance to Tier 2
9D	I-24	Pennyrile Pkwy	Tennessee state line	18.0	12.4	2.0	4.5	8.3	45.2	31	Not Advanced
3G	I-75	I-71	KY 536 in Boone Co.	3.0	16.4	2.0	10.5	11.3	43.2	32	Not Advanced
6A	I-65	Tennessee state line	Cumberland Expressway	3.0	16.4	0.0	10.5	11.9	41.8	33	Not Advanced

Corridor ID	Corridor Name	From	To	Safety	Mobility	Reliability	Accessibility	Freight & Logistics	Tier 1 Score	Tier 1 Rank	Recommendation
16C	Western KY Pkwy	KY 259 in Leitchfield	I-65	21.0	4.0	6.0	7.5	3.0	41.5	34	Not Advanced
19A	Bluegrass Pkwy	I-65	KY 555 in Washington Co.	27.0	4.0	4.0	3.0	3.0	41.0	35	Not Advanced
7D	I-265/KY 841 (Gene Snyder Fwy)	I-71	Indiana state line	27.0	2.2	4.0	1.5	5.6	40.3	36	Not Advanced
8H	I-64	KY 32 in Morehead	West Virginia state line	21.0	6.2	2.0	6.0	5.0	40.2	37	Not Advanced
14	Audubon Pkwy	I-69	US 60 in Owensboro	30.0	0.0	2.0	4.5	3.2	39.7	38	Not Advanced
16A	Western KY Pkwy	I-69/Pennyrile Pkwy	I-165	24.0	2.2	4.0	4.5	4.1	38.8	39	Not Advanced
17B	I-165/Natcher Pkwy	US 231 (north) in Bowling Green	Western KY Pkwy	24.0	2.2	4.0	4.5	4.1	38.8	40	Not Advanced
7A	I-265/KY 841 (Gene Snyder Fwy)	US 31 W	I-65	6.0	10.2	6.0	7.5	8.1	37.8	41	Not Advanced
19B	Bluegrass Pkwy	KY 555 in Washington Co.	US 60 in Woodford Co.	15.0	6.2	4.0	7.5	5.0	37.7	42	Not Advanced
17C	I-165/Natcher Pkwy	Western KY Pkwy	US 60 in Owensboro	27.0	0.0	4.0	1.5	5.1	37.6	43	Not Advanced
3B	I-75	KY 21 in Berea	KY 876 in Richmond	12.0	10.2	0.0	6.0	7.2	35.4	44	Not Advanced
8F	I-64	I-64/I-75 south split	Mountain Pkwy	9.0	8.4	0.0	9.0	7.1	33.5	45	Not Advanced
18A	Cumberland Expwy	I-65	KY 55 in Columbia	15.0	2.2	6.0	7.5	1.1	31.8	46	Not Advanced
9B	I-24	I-69 in Marshall Co.	I-69 in Lyon Co.	12.0	6.2	4.0	0.0	8.0	30.2	47	Not Advanced

Corridor ID	Corridor Name	From	To	Safety	Mobility	Reliability	Accessibility	Freight & Logistics	Tier 1 Score	Tier 1 Rank	Recommendation
12A	I-69	I-24 in Lyon Co.	Western KY Pkwy	24.0	0.0	2.0	1.5	2.4	29.9	48	Not Advanced
5B	Mountain Pkwy	KY 15 in Wolfe Co.	US 460 in Salyersville	21.0	0.0	8.0	0.0	0.6	29.6	49	Not Advanced
3D	I-75	Man o' War Blvd	I-64/I-75 south split	0.0	12.4	0.0	4.5	11.7	28.6	50	Not Advanced
5A	Mountain Pkwy	I-64	KY 15 in Wolfe Co.	18.0	0.0	6.0	3.0	0.0	27.0	51	Not Advanced
9A	I-24	Illinois state line	I-69 in Marshall Co.	3.0	10.2	0.0	4.5	8.6	26.3	52	Not Advanced
16B	Western KY Pkwy	I-165	KY 259 in Leitchfield	18.0	2.2	2.0	1.5	2.0	25.7	53	Not Advanced
8G	I-64	Mountain Pkwy	KY 32 in Morehead	6.0	6.2	2.0	7.5	3.9	25.6	54	Not Advanced
9C	I-24	I-69 in Lyon Co.	Pennyrile Pkwy	9.0	8.4	0.0	0.0	8.0	25.4	55	Not Advanced
12B	I-69	Western KY Pkwy	Henderson Bypass/KY 425	6.0	4.4	2.0	7.5	4.4	24.3	56	Not Advanced
13	I-69 Henderson Bridge (ORX)	Henderson Bypass/KY 425	Ohio River	6.0	4.4	6.0	3.0	2.7	22.1	57	Not Advanced
11	I-69/Purchase Pkwy	TN state line	I-24	3.0	2.2	6.0	4.5	4.1	19.8	58	Not Advanced
18B	Cumberland Expwy	KY 55 in Columbia	US 27 near Somerset	12.0	0.0	4.0	0.0	0.0	16.0	59	Not Advanced
17A	I-165/Natcher Pkwy	US 231 (south)	US 231 (north) in Bowling Green	0.0	2.2	6.0	3.0	3.5	14.7	60	Not Advanced

Figure 5.3 – Tier 1 Corridors Recommendations



CHAPTER 6: TIER 2 CORRIDOR PRIORITIZATION

The Tier 2 analysis follows an overall similar approach to that of Tier 1. Tier 2 incorporates refined quantitative factors, new qualitative indicators, and stakeholders' input to evaluate benefits of potential corridor improvements, while avoiding potential conflicts with KYTC's previous or ongoing efforts. Priority corridor segments were identified through Tier 2 analysis and were carried forward to Corridor Visioning.

6.1 TIER 2 CORRIDOR SCOPING

A comprehensive corridor scoping was conducted for each Tier 2 segment at planning level. The major goal of the scoping was to develop practical corridor improvement concepts based on a thorough review of each segment's existing conditions, issues, and needs. Extensive efforts were made to coordinate with the Project Team to develop the improvement recommendations.

6.1.1 Traditional and TSMO-Focused Corridors

The Tier 2 scoping investigated existing conditions, needs and limitations of each corridor segment, and recommended appropriate improvements categorized by "traditional" capacity improvements and Transportation Systems Management and Operations (TSMO) strategies. TSMO is a set of strategies that focus on operational improvements that can maintain and even restore the performance of the existing transportation system before extra capacity is needed. The goal is to get the most performance out of the transportation facilities that already exist. KYTC continues to implement the TSMO concept for finding solutions to improve safety and operations while maximizing its current assets and minimizing costs.

For congested urban settings where the acquisition of additional right-of-way (ROW) might not be feasible or there are significant environmental concerns and other impacts, the TSMO strategies might be more promising and practical solutions than "traditional" major capacity improvements that are likely to require significant additional ROW and have more impacts. TSMO strategies would be effective in some non-urban corridors as well.

Among the 30 Tier 2 corridor segments, the Project Team identified 11 TSMO-focused segments and 19 "traditional" segments based on a high planning-level review of capacity-constraint bottlenecks, unreliable travel times, crashes, available ROW, and roadway geometric configurations. It is noted that TSMO solutions remain a possibility for "traditional" corridors where applicable, and vice versa. **Figure 6.1** and **Table 6.1** show the TSMO-focused segments and "traditional" segments.

Figure 6.1 – Tier 2 Traditional and TSMO-Focused Segments

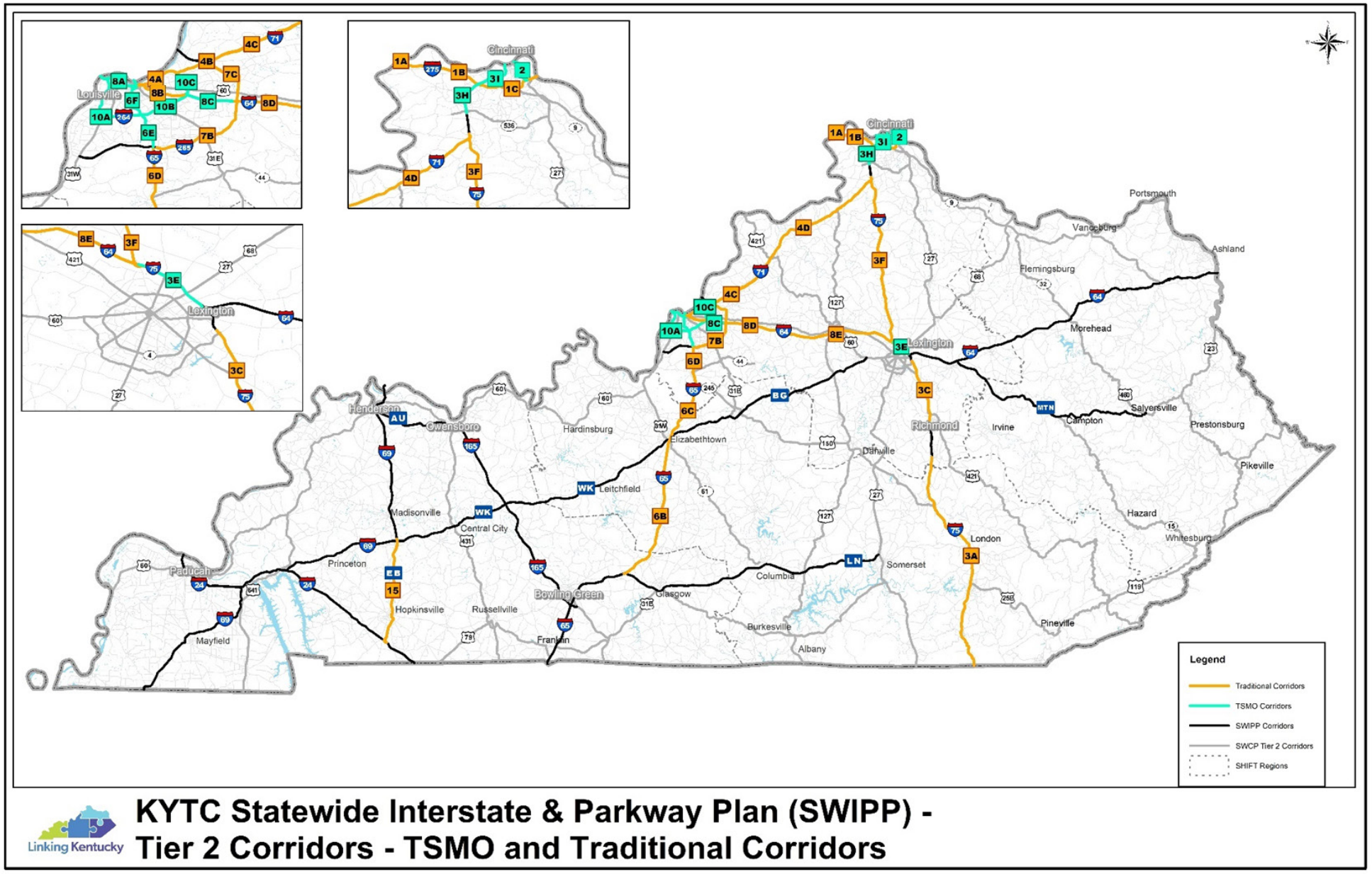


Table 6.1 – Tier 2 Traditional and TSMO-Focused Segments

Corridor ID	Corridor Name	From	To	TSMO-Focused
1A	I-275	Indiana state line	KY 237 in Boone Co.	No
1B	I-275	KY 237 in Boone Co.	I-71	No
1C	I-275	I-71	Ohio state line	No
2	I-471	Ohio state line	I-275	Yes
3A	I-75	Tennessee state line	KY 21 in Berea	No
3C	I-75	KY 876 in Richmond	Man o' War Blvd	No
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	Yes
3F	I-75	I-64/I-75 north split	I-71	No
3H	I-75	KY 536 in Boone Co.	I-275	Yes
3I	I-75	I-275	Ohio state line	Yes
4A	I-71	I-64	I-264	No
4B	I-71	I-264	I-265	No
4C	I-71	I-265	KY 53 in La Grange	No
4D	I-71	KY 53 in La Grange	I-75	No
6B	I-65	Cumberland Expressway	Western KY Pkwy	No
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	No
6D	I-65	KY 44 in Shepherdsville	I-265	No
6E	I-65	I-265	I-264	Yes
6F	I-65	I-264	Indiana state line	Yes
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	No
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	No
8A	I-64	Indiana state line	I-65	Yes
8B	I-64	I-65	I-264	No
8C	I-64	I-264	I-265	Yes
8D	I-64	I-265	KY 53 in Shelbyville	No
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	No
10A	I-264 (Watterson Expy)	I-64 (west)	I-65	Yes
10B	I-264 (Watterson Expy)	I-65	I-64 (east)	Yes
10C	I-264 (Watterson Expy)	I-64 (east)	I-71	Yes
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	No

6.1.2 Improvement Concepts

6.1.2.1 Improvement Concept Toolbox

To meet the needs of the SWIPP, the Project Team developed an Improvement Concept Toolbox which includes a list of general improvement categories and concepts at high planning level. The toolbox is separated by traditional capacity improvement strategies (see **Table 6.2**) and TSMO solutions (see **Table 6.3**). The improvement options noted in the toolbox are not intended to be all-encompassing. Other potential improvements are possible, including innovative solutions that could be cost-effective and address the reasons for improvement.

Table 6.2 – Improvement Concept Toolbox (Traditional Strategies)

IMPROVEMENT CATEGORIES	IMPROVEMENT STRATEGIES
Major Widening	Urban Freeway, Added Lanes (inner side)
	Urban Freeway, Added Lanes (outer side)
	Rural Freeway, Added Lanes (inner side)
	Rural Freeway, Added Lanes (outer side)
	New Collector-Distributor Road (mainly for urban)
Roadway Upgrade	Increase Shoulder Width
Interchange/Grade Separation	New Service Interchange - Rural
	New Service Interchange - Urban
	Interchange Modification - Rural
	Interchange Modification - Urban
	Add Auxiliary Lane - Rural
	Add Auxiliary Lane - Urban
	Interchange single ramp widening - Rural
	Interchange single ramp widening - Urban
Major Structure	Bridge - Replacement
	Bridge - Rehab
	Railroad Bridge

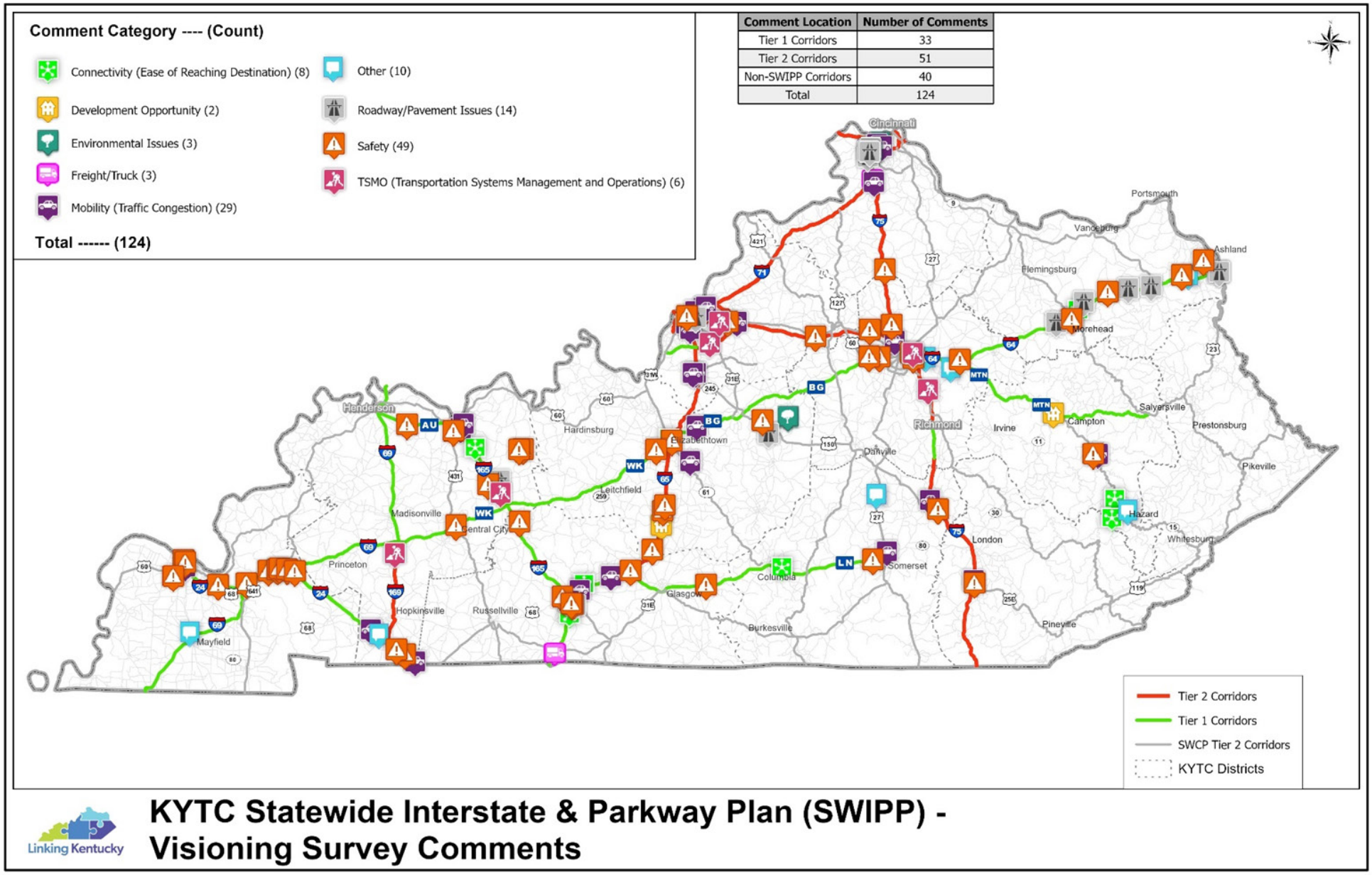
Table 6.3 – Improvement Concept Toolbox (TSMO Strategies)

IMPROVEMENT CATEGORIES	IMPROVEMENT STRATEGIES
Freeway	**Ramp Metering**
	Traffic responsive centralized
	Traffic responsive non-centralized
	Stand alone
	Managed Lanes
	Express Lanes (with/without Toll)
	HOT Lanes
	HOV Lanes
	Part-time Shoulder Use (General Purpose)
	Part-time Shoulder Use (Transit)
	Interchange Ramps
	Increase Acceleration Lane Length
	Increase Deceleration Lane Length
	Freight
	Truck Only Lanes
	Climbing Lanes
Other	Travel Demand Management
	Dynamic Lane Use
Applicable Everywhere	Road Weather Management
	Work Zone Management
	Variable Speed Limits
	Queue Warning
	Comparative Travel Times
	En-Route Traveler Information
	Truck Parking Information System
	Elongated Pavement Markings
	Improved Signage

6.1.2.2 Corridor Vision Survey

To support the development of corridor improvements, the Project Team used an innovative map-based online survey tool (VeraVoice©) to collect location-specific comments regarding corridor issues, needs and improvement strategies. The survey was open from August 17, 2022 to September 14, 2022 and collected a total of 124 comments from approximately 1,600 stakeholders, including KYTC Central Office, Districts, MPOs, ADDs, Traffic Incident Management (TIM), and elected local officials (grasstops). **Figure 6.2** shows comments collected from the survey. The comments helped not only identify important concerns and issues on study corridors, but also recommend improvement strategies. **Appendix G** shows details of survey results.

Figure 6.2 – Comments Collected by Corridor Vision Survey (VeraVoice©)



6.1.2.3 Tier 2 Corridor Review Workshop

The Project Team held a workshop at KYTC Central Office on October 11, 2022 to review preliminary results and recommendations from Tier 2 corridor scoping. The workshop engaged KYTC Central Office, Districts, FHWA, and identified TIM/TSMO subject matter experts. The goal of the workshop was to reach consensus on improvement strategies for all Tier 2 segments, by incorporating planning partners' insight and local knowledge of corridor needs and ensuring the consistency between the SWIPP and KYTC Districts' vision on corridors. The workshop reviewed and discussed the following factors for each corridor segment:

- Corridor characteristics
- Issues and needs of mobility, reliability, safety, ROW, etc., based on a planning-level analysis.
- KYTC's existing and committed (E+C) projects. These projects were already incorporated in 2045 SWIPP Model and thus no further improvement recommendations were made to avoid conflict.
- KYTC Active Highway Plan projects
- Comments from the Corridor Vision survey (VeraVoice©)

The Project Team reached consensus on most improvement recommendations in the workshop. After the workshop, additional coordination was made with the Project Team to adjust and finalize the remaining improvement strategies. It is noted that, for each corridor segment, the Tier 2 scoping recommended all practical strategies (traditional, TSMO, or a mix) without prioritizing them, based on a non-project specific approach. **Appendix H** shows Tier 2 corridor information and final improvement recommendations based on the corridor review workshop.

Appendix I includes scoping reports for all Tier 2 corridor segments, except for 3I – Brent Spence Bridge (BSB) Approach Corridor (I-75 from I-275 to Ohio state line), which is part of the on-going BSB project. Per KYTC's guidance, an **Appendix J** was included in this report to summarize segment 3I and keep consistency with the full BSB project.

The improvement strategies recommended by the corridor scoping supported Tier 2 corridor analysis. For each corridor segment, the recommended improvement concepts were coded into the SWIPP Model network for Build model runs and corridor performance analysis. In some cases, multiple improvement concepts were recommended at the same location, and they were all coded in the model to fully estimate corridor benefits in Tier 2 analysis, as long as these improvement concepts are compatible with each other; otherwise, only the larger-scale improvements were coded into the model for Tier 2 analysis.

It is noted that Tier 2 scoping recommended a general managed lane concept for segments 3E (I-64/I-75 in Lexington) and 3H (I-75 from KY 536 to I-275 in northern KY). While the managed lanes are a comprehensive suite of various technologies and solutions (e.g., express lanes, high-occupancy vehicle (HOV) lanes, high-occupancy toll (HOT) lanes, truck only lanes, toll lanes, etc.) and Tier 2 scoping did not specify a solution for these two segments, a particular strategy (i.e., express lane) was used for traffic modeling purpose in support of Tier 2 analysis. This is because 3E and 3H are multi-lane corridors carrying a fairly large amount of through traffic, and an express lane-type strategy by using signage and pavement markings to encourage/guide through traffic to use specific lanes would improve corridor mobility and safety, by reducing weaving/diverting/merging movements. However, the express lanes used for traffic modeling will not preclude other managed lane options, and those strategies may be studied in more detail in future projects.

6.2 TIER 2 QUANTITATIVE PERFORMANCE MEASURES AND SCORING

The SWIPP Tier 2 analysis focused on evaluating benefits that are anticipated from the potential improvement concepts on corridors. Therefore, 2045 future year performance measures were required to develop Tier 2 criteria by assuming the improvement projects will be fully built out by 2045. Some performance measures of existing condition were also included in Tier 2 criteria as needed, based on discussion within the Project Team.

A Tier 2 on-line survey was conducted to gather input from Project Team, Planning Partners, and key stakeholders on the Tier 2 performance criteria and weights. The Tier 2 survey was live for two weeks from May 24 through June 7, 2022. Detailed data gathered from the survey are shown in **Appendix K**. A Tier 2 rating system was developed using weights derived from survey results.

Seven quantitative performance measures were developed in Tier 2 to assess benefits of corridor improvements and determine which segments would advance to Corridor Visioning. **Table 6.4** lists the performance measures and their weights. Each performance criterion was assigned a value ranging from 0 to 5 points, with the latter indicating the highest need or benefit for the corresponding performance measure. All Tier 2 performance measure scores were converted to weighted scores and combined to create an overall weighted score that ranges from 0 to 100. A higher score generally indicates a greater benefit potential from the proposed corridor improvement. A detailed description of each performance measure and the scoring results follows.

Table 6.4 – Tier 2 Performance Measures

Scoring Factor Number	Tier 2 Corridor Performance Measures	Score Range	Score Weight	Max. Possible Weighted Score
#1	Mobility Index	0 – 5	3.0	15
#2	Reliability Index	0 – 5	2.6	13
#3	Accessibility Index	0 – 5	2.4	12
#4	Safety Index	0 – 5	4.0	20
#5	Freight & Logistics Index	0 – 5	2.2	11
#6	Infrastructure Index	0 – 5	3.2	16
#7	Economic Benefit Index	0 – 5	2.6	13
				Sum = 100

6.2.1 Mobility

The Tier 2 mobility index evaluates the improvement concepts impact on congestions at corridor and systemwide levels and for long-distance travels in future year (2045). **Table 6.5** summarizes the mobility criteria. According to data collected from the Tier 2 on-line survey mentioned above, the score of mobility index was weighted as 35% for corridor delay reduction, 35% for systemwide delay reduction, and 30% for long-distance travel time savings. In overall Tier 2 scoring, the mobility index contributes a maximum of 15 points.

