Johnson County I-35 Fixed Guideway Phased Implementation Plan

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Prepared for:

Johnson County Transit

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In Association With:

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Background

The I-35 Corridor has been the historical connection between the downtown Kansas City Central Business District (CBD) and the Johnson County suburbs. The I-35 Corridor has local, regional, and national significance as a primary route for automobile, truck, and rail travel. As the primary connection between the Kansas City CBD and Johnson County, the corridor serves people commuting to and from work, and people traveling to other destinations within and outside of the corridor. This area is home to national corporate offices and industrial areas, along with a variety of retail shops, residential housing, senior citizen housing, schools, and cultural and historic districts.

The I-35 Corridor continues to experience an increase in transportation challenges including increased traffic congestion and growth in vehicle miles traveled (VMT) due to population and employment growth, and rapid new development. Concerns about the corridor are high, as these existing and potential problems could affect the vitality of the local communities and inhibit economic development.

Leadership in Johnson County is committed to improving transit in the I-35 Corridor. This commitment is evident by participation in various studies during the past decade and efforts at the state and federal levels to secure funding for a major transit investment in this corridor. The I-35 Fixed Guideway Alternatives Analysis completed in FY 2007 concluded that Bus Rapid Transit (BRT) was the preferred alternative for transit in the I-35 Corridor. In FY 2008, Johnson County Transit (JCT) staff began a preliminary study of the implementation considerations for an initial phase of the BRT system. Since September 2008, JCT staff has been working with the Kansas Department of Transportation (KDOT), the Mid America Regional Council (MARC), and a consultant team to develop an implementation plan.

Project Purpose and Approach

The purpose of the project is to:

- Prepare a BRT service plan identifying routes, service levels, and stops;
- Further evaluate the Bus on Shoulder (BOS) operating strategy recommended in the Alternatives Analysis;
- Update capital and operating cost estimates; and
- Recommend a phasing plan for implementation.

The primary tasks in the project included the preparation of a service plan for BRT service on I-35 and an evaluation of the Bus on Shoulder operating strategy.

The I-35 BRT service plan was refined and two alternative approaches were developed, Alternative 1 with four BRT routes, and Alternative 2 with five routes. The routes in both alternatives would serve the south Overland Park and Olathe areas. Subsequent BRT phases will include service in other communities such as Lenexa and Shawnee.

The shoulders along the I-35 corridor were evaluated to determine their suitability for Bus on Shoulder operations. The evaluation was performed from two perspectives: 1) the physical characteristics of the shoulder and 2) traffic operations. The evaluation concluded that, in general, the shoulders along I-35 are suitable for BOS use; however, there are a few locations that, for a variety of reasons, do not lend themselves to this type of operation.

KDOT was involved throughout the project. The Project Team met with KDOT officials and managers to explain the BRT/BOS concept, and present preliminary conclusions regarding the BOS evaluation and the traffic analysis. The Project Team also worked with KDOT and the Kansas Highway Patrol on various institutional and legal issues associated with the bus use of shoulders and enforcement and safety concerns.

The project included a preliminary evaluation of new park and ride lot locations. The concepts call for larger lots with passenger amenities such as passenger shelters and electronic information signs.

Analysis and Conclusions Regarding Bus Rapid Transit Implementation

- The service, capital, and operating plans for BRT serving portions of southern Johnson County are consistent with direction provided by the Transportation Council based on the conclusions of the I-35 Fixed Guideway Alternatives Analysis and as reflected in JCT's Five-Year Strategic Plan.
- Figure ES-1 on the following page is a summary of the service enhancements that are included in the BRT service and capital plan, for both Phase I and a later enhanced phase.
- Figures ES-2 and ES-3 show the BRT routing plan for Alternatives 1 and 2.
- The number of bus trips in the study area would increase from the current 22 daily bus trips to 56 with Alternative 1 and 58 with Alternative 2. Table ES-1 shows the service plan assumptions.

Table ES-1. BRT Service Plan

Route	Alternative 1		Alternative 2	
	Daily Bus Trips	Headway	Daily Bus Trips	Headway
Olathe West	10	30	10	30
Olathe East	18	15	18	15
South OP	18	15	10	30
Route L	10	30	10	30
119th Street	N/A	N/A	10	30
Total	56		58	

The service period would be two to 2 ½ hours in both the morning and evening peak period. Midday service at a minimal level should be considered during the next phase.

- Ridership is estimated to increase by approximately 1,100 to 1,200 daily passenger trips, about three times the current ridership in the study area. Current ridership on the three routes serving the study area is 600 per day.

Figure ES-1. I-35 Bus Rapid Transit Service Concept

System Element	Initial Phase	Second Phase
Running Ways		
Guideway and Priority Measures	Operation in mixed traffic on arterial streets with some transit priority such as signal priority. Use of bus on shoulder operations on freeway segments.	Operation in mixed traffic on arterial streets with additional transit priority measures such as queue jumpers. Use of bus on shoulder operations or HOV lanes or separate roadways where available.
Service Plan		
Service Span	Peak period service with limited midday and evening service.	Peak period service with limited midday and evening service.
Service Frequency	15 - 30 minute peak period service frequency, limited off peak service.	10 - 15 minute peak period service frequency, 30 - 60 minute off peak.
Stop Spacing	One or two stops at park & ride lots.	One or two stops at park & ride lots.
Operations	Operated as premium service with technology support; higher performance standards.	Operated as premium service with technology support; higher performance standards.
Facilities and Equipment		
Stations	Higher level amenities at all stops; distinctive shelters and markers. Fully developed park & ride lots and transit centers. Upgraded user information, including electronic message signs	Higher level amenities at all stops; distinctive shelters and markers. Fully developed park & ride lots and transit centers. Upgraded user information, including electronic message signs.
Vehicles	Distinctive vehicles with higher level passenger amenities and greater capacity.	Distinctive vehicles with higher level passenger amenities and greater capacity.
Technology		
Control	Use of AVL/CAD and electronic user information systems.	Use of AVL/CAD and electronic user information systems.
Fare Collection	Standard fare collection, moving towards off board fare collection.	Off board fare collection with TVMs.
Branding/Marketing		
Branding	Branding to create identity.	Branding to create identity.
Marketing	Use of advanced techniques, including electronic user information.	Use of advanced techniques, including electronic user information.

Figure ES-1. I-35 BRT Routing Plan – Alternative 1

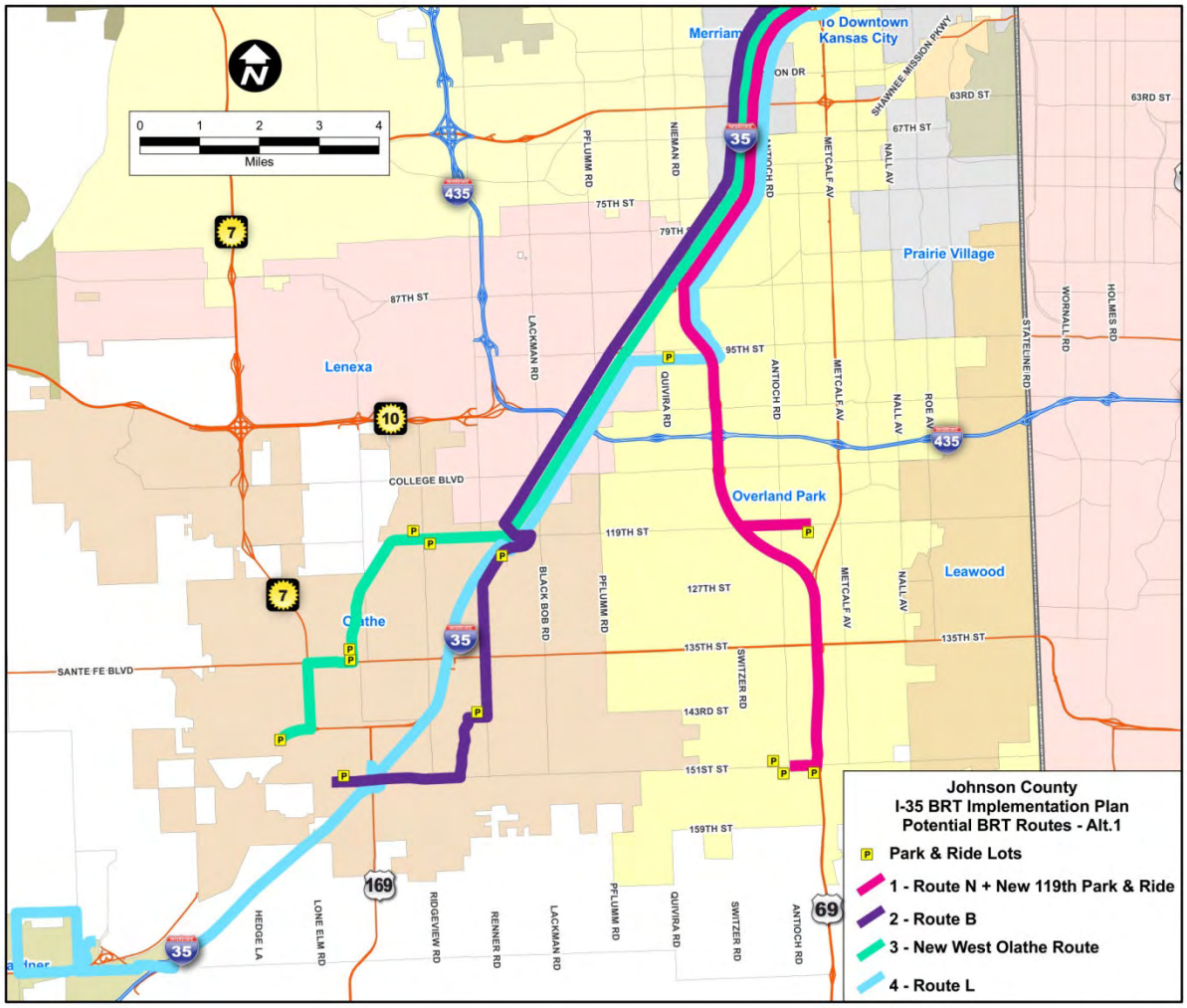
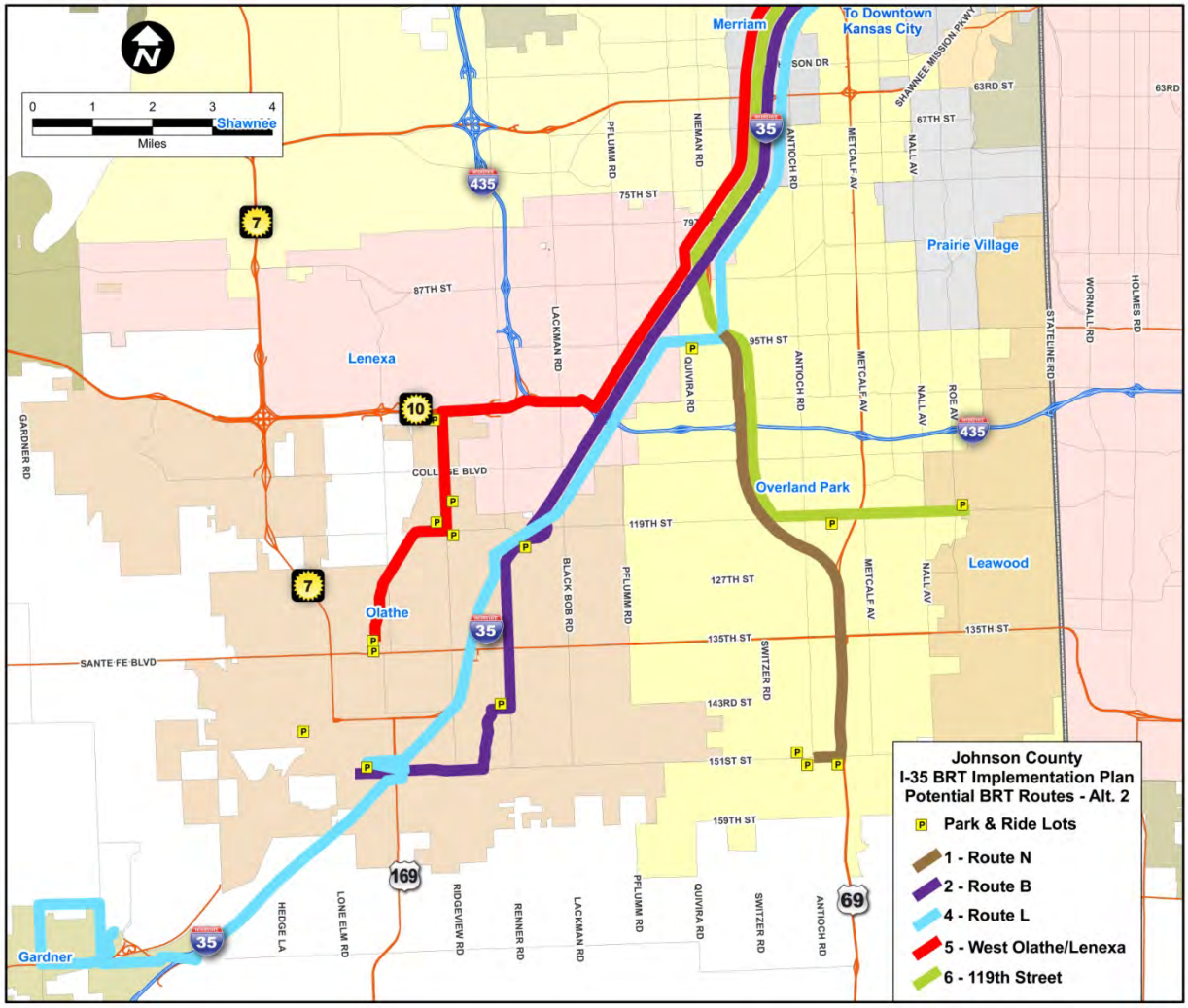


Figure ES-2. I-35 BRT Routing Plan – Alternative 2



- The implementation of BRT services can be phased in terms of geographic coverage and the level of BRT attributes. The Phase I BRT service and capital plan represents a significant enhancement in transit service in a key market area at a relatively low cost.
- Subsequent phases will include additional routes and further service enhancements will be implemented as funding allows.

Analysis and Conclusions Regarding Bus on Shoulder Implementation

Use of the Bus on Shoulder (BOS) operating strategy would significantly enhance the BRT service operating on I-35. The benefits include an improvement in schedule reliability, a significant travel time savings on "normal" days, and a greater opportunity for travel time savings when I-35 traffic is slowed due to incidents or weather.

- I-35 shoulders can support BOS along most of the length of the corridor in terms of physical characteristics, such as width, depth of construction, and absence of barriers.
- BOS can be used safely and effectively on I-35 based on traffic engineering simulation studies and the experience of other cities with BOS. The benefit to JCT transit operations is travel time savings of 15 to 20 percent and a significant improvement in reliability.
- Preparing the shoulders for BOS would be relatively inexpensive.
- The implementation period would be relatively short.

Analysis and Conclusions Regarding Costs and Financing

Capital costs were estimated based on the information developed for the project. The capital cost estimates are shown in the Table ES-2.

Table ES-2. BRT Capital Costs Estimates

Item	Alternative 1	Alternative 2
Buses	$10,080,000	$11,340,000
Stations	$1,760,000	$2,200,000
Park and Ride Lots	$1,600,000	$2,000,000
Shoulder Preparation	$2,360,000	$2,360,000
Other	$788,000	$985,000
Sub-total	$16,588,000	$18,885,000
Soft Costs	$1,046,000	$1,189,000
TOTAL	$17,634,000	$20,074,000

Operating costs and revenues were estimated for Alternatives 1 and 2 and compared with JCT's existing cost in the service area as shown in Table ES-3.

Table ES-3. BRT Operating Cost and Revenue Estimates

	Existing Service	BRT Alternative 1	BRT Alternative 2
Total Cost	$759,000	$1,659,000	$1,680,000
Fare Revenue	$165,000	$470,000	$504,000
Operating Deficit	$594,000	$1,189,000	$1,176,000

Thus, the BRT service plan is estimated to increase the operating deficit by $704,000 for Alternative 1 and $764,000 for Alternative 2.

