I-35 Integrated Corridor Management Plan

SYSTEM OVERVIEW AND OPERATIONAL NEEDS
# TABLE OF CONTENTS

Figures ................................................................................................................................. 2
Tables ................................................................................................................................. 3
Abbreviations ....................................................................................................................... 4
Purpose of Document ........................................................................................................... 5
  Contents ........................................................................................................................... 5
  Audience ......................................................................................................................... 5
  Intention ......................................................................................................................... 5
Understanding of the Corridor ............................................................................................. 5
  Physical Characteristics of the Corridor ........................................................................... 5
    South Segment – Edgerton to Olathe ............................................................................. 6
    Central Segment – Olathe and Lenexa ......................................................................... 7
    North Segment – Overland Park And Kansas City ......................................................... 8
Strategic Planning ................................................................................................................ 9
  Existing Plans and Implementation Status ...................................................................... 9
  Current Projects and Programs that Complement ICM .................................................. 15
Existing Transportation Assets .......................................................................................... 16
  Transportation Modes and Facilities in Corridor ............................................................ 16
    Rail Transit .................................................................................................................. 16
    Bus Transit .................................................................................................................. 17
    Ride Sharing ................................................................................................................ 20
    Active Transportation ................................................................................................. 21
Relevant Intelligent Transportation System Infrastructure ............................................... 24
  KC Scout Infrastructure Detail ...................................................................................... 25
  Operation Green Light Infrastructure Detail ................................................................. 32
Current Operations of the Corridor ................................................................................... 34
CONCEPT OF OPERATIONS

Demand Characteristics of the Corridor ........................................................................................................................................34
Congestion in the Corridor .........................................................................................................................................................38
Traffic Incidents .........................................................................................................................................................................41
System Reliability ...........................................................................................................................................................................44
Recommended Use cases ...............................................................................................................................................................46
Table of Use Cases Considered ..................................................................................................................................................47
Justification of Use Case Selected for Analysis ........................................................................................................................50

FIGURES

Figure 1 - South Segment of I-35 ICM Corridor (Source: Johnson County AIMS) .................................................................6
Figure 2 - Central Segment of I-35 ICM Corridor (Source: Johnson County AIMS) ..............................................................7
Figure 3 - North Segment of I-35 ICM Corridor (Source: Johnson County AIMS) ...............................................................8
Figure 4 - Excerpt of Johnson County Transit system map (Source: Johnson County Transit) ..............................................17
Figure 5 - Johnson County Transit Express Route Operations (Source: Johnson County Transit) ......................................19
Figure 6 - RideShare Connection Website Screen Capture (Source: MARC) .........................................................................20
Figure 7 - Bicycle Facilities in the I-35 South Segment Area (Source: MARC) .................................................................22
Figure 8 - Bicycle Facilities in the I-35 Central Segment Area (Source: MARC) .................................................................23
Figure 9 - Bicycle Facilities in the I-35 North Segment Area (Source: MARC) .................................................................24
Figure 10 – I-35 South Segment Scout Detector Locations Marked as Black Dots (Source: KC Scout) ...............................25
Figure 11 – I-35 Central Segment Scout Detector Locations Marked as Black Dots (Source: KC Scout) ..............................26
Figure 12 – I-35 North Segment Scout Detector Locations Marked as Black Dots (Source: KC Scout) ...............................27
Figure 13 – I-35 South Segment Scout Camera and DMS Locations (Source: KC Scout) ....................................................28
Figure 14 – I-35 Central Segment Scout Camera and DMS Locations (Source: KC Scout) ....................................................29
Figure 15 – I-35 North Segment Camera and DMS Locations (Source: KC Scout) .............................................................30
Figure 16 - KC Scout Ramp Metering Recommendations (Source: KC Scout) .................................................................32
Figure 17 - Traffic Signals in the I-35 Study Corridor Controlled by OGL (Source: Operation Green Light) ..................33
Figure 18 - I-35 South Segment Average Travel Speed (Average of all Tuesdays in 2015)..................35
Figure 19 - I-35 Central Segment Average Travel Speed (Average of all Tuesdays in 2015)..................36
Figure 20 - I-35 North Segment Average Travel Speed (Average of all Tuesdays in 2015)..................37
Figure 21 - I-35 Average Southbound Peak Hour Travel Speed (Average of all Tuesdays in 2015)...........38
Figure 22 - I-35 Average Northbound Peak Hour Travel Speeds (Average of all Tuesdays in 2015)..........39
Figure 23 - Southbound I-35 Average Minutes of Delay (Average of all Tuesdays in 2015)...................40
Figure 24 - Northbound I-35 Average Minutes of Delay (Average of all Tuesdays in 2015)...................40
Figure 25 - Breakdown of Incident Types in KC Scout Coverage Area (Source: KC Scout)...................41
Figure 26 - Multi-Vehicle Rate of Incidents along I-35 (Source: KC Scout)........................................42
Figure 27 - Incident Detection on Kansas City Metropolitan Area Freeways (Data Source: KC Scout)........43
Figure 28 - Commuter Perception of Travel Time Variability (Source: FHWA Travel Time Reliability brochure).........................44
Figure 29 - I-35 Northbound Planning Time Index (Tuesday in 2015)............................................45
Figure 30 - I-35 Southbound Planning Time Index (Tuesday in 2015).............................................46
Figure 31 – Sarah (User)..................................................................................................................50

TABLES

Table 1 - Use Case Operational Evaluation.......................................................................................46
Table 2 - Demographics Considered..................................................................................................47
Table 3 - Trip Purposes Considered....................................................................................................47
Table 4 – Travel Patterns and Trip Purpose.......................................................................................48
Table 5 - Potential Use Cases Considered..........................................................................................49
CONCEPT OF OPERATIONS

ABBREVIATIONS

BoS – Bus on Shoulder
BNSF – Burlington Northern Santa-Fe (Railroad)
CCTV – Closed Circuit Television
DMS – Dynamic Message Sign
FHWA – Federal Highway Administration
HOV/HOT – High-Occupancy Vehicle (Lane) / High-Occupancy-Toll (Lane)
ICM – Integrated Corridor Management
KC Scout - Kansas City Scout
KCATA – Kansas City Area Transit Authority
KDOT – Kansas Department of Transportation
MPH – Miles-Per-Hour
MARC – Mid-America Regional Council
MoDOT – Missouri Department of Transportation
OGL – Operation Green Light
PTI – Planning Time Index
PTZ – Pan-Tilt-Zoom (Camera)
TMC – Transportation Management Center
TMC – Traffic Message Channel
TOC – Traffic Operations Center
TSMO - Transportation System Management & Operations
# I-35 SYSTEM OVERVIEW AND OPERATIONAL NEEDS

## PURPOSE OF DOCUMENT

This document describes the system overview and derived operational needs relevant to the I-35 Integrated Corridor Management (ICM) Plan. The material contained and referenced herein provides the context for potential improvements and recommendations for ICM on I-35 within the project limits of City of Edgerton at Sunflower Road to Kansas City at Cambridge Circle.

## AUDIENCE

The audience intended for this document are stakeholders for ICM activities on the I-35 corridor, and transportation professionals who may use the ICM Concept of Operations for future development. Stakeholders include KC Scout, Operation Green Light, MARC, KDOT, MoDOT, KCATA, Rideshare providers, municipalities and their associated public works and transportation departments, law enforcement, and first responders. A complete list of stakeholders is included in Appendix A.

## INTENTION

The information presented in this document serves as a baseline understanding of the current transportation network system and its operational characteristics. This document will be incorporated into the ICM Concept of Operations documenting the system overview and current operational needs.

## UNDERSTANDING OF THE CORRIDOR

### PHYSICAL CHARACTERISTICS OF THE CORRIDOR

The I-35 corridor segment being considered in this document stretches for approximately 33 miles from Edgerton, KS to the Kansas & Missouri state line. The southern end of corridor starts at Exit 202, Sunflower Road, which serves the City of Edgerton. The corridor extends north to Exit 235, Cambridge Circle, which is only a few hundred feet south of the Kansas & Missouri state line. The highway has various cross-sections along the length of it including 4-lane sections, 6-lane sections, and an 8-lane section (excluding auxiliary lanes).

This corridor segment includes 24 interchanges, three of which are major system interchanges. The major system interchanges connect I-35 with I-435, US-69, and I-635. The interchanges with I-435 and I-635 are fully directional system interchanges; the interchange with US-69 only has access from I-35 southbound to US-69 southbound and US-69 northbound to I-35 northbound. The corridor can generally be considered in three major segments: from Edgerton to approximately the south boundary of Olathe (Exit 202, Sunflower Road to Exit 214, Lone Elm Road), the segment generally bisecting the cities of Olathe and Lenexa (Exit 214, Lone Elm Road to Exit 224, 95th Street), and from approximately the east boundary of Lenexa to the Kansas & Missouri state line (Exit 224, 95th Street, to Exit 235, Cambridge Circle).
CONCEPT OF OPERATIONS

SOUTH SEGMENT – EDGERTON TO OLATHE

The first segment from approximately Edgerton to Olathe is primarily rural and exurban in nature. This segment has a four-lane highway cross section (excluding auxiliary lanes) from Exit 202, Sunflower Road to Exit 214, Lone Elm Road. Through this 13 mile stretch, there are five interchanges that service the major crossroads of Sunflower Road, Homestead Lane, Gardner Road, 175th Street (US-56), and Lone Elm Road. These interchanges are spaced between 2.2 miles and 3.4 miles apart, with an average spacing of 3.25 miles. The posted speed limit on this segment of I-35 is 70 MPH.

![Figure 1 - South Segment of I-35 ICM Corridor (Source: Johnson County AIMS)](image)

This segment of highway is situated primarily in unincorporated Johnson County. Some portions are within the boundary of Edgerton and Gardner. In this area there are four primary activity centers including the cities of Edgerton and Gardner, the BNSF Intermodal Facility, and the New Century Air Center. The cities primarily produce commuter traffic to destinations in the northeast Johnson County area and downtown Kansas City, Missouri. The BNSF Intermodal facility and the New Century Air Center produce a large volume of commercial freight traffic in both the north and south directions on I-35.