- **Corridor Delay Reduction (2045).** This forecasts the reduction of vehicle hour delays along a corridor in the future year 2045, which would result from the recommended improvement for the corridor. For each corridor segment, the improvement concept recommended by Tier 2 corridor scoping was coded into the SWIPP Model for a 2045 "Build" model run. The corridor delay reduction is the difference of the vehicle hour delays for the corridor segment between 2045 "No Build" and 2045 "Build".
- **Systemwide Delay Reduction (2045).** This forecasts the reduction of vehicle hour delays at system level in the future year 2045, which would result from the recommended improvement for the corridor. It was calculated in the same way as the corridor delay reduction mentioned above, except for including all roadways in the SWIPP Model.
- **Long-Distance Travel Time Savings (2045).** This forecasts the travel time savings for long-distance trips (greater than 50 miles) that are served by corridor, between 2045 "No Build" and 2045 "Build". The interstates and parkways are intended to provide efficient long-distance connectivity between regions and major trip generators across Kentucky. Long-distance trip makers usually have limited knowledge of local roadway networks and alternative routes, so they usually prefer staying on the major corridors during their

journey even though unfavorable traffic conditions exist. Therefore, the improvement concepts would provide greater benefits to those corridors carrying more long-distance trips.

Table 6.5 – Tier 2 Mobility Index

MOBILITY							
Corridor Delay Reduction (2045) - X_1	Score		Systemwide Delay Reduction (2045) - X_2	Score		Long-Distance Travel Time Savings (2045) - X_3	Score
$X_1 < 50$	0		$X_2 < 0$	0		$X_3 < 10$	0
$50 <= X_1 < 300$	1		$0 <= X_2 < 200$	1		$10 <= X_3 < 50$	1
$300 <= X_1 < 500$	2		$200 <= X_2 < 500$	2		$50 <= X_3 < 100$	2
$500 <= X_1 < 1{,}000$	3		$500 <= X_2 < 1{,}000$	3		$100 <= X_3 < 200$	3
$1{,}000 <= X_1 < 1{,}500$	4		$1{,}000 <= X_2 < 2{,}500$	4		$200 <= X_3 < 500$	4
$X_1 >= 1{,}500$	5		$X_2 >= 2{,}500$	5		$X_3 >= 500$	5
Mobility Score = $0.35X_1 + 0.35X_2 + 0.30X_3$							
Final Score Weight = 15%, Multiplier = 3							

Table 6.6 summarizes the Tier 2 mobility scores for each segment. Unsurprisingly, the congested corridors in major metropolitan areas, including Segment 1B (I-275 from KY 237 to I-71) in northern Kentucky, Segment 6D (I-65 from KY 44 to I-265), 6E (I-65 from I-265 to I-264), and 8C (I-64 from I-264 to I-265) in Louisville, and Segment 8E (I-64 from KY 53 to I-64/I-75 north split) connecting Frankfort and Lexington, are at the high end of the mobility scores. This is because the recommended roadway widening, spot improvements at major interchanges, and TSMO solutions provide a significant amount of additional capacity and improve traffic operations.

Table 6.6 – Tier 2 Mobility Scoring

Corridor ID	Corridor Name	From	To	Corridor VHT Delay Reduction (2045)	Systemwide VHT Delay Reduction (2045)	Long-Distance Travel Time Savings (2045)	Mobility Score (Weighted)
1A	I-275	Indiana state line	KY 237 in Boone Co.	0	0	0	1.1
1B	I-275	KY 237 in Boone Co.	I-71	2,365	3,734	308	14.1
1C	I-275	I-71	Ohio state line	773	434	61	7.1
2	I-471	Ohio state line	I-275	208	501	14	5.1
3A	I-75	Tennessee state line	KY 21 in Berea	4	207	63	3.9
3C	I-75	KY 876 in Richmond	Man o' War Blvd	100	169	92	3.9

Corridor ID	Corridor Name	From	To	Corridor VHT Delay Reduction (2045)	Systemwide VHT Delay Reduction (2045)	Long-Distance Travel Time Savings (2045)	Mobility Score (Weighted)
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	624	-125	150	5.9
3F	I-75	I-64/I-75 north split	I-71	689	595	313	9.9
3H	I-75	KY 536 in Boone Co.	I-275	1,066	76	680	9.8
3I	I-75	I-275	Ohio state line	1,493	1,744	416	12.0
4A	I-71	I-64	I-264	507	-231	47	4.1
4B	I-71	I-264	I-265	329	1,195	35	7.2
4C	I-71	I-265	KY 53 in La Grange	275	243	219	6.8
4D	I-71	KY 53 in La Grange	I-75	475	306	407	7.8
6B	I-65	Cumberland Expressway	Western KY Pkwy	0	-47	-6	0.0
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	-311	-240	-80	0.0
6D	I-65	KY 44 in Shepherdsville	I-265	4,190	9,721	2,158	15.0
6E	I-65	I-265	I-264	4,296	1,167	419	13.1
6F	I-65	I-264	Indiana state line	635	1,131	108	10.1
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	1,317	2,227	176	11.1
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	2,519	933	146	11.1
8A	I-64	Indiana state line	I-65	255	-118	54	2.9
8B	I-64	I-65	I-264	114	559	68	6.0
8C	I-64	I-264	I-265	2,101	3,142	599	15.0
8D	I-64	I-265	KY 53 in Shelbyville	-1,832	7,164	-366	5.3
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	1,442	4,480	1,666	14.0
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	389	-80	36	3.0
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	1,417	1,604	80	10.2
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	478	843	41	6.2
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	15	19	6	1.1

6.2.2 Reliability

The Tier 2 reliability index evaluates the level of travel time reliability for both passenger vehicle and truck VMTs along a corridor. A higher percentage of unreliable corridor VMT indicates the existing mobility has higher variability of operation speeds, which may be caused by capacity constraint, incidents, weather, maintenance, or short-term construction, and is more likely to benefit from the recommended improvements. **Table 6.7** summarizes the reliability criteria. According to Tier 2 on-line survey mentioned above, the score of reliability index was weighted as 50% for passenger vehicle unreliable VMT and 50% for truck unreliable VMT. In overall Tier 2 scoring, the reliability index contributes a maximum of 13 points.

- **% Passenger Vehicle Unreliable VMT.** This factor measures unreliable passenger vehicle VMT as a percentage of the total passenger vehicle VMT for a corridor. Unreliable travel time is determined by the Level of Travel Time Reliability (LOTTR) value (>1.5) that is derived from observed speed or travel time data. It is usually difficult to forecast travel time reliability under future conditions, due to the unknowns and high variability of incidents, weather, maintenance, or short-term construction in future. Therefore, this factor is based on LOTTR data from the existing condition (2019).
- **% of Truck Unreliable VMT.** This factor measures unreliable truck VMT as a percentage of the total truck VMT for a corridor. Unreliable truck travel time is determined by the Truck Travel Time Reliability (TTTR) index (>1.5) that is derived from observed speed or travel time data. The factor uses TTTR data from the existing condition (2019) due to the same reason as mentioned above.

Table 6.7 – Tier 2 Reliability Index

RELIABILITY				
% of Passenger Vehicle Unreliable VMT (2019) - X_1	Score		% of Truck Unreliable VMT (2019) - X_2	Score
$X_1 < 0.1\%$	0		$X_2 < 1\%$	0
$0.1\% <= X_1 < 5\%$	1		$1\% <= X_2 < 10\%$	1
$5\% <= X_1 < 10\%$	2		$10\% <= X_2 < 30\%$	2
$10\% <= X_1 < 15\%$	3		$30\% <= X_2 < 50\%$	3
$15\% <= X_1 < 25\%$	4		$50\% <= X_2 < 70\%$	4
$X_1 > 25\%$	5		$X_2 > 70\%$	5
Reliability Score = $0.5X_1 + 0.5X_2$				
Final Score Weight = 13%, Multiplier = 2.6				

Table 6.8 summarizes the Tier 2 reliability scores for each segment. Corridors with the highest reliability scores include Segment 2 (I-471 from Ohio state line to I-275), Segment 3I (I-75 from I-275 to Ohio state line) in northern Kentucky, and Segment 7B (I-265/Gene Snyder Freeway from I-65 to I-64), 7C (I-265/Gene Snyder Freeway from I-64 to I-71), and 8B (I-64 from I-65 to I-264) in Louisville. These segments are in urban areas with more congestion and safety issues as well as construction impacts.

Table 6.8 – Tier 2 Reliability Scoring

Corridor ID	Corridor Name	From	To	% Passenger Vehicle Unreliable VMT (2019)	% Truck Unreliable VMT (2019)	Reliability Score (Weighted)
1A	I-275	Indiana state line	KY 237 in Boone Co.	0.0%	15.6%	2.6
1B	I-275	KY 237 in Boone Co.	I-71	6.0%	25.8%	5.2
1C	I-275	I-71	Ohio state line	8.6%	55.9%	7.8
2	I-471	Ohio state line	I-275	31.8%	100.0%	13.0
3A	I-75	Tennessee state line	KY 21 in Berea	0.0%	8.8%	1.3
3C	I-75	KY 876 in Richmond	Man o' War Blvd	0.0%	0.0%	0.0
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	0.0%	34.1%	3.9
3F	I-75	I-64/I-75 north split	I-71	0.0%	2.5%	1.3
3H	I-75	KY 536 in Boone Co.	I-275	11.4%	48.6%	7.8
3I	I-75	I-275	Ohio state line	45.7%	81.0%	13.0
4A	I-71	I-64	I-264	6.3%	95.0%	9.1
4B	I-71	I-264	I-265	0.0%	100.0%	6.5
4C	I-71	I-265	KY 53 in La Grange	0.0%	21.3%	2.6
4D	I-71	KY 53 in La Grange	I-75	0.0%	0.0%	0.0
6B	I-65	Cumberland Expressway	Western KY Pkwy	0.6%	1.1%	2.6
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	0.0%	1.0%	1.3
6D	I-65	KY 44 in Shepherdsville	I-265	11.6%	15.0%	6.5
6E	I-65	I-265	I-264	0.0%	49.1%	3.9
6F	I-65	I-264	Indiana state line	11.5%	55.2%	9.1
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	23.7%	77.3%	11.7
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	25.9%	51.0%	11.7
8A	I-64	Indiana state line	I-65	0.0%	37.9%	3.9
8B	I-64	I-65	I-264	17.3%	76.8%	11.7
8C	I-64	I-264	I-265	8.7%	68.7%	7.8
8D	I-64	I-265	KY 53 in Shelbyville	1.8%	1.3%	2.6
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	0.0%	0.0%	0.0
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	0.0%	10.9%	2.6
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	23.5%	56.4%	10.4
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	13.3%	32.4%	7.8
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	0.0%	0.0%	0.0

6.2.3 Accessibility

The Tier 2 accessibility index measures the percent of travel time saved when accessing special trip generators due to proposed corridor improvements and the corridor's importance to providing equitable accessibility to destinations. The Tier 2 analysis used the same set of special trip generators (i.e., hospitals/trauma centers, colleges/universities, non-retail job centers) throughout Kentucky identified in Tier 1 (see Section 5.5). **Table 6.9** summarizes the accessibility index. The weight of each factor was determined based on data collected from the Tier 2 on-line survey mentioned above. The percent of travel time savings is 55% of the index, while the equitable accessibility is 45% of the index. In overall Tier 2 scoring, the accessibility index contributes a maximum of 12 points.

- **% Travel Time Savings to Generators (2045).** This measures the percent travel time savings from all trips that use some part of the corridor to access special generators, due to recommended corridor improvements. This analysis compared the aggregated travel times of all relevant origin-destination (OD) pairs, between 2045 "No Build" and 2045 "Build". The greater the percent travel time savings achieved by a corridor, the more benefit the corridor improvement provides, the higher the score awarded to the corridor.
- **Equitable Accessibility (2019).** An equity accessibility gap was developed to evaluate the fair opportunity for all people in access to destinations via the corridor. This factor measures the difference (in percentage) of equity and non-equity populations that are served by corridors to reach special generators, under the existing condition. The ideal value of the equity accessibility gap is zero, which indicates a perfectly fair opportunity (or no difference) between equity and non-equity populations. The smaller the factor is, the higher score is assigned to the corridor.

As part of the equitable accessibility analysis, the Project Team identified equity-focused community (EFC) zones in the SWIPP Model traffic analysis zone (TAZ) structure, based on a threshold approach by using census tract data and considering low-income (poverty rate greater than 20%) and minority population (percent minority population greater than the Kentucky statewide average). **Figure 6.3** illustrates the EFC zones in Kentucky.

Table 6.9 – Tier 2 Accessibility Index

ACCESSIBILITY				
% Travel Time Savings to Generators (2045) - X_1	**Score**		**Equity Accessibility Gap (2019) - X_2**	**Score**
$X_1 < 0.01\%$	0		$X_2 >= 65\%$	0
$0.01\% <= X_1 < 0.1\%$	1		$40\% <= X_2 < 65\%$	1
$0.1\% <= X_1 < 0.4\%$	2		$30\% <= X_2 < 40\%$	2
$0.4\% <= X_1 < 0.6\%$	3		$20\% <= X_2 < 30\%$	3
$0.6\% <= X_1 < 0.9\%$	4		$15\% <= X_2 < 20\%$	4
$X_1 >= 0.9\%$	5		$X_2 < 15\%$	5
Accessibility Score $= 0.55X_1 + 0.45X_2$				
Final Score Weight = 12%, Multiplier = 2.4				

Figure 6.3 – Equity-Focused Community (EFC) Zones

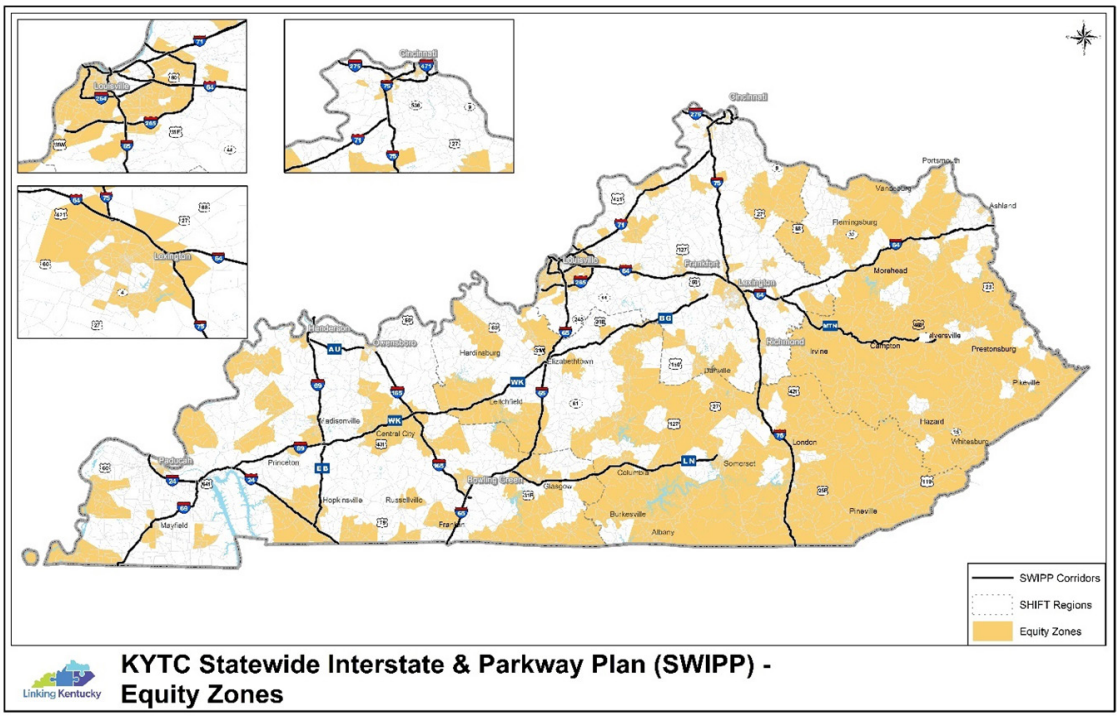


Table 6.10 summarizes Tier 2 accessibility scores. Segments 4B (I-71 from I-264 to I-265), 6D (I-65 from KY 44 to I-265), 6E (I-65 from I-265 to I-264), 7B (I-265/Gene Snyder Freeway from I-65 to I-64), 8C (I-64 from I-264 to I-265), and 8E (I-64 from KY 53 to I-64/I-75 north split) received the top scores, because they tend to achieve greater travel time savings from potential corridor improvements and provide stronger support to equitable access to major destinations.

Table 6.10 – Tier 2 Accessibility Scoring

Corridor ID	Corridor Name	From	To	% Travel Time Savings to Generators (2045)	Equity Accessibility Gap (2019)	Accessibility Score (Weighted)
1A	I-275	Indiana state line	KY 237 in Boone Co.	0.0%	99.9%	0.0
1B	I-275	KY 237 in Boone Co.	I-71	3.1%	65.8%	6.6
1C	I-275	I-71	Ohio state line	0.6%	68.8%	4.0
2	I-471	Ohio state line	I-275	0.1%	64.6%	3.7
3A	I-75	Tennessee state line	KY 21 in Berea	0.0%	68.4%	1.3
3C	I-75	KY 876 in Richmond	Man o' War Blvd	0.0%	39.4%	3.5
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	0.1%	20.9%	5.9
3F	I-75	I-64/I-75 north split	I-71	0.4%	29.1%	7.2
3H	I-75	KY 536 in Boone Co.	I-275	0.7%	26.4%	8.5
3I	I-75	I-275	Ohio state line	0.9%	28.2%	8.5
4A	I-71	I-64	I-264	0.6%	19.9%	9.6
4B	I-71	I-264	I-265	0.6%	4.6%	10.7
4C	I-71	I-265	KY 53 in La Grange	0.7%	33.7%	7.4

Corridor ID	Corridor Name	From	To	% Travel Time Savings to Generators (2045)	Equity Accessibility Gap (2019)	Accessibility Score (Weighted)
4D	I-71	KY 53 in La Grange	I-75	0.6%	35.5%	7.4
6B	I-65	Cumberland Expressway	Western KY Pkwy	0.0%	48.2%	1.1
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	0.0%	15.7%	4.3
6D	I-65	KY 44 in Shepherdsville	I-265	4.1%	18.0%	10.9
6E	I-65	I-265	I-264	1.7%	21.9%	9.8
6F	I-65	I-264	Indiana state line	0.4%	51.4%	5.0
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	0.9%	12.8%	12.0
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	0.3%	14.5%	8.0
8A	I-64	Indiana state line	I-65	0.1%	50.6%	3.7
8B	I-64	I-65	I-264	0.2%	41.5%	3.7
8C	I-64	I-264	I-265	1.3%	25.8%	9.8
8D	I-64	I-265	KY 53 in Shelbyville	-0.4%	1.0%	5.4
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	1.1%	7.7%	12.0
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	0.3%	78.2%	2.6
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	0.6%	37.6%	7.4
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	0.4%	20.5%	7.2
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	0.0%	15.4%	5.6

6.2.4 Safety

The Tier 2 safety index measures the overall crash severity of a corridor and the corridor's potential of crash reduction. **Table 6.11** summarizes the safety index and performance measures. The safety criteria (KA crashes per mile and potential for crash reduction) were assigned 50% each based on data collected from the Tier 2 on-line survey mentioned above. In overall Tier 2 scoring, the safety index contributes a maximum of 20 points.

- **KA Crashes per Mile.** This evaluates the worst outcomes from a corridor's crashes by focusing on fatality crashes (K) and disabling injury crashes (A). The analysis was based on the same safety data from KYTC used in Tier 1 analysis. The total number of "K" and "A" crashes along a corridor segment was divided by segment's mileage. Higher KA crashes per mile result in higher score.

- **Potential Crash Reduction.** Crash data for each corridor segment was analyzed and countermeasures were identified to mitigate crashes. Details of the countermeasures are described in Tier 2 scoping reports (see **Appendix I**) and visualized in a GIS Online Tool developed as part of the SWIPP (see **Appendix M**). Applicable Crash Modification Factors (CMFs) were identified for each of the countermeasures (see **Table 6.12**). Countermeasures were grouped into low, medium, and high bins, based on the CMFs. Consideration was also given to whether the countermeasure is a spot improvement, can be applied of a medium length of the corridor, or can be applied over a long length of the corridor. **Table 6.13** shows the matrix that estimates the potential for crash reduction based on CMF and improvement length. The corridor-level potential for crash reduction is calculated as:

X_2 = [(n*lowCMF spot) + (n*medMCF spot*2) + (n*highCMF spot*3) + (n*lowCMF med*2) + (n*medCMF med*4) + (n*highCMF med*6) + (n*lowCMF long*3) + (n*med CMF long*6) + (n*high CMF long*9)], weighted by VMT in existing condition

Table 6.11 – Tier 2 Safety Index

SAFETY				
KA Crashes per Mile - X_1	Score		Potential Crash Reduction (CMF) - X_2	Score
$X_1 < 1.2$	0		$X_2 < 6$	0
$1.2 <= X_1 < 1.6$	1		$6 <= X_2 < 10.5$	1
$1.6 <= X_1 < 2.5$	2		$10.5 <= X_2 < 14$	2
$2.5 <= X_1 < 3.5$	3		$14 <= X_2 < 17$	3
$3.5 <= X_1 < 4.3$	4		$17 <= X_2 < 20$	4
$X_1 >= 4.3$	5		$X_2 >= 20$	5
Safety Score = $0.5X_1 + 0.5X_2$				
Final Score Weight = 20%, Multiplier = 4				

Table 6.12 – Countermeasure Crash Modification Factors (CMFs)

Improvements Categories	Category	CMF
Widening (Major)		
Urban Freeway, Added Lanes (5 to 6 lane)	Low	1.03
Urban Freeway, Added Lanes (4 to 5 lane)	Low	1.11
Rural Freeway, Added Lanes (2 to 3 lane)	High	0.76
Rural Freeway, Added Lanes (4 to 6 lane)	Low	1.25
New Collector-Distributor Road (mainly for urban)	High	N/A
Upgrade		
Parkway Upgrade to Freeway with Pavement Reconstruction (Concrete - Diamond Grinding)	Low	0.943
Parkway Upgrade to Freeway with Pavement Rehab (Asphalt - Thin HMA)	Low	0.986
Install Raised Pavement Markers	Low	0.94
Upgrade Existing Markings	Medium	0.871
Increase Outside Shoulder Width from 6' to 8'	Low	0.98
Increase Outside Shoulder Width from 10' to 12'	High	0.774
Increase Inside Shoulder Width from 4' to 6'	High	0.472
Increase Inside Shoulder Width from 4' to 8'	High	0.78
Increase Inside Shoulder Width from 4' to 10'	High	0.665
Interchange / Grade Separation		
New Service Interchange - Rural	Low	1.01
New Service Interchange - Urban	Low	1.01
Interchange Modification - Rural	Low	1.01
Interchange Modification - Urban	Low	1.01
Single Ramp to Two-Lane Ramp Widening - Rural	High	0.76
Single Ramp to Two-Lane Ramp Widening - Urban	High	0.76
Add Auxiliary Lane - Rural	High	0.8
Add Auxiliary Lane - Urban	High	0.8
Major Structure		
Bridge - Replacement	Low	N/A
Bridge - Rehab	Low	N/A
Railroad Bridge	Low	N/A
TSMO		
Freeway Strategies		
Ramp Metering		
Traffic responsive centralized	High	N/A
Traffic responsive non-centralized	High	N/A
Stand alone	High	0.64
Managed Lanes		
Express Toll Lanes	High	0.53
HOT Lanes	High	0.72
HOV Lanes	High	N/A
Part-time Shoulder Use (GP)	Medium	N/A
Part-time Shoulder Use (Transit)	Medium	0.806
Freight Strategies and Systems		
Truck Only Lanes	High	0.57
Climbing Lanes	High	0.57
Other Strategies		
Travel Demand Management	Medium	N/A
Dynamic Lane Use	Medium	N/A
Applies everywhere:		
Road Weather Management	Medium	0.84
Work Zone Management	Medium	N/A
Variable Speed Limits	High	0.71
Queue Warning	Medium	0.84
Comparative Travel Times	Low	N/A
En-Route Traveler Information	High	0.56
Truck Parking Information System	Low	N/A
Low-Cost Safety		
Increase Acceleration Lane Length	Low	0.89
Increase Deceleration Lane Length	Low	0.93
Install Median Barrier	High	0.03
Add Rumble Strips on Shoulder	Medium	0.83
Install Guardrail	Low	0.93
Improve Signage	Medium	0.87
Improve Striping	Low	0.91
Install Lighting	Low	0.922

Table 6.13 – Potential Crash Reduction Estimation Matrix

		CRASH MODIFICATION FACTOR (CMF)		
		Low (weight =1)	Med (weight =2)	High (weight =3)
Improvement Length	Spot (weight =1)	n*1	n*2	n*3
	Med (weight =2)	n*2	n*4	n*6
	Long (weight =3)	n*3	n*6	n*9

Note:
Improvement length
- *Spot = spot improvement*
- *Med = improvement < 10 miles in length*
- *Long = improvement >= 10 miles in length*

Crash Modification Factor (CMF)
- *Low = CMF > 0.85*
- *Med = 0.7< CMF <=0.85*
- *High = CMF <= 0.7*

Table 6.14 summarizes Tier 2 safety scores. Corridor segments that carry heavier traffic and have more safety issues in urban or suburban areas generally scored higher. Segments 1C (I-275 from I-71 to Ohio state line), 3I (I-75 from I-275 to Ohio state line), 7B (I-265/Gene Snyder Freeway from I-65 to I-64), and 8C (I-64 from I-264 to I-265) have the highest safety scores. Greater benefits would be expected for these segments if the recommended improvements were made.

