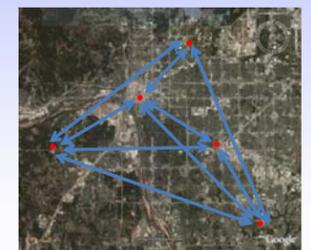
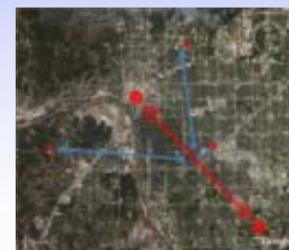
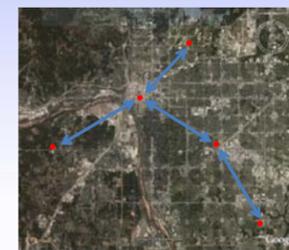
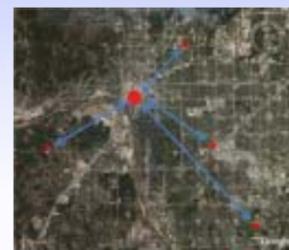
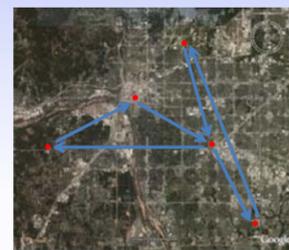
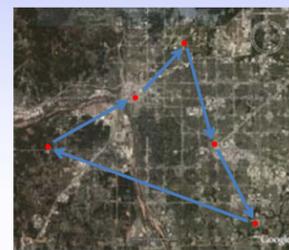


Tulsa Community College Transit Feasibility Study





The University of Oklahoma
Graduate College

Tulsa Community College Transit Feasibility Study

A Professional Project
Submitted to the Graduate Faculty
in partial fulfillment of the requirements for the
degree of

Master of Science in Architectural Urban Studies

By

Nathan J. Kuntz
Tulsa, Oklahoma
2009

A Professional Project approved for the
College of Architecture
Urban Design Studio

By

Shawn Michael Schaefer, Chair
Showa Omabegho, Ph.D
Hans-Peter Wachter
Christina Hoehn

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Urban Design Studio
 University of Oklahoma
 College of Architecture

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Report by Nathan Kuntz

Abstract

Tulsa Community College

This study explores the feasibility of Tulsa Community College implementing a transit service system to conduct routes that serve all TCC's campuses, and feasibly, neighboring partner campuses.

My research involved case studies and personal interviews to provide an understanding of transit operations. I specifically studied how universities implement transit systems and their general operation costs.

Methodology used to determine if a demand was present for TCC transit service was best served through a campus-wide survey. This survey relates to transit as well as transit needs assessment which help determine specific needs of TCC. The survey was posted for two months on TCC's website and was available to all website users.

Initial survey analysis indicated a demand for transit service. Additional in-depth survey data analysis helped design transit topology and route implementation.

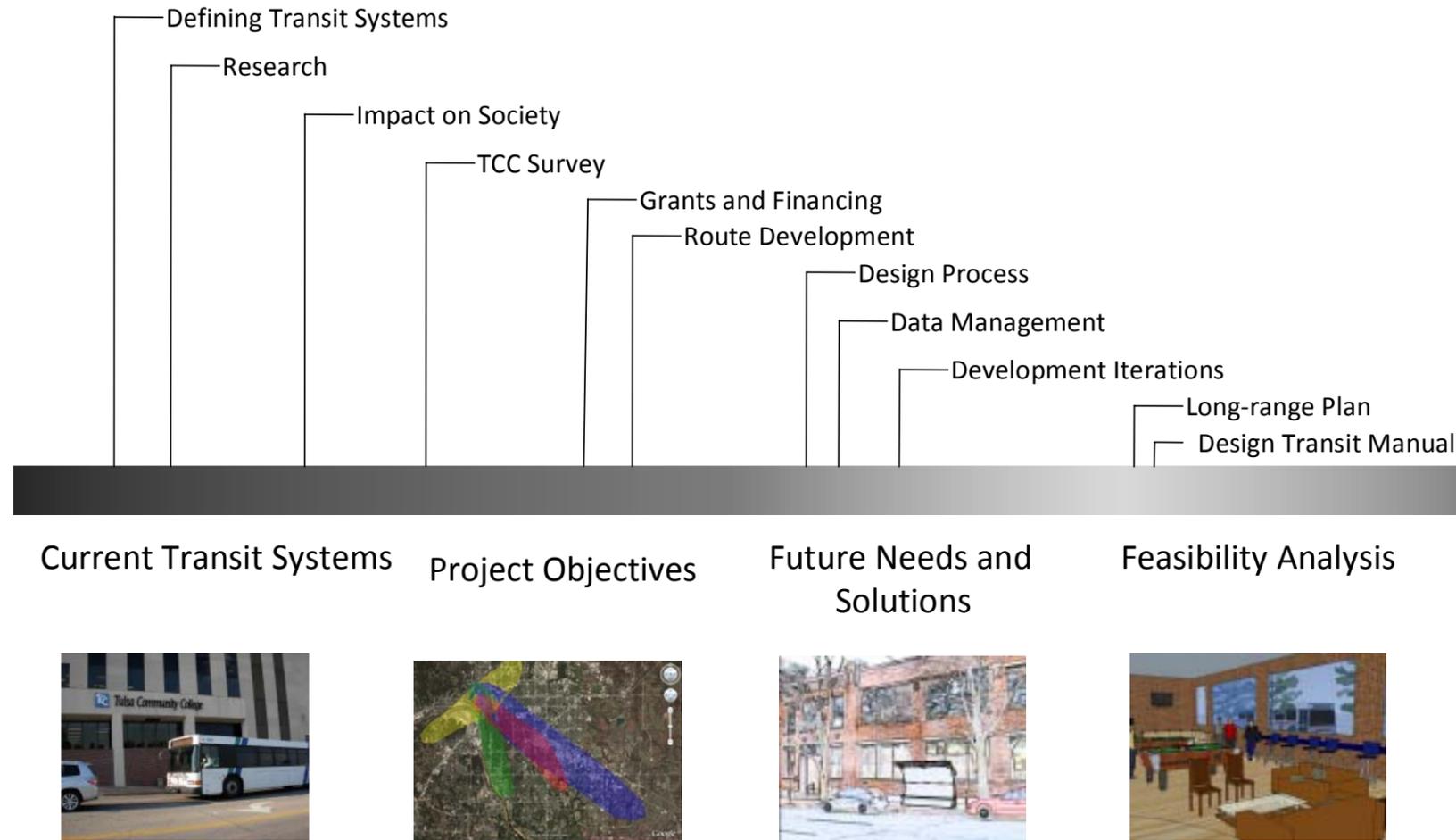
My study also included transit facility design, financial estimates, and innovative transit concepts unique to TCC and the greater Tulsa area.



Project Schedule

Research and Design

TCC Transit Feasibility Study



Research - 1st quarter

- Public Transit Background
- Tulsa Community College Study
- Tulsa Transit Study
- Case Studies
- Route Topologies

TCC Survey, Funding, and Route Timing - 2nd quarter

- Initial TCC Transit Survey Results
- Specific Route Timing
- Grants and Financing

Demand Analysis and Design - 3rd quarter

- Survey Analysis
- Specific Demand
- Transit Facilities Design
- Transit Cost Estimates

Bookmaking - 4th quarter

- Drafting and Production
- Editing and Proofing
- Reading Copy - first reading
- Second Proof
- Final Report



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Project Guideline

Common Public Transportation Goals and Objectives

- Reduce the Operating Subsidy per Passenger
- Reduce the Total Operating Subsidy
- Save Travel Time for Transportation System Users
- Focus Development in Selected Areas and Breach Geographic Barriers
- Transform a Locale into a Different Type of Environment
- Improve Transport System Safety and Security
- Reduce Travel Time to Improve Scheduling Efficiency
- Provide Alternatives Under Road Congestion Pricing
- Reduce Energy Consumption and Greenhouse Gas Generation

Goals and objectives for this project were established through several meetings with Tulsa Community College administrators, faculty, staff, and students along with public transportation professionals.

Tulsa Community College Project Goals and Objectives

- Understand the Need for Transportation
- Allow Student/Faculty Greater Access to all TCC Facilities
- Increase Enrollment College Wide
- Target Specific Degree Programs for Expansion
- Create a Sense of “One College.”
- Help Reduce Congested Parking
- More Affordable Means of Travel for Both Students and Faculty
- Reduce Energy Consumption and Greenhouse Gas Generation

Needs Assessment

Tulsa Community College located in Tulsa, Oklahoma has four separate campuses among the Tulsa area. These campuses offer many of the same general education courses but the campuses also specialize in targeted degree programs.

This multi-campus operation creates a demand for travel among campuses. Students often attend classes at multiple campuses, faculty and staff attend meetings held at other campuses, and course material is often to be purchased at another campus, all of which, students and faculty must arrange for their own transportation.

Tulsa Community College has established a goal of creating a “One College” environment. Currently the campuses are associated being disconnected and operating almost independently. Courses offered among the college do not necessarily use a college wide textbook for the same course. Students who enroll for internet courses offered through TCC typically are required to purchase the course materials at the Northeast Campus Bookstore. Scheduling of the courses is also a concern, although measures are taken to prevent course duplication of times offered, no system is currently in place to create a college-wide scheduling system.

Through the study, I determined that there is a demand for a transit system among Tulsa Community College campuses. This was accomplished by a college-wide survey that collected data from TCC students, faculty, and staff.



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Public Transportation

Background and Trends

Public transportation has been available since 1826 and occurs through several modes. Travel by boat, rail, bus, and airline are all classified as public transportation. Most often though, public transportation is typically by bus. Public transportation was at the pinnacle of its ridership numbers with the United States during the 1920s until the end of World War II. The popularity of the personal automobile was soon replacing public transit modes and reshaping the design of our cities, creating outlying suburbs, and in many cases edge cities.

The United States has been affected by the automobile and reluctance to use public transportation systems. The problem lies in destinations too far apart and density levels too low. The result of reliance on automobiles is specific land use policy and congested cities.

However, in recent years, public transportation has experienced a resurgence brought on by economic factors and increasing environmental concerns such as global warming. Studies conducted by the Environmental Protection Agency (EPA) and Federal Transit Administration (FTA) have concluded that public transportation reduces carbon dioxide emissions, saves money, promotes a healthy lifestyle, influences growth patterns, provides mobility of goods and services, and stimulates economic activity.



Photo provided by APTA



Photo provided by California University of Pennsylvania



Photo provided by UMASS Transit



Photo provided by Federal Transit Administration

Tulsa Community College

Enrollment Analysis

Tulsa Community College has a total student enrollment for 2008 Fall semester of 24,540. This number is divided throughout the TCC campuses with Southeast Campus having the highest student enrollment at 9,089, followed by Metro Campus with 7,276, Northeast Campus at 5,046, and West Campus being the smallest with a total student enrollment of 3,129. The TCC Conference Center typically does not conduct student classes.

Looking at the number of TCC faculty and staff, the numbers reflect student enrollment.

Southeast	751
Metro	679
Northeast	506
West	248
Conference Center	165

Figure 1: Graph representing TCC student enrollment for the 2008 Fall semester.

Figure 2: Graph representing TCC full-time student equivalent enrollment for the 2008 Fall semester.

Fall 2008 Student Enrollment Statistics

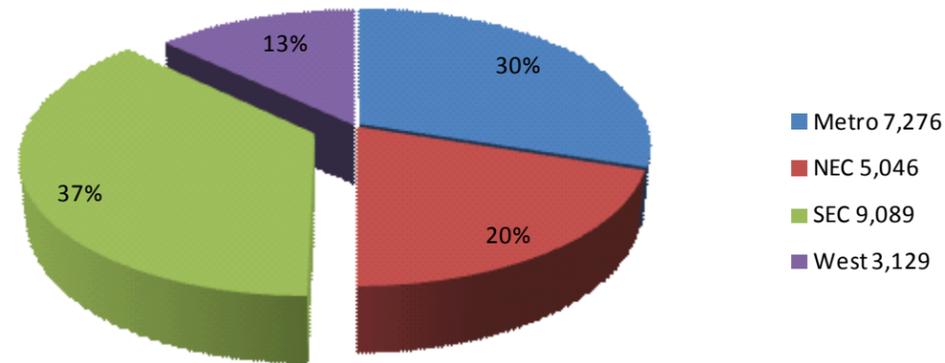


Figure 1
Data provided by Tulsa Community College

Fall 2008 FTE Student Enrollment Statistics

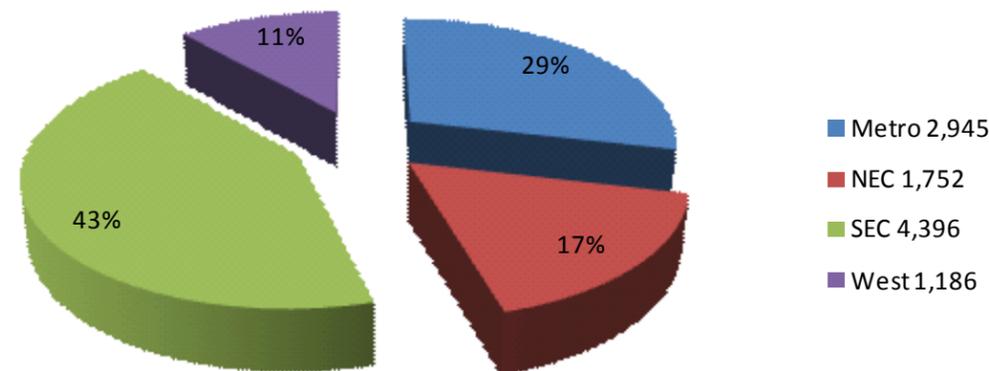


Figure 2
Data provided by Tulsa Community College



Tulsa Community College

Metro Campus

Metro Campus of Tulsa Community College is located at 909 S. Boston Ave, Tulsa, OK within the central business district. This unique location inside the inner dispersal loop of Tulsa offers a geographical center for TCC campuses and is about 8 blocks away from the Tulsa Transit downtown bus station.

Metro Campus has the second largest student enrollment of 7,276 for Fall 2008. It also has an emphasis on health sciences with academic programs such as nursing, allied health, and dental hygiene.

TCC's newest construction at Metro Campus is located directly west of the main academic building. This new building is named "the Center of Creativity," and will house art and technology divisions.



Figure 2



Figure 3



Figure 4

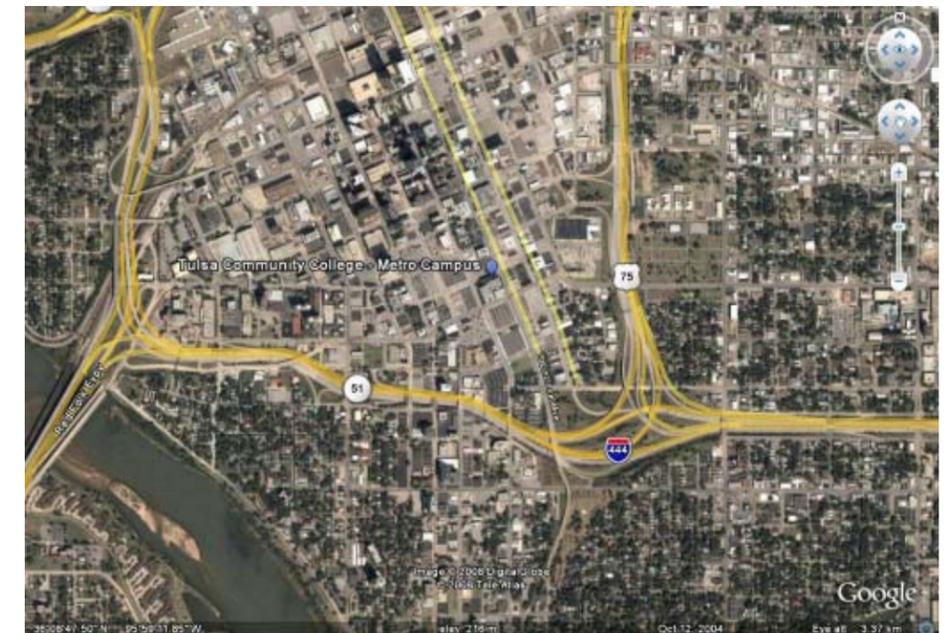
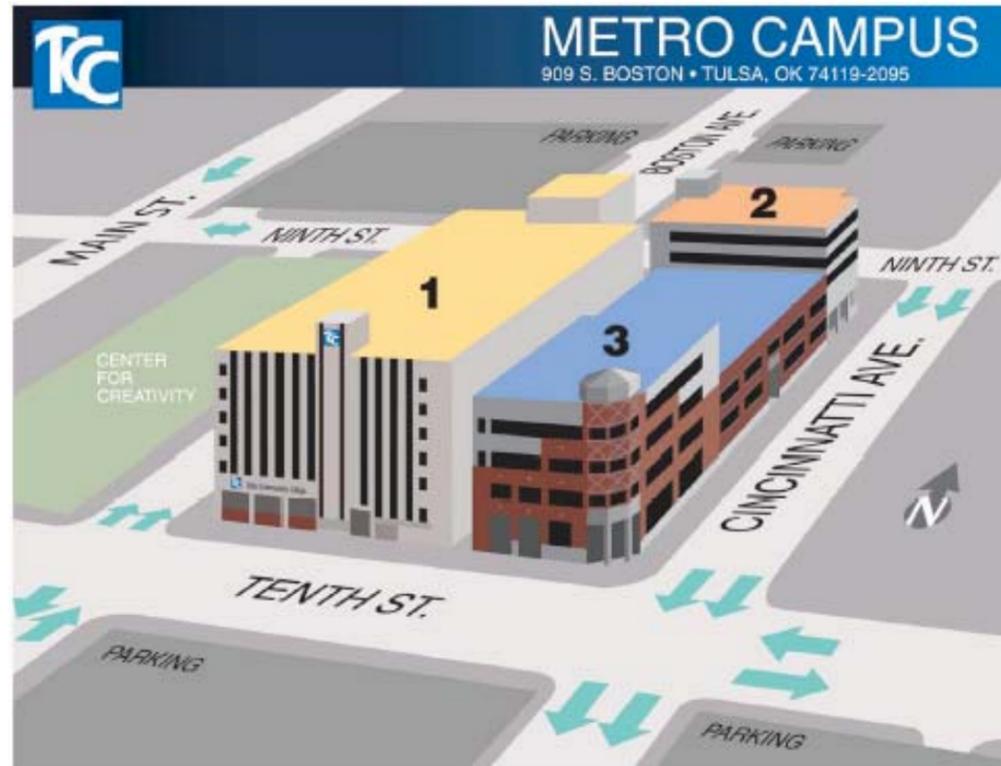


Figure 6

Aerial photography provided by GoogleEarth



- 1. Main Academic Building**
 - Admissions/Enrollment Services
 - Counseling and Testing
 - Advisement
 - Assessment
 - disAbled Student Resource Center
 - New Student Intake
 - Bursar Services
 - Distance Learning
 - LRC
 - Financial Aid and Scholarships
- 2. Alfred M. Philips Health Sciences Center**
 - Auditorium
 - Dental Hygiene Clinic
- 3. Student Union**
 - Campus Cafe/Vending Services
 - Campus Store
 - Fitness/Wellness Center
 - Student Activities Office



■ = PARKING

Figure 1

Data provided by Tulsa Community College

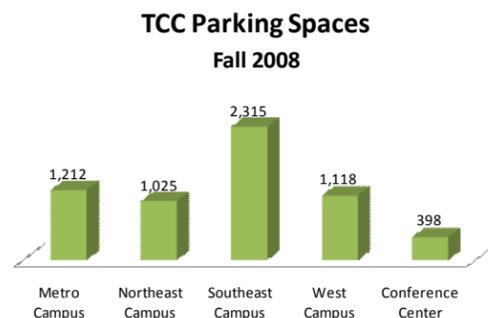


Figure 5: Parking Space statistics

Parking is also a concern for TCC. West Campus and Northeast Campus have ample parking lots per students and Metro has sufficient of parking as well but struggles with identifying the location of several parking lots. Southeast Campus has the largest parking concern. Initial site analysis does allow for newly contrusted parking lots, along with better design, will help relieve parking issues.



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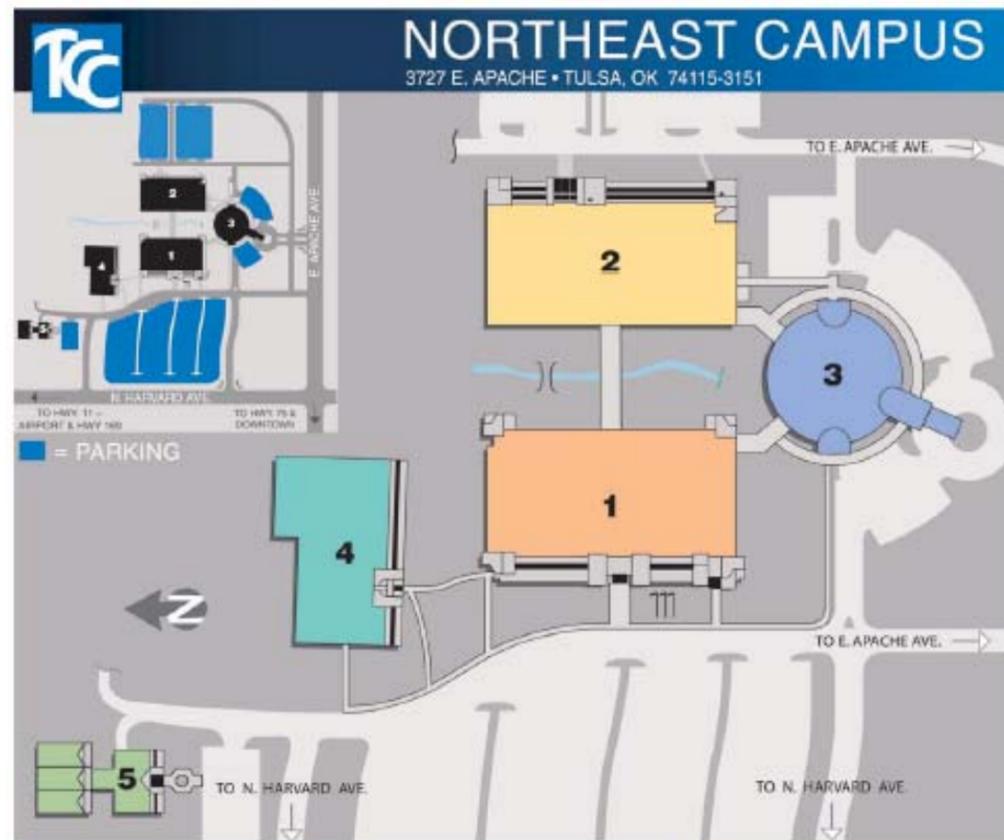
Tulsa Community College

Northeast Campus

Tulsa Community College Northeast Campus is located at 3727 E. Apache, Tulsa, OK near highway 11/Gilcrease Expressway. Many facilities in the surrounding area are distributive centers and manufacturing buildings.

