*Peoria/Riverside Corridor Transit Study: an Alternatives Analysis*

# Final Alternatives Analysis Report

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## Introduction

Located in northeast Oklahoma, the city of Tulsa is the state's second largest city and home to its most densely populated county, Tulsa County. A major hub for the nation's petroleum industry, the city has diversified its economic base to include finance, aviation, education, healthcare and technology markets as well as local entrepreneurs. Through active engagement with citizens and community stakeholders throughout the region, the Indian Nations Council of Governments (INCOG) has acknowledged the importance of efficient transportation systems as a fundamental component of the Tulsa Transportation Management Area's (TMA) economic vitality.

Adopted by INCOG in October 2011, the *Fast Forward* Regional Transit System Plan (RTSP) laid the groundwork for establishing effective transit service within the TMA over the next 25 years. One of the results of the RTSP was the identification of the Peoria/Riverside corridor as a priority for implementation of enhanced, high-capacity transit improvements. Through engagement of local citizens, stakeholders and policy makers, the Peoria/Riverside Corridor (PRC) was selected as the banner corridor for implementation of an innovative, high-capacity public transportation solution to improve regional mobility, while demonstrating the additional benefits of a "Complete Streets" vision of transportation investment.

## Study Area Description

The PRC (Error! Not a valid bookmark self-reference.) extends north to south across the TMA for a distance of approximately 20.2 miles. Beginning at its city of Tulsa limit at Peoria Avenue and 56th Street North, it spans the length of the city, predominantly along Peoria Avenue and Riverside Drive/Parkway, before heading east at approximately 121st Street South and terminating at Memorial Drive in Bixby.

The corridor is one of the most regionally significant arterial thoroughfares in the greater TMA. It is one of the primary north-south arterial roadway corridors in Tulsa County east of the Arkansas River, and the only one connecting

Figure 1: PRC Corridor Study Area

directly to the central business district (CBD). The only other highway alternative parallel to the PRC is US Highway 75, which is located on the west side of the Arkansas River south of Downtown. As a result, the PRC serves as a primary regional thoroughfare providing access to residential, employment, educational, commercial and activity centers across the area.

Serving a large portion of the community in terms of employment, housing and transportation; the PRC contains 1 of every 7 residents as well as 1 of every 5 jobs and transit dependent households present within the entire City. It is also home to significant portions of the TMA employment and transit dependent population. Comparison between the TMA, city of Tulsa and PRC study areas' demographics is illustrated in **Table 1**. PRC major activity centers are shown in **Figure 8**.

**Table 1: Comparison of PRC, city of Tulsa and Transportation Management Area (TMA) Demographics**

| | PRC | City of Tulsa | | TMA | |
|---|---|---|---|---|---|
| | | Total | PRC % | Total | PRC % |
| **Population*** | 56,450 | 391,906 | 14.40% | 778,051 | 7.26% |
| **Jobs**** | 52,627 | 259,914 | 20.25% | 376,954 | 13.96% |
| **Zero Car Households***** | 1,188 | 5,548 | 21.41% | 7,749 | 15.33% |

** Source: U.S. Census Bureau, 2010 Census*

***U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2010). All jobs all workers.*

**** U.S. American Community Survey and INCOG*

### *Alternatives Analysis Mission Statement and Goals*

*The Locally Preferred Peoria/Riverside Corridor (PRC) Alternative will improve mobility, increase travel choices and support economic development through the use of low-cost high-impact transit technology investments.*

**Goal 1: Improve Transit Access and Regional Mobility**

**Goal 2: Support Economic Development**

**Goal 3: Invest in Low-Cost, High-Impact Transit Infrastructure**

**Goal 4: Build Community Support for the Value of Transit**

Through the AA process, INCOG, together with the Metropolitan Tulsa Transit Authority (Tulsa Transit) will identify corridor problems, develop alternatives, analyze costs and benefits, and select a Locally Preferred Alternative (LPA) for implementation. This PRC Initiation Package was prepared at an early stage in the AA process to inform interested parties about key elements including the study's setting, purpose and need, preliminary alternatives and proposed evaluation methodology.

## Purpose & Need

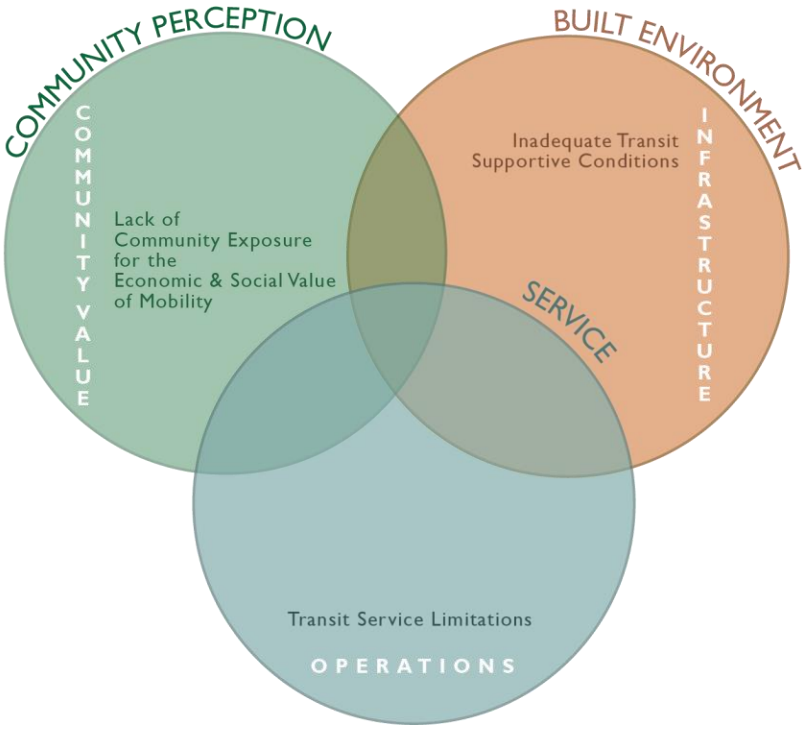
The purpose of the Alternatives Analysis (AA) study is to evaluate and determine a cost-effective transit mode and alignment that significantly improves transit services and access within the PRC. The need for improved transit service within the corridor is documented within the RTSP needs assessment analysis categorized into four goals:

- Mobility & Accessibility
- Efficiency & Safety
- Environmental Benefits
- Economic Development

The challenges posed to the community for the AA study were found to cluster into three basic categories:

- Lack of Community Exposure to Economic and Social Value of Mobility
- Existing Transit Service Limitations
- Inadequate Transit Supportive Conditions

Figure 2: PRC Challenges to Transit Improvements




Each of these issues is inter-dependent and have compounded upon one another to further degrade the transit service and service potential within the corridor. The (historically) negative community perception, paired with recent economic challenges creates an environment that discourages community support for capital and operational investment. The constraints of the built environment and urban development patterns also limit the opportunities for improved facilities and efficient services. The deficiency in funding support has led to inadequate infrastructure, amenities and transit service availability to support the existing and (potential) future patronage. Further description of public transportation and corridor mobility challenges is provided in the **Purpose and Need** Chapter of this document.

## Alternative Development and Preliminary Screening

To evaluate all viable funding and modal options, local policy makers and stakeholders elected to develop alternatives which could be implemented (both) independently by the city of Tulsa as well as those that could qualify for alternative funding sources thereby giving INCOG and the Tulsa Transit the option to seek funding for improved transit services within the PRC via grant programs authorized through agencies such as the Federal Transit Administration (FTA) or the State of Oklahoma Department of Transportation (ODOT).

To comply with Federal requirements for potential grant application, this Alternative Analysis considered Federal Transit Administration (FTA) and National Environmental Protection Agency (NEPA) project justification criteria and AA development guidelines in the formation of alternatives. FTA and NEPA compliance guidelines require

development of a locally accepted process for selection of a preferred transit alternative to the greatest extent practical, and within the constraints defined by INCOG and the Metropolitan Tulsa Transit Agency (Tulsa Transit).

### *Transit Alternative Components*

Transit opportunities within the PRC may be improved through various means and combinations of improvements to the existing transit service operating parameters, infrastructure, and/or technologies deployed within the corridor. These Build Alternative elements required additional refinement through the AA process via input from INCOG, Tulsa Transit, elected officials, citizens and stakeholders. Decision points were agreed upon for evaluation of alternatives and a recommendation by local policy makers was made at the conclusion of this AA study. The alternative components that were evaluated within this AA and a brief description of the parameters of each component are as follows:

- ***Geography:*** identification of distinct corridor segments and the beginning and end points (potential project limits) of implementation at initial and subsequent phase(s) of development
- ***Mode:*** the type of transit vehicles and supporting guideway infrastructure required for operations
- ***Alignment & Station Locations:*** the roadways and station locations within the selected scenario geography on which the LPA will be implemented
- ***Technology & Infrastructure Improvements:*** the scope and scale of LPA infrastructure and technology improvements deployed on vehicles as well as station areas
- ***Operating Conditions & Span of Service:*** the revenue service operating parameters after construction
- ***Funding Strategy:*** qualification criteria for potential funding sources

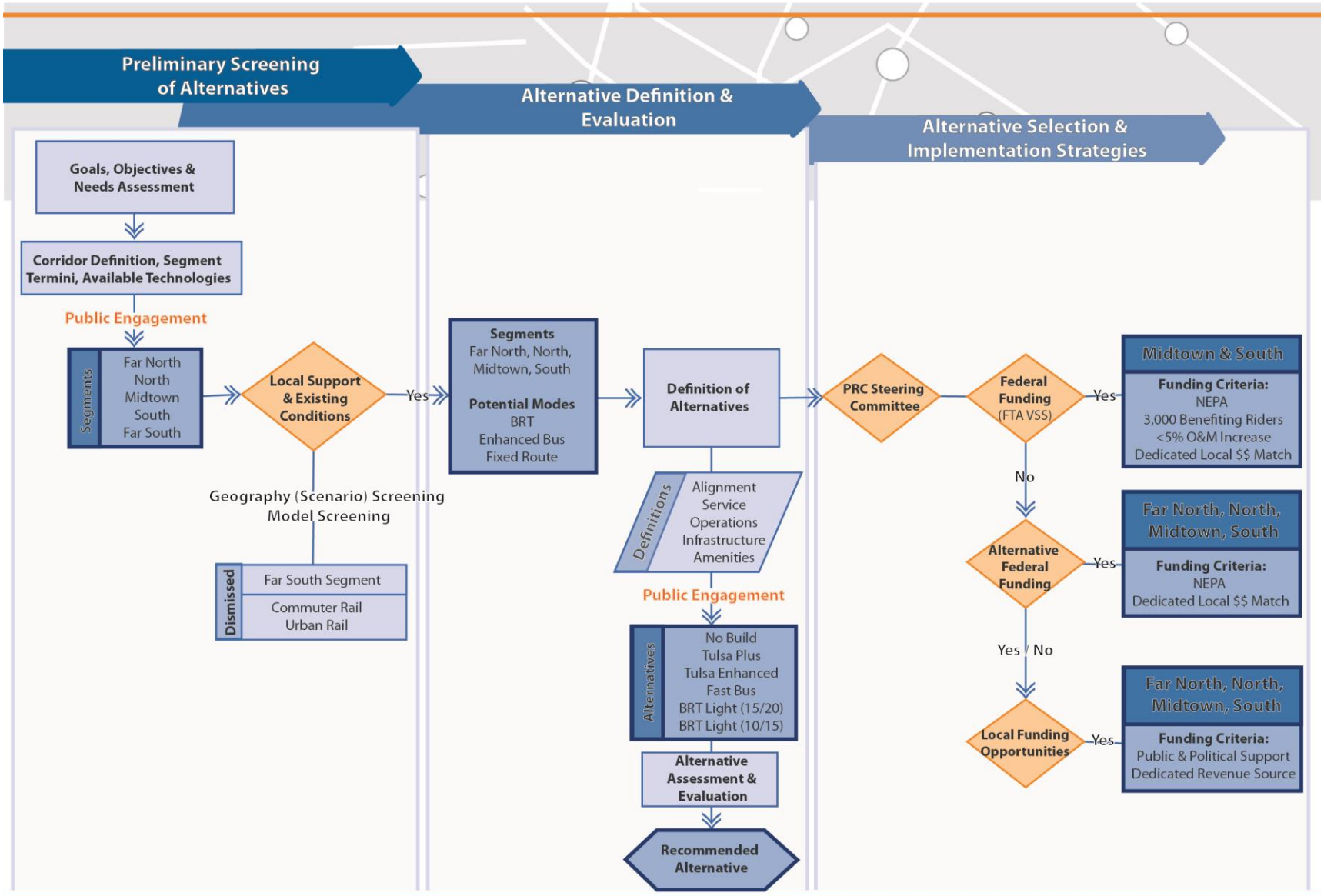
Several stages of consecutive evaluation and assessment were established to aid in the alignment selection and decision making process, including:

- Geography (Scenario) Screening
- Transit Mode Screening
- Detailed Alternative Development
- Potential Impact Assessment
- Financial Feasibility

Figure 3: PRC Evaluation Process and LPA Selection


Each stage of the successive evaluation process contained different alternatives, evaluation approaches and results. Summaries of those elements and findings are found below and within the subsequent chapters. Potential Impact Assessment, Financial Feasibility and Alternative Evaluation were conducted following refinement of proposed PRC transit solutions. A flowchart illustrating the Alternatives Analysis process is provided in **Figure 4**. As of the summer of 2013, a Recommended Alternative has been selected and approved by the Tulsa City Council and Transit Advisory Board. Additional coordination between regional partners is ongoing to determine appropriate governance and finance policies to support construction and continued operation of the Recommended Alternative. This AA study includes a recommendation of local and regional policies for implementation; as well as an assessment of financing tools available to support the deployment of high-capacity transit services within the PRC in **Chapter 10, Implementation**.

Figure 4: Alternative Analysis and Selection Methodology



## *Preliminary Screening of Alternatives*

This AA applied specific evaluation techniques to these proposed PRC transit alternatives. INCOG and Tulsa Transit developed and defined local screening tools to be utilized, in a qualitative capacity, to assess the potential of Build Alternative elements to meet the AA study goals. The goal of the Preliminary screening process was to develop a constrained set of Build Alternatives to evaluate potential impacts and benefits against the baseline, future conditions of the PRC.

In order to establish consensus of alternatives for further refinement, a comprehensive view of AA needs, goals and constraints was taken. Each screening tool was applied to the transit alternative components identified above in order to establish an overview of the dynamics influencing development of a Build Alternative that can meet all of the documented goals of the PRC AA.

- ***Public Engagement:*** Are transportation needs and concerns voiced by stakeholders and citizens met by recommended improvements?
- ***Compatibility with Existing Transit System:*** Does the alternative element support integration with existing activity centers, transportation modes and facilities present within the study area?
- ***Constructability:*** What are the potential construction impacts of the proposed alternative elements and are improvements of an appropriate magnitude to meet future needs?
- ***Funding Opportunities:*** What potential (local, state, federal) funding opportunities exist and can the proposed alternative element meet required funding qualification criteria?

Specific metrics related to each of the above screening tools are discussed in the PRC *Preliminary Screening of Alternatives* memorandum (February 2012). A summary of determining factors used in the qualitative screening of preliminary alternatives and development of refined alternatives for detailed evaluation is illustrated in **Table 7**. The Preliminary Screening process was utilized as a tool to understand the community goals and needs of the project. The locally preferred scenario geography was determined based on input received from citizens and stakeholders as well as physical, capital and operational funding constraints reflective of the local market and Tulsa Transit budget.

### Geography (Scenario) Screening

The PRC traverses multiple communities with varying demographics, neighborhood characteristics, land uses and transportation needs as it spans the north-south length of the City of Tulsa. To better evaluate the transit service needs and readiness to support high-capacity transit service. Preliminary screening conducted determined the most appropriate corridor segments to implement improved transit service as well as the most suitable locations for termini and on-line station development.

#### Alternatives Considered

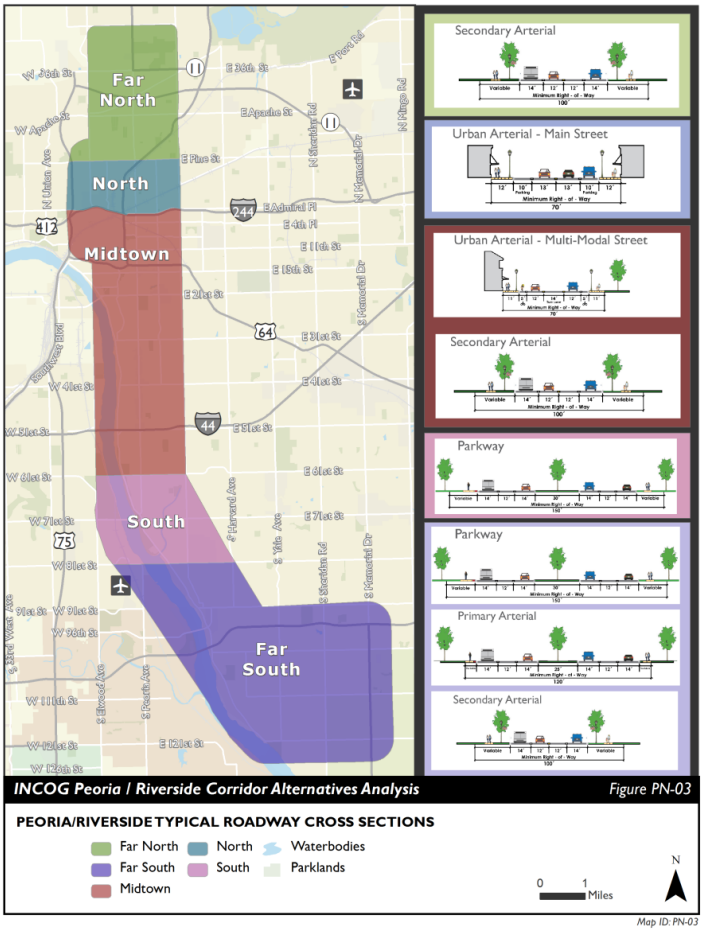
For simplification of evaluating alternatives, the PRC has been divided into segments for combination into a preferred corridor of the appropriate length and terminal anchors to make for an effective initial implementation phase. As identified in **Figure 5,** study corridor segments are as follows:

- Far North (FN)
- North (N)
- Midtown (MT)
- South (S)
- Far South (FS)

Five operating scenarios, assembled from the corridor segments identified above, have been developed for preliminary consideration:

1) Scenario A – FN, N, MT, S and FS segments (all segments)
2) Scenario B – FN, N, MT and S segments
3) Scenario C – N, MT, S and FS segments
4) Scenario D – the N, MT and S segments
5) Scenario E – the MT and S segments

Figure 5: PRC Corridor Segments




## Recommendations

The preferred scenario, based on technical findings and corresponding public feedback, was Scenario B, 66th Street North to 81st and Lewis Avenue. PRC recommended alternative will access the DAS via E 6th Street. Consistent responses from the public and the PRC Steering Committee strongly advocating improving service to the communities in Northern segments resulted in a preferred scenario which excluded only the Far South segment, connecting to Jenks.

## Alignment and Station Development

PRC transit users are largely accustomed to an existing Tulsa Transit system that includes many routing deviations from the mainline of major arterial corridors in order to directly serve large residential pockets of transit users or activity centers. The practice largely contributes to Tulsa Transit's ability to maintaining the system ridership, but has a cumulative impact on the 1-way travel times of fixed routes and degrades the in-vehicle travel time experience of many riders.

Service to existing destinations and trip generators is also a key factor in project justification during potential application for supplemental funding. The Midtown and South segments of the PRC are home to the largest concentration of employment and activity centers in the corridor and considerations were requested for destinations both along Peoria Avenue and Utica Avenue. Through engagement with PRC residents and stakeholders, particular concern was expressed regarding service impacts to North Tulsa residents.

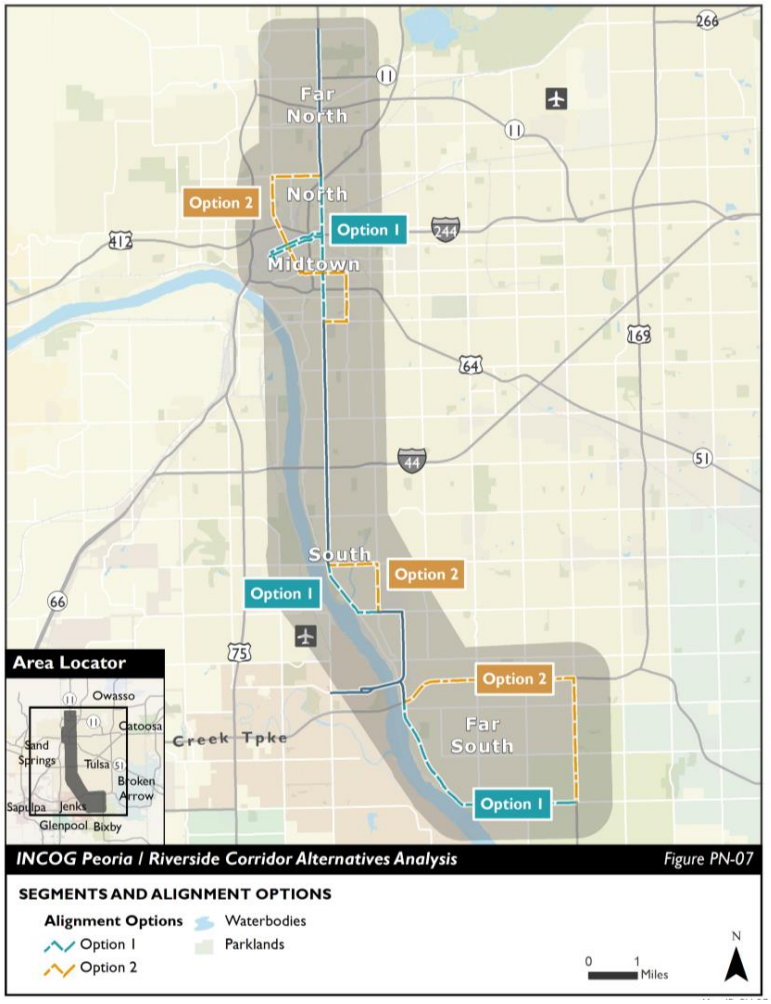
The FTA MAP-21 provision requiring "Substantial Transit Stations" in projects applying for funding assistance made the identification of ideal areas for investment in stations a core component in the development of detailed alternatives. The current lack of adequate shelters and accommodations to protect transit users at on-line stops was also acknowledged during public engagement activities.

## Recommendations

A balance between directly serving residents versus commercial and activity centers while optimizing routing efficiency to minimize point-to-point travel times is needed when selecting the routing alignment for enhanced PRC services. Three (3) PRC segments contained potential alignment options for further evaluation to better service transit users:

- **North Alignment Option**: Peoria Ave vs. Cincinnati Ave (from Pine Street to E 6th Street)
  - Peoria Ave is commercial and industrial use within this segment
  - Cincinnati Ave is residential corridor with an historically transit dependent population
- **Midtown Alignment Option**: Peoria Ave vs. Utica Ave (from E 6th Street to E 21st Street)
  - Peoria Ave is predominantly commercial and industrial use within this segment. Serves Pearl District
  - Utica Ave is predominantly the largest medical center in the area and contains several commercial retail centers.
- **South Alignment Option**: Riverside Drive to 81st Street South vs. Riverside Drive to 71st Street South (71st Street to 81st Street and Lewis Avenue, via Lewis Avenue)
  - Several residential developments currently served by the existing route 105 are present along the 71st Street alignment option

Figure 6: PRC Alignment Options




The desire for site-appropriate infrastructure and capital improvement solutions led to the recommendation of a modular station concept with shelters of varying dimensions to deploy, as needed, at the PRC station areas. Locations to receive investment in stations and amenities will be selected based on existing boarding/alighting volumes of the existing route 105, as well as intermodal opportunities connecting with other fixed routes of the Tulsa Transit system.

## Modal Screening

The PRC is a highly populated corridor and currently contains the highest transit ridership within the Tulsa Transit system. Transit modes able to support the deployment of high-capacity and high-frequency service alternatives were screened for constructability and operating benefits and impacts as well as financial feasibility. Preliminary transit modes identified for potential implementation along priority corridors of the RTSP included:

*Commuter Rail* operations generally serve long distance (end to end) travel patterns and have few stops (typically located at community anchors several miles apart) in between termini.

*Urban Rail* alternatives considered for implementation on the PRC included Modern Streetcar and Light Rail technologies. Vehicles operate along a fixed rail guideway and may include dedicated right-of-way, separated from automobile traffic or embedded rail installed within travel lanes shared with autos. Vehicles are typically powered by overhead catenary electrification or hybrid, electric-alternative fuel motors. Modal differences between vehicles include passenger car dimensions and passenger capacity

*Corridor-Based Bus Rapid Transit (BRT)* has be defined by the MAP-21 legislation as: a Small Start project utilizing buses in which the project represents a substantial investment in a defined corridor as demonstrated by features that emulate the services provided by rail fixed guideway public transportation systems, including: defined stations, traffic signal priority for public transportation vehicles, short headway bidirectional services for a substantial part of weekdays and weekend days, and any other features the Secretary of Transportation may determine support a long-term corridor investment.

*Fixed Guideway BRT* features a rapid-bus operating within a separated right-or-way dedicated for public transportation use during peak periods along the majority of the corridor, while *Corridor-Based BRT* implements rapid bus service operating within mixed traffic for the majority of the corridor.

*Enhanced Bus* service is a bus service intended to run faster than local bus services and deploy significant passenger amenities to signify a "premium service." Enhanced buses operate with limited stops to provide quicker travel along a corridor. Additional passenger amenities are featured on enhanced service buses, such as reclining seats and Wi-Fi, to make longer trips more comfortable. The amenities deployed may vary dependent upon individual need, but primary benefits are received from the increased efficiency of operations and faster point-to-point travel times over traditional local bus service.

### Recommendations

Sensitive to the local transit funding climate, the PRC Transit Study is focused on delivering a low-cost, high impact transit solution. As such, the capital cost threshold of the proposed project was set at $50 M in the Year of Expenditure (YOE). Due to the ineffective stop frequency and significant investment required to construct the necessary trackwork, Commuter Rail Transit was dismissed from further consideration. LRT and urban rail transit modes were dismissed from further consideration because of the PRC's lack of transit supportive land uses and densities beyond the central business district (CBD), as well as the significant capital investment required for construction of embedded rail infrastructure. Overall, due to the potential length of the corridor and average cost of implementation for fixed rail guideway transit, this transit study featured only bus alternatives operating with a variety of technology and service schemes or accompanied by a range of supporting infrastructure improvements.

The remaining transit mode alternatives included: Bus Rapid Transit (BRT), Enhanced Bus, and existing Fixed-Route (Local) Bus Service. Each remaining transit mode was incorporated into development of the Refined Alternatives for evaluation.

## Development of Capital Improvement and Operational Alternatives

Alternative service operating parameters, technology and infrastructure improvements were developed based feedback from citizens and stakeholders expressing perceived transit service needs within the study area during the initial public involvement meetings.

Recommended improvements incorporated into refined alternatives for detailed evaluation were as follows:

- PRC Alternative **Hours of Operation** will be expanded later in the evenings to provide more opportunities to access transit by employees and resident return work and/or personal transit trips.
- **Service Frequency** modifications may be implemented in various combinations to meet peak and off-peak ridership demand, improve timed transfers with existing fixed routes and improve overall transit system efficiency.
- Designated transit **Stop Intervals** may be modified from the existing Tulsa Transit fixed-route, flag-stop operation to a traditional local, limited, or skip-stop operation to improve one-way travel speeds.
- **Infrastructure** improvements proposed in combination for development of alternatives include: new clean fuel vehicles, dedicated transit lanes, branded shelter and amenities, Multiple footprint sizes & amenity options for PRC station platforms and shelters will be carried forward for deployment of site-appropriate transit facilities at station areas.
- **Technology** improvements proposed in combination for development of alternatives include: traffic signal prioritization (TSP), automated ticket vending machines (TVMs), Variable Message Signs (VMS) displaying real-time transit vehicle arrival information, and automated fare collection on transit vehicles.

## *PRC Alternatives for Detailed Evaluation*

Due to the potential length of the corridor and average cost of implementation for fixed rail guideway transit, this AA will feature *BRT* and *Enhanced Bus* alternatives operating in a variety of potential technology and service deployment schemes or accompanied by a range of supporting infrastructure improvements. The alternatives are proposed to operate in mixed traffic and will include all the elements of the Tulsa Transit system planned as part of the No-Build/Baseline alternative plus deployment of additional service, infrastructure and technology improvements. These Build Alternatives, described below, would enhance and complement existing fixed route bus service within the corridor, without diminishing existing service.

### No-Build/Baseline Alternative

The No-Build/Baseline Alternative consists of existing fixed route bus transit service and committed transportation improvements within the PRC, as identified by the city of Tulsa (Tulsa Transit) and included in the fiscally constrained Transportation Improvement Program (TIP) of INCOG. The No-Build/Baseline Alternative establishes a foundation, or reference, condition from which the Build Alternatives are developed and evaluated.

For comparison against proposed alternatives, the existing Tulsa Transit route 105 is identified as the baseline transit operating condition for the PRC. It services North and South Tulsa, operating from approximately 66th Street North to 81st Street South and Lewis Avenue. Existing facilities along route 105 and its current service operating parameters are described below:

- Currently operates approximately 15 hours daily, from approximately 5:30 am to 8:30pm (M-F) and from 6:30 am to 6:30 pm on Saturday
- Current headway is 30-minutes all day, with an off peak period of 45-minute frequency from approximately 10:30 am to 1 pm. (Average Tulsa Transit system-wide headways are approximately 45- to 50-minutes)
- Fixed route local service with flag-stop operations, allowing passengers to board and alight at any safe stopping location along the corridor by alerting the vehicle operator.
- Transit shelters and amenities are available only at a few locations within the corridor.