FTA capital funding is available to cover up to 80 percent of the capital cost of the service. The non-FTA share of capital costs and the operating cost would have to be covered by local sources either through the County or the State. Table ES-4 summarizes the financing requirements.

Table ES-4. BRT Financing Requirements

	Alternative 1	Alternative 2
Federal Share of Capital Cost	$14,107,200	$16,059,200
Local Share of Capital Cost	$3,526,800	$4,014,800
Additional Annual Operating Cost	$595,000	$582,000

Next Steps to Implementation

The Johnson County Transportation Council received a project update at the June 9, 2009 meeting and took several actions. The following is a summary of the Transportation Council's actions.

- The Transportation Council approved the BRT service and capital plans for improved transit service in the I-35 Corridor as presented during the meeting. The decision between Alternative 1 and Alternative 2 will be made during the next phase of the implementation plan.
- The Transportation Council directed staff to proceed with next steps which include:
    - Working with FTA and KDOT for required capital funding.
    - Continue to work with KDOT and other agencies to secure the necessary agreements and legislation changes to permit Bus on Shoulder operations.
- The Transportation Council directed staff to prepare for the next phase of the implementation plan to include detailed transit service planning and preliminary engineering.

The Phase I project included the preparation of a detailed implementation plan that listed next steps and tasks required for implementation. A project schedule was prepared to show the timing, duration, and sequencing of tasks required for implementation of the I-35 BRT service.

If work on the next phase starts in August 2009, the new service could start in the first quarter of 2012. Vehicle procurement is the task with the longest lead time and is therefore on the project's critical path.

In general the project implementation will proceed through three distinct phases:

Program Development Phase – August 2009 through June 2010. This phase includes additional advanced service planning, addressing institutional and legal issues, and project financing. During this phase, conceptual planning for BOS and facilities will transition to preliminary design.

Design Phase – December 2009 through January 2011. The Design phase overlaps with the Program Development phase because conceptual design is included in both phases. The Design phase includes the conceptual, preliminary, and final design for the preparation of I-35 shoulders for BOS, stations, and park and ride lots.

Construction Phase – The Construction Phase includes the procurement and construction of the I-35 shoulders for BOS, stations, and park and ride lots. This final phase also includes the delivery and testing of buses and other tasks involved with project implementation.

Section 1: Background

1.1 Current JCT Service

Johnson County Transit (JCT) is the primary provider of transit services for Johnson County, Kansas. JCT was established in 1986 to administer the county's transit system, and in January 2007, JCT began operating as an independent department no longer a division affiliated with the county's Public Works Department. As a department, JCT reports directly to the County Manager's Office. The Johnson County Transportation Council (JCTC) also provides strong leadership to JCT staff. The JCTC meets monthly to discuss, strategize, review, and provide input regarding local and regional transit issues affecting Johnson County.

JCT has worked over the past several years to improve public transit in Johnson County, both on a local and regional level. At the local level, JCT has developed new routes and services cooperatively with city officials. JCT has also strengthened the position of transit within Johnson County government, a benefit to residents who expect better transit services as well as those who rely on current services. On a regional level, JCT has worked with the Mid-America Regional Council (MARC), the Kansas City Area Transportation Authority (KCATA), and Unified Government Transit to further transit initiatives and improve the cooperation among agencies involved in transit in the Kansas City metropolitan area.

In 2007, JCT adopted a Five Year Strategic Plan to guide the development of JCT services and the county's transit program. This document is available on JCT's website at www.thejo.com.

1.2 Johnson County Transit Routes and Services

JCT operates three service programs: The JO, Special Edition, and SWIFT. JCT maintains a fleet of approximately 100 vehicles. During weekday peak periods, approximately 46 vehicles are dispatched to provide fixed-route service. JCT does not operate evening or weekend service.

1.2.1 Fixed Route Service

JCT operates approximately 23 fixed routes, a program referred to as "The JO." These routes are primarily designed to move commuters between Johnson County and downtown Kansas City, Missouri, although other major employment concentrations are also served. Most JO services are provided during the weekday peak periods, with some flexible and fixed routes operating in the middle of the day. The JO operates in Kansas City, Missouri, Wyandotte County, and several Johnson County communities Monday through Friday. The JO serves approximately 2,300 riders per day on these routes.

JCT's routes can be categorized as Local Links, Express, and Commuter Express services. The Express routes serve the northeast portion of the County, operating on arterial streets before entering I-35 to travel to downtown Kansas City. The Commuter Express routes serve longer distance routes and operate on I-35 for a greater portion of their trip to downtown Kansas City.

JCT operates a number of intra-county routes. These include flexible routes that are designed to address specific transit needs in the community. These routes are designed for general

public transit service, but some operate as demand response services. These services are described below.

- ***EasyRide*** provides curb-to-curb, on-demand service to popular destinations within the Northeast Johnson County cities of Fairway, Merriam, Mission, and Roeland Park. The service operates during the midday period.
- ***Route J–JoFlex*** is a midday service that operates on Monday, Wednesday, and Friday in a service area bounded by 75th Street on the north, 95th Street on the south, Quivira on the west, and Lamar on the east. The zone includes the Overland Towers and Santa Fe Towers apartment complexes and the surrounding community. The route operates as a point deviation and maintains scheduled timepoints.
- ***Route K–Olathe Gold, Green and Red circulator services*** provide intra-city service on Mondays, Wednesdays, and Fridays within the City of Olathe. The service operates during the midday period.
- ***DeSoto FlexRide*** service provides service to popular destinations in De Soto on Tuesday and Wednesday, with service into Shawnee on Tuesdays and Olathe on Wednesdays.
- ***Shawnee CityRide*** provides service to popular destinations within Shawnee via two loops on Tuesdays and Fridays.
- ***Spring Hill Shuttle*** provides service to popular destinations within Spring Hill on Tuesdays and Fridays, with trips to the Gardner Wal-Mart on Tuesdays and to the Olathe Target and the Great Mall of the Great Plains on Fridays.

JCT also operates an intercity route, the ***K-10 Connector***, operating between the City of Lawrence and Johnson County.

1.2.2 Paratransit Service

JCT operates an expansive paratransit service, with 35 vehicles that are used to provide curb to curb service for elderly, disabled, and non-urban residents of Johnson County.

Special Edition is a shared ride program providing curb-to-curb transportation for residents of Johnson County who are sixty (60) years of age or older, have a documented disability, or are within established low-income guidelines. Eligible riders can use Special Edition for any trip purpose within Johnson County. Riders can travel to designated areas of Kansas City for medical purposes only.

The Sheltered Workshop Industrial Fixed Transportation (SWIFT) service provides home to worksite commute trips for Johnson County Developmental Supports clients.

1.3 Bus Rapid Transit Service Concept

The 2007 I-35 Fixed Guideway Alternatives Analysis study recommended Bus Rapid Transit (BRT) as the preferred alternative for the I-35 corridor.

According to *Characteristics of Bus Rapid Transit for Decision-Making*[1], Bus Rapid Transit (BRT) is "a flexible, high performance rapid transit mode that combines a variety of physical, operating and system elements into a permanently integrated system with a quality image and unique identity."

BRT relies on the following six system elements to create a transit system with high level service attributes and customer attraction.

1. **Running Ways.** Running ways affect travel speeds, reliability, and identity. BRT typically has at least portions of the route in running ways (exclusive lanes, busways, etc.) to segregate transit vehicles from general traffic and therefore traffic congestion. These running ways can be physically separated or designated by pavement markings and signage.

2. **Stations.** Rather than standard bus stops, BRT typically uses stations for boarding and alighting that incorporate enhanced facilities such as larger shelters, waiting areas, customer amenities, and unique visual elements. Stations are the entry point to the system and are the single most important customer interface affecting accessibility, reliability, comfort, safety, and security, as well as dwell times, and system image. BRT station options vary from simple stops with basic shelters to complex intermodal terminals with many amenities.

3. **Vehicles.** BRT can utilize a wide range of vehicles, from standard buses to specialized vehicles, although unique "premium" vehicles are usually used. Vehicle aesthetics, both internal and external, are important for establishing and reinforcing the brand identity of the system.

4. **Fare Collection.** Fare collection affects customer convenience and accessibility, as well as dwell times and service reliability. Options range from traditional pay-on-board methods to pre-payment with electronic fare media (e.g., smart cards) and off-vehicle fare payment.

5. **Intelligent Transportation Systems (ITS).** ITS technologies can be integrated into BRT systems to improve BRT system performance in terms of travel times, reliability, convenience, operational efficiency, safety, and security. ITS applications include vehicle priority, operations and maintenance management, operator communications, real-time passenger information, and safety and security systems.

6. **Service and Operations Plan.** The service plan should meet the needs of the population and employment centers in the service area and match the demand for service. BRT typically has high service levels in terms of service frequency and service span (days and hours of operation).

[1] *Characteristics of Bus Rapid Transit for Decision-Making*, August 2004, Federal Transit Administration.

A marketing strategy or "branding" is used to tie all of these elements together to present a highly visible, easily recognizable, customer oriented, and easily understood transit service package.

Future traffic conditions may make it difficult to justify significant capital expenditures for new infrastructure for bus priority. Thus, the Bus on Shoulder concept service plan gives buses an advantage over general traffic and reduces transit travel times.

The capital cost investment is directed at the Bus on Shoulder operation and spot improvements on arterial roadways and at ramps leading to I-35. Additional investment could be used for integrating the shoulder bus lanes with operations at the interchanges through transit signal priority (TSP). This could secure significant benefits in terms of schedule reliability and travel time reduction.

1.4 Bus on Shoulder (BOS) Concept

Bus on Shoulder (BOS) operation is used successfully in a number of metro areas worldwide. Minneapolis-St. Paul has deployed over 200 miles of BOS on urban freeways and arterials, and Ottawa, ON, Canada operates up to 100 buses an hour on its BOS lanes from the east and west suburbs of the city. There are also buses operating on shoulders in:

- Mississauga, ON, Canada,
- Washington, DC,
- San Diego, CA,
- Atlanta, GA,
- Boston, MA,
- Auckland, New Zealand
- Melbourne, SA, Australia,
- Sydney, NSW, Australia,
- Utrecht, Netherlands and
- Dublin, Ireland

Increasingly, transit agencies and transportation departments are turning to this technique as a way to improve transit service and increase the effectiveness of urban roadways without the large infrastructure investment required of a dedicated Right of Way (ROW) or other transit and highway infrastructure improvements.

The BOS concept allows buses to use the shoulder in designated sections of the freeway when traffic congestion reduces traffic speeds below a certain level, usually 35 MPH (although not all facilities have this restriction). The designated BOS sections are predetermined based on the physical and operational characteristic of the shoulder and the freeway. Interchange areas are evaluated on a case-by-case basis to determine how buses can best operate through the interchange. BOS operation is permitted only where it can be used safely.

The shoulder remains a shoulder in terms of its functions. If the shoulder is in use by a disabled vehicle or an emergency vehicle, the bus cannot use the shoulder and must merge back into the adjacent traffic stream.

In addition to the drop in speed as mentioned above (i.e., transit only uses shoulder lanes when traffic speeds are below a certain speed), another restriction typically put in place for BOS

operations includes a restriction on the speed differential. This is to say that the speed differential between the buses operating on the shoulders and the general traffic is not greater than 15 MPH (i.e., traffic is traveling at 20 MPH buses can only travel at 35 MPH.) There are BOS operations that operate safely with no minimum speed requirement or no speed differential.

Signage, pavement markings, an effective public information campaign, and agreements between all operating agencies along with bus driver training are also components of a successful BRT operation employing BOS.

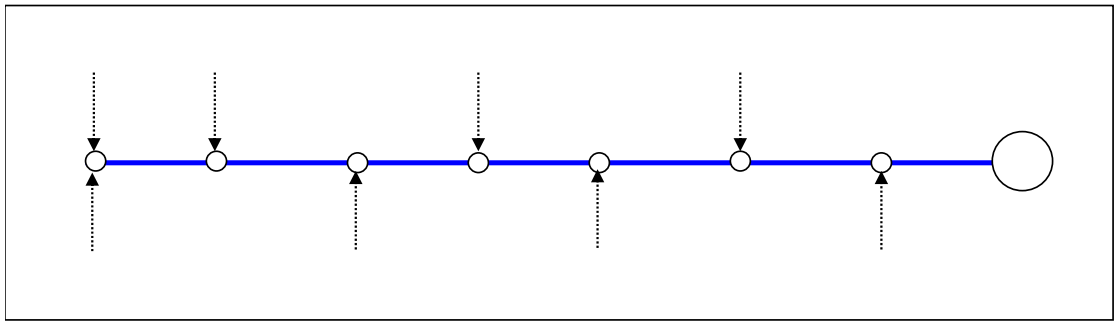
Section 2: Summary of Service Plan

This section describes the bus rapid service concept and how the service plan was developed from the concepts that led to the adoption of the Locally Preferred Alternative from the I-35 Fixed Guideway Alternatives Analysis in 2007. The ridership demand assessment used in the development of the alternatives is also summarized.

2.1 BRT Operating Concepts

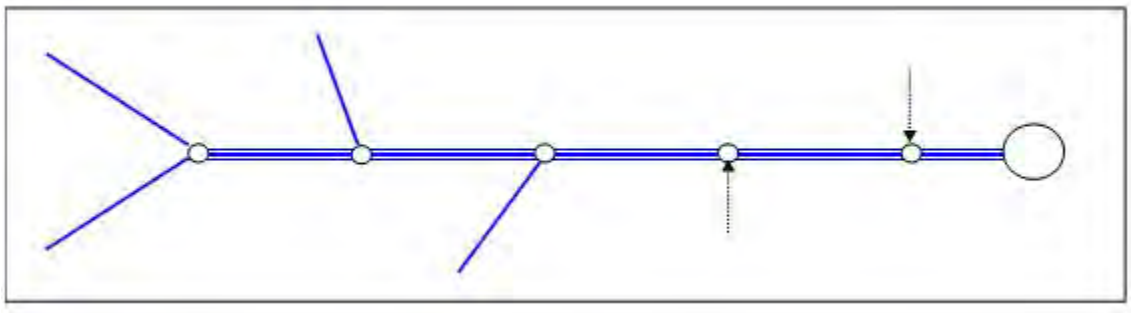
There are fundamentally two routing concepts used by BRT. One, sometimes referred to as "single route", operates BRT vehicles along the busway between stations, much like a rail transit route. For I-35 BRT, the I-35 freeway and the shoulders available for buses represent the busway. With the single route busway, buses do not leave the busway. Passengers either use non-motorized modes of transportation (i.e., walk or bike) to the stations, autos (park and ride) or feeder buses to access the stations. The "single route" concept is shown in Figure 1.

Figure 1. Single Route Concept



The other routing concept, integrated line haul and collection system, takes advantage of the inherent flexibility of buses and allows buses to circulate in the community for passenger access then uses the busway for the express portion of the route. Most passengers will access buses along the portion of the route off the busway, but passengers can also board at stations along the busway using feeder buses, auto access, or non-motorized modes of transportation. This concept is shown in Figure 2.

Figure 2. Integrated Line Haul and Collection System



The Integrated Line Haul and Collection System is best suited for the I-35 Corridor for the following reasons:

- The development immediately adjacent to the freeway will not generate sufficient trips, either origins or destinations, to justify BRT buses operating only on the Interstate with stations on the Interstate. Both origins and destinations are removed from the freeway.
- This service configuration provides transit users a "one seat ride" making the service much more attractive to choice riders by avoiding the inconvenience of transferring.
- Sites for park and ride lots are often not available immediately adjacent to the busway, thus buses must leave the busway to access the lots.

2.2 I-35 Fixed Guideway Service Objectives

The following objectives were developed to guide the development of the I-35 Fixed Guideway Phased Implementation Service Plan. The objectives are aligned with those developed for the *I-35 Fixed Guideway Alternatives Analysis* and the *Johnson County Transit Five-Year Strategic Plan*.

