Tulsa Transit

On Track for the Future

BROKEN ARROW TO TULSA MASS TRANSIT FEASIBILITY STUDY

Executive Summary

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Executive Summary

Introduction

Approximately 125,000 people live and work between Broken Arrow and the Tulsa Central Business District. Many of these people depend on State Highway 51 (SH-51), also known as the Broken Arrow Expressway, to commute to work and other everyday transportation needs. In 1993 Tulsa Transit commissioned a Regional Mobility Study that recommend a pilot commuter rail program from Broken Arrow to Tulsa. The idea behind the pilot program was to relieve traffic associated with ODOT plans for improvements along SH-51. Since then the improvements to SH-51 have been completed, and talk of commuter rail has continued, including this corridor's inclusion in INCOG's Destination 2030 Long Range Transportation Plan.

On July 23, 2006, a Request for Proposals was issued by Metro Tulsa Transit Authority for the Broken Arrow to Tulsa Mass Transit Feasibility Study. A team headed by Lockwood, Andrews & Newnam was selected for this study, and given the notice to proceed on October 4, 2006.

Scope of the Feasibility Study

The overall study area includes the cities of Tulsa and Broken Arrow in Tulsa County, Oklahoma. More specifically, the cities to be served along the corridor are those located along the original railroad and along SH-51 parallel to the railroad. These communities are located between Tulsa on the west end and extend to Broken Arrow on the east end. The commuter rail corridor proposed includes two Class I Railroads: Union Pacific for the majority of the corridor, and the Burlington Northern Santa Fe for a short distance from a junction just east of Greenwood Avenue in downtown Tulsa to the Union Station.

The Bus Rapid Transit (BRT) portion of the study looked at the SH-51 corridor and potential HOV dedicated bus lanes to provide quick reliable service. More detail on each option will be discussed later in this report.

The study includes:

- Analysis of route and operational options
- Analysis of ridership potential
- A Community Involvement Program
- Evaluation of grade crossing safety along the corridor
- Development of an operations and maintenance (O&M) plan
- Development of costs and schedules

SYSTEM SUMMARY (Concept Data)
Commuter Rail

Initial Train Frequency:
Peak Hours: every 72 minutes
Off-peak: none
One-Way Fares:
Fare–maximum $2.00 (estimated)
Travel Time:
Broken Arrow Main Street to Tulsa CBD
31 minutes – one way
System Length: 14 miles
Stations: 4
Design Speed: approx. 70 mph
Operating Hours: 6am to 6pm (Peak Only)
Ridership Projections:
Year 2010:
600K to 2.5M per year
Year 2030:
1.9M to 4.1M per year
Costs (2010 dollars):
Capital:
$43M to $49M
Operations & Maintenance:
$3.1M*

** This includes $2,000,000 in annual insurance premium which does not take into account the Oklahoma Tort Claims Act, which limits the liability of Oklahoma governmental entities with regard to 3rd party claims.*

SYSTEM SUMMARY (Concept Data)
Bus Rapid Transit

Initial BRT Frequency:
Peak Hours: every 40 minutes
Off-peak: none
One-Way Fares:
Fare–maximum $2.00 (estimated)
Travel Time:
Broken Arrow Park & Ride to Tulsa CBD
22 minutes – one way
System Length: 12 miles
Stations: 1
Design Speed: approx. 50 mph
Operating Hours: 6am to 6pm
Ridership Projections:
Year 2010:
48K per year
Year 2030:
70K per year
Costs (2010 dollars):
Capital: (full implementation)
$22M to $23M
Operations & Maintenance:
$1.9M

Background

The tracks and rights-of-way of the railroads in the corridor, except for a short portion of rail in downtown Tulsa, are owned and operated by the Union Pacific Railroad (UP) and carry from 2 to 3 freight trains every day.

The tracks were originally built in the late 1800s and have been an important part of the development of the economy in Tulsa. The possible need for commuter rail connectivity from Broken Arrow to Tulsa, Oklahoma was borne out of a Regional Mobility Study conducted in 1993 by Tulsa Transit.

Additionally, this corridor was included in the 2030 "Long Range Transportation Plan for the Tulsa Region," and was included in the "Transportation Improvement Program for the Tulsa Transportation Management Area" which was endorsed by the Indian Nations Council of Governments (INCOG) on June 9, 2005.