### Enhanced Local Service ("Tulsa Enhanced") Build Alternative

This alternative will replace the existing fixed route 105 service along the PRC and modify the current flag-stop service operating procedure to a traditional, fixed-route local service. Vehicles will stop only at Tulsa Transit designated locations at approximately 2 – 5 block intervals. Alternative features include:

- 17 hours service operating span (approximately 6am to 11pm) Monday thru Saturday
- Continuous 20-minute headways all day from 38th Street North to 81st Street South and Lewis Avenue
- Traditional fixed route stop pattern (average every 2 to 5 blocks) from 38th Street North to 81st Street South and Lewis Avenue.
    - A local circulator bus will be added to the end of the alignment to maintain 15-minute continuous service in between 38th and 66th Streets.
- Traffic signal prioritization at all PRC signalized intersections
- Branding of vehicles and transit amenities
- Significant transit shelters and amenities at end of line or major destinations / activity centers only; minimal transit amenities installed at major arterials intersections or multimodal transfer points
- Real time arrival information and passenger information media at shelters
- Pedestrian crossing protection and sidewalk repair/installation at stations adjacent to major arterial intersections or multimodal transfer points

### Limited Stop Service ("Fast Bus") Build Alternative

This alternative is proposed to operate in mixed traffic, overlaid on top of the existing route 105 service within the PRC to a 'limited stop' service while maintaining a 30-minute continuous headway. Alternative features include:

- 17 hours service operating span (approximately 6am to 11pm) Monday thru Saturday
- Continuous 30-minute headways all day from 66th Street N to 81st Street S
- Limited stop frequency ranging from approximately every ½ mile to 1½ miles
- Traffic signal prioritization at all PRC signalized intersections
- Branding of vehicles and transit amenities
- Significant transit shelters and amenities at end of line or major destinations / activity centers, major arterials intersections and multimodal transfer points. Minimal transit shelters and amenities will be installed at other selected stations.
- Real time arrival information and passenger information media at shelters
- Pedestrian crossing protection and sidewalk repair/installation at stations adjacent to major arterial intersections or multimodal transfer points
- Automated ticket vending and pedestrian lighting fixtures along sidewalk approaches to stations adjacent to major arterial intersections or multimodal transfer points

### Corridor-Based BRT ("BRT 10/15" & "BRT 15/20") Build Alternatives

At least one (1) Build Alternative having capital components and an operating profile capable of meeting FTA MAP-21 requirements for Small Starts funding eligibility was to be included in the detailed evaluation of PRC alternatives. Through coordination with Tulsa Transit and INCOG, two bus rapid transit solutions were developed for detailed evaluation. These alternatives are proposed to operate in mixed traffic, replacing the existing route 105 service within the PRC. Two BRT scenarios were devised in order to compare cost efficiency of operating at a 10-minute/15-minute or at a 15-minute/20-minute peak versus off peak service frequency. The 10/15-minute

frequency alternative was developed to maintain compliance with FTA MAP-21 Small Starts eligibility requirements. The intent of the 15/20-minute frequency alternative was to mimic the FTA's vision of BRT service, but allow for flexibility in service operations to more appropriately suit the needs of the PRC. Infrastructure and technology improvements are the same between alternatives. BRT Alternative features include:

- 15 hours service operating span (approximately 6am to 9pm) Monday thru Sunday (BRT 10/15) OR Monday thru Saturday (BRT 15/20)
- 10-minutes peak / 15-minutes off-peak daily service frequency OR 15-minutes peak / 20-minutes off-peak daily service frequency
- Limited stop frequency ranging from approximately every ½ mile to 1½ miles from 38th Street North to 81st Street South and Lewis Avenue.
    - A local circulator bus will be added to the end of the rapid bus alignment to maintain service in between 38th and 66th Streets.
- Traffic signal prioritization at all PRC signalized intersections
- Branding of vehicles and transit amenities
- Significant transit shelters and amenities at end of line or major destinations / activity centers, major arterials intersections and multimodal transfer points. Minimal transit shelters and amenities will be installed at other selected stations.
- Real time arrival information and passenger information media at shelters
- Pedestrian crossing protection and sidewalk repair/installation at stations adjacent to major arterial intersections or multimodal transfer points
- Automated ticket vending and pedestrian lighting fixtures along sidewalk approaches to stations adjacent to major arterial intersections or multimodal transfer points
- Dedicated transit lanes deployed in select locations (only as appropriate)

## Detailed Screening of Alternatives

The purpose of the Alternatives Analysis (AA) study is to evaluate and determine the most appropriate level of capital investment, including a transit mode and alignment, which significantly improves transit services and access within the Peoria/Riverside Corridor (PRC). A two-step evaluation process was used to identify the potential costs and benefits of implementation associated with each proposed alternative.

A qualitative impact assessment was conducted to determine the construction impacts to the existing PRC infrastructure and surrounding environment; as well as operational impacts to the existing transit service and traffic operations within the corridor. A qualitative evaluation of alternatives was also performed based on comparative assessment of each alternative's respective ability to respond to the stated goals of the AA study and corridor needs identified via public engagement.

### *Construction Impact Assessment*

Typical improvements associated with proposed Alternatives may modify the existing infrastructure, surrounding environment or transportation operations within the PRC. Potential construction and long-term operating impacts of implementing the alternatives were compared and rated to reflect severity of impacts on a five-point scale. The various manners of improvement were grouped into categories of common influence, such as:

- Passenger Stations & Amenities
- Roadway
- Pedestrian Facilities
- Buried Utilities

- Technologies
- Environment
- Traffic Operations
- Transit Operations

A rating of five (5,4) indicates an alternative having little-to-no adverse impact; and one (1,0) indicated having an undesirable or potentially dangerous impact. Detailed discussion of methodology and metrics used in the assessment may be found in **Chapter 7**.

**Table 2: Summary of PRC Transit Alternative Potential Impacts**

| | No Build | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 10/15 | BRT 15/20 |
|---|---|---|---|---|---|---|
| Passenger Stations & Amenities | 4 | 3 | 2 | 2 | 2 | 2 |
| Roadway | 4 | 3 | 3 | 3 | 3 | 3 |
| Pedestrian Facilities | 0 | 0 | 2 | 3 | 3 | 3 |
| Buried Utilities | 4 | 2 | 2 | 2 | 2 | 2 |
| Technologies | 0 | 1 | 2 | 3 | 3 | 3 |
| Environmental | 4 | 3 | 2 | 2 | 2 | 2 |
| Traffic Operations | 2 | 3 | 3 | 3 | 3 | 3 |
| Transit Operations | 2 | 2 | 3 | 4 | 4 | 4 |
| **TOTAL SCORE** | 28 | 25 | 27 | 30 | 30 | 30 |

Rating Scale: (1 – 0), (2 – 1), (3 – 2), (4 – 3), (5 – 4)

With no proposed changes from current capital and operating conditions within the PRC, the No Build Alternative is the baseline for evaluation of all alternatives. The assessment of comparative impacts to the existing facilities found that there are inherent constructability impacts of any Build Alternative to the existing roadway, utilities and environmental resources of the PRC that are not affected by the No Build Alternative,

The lower rating of the Tulsa Plus and Tulsa Enhanced Alternatives indicates that they may have greater impacts, with relatively few benefits to mobility within the corridor when compared to the No Build Alternative. The construction impacts, without the breadth of technology and pedestrian improvements associated with the more significant Build Alternatives, do not provide benefits over the existing route 105 amenities and service operating parameters (No Build). This is primarily due to the construction of more significant transit stations without addressing the pedestrian and technology enhancements that are included within the Fast Bus, BRT 10/15 and 15/20 Alternatives.

## *Detailed Evaluation Results*

Detailed evaluation of alternatives focused on the potential benefits and impacts to service operations, performance and financial feasibility. Developed based on the goals and needs established during the PRC project, a set of criteria were developed to comparatively evaluate the final set of alternatives. Evaluation criterion included:

- Travel Time;
- Capital Cost;

- Transit Visibility and Perception;
- Comfort and Reliability;
- Safety;
- Incremental Operating and Maintenance; and
- Percent of Current Tulsa Transit Operating Budget

Each evaluation criterion was supported by multiple attributes, which were scored qualitatively, low to high, based (comparatively) on positive attributes (benefits) offered by an alternative's proposed scope of improvements. Numerical rating scales were developed for each evaluation criterion in order to tabulate cumulative benefits and impacts of each. The respective rating values are composite, determined by assessing the combined impact potential of an alternative's service, infrastructure and technology improvements.

Scores range from one (1 – 0), representing a perceived negative impact, to five (5 – 4), representing a perceived positive impact. The scores evaluated for each criterion were summed to produce a relative ranking of the alternatives' construction impacts. A detailed summary of the evaluation criteria and ratings attributed to each alternative is shown in **Table 3** and discussed below.

Table 3: PRC AA Detailed Evaluation Results

| Evaluation Criteria | No Build | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 15/20 | BRT 10/15 |
|---|---|---|---|---|---|---|
| Travel Time | 0 | 1 | 2 | 3 | 3 | 3 |
| Transit Visibility & Perception | 0 | 1 | 2 | 3 | 3 | 2 |
| Comfort & Reliability | 0 | 1 | 2 | 3 | 2 | 2 |
| Safety | 0 | 0 | 2 | 3 | 3 | 3 |
| Support Economic Development | 1 | 0 | 2 | 3 | 2 | 2 |
| Capital Cost | 4 | 2 | 1 | 1 | 1 | 0 |
| Incremental Operating & Maintenance Cost | 4 | 4 | 2 | 2 | 2 | 1 |
| Feasibility – Percent of Current Tulsa Transit Operating Budget | 3 | 3 | 2 | 2 | 2 | 1 |
| **TOTAL SCORE** | **20** | **20** | **23** | **28** | **26** | **22** |

Rating Scale: (1 – 0), (2 – 1), (3 – 2), (4 – 3), (5 – 4)

As stated within the Purpose and Need of this AA, the primary goals of this study are to identify a set of Low-Cost, High Impact transportation improvements that may be used to meet the mobility, accessibility, safety needs of the study area; as well as support the economic development potential and community vision for the PRC. One of the more resounding conclusions to be drawn from the detailed impact evaluation of alternatives is that there appears to be a threshold to the scope of proposed service, infrastructure and technology improvements that combines optimal potential benefits with pragmatic investment. The *Fast Bus* and the *BRT 15/20* alternatives recommended by this evaluation propose scenarios of best fit to significantly improve service frequency, public perception and pedestrian accommodations of the public transportation system.

The Alternative recommendation and adoption process concluding this Alternatives Analysis study included technical evaluations as well as review and feedback of public stakeholders, including the PRC Steering Committee.

## Selection of Recommended Alternative

The detailed evaluation of alternatives was conducted to analyze and determine the most appropriate level of capital investment that would significantly improve transit services and access within the Peoria/Riverside Corridor (PRC). The objective evaluation of a these alternatives included an analysis of the potential impacts of proposed solutions on the PRC existing conditions. Typical improvements associated with proposed Alternatives may modify the existing infrastructure, surrounding environment or transportation operations within the PRC. The detailed evaluation of alternatives comparatively highlighted the potential impacts of construction and continued operation of alternative solutions on these conditions within the corridor.

### *Description of Recommended Alternative, Costs & Impacts*

Two alternative transit solutions were recommended through the detailed evaluation of alternatives: The Fast Bus Alternative and the BRT Light (15/20) Alternative. The primary operating difference between these alternative is the stopping frequency of vehicles.

The Fast Bus Alternative is proposed to operate in mixed traffic in addition to the existing route 105, while the BRT Light 15/20 Alternative would operate in mixed traffic to replace the existing PRC fixed route service. The Fast Bus Alternative offers service advantages over the BR Light Alternative by allowing passengers to access transit at existing local stops, spaced an average of every 1 – 3 blocks within the corridor. However, these operating profiles of have a direct impact on the capital and annual operating costs of the alternatives, accounting for the significant number of vehicles and operators required conduct the transit service at the proposed levels.

Deployment of the Fast Bus Alternative is estimated to cost up to approximately $16.4 M (2012 dollars), adding approximately $1.35 M to the annual Tulsa Transit Operating Budget while maintaining the existing route 105. The BRT Light (15/20) Alternative is estimated to cost up to approximately $18.6 M (2012 dollars), increasing the current Tulsa Transit operating budget by approximately $1.03 M despite replacing the existing route 105.

The two alternatives recommended from the detailed evaluation of alternatives were then presented to the PRC Steering Committee for review and concurrence. The committee considered potential benefits and impacts of each alternative and determined that the *BRT Light (15/20)* Alternative was preferred.

Their recommendation, in part, may be attributed to the desire for implementation of high-capacity high-frequency transit service within the PRC to act as a banner project and be used as a catalyst to encourage a shift in the current operating structure of fixed route transit service within the greater Tulsa Transportation Management Area (TMA). The increased scope of pedestrian accessibility, comfort and safety improvements supports an innovative and transformative vision of Tulsa Transit to appeal to both existing and potential transit users.

### Deployment of Recommended Alternative

The BRT Light service would be implemented with 15- to 20-minute headway, operating on a 15 hour operating schedule from Monday thru Friday and 12 hours of service on Saturday. The existing route 105 operates from approximately 5:30 am to 8:30pm (M-F) and from 6:30 am to 6:30 pm on Saturday at a 30-minute continuous headway, with an off peak period of 45-minute frequency from approximately 10:30 am to 1 pm. Existing fixed route service provided by Tulsa Transit would gradually be phased out; potentially after the first several months of BRT operations. The vehicles currently used to provide fixed route service on the route 105 may be repurposed

to provide the recommended local circulator service, connecting to the BRT and operating between N 36th Street and N 66th Street. The deployment of the BRT (15/20) alternative also gives greater flexibility to Tulsa Transit to reallocate existing fleet resources from the current route 105 to other fixed routes in order to improve service frequency at other areas of need within the Tulsa Transit system.

The initial redundancy of existing fixed route 105 and premium service lines within the same corridor may be confusing for passengers and an aggressive public information campaign would be needed during project construction leading up to operations. Information regarding peripheral changes to the Tulsa Transit system in support of the improved PRC service will be distributed system-wide as well. Targeted dissemination of information specific to PRC residents and employers emphasizing the forthcoming changes in stop frequency, in-vehicle travel time and connectivity with other existing fixed routes will precede revenue operations and continue through the PRC service transition period (length to be determined).

### Project Approvals and Endorsements

The BRT 15/20 Alternative was presented to the following bodies and approved or endorsed by each.

- Metropolitan Tulsa Transit Authority; February 26, 2013
- INCOG Transportation Policy Committee; February 27, 2013
- INCOG Board of Directors; March 12, 2013

## Implementation Strategy

Several steps are necessary to move the Recommended Alternative from conceptual planning to a constructed BRT project under operations. Immediate steps to further the PRC Alternative include: Project Scoping Preparations: Preliminary Environmental Coordination; Explore Financing Opportunities; and Transit Supportive Land Use Coordination.

### Project Scoping

It is critical to define the project to a sufficient level of detail in order to efficiently progress the project to the subsequent stages of project development: NEPA coordination, engineering design and construction. The project scope should also be developed in coordination with contributing city of Tulsa departments and agencies to maintain compliance with all existing local transportation policies, land use and guidelines for context sensitive infrastructure improvements.

In order to advance into design services, a complete scope of services needs to be developed. Full specifications developed by Tulsa Transit should include written specifications in technology choices, infrastructure improvement limits, station platform locations and vehicle selection. Finalizing station locations and level of improvement at each location is required as data collection for further impact assessments and stakeholder coordination continues. Tulsa Transit and the city of Tulsa must also develop a Project Management Plan and Fleet Management Plan to identify project expectations organizational structure, and protocols during procurement, design, construction and operation of the Recommended Alternative.

Local adoption of the project scope and budget; as well as dedication of funding sources are also needed for project advancement. The scope of the proposed PRC project must be adopted into the city of Tulsa's fiscally constrained Transportation Improvement Plan (TIP) before professional engineering design or construction services can be procured. Refined estimates of capital and operational funding needs must also be determined in order to operate and maintain the existing Tulsa Transit system and new PRC services after construction. If

Federal (or other alternative) funding is sought to supplement the local funding allocated toward the project, additional analyses, local agreements or legislative actions may be required.

## Preliminary Environmental Coordination

The National Environmental Policy Act of 1969 (NEPA) requires that the environmental impacts of proposed projects be described and evaluated as part of the decision-making process prior to the use of federal funding. NEPA establishes a nationwide policy of maintenance and enhancement of the environment, as well as a process for project development and environmental protection that all federally funded transportation projects must complete. It is anticipated that INCOG and Tulsa Transit will pursue the Programmatic or Individual Categorical Exclusion (CE) through the ODOT.

Coordination with Oklahoma Department of Transportation (ODOT) and any other regulatory agencies is important to initiate the environmental clearances needed to begin development of the project. Although, environmental documentation cannot begin until the project is in advanced level of development, numerous activities can be completed in preparation for the impact assessment. Data collection can commence prior to the environment documentation and a preliminary environmental constraints analysis may be conducted in order to determine the approximate magnitude of impacts that would be caused by the project and the appropriate level of environmental compliance documentation that will require review and concurrence in order to proceed with construction.

## Financing and Governance

In order to fund this PRC Recommended Alternative, INCOG and Tulsa Transit should seek opportunities for local, state, federal and private-sector financial support. Both capital and operating expenditures can be secured through multiple sources to ensure development and operations of the PRC Recommended Alternative. Outlets for financial investment include Federal, State and local support. Addressing long-term governance issues also serves as an important element of sustainable transit revenue.

### Potential Funding Sources

It is important that the Peoria/Riverside Corridor project consider all potential funding sources including potential federal grant and financing and funding opportunities. It is recognized that the current and near-term federal transit funding picture is difficult. It is important, however, that INCOG, Tulsa Transit and other potential grantees continue to position themselves for available federal funding; including ongoing programs such as: the urbanized area formula grants, the surface transportation program and any funds that may be available under the current Map-21 (moving ahead for progress in the 21st century) Program.

In order to be in a position to take advantage of potential funding sources is important to conduct the proper technical evaluations to the level of detail and completeness required for submission of federal grants. Completion of proper environmental clearances will address important community and planning concerns as well as position INCOG, Tulsa Transit and others as appropriate to take advantage of any potential federal funding programs which may arise.

State and Local financial resources will need to be explored to successful deploy and operate the Recommended Alternative. Tulsa Transit currently receives funding primarily from the city of Tulsa general fund which is derived from sales taxes. Property taxes, by state law, are required to go to Counties for local schools, vocational-technical education, libraries, and county government. Other potential local funding sources for Tulsa Transit include gas taxes, motor/vehicles taxes, bond proceeds, vehicle registration fees, and public-private partnerships. State and local capital infrastructure or maintenance budgets can be an important source of BRT project funds. Due to the

fact that BRT can operate on mixed-use roadways, agencies have utilized state and local commitments for road reconstruction, streetscape improvements, and traffic signal upgrades.

Engaging local project champions is also a powerful tool in advancing a project at the State and local level. Public-private partnerships are helpful in generating funding for joint development, operations or capital expenditures. Leveraging business interests in potential investment can create successful mutual partnerships. Advocating for transit-supportive policy changes can also position the project in a way that better assures its value to the community.

Based on numerous evaluations of the economic impact of public transit investment, it is well documented that every dollar spent on public transit, there are four dollars in economic benefits. The environmental, energy, air quality, quality of life and economic development opportunities created by transit service should be continually documented and monitored. This will ensure the optimum benefit is generated by the transit services and that the local community understands the benefits that are created.

As has been the experience of other communities in Oklahoma, Texas and elsewhere dedicated funding sources may ultimately be required to support transit and or other public sector infrastructure and investments, and economic development that mutually support transit and community benefits and objectives. This could function as user type fees and benefit assessments or local or regional dedicated funding sources that could free up current general fund contributions.

In the summer of 2013, Tulsa area residents approved the PRC project to be included within the "Improve Our Tulsa" capital improvements package to support routine maintenance, repairs and upgrades to City of Tulsa infrastructure, public safety and recreational resources. The package is divided into two Propositions; Prop 2 is an extension of an existing sales tax, and Prop 3 is the issuance of general obligation bonds by the City. Results of the November 12, 2013 election will largely determine the local capacity to fund the construction of the PRC without additional State or Federal assistance.

### Governance

It is important for the Tulsa region to identify a sustainable revenue stream to enable financial stability for advancing transit services throughout the region. Continued coordination with local leadership to determine the most appropriate governance and financing schemes will make advancing the project as seamless as possible.

The first major element of addressing governance is to assure that a fair and equitable governance mechanism is created that has broad local community and political support. The development of a governance structure should not necessarily be specifically related to a specific capital program; but first assure a fair, equitable, legally authorized, implementable, and politically acceptable structure is created. The first act of an effective governing body is to assure that funding of the current transit system and programmed enhancements and/or improvements is addressed with mechanisms provided to assure its continued efficient and effective maintenance and operation. This includes assuring maintenance and operation, and the state of good repair as a fundamental priority before moving forward with various well documented and supported capital programs.

To effectively implement transit improvements recommended by the PRC Transit Study as well as the Regional Transit System Plan (RTSP), the region must address institutional and funding issues to ensure adequate public transportation support. Tulsa Transit is currently structured as a municipal trust of the city of Tulsa as therefore depends on annual local general fund contributions for operational and capital expenditures.

# 2 | Project Background

## Overview

- Several regional plans in the last decade have made the case and laid the groundwork for transit supportive land use and transportation policies in Tulsa
- The Regional Transit System Plan (RTSP) identifies the Peoria/Riverside Corridor (PRC) as the corridor with the greatest capacity to benefit and demonstrate the benefits of a "complete streets" approach to transportation investment
- The PRC has five distinct segments for which proposed transit solutions can be combined in various alternative operating scenarios or used to define a minimum operating segment for viable demonstration of the project's potential value

## Regional Planning Context

Located in northeast Oklahoma, the city of Tulsa is the state's second largest city and home to its most densely populated county, Tulsa County. A major hub for the nation's petroleum industry, the city has diversified its economic base to include finance, aviation, education, healthcare and technology markets as well as local entrepreneurs. Through active engagement with citizens and community stakeholders throughout the region, the Indian Nations Council of Governments (INCOG) has acknowledged the importance of efficient transportation systems as a fundamental component of the Tulsa Transportation Management Area's (TMA) economic vitality.

Proactive public engagement and education helped establish the city of Tulsa's PLANiTULSA Comprehensive Plan Update, adopted by the City in July 2010, and the *Fast Forward* Regional Transit System Plan (RTSP) adopted by INCOG in October 2011. The *Fast Forward* Regional Transit System Plan (RTSP) laid the groundwork for establishing effective transit service within the TMA over the next 25 years. One of the results of the RTSP was the identification of the Peoria/Riverside corridor as a priority for implementation of enhanced, high-capacity transit improvements. Local consensus attained identified the Peoria/Riverside Corridor as the first to undergo a detailed Alternatives Analysis (AA) evaluation of transit options to determine the most appropriate transit mode, alignment and service operating parameters that meet the travel needs of the corridor.

### PLANiTULSA Comprehensive Plan

Incorporating unprecedented levels of public involvement during planning and development stages, the city of Tulsa created a comprehensive planning document, PLANiTULSA, which seeks to identify needs and goals of the community for 20 to 30 years into the future. Tulsa's comprehensive plan depicts the vision of Tulsa in terms of economic development, housing, transportation, parks and open space.

PLANiTULSA recommended improved collaboration between land use and transportation goals. Improvements to accessibility, according to PLANiTULSA, are possible with a concentrated effort to collocate homes and jobs near transit. Transportation related recommendations include provisions for greater modal choices including driving, biking, and reliable and frequent bus or rail transit. Tulsa residents indicated the preferred mode split of all regional trips would decrease vehicle share from the 2030 trend projected at 95% to 84%; increase pedestrian and cycling share from 4% to 9%; and increase transit share from 1% to 7%. Successful implementation of all land use and transportation related goals could result in transit ridership increases of 600% over the next 25 years.

Preliminary transit demand modeling results, conducted in concert with PLANiTULSA efforts, indicated the highest performing travel corridors were radial from downtown Tulsa to the southeast, south, east and north. The

strongest non-radial corridors were north-south corridors, roughly following US Highway 169 and Yale Avenue. The plan recommended a greater focus of transit along the "Big T", or the perpendicular pair of 21st Street and Peoria Avenue, to serve as a base transit network. The plan also stressed the importance of evaluating potential transit alignments in terms of ridership and development potential. Potential incentives were identified and included reduction in parking requirements as well as tax increment financing.

### *Fast Forward* Regional Transit System Plan (RTSP)

INCOG recently completed the *Fast Forward* Regional Transit System Plan (RTSP) which identifies a comprehensive, long-range system of transit corridors to help meet the region's transit needs over the next 25 years. The plan defines corridor priorities for the region and policy needs for feasible development to meet the growing needs of the community.

The RTSP identified and prioritized corridors within the TMA which are suitable candidates for high capacity, rapid transit service. Local consensus identified the Peoria/Riverside Corridor (PRC) as the first priority for a detailed Alternatives Analysis (AA) evaluation of transit options to determine the most appropriate transit mode, alignment and service operating parameters for the corridor.

## Other Studies

### Tulsa Transit Bus Service Needs Assessment – Metropolitan Tulsa Transit Authority, 2010

Developed by the Metropolitan Tulsa Transit Authority (Tulsa Transit/MTTA), the Needs Assessment identified ways to bolster transit service to a level-of-service standard to that of comparable cities. In 2002, the Tulsa Transit budget saw dramatic decreases which resulted in a 50% reduction in bus service hours and workforce reduction of a third. Although Tulsa Transit bus service hours have remained limited, passenger ridership demand has continued to increase. At a total annual fixed route service level of 160,000 bus service hours, Tulsa has one of the lowest ratios of bus service hour per capita of comparable US cities.

The total recommended investment for all service improvements reached $7.2 million in operating investment and $10 million in capital expenditures. The needs assessment notes that high capacity options, such as rail or bus rapid transit, are important options and warrant further study.

### Downtown Tulsa Area Master Plan – city of Tulsa, 2010

In an effort to coordinate multiple initiatives, studies and plans throughout downtown Tulsa, the Downtown Tulsa Area Master Plan was developed by the city of Tulsa. The plan was realized after several downtown initiatives focused on enhancing existing and planned development were identified by Vision 2025. Three major targets of the plan were identified as: revitalization of downtown; improving connection and accessibility to Tulsa River Parks system; and initiation of rail transit.

Two transit corridors were defined as priorities through the Downtown Master Plan process, which included recommendations of rail transit technology solutions. Urban design elements included within the master plan add important elements to the downtown region which help support future transit investments. The master plan distributed major gateway locations around the downtown fringe to focus investment on designing urban gateways into the downtown core. These envisioned gateways would create a sense of regionalism and provide increased safety to an assortment of users, whether transit patrons, pedestrians, cyclists, or motorists.

### Rail Transit Strategic Plan, INCOG 2008

The Rail Transit Strategic Plan Ad Hoc Committee, formed by the INCOG Transportation Policy Committee, was tasked to recommend a series of near term and long term actions which promote development of a regional transportation system and to develop systematic transportation implementation strategies for consideration by the INCOG Transportation Policy Committee and the INCOG Board of Directors. The Final Rail Transit Strategic Plan investigated the potential of seven corridors in the Tulsa Transportation Management Area for rail transit service viability as part of a comprehensive transportation system.

The plan's recommendations for improvements in the region's transportation system included rail transit serving as a core component. Rail transit was recognized as a fundamental element of a greater regional transportation system because of its economic, environmental, social and safety benefits.

### Tulsa Regional Coordinated Public Transit-Human Services Transportation Plan, INCOG 2007

In an effort to collaborate regional transportation initiatives focused on older adults, persons with disabilities, and lower income populations, the Tulsa Regional Coordinated Public Transit-Human Services Transportation Plan was developed. The plan assesses existing transportation services and options including public transit fixed route systems, specialized dial-a-ride van programs, taxi vouchers, and volunteer drivers. Analyzing operations of such a vast variety of services, the study indicated a need for coordination due to inadequacies such as underutilized or inefficiently operated vehicles. All deficiencies are accentuated with rising numbers of people unable to access transportation services. The plan was developed in order to improve efficiencies and maximize limited community resources.

Recommended improvements in the Tulsa Regional Coordinated Public Transit-Human Services Transportation Plan include safe routes for transit as well as increased transit service to regional medical facilities, employment centers and social activities. Enhanced transit facilities and amenities as well as increases in transit frequencies to fixed route service are all priorities established by the plan. Extended transit service hours to evenings, holidays and Sundays are also noted as important regional transit solutions.

*Alternatives Analysis Mission Statement and Goals*

*The Locally Preferred Peoria/Riverside Corridor (PRC) Alternative will improve mobility, increase travel choices and support economic development through the use of low-cost high-impact transit technology investments.*

**Goal 1: Improve Transit Access and Regional Mobility**

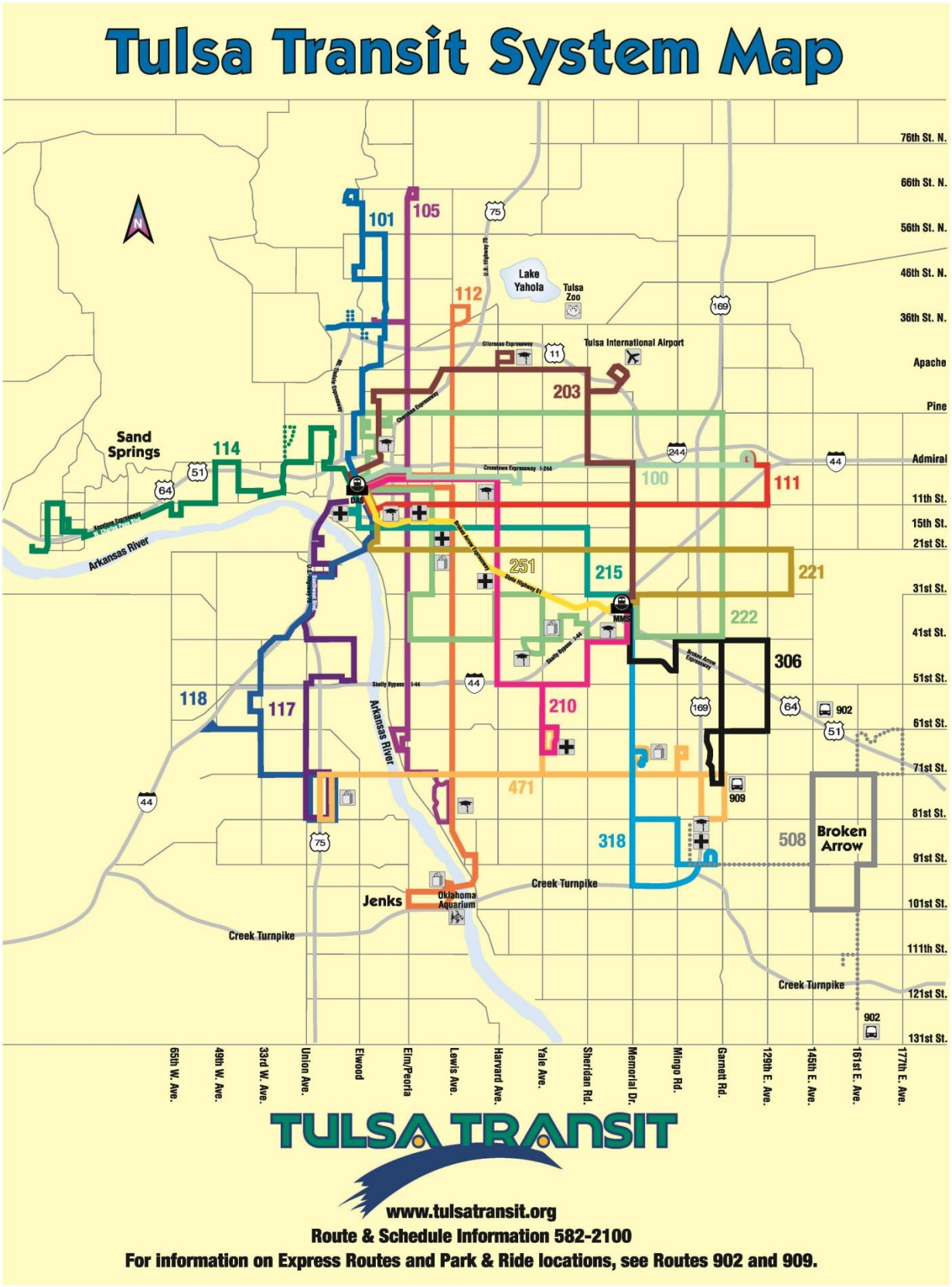
**Goal 2: Support Economic Development**

**Goal 3: Invest in Low-Cost, High-Impact Transit Infrastructure**

**Goal 4: Build Community Support for the Value of Transit**

Through the AA process, INCOG, together with the Metropolitan Tulsa Transit Authority (Tulsa Transit) will identify corridor problems, develop alternatives, analyze costs and benefits, and select a Locally Preferred Alternative (LPA) for implementation. This PRC Initiation Package was prepared at an early stage in the AA process to inform interested parties about key elements including the study's setting, purpose and need, preliminary alternatives and proposed evaluation methodology.

Figure 7: Tulsa Transit System Map (March 2013)



# 3 | Peoria/Riverside Corridor (PRC) Description

The TMA is approximately 1,400 square miles and home to 778,000 residents, representing all of Tulsa County and portions of four adjacent counties: Creek, Osage, Rogers and Wagoner. The Tulsa Metropolitan Area and surrounding region contains 18 incorporated municipalities, including: Bixby, Broken Arrow, Catoosa, Claremore, Collinsville, Coweta, Glenpool, Jenks, Kiefer, Liberty, Mounds, Owasso, Sand Springs, Sapulpa, Skiatook, Sperry, Tulsa and Verdigris. The public transportation needs of the region were considered in the development of the *Fast Forward* RTSP, which recommended an integrated system of urban, commuter and circulator corridors.

The PRC (**Figure 5**) extends north to south across the TMA for a distance of approximately 20.2 miles. Beginning at its city of Tulsa limit at Peoria Avenue and 56th Street North, it spans the length of the city, predominantly along Peoria Avenue and Riverside Drive/Parkway, before heading east at approximately 121st Street South and terminating at Memorial Drive in Bixby.