1. Enhance transit service attractiveness and service identity to attract additional ridership from downtown commuters now using single vehicle autos. This may include faster trip times, improved reliability, more frequent service, and extended service span.
2. Provide a higher quality more visible transit service, which may include dedicated park and ride lots, enhanced vehicles, and more fully developed station locations.
3. Provide improved customer service and user information, including electronic and web-based techniques, and service branding.
4. Create a financially feasible service package that minimizes increases in capital and operating costs, employs phasing in the financial plan, and considers non-traditional financing strategies.
5. Support existing and planned development investments in the County, and encourage effective development patterns.

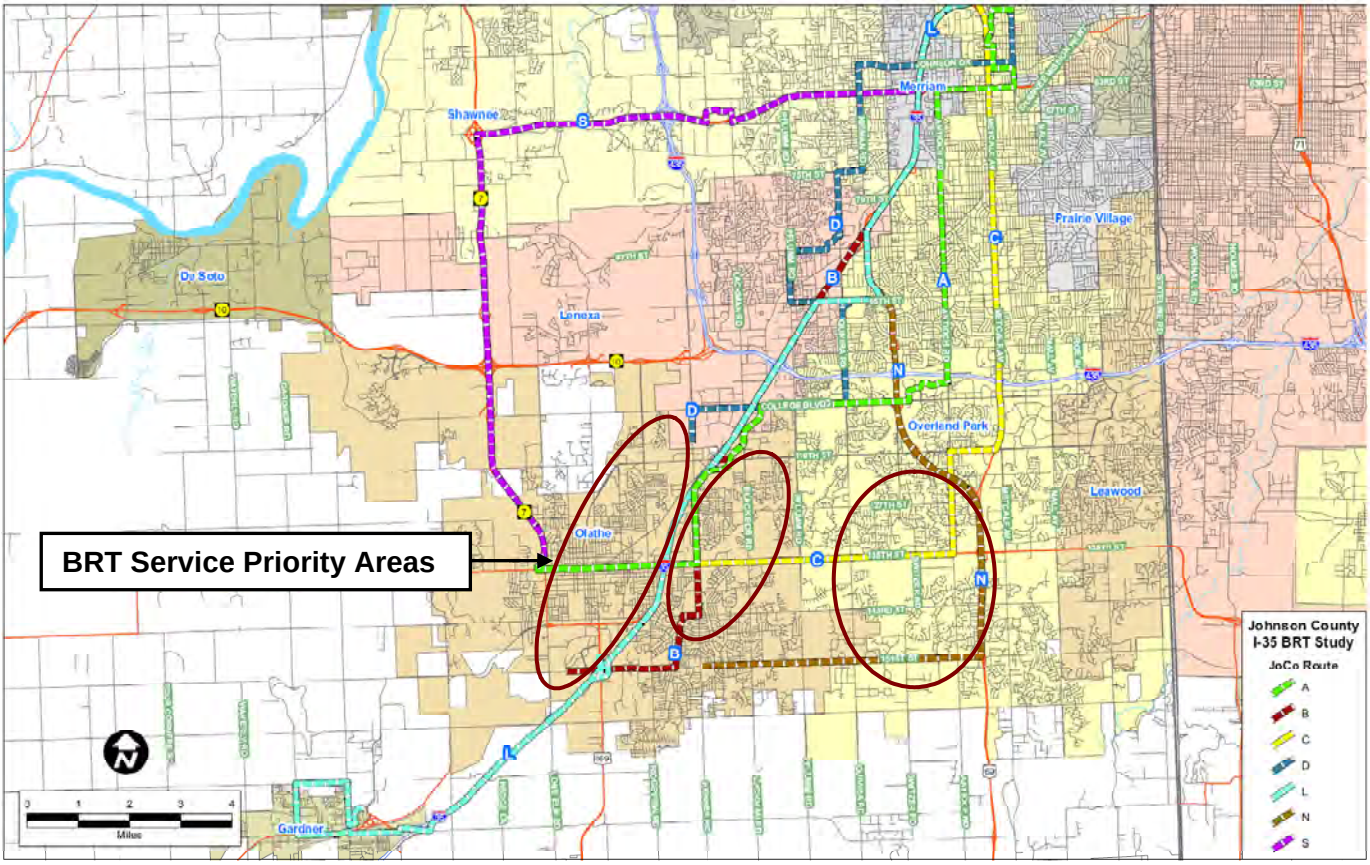
2.3 I-35 Fixed Guideway Service Area

The target service area for the I-35 BRT service is the urbanized portion of Johnson County south of K-10 and I-435, and west of US 69. This area will be referred to as the “BRT Phase I study area,” or simply “study area.” The priority areas are shown in Figure 3 on the following page.

The target market is downtown commuters. For the purpose of this report the term “downtown Kansas City” will be used to describe the area comprised of the central business district (CBD), River Market, Crossroads District, and the Crown Center/Union Station area.

The study area is served by several JCT routes, ***Route A – Antioch-Downtown***, ***Route B – Olathe Express***, ***Route C – Metcalf-Downtown***, ***Route D – Quivira-Downtown***, ***Route L – South Johnson County Express*** and ***Route N – 151st Street-Downtown Express***. Figure 3 shows the current route structure in the area along with the priority service areas.

Figure 3: JCT Commuter Routes and Revised BRT Route Priorities



2.4 I-35 BRT Service Plan Development

An initial step in the development of the service plan was to review BRT service concepts and develop a general guide for the task of developing the concept. Figure 4 on the following page is a summary of the BRT concept and best practices applied around the country. BRT is an operating concept that describes many different variations of service types and levels of investment. Figure 4 generalizes the various levels of BRT service, and includes the distinction between the arterial BRT application and the freeway/express application. The I-35 BRT is a version of the latter.

Figure 5 takes the additional step of applying the BRT concept to I-35 more specifically. It also illustrates how the phasing of the BRT improvements could be accomplished.

The remainder of this section describes the step-by-step process of defining the I-35 BRT service plan.

Figure 4. BRT Elements

System Element	Arterial BRT – Basic	Arterial BRT – Enhanced	Freeway/Express BRT
Running Ways			
Guideway and Priority Measures	Minimally, operation in mixed traffic with some transit priority such as signal priority. Use of transit lanes and queue jumpers.	Operation in exclusive transit lanes or separate roadway with signal priority at intersections.	Operation in mixed traffic with some transit priority such as signal priority on arterial streets. Use of Bus on Shoulder operations or High Occupancy Vehicle (HOV) lanes or separate roadway.
Service Plan			
Service Span	Full service span including evening and weekend service.	Full service span including evening and weekend service.	Peak period service with limited midday and evening service.
Service Frequency	10 minute peak period service frequency, 15 minute off peak.	10 minute peak period service frequency, 15 minute off peak.	10 - 15 minute peak period service frequency, 30 - 60 minute off peak.
Stop Spacing	Fewer stops, ¼ mile spacing or greater.	Fewer stops, ½ mile spacing except in CBD areas.	One or two stops at park & ride lots.
Operations	Operated as premium service with technology support; higher performance standards.	Operated as premium service with technology support; higher performance standards.	Operated as premium service with technology support; higher performance standards.
Facilities and Equipment			
Stations	Higher level amenities at stops; distinctive shelters and markers. Upgraded user information.	Higher level amenities at all stops; distinctive shelters and markers. Upgraded user information, including electronic message signs.	Higher level amenities at all stops; distinctive shelters and markers. Fully developed park & ride lots and transit centers. Upgraded user information, including electronic message signs.
Vehicles	Distinctive vehicles with higher level passenger amenities.	Distinctive vehicles with higher level passenger amenities and greater capacity.	Distinctive vehicles with higher level passenger amenities and greater capacity.
Technology			
Control	Use of Automated Vehicle Location/Computer Aided Dispatch (AVL/CAD) and electronic user information systems.	Use of AVL/CAD and electronic user information systems.	Use of AVL/CAD and electronic user information systems.
Fare Collection	Standard fare collection, or off board fare collection.	Off board fare collection with ticket vending machines.	Standard fare collection, or off board fare collection.
Branding/Marketing			
Branding	Branding to create identify.	Branding to create identify.	Branding to create identify.
Marketing	Use of advanced techniques, including electronic user information.	Use of advanced techniques, including electronic user information.	Use of advanced techniques, including electronic user information.

Figure 5. I-35 Bus Rapid Transit Service Concept

System Element	Initial Phase	Second Phase
Running Ways		
Guideway and Priority Measures	Operation in mixed traffic on arterial streets with some transit priority such as signal priority. Use of bus on shoulder operations on freeway segments.	Operation in mixed traffic on arterial streets with additional transit priority measures such as queue jumpers. Use of bus on shoulder operations or HOV lanes or separate roadways where available.
Service Plan		
Service Span	Peak period service with limited midday and evening service.	Peak period service with limited midday and evening service.
Service Frequency	15 - 30 minute peak period service frequency, limited off peak service.	10 - 15 minute peak period service frequency, 30 - 60 minute off peak.
Stop Spacing	One or two stops at park & ride lots.	One or two stops at park & ride lots.
Operations	Operated as premium service with technology support; higher performance standards.	Operated as premium service with technology support; higher performance standards.
Facilities and Equipment		
Stations	Higher level amenities at all stops; distinctive shelters and markers. Fully developed park & ride lots and transit centers. Upgraded user information, including electronic message signs.	Higher level amenities at all stops; distinctive shelters and markers. Fully developed park & ride lots and transit centers. Upgraded user information, including electronic message signs.
Vehicles	Distinctive vehicles with higher level passenger amenities and greater capacity.	Distinctive vehicles with higher level passenger amenities and greater capacity.
Technology		
Control	Use of AVL/CAD and electronic user information systems.	Use of AVL/CAD and electronic user information systems.
Fare Collection	Standard fare collection, moving towards off board fare collection.	Off board fare collection with TVMs.
Branding/Marketing		
Branding	Branding to create identity.	Branding to create identity.
Marketing	Use of advanced techniques, including electronic user information.	Use of advanced techniques, including electronic user information.

2.4.1 Market Analysis

HNTB performed a transit market analysis of the study area based on current ridership and an evaluation of the demographics of the target area, including Journey to Work (JTW) data from the 2000 Census. The JTW data is particularly important because it includes place of employment. The market for the I-35 BRT service is downtown commuters. A JTW analysis of downtown Kansas City commuters is summarized in Table 1.

Table 1. Downtown Kansas City Employees – 2000 Census

Area	Persons Employed Downtown	Percent of Total Employed Persons
Gardner	117	2.6%
Olathe West	585	3.0%
Olathe East	1,029	5.0%
South Overland Park	3,383	7.8%
Lenexa	819	6.2%
Shawnee	1,942	8.8%
NE Johnson County	2,964	8.3%
Total	10,839	6.8%

Source: 2000 Census JTW

Although the number of Johnson County commuters to downtown Kansas City have been declining as Johnson County continues to develop as an employment area, the downtown central business district remains a significant employment destination. As shown in Table 1, 6.8 percent of the Johnson County work force is employed in the downtown area which includes the CBD and Crown Center. The study area alone has over 5,000 downtown commuters. South Overland Park, the portion of the city south of 95th Street supports over 3,000 downtown commuters, and has a strong orientation to downtown with nearly 9 percent of the work force employed downtown, creating the propensity to use transit.

HNTB performed an analysis of current ridership on ***Route B – Olathe Express***, ***Route D – Quivira-Downtown***, ***Route L –South Johnson County*** and ***Route N – 151st Street - Downtown*** to approximate the number of downtown commuters currently served by transit.

Table 2 shows the estimated market share by area. Lenexa and ***Route D – Quivira – Downtown*** were included because of the overlap in service areas and the fact that a significant number of Lenexa residents drive to Oak Park Mall to access ***Route L – South Johnson County***.

Table 2. Downtown Kansas City Commuter Market Share

Area	Market Share
Gardner	10.5%
Olathe West	9.2%
Olathe East	9.3%
South OP	2.0%
Lenexa	7.3%

Source: 2000 Census JTW and JCT ridership statistics

In summary, the data in Table 1 and Table 2 lead to the following conclusions:

- The Olathe market is well served. ***Route B – Olathe Express***, JCT's most successful commuter route, is attracting a respectable market share of nearly ten percent.
- The South Overland Park market is not well served, with only an estimated two percent market share.
- The South Overland Park market has the highest potential with about twice the number of downtown commuters as the Olathe market.

2.4.2 Service Plan - Service Levels

Service levels in Johnson County have historically been low. Frequency usually has not exceeded 30 minutes and service spans have been short. Many routes have just two or three trips per peak period. An important part of the BRT concept is a higher frequency of service level than has been provided.

The service plan for I-35 has continued to evolve since the project began in FY 2008. Because BRT is scalable, that is, its development can be phased and adjusted to meet demand and funding availability, alternatives have been developed that reflect varying levels of service.

Two levels of service were initially evaluated, including affect on operating and capital costs, and likely ridership benefits. These are:

Medium Service Scenario: 30 minute frequency with expanded service span to include a two hour service period minimum (five trips) and limited midday and evening service.

High Service Scenario: 15 minute frequency with expanded service span to include a two to two and half hour service period minimum (eight or more trips) and limited midday service.

It was recommended that the Medium Service Level with a 30 minute service headway that operates at a minimum of two hours be considered the minimum service level for BRT. Midday service should be part of the service plan as well.

2.4.3 Service Plan - Routing

The following guiding principles were developed to facilitate the development of the route structure for the I-35 BRT Phased Implementation Plan:

- The current routes reflect years of experience serving the target market and represent a useful starting point for new service design.
- Park and ride lots are critical elements and nearly exclusive access points for express transit routes. The location of park and ride lots and location of the stop within the lot is important, more so than the configuration of the route stops because so few people are likely to walk to bus stops.
- Direct routes are preferred for simplicity and faster travel times. BRT travel times should be within five to ten minutes of auto travel time. Direct routes with limited stops are preferred for operating considerations.

- The routes will incorporate understandable and predictable operations through interchanges to provide safer interactions between buses and automobiles.

Based on an evaluation of existing ridership and market potential, two routing concepts were developed. It was concluded that ***Route L – South Johnson County Express*** should be included in the BRT service plan because it is integral to the service provided along I-35. ***Route B – Olathe Express*** and ***Route N – 151st – Downtown*** are successful and should also be part of the service plan.

Two alternative routing plans were developed. Alternative 1 relies primarily on existing routes and takes the approach of developing ridership through improved service. Alternative 2 is more aggressive and would add two new routes designed to develop ridership by serving the South Overland Park market better.

Alternative 1

- Maintain ***Route B – Olathe Express*** as is, or possibly modify the south terminus.
- Maintain ***Route L – South Johnson County*** as is; increase service level.
- Maintain ***Route N – 151st Street - Downtown*** as is; add a park and ride stop on 119th Street; increase service level.
- Create new West Olathe route.

Alternative 2

- Maintain ***Route B – Olathe Express*** as is, or possibly modify the south terminus.
- Maintain ***Route L – South Johnson County Express*** as is; increase service level.
- Maintain ***Route N – 151st Street - Downtown*** as is; increase service level.
- Create new 119th Street Route.
- Create new West Olathe/Lenexa route.

Figures 6 and 7 on the following pages show these routing alternatives graphically.