The proposed corridor for this study is the Union Pacific Railroad "Tulsa Branch" from the vicinity of Main Street in Broken Arrow to the vicinity of 1st Street in downtown Tulsa. This study examines community interest for mass transit, further accessibility, station locations, adjacent land-use, right-of-way, and capacity constraints for commuter rail.

The Bus Rapid Transit (BRT) portion of the study looked at the SH-51 corridor and potential HOV dedicated bus lanes to provide quick, reliable service. More detail on each option will be discussed later in this report.

Regional Growth

The population of the region continues to grow. The table on the following page shows the forecasted population for Tulsa Metropolitan Area. Highway traffic on SH-51 is also indicative of the demand for travel along the corridor. This corridor carries between 75,000 and 90,000 vehicles per day. Construction of additional highway capacity to relieve congestion is limited especially west of Sheridan Avenue due to limited right-of-way. Options for travel are needed, now and in the future, Commuter rail and/or BRT are complementary modes, which provide a sensible alternative to highway travel during peak travel times.

TMA Population Projections

	1990*	2000	2015	2030	change 2000-2030
Creek	33,347	36,086	39,960	43,335	7,249
Osage	17,325	20,521	30,905	42,290	21,769
Rogers	32,602	45,619	66,805	91,038	45,419
Tulsa	503,341	563,299	615,500	658,500	95,201
Wagoner	29,470	36,055	45,237	54,043	17,988
TMA	616,085	701,580	798,408	889,206	187,626

*adjusted to fit the 2000 TMA boundary
NOTE: The projected population for each county portion of the TMA is based upon its respective share of the parent county.

Ridership Analysis

The forecast of commuter rail ridership was based on a schedule of trains that would be recognized by commuters as providing regular and reliable service. The service plan is one involving a low capital and operating cost. The schedule for this plan provides a train every 72 minutes in the weekday morning and evening rush. This analysis was based on an assumed single fare system, meaning a rider would pay one fare regardless of the length of their trip. The actual fares have not yet been set, but for purposes of the ridership analysis the maximum fare would be $2.00 in 2010 dollars.

The ridership was forecast for the years 2010 and 2030 to provide a sense of how it would change over time as a result of the steadily increasing population and employment in the region. The same schedule of trains was used for both forecast years to provide a basis for comparison. There is a range of ridership expectations, depending on the future residential and commercial development creating various population densities around the passenger stations. Development precipitated by the location of a transit station is referred to as Transit Oriented Development (TOD).

The range of ridership forecasts varies. The low end uses current demographic data which does not include TOD resulting from yet-to-be available rail service. The high end, which is a more optimistic demographic data, takes advantage of future TOD which has been shown in other cities to be encouraged by the introduction of passenger rail service. The ridership study (which reflects boardings) concluded that 2010 ridership would range between 1.4 million and 5.0 million, and that by the year 2030 between 1.9 million and 4.1 million people would board the train during an average year, depending on the extent to which TOD occurred. This assumes no increase in service hours. Should hours of operation and service be increased, ridership numbers would be expected to increase as well.

The analysis of ridership is based solely on the assumptions and sources of information outlined in this feasibility study. The achievement of any projection may be affected by fluctuating economic conditions and depends on the occurrence of future events that cannot be assured. Therefore, the actual results achieved may vary from the projections, and the variations could be significant.

Ridership for the BRT service was approached differently, as BRT is a relatively new concept in the United States. Each implementation is different in that some are using dedicated separate lanes while others are using bus lanes and bus queue jumping to enhance the service. Without the benefit of software that can take the Traffic Area Zone (TAZ) data and perform the mode share calculations, the LAN team reviewed document FTA-CA-26-7068-2004.1 entitled *Bus Rapid Transit Ridership Analysis.* The document reviewed the FTA's BRT pilot program and looked at ridership increases due to the systems implementation. These ridership increases experienced in other cities were used

to interpolate potential ridership in Tulsa. This interpolation concluded that 2010 ridership would range between 48,360 and 58,507, and that by the end of the year 2030 between 64,220 and 70,208 people would board the BRT vehicles during an average year. This assumes no increase in service hours. Should hours of operation and service be increased, ridership numbers would be expected to increase as well.

Public Involvement Program

A public involvement program was conducted during the study to include two informal open house type gatherings. Meeting were held in both Tulsa and Broken Arrow to inform citizens in both communities of the extent of the study and solicit input. In addition several Oversight Committee Meetings were held to maintain a direction on the study and a special meeting was held in Broken Arrow with the city planners and leaders. It is the LAN Team recommendation that the public remain engaged in order to maintain the momentum built by this study. The next steps to keep this momentum would be to proceed with the Alternatives Analysis, which is a requirement to obtain federal funding.