The surrounding arterial street network consists primarily of county roads on a one-mile grid pattern. The majority of these roads are paved two-lane roads with 40 MPH – 55 MPH posted speed limits. A small number of these roads adjacent to I-35 have crushed aggregate surfaces. Two notable exceptions are Homestead Lane and 175th Street. Homestead lane has been recently improved with a double cross-over diamond type interchange and a four-lane divided highway north of I-35. This highway serves as the primary access for the BNSF Intermodal Center.
With characteristics of both a four-lane divided and undivided street, 175th Street (US-56) west of I-35 serves as primary access to the City of Gardner and the New Century Air Center.

**CENTRAL SEGMENT – OLATHE AND LENEXA**

The central segment of I-35 includes the less dense exurban and suburban area approximately from the southern boundary of Olathe to the eastern boundary of Lenexa. From Exit 214, Lone Elm Road to Exit 224, 95th Street, the highway has six primary through lanes. The cross section varies between the six-lane cross section up to a maximum of a 10-lane cross section between Exit 220, 119th Street and Exit 222, I-435. This 10-lane section includes two auxiliary lanes in both the northbound and southbound directions in addition to the three northbound and three southbound primary lanes.

This 10-mile stretch of highway has seven interchanges including the I-435 fully directional system interchange. These interchanges serve the major cross roads of Lone Elm Road, 151st Street, K-7, Old 56 Highway, Santa Fe Street (135th Street), 119th Street, and 95th Street. These interchanges are spaced between 1.0 mile and 2.3 miles apart, with an average spacing of 1.6 miles. The average spacing in this segment is slightly lower than the FHWA recommendation of 2.0 mile spacing for interchanges. The speed limit for this segment is posted at 65 MPH.

This segment of highway passes through the cities of Olathe and Lenexa. It serves a typical suburban type mix of activity including retail centers, multifamily residential developments, and single family residential developments radiating out from each interchange. Toward the northern end of this segment, clustered around the I-35 and I-435 interchange exists a large amount of industrial and office uses. The industrial uses are primarily warehousing, distribution, and light manufacturing. Some major traffic generators along this segment of the corridor include the Olathe Medical Center, the Garmin International headquarters, Sysco Food Services of KC, the JCPenney Distribution Center, UPS and FedEx distribution facilities, and Oak Park Mall and the surrounding retail on 95th Street. Other major retail activity centers are situated on Santa Fe Street (135th Street) and 119th Street primarily on the east side of I-35.
CONCEPT OF OPERATIONS

The arterial street network adjacent to I-35 through the central segment consists primarily of urban arterial streets placed on a one-mile grid pattern. These streets are typically four-lane or six-lane divided roadways. They are typically signalized at the intersections of two arterial streets and are also regularly signalized at intersections with local roads or major development driveways. Few if any secondary collector streets exist between these arterial streets giving limited routing choices to drivers.

NORTH SEGMENT – OVERLAND PARK AND KANSAS CITY

The third major segment of I-35 runs generally from Exit 224, 95th Street, to Exit 235, Cambridge Circle, at approximately the Kansas & Missouri state line. This 11-mile segment is higher density suburban / urban in character. The highway has 6 through lanes from Exit 224, 95th Street, to Exit 227, 75th Street. Between Exit 227, 75th Street, and Exit 231, I-635, the highway has 8 primary through lanes. North of the I-635 interchange, the highway returns to the 6-lane cross section. The highway varies in cross section width including auxiliary lanes up to a maximum 10-lane cross section between the interchanges with 67th Street and Shawnee Mission Parkway (US-56) and between Shawnee Mission Parkway (US-56) and Johnson Drive.

This segment of highway includes 15 interchanges. Of these, two are system interchanges with US-69 and I-635. The I-635 interchange is fully directional, whereas the interchange with US-69 only has access from I-35 southbound to US-69 southbound and US-69 northbound to I-35 northbound. The at-grade facilities served by these interchanges include 87th Street, 75th Street, 67th Street, Shawnee Mission Parkway (US-56/69), Johnson Drive, Antioch Road, Lamar Ave, Roe Ave (US-69), Southwest Boulevard, Mission Road, 7th Street Trafficway (US-169), and Cambridge Circle. These interchanges have spacings between 0.5 mile and 1.25 miles, with an average spacing of 0.7 miles. The average spacing in this segment is lower than the FHWA recommendation of 2.0 mile spacing for interchanges. The posted speed limit for this segment is 65 MPH between Exit 224, 95th Street, and Exit 225, 87th Street, and 60 MPH from Exit 225, 87th Street to the Kansas & Missouri state line.

This segment of I-35 passes through a number of small, medium, and large municipalities including Lenexa, Overland Park, Merriam, Mission, and Kansas City, KS. Several other cities located adjacent to the corridor and affected by its operations include Shawnee, Roeland Park, and Westwood. The character of the corridor within this

Figure 3 - North Segment of I-35 ICM Corridor (Source: Johnson County AIMS)
area is a typical inner-ring suburban mix. This includes smaller industrial and commercial parcels lining the highway for the length of the corridor with a mix of multifamily and single family subdivisions adjacent to these industrial and commercial uses. Major traffic generators along this segment of the corridor include Shawnee Mission Medical Center, Ikea Merriam, Merriam Town Center, and the University of Kansas Hospital. The Kansas City Central Business District, albeit outside the direct scope of this project, is one of the largest traffic generators in the region and draws much through traffic that uses the study corridor to access that area.

The surrounding street network consists of arterial roads typically placed on a one-mile grid with regular collector roads spaced on the half-mile grid between the arterial roads. The arterial streets are typically four-lane divided or undivided cross sections and the collector roads typically have two or four-lane undivided cross sections. The exception to this is Shawnee Mission Parkway, which has a 6-lane divided cross section from approximately one-quarter mile east of I-35 to approximately 2.5 miles west of I-35.

**STRATEGIC PLANNING**

**EXISTING PLANS AND IMPLEMENTATION STATUS**

The project team conducted a literature search of relevant studies, designs and reports on the I-35 corridor in Kansas City between Downtown and the Johnson County line near Edgerton. There have been several studies completed in the last 5 years with varying recommendations and levels of effort along with varying cost estimates. The studies and projects reviewed by the project team include the following:

- I-35 Ramp Metering Installation Design – 2016
- Transportation Outlook 2040 – 2015
- Operation Green Light Strategic Plan – 2013-2016
- 5-County Regional Study - 2013
- The Southwest Johnson County Area Plan - 2013
- I-35 Moving Forward Optimization Plan – 2013
- Johnson County Gateway Design – 2013
- Regional Transit Implementation Plan – 2011
- Johnson County Transit Strategic Plan Update – 2011

Although some of the studies reviewed made no specific recommendations for the I-35 corridor, all were in consensus that traffic volumes and congestion were on the rise along the I-35 corridor. Suggested strategies to resolve or counteract the evolution of congestion in the I-35 corridor included expansion of capacity, use of technology, increased multi-modal travel and alternative use of lanes and shoulders, all to be considered or implemented in the short term to long term time frames. Specifically:

- Improve the geometrics of the I-35/I-435/K-10 interchange (under construction)
- Implement Ramp Metering along I-35 to improve flow (in final planning phases)
- Implement Bus-on-Shoulder (BoS) operations to improve transit efficiency (partially implemented)
- Expand capacity of I-35 in the 75th Street area to reduce bottlenecks
- Expand capacity of I-35 to 6-lanes south of Lone Elm Road interchange to reduce congestion
CONCEPT OF OPERATIONS

- Utilize HOT/Managed Lanes strategies to manage user demand
- Improve convenience of transit with additional park and ride locations and transit centers
- Implement Integrated Corridor Management strategies
- Enhance the commuter express routes for transit to improve transit efficiency
- Implement transit signal priority to improve transit efficiency
- Develop a hard shoulder running plan to increase peak hour capacity
- Add auxiliary lanes at various locations to reduce vehicle conflicts
- Enhance arterial operations through Operation Green Light and the use of arterial dynamic message signs (DMS)
- Utilize variable speed limits to enhance safety and manage demand
- Increase bike and pedestrian facilities along the corridor and consider in all designs

There have been varying degrees of implementation of the recommendations of these studies. Many are long-term recommendations and require large revenue commitments in order to become reality and a political champion in order to be considered. Some key implementations that have taken place or are taking place are:

- The Johnson County Gateway project is set to be completed in late 2016 or early 2017. It will significantly improve access to and from the I-35 corridor to I-435 and K-10. This may ultimately hinder the efficiency of the corridor as it will allow for increased loading on an already over-utilized corridor during peak periods.
- Ramp metering at up to 9 locations in the north segment of the I-35 corridor study area between 87th Street and 7th Street Trafficway is scheduled to be in place by the end of 2016 with an operations start date yet to be determined. This will have a major impact on corridor operations if utilized in the manner designed by managing the demand on I-35 near the metered interchanges.
- Bus-on-Shoulder (BoS) operations began in January 2012 along an 8-mile stretch of I-35 from 95th Street to Lamar Avenue. Although not used extensively and operating under speed limitations, the use of BoS has slightly improved the transit travel times along I-35 for express routes and ridership has increased since BoS began. Based on the last report from Johnson County Transit, the most used portions of the BoS are in the southbound direction between I-635 and 75th Street.

In the following pages, the existing studies and projects reviewed are summarized and recommendations with direct or indirect implications on the I-35 corridor are noted along with known implementation status. As project plans and project programming are ever changing, the status of the various recommendations and strategies may change as well.