Northeast Campus has an educational focus on technology, engineering, aviation sciences, and an expanding fire and emergency services program. This program plans to build a facility directly east of the existing campus.

Enrollment of the Northeast Campus for Fall 2008 consist of 5,046 students, of that number, 1,752 students are full time equivalent. Student enrollment for Northeast Campus has increased 12% from the 2007 school year.



- | | | |
|--|---|--|
| 1. Main Academic Building <ul style="list-style-type: none"> • Campus Police • Learning Resource Center • EMERGE Office • Assessment/Testing Services • Division Offices • Board Room • Seminar Center • Large Auditorium • Continuing Education • Resource Center for the Deaf and Hard of Hearing • Tulsa Achieves | 2. Student Union <ul style="list-style-type: none"> • Dean of Student Services • Campus Store • Bursar's Office • Welcome Center/Admissions & Enrollment Services • Career Services/Academic Advisement • International Student Services • Financial Aid • Campus Cafe • Small Auditorium • Multicultural Language Center • Student Activities/Fitness Center | 3. Enterprise Building <ul style="list-style-type: none"> • Provost Office • FACET Center/Computer Lab • Academic & Campus Services/Part-Time Instructor Support |
| | 4. Technology Building <ul style="list-style-type: none"> • Nanotechnology Lab • Manufacturing • Engineering • Electronics • Drafting | 5. Green Country Horticulture Center <ul style="list-style-type: none"> • Greenhouse • Classrooms |

Figure 1

Data provided by Tulsa Community College



Figure 2: Parking Space statistics



Figure 3



Figure 4



Figure 5



Figure 6

Aerial photography provided by GoogleEarth



Report by Nathan Kuntz

Tulsa Community College

West Campus

West Campus is located at 7505 W. 41st Street, Tulsa, OK. This location is targeted toward serving communities of Sand Springs, Sapulpa, Glenpool, and other communities located west side of the Arkansas river.

This is the newest TCC Campus and is currently adding onto the Science and Mathematics division. West Campus has the fewest students enrolled for Fall 2008 semester at a total of 3,129.

The College's Veterinary degree program is offered only at the West Campus. The campus also hosts programs such as Child Development and Hospitality and Gaming Operations programs.

Currently, there are no bus routes serving West Campus.



Figure 3



Figure 4



Figure 5

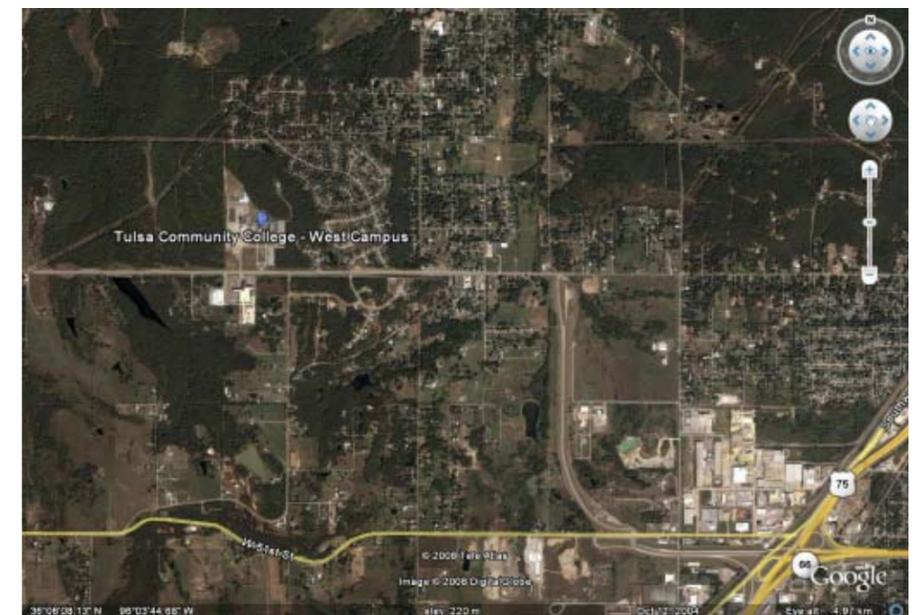
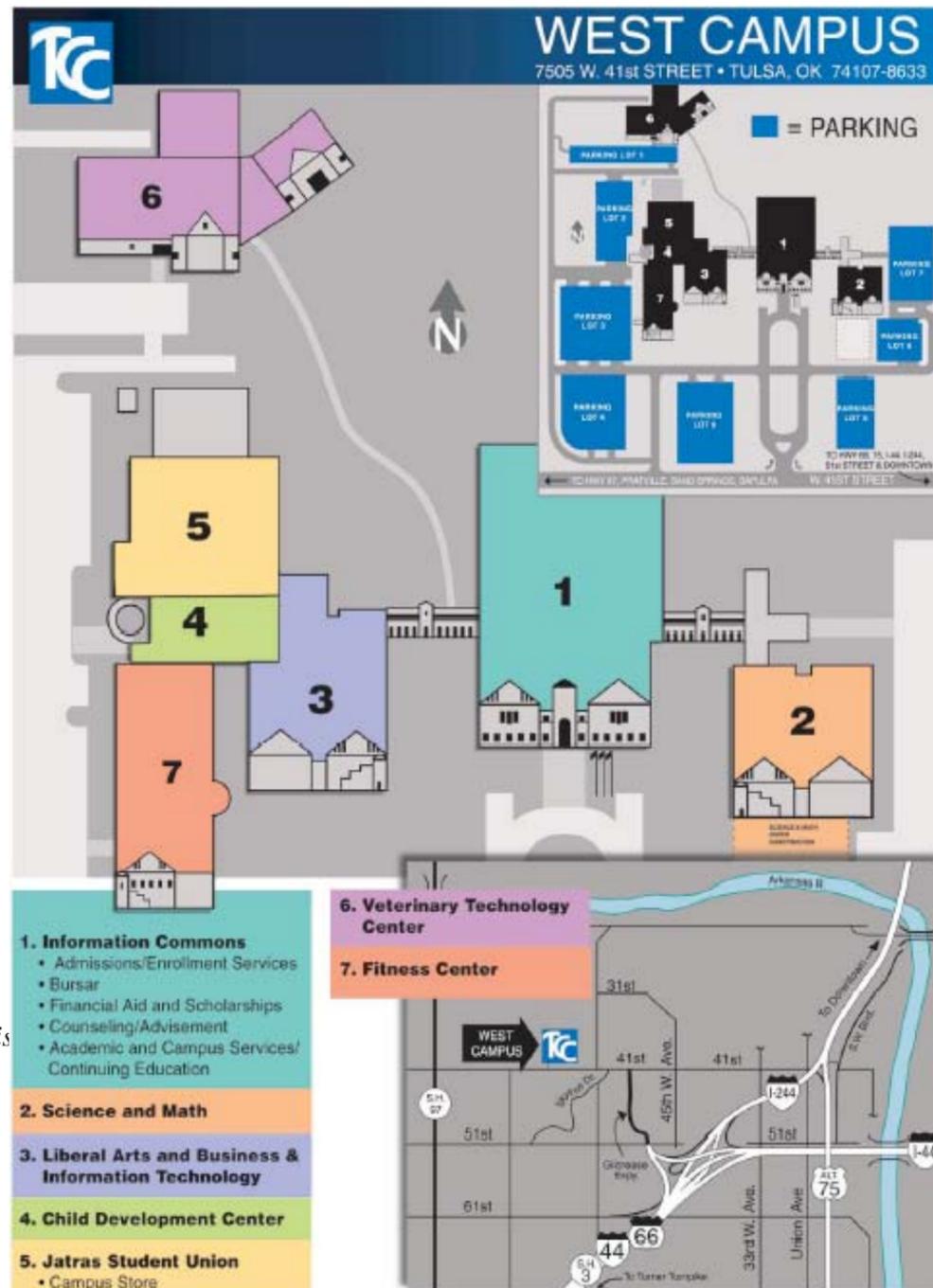


Figure 6

Aerial photography provided by GoogleEarth



This

Figure 1 TCC Parking Spaces Fall 2008 Data provided by Tulsa Community College

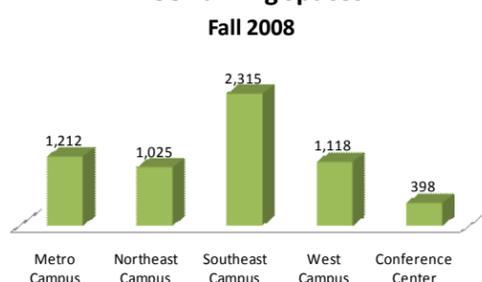


Figure 2: Parking Space statistics



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Tulsa Community College

Conference Center

Tulsa Community College's Conference Center is located at 6111 East Skelly Drive along highway 44 and south of Broken Arrow Expressway. This location is almost directly a mid-point between Metro Campus and Southeast Campus.

The Conference Center contains the administration body of TCC as well as marketing, human resources, and grant development. The building is also shared with Tulsa Technical College.

There are frequent employee training classes offered at this facility, but actual student classes are few and are typically offered as evening classes.

The Conference Center has the smallest population of all TCC facilities



Figure 1

Data provided by Tulsa Community College

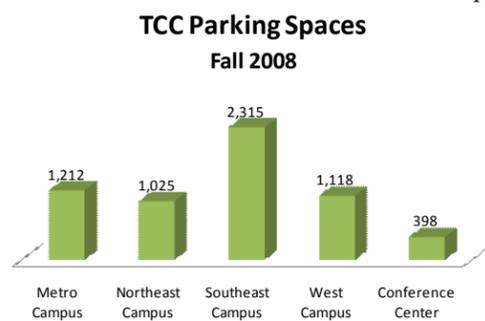


Figure 2: Parking Space statistics



Figure 3



Figure 4



Figure 5

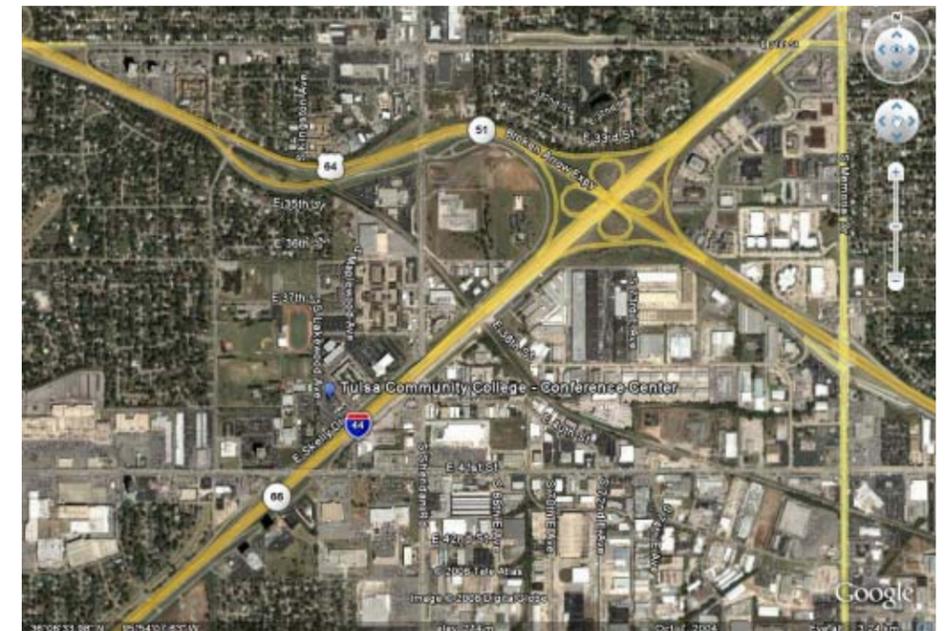


Figure 6

Aerial photography provided by GoogleEarth



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Tulsa Transit

Current Conditions

Established in 1968 Tulsa Transit has approximately 180 employees governed by a seven member board appointed by the mayor. The mission statement of Tulsa Transit is to offer a premier transit service that is safe, professional, efficient, reliable, and accessible.

For specific Tulsa Transit routes currently serving TCC campuses refer to appendix page 60.

Number of Employees: 180
Service Area Population: 389,410
Square Mile Service Area: 197

	FY08 Actual	FY09 Budget
Operating Revenues	\$2.6m	\$2.9m
Grant Revenues	\$14.9m	\$15.8
Operating Expenses	\$17.5m	\$18.7m
Capital Funding	\$3.0m	\$2.3m

Ridership FY 08

Fixed Route	2,520,000
Lift	230,000

Vehicles
 Fixed Route vehicles - 63
 Lift Program vehicles - 49

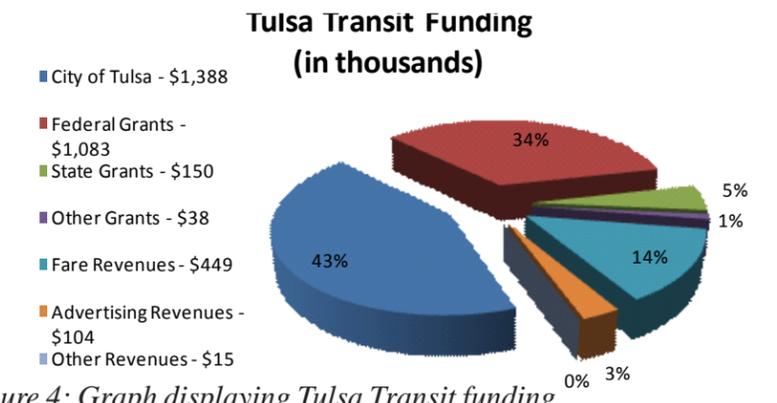
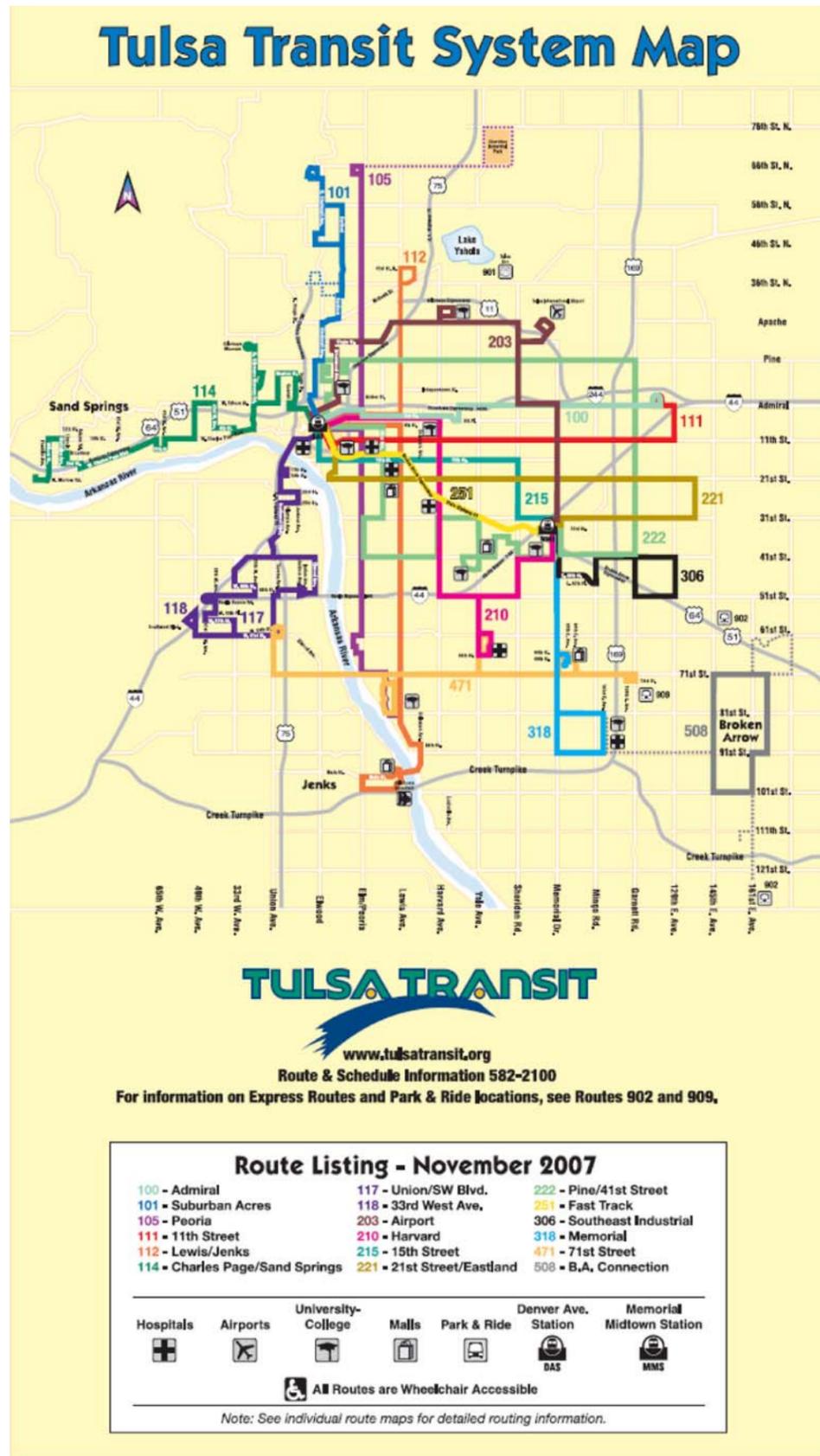


Figure 4: Graph displaying Tulsa Transit funding Data provided by Tulsa Transit



Report by Nathan Kuntz



Data provided by the Metropolitan Tulsa Transit Authority



Figure 2

FARE PRICES	
CASH FARES	
Adult	\$.25
Youth (Up to age 18)	\$.10
Children (4 and under)	FREE
Reduced*	\$.60
Lift Card Holders	\$.60
Approved escorts for Lift Card Holders	FREE
Express Routes	\$.50
Express Routes Reduced*	\$.75
10-RIDE FARE CARDS	
Adult	\$10.00
Youth	\$8.00
Express	\$12.50
Reduced*	\$5.00
- (when used on Express route, add \$0.15 per trip) -	
10 Lift Program Tickets	\$25.00
TRANSFERS	
When transferring from a Fixed Route to an Express Route please add .25cents with transfer. (see pages 8 & 9 for more information on transfers)	FREE
UNLIMITED RIDE PASSES	
The unlimited ride passes are good on local routes only. Extra .25 fare is required if riding an Express route. The Day Pass is good for unlimited rides on the day you first use the pass. It will expire at the end of the service day on the day it was first used. It will be valid for Nightline service on the day it is activated. The 31-Day Pass is valid for 31 days beginning the day you first use the pass.	
Regular:	
1-Day Pass****	\$.30
31-Day Pass	\$40.00
Reduced Fare:**	
1-Day Pass	\$.15
31-Day Pass	\$20.00
(Youth age 18 and under are also eligible to utilize the Reduced Fare Day Pass and 31-Day Pass, but may be required to show proof of age when using the pass.)	
Super Seniors 75 and older***	FREE
Tokens (in pack of 50)	\$50.00
Tokens are available at our Denver Avenue Station. Please call 582-2100 to order.	

Figure 3

Tulsa Transit

Survey

Metropolitan Tulsa Transit Authority recently conducted a survey open to the public. This survey was composed of specific transit related questions along with demographic questions to gain a better understanding of who is using Tulsa Transit and how can Tulsa Transit could be improved. I have selected a few survey questions along with the results. Questions listed here relate to the Tulsa Community College transit feasibility study by providing common issues and current rider demographics.

The most common request listed through the survey is to increase route frequency, in turn, shortening headways. This is a major factor on ridership numbers.

This survey also shows that the majority of riders are required to take two bus routes before reaching their final destination. Relating to headway times, this again is another player on whether or not people choose to ride the bus. Other results posted show the average age of riders and why they typically ride the bus.

Figure 1: Graph depicting that the majority of Tulsa Transit riders typically need to take more than one bus to reach their final destination.

Figure 2: Analysis of most common bus trip among Tulsa Transit riders.

Figure 3: When asked Tulsa Transit riders what improvements you would like to see, 43% responded that they would like to see more frequency of bus trips.

Figure 4: Graph portraying age distribution of Tulsa Transit riders.

Data provided by Metropolitan Tulsa Transit Authority

How many bus routes do you normally take to get to your final destination?

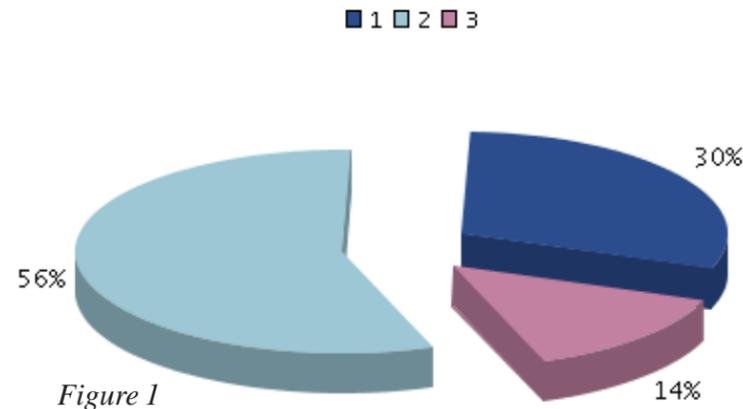


Figure 1

What is the purpose of your most common bus trip?