Table 6.14 – Tier 2 Safety Scoring

Corridor ID	Corridor Name	From	To	KA Crashes Per Mile	Potential Crash Reduction (CMF)	Safety Score (Weighted)
1A	I-275	Indiana state line	KY 237 in Boone Co.	1.5	4.0	2.0
1B	I-275	KY 237 in Boone Co.	I-71	1.7	18.0	12.0
1C	I-275	I-71	Ohio state line	4.1	30.6	18.0
2	I-471	Ohio state line	I-275	1.6	17.7	10.0
3A	I-75	Tennessee state line	KY 21 in Berea	1.1	14.5	6.0
3C	I-75	KY 876 in Richmond	Man o' War Blvd	1.2	17.4	10.0
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	1.3	15.3	8.0
3F	I-75	I-64/I-75 north split	I-71	1.0	18.5	8.0
3H	I-75	KY 536 in Boone Co.	I-275	3.4	18.3	14.0
3I	I-75	I-275	Ohio state line	4.1	23.1	18.0
4A	I-71	I-64	I-264	4.0	5.4	8.0
4B	I-71	I-264	I-265	11.3	6.3	12.0
4C	I-71	I-265	KY 53 in La Grange	2.8	10.5	10.0
4D	I-71	KY 53 in La Grange	I-75	1.1	10.9	4.0
6B	I-65	Cumberland Expressway	Western KY Pkwy	1.2	0.6	0.0

Corridor ID	Corridor Name	From	To	KA Crashes Per Mile	Potential Crash Reduction (CMF)	Safety Score (Weighted)
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	1.8	22.1	14.0
6D	I-65	KY 44 in Shepherdsville	I-265	3.0	17.1	14.0
6E	I-65	I-265	I-264	4.5	13.5	14.0
6F	I-65	I-264	Indiana state line	7.4	10.8	14.0
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	2.9	26.1	16.0
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	2.2	17.2	12.0
8A	I-64	Indiana state line	I-65	4.2	16.2	14.0
8B	I-64	I-65	I-264	2.8	10.4	8.0
8C	I-64	I-264	I-265	5.3	35.1	20.0
8D	I-64	I-265	KY 53 in Shelbyville	1.6	4.8	4.0
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	1.4	9.5	4.0
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	4.3	14.1	14.0
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	8.4	13.5	14.0
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	1.5	6.3	4.0
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	0.8	3.5	0.0

6.2.5 Freight and Logistics

The Tier 2 freight and logistics index evaluates the corridor's importance in support of statewide freight/logistics mobility and economy, in terms of truck congestion relief by proposed improvements, intermodal linkage, and corridor value. **Table 6.15** summarizes this index and its performance criteria. The weight of each criterion was determined by data collected from the Tier 2 on-line survey. The score was weighted as 35% for corridor truck delay reduction, 35% for intermodal linkage, and 30% for corridor value. In overall Tier 2 scoring, the freight and logistics index contributes a maximum of 11 points.

- **Corridor Truck Delay Reduction (2045).** This measures the reduction of truck vehicle-hours of delay at the corridor level between 2045 "No Build" and 2045 "Build".
- **Intermodal/Logistics Linkage.** This evaluates the corridor's role in support of first-/last-mile of freight movement and intermodal linkages by measuring the corridor length that is within 5 miles of major freight modal hubs (e.g., cargo airports, riverports, rail yards, and intermodal connectors) or freight generators as a percentage of the total corridor length. **Figure 6.4** illustrates the 5-mile buffers of the major modal hubs and freight generators throughout Kentucky.

- **Corridor Value (2018).** This measures the monetary value of commodities carried by corridor, using 2018 TranSearch county-level data (see Section 2.7.1). The TranSearch highway commodity value (see **Figure 6.5**) was distributed to the latest FHWA Freight Analysis Framework (FAF5) network links based on the link-level share of truck vehicle mileage traveled (VMT) estimated by the SWIPP Model within each county. The link-level commodity values were then aggregated to each corridor segment.

Table 6.15 – Tier 2 Freight and Logistics Index

FREIGHT & LOGISTICS							
Corridor Truck Delay Reduction (2045) - X_1	Score		Intermodal/Logistics Linkage - X_2	Score		Corridor Value ($M) - X_3	Score
$X_1 < 5$	0		$X_2 < 55\%$	0		$X_3 < 1,400$	0
$5 <= X_1 < 35$	1		$55\% <= X_2 < 65\%$	1		$1,400 <= X_3 < 1,700$	1
$35 <= X_1 < 100$	2		$65\% <= X_2 < 75\%$	2		$1,700 <= X_3 < 2,000$	2
$100 <= X_1 < 160$	3		$75\% <= X_2 < 85\%$	3		$2,000 <= X_3 < 2,500$	3
$160 <= X_1 < 300$	4		$85\% <= X_2 < 95\%$	4		$2,500 <= X_3 < 4,000$	4
$X_1 >= 300$	5		$X_2 > 95\%$	5		$X_3 >= 4,000$	5
Freight & Logistics Score = $0.35X_1 + 0.35X_2 + 0.30X_3$							
Final Score Weight = 11%, Multiplier = 2.2							

Figure 6.4 – 5-Mile Buffers of Major Modal Hubs and Freight Generators

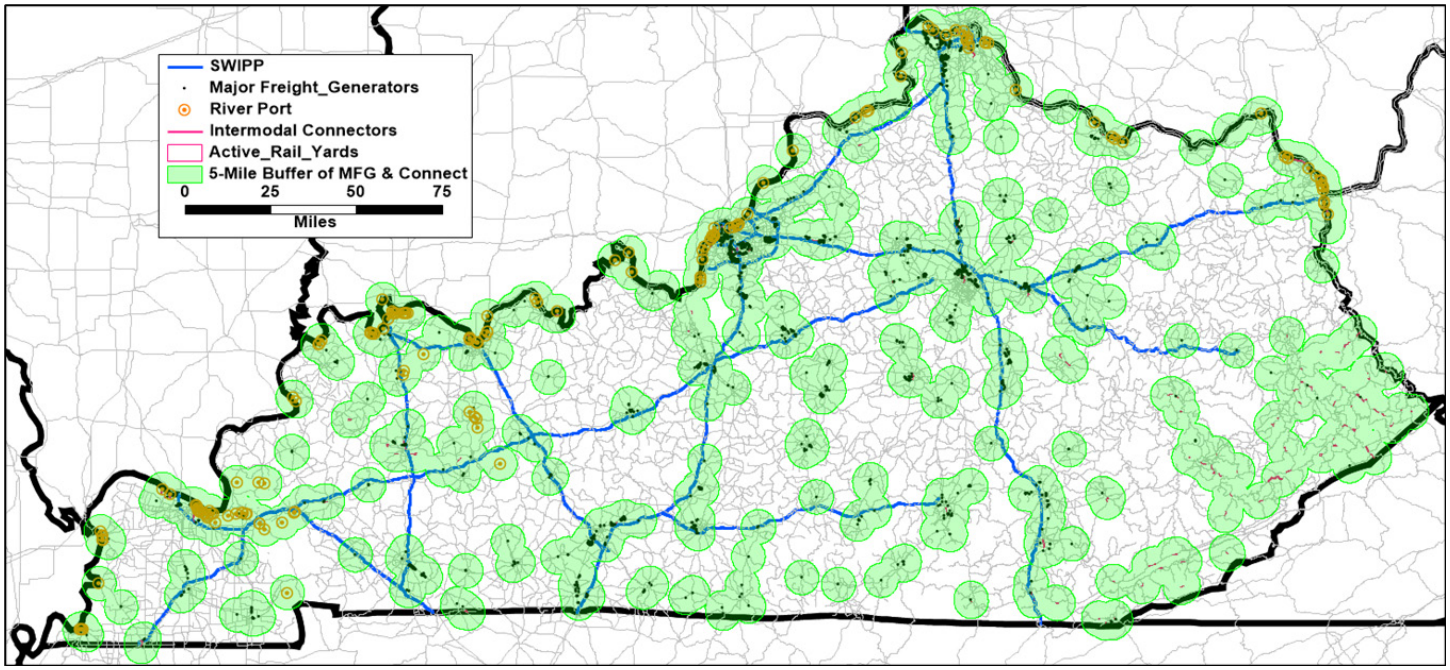


Figure 6.5 – 2018 TranSearch Highway Commodity Values (County Level)

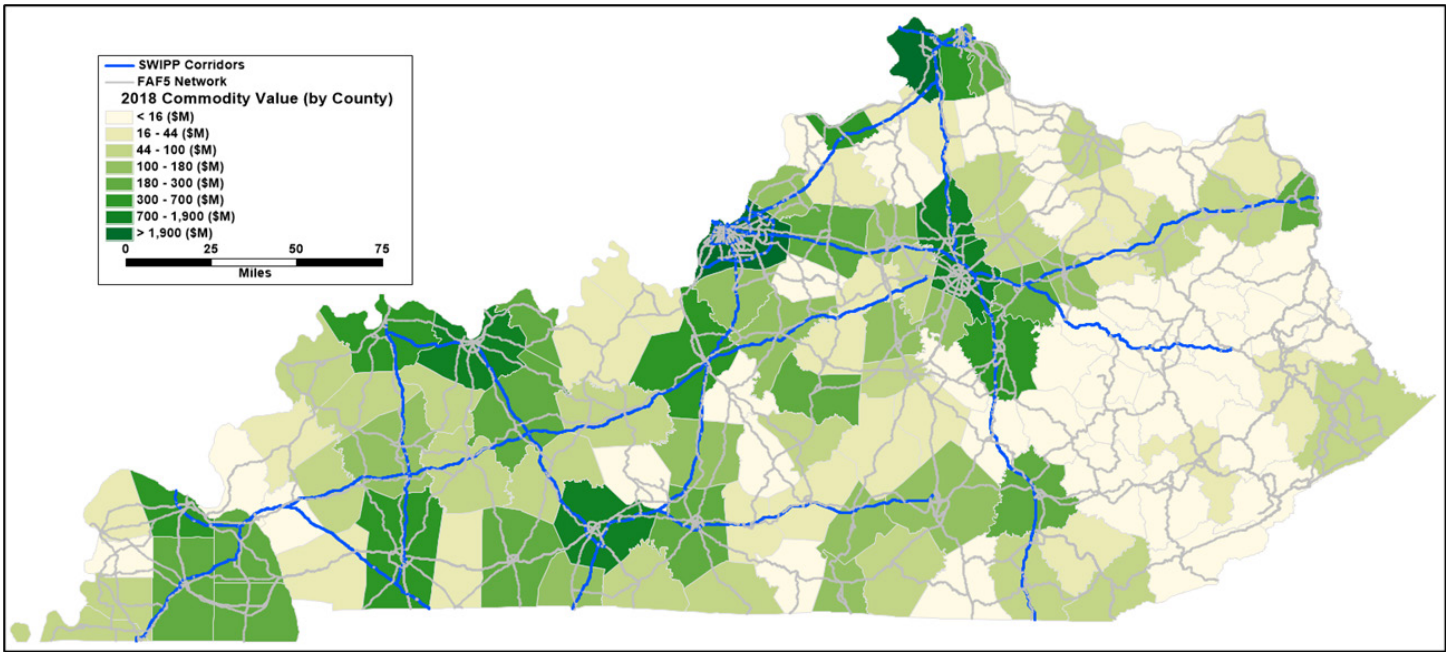


Table 6.16 summarizes the Tier 2 freight and logistics scores. Corridor segments that carry heavier truck traffic in congested urban areas and provide connections between regional freight generators (e.g., Louisville, Lexington, and northern Kentucky) generally scored higher. Segments 3H (I-75 from KY 536 to I-275), 3I (I-75 from I-275 to Ohio state line), 6E (I-65 from I-265 to I-264), and 7C (I-265/Gene Snyder Freeway from I-64 to I-71) have the highest freight and logistics scores.

Table 6.16 – Tier 2 Freight and Logistics Scoring

Corridor ID	Corridor Name	From	To	Corridor Truck Delay Reduction (2045)	Intermodal & Logistics Linkage	Corridor Value ($M)	Freight & Logistics Score (Weighted)
1A	I-275	Indiana state line	KY 237 in Boone Co.	0	94%	1,509	3.7
1B	I-275	KY 237 in Boone Co.	I-71	441	100%	1,719	9.0
1C	I-275	I-71	Ohio state line	61	100%	785	5.4
2	I-471	Ohio state line	I-275	13	100%	234	4.6
3A	I-75	Tennessee state line	KY 21 in Berea	1	78%	2,177	4.3
3C	I-75	KY 876 in Richmond	Man o' War Blvd	23	79%	4,201	6.4
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	35	100%	2,375	7.4
3F	I-75	I-64/I-75 north split	I-71	135	74%	13,445	7.2
3H	I-75	KY 536 in Boone Co.	I-275	192	100%	5,252	10.2
3I	I-75	I-275	Ohio state line	392	100%	2,738	10.3
4A	I-71	I-64	I-264	47	100%	781	5.4
4B	I-71	I-264	I-265	81	100%	1,676	6.1
4C	I-71	I-265	KY 53 in La Grange	120	100%	1,682	6.8

Corridor ID	Corridor Name	From	To	Corridor Truck Delay Reduction (2045)	Intermodal & Logistics Linkage	Corridor Value ($M)	Freight & Logistics Score (Weighted)
4D	I-71	KY 53 in La Grange	I-75	304	62%	6,683	7.9
6B	I-65	Cumberland Expressway	Western KY Pkwy	0	75%	3,537	5.0
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	-155	89%	2,073	5.1
6D	I-65	KY 44 in Shepherdsville	I-265	1,784	100%	1,771	9.0
6E	I-65	I-265	I-264	1,332	100%	4,238	11.0
6F	I-65	I-264	Indiana state line	265	100%	3,975	9.6
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	182	100%	3,658	9.6
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	307	100%	2,178	9.7
8A	I-64	Indiana state line	I-65	31	100%	1,294	4.6
8B	I-64	I-65	I-264	37	100%	1,772	6.7
8C	I-64	I-264	I-265	260	100%	1,783	8.3
8D	I-64	I-265	KY 53 in Shelbyville	-217	100%	2,481	5.8
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	157	72%	5,298	7.2
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	32	100%	1,883	5.9
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	205	100%	2,643	9.6
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	102	100%	1,415	6.8
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	4	49%	1,427	0.7

6.2.6 Infrastructure

The Tier 2 infrastructure index evaluates the pavement and bridge conditions along the corridor segments. **Table 6.17** summarizes the infrastructure index. The pavement conditions and bridge conditions were assigned a weight of 50% each, based on data collected from the Tier 2 on-line survey mentioned above. In overall Tier 2 scoring, the infrastructure index contributes a maximum of 16 points.

- **Pavement Condition.** The pavement condition was broken down by pavement distress index (PDI), year of next treatment (YearNT), and year of six-year improvement plan (YearSYP), weighted by length of sections for a corridor segment. This factor (X_1) was calculated using the same formula used in KYTC's Strategic Highway Investment Formula for Tomorrow (SHIFT) program, as shown below:

  $X_1 = [(1 - 0.688/PDI) + (10/(YearNT – YearSYP + 1))]$

- Bridge Condition. Bridge condition scores were based on the National Bridge Inspection Standards (NBIS) ratings of the deck, superstructure, and substructure, weighted by the deck area of each bridge within a corridor segment. If all three items are rated 6 or above, the bridge is in good condition and is given a score of one. A deck rating of less than six (while substructure and superstructure are a six or higher) indicates that only deck rehabilitation is needed and is given a score of 2. A superstructure rating of five (while the deck and substructures score six or above) indicates the need for superstructure rehabilitation and is given a score of 3. A substructure rating of five necessitates a substructure rehabilitation and is given a score of 4. A superstructure or substructure rating of less than five requires a bridge replacement and receives a score of 5. The bridge condition factor (X_2) that is a part of the Infrastructure Score equation is shown below:

  X_2 = [(If Deck, Super, Sub >= 6, 1), (If Deck<6, Super, Sub >= 6, 2), (If Super=5, Deck, Sub >= 6, 3), (If Sub = 5, Deck, Super >= 6, 4), (If Sub, Super =< 4, 5)]

Table 6.17 – Tier 2 Infrastructure Index

INFRASTRUCTURE INDEX				
Pavement Condition – X_1	**Score**		**Bridge Condition - X_2**	**Score**
$X_1 < 0.5$	0		$X_2 < 1.2$	0
$0.5 <= X_1 < 1.2$	1		$1.2 <= X_2 < 1.4$	1
$1.2 <= X_1 < 2.4$	2		$1.4 <= X_2 < 1.6$	2
$2.4 <= X_1 < 3.0$	3		$1.6 <= X_2 < 1.8$	3
$3.0 <= X_1 < 3.5$	4		$1.8 <= X_2 < 2.0$	4
$X_1 >= 3.5$	5		$X_2 >= 2.0$	5
Infrastructure Score = $0.5X_1 + 0.5X_2$				
Final Score Weight = 16%, Multiplier = 3.2				

Table 6.18 summarizes the infrastructure scores for all 30 segments. Segments 1A (I-275 from Indiana state line to KY 237 in Boone County) and 3H (I-75 from KY 536 in Boone County to I-275) in northern Kentucky, 3E (I-64/I-75 overlapped section) in Lexington, 6E (I-65 from I-265 to I-264) and 8A (I-64 from Indiana state line to I-65) in Louisville have the highest infrastructure scores. It should be noted that the vast majority of bridges on interstates and parkways are in good condition. Therefore, despite the fact that bridge and pavement are each 50% of the score, the pavement condition is usually the differentiator between segments.

Table 6.18 – Tier 2 Infrastructure Scoring

Corridor ID	Corridor Name	From	To	Pavement Condition	Bridge Condition	Infrastructure Score (Weighted)
1A	I-275	Indiana state line	KY 237 in Boone Co.	5.07	4.61	16.0
1B	I-275	KY 237 in Boone Co.	I-71	2.05	1.00	3.2
1C	I-275	I-71	Ohio state line	2.85	1.00	4.8
2	I-471	Ohio state line	I-275	3.18	1.00	6.4
3A	I-75	Tennessee state line	KY 21 in Berea	0.28	1.00	0.0
3C	I-75	KY 876 in Richmond	Man o' War Blvd	0.75	1.00	1.6
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	7.94	1.00	8.0
3F	I-75	I-64/I-75 north split	I-71	0.28	1.00	0.0
3H	I-75	KY 536 in Boone Co.	I-275	7.00	1.00	8.0
3I	I-75	I-275	Ohio state line	3.20	1.00	6.4
4A	I-71	I-64	I-264	3.01	1.00	6.4
4B	I-71	I-264	I-265	2.75	1.00	4.8
4C	I-71	I-265	KY 53 in La Grange	0.86	1.00	1.6
4D	I-71	KY 53 in La Grange	I-75	0.27	1.00	0.0
6B	I-65	Cumberland Expressway	Western KY Pkwy	0.41	1.00	0.0
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	0.59	1.00	1.6
6D	I-65	KY 44 in Shepherdsville	I-265	1.61	0.00	3.2
6E	I-65	I-265	I-264	3.76	1.00	8.0
6F	I-65	I-264	Indiana state line	2.67	1.00	4.8
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	1.31	1.00	3.2
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	2.16	1.00	3.2
8A	I-64	Indiana state line	I-65	6.92	1.00	8.0
8B	I-64	I-65	I-264	2.37	1.00	3.2
8C	I-64	I-264	I-265	2.78	1.00	4.8
8D	I-64	I-265	KY 53 in Shelbyville	1.05	1.00	1.6
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	0.43	1.00	0.0
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	2.36	1.00	3.2
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	2.63	1.00	4.8
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	3.39	1.00	6.4
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	0.54	1.72	6.4

6.2.7 Economic Benefit

The Tier 2 economic index measures the economic benefits expected from the recommended corridor improvements. For the purpose of economic modeling, all corridor segments are assumed to start construction in 2025, complete construction in 2030, and operate over the next 15 years (2031 – 2045), so the economic benefits can be estimated and compared across all segments in a consistent way. For each corridor segment, the SWIPP Model was used to generate 2025, 2030, 2045 "No Build" and "Build" model data, including VMT and VHT by trip purpose, vehicle type, and internal-internal/external-internal/internal-external trip patterns, etc. The model data was entered into the Transportation Economic Development Impact System (TREDIS) software for economic benefit analysis.

Table 6.19 summarizes the economic index and its performance measures: the cumulative number of new jobs and the percent change of Gross Regional Product (GRP). These two performance measures use the same factors from the SHIFT statewide Economic Competitiveness Measure (ECM). The cumulative number of new jobs and the percent change of GRP were assigned 50% weight each, based on data collected from the Tier 2 on-line survey mentioned earlier. In overall Tier 2 scoring, the economic index contributes a maximum of 13 points.

- **Cumulative # of Jobs (2030-2045).** This factor (X_1) evaluates the relative magnitude of total new jobs created over a 15-year period (2031 – 2045). This is based upon the assumption of completing improvement projects for each corridor segment. As the formula shows below, the cumulative number of new jobs was derived by using TREDIS outputs (e.g., #_Jobs – estimated new jobs in the last year of operation (2045)), then scaled to a value of 0 to 100 by calculating its percentile rank among all Tier 2 segments.

  X_1 = #_Jobs x 15 years x 0.5 (scaled by percentile rank)

- **% Change of GRP (2030-2045).** This factor (X_2) uses TREDIS outputs to calculate the percent change in GRP over a 15-year period (2031 – 2045). This is based upon the assumption of completing improvement projects for each corridor segment, then scaled to a value of 0 to 100 by calculating its percentile rank among all Tier 2 segments.

Table 6.19 – Tier 2 Economic Benefit Index

ECONOMIC BENEFIT INDEX				
Cumulative # of Jobs (2030-2045) – X_1	**Score**		**% Change of GRP (2030-2045) – X_2**	**Score**
$X_1 < 17$	0		$X_2 < 17$	0
$17 <= X_1 < 33$	1		$17 <= X_2 < 33$	1
$33 <= X_1 < 50$	2		$30 <= X_2 < 50$	2
$50 <= X_1 < 67$	3		$50 <= X_2 < 67$	3
$67 <= X_1 < 83$	4		$65 <= X_2 < 83$	4
$X_1 >= 83$	5		$X_2 >= 83$	5
Economic Benefit Score = $0.5X_1 + 0.5X_2$				
Final Score Weight = 13%, Multiplier = 2.6				

Table 6.20 summarizes Tier 2 economic benefit scores. Segments 1B (I-275 from KY 237 in Boone County to I-71) and 3I (I-75 from I-275 to Ohio state line) in northern Kentucky, and 6D (I-65 from KY 44 to I-265), 7B (I-265/Gene Snyder Freeway from I-65 to I-64), and 8D (I-64 from I-265 to KY 53) in Louisville received the highest economic scores.

Table 6.20 – Tier 2 Economic Benefit Scoring

Corridor ID	Corridor Name	From	To	Cumulative # of Jobs (2030-2045) (Percentile Rank)	% Change of GRP (2030-2045) (Percentile Rank)	Economic Benefit Score (Weighted)
1A	I-275	Indiana state line	KY 237 in Boone Co.	21	24	2.6
1B	I-275	KY 237 in Boone Co.	I-71	93	100	13.0
1C	I-275	I-71	Ohio state line	59	86	10.4
2	I-471	Ohio state line	I-275	17	21	2.6
3A	I-75	Tennessee state line	KY 21 in Berea	28	31	2.6
3C	I-75	KY 876 in Richmond	Man o' War Blvd	62	83	9.1
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	14	7	0.0
3F	I-75	I-64/I-75 north split	I-71	7	3	0.0
3H	I-75	KY 536 in Boone Co.	I-275	10	10	0.0
3I	I-75	I-275	Ohio state line	86	97	13.0
4A	I-71	I-64	I-264	52	48	6.5
4B	I-71	I-264	I-265	55	55	7.8
4C	I-71	I-265	KY 53 in La Grange	66	66	7.8
4D	I-71	KY 53 in La Grange	I-75	31	41	3.9
6B	I-65	Cumberland Expressway	Western KY Pkwy	34	34	5.2
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	3	14	0.0
6D	I-65	KY 44 in Shepherdsville	I-265	97	93	13.0
6E	I-65	I-265	I-264	45	17	3.9
6F	I-65	I-264	Indiana state line	69	69	10.4
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	90	79	11.7
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	72	59	9.1
8A	I-64	Indiana state line	I-65	38	38	5.2
8B	I-64	I-65	I-264	76	72	10.4
8C	I-64	I-264	I-265	79	62	9.1
8D	I-64	I-265	KY 53 in Shelbyville	100	90	13.0
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	0	0	0.0

Corridor ID	Corridor Name	From	To	Cumulative # of Jobs (2030-2045) (Percentile Rank)	% Change of GRP (2030-2045) (Percentile Rank)	Economic Benefit Score (Weighted)
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	41	45	5.2
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	83	76	10.4
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	48	52	6.5
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	21	24	2.6

6.3 TIER 2 QUALITATIVE PERFORMANCE INDICATORS

The Tier 2 quantitative performance measures only tell a portion of the story. There are "intangible" performance indicators such as project delivery timeline, planning-level project cost estimation, economic feasibility, and multi-infrastructure opportunity for resilience and innovation to support Tier 2 corridor prioritization and selection. Brief descriptions for these performance indicators follow.