It should be noted that Integrated Corridor Management strategies don’t necessarily rely on capital improvements in order to be effective, but rather look at various strategies used in concert with each other to improve overall efficiency of the existing infrastructure and capacity. Managing demand, balancing loading and managing incidents that take place on the corridor in a coordinated manner are all key to a successful ICM strategy. Many of the recommendations in the various studies conducted rely upon intense capital improvements or costly systems to improve I-35 operations. ICM seeks to utilize assets we have now and use them more effectively. These existing transportation assets will be detailed and explored further below, along with the capital improvements to come.
# I-35 INTEGRATED CORRIDOR MANAGEMENT

<table>
<thead>
<tr>
<th>Study/Design Name</th>
<th>5 County Regional Study (Phase 2 Final Report)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>April 8, 2013</td>
</tr>
<tr>
<td>Prepared for</td>
<td>KDOT/MARC/Lawrence-Douglas County MPO</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Bright Logistics; Sierra Club/Johnson County Park and Recreation Board; Kansas City, KS Chamber of Commerce; City of Lousburg; Johnson County; Douglas County Commission; League of Women Voters; Lawrence-Douglas County Planning Commission; Leavenworth County Development Corporation; City of Leavenworth; MARC Bicycle/Pedestrian Advisory Committee; Miami County; Commission/Kansas Farm Bureau; Kessinger/Hunter &amp; Company, LLC; City of Olathe; Johnson County Transit; City of Overland Park; Douglas County; KansbikeWalk, Inc.; Unified Government of Wyandotte County Transit; Leavenworth Council on Aging; Unified Government of Wyandotte County; Kansas Turnpike Authority; KCATA, Union Pacific; Second Baptist Church of Olathe; City of Lawrence; Storage Solutions; Lawrence; Transit; Johnson County; Miami County Planning; The Allen Group; Leavenworth County; City of Lansing; general public</td>
</tr>
<tr>
<td>Purpose</td>
<td>To assess the changing transportation needs of the region and identify key strategies to enhance the regional transportation system in a sustainable way</td>
</tr>
</tbody>
</table>

## Strategy/Recommendation Relative to I-35 Corridor

<table>
<thead>
<tr>
<th>Transportation System Management Strategies</th>
<th>Timeframe</th>
<th>Status/Actions Taken to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp metering north of K-7</td>
<td>2020-2030</td>
<td>Ramp metering designed and out for bid May 2016</td>
</tr>
<tr>
<td>Variable speed limits from 127th Street to the KS/MO state line</td>
<td>2020-2030</td>
<td></td>
</tr>
<tr>
<td>Construct new truck inspection stations</td>
<td>2020-2030</td>
<td></td>
</tr>
<tr>
<td>Other TSM strategies that may affect I-35:</td>
<td>US-69, variable speed limits from 143rd St. to I-35</td>
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</tbody>
</table>

## Transportation Demand Management Strategies

| Construct Park & Ride facilities near US-169, K-7, and Santa Fe | 2020-2030 |
| Bicycle/pedestrian facilities: Consider all new or renovated bridges over I-35 | 2020-2030 |

## Other TDM strategies considered but not recommended:
- Commuter transit service from BNSF Intermodal Facility
- Parallel bicycle/pedestrian development
- Transit commuter service connecting Lousburg with JO

## Capacity Strategies

| I-35 and I-635 interchange improvements | 2020-2030 |
| Active lane use control including “hard shoulder running” (with potential for HOT or HOV use only) lane during peak hours from 127th to KS/MO state line | 2030-2040 |
| Construct remaining phases of Gateway project | 2020-2030 |
| Widen I-35 to 6 lanes from Homestead Lane to Lone Elm Road | 2030-2040 |

## Other Capacity strategies that may affect I-35:
- Widen US-69 to 6 lanes from 119th Street to 167th Street, includes interchange at 159th Street
- Construct remaining phases of US-69 and I-435 interchange

## Other Capacity strategies considered but not included in recommendations:
- Construct additional lanes for HOV/HOT use from 127th to the KS/MO state line
## Study/Design Name: The Southwest Johnson County Area Plan

**Date:** November 2013  
**Prepared for:** KDOT, Johnson County, City of Edgerton, City of Gardner, MARC  
**Stakeholders:** KDOT, Johnson County, MARC, City of Gardner, City of Edgerton, general public  
**Purpose:** The purpose of this Southwest Johnson County Area Plan is to identify and evaluate potential development scenarios and determine the transportation system necessary to support development associated with the BNSF intermodal facility.

### Strategy/Recommendation Relative to I-35 Corridor

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Status/Action Taken to Date</th>
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<tbody>
<tr>
<td>Replace Gardner Road bridge over I-35 to 5-lanes, construct right turn lane on NEB off-ramp, construct right turn lane on SWB off-ramp</td>
<td>by 2025</td>
</tr>
<tr>
<td>Gardner Road at I-35 interchange, install traffic signal on NEB off-ramp, install traffic signal on SWB off-ramp</td>
<td>by 2040 Under consideration currently</td>
</tr>
</tbody>
</table>

### Study/Design Name: I-35 Moving Forward, Optimization Plan

**Date:** May 2013  
**Prepared for:** Kansas Department of Transportation, Mid-America Regional Council, Federal Highway Administration  
**Stakeholders:** MARC, Johnson County Transit, Overland Park, Kansas Chamber of Commerce, Unified Government WyCo/KCK, City of Shawnee, City of Lenexa, SmartPort, Rosedale Development Association, City of Olathe, MoDOT, FHWA, Kansas Highway Patrol, City of Gardner, City of Merriam, Mission, Olathe EDC, Johnson County Airport Commission, BNSF Railway, Johnson County, MRI Global, Kansas City Regional Transit Alliance, Southwest Johnson County EDC, Allen Group, Robinson’s Delivery Service, Fairfax Industrial Association, Lenexa Chamber of Commerce, Northeast Johnson County, Chamber of Commerce, KC Scout, Heavy Constructors Association of Greater Kansas City  
**Purpose:** To examine options to keep traffic moving safely and reliably today and in the future along the I-35 corridor in Johnson and Wyandotte counties.

### Strategy/Recommendation Relative to I-35 Corridor

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Status/Action Taken to Date</th>
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</table>
| ITS through corridor, including:  
- Ramp metering  
- Advanced traveler information  
- Enhanced traffic incident management plan  
- Arterial dynamic message signs plan | Ramp metering designed and out for bid May 2016 |
| Expand JoCo Transit Bus on Shoulder | 2013-2020 |
| Fix key bottlenecks (near/mid term):  
- Complete Preliminary Engineering for mainline through 75th Street to extend 4 lane section thru 75th Street in on direction.  
- Detailed geometries study of proposed improvements | 2013-2020 |
| Fix key bottlenecks (mid/long term):  
- Southwest Trafficway/Broadway Improvements  
- I-635 Partial Improvements  
- New Lamar interchange  
- Extend 4 lane section thru 75th Street in other direction  
- Extend 6 lane section near 167th Street to 175th Street  
- Add continuous auxiliary lane from SB Mission on-ramp to 18th St. Expressway off-ramp  
- Add continuous auxiliary lane at 75th Street | 2020-2040 |
| Shoulder running in concert w/ crash investigation sites and active traffic management lane control:  
- Develop plan, including governance plan  
- Shoulder running from KS/MO state line to US-169 | 2013-2020 2020-2040 |
| Managed lanes:  
- Feasibility study  
- Priced managed lanes, KS/MO state line to Homestead Lane | 2013-2020 2040+ |
I-35 INTEGRATED CORRIDOR MANAGEMENT

Study/Design Name: I-35 Ramp Metering Installation Plans

Date: May 2016
Prepared for: KDOT
Stakeholders: Not applicable
Purpose: Construction Plans for installation of ramp meters

Strategy/Recommendation Relative to I-35 Corridor

Install ramp meters at the following locations along the I-35 corridor in Johnson County:

- 7th Street Trafficway – NB and SB
- Southwest Boulevard - SB
- 18th Street Expressway - SB
- Antioch Road – SB (optional bid)
- Johnson Drive - NB
- 67th Street - SB
- 87th Street – NB and SB (optional bid)

Timeframe | Status/Action Taken to Date
--- | ---

Study/Design Name: Kansas City Scout Annual Report

Date: 2014
Prepared by: KDOT/MoDOT
Stakeholders: Not Applicable
Purpose: Summarizes the congestion and incident information that was collected over the year, along with data about the type of assistance provided to motorists, how tools functioned, and the benefits of investing in the Scout program.

Strategy/Recommendation Relative to I-35 Corridor

None – data only.

Highlights relative to I-35 include:

- I-35 had the second highest number of multi-vehicle incidents, 824
  - I-35 SB
    - Past 67th Street: 27 incidents
    - At 67th Street: 1- incidents
    - Past SMP: 11 incidents
    - Past Antioch: 10 incidents
    - Past 95th: 10 incidents
- I-35 NB
  - Past 87th Street: 41 incidents
  - Past 119th Street: 30 incidents
  - At 87th Street: 24 incidents
  - Past I-435: 14 incidents
  - At 75th Street: 14 incidents
  - Past 95th Street: 12 incidents
- NB I-35, 69 Hwy to I-635 is KC’s 3rd most traveled segment in AM peak
- SB I-35, I-635 to 69 Hwy is KC’s 4th most traveled segment in AM peak
- SB I-35, 69 Hwy to I-635 is KC’s 2nd most traveled segment in P.M. peak
- NB I-35, I-635 to 69 Hwy is KC’s 3rd most traveled segment in P.M. peak
Relevant studies with no specific strategies/recommendations for I-35 corridor:

<table>
<thead>
<tr>
<th>Study</th>
<th>Date</th>
<th>Prepared for</th>
<th>Stakeholders</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation Outlook 2040</td>
<td>2015</td>
<td>MARC</td>
<td>MoDOT, KDOT, local transit agencies, local governments, private stakeholders, general public</td>
<td>Provides a policy framework for the investment of anticipated federal, state and local funds, based on anticipated needs and regional goals and objectives, through the year 2040.</td>
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<td>• Notes that corridors w/ significant peak period congestion include I-35 for downtown KCMO to I-435 in Johnson County</td>
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<td></td>
<td>• Notes reconstruction and implementation strategies on I-35 in Johnson County has an example project to support system performance</td>
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<td>• Notes I-35 from Edgerton to 7th Street as a potential ICM corridor</td>
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<td>ICM AMS Workshop</td>
<td>October 23, 2014</td>
<td>MARC</td>
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<td>To motivate, inspire, and equip regional participants to take specific, successful action towards accomplishment advancement of ICM Analysis, Modeling and Simulation (AMS) in the region. Provided a high level overview of the US DOT’s ICM program, ICM AMS methodology, and available resources, and reviewed the five defined work steps of the ICM AMS Approach.</td>
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<td>OGL Strategic Plan: 2013-2016</td>
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CURRENT PROJECTS AND PROGRAMS THAT COMPLEMENT ICM

The Kansas City region has a well-established transportation management program. The Kansas City Scout operations began in 2003 and was followed by the advancement of the Operation Green Light (OGL). OGL coordinates arterial signal systems throughout the metro area. Transit program coordination is continually improving, especially with the consolidation of efforts through KCATA, Johnson County Transit and other regional transit providers. Ramp metering projects have already been implemented on I-435 and will be implemented soon on I-35. The region has also embraced the Transportation System Management & Operations (TSMO) philosophy and is developing TSMO plans to support the Kansas City transportation network well into the future.