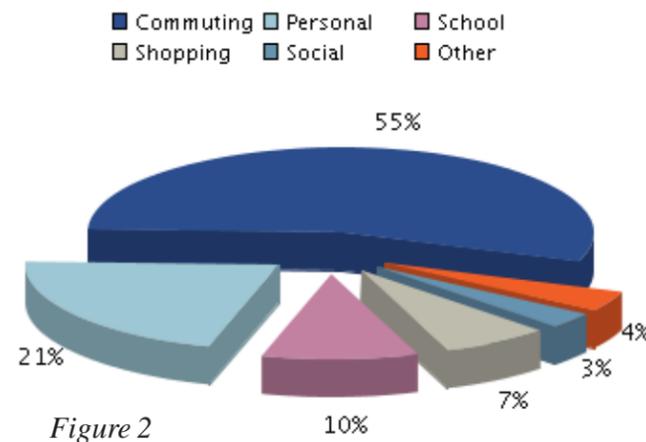


Figure 2

Which one improvement would you like to see?

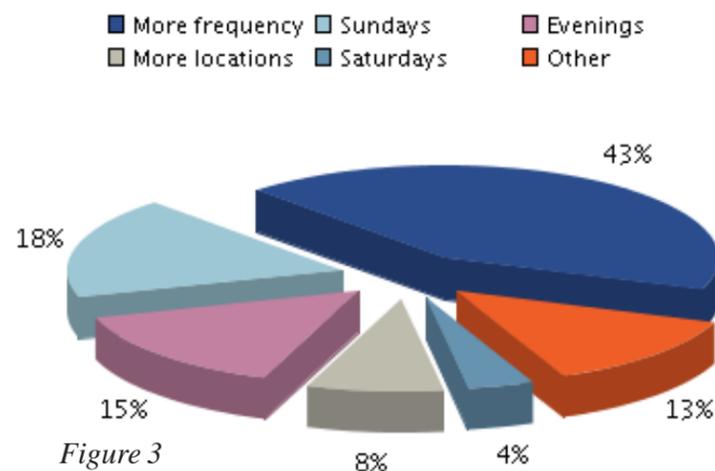


Figure 3

Your age?

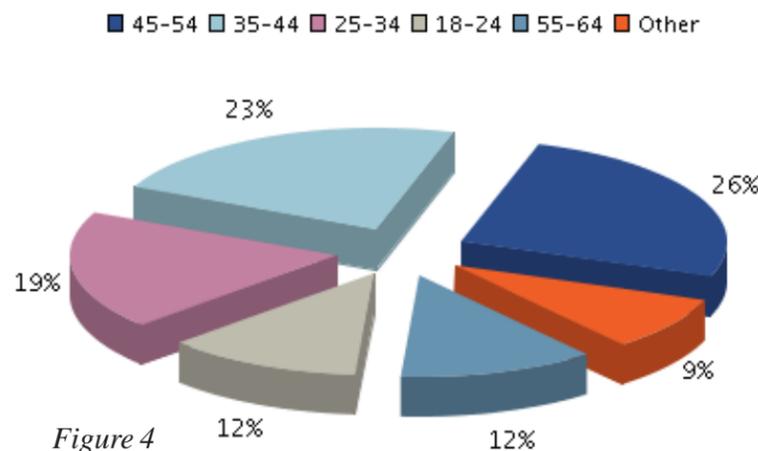


Figure 4



Tulsa Transit

Conditions with TCC

Tulsa Transit currently has routes that stop at some Tulsa Community Campuses, but other facilities such as the Conference Center and TCC West Campus do not have routes that stop at their location. Other means of transportation or walking would be required to reach either of these destinations.

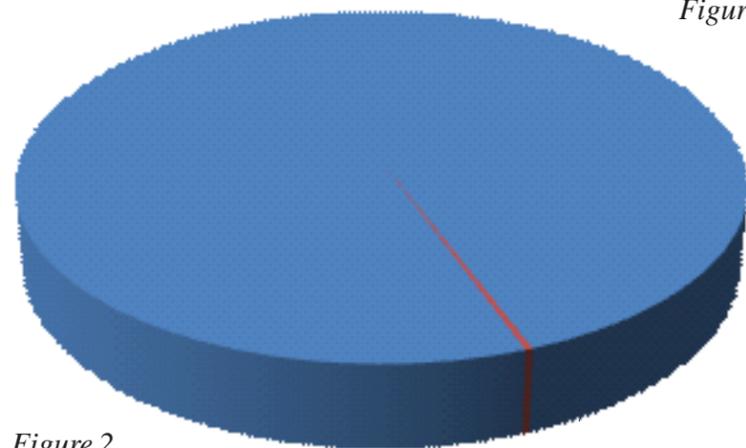
Existing routes among campuses are time consuming and become impractical for commuting to and from campuses to attend classes or meetings. Most routes require a transfer and have several stops between their final destinations.

Figure 1: shown to the left, depicts average times for buses and cars traveling between campuses. Only campuses that have current Tulsa Transit routes are shown. Riding time for buses excludes any headway times which could significantly increase travel times. Routes traveling in opposite directions are also available and typically have the same average time, except for Northeast – Southeast travel time. If a rider rode the bus from Southeast – Northeast, riding times would actually average 89 minutes while a car averages 21 minutes.

Figure 2: Current TCC students/employees may purchase Tulsa Transit bus passes at all three TCC campuses except West Campus where there is no current bus service. TCC sells Tulsa Transit's 10 rides for 10 dollars package, which is available to the public and not a special student/faculty discount. Northeast Campus averages selling about 10 packages a month, Metro sells approximately 30 packages, and Southeast also sells approximately 30 packages in a month. This data does not show whether students/faculty are travelling between campuses, but it does show less than 1% of ridership for total student enrollment.

Figure 3: Cost analysis of choosing whether to ride the bus from campus to campus clearly shows that riding the bus does save money, but because of the value of people's time, it becomes cost neutral. Amount calculated for car travel was based on Tulsa Community College's travel reimbursement rate of .505 cents per mile.

TCC ridership



- student enrollment Fall 2008 - 24,540
- student bus tickets sold per month - 70

Figure 2

Data provided by the Metropolitan Tulsa Transit Authority and Tulsa Community College

Travel Time (in minutes)

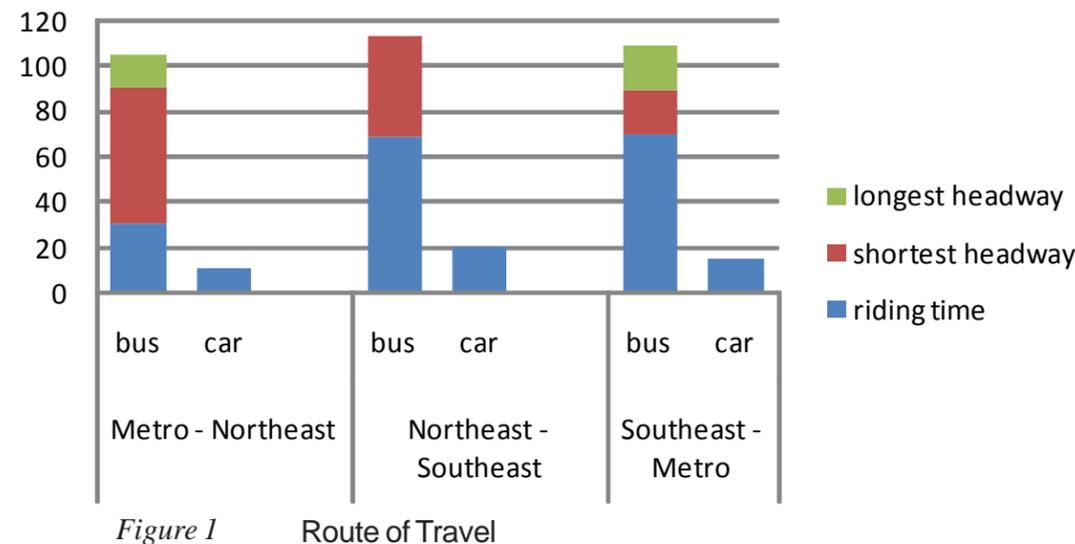


Figure 1

Route of Travel

Mode of Travel Costs

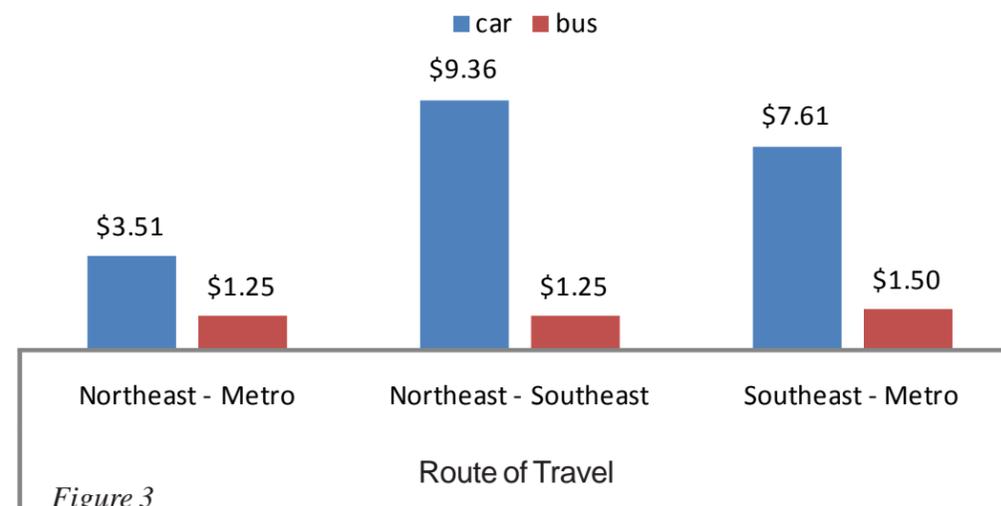


Figure 3

Route of Travel



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Case Studies

West Virginia University

West Virginia University is located among the hills nearby Morgantown, WV to the east and the Monongahela River to the west. This unique geographic layout required some different transit strategies and designs.

The most definable difference is in the college's famous Personal Rapid Transit (PRT) system. The PRT system has been established for over 30 years and has recently celebrated its 70 millionth passenger. The PRT system is computer automated and runs on electric motors. Students/faculty simply swipe the WVU ID card and the computer driven PRT car will arrive within five minutes.

West Virginia University also offers a campus bus which serves campus routes, but also shares a station with the local transit service in Morgantown. At this shared bus station, riders may transfer to different routes throughout the city of Morgantown.

The most common route topology for West Virginia University is a loop route. WVU had experimented with a few linear routes but this resulted in service problems. Plus, the loop system is better suited for serving areas with limited resources and can cover a greater area. The negative of the loop route is the longer headways.

The payment method for students using both the campus bus service and the PRT system is a transportation fee of \$72 per semester.

Future plans of the Parking and Transit Services of WVU is to finish construction of the "Intermodal Transportation Center." This facility will house 500 parking spaces, bike lockers, showers, and operate both bus routes from Morgantown and WVU campus routes.



Figure 4: PRT system



Figure 5



Figure 6

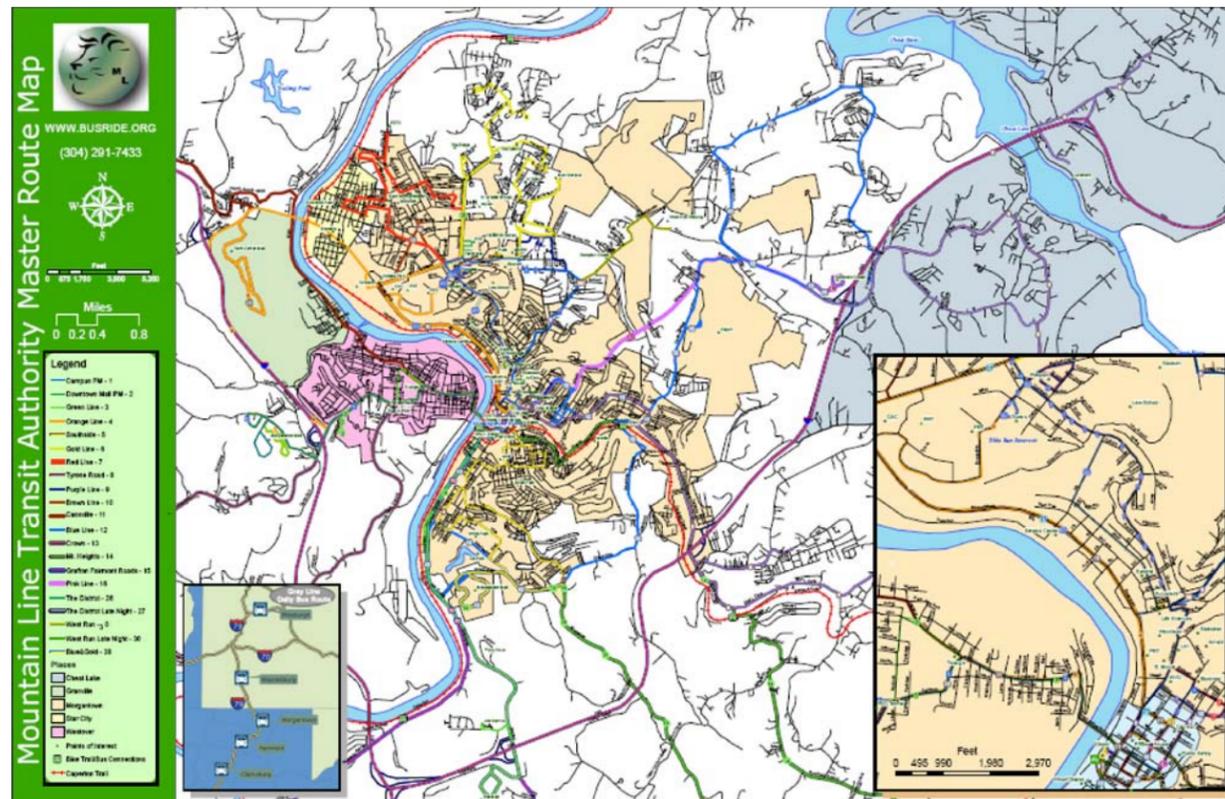


Figure 1: WVU campus transit map



Figure 2: WVU transit bus



Figure 3

Images and data provided by West Virginia University; available from <http://transportation.wvu.edu>; Internet accessed 28 July 2008

Case Studies

University of Oklahoma

The University of Oklahoma has a partnership with the Cleveland Area Rapid Transit (CART) that provides the City of Norman with a public transit system.

The CART system is comprised of five City of Norman routes, three University of Oklahoma routes, Sooner Express, and a few other commuter routes.

CART first formed the partnership with the University of Oklahoma in 1980 to help relieve parking and traffic congestion on campus. The initial system design was to simply be a “park and ride” design (Kris Glen, Cleveland Area Rapid Transit).

However, over the years, the University of Oklahoma has expanded its partnership with CART. New routes were developed to serve as a transit system on campus rather than to and from campus.

Operating costs for university routes have typically cost one million dollars per year. Again, recent economic factors have led to sharp increases in operating costs, specifically cost of fuel. Student fees cover about 50% of operating cost and are paid through a \$1.50/credit hour fee. CART also receives sources from federal, state, and local grants.

The university routes are all loop routes. This route topology is better suited for lower density areas and is capable of covering greater areas. The drawback to loop topology are longer headways, poorer frequency, and reduced efficient.

Future improvements for CART include three new buses that operate on Compressed Natural Gas (CNG), fast fueling stations, and use of bio-diesel for current buses.



Report by Nathan Kuntz



Figure 1: University of Oklahoma transit bus



Figure 2



Figure 3



Figure 4

Data and images provided by the University of Oklahoma; available from <http://cart.ou.edu/about.html>; Internet accessed 19 Sept 2008

Case Studies

University of Chicago

The University of Chicago has a contract with Chicago Transit Authority (CTA). This contract allows for both university use and general public use, although CTA does operate six routes specifically for the University of Chicago.

Students of the University of Chicago pay a transportation fee calculated by a per semester rate. This allows students/faculty to ride any CTA bus by showing their University of Chicago ID card. Cash fare for non university adults is \$2.00 per ride.

Routes on the university are all loop topology for greater area coverage. Even though these are loop routes, headway for most routes average 10 minutes.

With the addition of the University of Chicago routes, we can see a sharp increase in ridership by comparing past ridership data. Unofficial reports suggest that ridership for 2008-2009 fiscal year is projected to be even higher. This steep increase in ridership numbers is most likely a result of rising fuel cost.

No specific plans are in place to convert current buses, which operate on diesel, to CNG or other forms of alternative fuels for CTA.

Data provided by the Chicago Transit Authority and the University of Chicago; <http://facilities.uchicago.edu/transparking/transportation/index.shtml>; Internet accessed 19 Sept. 2008.

170 University of Chicago-Midway - Stops

Westbound	Eastbound
Stony Island at 57th (Metra Electric)	60th at Cottage Grove
Stony Island at 59th	60th at Ellis
59th at Harper	60th at University
59th at Kimbark (Lab School)	60th at Woodlawn
59th at Ellis	60th at Kenwood
59th at Drexel (Goldblatt Pavilion)	60th at Blackstone
	Stony Island at 59th (Metra Electric)
	Stony Island at 57th (Metra Electric)

CTA Bike & Ride
Bicycle racks are available on the front exteriors of CTA buses. Bicycles can be placed on bicycle racks during normal hours of operation for each route. Racks accommodate two (2) bicycles at a time. Bicycles are also permitted on CTA trains during certain hours.

Please Stand Up & for Seniors and People with Disabilities
Federal law requires priority seating be designated for seniors and people with disabilities.

The schedules and other information in this timetable are subject to change. CTA does not assume responsibility for errors in timetables, nor for inconvenience or damage resulting from delayed trains or buses due to weather, traffic conditions, etc.

CTA operating costs are funded in part through the Regional Transportation Authority, by the federal and state governments, and the City of Chicago and County of Cook.

For more information call the RTA Travel Information Center in Chicago: 836-7000. Open 5 a.m. until 1 a.m. every day.

Para obtener mayor información, en Español, llame al Centro de Información: 836-7000.



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170 University of Chicago-Midway - Stops

Westbound	Eastbound
Stony Island at 57th (Metra Electric)	60th at Cottage Grove
59th at Harper	60th at Ellis
59th at Kimbark (Lab School)	60th at University
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Weekdays AM 170 U of C/Midway

Westbound			Eastbound		
Leave 59th/ Stony Island	Arrive 59th/ Drexel	Arrive 60th/ Stony Island	Leave 60th/ Stony Island	Arrive 60th/ Stony Island	Arrive 59th/ Drexel
6:29a	6:38a	6:39a	6:40a	6:46a	6:53a
6:39	6:48	6:49	6:50	6:56	7:03
6:49	6:58	6:59	7:00	7:06	7:13
6:59	7:08	7:09	7:10	7:16	7:23
7:09	7:18	7:19	7:20	7:26	7:33
7:19	7:28	7:29	7:30	7:36	7:43
7:29	7:38	7:39	7:40	7:46	7:53
7:39	7:48	7:49	7:50	7:56	8:03
7:49	7:58	7:59	8:00	8:06	8:13
7:59	8:08	8:09	8:10	8:16	8:23
8:09	8:18	8:19	8:20	8:26	8:33
8:19	8:28	8:29	8:30	8:36	8:43
8:29	8:38	8:39	8:40	8:46	8:53
8:39	8:48	8:49	8:50	8:56	9:03
8:49	8:58	8:59	9:00	9:06	9:13
8:59	9:08	9:09	9:10	9:16	9:23
9:09	9:18	9:19	9:20	9:26	9:33
9:19	9:28	9:29	9:30	9:36	9:43
9:29	9:38	9:39	9:40	9:46	—

University of Chicago
• #170, #171, #172—Students, faculty, and staff of the University, including hospital staff, shall ride free, upon displaying a University issued "Chicago Card" (University of Chicago I.D.), University of Chicago hospital identification, or University of Chicago Laboratory School identification. All others shall pay ordinary CTA fares.
• #173, #174, #182—Ordinary CTA fares shall be paid by all riders including University and hospital students, faculty and staff.

All Other Customers
• Pay regular fares and can buy transfers to other CTA services.

CTA Full/Reduced Fares (exact fare required)
• Cash Fare \$2.00 Full/\$1.00 Reduced
• Transfers will be available to customers using Transit Cards, Chicago Cards, and Chicago Card Plus only.
• Transit Card-Full/Reduced (buy at CTA rail stations)
\$1.75 Full/\$.85 Reduced—deducted on 1st ride.
\$.25 Full/\$.15 Reduced—deducted on 2nd use within two hours; FREE — 3rd use within two hours.