## Regional Significance

The PRC is one of the most regionally significant arterial thoroughfares in the greater TMA. It is one of the primary north-south arterial roadway corridors in Tulsa County east of the Arkansas River, and the only one connecting directly to the central business district (CBD). The only other highway alternative parallel to the PRC is US Highway 75, which is located on the west side of the Arkansas River south of Downtown. As a result, the PRC serves as a primary regional thoroughfare providing access to residential, employment, educational, commercial and activity centers across the area. Several PRC activity centers, destinations and existing transit trip patterns of route 105 passengers are illustrated in **Figure 8**.

The PRC serves a large portion of the community in terms of employment, housing and transportation. The corridor contains 1 of every 7 residents as well as 1 of every 5 jobs. It is also home to significant portions of the TMA employment and transit dependent population. Comparison between the TMA, city of Tulsa and PRC study areas' demographics is illustrated in **Table 4**.

**Table 4: Comparison of PRC, city of Tulsa and Transportation Management Area (TMA) Demographics**

| | PRC | City of Tulsa | | TMA | |
|---|---|---|---|---|---|
| | | Total | PRC % | Total | PRC % |
| Population* | 56,450 | 391,906 | 14.40% | 778,051 | 7.26% |
| Jobs** | 52,627 | 259,914 | 20.25% | 376,954 | 13.96% |
| Zero Car Households*** | 1,188 | 5,548 | 21.41% | 7,749 | 15.33% |

** Source: U.S. Census Bureau, 2010 Census*

***U.S. Census Bureau, OnTheMap Application and LEHD Origin-Destination Employment Statistics (Beginning of Quarter Employment, 2nd Quarter of 2010). All jobs all workers.*

**** U.S. American Community Survey and INCOG*

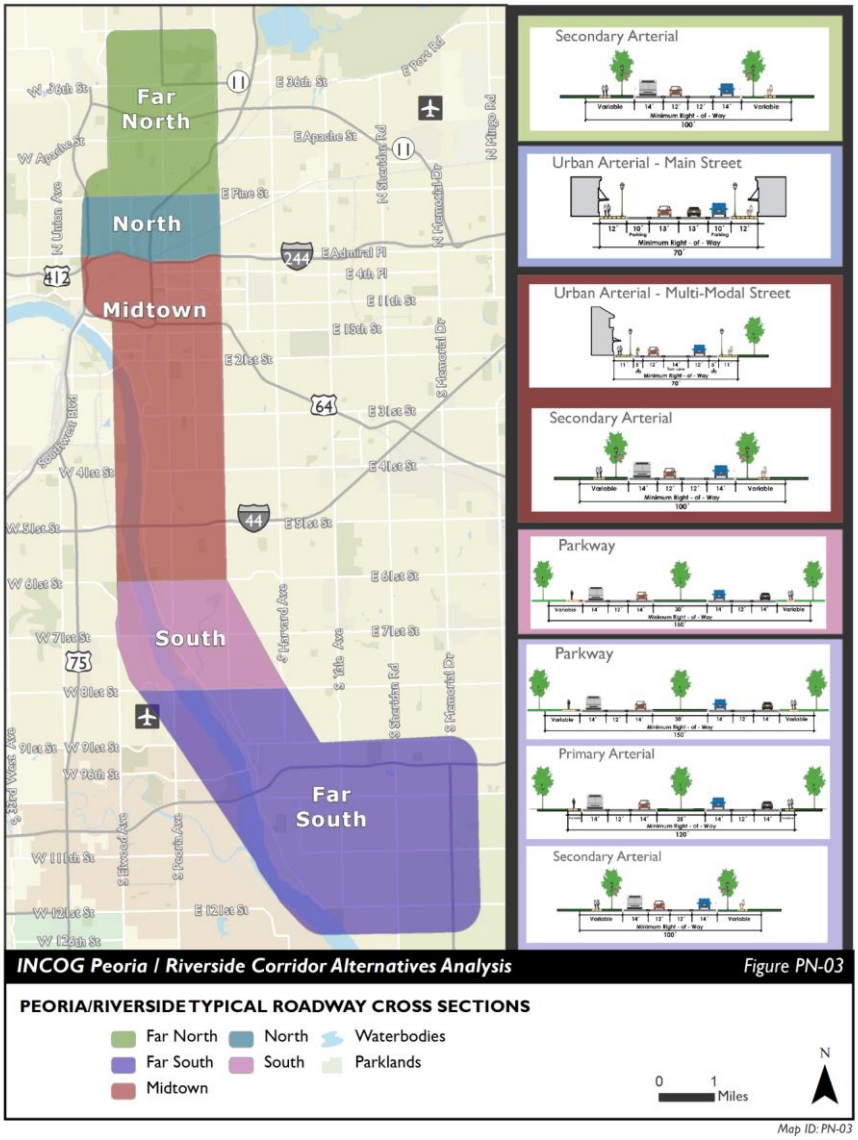
Figure 8: PRC Corridor Study Area Activity Centers and Existing Transit User Destinations

## Corridor Segmentation

To facilitate the evaluation of transit alternatives, the PRC was divided into five logical segments that could be combined into a minimum operable segment (MOS). These segments allowed for the evaluation of realistic alternatives that provide appropriate length and logical terminal anchors to make for an effective initial implementation phase. Corridor segments, as depicted in **Figure 9**, are delineated as follows:

- Far North (FN) – 56th Street N. to Pine Street
- North (N) – Pine Street to Admiral Boulevard / I-244
- Midtown (MT) – Admiral Boulevard/I-244 to 61st Street S
- South (S) – 61st Street S. to 91st Street S.
- Far South (FS) – 91st Street S. to 121st Street & Memorial Drive

Figure 9: PRC Corridor Segments



# 4 | Purpose and Need

## Overview

- The PRC is one of very few regionally significant corridors connecting downtown Tulsa to a large number of residents and supporting jobs
- Existing transit service in the PRC corridor is limited and lacks amenities.
- The corridor would benefit from sidewalks, covered shelters, Americans with Disabilities Act (ADA) compliant crosswalks that support transit and other complete streets initiatives such as Safe Routes to Schools.
- Marketing and branding of transit improvements will be keys to raising visibility and awareness of transit alternatives in the community
- Alternatives considered should incorporate distinctive marketing, branding, amenities, travel time benefits and a "complete streets" solution to meet stated goals and objectives.

## The Transportation Problem

The Peoria Avenue/Riverside Drive Corridor (PRC) is one of the most regionally significant arterial thoroughfares in the greater TMA. It is one of the primary north-south arterial roadway corridors in Tulsa County east of the Arkansas River, and the only one connecting to the central business district (CBD). The only other highway alternative parallel to the PRC is US Highway 75, which is located on the west side of the Arkansas River south of Downtown. As a result, it serves as a primary regional roadway providing access to residential, employment, education, commercial and activity centers across the area.

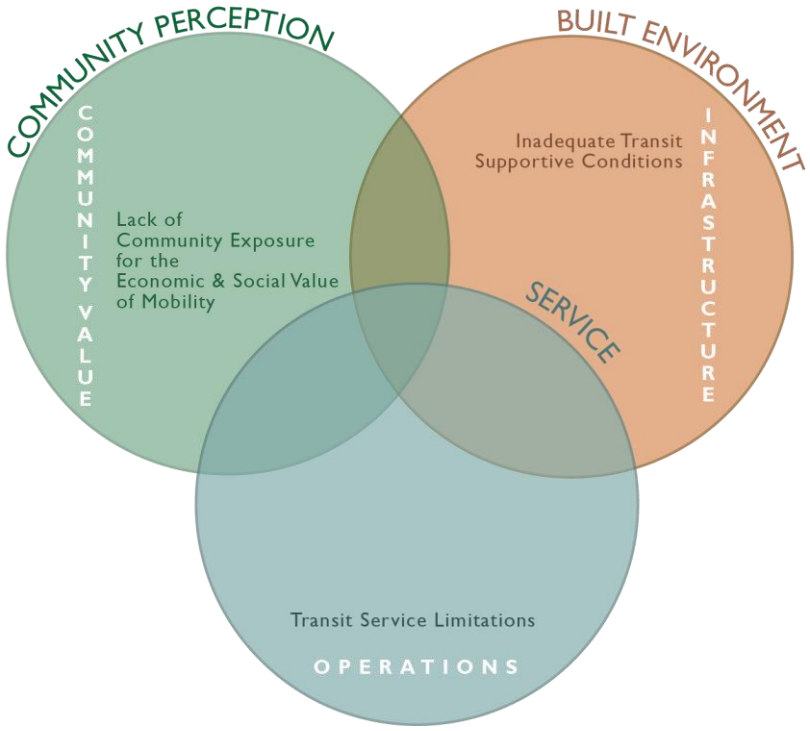
Through proactive public engagement and education, via the 2010 city of Tulsa Comprehensive Plan Update and the 2011 *Fast Forward* Regional Transit System Plan (RTSP), citizens and stakeholders have acknowledged the need to take action in improving their transit system in order to support regional growth projections and stay economically competitive with other metropolitan areas in an increasingly difficult market. The PRC was identified in both plans as a priority corridor for transit development.

## Purpose and Need of Transit Improvements

The purpose of the Alternatives Analysis (AA) study is to evaluate and determine a cost-effective transit mode and alignment that significantly improves transit services and access within the PRC. The challenges posed to the community for the AA study cluster into three basic categories:

- Lack of Community Exposure to Economic and Social Value of Mobility
- Existing Transit Service Limitations
- Inadequate Transit Supportive Conditions

Figure 10: PRC Challenges to Transit Improvements




Each of these issues is inter-dependent and have compounded upon one another to further degrade the transit service and service potential within the corridor. The (historically) negative community perception, paired with recent economic challenges creates an environment that discourages community support for capital and operational investment. The constraints of the built environment and urban development patterns also limit the opportunities for improved facilities and efficient services. The deficiency in funding support has led to inadequate infrastructure, amenities and transit service availability to support the existing and (potential) future patronage. The subsequent sections briefly describe these three problems and how they contribute to an overall need for improved transit services within the corridor.

The need for improved transit service within the corridor is documented within the RTSP Needs Assessment analysis and categorized into four goals:

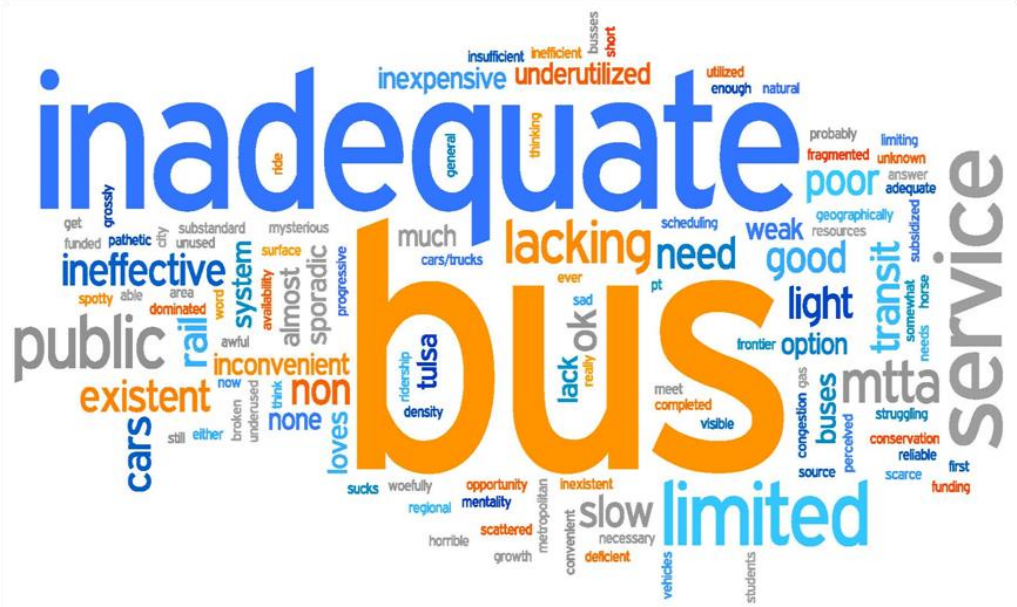
- Mobility & Accessibility
- Efficiency & Safety
- Environmental Benefits
- Economic Development

### *Lack of Community Exposure to Transit*

The regional community – including the business community and political figures – are still striving to fully appreciate the potential economic and social advantages transit can provide. This lack of appreciation limits the advocacy and willingness of policy makers to take action to improve the existing public transportation system.

As part of the RTSP public outreach process, a series of in-depth interviews was conducted with community leaders to gain a better understanding of regional thinking with regard to transit. **Figure 11** is a word graphic, or "wordle," depicting the most common themes for the interview question, "When you think about public transportation in the Tulsa region, what is the first word that comes to mind?"

Figure 11: First Word Reaction to Public Transportation in Tulsa (RTSP 2011)




The overwhelming responses were a negative reflection on the existing level of transit service available, with common adjectives such as: inadequate, lacking, limited, ineffective, etc. dominating the responses. However, nearly 85% of the group had little to no experience in regular use of public transportation systems. While 50% of participants stated that they have never used Tulsa Transit, with their only transit experiences having been in other cities or metropolitan areas. With such little exposure to mature transit systems and the mobility, social, employment and commercial opportunities afforded to those with access to efficient public transportation, community leaders have struggled to justify continued investment into the existing system. The repercussions of these reductions have eroded the existing service to the point where there is only the most basic of level of transit available.

Although political support has wavered throughout the years, the community has become better educated to the disparate level of reliable transportation options in the area and show consistency in the desire that elected leaders work on transportation alternatives. A statistically valid survey, conducted as another public outreach component of the RTSP, provided additional insight of the general attitudes and aptitude of regional transportation issues. According to the findings, 62% of people in the TMA identify the lack of public transportation is a current or emerging problem. Of the at-large citizens surveyed, 85% of respondents stating the development of viable transportation options are very important. In addition, 48% of respondents indicated they are willing to vote for those who work on transportation alternatives.

### *Transit Service Limitations*

Due to the local funding constraints, largely mirroring the historic lack of support from local leadership identified in the previous section, transit services in the Tulsa region are extremely limited. Regular service along the corridor operates from 5:00 am to 8:00 pm Monday through Friday and 7:00 am to 7:00 pm on Saturday. No service is available on Sundays. The corridor does contain the bus route with the highest ridership in the system, route 105, with additional service available via routes 112 and 222. General Service operating parameters of these routes is shown in Table 5.

Table 5: PRC Existing Fixed-Route Transit Service

| Rte | Description (name) | Hours of Operation | | Average Weekday | | | |
|---|---|---|---|---|---|---|---|
| | | Weekday | Saturday | Frequency | Revenue Miles | Cycle Time (minutes) | Ridership (daily) |
| 105 | Peoria | 5:30am – 8:30pm | 6:30am – 6:30pm | 30 | 967 | 150 | 1500 |
| 112 | Lewis / Jenks | 5:15am – 7:00pm | 7:15am – 6:00pm | 60 | 672 | 180 | 740 |
| 222 | Pine / 41st Street | 5:15am – 7:30pm | 7:00am – 6:30pm | 70 | 800 | 280 | 950 |

Source: Tulsa Transit (2011)

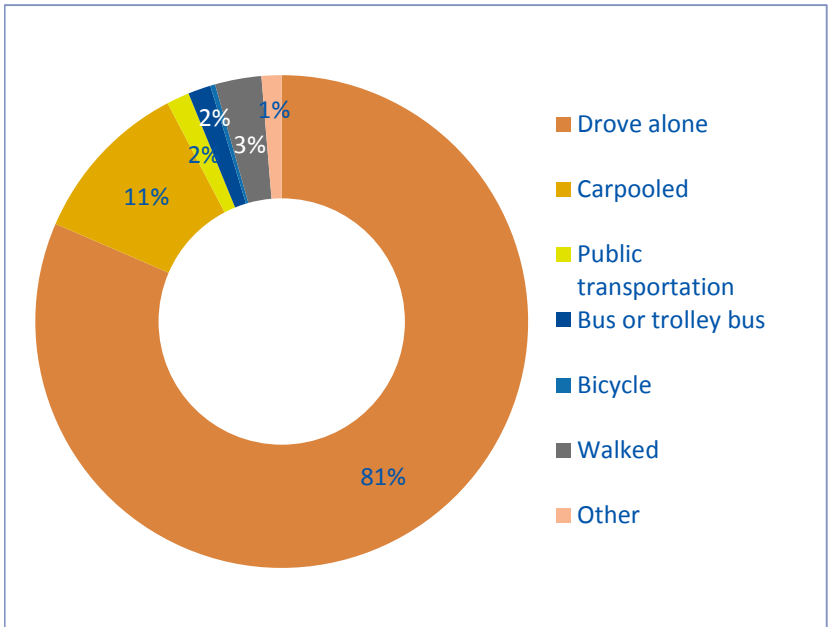
These limitations in the amount of service available affect patrons' willingness to travel via transit. The infrequency and short hours of operation result in discontinuity and inability to attract and retain patrons. In addition, alternative modes such as carpooling, walking and cycling become more desirable means of transport.

According to the 2005-2009 American Community Survey, 4% of households in the PRC are without access to a car. As shown in **Figure 12,** more commuters walk (2.9%) than take public transit (1.4%).

### *Inadequate Transit Supportive Conditions*

The built environment within the study area does not adequately support existing transit services. Several scattered destinations and activity centers create diverse trip patterns rather than consolidated patterns. Diverse land use characteristics in the various corridor segments and travel demands along the corridor require innovative solutions to enhance transit's competitiveness.

Figure 12: Journey to Work by Mode in PRC (ACS 2005-2009)




One element necessary to attract and retain new, existing and choice riders is safe, attractive, comfortable and accessible facilities including bus stops, transfer centers and supporting amenities. To facilitate ease and safety of transit usage, service providers must invest in amenities directed towards patrons. Existing Tulsa Transit stops within the PRC lack consistent amenities, and those with amenities present are often in poor condition, barely visible, or difficult to access. Tulsa Transit passengers have few stops within the PRC with benches and even fewer stops have covered shelters or shaded areas that offer protection from the elements (see Error! Reference source ot found. through Error! Reference source not found.). The propensity of potential users to endure long wait times

at bus stops without any protection decreases the attractiveness of transit. Indoor climate-controlled waiting areas are currently only available at Tulsa Transit's two major transfer facilities, Denver Avenue Station (DAS) in downtown Tulsa and Memorial Midtown Station (MMS) in east Tulsa near I-44 and Memorial. Commercial and private properties utilized as park-n-ride facilities do not contain shelters or passenger waiting facilities. Dilapidated and inconsistent shelters, benches and facilities reinforce negative perceptions of the service provided.

Figure 13: Route 105 End of Line (Wal-Mart) 81st and Lewis

Figure 14: On-line Stop at 36th S and Peoria

Figure 15: 25th and Peoria

Visibility, signage and access to transit system information are also important for transit user safety and guidance. Landscaping, street furniture and walkways are largely absent and contribute to the harsh environmental conditions for existing patrons and pedestrians. The PRC has frequent gaps in its sidewalk network and is routinely lacking ADA compliant features such as curb ramps and minimum clear zones for safe passage of wheelchairs within the sidewalk. Lack of visibility and access to information are also deterrents to ridership. Tulsa Transit stops are often only designated by singular sign posts in the ground and system route and schedule information is available only at the two major transfer centers (see **Figure 16** through **Figure 19**).

Figure 16: No Visibility or Sidewalk Accessibility

Figure 17: Partial Sidewalk Accessibility

Figure 18: Non-ADA Compliant Access

Figure 19: No Sidewalk Accessibility

# 5 | Alternative Development

## Introduction

Transit opportunities within the PRC may be improved through various means and combinations of improvements to the existing transit service operating parameters, infrastructure, and/or technologies deployed within the corridor. INCOG and Tulsa Transit evaluated multiple scenarios from which to recommend a series of improvements for implementation within the PRC.

To evaluate all viable funding and modal options, local policy makers and stakeholders elected to develop alternatives which could be implemented (both) independently by the city of Tulsa as well as those that could qualify for alternative funding sources thereby giving INCOG and Tulsa Transit the option to seek funding for improved transit services within the PRC via grant programs authorized through agencies such as the Federal Transit Administration (FTA) or the State of Oklahoma Department of Transportation (ODOT). To comply with Federal requirements for potential grant application, this Alternative Analysis considered Federal Transit Administration (FTA) and National Environmental Protection Agency (NEPA) project justification criteria and AA development guidelines in the formation of alternatives.

FTA and NEPA compliance guidelines require development of a locally accepted process for selection of a preferred transit alternative to the greatest extent practical, and within the constraints defined by INCOG and the Metropolitan Tulsa Transit Authority (Tulsa Transit). This section identifies the underlying principles of the FTA and NEPA AA process as well as the preliminary decision points that were used to define the scope of proposed transportation alternatives for detailed evaluation.

## Overview

- Potential modes considered included rail, BRT and enhanced bus in addition to more frequent local fixed-route bus
- Potential funding sources should include local, state and federal alternatives up to FTA's "Small Starts" program
- The frequency of service should be increased from existing conditions as should the hours and days of service, if feasible to do so
- Vehicles used should be environmentally friendly and incorporate passenger-friendly technologies such as variable message signs and automated ticketing machines
- All alternatives considered should be vetted through an aggressive public involvement campaign

### *FTA Guidelines*

The New Proposed Rulemaking of the MAP-21 process has been evolving throughout the FY 2012 timeframe and FTA recently published its Proposed New Starts and Small Starts (NS/SS) Policy Guidance (January 9, 2013). Among other modifications to the NS/SS processes, the FTA has re-defined projects eligible for application of NS/SS funding.

Newly defined FTA, Section 5309, Fixed Guideway capital investment grants quantified a MAP-21 eligible Small Starts project as one meeting one or more of the following criteria:

- Total cost is less than $250 million and Small Starts share is less than $75 million
- New fixed Guideway systems and extensions
- Fixed Guideway BRT projects
- Corridor Based BRT projects

Project definitions relevant to the development of PRC alternatives for analysis are included within this document. Interim guidance on MAP-21 Fixed Guideway Capital Investment Program (September 2012) also noted:

- Projects under $100 million can utilize an expedited review process if they meet standards of similar highly qualified projects
- If a project is currently in AA, it may choose to continue or may choose to wrap Alternatives Analysis efforts into NEPA, at the grantee's/applicant's discretion
- AA scopes will no longer need to address the FTA New Starts/Small Starts requirements, such as development and evaluation of the baseline alternative, but should focus on information for local decision-making

### *NEPA Guidelines*

On October 1, 2012, the new two-year Federal transportation authorization, MAP-21, authorized surface transportation programs of the Department of Transportation for fiscal years (FY) 2013 and 2014. The law includes significant reforms aimed at expediting the environmental review and project development entry processes for transportation projects.

An important change in the FTA evaluation of a proposed project's readiness to enter into the Very Small Starts (VSS) Project Development Phase, attributed to MAP-21, is the merging of the Alternatives Analysis phase of planning with the environmental clearance phase. MAP-21 eliminated the requirement that a New Starts or Small Starts project be the result of an Alternatives Analysis and instead relies on the similar evaluation of alternatives performed as part of the environmental review process conducted in accordance with the requirements of the National Environmental Policy Act (NEPA). NEPA requires AA studies to clearly document the following:

- Indicate why and how the particular range of project alternatives was developed. This includes the kind of public and agency input used.
- Indicate why and how alternatives were eliminated from consideration. This includes identification of:
    - Criterion used to eliminate alternatives from consideration and members involved in establishing the criteria for assessing alternatives.
    - At what point in the process the alternatives were removed
    - Measures used to assess the alternatives' effectiveness

## Development of Preliminary Alternatives

The proposed alternatives range from minor service modifications to existing fixed-route service along the corridor; to implementation of a corridor based Bus Rapid Transit (BRT) solution, which might qualify for Federal funding.

### *Existing Transit Conditions*

For comparison against proposed alternatives, the existing Tulsa Transit fixed route 105 was identified as the baseline transit operating condition for the PRC. Existing facilities along route 105 and its current service operating parameters are described below:

- Operates approximately 15 hours daily, from approximately 5:30 am to 8:30pm (M-F) and from 6:30 am to 6:30 pm on Saturday
- Headway is 30-minutes all day. (Average Tulsa Transit system-wide headways are approximately 45- to 50-minutes)
- Fixed route local service allowing flag-stop operations that allow passengers to board and alight at any safe stopping location along the corridor by alerting the bus driver.

- Transit shelters and amenities are available only at a few locations within the corridor.

## *Elements Considered in Development of Alternatives*

### Modal Alternatives

*Commuter Rail* operations generally serve long distance (end to end) travel patterns and have few stops (typically located at community anchors several miles apart) in between termini.

*Urban Rail* alternatives considered for implementation on the PRC included Modern Streetcar and Light Rail technologies. Vehicles operate along a fixed rail guideway and may include dedicated right-of-way, separated from automobile traffic or embedded rail installed within travel lanes shared with autos. Vehicles are typically powered by overhead catenary electrification or hybrid, electric-alternative fuel motors. Modal differences between vehicles include passenger car dimensions and passenger capacity

*Corridor-Based Bus Rapid Transit (BRT)* has be defined by the MAP-21 legislation as: a Small Start project utilizing buses in which the project represents a substantial investment in a defined corridor as demonstrated by features that emulate the services provided by rail fixed guideway public transportation systems, including: defined stations, traffic signal priority for public transportation vehicles, short headway bi-directional services for a substantial part of weekdays and weekend days, and any other features the Secretary of Transportation may determine support a long-term corridor investment.

*Fixed Guideway BRT* features a rapid-bus operating within a separated right-of-way dedicated for public transportation use during peak periods along the majority of the corridor, while *Corridor-Based BRT* implements rapid bus service operating within mixed traffic for the majority of the corridor.

*Enhanced Bus* service is a bus service intended to run faster than local bus services and deploy significant passenger amenities to signify a "premium service." Enhanced buses operate with limited stops to provide quicker travel along a corridor. Additional passenger amenities are featured on enhanced service buses, such as reclining seats and Wi-Fi, to make longer trips more comfortable. The amenities deployed may vary dependent upon individual need, but primary benefits are received from the increased efficiency of operations and faster point-to-point travel times over traditional local bus service.

### Corridor Termini and Alignment

As identified in previous chapters, the PRC traverses multiple communities with varying demographics, neighborhood characteristics, land uses and transportation needs as it spans the north-south length of the city of Tulsa. To better evaluate the transit service needs and readiness to support high-capacity transit service. Preliminary screening conducted determined the most appropriate corridor segments to implement improved transit service as well as the most suitable locations for terminal and on-line station development. The approach to PRC alignment development focused on providing the greatest utility to PRC residents and commercial activity centers, while optimizing routing efficiency to minimize in-vehicle travel times experienced by passengers.

### Service Operating Parameters

PRC Alternative **Hours of Operation** will be expanded later in the evenings to provide more opportunities to access transit by employees and resident return work and/or personal transit trips.

**Service Frequency** modifications may be implemented in various combinations to meet peak and off-peak ridership demand, improve timed transfers with existing fixed routes and improve overall transit system efficiency.

Designated transit **Stop Intervals** may be modified from the existing Tulsa Transit fixed-route, flag-stop operation to a traditional local, limited, or skip-stop operation to improve one-way travel speeds.

### Capital Improvements

**Infrastructure** improvements proposed in combination for development of alternatives include: new clean fuel vehicles, dedicated transit lanes, branded shelter and amenities,

**Technology** improvements proposed in combination for development of alternatives include: traffic signal prioritization (TSP), automated ticket vending machines (TVMs), Variable Message Signs (VMS) displaying real-time transit vehicle arrival information, and automated fare collection on transit vehicles.

## Alternatives Analysis Approach

At the beginning of the AA process, INCOG and MTTA elected to conduct a ride check survey documenting the performance of the existing transit service operations within the PRC corridor. From April 24 – 26, 2012, a ride check survey was conducted of the nine (9) Metropolitan Tulsa Transit Authority (Tulsa Transit) routes within the PRC study area. The purpose of the counts was to determine the existing ridership levels on the routes and establish the eligibility of the recommended PRC transit solution to meet FTA Very Small Starts criteria. As identified above, the FTA requires a minimum of 3,000 existing transit riders within the corridor who would benefit directly from the improvements deployed.

The *Peoria/Riverside Corridor Alternatives Analysis Ride Check Survey* (June 2012) documented the results of the survey and was submitted to FTA in July of 2012 for review and concurrence. During subsequent discussions regarding the potential benefits that would be realized by existing MTTA riders, it was determined that the PRC did not meet the minimum 3,000 existing, benefitting riders required by the FTA to meet VSS project justification criteria. The technical memorandum is included as an appendix to this document and the full report is available, under separate cover, upon request from INCOG.

Although the PRC corridor represents the highest ridership corridor of the MTTA system, its inability to meet the FTA SS simplified evaluation threshold led the steering committee to elect development of alternatives that could be financed and implemented independently and outside of the realm of FTA NS/SS, while not precluding future application for other discretionary Federal funding programs. The opportunities for capital and operation financing of the recommended alternative are discussed in the **Implementation** Chapter (11) of this document. At a minimum, any project applying for these potential alternate funding sources must meet the NEPA guidelines for AA development. As a result, the development of detailed alternatives and the evaluation process leading to the Recommended Alternative were developed to satisfy the questions, concerns, needs and goals of the PRC area stakeholders while maintaining compliance with NEPA regulations.

The breadth of transportation improvement opportunities available to the community and the market constraints facing Tulsa Transit are such that the evaluation of these measures was conducted on several, iterative levels to formulate the most effective process to find a community supported Recommended Alternative.

This study applied specific evaluation techniques during each stage of the AA process to the various elements making up the proposed PRC transit alternatives. This approach may be summarized into the following phases:

- Preliminary Screening
  - Public Engagement
  - Scenario (corridor termini) and Alignment Screening
  - Transit Mode Screening

    - Technology and Infrastructure
    - Operating Conditions
- Alternative Definition and Evaluation
    - Define Alternative Capital and Operating Scenarios
    - Potential Impact Assessment
    - Alternative Evaluation
- Alternative Selection and Implementation
    - Public Involvement
    - Financial Feasibility

The preliminary screening methodology and analysis were used to formulate alternative PRC transit solutions for evaluation. The results are discussed in **Chapter 6** of this document as well as the *PRC Preliminary Screening of Alternatives Memorandum (March 2013)*.

Transportation alternatives for detailed evaluation were then defined from the capital and operating improvements that best addressed the needs of the corridor. Specific scopes of alternatives were developed for comparative analysis by building upon the existing (No Build) transportation and infrastructure conditions within the PRC. Various levels of capital investment in transit and pedestrian supportive infrastructure and technologies, requiring minimal to high investment of resources, were identified for implementation as a range of alternatives.

Each alternative capital improvement scenario was further refined to include a gradually modified service operating profile to compare the potential benefits and impacts to improve mobility, community support and economic development potential of transit within the corridor. Comprehensive alternatives were again presented to Tulsa Transit and PRC stakeholders for additional feedback and concurrence. This group of alternative permutations was then subjected to a rigorous screening of potential construction and service impacts, financial feasibility forecasts, as well as an assessment of their respective ability to fulfill PRC mobility needs and AA study goals. The methodology and results of the detailed evaluation of alternatives is found in **Chapters 7 thru 9** of this document as well as the *PRC Evaluation of Alternatives Memorandum (June 2013)*.

The alternative(s) assessed to have the most appropriate scope of improvements benefiting PRC residents, businesses and transit users were presented to the PRC AA Steering Committee for concurrence and final recommendation of a preferred alternative for implementation.

# 6 | Public Involvement

Following the success of the public involvement strategies employed during and achievements resulting from the Regional Transit System Plan (RTSP), the Peoria/Riverside Corridor Transit Study public involvement approach utilized the momentum to capture the attention of corridor specific stakeholders.. Due to the specific geographic limits and land uses of the corridor, the study focused its outreach on members of the community directly affected by any proposed changes to existing conditions. Business owners, institutions, agencies and residential groups along the PRC were all targets for distribution of information in an effort to gather input, whether in a public workshop setting, one-on-one stakeholder meeting, or as a member of the Steering Committee.

## Overview

- Outreach for the PRC study built on successful outreach strategies included as part of the recent Regional Transit System Plan
- Stakeholders ranging from residents and communities along the corridor to general business concerns and key stakeholders were actively engaged throughout the study.
- Media campaigns, a project website and social-media were also used to reach out in non-traditional ways and to engage the largest possible audience.