Through these various transportation programs, several technologies, systems, and initiatives have emerged that by themselves are very effective and even more so when coordinated. Some of the initiatives noted below work in concert with each other and complement each other, and some work on the fringes of other programs and have minimal overlap. All could potentially be part of a larger ICM initiative here in Kansas City. We will explore these areas more in depth to provide an inventory of what is available in the ICM toolbox to use here in Kansas City.

- Kansas City Scout Transportation Management Center
  - TSMO Plans
  - Device Coverage
  - Operational Parameters
  - Travel Times
  - System Reliability Index
- Operation Green Light
  - Coordinated Arterial Signal Control
- Adaptive Signal Control
- Ramp Metering
  - Loading Management
  - System Wide Coordination
  - Coordination with Arterial Signals
- Traffic Incident Management Plans
  - Motorist Assist
  - Quick Clearance
  - Response Plans
  - Alternate Route Plans (coordinated with arterial signals)
- Transit Initiatives
  - Bus on Shoulder
  - Park and Ride
  - Transit Centers
  - Express Routing
  - Promotion of Multi-Modalism
  - Transit Signal Priority/Queue Jumping
- Traveler Information/Data
  - 511/Public Resources
  - Dynamic Messaging
CONCEPT OF OPERATIONS

- Media
- Private Sector Applications
- Parking Information
- Arterial Information

- Capital Improvements
  - Johnson County Gateway
  - Auxiliary Lane Construction
  - New Interchanges

- Other Strategies
  - HOV/HOT Lanes
  - Ride Sharing
  - Telework Programs
  - Congestion Pricing
  - Hard Shoulder Running
  - Off-Peak Freight Routing
  - Promote Bicycle and Pedestrian Modes
  - Managed Lanes

EXISTING TRANSPORTATION ASSETS

TRANSPORTATION MODES AND FACILITIES IN CORRIDOR

Along the I-35 corridor covered by this study there are two primary modes of personal transportation. These are the passenger car and transit. Commercial transportation consists of freight rail, trucking, and intermodal freight transfers between rail, air, and trucking. No passenger rail exists along the corridor. The vehicular modes of travel has been discussed in depth in the Physical Characteristics of the Corridor section of this report. This section will focus on alternate modes of travel to private and commercial automobiles and commercial trucks.

RAIL TRANSIT

Freight rail exists directly adjacent to the majority of the corridor to the west and north of I-35. The rail corridors consist primarily of two parallel main line tracks with a number of spurs for private industrial users. The rail is primarily owned by Burlington Northern - Santa Fe (BNSF) railway in this corridor. The BNSF Fort Scott line runs adjacent to the corridor from the state line to Old Highway 56 where it continues southward. The BNSF Emporia line runs through downtown Olathe where it begins to mirror the I-35 alignment south of Old Highway 56. There is a connection between these two main rail lines at Old Highway 56 in Olathe. The Johnson County Industrial Airport railway operates a number of spurs lines parallel to the BNSF Emporia line at the New Century Air Center in Gardner. BNSF has recently opened a large new rail to truck intermodal center at Edgerton. The new BNSF intermodal center is expected to generate 9,000 – 11,000 truck trips daily once the facility and surrounding industrial park have been fully developed.

For the most part, the arterial road crossings of the BNSF rail lines are grade separated along the corridor. The notable exceptions to this are at Johnson Drive and 67th Street. At Johnson Drive, there is an at-grade rail crossing
located approximately 150 feet west of the southbound I-35 to Johnson Drive ramp terminals. At 67th Street, the at-grade rail crossing is located approximately 850 west of the southbound I-35 to 67th Street ramp terminals.

Commuter rail has been studied a number of times along this corridor and has always been found to be infeasible. This is primarily due to the high amount of freight rail traffic on the corridor that would likely be given preference over passenger rail by BNSF causing the passenger rail to be unreliable and slow.

**BUS TRANSIT**

Johnson County Transit and the Kansas City Area Transportation Authority operate a limited number of bus lines on and adjacent to the I-35 corridor. These bus lines primarily connect commuters to the central business district (CBD) in downtown Kansas City, Missouri and a number of high traffic destinations near I-35 and I-435 east of I-35. The locations outside of the central business district that the bus system provides regular service to include the Mid-America Nazarene College, the commercial developments at Santa Fe Street (135th Street) and Mur-Len Road, the commercial developments at 119th Street and Strang Line Road, Johnson County Community College (JCCC), the University of Kansas Edwards Campus (KU Edwards), Oak Park Mall, Downtown Mission (Johnson Drive), and the University of Kansas Medical Center.

Johnson County Transit operates Park and Ride lots at many of the more southern major destinations along the I-35 corridor in addition to a few others spread along the corridor. These locations include the Johnson County Library at 4th & Nelson in Edgerton at the end of the 670 bus line, Gardner TradeNet near the New Century Air Center, Mid-America Nazarene College, KU Edwards, Heartland Church (on Strang Line Road near 119th Street), JCCC, Oak Park Mall, and the Mission Transit Center. An excerpt from the Johnson County Transit map is in Figure 4.

Johnson County Transit operates three express service lines from locations along I-35 to downtown Kansas City, Missouri. These include the 661B – Olathe – Downtown Express, the 673N – 151st – Downtown Express, and the 670L – South JoCo – Downtown Express. Each of these lines connects the major park and ride destinations adjacent to the I-35 corridor to downtown Kansas City, Missouri. The 670L line extends from Gardner to downtown, and the 673N line from 151st Street and Mur-Len Road (east Olathe) to downtown.

![Figure 4 - Excerpt of Johnson County Transit system map (Source: Johnson County Transit)](image-url)
KDOT has authorized the use of hard shoulder running for buses on I-35 between the 87th Street and the Johnson County / Wyandotte County line. It was reported in the I-35 Optimization Plan that bus ridership increased by 10.4% in 2013 when the bus-on-shoulder strategy was first implemented in 2012. An exhibit detailing the express routes, park and ride locations, and bus-on-shoulder operating area is shown in Figure 5.
Figure 5 - Johnson County Transit Express Route Operations (Source: Johnson County Transit)
RISE SHARING

The Mid-America Regional Council operates the RideShare Connection and ridesharekc.org. This is a service for commuters in the Kansas City metropolitan area to find ridesharing partners and for employers to organize vanpools. Users can register for the service and utilize it to find carpool or vanpool partners, whether the user is looking for a driver or a passenger. This can be done on a single-trip basis, or the user can enter a customized commute route and timeframe to find alternate modes of transportation to reach their workplace. The website will calculate calories spent on each trip option and pounds of CO₂ spent for each option. A screen capture of the website is included in Figure 6.

![RideShare Connection Website Screen Capture](Source: MARC)
ACTIVE TRANSPORTATION

With recent guidance from the Federal Highway Administration and changes to Title 23 CFR regulations, bicycle and pedestrian travel is now being considered an equal mode of transportation to automobiles. High quality and Americans with Disabilities Act (ADA) accessible bicycle and pedestrian facilities are now being added to all grade separated crossings of I-35 where bridges are rebuilt or rehabilitated. However, the active transportation options in the I-35 corridor remain extremely limited and of poor quality. A number of crossings still have deficient or no pedestrian and bicycle facilities where these modes of transportation are available on either side of the highway. Crossing locations with deficient pedestrian and bicycle facilities include the interchanges of I-35 with 67th Street and Cambridge Circle. No pedestrian and bicycle facilities exist at the interchanges of I-35 with Shawnee Mission Parkway (US-56) or Lamar Ave. Virtually no facilities exist to accommodate active transportation parallel to the I-35 corridor.

The Mid-America Regional Council maintains a complete map of bicycle facilities throughout the metro area. Excerpts of this map showing the I-35 corridor are included in Figure 7 through Figure 9. It should be noted that a number of routes are listed as “Unmarked Share the Road” routes. These routes lack any physical modifications to the roadway to enhance bicyclists’ experience. “Marked Share the Road” routes can be marked either with signs or bike-and-chevron “sharrows.” However, many of these routes indicated on the MARC map appear to lack any signing, pavement marking or have extremely minimal signing. Among both the marked and unmarked “Share the Road” routes many of the indicated routes appear to be unsuitable for bicycle travel with speed limits in excess of 40 MPH, four or six-lane cross sections, narrow lanes, right turn lanes, and no shoulders. A notable example of this is 119th Street.
CONCEPT OF OPERATIONS

Legend

Trail Types
- Bike Lane
- Marked Bike Route
- Marked Share the Road
- Unmarked Share the Road
- Pedestrian Bike Trail
- Shared Use Path
- Mountain Bike Trail
- Equestrian Trail

Figure 7 - Bicycle Facilities in the I-35 South Segment Area (Source: MARC)
Figure 8 - Bicycle Facilities in the I-35 Central Segment Area (Source: MARC)
CONCEPT OF OPERATIONS

Figure 9 - Bicycle Facilities in the I-35 North Segment Area (Source: MARC)

RELEVANT INTELLIGENT TRANSPORTATION SYSTEM INFRASTRUCTURE

The study corridor of I-35 for this report has a robust Intelligent Transportation System (ITS) with infrastructure provided through Kansas City Scout (Scout) and Operation Green Light (OGL). Scout primarily has ITS components focused on the access points to I-35. The Scout infrastructure generally consists of communications networks, traffic sensors, CCTV cameras, dynamic message signs (DMS), and ramp metering. KC Scout controls this infrastructure from a central Transportation Management Center (TMC) located at the Missouri Department of Transportation (MoDOT) Kansas City District Office at 600 NE Colbern Road, Lee’s Summit, MO.