6.3.1 Project Delivery Timeline

Table 6.21 shows a project deliver timeline indicator based on the amount of time estimated to develop the improvement concepts and get them constructed. Concepts which are anticipated to have a faster delivery receive a higher score.

Table 6.21 – Project Delivery Timeline

PROJECT DELIVERY TIMELINE	
Duration	**Score**
> 15 Years	Very Low (0)
10 - 15 Years	Low (L)
5 - 10 Years	Medium (M)
< 5 Years	High (H)

In general, the complexity of project (and sometimes length) will control delivery time, not necessarily cost. The project delivery timeline was determined at a high planning level based on a guideline provided by KYTC, as described below:

- **< 5 Years**
  - Spot improvements with no right of way or utilities (cost ballpark around $500,000).
  - Basic signal work, optimization, ITS deployments.
  - Bridge rehabilitation with no associated environmental concerns or roadway improvements (otherwise roadway improvements control timeline).
  - Minor intersection improvements (adding a turn lane where there is currently a median, etc.).

- Anything that would require minimal environmental documentation such as a Categorical Exclusion (CE) for Minor Projects (CEMP), CE 1, or CE 2.
- Completing an original 2 lane initial/4 lane ultimate where the right-of-way (ROW) for other lanes has been bought, cleared, and graded.
- Freeway widening (in median) and rehabilitation between adjacent interchanges (unless there is significant bridge work; if bridge work involved then it would increase to the next level of 5-10 years).
- TSMO solutions

- **5-10 Years**
  - Select longer (7-15 mile) segments with no ROW or utilities (e.g., adding a couple feet of shoulder on existing ROW).
  - Shorter segments (less than approximately 7 miles) with minimal/low ROW, utility impacts.
  - Bridge replacement with no associated environmental concerns or roadway improvements (otherwise roadway will control).
  - Rural interchange modifications (i.e., parkway tollbooth interchange to simple diamond).
  - Major intersection improvements requiring ROW, utility relocation.
  - Anything requiring a CE 3.

- **10-15 Years**
  - Long segments (> 15 miles) with no ROW or utilities.
  - Short segments (< 15 miles) with significant ROW, utility impacts (basically any new 2- to 4-lane widening).
  - New rural service interchange.
  - Urban interchange modification.
  - Anything that gets to an Environmental Assessment (EA) and a Finding of No Significant Impact (FONSI).

- **> 15 Years**
  - Long segments (> 15 miles) with significant ROW, utility impacts.
  - New system interchange or system interchange modification.
  - New urban interchange.
  - > 500-ft span bridge replacement.
  - Anything that gets to an Environmental Impact Statement (EIS) and a Record of Decision (ROD).

Table 6.22 summarizes project delivery timeline scores for all Tier 2 segments. It is noted that if there are various types of recommended improvement concepts along a segment, the most time-consuming project controls; if more than one improvement concept is proposed at the same location, the larger-scale project controls.

Table 6.22 – Project Delivery Timeline Scoring

Corridor ID	Corridor Name	From	To	Project Delivery Timeline	
				Years	Score
1A	I-275	Indiana state line	KY 237 in Boone Co.	< 5	H
1B	I-275	KY 237 in Boone Co.	I-71	10 - 15	L
1C	I-275	I-71	Ohio state line	10 - 15	L
2	I-471	Ohio state line	I-275	< 5	H
3A	I-75	Tennessee state line	KY 21 in Berea	< 5	H
3C	I-75	KY 876 in Richmond	Man o' War Blvd	5 - 10	M
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	< 5	H
3F	I-75	I-64/I-75 north split	I-71	10 - 15	L
3H	I-75	KY 536 in Boone Co.	I-275	< 5	H
3I	I-75	I-275	Ohio state line	< 5	H
4A	I-71	I-64	I-264	< 5	H
4B	I-71	I-264	I-265	> 15	0
4C	I-71	I-265	KY 53 in La Grange	> 15	0
4D	I-71	KY 53 in La Grange	I-75	5 - 10	M
6B	I-65	Cumberland Expressway	Western KY Pkwy	< 5	H
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	< 5	H
6D	I-65	KY 44 in Shepherdsville	I-265	> 15	0
6E	I-65	I-265	I-264	5 - 10	M
6F	I-65	I-264	Indiana state line	< 5	H
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	> 15	0
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	> 15	0
8A	I-64	Indiana state line	I-65	< 5	H
8B	I-64	I-65	I-264	> 15	0
8C	I-64	I-264	I-265	5 - 10	M
8D	I-64	I-265	KY 53 in Shelbyville	10 - 15	L
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	10 - 15	L
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	< 5	H
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	< 5	H
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	< 5	H
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	5 - 10	M

6.3.2 Cost

Preliminary cost estimates (in 2021 dollars) were prepared for the improvement concepts through Tier 2 corridor scoping. The detail of the cost estimate was on a high level such as "typical cost per mile", "typical cost per interchange", or "typical cost per sq ft (bridge deck area)", in terms of improvement categories identified by the Project Team.

Table 6.23 shows itemized unit cost (Design, ROW, Utility and Construction) for "traditional" improvement concepts (by category) and **Table 6.24** shows total unit cost for TSMO solutions (by category). The unit costs were derived from recent project data provided by KYTC and similar types of projects in other states (especially for TSMO solutions). The following guidelines were also used in cost estimations to meet project needs:

1. The cost estimation may not include additional costs to address the potential impacts of major utilities (e.g., gas line, major water supplier, transmission line) within the proximity of the corridor, due to the lack of data when the cost was estimated. Further investigation is recommended in future phases/studies.
2. Cost estimation was based on 2021 dollars. There is a 1-3% inflation rate. Estimated cost could vary -50% to +250% of the actual number as a rule of thumb.
3. The cost estimation does not include bridges outside of the proposed widening section for mobility/safety reason, as they are not assumed to rise to the level of a corridor improvement. The cost estimation only includes necessary bridge replacement/rehab/widening costs within the bottleneck locations with proposed widening improvement.
4. Cost estimation does not account for KYTC's existing and committed (E+C) projects.
5. Shoulder widening is not included in the cost estimation, as it is a relatively minor cost.
6. If multiple improvement concepts are recommended for the corridor and are not compatible with each other, only the cost of the larger-scale improvement concept is estimated.
7. Railroad bridge widening should be avoided.

Table 6.25 lists the costs for Tier 2 corridor segments, by "traditional" improvements, TSMO solutions, and overall totals. **Appendix L** includes complete cost estimation sheets for all Tier 2 segments.

Table 6.23 – Unit Cost of "Traditional" Improvements

Improvement Categories	Improvement Strategies	Unit	Cost (in 2021 Dollars)				
			D	R	U	C	Total
Major Widening	Urban Freeway, Added Lanes (inner side)	Per Mile	$ 497,000	$ 2,000	$ -	$ 16,699,000	$ 17,200,000
	Urban Freeway, Added Lanes (outer side)	Per Mile	$ 1,682,000	$ -	$ 48,000	$ 15,466,000	$ 17,200,000
	Rural Freeway, Added Lanes (inner side)	Per Mile	$ 129,000	$ -	$ -	$ 14,206,000	$ 14,340,000
	Rural Freeway, Added Lanes (outer side)	Per Mile	$ 846,000	$ 423,000	$ 423,000	$ 9,308,000	$ 11,000,000
	New Collector-Distributor Road (mainly for urban)	Per Mile Per Lane	$ 1,913,000	$ 247,000	$ 247,000	$ 17,592,000	$ 20,000,000
Roadway Upgrade	Increase Shoulder Width	Per Mile	$ 15,000	$ -	$ -	$ 148,000	$ 160,000
Interchange/ Grade Separation	New Service Interchange - Rural	Per Interchange	$ 2,073,000	$ 1,246,000	$ 1,539,000	$ 26,008,000	$ 30,870,000
	New Service Interchange - Urban	Per Interchange	$ 2,400,000	$ 1,600,000	$ 1,250,000	$ 12,000,000	$ 17,250,000
	Interchange Modification - Rural	Per Interchange	$ 250,000	$ -	$ -	$ 2,538,000	$ 2,790,000
	Interchange Modification - Urban	Per Interchange	$ 6,245,000	$ 2,276,000	$ 1,270,000	$ 60,000,000	$ 69,790,000
	Add Auxiliary Lane - Rural	Per Mile Per Lane	$ 423,000	$ 211,500	$ 211,500	$ 4,654,000	$ 5,500,000
	Add Auxiliary Lane - Urban	Per Mile Per Lane	$ 841,000	$ -	$ 24,000	$ 7,733,000	$ 8,600,000
	Interchange single ramp widening - Rural	Per Mile Per Lane	$ 423,000	$ 211,500	$ 211,500	$ 4,654,000	$ 5,500,000
	Interchange single ramp widening - Urban	Per Mile Per Lane	$ 841,000	$ -	$ 24,000	$ 7,733,000	$ 8,600,000
Major Structure	Bridge - Replacement	Per Square Ft (Deck Area)	$ 71	$ 63	$ 25	$ 291	$ 450
	Bridge - Rehab	Per Square Ft (Deck Area)	$ 77	$ 7	$ 3	$ 164	$ 250
	Railroad Bridge	Per Square Ft (Deck Area)	Avoid				

Table 6.24 – Unit Cost of TSMO Solutions

Improvement Categories	Improvement Strategies	Unit	Total Cost (in 2021 Dollars)
Freeway	**Ramp Metering**		
	Traffic responsive centralized	Per Entrance Ramp	$250,000 + ATMS (1)
	Traffic responsive non-centralized	Per Entrance Ramp	$250,000
	Stand alone	Per Entrance Ramp	$250,000
	Managed Lanes		
	Express Toll Lanes	Per Mile	$1,000,000 + ATMS (1) + Toll Back Office
	HOT Lanes	Per Mile	$1,000,000 + ATMS (1) + Toll Back Office
	HOV Lanes	Per Mile	$100,000
	Part-time Shoulder Use (General Purpose)	Per Mile	$250,000 - $500,000 + ATMS (1)
	Part-time Shoulder Use (Transit)	Per Mile	$100,000
	Interchange Ramps		
	Increase Acceleration Lane Length	Per Ramp	$600,000
	Increase Deceleration Lane Length	Per Ramp	$450,000
	Freight		
	Truck Only Lanes	Per Mile	$50,000 - $250,000
	Climbing Lanes	Per Mile	$0 - $100,000
Other	Travel Demand Management	Policy	N/A
	Dynamic Lane Use	Per Mile	$1,000,000 + ATMS (1)
Applicable Everywhere	Road Weather Management	Per Site	RWIS ($80,000) + Integration
	Work Zone Management	Work Zone Length (Mile)	$50,000 - $75,000
	Variable Speed Limits	Per Mile	$100,000 - $500,000 + ATMS (1)
	Queue Warning	Per Mile	$100,000 - $500,000
	Comparative Travel Times	Per Location	$75,000 - $300,000
	En-Route Traveler Information	Per Location	$250,000
	Truck Parking Information System	Per Location	$225,000
	Elongated Pavement Markings	Per Group of Shields (3)	$15,000
	Improved Signage	Per Location	$200,000

(1) Advanced Traffic Management System (ATMS)

Table 6.25 – Cost of Tier 2 Corridor Improvements

Corridor ID	Corridor Name	From	To	Cost ($M in 2021 Dollars)		
				Traditional Improvements	TSMO Solutions	Total
1A	I-275	Indiana state line	KY 237 in Boone Co.	0.0	2.4	2.4
1B	I-275	KY 237 in Boone Co.	I-71	160.3	3.3	163.5
1C	I-275	I-71	Ohio state line	145.8	6.9	152.6
2	I-471	Ohio state line	I-275	0.0	3.5	3.5
3A	I-75	Tennessee state line	KY 21 in Berea	4.3	8.8	13.1
3C	I-75	KY 876 in Richmond	Man o' War Blvd	144.8	3.2	148.0
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	0.0	8.3	8.3
3F	I-75	I-64/I-75 north split	I-71	137.8	7.6	145.4
3H	I-75	KY 536 in Boone Co.	I-275	0.0	8.6	8.6
3I	I-75	I-275	Ohio state line	0.0	5.8	5.8
4A	I-71	I-64	I-264	6.3	4.6	10.9
4B	I-71	I-264	I-265	69.8	2.8	72.6
4C	I-71	I-265	KY 53 in La Grange	72.6	10.4	83.0
4D	I-71	KY 53 in La Grange	I-75	98.5	23.6	122.1
6B	I-65	Cumberland Expressway	Western KY Pkwy	12.9	6.0	18.9
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	19.7	6.3	26.0
6D	I-65	KY 44 in Shepherdsville	I-265	215.1	1.5	216.6
6E	I-65	I-265	I-264	80.0	2.8	82.7
6F	I-65	I-264	Indiana state line	0.0	6.0	6.0
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	218.0	8.6	226.5
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	307.5	6.8	314.2
8A	I-64	Indiana state line	I-65	0.0	3.0	3.0
8B	I-64	I-65	I-264	90.7	2.8	93.5
8C	I-64	I-264	I-265	55.7	5.9	61.6
8D	I-64	I-265	KY 53 in Shelbyville	92.5	2.8	95.3
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	388.7	5.2	393.9
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	0.0	9.5	9.5
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	0.0	6.5	6.5
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	0.0	3.8	3.8
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	175.2	7.2	182.4

6.3.3 Economic Feasibility

This economic feasibility indicator evaluates the effectiveness of corridor concepts to improve the transportation efficiency which promotes Kentucky's economy. A planning-level benefit/cost (B/C) ratio was derived from the total societal benefit estimated by TREDIS and the cost of corridor concepts described in Section 6.3.2. In TREDIS, the total societal benefit accounts for all user benefits (in travel time, expense, and safety), logistics benefits, and indirect benefits (e.g., air quality, water quality, noise impacts) in 2020 dollars. As **Table 6.26** shows, the economic feasibility score (Low, Medium, High) was determined based on the anticipated B/C ratio of improvement concepts.

Table 6.26 – Tier 2 Economic Feasibility

ECONOMIC FEASIBILITY	
B/C Ratio	Score
< 2	Low (L)
2 - 5	Medium (M)
> 5	High (H)

Table 6.27 summarizes Tier 2 economic feasibility scores. Urban corridor segments in Louisville and northern Kentucky, including 3I (BSB Approach Corridor – I-75 from I-275 to Ohio state line), 4A (I-71 from I-64 to I-264), 6F (I-65 from I-264 to Indiana state line), 10B (I-264/Watterson Expwy from I-65 to I-64 (east)), and 10C (I-264/Watterson Expwy from I-64 (east) to I-71), received higher scores (higher B/C ratios), indicating that improvements on these corridors tend to be more efficient in promoting the economy of Kentucky. Several segments have negative B/C ratios, because TREDIS estimates negative total societal benefits over the 15-year analysis period (2030-2045), which are partially due to the estimated negative impact on freight movements.

Table 6.27 – Tier 2 Economic Feasibility Scoring

Corridor ID	Corridor Name	From	To	Economic Feasibility	
				B/C Ratio	Score
1A	I-275	Indiana state line	KY 237 in Boone Co.	1.0	L
1B	I-275	KY 237 in Boone Co.	I-71	1.6	L
1C	I-275	I-71	Ohio state line	1.6	L
2	I-471	Ohio state line	I-275	1.1	L
3A	I-75	Tennessee state line	KY 21 in Berea	1.0	L
3C	I-75	KY 876 in Richmond	Man o' War Blvd	1.3	L
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	-7.4	L
3F	I-75	I-64/I-75 north split	I-71	1.1	L
3H	I-75	KY 536 in Boone Co.	I-275	4.4	M
3I	I-75	I-275	Ohio state line	27.6	H
4A	I-71	I-64	I-264	5.2	H
4B	I-71	I-264	I-265	1.8	L
4C	I-71	I-265	KY 53 in La Grange	1.9	L
4D	I-71	KY 53 in La Grange	I-75	0.7	L
6B	I-65	Cumberland Expressway	Western KY Pkwy	1.4	L

Corridor ID	Corridor Name	From	To	Economic Feasibility	
				B/C Ratio	Score
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	-2.5	L
6D	I-65	KY 44 in Shepherdsville	I-265	1.9	L
6E	I-65	I-265	I-264	0.8	L
6F	I-65	I-264	Indiana state line	12.0	H
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	1.7	L
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	1.2	L
8A	I-64	Indiana state line	I-65	4.8	M
8B	I-64	I-65	I-264	2.4	M
8C	I-64	I-264	I-265	2.3	M
8D	I-64	I-265	KY 53 in Shelbyville	4.8	M
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	0.1	L
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	4.7	M
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	22.0	H
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	9.7	H
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	1.0	L

6.3.4 Multi-Infrastructure Opportunity

The multi-infrastructure opportunity indicator evaluates the alternative infrastructure potentials to improve the corridor segment. Based on discussion within the Project Team, five types of alternative strategies, including transit, TSMO, connected/autonomous vehicles (CAV), Electric Vehicles (EV), and other alternative fuels (compressed/liquid natural gas, propane, hydrogen) were considered for locations where issues are identified, and improvements are needed. The alternative strategies bring multi-modal planning benefits, innovative technologies, and environmental resilience to improve problematic locations, especially when it would be challenging to implement traditional capacity improvement solutions due to various limitations. For each corridor segment, the feasibility of each alternative infrastructure strategy was determined at a high planning level, as described below.

- The transit opportunity is generally considered if it is warranted by either of the following typical conditions:
  - o There are existing transit services on a corridor.
  - o There is a potential for new transit services on a corridor, which could improve connectivity with adjacent transit facilities and/or enhance accessibility to major amenity destinations such as hospitals, colleges/universities, and commercial airports.
- TSMO solutions utilize technology and operational improvements as well as system management to optimize the existing capacity of a roadway. All Tier 2 segments have opportunities to deploy TSMO solutions.
- The suitability for CAV technology is determined based on the following major factors. All Tier 2 segments have a potential for CAV corridor, except for segment 6F (I-65 from I-264 to Indiana state line) and segment 15 (Pennyrile Parkway).
  - o Geometric characteristics of the corridor. This includes existing right-of-way and number of lanes (these indicate the opportunity for additional capacity to be added in future) and corridor length and number of exits (these impact the density of access points which could have varying applications depending on the needs of the corridor).

- o Presence of fiberoptic cable and/or ITS connectivity. This includes the availability of existing devices in the field (CCTV or DMS) and fiber optic communication in the area.
- o Land use characteristics. This considers the area type and associated destinations along or at either end of a corridor. The potential for major generators or transit hubs/Park-n-Ride facilities are a few examples of land uses which can have a significant increase in opportunities to capitalize on with varying applications depending on the needs of the corridor.
- o Traffic volumes and mix. The amount of traffic, in particular the number of tractor trailers and/or transit vehicles are usually considered so that an appropriate approach is defined to meet the needs of the corridor. For example, a combination of low traffic and high trucks/transit or the reverse could benefit from a number of CAV applications, specifically CAV platooning and the opportunity to reduce the number of vehicles due to ride sharing can drastically increase capacity with further CAV market penetration.

- The potential of EV corridors was determined based on KYTC's pending and designated Alternative Fuel Corridors (EV) (Round 6) when the SWIPP analysis was conducted. All Tier 2 segments have opportunities to be an EV corridor.
- The potential of other alternative fuels corridor was also determined based on KYTC's pending and designated Alternative Fuel Corridors (Compressed/liquid gas, propane, or hydrogen) (Round 6) when the SWIPP analysis was conducted.

Table 6.28 summarizes the rating structure of the multi-infrastructure bonus factor, depending on how many alternative strategies are determined feasible for a given corridor segment. The multi-infrastructure bonus has a maximum of 5 points towards the Tier 2 final total score.

Table 6.28 – Tier 2 Multi-Infrastructure Opportunity

MULTI-INFRASTRUCTURE INFRASTRUCTURE OPPORTUNITY	
# of Alternative Opportunities (e.g., Transit, TSMO, CAV, EV, Other Alternative Fuels)	Score
0 - 2	Low (L)
3 - 4	Medium (M)
5	High (H)

Table 6.29 summarizes multi-infrastructure scores for Tier 2 segments. All segments received a Medium (M) or High (H) score.

Table 6.29 – Tier 2 Multi-Infrastructure Opportunity Scoring

Corridor ID	Corridor Name	From	To	Multi-Infrastructure Opportunity						
				Transit	TSMO	CAV	Alternative Fuels (EV)	Alternative Fuels (Other)	# of Opportunity	Score
1A	I-275	Indiana state line	KY 237 in Boone Co.	Unlikely	Likely	Likely	Likely	Likely	4	M
1B	I-275	KY 237 in Boone Co.	I-71	Likely	Likely	Likely	Likely	Likely	5	H
1C	I-275	I-71	Ohio state line	Likely	Likely	Likely	Likely	Likely	5	H
2	I-471	Ohio state line	I-275	Likely	Likely	Likely	Likely	Unlikely	4	M
3A	I-75	Tennessee state line	KY 21 in Berea	Unlikely	Likely	Likely	Likely	Likely	4	M
3C	I-75	KY 876 in Richmond	Man o' War Blvd	Likely	Likely	Likely	Likely	Likely	5	H
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	Likely	Likely	Likely	Likely	Likely	5	H
3F	I-75	I-64/I-75 north split	I-71	Unlikely	Likely	Likely	Likely	Likely	4	M
3H	I-75	KY 536 in Boone Co.	I-275	Likely	Likely	Likely	Likely	Likely	5	H
3I	I-75	I-275	Ohio state line	Likely	Likely	Likely	Likely	Likely	5	H
4A	I-71	I-64	I-264	Likely	Likely	Likely	Likely	Likely	5	H
4B	I-71	I-264	I-265	Unlikely	Likely	Likely	Likely	Likely	4	M
4C	I-71	I-265	KY 53 in La Grange	Unlikely	Likely	Likely	Likely	Likely	4	M
4D	I-71	KY 53 in La Grange	I-75	Unlikely	Likely	Likely	Likely	Likely	4	M
6B	I-65	Cumberland Expressway	Western KY Pkwy	Unlikely	Likely	Likely	Likely	Likely	4	M
6C	I-65	Western KY Pkwy	KY 44 in Shepherdsville	Unlikely	Likely	Likely	Likely	Likely	4	M
6D	I-65	KY 44 in Shepherdsville	I-265	Likely	Likely	Likely	Likely	Likely	5	H
6E	I-65	I-265	I-264	Likely	Likely	Likely	Likely	Likely	5	H
6F	I-65	I-264	Indiana state line	Likely	Likely	Unlikely	Likely	Likely	4	M
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	Likely	Likely	Likely	Likely	Likely	5	H
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	Likely	Likely	Likely	Likely	Likely	5	H
8A	I-64	Indiana state line	I-65	Likely	Likely	Likely	Likely	Likely	5	H

Corridor ID	Corridor Name	From	To	Multi-Infrastructure Opportunity						
				Transit	TSMO	CAV	Alternative Fuels (EV)	Alternative Fuels (Other)	# of Opportunity	Score
8B	I-64	I-65	I-264	Likely	Likely	Likely	Likely	Likely	5	H
8C	I-64	I-264	I-265	Likely	Likely	Likely	Likely	Likely	5	H
8D	I-64	I-265	KY 53 in Shelbyville	Unlikely	Likely	Likely	Likely	Likely	4	M
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	Unlikely	Likely	Likely	Likely	Likely	4	M
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	Likely	Likely	Likely	Likely	Unlikely	4	M
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	Likely	Likely	Likely	Likely	Unlikely	4	M
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	Likely	Likely	Likely	Likely	Unlikely	4	M
15	Pennyrile Pkwy	I-24	I-69/Western KY Pkwy	Likely	Likely	Unlikely	Likely	Unlikely	3	M

6.4 TIER 2 CORRIDOR PRIORITIZATION AND RECOMMENDATIONS

6.4.1 Tier 2 Scores

The Tier 2 quantitative analysis results are shown below based on the performance measures and scoring methodology described in Section 6.2. The scores from the various performance criteria have been combined into a single corridor segment score as shown in **Table 6.30**. Tier 2 corridor segments were sorted by the single quantitative score, in descending order, with the highest score on top. The table also shows TSMO-focused segments as a reference. **Figure 6.6** illustrates the segment ranking based on the single quantitative score. **Table 6.31** lists the corridor segments in the same descending order of Tier 2 quantitative performance score, but also summarizes the intangible performance indicators to the right of each score.