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Weekdays PM 170 U of C/Midway

Westbound			Eastbound		
Leave 57th/ Stony Island	Arrive 59th/ Drexel	Arrive 60th/ Stony Island	Leave 60th/ Stony Island	Arrive 60th/ Stony Island	Arrive 57th/ Stony Island
3:30p	3:36p	3:37p	3:40 p	3:46p	3:49 p
3:40	3:46	3:47	3:50	3:56	3:59
3:50	3:56	3:57	4:00	4:06	4:09
4:00	4:06	4:07	4:10	4:16	4:19
4:10	4:16	4:17	4:20	4:26	4:29
4:20	4:26	4:27	4:30	4:36	4:39
4:30	4:36	4:37	4:40	4:46	4:49
4:40	4:46	4:47	4:50	4:56	4:59
4:50	4:56	4:57	5:00	5:06	5:11
5:00	5:06	5:07	5:10	5:16	5:19
5:11	5:17	5:18	5:20	5:26	5:29
5:20	5:26	5:27	5:30	5:36	5:39
5:30	5:36	5:37	5:40	5:46	5:49
5:40	5:46	5:47	5:50	5:56	5:59
5:50	5:56	5:57	6:00	6:06	6:09
6:00	6:06	6:07	6:10	6:16	6:19
6:10	6:16	6:17	6:20	6:26	6:29
6:20	6:26	6:27	6:30	6:36	6:39
6:30	6:36	6:37	6:40	6:46	6:49

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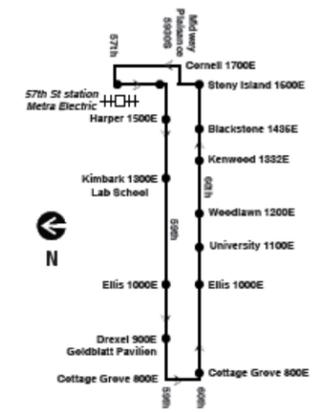
Chicago Transit Authority

170

University of Chicago/
Midway

Effective August 31, 2008

AM Routing
No midday service



OPERATES WEEKDAYS ONLY YEAR-ROUND



transitchicago.com

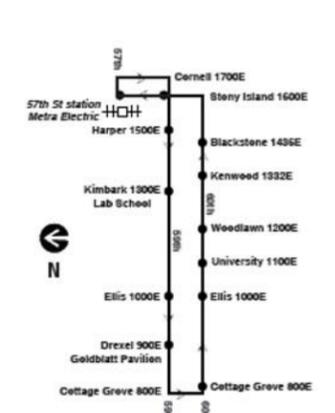
Chicago Transit Authority

170

University of Chicago/
Midway

Effective August 31, 2008

PM Routing
No midday service



OPERATES WEEKDAYS ONLY YEAR-ROUND



transitchicago.com



Report by Nathan Kuntz

January 2007 Bus Ridership by Route

Section I: Average Weekday Boardings

Route	Name	2005	2006	2007	Percent Change		Passengers Per Platform Hour
					'05-'07	'06-'07	
136	Sheridan/LaSalle Express	1,512	1,889	2,230	47.4%	32.0%	51.9
143	Stockton/Michigan Express	1,007	882	1,042	3.5%	18.1%	57.0
144	Marine/Michigan Express	577	905	1,059	83.5%	17.0%	35.5
145	Wilson/Michigan Express	5,582	5,752	7,139	27.9%	24.1%	51.7
146	Inner Drive/Michigan Express	7,677	7,603	8,301	8.1%	9.2%	44.0
147	Outer Drive Express	10,541	10,284	12,297	16.7%	19.6%	48.7
148	Clarendon/Michigan Express	1,380	1,639	1,820	31.9%	11.0%	49.9
151	Sheridan	18,606	18,690	19,222	3.3%	2.8%	43.4
152	Addison	10,706	10,112	10,078	-5.9%	-0.3%	42.3
155	Devon	6,515	5,711	5,939	-8.8%	4.0%	54.2
156	LaSalle	9,118	8,841	9,383	2.9%	6.1%	49.5
157	Streeterville	3,024	3,387	3,208	6.1%	-5.3%	38.3
168	UIC-Pilsen Express	85	79	90	5.1%	14.1%	22.9
169	69th-UPS Express	271	278	333	23.2%	20.0%	37.7
170	U of Chicago - Midway	367	342	483	31.6%	40.9%	39.1
171	U of Chicago - Hyde Park	1,816	1,444	2,763	52.1%	91.3%	78.8
172	U of Chicago - Kenwood	1,182	879	1,627	37.7%	85.1%	44.8
173	U of Chicago - Lakeview	202	201	220	8.9%	9.7%	26.4
174	U of Chicago - Garfield			316			14.1
192	U of Chicago Hospital Express			390			46.9
200	Main Shuttle	333	216	213	-35.9%	-1.4%	27.2
201	Central/Ridge	1,427	1,491	1,414	-0.9%	-5.2%	16.0
205	Chicago/Golf	1,111	1,144	1,036	-8.8%	-9.5%	18.2
206	Evanston Circulator	1,108	1,044	950	-14.2%	-8.9%	28.9
Weekday Total		916,007	900,990	929,961	1.5%	3.2%	44.4

Figure 1: Spreadsheet comparison of yearly transit passengers. Chicago Transit Authority

Data provided by the Chicago Transit Authority and the University of Chicago; <http://facilities.uchicago.edu/transparking/transportation/index.shtml>; Internet accessed 19 Sept. 2008.

Case Studies

University of Chicago

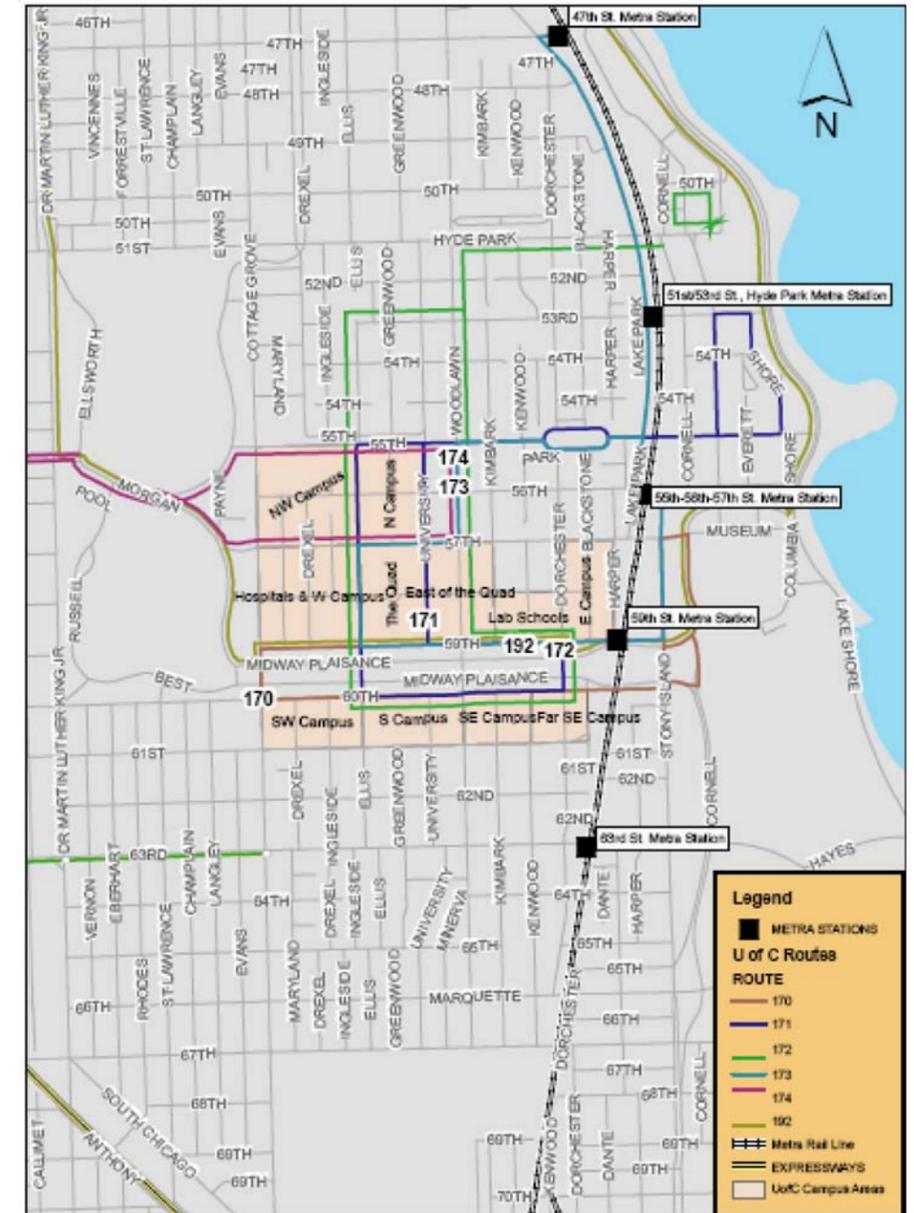


Figure 2: University of Chicago transit map



Case Studies

University of Iowa

The University of Iowa operates a transit system named “Cambus.” Cambus is entirely university owned and operated. The Cambus system has 165 employees and almost all of them are students. This pool of student employees helps to dramatically reduce operating costs (McClatchey, Brian. Cambus Manager, University of Iowa).

Cambus coordinates its routes with local transit systems by sharing a common bus stop in downtown Coralville.

- Transit system was implemented in 1972
- Operating costs for fiscal year 2008 - \$38/hour per bus
- Operates mainly loop routes
- 10-15 minute headways
- Student fees - \$20/semester (\$10 summer semester) for full-time students
 - No costs to public on campus
- Ridership – 3.7 million during fiscal year 2008
 - Students account for 75% of ridership
- Funding
 - 40% - Student fees
 - 20% - State formula funding
 - 10% - Federal Transit Authority
 - 30% - Parking fees
- Use of alternative fuels – currently operating on 10% biodiesel fuel
 - Plans to convert to 20% biodiesel fuel soon.

Increasing fuel costs have hampered efforts to convert to alternative fuels and other general operational costs. Fuel costs several years ago accounted for around 8% of operating costs, but now account for over 20% of operating costs.



Figure 1: University of Iowa bus at night

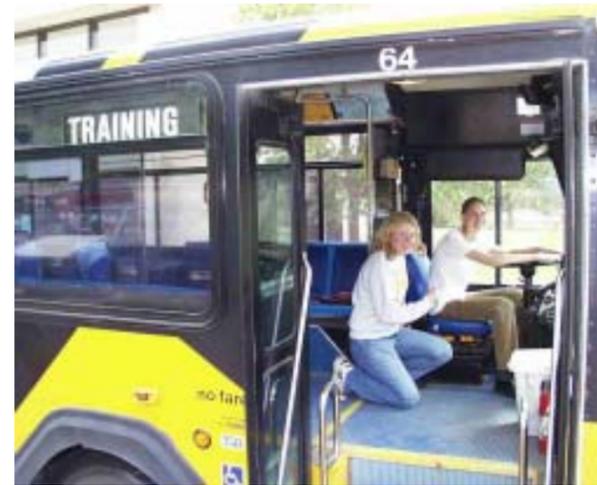


Figure 3



Figure 4



Figure 5

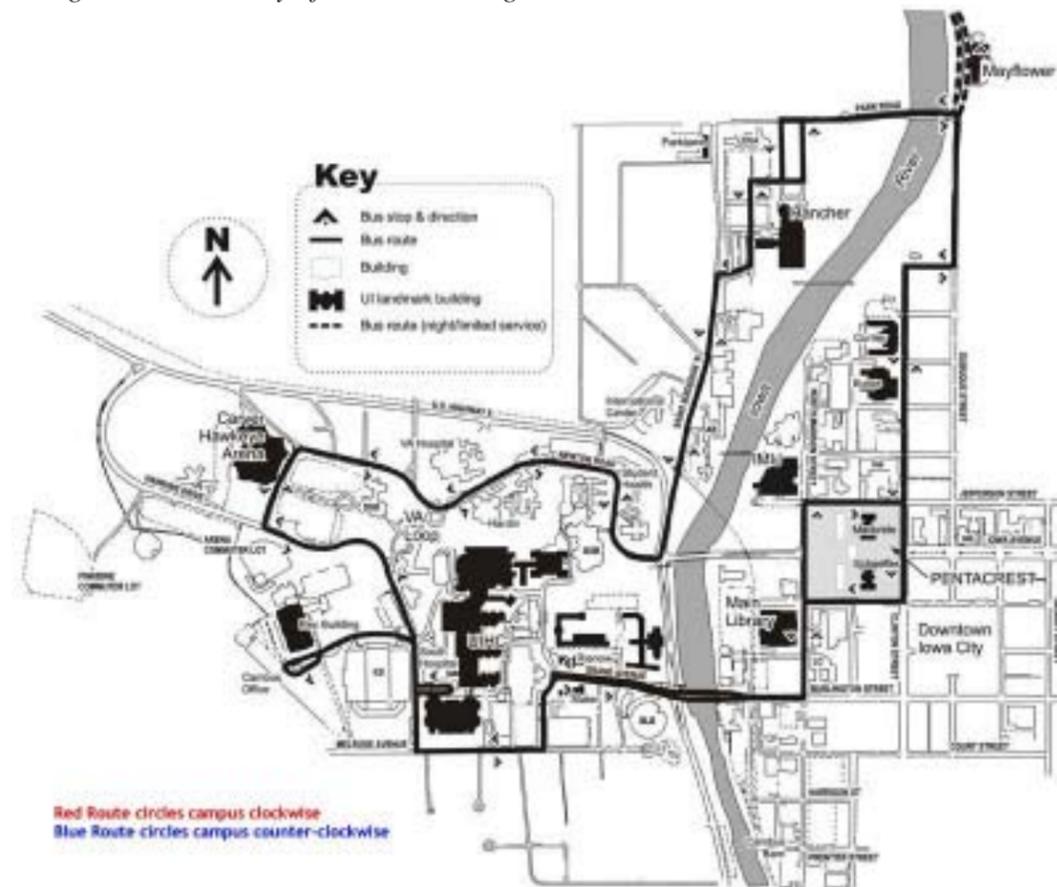


Figure 2: University of Iowa campus transit map

Data and images provided by the University of Iowa, Cambus; available from <http://www.uiowa.edu/~cambus/>; Internet; accessed 22 Sept. 2008.



Case Studies

Oklahoma State University

Oklahoma State University began in 1997 operating two buses contracted from First Capital Trolley from Guthrie, Oklahoma. By 2002 the OSU shuttle system ridership had grown to over 200,000 and several new buses have entered service. (Singleton, Steve. Assistant Manager, OSU Transit)

The OSU shuttle is partnered with the community of Stillwater, Oklahoma offering both on and off campus services.

- Transit system was implemented in 1997
- Operates mainly linear routes (recently converted from loop routes)
- Average of 15 minute headways
- Fees - Student voted \$2 per credit hour transit fee; \$.50/ride for general public
- Ridership – 560,262 boardings in 2005
- Funding - Use of federal funding from grants 5311 (less than 50,000 population) and 5309 (purchase buses, bike racks, bus stops)
- Use of alternative fuels – currently using diesel with plans to convert to CNG



Figure 1: OSU bus outfitted with bike rack



Figure 3: OSU bus shelter with solar panel

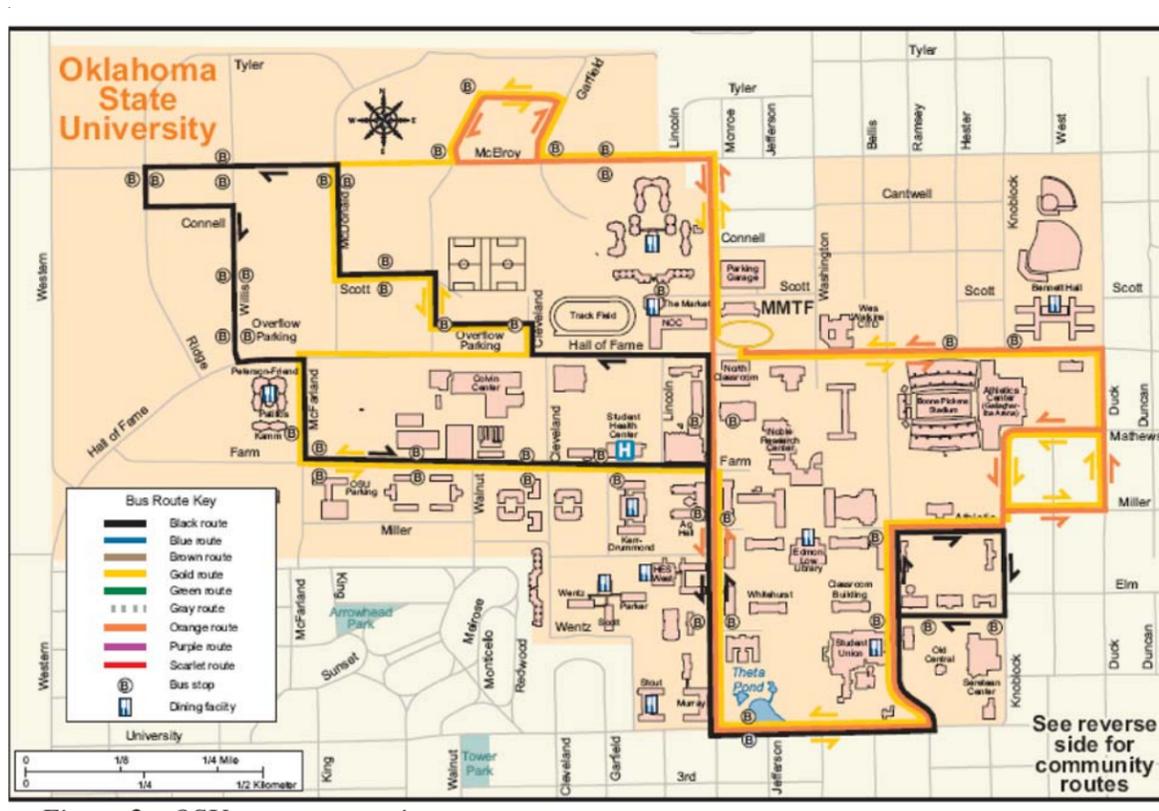


Figure 2: OSU campus transit map

Data and images provided by Oklahoma State University; <http://www.osu-tulsa.okstate.edu/services/shuttle.asp>; Internet accessed 19 Sept. 2008.



Figure 4



Case Studies

Oklahoma State University

Oklahoma State University offers a shuttle system from OSU Stillwater campus to OSU Tulsa campus. This system operates on different headway times adjusted for peak demand times. The payment method is also different from the on-campus system. Reservations must be made through OSU transit center ahead of time and ridership fees are \$7.00 for students one-way and \$13.00 for faculty/staff one-way.

This trip from Stillwater to Tulsa or vice-versa is approximately 70 miles and takes about one hour and 15 minutes.

Tulsa to Stillwater

Depart Tulsa	Arrive Stillwater
5:30 a.m.	6:45 a.m.
7:00 a.m.	8:15 a.m.
7:30 a.m.	8:45 a.m.
9:00 a.m.	10:15 a.m.
12:30 p.m.	1:45 p.m.
2:30 p.m.	3:45 p.m.
4:30 p.m.	5:45 p.m.
*7:30 p.m.	*8:45 p.m.
*10:30 p.m.	*11:45 p.m.

Stillwater to Tulsa

Depart Stillwater	Arrive Tulsa
5:30 a.m.	6:45 a.m.
7:15 a.m.	8:30 a.m.
10:45 a.m.	12:00 p.m.
12:30 p.m.	1:45 p.m.
2:30 p.m.	3:45 p.m.
4:30 p.m.	5:45 p.m.
5:30 p.m.	6:45 p.m.
*7:30 p.m.	*8:45 p.m.
*10:30 p.m.	*11:45 p.m.

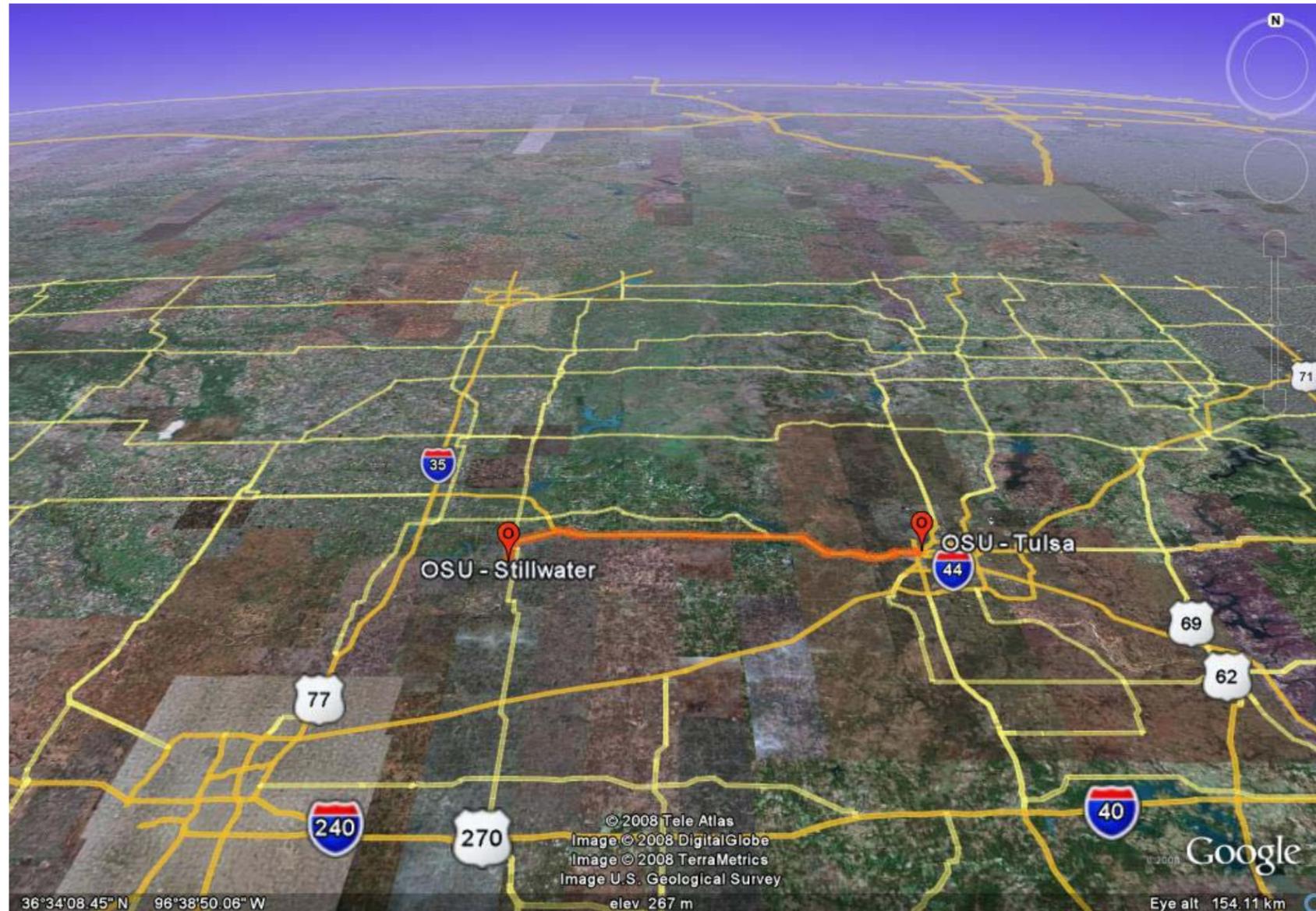


Figure 1 Aerial photography provided by GoogleEarth



Figure 2

Data and images provided by Oklahoma State University; <http://www.osu-tulsa.okstate.edu/services/shuttle.asp>; Internet accessed 19 Sept. 2008.



Figure 3

Transit Survey

Tulsa Community College

An online survey was posted on the Tulsa Community College website regarding a proposed TCC transit service. This survey was available during November and December of 2008. The survey consisted of 24 questions and asked a range of transit questions.

This survey was developed by sampling past university transit surveys such as the one from the University of Chicago along with specific questions tailored to the needs of Tulsa Community College. The survey was also modeled after the Tulsa Transit survey.