OGL picks up where Scout leaves off on the arterial road network surrounding I-35. OGL controls numerous traffic signals at the interchanges intersecting I-35 and the arterial street network. OGL proposes and maintains regular timing and coordination plans across jurisdictional boundaries and is able to dynamically implement special traffic signal plans from their traffic operations center (TOC) when incidents or special events occur. The OGL TOC is located at the MoDOT Kansas City District Office in Lee’s Summit adjacent to the Scout TMC. Many of the intersections and signals controlled by OGL have surveillance cameras and traffic detectors accessible via the OGL TOC. OGL also maintains a wireless and fiber communication network for both connectivity and to access this infrastructure.
I-35 INTEGRATED CORRIDOR MANAGEMENT

KC SCOUT INFRASTRUCTURE DETAIL

To monitor the operations and incidents on I-35, Scout relies on a network of traffic detectors and surveillance cameras. Along the I-35 study corridor, Scout monitors 83 directional locations for traffic speed, volume, and occupancy. Of these 83 locations, 47 locations are monitored by side-fire radar. Some of the side-fire radar detectors monitor both directions of travel on the highway. In addition to the side-fire radar, 36 inductive loop detectors are in this corridor. All of the loop detectors are located on the corridor north of I-435. Exhibits detailing the ITS infrastructure along the corridor are included on the following pages.

DETECTOR LOCATIONS

In the south segment of the I-35 corridor, Scout maintains 14 detector directional locations. These detectors are spaced between 0.8 mile and 3.1 miles apart. On average, they have 1.9 mile spacing between detector locations. Locations are shown on Figure 10.

Figure 10 – I-35 South Segment Scout Detector Locations Marked as Black Dots (Source: KC Scout)
CONCEPT OF OPERATIONS

The central segment of the I-35 corridor contains 20 detector directional locations. These are spaced between 0.3 mile and 2.1 miles apart with an average spacing of 0.5 mile. Locations are shown on Figure 11.

Figure 11 – I-35 Central Segment Scout Detector Locations Marked as Black Dots (Source: KC Scout)
The northern segment of the I-35 corridor has the highest concentration of detector stations with 49 detectors. These detectors are spaced between 0.07 mile and 1.1 mile apart with an average spacing of 0.3 mile. Locations are shown on Figure 12.

Figure 12 – I-35 North Segment Scout Detector Locations Marked as Black Dots (Source: KC Scout)
CONCEPT OF OPERATIONS

CAMERA AND DYNAMIC MESSAGE SIGN LOCATIONS

Scout maintains 31 pan-tilt-zoom (PTZ) video camera’s along the I-35 study corridor. They have an additional three PTZ snapshot cameras on the route. These cameras are a mixture of CCTV and IP cameras. In the south segment of the I-35 corridor, Scout has eight PTZ video cameras. They are spaced between 0.8 mile and 3.1 miles apart with an average spacing of 1.6 miles. Locations are shown on Figure 13.
In the central segment of the I-35 corridor, Scout has eight PTZ video cameras and two PTZ snapshot cameras. They are spaced between 0.8 mile and 2.1 miles apart with an average spacing of 1.1 miles. Locations are shown on Figure 14.

Figure 14 – I-35 Central Segment Scout Camera and DMS Locations (Source: KC Scout)
CONCEPT OF OPERATIONS

In the north segment of the I-35 corridor, Scout has 15 PTZ video cameras and one PTZ snapshot cameras. They are spaced between 0.2 mile and 1.0 miles apart with an average spacing of 0.7 mile. Locations are shown on Figure 15.

Figure 15 – I-35 North Segment Camera and DMS Locations (Source: KC Scout)

Scout also maintains dynamic message signs (DMS) along the study corridor. In the corridor, there are six north-facing DMS and four south-facing DMS. The DMS locations are shown in the preceding figures with the camera locations. The south segment contains only one DMS sign facing the north direction. The central segment contains four DMS, two facing the north and two facing the south. The north segment contains five DMS. Three of these face the south, and two face the north. All of these DMS are National Transportation Communications for Intelligent Transportation System Protocol (NTCIP) 105x27 specification boards. They have three rows of text and each row can display up to 21 characters.
COMMUNICATIONS NETWORK

The communications that Scout uses to communicate with the ITS infrastructure is a mixture of radio, private fiber optic, and KC Scout fiber optic networks. From Santa Fe Street (135th Street) and to the south, Scout does not maintain any fiber optic communications. In this area, the Century Link fiber optic network is utilized for all data collection. The data is collected from individual sensors either via radio to a centralized radio receiver and then connected to the fiber network, or connected directly to the fiber network. Between Santa Fe Street (135th Street) and College Boulevard, there is a mixture of Century Link and Scout fiber optic networks utilized. The Century Link network interfaces with the Scout network in this area. North of College Boulevard, all communications are routed back to the TMC via Scout fiber optic communications.

The detailed communication infrastructure is described herein starting from the south and working northward. The radar and camera units at Sunflower Road, Spoon Creek Road, Gardener Road, and 199th Street and the DMS at Moonlight Road are all connected via radio point-to-multi-point link to the Verizon Wireless communication tower at the southeast corner of the I-35 and Homestead Lane interchange. A PTZ camera is located on the Verizon tower. All of the data received at the Verizon tower radio is connected by licensed radio to the Kansas Highway Patrol (KHP) Troop A building tower at 1220 S Enterprise St, Olathe. The transportation related data transmitted through the KHP tower is then connected to Scout with the Century Link fiber network.

The radar and camera at Clare Road is connected via radio point-to-multi-point link to the Scout pole at 175th Street. The radar and camera on the 175th Street pole and the Clare Road radar and camera are then connected to the Century Link fiber network. With a similar setup, the radar and camera at 167th Street is connected via radio point-to-multi-point link to Scout pole at Lone Elm Road. The radar and camera on the Lone Elm Road pole and the 167th Street radar and camera are then connected to the Century Link fiber network. The radar and camera at 151st Street, Sheridan Street, and Prairie Street and the DMS at Santa Fe Drive all connects directly to the Century Link fiber optic network.

Continuing to the north, the radar, camera, and DMS at 127th Street all connect directly to Scout fiber. In this area, the Scout and Century Link fiber optic networks are interfaced. Continuing to the north, all Scout ITS infrastructure is connected directly to Scout fiber. There is a reported excess of capacity in the Scout fiber network in this area. From this area, all communications are linked back to the Scout TMC via their fiber optic communication lines that run along I-435.
CONCEPT OF OPERATIONS

FUTURE SCOUT INFRASTRUCTURE – RAMP METERING

Scout is currently in the planning process to implement ramp metering in the I-35 study corridor of this report. To date, they have identified 10 on-ramps recommended for metering. All of the locations identified for ramp metering are in the north segment of the study corridor. These ramps include 87th Street northbound and southbound, 67th Street southbound, Johnson Drive northbound, Antioch Road southbound, Roe Boulevard (18th Street Expressway) northbound and southbound, Southwest Boulevard southbound, and 7th Street Trafficway / Rainbow Boulevard (US-169) northbound and southbound. Figure 16 depicts the locations recommended for ramp metering installation and those not recommended. The design of the ramp metering plans at the recommended on-ramps are currently underway.

![Figure 16 - KC Scout Ramp Metering Recommendations](Source: KC Scout)

OPERATION GREEN LIGHT INFRASTRUCTURE DETAIL

Operation Green Light primarily coordinates, operates, and monitors the operation of a connected traffic signal network. Along the I-35 study corridor, OGL operates connected signal corridors along Santa Fe Street (135th Street), 119th Street, 95th Street, 87th Street, Quivira Road, 75th Street, Shawnee Mission Parkway (US-56), Johnson Drive, Antioch Road, Merriam Lane, Mission Road, Southwest Boulevard, and 7th Street Trafficway / Rainbow.
Boulevard (US-169). These arterial corridors represent all of the most congested and highest volume major arterial roadways that connect to I-35 with interchanges that also have a multitude of closely spaced traffic signals near the interchanges. Locations of these corridors and the signals controlled by OGL are shown on Figure 17. The cities of Overland Park and Olathe also have connected signals that are controlled through their own traffic management system. The Overland Park and Olathe signals are not included on Figure 17.
OPERATION GREEN LIGHT COMMUNICATIONS

The OGL communications between traffic signals along an individual corridor is a mix of radio, twisted pair copper and fiber optic lines. OGL utilizes unlicensed 5.3/5.4 and 5.8 GHz wireless radio network at its intersections. The communication between these signals and the TOC is then broadcast via a licensed 18 GHz microwave backbone and back to the TOC at the MoDOT District Office in Lee’s Summit, MO. Through the Mid-America Regional Council (MARC), OGL owns the communication system.

OGL operates a number of PTZ video cameras on their signals and are able to view these feeds real-time through an 18 GHz microwave link. OGL has agreed with several other agencies via IP to view both detection and surveillance cameras at signals off of the OGL system. Some of these signals also directly abut I-35. Both OGL cameras (and the other agency cameras) could see I-35 to supplement Scout’s camera coverage and Scout cameras could view OGL routes to supplement OGL camera coverage.

CURRENT OPERATIONS OF THE CORRIDOR

The traffic operations of the I-35 corridor covered by this report has been studied a number of times in the recent past and is well understood. The studies most relevant to this study and modeling are the 5 County Regional Study (Phase 2 Final Report); I-35 Moving Forward, Optimization Plan; and Transportation Outlook 2040. Each of these studies undertook extensive review and modeling of the corridor to provide recommendations for the future design horizons. A brief overview of the current operations of the I-35 corridor follows.