Table 6.30 – Tier 2 Quantitative Scores & Ranks

Corridor ID	Corridor Name	Mobility (Max = 15)	Reliability (Max=13)	Accessibility (Max=12)	Safety (Max=20)	Freight & Logistics (Max=11)	Infrastructure (Max=16)	Economic (Max=13)	TSMO Focused	Tier 2 (Quantitative)	
										Score (0-100)	Rank
3I	I-75	12.0	13.0	8.5	18.0	10.3	6.4	13.0	Yes	81.3	1
7B	I-265/KY 841 (Gene Snyder Fwy)	11.1	11.7	12.0	16.0	9.6	3.2	11.7		75.3	2
8C	I-64	15.0	7.8	9.8	20.0	8.3	4.8	9.1	Yes	74.8	3
6D	I-65	15.0	6.5	10.9	14.0	9.0	3.2	13.0		71.6	4
10B	I-264 (Watterson Expwy)	10.2	10.4	7.4	14.0	9.6	4.8	10.4	Yes	66.8	5
7C	I-265/KY 841 (Gene Snyder Fwy)	11.1	11.7	8.0	12.0	9.7	3.2	9.1		64.8	6
6E	I-65	13.1	3.9	9.8	14.0	11.0	8.0	3.9	Yes	63.7	7
1B	I-275	14.1	5.2	6.6	12.0	9.0	3.2	13.0		63.1	8
6F	I-65	10.1	9.1	5.0	14.0	9.6	4.8	10.4	Yes	63.0	9
3H	I-75	9.8	7.8	8.5	14.0	10.2	8.0	0.0	Yes	58.3	10
1C	I-275	7.1	7.8	4.0	18.0	5.4	4.8	10.4		57.4	11
4B	I-71	7.2	6.5	10.7	12.0	6.1	4.8	7.8		55.0	12
8B	I-64	6.0	11.7	3.7	8.0	6.7	3.2	10.4		49.7	13
4A	I-71	4.1	9.1	9.6	8.0	5.4	6.4	6.5		49.0	14
2	I-471	5.1	13.0	3.7	10.0	4.6	6.4	2.6	Yes	45.4	15
10C	I-264 (Watterson Expwy)	6.2	7.8	7.2	4.0	6.8	6.4	6.5	Yes	44.9	16
4C	I-71	6.8	2.6	7.4	10.0	6.8	1.6	7.8		43.0	17
8A	I-64	2.9	3.9	3.7	14.0	4.6	8.0	5.2	Yes	42.3	18
3E	I-75	5.9	3.9	5.9	8.0	7.4	8.0	0.0	Yes	39.0	19
8D	I-64	5.3	2.6	5.4	4.0	5.8	1.6	13.0		37.7	20
8E	I-64	14.0	0.0	12.0	4.0	7.2	0.0	0.0		37.1	21
10A	I-264 (Watterson Expwy)	3.0	2.6	2.6	14.0	5.9	3.2	5.2	Yes	36.6	22

Corridor ID	Corridor Name	Mobility (Max = 15)	Reliability (Max=13)	Accessibility (Max=12)	Safety (Max=20)	Freight & Logistics (Max=11)	Infrastructure (Max=16)	Economic (Max=13)	TSMO Focused	Tier 2 (Quantitative)	
										Score (0-100)	Rank
3C	I-75	3.9	0.0	3.5	10.0	6.4	1.6	9.1		34.5	23
3F	I-75	9.9	1.3	7.2	8.0	7.2	0.0	0.0		33.6	24
4D	I-71	7.8	0.0	7.4	4.0	7.9	0.0	3.9		31.1	25
1A	I-275	1.1	2.6	0.0	2.0	3.7	16.0	2.6		28.0	26
6C	I-65	0.0	1.3	4.3	14.0	5.1	1.6	0.0		26.3	27
3A	I-75	3.9	1.3	1.3	6.0	4.3	0.0	2.6		19.4	28
15	Pennyrile Pkwy	1.1	0.0	5.6	0.0	0.7	6.4	2.6		16.4	29
6B	I-65	0.0	2.6	1.1	0.0	5.0	0.0	5.2		13.8	30

Figure 6.6 – Tier 2 Quantitative Ranks

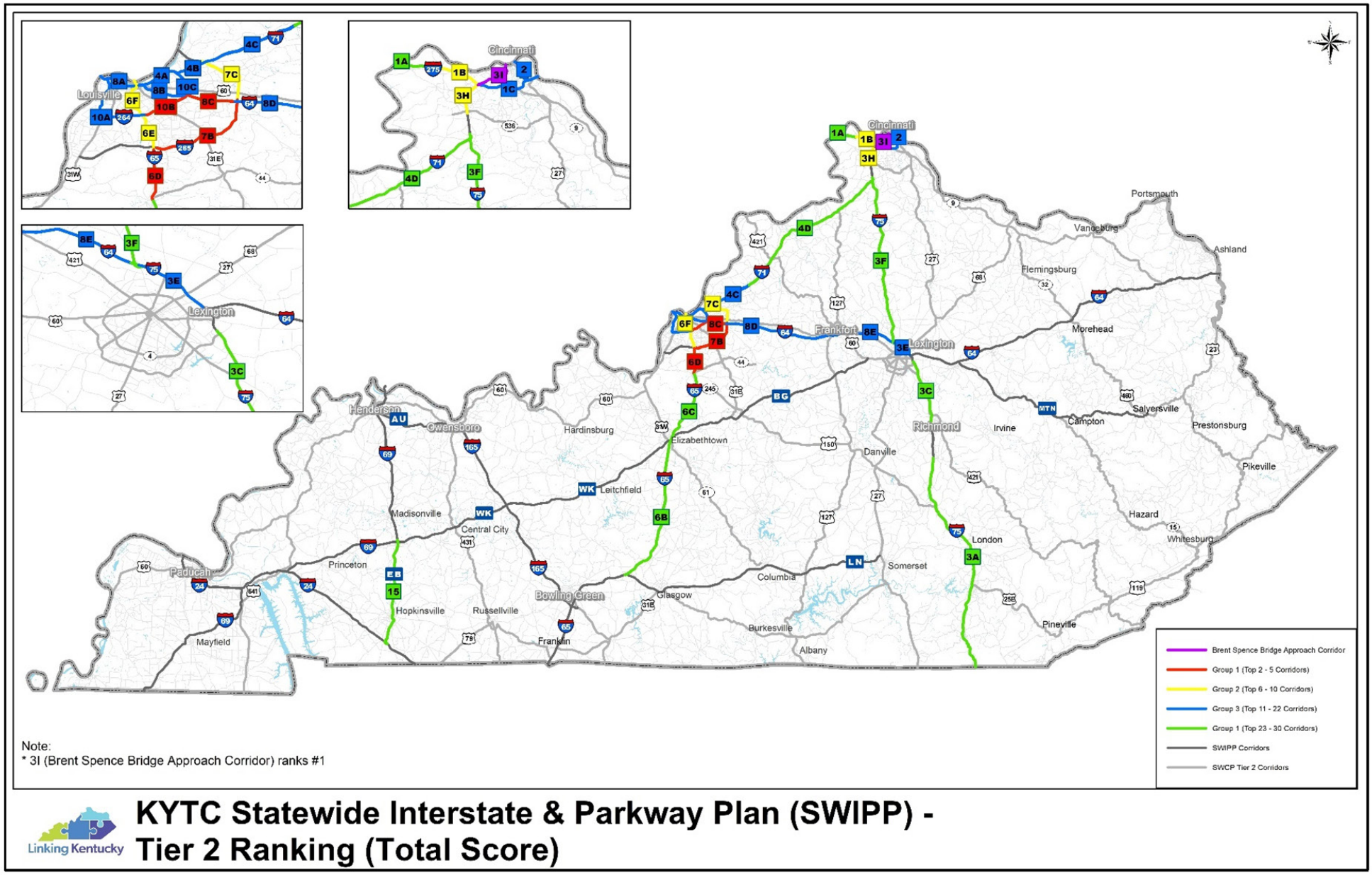


Table 6.31 – Tier 2 Quantitative Scores, Ranks & Qualitative Indicators

Corridor ID	Corridor Name	TSMO Focused	Tier 2 (Quantitative)		Tier 2 (Qualitative)			
			Score (0-100)	Rank	Project Delivery Timeline	B/C Ratio	Cost ($M)	Multi-Infrastructure
3I	I-75	Yes	81.3	1	H	27.6 (H)	5.8	H
7B	I-265/KY 841 (Gene Snyder Fwy)		75.3	2	0	1.7 (L)	226.5	H
8C	I-64	Yes	74.8	3	M	2.3 (M)	61.6	H
6D	I-65		71.6	4	0	1.9 (L)	216.6	H
10B	I-264 (Watterson Expwy)	Yes	66.8	5	H	22.0 (H)	6.5	M
7C	I-265/KY 841 (Gene Snyder Fwy)		64.8	6	0	1.2 (L)	314.2	H
6E	I-65	Yes	63.7	7	M	0.8 (L)	82.7	H
1B	I-275		63.1	8	L	1.6 (L)	163.5	H
6F	I-65	Yes	63.0	9	H	12.0 (H)	6.0	M
3H	I-75	Yes	58.3	10	H	4.4 (M)	8.6	H
1C	I-275		57.4	11	L	1.6 (L)	152.6	H
4B	I-71		55.0	12	0	1.8 (L)	72.6	M
8B	I-64		49.7	13	0	2.4 (M)	93.5	H
4A	I-71		49.0	14	H	5.2 (H)	10.9	H
2	I-471	Yes	45.4	15	H	1.1 (L)	3.5	M
10C	I-264 (Watterson Expwy)	Yes	44.9	16	H	9.7 (H)	3.8	M
4C	I-71		43.0	17	0	1.9 (L)	83.0	M
8A	I-64	Yes	42.3	18	H	4.8 (M)	3.0	H
3E	I-75	Yes	39.0	19	H	-7.4 (L)	8.3	H
8D	I-64		37.7	20	L	4.8 (M)	95.3	M
8E	I-64		37.1	21	L	0.1 (L)	393.9	M
10A	I-264 (Watterson Expwy)	Yes	36.6	22	H	4.7 (M)	9.5	M
3C	I-75		34.5	23	M	1.3 (L)	148.0	H
3F	I-75		33.6	24	L	1.1 (L)	145.4	M
4D	I-71		31.1	25	M	0.7 (L)	122.1	M
1A	I-275		28.0	26	H	1.0 (L)	2.4	M
6C	I-65		26.3	27	H	-2.5 (L)	26.0	M
3A	I-75		19.4	28	H	1.0 (L)	13.1	M
15	Pennyrile Pkwy		16.4	29	M	1.0 (L)	182.4	M
6B	I-65		13.8	30	H	1.4 (L)	18.9	M

6.4.2 Tier 2 Corridor Selection for Visioning

The Project Team reviewed the Tier 2 quantitative scores and ranks along with supportive information from the qualitative analysis (see **Table 6.31**). The following decisions were made to identify Tier 2 corridors that would advance to visioning:

- Segment 3I (BSB Approach Corridor – I-75 from I-275 to Ohio state line) ranked #1. As part of the on-going full BSB project, this corridor segment was recommended to be treated as a special corridor for independent discussion in the study (see **Appendix J**), instead of advancing to visioning.
- The next 21 priority corridor segments (ranks #2 through #22) were determined as visioning beneficial. These segments have higher quantitative scores and are generally supported by qualitative analysis screening. Segment 10A (I-264 from I-64 (west) to I-65) ranked #22 and was included in recommendations for visioning, because it has a close quantitative score to 8E (ranks #21), short project delivery timeline, healthy B/C ratio, and much lower cost.
- The remaining eight corridor segments at the low end of Tier 2 quantitative scores were not recommended for visioning.

Table 6.32 summarizes the corridor selection process. Tier 2 corridor segments were sorted by the single quantitative score, in descending order, with the highest score on top. The table also summarizes Tier 2 qualitative analysis results and identifies segments that were recommended for visioning. **Figure 6.7** illustrates the corridor selection in graphical format.

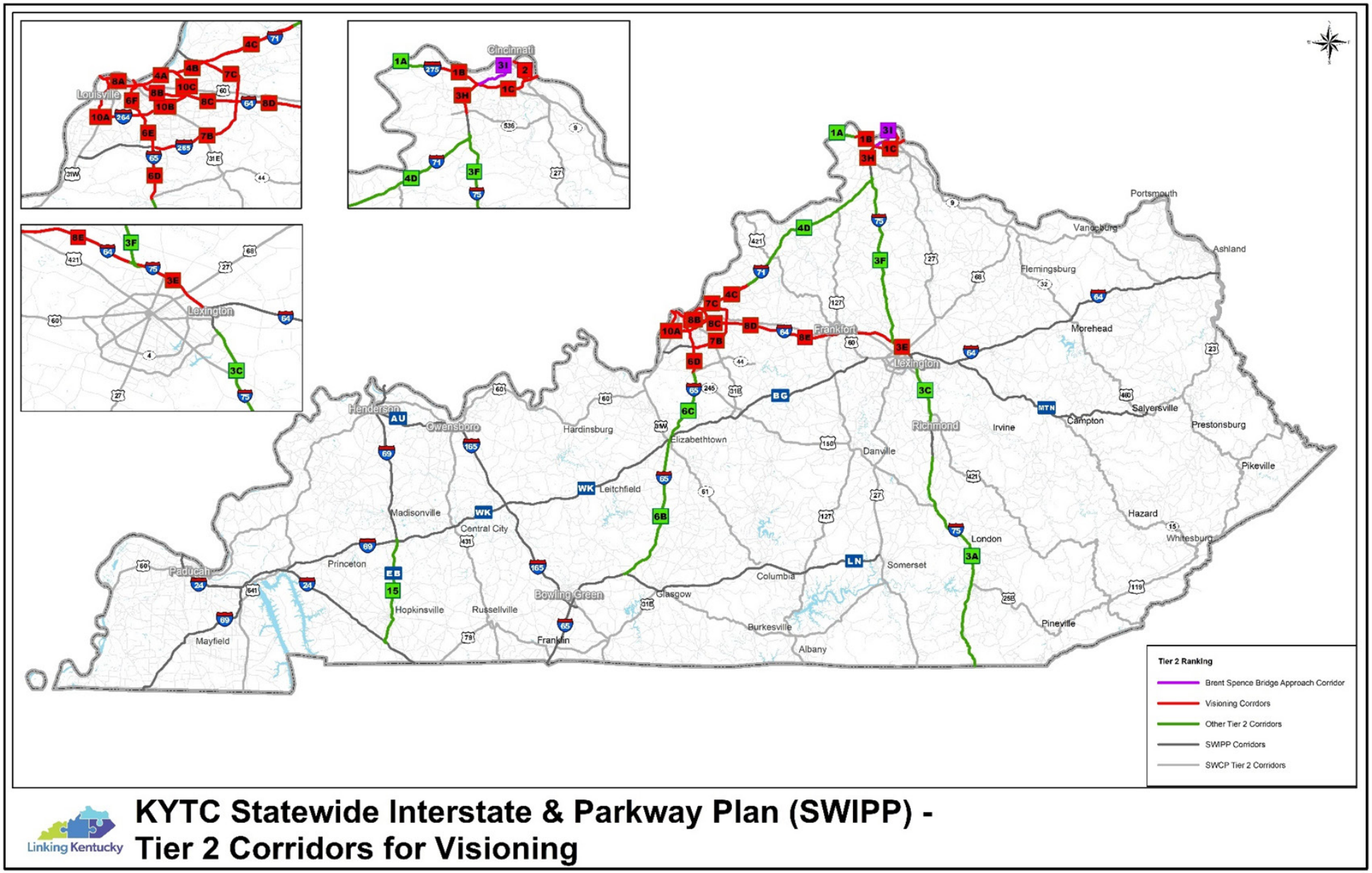
It is noted that all 21 visioning priority segments are in major urban areas (Louisville, Lexington, and norther Kentucky) or provide regional connection between these areas (i.e., 8D and 8E presenting I-64 connecting Louisville and Lexington). All TSMO-focused corridor segments advanced to visioning, except for 3I (BSB Approach Corridor) mentioned above.

Table 6.32 – Tier 2 Scoring & Recommendations - Visioning Corridors

Corridor ID	Corridor Name	TSMO Focused	Tier 2 (Quantitative)		Tier 2 (Qualitative)				Advance to Visioning	Note
			Score (0-100)	Rank	Project Delivery Timeline	B/C Ratio	Cost ($M)	Multi-Infrastructure		
3I	I-75	Yes	81.3	1	H	27.6 (H)	5.8	H		Top 22, Special Corridor
7B	I-265/KY 841 (Gene Snyder Fwy)		75.3	2	0	1.7 (L)	226.5	H	Y	Top 22, Visioning Beneficial
8C	I-64	Yes	74.8	3	M	2.3 (M)	61.6	H	Y	Top 22, Visioning Beneficial
6D	I-65		71.6	4	0	1.9 (L)	216.6	H	Y	Top 22, Visioning Beneficial
10B	I-264 (Watterson Expwy)	Yes	66.8	5	H	22.0 (H)	6.5	M	Y	Top 22, Visioning Beneficial
7C	I-265/KY 841 (Gene Snyder Fwy)		64.8	6	0	1.2 (L)	314.2	H	Y	Top 22, Visioning Beneficial
6E	I-65	Yes	63.7	7	M	0.8 (L)	82.7	H	Y	Top 22, Visioning Beneficial
1B	I-275		63.1	8	L	1.6 (L)	163.5	H	Y	Top 22, Visioning Beneficial
6F	I-65	Yes	63.0	9	H	12.0 (H)	6.0	M	Y	Top 22, Visioning Beneficial
3H	I-75	Yes	58.3	10	H	4.4 (M)	8.6	H	Y	Top 22, Visioning Beneficial
1C	I-275		57.4	11	L	1.6 (L)	152.6	H	Y	Top 22, Visioning Beneficial
4B	I-71		55.0	12	0	1.8 (L)	72.6	M	Y	Top 22, Visioning Beneficial
8B	I-64		49.7	13	0	2.4 (M)	93.5	H	Y	Top 22, Visioning Beneficial
4A	I-71		49.0	14	H	5.2 (H)	10.9	H	Y	Top 22, Visioning Beneficial
2	I-471	Yes	45.4	15	H	1.1 (L)	3.5	M	Y	Top 22, Visioning Beneficial
10C	I-264 (Watterson Expwy)	Yes	44.9	16	H	9.7 (H)	3.8	M	Y	Top 22, Visioning Beneficial
4C	I-71		43.0	17	0	1.9 (L)	83.0	M	Y	Top 22, Visioning Beneficial
8A	I-64	Yes	42.3	18	H	4.8 (M)	3.0	H	Y	Top 22, Visioning Beneficial
3E	I-75	Yes	39.0	19	H	-7.4 (L)	8.3	H	Y	Top 22, Visioning Beneficial
8D	I-64		37.7	20	L	4.8 (M)	95.3	M	Y	Top 22, Visioning Beneficial
8E	I-64		37.1	21	L	0.1 (L)	393.9	M	Y	Top 22, Visioning Beneficial

Corridor ID	Corridor Name	TSMO Focused	Tier 2 (Quantitative)		Tier 2 (Qualitative)				Advance to Visioning	Note
			Score (0-100)	Rank	Project Delivery Timeline	B/C Ratio	Cost ($M)	Multi-Infrastructure		
10A	I-264 (Watterson Expwy)	Yes	36.6	22	H	4.7 (M)	9.5	M	Y	Top 22, Visioning Beneficial
3C	I-75		34.5	23	M	1.3 (L)	148.0	H		Other Tier 2 Corridors
3F	I-75		33.6	24	L	1.1 (L)	145.4	M		Other Tier 2 Corridors
4D	I-71		31.1	25	M	0.7 (L)	122.1	M		Other Tier 2 Corridors
1A	I-275		28.0	26	H	1.0 (L)	2.4	M		Other Tier 2 Corridors
6C	I-65		26.3	27	H	-2.5 (L)	26.0	M		Other Tier 2 Corridors
3A	I-75		19.4	28	H	1.0 (L)	13.1	M		Other Tier 2 Corridors
15	Pennyrile Pkwy		16.4	29	M	1.0 (L)	182.4	M		Other Tier 2 Corridors
6B	I-65		13.8	30	H	1.4 (L)	18.9	M		Other Tier 2 Corridors

Figure 6.7 – Tier 2 Corridor Selection for Visioning



CHAPTER 7: CORRIDOR VISIONS

As part of the Statewide Interstate and Parkway Plan (SWIPP), corridor visions were developed for the 21 priority segments identified by the Tier 2 analysis (see **Figure 6.7**). These visions identify intermediate (2030) and long-term (2045) transportation needs and practical improvement strategies. The Project Team established a common visioning evaluation matrix to ensure that the most important topics and issues along each corridor segment were evaluated consistently. The visioning matrix covers broad aspects of corridor performance of interest to KYTC, including an overview of corridor's basic information, traffic and growth, freight and logistics, issues and concerns, improvement concepts, stakeholder inputs, and a preliminary scoping report (see **Appendix I**). As described in Chapter 6, segment 3I (Brent Spence Bridge Approach Corridor – I-75 from I-275 to Ohio state line) was treated as a special corridor for independent discussion (see **Appendix J**) instead of being included in corridor visioning, while it ranked #1 in the Tier 2 analysis.

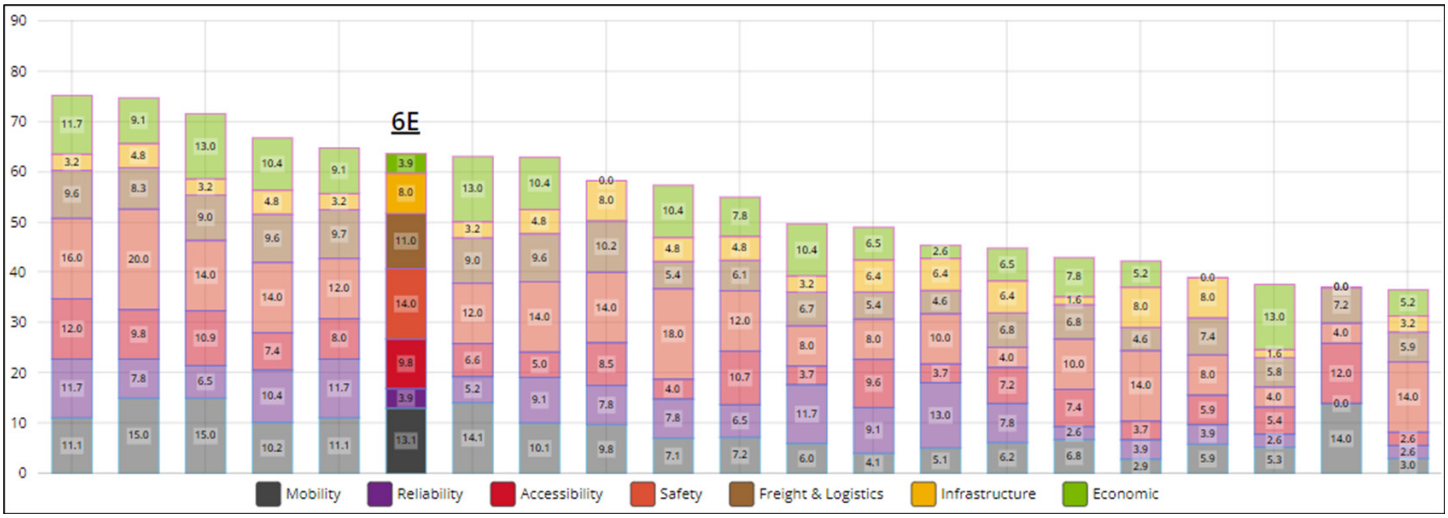
The development of corridor visions and related analyses relied heavily on existing tools and available data sources from KYTC. Additional data was also collected from open sources (e.g., U.S. census, Google maps, Kentucky Geography Network, etc.) to support and meet project needs. All analysis approaches were based on a consensus reached among the Project Team and were consistently applied to each visioning corridor segment. This chapter describes data, tools and methodologies used for corridor analysis in developing corridor visions. Details of the 21 visioning corridors are illustrated in the GIS Online Tool (see **Appendix M**).

7.1 CORRIDOR OVERVIEW

The corridor overview includes a brief description, a key map showing corridor location, and the following basic information of each visioning corridor:

- Corridor Name and ID
- Mileage and Terminus
- Functional Classification
- KYTC Highway District(s)
- County(s)
- Major City(s)
- MPO(s)
- Area Development Districts (ADDs)
- Tier 2 Score. The score is illustrated as an interactive stacked column chart by Tier 2 quantitative scores in the GIS Online Tool. The chart shows all 21 visioning corridors by Tier 2 ranks in a descending order and highlights the corridor of interest (see **Figure 7.1**).