The survey resulted in 1,228 views and 595 participants providing crucial data regarding the transit study.

Questions 1-5 gathered demographic data from both the faculty and students. This determination would later be able to separate specific groups and identify developing themes and patterns in terms of transit needs and requests.

Other questions targeted the campus most often attended, which campus a rider travels to if traveling among campuses, current mode of transportation, and amount of travel time.

1. What is your student/faculty status?		Response Percent	Response Total
full-time student		33%	132
part-time student		18%	71
full-time employee		43%	175
part-time employee		6%	26
Total Responses		404	
2. Which campus do you attend most often?		Response Percent	Response Total
Metro		40%	157
Northeast		18%	72
Southeast		29%	115
West		13%	50
Total Responses		394	
3. Do you attend classes on more than one TCC campus? If yes, which campus do you also attend?		Response Percent	Response Total
Metro		38%	109
Northeast		21%	61
Southeast		25%	72
West		15%	43
Total Responses		285	
4. How do you typically get to campus?		Response Percent	Response Total
Drive by yourself		84%	337
Carpool		7%	29
Ride a bus		7%	30
Ride a motorcycle		0%	0
Ride a bike		1%	3
Walk		1%	3
Total Responses		402	
5. How long does your trip to campus usually take?		Response Percent	Response Total
Less than 10 minutes		17%	70
11-20 minutes		38%	153
21-30 minutes		26%	105
31-40 minutes		10%	42
41-50 minutes		3%	13
51-60 minutes		2%	9
More than one hour		3%	11
Total Responses		403	

Chart created by Zipsurvey.com

Figure 1: TCC Transit Survey Results



Figure 2: Tulsa Community College website. www.tulsacc.edu



Transit Survey

Tulsa Community College

The survey's initial results indicate the premise that there is a demand for a transit system at Tulsa Community College and students and faculty alike are willing to pay for the service.

Also, the data represents a need for TCC students to have access to other colleges within Tulsa, while large majorities of TCC students/faculty believe a route to the conference center is unnecessary.

Questions 6-12 cover the basis for the overall demand for a transit system among TCC campuses. Question six specifically addresses the question "would you use the service?" The result of this question responded in 58% of the participants answering "yes."

Question 7 was designed to determine the specific demand among campuses. The largest percentage of people would prefer a route linking the Metro Campus and Southeast Campus.

Other questions were targeted toward route design and financial estimates/payment methods.

6. If bus service were provided directly to other TCC campuses, would you use the service?		Response Percent	Response Total
Yes		58%	233
No		18%	73
Not sure		24%	96
Total Responses		402	
7. Please select which route would be most important to you. (Routes will run in both directions. Select more than one, if necessary.)		Response Percent	Response Total
Metro - Northeast		23%	108
Metro - West		15%	68
West - Northeast		9%	41
Metro - Southeast		30%	138
Southeast - West		11%	53
Southeast - Northeast		12%	58
Total Responses		466	
8. Would you use the bus service if there were indirect routes from one campus to another campus? An example would be: traveling from the Southeast Campus to the Northeast Campus there may be a stop at the Metro Campus.		Response Percent	Response Total
Yes		69%	235
No		31%	107
Total Responses		342	
9. How important is it to you that the bus stop at the TCC Conference Center?		Response Percent	Response Total
Very important		19%	68
Somewhat important		23%	83
Not important		57%	203
Total Responses		354	
10. Would it be useful to you if the bus provided service to other college campuses in the Tulsa area? If yes, please check all that apply.		Response Percent	Response Total
OSU-Tulsa		23%	131
OU-Tulsa		14%	79
Langston University-Tulsa		8%	45
University of Tulsa		11%	63
NSU-Broken Arrow		17%	94
Oral Roberts University		6%	35
None		20%	115
Other Selection: View Responses		1%	7
Total Responses		569	

Chart created by Zipsurvey.com

Figure 1: TCC Transit Survey Results

11. What is the maximum amount you would be willing to pay per ride?		Response Percent	Response Total
\$0.00		9%	32
\$0.50		20%	69
\$1.00		38%	133
\$1.50		14%	51
\$2.00		15%	52
More than \$2.00		4%	15
Total Responses		352	
12. How would you prefer to pay for the service?		Response Percent	Response Total
Cash payment per ride as you enter the bus		16%	54
A pre-purchased card similar to a debit card and swipe the card per ride (swipe and ride)		42%	145
Pre-purchased tickets or tokens		7%	23
A fee included in tuition costs for unlimited rides using your TCC ID card		36%	123
Total Responses		345	

Chart created by Zipsurvey.com

Figure 2: TCC Transit Survey Results



Transit Survey

Tulsa Community College

13. If you live near one campus, but attend classes at another campus; would you consider driving to the campus nearest you and riding the bus the rest of the way? If so, how likely would you travel to campus this way?		Response Percent	Response Total
Very likely		50%	157
Somewhat likely		32%	103
Not at all likely		18%	57
Total Responses		317	

14. If you chose to use the bus service provided, what would be your main reason for doing so? Please check all that apply.		Response Percent	Response Total
Save money		43%	262
Support eco-friendly means of transportation		35%	209
Access to other classes offered from different campuses		17%	100
Other Selection: View Responses		6%	34
Total Responses		605	

15. What is your gender?		Response Percent	Response Total
Male		29%	102
Female		71%	254
Total Responses		356	

Chart created by Zipsurvey.com

Figure 1: TCC Transit Survey Results

18. What time of the day are you typically on campus on Monday?		Response Percent	Response Total
7:00 am - 9:00 am		15%	152
9:00 am - 11:00 am		19%	197
11:00 am - 1:00 pm		19%	195
1:00 pm - 3:00 pm		16%	166
3:00 pm - 5:00 pm		13%	137
5:00 pm - 7:00 pm		9%	93
7:00 pm - 9:00 pm		5%	53
none		3%	31
Total Responses		1024	

19. What time of day are you typically on campus on Tuesday?		Response Percent	Response Total
7:00 am - 9:00 am		14%	142
9:00 am - 11:00 am		17%	171
11:00 am - 1:00 pm		19%	188
1:00 pm - 3:00 pm		16%	154
3:00 pm - 5:00 pm		13%	128
5:00 pm - 7:00 pm		10%	98
7:00 pm - 9:00 pm		6%	58
none		5%	47
Total Responses		986	

Chart created by Zipsurvey.com

Figure 2: TCC Transit Survey Results

Questions 16 and 17 from the survey asked in which city you currently reside and its zipcode. This data provided insight into where the majority of students and faculty live and what campus they traveling to. Analysis of this data would prove that the two largest survey participants bodies reside by Metro campus and Southeast campus.



Transit Survey

Tulsa Community College

The typical time which students are on campus is also a consideration when determining peak times of the transit system. Results indicate the majority of students are on campus from 7:00 am to approximately 1:00 pm Monday through Friday. Very few students are on campus during weekends and would not attain target transit operating ridership.

20. What time of day are you typically on campus on Wednesday?		Response Percent	Response Total
7:00 am - 9:00 am		15%	146
9:00 am - 11:00 am		20%	192
11:00 am - 1:00 pm		19%	184
1:00 pm - 3:00 pm		16%	160
3:00 pm - 5:00 pm		13%	127
5:00 pm - 7:00 pm		9%	85
7:00 pm - 9:00 pm		5%	45
none		4%	40
Total Responses		979	

21. What time of day are you typically on campus on Thursday?		Response Percent	Response Total
7:00 am - 9:00 am		15%	144
9:00 am - 11:00 am		18%	180
11:00 am - 1:00 pm		18%	180
1:00 pm - 3:00 pm		16%	156
3:00 pm - 5:00 pm		13%	131
5:00 pm - 7:00 pm		9%	87
7:00 pm - 9:00 pm		5%	53
none		5%	53
Total Responses		984	

22. What time of day are you typically on campus on Friday?		Response Percent	Response Total
7:00 am - 9:00 am		14%	116
9:00 am - 11:00 am		17%	138
11:00 am - 1:00 pm		17%	138
1:00 pm - 3:00 pm		15%	120
3:00 pm - 5:00 pm		13%	105
5:00 pm - 7:00 pm		6%	51
7:00 pm - 9:00 pm		3%	28
none		14%	115
Total Responses		811	

Chart created by Zipsurvey.com

Figure 1: Results of TCC Transit Survey

Figure 2: Results of TCC Transit Survey

23. What time of day are you typically on campus on Saturday?		Response Percent	Response Total
7:00 am - 9:00 am		7%	35
9:00 am - 11:00 am		11%	53
11:00 am - 1:00 pm		9%	45
1:00 pm - 3:00 pm		7%	31
3:00 pm - 5:00 pm		5%	22
5:00 pm - 7:00 pm		3%	14
7:00 pm - 9:00 pm		2%	11
none		56%	265
Total Responses		476	

24. What time of day are you typically on campus on Sunday?		Response Percent	Response Total
7:00 am - 9:00 am		2%	8
9:00 am - 11:00 am		3%	11
11:00 am - 1:00 pm		2%	9
1:00 pm - 3:00 pm		4%	16
3:00 pm - 5:00 pm		3%	13
5:00 pm - 7:00 pm		3%	11
7:00 pm - 9:00 pm		2%	6
none		81%	311
Total Responses		385	

Chart created by Zipsurvey.com



Transit Survey

Tulsa Community College

Using statistical software (SPSS) I was obtained more value from the survey by identifying specific groups and trends that developed throughout participant's responses.

Figure 1: using SPSS I determined how much money students would be willing to pay to ride a bus one way compared to faculty.

Figure 2: a break down of how students and faculty typically travel to campus.

Figure 3: a specific look at how full time students typically travel to campus.

The data indicates that the vast majority of TCC students and faculty drive themselves when traveling to campus.

How much would you be willing to pay per ride?

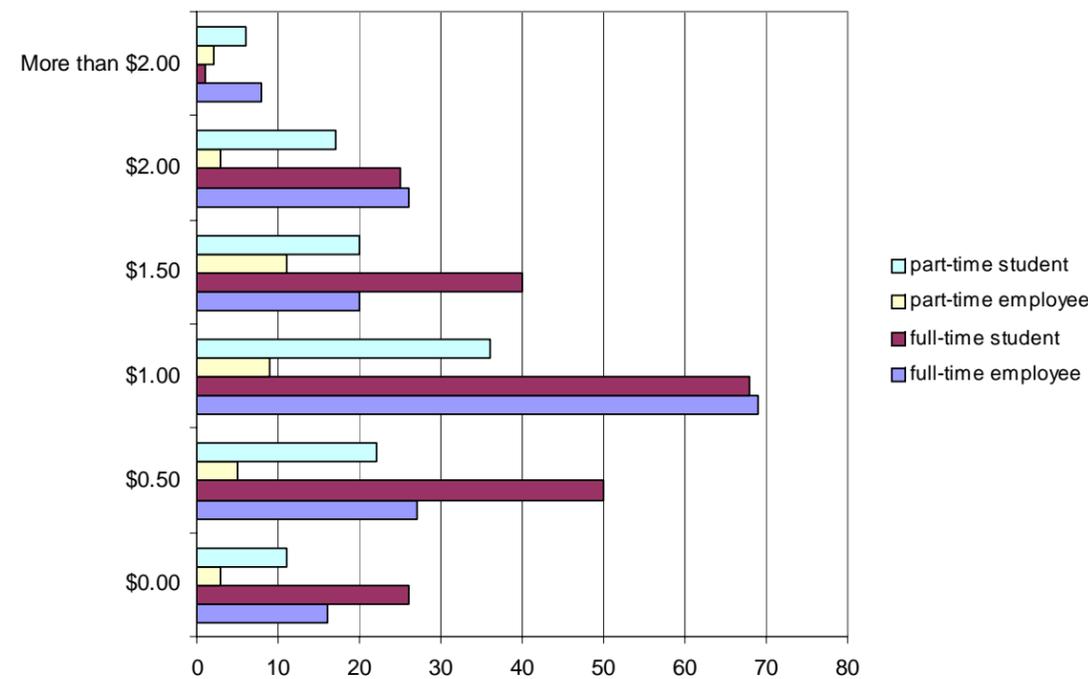


Figure 1: Graph depicting the amount TCC participants would be willing to pay.

How do you typically travel to campus?

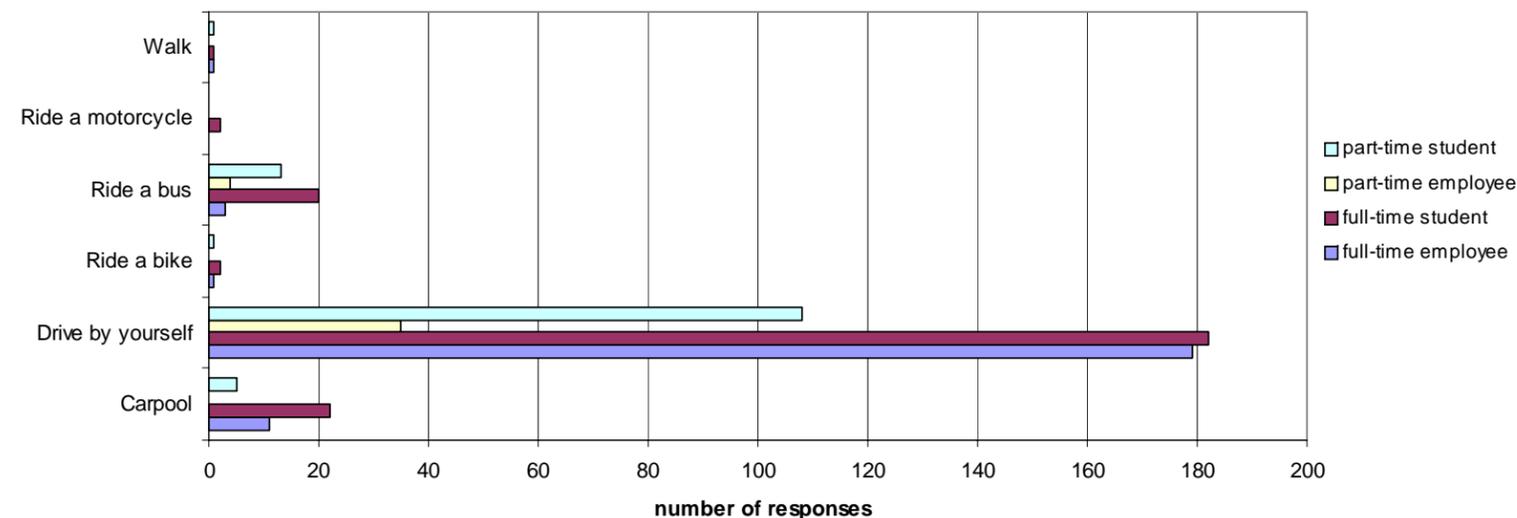


Figure 2: Graph displaying how TCC faculty and students typically get to campus

Full-time student mode of transit

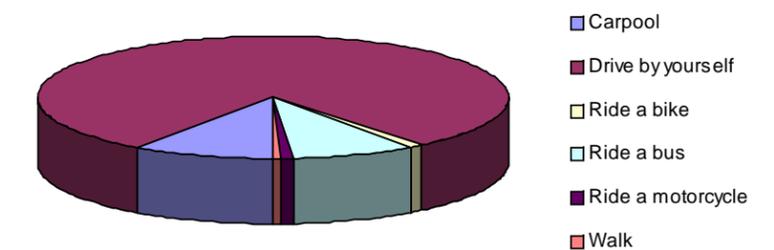


Figure 3: Analysis of how full-time students travel to campus



Transit Survey

Tulsa Community College

Time frames for TCC students and faculty arriving at campus have a wide variety, but the most common travel time is around 10 to 30 minutes. As a general rule of thumb, public transportation systems operate about twice as long as it would take a person to drive to their destination and still have positive ridership. Students are more likely to wait a little longer for public transportation than most general public.

Target goal for a transit system would be to operate a system with a 45 minute headway. This target time would be about double the travel time to drive, but still be efficient enough to encourage ridership.

Figure 1: this chart depicts demand from one campus to another. The strongest route demand is from Southeast Campus to Metro Campus while the second strongest demand is vice versa.

Which campus would you prefer a route to?

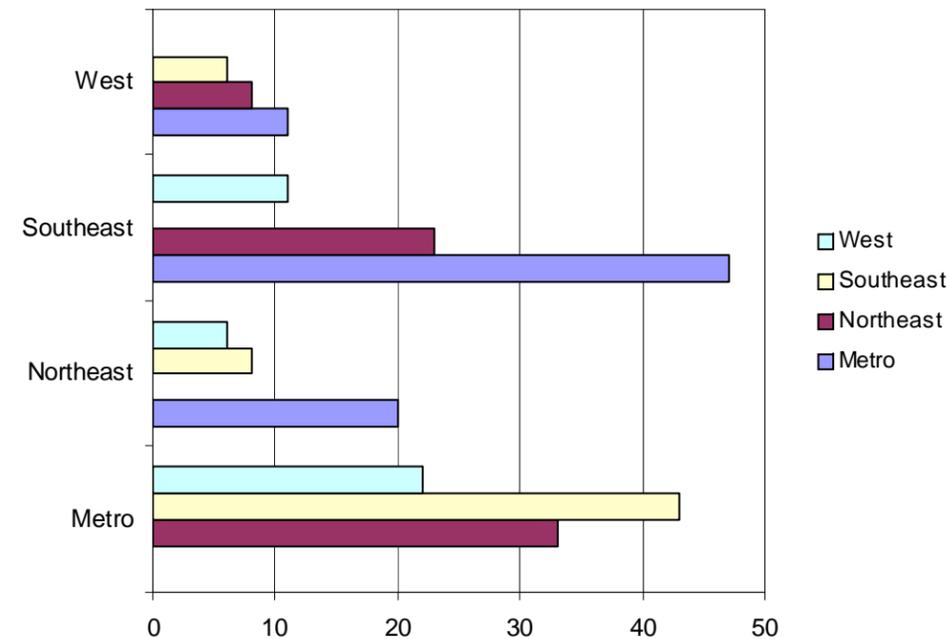


Figure 1: Results of TCC Transit Survey. Analysis of responses that depict need for route between campuses. The highest demand for a TCC route between campuses is linking the Southeast Campus to Metro Campus.

How long does it take you to typically travel to campus?

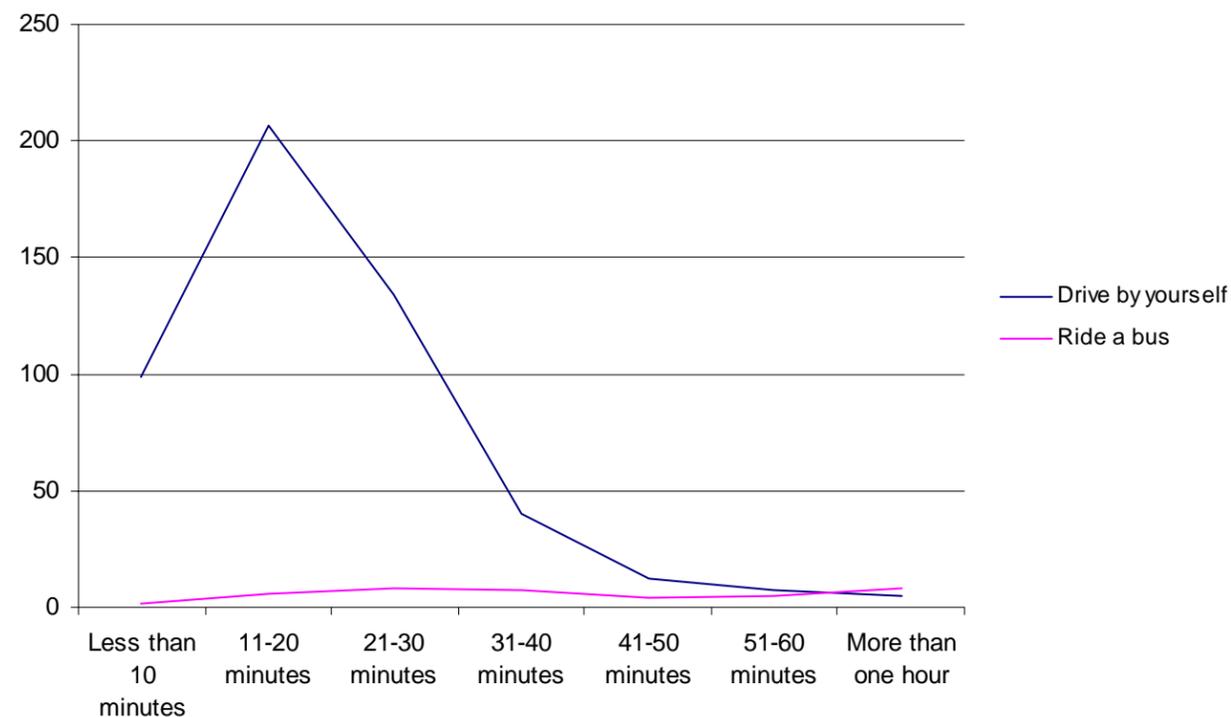


Figure 2: Line graph displaying amount of travel time by car compared to use of current Tulsa Transit routes. The majority of survey respondents to travel to campus by car while only a few travel to campus by bus.

How long does it take you to travel to campus by yourself?

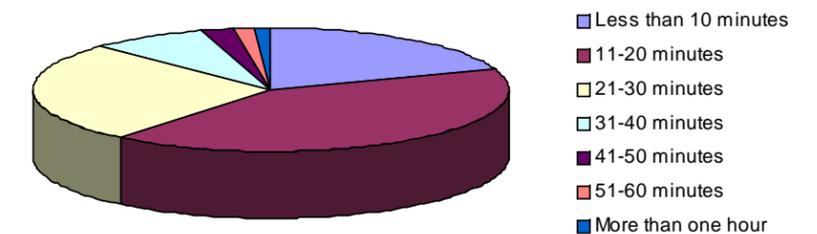


Figure 3: Analysis of typical travel time by single occupancy vehicles



Transit Survey

Tulsa Community College

Taking a closer look at the specific question “would you ride a TCC transit bus” the number of “yes” responses were the largest at Metro Campus. Metro Campus is the second largest campus in student enrollment. It is also possible that my influence at the Metro Campus has encouraged a larger representation of the Metro Campus than there would have been without my influence.