Figure 6. I-35 BRT Routing Plan – Alternative 1

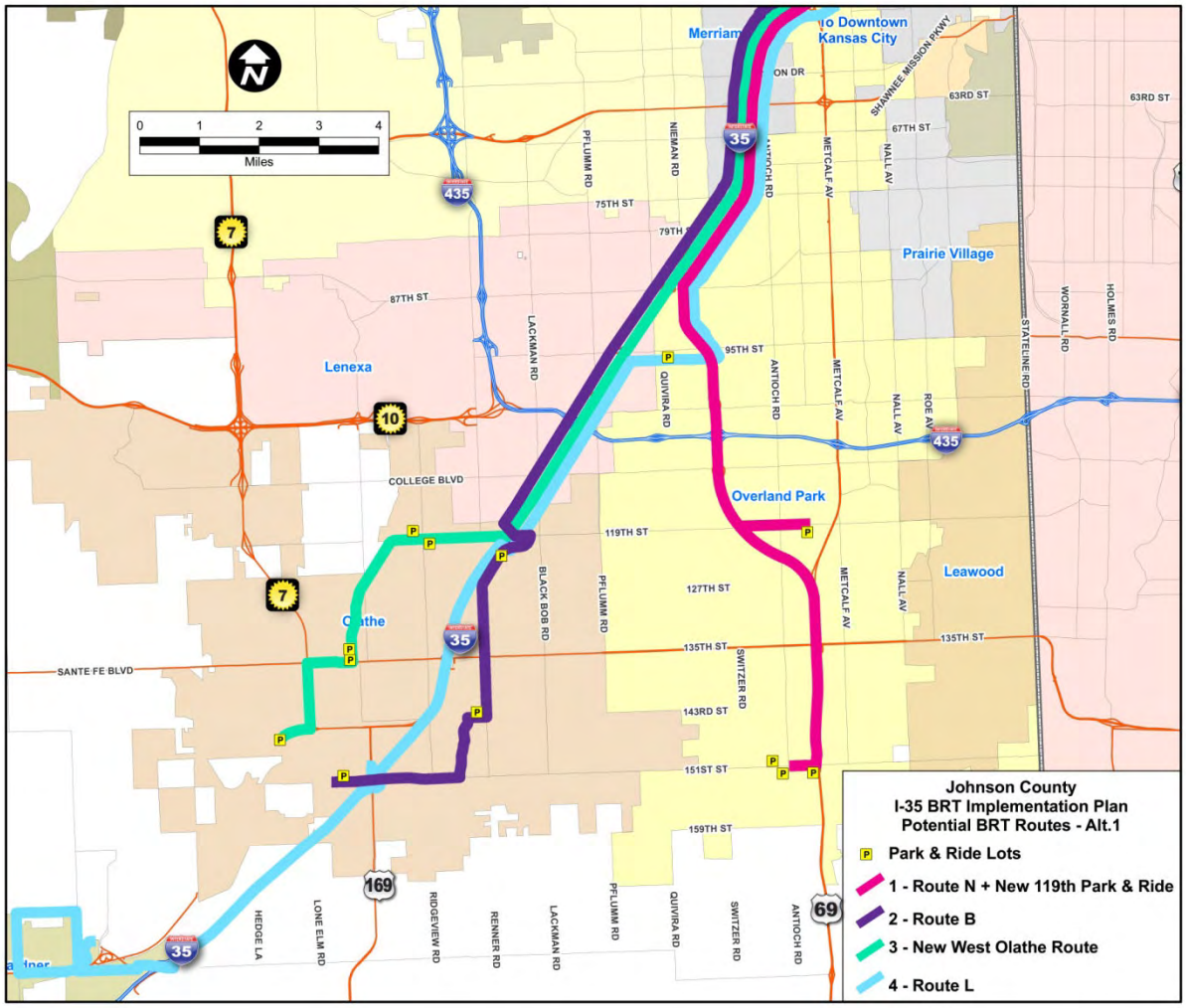
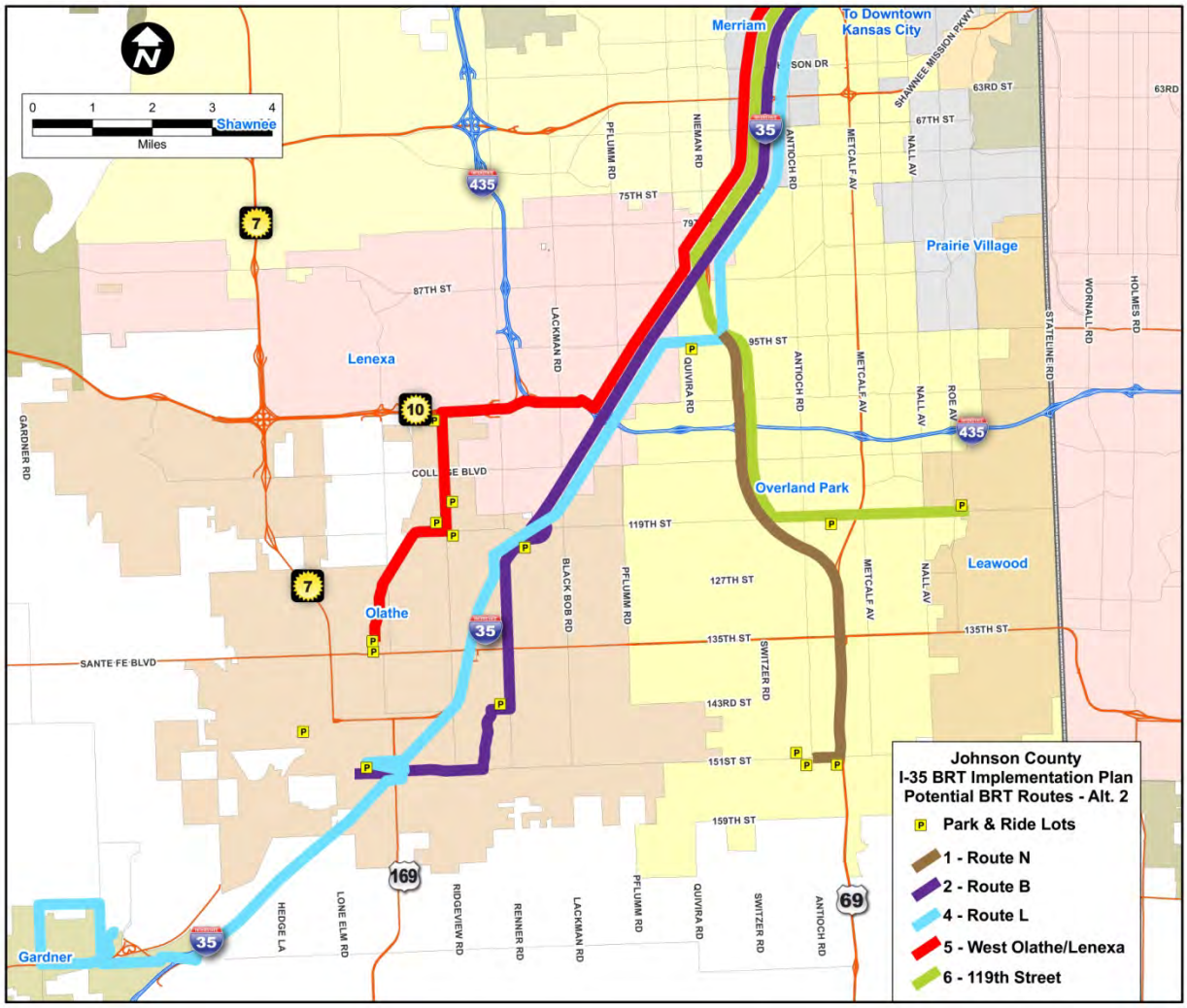


Figure 7. I-35 BRT Routing Plan – Alternative 2



2.4.4 Demand Assessment

Using the JTW data presented in Table 2 along with current ridership patterns, potential demand for the routes in Alternatives 1 and 2 was estimated. Table 3 shows these estimates for 2010 compared with current ridership levels in the area.

Table 3. Estimated BRT Daily Ridership Levels

Route	Current	Alt. 1	Alt. 2
Olathe West		270	370
Olathe East	320	440	440
South OP	110	730	350
Route L	170	270	290
119th Street			380
Total	600	1,710	1,830

Source: JCT ridership statistics and HNTB

2.4.5 Refinement of Service Plan

Based on the demand assessment and the ridership estimates presented in Table 3, the service plans for Alternative 1 and Alternative 2 were refined as shown in Table 4.

Table 4. Projected BRT Service Levels

Route	Service Level	
	Alt. 1	Alt. 2
Olathe West	Medium	Medium
Olathe East	High	High
South OP	High	Medium
Route L	Medium	Medium
119th Street		Medium

The service levels shown in Table 4 are matched to the existing demand and the ridership potential for each of the routes. The “Medium” and “High” service levels are as described previously.

- Medium service level is 30 minute frequency with expanded service span to include a two hour service period minimum (five trips) and limited midday and evening service.
- High service level is 15 minute frequency with expanded service span to include a two to two and half hour service period minimum (eight or more trips) and limited midday service.

Section 3: I-35 Bus on Shoulder Evaluation

This section describes the evaluation that was conducted to determine the suitability of the I-35 shoulders for bus operations from a physical and configuration perspective as well as from a traffic perspective. A traffic analysis was conducted using simulation software to demonstrate how buses operating on the shoulders would interact with general traffic on I-35. This section also summarizes the physical improvements that should be made to the shoulders, including a signing concept, to permit bus on shoulder operations.

3.1 Purpose

HNTB preliminarily evaluated shoulders along the I-35 corridor to determine their suitability for Bus on Shoulder (BOS) operations. The evaluation was done from two perspectives: 1) the physical characteristics of the shoulder and 2) traffic operations. This evaluation concluded that, in general, the shoulders along I-35 are suitable for BOS use; however, there are a few locations that, for a variety of reasons, do not lend themselves to this type of operation. This may be the result of physical and/or operational deficiencies.

3.2 Physical Evaluation

HNTB conducted the physical evaluation using KDOT roadway plans and field observations and measurements. The evaluation determined where BOS operations could safely be used in accordance with the following considerations.

- **Shoulder Width.** A minimum 10' shoulder width was recommended to allow for safe operation of a vehicle the size of a transit bus alongside adjacent traffic and occasional fixed structural objects. The shoulder must be continuous and free from any object that may encroach upon the 10' minimum width, such as sign foundations, retaining walls, bridge piers, roadside protection, etc. These criteria essentially eliminate use of the inside shoulders and shoulder along auxiliary, acceleration, and deceleration lanes.

- **Shoulder Depth.** Shoulder pavement sections need to be substantial enough to withstand the wheel loads imparted by transit buses over a period of time. An as-built and visual investigation indicate that, given the projected BOS volumes, the existing shoulders within the corridor could support BOS operations for a decade or more with minimal maintenance due to, in most cases, recent reconstruction. Nonetheless, a more extensive evaluation of existing shoulder pavement structure may be needed prior to implementation of BOS to determine an accurate up-front and life-cycle cost estimate for the various portions of the corridor, especially within the few aging pavement sections.

- **Shoulder Slope.** The vast majority of shoulders within the corridor are sloped at a standard 4.2 percent and match the adjacent lane cross-slope in superelevated situations. There are, however, isolated locations with variable sloped shoulders and shoulders with rounding and adverse cross-slope while in superelevation. These unique situations, if not modified, will need to be evaluated relative to impacts on bus handling.
- **Rumble Strips and Inlets.** While not eliminating a shoulder from BOS use, the presence of rumble strips and/or stormwater inlets are important to keep in mind. Rumble strips are undesirable in BOS locations and will need to be removed via grinding, mill and overlay, or other suitable method prior to implementation of BOS. So

too is the case for storm inlets. All inlets will require a structural evaluation to ensure resistance to bus loads and some inlets may need to be extended, raised, or replaced to eliminate excessive sumps. Hydraulic reviews of inlets will ensure capacity and point out possible impacts of spread on the drivability of the shoulder.[2]

- **Interchanges.** There are two types of interchanges along the I-35 project corridor: 1) a *service interchange* where the freeway intersects an arterial roadway, and 2) a *system interchange* which is the juncture of two freeways. BOS operations approaching a service interchange will typically continue off the shoulder and onto a deceleration lane as it is developed. The deceleration lane will then be used before re-entering the shoulder though the exit ramp gore. Buses will leave the shoulder by passing through the entrance gore area, yielding to entrance ramp traffic, and utilizing the ramp acceleration lane before re-entering the shoulder as the acceleration lane tapers away. Due to typically higher speeds and higher traffic volumes, it is recommended to not allow BOS operations through a system interchange with ramps entering or exiting from the right. Instead, buses should enter a through traffic lane in advance of the interchange and re-enter the shoulder at a point downstream of the interchange.

  The BOS operations through the interchanges on I-35 and their evaluation are described in more detail in Section 3.3 Traffic Analysis.

3.2.1 Limiting Bus Movement

There are segments where the shoulders may meet the physical requirements for BOS operation but BOS is not recommended. For example, the use of shoulders for BOS is not recommended along auxiliary lanes between system interchange ramps, where there are high speed and high volume traffic movements.

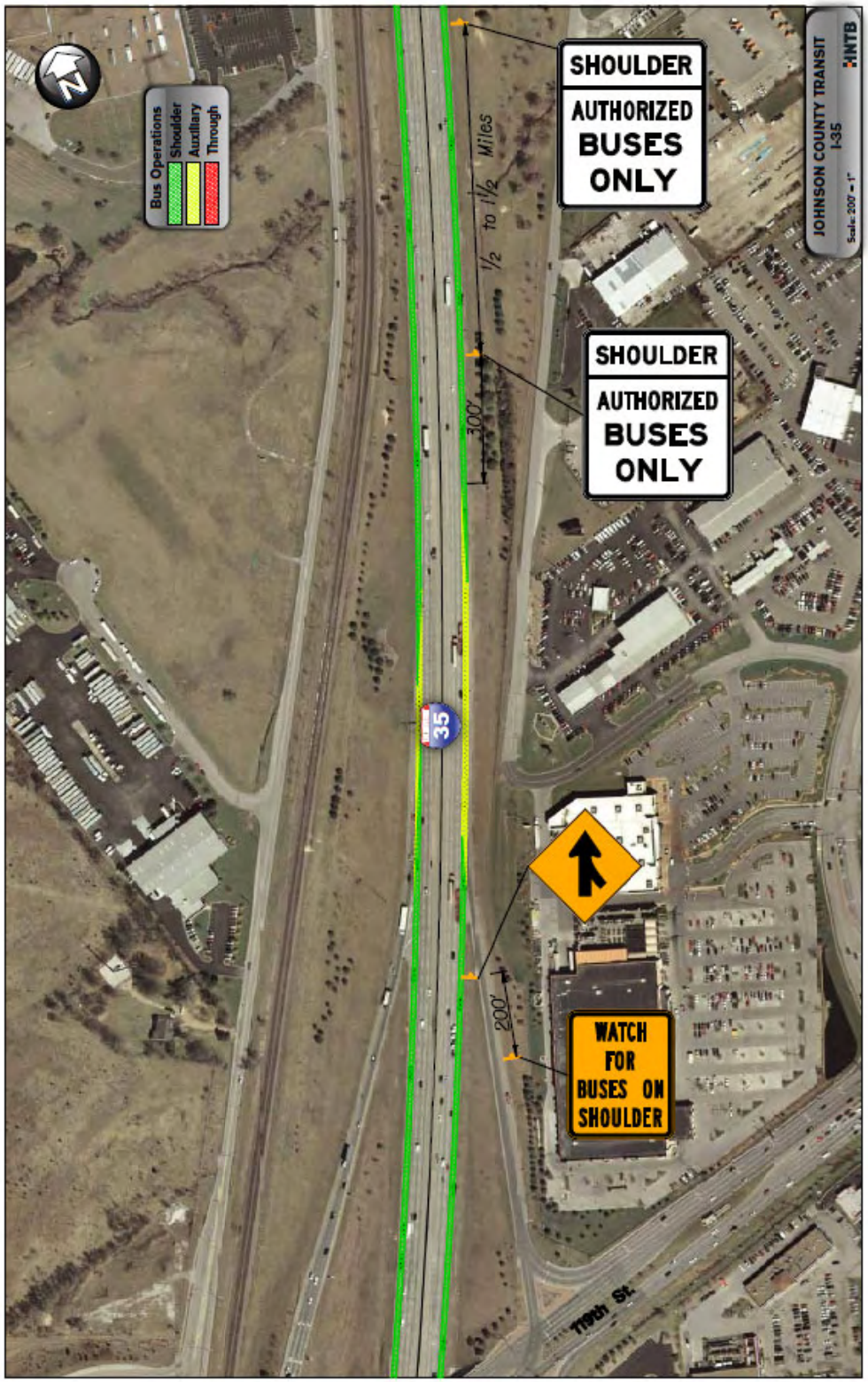
3.2.2 Signing Bus on Shoulder

Along with a public awareness campaign and proper training of bus drivers as to the acceptable when/where/how of BOS operations, an effective signing scheme is necessary to inform the traveling public of where BOS operations can occur. The signing needs to alert drivers in advance of the possibility of encountering buses operating on the shoulder so as not to surprise or distract them when they are encountered.