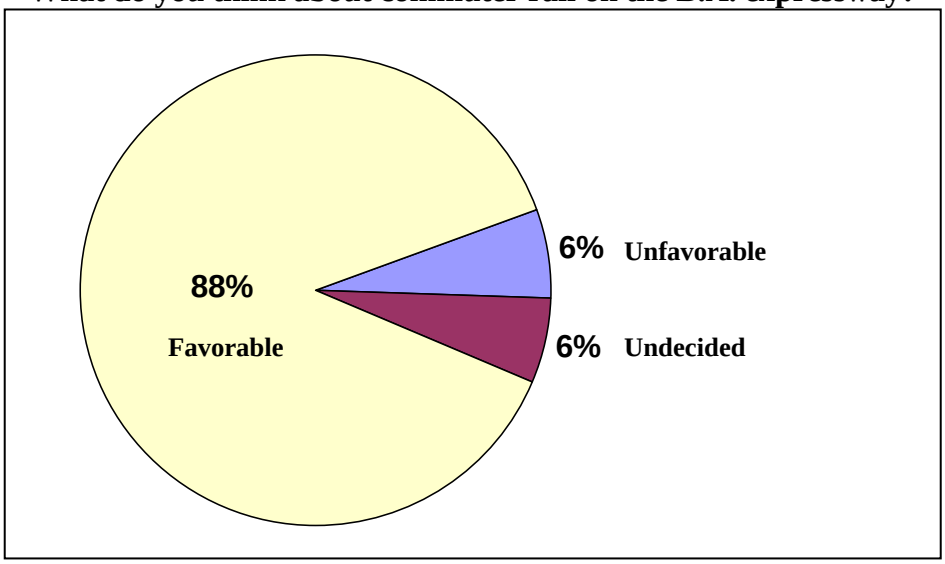
As part of involving the public, an online survey was conducted from early February through the end of March 19, 2007. Links were provided on the Tulsa Transit website; it is anticipated that the majority of those individuals completing this survey were predisposed to support public transportation, since they were likely looking for other information on Tulsa Transit services. Strong support for the study and potential improvements in this corridor was shown when the survey results were compiled. In addition to the online survey a random phone survey was conducted asking the same questions as the online survey. Certain results of these are provided in the following charts.

In your opinion, how vital is mass transit to the region's economy?		
Extremely	123	62%
Somewhat	65	32%
No effect	8	4%
No opinion	4	2%
Total	200	100%

In your opinion, would a mass transit system from Broken Arrow to downtown Tulsa be beneficial to the region?		
Agree	144	72%
Somewhat agree	37	18%
Neither agree or disagree	8	4%
Somewhat disagree	4	2%
Disagree	8	4%
Total	201	100%

Tulsa Transit conducted a poll on its website asking about this study and its relevance. Those results show 88% of respondents believe that some type of improvements should made in this corridor. Below are the responses to the question "What do you think about commuter rail on the B.A. expressway?" There were 1,144 responses.

What do you think about commuter rail on the B.A. expressway?



Route Evaluations
In general the commuter rail route will follow the existing Union Pacific Railroad Tulsa Branch from the vicinity of Main Street in Broken Arrow to a location in downtown Tulsa. Two locations were reviewed in downtown Tulsa: the historic Union depot, and a location near 1st Street and Hartford. The 1st and Hartford location was considered due to an onerous initial insurance subrogation request by the Burlington Northern Santa Fe Railroad which owns and operates the line behind the Union Depot to a point east of Greenwood Avenue where the UP merges.

Defining the New Rail Line
New facilities would need to be built, including:

- Passenger stations at each of the proposed locations.
- Maintenance and storage facilities for service, inspection and maintenance of the trains.

Passenger Stations
Four stations have been considered: Downtown Tulsa, Downtown Broken Arrow, Lewis Avenue, and either Sheridan Road or Memorial Drive. Each station will consist of a platform, approximately 300 feet in length, with a short overhead canopy to shield passengers from the weather. Ticket dispensers will be located on the platform. Parking will be provided at stations in Broken Arrow, and Memorial or Sheridan for those wanting to park and ride. The stations, as well as the rest of the system, will be fully ADA accessible. Each station location took into consideration multimodal access, development or redevelopment opportunities, and potential population densities.

Connections will be provided by the local transit service in each area. Such transit connections will be vital to the success of the system, and will be carefully coordinated to maximize potential ridership.