## Public Outreach Methodology

Consistent with the Federal Transit Administration (FTA) and INCOG policies and procedures for public participation, the Peoria/Riverside Corridor Transit Study utilized several various approaches for citizen engagement. Major components of the public involvement effort included:

- Project website (www.fastforwardplan.org/Peoria)
- Media Outreach & Social Media Campaign
- Steering Committee Meetings
- Corridor Stakeholder Meetings
- General Public Workshops & Outreach

### *Project Website*

In order to achieve a comprehensive transit vision, consistent with the RTSP effort, the PRC Transit Study used the same branding and website as the RTSP process. The website contained information of the RTSP effort and results, along with PRC Transit Study updates, presentation materials and press releases. The website provided visitors with opportunities to contact INCOG with questions and comments on materials posted, as well as sign up for future newsletters and notifications related to the PRC Transit Study.

### *Media Outreach & Social Media Campaign*

With features aired on Public Radio Tulsa, Tulsa World, KJRH-TV and KTUL-TV, the PRC Corridor and public transit within Tulsa received optimal levels of exposure to wide audiences across Tulsa.

Regular project updates and notifications of upcoming meeting were posted on social media sites to ensure followers interested in the project remain informed about ongoing project progress. The site created a forum for discussion on topics related to major project decisions.

### *Steering Committee Meetings*

A Peoria/Riverside Corridor Steering Committee was established to represent agencies and stakeholders within the corridor, and to provide input and understanding of the community's viewpoints. The Steering Committee was

comprised of 16 members including agency representatives, community leaders and corridor-specific stakeholders. The Steering Committee had an active and important role in guiding the direction of the Alternatives Analysis and was provided presentations of the project's progress and asked to contribute input at key milestones.

Several key meetings with the Steering Committee helped guide the direction of the PRC analysis during the development of alternatives and alternatives evaluation. All meeting dates of the Steering Committee are provided below:

- June 15, 2012 – Inaugural Meeting
- October 25, 2012 – Description of Alternatives, Capital and Operating Cost Estimates
- January 22, 2013 – Alternatives Description, Evaluation Methodology
- February 15, 2013 – Discussion of Recommended Alternative

Table 6: Steering Committee Members

| Title | First | Last | Agency |
|---|---|---|---|
| Councilor | Jack | Henderson | Tulsa City Council |
| Councilor | Jeannie | Cue | Tulsa City Council |
| Councilor | Blake | Ewing | Tulsa City Council |
| Councilor | G.T. | Bynum | Tulsa City Council |
| Commissioner | Karen | Keith | Tulsa County Board of County Commissioners |
| Mr. | Tom | Baker | Downtown Coordinating Council |
| Mr. | Nick | Doctor | Tulsa Regional Chamber |
| Mr. | Francisco | Treviño | Greater Tulsa Hispanic Chamber |
| Mr. | Reuben | Gant | Greenwood Chamber |
| Ms. | Rose | Washington Rentie | TEDC |
| Mr. | Jeff | Mulder | City of Tulsa |
| Ms. | Dawn | Warrick | City of Tulsa |
| Mr. | Jim | Twombly | City of Tulsa |
| Ms. | Ann | Metcalf | Tulsa Transit Board |
| Mr. | Bill | Cartwright | Tulsa Transit, General Manager |
| Mr. | Rich | Brierre | INCOG |

## *Corridor Stakeholder Meetings*

A series of targeted stakeholder meetings were conducted to inform businesses, institutions and residential group about the PRC project. Representatives from these organizations were contacted and private meetings were held at their locations to discuss the project, address any questions they might have and make them aware of any changes to look forward to in the future. The following meetings were held:

- November 19, 2012- Indian Health Care Resource Center
  Attendees: Katie Brown, Lou Reynolds, Carmelita Skeeter, Janice Edmiston, Russel Burkhart, Robert Shears, Jim Cameron, Viplav Putta (INCOG) and James Wagner (INCOG)
- November 20, 2012- Pearl District Association
  Attendees: Jamie Jamieson, Rachel Navarro, Dave Strader, Kasey St. John (INCOG) and James Wagner (INCOG)
- November 20, 2012- Cherry St. Business Association
  Attendees: Josh Walker, Kasey St. John (INCOG) and James Wagner (INCOG)

- November 27, 2012- Tulsa Housing Authority/Comanche Park staff
  Attendees: Melissa Dumas, Lucy Terrell, Tim Moore, Leslie Gross, Kasey St. John (INCOG) and James Wagner (INCOG)
- December 4, 2012- Transportation Advisory Board
  James Wagner (INCOG) presented information to the board.
- December 11, 2012- Educare and Hawthorne Elementary (Tulsa Public Schools)
  Attendees: Jennifer Ladner, Dr. Estella Bitson, Kasey St. John (INCOG) and James Wagner (INCOG)
- December 12, 2012- OKDHS
  Attendees: Rachel Kasika, Kasey St. John (INCOG) and James Wagner (INCOG)
- December 12, 2012- Planned Parenthood
  Attendees: Angie Axdahl, Kasey St. John (INCOG) and James Wagner (INCOG)

## *General Public Workshops*

Several public workshops were held in locations along the PRC to allow the public opportunity to get informed about the PRC initiative and help guide the progress of the study. Each meeting was advertised on the project website, social media site and public meeting notices. Presentations, handouts, exhibits and meeting agendas were available during each meeting. Opportunities for public involvement and comment are found on the list below with following meeting summaries:

- Public Outreach–Round One
  - July 16, 2012 – Inaugural Public Meeting #1, Tulsa Tech Peoria Campus
  - July 17, 2012 – Inaugural Public Meeting #2, South Brooke Church of Christ
- Public Outreach – Round Two
  - January 8, 2013 – Public Meeting #3, South Brooke Church of Christ

### Public Outreach – Round One

Outreach began for the first round of public meetings with a mailing of postcards to over 1,200 businesses and neighborhood associations located within a half-mile of the Peoria corridor from 66th Street North to 121st and Memorial. INCOG's staff also distributed fliers to businesses and posted on bulletin boards or store windows along the corridor the week prior to the public meetings in July. Two public meetings were held within the PRC, the first at Tulsa Tech Peoria Campus on July 16, 2012 and the final at South Brooke Church of Christ on July 17, 2012.

Figure 20: Public Outreach Flyer


Attendees were invited to visit display boards as they entered the meeting room. INCOG and PRC AA consultants began a presentation lasting approximately 30-minutes. After the presentation, attendees were asked to visit the displays and participate in three exercises: Station 1, Pin Exercise; Station 2, Post-it Exercise; and Station 3, Menu Exercise.

- Station 1 allowed attendees to put three different colored map pins on a map for places that they live, work and play/attend school/church.
- Station 2 allowed attendees to view scenarios of the corridor limits and make comments on post-its.
- Station 3 allowed attendees to choose from a menu of options to "build" a better route through selection of options like: extended weekend service, shorter bus frequencies and pedestrian amenities. The exercise gave attendees a glimpse into the eyes of planners who must plan a system with financial constraints and many, diverse service options.

Comments were received and mostly pertained to concern of citizens living in the far north and north Tulsa areas. Citizens feel that this plan should not "leave these citizens out". Many were excited about improvements, especially increased frequencies. A representative from Tulsa Transit was also present to answer any questions directly about Tulsa Transit service.

Figure 21: Public Outreach Promotional Material


Figure 22: Public Outreach Promotional Material, Round Two


## Public Outreach – Round Two

After the initial round of public meetings, outreach techniques (specifically for the North Tulsa community) were revisited. Attendees at the initial meetings suggested that outreach be done to community churches. INCOG staff collected church minister contact information from citizens and setup a meeting on September 5th at Educare with those ministers.

On January 6th, 2013, INCOG staff members were able to visit Metropolitan Baptist Church, one of North Tulsa's largest churches, to promote the project and upcoming public meeting. Outreach to the Tulsa's Young Professionals Urbanists Crew was done at the crew's monthly meeting on January 7th, 2013. Fliers for the meeting were posted in businesses along Cherry St. and Brookside as well as, in each Tulsa Transit Bus.

January 8, 2013 – Public Meeting #3, South Brooke Church of Christ

Presentation began at 6:15. INCOG and PRC AA consultants spent approximately 30-minutes presenting information. INCOG opened up the floor to questions/comments. A total of 45 attendees (not including staff) were present. After the questions/comments section, attendees were invited to post comments to the comment board and discuss transit advocacy with Transit Matters at their table. A list of meeting comments was collected and further comments posted to the online comment board were collected.

## Final Recommended Alternative

The BRT 15/20 Alternative was presented to the following bodies and approved or endorsed by each. All meetings where action was taken to approve the recommended alternative were open to the public and posted according to the Oklahoma Open Meeting Act.

- Metropolitan Tulsa Transit Authority; February 26, 2013
- INCOG Transportation Policy Committee; February 27, 2013
- INCOG Board of Directors; March 12, 2013

# 7 | Preliminary Screening and Refinement of Alternatives

Transit opportunities within the PRC may be improved through various means and combinations of improvements to the existing transit service level, infrastructure, and/or technologies used. The goal of the evaluation process was to select a Recommended Alternative for improving transit services and accessibility within the Peoria/Riverside Corridor. The evaluation of alternatives was developed to remain consistent with FTA guidance, community involvement and the PRC goals and needs leading to a Recommended Alternative decision. The PRC AA process was also highly engaging of the public and regional stakeholders within the study area and Tulsa Metropolitan Area.

As discussed in Chapter 4, the AA evaluation process was conducted on a three-tier basis; first establishing fundamental scope items that would be commonly deployed amongst all alternatives. The scope items of the Preliminary Screening process included:

- Public Engagement
- Scenario (corridor termini) and Alignment Screening
- Transit Mode Screening
- Technology and Infrastructure components
- Operating Conditions

The preliminary screening methodology and analysis were used to formulate alternative PRC transit solutions for evaluation. A robust list of potential alternatives was considered for each scope element and condensed into those alternatives most feasible and appropriate for implementation within the PRC via pubic engagement and the initial corridor needs assessment.

Each successive stage of the evaluation process contained modifications to alternatives and evaluation approaches to reflect previous input received and refinements to alternatives. Results of the Preliminary Screening of Alternatives were used to develop refined alternatives for detailed evaluation and recommendation. After presentation of detailed evaluations and recommendations to the public stakeholders, additional feedback was incorporated into the final, Recommended Alternative. An illustration of the AA framework and decision making process is show in **Figure 23.**

Summaries of those elements and findings are found below and within the subsequent chapters. Detailed discussion of Potential Impact Assessment, Financial Feasibility and Alternative Evaluation were conducted following refinement of proposed PRC transit solutions may be found in subsequent chapters.

## Overview

- Public outreach efforts identified both opportunities and constraints facing the PRC
- All potential modes were evaluated for each of the PRC's five major segments

Transit modes demonstrating incompatible costs and benefits with the project's stated objectives, the region's constraints, or nationally-recognized service standards were eliminated from serious consideration.

## Preliminary Screening of Alternatives

INCOG and Tulsa Transit developed and defined local screening tools to be utilized, in a qualitative capacity, to assess the potential of Build Alternative elements to meet the AA study goals. The goal of the Preliminary screening process was to develop a constrained set of Build Alternatives to evaluate potential impacts and benefits against the baseline, future conditions of the PRC. In order to establish consensus of alternatives for further refinement,

a comprehensive view of AA needs, goals and constraints was taken. Each screening tool was applied to the transit alternative components identified above in order to establish an overview of the dynamics influencing development of a Build Alternative that can meet all of the documented goals of the PRC AA.

- ***Public Engagement:*** Are transportation needs and concerns voiced by stakeholders and citizens met by recommended improvements?
- ***Compatibility with Existing Transit System:*** Does the alternative element support integration with existing activity centers, transportation modes and facilities present within the study area?
- ***Constructability:*** What are the potential construction impacts of the proposed alternative elements and are improvements of an appropriate magnitude to meet future needs?
- ***Funding Opportunities:*** What potential (local, state, federal) funding opportunities exist and can the proposed alternative element meet required funding qualification criteria?

Specific metrics related to each of the above screening tools are discussed in the PRC *Preliminary Screening of Alternatives* memorandum (February 2012). A summary of determining factors used in the qualitative screening of preliminary alternatives and development of refined alternatives for detailed evaluation is illustrated in **Table 7**. The Preliminary Screening process was utilized as a tool to understand the community goals and needs of the project. The locally preferred scenario geography was determined based on input received from citizens and stakeholders as well as physical, capital and operational funding constraints reflective of the local market and Tulsa Transit budget.

Figure 23: Alternative Analysis and Selection Methodology

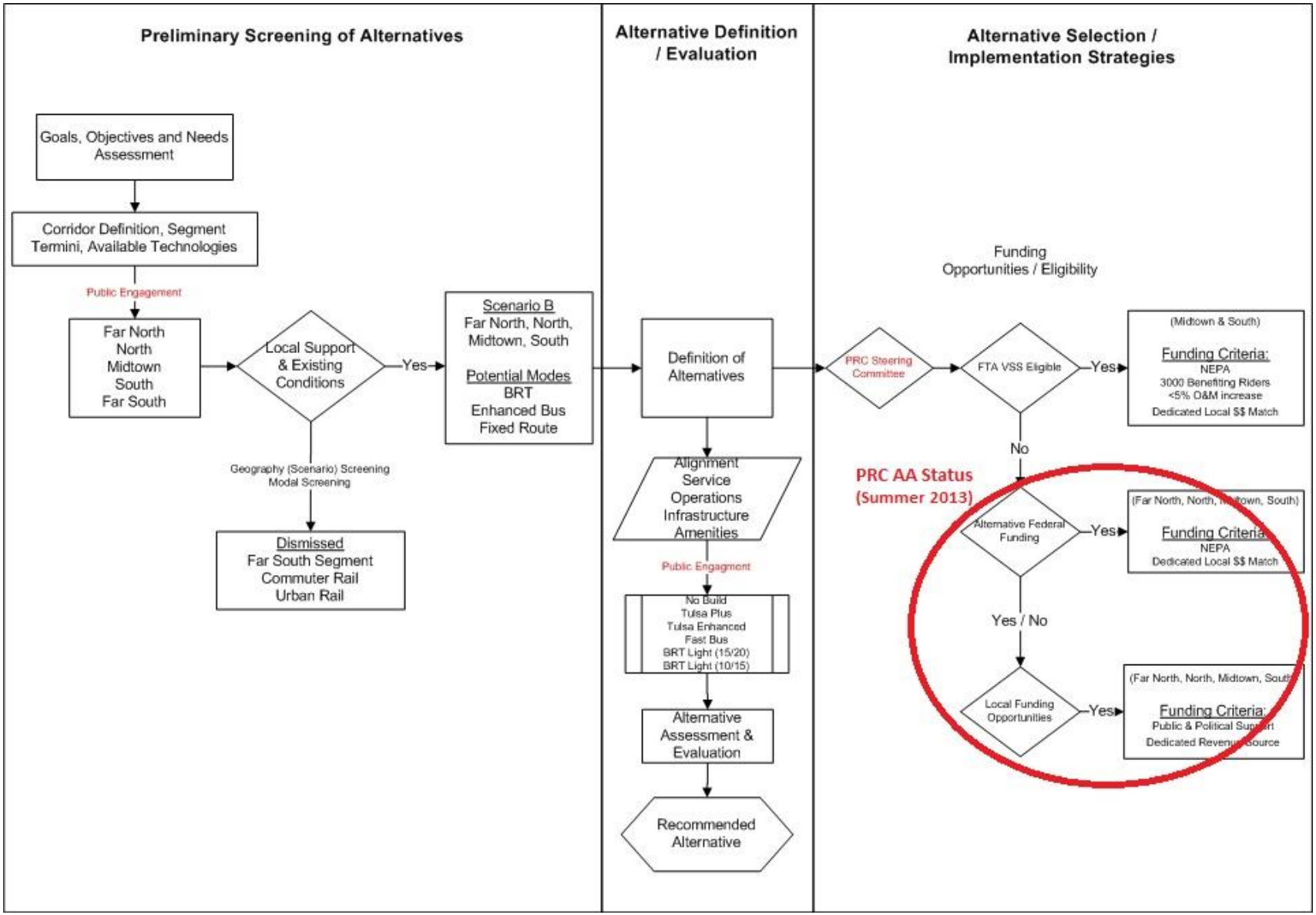


Table 7: PRC Alterative Screening Matrix

| Alternative Elements | Application of Screening Tools | | | |
|---|---|---|---|---|
| | Public Engagement | System Compatibility | Constructability | Funding Opportunities (FTA VSS) |
| Geography (Segments/Limits) | • North Tulsa must be served<br>• What are the mobility needs (trip patterns) of the PRC?<br>• Perceived adequacy of service by corridor segment | • Where are trip ends (generators)?<br>• What are the origins and destinations of existing transit riders in the corridor? | • Environmental, historic resources to avoid / mitigate impacts | • Requires 3,000 existing riders within proposed corridor that will benefit from improvements |
| Alignment & Stations | • Major activity centers or destinations to serve<br>• Need to serve transit dependent residents<br>• Comfortable / safe stations needed | • Existing pedestrian activity / accessibility<br>• Existing transfer points with local routes<br>• TOD and future growth areas | • Available ROW to construct stations<br>• Minimize impacts to private property<br>• Access management & safety | • Requires 3,000 existing riders along (or parallel to) proposed alignment that will benefit from improvements<br>• "Substantial" transit stations |
| Technology & Infrastructure | • Deploy improvements with greatest utility to riders | • Benefits both local service and BRT<br>• Can overall transit system efficiency be increased? | • Existing access to power at stations<br>• Communications with Ops Center | • Branded stations and vehicles<br>• Real-time vehicle arrival<br>• Traffic signal priority |
| Operating Conditions | • Focus should be put on service frequency (Citizens)<br>• Extended service hours<br>• Current round trip times are unacceptable | • Can redundant service be optimized?<br>• Can the PRC help optimize other routes?<br>• Limited stop vs. flag stop | • Infrastructure compatibility with existing fleet | • 14hrs M – F<br>• 10 min peak / 15 min off peak frequency |
| Funding Strategy | • Cost-effectiveness of service area vs. frequency (Elected Officials) | • Allocating resources for sustained operations | • Appropriate scale and magnitude vehicles, stations & amenities | • Max capital cost of $50M<br>• 20% minimum local match of capital cost<br>• Max O&M cost ≤ 5% of existing budget |

## *Geography (Scenario) Screening*

In order to determine the appropriate scope of transit improvements to propose within the study area, several scenarios were developed to determine the basic geographic extents of the corridor. The Scenario Screening process was utilized as a tool to understand the community goals and needs of the project. The locally preferred scenario geography was determined based on input received from citizens and stakeholders as well as physical, capital and operational funding constraints reflective of the local market and Tulsa Transit budget.

### Termini Alternatives Considered

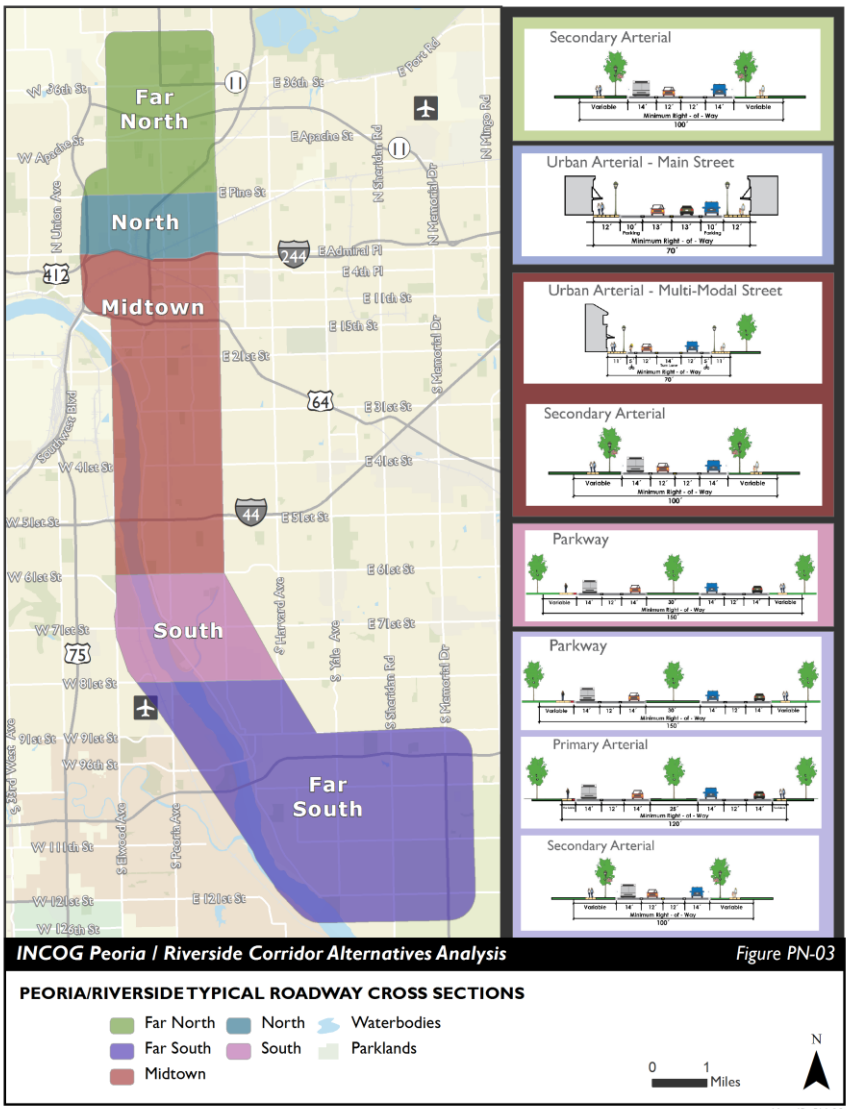
For simplification of evaluating alternatives, the PRC has been divided into segments for combination into a preferred corridor of the appropriate length and terminal anchors to make for an effective initial implementation phase. As identified in **Figure 24,** study corridor segments are as follows:

- Far North (FN)
- North (N)
- Midtown (MT)
- South (S)
- Far South (FS)

Five operating scenarios, assembled from the corridor segments identified above, have been developed for preliminary consideration:

6) Scenario A – FN, N, MT, S and FS segments (all segments)
7) Scenario B – FN, N, MT and S segments
8) Scenario C –N, MT, S and FS segments
9) Scenario D –the N, MT and S segments
10) Scenario E –the MT and S segments

Figure 24: PRC Corridor Segments




### Methodology

Screening of each scenario was heavily dependent on community input. Each scenario was analyzed based on length, population per square mile, employment per square mile, existing transit riders, one-way trip time, capital cost range, operating cost range and percent of Tulsa Transit's existing operating budget. The indicators were presented to the public and the PRC Steering Committee for comment. The intent of the stakeholder and public involvement was to gauge the community goals in terms of geographic extent of the proposed alternatives. Each indicator was presented to demonstrate the benefits and costs of each scenario.

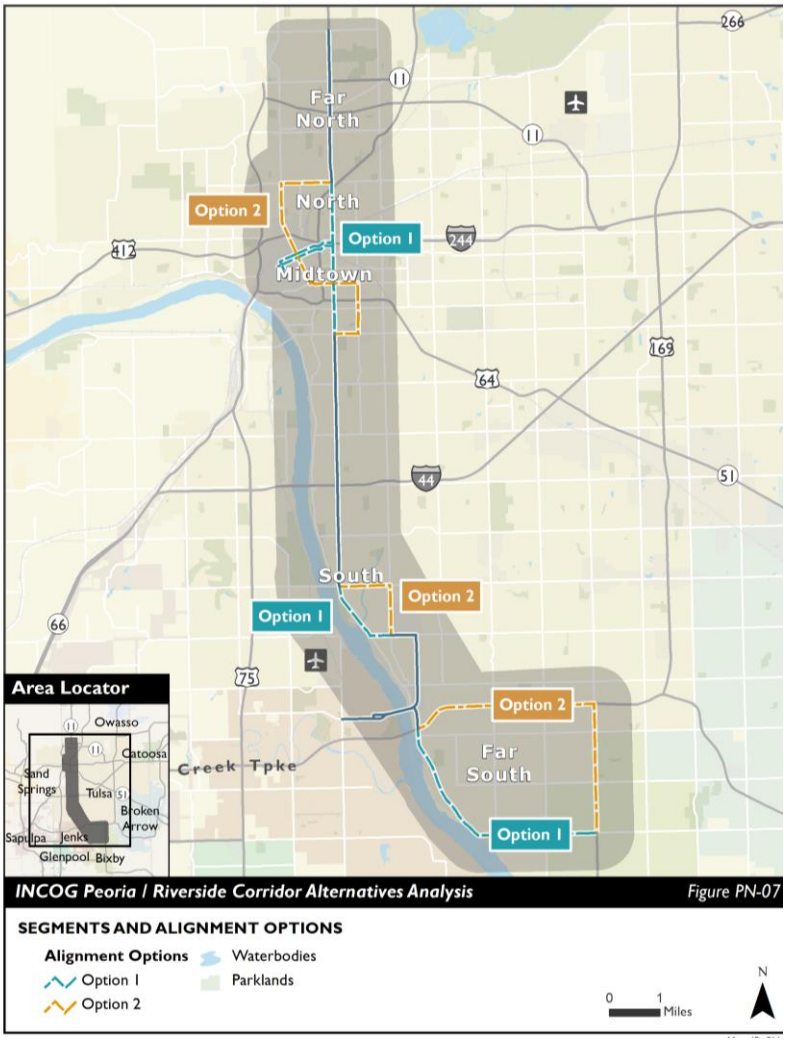
## Results

The preferred scenario was based on technical findings and corresponding public feedback was Scenario B, 66th Street North to 81st South and Lewis Avenue. Consistent responses from the public and the PRC Steering Committee strongly advocating inclusion of the communities in Northern segments resulted in a preferred scenario which excluded only the Far South segment, connecting to Jenks. The Far North segment generally contains a limited number of major PRC activity centers, with high concentrations of existing transit users and transit dependent residents. To effectively service this community, several of the refined Build Alternatives included modified community collector and circulator services operating from 38th Street North to 66th Street North.

### *Alignments & Station Development*

PRC transit users are largely accustomed to an existing Tulsa Transit system that includes many routing deviations from the mainline of major arterial corridors in order to directly serve large residential pockets of transit users or activity centers. The practice largely contributes to Tulsa Transit's ability to maintaining the system ridership, but has a cumulative impact on the 1-way travel times of fixed routes and degrades the in-vehicle travel time experience of some riders.

Figure 25: PRC Alignment Options




Service to existing destinations and trip generators is also a key factor in project justification during potential application for supplemental funding. The Midtown and South segments of the PRC are home to the largest concentration of employment and activity centers in the corridor and considerations were requested for destinations both along Peoria Avenue and Utica Avenue.

Through engagement with PRC residents and stakeholders, particular concern was expressed regarding service impacts to North Tulsa residents. The North Tulsa community has historically been an economically and mobility challenged area and the resultant, transit dependent population depends on access to the fixed route service. Similar communities are present in the South and Far South segments of the PRC.

The FTA MAP-21 provision requiring "Substantial Transit Stations" in projects applying for funding assistance made the identification of ideal areas for investment in stations a core component in the development of detailed alternatives. The current lack of adequate shelters and accommodations to protect transit users at on-line stops was also acknowledged during public engagement activities. In studies such as the Transit Cooperative Research

Program (TCRP) Report 46, station amenities such as weather protection, sidewalk accessibility, available seating and overall aesthetics are proven to directly impact the passenger experience and the ridership decisions of patrons. Intelligent deployment of passenger amenities at stations can have a significant return on a relatively low-cost investment by helping "…to instill rider confidence in a transit agency, as well as raise passenger optimism regarding the quality of future transit improvements and service".

### Results

The approach to PRC alignment development focused on this necessary balance between directly serving PRC residents versus commercial and activity centers, while providing the greatest utility and optimizing routing efficiency to minimize point-to-point travel times. Three (3) PRC segments contained potential alignment options for further evaluation to better service transit users:

- North Alignment Option: Peoria Ave vs. Cincinnati Ave (from Pine Street to E 6th Street)
  - Peoria Ave is commercial and industrial use within this segment
  - Cincinnati Ave is residential corridor with an historically transit dependent population
- Midtown Alignment Option: Peoria Ave vs. Utica Ave (from E 6th Street to E 21st Street)
  - Peoria Ave is predominantly commercial and industrial use within this segment. Serves Pearl District
  - Utica Ave is predominantly the largest medical center in the area and contains several commercial retail centers.
- South Alignment Option: Riverside Drive to 81st Street South vs. Riverside Drive to 71st Street South (71st Street to 81st Street and Lewis Avenue, via Lewis Avenue)
  - Several residential developments currently served by the existing route 105 are present along the 71st Street alignment option

A fourth alignment option was proposed in the Far South segment leading into the preliminary screening, but the Scenario recommendation to terminate the initial deployment of improved PRC service at 81st Street South eliminated the need to further analyze the Far South alignment option.

- Far South Alignment Option: Delaware Ave/121st St vs. Creek Turnpike/Memorial Drive (from 81st Street S to 121st Street and Memorial Drive)
  - Predominantly residential interests are present along the Delaware Avenue alignment; while the Creek Turnpike option improves travel time and services more commercial centers along Memorial Drive.

The stated study goal of low-cost, high-impact solutions led to the recommendation of a modular station concept with shelters of varying dimensions to deploy, as needed, at the PRC station areas. Locations to receive investment in stations and amenities will be selected based on existing boarding/alighting volumes of the existing route 105, as well as intermodal opportunities connecting with other fixed routes of the Tulsa Transit system.

## *Modal Screening*

The RTSP process identified the PRC as an "Urban Corridor," which recommended a range of mode options for further research, including: fixed route bus service, Bus Rapid Transit, Light (Urban) Rail, and Commuter Rail. A simple screening was applied to all alternatives in order to concentrate analysis on feasible transit mode alternatives.

### Alternatives Considered

Preliminary transit modes identified for service along priority corridors of the RTSP included:

- Enhanced Bus
- Bus Rapid Transit

- Light (Urban) Rail
- Commuter Rail

Commuter Rail operations generally serve long distance (end to end) travel patterns and have few stops (typically located at community anchors several miles apart) in between termini. As the PRC is a highly populated corridor and currently contains the highest transit ridership within the Tulsa Transit system, commuter rail does not function with the stop frequency desired to effectively offer the accessibility to transit users. The PRC is an arterial roadway and does not currently have a parallel fixed rail guideway available for use. National averages for construction of commuter rail systems along existing freight railroad right-of-way (ROW) range between approximately $5M and $8M per mile.

Light rail transit (LRT) alternatives considered for implementation on the PRC included Modern Streetcar and Light Rail technologies. LRT alternatives' construction cost per mile may range from approximately $20M to over $50M. Employment and population densities required to support a LRT or urban rail corridor within a ½ mile area of influence surrounding the PRC alignment and stations are far lower than the average for successfully operating systems.

According to the Transit Cooperative Research Program (TCRP), bus rapid transit (BRT) is "an integrated system of facilities, services, and amenities that collectively improve the speed, reliability, and identity of bus transit." It operates with regular high frequency, utilizes time saving elements for boarding and alighting at stations and can be implemented on the existing roadway infrastructure with relatively low construction impacts. Without the need for construction of a fixed guideway infrastructure, BRT can be implemented incrementally and relatively quickly. Its operating flexibility and ability to integrate with existing fixed route bus transit also allows agencies to serve a variety of urban and suburban markets. Typical costs of implementation for BRT service will vary depending on the application of dedicated guideway and station area improvements within this mode, but range from approximately $1M to $5M per mile.

Enhanced bus service, is a bus service intended to run faster than local bus services with passenger amenities to signify a "premium service." Enhanced buses may operate with limited ('skip) stops to provide quicker travel along a corridor. Additional passenger amenities are featured on enhanced service buses, such as reclining seats and Wi-Fi, to make longer trips more comfortable. The amenities deployed may vary dependent upon individual need, but primary benefits are received from the increased efficiency of operations and faster point-to-point travel times over traditional local bus service. With Capital costs of implementation for typical Enhanced service improvements are less than $1M per mile, exclusive of vehicle purchase.