Figure 8 depicts a typical signing layout based on both current and historical signage of BOS operations in other U.S. cities and on Transit Cooperative Research Program *Synthesis 64 Bus Use of Shoulders*[3]. In conjunction with the KDOT's signing philosophy and standards, modifications to this typical signing plan can be made to mark the beginning and end of BOS zones or to fit unique signing situations.

[2] The locations of rumble strips and drainage inlets are shown on the BOS conceptual design plans included in technical memorandum "I-35 Bus on Shoulder Evaluation," April 20, 2009.
[3] TCRP Synthesis 64 *Bus Use of Shoulders*, Transportation Research Board, 2006.

Figure 8: Typical Signing Layout



3.3 Traffic Analysis

HNTB conducted a traffic analysis to determine the traffic impacts of bus on shoulder (BOS) operations on I-35 from 151st Street in Olathe, Kansas to downtown Kansas City, Missouri. The analysis was also performed to:

1. Identify the travel time benefit to transit users.
2. Evaluate the operational impacts to vehicles on the I-35 mainline and at freeway interchanges.

3.3.1 Methodology

The traffic study was coordinated with Johnson County Transit (JCT) and the Kansas Department of Transportation (KDOT). The methodology of the traffic study was to analyze the operational and safety impacts of the BOS concept along I-35 as they relate to mainline, merge, diverge, and interchange traffic operations. Although the I-35 corridor from downtown Kansas City, Missouri to the 151st Street Interchange in Olathe is the proposed corridor for BOS, the traffic study focused on the highest traffic volume segment from Shawnee Mission Parkway to 119th Street. A VISSIM simulation model, built from the Johnson County Gateway model, was used to analyze the impacts of a BOS system. The following sections describe the data collection and model development.

3.3.2 Scenarios

Four scenarios were developed and analyzed as listed below. For all scenarios, the traffic was modeled for the AM and PM peak periods.

1. **Existing Conditions** – Existing (2008) traffic demand with existing lane geometrics.

2. **Existing Conditions with Bus on Shoulder Operation** – Existing (2008) traffic demand with existing lane geometrics and bus access to the shoulders.

3. **Future No Build** – Future (2040) traffic demand with future committed and limited planned projects. Future committed and limited planned projects include the northbound and southbound improvements to I-35 from 75th Street to 87th Street and the future no build assumptions for the Johnson County Gateway at I-435/I-35/K-10. This includes auxiliary lanes between all interchanges from 87th Street to 135th Street. The remainder of the I-35 Major Investment Study improvements were not included.

4. **Future Conditions with Bus on Shoulder Operation** – Future (2040) traffic demand with future committed and limited planned projects. Future committed and limited planned projects include the northbound and southbound improvements to I-35 from 75th Street to 87th Street and the future no build assumptions for the Johnson County Gateway at K-10. This includes auxiliary lanes between all interchanges from 87th Street to 135th Street. Bus access to the shoulder was allowed. The remainder of the I-35 Major Investment Study improvements were not included in order to show the benefits of bus on shoulder.

3.3.3 Conclusions

A description of the resulting level of service, travel time, and operational conclusions for the traffic analysis are as follows.

3.3.3.1 Level of Service

Generally, BOS operation does not affect the peak direction level of service of the freeway operation. Although the BOS operation does affect the density or speed of a segment slightly in the peak direction, no actual level of service change is experienced.

3.3.3.2 Travel Time

Since the main purpose of BOS operation is to save transit riders travel time during recurring and non-recurring congestion, travel time savings is a very important measure of the feasibility of BOS operation. The greatest travel time savings occurs at the following locations in the existing and future scenarios:

- In the AM, the worst congestion occurs northbound between 95th Street and US-69. Since BOS operation increases the speed through this area for the buses, travel time savings result.

- In the PM, the worst congestion occurs southbound between Shawnee Mission Parkway and 75th Street. Again, BOS operation results in a travel time savings in this section.

Using extrapolation, it is estimated that total travel time savings within the corridor in the existing AM and PM peak hours are approximately 3 minutes and 5 ½ minutes, respectively. The total travel time savings for the future 2040 AM and PM peak hours are just over 3 ½ minutes and just under 8 ½ minutes, respectively.

On days with inclement weather or incidents, KC Scout data has recorded MPH average speeds below 35 MPH for the entire corridor, with speeds as low as 5 MPH. It is likely that BOS would result in greater travel time savings for buses on days when incidents or weather affect traffic flow.

3.3.3.3 Bus on Shoulder Operation

Based on the modeling of the BOS operation and the physical assessment of the shoulders, the following locations are not recommended for Bus on Shoulder use:

- For I-35 from 119th Street to I-435, the low speeds experienced in the right lane in the northbound direction in the AM and the southbound direction in the PM would result in the bus needing to yield to the large vehicle backup once it made its way through this section. Instead, it is recommended that the bus travel in the left lane for the section of I-35 between 119th Street to I-435 where traveling speeds are higher.

- As a result of the high traffic volumes at the US-69 interchange merge and diverge locations, buses should not operate on the shoulder from US-69 to 75th Street.

Figure 9 shows the recommended BOS use of shoulders for the I-35 Corridor.

Figure 9: Recommended Bus on Shoulder Utilization

Section 4: Operating Plan

The operating plan describes how the BRT service would operate in addition to the service plan. This section provides a summary of the operating plan provisions dealing with bus on shoulder operations.

4.1 General

JCT will operate the BRT service though their contract for transit operations. The BRT service will be operated in accordance with the I-35 BRT service plan documented in Section 2.

In addition, JCT will operate the BRT service in accordance with JCT and contractor operating procedures, except that the BOS operations will be made part of the operating procedures.

4.2 BOS Operating Guidelines

All bus drivers must be trained and certified in BOS operations by the contract operator. The contract operator will develop a training and certification process based on the I-35 BRT and BOS plans, and experience from other transit systems using BOS.

Only JCT buses are authorized to use the designated BOS shoulders. Other bus operators, such as private bus companies, are not authorized to use BOS. The JCT dispatcher may direct drivers not to use BOS, at his or her discretion, based on traffic, weather, and other conditions. While buses will operate only on designated BOS shoulders, the driver's discretion guides where and when to operate on BOS. Drivers may determine it is not safe or appropriate to use BOS as a result of their perception of conditions.

JCT can use BOS during specific periods and only when conditions meet certain criteria. This includes weekday peak periods only from 6 AM to 9 AM and from 4 PM to 7 PM. In addition, BOS will be used only when the following criteria are met:

- mainline traffic is congested and speeds are 35 MPH or less
- when permitted by the JCT dispatcher
- when shoulders are not blocked by disabled vehicles, maintenance, equipment, debris, piled snow, etc.

4.2.1 Other

Buses must yield to any vehicle that enters the shoulder as well as any vehicle merging or exiting at an interchange ramp or intersection. The bus must re-enter the mainline at areas where BOS is not permitted and in places where the shoulder is obstructed (parked vehicle, debris, etc). The bus will use the acceleration and deceleration auxiliary lane at service interchanges (i.e., interchanges with surface roadways) and will merge into general traffic lanes at the US-69 and I-435 system to system interchanges (i.e., freeway to freeway interchanges).

4.3 Initial Bus on Shoulder Segments

The initial BOS segments are as defined in Section 3. The operable segments include the following:

Northbound
135th (Santa Fe) Street to State Line, except:

- From 119th Street to north of I-435
- Through the US-69 interchange area to 75th Street

Southbound
State Line to 135th Street (Santa Fe), except:

- From 75th Street through the US-69 interchange
- Through the I-435 interchange to south of 119th Street

Figure 9 on page 30 shows the BOS operating segments.

Section 5: Stations, Stops, and Park and Ride Facilities

Facilities such as stations and park and ride lots are a very important part of the BRT concept because these facilities contribute to the image of BRT as a permanent premium facility. They also are the most visible elements of BRT service. This section includes recommendations at the planning level for stations and park and ride facilities.

5.1 BRT Stations/Stops

I-35 BRT will have very few stations. As a result, the number of passengers using the stations will be much greater than for other transit services. Accordingly, the BRT stations should be much more significant than stops for conventional local transit bus services. I-35 BRT stations should be designed to convey the brand identity that distinguishes the BRT service from other public transit services, portraying a premium-type service.

The I-35 BRT stations should contain the following elements:

- A passenger shelter with the BRT branding theme
- Appropriate lighting
- A distinctive marker (or sign)
- User information, including electronic "next bus" signage
- A well defined platform or boarding area

BRT station/stops in other cities have employed various shelter types and other amenities. Some are simple, but most are custom designed and different than the shelters used for local transit service. Figure 10 shows a station/stop on Los Angeles' very successful Metro Rapid BRT route. Figure 11 is a stop on Kansas City's Main Street MAX route.

Figure 10. Los Angeles Metro Rapid Station

Figure 11. Kansas City MAX Route Stop

Most I-35 stations in Johnson County will be located at park and ride lots, typically on private property. As a result, JCT will be subject to the property owner's willingness to allow the installation of a shelter. JCT will need to negotiate with property owners and likely should be prepared to pay for an easement for the installation of a shelter and other station elements.

BRT stops that are not at park and ride locations should be evaluated on a case by case basis for the need and opportunity for the installation of a passenger shelter.

The opportunity to create platforms at the larger park and ride stations should be evaluated on a case by case basis. At a minimum, passenger loading areas should be delineated with pavement markings, signage, and other surface treatment. Delineation of the bus driving lane with curbing should be accomplished where possible. Increasingly, BRT systems are using elevated platforms to eliminate or reduce the elevation between the loading area and the interior of the low floor bus for improved accessibility.

The importance of BRT stops in the downtown Kansas City area should not be overlooked. Space limitations in the downtown area challenge the development of transit stops. Once the downtown routing and stop locations are determined, JCT should begin to work with Kansas City and the KCATA regarding the design and location of station amenities. Joint KCATA and JCT stations are likely to require particular attention for proper site design.

5.2 Park and Ride Lots

An important task of the I-35 Fixed Guideway Phased Implementation Plan is the preliminary identification of potential park and ride lot locations.

Park and ride lots serve as the point of transfer for riders from single occupant vehicles to transit vehicles. An effective park and ride strategy is key to the success of the BRT service in Johnson County. Recent detailed passenger counts performed by HNTB indicate that nearly 90 percent of passengers on express routes serving portions of Johnson County south of I-435 access the bus stop via park and ride. This leads to two conclusions: 1) the availability of well located park and ride lots is critical to the success of these types of routes, and 2) the detail of the routing is not as important as the general location of the route, because the riders are willing to drive to a convenient stop.

With the expected increase in ridership with the phased implementation of BRT service, the need arises for additional capacity at park and ride lots. Lots with capacity for 20 or 30 commuters may be sufficient today, but lots with capacity for several hundred spaces will be needed in the future.

5.2.1 Considerations and Criteria for Park and Ride Lot Locations

In order to identify potential park and ride lots, the following criteria were developed to help narrow down the possibilities:

- The lot should be located along the initial BRT routes with good access for buses, although route diversions are sometimes necessary to serve a park and ride lot.
- The lot should be in a suitable location to effectively serve the targeted market.
- To help reduce cost, a priority was given to existing lots with excess capacity during the work week.
- An attempt was made to identify lots that could accommodate buses entering and exiting the lot for the convenience of passengers.

- An attempt was made to identify parking lots, in which the owners could benefit from a partnership with JCT.

5.2.2 Cost Considerations

There are essentially two types of park and ride lots. The first type includes dedicated lots that are developed exclusively for use by commuters and the second type consists of shared use lots wherein the commuter function shares the lots with another use. In the latter case, retail commercial and church lots, for example, can work well. These lots have peak demands at times that are different than commuter lots.

These two types of park and ride lots have very different development costs. The construction of dedicated park and ride lots has costs ranging from $5,000 to $6,000 per parking space. This cost increases with the construction of needed access roadways and other appurtenances. The cost of the property can be very high, and can easily exceed the cost of construction. The preferred locations for park and ride lots are also preferred locations for commercial properties, thus the value of the land is high. Because of this, dedicated commuter park and ride lots are often constructed on public property (e.g., surplus roadway right-of-way) to avoid the high cost of property acquisition.

Shared use lots are much less expensive because they are already developed for the primary purpose. In the best case, they are virtually free for the park and ride function. More realistically, there is a cost associated with the shared use, but is much less than the cost to develop, construct, and maintain. Table 5 illustrates these differences for three different scenarios for a 200 space park and ride lot development.

Table 5. Park and Ride Lot Capital Cost – Hypothetical 200 Space Lot

Type of Lot	Total Cost	Cost per Space
Shared Use with repaving and reinforcement for buses*	$431,000	$2,150
Dedicated lot with bus drives; no property cost	$1,880,000	$8,900
Dedicated lot with bus drives; property cost at $20/SF	$3,715,000	$18,600

*Cost assumes repaving an existing lot and realigning curbs to create a bus stop area.

Due to the high cost of construction, the identification of potential park and ride lots focused on shared use. This strategy is considered appropriate for the initial phase of I-35 BRT phased service implementation plan. It is likely that dedicated lots may be required in a future phase as ridership increases to a point that the transit function outgrows shared use lots.

An attempt was made to identify excess right of way, but none was identified that would be in close proximity to the proposed routes. This possibility should be considered in the redesign of interchanges.

5.2.3 Potential Lots

Based on the criteria discussed previously, several existing lots were identified as potential locations. In addition, several of JCT's existing park and ride lots were determined to serve the BRT purpose well.

Section 6: Other BRT Service Elements

The BRT concept combines multiple system elements into an integrated service package to provide a premium service and support the image and visibility of a premium transit service. This section describes and provides preliminary recommendations relative to vehicles, fare collection, Intelligent Transportation Systems (ITS), and marketing and branding.

6.1 Vehicle Types

BRT systems in operation use all manner of transit vehicles from standard transit coaches to exotic specialty vehicles. In practice, the choice of the BRT vehicle is dependent on a number of factors, with emphasis on tailoring the vehicle to the service type and market. Consideration should be given to capacity, technology, styling, and branding. The vehicle is one of the single most important elements that define the BRT service to the passengers and the public, in general. BRT vehicles are usually distinguished from other vehicles in the transit systems fleet by style and amenities, or at least paint scheme and logos. This is an important part of the branding that binds the BRT elements together into a single premium service package.

The vehicle configuration refers to the combination of the length (seating capacity), body type, and floor height of the vehicle. Because of the flexibility of vehicle implementation, transit systems frequently have started BRT service with 40 to 45 foot vehicles with a plan to transition to 60 foot articulated buses as demand grows. Low floor vehicles are the predominant choice among transit agencies in the U.S. The following is a brief summary of available vehicle types for BRT services.

Standard

Standard vehicles are 40-45 feet in length and have a conventional (“boxy”) body style. The partial low-floor variety contains internal floors that are significantly lower (14 inches above pavement) than high floor buses. They typically have at least two doors and a rapidly deployable ramp for wheelchair–bound and other mobility-challenged customers.

A typical 40 foot vehicle has seating for 35-44 patrons expanding to between 50 and 60 with standing room. A typical 45 foot vehicle can carry 35-52 passengers seated and 60-70, with standing room.

Stylized Standard

Stylized Standard vehicles have all of the features of a conventional step low-floor vehicle. The major difference is that they incorporate slight body modifications or additions to make the body appear more modern, aerodynamic and attractive. The passenger capacity is similar to Standard vehicles of the same size.