However, with that aside, Metro Campus and Southeast Campus have the two largest raw data counts for responding “yes.” Logically, this could lead to the conclusion that if only two campuses were to be connected by a transit service, that a Metro and Southeast connection would be the best utilized.

On the other hand, if you take the total number of those who responded “yes” and normalized this figure by the actual number of respondents at each campus, results indicated West Campus may actually have the highest demand for a transit service. Following closely behind West Campus in specific demand by campus, the Northeast Campus shows a high percentage of those who responded “yes” to I would ride a TCC transit bus.

For the scenario of establishing one route to connect two campuses, the challenge is to determine which campuses would be best served by a connecting route. Which factor determines where a route should be located, absolute values or specific demand?



Report by Nathan Kuntz

Would you ride a TCC transit bus?

campus raw counts

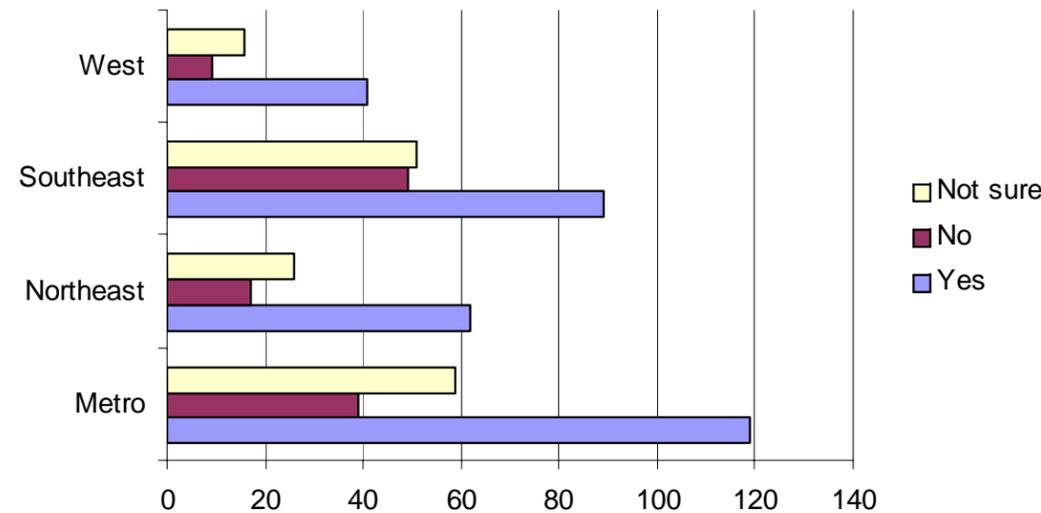


Figure 1: Graph displaying raw counts of the TCC survey question #6, “would you ride a TCC transit bus,” by campus

Would you ride a TCC transit bus?

campus percentage

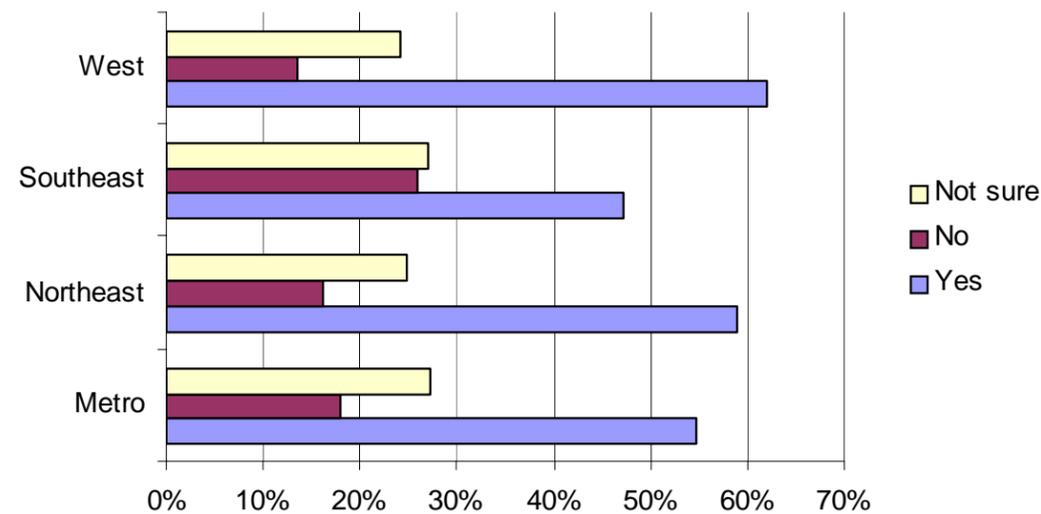


Figure 2: Graph displaying the same data from question #6 but normalized by campus size. This data determines that West Campus has the highest percentage of demand than any other campus.

Tulsa Community College

Transit Survey

Maps shown here are similar to charts from “would you ride a TCC transit bus” question. In this case, I have represented the survey by zipcode and mapped counts of each respondent using GIS.

Figure 1: this image is the raw count of participant numbers in which zipcode they reside. Note the fact that the largest percentage is in South Tulsa near Southeast Campus, TCC’s largest campus.

Figure 2: this image is survey respondents number normalized by actual zipcode population. From this map, it is determined that a larger majority of people near West Campus have taken the transit survey.

Figure 3: word cloud image depicting which zipcodes occurred most frequently in aspect to its size.

Raw counts of survey participants by zipcode

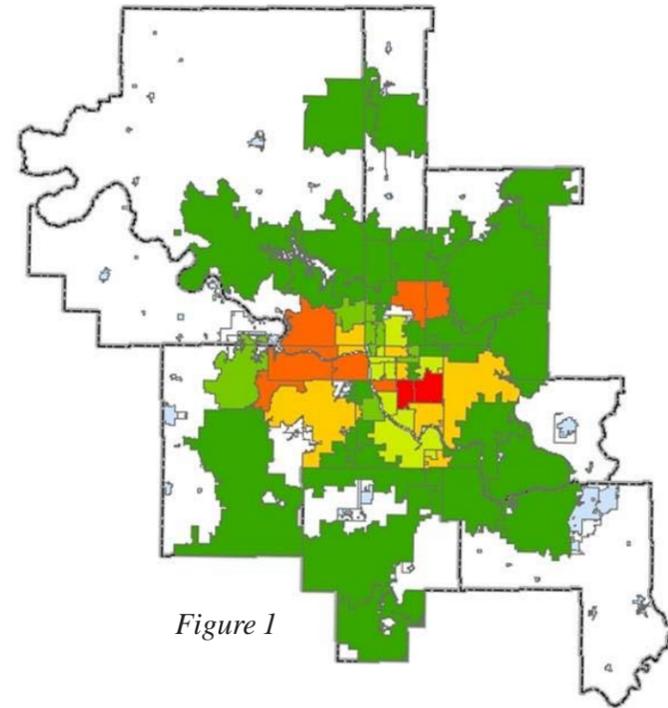


Figure 1

Survey participants normalized by zipcode population

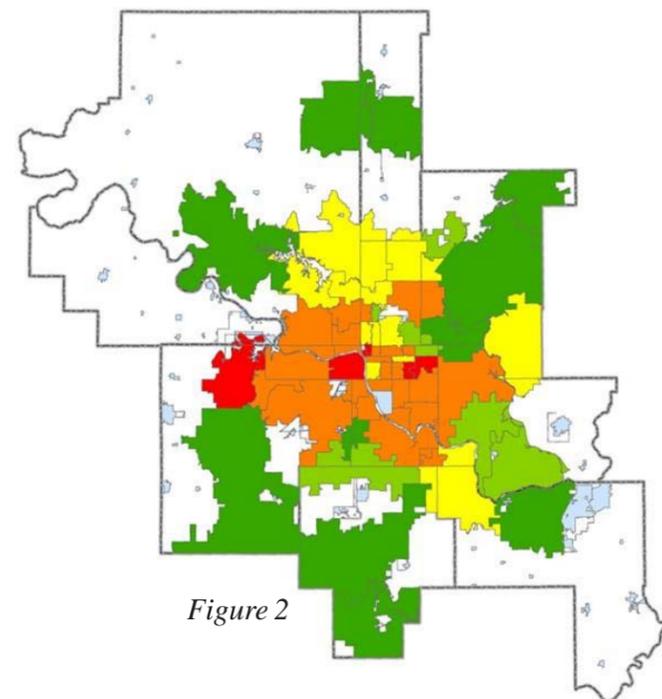


Figure 2



Figure 3 Image created using <http://www.wordle.net/>



Route Design

TCC Route Topologies

Aerial photography provided by google earth

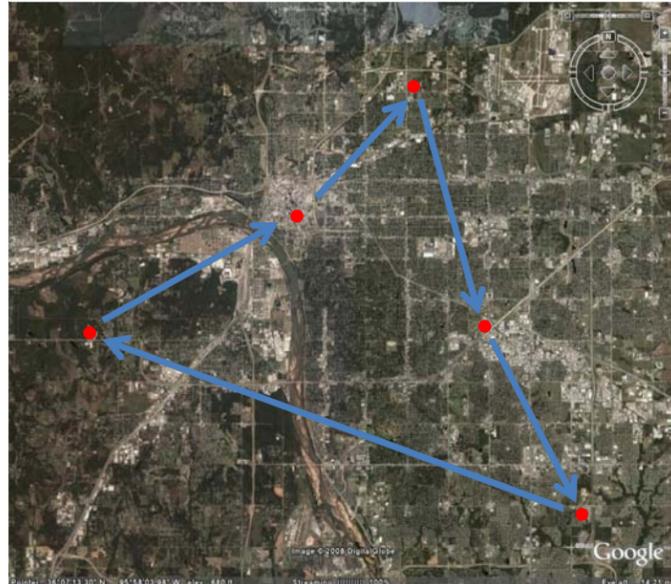


Figure 1: Single Loop Topology:
This map displays the general design concept of using a single loop topology to connect all TCC campuses.

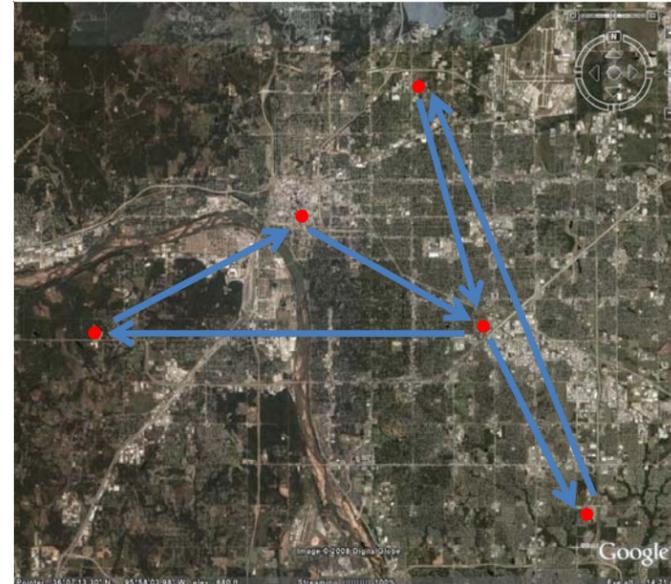


Figure 2: Dual Loop Topology:
This map provides the general design concept for developing a dual loop route system to connect all TCC campuses.

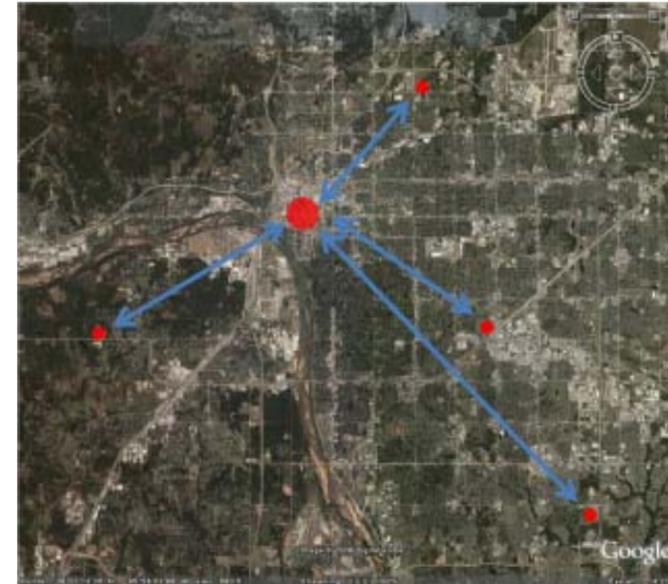


Figure 3: Hub and Spoke Topology:
This map depicts routes serving all TCC campuses using a hub and spoke system with TCC Metro Campus serving as the system hub.

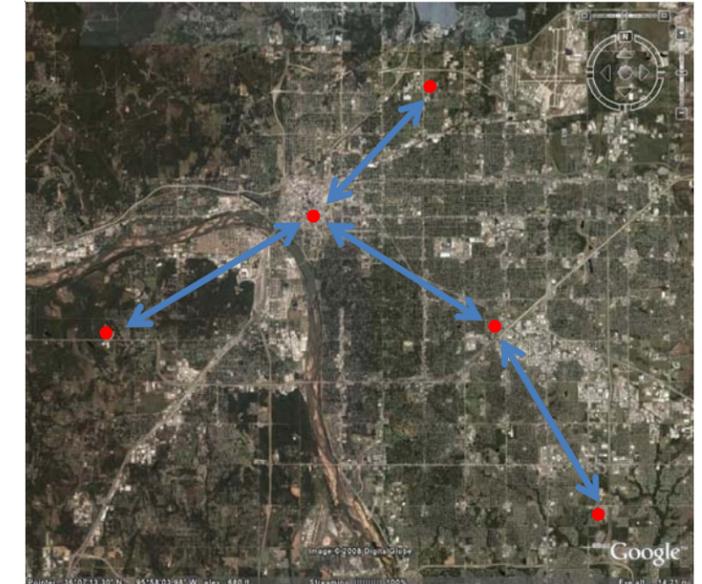


Figure 4: Point-to-Point Topology:
Map portrayal of all TCC Campuses served by transit routes on a point-to-point system.

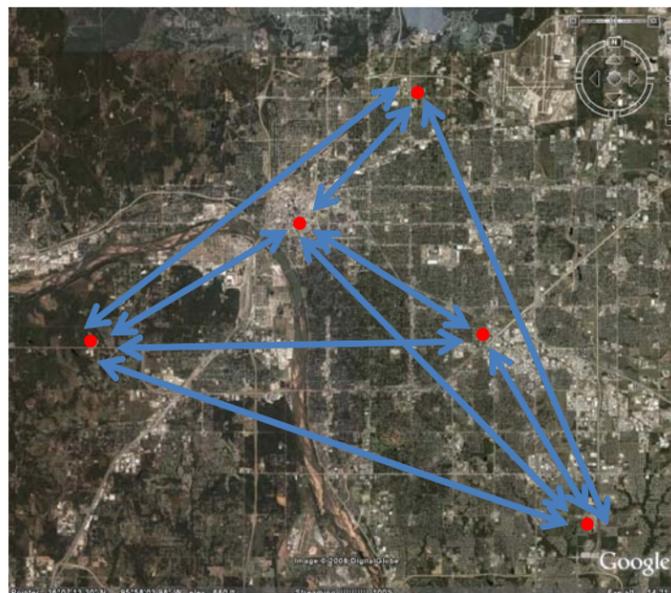


Figure 5: Full Mesh Topology:
Conceptual diagram of all TCC campuses being served by a full mesh topology

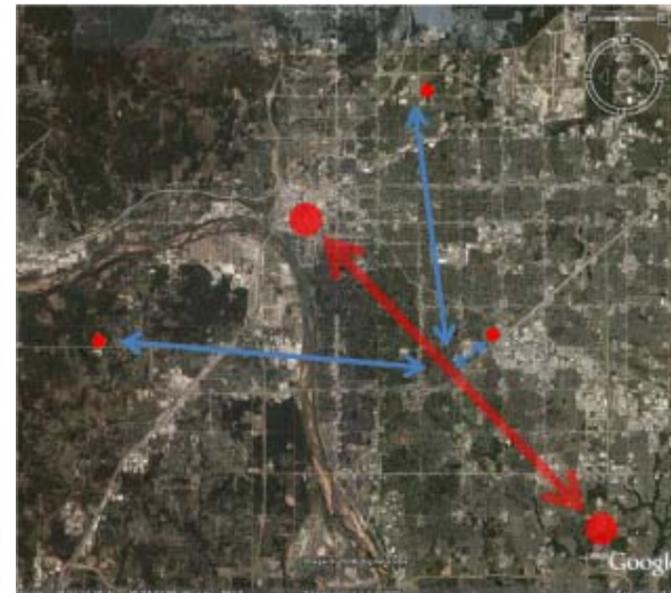


Figure 6: Trunk and Feeder Topology:
Map depicting a general design for a trunk and feeder topology applied to all TCC campuses.



Tulsa Area Colleges

Oklahoma State University - Tulsa

Oklahoma State University is located in the historic Greenwood District of Tulsa north of downtown. OSU Tulsa has offered classes at this location since 1982. The college has more than 2,600 students attending and offers several transfer options with Tulsa Community College.

University of Oklahoma - Tulsa

University of Oklahoma – Tulsa is located at 41st and Yale. This campus is known as Schusterman Center. The OU-Tulsa Campus has an emphasis on Health Sciences and tends to offer more graduate level courses. However, many TCC students enrolled in Allied Health Program plan to continue their education at OU-Tulsa, specifically in the Pharmacy Program.

University of Tulsa

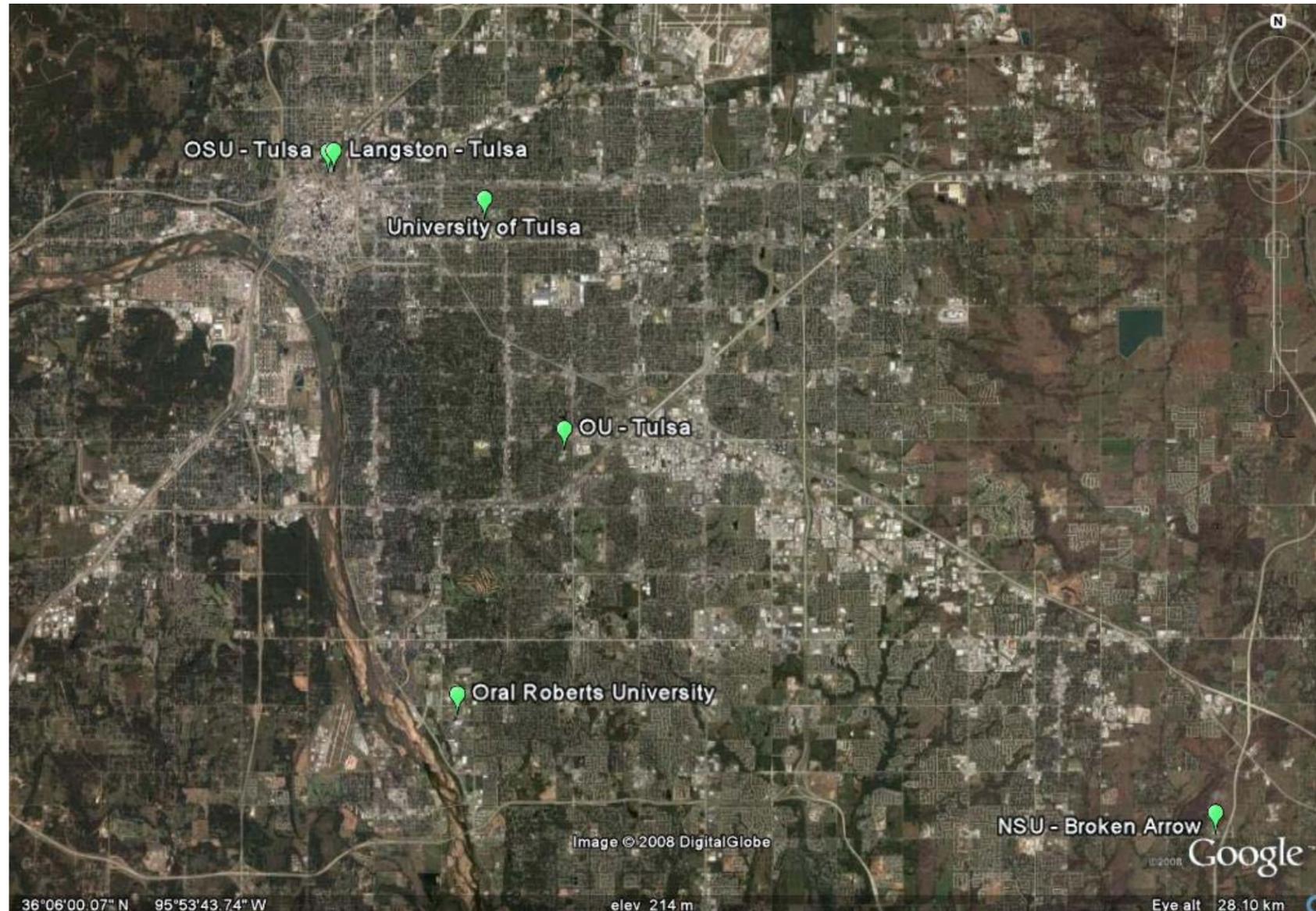
Founded in 1894, the University of Tulsa has a total enrollment of 4,165 students and has been ranked among the top 100 colleges by U.S. News and World Report. TU offers 59 undergraduate, 33 graduate, and 9 doctoral programs.

Oral Roberts University

Oral Roberts University is located in south Tulsa on 263 acres. Programs offered are 65 undergraduate, 14 masters, and 2 doctoral. Business is the largest program at ORU. Current total enrollment for credit hour during Fall of 2008 is 3,067.



Report by Nathan Kuntz



Aerial photography provided by Google Earth

Northeastern State University - Broken Arrow

Located in Broken Arrow, one of the fastest growing cities in Oklahoma, Broken Arrow campus is an extension of the Tahlequah based campus. NSU-Broken Arrow shares many transfer programs with TCC such as Hospitality and Gaming program.

Langston University - Tulsa

Langston University has three campuses in Oklahoma, including Langson, Oklahoma City, and Tulsa. The Langston Tulsa University is located adjacent to OSU-Tulsa Campus in the Greenwood District. Tulsa Community College and Langston University operate a 2+2 program geared toward education. Students enrolled in this program receive an Associate's Degree at TCC, then attend Langston University for their Bachelor's.