The I-35 corridor covered by this report’s concept of operations functions much like a typical urban arterial freeway. During the typical workday, the major traffic movement in the A.M. peak hour is from suburban Johnson County northbound towards the downtown central business district in Kansas City, Missouri. In the P.M. peak hour major traffic movement is from the central business district southbound to the suburbs. These peak hours typically fall within the 7:00 a.m. – 9:00 a.m. period in the morning and the 4:00 p.m. – 6:00 p.m. period in the afternoon. The peak demand times are typically 7:30 a.m. – 8:00 a.m. in the morning and 5:00 p.m. – 5:30 p.m. in the afternoon.

In addition to the typical urban freeway operations, there is a smaller but not insignificant reverse commuter pattern along this I-35 corridor. There are many employment and shopping destinations in central Johnson County primarily clustered around the I-435 and Metcalf area and along I-35 south of 87th Street. There are large tracts of residential land use between these destinations and the central business district. These residential sections lead to many southbound commuters for work in the A.M. who exit on US-69 southbound to access the destinations on I-435 or continue on I-35 southbound to their destinations. These commuters then return home northbound in the P.M. (see Figure 23 and Figure 24). This is most evident in the north section of the I-35 corridor.

DEMAND CHARACTERISTICS OF THE CORRIDOR

Major access points where vehicles enter onto I-35 in this corridor include the interchanges with Santa Fe St (135th Street), 119th Street, I-435, US-69, Shawnee Mission Parkway (US-56), I-635, and Southwest Boulevard / Mission Road. The I-35 corridor in this study area currently operates well during normal traffic conditions (minus incidents) for the majority of the highway sections. The operations are detailed by highway segment below. Daily peak traffic periods experience a decrease in traffic speeds in both the central and north I-35 corridor segments. The data
used in this report comes from the Regional Integrated Transportation Information System (RITIS) tool as provided by MARC. RITIS analysis of the work day operations of the corridor illustrated that Tuesday and Thursday are the days of the week with the highest traffic volumes and most variation in travel times. Therefore, the project team selected Tuesday as the benchmark day to evaluate operations. Operating speeds along the I-35 corridor were averaged for each Traffic Message Channel (TMC) segment of the corridor for every Tuesday in 2015 to provide a typical workday snapshot.

**SOUTH SEGMENT – EDGERTON TO OLATHE**

The south segment of the highway from approximately Edgerton to Olathe is primarily rural and exurban in nature and has no substantial operational issues during the typical workday. In this data from 2015, the peak hour commuter traffic shows very little operational effect on the highway. The average travel speeds over the length of the south segment reported by hour of the day are shown in Figure 18. The posted speed limit in this segment is 70 MPH.

![Figure 18 - I-35 South Segment Average Travel Speed (Average over all Tuesdays in 2015)](image-url)
CENTRAL SEGMENT – OLATHE AND LENEXA

In the central segment of the I-35 corridor, which includes the less dense exurban and suburban area, approximately from the southern boundary of Olathe to the eastern boundary of Lenexa, the effects of the commuter traffic become apparent. However, this segment of the corridor still maintains a very good level of service and has few operational issues.

This segment experiences the typical commuter pattern of travel. In the A.M. peak hour, there is a higher northbound volume towards the central business district of Kansas City, Missouri, and in the P.M. peak hour, there is a higher southbound volume. During these peak travel times and in the peak travel direction, the speeds of the highway are lowered somewhat below the free flow speed. However, the speeds experienced during a typical incident-free travel period seem to suggest that the highway maintains excess capacity over the demand. The average travel speeds over the length of the central segment reported by hour of the day are shown in Figure 19. The posted speed limit in this segment is 65 MPH.

![Figure 19 - I-35 Central Segment Average Travel Speed (Average of all Tuesdays in 2015)](image-url)
The north segment of I-35, generally from Exit 224, 95th Street to Exit 235, Cambridge Circle, at approximately the Kansas & Missouri state line, has a higher density suburban / urban character. The denser land uses, coupled with the closer proximity to the major travel generator of the central business district lead to a much higher travel volume than the south or central segments. As detailed previously, this segment has a strong typical commuter pattern to and from the central business district, but also has a less intense but still substantial reverse commuter movement to the south.

The corridor in this segment experiences substantial speed drops in both directions in the A.M. and P.M. peak hours. The most substantial locations and times for congestion are in the northbound direction in the A.M. peak hour and in the southbound direction in the P.M. peak hour. It is evident from the speeds experienced during these times that the highway demand has exceeded the capacity. The average travel speeds over the length of the north segment reported by hour of the day are shown in Figure 20. The posted speed limit in this segment is 60 MPH.
CONCEPT OF OPERATIONS

CONGESTION IN THE CORRIDOR

The I-35 corridor in this study generally has sufficient capacity to carry the existing vehicular demand. However, there are a few key areas where the demand exceeds the capacity. With the Johnson County Gateway project nearing completion, these areas are all contained within the northern segment of the corridor. The main capacity restrictions are illustrated for the northbound and southbound directions in the following two exhibits, Figure 21 and Figure 22. The main physical characteristics of the highway that affect capacity are noted below the exhibits.

![Figure 21 - I-35 Average Southbound Peak Hour Travel Speed (Average over all Tuesdays in 2015)](image)

The primary points of congestion in the southbound direction are noted as follows:

1. Merge point of Southwest Trafficway / Mission Road entrance ramp
2. Short weaving section (less than 900 feet) for auxiliary lane between Johnson Drive entrance ramp and Shawnee Mission Parkway (US-56) exit ramp
3. Short weaving section (less than 900 feet) for auxiliary lane between Shawnee Mission Parkway (US-56) entrance ramp and 67th Street exit ramp
4. Lane drop from four through lanes to three through lanes between the 67th Street and 75th Street interchanges
5. This capacity restriction was temporary due to the ongoing construction on the southbound I-35 lanes in the vicinity of Santa Fe Street (135th Street) and Old Highway 56—I-35 was restricted to two through lanes in the southbound direction and three lanes in the northbound direction
The primary points of congestion in the northbound direction are noted as follows:

1. Merge point of US-69 to I-35 interchange ramp
2. Lane addition from three through lanes to four through lanes on I-35 north of the 75th Street
3. Lane drop from four through lanes to three through lanes to provide the collector-distributor road for the I-635 exit and entrance ramps
4. Lane addition from three through lanes to four through lanes on I-35 north of the I-635 entrance ramp

The average delay experienced by commuters is reported in Figure 23 and Figure 24. It is evident that the majority of the delay incurred by drivers comes in the north segment. The only other area to add a significant amount of delay is the central segment in the northbound direction in the A.M. peak travel time and in the southbound direction in the P.M. peak travel time. The maximum delay incurred by a driver on average is approximately 14 minutes, which accounts for traveling southbound from the state line southbound to Edgerton in the 5:00 p.m. hour. The north segment accounts for 11 minutes of the 14 minutes of delay.
CONCEPT OF OPERATIONS

Figure 23 - Southbound I-35 Average Minutes of Delay (Average of all Tuesdays in 2015)

Figure 24 - Northbound I-35 Average Minutes of Delay (Average of all Tuesdays in 2015)
TRAFFIC INCIDENTS

HIGHWAY

KC Scout coordinates responses to incidents and tracks the incidents that occur in the Kansas City metropolitan area. In 2015, there were 30,764 incidents on the freeways that KC Scout covers. Of these, 6,803 were lane blocking incidents and 4,740 incidents involved multi-vehicle collisions. Fifty-five percent (55%) of the incidents were due to a stalled vehicle. Figure 25 shows the full breakdown of the incidents in the KC Scout coverage area. Approximately one-third of all incidents in the KC metro area occurred during the A.M. and P.M. peak travel periods. Along the I-35 corridor covered in this report, a lane blocking incident occurred somewhere along the study corridor approximately every other day in the A.M. peak travel period, and two out of three days in the P.M. peak hour period on average. The average clearance time for incidents across the KC Scout coverage area was 36 minutes in 2015.

![Figure 25 - Breakdown of Incident Types in KC Scout Coverage Area (Source: KC Scout)](image)

The I-35 corridor through the Kansas City metropolitan area (on both the Kansas and Missouri sides of the state line) has the highest number of multi-vehicle incidents of any corridor in the Metro area. In 2015, there were 1054 multi-vehicle incidents I-35 northbound and I-35 southbound. This is nearly one-quarter of all the multi-vehicle crashes in on the freeways in the Metro area. Most of the areas on I-35 identified with the highest number of multi-vehicle incidents are within this study corridor area. Figure 26 illustrates the areas prone to multi-vehicle accidents.
As noted earlier in this report, KC Scout operates a TMC that monitors the traffic and incidents along the freeways in the Metro area. The operators at this center utilize real-time traffic data and cameras to detect incidents. However, the majority of the incidents on metro area freeways are detected by emergency response operators via the 911 system. These operators detected over one-third of the incidents on the freeways in 2015. The TMC operators detected approximately 20% of the incidents, and area police and highway patrol detected approximately 15% of the incidents. A full breakdown of area incident detection is listed in Figure 27.
Operation Green Light (OGL) manages the arterial signal coordination for participating municipalities in the region. Through coordinated planning efforts, OGL has established operating protocols for responding to arterial incidents and congestion documented in the 2015 Concept of Operations for Non-Recurring Congestion Plans and in a series of Incident Response Plans. The Incident Response Plans are coordinated with the participating agencies and managed by the OGL team.

Incident detection on arterials occurs via KC Scout reports, CCTV camera observation by OGL staff, or reports from local agencies. An Incident Response Plan is initiated when the event is determined by OGL staff to warrant and incident response. The plan is then manually implemented by the OGL staff with notification to affected agencies.
SYSTEM RELIABILITY

Recurring and non-recurring congestion due to incidents, special events, and weather leads to an unpredictable commute on I-35 within the study area of this report. Because the corridor is reaching capacity in some areas, a lane blocking incident has the possibility of severely impacting the operations of the highway. Given the large number of lane blocking incidents as described in the previous section, this makes it difficult for commuters to plan the travel time required to reliably arrive at their destination on time.