Conventional Articulated

The longer, articulated vehicles have a higher percent passenger seating capacity (50 percent more) than standard vehicles. Typical layout or configurations are partial low floors with steps with two or three doors. Articulated vehicle seating capacity depends heavily on the number and placement of doors ranging from 31 (four wide doors) to 65 (two doors) and total capacity of 80-90 passengers, including standees.

Stylized Articulated

Stylized articulated vehicles are emerging in the United States to respond to BRT communities' desire for more modern, sleeker, and more comfortable vehicles.

Step-low floors, at least three doors, with two double stream and quick deploy ramps all facilitate boarding and alighting to shorten stop dwell times.

Over the Road Coaches

Vehicles designed for longer distance travel, including inter-city travel, have been used for express transit services in many transit systems. These vehicles typically have high floors and a single door at the front. The interior is configured and outfitted for trips of greater duration than typical transit trips and may include high backed seats, reclining seats, luggage racks (for briefcases and computer bags), reading lights, and computer accessories such as electrical outlets and wireless Internet access.

The single door and high platform can lengthen boarding and alighting times so these vehicles are often used for services with very limited stops.

Specialized BRT Vehicles

Specialized vehicles employ a modern, aerodynamic body that has a look similar to that of rail vehicles. They also employ advanced propulsion systems and often come with advanced ITS and guidance systems.

6.1.1 Recommendation

JCT should initially use stylized standard low floor transit coaches for I-35 BRT service. The use of 45 foot coaches will provide some increase in seating capacity without moving into an altogether different type of vehicle, such as articulated coaches. Use of over the road coaches is not recommended because the trips will be in the range of 30 to 40 minutes, not long enough to rationalize the use of this type of coach. The increase in boarding and alighting times would have a negative effect on transit travel times.

The I-35 vehicles should include extra features to enhance the attractiveness of the vehicle and the overall service. Selection of these features can have an important impact on community and rider acceptance.

I-35 BRT will have a unique brand and theme that will include a specialized logo and paint scheme. Use of such features to differentiate BRT systems from other services requires a dedicated fleet, which affects operations strategies such as interlining and rotating vehicles with local transit service.

The incorporation of larger windows and interior light fixtures that allow for abundant light day or night to provide an "open feeling" can improve the perception of the service.

Enhanced interior amenities such as more comfortable seating including high backed seats, higher quality materials and finishes, and better climate control can improve the perception of the service. It should be noted that many of JCT's existing coaches have amenities such as more comfortable seating.

These recommendations will provide for a higher quality vehicle suitable for the BRT service without a significant increase in capital or operating costs. A vehicle fleet management plan should be developed to integrate the BRT buses into the JCT fleet. The BRT service will require the acquisition of additional vehicles due to the higher level of service. These new vehicles can be ordered with the BRT enhancements and used on the trips with the highest ridership. Buses currently in the JCT fleet can be retrofitted as necessary to replicate the BRT vehicles and can be used on trips with lower ridership

6.2 Fare Collection

Fare collection systems for BRT can take many forms, but a key BRT planning objective is to support efficient, multiple stream boarding, to the extent possible. JCT currently uses a pay-on-entry fare collection process that requires each passenger to board through a single front door and pay the fare as they enter. A high percentage of JCT passengers currently use prepaid fares. JCT recently implemented an electronic farebox system that provides additional options for prepaid fares, and is preparing to introduce a monthly pass in the near future.

This type of fare payment system has the advantage of low costs (ticket vending machines – TVMs are not required at stations) and passenger familiarity. However, pay-on-entry can result in significant dwell times on busy BRT routes, particularly those with heavy passenger turn-over.

An alternative fare collection system is the Barrier-Free (self-service) or Proof-of-Payment (POP) system. This approach requires the rider to carry a valid (usually by time and day) ticket or pass when on the vehicle and is subject to random inspection by roving personnel. It typically requires ticket vending and/or validating machines. The advantage of this less restrictive system is that it supports multiple door boarding and thus lower dwell times. The disadvantage is the increase in capital and operating costs for TVMs and increased risk of fare evasion. There would also be a cost for fare enforcement personnel.

The JCT BRT routes are not expected to have significant rider turnover. Rather, on inbound trips, most passengers will board at two or three stations along the route and remain on-board until their destination in the downtown area. Boarding through either door would

reduce dwell times, particularly if fare payment was not processed at the farebox. This could result in a savings of one to two minutes per large boarding location. However, the potential time savings is reduced as a greater number of passengers use prepaid fare media.

Another consideration is the inspection/enforcement process with the proof-of-payment system. Transit coaches do not lend themselves to inspection as well as light rail vehicles that are larger and carry greater passenger loads.

It is recommended that JCT retain the pay-on-entry fare payment system for the initial phase of the I-35 BRT. Efforts should continue to encourage BRT passengers to use prepaid fare mechanisms as much as possible to simplify fare collection and speed the boarding process. Proof-of-payment should be considered later as ridership levels grow and resultant dwell times become greater.

It is further recommended that the fare level for I-35 BRT service remain consistent with current JCT pricing practice. BRT fare levels should be the same as the fares for other JCT express service. I-35 BRT fares should be fully integrated into the JCT fare structure including passes, tickets, and transfers. The I-35 BRT fare structure should consider integration opportunities with other transit systems in the region to maximize the potential benefits, particularly the facilitation of transfers.

6.3 ITS Overview

Intelligent Transportation Systems (ITS) are a vital component in the operation of an integrated BRT System. The ITS system can contribute to operational enhancements, schedule adherence, improved passenger safety, and enhanced customer service. Underlying and connecting all these systems is an advanced communications network which must deliver absolute reliability at all times under challenging conditions. This section provides an overview of the components of a comprehensive ITS system and their impacts on the BRT operation as a whole, from operations to passenger interests.

The key components of a typical ITS system include:

- Transit management;
- Traffic Signal Priority (TSP);
- Real-time passenger information systems;
- Passenger safety and security systems; and
- Communications network.

Transit management systems typically incorporate on-board Automated Vehicle Location (AVL) equipment and monitoring facilities located at a centralized operations center. The AVL systems, which are currently largely GPS-based, are equipped on each bus to collect and process, store data, and manage schedule information. This also provides the exact location of the vehicle at all times to the operations center, allowing staff to monitor the

schedule adherence of the vehicle. In addition, the operations center has the ability, through voice and data communications, to convey to the operator the status of their vehicle as it relates to their schedule.

This information then feeds back into a TSP system. Under a TSP system, the signal phase timings can be instantly modified (within specified parameters) by a stand-alone traffic signal controller upon the approach of a late-running bus to either turn a red signal to green, or to extend a stale green signal for the bus. This reduces the amount of delay experienced by the vehicle and allows it to "catch up" to its schedule. Where the impacts to cross-streets could potentially be considered significant, the TSP system could be configured with a "check in / check out" system, which would return the intersection to its regular signal phasing after the bus has cleared a specified point in the intersection. Introduction of TSP measures have proven effective in reducing operating costs, reducing stoppages and delays, improving overall schedule adherence, and ultimately improving customer satisfaction.

Further measures to improve customer satisfaction include the introduction of real-time passenger information systems. These systems are typically comprised of variable message signs on platforms that convey "next bus arrival time" information (from the on-board AVL system), providing waiting passengers with a level of comfort in knowing when the next bus is expected to arrive. In addition, on-board automated voice and digital "next stop" equipment provides announcements to assist those with disabilities in finding their destination. This information can also be pushed out to web sites, PDAs, and cell phones to help customers plan their travel.

Within stations, ITS systems also contribute to the overall monitoring and passenger safety scheme by providing passengers with direct emergency telephones, Closed Circuit Television (CCTV), and Public Address (PA) systems. These combine to allow for monitoring of the station from a Busway Control Center and two-way communication between passengers on the platform, in station buildings, or in parking facilities and the monitoring center.

Along the BRT route, cameras (either pole-mounted or wall-mounted) can be used to allow the operations center to monitor activities such as breakdowns, stoppages, and emergency situations. This subsequently affords the Busway Control Center the opportunity to react to and avoid trouble spots by re-routing buses around the incident. This also assists emergency services by providing detailed, real-time information about the incident to those responding. Cameras may be linked from a Freeway Traffic Management System, or (ideally) the transit and road traffic control centers are integrated in a single joint facility.

These monitoring systems, both at-station and along the route, are typically connected by a fiber optic system situated in conduits along the length of the corridor, and ultimately tied to the City's existing communications grid for security and emergency response. Alternatively,

wireless communications can be used in a lower-volume environment.

6.3.1 Current JCT Fixed Route ITS Program

JCT is currently implementing an ITS system developed by RouteMatch (RM). The product is RouteMatch CA (CAD/AVL), a fixed route transit management and AVL system. CA functionality includes vehicle location and schedule adherence information made available to the system dispatcher. The system does not include an input/output device in the driver's area, thus there is no direct involvement by or intervention with the bus operator. The information is archived for use in playback mode and for reporting purposes.

The communications backbone for the CA system is provided by Sprint/Nextel's IXRTT network. Voice communication between the driver and dispatch will continue via the radio system. JCT's radio system is an open system.

The primary on-bus system component is Mentor Engineering's BBX unit. BBX includes the CPU, GPS and control head function. As previously noted, the system does not include an operator terminal. BBX communicates with RouteMatch CA software through Mentor's middle ware X-Gate and RM's RM-Gate. It was noted that BBX has 16 ports thus has the capability to support 16 peripherals such as terminals, electronic signs, audio messaging devices, etc.

The system is expected to interface with JCT's GFI fareboxes. The intent of the interface is to allow CA to provide "passive passenger counting." The process will integrate passenger transactions from the fareboxes with location information from CA to produce estimates of passenger boardings by stop.

CA implementation is nearly complete. The system was cutover in June 2009. With this basic AVL/CAD system in place, the capability exists to deploy electronic messaging signs with next bus information at BRT stations.

6.4 Marketing and Branding

An important objective for JCT is to establish a BRT image and identity separate from local bus operations, to maximize the potential for attracting additional riders who might not be able or want to use the current system. Identity here refers to "branding" and image relates to the style, aesthetics and compatibility of BRT's physical elements. Most successful BRT projects have employed the concept of branding as part of the BRT service package.

There is significant flexibility in the way that transit elements can be packaged for a particular BRT system. Each element could be implemented independently, based on what makes the most sense for a particular corridor or what financial resources are currently available. Alternatively, multiple elements can be implemented in an integrated fashion to provide increased quality for the BRT service relative to conventional bus services. Regardless of what elements are included, it is important for JCT to develop a strategy to foster a brand for BRT. This section presents a brief introduction to appropriate strategies in developing a unique identity for BRT applications.

The application of branding starts with the planning for BRT. It is important to note that transit agencies and the services they operate have a brand identity, whether consciously developed or not. The brand identity is based upon existing characteristics of the system,

existing transit services, and existing business processes at the transit agency. The brand identity is not merely visual but relates to the product in relation to the needs and desires of the consumer. JCT has successfully developed "The JO" as a readily recognized brand for transit service in Johnson County.

Brand identity is communicated visually through names, logos, color schemes, graphics, the design of physical elements, and marketing materials. It is also communicated in day-to-day dealings with passengers, potential customers, and others within the BRT market area.

Developing a BRT system provides an opportunity to articulate a brand for a unique and distinct system. Because markets are particular to specific regions and evolve over time, the approach to BRT must be tailored to each specific situation. The following paragraphs summarize a typical process to develop a branding strategy for JCT which involves three distinct steps.

1. **Research.** Consumer research reveals market area demographic information, what potential consumers perceive about existing transit service, and what they would value in a new transit service. Research can also involve an internal review of JCT to gauge attitudes about provision of service and how business processes affect the end product.

   JCT has conducted market research that includes surveys, focus groups, and interviews with both users and non-users of transit service. This research has been used to position the agency in the market. This body of research information can be used in the branding exercise.

2. **Identification of Points of Differentiation for BRT.** The second step in developing the JCT brand involves identifying the point of differentiation for BRT. This would involve identifying features that are relevant to the target market. These features can be both related to what the product does (its performance – travel time savings, reliability, safety, security, and effective design) and the impression it conveys. These points of differentiation will help JCT in the planning for the system and selection of elements, and ultimately with the marketing of the service.

3. **Implementation of the Brand.** Implementation of the BRT brand would involve at least three activities:

   Implementation of the BRT System Elements: The elements that most support the brand are key to presenting an attractive product that potential customers would want to use.

   Changing Internal Business Processes: Critical to a successful product is an organization that believes in the product it is presenting to the customer and efficient and effective delivery of the product. This often involves any necessary reorganization of JCT internal business structures, processes, relationships, and delivery approaches.

   Marketing: A good product with a good delivery mechanism is reinforced by an effective marketing campaign. This involves brand identifiers such as distinctive product names, logos, taglines, slogans, and color schemes as well as advertising through visual and other media.

6.4.1 Identity and Image

The three most visible BRT elements are the vehicles, stations, and running ways. A distinct BRT color scheme (livery) and logo used with unique, modern vehicles are growing more common in BRT systems. Most BRT systems also have stations with highly visible, distinct design cues to differentiate the BRT routes that serve them from regular local bus stops. Some combine architecture and design with high visibility to both “advertise” the system and indicate where to gain access to the BRT system.

Section 7: BRT Benefits

Obviously the benefits of the BRT system must be considered in the context of the required investment. This section summarizes projected benefits in the form of increased ridership, transit user time savings, and operational benefits.

7.1 Ridership Estimates

HNTB completed an analysis of the market potential in the study area as part of the basis for the ridership estimates. The market potential was based on current JCT ridership in the study area and an evaluation of the demographics of the target area, including Journey to Work (JTW) data from the 2000 Census. The JTW data is particularly relevant because it includes place of employment. The market for the I-35 BRT service is downtown commuters. A JTW analysis of downtown Kansas City commuters is summarized in Table 6.

Table 6. Downtown Kansas City Employees – 2000 Census

Area	Persons Employed Downtown	Percent of Total Employed Persons
Gardner	117	2.6%
Olathe West	585	3.0%
Olathe East	1,029	5.0%
South Overland Park	3,383	7.8%
Lenexa	819	6.2%
Shawnee	1,942	8.8%
NE Johnson County	2,964	8.3%
Total	10,839	6.8%

Source: 2000 Census JTW

Using the JTW data along with current ridership patterns, potential demand for the routes in alternatives 1 and 2 was estimated. Table 7 shows these estimates for 2010 compared with current ridership levels in the area.

Table 7. Estimated BRT Daily Ridership Levels

Route	Current	Alt. 1	Alt. 2
Olathe West		270	370
Olathe East	320	440	440
South OP	110	730	350
Route L	170	270	290
119th Street			380
Total	600	1,710	1,830

Source: JCT ridership statistics and HNTB

These estimates are intended to serve as a guide for evaluation of the various alternatives. The estimates do compare quite well with the ridership estimates developed during the FY 2008 I-35 Alternatives Analysis using the MARC regional demand forecasting model.

7.2 Transit User Benefits

The primary benefit to transit users is the travel time savings due to the use of Bus on Shoulder operations and other BRT service enhancements. The time savings were estimated at approximately 3 ½ to 8 ½ minutes per one-way trip. This is a significant time savings representing approximately 20 percent of the travel time on the freeway.

Another significant benefit is the improvement in reliability of travel times. Peak period traffic flow on I-35 is unstable and susceptible to delays resulting from incidents and weather. The BOS operation and the operational enhancement with AVL/CAD are expected to allow buses to avoid these unpredictable delays, with the result being improved reliability.

7.3 Transit Operations Benefits

The improvement in travel time and reliability is expected to translate into operational benefits including reduced transit running times and reduced delays. Depending on the particular circumstances this could reduce operating costs. The BRT service with BOS will help JCT avoid increases in operating cost as traffic volumes and congestion increase in the future.

Section 8: Financial Analysis

This section provides information on the estimated capital and operating costs, funding requirements, and potential financing approaches.

8.1 Potential Funding Sources

There are several sources of capital funding for the development of the I-35 BRT service and facilities.