### Methodology

Financial Feasibility was established as the primary criteria for evaluation of potential transit modes. To determine feasibility thresholds, analysis focused on existing Tulsa Transit operating budget and the proposed capital cost threshold limit of approximately $50 million. Sensitive to the local transit funding climate, the PRC Transit Study is focused on delivering a low-cost, high impact transit solution. As such, the capital cost limit of the proposed project was set at $50 M in the Year of Expenditure (YOE).

### Results

Due to the ineffective stop frequency and significant investment required to construct the necessary trackwork, Commuter Rail Transit was dismissed from further consideration. LRT and urban rail transit modes were dismissed from further consideration because of the PRC's lack of transit supportive land uses and densities

beyond the central business district (CBD), as well as the significant capital investment required for construction of embedded rail infrastructure. Overall, due to the potential length of the corridor and average cost of implementation for fixed rail guideway transit, this transit study featured only bus alternatives operating with a variety of technology and service schemes or accompanied by a range of supporting infrastructure improvements.

The remaining transit mode alternatives included: Bus Rapid Transit (BRT), Enhanced Bus, Fixed-Route (Local) Bus Service, and No-Build. Each remaining transit mode was incorporated into development of the Refined Alternatives for evaluation.

### *Service, Infrastructure & Technology (S/I/T) Scenarios*

Tabletop exercises were presented to corridor meeting attendees to inform stakeholders of potential improvements to service operating parameters, transit supportive infrastructure and technologies available for deployment within the PRC.

*Service* improvements considered for implementation within this AA include modifications to transit service frequency, stop intervals and operating schedule. FTA MAP-21 NS/SS guidance for corridor-based BRT projects requires "short headway bidirectional services for a substantial part of weekdays and weekend days"

*Infrastructure* improvements considered include: modification to existing roadway facilities, construction of enhanced transit stops and/or terminal stations, intermodal accessibility and pedestrian safety improvements at PRC station areas. FTA MAP-21 NS/SS guidance for corridor-based BRT projects does not require a separated right –of-way dedicated for public transportation use during peak periods, provided that the project represents a substantial investment in service which emulates rail fixed guideway transit.

*Technology* improvements considered for implementation include: traffic signal prioritization, automated ticketing / fare collection; as well as passenger information systems, safety and amenities at stations or on vehicles. FTA MAP-21 NS/SS guidance for corridor-based BRT projects specifically requires installation of traffic signal prioritization, but encourages deployment of additional features that support long-term corridor investment.

### Results

The INCOG and Tulsa Transit vision of supporting a more livable and sustainable community by investing in transit service operations and pedestrian accessibility is consistent with development of an array of service, infrastructure and technology improvement scenarios for further evaluation. The approach taken in the development of modular station shelters will similarly be applied to the development of SIT improvement scenarios for the refined transit alternatives. Input received from the public and stakeholder meetings will be prioritized to incorporate the most commonly requested, baseline improvements in all proposed alternatives. Higher investment Alternatives' deployment scenarios will increase the range of SIT features installed as well as expand the scope and magnitude of their implementation within the PRC. Aside from capital improvements, proposed Alternatives may also include variable service characteristics deployed within different segments of the PRC according to need. Variable service parameters included: stop frequency, hours of operation and vehicle type.

## Refined Alternatives

Based on the screening of scenarios and transit modes, several suitable refined alternatives were developed for the detailed evaluation. All alternatives, including No Build and Build Alternatives, were developed to include differing elements addressing alignments, station locations, operating plans, capital and operating cost estimates. The stated study goal of low-cost, high-impact solutions will be incorporated into detailed evaluation criteria in

order to assess the most appropriate deployment of resources at identified PRC station areas. A detailed evaluation of the costs, benefits and impacts of alternative implementation is discussed in Chapter 8.

## *Alternatives Considered*

Six alternatives were evaluated for the final Recommended Alternative selection. The alternatives are proposed to operate in mixed traffic and will include all the elements of the Tulsa Transit system planned as part of the No-Build/Baseline alternative plus deployment of additional service, infrastructure and technology improvements. The evaluation of alternatives analyzed the operating strategy, technology components, station location strategies, alignment options, capital and operating cost estimates for each. Below is the list of the various alternatives evaluated for selection:

- No Build
- Tulsa Plus
- Tulsa Enhanced
- Fast Bus
- Bus Rapid Transit (BRT) 15/20
- Bus Rapid Transit (BRT) 10/15

These Build Alternatives described below, would enhance and complement existing fixed route bus service within the corridor, without diminishing existing service.

### No-Build/Baseline Alternative

The No-Build/Baseline Alternative consists of existing fixed route bus transit service and committed transportation improvements within the PRC, as identified by the city of Tulsa (Tulsa Transit) and included in the fiscally constrained Transportation Improvement Program (TIP) of INCOG. The No-Build/Baseline Alternative establishes a foundation, or reference, condition from which the Build Alternatives are developed and evaluated.

For comparison against proposed alternatives, the existing Tulsa Transit route 105 is identified as the baseline transit operating condition for the PRC. It services North and South Tulsa, operating from approximately 66th Street North to 81st Street South and Lewis Avenue. Existing facilities along route 105 and its current service operating parameters are described below:

- Currently operates roughly 15 hours daily, from approximately 5:30 am to 8:30pm (M-F) and from 6:30 am to 6:30 pm on Saturday
- Current headway is 30-minutes all day, (Average Tulsa Transit system-wide headways are approximately 45 to 50-minutes)
- Fixed route local service with flag-stop operations, allowing passengers to board and alight at any safe stopping location along the corridor by alerting the vehicle operator.
- Transit shelters and amenities are available only at a few locations within the corridor.

### Improved Local Service ("Tulsa Plus") Build Alternative

This alternative will maintain the existing flag-stop operations of the fixed route 105 service along the same limits of the PRC, but offer service modifications in response to public demand for increased frequency and hours of operation, including:

- 17 hours service operating span (approximately 6am to 11pm) Monday thru Saturday
- Continuous 30-minute headways all day

- Traffic signal prioritization at all PRC signalized intersections
- Significant transit shelters and amenities at end of line and major destinations / activity centers only; minimal transit amenities installed at major arterials intersections or multimodal transfer points
- limited sidewalk repair/installation at proposed station areas

### Enhanced Local Service ("Tulsa Enhanced") Build Alternative

This alternative will replace the existing fixed route 105 service along the PRC and modify the current flag-stop service operating procedure to a traditional, fixed-route local service. Vehicles will stop only at Tulsa Transit designated locations at approximately 2 – 5 block intervals. Alternative features include:

- 17 hours service operating span (approximately 6am to 11pm) Monday thru Saturday
- Continuous 20-minute headways all day from 38th Street North to 81st Street South and Lewis Avenue
- Traditional fixed route stop pattern (average every 2 to 5 blocks) from 38th Street North to 81st Street South and Lewis Avenue.
    - A local circulator bus will be added to the end of the alignment to maintain 15-minute continuous service in between 38th and 66th Streets North.
- Traffic signal prioritization at all PRC signalized intersections
- Branding of vehicles and transit amenities
- Significant transit shelters and amenities at end of line and major destinations / activity centers only; minimal transit amenities installed at major arterial intersections or multimodal transfer points
- Real time arrival information and passenger information media at shelters
- Pedestrian crossing protection and ADA curb ramp repair/installation at stations adjacent to major arterial intersections or multimodal transfer points
- limited sidewalk repair/installation at proposed station areas

### Limited Stop Service ("Fast Bus") Build Alternative

This alternative is proposed to operate in mixed traffic, overlaid on top of the existing route 105 service within the PRC to a 'limited stop' service while maintaining a 30-minute continuous headway. Alternative features include:

- 17 hours service operating span (approximately 6am to 11pm) Monday thru Saturday
- Continuous 30-minute headways all day from 66th Street N to 81st Street S
- Limited stop frequency ranging from about every ½ mile to 1½ miles
- Traffic signal prioritization at all PRC signalized intersections
- Branding of vehicles and transit amenities
- Significant transit shelters and amenities at end of line and major destinations / activity centers, major arterials intersections and multimodal transfer points. Minimal transit shelters and amenities will be installed at other selected stations.
- Real time arrival information and passenger information media at shelters
- Pedestrian crossing protection and ADA curb ramp repair/installation at stations adjacent to major arterial intersections or multimodal transfer points
- limited sidewalk repair/installation at proposed station areas
- Automated ticket vending and pedestrian lighting fixtures along sidewalk approaches to stations adjacent to major arterial intersections or multimodal transfer points

### Corridor-Based BRT ("BRT 10/15" & "BRT 15/20") Build Alternatives

At least one (1) Build Alternative having capital components and an operating profile capable of meeting FTA MAP-21 requirements for Small Starts funding eligibility was to be included in the detailed evaluation of PRC alternatives. Through coordination with Tulsa Transit and INCOG, two bus rapid transit solutions were developed for detailed evaluation. These alternatives are proposed to operate in mixed traffic, replacing the existing route 105 service within the PRC. Two BRT scenarios were devised in order to compare cost efficiency of operating at a 10-minute/15-minute or at a 15-minute/20-minute peak versus off peak service frequency; as well as to provide a rapid bus alternative not bound by the FTA requirement of operating Sunday service. Infrastructure and technology improvements are the same between alternatives. BRT Alternative features include:

- 15 hours service operating span (approximately 6am to 9pm) Monday thru Sunday (BRT 10/15) OR Monday thru Saturday (BRT 15/20)
- 10-minutes peak / 15-minutes off-peak daily service frequency OR 15-minutes peak / 20-minutes off-peak daily service frequency
- Limited stop frequency ranging from approximately every ½ mile to 1½ miles from 38th Street North to 81st Street South and Lewis Avenue.
    - A local circulator bus will be added to the end of the rapid bus alignment to maintain service in between 38th Street North and 66th Street North.
- Traffic signal prioritization at all PRC signalized intersections
- Branding of vehicles and transit amenities
- Significant transit shelters and amenities at end of line and major destinations / activity centers, major arterials intersections and multimodal transfer points. Minimal transit shelters and amenities will be installed at other selected stations.
- Real time arrival information and passenger information media at shelters
- Pedestrian crossing protection and ADA curb ramp repair/installation at stations adjacent to major arterial intersections or multimodal transfer points
- limited sidewalk repair/installation at proposed station areas
- Automated ticket vending and pedestrian lighting fixtures along sidewalk approaches to stations adjacent to major arterial intersections or multimodal transfer points
- Dedicated transit lanes deployed in select locations (only as appropriate)

Table 8 illustrates the operational and capital components included in each proposed transit alternative.

Table 8: PRC Transit Alternative Operating Parameters and Capital Components

| | No Build (Route 105) | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 15/20 | BRT 10/15 |
|---|---|---|---|---|---|---|
| OPERATIONAL ELEMENTS | | | | | | |

| | No Build (Route 105) | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 15/20 | BRT 10/15 |
|---|---|---|---|---|---|---|
| TRIP TIME | 75-minutes | 70-minutes | 60-minutes | 50-minutes | 50-minutes | 50-minutes |
| STOP SPACING | Local & Flag Stop (196 stops in 98 locations) | Local & Flag Stop (196 stops in 98 locations) | 2-3 Blocks (120 stops at 60 locations) | ½ mile interval (36 stations at 19 locations) | ½ mile interval (36 stations at 19 locations) | ½ mile interval (36 stations at 19 locations) |
| HEADWAYS | 30-minute frequency | 30-minute frequency | 20-minute frequency | 30-minute frequency | 15- to 20-minute frequency | 10- to 15-minute frequency |
| HOURS OF OPERATION | 5:30am-8:30pm | 5:30am-10:30pm | 5:30am-10:30pm | 5:30am-10:30pm | 5:30am-8:30pm | 5:30am-8:30pm |
| DAYS OF OPERATION | Mon.-Sat. | Mon.-Sat. | Mon.-Sat. | Mon.-Sat. | Mon.-Sat. | Mon.-Sun. |
| RAPID LOCAL SERVICE | No Circulator | No Circulator | Circulator from 66th Street N. to 38th Street N. | No Circulator | Circulator from 66th Street N. to 38th Street N. | Circulator from 66th Street N. to 38th Street N. |
| EXISTING SERVICE | No Change to Existing Route 105 | Modifies Existing Route 105 | Replaces Route 105 | Local Route 105 remains unchanged | Replaces Route 105 | Replaces Route 105 |
| CAPITAL ELEMENTS | | | | | | |
| DEDICATED LANES | NO | NO | NO | NO | NO | YES |
| TRAFFIC PRIORITY AT SIGNALS | NO | YES | YES | YES | YES | YES |
| TICKET VENDING MACHINES | NO | NO | NO | YES | YES | YES |
| NEXT BUS ARRIVAL INFORMATION | NO | NO | YES | YES | YES | YES |
| PEDESTRIAN CROSSINGS | NO | NO | YES | YES | YES | YES |
| SIDEWALKS | NO | NO | YES | YES | YES | YES |
| ILLUMINATION | NO | NO | NO | YES | YES | YES |

# 8 | Potential Impacts to Existing Conditions

The purpose of the Alternatives Analysis (AA) study is to evaluate and determine the most appropriate level of capital investment, including a transit mode and alignment, which significantly improves transit services and access within the Peoria/Riverside Corridor (PRC). The objective evaluation of a these alternatives includes an analysis of the potential impacts of proposed solutions on the PRC existing conditions.

Typical improvements associated with proposed Alternatives may modify the existing infrastructure, surrounding environment or transportation operations within the PRC. This section comparatively highlights the potential impacts of construction and continued operation on these conditions within the corridor.

## Overview

- The BRT alternative incorporates upgraded passenger and pedestrian amenities that will positively impact adjacent neighborhoods including new sidewalks, streetlights and landscaping
- Construction of passenger shelters and bus stop waiting areas will incorporate design features intended to promote safety and improve traffic flow throughout the PRC
- Relocation of utilities during construction could cause temporary disruptions to communities and traffic circulation
- Any significant findings from subsequent environmental studies will need to be vetted through additional public outreach efforts
- If the BRT can largely operate in existing transportation rights-of-way as expected, it should qualify for a Categorical Exclusion under the National Environmental Policy Act (NEPA) process thereby allowing for a much shorter implementation schedule

## Infrastructure Impacts

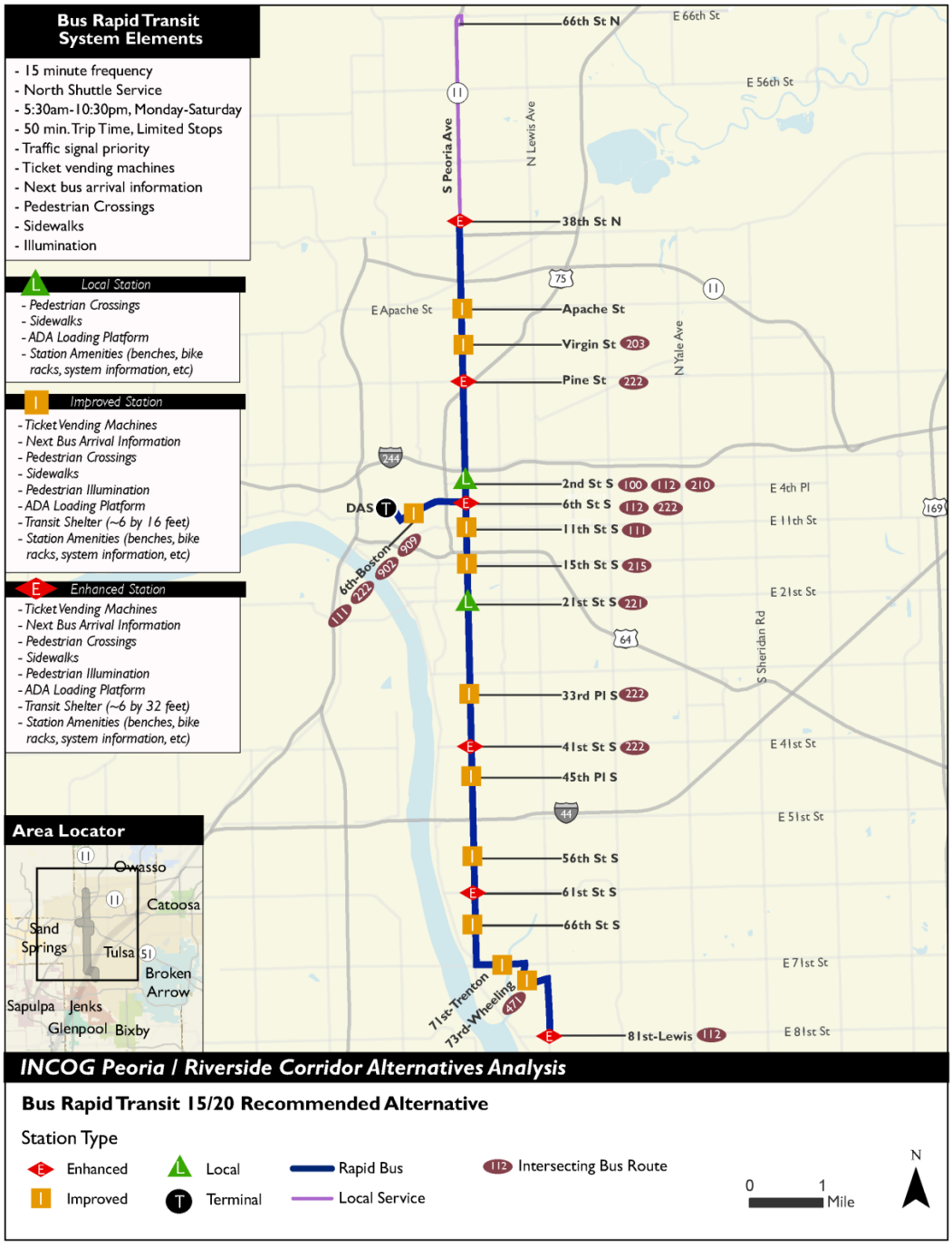
### *Passenger Stations and Amenities*

PRC transit stations and supporting passenger amenities may be constructed and installed to varying magnitudes, appropriately sized for the as-built environment and projected boardings and alightings at each station. Stations with sheltered waiting areas provide a pedestrian refuge for protection for inclement weather and a well-lit, safe waiting area. Three levels of station shelter and amenity installation have been identified for deployment within the PRC transit alternatives: Local, Improved, and Enhanced. The proposed magnitude and location of PRC transit stations is shown in Figure 26:

- Construction at ***Local*** stops will include:
  - 6" height concrete platform of approximately 12' in length (or 96 sf)
  - Benches and / or leaning rails, bicycle racks, trash cans
  - Branded, BRT signage and passenger information
- Construction at ***Improved*** stops will include:
  - 6" height concrete platform of approximately 20' in length (or 160 sf)
  - Station canopy (16' x 6') and structural framing support
  - LED lighting beneath station canopy
  - Benches and / or leaning rails, bicycle racks, trash cans
  - Branded, BRT signage and passenger information
  - Conduit or wiring needed to connect and distribute power to elements
  - Public art incorporated into amenities

- Construction at ***Enhanced*** stops will include:
  - 6" height concrete platform of approximately 35' in length (or 280 sf)
  - Station canopy (30' x 6') and structural framing support
  - LED lighting beneath station canopy
  - Benches and / or leaning rails, bicycle racks, trash cans
  - Branded, BRT signage and passenger information
  - Conduit or wiring needed to connect and distribute power to elements
  - Public art incorporated into amenities

Figure 26: Proposed PRC Station Locations and Types



Typical impacts of activities associated with construction of new or improved transit stations may include:

- ***Right of way (ROW) acquisition*** may be necessary at station areas where the footprint of the proposed station platform or pedestrian enhancements requires a greater width than the existing public ROW along the corridor allows. ROW conflicts will be resolved through negotiated use agreements or purchase of parcel slivers necessary to install the improvements.
- ***Access management*** impacts may be caused by the proximity of the station shelters and canopies to nearby driveways on adjacent properties. Structural elements may obstruct driver's line of sight at points of egress, causing safety hazards.
  - Resolution may require selection of alternative platform locations or coordination with stakeholders to potentially compensate them for the loss of access or modification to driveways or other facilities providing access to the parcel.
- Existing ***parking lots or on-street parking spaces*** may abut proposed station platform locations. Station platforms abutting existing parking lots will be separated by bollards for protection of waiting passengers from circulating vehicles.
  - Depending on the existing configuration of the parking lot and the amount of right-of-way needed to construct the platforms or curb extensions, up to approximately 10 existing spaces may be removed.

Existing Tulsa Transit stops that are not coincident with the proposed PRC rapid transit stations will not be improved as part of the *Fast Bus*, *BRT 15/20* or *BRT 10/15* Alternatives since these alternatives operate on a skip-stop or limited stop frequency. The Tulsa Enhanced and Tulsa Plus Alternatives, however, proposed to continue local flag-stop service within Segments of the PRC and may include "Local" station enhancements to additional fixed route stops within the PRC.

### Evaluation Measures: Passenger Stations and Amenities

| | |
|---|---|
| Benefit (5, 4): | No ROW impacts/acquisition; No access management and parking impacts |
| Minor Benefit (4, 3): | Minimal ROW impacts/acquisition; minimal access management and parking impacts |
| Neutral (3, 2): | Minor ROW impacts/acquisition; minor access management and parking impacts |
| Minor Impact (2, 1): | Multiple ROW impacts/acquisition; multiple access management and parking impacts |
| Impact (1, 0): | Significant ROW impacts/acquisition; major access management and parking impacts |

Table 9: Potential Impacts at Passenger Stations and Amenities

| | No Build | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 10/15 | BRT 15/20 |
|---|---|---|---|---|---|---|
| Passenger Stations & Amenities | 4 | 3 | 2 | 2 | 2 | 2 |
| **Scoring** | 5 | 4 | 3 | 3 | 3 | 3 |

### Evaluation Results

Station platform boarding areas and pedestrian amenities may require partial acquisition of private ROW, potentially impacting the existing parking and/or driveway accessibility of the affected properties. Proposed station footprints are not assumed to require full property takes, demolition of existing structures or significant changes to parking or traffic operations. The No Build Alternative has no capital investment in new infrastructure which would impact existing properties or traffic operations. The Tulsa Plus, Enhanced, Fast Bus and BRT Build Alternatives include similar scopes for construction of new, significant bus stops at major destinations and intermodal transfer points. The Tulsa Plus alternative deploys fewer significant stations than the other Build Alternatives and was rated slightly higher than the Enhanced, Fast Bus and BRT Light Alternatives.

## *Roadway*

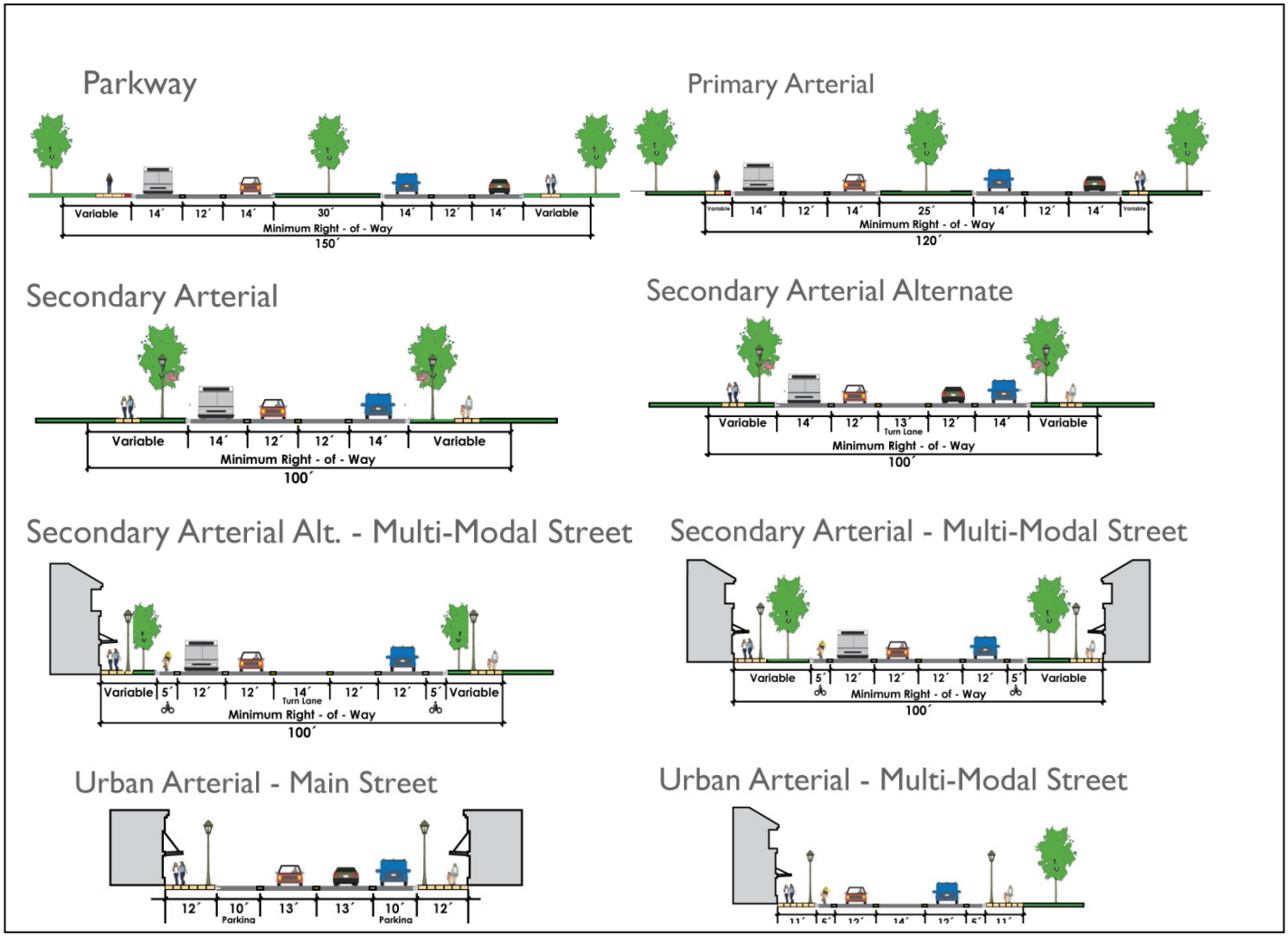
Varying urban landscapes and land uses support the PRC's assortment of residential, commercial, entertainment and retail districts. The city of Tulsa has defined the characteristics of typical roadway thoroughfare cross sections and prescribed traffic and ROW standards for construction and maintenance of each based on the *Tulsa Metropolitan Area Major Street and Highway Plan*. Figure 27 illustrates the typical cross sections of roadway that may be found within the PRC.

Roadway improvements associated with proposed Build alternatives include a combination of the items shown below and summarized in Table 10:

- *Concrete bus pads* are typically constructed at transit stops to mitigate the deterioration and maintenance needs of the roadway surface, caused by the weight of the buses, combined with pressures of acceleration and deceleration at bus stops. At the station platform of all Improved and Enhanced transit stations, 60 foot bus pads will be constructed within the curbside travel lane. Construction impacts may include:
  - Removal of approximately a 60' x 12' of existing asphalt pavement and replacement by reinforced concrete pavement
  - Roadway restriping at approaches to station platforms accompanies construction of new bus pads
- *Curb extensions* build out the existing curb or sidewalk into the parking lane and are only able to be constructed when on-street parking is currently provided. Curb extensions would only be installed to allow accessibility at proposed Improved or Enhanced station platforms abutted by on-street parking. Construction impacts may include:
  - Loss of on-street parking at station platforms
  - Improved pedestrian crossing safety by decreasing crossing distances
- *Bus pull out bays* are constructed to allow a safe refuge area for boarding and alighting of transit vehicles along roadways with high travel speeds or prone to significant congestion. Pull out bays require an existing parking lane, emergency lane (shoulder), or undeveloped ROW adjacent to the outside travel lane for construction. Construction impacts may include:
  - Requires existing wide shoulder, construction of new shoulder or narrowing of existing travel lanes
  - Potential impact to existing roadway drainage structures and/or adjacent utilities
- *Dedicated transit lanes* restrict travel lane accessibility to transit operations and other designated vehicles, (i.e. – high occupancy vehicles (HOV)). They may be deployed and operated on a continuous basis, or as-needed during peak travel demand or congested periods. Designation of dedicated lanes within the PRC would be achieved through signage, striping and pavement marking only. Construction impacts may include:

- Reduction in roadway capacity by restricting travel lane usage
- May require construction of additional infrastructure to designate transition from mixed use to dedicated transit lane

Figure 27: Typical Roadway Cross Sections




## Evaluation Measures: Roadway

| | |
|---|---|
| Benefit (5, 4): | No roadway reconstruction or lane closures required; increase to travel lane capacity |
| Minor Benefit (4, 3): | Minor roadway reconstruction and lane closures required; no impact or minor increase to travel lane capacity |
| Neutral (3, 2): | Minor roadway reconstruction and lane closures required; Minor impact or change to travel lane capacity |
| Minor Impact (2, 1): | Moderate roadway reconstruction and lane closures required; Limited reduction to travel lane capacity |
| Impact (1, 0): | Significant roadway reconstruction and long-term lane closures required; Significant reduction of travel lane capacity |

Table 10: Potential Impacts of Proposed Roadway Improvements

| Proposed Improvement | No Build | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 10/15 | BRT 15/20 |
|---|---|---|---|---|---|---|
| Roadway | 4 | 3 | 3 | 3 | 3 | 3 |
| Scoring | 5 | 4 | 4 | 4 | 4 | 4 |

### Evaluation Results

Current traffic volumes and congestion levels along PRC corridor roadways do not support the installation of dedicated transit lanes; therefore, they are currently not included in either of the BRT Alternatives. Pending future traffic conditions, dedicated transit lanes may be considered for installation, as warranted, to support BRT transit solutions. An analysis of impacts to vehicle capacity and congestion during peak demand periods should be performed to assess any adverse effects of implementation.

The No Build Alternative has the least impact on existing conditions, as it does not require any roadway reconstruction. All of the proposed Build Alternatives feature similar elements requiring minor road construction for bus pads at all stations, as well as curb extensions and pull out bays where necessary.

## *Pedestrian Facilities*

Adjacent to all proposed 'Improved' and 'Enhanced' station locations are additional sidewalk and pedestrian improvements proposed within the scope of the transit alternatives. The proposed improvements to the existing facilities, as well as their potential impact to the existing corridor conditions, are described below and summarized in Table 11.

- *New sidewalk* will be installed adjacent to 'Improved' or 'Enhanced' stations for up to several hundred non-consecutive feet from the platform. Installation of sidewalk will provide pedestrian connectivity to the nearest signalized intersection or several hundred feet away from the intersection. Construction will occur on an as-needed basis depending upon the presence and condition of existing sidewalk adjacent to proposed transit platforms. Construction impacts may include:
  - Impact to existing drainage facilities due to limited ROW for installation of sidewalks
  - Greater walk accessibility and ADA compliance
- *Pedestrian illumination* fixtures will be installed immediately surrounding 'Improved' or 'Enhanced' stations. A minimum of two (2) Illumination fixtures will be placed adjacent to the station platform areas. Construction impacts may include:
  - Improved passenger safety and physical representation of improved transit
  - Excavation of sidewalk area to install foundation and illumination fixture base
- *Pedestrian crossing protection* in the form of crosswalk restriping, ADA compliant curb ramps and pedestrian signal heads will be installed (or replaced as needed) at the nearest signalized intersection to station platform locations. Construction impacts may include:
  - Improved safety at station area intersections
  - Improve ADA accessibility and mobility within the corridor

### Evaluation Measures: Pedestrian Facilities

Benefit (5, 4): Construction of new sidewalk and ADA compliance improvements; significant installation of proposed pedestrian crossing/safety measures

Minor Benefit (4, 3): Construction of new sidewalk and ADA compliance improvements; installation of proposed pedestrian crossing/safety measures

Neutral (3, 2): Limited sidewalk and ADA compliance improvements; installation of select pedestrian crossing/safety measures

Minor Impact (2, 1): No new sidewalk or ADA compliance improvements; installation of select pedestrian crossing/safety measures

Impact (1, 0): No new sidewalk or ADA compliance improvements; no pedestrian crossing/safety measures

Table 11: Potential Impacts to Pedestrian Facilities

| | No Build | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 10/15 | BRT 15/20 |
|---|---|---|---|---|---|---|
| Pedestrian Facilities | 0 | 0 | 2 | 3 | 3 | 3 |
| **Scoring** | 1 | 1 | 3 | 4 | 4 | 4 |

### Evaluation Results

The No Build and Tulsa Plus Alternative rated poorly in comparison to the other Build Alternatives, since they do not introduce any pedestrian mobility enhancements to the corridor. The Tulsa Enhanced Alternative proposed some sidewalk, pedestrian crossing protection improvements; but does not include the pedestrian illumination improvements at station platforms recommended as part of the Fast Bus and BRT Build Alternatives.