The FHWA has recognized the importance of travel time reliability as a measure for the traveling public. The unexpected delays are most troublesome for commuters because the event and its impacts are unpredictable and difficult to avoid. Therefore, the unexpected delays are those that affect travelers’ confidence in the transportation network the most, as illustrated in the FHWA graphic in Figure 28.

A common way to quantify this unpredictability is by using the Planning Time Index (PTI). The PTI is a measure of how much additional time a commuter must factor into their travel time in order to arrive at their destination on time within certain probabilities. A PTI of 1.0 indicates that the travel time is equal to the free flow speed travel time. A PTI of 2.0 indicates that the driver must double their expected travel time over the free flow speed travel time to arrive at their destination on-time.

The PTI is reported based on confidence intervals. For a commuter who travels to work five days per week, if the commuter arrives at their workplace on time 95% of the time, this equates to arriving late to work once every four weeks. If the commuter arrives at their workplace on time 80% of the time, this equates to arrive late to work once every week. It is important to note that the PTI does not indicate how much extra time is needed to complete the average commute over the specified confidence interval. For example, arriving on time 95% of the time means arriving on time exactly within the allotted time frame. It does not connote whether the commuter may be 1 minute or 10 minutes late the one day per month that they would probably be late.

The following two exhibits, Figure 29, detail the PTI for the entire I-35 corridor covered by this study based on the HERE data as provided by MARC. The free flow travel time for this segment of I-35 is approximately 33 miles long and takes approximately 30 minutes to traverse by auto during free flow conditions. The A.M. peak hour in the northbound direction and the P.M. peak hour in the southbound direction experience the least reliable commute times. During the typical weekday commute in 2015, in order to arrive on time to your destination 95% of the time for these two movements required a PTI of 2.09, or 63 minutes, from Edgerton to the state line in the A.M. peak hour and a PTI of 2.18, or 65 minutes, from the state line to Edgerton in the P.M. peak hour. If the confidence interval is lowered to 75%, then the PTI is reduced to 1.37, or 41 minutes, from Edgerton to the state line in the A.M. peak hour and a PTI of 1.58, or 47 minutes, from the state line to Edgerton in the P.M. peak hour.
Figure 29 - I-35 Northbound Planning Time Index (Tuesday in 2015)
CONCEPT OF OPERATIONS

RECOMMENDED USE CASES

To clearly scope the Concept of Operations, one Use Case was selected to be thoroughly analyzed. The Use Case presents a single user’s point of view from trip origin to destination, considering decision factors, resources available, and choices made. The selected Use Case was considered in three scenarios for four conditions for a total of twelve operational views. The scenarios are Current (2016), Future (2030), and ICM. Each of the scenarios was evaluated in four conditions: Typical commute; Incident during commute; Planned Construction along I-35; and One Time Event that causes major predictable delays along I-35. The single Use Case, evaluated in the various scenarios and conditions, provides a solid basis of comparison and evaluation of the transportation network from the user’s perspective. The insight gained during the Current and Future Use Cases informs the ICM techniques recommended and highlights operations that are most likely to have a positive benefit to users when implemented. Table 1 outlines the Use Case operational scenarios.

<table>
<thead>
<tr>
<th>Current (2016)</th>
<th>Typical</th>
<th>Incident</th>
<th>Planned Construction</th>
<th>One Time Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future (2030)</td>
<td>Typical</td>
<td>Incident</td>
<td>Planned Construction</td>
<td>One Time Event</td>
</tr>
<tr>
<td>ICM</td>
<td>Typical</td>
<td>Incident</td>
<td>Planned Construction</td>
<td>One Time Event</td>
</tr>
</tbody>
</table>

The project team obtained input for the scenarios from existing models, plans, and documented resources of MARC, KDOT, KC Scout and Operation Green Light (OGL). The Current (2016) scenarios were evaluated using real time mapping applications, information from RITIS, team access of existing travel planning tools, and phone calls as
needed to validate current use of known existing planning resources (such as the KU Medical Center’s internal Ride Share website). The Future (2030) scenarios were evaluated based on travel times predicted from the MARC regional travel demand model. Since the model is a regional model, it was not an accurate predictor of real times for the specific trip our User would take. However, the differences (increase or decrease) in travel times for the conditions and routes of the User was used to compare travel alternatives. The Future conditions, available technology, and road conditions were predicted by the project team based on development trends. The technology, tools, and implementation were grouped by type of resource so the user’s behavior is not tied to specific technological solutions. For example, Google Maps is currently a popular mapping and traffic information tool. Google Maps is considered as a mobile “push-pull” mapping tool that will “push” travel information for known trips and is available for users to “pull” information on demand. Categorizing Google Maps in this way allows new mobile tools to be similarly grouped and the user could choose any of the tools in this group. Future scenarios are more robust using the categories because they are not tied to a specific technology.

TABLE OF USE CASES CONSIDERED

The user definition, origin, and destination for the potential Use Cases was selected by the MARC ICM team, based on the problem areas and priorities for improvement.

The User Information is more detailed than typical transportation assessments. The User here creates a vision of a person in the metro area living their life. This supports the project team’s analysis by illuminating the factors that inform decisions the User may make related to transportation choices.

Mode is not included as part of the primary Use Case. The User’s decision on mode (private auto, transit, ride share, etc.) is based on the travel conditions, available options, and trip purpose.

Demographics considered follow in Table 2:

<table>
<thead>
<tr>
<th>Gender</th>
<th>Life Status</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male or Female</td>
<td>Single</td>
<td>18–24</td>
</tr>
<tr>
<td>Male or Female</td>
<td>Single w/kids</td>
<td>25–30</td>
</tr>
<tr>
<td>Male or Female</td>
<td>Married</td>
<td>30–35</td>
</tr>
<tr>
<td>Male or Female</td>
<td>Married w/kids</td>
<td>40–45</td>
</tr>
<tr>
<td>Male or Female</td>
<td>Widowed</td>
<td>50–55</td>
</tr>
</tbody>
</table>

Table 2 - Demographics Considered

Trip Purposes considered follow in Table 3:

<table>
<thead>
<tr>
<th>Purposes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work</td>
</tr>
<tr>
<td>Home</td>
</tr>
<tr>
<td>School</td>
</tr>
<tr>
<td>Shopping/Use</td>
</tr>
<tr>
<td>Recreation</td>
</tr>
</tbody>
</table>

Table 3 - Trip Purposes Considered

Major origins and destinations were considered and the potential trip purpose for each was identified. Some areas were narrowed to a neighborhood or community in order to help visualize a real user associated with each trip. The trip origins, destinations and associated trip purposes follow in Table 4:
**CONCEPT OF OPERATIONS**

<table>
<thead>
<tr>
<th>Traveling From / To [Origin / Destination]</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downtown, Kansas City, MO</td>
<td></td>
</tr>
<tr>
<td>Shawnee Mission Parkway, Shawnee, KS</td>
<td></td>
</tr>
<tr>
<td>75th &amp; Antioch Area, Overland Park, KS</td>
<td></td>
</tr>
<tr>
<td>95th &amp; Metcalf, Overland Park, KS</td>
<td></td>
</tr>
<tr>
<td>103rd &amp; Quivira, Overland Park, KS</td>
<td></td>
</tr>
<tr>
<td>127th &amp; N Mur-Len, Olathe, KS</td>
<td></td>
</tr>
<tr>
<td>151st &amp; S. Pflumm, Olathe, KS</td>
<td></td>
</tr>
<tr>
<td>K-7 and W. Santa Fe, Olathe, KS</td>
<td></td>
</tr>
<tr>
<td>N Center &amp; E Main, Gardner, KS</td>
<td></td>
</tr>
<tr>
<td>W Morgan &amp; Edgerton, Edgerton, KS</td>
<td></td>
</tr>
<tr>
<td>Downtown, Kansas City, MO</td>
<td></td>
</tr>
<tr>
<td>Armourdale Rail Yard, Kansas City, KS</td>
<td></td>
</tr>
<tr>
<td>KU Medical Center</td>
<td></td>
</tr>
<tr>
<td>Shawnee Mission Parkway, Shawnee, KS</td>
<td></td>
</tr>
<tr>
<td>Shawnee Mission Medical Center</td>
<td></td>
</tr>
<tr>
<td>Oak Park Mall</td>
<td></td>
</tr>
<tr>
<td>Corporate Woods, College Blvd.</td>
<td></td>
</tr>
<tr>
<td>Johnson County Government Plaza (119th St.)</td>
<td></td>
</tr>
<tr>
<td>Johnson County Community College</td>
<td></td>
</tr>
<tr>
<td>Mid-America Nazarene University</td>
<td></td>
</tr>
<tr>
<td>Heritage Park Sports Complex</td>
<td></td>
</tr>
<tr>
<td>BSNF Intermodal Facility, Edgerton, KS</td>
<td></td>
</tr>
</tbody>
</table>

**Table 4 – Travel Patterns and Trip Purpose**

The Use Cases considered for evaluation were distilled from the demographics, trip purposes, and travel patterns iterated above. Random combinations were created to offer logical users for an associated origin, destination and trip purpose. This list of Potential Use Cases was vetted through the Stakeholders for preferences by publicly posting the potential Use Cases on the ICM page on the MARC website. The table of Use Cases Considered follows in Table 5:
## Table 5 - Potential Use Cases Considered