- **FTA 5309 Bus and Bus Facilities funding**. These funds are accessed through project based grant applications and are eligible to fund bus acquisition and the design, acquisition, and construction of station facilities, park and ride lots, and bus on shoulder development. These funds are distributed by FTA on a discretionary basis and can be used for up to 80 percent of the cost of capital projects.

- **American Recovery and Reinvestment Act (ARRA) Multimodal Discretionary Program (Stimulus Program)**. ARRA legislation includes $1.5 billion for transportation projects to be administered by FTA on a competitive and discretionary basis. These funds are intended for short term projects, and applications must be submitted to FTA by September 15, 2009. These funds do not require a local match and can be used to cover 100 percent of the capital project cost.

- **I-35 Commuter Rail funding**. JCT has secured approximately $3 million in earmarked FTA 5309 funds for the development of commuter rail in the I-35 corridor. With the decision by the BOCC to implement BRT in the corridor instead of commuter rail, these funds can be reprogrammed for other transit projects in Johnson County. JCT has initiated this process. The funds can be used for design, acquisition, and construction as with other 5309 funds.

- **KDOT funding assistance**. Currently KDOT provides funding to JCT and other state transit agencies through the Comprehensive Transportation Program (CTP). These funds are distributed on a formula basis and JCT uses the funding for the capital and operating needs of the Johnson County transit system. The nature of the I-35 BRT project as a partnership between Johnson County and KDOT may offer opportunities for additional funding assistance from KDOT. For example, KDOT may cover the cost of preparing the shoulder for BOS operation. Much of the required work can be accomplished efficiently with KDOT staff. This will reduce the need for capital funding and KDOT's contribution to the project may be eligible to be regarded as local match.

- KDOT should provide additional funding assistance for implementing the project, including the provision of other direct funding. The I-35 BRT project affects one of the most significant urban freeways on KDOT's system. The project is a partnership between JCT and KDOT with benefits to both agencies. A primary objective of the I-35 BRT project is to provide a viable alternative to single occupant vehicle commuting.

It is recommended that JCT discuss these funding possibilities with FTA Region VII staff and KDOT staff to determine the approaches to funding the capital requirements of the I-35 BRT project.

Funding opportunities for operating costs are more limited. FTA does not provide funding for operations. JCT currently funds fixed route operating costs through a combination of passenger fare revenue and funding from Johnson County and the state CTP. It is likely that operating costs for I-35 BRT will be covered by the same mix of funding sources.

JCT requested additional funding for transit operations from the Board of County Commissioners (BOCC). Additional County funding, if made available, can be used for the I-35 BRT service enhancements.

City participation in Johnson County transit programs has been limited in the past. There may be opportunities for JCT to partner with the cities of Overland Park and Olathe in funding the I-35 BRT project.

8.2 Capital Costs

Capital costs were estimated based on the information developed during the project. The capital cost estimates include the cost of construction and acquisition, plus costs for design, testing, permitting, and construction services. The capital cost estimates are shown in Table 8 below.

Table 8. Capital Costs

Item	Alternative 1	Alternative 2
Buses	$10,080,000	$11,340,000
Stations	$1,760,000	$2,200,000
Park and Ride Lots	$1,600,000	$2,000,000
Shoulder Preparation	$2,360,000	$2,360,000
Other[1]	$788,000	$985,000
Sub-total	$16,588,000	$18,885,000
Soft Costs[2]	$1,046,000	$1,189,000
TOTAL	$17,634,000	$20,074,000

[1] Other includes ITS enhancements such as electronic signs, transit signal priority, and queue jumper applications.
[2] Soft costs include design (preliminary and final), testing, inspections, construction administration, permitting, and insurance.

8.3 Operating Costs

Existing service in the defined service area is provided by ***Route B – Olathe Express***, ***Route L – South Johnson County Express*** and ***Route N – 151st – Downtown***. Table 9 shows the current service levels and operating costs.

Table 9. Current Study Area Service Levels and Cost

Route	Daily Trips	Daily Miles	Daily Hours	Buses	Daily Ridership	Annual Cost
Route B	12	614	21.9	6	320	$374,000
Route L	6	400	14.8	3	170	$253,000
Route N	4	244	7.7	2	110	$132,000
Total	22	1,258	44.4	11	600	$759,000

Johnson County has an investment in the service area of $759,000 in annual operating costs and a capital investment in 11 buses, approximately $4,000,000 capital cost.

The BRT service would represent a substantial improvement in transit service in the area and a substantial increase in both operating and capital cost. Table 10 shows the service levels and operating costs for the I-35 BRT operating plans.

Table 10. I-35 BRT Service Levels and Cost

Route	Alternative 1			Alternative 2		
	Daily Trips	Buses	Operating Cost	Daily Trips	Buses	Operating Cost
Olathe West	10	5	$250,000	10	5	$250,000
Olathe East	18	7	$471,000	18	7	$471,000
South OP	18	7	$499,000	10	5	$260,000
Route L	10	5	$349,000	10	5	$349,000
119th Street				10	5	$260,000
Total	56	24	$1,569,000	58	27	$1,590,000

In addition to the cost of bus operations, the new BRT service would have additional operating costs for the servicing and maintenance of stations, park and ride lots, and other BRT elements estimated at $90,000 per year. Total operating costs and revenues for alternatives 1 and 2 and were compared with JCT's existing cost in the service area for routes ***B Olathe Express***, ***L South Johnson County Express Street*** and ***N – 151st Street***, as shown in Table 11.

Table 11. Estimated Operating Costs and Revenues Compared to Current Service

	Existing Service	BRT Alternative 1	BRT Alternative 2
Total Cost	$759,000	$1,659,000	$1,680,000
Fare Revenue	$165,000	$470,000	$504,000
Operating Deficit	$594,000	$1,189,000	$1,176,000

Thus, the BRT service plan is estimated to increase the operating deficit by $595,000 for Alternative 1 and $582,000 for Alternative 2.

8.4 Funding Approach

A conclusion during the I-35 Fixed Guideway Alternatives Analysis was that FTA funding for capital costs should be pursued through FTA's 5309 Bus and Bus Facilities program rather than FTA's New Starts program. The conclusion was based on the fact that the capital costs would be relatively low (compared to New Starts projects) and the project would not likely fare well in FTA's highly competitive New Starts program. Moreover, the administrative requirements for New Starts programs can complicate project development.

FTA capital funding through the discretionary 5309 program is available to cover up to 80 percent of the capital cost of the project. During the next phase of the project, JCT should work with FTA Region VII to determine the most effective way to develop the grant application or applications. Additionally, JCT should develop support from the Kansas congressional

delegation. All FTA discretionary grants are awarded through the congressional earmarking process.

For planning purposes, it is assumed that FTA will cover 80 percent of the project's capital cost. The non-FTA share of capital costs will have to be covered by non-federal sources either through the County or the State. The capital costs will be spread out over the 32 month project schedule.

Operating costs will also have to be covered by either County, state, or city revenue sources, or a combination thereof. The financial plan developed in the next phase of the project should include a strategy for funding the ongoing costs of operating the I-35 BRT service.

Table 12 below summarizes the financing requirements for the project assuming 80 percent capital funding from FTA.

Table 12. Federal and Local Funding Requirements

	Alternative 1	Alternative 2
Federal Share of Capital Cost	$14,107,200	$16,059,200
Local Share of Capital Cost	$3,526,800	$4,014,800
Additional Annual Operating Cost	$595,000	$582,000

Section 9: Implementation Plan

This section provides information on the steps required for implementation of the I-35 BRT service. Subsection 9.1 provides an outline of the implementation tasks and 9.2 proposes a preliminary schedule for the project. The remainder of the section provides additional detail on tasks that should be started immediately for the completion of the schedule.

9.1 Tasks Required for Implementation

Project tasks required for implementation include the following and are shown in Table 13 on the following page:

- Program Management
- Institutional/Legal Matters
- Service Planning
- BRT Branding
- Public/Stakeholder Involvement
- Funding/Financial Plan
- ITS Related
- Roadway Design
- Station and Park & Ride Design
- Procurement of Stations and Vehicles

9.2 Project Schedule

HNTB prepared a project schedule to show the timing, duration, and sequencing of tasks required to complete the tasks required for implementation of the I-35 BRT service.

A summary of the project schedule is shown in Figure 12. The schedule assumes work will begin on the next phase of project development August 3, 2009. The new service would then start in the first quarter of 2012. Vehicle procurement is the task with the longest lead time and is therefore on the project's critical path. Delivery of buses is anticipated to require 18 months after the order is placed.

In general, the project implementation will proceed through three distinct phases:

Program Development Phase – August 2009 through June 2010. This phase includes additional advanced service planning, addressing institutional and legal issues, and project financing. During this phase, conceptual planning for BOS and facilities will transition to preliminary design.

Design Phase – December 2009 through January 2011. The Design phase overlaps with the Program Development phase because conceptual design is included in both phases. The Design phase includes the conceptual, preliminary, and final design for the preparation of I-35 shoulders for BOS, stations, and park and ride lots.

Construction Phase – The Construction Phase includes the procurement and construction of the I-35 shoulders for BOS, stations, and park and ride lots. This final phase also includes the delivery and testing of buses and other tasks involved with project implementation.

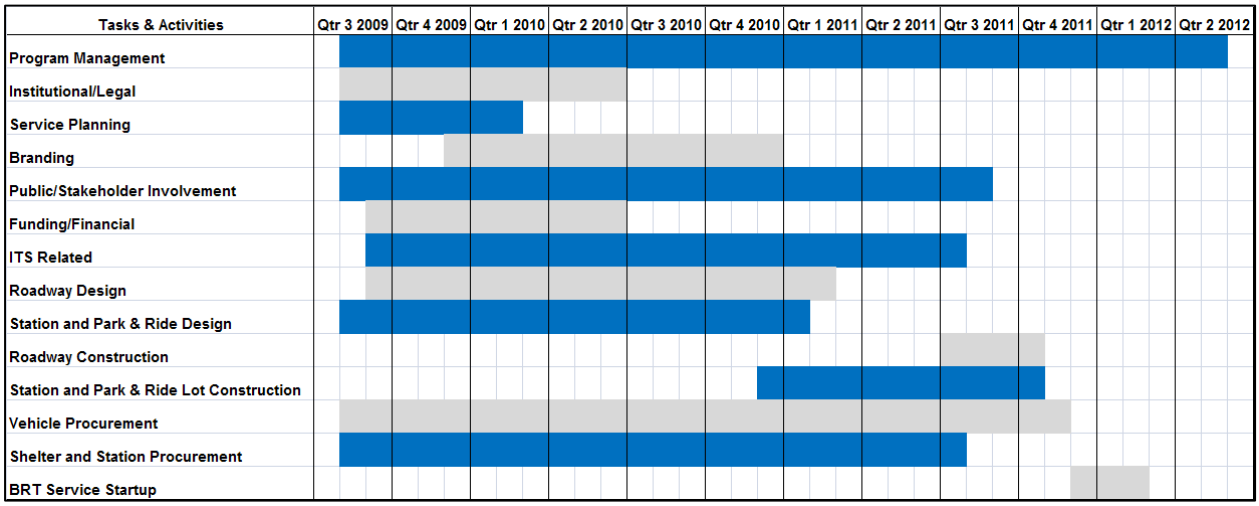
Table 13: I-35 BRT Implementation Tasks

Task/Activity Name	Description of Task/Activity
Program Management	Overall management of the project and tasks required for implementation.
Institutional/Legal	
Secure KDOT Approval	Secure KDOT approval for the BOS concept and the details of the design of shoulders and service.
Secure KDOT Agreements	Develop, negotiate, and execute formal agreements between JCT and KDOT for BOS operation.
Revise Legislation	Revise the state statutes that prohibit operation on shoulders and are otherwise required for BOS, working with KDOT, Kansas Highway Patrol, and the state legislature.
Service Planning	
Decide on Alternatives	Decide between service concept Alternative 1 and Alternative 2.
Complete Service Plan	Finalize routings, stops, park & ride lots, service schedules.
Detailed Service Planning	
Downtown Routing	Determine routing and stops in the Kansas City downtown area.
Complete Operating Plan	Finalize BOS operation procedures.
Prepare BRT Schedules	Prepare final operating schedules, blocking, and driver assignments.
Branding	
Brand Concept Development	Develop the basic brand image for I-35 BRT.
Collateral Materials	Apply the brand image to collateral materials such as public timetables, information displays, etc.
Vehicle and Facility Designs	Apply the brand image to the vehicle paint scheme and facility designs.
Public/Stakeholder Involvement	
Stakeholder Coordination and Support	Hold meetings, prepare presentations, and respond to questions from project stakeholders.
Public Meeting(s) on Service Plan	Hold at least one public meeting related to service plan.
Public Meeting(s) on Service Changes	Hold at least one public meeting related to service changes.
Finalize Public Education Program	Include costs, schedule, specific assignments.
Execute Public Education Program	Implement the public education campaign.
Funding/Financial	
Finalize Financing Plan	Work with JCT staff to determine funding sources for project financing.
Secure KDOT Funding	Work with KDOT staff on financing plan and KDOT involvement.
Secure Local City/County Funding	Work with city staff on financing plan and city involvement. Work on county portion of the financing plan.
Preliminary FTA Discussions	Meet with FTA regional staff regarding funding.
Preliminary FTA Project Justification	Prepare project description and justification for inclusion in the FTA grant application.
Environmental Clearances	Secure the environmental clearances required for FTA funding.
Prepare FTA Grant	Prepare and submit a grant application for capital funding under FTA's 5309 program.
ITS Related	
Prepare Deployment Plan	Prepare a preliminary plan for the deployment of ITS enhancements, including electronic messaging signs.
Assess RouteMatch CA	Determine CA ability to support remote bus arrival signs.

Table 13 (Continued). I-35 BRT Implementation Tasks

Task/Activity Name	Description of Task/Activity
Preliminary Plan for Electronic Signs	Prepare a plan for the location, number, and type of electronic messaging signs.
System Design/Implementation	Prepare an implementation plan, specifications, and bidding materials for the ITS enhancements.
Roadway Design	
Shoulder Preliminary Design	Prepare preliminary design documents for shoulder preparation, including signing plan.
Shoulder Final Design	Prepare final design documents for shoulder preparation, including specifications.
Construction Services	Provide construction administration and inspection services.
Traffic Analysis - Surface Streets	Conduct traffic analyses as required for queue jump design, site analyses.
Identify Queue Jumper Sites	Identify sites for queue jumpers based on traffic analysis.
Queue Jumper Conceptual Designs	Prepare conceptual designs for queue jumpers.
Queue Jumper Preliminary Designs	Prepare preliminary designs for queue jumpers.
Construction Services	Provide construction administration and inspection services.
Station and Park & Ride Design	
Secure Park and Ride Sites	Contact property owners, prepare concepts for use with owners, negotiate agreements for designs and use.
Conceptual Designs	
Negotiate Agreements	
Preliminary Designs	Prepare preliminary designs for park and ride lots.
Final Designs	Prepare final designs for park and ride lots, including specifications.
Construction Services	Provide construction administration and inspection services.
Identify Station/Stop Locations	Determine stop locations for stops not at park and ride lots.
Conceptual Designs	Prepare conceptual designs for stations, including shelter type.
Preliminary Designs	Prepare preliminary designs for park and ride lots.
Final Designs	Prepare final designs for park and ride lots, including specifications.
Construction Services	Provide construction administration and inspection services.
Procurement	
Determine BRT Vehicle Type	Decide on the type and size of the BRT buses including amenities.
Finalize Vehicle Order Size	Determine number of units in the bus order.
Prepare Vehicle Specs	Prepare specifications for the desired vehicle and place order.
Determine Station Furnishings	Determine the level and type of furnishings and other amenities at each stop.
Prepare Specs/Research Products	Prepare specifications for the desired furnishings.
Procurement	Procure furnishings.
BRT Service Start Up	
Vehicle Testing	Inspect and test the buses upon arrival. Instruct drivers on operating the new buses.
Start Revenue Service	Initiate new BRT service.