## *Utilities and Technologies*

Ground disturbing activities during and construction of transit improvements may come into conflict with existing utility facilities within the PRC. When a potential conflict is identified, it may be resolved by relocating the existing resource, relocating the proposed transit improvement, or modification to the construction/excavation method. Installation of Intelligent Transportation Systems (ITS) such as real time vehicle arrival, automated ticket vending, or traffic signal prioritization at station platforms and signalized intersections will require integration with the existing information technology or telecommunications resources within the corridor. These resources may be accessible through various portal types throughout the PRC, some of which may require additional construction activities.

- *Buried utilities* may be affected by ground disturbing activities such as:
  - Concrete bus pad, station platform or pedestrian illumination foundations construction
  - ITS controller hardware at station platforms connecting to existing fiber optic network
  - Electrification supply for station area amenities (i.e. – ticket vending, real time information displays, illumination)
  - Integration of traffic signal prioritization (TSP) equipment with existing traffic signal network
- *Technologies* deployed within the proposed PRC transit solutions include: TSP, automated vehicle location (AVL), automatic ticket vending machines (TVM), and real time vehicle arrival using variable message signs (VMS).
  - Automatic vehicle location (AVL) technology installed on vehicles will allow more accurate schedule information to be available to passengers at home and in the Tulsa Transit system to help with trip planning and improve reliability of service.

- Deployment of TSP provides opportunity for modification and/or synchronization to improve existing traffic signals and gives additional green time to the transit vehicles and automobiles on the main line.
- Automated ticket vending reduces dwell time at stations and improves one-way travel times
- Modernization of existing facilities to improve throughput on mainline

### Evaluation Measures: Utilities and Technologies

| | |
|---|---|
| Benefit (5, 4): | No conflicts with buried utilities; Significant technology improvements to operational efficiency |
| Minor Benefit (4, 3): | Minimal minor conflicts with buried utilities; Moderate technology improvements to operational efficiency |
| Neutral (3, 2): | Multiple minor conflicts with buried utilities; Select technology improvements to operational efficiency |
| Minor Impact (2, 1): | Moderate conflicts with buried utilities; Minor technology improvements to operational efficiency |
| Impact (1, 0): | Numerous or cumulatively significant conflicts with buried utilities; no technology improvements to operational efficiency |

Table 12: Potential Impacts to Utilities and Technologies

| | No Build | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 10/15 | BRT 15/20 |
|---|---|---|---|---|---|---|
| Buried Utilities | 4 | 2 | 2 | 2 | 2 | 2 |
| Technologies | 0 | 1 | 2 | 3 | 3 | 3 |
| **Utilities Scoring** | 5 | 3 | 3 | 3 | 3 | 3 |
| **Technologies Scoring** | 1 | 2 | 3 | 4 | 4 | 4 |

### Evaluation Results

Utility impacts are not likely to be encountered in deployment of the No Build Alternative. Excavation and ground disturbing activities for installation of station platforms, bus pads, sidewalk and illumination improvements present the opportunity for increased conflict with existing utility resources as part of the Build Alternatives. Improvements are generally localized around station platform locations, however, and are assumed relatively consistent among Build Alternatives.

The No Build Alternative deploys no new technologies, while the Tulsa Plus begins progressive technology deployment with the installation of traffic signal prioritization. Tulsa Enhanced builds upon the TSP infrastructure by including real time vehicle arrival; and the Fast Bus and BRT Alternatives adds automated ticket vending for passenger convenience.

## *Environmental*

The National Environmental Policy Act of 1969 (NEPA) requires that the environmental impacts of proposed projects be described and evaluated as part of the decision-making process prior to the use of federal funding. It

is anticipated that INCOG and Tulsa Transit will pursue the Programmatic or Individual Categorical Exclusion (CE) through the Oklahoma Department of Transportation (ODOT). A detailed evaluation of potential impacts to the existing habitats and environmental resources within the project area must be conducted to determine appropriate mitigation and (if necessary) remediation activities to avoid or reduce adverse impacts to the resources including, but not limited to:

- The ***Cultural Resources Study*** is conducted to: a) identify cultural resources within the NEPA study area, and b) provide sufficient documentation and National Register of Historic Places (NRHP) assessment of cultural resources to ODOT for submittal to the State Historic Preservation Office (SHPO) and other consulting parties.
- The ***Threatened and Endangered (T&E) Species and Wetland Studies*** is conducted to evaluate the potential impacts to the biological resources within the corridor. The evaluation will consist of reviewing the US Fish and Wildlife Service (USFWS) current list of federally listed, proposed and candidate species and designated critical habitat for Tulsa County, a Bald Eagle, and Swallow assessment.
- Potential impacts to ***jurisdictional waters of the US and wetlands*** need to be evaluated for the study corridor. The evaluation will consist of reviewing the National Wetland Inventory (NWI) maps, Natural Resources Conservation Service (NRCS) soil maps and a field investigation to delineate any potential wetlands or floodplains that may be within the project area.
- An Initial Site Assessment (ISA), database search and field investigation will be conducted to identify hazardous and potentially ***hazardous waste*** related problems within and adjacent to the existing and proposed right-of-way. The investigation shall include all pertinent information regarding listed hazardous waste and potential hazardous waste sites in the vicinity of the project.
- NRCS coordination will be conducted to determine ***farmland impact*** within the study area.
- A **noise study** is required to meet FHWA regulations, 23 CFR 772 Procedures for Noise Abatement of Highway Traffic Noise and Construction and the FHWA Highway Traffic Noise Analysis and Abatement: Policy and Guidelines – June 1995 and complies with the ODOT Policy Directive C-201-3 Highway Noise Abatement (ODOT Noise Policy) and the ODOT Guidelines for Analysis and Abatement of Highway Traffic Noise – July 1998.
    - Federal aid project requiring a noise study involve one of the following: (1) construction of a roadway on new location; (2) when an existing roadway is significantly changed by horizontal or vertical realignment; or (3) when the number of through-traffic lanes is increased.
- ***Public meetings*** will be held to provide information to the public about the environmental study. ODOT Environmental Programs Division will provide the guidelines for the public meeting to INCOG and Tulsa Transit. A record of information presented at the meeting, number of attendees, and any written and verbal comments and the responses to such comments will be documented and submitted to ODOT.

## Evaluation Measures: Environmental Impacts

| | |
|---|---|
| Benefit (5, 4): | No impacts to existing environmental resources; does not require environmental analysis for NEPA clearance |
| Minor Benefit (4, 3): | Minor impacts to existing environmental resources; requires Categorical Exclusion level environmental analysis for NEPA clearance |

Neutral (3, 2): Moderate impacts to existing environmental resources; requires Categorical Exclusion level environmental analysis for NEPA clearance

Minor Impact (2, 1): Numerous moderate impacts to existing environmental resources; requires more rigorous environmental analysis for NEPA clearance, mitigation or remediation

Impact (1, 0): Numerous or significant impacts to existing environmental resources; requires more rigorous environmental analysis for NEPA clearance, mitigation or remediation

Table 13: Potential Environmental Impacts

| | No Build | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 10/15 | BRT 15/20 |
|---|---|---|---|---|---|---|
| Environmental | 4 | 3 | 2 | 2 | 2 | 2 |
| **Scoring** | 5 | 4 | 3 | 3 | 3 | 3 |

### Evaluation Results

As the No Build Alternative does not require construction of new facilities or modification to existing traffic or roadway conditions, no environmental analysis is needed. Implementation of each of the Build Alternatives would include construction of new shelters and bus pads at specified station locations. While minor, these ground disturbing activities and potential changes to traffic operations within the corridor would require analysis and documentation to identify potential environmental impacts and appropriate mitigation measures consistent with a Categorical Exclusion (CE).

## Operational Impacts

The deployment of proposed transit solutions within the PRC, while modifying the physical characteristics and landscape of the corridor, will also have potentially long reaching implications on traffic and transit operations within the project area.

***Traffic Operations*** *within the PRC may be affected by the introduction of transit solutions which deploy traffic signal prioritization (TSP) or dedicated transit lanes.*

- *TSP* gives additional green time to transit and automobiles along the mainline, increasing throughput; but may increase delay for vehicles at intersections.
- *Dedicated transit lanes* may require special signal phases or infrastructure at locations where the roadway is transitioning from mixed traffic to dedicated transit lanes, increasing delay at or presenting safety concerns for vehicle movements.

***Transit Operations*** within the PRC and all fixed route transit connecting to the PRC may be modified as to improve service efficiency because of transit solutions deployed under the proposed alternatives. A detailed evaluation of potential impacts to Transit Operations is included within the PRC *Evaluation of Alternatives Memorandum (June 2013)*.

- Extended *hours of operation* are proposed as part of several alternative scenarios. Ridership during extended hours or other performance measures may be used to justify the expansion of extended service hours to other fixed-routes and corridors of the Tulsa Transit system.
- The proposed alternatives improve existing *headways* and reduce *stop frequency* within the corridor. Changes to these service parameters may have the following impacts:

- Improved headways allow more frequent access to transit, improving system reliability and trip planning flexibility for users
- Transitioning the stop frequency along the PRC from a flag-stop to local-stop or limited-stop operation will decrease the total number stops made by transit vehicles and improve one-way travel time.
- Departing from flag-stop operations, passengers will be required to board and alight only at designated transit stops. Transit users may experience some confusion or resistance to traveling longer distances to designated stop locations.

- *Modifications to existing fixed-route transit* services within or connecting to the PRC will be recommended to improve the waiting period at fixed route, intermodal transfer points.
  - Service coverage areas or routing of existing fixed routes may be changed to eliminate inefficiencies and meet timed transfer goals
  - Efficiency, ridership and/or travel time improvements realized through modifications to stop frequencies may be adopted on a more broad level across the Tulsa Transit system
- Implementation of a 'premium' transit service within the corridor may be accompanied by changes to the Tulsa Transit *Fare Collection Schedule* to institute a premium fare for the enhanced services.

### Evaluation Measures: Traffic Operations

| | |
|---|---|
| Benefit (5, 4): | Increases average vehicle travel speeds, vehicle capacity of roadway, and/or traffic safety |
| Minor Benefit (4, 3): | Minor increases in average vehicle travel speeds, vehicle capacity of roadway, and/or traffic safety |
| Neutral (3, 2): | No change in average vehicle travel speeds, vehicle capacity of roadway, and/or traffic safety |
| Minor Impact (2, 1): | Minor decreases in average vehicle travel speeds, vehicle capacity of roadway, and/or traffic safety |
| Impact (1, 0): | Decreases average vehicle travel speeds, vehicle capacity of roadway, and/or introduces traffic safety concerns/issues |

### Evaluation Measures: Transit Operations

| | |
|---|---|
| Benefit (5, 4): | Extended hours of operation, improved service frequency AND one-way travel time |
| Minor Benefit (4, 3): | Extended hours of operation, improved service frequency OR one-way travel time |
| Neutral (3, 2): | None-to-minimal extension to hours of operation, change to service frequency and one-way travel time |
| Minor Impact (2, 1): | Reduced hours of operation, service frequency OR longer one-way travel time |

Impact (1, 0): Reduced hours of operation, diminished service frequency AND longer one-way travel time

Table 14: Potential Impacts to Operations

| | No Build | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 10/15 | BRT 15/20 |
|---|---|---|---|---|---|---|
| Traffic Operations | 2 | 3 | 3 | 3 | 3 | 3 |
| Transit Operations | 2 | 2 | 3 | 4 | 4 | 4 |
| Scoring | 3 | 4 | 4 | 4 | 4 | 4 |
| Scoring | 3 | 3 | 4 | 5 | 5 | 5 |

### Evaluation Results

The No Build Alternative has no impact on existing traffic operations within the corridors. Overall vehicle throughput and one-way travel time along the mainline of the PRC will be improved with the Build Alternatives' implementation of TSP along the corridor, allowing additional green time at signalized intersections when transit vehicles are approaching. Construction of Build Alternative transit stations adjacent to existing commercial properties may result in impacts to parking lot capacity or changes to driveway access to accommodate minimum sight distance requirements for access/egress turning movements.

The service operating parameters of the Tulsa Plus alternative are identical to that of the current route 105 (No Build Alternative). Increased frequency of transit service and one-way travel time improvements due to elimination of flag-stops and transitioning to limited or skip-stop service, as well as technology improvements shows greater potential to improve in-vehicle passenger time and route efficiency.

## Summary of Potential Impacts

The evaluation of potential impacts to the existing facilities of the PRC may be interpreted as a comparative assessment of relative benefits/impacts of each alternative versus the benchmark No Build Alternative. The individual ratings per existing condition were determined based on the scope of improvement deployed within each respective alternative. The results of the analysis of potential Construction and Operational Impacts are presented in Table 15.

Table 15: Summary of Transit Alternative Potential Impacts

| Existing Condition | No Build | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 10/15 | BRT 15/20 |
|---|---|---|---|---|---|---|
| Passenger Stations & Amenities | 4 | 3 | 2 | 2 | 2 | 2 |
| Roadway | 4 | 3 | 3 | 3 | 3 | 3 |
| Pedestrian Facilities | 0 | 0 | 2 | 3 | 3 | 3 |
| Buried Utilities | 4 | 2 | 2 | 2 | 2 | 2 |
| Technologies | 0 | 1 | 2 | 3 | 3 | 3 |
| Environmental | 4 | 3 | 2 | 2 | 2 | 2 |
| Traffic Operations | 2 | 3 | 3 | 3 | 3 | 3 |
| Transit Operations | 2 | 2 | 3 | 4 | 4 | 4 |
| **TOTAL SCORE** | 28 | 25 | 27 | 30 | 30 | 30 |

Rating Scale: (1 – 0), (2 – 1), (3 – 2), (4 – 3), (5 – 4)

The qualitative assessment finds that the Tulsa Plus Alternative may have greater impacts and less benefit to mobility within the corridor than the No Build Alternative. This is due to the construction of Improved and Enhanced stations without the additional pedestrian and technology enhancements that are included within the Tulsa Enhanced, Fast Bus and BRT 10/15 & 15/20 Alternatives. The benefits over the existing route 105 amenities and service operating parameters (No Build) do not offset the impacts of construction without the breadth of technology and pedestrian improvements associated with the more significant Build Alternatives. The alternatives proposing more significant investment in technologies and pedestrian facilities were all rated higher in perceived benefits to Transit Operations. Potential impacts to roadways and private properties at station areas may be minimized during design or mitigated to temporary impacts during construction.

# 9 | Financial Feasibility

## Overview

This Alternatives Analysis (AA) was developed according to the FTA's *Reporting Instruction for the Section 5309 Small Starts Criteria (July 2010)*. Capital cost estimate construction items, cost categories and assumptions were developed be consistent with the Federal Transit Administration Standard Cost Categories (SCCs).

This chapter provides a framework for the presentation of methods, cost data and cost assumptions to be used in the development of conceptual level capital cost estimates for the alternatives defined within this Alternatives Analysis (AA) study. It is used to describe:

- The methods that were used to define, quantify and present capital cost information
- Sources for cost data used in preparation of capital cost estimates
- Cost assumptions used in preparation of capital cost estimates; and
- Current limitations of the capital cost estimates

Comparative estimates will be developed as the proposed project is further developed and progresses into detailed design.

This chapter presents the methodology and preliminary results of the conceptual capital cost estimates of the proposed transit improvements to be implemented on the PRC, including:

- Total Construction Cost
- Property Acquisition
- Vehicles
- Professional Services
- Contingencies and Escalation

### *Methodology and Cost Data*

The methodology used in developing AA capital cost estimates has been developed in general accordance with FTA guidelines for estimating capital costs. Part of those guidelines calls for proposed alternative cost components to be summarized and identified within one of ten (10) FTA Standard Cost Categories (SCC). Those categories are as follows:

10 – Guideway & Track Elements
20 – Stations, Stops, Terminals & Intermodal
30 – Support Facilities: Yards, Shops, Admin Buildings
40 – Sitework & Special Conditions
50 – Systems
60 – Right of Way, Land, Existing Improvements
70 – Vehicles
80 – Professional Services
90 – Unallocated Contingency
100 – Finance Charges

Each SCC has multiple sub-categories in which to describe capital costs of generalized project elements or improvements within the scope of the proposed project. Summaries of proposed Build Alternative improvements included in each of these SCCs are described in the following sections.

### Cost Data Sources

The capital cost estimate presented within this report was developed with the use of the most current construction cost data available and includes multiple sources. Resources used in development of conceptual capital cost estimates included the following:

- Oklahoma City, OK - MAPS 3, Phase I construction bid prices (2010)
- Oklahoma Department of Transportation (ODOT) - Construction pay items list ( 4th Qtr, 2010)
- El Paso, TX – Mesa BRT Corridor Final Design Engineer's Estimate (September 2012)

An annual inflation rate of four percent (4%) was utilized for historic unit costs of construction elements in order to escalate to year (2012) dollars.

## Scope of Improvements

Existing conditions of the Metropolitan Tulsa Transit Authority's (Tulsa Transit) transit system are assumed as the No Build Alternative; the programmed improvements to the transit system through 2015 shall be considered the Baseline Alternative; and the proposed BRT infrastructure and service improvements shall be considered the Build Alternative.

### *Build Alternatives*

The Build Alternatives contain all planned transit improvements proposed within the fiscally constrained regional Transportation Improvement Plan (TIP) as well as a range of low-cost investment improvements to transit services, sometimes referred to as "BRT Light". The Bus Rapid Transit (BRT) "Light" alternatives proposed are innovative, high capacity, lower cost public transit solutions that provide a permanent, integrated system of buses (or specialized vehicles) on mixed-traffic roadways or dedicated lanes to collectively improve the speed, reliability, and identity of bus transit.

The proposed PRC rapid transit service will travel from North Tulsa (beginning at approximately 66th Street North) to 81st Street South and Lewis Avenue, primarily along north-south alignments of Peoria Avenue and Riverside Drive. The alternatives considered may modify service operating parameters such as: stop frequency, headways and hours of operation in addition to varying levels of infrastructure and technology investment. The alternative features technology and infrastructure improvements along the corridor, consisting of:

- Branded transit stations with passenger amenities
- Traffic signal prioritization (TSP) at all signalized intersections along the alignment
- Branded, clean-fuel buses with TSP and Automated Vehicle Locator (AVL) equipment
- Real-time schedule and arrival information
- Automated ticket vending at select stations
- Pedestrian accessibility and safety improvements at station area intersections

The buses and the stations will be branded to distinguish the service from conventional routes in the system. The proposed opening year of revenue service for the PRC Build Alternative is 2016.

### *FTA Standard Costs Categories and Assumptions*

Construction line items identified in the following cost estimate descriptions are organized within the FTA designated SCC sub-categories. Construction totals provided in each SCC sub-category are the accumulated costs of all line items associated with said sub-category. Quantities developed to compute direct construction costs found within the detailed cost estimate summary are based on elements such as the number of: new station platforms, affected intersections, vehicles required, and/or individually installed elements.

Bottom-up estimating of construction line items was used when sufficient information was available for detailed component and quantity development. A top-down approach was used for transit specific items (such as shelters and communications equipment) based on recent cost estimates from BRT projects of comparable scope. Unit costs may be escalated at the estimator's prerogative due to localized construction at multiple platform locations.

### *10 – Guideway & Track Elements*

Transit service improvements described within the Build Alternative are assumed to operate completely in mixed traffic along the alignment. .Build Alternative improvements to roadway elements are included under SCC sub-category 10.03 – *Guideway: At-grade in mixed traffic.*

- Concrete bus pads will be constructed at all BRT station platforms. Approximate dimensions of the bus pads are 12' x 60'. Roadway reconstruction/resurfacing will be needed to replace the excavated area surrounding bus pads at station platforms; and as needed within station improvement limits.
- Concrete curb extensions (or "bulb outs) may be constructed at proposed station locations in which on-street parking is present at the platforms. Bus pull-in bays may be required at proposed station areas to allow passengers to board and alight the vehicles without negatively impacting traffic flow along the roadway. It is assumed that 20% of proposed stations will require either improvement.
- An allowance for relocation of one (1) overhead roadway illumination assembly and one (1) small roadway sign at 20% of BRT stations has been included, as precise impacts to existing signage and illumination infrastructure have yet to be determined.
- Travel lane restriping will occur in the curbside travel lane approaches to all station area platforms requiring bus pad installation. Costs also include roadway preparation for new striping and installation of any new pavement symbols and/or markings.

### *20 – Stations, Stops, Terminals, Intermodal*

Build Alternative station platform improvements, canopies and amenities are included within SCC sub-category 20.01 – *At-grade station, stop, shelter, etc.*

Three levels of station platform, shelter and amenity improvements have been identified for implementation within the Build Alternative: Local, Improved and Enhanced. A standard station platform width of 8' has been assumed for all stations. Station canopy and LED lighting costs are (respectively) assumed at $160 and $50 per square foot of the canopy. Platform foundations requirements are unknown due to the current lack of station shelter and canopy designs. A platform foundation lump sum allowance equivalent to 50% of station platform cost plus 25% of the station canopy is assumed.

- Construction at ***Local*** stops will include:
  - 6" height concrete platform of approximately 12' in length (or 96 sf)
  - Benches and / or leaning rails, bicycle racks, trash cans
  - Branded, BRT signage and passenger information
- Construction at ***Improved*** stops will include:
  - 6" height concrete platform of approximately 20' in length (or 160 sf)
  - Station canopy (16' x 6') and structural framing support
  - LED lighting beneath station canopy
  - Benches and / or leaning rails, bicycle racks, trash cans
  - Branded, BRT signage and passenger information
  - Allowance for additional wiring or conduit needed to connect and distribute power to elements

- Allowance for public art incorporated into amenities

- Construction at ***Enhanced*** stops will include:
  - 6" height concrete platform of approximately 35' in length (or 280 sf)
  - Station canopy (30' x 6') and structural framing support
  - LED lighting beneath station canopy
  - Benches and / or leaning rails, bicycle racks, trash cans
  - Branded, BRT signage and passenger information
  - Allowance for additional wiring or conduit needed to connect and distribute power to elements
  - Allowance for public art incorporated into amenities
- Station platforms abutting existing parking lots will be separated by bollards for protection of waiting passengers from circulating vehicles. As platform locations requiring bollards will be determined during the design phase, it was assumed necessary at 25% of proposed Improved and Enhanced Stations.

### *30 – Support Facilities: Yards, Shops, Admin. Buildings*

No costs for improvements to or construction of operations, storage and maintenance facilities have been included in the scope of the PRC Build Alternative. Tulsa Transit currently operates all fixed route and demand response services out of its existing storage and maintenance facility located at 510 S. Rockford Avenue. The current Tulsa Transit fleet size includes sixty-one (61) 40-foot coach buses. The facility has a capacity of approximately seventy two (72) vehicles and is equipped to store and maintain new vehicles necessary to operate the proposed Build Alternative without modification.

### *40 – Sitework & Special Conditions*

The demolition and removal of existing infrastructure is included within SCC sub-category 40.01 – *Demolition, Clearing, Earthwork*. Capital cost items included within this category are: removal of existing roadway striping, structural excavation and removal of existing curbs and sidewalk for pedestrian and station area improvements. (See SCC sub-category 40.06 for additional information on assumed sidewalk, curb and ADA improvement limits).

- Demolition and earthwork for construction of BRT station platforms and foundation assumes is a lump sum percentage (30%) of the direct cost estimated for platform, foundation and canopy construction.
- Trenched excavation and backfill is assumed for sidewalk improvements based on the distance, in linear feet (LF), of sidewalk that will be constructed or replaced at each BRT station.
- Removal of existing concrete curb and gutter is assumed at all proposed BRT station platforms as well as at the nearest intersection for installation of ADA compliant curb ramps.
- Roadway demolition costs are inclusive of travel lane and crosswalk striping removal; traffic signal or roadway signage removal; and roadway excavation for construction of bus pads or replacement of degraded roadway.

Build Alternative utility improvements are included within SCC sub-category 40.02 – *Site Utilities, Utility Relocation.*

- A buried utility relocation allowance is assumed for construction of each BRT station platform as a lump sum percentage (20%) of all station capital improvements (platform canopies, amenities, ITS and communications equipment). Site specific utility conflicts will identified during project development activities.

- Electrical service to each BRT station platform will be established to power IT equipment as well as canopy illumination. It is assumed that 25% of proposed Improved and Enhanced BRT stations will require new electrical power connections. Unit costs for this line item include cost of establishing connection and supporting equipment to distribute electricity to station area elements.

SCC sub-category 40.03– *Hazardous Material, Contaminated Soil Removal/Mitigation* measures are provisions to remove, minimize impacts to or mitigate potentially hazardous or contaminated resources existing at proposed station platform construction sites.

- At the time of development of this capital cost estimate, no hazardous or contaminated sites have been identified for installation of station area improvements.

SCC sub-category 40.04 – *Environmental Impact Mitigation* measures are provisions to avoid, minimizes or mitigates impacts to environmentally sensitive locations near proposed station platform construction sites.

- At the time of development of this capital cost estimate, no environmental, cultural or historic impacts have been identified at proposed BRT station locations. Additional analysis will take place during project development activities and appropriate mitigating measures will be recommended during construction.

Streetscape and pedestrian accessibility improvements, including sidewalk reconstruction and pedestrian crossing treatments are included within SCC sub-category 40.06 – *Pedestrian / Bike Access and Accommodation, Landscaping.*

- Crosswalk restriping will be performed at all approaches to the nearest BRT station area intersections. "Piano-key" striping is assumed at four (4) feet center-to-center to establish a crosswalk width of approximately ten feet. The assumed average width of each intersection approach is 60 feet.
- Sidewalk improvements; including: concrete curb, ADA curb ramps, new or replacement of degraded sidewalk, level sidewalks across driveways may be installed within up to approximately 500 linear feet from any BRT station platform.
    - Sidewalk construction quantities were computed by an assumed average sidewalk length of six (6) feet and the length (linear feet) of sidewalk demolition was assumed at 150' or 350', depending upon observed existing conditions.

Traffic diversion and temporary facilities associated with construction of the Build Alternative is accounted for in SCC sub-category 40.08 – *Temporary Facilities*. A lump sum percentage of 12% was applied to the sum of estimated costs from categories 10, 20 and 30 as well as sub-categories 40.01 thru 40.07 and 50.02.

- Contractor mobilization, including construction staging, field offices, etc. has been allotted a 5% lump sum of the construction total of SCC categories identified above.
- Implementation of the Final Design Traffic Control Plan (TCP) has been allotted a 7% lump sum of the construction total of SCC categories identified above.

### *50 – Systems*

The deployment of traffic signal priority technology and pedestrian crossing enhancements are included in SCC sub-category 50.02 – *Traffic Signals and Crossing Protection*.

- Traffic signal priority (TSP) hardware will be installed at the (47) signalized intersections along the mainline of the proposed Build Alternative alignment. It is assumed that two receivers will be required per signalized intersection.
    - A spare part allowance (5% of capital cost) has been included for spare TSP hardware.
- Installment of new or upgrade of existing pedestrian crossing signals will occur at all station area intersections. The condition of existing pedestrian crossing signals has not been evaluated at this time. A unit cost per station area intersection has been applied, assuming one (1) assembly pole and two (2) pedestrian signal heads at each corner of the intersection.
- A miscellaneous allowance per intersection for improvements or repairs to the existing traffic signals at signalized intersections is included as an individual line item. The condition of existing traffic signal infrastructure will be evaluated during project development activities and replace this miscellaneous allowance.

SCC sub-category 50.05 – *Communications* includes all passenger information systems at stations and on vehicles, as well as equipment allowing communication among vehicles and central control facilities.

- Real time arrival systems will be installed at all *Improved* and *Enhanced* BRT station platforms, in the form of one (1) variable message sign (VMS) per platform.
    - A spare part allowance (5% of capital cost) has been included for spare VMS hardware.

SCC sub-category 50.06 – *Fare Collection System & Equipment* includes hardware and equipment installation for all fare collection equipment in the Build Alternatives.

- Ticket vending machines (TVMs) will be installed at each Enhanced BRT station platforms only. The TVM unit installed at these station platforms will only be capable of dispensing a limited variety ticket types.
    - A spare equipment allowance (5% of total TVM capital expense) has been included for spare hardware.

SCC sub-category 50.07 – *Central Control* includes cost provisions for all equipment and technology improvements to the Tulsa Transit operations control center required for successful deployment and operation of new Build Alternative services.

- A line item for IT and communications hardware integration at the Tulsa Transit Operations Facility and BRT stations is included based on a lump sum allowance (20% of the projected cost of SCC items 50.02, 50.05 and 50.06).

### *60 – Right Of Way, Land, Existing Improvements*

The Build Alternative ROW impacts are included in sub-category 60.01 – *Purchase or Lease of Real Estate.*

- A lump sum allowance (2% of project construction cost; SCC items 10-50) for fee-simple purchase of ROW slivers, as needed, at BRT station platform locations has been included in capital cost estimates of all Build Alternatives.

### *70 – Vehicles*

The vehicles proposed to use in operation of the Bus Rapid Transit (BRT) Build Alternative are included in the SCC sub-category 70.04 – *Bus.* The estimated total number of vehicles required includes a 20% spare ratio.

- PRC transit vehicles will be forty foot (40') compressed natural gas (CNG) fueled, low-floor buses. Based on projected route cycle time and the headway requirements identified, fleet requirements of the Build Alternatives are as follows:
    - Tulsa Plus – eight (8) vehicles
    - Tulsa Enhanced – ten (10) vehicles
    - Fast Bus – five (5) vehicles
    - BRT 10/15 – twelve (12) vehicles
    - BRT 15/20 – nine (9) vehicles
- All PRC transit vehicles will be branded for passenger recognition and contain the following systems:
    - Automated passenger counters (APC)
    - Traffic signal priority (TSP) infra-red emitter
    - GPS automated vehicle locating system
    - Passenger information systems (including VMS, and audible "next stop")
    - On board bike racks
    - Wheelchair tie down systems

SCC sub-category 70.07 – *Spare Parts* includes an allowance of 5% of the vehicle capital expense for initial purchase of spare parts.

### *80 – Professional Services*

Add-on items for indirect services required from project start up to completion are part of the project cost, but not directly attributable to construction hard costs. These items are incorporated into the capital cost estimates of the Build Alternatives as a percentage of construction costs and include all items listed in **Table 16**. All professional service items accumulate to a total approximately 30% of the subtotal of project construction (SCC items 10 thru 50).

Table 16: Applied Professional Service Percentages

| FTA SCC | Professional Service Item Description | % of Construction |
|---|---|---|
| 80.01 | Preliminary Engineering | 6.0% |
| 80.02 | Final Engineering | 8.0% |
| 80.03 | Project Management for Design and Construction | 4.5% |
| 80.04 | Construction Administration & Management | 4.0% |
| 80.05 | Insurance | 1.0% |
| 80.06 | Legal; Permits; Review Fees by other agencies, cities, etc. | 1.5% |
| 80.07 | Surveys, Testing, Investigation, Inspection | 3.0% |
| 80.08 | Start Up | 2.0% |

## Uncertainties in Project Scope

A common issue faced when forecasting potential capital costs of construction is the evaluation and treatment in project uncertainty. Uncertainty can result in differences between the estimated cost defined during the planning or conceptual phase and the actual cost of construction and implementation. Potential sources of uncertainty generally occurring and recognized include, but are not limited to:

- Changes in project scope
- Changes in design standards
- Adjustment to unit cost and quantity assumptions
- Unforeseen problems in implementation

Although a general level of consistency in proposed BRT improvements is present throughout the corridor, there are site specific conditions which will require case-by-case consideration in resolution or mitigation of potential conflicts. Typical issues encountered in project development activities may include, but are not limited to: utility holders' existing facilities, identification of ROW impacts, assessment of the condition of pedestrian facilities and ADA compliance at stations; as well as development of station shelter, public art and branding design consensus.