<table>
<thead>
<tr>
<th>Potential Use-Case</th>
<th>User Info</th>
<th>Traveling From</th>
<th>Traveling To</th>
<th>Purpose</th>
<th>Time of Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Male 18 – 24 years Single</td>
<td>K-7 and W. Santa Fe, Olathe, KS (near Walmart south of Ernie Miller Nature Park)</td>
<td>Johnson County Community College</td>
<td>School</td>
<td>A.M. [non-peak]</td>
</tr>
<tr>
<td>B</td>
<td>Female 25 to 30 years Single</td>
<td>127th &amp; N Mur-Len, Olathe, KS (near Pioneer Trail Middle School)</td>
<td>KU Medical Center</td>
<td>Work</td>
<td>A.M. [peak]</td>
</tr>
<tr>
<td>C</td>
<td>Male 25 to 30 years Married</td>
<td>151st &amp; S. Pflumm, Olathe, KS (near Black Bob Park)</td>
<td>Downtown, Kansas City, MO</td>
<td>Work</td>
<td>A.M. [peak]</td>
</tr>
<tr>
<td>D</td>
<td>Male 30 – 35 years Married w/kids</td>
<td>Downtown Kansas City, KS</td>
<td>Near Johnson County Community College</td>
<td>Home/Recreation</td>
<td>P.M. [peak]</td>
</tr>
<tr>
<td>E</td>
<td>Female 40 – 45 years Single w/kids</td>
<td>75th &amp; Antioch Area (near Shawnee Mission Medical Center)</td>
<td>BSNF Intermodal Facility, Edgerton, KS</td>
<td>Work</td>
<td>A.M. [peak]</td>
</tr>
<tr>
<td>F</td>
<td>Male 50 – 55 years Married</td>
<td>BSNF Intermodal Facility, Edgerton, KS</td>
<td>Armourdale Rail Yard, Kansas City, KS</td>
<td>Freight</td>
<td>A.M. [non-peak]</td>
</tr>
<tr>
<td>G</td>
<td>Female 60 – 65 years Widowed</td>
<td>127th &amp; N Mur-Len, Olathe, KS (near Pioneer Trail Middle School)</td>
<td>Shawnee Mission Parkway, Shawnee, KS</td>
<td>Pick up Grandchild from School</td>
<td>P.M. [peak]</td>
</tr>
<tr>
<td>H</td>
<td>Male 70 – 75 years Married</td>
<td>103rd &amp; Quivira, Overland Park, KS (neighborhoods south of Oak Park Mall)</td>
<td>KU Medical Center</td>
<td>Use</td>
<td>P.M. [non-peak]</td>
</tr>
<tr>
<td>I</td>
<td>Female 80 – 85 years Widowed</td>
<td>W Morgan &amp; Edgerton, Edgerton, KS</td>
<td>Shawnee Mission Parkway, Shawnee, KS</td>
<td>Recreation</td>
<td>P.M. [non-peak]</td>
</tr>
</tbody>
</table>
CONCEPT OF OPERATIONS

JUSTIFICATION OF USE CASE SELECTED FOR ANALYSIS

Stakeholders responded that Use Cases B and C were preferred because they represented a trip that covered much of the study corridor, and were representative of a large number of A.M. peak period trips. The project team evaluated the details of the two trips to compare them and verify that the final selection provided the most robust scenario.

The team considered the corridor length in detail. The longer corridor represented by Use Case C (151st St. & S. Pflumm to downtown KC, MO) presented more opportunities for transit use or diverting trips to arterials because of the increased distance traveled. However, the longer trip would also be more complex for future modeling and could introduce too many variables for an initial Use Case for ICM in the corridor. The shorter corridor of Use Case B (127th & N. Mur-Len to KU Medical Center) was evaluated as being more realistic and lent itself to a higher probability of ICM implementation as an initial effort. The destination of KU Medical Center was valuable because it is a logical hub, KU Medical Center could be potential partner in ICM techniques, and KCATA was planning a last-mile planning tool (Ride KC Regional Transit Plan & Ride KC Workforce Connex) that would have its initial implementation at KU Medical Center. Therefore, the origin and destination of Use Case B (127th & N. Mur-Len to KU Medical Center) was confirmed.

The team also considered the travel time of A.M. peak versus P.M. peak. The P.M. peak has higher travel volumes as reported in the regional planning studies and by RITIS data. However, there is a higher perceived value of getting to work on time to begin the workday. Travel reliability is more critical for commuters traveling to work, which happens mostly during the A.M. travel times in the metro area. Off peak travel times are more reliable and have lower travel volumes, so that time period was not selected. The team determined that the higher criticality of the A.M. travel warranted preference for the first Use Case.

Trip B was ultimately selected because the trip from 127th and Mur-Len to KU Medical Center is entirely within the study area, the trip length is long enough to evaluate and short enough to implement, and travelers value a reliable travel time in the A.M. peak in the metro area.

Details about the User were developed to complete the User description as defined within the framework of the demographics, origin, demographics, origin, destination and trip purpose selected. The project team identified Sarah, a 29-year old radiologist at KU Med, who radiologist at KU Med, who likes country music, and is a Roasterie coffee fan. Sarah, iconized in Figure 31, lives in a townhouse that she owns at 127th and Black Bob with her young child. She plays volleyball on co-ed, evening league. On Tuesday morning, Sarah needs to get to work at KU Medical Center for an 8:45 A.M. patient appointment. She will depart from her townhouse near S. Black Bob Road and 127th Street so she can arrive 30 minutes prior to her appointment to turn on her radiology equipment. On the way to work, Sarah drops her child off at her parents’ house at West 61st Street (east of Antioch) in Merriam for day care.

Figure 31 – Sarah (User)
## APPENDIX A – LIST OF STAKEHOLDERS

<table>
<thead>
<tr>
<th>Organization</th>
<th>First</th>
<th>Last</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bike-Walk KC</td>
<td>Eric</td>
<td>Bunch</td>
</tr>
<tr>
<td>Bike-Walk KC</td>
<td>Eric</td>
<td>Vaughan</td>
</tr>
<tr>
<td>FHWA</td>
<td>David</td>
<td>LaRoche</td>
</tr>
<tr>
<td>FHWA</td>
<td>John</td>
<td>Knowles</td>
</tr>
<tr>
<td>Gardner</td>
<td>Tim</td>
<td>McEldowney</td>
</tr>
<tr>
<td>Johnson County</td>
<td>Brian</td>
<td>Pietig</td>
</tr>
<tr>
<td>Johnson County</td>
<td>Paul</td>
<td>Greeley</td>
</tr>
<tr>
<td>Johnson County</td>
<td>Penny</td>
<td>Postoak Furgeson</td>
</tr>
<tr>
<td>Johnson County Commissioner</td>
<td>Steve</td>
<td>Klika</td>
</tr>
<tr>
<td>Johnson County EOC</td>
<td>Cary</td>
<td>Gerst</td>
</tr>
<tr>
<td>Johnson County Transit</td>
<td>Josh</td>
<td>Powers</td>
</tr>
<tr>
<td>Kansas Highway Patrol</td>
<td>Candice</td>
<td>Breshears</td>
</tr>
<tr>
<td>KC Scout</td>
<td>Marcus</td>
<td>Slaughter</td>
</tr>
<tr>
<td>KC Scout</td>
<td>Mark</td>
<td>Sommerhauser</td>
</tr>
<tr>
<td>KC Scout</td>
<td>Randy</td>
<td>Johnson</td>
</tr>
<tr>
<td>KCATA</td>
<td>Chuck</td>
<td>Ferguson</td>
</tr>
<tr>
<td>KCATA</td>
<td>Shawn</td>
<td>Strate</td>
</tr>
<tr>
<td>KCMO</td>
<td>Bob</td>
<td>Bennett</td>
</tr>
<tr>
<td>KCMO - Traffic</td>
<td>Chris</td>
<td>Lockey</td>
</tr>
<tr>
<td>KCMO EOC</td>
<td>Jennifer</td>
<td>Fales</td>
</tr>
<tr>
<td>KDOT</td>
<td>David</td>
<td>Schwartz</td>
</tr>
<tr>
<td>KDOT</td>
<td>Davonna</td>
<td>Moore</td>
</tr>
<tr>
<td>KDOT</td>
<td>Hugh</td>
<td>Bogel</td>
</tr>
<tr>
<td>KDOT</td>
<td>Kim</td>
<td>Qualls</td>
</tr>
<tr>
<td>KDOT</td>
<td>Mike</td>
<td>Floberg</td>
</tr>
<tr>
<td>KDOT</td>
<td>Shari</td>
<td>Hilliard</td>
</tr>
<tr>
<td>Lenexa</td>
<td>Steve</td>
<td>Schooley</td>
</tr>
<tr>
<td>Lenexa</td>
<td>Tim</td>
<td>Green</td>
</tr>
<tr>
<td>MARC</td>
<td>Amanda</td>
<td>Graor</td>
</tr>
<tr>
<td>MARC</td>
<td>David</td>
<td>Warm</td>
</tr>
<tr>
<td>MARC</td>
<td>Jim</td>
<td>Hubbell</td>
</tr>
<tr>
<td>MARC</td>
<td>Keith</td>
<td>Pattis</td>
</tr>
</tbody>
</table>
## CONCEPT OF OPERATIONS

<table>
<thead>
<tr>
<th>MARC</th>
<th>Martin Rivarola</th>
</tr>
</thead>
<tbody>
<tr>
<td>MARC</td>
<td>Ron Achelpohl</td>
</tr>
<tr>
<td>Merriam</td>
<td>Chris Engel</td>
</tr>
<tr>
<td>Merriam</td>
<td>Gerry Vernon</td>
</tr>
<tr>
<td>Merriam</td>
<td>Phil Lammers</td>
</tr>
<tr>
<td>Mission</td>
<td>John Belger</td>
</tr>
<tr>
<td>MoDOT</td>
<td>Dan Niec</td>
</tr>
<tr>
<td>MoDOT</td>
<td>Derek Olson</td>
</tr>
<tr>
<td>OGL</td>
<td>Ray Webb</td>
</tr>
<tr>
<td>Olathe</td>
<td>Beth Wright</td>
</tr>
<tr>
<td>Olathe</td>
<td>Linda Voss</td>
</tr>
<tr>
<td>Olathe</td>
<td>Mary Jaeger</td>
</tr>
<tr>
<td>Overland Park</td>
<td>Brian Shields</td>
</tr>
<tr>
<td>Overland Park</td>
<td>Burt Morey</td>
</tr>
<tr>
<td>Overland Park</td>
<td>Jack Messer</td>
</tr>
<tr>
<td>Roeland Park</td>
<td>Jose Leon</td>
</tr>
<tr>
<td>Shawnee</td>
<td>Doug Whitacre</td>
</tr>
<tr>
<td>Shawnee</td>
<td>Kevin Manning</td>
</tr>
</tbody>
</table>