Route Design

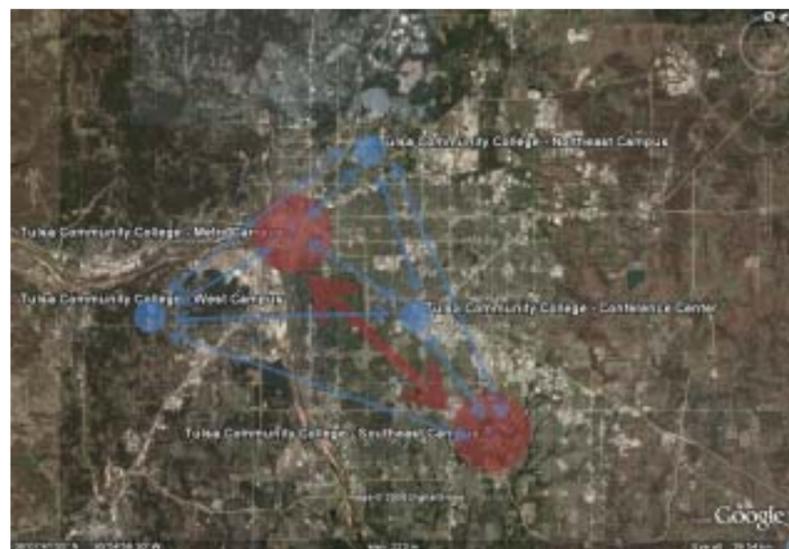
Conceptual Full Mesh Topology

To help understand possible routes, number of buses needed, headways, and other related statistics, shown here are presented models displaying routes from all Tulsa Community College facilities.

Figure 1: This is a conceptual full mesh topology system that displays TCC facilities and connecting routes. This model assists to visually read data easily and have an understanding of the transit system's possibilities. Actual road routes have been left off for clarity.

From this topology, a rider would have direct access to any of TCC facilities, greatly increasing efficiency of rider times. For example, each TCC facility may house four buses. Each bus would travel to a different TCC facility and return. Doubling the number of buses each campus houses, would in turn, cut headway time in half. However, full mesh topology systems are typically more expensive to operate and require a greater number of buses needed. Linear designed routes are usually for high ridership areas.

TCC Metro Campus and Southeast Campus are circled in red with a red arrow in both directions between the two campuses. This is a theory of higher ridership needs between the two campuses. These two campuses for TCC have the highest student enrollment numbers and the largest percentage of faculty/staff. Metro and Southeast also share several academic programs.



Aerial photography courtesy of google earth

Figure 1

Spatial Analysis

Considering the locations of the Tulsa Community College Campuses, two general loop concepts are identifiable.

Figure 2: One loop would operate from West Campus – Metro Campus – and Northeast Campus. Placing a visual loop overlay (yellow) helps depict the nature of the loop as it runs from southwest toward northeast or vice versa.

The second loop operates from Metro Campus – Conference Center – and Southeast Campus. Again, placing a loop overlay (red) above these campuses helps distinguish the loop's characteristics. This red loop is perpendicular to the first loop and is generally the same size as the first loop.

The shared hub for this system would be at Metro Campus where both loops intersect. This would allow for students/faculty the option of transferring routes.

Figure 3: Step two of this process is to include other Tulsa area colleges. These colleges include the University of Tulsa, Oral Roberts University, Oklahoma State University – Tulsa, University of Oklahoma – Tulsa, Langston University, and Northeastern State University – Broken Arrow. After spatially analyzing geographic locations of these campuses, two loops were developed to include Tulsa area colleges. These loops are colored blue and green. The blue loop would operate from southeast toward northwest or visa versa. This is also the largest created loop.

The second loop (green) created for Tulsa area colleges operate in a north-south direction. This loop is slightly smaller than the other loops.

Figure 4: Step three is to combine all loops over the aerial photo. From this process we find that TCC red loop and Tulsa area college blue loop overlap the majority of each other. However, the green loop does not overlap any other loop except at TCC Metro and Oklahoma State University – Tulsa. All loops intersect at TCC Metro Campus again making it the transit system hub.



Figure 2

Figure 2: image displaying all Tulsa Community College facilities with a general loop.



Figure 3

Figure 3: image displaying surrounding area colleges.

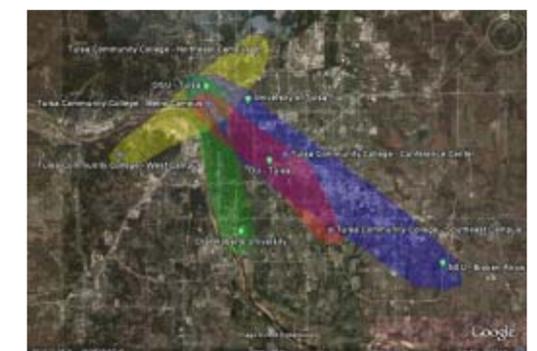


Figure 4

Figure 4: collobartion of all Tulsa Community College facilities and surrounding area colleges.



Route Design

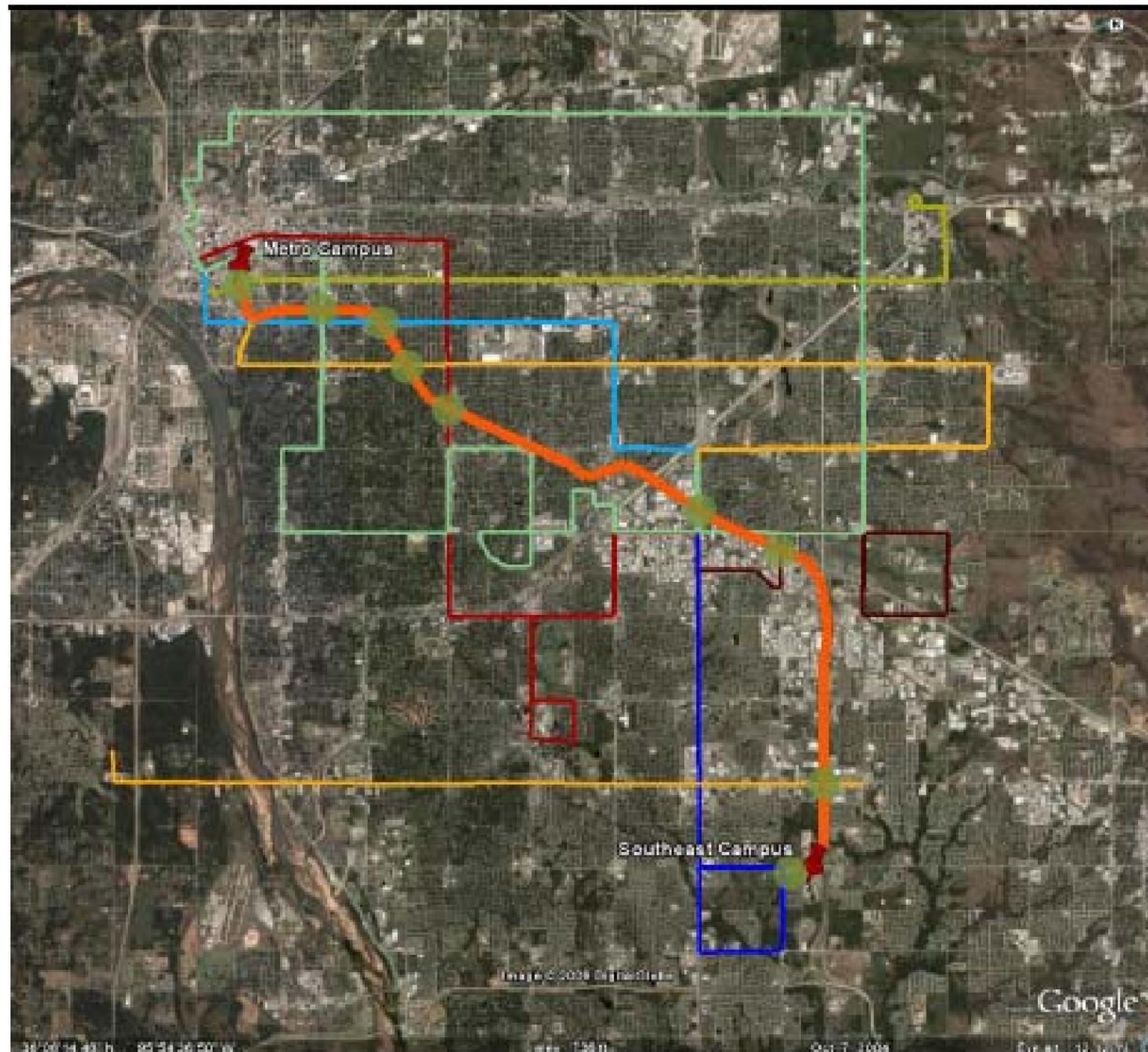
Tulsa Community College

This map (figure 1) presents general routes Tulsa Transit operates that would intersect with a proposed route from TCC's Southeast Campus and Metro Campus.

The orange line represents TCC transit route between southeast and metro campuses, while highlighted green circles indicate where the TCC route would intersect with Tulsa Transit routes. These areas could serve as additional stops to allow greater public access to the route if deemed necessary by the Federal Transit Administration in conjunction with TCC forming a partnership with Tulsa Transit.

However, if TCC independently operates the transit system, a few additional stops along this route should be considered to grant access to the nearby conference center and greater public accessibility.

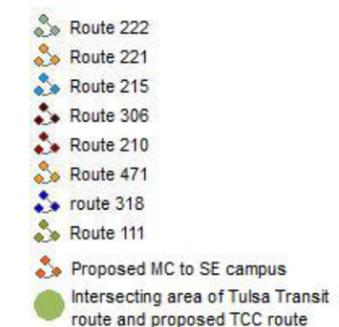
Many university transit systems that are independently operated also strive to maintain a positive working relationship with the existing local transit authority. Having two transit systems in place does not always mean a direct competition will exist. The two systems have an opportunity to complement one another and create nodes that allow passengers to transfer buses allowing greater access to destinations and making public transit system more effective.



Aerial photography provided by GoogleEarth

Figure 1

Figure 1: displays proposed TCC route (orange) and intersecting current Tulsa Transit routes. Although these routes intersect, the proposed TCC route travels on the expressway while Tulsa Transit routes utilize mostly arterial streets. Therefore, necessary adjustments would need to be included in route design to ensure that patrons for both TCC Transit system and Tulsa Transit would have a safe environment for bus transfers.



Route Topologies

Single Loop

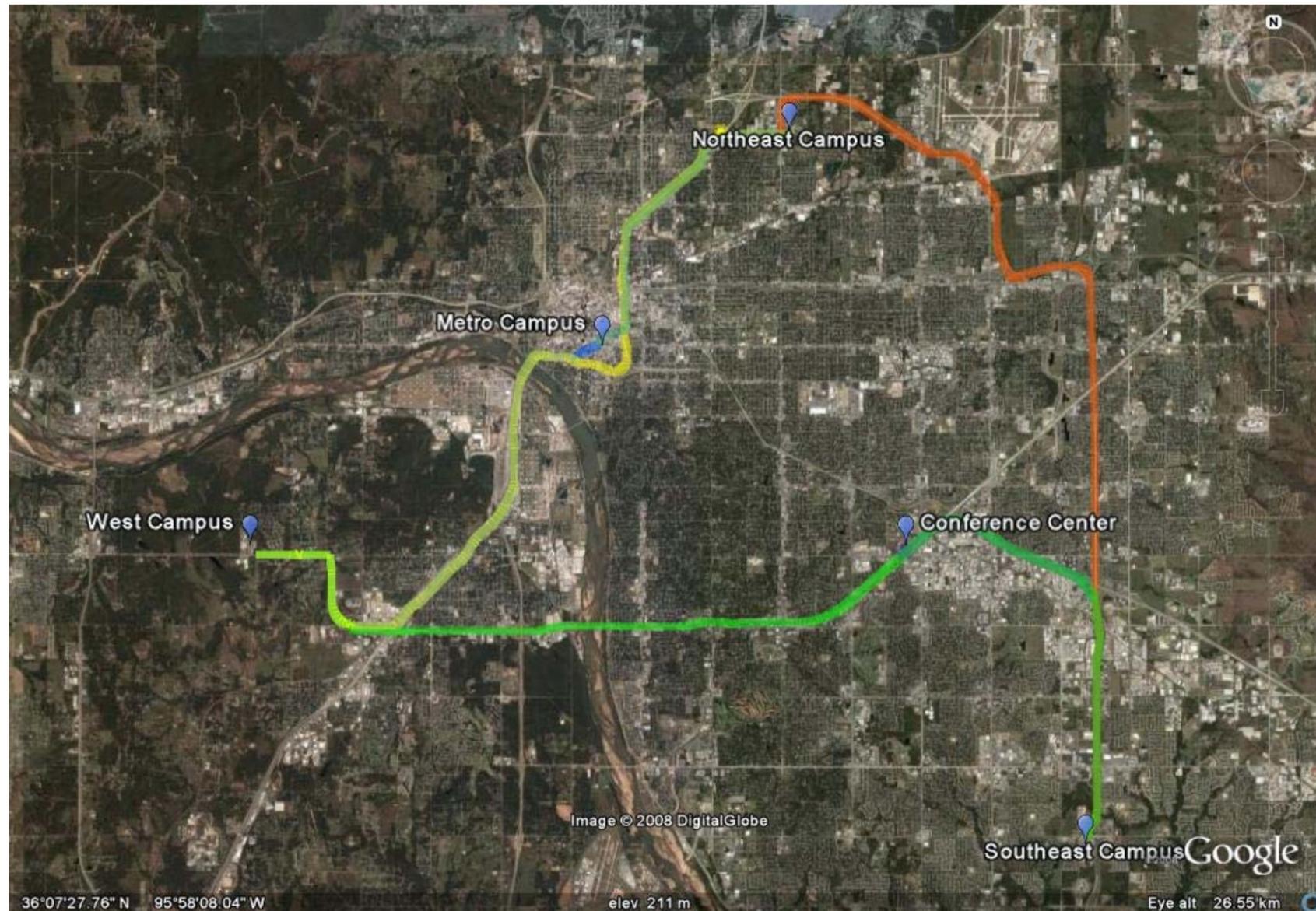


Figure 1: Single Loop topology

Aerial photo provided by GoogleEarth

		time (minutes)	miles
West	Metro	16	8
Metro	Northeast	11	6
Northeast	CC	18	13
CC	Southeast	13	7
Southeast	West	27	17
Southeast	Metro	43	25
Southeast	Northeast	54	31
Southeast	CC	72	44
West	Northeast	27	14
West	CC	45	27
West	Southeast	63	34
Metro	CC	29	19
Metro	Southeast	42	26
Metro	West	109	43
Northeast	Southeast	31	20
Northeast	West	58	37
Northeast	Metro	74	45
CC	West	40	24
CC	Metro	56	30
CC	Northeast	67	36
		one loop	51 miles
	Total	895	506
	Average	44.75	25.3
		Normalized \$/hr estimate	\$/route length
1 bus		57.43	95.13
2 bus		114.86	190.26
3 bus		172.29	285.38
4 bus		229.72	380.51

A transit system using Single Loop Topology would serve each Tulsa Community College campus with one bus at minimum operating cost. Costs would be minimized by needing one bus and one driver in current operation, however, this topology is also the most inefficient in terms of time. For example, if a student wanted to travel from Northeast Campus to Metro Campus, the worst case scenario would be a riding time of 74 minutes, excluding stoppage time for loading and unloading passengers at other campuses. A single loop topology using more than one bus would struggle to meet satisfaction of travel time among campuses.

The chart on the right indicates riding time among campuses and mileage. The system is normalized by calculating the operating costs per vehicle hour (\$77) and multiplying this figure by average commuting time. It is also normalized by cost per mile.



Route Design

MC Hub and Spoke - Timing

Expected travel time is a critical factor in route planning especially in hub and spoke systems where routes are dependent on each other. In this demonstration of route times, students may be transferring buses to ride to another campus. A layover time at Metro campus must be established for this to occur.

Travel time from Metro to Northeast is the shortest riding time and can serve as a buffer route to buses that are struggling to stay on time. Traveling from Metro Campus to either West or Southeast campus is relatively equal riding time.

Figure 1: Map displaying estimated route travel time by bus for Metro Campus and West Campus connection.

Figure 2: Map displaying estimated route travel time by bus for Metro Campus and Northeast Campus connection. Note that this route is the shortest route for time and mileage.

Figure 3: Map displaying estimated route travel time by bus for Metro Campus and Southeast Campus connection. This route is the longest mileage but utilization of expressways keeps travel time relatively similar as the route connecting Metro and West campuses.

Figure 4: Map portraying overall transit scheme for travel time.

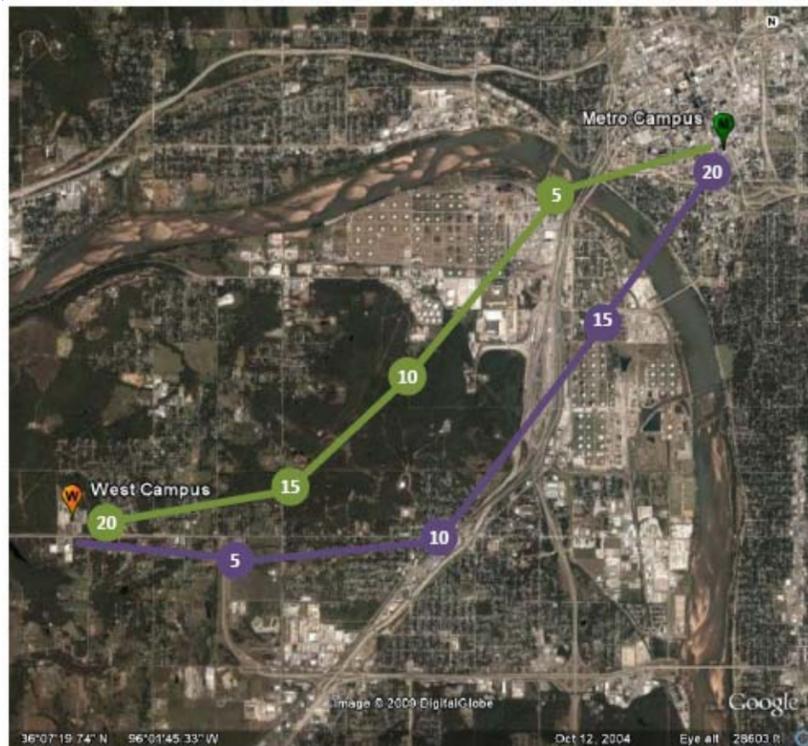


Figure 1

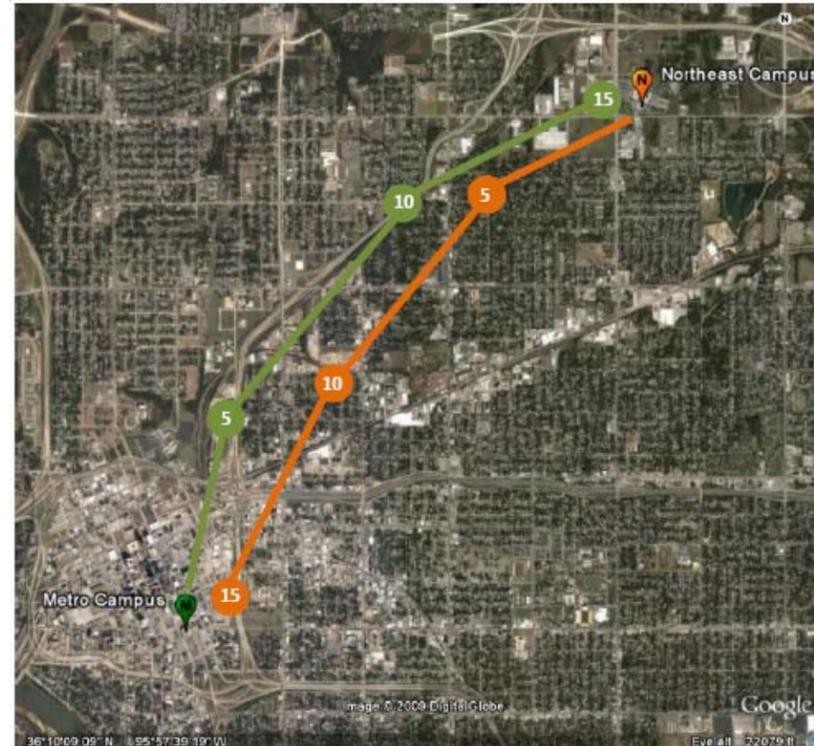


Figure 2

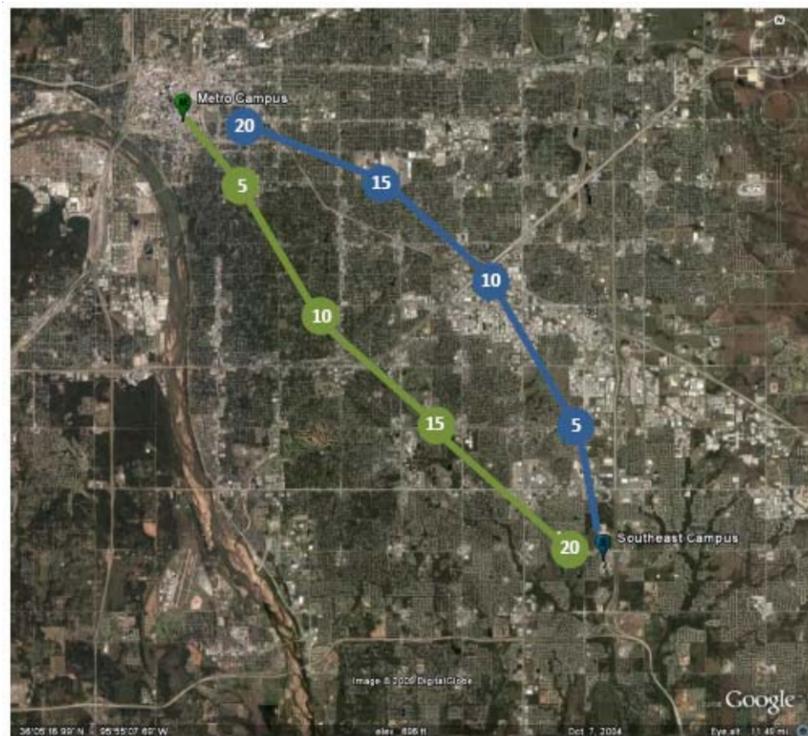


Figure 3



Figure 4

Route Topologies

Hub & Spoke - Southeast

		time (minutes)	miles
West	Metro	43	30
Metro	Northeast	37	29
Northeast	CC	34	23
CC	Southeast	13	24
Southeast	West	27	17
Southeast	Metro	16	13
Southeast	Northeast	21	16
Southeast	CC	13	7
West	Northeast	48	33
West	CC	40	24
West	Southeast	27	17
Metro	CC	29	20
Metro	Southeast	16	13
Metro	West	43	30
Northeast	Southeast	21	16
Northeast	West	48	33
Northeast	Metro	37	29
CC	West	40	24
CC	Metro	29	20
CC	Northeast	34	23
	Total	616	441
	Average	30.8	22.05
	Normalized \$/hr estimate		
	4 bus	158.11	331.63