### *90 – Unallocated Contingency*

Unallocated contingency represents a level of uncertainty in the identification of all scope items required for mitigation, construction and implementation of the Build Alternative. The unallocated contingency applied is currently 10% of the total estimated base project cost. This percentage will be reduced as engineering design progresses to remove areas of uncertainty from assumed project elements.

## Allocated Contingencies

An individual allocated contingency percentage is applied separately to each of the SCC sub-categories. Percentages are based on the level of confidence in the quantities and unit costs developed for this conceptual planning estimate. Allocated Contingency is gradually phased out of capital cost during the Preliminary Engineering and Final Design phases as uncertainties in design decrease.

Allocated contingencies may be separated into Design and Construction contingencies, where each represents a level of uncertainty in the cost for design of construction elements and for labor and material costs during construction. At the conceptual level of design available during the Alternatives Analysis phase of the proposed project, a standard allocated contingency rate of 20% for design and 10% (construction) has been applied to all construction elements. A 5% design and 5% construction contingency were used for all vehicles.

### *Escalation*

The impacts of inflation on the overall project cost are realized through projection of project on a Design-Bid-Build construction schedule. The proposed time frame for implementation of the PRC locally preferred transit improvements assumes the Build Alternative is preferred over the Baseline "no build" scenario. This time frame assumes approximately fifteen (15) months for design and procurement and eighteen (18) months for construction and testing.

The FTA SCC worksheets document the potential impact of inflation on the total cost of the proposed alternatives by allowing for the spread of inflation costs over the proposed construction life cycle. The Inflation worksheet found in Appendix A shows the allocation of funds for each SCC category over the course of the Design-Bid-Build process. Through approximating the percentage of work to be performed under each SCC during every year through construction, the annual inflation factor is applied only to the activities to be performed within that time frame. This systematic distribution of inflation costs comprises the Year of Expenditure (YOE) cost of an alternative and represents the total amount that will be spent to complete construction and deployment in the present year's dollar value.

Consulting national construction market indicator resources, such as Engineering News Record and Vermeulens Cost Consultants, a current national average in construction cost escalation is estimated at approximately 2.7%

and is forecast to increase to the historical construction cost escalation trendline of approximately 3.3% over the next several years. In an effort to accurately reflect the forecasted trends in construction costs, a variable escalation rate has been used in projecting the YOE capital cost of the PRC Build Alternative according to the following schedule:

Table 17: Forecast Escalation

| Construction Year | Forecast Escalation |
|---|---|
| 2014 | 2.85% |
| 2015 | 3.0% |
| 2016 | 3.15% |
| 2017 | 3.3% |
| 2018 | 3.3% |

## Capital Cost Estimate Summary

The capital cost estimates presented within this document were developed in accordance with Part II of the Procedures and Technical Methods for Transit Project Planning and the Standard Cost Categories (SCC) for Capital Projects as defined by the Federal Transit Administration (FTA) (rev. 14, August 5, 2011). A summary of PRC Build Alternative capital costs are expressed in terms of the FTA Standard Cost Categories (SCCs) in **Table 18**. Estimated costs include allocated contingencies and are rounded to the nearest $1000.

Table 18: Build Alternative Capital Cost[1]

| FTA SCC | Item Description | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 15/20 | BRT 10/15 |
|---|---|---|---|---|---|---|
| 10 | Guideway & Track Elements | $660 | $660 | $653 | $653 | $726 |
| 20 | Stations, Stops, Terminals | $2,101 | $2,101 | $2,044 | $2,044 | $2,044 |
| 30 | Support Facilities | $0 | $0 | $0 | $0 | $0 |
| 40 | Sitework & Special Conditions | $2,595 | $3,596 | $4,161 | $4,161 | $4,160 |
| 50 | Systems | $0 | $1,898 | $2,618 | $2,618 | $2,618 |
| 60 | ROW | $161 | $248 | $284 | $284 | $286 |
| 70 | Vehicles | $4,158 | $5,198 | $2,599 | $4,678 | $6,237 |
| 80 | Professional Services | $1,607 | $2,191 | $2,843 | $2,843 | $2,864 |
| 90 | Unallocated Contingency | $914 | $1,298 | $1,184 | $1,373 | $1,590 |
| 100 | Finance Charges | N/A | N/A | N/A | N/A | N/A |
| | **Project Total** | **$12,196** | **$17,190** | **$16,386** | **$18,654** | **$20,525** |

[1] all costs in 2012 dollars, inclusive of contingencies and rounded to nearest thousand (x$000)

The estimated cost, in base year (2012) dollars, of the Build Alternatives range from approximately $12.2 M to $20.6 M. The estimated YOE (2016) cost of the Build Alternatives may range from approximately $13.6 M to $22.8 M, dependent upon availability of materials market fluctuations in labor costs. Further information on itemized quantities by SCC sub-category and the application of escalation factors to determine the YOE costs of proposed alternatives is available upon request.

## Operations and Maintenance Costs

The annual operating cost of the proposed Peoria/Riverside Corridor project was estimated in order to determine financial feasibility of alternatives and to aid in the evaluation process. The "Financial Feasibility" criterion was based on the incremental increase to the Tulsa Transit operating budget necessary to deploy and maintain the

various transit alternatives, as a percent of Tulsa Transit's current operating budget. This section elaborates on the baseline existing service, proposed alignment options, and operative assumptions built into the operating cost estimation in order to assess the additional operating expense requirements of each alternative.

## *Existing Conditions (No Build Alternative)*

### Alignment

Route 105 currently operates generally on the Peoria Avenue corridor between 66th Street North and 81st Street South. South of the Crosstown Expressway (Interstate 244), routing into Downtown Tulsa occurs along Admiral Boulevard/1st and 2nd/3rd Streets to reach the main transfer hub of the Tulsa Transit system, the Denver Avenue Station (DAS). Some deviation occurs between East 63rd Street South and East 66th Place South to serve multi-family housing and Inhofe Plaza west of Peoria Avenue. South of East 71st Street the 105 travels along 71st Street South to Lewis Avenue and terminates at East 81st Street and Lewis Avenue to serve the Walmart. Return routing occurs along Wheeling Avenue to 71st Street. See **Figure 7** for a complete map of the Tulsa Transit System and service area.

### Service Characteristics

The 105 operates Monday through Friday from approximately 5:30 am to 8:30 pm. Saturday service operates between 7:00 am and 6:30 pm. Weekday headways are 30-minutes for most of the day, with a few hours in the midday (approximately 9:15 am to 1:00 pm) where buses run every 45 minutes. Frequencies are hourly on Saturday.

For the Existing and No-Build scenarios, the peak period was assumed at 12 hours and the base period was 3 hours only to fully capture the short period with 45-minute frequencies. Estimated revenue hours were 60 in the peak and 10 in the base.

## *Build Alternative Assumptions*

### Alignment

The AA process identified five distinct segments of the PRC, each with their own unique neighborhood character, activity centers and existing infrastructure: Far North, North, Midtown, South and Far South. The results of the initial screening of alignment and corridor termini led to the decision to deploy Build Alternative solutions within the Far North to the South segments only, during the initial roll out of services. The Northern segment of the Build Alternatives would all operate along Peoria Avenue from 66th Street North to 38th Street North. The alignment for the Midtown segment would continue to operate along Peoria Avenue, but rerouted to travel along 6th Street from Peoria Avenue to Denver Avenue Station. This adds approximately three-tenths of a mile. The southern segment of the new rapid BRT service would remain on Peoria Avenue all the way to 81st Street South and Lewis Avenue.

Five Build Alternative scenarios were studied along the corridor in addition to the existing Route 105/No-Build Alternative. Depending on the Build Alternative, operating scenarios may deploy a singular, rapid premium service or a combination of both rapid, premium service and community circulator service between 66th Street North and 81st Street South and Lewis Avenue. Those alternatives which included both new, premium rapid service and local circulator bus service, operating in complimentary fashion, used 38th Street North as the terminus at which these services will intersect. **Table 19** identifies the proposed Build Alternative termini of rapid bus and local circulator service.

Table 19: PRC Build Alternative Service Operating Termini

| | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 15/20 | BRT 10/15 |
|---|---|---|---|---|---|
| Rapid Bus Termini | 81st Street S & Lewis to Peoria & 66th Street N | 81st Street S & Lewis to Peoria & 38th Street N | 81st Street S & Lewis to Peoria & 66th Street N | 81st Street S & Lewis to Peoria & 38th Street N | 81st Street S & Lewis to Peoria & 38th Street N |
| Local Circulator Termini | N/A | Peoria & 38th Street N to Peoria & 66th Street N | N/A | Peoria & 38th Street N to Peoria & 66th Street N | Peoria & 38th Street N to Peoria & 66th Street N |

## Service

As well as proposing both premium rapid and local circulator service within the PRC, Build Alternatives include specific general service operating parameters such as: hours of operation, headways and stop frequency. **Figure 26** illustrates the proposed extents of Build Alternative service operations and operating parameters of each Alternative are identified as follows:

- The ***Tulsa Plus*** alternative proposes minimal improvement to the No Build route 105 by improving to a 30-minute headway along the entire alignment, continuing flag stop operations and eliminating the 45-minute mid-day headway. Weekday evening service would also be extended from approximately 8:30 pm to 10:30 pm. Saturday service operates between 7:00 am and 6:30 pm on a 30-minute continuous headway.
- The ***Tulsa Enhanced*** alternative proposes replacement of route 105 with a fixed, local-stop (2 to 3 block) operation on a continuous 20-minute headway from 81st Street South to 38th Street North. A local circulator would connect to the rapid bus service at 38th Street and operate on a continuous 15-minute headway between 38th Street North and 66th Street North. Weekday evening service would also be extended from approximately 8:30 pm to 10:30 pm. Saturday service operates between 7:00 am and 6:30 pm on a 30-minute continuous headway for rapid bus.
- The ***Fast Bus*** alternative proposes improvement of the route 105 to 30-minute continuous headway and overlapping rapid bus service from 81st Street South to 66th Street North running at a 30-minute continuous headway, but on a limited skip-stop ($^1/_2$ mile to 1 mile) basis at major intersections, activity centers and fixed route transfer points only. Weekday evening service would also be extended from approximately 8:30 pm to 10:30 pm. Saturday service operates between 7:00 am and 6:30 pm on a 30-minute continuous headway.
- The ***BRT 15/20 and BRT 10/15*** alternatives propose replacement of route 105 with rapid, limited stop service from 81st Street South to 38th Street North, operating on either a 15-minute peak/20-minute off peak or 10-minute peak/15-minute off peak headway. A local circulator would connect to the rapid bus service at 38th Street and operate on a continuous, 15-minute headway between 38th Street North and 66th Street North. Weekday evening service would also be extended from approximately 8:30 pm to 10:30 pm. Saturday and Sunday service operates between 7:00 am and 6:30 pm on a 30-minute continuous headway for 10/15-minute rapid bus. Sunday service would not be provided under the 15/20-minute rapid bus alternative.

Observation of existing Tulsa Transit ridership and origin-destination data has identified a maximum peak period of one and one-half (1.5) hours in the morning and one and one-half (1.5) hours in the evening (from approximately 6:30am to 8:00 am and 4:30pm to 6:00 pm), respectively. Local circulator services within the Far North segment

of the PRC (38th Street North to 66th Street North) proposed as part of Build Alternatives would operate on a local-stop basis, with routine stops at existing designated Tulsa Transit bus stops.

Faster one-way travel speeds along the Peoria/Riverside Corridor are hoped to be achieved through a combination of faster passenger boarding capabilities via off-board fare collection and consolidated stops. The removal of the current practice of "flag" stops is highly desired to improve on-time performance and boost productivity but has not yet been decided upon. Having consolidated stops would greatly improve travel times along this corridor. Table 20 tabulates alignment characteristics for the existing Route 105/No-Build scenario, as well as characteristics for each new service alternative.

### *Calculation of Average Daily and Annual Revenue Service Parameters*

With assumed travel times and speeds, both BRT and the Fast Bus alternatives can complete a round trip in 50-minutes. The Tulsa Enhanced completes a round trip in approximately 60-minutes and the Tulsa Plus takes five (5) fewer minutes than the existing round trip which is 75-minutes. All alternatives have sufficient recovery time built into the travel time.

Table 21 elaborates on service characteristics for local service and the new alternatives.

For purposes of this analysis, the number of annual weekdays was assumed to be 251, with 56 Saturdays, and 52 Sundays. These values were accepted by Tulsa Transit and later used in creating operating statistics the Regional Transit System Plan Bus System Evaluation and Service Plan analyses.

Table 20: Alignment Characteristics for Existing/No-Build Scenario and Alternatives

| | No Build (rte 105) | Tulsa Plus | Tulsa Enhanced | *Local Circulator* | Fast Bus | *Route 105* | BRT 15/20 | *Local Circulator* | BRT 10/15 | *Local Circulator* |
|---|---|---|---|---|---|---|---|---|---|---|
| **One-Way Length [mi.]** | 18.7 | 18.7 | 14.8 | *3* | 14.8 | *18.7* | 14.8 | *3* | 14.8 | *3* |
| **Travel Time [min.]** | 75 | 70 | 60 | *15* | 50 | *75* | 50 | *15* | 50 | *15* |
| **Speed [mph]** | 15 | 16 | 14.8 | *12* | 17.8 | *15* | 17.8 | *12* | 17.8 | *12* |

Table 21: Service Statistics by Period and Day

| | No Build (rte 105) | Tulsa Plus | Tulsa Enhanced | Local Circulator | Fast Bus | Route 105 | BRT 15/20 | Local Circulator | BRT 10/15 | Local Circulator |
|---|---|---|---|---|---|---|---|---|---|---|
| **Weekday Peak Period** | | | | | | | | | | |
| headway | 30 | 30 | 20 | 15 | 30 | 30 | 15 | 15 | 10 | 15 |
| hour span | 12 | 17 | 17 | 17 | 17 | 17 | 3 | 17 | 3 | 17 |
| required vehicles | 5.0 | 5.0 | 6.0 | 2.0 | 4.0 | 5.0 | 7.0 | 2.0 | 10.0 | 2.0 |
| required spares | 1.0 | 1.0 | 2.0 | 1.0 | 1.0 | 1.0 | 2.0 | 1.0 | 2.0 | 1.0 |
| **Weekday Off-Peak Period** | | | | | | | | | | |
| headway | 45 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 15 | 0 |
| hour span | 3 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 14 | 0 |
| required vehicles | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 0.0 | 7.0 | 0.0 |
| required spares | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 2.0 | 0.0 |
| **Saturday** | | | | | | | | | | |
| headway | 60 | 30 | 30 | 15 | 30 | 60 | 30 | 15 | 30 | 15 |
| hour span | 11.5 | 11.5 | 11.5 | 11.5 | 11.5 | 11.5 | 11.5 | 11.5 | 11.5 | 11.5 |
| required vehicles | 3.0 | 5.0 | 4.0 | 2.0 | 4.0 | 3.0 | 4.0 | 2.0 | 4.0 | 2.0 |
| required spares | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| **Sunday** | | | | | | | | | | |
| headway | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 15 |
| hour span | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11.5 | 11.5 |
| required vehicles | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 | 2.0 |
| required spares | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 |

Table 22 summarizes the annual revenue hours for the Existing Route 105/No-Build Scenario as well as each proposed alternative. The total existing annual revenue hours for Route 105 are estimated at just over 19,000 hours, given the assumptions outlined above. The BRT 10/15 alternative requires nearly 36,000 annual revenue hours owing mostly to frequent headways and Sunday service, while the BRT 15/20 alternative requires nearly 25,000 annual revenue hours. For the BRT 10/15 and BRT 15/20 alternatives, the local circulator requires 11,000 and 9,800 annual revenue hours, respectively. This represents a corridor total of slightly over 46,000 annual revenue hours for the BRT 10/15 and nearly 35,000 annual revenue hours for the BRT 15/20. The Fast Bus alternative requires 16,000 annual revenue hours and the continuous, 30-minute Route 105 requires a new total of 23,000 annual revenue hours for a corridor total of slightly over 39,000 annual revenue hours. The Tulsa Enhanced requires 28,000 annual revenue hours, the local circulator for this alternative is 9,800 revenue hours, for a corridor total of 38,000 annual revenue hours. The Tulsa+ requires 23,000 annual revenue hours.

Table 22: Estimated Annual Revenue Hours

| | No Build (rte 105) | Tulsa+ | Tulsa Enhanced | Local Circulator | Fast Bus | Route 105 | BRT 15/20 | Local Circulator | BRT 10/15 | Local Circulator |
|---|---|---|---|---|---|---|---|---|---|---|
| **Weekday Total** | | | | | | | | | | |
| *Weekdays* | *251* | *251* | *251* | *251* | *251* | *251* | *251* | *251* | *251* | *251* |
| Rev. Hrs. | 70 | 79 | 102 | 34 | 57 | 85 | 90 | 34 | 123 | 34 |
| **Ann. Rev. Hrs.** | **17,570** | **19,913** | **25,602** | **8,534** | **14,223** | **21,335** | **22,590** | **8,534** | **30,957** | **8,534** |
| **Weekend Total** | | | | | | | | | | |
| *Saturdays* | *56* | *56* | *56* | *56* | *56* | *56* | *56* | *56* | *56* | *56* |
| Saturday Rev. Hrs. | 29 | 54 | 46 | 23 | 38 | 29 | 38 | 23 | 38 | 23 |
| *Sundays* | *52* | *52* | *52* | *52* | *52* | *52* | *52* | *52* | *52* | *52* |
| Sunday Rev. Hrs. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 23 |
| **Ann. Rev. Hrs.** | **1,610** | **3,005** | **2,576** | **1,288** | **2,147** | **1,610** | **2,147** | **1,288** | **4,140** | **2,484** |
| **TOTAL** | | | | | | | | | | |
| Annual Days | 359 | 359 | 359 | 359 | 359 | 359 | 359 | 359 | 359 | 359 |
| Rev. Hrs. | 99 | 133 | 148 | 57 | 95 | 114 | 128 | 57 | 162 | 57 |
| **Ann. Rev. Hrs.** | **19,180** | **22,918** | **28,178** | **9,822** | **16,370** | **22,945** | **24,737** | **9,822** | **35,097** | **11,018** |

## *Operating Budget and Variable Cost per Hour*

Tulsa Transit's budget for the 2011 National Transit Database (NTD) year was recorded as $16.7 million. Commensurate with minor improvements to selected fixed route headways and increased security personnel at transit centers, the fiscal year (FY) 2012 Tulsa Transit budget was increased by approximately $800K. For purposes of this analysis, $18 million was assumed and accepted for analysis by Tulsa Transit. The accepted variable cost per hour, which goes toward building up the total operating cost, is $45.

Current local service is estimated to be approximately 7.7% of Tulsa Transit's operating budget. New services (for all options) range from approximately 9.3% to 18.6% of the agency's total operating budget. The existing Route 105 was estimated to cost $1.3 million annually to operate. The BRT 10/15 option has an estimated annual operating cost of $3.11 million (rounded in 2013 dollars), meaning it is $1.81 million more than it costs the Route 105 to operate. The BRT 15/20 requires $2.33 million annually, which is $1.03 million more than the Route 105. Both BRT alternatives include the cost of the local circulator service. The Fast Bus alternative requires $2.65 million, the Tulsa Enhanced requires $2.57 million, and the Tulsa Plus requires $1.55 million annually, and cost $1.35 million, $1.27 million, and $250,000 more, respectively, to operate compared to Route 105. Table 23 compares different options to the Existing/No-Build scenario.

Table 23: Annual Operating Costs by Service Pattern and Day

| | No Build (rte 105) | Tulsa+ | Tulsa Enhanced | Fast Bus / Route 105 | BRT 15/20 | BRT 10/15 |
|---|---|---|---|---|---|---|
| | | | *(Tulsa Enhanced + Local Circulator)* | *(Fast Bus + Route 105)* | *(BRT + Local Circulator)* | *(BRT + Local Circulator)* |
| Estimated Ann. Op. Cost | $1,294,650 | $1,546,965 | $ 2,565,000 | $ 2,653,763 | $ 2,332,710 | $ 3,112,740 |
| % of Ops Budget | 7.7% | 9.3% | 15.3% | 15.9% | 14.0% | 18.6% |
| *Rounded Op Cost* | $1,295,000 | $1,547,000 | $ 2,565,000 | $ 2,654,000 | $ 2,333,000 | $ 3,113,000 |
| % of Ops Budget | 7.2% | 8.6% | 14.3% | 14.7% | 13.0% | 17.3% |
| *Rounded Op Cost* | *$1.30 M* | *$ 1.55 M* | *$ 2.57 M* | *$ 2.65 M* | *$ 2.33 M* | *$ 3.11 M* |
| *Difference from Rte. 105* | *n/a* | *$ 0.25 M* | *$ 1.27 M* | *$ 1.35 M* | *$ 1.03 M* | *$ 1.81 M* |

# 10 | Evaluation of Refined Alternatives

The final evaluation of alternatives was conducted with a compilation of data used in technical analyses and public input received via engagement activities throughout the AA study timeframe. Building from results of the preliminary screening process, assessment of potential impacts to existing conditions and financial feasibility analysis, the evaluation utilized numerous indicators to determine a transportation solution best fit for the PRC study area.

## Overview

- Alternatives were scored in their effectiveness to meet stated PRC AA goals as well as with feedback received from public engagement
- After an extensive alternative evaluation process, Bus-Rapid Transit (BRT) with 15-minute peak headway and 20-minute off-peak headway was determined to be the alternative that best met the goals for the project in the most cost-effective manner

## Evaluation Methodology

The AA study goals were developed to address the Tulsa Transit system needs identified during the (2011) RTSP Needs Assessment, as they apply to the Peoria/Riverside Corridor. Input received from PRC community stakeholders and at-large citizens also identified several operating and performance challenges within the current Tulsa Transit system which were perceived as barriers to greater utilization of the system (See **Chapter 3**). The refined alternatives were comparatively rated based on perceived ability to address the stated goals and challenges for implementation of enhanced transit service within the PRC:

- **Challenge 1:** Lack of Community Exposure to Economic and Social Value of Mobility
- **Challenge 2:** Existing Transit Service Limitations
- **Challenge 3:** Inadequate Transit Supportive Conditions

- **Goal 1:** Improve Transit Access and Regional Mobility
- **Goal 2:** Support Economic Development
- **Goal 3:** Invest in Low-Cost, High-Impact Transit Infrastructure
- **Goal 4:** Build Community Support for the Value of Transit

Developed based on the goals and needs established during the PRC project, a set of criteria were developed to evaluate the final set of alternatives. Several criterion, developed to demonstrate varying levels of costs and benefits associated with the challenges and goals, were identified to evaluate the full range of alternatives and included:

- Travel Time
- Transit Visibility and Perception
- Comfort and Reliability
- Safety
- Economic Development
- Capital Cost
- Incremental Operating and Maintenance
- Percent of Current Tulsa Transit Operating Budget

Each criterion identified within this evaluation was supported by multiple attributing factors which may have been associated with negative or positive effects. **Table 24** highlights the ranging transit improvements and factors of each alternative which attributed to high and low scores. Build Alternatives were rated qualitatively, high to low, based on each alternative's ability to meet each criterion. Scores ranges from one (1 – 0), representing a perceived negative impact, to five (5 – 4), representing a perceived positive impact. The total scores were summed to produce a relative technical ranking of the alternatives shown in **Table 25**.

Table 24: Factors Attributing to High and Low Scores of each Evaluation Criterion

| Evaluation Criteria | Factors Attributing to Low Score | Factors Attributing to High Score |
|---|---|---|
| Travel Time | • Longer Travel Time<br>• Mixed Traffic<br>• Frequent Stops | • Shorter Travel Time<br>• Dedicated Travel Lanes<br>• Fewer Frequent Stops<br>• Traffic Signal Priority |
| Perception and Visibility | • Few Passenger Amenities<br>• Variable Wait Times<br>• Minimal Passenger Information | • Branded Service<br>• Landmark Stations with Passenger Amenities<br>• Prompt Service<br>• Multi-Media Information Technology |
| Comfort and Reliability | • Few Passenger Amenities<br>• Variable Wait Times<br>• Minimal Passenger Information<br>• Limited Access to Stations | • Branded Service<br>• Landmark Stations with Passenger Amenities<br>• Prompt Service<br>• Pedestrian Accessibility Improvements<br>• Multi-Media Information Technology |
| Safety | • Limited Pedestrian Improvements | • Sidewalk Enhancement<br>• Pedestrian Street Crossings<br>• Lighting at Stations |
| Support Economic Development | • Disruption to business during or after construction<br>• Numerous property impacts or acquisitions | • Improve travel times and intermodal connectivity<br>• Improved job accessibility and expanded labor pool<br>• Extended hours of service |
| Capital Cost | • Significant investment in high cost construction scope items such as: station improvements, vehicles and pedestrian improvements | • Minimal high cost construction scope items such as: station improvements, vehicles and pedestrian improvements |
| Incremental PRC O&M Cost - *from Route 105* | • Significant increase to annual operational budget needed to maintain proposed PRC transit alternative | • Low or minimal change in annual operational budget needed to maintain proposed PRC transit alternative |
| Feasibility – *Percent of Tulsa Transit Annual Operating Budget* | • High percentage indicating significant shifts in existing resources necessary to continually operate proposed project | • Low percentage indicating minor or non-existing shifts in resources necessary to continually operate proposed project |

## Application of Evaluation Criteria

The evaluation criteria listed in the above table may be grouped into two categorize: Transit Service Operations or Financial Feasibility.

### *Transit Service Operations*

The transit impact criteria considered would result in direct and tangible impacts to the existing transit operations or infrastructure within the PRC. These criteria were: Travel Time; Perception & Visibility; Comfort & Reliability; and Safety.

#### Travel Time

Attributing factors used to evaluate *Travel Time* performance included service operating or infrastructure improvements that would directly influence a passenger's in-vehicle travel time.

Implementation of *dedicated transit lanes* would offer transit (and other approved vehicles) a dedicated roadway to utilize at designated times to avoid potential congestion related queues or delays. Potential negative effects include reduction in roadway capacity for automobiles and increased congestion for non-transit vehicles.

Implementation of *traffic signal prioritization (tsp)* technologies increases green time of traffic signals for approaching transit vehicles traveling along the mainline of the PRC. This reduces the delay experienced due to queuing for traffic signal cycles.

The *number of 1-way stops* that the proposed alternative may have direct impacts on the in-vehicle passenger travel time because of the added dwell time for boarding and alighting at on-line bus stops or passenger-requested flag stops.

The *1-way travel time* projected for each alternative utilized the baseline travel time of the No Build Alternative and estimated the time savings for each alternative through a serious of assumptions attributed to service, infrastructure or technology improvements of each. For more detail on 1-way travel time value assumptions, refer to the *Peoria/Riverside Corridor Alternatives Analysis Operating Cost Report (rev. 3/13/13)* for further information.

#### Perception and Visibility

Attributing factors used to evaluate *Perception and Visibility* performance included service, infrastructure or technology improvements that would improve the visibility and perceived image of Tulsa Transit within the community as a viable and attractive transportation alternative.

The deployment of *branded vehicles and stations* would distinguish new, high-capacity and/or high frequency services from the existing fixed routes by using branded vehicles and station shelters equipped with improved passenger amenities and technologies.

The installation of *dedicated transit lanes* would give drivers, pedestrian and transit users a consistent visual and operational reminder to consider transit within daily transportation related activities. Such improvements may help reinforce that transit is an integrated part of the overall transportation system and has been given a more prominent role in the Tulsa community

The deployment of *passenger technologies* includes posted transit system and connecting bus route information (PI), real-time vehicle arrival information via variable message signs (VMS), and off board fare collection via automated ticket-vending machines (TVMs) at designated stations.

Extending *daily hours of operation* to provide high-frequency passenger service beyond the peak evening commute times gives access to potential transit users who may work later or staggered shifts, or those who may want to travel to non-business destinations after work and still be able to complete their return trip home.

### Comfort and Reliability

Attributing factors used to evaluate *Comfort and Reliability* performance included service, infrastructure or technology improvements that would provide potential transit users with a comfortable waiting facility and refuge from severe weather; furnished with pedestrian amenities and decision making tools to instill confidence in trip planning capability.

The deployment of *passenger/pedestrian amenities* would only be deployed at stations designated for "Improved" and "Enhanced" improvements. Existing Tulsa Transit stops that are not coincident with the proposed PRC "Improved" and "Enhanced" stations will not be improved by shelters or significant passenger information upgrades. Alternatives proposed to continue local service stop frequency within segments of the PRC may improve additional fixed route stops with "Local" station enhancements.

Increasing service *frequency* would decrease passenger wait times, allowing for more effective timing of intermodal transfers with fixed routes. Greater trip planning reliability is also provided for passengers new to the Tulsa Transit system, knowing that the next PRC transit vehicle will is no more than 30-minutes away from arrival, whenever they arrive at a PRC station.

Improvements contributing to *on-time performance reliability* include: increased service frequency; projected 1-way travel time and real-time vehicle arrival (VMS) information. The perceived benefits or impacts to this attribute were evaluated on a low-medium-high gradient based on a comparison of all improvements deployed within an alternative.

The assessment of *accessibility* benefits includes factors impacting pedestrian walk access to station areas, including station spacing intervals and presence of sidewalk facilities. The perceived benefits or impacts to this attribute were evaluated on a low-medium-high gradient based on a comparison of all improvements deployed within an alternative.

### Safety

Attributing factors used to evaluate *Safety* performance primarily included infrastructure improvements that installed ADA compliant pedestrian facilities (including sidewalks and curb ramps), or features to increase pedestrian or passenger visibility and protection.

The construction of *sidewalks and ADA facilities* would make the PRC more walkable to pedestrians seeking to access transit or multimodal facilities such as the City's extensive trail system.

The installation of *pedestrian illumination* would occur around Enhanced and Improved PRC stations only. The additional illumination gives passengers additional security during night hours and reinforces Tulsa Transit facilities as designated "safe areas" for pedestrian refuge.

The installation of *pedestrian crossing protection* would occur at the nearest signalized intersection to proposed PRC "Enhanced", "Improved", and "Local" stations to facilitate the safe pedestrian arrival and circulation about the station areas, nearby activity centers and intermodal facilities.

## *Financial Feasibility*

The evaluation of financial impacts of deployment was a necessary and proper evaluation based on the Tulsa Transit's historic funding capacity for capital improvement projects as well as maintaining and expanding existing fixed route service. These criteria were: Support for Economic Development; Capital Cost; Incremental O&M Cost; and Percentage of Current Tulsa Transit Operating Budget.

### Support for Economic Development

Attributing factors used to evaluate *Support for Economic Development* included potential property impacts to community stakeholders, accessibility to jobs and labor pools, and magnitude of investment supporting further development.

The *commercial and residential property impacts* caused by construction of stations and pedestrian amenities may include (temporary or permanent) acquisition of right-of-way (ROW) and modifications to traffic circulation or access, which could disrupt businesses or residents.

Community *access to jobs and labor markets* would be expanded by more frequent service, shorter travel times and longer hours of operation, enabling greater utilization of transit for work-based trips.

Improvements that contribute to the PRC vision of *supporting further economic development* include improving pedestrian accessibility, implementing sustainable community development principles and investing in station areas with potential for joint development opportunities.

### Capital Cost

The projected capital cost of alternatives was an essential aspect of this alternatives analysis in order to shape the development of capital funding strategies to be pursued by the city of Tulsa and Tulsa Transit. Capital cost projections shown in Table 18 are presented in 2012 construction dollars. Figures include all applied construction, design, unallocated contingencies as well as an escalation factor to account for any changes in market pricing of construction materials and labor between the time of the estimate and the proposed beginning date of revenue operations.