Figure 7.1 – Tier 2 Score Chart (Example Corridor of Interest: 6E)



The overview also outlines the following typical attributes of the existing corridor by sub-segment with logical termini. The GIS Online Tool includes interactive map layers displaying the following:

- Functional Classification
- Number of Lanes and Lane Width
- Shoulder and Width
- Median Type and Width
- Posted Speed Limit

In addition, the overview summarizes existing interchanges (and types) and TSMO implementations along each visioning corridor segment.

7.2 TRAFFIC AND GROWTH

7.2.1 Traffic Flow

The SWIPP corridors are high-speed and high-volume corridors, serving as a backbone of the statewide roadway system and providing mobility within regions and across the entire state of Kentucky. Assessing existing conditions and future trends is a means to identify future transportation needs that continue to influence transportation decision-making. Existing traffic flow and future forecasts were evaluated using the SWIPP Model data. Based on a consensus among the Project Team, the length-weighted averages of daily total traffic were calculated for each visioning corridor segment for 2019, 2030 and 2045. The averages are a meaningful measure of corridor-level traffic flow carried by each corridor segment.

7.2.2 Traffic Growth

Annual growth rates of daily total traffic were derived using 2019 and 2045 corridor-level traffic data. **Table 7.1** shows results of a quartile analysis of traffic growth for all 60 SWIPP corridor segments. In Kentucky, the interstates and parkways show a healthy growth of total traffic over the next 25 years, with an average annual growth rate of 1.12%.

Table 7.1 – Quartile Analysis of Daily Total Traffic Growth

Quartile/Percentile	Annual Growth Rate of Daily Total Traffic
Minimum	0.11%
1st Quartile (25th Percentile)	0.76%
Median (50th Percentile)	0.98%
Mean	1.12%
3rd Quartile (75th Percentile)	1.41%
Maximum	2.98%

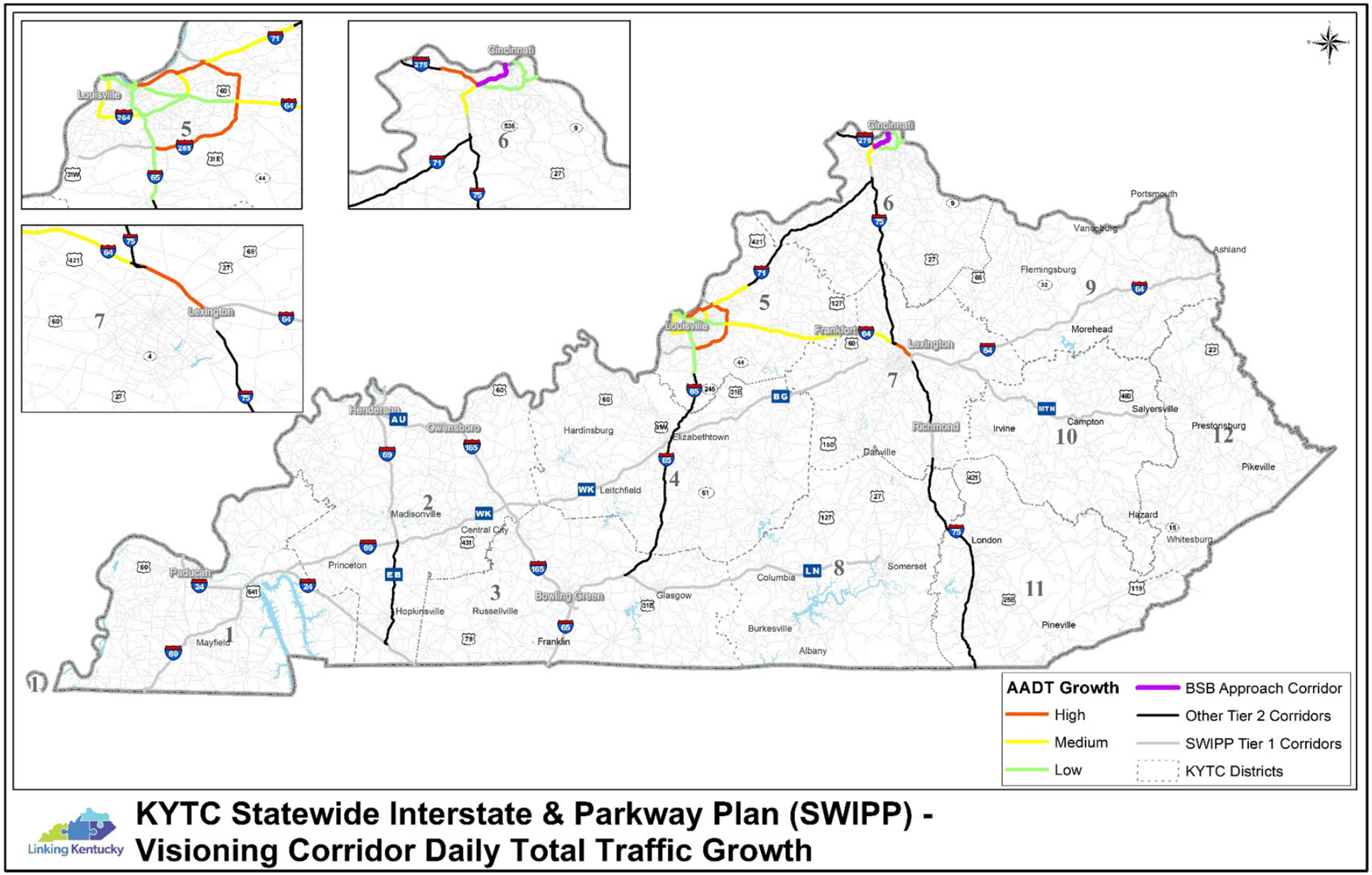
The Project Team reviewed corridor-level annual growth rates and decided to use three categories (low, medium, and high) to generally classify corridor traffic growth patterns by using thresholds specified in **Table 7.2**. Note that the thresholds generally agree with the 25th and 75th percentiles of annual growth rates based on analysis of all SWIPP corridor segments instead of only 21 visioning corridors, providing a relatively large sample size. The low, medium and high categories are a relative measure among corridors.

Table 7.2 – Daily Total Traffic Growth Categories

Traffic Growth Category	Annual Growth Rate Thresholds of Daily Total Traffic
Low	< 0.75%
Medium	0.75% - 1.50%
High	> 1.50%

Figure 7.2 illustrates daily total traffic growth for 21 visioning corridor segments by categories (low, medium, high).

Figure 7.2 – Visioning Corridor Daily Total Traffic Growth



7.2.3 Land Use Growth

There is a clear link between land use development and transportation. Land use growth drives transportation needs and improvements and, vice versa, transportation improvements can spawn development.

The current Kentucky Statewide Traffic Model (v8_KYSTMv19) data indicates that the state's population will grow from 4.4 million in 2015 to 5.0 million in 2045, an increase of 12.5 percent. Based on the net population growth rate, Kentucky's population would increase at a pace slower than the fastest growing areas of the country (e.g., the South and the West). Increased population can create congestion and capacity issues, especially in urban and suburban areas. The population of rural areas is expected to continue increasing at a low annual growth rate of 0.11 percent through 2045. In comparison, suburban (including towns) and urban populations are expected to increase at a greater annual growth rate of 0.6 percent and 0.56 percent, respectively, through the year 2045. This may lead to longer trip lengths, extending peak commuting times, between suburban and urban areas.

According to v8_KYSTMv19 data, total employment in Kentucky is expected to increase from 1.8 million in 2015 to 2.1 million in 2045, an increase of 17.9 percent. Suburban employment (including towns) is estimated to increase at an annual growth rate of 0.63 percent, while urban and rural employment are expected to increase at 0.53 percent and 0.39 percent, respectively. With a greater increase in suburban employment, it may be possible that employers could relocate closer to the suburban workforce, altering regional travel patterns and levels. In general, employment growth would likely increase trip lengths and generate more trips, resulting in longer work trips, increased traffic, and congestion, as has been the national trend for many years. As such, the existing transportation system would need to adapt to continuing demographic changes.

For each SWIPP corridor segment, land use impact was based on anticipated population and employment growth near the corridor. This analysis focused on the direct influence of the local economy on study corridors. A 3-mile buffer around corridors was used for analysis, based on discussion within the Project Team. The model TAZ data was used to derive annual population and employment growth rates respectively, within the 3-mile buffer. **Table 7.3** shows population and employment growth statistics for all 60 SWIPP corridor segments.

Table 7.3 – Quartile Analysis of Population and Employment Growth

Quartile/Percentile	Annual Growth Rates	
	Population	Employment
Minimum	-0.61%	-0.59%
1st Quartile (25th Percentile)	0.24%	0.35%
Median (50th Percentile)	0.52%	0.69%
Mean	0.59%	0.76%
3rd Quartile (75th Percentile)	1.05%	1.18%
Maximum	1.98%	3.08%

The Project Team reviewed analysis results and decided to use three categories (low, medium, and high) to generally classify land use growth, using thresholds specified in **Table 7.4**. Like the traffic growth analysis, the thresholds of land use growth categories used the refined 25th and 75th percentiles of data from all 60 SWIPP corridors which provided a relatively large sample size. The low, medium and high categories provide a relative measure among all corridors.

Table 7.4 – Population and Employment Growth Categories

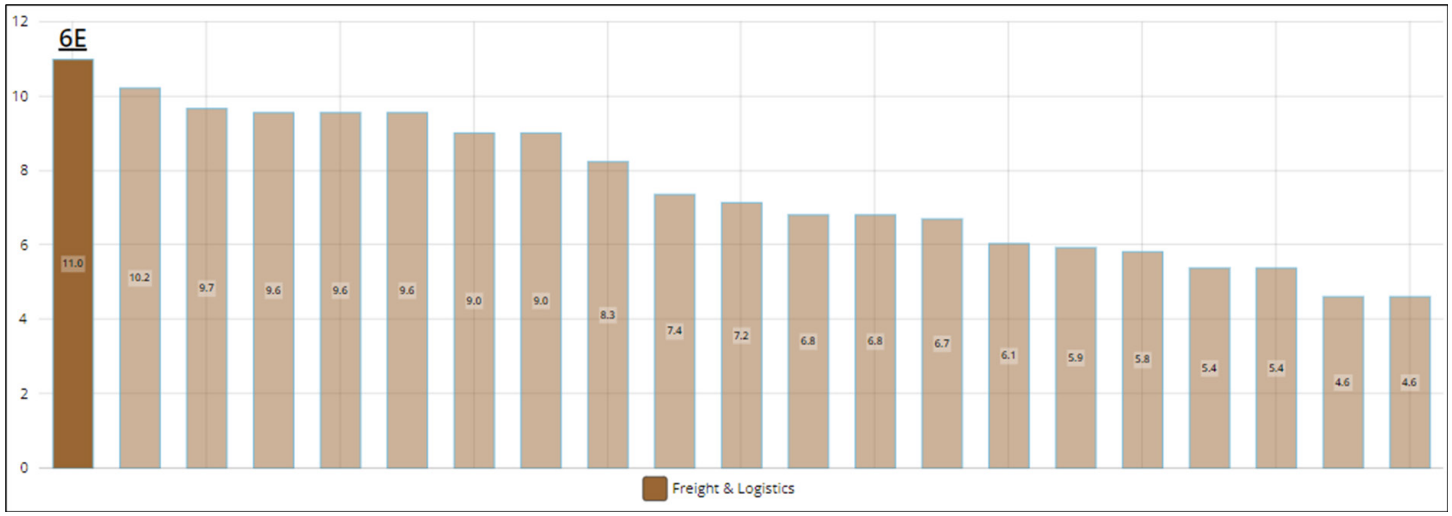
Land Use Growth Category	Thresholds of Annual Growth Rates	
	Population	Employment
Low	< 0.25%	< 0.35%
Medium	0.25% - 1.05%	0.35% - 1.20%
High	> 1.05%	> 1.20%

7.3 FREIGHT AND LOGISTICS

Freight and logistics are an independent topic in corridor visioning, because the SWIPP corridors (especially the visioning corridors) are major statewide truck routes carrying a significant amount of commodity flows that impact the transportation system and drive the economy in Kentucky.

The corridor visions include Tier 2 freight/logistics scores (see Section 6.2.5). The scores are illustrated as an interactive stacked column chart in the GIS Online Tool. The chart shows all 21 visioning corridors by Tier 2 ranks in a descending order and highlights the corridor of interest (see **Figure 7.3**). A higher score means there is a greater need to improve the corridor and greater statewide/regional benefits are expected from the corridor improvement, from a freight/logistics perspective.

Figure 7.3 – Tier 2 Freight/Logistics Score Chart (Example Corridor of Interest: 6E)



7.3.1 Truck Flow

Existing truck flow and future forecasts were evaluated using data from the SWIPP Model. Based on a consensus among the Project Team, the length-weighted averages of daily truck traffic were calculated for each corridor for 2019, 2030 and 2045. The averages are a meaningful measure of corridor-level truck traffics carried by each corridor segment.

7.3.2 Truck Growth

Annual truck traffic growth rates were derived using 2019 and 2045 corridor-level traffic data. **Table 7.5** shows results of a quartile analysis of truck traffic growth for all 60 SWIPP corridor segments. Kentucky's interstate and parkway system shows a strong growth of truck flows over the next 25 years, with an average annual growth rate of 2.32%. Note that truck traffic grows faster than total traffic, which is consistent with the national trend.

Table 7.5 – Quartile Analysis of Truck Traffic Growth

Quartile/Percentile	Annual Growth Rates of Daily Truck Traffic
Minimum	1.38%
1st Quartile (25th Percentile)	2.09%
Median (50th Percentile)	2.39%
Mean	2.32%
3rd Quartile (75th Percentile)	2.54%
Maximum	3.49%

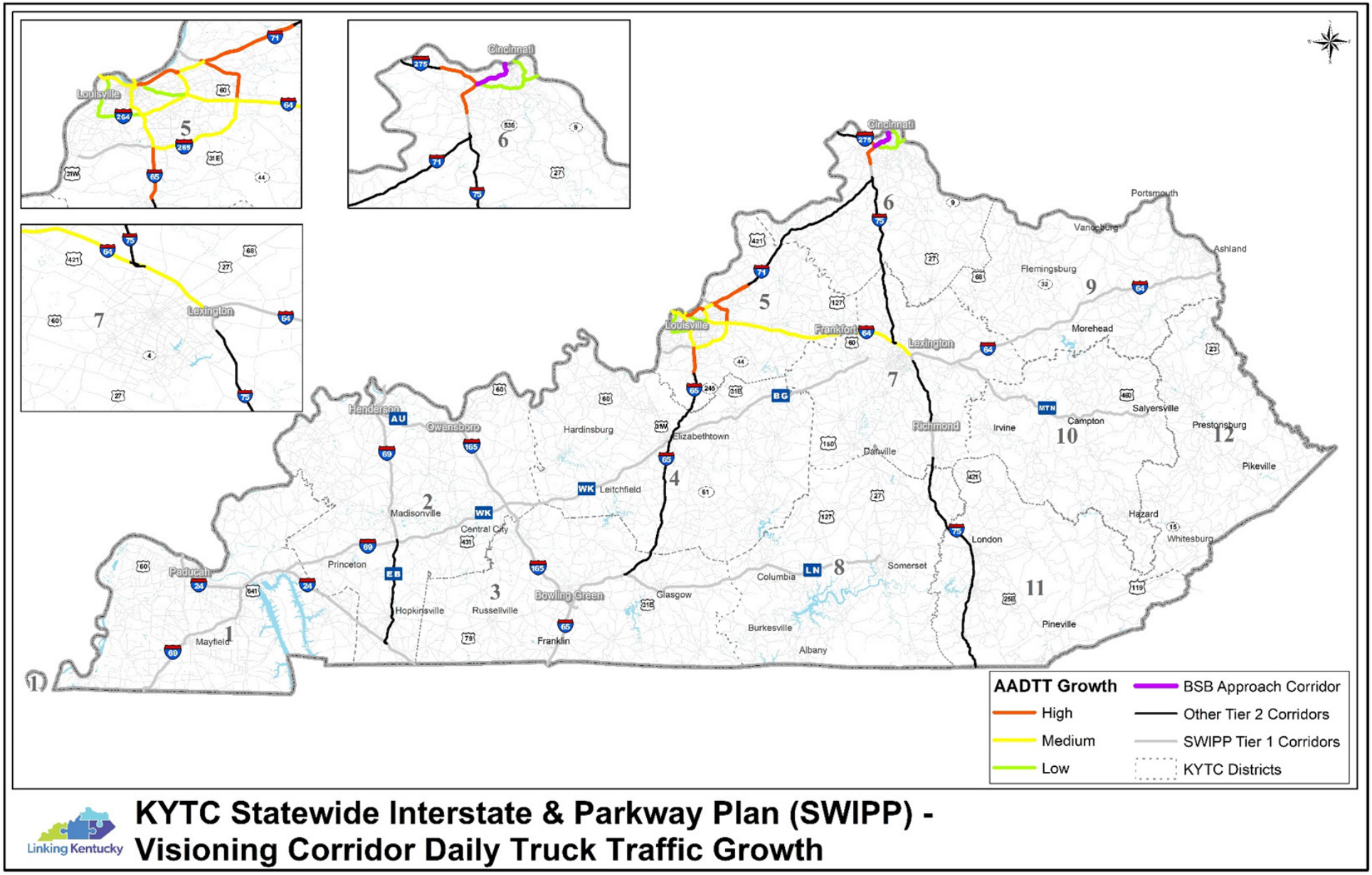
The Project Team reviewed corridor-level annual growth rates and decided to use three categories (low, medium, and high) to generally classify corridor truck traffic growth patterns by using thresholds specified in **Table 7.6**. Note that the thresholds generally agree with the 25th and 75th percentiles of truck traffic annual growth rates based on analysis of all SWIPP corridor segments instead of only 21 visioning corridors, providing a relatively large sample size. The low, medium and high categories are a relative measure among all corridors.

Table 7.6 – Truck Traffic Growth Categories

Traffic Growth Category	Annual Growth Rate Thresholds of Daily Truck Traffic
Low	< 2.00%
Medium	2.00% - 2.50%
High	> 2.50%

Figure 7.4 illustrates daily truck traffic growth for 21 visioning corridor segments by categories (low, medium, high).

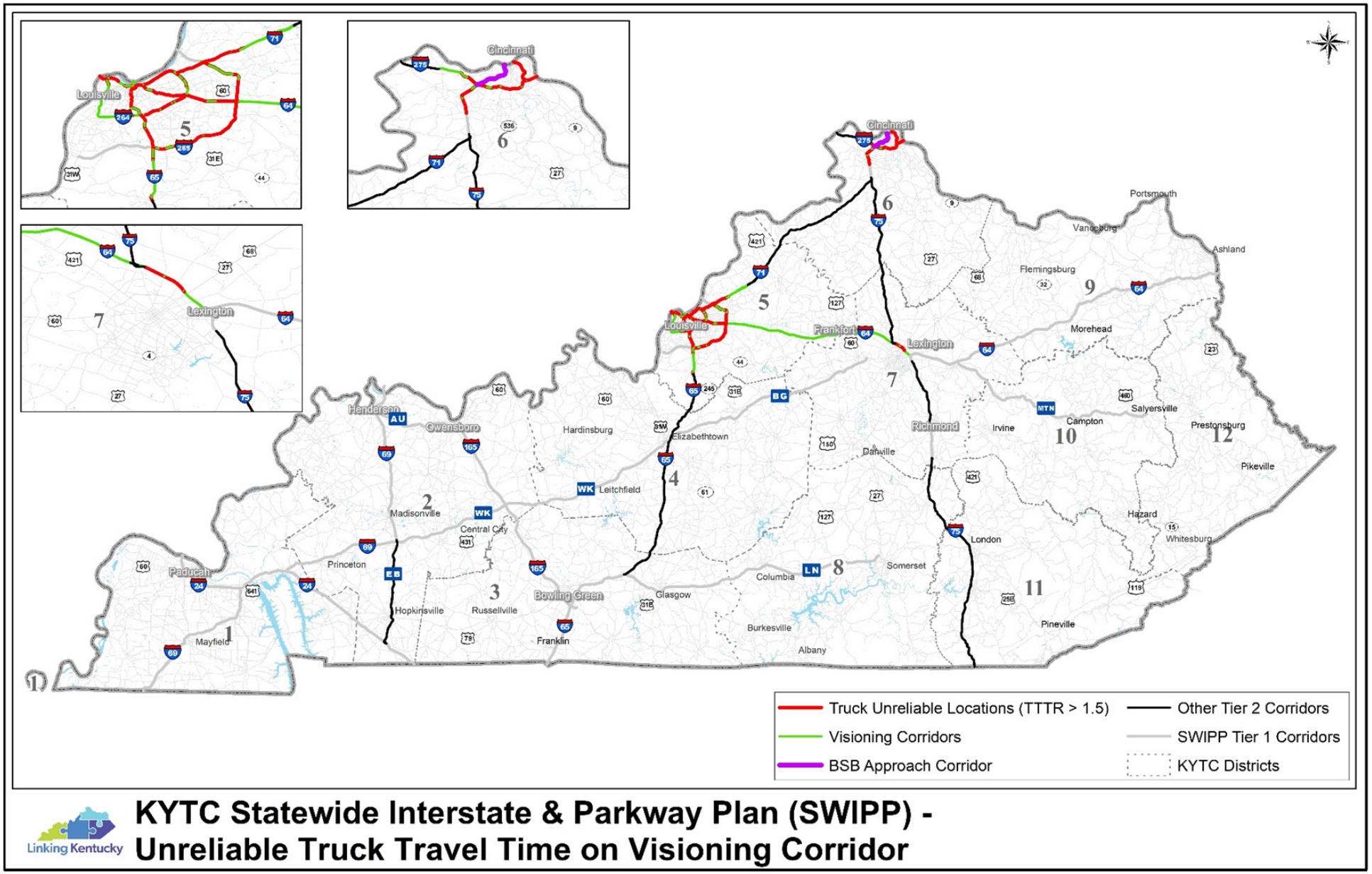
Figure 7.4 – Visioning Corridor Daily Truck Traffic Growth



7.3.3 Truck Travel Time Reliability

FHWA defines truck travel time reliability as consistency or dependability in travel times, as measured from day to day or across different times of day. The freight/logistics industry values reliability because shippers and freight carriers require predictable travel time to deliver goods and services on time. Measurement of truck travel time reliability on the interstate and non-interstate National Highway System (NHS) using the Truck Travel Time Reliability (TTTR) Index is part of FHWA's Transportation Performance Management (TPM) framework, which has been adopted by the Bipartisan Infrastructure Law (BIL)/Infrastructure Investment and Jobs Act (IIJA) from preceding legislations (e.g., the Fixing America's Surface Transportation (FAST) Act). TTTR is defined as the ratio of congested truck travel times (95th percentile) to "normal" truck travel times (50th percentile), using data from FHWA's National Performance Management Research Data Set (NPMRDS) or equivalent. Data are collected in 15-minute intervals during all five required time periods (see details in Section 2.8). As federal guidelines do not establish a TTTR threshold for unreliable truck travel time, the Project Team decided to use 1.5 as a threshold to determine unreliable truck travel time. The TTTR Index values were provided by KYTC based on 2017-2019 NPMRDS dataset. **Figure 7.5** shows the unreliable truck travel time locations on visioning corridors.

Figure 7.5 – Unreliable Truck Travel Time on Visioning Corridors



7.3.4 Intermodal and Logistics Linkage

The intermodal and logistics linkage of each visioning corridor was visualized by overlaying the corridor with major intermodal facilities and freight/logistics hubs. A 5-mile buffer of the corridor was also included to help understand the effectiveness of access to freight-related facilities and the support of first-/last-mile of freight movements. See the detailed methodology in Section 6.2.5. The maps are included for visioning corridors in the GIS Online Tool.

7.3.5 Freight Tonnage

The tonnage of commodities carried by each visioning corridor was evaluated and included in corridor visions. The freight tonnage was derived using 2018 TranSearch data and the SWIPP Model (see Section 5.6 for details). Different from total truck flows, the freight tonnage is an indictor focusing on commodities moved by long-haul heavy trucks. The GIS Online Tool includes an interactive layer that shows the freight tonnage of each visioning corridor.

7.3.6 Freight Value

Freight value is another indicator of the corridor's importance in support of the statewide economy. This factor measures the monetary value of commodities carried by corridor, using 2018 TranSearch data, the latest FHWA Freight Analysis Framework (FAF5), and the SWIPP Model (see Section 6.2.5 for details). Freight values of visioning corridors are included in an interactive layer of the GIS Online Tool.