Defining BRT Line
The BRT option would generally operate within managed lanes from 145th E. Avenue in Broken Arrow to a location between I-44 and Memorial, where the study proposes the use of contra-flow lanes. This is recommended due to the limited right-of-way from Sheridan to west of Lewis on the expressway. The photo below is an example of the movable barriers that create a contra-flow lane.

BRT Stops
BRT stops, whether at a park & ride facility or in downtown Tulsa, could provide some features that are similar to rail stops. Those features could include all or some of the following:

- Level boarding
- Real time arrival/departure information
- Shelter
- Ticket Vending/Electronic Ticketing

Grade Crossing Safety
The present rail line includes many crossings with streets and highways, called "grade-crossings." Safety at those crossings, for trains, pedestrians and motor vehicles is important. With a change in the type and number of trains operating, it was necessary to analyze the new configuration to be sure the current safety level was maintained.

All the crossings today that are passive (meaning they have neither lights nor gates) or are flashing lights only, will be upgraded to gates. Of the gated crossings, many will be upgraded to a four-quadrant gate.

Operating and Maintenance Plan
A plan of operations was developed based on the train schedules used for the ridership analysis. It was assumed that the trains would consist of two passenger cars, with a total seated capacity of 250 to 350. Crush load (seated and standees) for this configuration

would be 410 to 440. The train will either be two passenger coaches and a locomotive, or two Diesel Multiple Units (DMUs). A DMU is self-powered diesel-electric equipment that can operate in either direction without the need for a separate locomotive. To support the initial schedule, one train will be needed plus one reserve train (2 locomotives and three coaches), or three DMU's.

Maintenance will be performed on the trains at night and during the mid-day period at a system maintenance facility. At both end stations, there will be a limited amount of storage track so that when the trains are not in service minor maintenance and cleaning can be performed.

Operations & Maintenance Costs

An analysis was made of the costs for operating and maintaining the commuter rail system after beginning revenue service. These costs, based on experience of similar commuter rail systems, indicate that it will cost approximately $3.1 million per year (2010 dollars) for all operational and maintenance expenses to provide the initial level of service.*

Included in that cost is the operation of the trains as well as maintenance-of-way, which includes maintenance of everything other than the trains. This includes tracks, bridges, stations, parking lots, signals, etc. It should be noted that no cost for track usage are included as no agreement or discussion with UP has been taken to that level.

The annual operating cost for the BRT operation is projected to be approximately $1.9 million. It should be noted that these operating costs for BRT indicate full service to include new stylized buses, their maintenance, operation, and maintenance of the movable barrier equipment. This does not include the cost of replacement or repair of damaged barriers or safety devices that would be included in any final BRT lane configuration. Should existing revenue vehicles be utilized to operate within the HOV/Contra-Flow, these annual costs would be significantly less.

** Includes $2,000,000 in annual liability insurance premium. This premium projection does not take into account the Oklahoma Tort Claims Act, which limits the liability of Oklahoma governmental entities with regard to 3rd party claims.*

Capital Costs

Commuter Rail

The costs to build the needed facilities and tracks and to buy the rolling stock were developed using data from recent similar projects around the country. As in the case of operating and maintenance costs, the construction cost will vary depending on the level of service to be provided. With more frequent service, additional double track sections would need to be constructed and more trains would need to be purchased.

The total cost to build the commuter rail system to provide the initial level of service along the 14-mile preferred route is shown in the following table. Depending on the equipment and midtown station location selected, the total cost ranges from $43 million to $49 million (in 2010 dollars).

Push-Pull Locomotive	Option 1 (with Sheridan Station)	Option 2 (with Memorial Station)
Track Improvements	$ 1,884,900	$ 1,884,900
Signal & Systems Costs	11,540,000	11,540,000
Yard & Inspection Costs	5,667,800	5,667,800
Station Construction Costs	9,085,500	13,241,200
Soft Costs	5,242,000	5,242,000
Train Equipment Costs	10,000,000	10,000,000
Total Cost	43,420,200	47,575,900
DMU	**Option 1 (with Sheridan Station)**	**Option 2 (with Memorial Station)**
Track Improvements	$ 1,884,900	$ 1,884,900
Signal & Systems Costs	11,540,000	11,540,000
Yard & Inspection Costs	5,667,800	5,667,800
Station Construction Costs	9,085,500	13,241,200
Soft Costs	5,242,000	5,242,000
Train Equipment Costs	11,600,000	11,600,000
Total Cost	45,020,200	49,175,900

Commuter Rail Capital Costs

These cost projections include all construction, rolling stock, rights-of-way (except for railroad), and design and management expenses. They do not include the cost of acquiring rights to use the UP track.