(1 – 0) – $20 M or greater

(2 – 1) – $15 M to $20M

(3 – 2) – $10M to $15M

(4 – 3) – $5 M to $10M

(5 – 4) – Less than $5M

### Incremental Operations & Maintenance Cost

The projection of incremental increase to the existing Tulsa Transit annual operating & maintenance (O&M) budget (shown in Table 23) is a critical tool in the public involvement and local decision making process. Policy makers, city of Tulsa administrative staff, and potential local funding partners must determine the amount of additional revenues that must be raise in order to support the continued operations of Tulsa Transit at levels required by

implementing the proposed alternatives. The rating of Alternatives' incremental O&M cost was evaluated as follows:

(1 – 0) – $2 M or greater increase

(2 – 1) – $1.5 M to $2M increase

(3 – 2) – $1M to $1.5M increase

(4 – 3) – $0.5 M to $1M increase

(5 – 4) – Less than $0.5M increase

### Percentage of Current Tulsa Transit Operating Budget

A useful tool in evaluation and selection of a preferred alternative is the relative long term financial commitment of agency O&M budget needed to maintain alternatives' proposed service profiles. This comparison (shown in Table 23) highlighted the amount of resources that would be dedicated towards continued deployment of the new service versus known expense of existing route 105 annual revenue operations. Alternatives were rated based on the calculated proportion of the existing Tulsa Transit budget required for operations (as a percentage of the current total O&M budget of approximately $18 M).

(1 – 0) – Greater than 20% of current budget

(2 – 1) – 15% to 20% of current budget

(3 – 2) – 10% to 15% of current budget

(4 – 3) – 5% to 10% of current budget

(5 – 4) – 0% to 5% of current budget

## Evaluation Results

As stated within the Purpose and Need of this AA, the primary goals of this study are to identify a set of Low-Cost, High Impact transportation improvements that may be used to meet the mobility, accessibility, safety needs of the study area; as well as support the economic development potential and community vision for the PRC. Potential impacts of individual Build Alternative components to the existing infrastructure and transportation conditions of the PRC were evaluated in Chapter 7. However, an assessment of the overall performance of Build Alternatives' capital and operating scenarios was necessary to present policy makers with an objective, comprehensive view of alternatives from which to recommend a solution for implementation.

The final recommendation process included both technical evaluations and stakeholder engagement by the PRC Steering Committee. The PRC Steering Committee utilized the technical findings to issue an informed, final recommendation. Table 25 shows the results of the detailed evaluation of PRC alternatives.

Two alternatives surfaced as the best at meeting the needs and goals of the corridor, the *Fast Bus* and the *BRT 15/20*. A detailed description of the indicators factoring into the evaluation criteria ratings shown below may be found in the *PRC Evaluation of Alternatives Memorandum (June 2013)*.

Table 25: PRC Refined Alternative Evaluation Results

| Evaluation Criteria | No Build | Tulsa Plus | Tulsa Enhanced | Fast Bus | BRT 15/20 | BRT 10/15 |
|---|---|---|---|---|---|---|
| Travel Time | 0 | 1 | 2 | 3 | 3 | 3 |
| Transit Visibility & Perception | 0 | 1 | 2 | 3 | 3 | 2 |
| Comfort & Reliability | 0 | 1 | 2 | 3 | 2 | 2 |
| Safety | 0 | 0 | 2 | 3 | 3 | 3 |
| Support Economic Development | 1 | 0 | 2 | 3 | 2 | 2 |
| Capital Cost | 4 | 2 | 1 | 1 | 1 | 0 |
| Incremental Operating & Maintenance Cost | 4 | 4 | 2 | 2 | 2 | 1 |
| Feasibility – Percent of Current Tulsa Transit Operating Budget | 3 | 3 | 2 | 2 | 2 | 1 |
| **TOTAL SCORE** | **20** | **20** | **23** | **28** | **26** | **22** |

Scoring: (1 – 0), (2 – 1), (3 – 2), (4 – 3), (5 – 4),

One of the more resounding conclusions to be drawn from the detailed impact evaluation of alternatives is the apparent threshold to the scope of proposed service, infrastructure and technology improvements that combines optimal potential benefits with pragmatic investment. The *Fast Bus* and the *BRT 15/20* alternatives recommended by this evaluation propose scenarios of best fit to significantly improve service frequency, public perception and pedestrian accommodations of the public transportation system.

The Tulsa Plus Alternative provides only minimal opportunities for high-impact service, infrastructure and technology improvements and was rated to have a negligible effect on the overall mobility needs of the PRC. The Tulsa Enhanced Alternative was assessed to offer marginal improvements to mobility at an acceptable cost, but falls short of the AA goal of implementing a transformative, signature project for the community.

From the construction impact evaluation in Chapter 7, the Fast Bus, BRT Light (15/20) and BRT Light (10/15) Alternatives are the only ones that were assessed to have a net benefit to existing mobility services, infrastructure and technologies deployed within the PRC. Of these three alternatives, the Fast Bus Alternative most effectively meets the stated goals of this Alternatives Analysis, followed closely by the BRT Light (15/20) Alternative. Although the recommended improvements of the BRT Light (10/15) Alternative were found to meet the mobility needs of the corridor, the financial constraints of the city of Tulsa and Tulsa Transit make the implementation of the alternative less feasible.

The Alternative recommendation and adoption process concluding this Alternatives Analysis study will include technical evaluations as well as review and feedback of public stakeholders, including the PRC Steering Committee. Through a consensus building process, the PRC Steering Committee met and reviewed each alternative, the evaluation metrics and results. With unanimous consent, the PRC Steering Committee made the final recommendation of the BRT 15/20 Alternative.

## Recommended Alternative

The final Recommended Alternative, the BRT 15/20, was selected due to its opportunity transform the community perception and mobility within the corridor. The total trip time is 50-minutes with stations spaced every ½ mile to 1 mile. Bus frequency will range from 15- to 20-minute headways from 38th Street N to 81st Street S and will operate from 5:30am to 10:30pm, Monday through Saturday. The service will include a rapid local circulator traveling from 66th Street N to 38th Street N at 15-minutes frequencies.

The estimated capital cost (in base year 2012) is approximately $18.6 million. The operating cost estimate is approximately $2.33 million, a $1.03 million change from the existing Tulsa Transit operating budget. The additional annual operating budget represents about 13 percent of the FY 2012 annual operating budget for Tulsa Transit. The alternative requires a need for an additional seven (7) buses to operate the rapid bus service.

Traffic priority at signalized intersections will aid in reliable and efficient service. Patrons will enjoy extra passenger amenities to ease the transit experience with technologies such as, ticket vending machines, next bus arrival information at stations and improved route and system information. The Recommended alternative plans to improve safety conditions throughout the corridor with additional pedestrian crossings, sidewalk improvements and street illumination near major stations and stops.

### *Alignment*

The previously identified three (3) PRC segments with potential alignment options:

- North Alignment Option: Peoria Ave vs. Cincinnati Ave (from Pine Street to E 6th Street)
  - Peoria Ave is commercial and industrial use within this segment
  - Cincinnati Ave is residential corridor with an historically transit dependent population
- Midtown Alignment Option: Peoria Ave vs. Utica Ave (from E 6th Street to E 21st Street)
  - Peoria Ave is predominantly commercial and industrial use within this segment. Serves Pearl District
  - Utica Ave is predominantly the largest medical center in the area and contains several commercial retail centers.
- South Alignment Option: Riverside Drive to 81st Street South vs. Riverside Drive to 71st Street South (71st Street to 81st Street and Lewis Avenue, via Lewis Avenue)
  - Several residential developments currently served by the existing route 105 are present along the 71st Street alignment option

Alignment evaluation prioritized efficiency in transit operations and improvement of 1-way travel times. Maintaining rapid bus service along the PRC mainlines saves time by eliminating queuing due to turning movements and simplifies intermodal connectivity with complementary fixed route services along the corridor. As such, the recommended alignment option within the North and Midtown segments was Peoria Avenue. The South segment alignment was recommended to follow the existing route 105 alignment along 71st Street South and Lewis Avenue to maintain service to the higher density residential populations currently served. Tulsa Transit may also adjust PRC fixed routes to optimize potential for intermodal transfers between rapid bus and local bus routes.

### *Station Locations*

The Recommended Alternative includes local stops, improved stops and enhanced stops as illustrated in **Figure 28**. Major activity center and intermodal stations are included at the following intersections:

- Peoria & 66th Street North
- Peoria & 38th Street North
- Peoria & Pine Street
- Peoria & 6th Street North
- Denver Avenue Station
- Peoria & 41st Street South
- Peoria & 61st Street South
- Lewis & 81st Street South

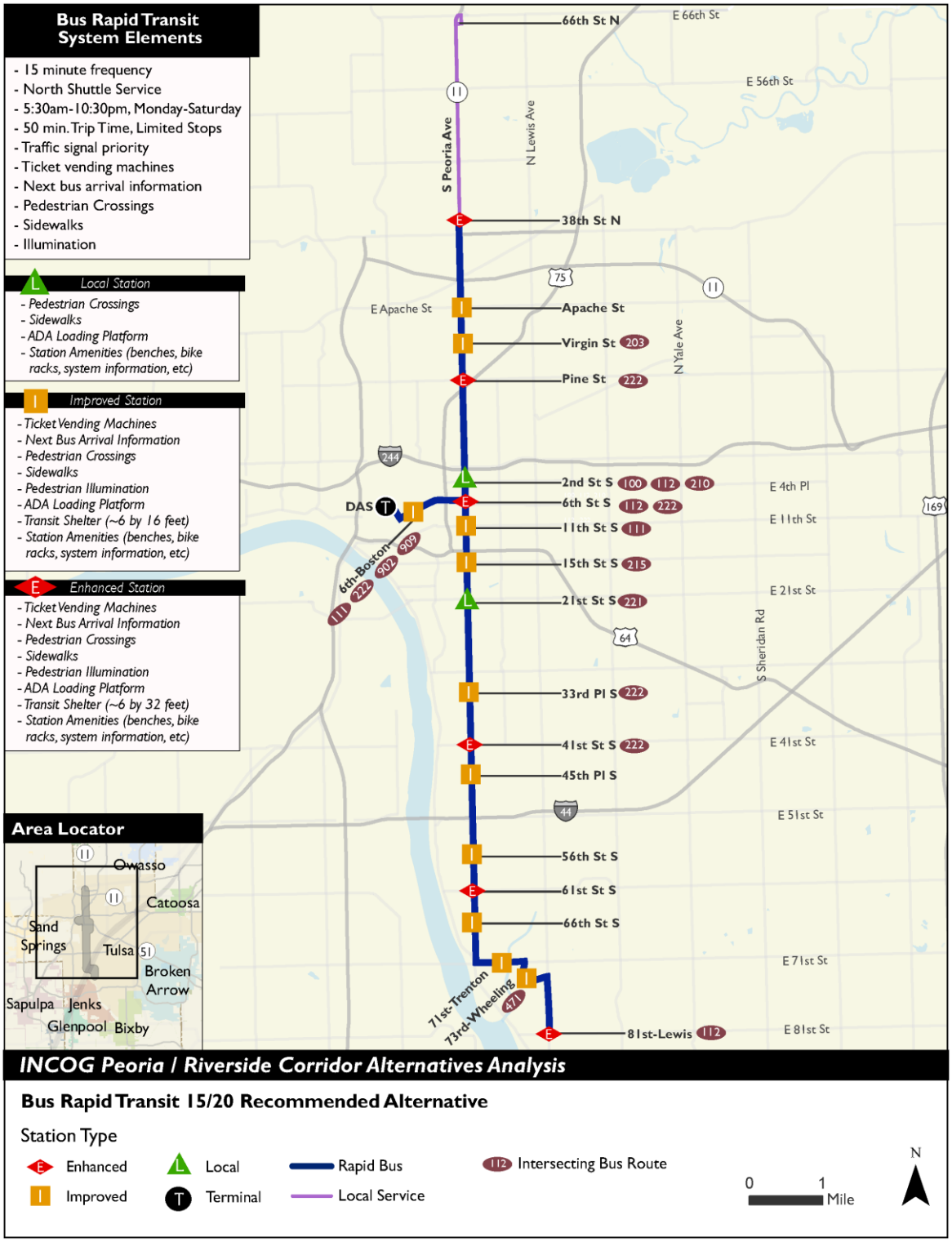
Table 26: PRC List of Station Locations

| | Location | Station Improvement Level | Adjacent Activity Centers |
|---|---|---|---|
| 1 | 38th St. N. | Enhanced | |
| 2 | Apache | Improved | |
| 3 | Virgin | Improved | |
| 4 | Pine | Enhanced | |
| 5 | 2nd & Peoria | Local | |
| | **Denver Ave. Station** | | |
| 6 | 6th & Boston | Improved | |
| 7 | 6th & Peoria | Enhanced | |
| 8 | 11th St. | Improved | Route 66 |
| 9 | 15th St. | Improved | Cherry St. |
| 10 | 21st St. | Local | Woodward Park |
| 11 | 33rd Place | Improved | Brookside/Riverparks |
| 12 | 41st St. | Enhanced | Brookside South |
| 13 | 45th St. | Improved | |
| 14 | 56th St. | Improved | |
| 15 | 61st St. | Enhanced | |
| 16 | 66th St. | Improved | |
| 17 | 71st & Trenton | Improved | |
| 18 | 71st & Wheeling | Improved | TV Guide |
| 19 | 81st & Lewis | Enhanced | Wal-Mart |

Table 27: PRC Amount of Station Locations by Improvement Type

| | **Locations** (i.e. 41st & Peoria) | **Bi-Direction Stations** (i.e. Southbound 41st & Peoria, Northbound 41st & Peoria) |
|---|---|---|
| Enhanced | 6 | 10 |
| Improved | 11 | 22 |
| Local | 2 | 4 |

Figure 28: PRC Recommended Alternative, BRT 15/20



The BRT 15/20 Alternative was presented to the following bodies and approved or endorsed by each.

- Metropolitan Tulsa Transit Authority; February 26, 2013
- INCOG Transportation Policy Committee; February 27, 2013
- INCOG Board of Directors; March 12, 2013

The final recommendation meets the goals and needs established in the early stages of the Transit Study. Below are several benefits of the Recommended Alternative and how each corresponds to the main goals of the PRC project:

- Improve Transit Access and Regional Mobility
  - Improves route connectivity and increase the overall mobility of the corridor
  - Catalyzes support for future investment
  - Increased intermodal opportunities
  - Increased pedestrian and ADA accessibility
- Support Economic Development
  - Promotes better job accessibility for local business with access to a larger employment pool
  - Ability to attract new Tulsa Transit ridership
  - Branding and improved transit stations may support transit support development
- Invest in Low-Cost, High-Impact Transit Infrastructure
  - Relatively low investment required for substantial in-vehicle travel time benefits
  - Minor operating policy changes dramatically improve efficiency
  - Inexpensive branding campaign improves visibility and public awareness
  - Low cost information technology systems attract riders through ease of information
  - Weather protection at passenger waiting area and basic amenity improvements have the potential for a large impact for patron satisfaction
  - Sidewalk improvements utilized by general public along with transit users will provide a benefit to the entire community
  - Low cost of construction
  - Improvements consistent with long range transit planning recommendations
- Build Community Support for the Value of Transit
  - More efficient service ensures community support
  - Successful implementation and wide utilization allows for more generated support for additional transit initiatives
  - Decreased wait time and on-time reliability will generate passenger confidence and endorsement
  - Creates safe zones, sidewalk infill and improves existing streetscapes
  - Minimalist scope and design result in minor construction impacts
  - Investment impact with within range of previous incremental budget increases and therefore is a reasonable investment for the community

# 11 | Implementation

Several steps are necessary to move the Recommended Alternative to a constructed BRT project under operations. The successful deployment of BRT operations within the PRC will be greatly determined by the due diligence of the Tulsa Transit and the city of Tulsa in preparing themselves and the PRC community for the transition to high-capacity, high-frequency service.

## Overview

- Successful implementation of the PRC BRT (recommended) alternative will require additional detailed engineering and environmental studies to locate stations and amenities where they have the most reasonable cost and least socio-environmental impact
- The optimal mix of capital financing and sustainable operating funding sources will be inextricably tied to which agency in the region operates service on the corridor
- The long-term success of the PRC will hinge on public sector agencies putting policies in place to promote transit supportive land uses along the corridor along with private-sector investments necessary to realize the PRC's full potential

## Deployment of Recommended Alternative

The BRT Light service would be implemented with 15- to 20-minute headway, operating on a 15 hour operating schedule from Monday thru Friday and12 hours of service on Saturday. The existing route 105 operates from approximately 5:30 am to 8:30pm (M-F) and from 6:30 am to 6:30 pm on Saturday at a 30-minute continuous headway, with an off peak period of 45-minute frequency from approximately 10:30 am to 1 pm. Existing fixed route service provided by Tulsa Transit would gradually be phased out; potentially after the first several months of BRT operations. The vehicles currently used to provide fixed route service on the route 105 may be repurposed to provide the recommended local circulator service on the PRC between N 36th Street and N 66th Street. The deployment of the BRT (15/20) alternative also gives greater flexibility to Tulsa Transit to reallocate existing fleet resources from the current route 105 to other fixed routes in order to improve service frequency at other areas of need within the Tulsa Transit system.

The initial redundancy of existing fixed route 105 and premium service lines within the same corridor may be confusing for passengers and an aggressive public information campaign would be needed during project construction leading up to operations. Information regarding peripheral changes to the Tulsa Transit system in support of the improved PRC service will be distributed system-wide as well. Targeted dissemination of information specific to PRC residents and employers emphasizing the forthcoming changes in stop frequency, in-vehicle travel time and connectivity with other existing fixed routes will precede revenue operations and continue through the PRC service transition period (length to be determined).

Next steps to further the development of the recommended PRC Alternative include: Project Scoping: Preliminary Environmental Coordination; Explore Financing Opportunities; and Transit Supportive Land Use Coordination.

## Project Scoping

It is critical to define the project to a sufficient level of detail in order to efficiently progress the project to the subsequent stages of project development: NEPA coordination, engineering design and construction. The project scope should also be developed in coordination with contributing city of Tulsa departments and agencies to maintain compliance with all existing local transportation policies, land use and guidelines for context sensitive infrastructure improvements.

In order to advance into design services, a complete scope of services needs to be developed. Full specifications developed by Tulsa Transit's engineering and real estate departments should include written specifications in technology choices, infrastructure improvement limits, station platform locations and vehicle selection. Finalizing station locations and level of improvement at each location is required as data collection for further impact assessments and stakeholder coordination continues. Corridor specific meetings with potentially effected stakeholders are standard practice in finalizing station locations. Public workshops based on station areas will help insure that locations and design criteria are tailored to the needs of each community.

Project scoping preparation should also include the development of a detailed project management plan, clearly identifying agency and staff responsibilities during procurement design, construction and continued operations of the PRC Recommended Alternative. Additional planning on the part of Tulsa Transit to develop a phased implementation strategy, public information campaign and optimization of fixed routes connecting to the PRC should be finalized prior to conclusion of engineering design.

Local adoption of the project scope and budget; as well as dedication of funding sources are also needed for project advancement. The scope of the proposed PRC project must be adopted into the city of Tulsa's fiscally constrained Transportation Improvement Plan (TIP) before professional engineering design or construction services can be procured. Refined estimates of capital and operational funding needs must also be determined in order to operate and maintain the existing Tulsa Transit system and new PRC services after construction. If Federal (or other alternative) funding is sought to supplement the local funding allocated toward the project, additional analyses, local agreements or legislative actions may be required.

## Preliminary Environmental Coordination

Coordination with Oklahoma Department of Transportation (ODOT) and any other regulatory agencies is important to initiate the environmental clearances needed to begin development of the project. Although, environmental documentation cannot begin until the project is in advanced level of development, numerous activities can be completed in preparation for the impact assessment. Data collection can commence prior to the environment documentation and a preliminary environmental constraints analysis may be conducted in order to determine the approximate magnitude of impacts that would be caused by the project and the appropriate level of environmental compliance documentation that will require review and concurrence in order to proceed with construction.

The National Environmental Policy Act of 1969 (NEPA) requires that the environmental impacts of proposed projects be described and evaluated as part of the decision-making process prior to the use of federal funding. NEPA establishes a nationwide policy of maintenance and enhancement of the environment, as well as a process for project development and environmental protection that all federally funded transportation projects must complete. It is anticipated that INCOG and Tulsa Transit will pursue the Programmatic or Individual Categorical Exclusion (CE) through the ODOT. The information required for application for a Programmatic/Individual CE includes, but is not limited to:

- Land Uses, Local Policies and Future Development Plans
- Cultural, Historic, Archaeological or Recreationally Significant Resources
- Socio-Economic Considerations and Environmental Justice
- Air Quality
- Effect of Proposed Improvements on: Travel Patterns, Traffic Levels, Transportation Resources, Parking and Modal Connectivity, Pedestrian and Bicycle Facilities
- Threatened and Endangered Species, Habitats and Vegetation Study

- Hazardous Waste Study
- Farmland and Floodplain Impacts
- Noise, Vibration and Sensitive Receptor Studies

## Financing Opportunities and Governance

In order to fund this PRC Recommended Alternative, INCOG and Tulsa Transit should seek opportunities for local, state, federal and private-sector financial support. Both capital and operating expenditures can be secured through multiple sources to ensure development and operations of the PRC Recommended Alternative. Outlets for financial investment include Federal, State and local support. Addressing long-term governance issues also serves as an important element of sustainable transit revenue.

### *Federal Finance Options*

It is important that the Peoria/Riverside Corridor project consider all potential funding sources including potential federal grant and financing and funding opportunities. It is recognized that the current and near-term federal transit funding picture is difficult. It is important however that INCOG, Tulsa Transit and other potential grantees continue to position themselves for available federal funding; including ongoing programs such as: the urbanized area formula grants, the surface transportation program and any funds that may be available under the current Map-21 (moving ahead for progress in the 21st century) Program.

In order to be in a position to take advantage of potential funding sources is important to conduct the proper technical evaluations to the level of detail and completeness required for submission of federal grants. Fortunately, federal grant programs appear to be providing more flexibility to local grantees in conducting their evaluation and planning processes. It still remains critical however, to position grant requests with the proper environmental clearance which will facilitate grant approval and release of funds. Completion of proper environmental clearances will also address important community and planning concerns. Proper environmental clearances will also position INCOG, Tulsa Transit and others as appropriate to take advantage of any potential federal funding programs which may arise such as the TIGER Grant Programs or the FTA, Housing & Urban Development (HUD), Environmental Protection Agency (EPA) Partnership for Sustainable Communities and Livability.

An important and growing aspect of federal funding is an assurance of maintaining the local transit system in a state of good repair. Just as it is important for the local jurisdiction to assure that the existing transit system is improved and maintained before moving forward with new capital and operating initiatives, it is also important to the federal funding sources that adequate funds continue to be made available to support and maintain the existing transit service and ensure that the system continues in a state of good repair. Funds must be designated or reserve funds provided for maintenance and proper replacement of capital facilities taking into consideration their useful life, which for example for a typical bus is 12 years.

While limited funds are currently available through the existing Map 21 Program planning, programming, environmental review and funding and implementation approaches should continue to monitor the ongoing formulation of a new federal transit funding program which will follow Map 21 which is unlike the current contentious political environment was passed, with strong bipartisan support and majorities in both the House and Senate, Map 21 expires in September 2014. Particular attention should be placed upon potential emerging federal transportation funding programs which could include innovative public/private funding programs, continuation of federal financial assistance through Transportation Infrastructure Finance and Innovation Act (TIFIA) loans, or the creation of infrastructure banks, and or the formulation of federal transportation block grants.

## *State and Local Finance Options*

Tulsa Transit currently receives funding primarily from the city of Tulsa general fund which is derived from sales taxes. Property taxes, by state law, are required to go to counties for local schools, vocational-technical education, libraries, and county government. Other potential local funding sources for Tulsa Transit include gas taxes, motor/vehicles taxes, bond proceeds, vehicle registration fees, and public-private partnerships. State and local capital infrastructure or maintenance budgets can be an important source of BRT project funds. Due to the fact that BRT can operate on mixed-use roadways, agencies have utilized state and local commitments for road reconstruction, streetscape improvements, and traffic signal upgrades

Engaging local project champions is also a powerful tool in advancing a project at the state and local level. Public-private partnerships are helpful in generating funding for joint development, operations or capital expenditures. Leveraging business interests in potential investment can create successful mutual partnerships. Advocating for transit-supportive policy changes can also position the project in a way that better assures its value to the community.

State and local financial resources will need to be explored. It appears that there are limited near-term opportunities for the state funding assistance. It also is desirable to reduce the dependence upon annual local general fund contributions. In any event it will be critical to document the benefits that transit service provides not just to the transit dependent population but to the overall economic development and competitiveness of the Tulsa region and the quality of life of Tulsa residents, both to those utilizing the transit system and those that benefit from the access that is provided for employees, students, the elderly, and people with disabilities.

Based on numerous evaluations of the economic impact of public transit investment, it is well documented that every dollar spent on public transit, there are four dollars in economic benefits. The environmental, energy, air quality, quality of life and economic development opportunities created by transit service should be continually documented and monitored. This will ensure the optimum benefit is generated by the transit services and that the local community understands the benefits that are created.

As has been the experience of other communities in Oklahoma, Texas and elsewhere dedicated funding sources may ultimately be required to support transit and or other public sector infrastructure and investments, and economic development that mutually support transit and community benefits and objectives. This could function as user type fees and benefit assessments or local or regional dedicated funding sources that could free up current general fund contributions.

In the summer of 2013, Tulsa area residents approved the PRC project to be included within the “Improve Our Tulsa” capital improvements package to support routine maintenance, repairs and upgrades to City of Tulsa infrastructure, public safety and recreational resources. The package is divided into two Propositions; Prop 2 is an extension of an existing sales tax, and Prop 3 is the issuance of general obligation bonds by the City. Results of the November 12, 2013 election will largely determine the local capacity to fund the construction of the PRC without additional State or Federal assistance.

## Private Sector Financing Options

Public-private partnerships should be explored to assure the transit system is provided at the maximum operating efficiency and positively contributes to the economic development and competitiveness of Tulsa. Opportunities for cost savings, sponsorships, job creation, and economic development are becoming increasingly important elements of transit funding. Transit service enhancements such as the Peoria/Riverside corridor may create specific opportunities related both to the enhanced service and accessibility provided and the capital facilities

enhances the local economy, directly generates business sales revenues, and private investments that potentially can encourage private sector interest and cooperation.

The private sector can efficiently and effectively be involved in either the capital and or operating aspects of public transportation. Private equity and or management expertise can be brought to the table which could include upfront capital investments, risk sharing or capital efficiencies. The creation of a dedicated funding source, the utilization of innovative financing and funding programs such as Transportation Infrastructure Finance and Innovation Act (TIFIA), could serve to attract private sector capital and management expertise.

The range of private sector involvement is broad. It could include specialized contracted services to a broader utilization of private sector contract and managed services. In terms of capital facilities it may be possible through the use of dedicated funds and or federal financial enhancements to potentially utilize a combination of design, build, finance, operate and maintain responsibilities for direct private involvement. Transit agencies in Texas, Colorado, Nevada, California and numerous other states have extensively utilized private sector involvement. There are also important supply chain aspects related to transportation investments. Many spinoff benefits are created to the local private sector. Oklahoma ranks 14th of all states in terms of primary transportation manufacturing supply chain concentrations. Three of the 124 prime locations, which directly employ 25,000-33,000 workers, have many more jobs in the secondary and tertiary supply chain.

### *Addressing Governance*

It is important for the Tulsa region to identify a sustainable revenue stream to enable financial stability for advancing transit services throughout the region. Continued coordination with local leadership to determine the most appropriate governance and financing schemes will make advancing the project as seamless as possible.

The first major element of addressing governance is to assure that a fair and equitable governance mechanism is created that has broad local community and political support. The development of a governance structure should not necessarily be specifically related to a specific capital program; but first assure a fair, equitable, legally authorized, implementable, and politically acceptable structure is created. The first act of an effective governing body is to assure that funding of the current transit system and programmed enhancements and/or improvements is addressed with mechanisms provided to assure its continued efficient and effective maintenance and operation. This includes assuring maintenance and operation, and the state of good repair as a fundamental priority before moving forward with various well documented and supported capital programs.

To effectively implement transit improvements recommended by the PRC Transit Study as well as the Regional Transit System Plan (RTSP), the region must address institutional and funding issues to ensure adequate public transportation support. Tulsa Transit is currently structured as a municipal trust of the city of Tulsa and therefore depends on annual local general fund contributions for operational and capital expenditures.

The Tulsa region has a range of funding mechanisms to help fund operations and capital expenses of basic transit services and future RTSP corridors. As the findings of the RTSP concluded, general fund revenues alone are not sufficient to support implementation of the RTSP. Both governance and finance decisions are important to the success of implementation of the PRC Recommended Alternative and additional corridors of the RTSP. Addressing governance is critical to ensure the feasibility of any agency, authority or department to maintain the level of service demands of the public.

Oklahoma statutes accommodate a range of local and regional governance options including three viable for the Tulsa region which include:

- Remain as a city of Tulsa Municipal Trust
- Create a city of Tulsa Municipal Department
- Create a Regional Transportation Authority (any combination of cities, towns and counties)

An approach to a more regional perspective in terms of transportation, land use, economic development, livability and sustainability may be desired. This would likely result in the creation of a regional authority which under current Oklahoma law cannot be a specific district but must be a combination of cities, towns, counties or their agencies. A Tulsa municipal approach, a county wide approach, a combination of cities and towns or a multi-County approach could be undertaken. Important factors would be the potential board membership allocation structure and the size of any governance board, either a small appointed board or a large appointed board with certain defined powers given to an executive subcommittee. A number of potential membership allocation approaches could be formulated based upon: population, revenue source, service provision, or other combinations thereof. The creation of a government source and potential dedicated funding sources is likely a more long-term option that needs to be explored, however it is not necessarily a prerequisite for moving forward with the Peoria/Riverside Corridor Plans.

## Transit Supportive Land Use Coordination

INCOG has the unique opportunity to begin coordination and review of zoning code updates to incorporate transit supportive land use designation along RTSP identified corridors. PLANiTULSA developed a process to revise existing land use policies, including the Small Area Planning process and the Zoning Code Updates. By playing an active role in the development of the new zoning designations and small plan designations, INCOG can serve as an advocate for transit supportive conditions that create a more conducive environment for successful and sustainable transit operation in the Tulsa region.

Transit supportive plans and policies should include land use, zoning, and economic development programs, public sector infrastructure investments, as well as, active efforts to encourage public-private partnerships and community participation. Land-use and economic development policies, public sector investments, institutional plans and investments and private sector development should be coordinated to optimize the efficiency and effectiveness of the transit service as well as achieving economic development, private investment and public policy objectives. The planning and the operation of any transit investment must not be conducted in a vacuum from land use and economic development policies.

The coordination of transportation, land use, economic development, planning, infrastructure and environmental is critical. This will serve to optimize both the efficiency of the transit system and the other important community objectives. Coordination of land use and development is also an important aspect of creating sustainable communities and addressing livability principles. Any transit investment should be designed to provide improved and enhance transportation choices that decreases transportation costs and creates opportunities for economic development, community health, and environmental enhancement.

Integrated transportation land use and economic development policies can improve the relationship between one's place of residence and their employment. This could also serve to promote equitable and affordable housing. By looking holistically at both transportation and housing costs equitable and affordable housing can be promoted and the economic competitiveness of the region enhanced. Improved and more efficient access to employment, education, and support services will also enhance and facilitate the growth of the local economy. The public and private sectors should become partners in business development expansion, retention and attraction and improving labor force access to jobs.

Concentrated and coordinated transportation, infrastructure, institutional, governmental and private sector development such as could occur in the Peoria/Riverside Corridor could serve to support existing communities along and adjacent to the corridor, creating enhanced benefits to the local communities and the community at large. Local communities should be valued and neighborhoods respected. This would serve to both garner support for transit and other public sector actions; enhance the quality of life of existing residents; and, the economic strength and competitiveness of the larger community. Finally, coordinated land use and economic development policies are important aspects of attracting federal and private sector dollars to leverage transit investments and redevelopment and development opportunities. By effectively delineating planning, economic development, and transportation needs in pursuing goals and implementing local plans and policies successful funding plans and projects can be created.