7.4 ISSUES AND CONCERNS

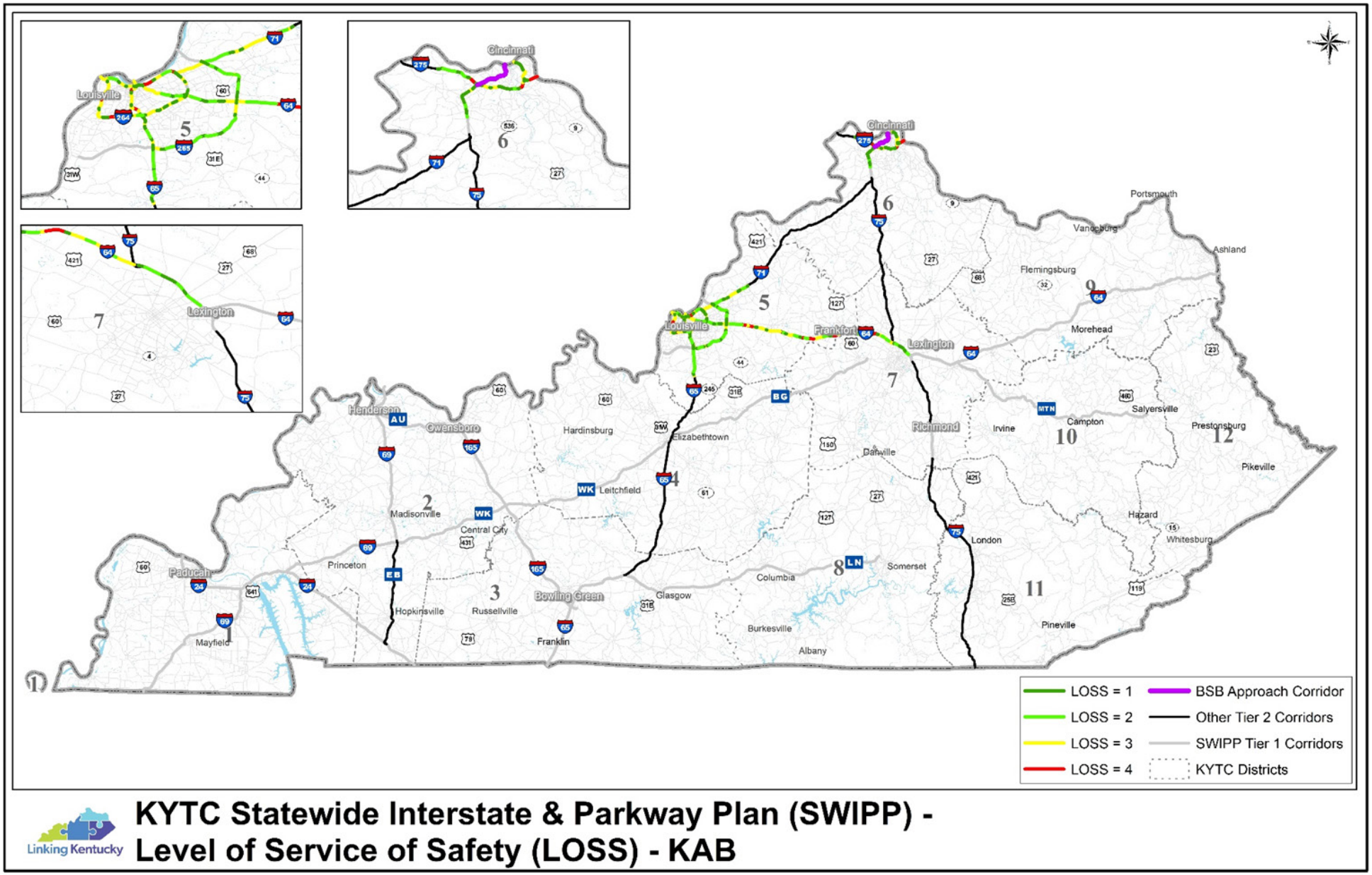
7.4.1 Safety

Safety is one of the most important factors to be considered in transportation planning. According to BIL/IIJA, a national goal is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads. KYTC's current 2022-2045 LRSTP includes a goal to enhance safety.

KYTC provided 2015-2019 statewide safety data in a GIS format which contains critical rate factor (CRF), excess expected crashes (EEC), and level of service of safety (LOSS). Based on the concept of Safety Performance Functions (SPF), LOSS quantifies the magnitude of the safety problem using four categories (I, II, III, IV) with LOSS-I indicating low potential for crash reduction while LOSS-IV indicates high potential for crash reduction. The LOSS data was split into subcategories of KAB (Fatality (K), Disabling Injury (A), and Evident Injury (B)) crashes and CO (Possible Injury (C) and Property Damage Only (O)) crashes. The safety data was processed and attached to corresponding SWIPP corridors for analysis.

Based on the discussion within the Project Team, a percentage of the corridor mileage that had a LOSS-IV was calculated for each visioning corridor. It provided a corridor-level assessment of the highest potential to decrease crashes. As the fatality (K), Disabling Injury (A), and Evident Injury (B) crashes are the worst outcomes from a crash and usually need more attention in regard to safety improvements, an interactive GIS layer of KAB LOSS data was also developed for all visioning corridors and included in the GIS Online Tool (see **Figure 7.6**).

Figure 7.6 – Level of Service of Safety (LOSS) – KAB (2015-2019)



7.4.2 Congestion

Major traffic bottlenecks were identified for each visioning corridor. A traffic bottleneck is a localized section of highway that experiences reduced speeds and greater delays due to a recurring operational influence or a nonrecurring event, according to the definition of FHWA's Localized Bottleneck Reduction (LBR) Program. General characteristics of bottlenecks are:

1. Limited physical capacity
2. Poorly functioning traffic signals
3. Traffic incidents
4. Work zones
5. 5Bad weather
6. Special events

Only the first and second sources contribute to recurring congestion. They are measurable in design and function and are therefore candidates for remediation. The remaining sources of bottlenecks are nonrecurring and random. In addition, high traffic volumes approaching capacity, maintenance or short-term construction (e.g., work zone), incidents or weather, are typical causes for poor reliability that trigger high variability in operating speeds and travel times. KYTC's 2022-2045 Long Range Statewide Transportation Plan (LRSTP) requires establishing a reliable flow of people and freight. Therefore, it is important to reduce bottlenecks to improve the mobility and reliability of movements, leading to less congestion, fewer infrastructure repairs, and lower emissions.

The SWIPP used the following criteria to identify potential bottlenecks for each visioning corridor and included them in an interactive map layer in the GIS Online Tool:

- **Daily Volume-to-Capacity (V/C) Ratio.** V/C ratio is one of the most frequently used indices for assessing roadway traffic congestion at the planning level. 2045 daily traffic volumes and roadway capacities were extracted from the SWIPP Model, and the 2045 daily V/C ratio was calculated. Based on discussions within the Project Team, links with a V/C ratio of 0.6 or more were considered to be bottlenecks. As the SWIPP Model is a daily model and does not estimate peak-period/peak-hour traffic condition, a relatively low daily V/C ratio threshold such as 0.6 avoids overlooking bottlenecks that are congested during peak period or peak hour (high V/C ratio values), even if their overall daily V/C ratio is not high. The 2045 V/C ratio provides insight into future levels of congestion due to capacity constraints, after accounting for existing and programmed project improvements. **Figure 7.7** shows potential bottlenecks on visioning corridors. These locations were candidates for more detailed traffic capacity analysis leading to SWIPP improvement strategies.
- **Level of Travel Time Reliability (LOTTR).** FHWA defines travel time reliability as consistency or dependability in travel times, as measured from day to day or across different times of day. Personal and business travelers value reliability because it allows them to make better use of their time. Measurement of travel time reliability on the interstate and non-interstate National Highway System (NHS) using the Level of Travel Time Reliability (LOTTR) is part of FHWA's Transportation Performance Management (TPM) framework, which has been adopted by BIL/IIJA from preceding legislations (e.g., the FAST Act). LOTTR is defined as the ratio of the longer travel times (80th percentile) to a "normal" travel time (50th percentile), using data from FHWA's National Performance Management Research Data Set (NPMRDS) or equivalent. Data are collected in 15-minute intervals during all time periods between 6am and 8pm (see Section 2.8 for details). The reporting corridor segment is considered reliable when LOTTR is less than 1.5 for all time periods, otherwise unreliable. KYTC provided LOTTR values based on 2017-2019 NPMRDS data. The LOTTR values were attached to SWIPP corridor network, so that all unreliable locations (LOTTR >= 1.5 for any time period) were also identified as potential bottlenecks. **Figure 7.8** shows the unreliable locations on visioning corridors.

Figure 7.7 – Potential Bottlenecks (2045 Capacity Constraint)

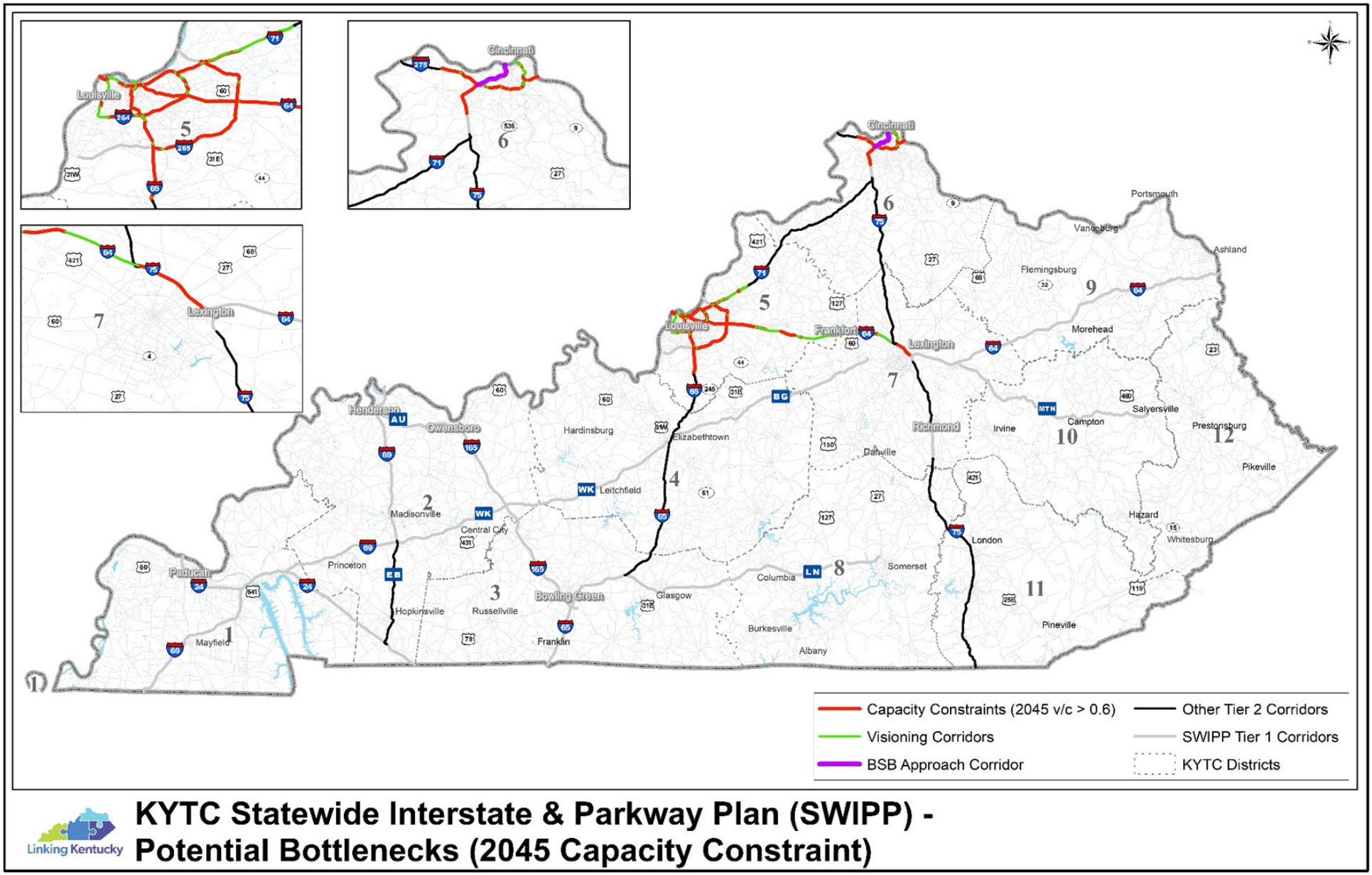
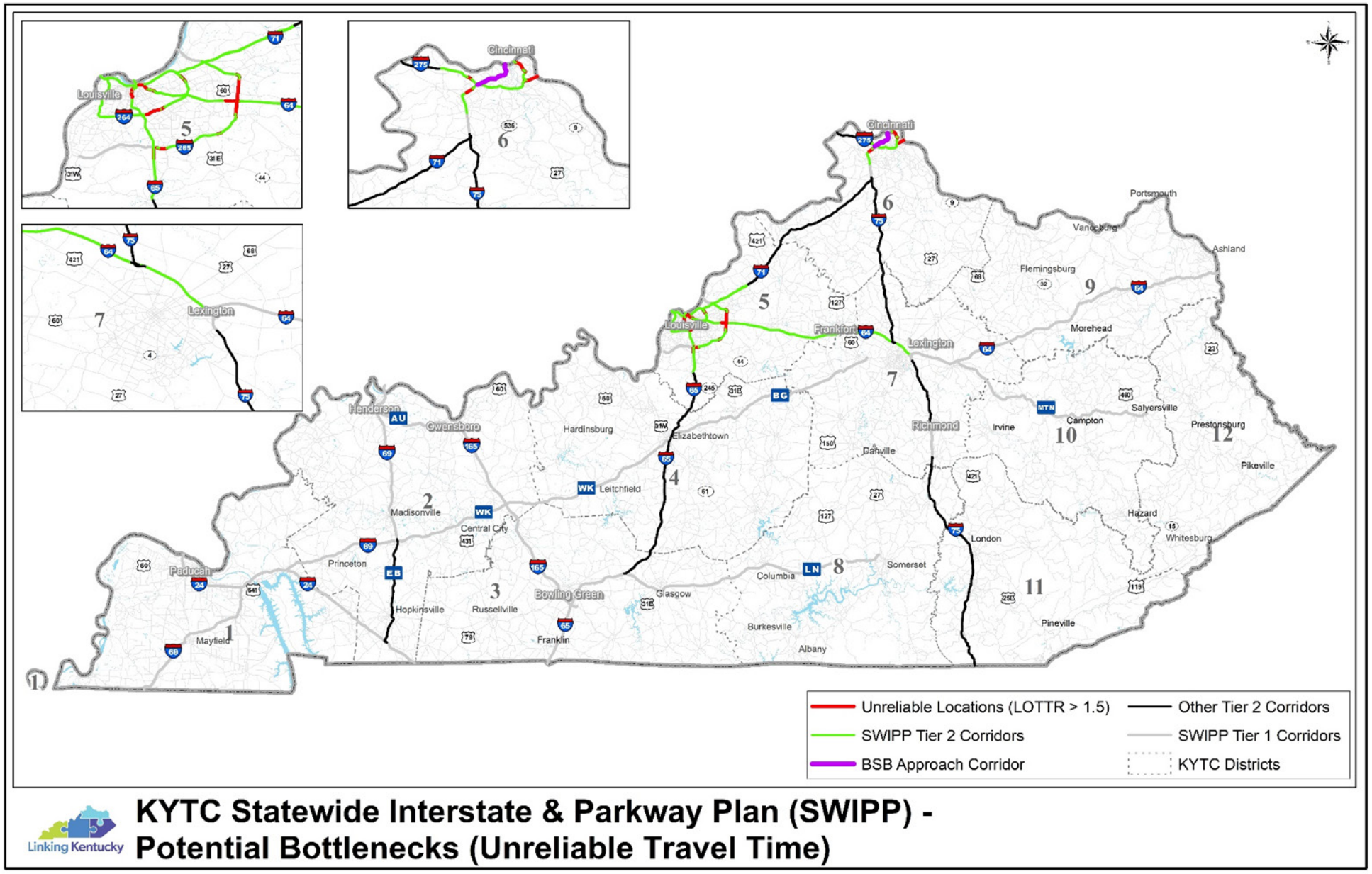


Figure 7.8 – Potential Bottlenecks (2019 Unreliable Travel Time)



The level of congestion was further evaluated at potential bottlenecks described above for 2015, 2030 and 2045. The Project Team reached consensus on adopting the "Acceptable" and "Unacceptable" categories in the SWIPP to indicate potential roadway deficiencies at the planning level and to ease the understanding and dissemination of the analysis results to stakeholders and the public. If the V/C ratio is less than 0.85 in urban areas or less than 0.7 in rural areas, the roadway is considered to be "Acceptable"; otherwise, it was considered "Unacceptable". An "Unacceptable" segment does not necessarily mean traffic operational failure; rather, it is an indicator of potential deficiencies that require attention in future planning activities and a more detailed engineering level capacity analysis may be warranted.

7.4.3 Infrastructure

The pavement analysis was performed using the Pavement Distress Index (PDI) data provided by KYTC. KYTC criteria was used to determine pavement conditions (see **Table 7.7**). Pavement conditions for all visioning corridors are included in an interactive layer of the GIS Online Tool and are also shown in **Figure 7.9**.

Table 7.7 – KYTC Criteria on Pavement Conditions

Pavement Condition	Pavement Distress Index (PDI)
Good	0.00 – 0.35
Fair	0.36 – 0.65
Poor	0.66 – 0.99

KYTC provided a complete list of bridges throughout the state along with key attributes such as structure ID, National Bridge Inspection Standards (NBIS) classification, sufficiency rating, substructure rating, superstructure rating, deck rating, vertical/horizontal clearance, etc. The file contains latitude/longitude of each structure, so the bridges and culverts were geocoded and attached to each study corridor. Bridge conditions were determined by NBIS classification (poor, fair, good) and are included in an interactive layer of the GIS Online Tool. **Figure 7.10** shows all bridges associated with visioning corridors and their NBIS classifications.

Structures crossing over the corridors were also summarized, including structure ID, facility carried, under clearance, and horizontal clearance. The structure's under clearance could impact vehicles passing through, especially heavy trucks, while the horizontal clearance impacts the maximum number of lanes carried by the study corridor and could be a constraint if congestion exists and roadway widening is needed. All these features are included in interactive layers of the GIS Online Tool.

Figure 7.9 – Pavement Conditions

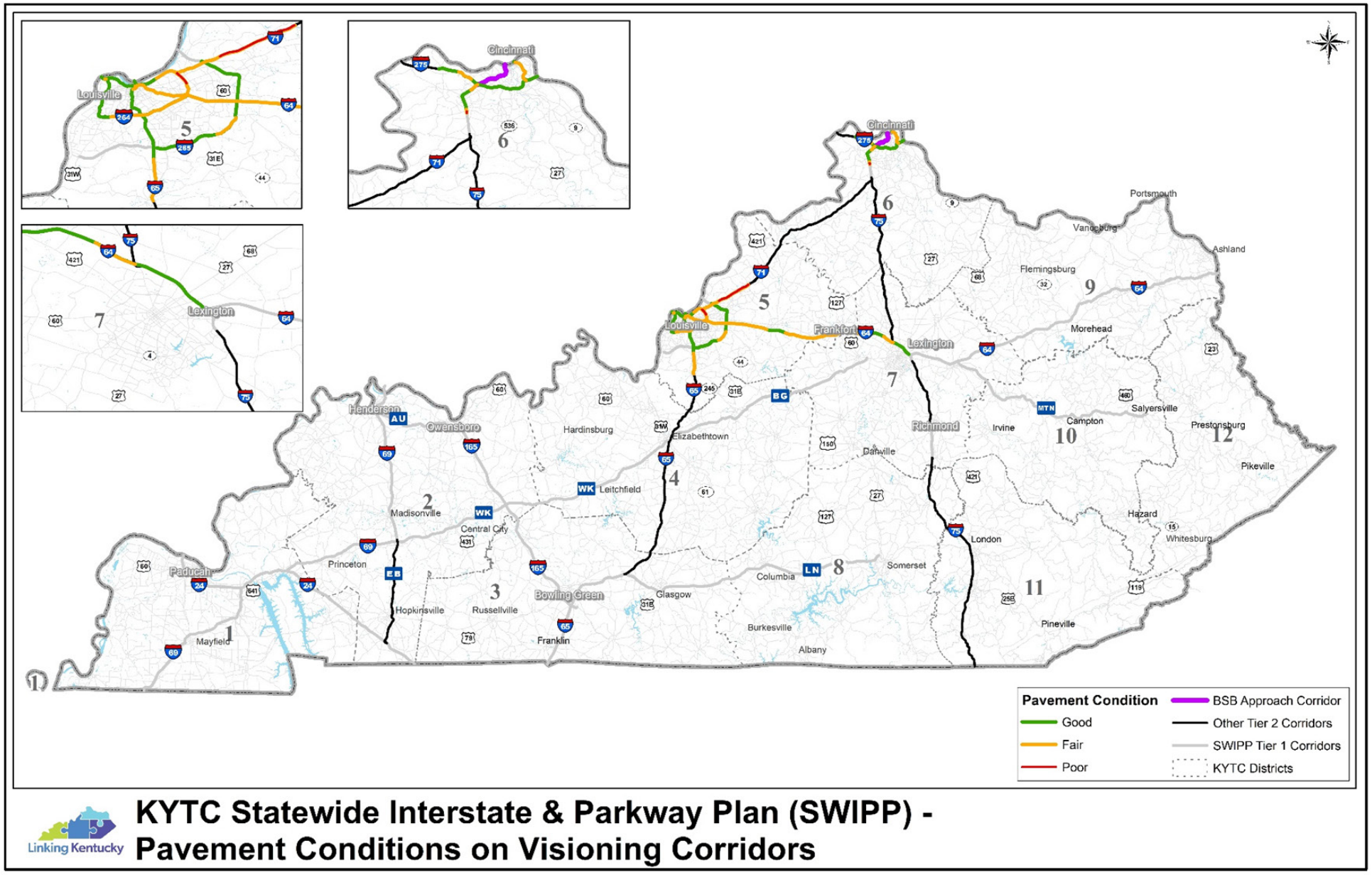
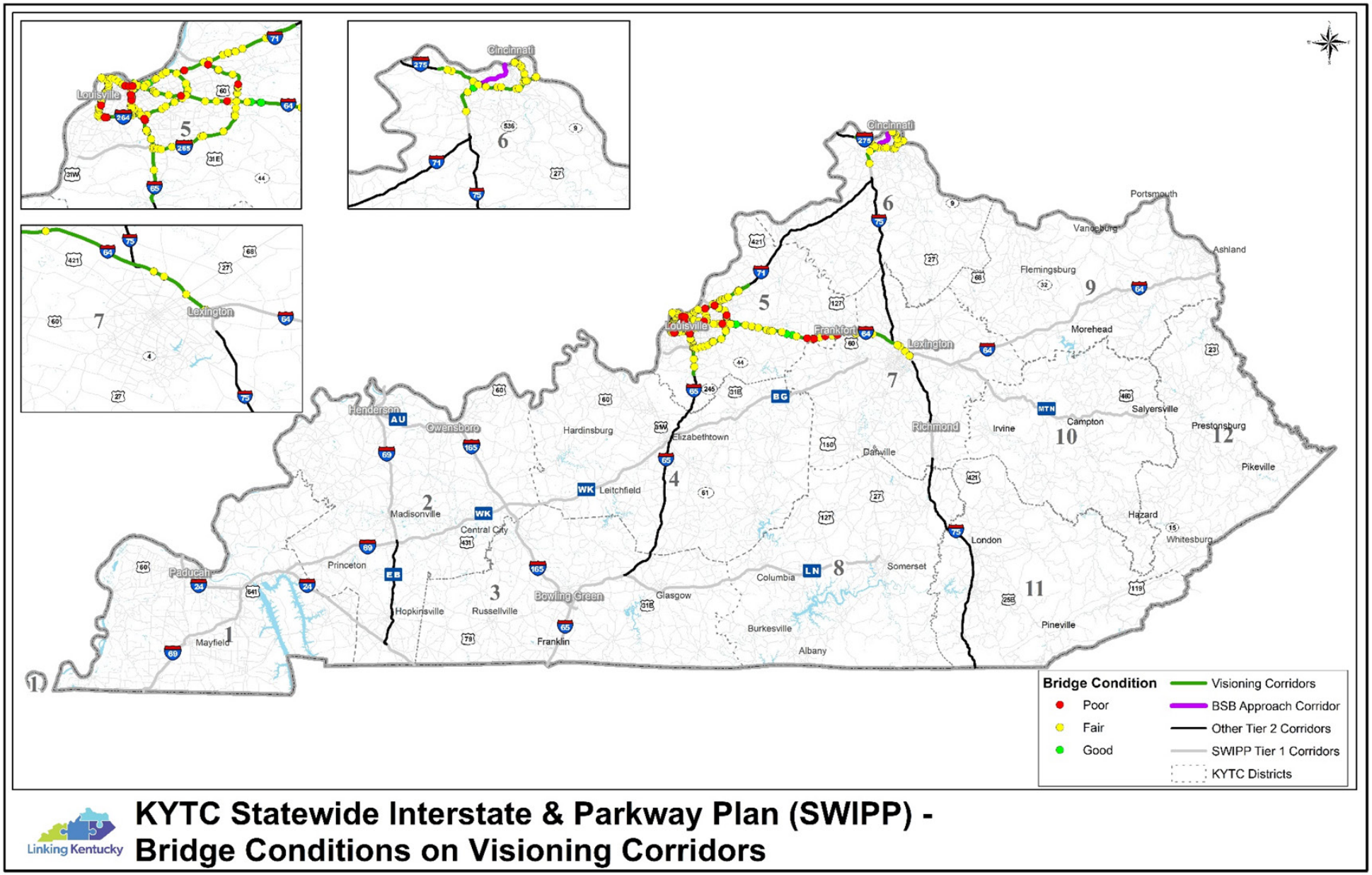


Figure 7.10 – Bridge Conditions



7.4.4 Environmental Concerns

The Project Team utilized readily available GIS environmental data sources to identify potential red flag environmental issues for each visioning corridor. The purpose of this analysis was to assemble preliminary environmental information at high planning level to facilitate more detailed and specific corridor studies in the future to meet KYTC's needs. This work was preliminary and did not constitute a red flag survey.