Bus Rapid Transit

The guideway for BRT is simply the lane work required to provide the HOV/Contra-Flow facility. This would include all striping, widening, buttons, barriers, and signage and safety devices.

One park & ride facility is provided for in the BRT system located in Broken Arrow. In the 60' articulated bus option there are provisions for special BRT stops in downtown Tulsa. These stops could consist of a raised sidewalk to allow for level boarding and could be initially approximately 80 feet long to accommodate a stylized bus. As with the rail platforms each would be equipped with ticket machines and other amenities.

BRT service would require very little additional expense to expand service. Vehicles would need to be purchased should the sleeker BRT stylized vehicles be used for this service.

BRT	Option 1 (existing vehicles)	Option 2 (new BRT vehicles)
HOV Guideway Costs	$ 70,400	$ 70,400
Contra-Flow Guideway Costs	15,373,900	15,373,900
Park & Ride Facility	2,994,900	2,994,900
Downtown BRT Stops		480,000
Soft Costs	2,823,500	2,823,500
60' Articulated Buses (2)	-	1,700,000
Total Cost	21,262,700	23,442,700

BRT Capital Costs

Next Steps

There are a number of ways in which this project might proceed from the date of this Feasibility Study. It is not the intent of this document to recommend how this project might be organized, but to only present some options that might be used and to explain the approach that is reflected in the cost and schedule information included in this report.

Decisions on how the project is constructed and on how the continuing operations and maintenance functions are to be handled will be needed during future phases of the project. Either Tulsa Transit or INCOG could take the lead in future phases of this project. In addition, as discussed earlier in order to maintain the public interest and momentum, the next phase (Alternatives Analysis) should begin as soon as practical.

Phase 1 – Organization: This phase is difficult to predict a time for, depending on agreements with stakeholders and support form decision makers. It is forecasted that this phase could take from 6 months to 18 months.

Phase 2 – AA / Environmental/PE: This phase is forecasted to take from 18 months to 2 years. The primary unpredictability in this schedule is the time needed for federal review and approval.

Phase 3 – Design: As soon as approval is granted from the FTA, design can begin and is expected to take from 6 months to 2 years. On a linear project such as this, it is expected that construction could begin in certain areas within 6 months, while design continues in other areas.

Phase 4 - Construction & Procurement: If funding or UP operations don't hinder progress, the construction and procurement should be accomplished in 2 to 3 years.

Phase 5 - Testing & Start-up: Six months should be allocated for this phase, which ideally should only begin after construction is competed. However, on a linear system it is possible that some testing can begin in certain areas while construction is being completed in other areas.

Phase 6 - Revenue Service: Depending on the time required for each of the above steps, the most optimistic date for the start of revenue service is 2012.

Conclusion

The Broken Arrow Expressway is currently the major artery providing transportation to and from Broken Arrow and Tulsa. This corridor carries between 75,000 and 90,000 vehicles per day. That amounts to 37,000 – 45,000 vehicles in each direction, based on the location.

Peak hour traffic accounts for 10% of the total volume in each direction: approximately 3,700 to 4,500 vehicles in a given peak hour (AM or PM) in either direction, or roughly 5,000 vehicles per hour at a location where heavier volume is noted.

A mass transit solution providing 1,000 weekday trips in each direction would remove roughly 20% of the total rush hour vehicular traffic from the road. By running the train schedule contained in this report (two train runs per day in each direction to coincide with the AM Peak or the PM Peak hour), this goal could be accomplished.

The LAN Team believes that both commuter rail and bus rapid transit merit further review and analysis. The focus of this study was to determine the fiscal and technical practicality of providing mass transit choices between Broken Arrow and Tulsa. After reviewing the available local data, reports, and national data, the initial question of this study has been answered: both alternatives are feasible.

In our professional opinion, to provide Tulsa and Broken Arrow with a transportation alternative that has the potential to influence economic development and enhance livability, the commuter rail option provides the most feasible option. Rail has a history of spurring development at and near stations, and choice riders are more likely to hop on a train than a bus. This is not to say that BRT is not an attractive option. However with the visions of both cities, rail has the potential to spur continued interest from developers, and based on the initial ridership forecast, will attract the most riders.