Figure 12: I-35 BRT Implementation Schedule



9.3 KDOT Review and Approval

An initial step in implementation of I-35 BRT with Bus on Shoulder (BOS) operation involves coordinating with KDOT to secure necessary approvals for the project. The ultimate decision whether KDOT will approve BOS will be with KDOT's Program Review Committee (PRC).

Another important step is defining the issues regarding the legislative statutes that need modifications and what role KDOT will play in the process of revising the statutes. JCT and KDOT should work together to:

- Identify who should take the lead on each statute, JCT or KDOT
- Draft the statute modifications
- Identify legislative champions and the process to get legislation changed

The process of changing the legislation could take a year or more to address given the limited duration of the legislative session. It will likely take months to identify champions, draft modifications, and begin the process.

Finally, the internal and public educational component will be important and should be referenced in communications with the PRC and the legislature.

9.4 Institutional and Legal Arrangements

JCT proposes to enhance their existing express bus service in part by implementing the BOS technique. Collaboration with Kansas Department of Transportation (KDOT), Kansas Highway Patrol (KHP), and other stakeholders on issues involving safety, maintenance, operation, enforcement, and liability will be essential to developing and operating the program. As evidenced by other communities that have effectively implemented BOS service, the institutional and legal framework created among the cooperative parties directly affects the ease of implementation, the degree of public support, and ultimately the overall success of the program.

To date, JCT has involved many stakeholders in the project. As these discussions continue, each party will begin to identify and delineate their areas of responsibility leading to the execution of Cooperative Agreements and if desired, a formal statement of Partnership with JCT. The term, "Cooperative Agreement" refers to all formal agreements (e.g., Memorandum of Understanding and Memorandum of Agreement documents) that may be executed among cooperating parties.

The objective of discussing institutional considerations of BOS service is to identify various issues that JCT and other stakeholders find important. While an attempt has been made to include all possible issues that may emerge, unexpected challenges will likely occur throughout the development and advancement of the program.

9.4.1 Organizing for Improved Transit Service

Transit systems across the country have addressed the question of institutional and legal arrangements in many ways. Minneapolis is one such system that has taken collaboration a step further by creating an organization to ensure the necessary communication and cooperation for improved transit service. Team Transit is a partnership between Metro Transit and other transit providers, Minnesota Department of Transportation (Mn/DOT), Metropolitan Council, the cities of Minneapolis and St. Paul, and metro-area counties and municipalities. The parties have formalized this partnership.

Team Transit functions as a working group meeting every two months to discuss transit needs and to review Mn/DOT's planned improvement program. Needs for transit advantages are identified by the transit providers during regular meetings. Opportunities to incorporate transit advantages into regular Mn/DOT construction projects are identified during a review of Mn/DOT's program. Mn/DOT's Team Transit project manager then coordinates the needs of the providers, integrating them into Mn/DOT projects when feasible and appropriate to the construction schedule.

California has also formalized cooperation between Caltrans and transit agencies. A Director's Policy on BRT Implementation Support sets the tone for Caltrans to work in partnership with transit development entities in implementing BRT projects. To reinforce this shared ownership, a Departmental Directive spells out opportunities for Caltrans to better assist local and regional entities and guide staff in the implementation of BRT strategies on the State Highway System and within State rights-of-way.

The best way for Caltrans to share project ownership is through formal agreements with the BRT development entities, such as a Memorandum of Agreement (MOA), Memorandum of Understanding (MOU), or Cooperative Agreement. In some cases, a less formal "charter" may suffice; in others, a more formal agreement would be preferable. The appropriate document is determined for each case, but each ratified document covers key areas of the partnership.

The Minneapolis Team Transit has been very effective and successful and is a useful model for JCT and KDOT. It is recommended that this type of partnership be created to facilitate the implementation of I-35 BRT and the BOS operating technique.

9.4.2 Agency Roles in Institutional Arrangements

Johnson County Transit

As the lead organization, JCT will be responsible for developing and administering formal agreements with the cooperative parties. Identifying both legal and functional responsibilities, these agreements will delineate the administrative structure of the partnership and guide decisions for the development and operation of the service. JCT should take a proactive role in fostering cooperative relationships among the stakeholders, revise JCT training policies reflecting the organization's commitment to safety, and implement a Public Education Program that will generate positive support for BOS service in the region.

Developing the Program. The approval process of each cooperating party will dictate JCT's schedule for advancing the program. As a result, JCT must first identify the approval hierarchy of each of the cooperative parties involved. Once JCT understands the approval process of each organization, they will be able to draft their schedule and begin developing the Cooperative Agreement documents. Unless stipulated otherwise, there is not a formal outline for the agreements. Details of the agreement may either be included in or appended to the Agreement depending on the desired format. It is assumed JCT will begin the documents with broad statements; refining and revising details as the agreement is processed through the approval process. In the case of amending State of Kansas highway operating statutes, the approval process may be driven by third parties (e.g., legislators) who may require a longer time for review and approval. In this case, JCT will proactively assist the state and continue to build consensus among regional stakeholders as the statutes are revised.

Training. JCT will revise their current training and operational requirements to include the new BOS operations. Revisions may include safety guidelines, speed restrictions, incident reporting protocol, and other operational policies. Prior to implementation, JCT will develop a list of administrative and operational changes that will occur once the new service is instituted.

Public Education Plan. As identified in the JCT Public Education Plan for BOS operations, JCT will identify, inform, and educate affected groups and audiences. Approached as a partnership with the public rather than a training exercise, the public education effort will include building consensus for the service by openly sharing program information and soliciting input from patrons.

Kansas Department of Transportation

KDOT owns I-35 and is responsible for its operation and maintenance. Moreover, KDOT has been a partner with JCT generally and on initiatives involving I-35. KDOT also provides funding for transit statewide.

In preparation for the formal agreements, KDOT will examine their Standard Operating Procedures (SOPs), design standards and other policies and standards to identify those that require revisions necessary to include BOS operations. In addition to the issues previously identified, KDOT and JCT will also have to address the following:

- Signage and striping – practices and standards
- Maintenance considerations

- Funding
- Liability and indemnification
- Possible KDOT owned park & ride lots

Enforcement, Kansas Highway Patrol, and Legislation

Enforcement issues are important in the context of preparing agreements and implementation of BOS. The Kansas Highway Patrol (KHP) has been involved in the I-35 initiative since its inception, and should be included in the partnership as an active participating member.

Enforcement is based on regulations backed by ordinances or legislation. There are a number of traffic laws that must be revised through the Kansas legislative process. KHP has identified legislation that needs to be changed.

- KSA 8-1516 (passing on left required)
- KSA 8-1517 (no driving on shoulder, passing required on roadway) - refer to "roadway" definition.
- KSA 8-1524 (limitations on divided highways)
- KSA-1525 (restriction on divided highways)
- KSA-8-1459 (roadway defined)
- KSA-8-1522 (failure to maintain lane of travel)
- KSA-81529 (entering or crossing roadway required to yield)
- KSA-8-1530 (requirement to yield "to right" for emergency vehicle)
- KSA 8-1539 (driving through safety zone) - this is inclusive of painted traffic gores. Refer to 8-1524
- KSA 8-1460 (Safety Zone defined)

As previously explained, Johnson County will likely have to take the lead in introducing legislation to support BOS.

9.5 Overview of the Public Education and Promotion Plan

JCT and The Kansas Department of Transportation (KDOT) have been evaluating the feasibility of Bus on Shoulder (BOS) operations for the I-35 Corridor linking Johnson County, Kansas with the downtown Kansas City, Missouri region.

The Public Education Plan is developed specifically for educating highway users and potential transit users with the Bus on Shoulder concept.

9.5.1 Objectives and Goals

The Public Education Program's objectives are:

- **Identify affected groups or audiences**. These stakeholder groups will be identified early in the project in consultation with JCT. Groups will be added throughout the project as they are identified.
- **Inform and educate affected groups and audiences of BOS operations and guidelines**. Information will be provided to groups in a variety of formats, from media releases to special presentations. Throughout the project, the team will educate various audiences on the BOS concepts and guidelines. Information will be presented through electronic outreach, videos, newspaper articles, media and user tours, and community presentations.

The public education process builds on the following principles:

- The Public Education Plan will serve as a flexible guiding document for public education activities that adapts to new and changing communication and education needs.
- It will develop education strategies that will enhance groups or individuals understanding of the BOS service, its operations, and benefits to bus and highway users.
- To maximize efficiency, existing resources and channels of communication will be utilized whenever possible, including the media and all existing web sites and online tools available to both JCT and KDOT.

The Study Team will implement effective approaches for meeting the goals of the Public Education Plan through:

- Consistent messages on the needs, benefits, and guidelines of Bus on Shoulder operations.
- Effective communication strategies to address and enhance Bus on Shoulder image.
- Timely and accurate information about BOS operational guidelines.

9.5.2 Public Education Process

The public education process for JCT application of BOS is anchored by activities that educate target audiences about the BOS operations and functionality while promoting ridership on the BOS routes. These activities will be based on and directly reflect the primary issues and concerns of target audiences.

9.5.2.1 Key Public Education Issues and Audiences

Table 14 on the following page outlines the issues and concerns from the different stakeholder groups going into the campaign.

Table 14. Audiences, Key Issues and Concerns

Audience/Stakeholder Group	Key Issues	Concerns
Commuters - Regional motorists in cars/trucks or motorcycles	Traffic flow, routing, safety operation guidelines	• Safety • Less congestion • Routing
Bus Users	Efficiency, routes, safety, operation guidelines	• Less congestion • Time savings • Routing • Safety
Community Leaders	Traffic flow, routing, safety, operation guidelines, enforcement, fiscal responsibility	• Cost • Safety • Routing • Less congestion
Special Interest Groups (environmental, etc.)	Traffic, pollution, sustainability	• Reduction in congestion • Reduction in emissions

9.5.2.2 Public Education and Information Activities

The following strategy activities were developed as a comprehensive program that communicates and informs varied audiences in the region in a targeted way:

Database of Interested Parties. The project database will include contact information for elected officials, stakeholders, interest groups, businesses, and those members of the public interested in transit related information. The majority of addressed information for these groups will be provided by Johnson County Transit and KDOT. Contact information can also be collected over time as people become aware and informed about the BOS operation. The database will be maintained throughout the project. The database will be utilized for electronic information releases, and will be updated as necessary and appropriate.

Media Relations. Media releases and other activities will introduce and promote the BOS operation concept and provide coverage of its rollout, including:

- Media Tours—a guided bus tour of the commuter routes and the use of the Bus on Shoulder operations will be given to traffic reporters and other media officials.
- Video Tour—a guided video tour will be developed to show the BOS operations and functionality to the public from the perspective of the bus user. This video will be provided to media outlets and posted on the JCT and KDOT web sites, made available as a downloadable link.
- Team Transit Race—a bus versus auto ‘race’ to showcase the reliability and benefits of the BOS concept. The event would utilize a regional celebrity to drive an auto along the same route as the bus.

Advertisement and Promotion. Specific and targeted use of paid media will provide widespread distribution of BOS concept, guidelines, and promotion.

- Billboard—use of billboard advertising along I-35 to introduce the BOS operations and direct questions to a web site.
- Bus Advertisements—Use buses (inside and outside) to promote BOS concept and guidelines.
- Radio Spots—Radio announcements during drive time will disseminate information to a broad audience.

Web Page. A specific web page or pages devoted to the BOS operations and questions that can be linked to the JCT page will be developed. Information provided would include how the BOS operates, route information, video information, and frequently asked questions (FAQ). Links can be provided to other information sources including: Mid-America Regional Council, partner communities, transit organizations, Kansas City Scout, KTA, etc.

- *Social Media*—Utilize Twitter, Facebook, MySpace, and other forms of social media to provide information about the BOS operations and rollout.

Informational Materials. In support of educational opportunities, written materials may be produced to inform the public regarding BOS operations. These could include newsletters, fact sheets, and/or frequently asked questions sheets (FAQs). All written material will also be produced in an electronic format for ease of e-mailing. Materials could be provided on established bus routes.

Management and Coordination. Public education activities will be coordinated with the technical activities and with project team goals, objectives, and policies through team meetings.

Key Messages

The Study Team will convey the following key messages to introduce the BOS operations. These messages will be refined or augmented during the rollout. The initial key messages address the benefits of BOS and its endorsement by JCT and KDOT. Initial messages will also include guidelines for how and when BOS operates, as well as:

- Congestion along I-35 is increasing. **Bus on Shoulders** is an innovative way to move more people through the congestion on existing I-35.
- **Bus on Shoulders** means that buses can use the shoulders as a lane during peak congestion when traffic is moving slower than 35 MPH.
- **Bus on Shoulders** is a cost effective and time efficient use of existing infrastructure to address congestion concerns. (Utilizing the shoulder is less expensive than adding new lanes.)
- **Bus on Shoulders** is safe because buses using shoulders do not travel more than 35 MPH.

- **Bus on Shoulders** is safe because buses must yield to any vehicle entering, merging or exiting through the shoulder.
- **Bus on Shoulders** must re-enter the mainline when the shoulder is obstructed (vehicle debris, incident, etc).
- **Bus on Shoulders** is reliable and efficient because buses run on schedule regardless of congestion.

As we move forward with the public education campaign, new key messages will be added in support of the evolution of the process. Specific questions or issues may arise that need to be addressed.

9.5.2.3 Measurement

In an effort to monitor and measure the success of the public education campaign, a survey (online, telephone, or mail) could be done to gauge awareness, perception and or/support for the BOS operations. Additionally, efforts could be measured by monitoring the following:

- BOS ridership numbers, initial, three months, six months and one year
- Number of web site comments, calls, or inquiries about BOS use

Section 10: Conclusions

10.1 Bus Rapid Transit Implementation

The service, capital, and operating plans for BRT serving portions of southern Johnson County are consistent with direction provided by the Transportation Council based on the conclusions of the I-35 Fixed Guideway Transit Alternatives Analysis and as reflected in JCT's Five-Year Strategic Plan.

With BRT, the number of bus trips in the study area would increase from the current 22 daily bus trips to 56 with Alternative 1 and 58 with Alternative 2.

Ridership is estimated to increase by approximately 1,100 to 1,200 daily passenger trips; about three times the current ridership in the study area.

The implementation of BRT services can be phased in terms of geographic coverage and the level of BRT attributes. The Phase 1 BRT service and capital plan represents a significant enhancement in transit service in a key market area at a relatively low cost.

Subsequent phases will include additional routes and further service enhancements will be implemented as funding allows.

10.2 Bus on Shoulder Implementation

Use of the Bus on Shoulder (BOS) operating strategy would be a significant enhancement to the BRT service operating on I-35. The benefits would be an improvement in schedule reliability, a significant travel time savings on "normal" days, and a greater opportunity for travel time savings when I-35 traffic is slowed due to incidents or weather.

I-35 shoulders can support BOS along most of the length of the corridor in terms of physical characteristics, such as width, depth of construction, and absence of barriers. BOS can be used safely and effectively on I-35 based on traffic engineering simulation studies and the experience of other cites with BOS. Preparing the shoulders for BOS would be relatively inexpensive and the implementation period would be relatively short.

10.3 Timing and Schedule

A preliminary project schedule shows that a period of approximately two and one-half years would be required for implementation. If the next phase of work was started in August 2009, the new service could be implemented during the first quarter 2012.

10.4 Recommendations

At the June 9, 2009 meeting of the Johnson County Transportation Council, staff provided a project update and recommended several actions. The following is a summary of the Transportation Council's actions.

- The Transportation Council approved the BRT service and capital plans for improved transit service in the I-35 Corridor as presented during the meeting. The decision

between Alternative 1 and Alternative 2 will be made at the next phase of the implementation plan.

- The Transportation Council directed staff to proceed with next steps which include:
    - Working with FTA and KDOT for required capital funding.
    - Continue to work with KDOT and other agencies to secure the necessary agreements and legislation changes to permit Bus on Shoulder operations.
- The Transportation Council directed staff to prepare for the next phase of the implementation plan to include detailed transit service planning and preliminary engineering.