Table 7.8 summarizes the results from a preliminary screening of red flag resources during the visioning analysis, based on consensus within the Project Team. The table includes 16 major red flag items that the Project Team identified to review during the preceding Tier 2 corridor scoping efforts. The 16 major items were identified because they often have bigger consequences which could potentially add significant time and cost to a project. It was beneficial to review potential environmental impacts from these major items early in the development of improvement concepts.

Table 7.8 – Red Flag Resources Analyzed in Corridor Vision

Category	Red Flag Resources	Major Items Included in Tier 2 Scoping Report
Water Resources	Floodplain	
	Streams	
	NWI Wetland Features	
	Water Wells	
	Groundwater Wells	
	Wellhead Protection Areas	
	Springs (KGS)	
	Groundwater Springs	
	303(d) Listed Streams	
	305(b) Listed Streams	
	Special Waters[1]	✓
Threatened & Endangered Species Habitat	Forested Areas	✓
	NLEB Habitat Priority	✓
	IB Habitat Priority Area	✓
	Quarries	
	Karst (Sinkholes)	
	Permitted Mine Boundaries	
	Mined-Out Areas	
Land Use/Community Resources	Libraries	
	Schools	
	Kentucky Higher Education	
	Hospitals	
	FAA Airport Runways	✓
	Local Parks	✓
	Public Hunting Areas	✓

Category	Red Flag Resources	Major Items Included in Tier 2 Scoping Report
Land Use/Community Resources	Wildlife Management Areas	✓
	State/National Parks	✓
	Kentucky Heritage Land Conservation Fund	✓
	Area Landmarks	✓
	Point Landmarks	✓
	US Military Installations	
	National Register of Historic Places Location (Point)	✓
	National Register of Historic Places Location (Polygon)[2]	✓
	Land and Water Conservation Fund (LWCF)[3]	✓
Socioeconomic Data	Percent Minority	
	Low Income Community	
Hazardous Materials	Oil and Gas Wells (KGS)	
	Kentucky UST List	
	Kentucky Hazardous Waste List	
	Superfunds	✓

[1] *Special Waters are defined as Cold Water Aquatic Habitats, Outstanding State/National Resource Waters, Exceptional Waters, State Wild Rivers, and Federally Designated Wild/Scenic Rivers.*

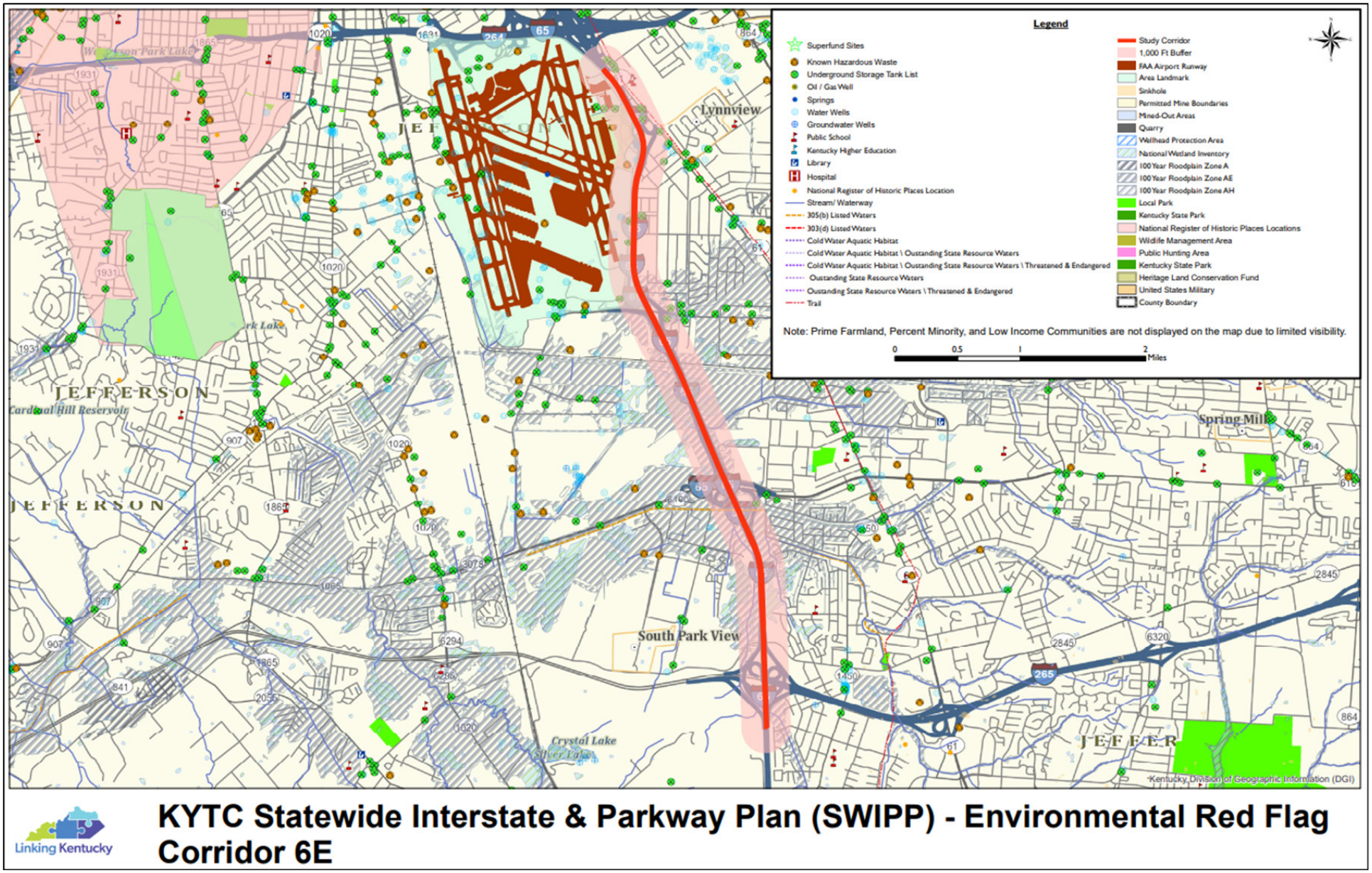
[2] *The NRHP polygon files were downloaded from the National Park Service's online GIS database. This data has potential data accuracy issue.*

[3] *LWCF resources were visually checked based on available data from https://lwcfcoalition.org/map.*

For each visioning corridor, a brief narrative was provided to summarize the findings of potential environmental constraints based on available GIS environmental data. It is noted that a general review of gray bat habitat was added in the brief narrative per KYTC'S request, although the gray bat habitat is not included in **Table 7.8** due to limited available data. This review was performed at a high level, based on a county-level gray bat habitat map from the Kentucky Department of Fish and Wildlife Resources.

For each visioning corridor, maps were also created to illustrate red flag resources within a 1,000-foot buffer of the corridor. It is noted that some red flag resources may not be included in the map to avoid an overwhelmed content, however, they are generally described in the narrative summary. **Figure 7.11** shows an example map of environmental red flag resources.

Figure 7.11 – Example of Red Flag Environmental Screening Analysis



7.5 IMPROVEMENT CONCEPTS

7.5.1 Potential Improvements

The potential improvements rely heavily on the Tier 2 corridor scoping efforts, with slight adjustments made by the Project Team during the corridor visioning phase. To meet the needs of the SWIPP at a high planning level, the Project Team developed a list of general improvement categories that include traditional capacity improvement concepts (see **Table 6.2**) and TSMO strategies (see **Table 6.3**). The improvement options noted in the SWIPP are not intended to be all-encompassing. Other potential improvements are possible, including innovative solutions that could be cost-effective and address the reasons for improvement. Further study may be needed as part of any future project development process.

7.5.1.1 Bottleneck Improvements

Based on discussions within the Project Team, it made more sense to apply improvements on a location specific basis, instead of the entire length of the corridor. Practical improvement concepts (traditional improvements, TSMO strategies, or a mix) were recommended for bottlenecks where applicable. They are expected to maintain an enhanced traffic condition through 2045 and address safety issues at bottlenecks. Details of proposed improvement concepts, such as bottleneck location and terminus, improvement strategies, improved typical section, reason for improvement, and planning-level traffic operational assessment of 2045 No Build and 2045 Build scenarios (i.e., bottleneck Level of Service (LOS) estimated using an approach described by the Florida Department of Transportation (FDOT) Quality/Level of Service Handbook), were provided and included in the GIS Online Tool. Cross-section drawings of the proposed major widening improvements (e.g., added travel lanes, truck climbing lanes) are also included in the GIS Online Tool.

It is noted that a non-project specific approach was used in developing improvement concepts. For example, if more than one improvement were proposed for a bottleneck by considering issues, needs and constraints in vicinity of the location, they were all included in corridor visions without being prioritized. This approach allows for flexibility in strategies and opportunities over time that may better fit continuing changes in transportation demand, technology, and conditions. The proposed improvement concepts were coordinated with KYTC's on-going projects and were reviewed and approved by KYTC Division of Planning and Highway Districts. The GIS Online Tool also includes an interactive layer for the KYTC 2022 Enacted Highway Plan along visioning corridors as a reference.

7.5.1.2 Interchange Improvements

Potential new interchanges and/or interchange modifications were recommended based on thorough review of existing and future traffic volumes, V/C ratios, LOTTR data, crash data, adjacent environmental constraints, available right-of-way (ROW), as well as discussions within the Project Team. More detailed engineering capacity analysis will be needed in future specific studies to meet KYTC's needs. Potential new interchanges and interchange modifications were summarized and included in separate interactive layers of the GIS Online Tool.

7.5.1.3 Bridge Improvements

Bridge improvement recommendations were based on ratings of substructure, superstructure and deck using a methodology developed by the Project Team, as shown in **Table 7.9**.

Table 7.9 – Methodology for Structure Replacement/Rehab Recommendation

Structures	Substructure Rating	Superstructure Rating	Deck Rating	Culvert Rating	Recommendations
Bridges	<=4	Any	Any	/	Replacement
	=5	Any	Any	/	Rehabilitation
	>=6	<=5	Any	/	Rehabilitation
	>=6	Any	<=5	/	Rehabilitation
	>=6	>=6	>=6	/	None [1]
Culverts	/	/	/	<=4	Replacement
	/	/	/	5 or 6	Rehabilitation
	/	/	/	>=7	None

[1] *If the bridge is on a corridor with a recommendation of widening, it will be widened (considered as rehabilitation) as necessary to accommodate the additional proposed lanes.*

It is worthy to note that:

- If the bridge is in good condition but is within a bottleneck location with recommended widening, it will be widened as necessary to accommodate the additional proposed lanes and the cost of widening is assumed to be the same as bridge rehab for the planning-level cost estimation purpose.
- If the bridge needs replacement and is within a bottleneck location with recommended widening, it will be widened during the replacement to accommodate the additional proposed lanes and the cost of bridge replacement is used for the planning-level cost estimation purpose.
- Bridges for replacement and rehabilitation/widening along the visioning corridors were identified and included in separate interactive layers of the GIS Online Tool.

7.5.1.4 Pavement Treatment

The overall pavement condition (good, fair, or poor) along with the average Pavement Distress Index (PDI) were summarized for each visioning corridor. While detailed pavement treatments were not included in corridor visions, the locations that were identified with poor pavement condition should be given more attention for existing pavement replacement, overlay, or patching. At bottlenecks, the proposed additional lanes will consist of full depth asphalt pavement construction. Spot reconstruction and rehabilitation of existing asphalt pavement lanes might be needed based on more detailed evaluation of the corridor's pavement condition.

7.5.1.5 Phasing

According to proposed improvement concepts, preliminary phasing plans were recommended for each visioning corridor at a high planning level, by generally following the guidelines described below:

- Mainline traditional widening improvements (e.g., added travel lanes) or TSMO solutions with capacity improvements are proposed (e.g., hard shoulder running, managed lanes). If the project has a short mileage, it is possible to complete in one phase. The TSMO spot improvements along the improved section (e.g., signage, pavement marking, DMS), can be constructed as part of and at the same time as the capacity

improvement project. Otherwise, it can be split into multiple phases geographically depending on funding availability.

- Mainline spot improvements are proposed.
  a) If the spot improvements are located within the mainline widening section, they will be constructed as part of and at the same time as the widening project. However, there might be a case where the widening is too expensive and not high enough priority such that it would not be built in a foreseeable future, then it would be recommended to complete spot improvements in Phase 1 and widen the roadway in a future phase.
  b) If there are only a few locations for improvement, it is recommended to improve them at the same time. This is because the study corridors are long, so dividing them into individual phases for individual spot improvements seemed to be unrealistically detailed.
- The proposed new interchange can be one phase. The TSMO spot improvements at the interchange (e.g., ramp metering, DMS, increase acceleration lane, etc.) can be done at the same time. The associated new connector road can be a separate phase.
- Interchange modifications and spot improvements are proposed. If an urban interchange modification is required, a separate phase would be recommended because of the longer time required to develop the project. Rural interchange modifications might be appropriate to propose one phase if they are not complex in nature and are close together; otherwise, they could be grouped in separate phases geographically. The TSMO spot improvements at interchanges (e.g., ramp metering, DMS, increasing acceleration/deceleration lane lengths, etc.) may be done as part of and at the same time as the interchange project.
- A separate phase would be recommended for statewide TSMO initiatives, e.g., Traffic Incident Management (TIM) systematic plan along with comparative travel time.

7.5.2 Safety

Safety improvements were recommended at locations with LOSS = IV, as well as locations where there are crash clusters or serious or fatal injury crashes. To effectively make safety improvement recommendations, safety improvements were recommended based on three categories:

- **Category 1.** These are clusters located in areas where the SWIPP already recommends corridor improvements for mobility reasons. For this category, it is assumed any corridor improvement based on mobility needs will be constructed to current KYTC standards and will include the necessary safety improvements.
- **Category 2.** These are major clusters not located in areas previously recommended for corridor mobility improvements. This category is intended to identify corridor sections that may warrant improvement solely for safety, even though improvements might not be needed for mobility.
- **Category 3.** These are recommendations at locations where there is a history of severe crashes. This category is intended to identify spot locations with a history of severe crashes where spot safety improvements would be beneficial.

The corridor visions summarize locations, possible causes, and recommendations for locations with safety concerns identified in all three categories. There might be isolated links with LOSS value of IV which are not included in corridor visions. Spot improvements could be warranted for those locations, but it is assumed these spot improvements do not rise to the level of a corridor improvement. Therefore, these locations were not addressed in this planning study.

7.5.3 Multi-Infrastructure Opportunity

It is KYTC's responsibility to deliver an integrated multimodal transportation system, according to KYTC's current 2022-2045 LRSTP. To ensure that multi-infrastructure opportunities would be considered for incorporation into the long-term corridor vision, the Project Team assessed existing and new TSMO applications and transit services, potential of Connected and Autonomous Vehicles (CAV), and alternative fuel options for visioning corridors. The assessment was generally broad.

7.5.3.1 Transportation System Management and Operations (TSMO)

Transportation System Management and Operations (TSMO) is an important component of the infrastructure system, as it can improve safety, mobility, and operations to extend the life of the current roadway system. Each of the visioning corridors was evaluated for opportunities to deploy TSMO solutions. TSMO solutions were considered to address identified safety or operational issues. All visioning corridors have opportunities to deploy TSMO solutions, including ramp metering, hard shoulder running, managed lanes, truck climbing lanes, dynamic message signs (DMS), CCTV cameras, speed warning signs, comparative travel time signs, queue warning, incident management, and variable speed limits. The proposed TSMO solutions are included in separate interactive layers (by point-based and line-based applications) in the GIS Online Tool.

7.5.3.2 Connected and Autonomous Vehicles (CAV)

Connected and Autonomous Vehicles (CAV) are becoming more common and can improve the safety and mobility of the current roadway system. Each of the visioning corridors was evaluated for potential CAV considerations. CAV corridors are typically in areas with the geometrics, ITS infrastructure, land use considerations, and traffic volumes and mix that support it, as described in Section 6.3.4. The majority of the vision corridors are either already identified as a CAV corridor or have the potential to be, with the exception of segment 6F (I-65 from I-264 to the Indiana state line).

7.5.3.3 Transit

The assessment of transit opportunity for corridors was primarily based on two data sources. First, the information of existing transit services (in the format of interactive or static maps) was collected from the websites of most transit agencies, such as Transit Authority of Northern Kentucky (TANK) and Transit Authority of River City (TARC). Second, GIS files of transit routes and stops were requested from MPOs and ADDs through KYTC's coordination. Most MPOs and ADDs provided requested data for their jurisdictions. However, for a large-scale effort of statewide data collection like this, some gaps might still exist in some areas due to data unavailability.

A review of existing transit services was then conducted for corridors. This generally involved a cross-comparison of the available transit routes/stops and GIS data with the transit maps from transit agency websites to verify the availability of facilities within and along the corridor. Google mapping was also overlayed to help understand the connectivity with other adjacent facilities and land uses which may call for potential new transit services in future. **Table 7.10** summarizes the existing transit services and potential new transit routes for visioning corridors. Detailed information is included in the GIS Online Tool.

Table 7.10 – Existing and Potential Transit Services for Visioning Corridors

Corridor ID	Corridor Name	From	To	Transit Service	
				Existing	Potential New
1B	I-275	KY 237 in Boone Co.	I-71	Yes	Yes
1C	I-275	I-71	Ohio state line	Yes	Yes
2	I-471	Ohio state line	I-275	Yes	Yes
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	Yes	Yes
3H	I-75	KY 536 in Boone Co.	I-275	Yes	Yes
4A	I-71	I-64	I-264	No	Yes
4B	I-71	I-264	I-265	No	No
4C	I-71	I-265	KY 53 in La Grange	No	No
6D	I-65	KY 44 in Shepherdsville	I-265	No	Yes
6E	I-65	I-265	I-264	Yes	Yes
6F	I-65	I-264	Indiana state line	Yes	Yes
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	No	Yes
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	No	Yes
8A	I-64	Indiana state line	I-65	Yes	Yes
8B	I-64	I-65	I-264	Yes	Yes
8C	I-64	I-264	I-265	Yes	Yes
8D	I-64	I-265	KY 53 in Shelbyville	No	No
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	No	No
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	No	Yes
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	Yes	Yes
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	Yes	Yes

7.5.3.4 Alternative Fuels

The alternative fuel opportunities were determined based on KYTC's Round 6 designation of Alternative Fuel Corridors (either ready or pending) when the corridor visions were developed. All visioning corridors were designated as electric vehicle (EV) corridors, but they have opportunities for other types of alternative fuels, including compressed/liquid natural gas, propane, and hydrogen. **Table 7.11** summarizes alternative fuel options for visioning corridors.

Table 7.11 – Alternative Fuels

Corridor ID	Corridor Name	From	To	Alternative Fuels				
				EV	Compressed Natural Gas	Liquid Natural Gas	Propane	Hydrogen
1B	I-275	KY 237 in Boone Co.	I-71	Yes	Yes	No	No	No
1C	I-275	I-71	Ohio state line	Yes	Yes	No	No	No
2	I-471	Ohio state line	I-275	Yes	No	No	No	No
3E	I-75	I-64/I-75 south split	I-64/I-75 north split	Yes	Yes	Yes	No	Yes
3H	I-75	KY 536 in Boone Co.	I-275	Yes	Yes	Yes	No	Yes
4A	I-71	I-64	I-264	Yes	Yes	No	No	No
4B	I-71	I-264	I-265	Yes	Yes	No	No	No
4C	I-71	I-265	KY 53 in La Grange	Yes	Yes	No	No	No
6D	I-65	KY 44 in Shepherdsville	I-265	Yes	Yes	No	Yes	Yes
6E	I-65	I-265	I-264	Yes	Yes	No	Yes	Yes
6F	I-65	I-264	Indiana state line	Yes	Yes	No	Yes	Yes
7B	I-265/KY 841 (Gene Snyder Fwy)	I-65	I-64	Yes	Yes	No	No	No
7C	I-265/KY 841 (Gene Snyder Fwy)	I-64	I-71	Yes	Yes	No	No	No
8A	I-64	Indiana state line	I-65	Yes	No	No	No	Yes
8B	I-64	I-65	I-264	Yes	No	No	No	Yes
8C	I-64	I-264	I-265	Yes	No	No	No	Yes
8D	I-64	I-265	KY 53 in Shelbyville	Yes	No	No	No	Yes
8E	I-64	KY 53 in Shelbyville	I-64/I-75 north split	Yes	No	No	No	Yes
10A	I-264 (Watterson Expwy)	I-64 (west)	I-65	Yes	No	No	No	No
10B	I-264 (Watterson Expwy)	I-65	I-64 (east)	Yes	No	No	No	No
10C	I-264 (Watterson Expwy)	I-64 (east)	I-71	Yes	No	No	No	No

7.5.4 Cost

Preliminary costs of the proposed improvement concepts were estimated (in 2021 dollars) through the Tier 2 analysis. Separate costs of traditional improvement strategies and TSMO solutions as well as a total cost were included. See the detailed methodology in Section 6.3.2 and the complete cost estimation sheets in **Appendix L**.

7.5.5 Economic Feasibility

The economic feasibility analysis incorporates the following two components based on data generated in the Tier 2 analysis:

- **Project Delivery Timeline.** It is an indicator of developing the improvement concepts to delivery. The delivery timeline was categorized by <5 years, 5-10 years, 10-15 years, and > 15 years, based on the complexity of project. See detailed methodology in Section 6.3.1.
- **Benefit/Cost (B/C) Ratio.** It is an indicator of the effectiveness of improvement concepts to improve the transportation efficiency and promote Kentucky's economy. The B/C ratio was categorized by low (B/C < 2), medium (2< B/C <5), and high (B/C > 5). See detailed methodology in Section 6.3.3.

As part of the SWIPP, a high-level funding and fiscal analysis was also conducted to understand the range of possible improvements that could be made over time with expected funding levels and increases in funding from existing and new programs. Through this effort, the Project Team reviewed existing and potential funding sources at the federal and statewide levels and provided a high-level analysis of infrastructure demand and cost for all Tier 2 corridors, except for 3I (BSB Approach Corridor) due to the funding commitments made for the BSB project. This analysis recommended a list of SWIPP corridors that can be delivered in the intermediate (before 2030) and long-range (between 2030 and 2045) timeframes, given the assumed funding scenarios (low, medium, and high). Details of the analysis can be found in **Appendix N**.

7.6 STAKEHOLDER INPUTS

The Project Team used a crowdsourcing map-based online survey tool (VeraVoice©) to collect location-specific comments from approximately 1,600 stakeholders (including KYTC Central Office, Districts, MPOs, ADDs, Traffic Incident Management (TIM), and elected local officials, etc.) regarding corridor issues, needs and improvements during Tier 2 scoping.

The survey was open from August 17 to September 14 in 2022. The survey successfully collected a total of 124 comments throughout the state, which cover all Highway Districts that have SWIPP corridors. **Figure 7.12** shows all collected comments. The collected comments helped identify important concerns and issues on study corridors and supported the development of improvement concepts. **Appendix G** shows details of the collected comments.

7.7 SCOPING REPORT

A scoping report (see **Appendix I**) was developed for each Tier 2 corridor at the planning level as part of the Tier 2 analysis effort. The major goal of the Tier 2 corridor scoping was to develop practical corridor improvement concepts based on a preliminary review of each corridor's existing conditions, issues, and needs. The contents of the scoping report generally mirror the aspects of corridor visions but are less detailed in some topics than corridor visions. The Project Team decided to include the scoping reports in the corridor visions and in the GIS Online Tool. The GIS Online Tool also displays other Tier 2 corridors not selected for visioning and provides a link to their scoping reports, except for segment 3I (BSB Approach Corridor) which links to the BSB project website.

Figure 7.12 – Stakeholder Comments Collected by VeraVoice©