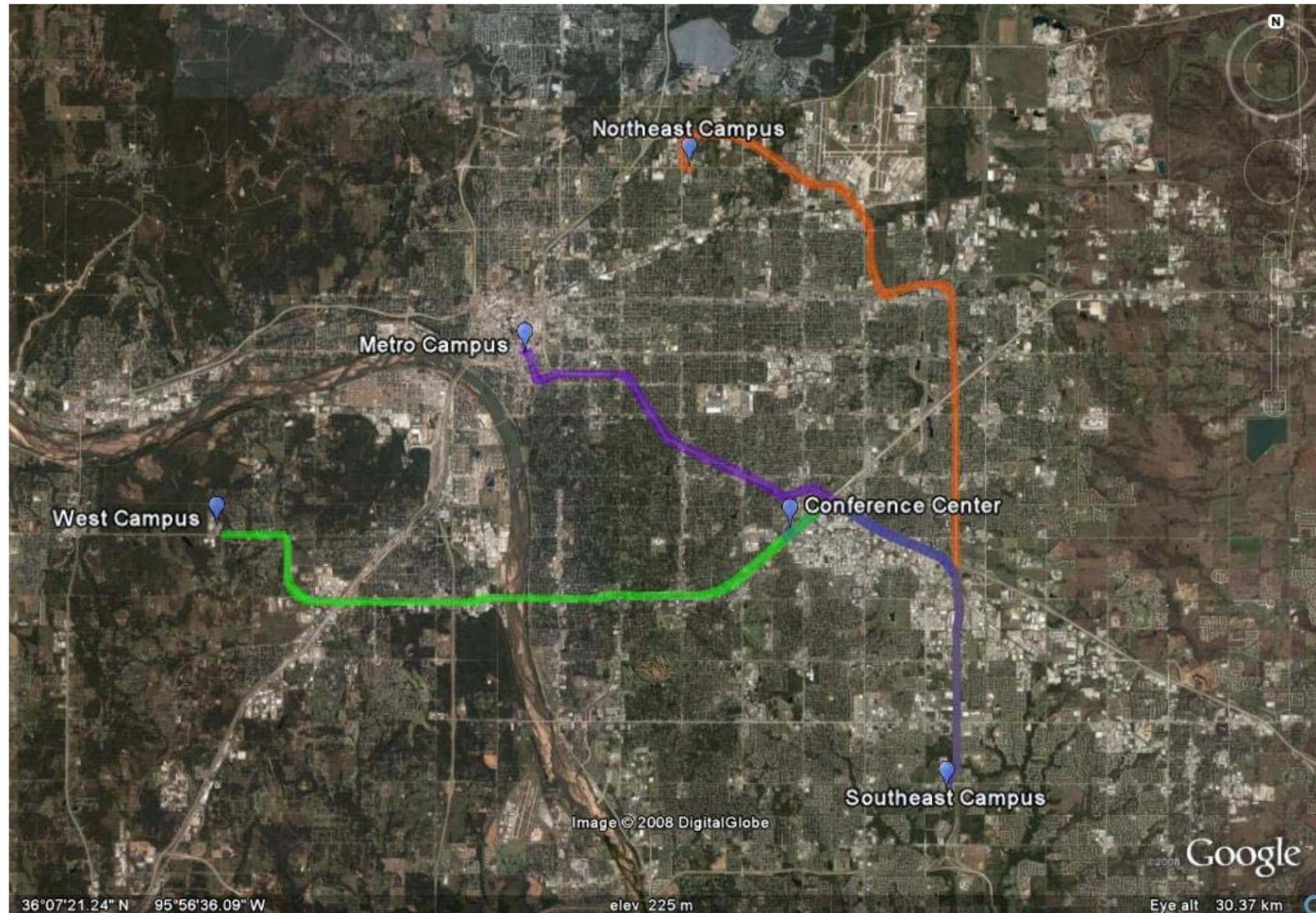


Figure 1: Hub and Spoke topology - Southeast Campus

Aerial photo provided by GoogleEarth

One scenario for a hub and spoke system would be to establish the hub at Southeast Campus. The reason for doing so is that Southeast campus has the largest student and faculty population. Perhaps the system could be better utilized if all routes were directed inbound and outbound from this location. The challenge with this topology is that this significantly raises riding time and result in poor ridership. Also, this system is less efficient fiscally.

The chart on the right indicates riding time among campuses and mileage. The system is normalized by calculating operating costs per vehicle hour (\$77) and multiplying this figure by average commuting time. It is also normalized by cost per mile.



Report by Nathan Kuntz

Route Topologies

Full Mesh

		time (minutes)	miles
West	Metro	16	8
Metro	Northeast	11	6
Northeast	CC	18	13
CC	Southeast	13	7
Southeast	West	27	17
Southeast	Metro	16	13
Southeast	Northeast	21	16
Southeast	CC	13	7
West	Northeast	23	13
West	CC	19	11
West	Southeast	27	17
Metro	CC	10	8
Metro	Southeast	16	13
Metro	West	16	8
Northeast	Southeast	21	13
Northeast	West	23	13
Northeast	Metro	11	6
CC	West	19	11
CC	Metro	10	8
CC	Northeast	18	13
	Total	348	221
	Average	17.4	11.05
	Normalized \$/hr estimate		\$/route length
	9 bus	200.97	373.93

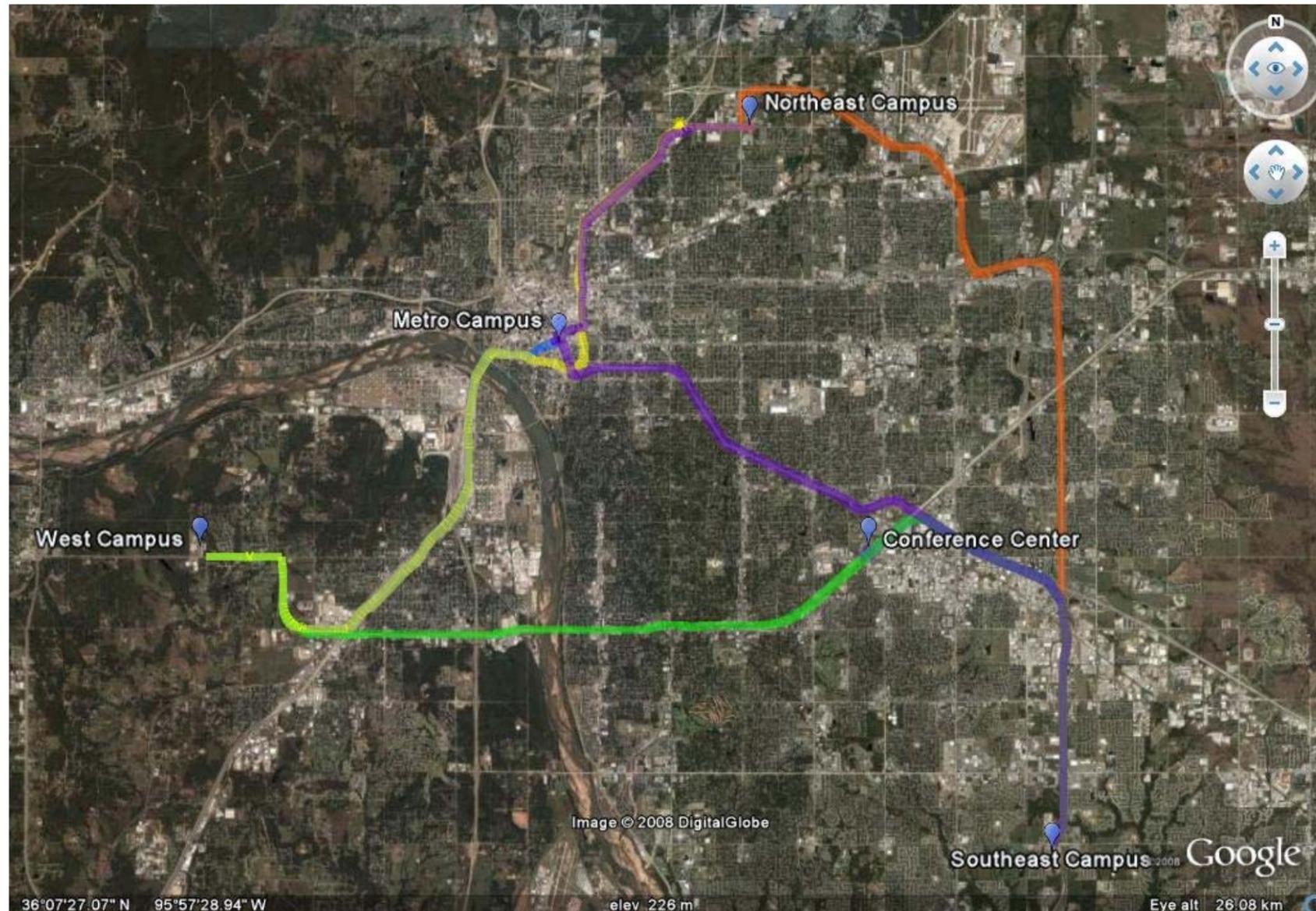


Figure 1: Full Mesh topology

Aerial photo provided by GoogleEarth

A full mesh topology is a system that creates routes to every destination point from any point of origin. This is the most efficient system for riding time, but is exceedingly expensive to operate. Generally speaking, only transit systems that have very large ridership numbers and are well funded, can financially operate a full mesh topology. Tulsa Community College would need a minimum of 16 buses in operation to use a full mesh topology and student ridership would have to be extremely high.

The chart on the right indicates riding time among campuses and mileage. The system is normalized by calculating operating costs per vehicle hour (\$77) and multiplying this figure by average commuting time. It is also normalized by cost per mile.



Report by Nathan Kuntz

Detailed Route Design

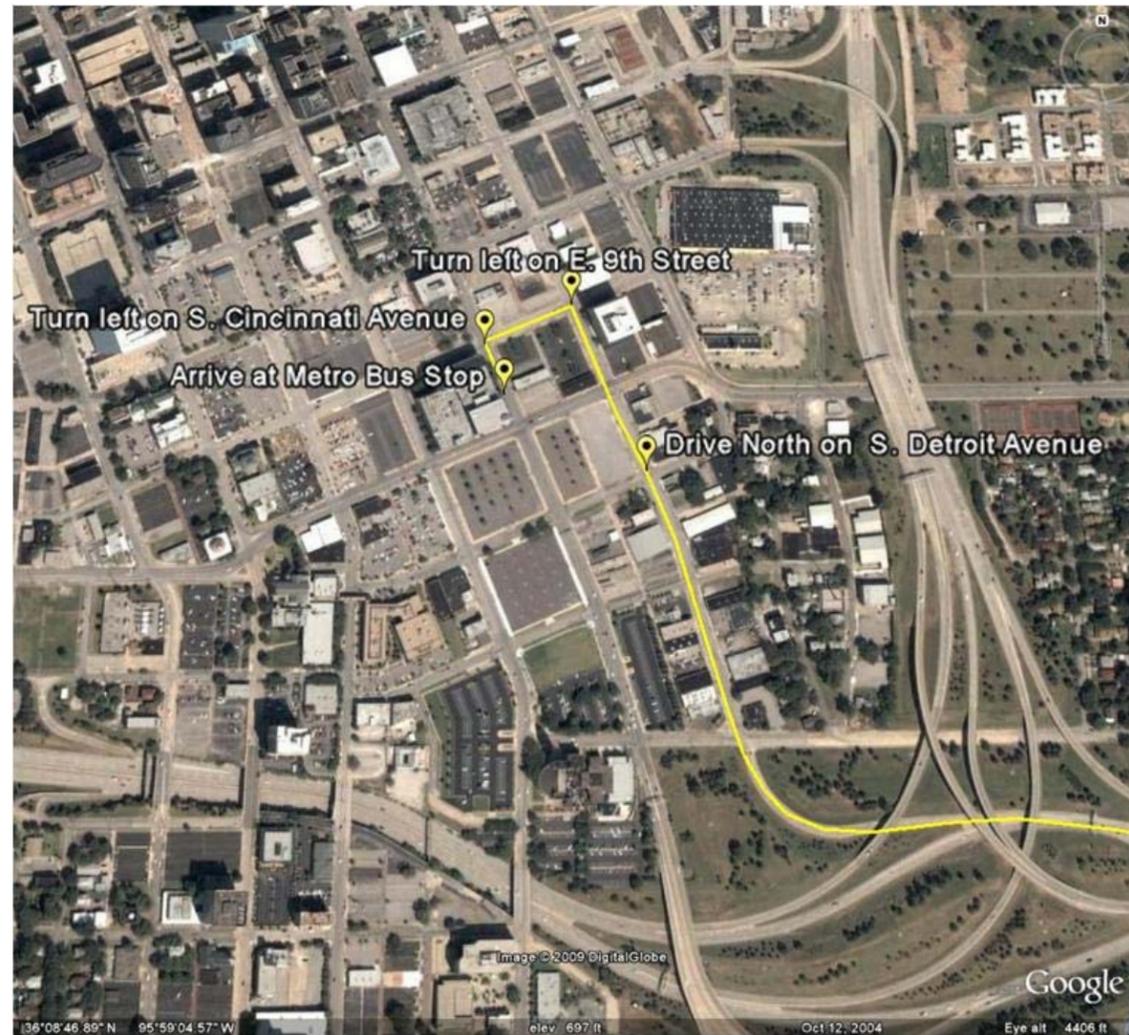
Tulsa Community College

Route design is a key to transit system success. Routes must be established on two basic principles.

First being what is the most efficient route from point A to point B.

Secondly, the route must be designed with safety in mind. Bus routes will typically avoid making left hand turns which are more difficult for a bus to make across traffic. However, left hand turns depicted on this route are entering one way streets which is an exception to the rule. Also, routes must take into consideration location of passenger loading and unloading areas. Bus cut-outs are safest for passengers and commonly allow bus easy re-entry into traffic. Yet bus cutouts are fairly rare and most communities have not incorporated streetscape for this addition. A good number of transit systems simply have its buses load and unload passengers directly on the street. In spite of this, safety measures can still be taken to help prevent an accident. There are near-side stops and far-side stops. Near-side stops occur before an intersection while far-side stops occur past the intersection. More often than not, far-side stops tend to be the safest location for loading and unloading passengers.

Metro Campus of Tulsa Community College would be best served with a bus stop at 950 S. Cincinnati Ave. This location allows for a far-sided stop, easy access to and from downtown, and possible bus transit facility expansions within the building.



Aerial photo provided by GoogleEarth

Figure 1

Figure 1 (top): small scale map depicting TCC Metro Campus in downtown Tulsa along with detailed route directions from traveling from Southeast Campus to Metro Campus

Figure 2 (bottom left): depicts the route upon entering downtown area from highway 51

Figure 3 (bottom right): large scale map depicting the proposed route from Southeast Campus to Metro Campus

Figure 4: Graph displaying TCC survey data from participants who responded how important a stop at TCC Conference Center would be. 62% of the respondents felt that a transit stop at TCC Conference Center would not be important.

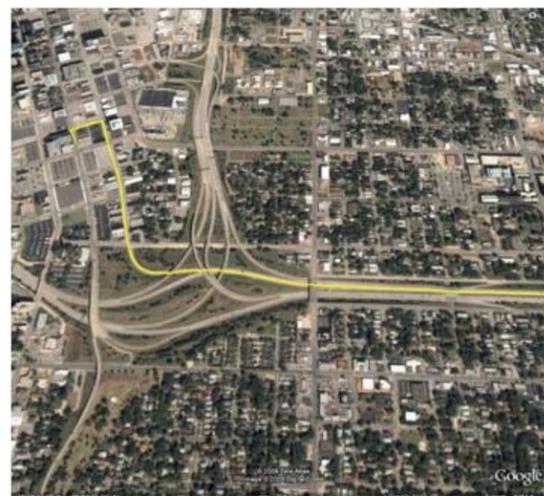


Figure 2

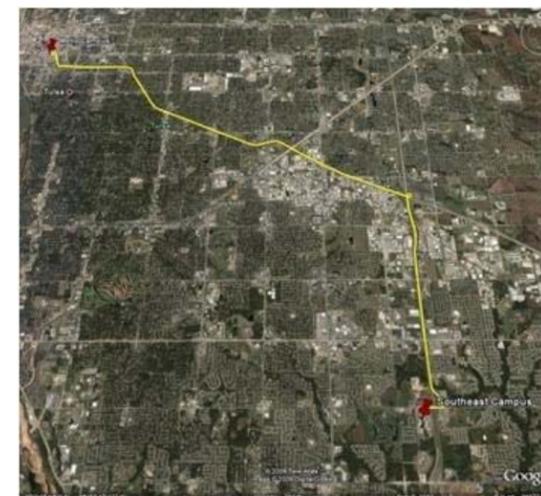


Figure 3

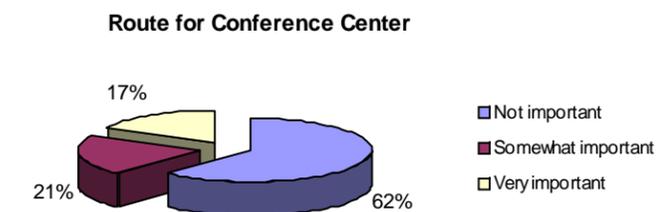


Figure 4



Detailed Route Design

Metro-Northeast connection

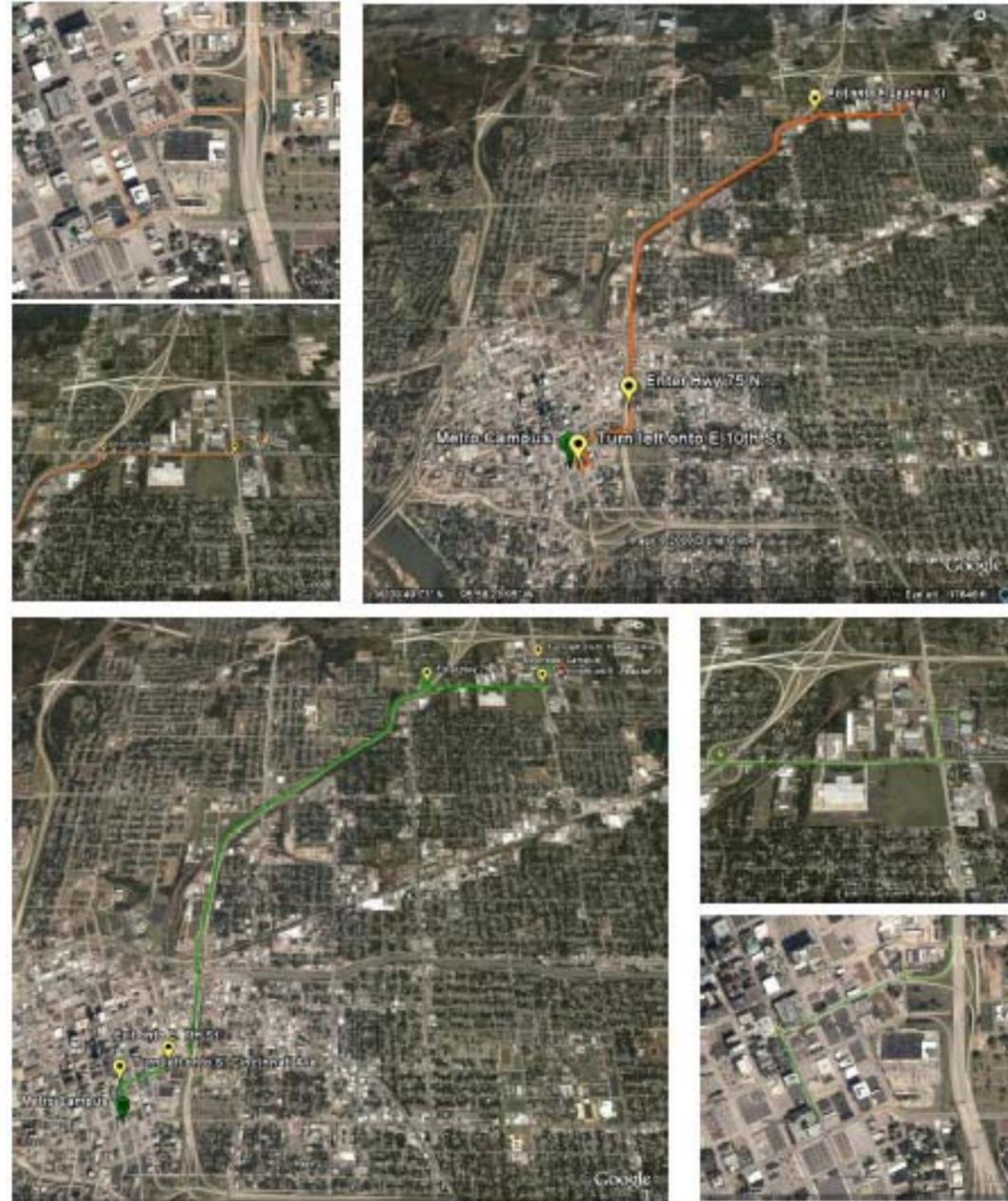


Figure 1

Figure 1 represents detailed route design for routes which leave Metro Campus traveling to Northeast Campus and route design for the return trip. Note that the design of in-bound and out-bound route varies to maximize efficiency and create the most bus friendly route.

Figure 2 represents the detailed route design for routes leaving Metro Campus and traveling to West Campus, again note that in-bound and out-bound route design varies.

Metro-West connection

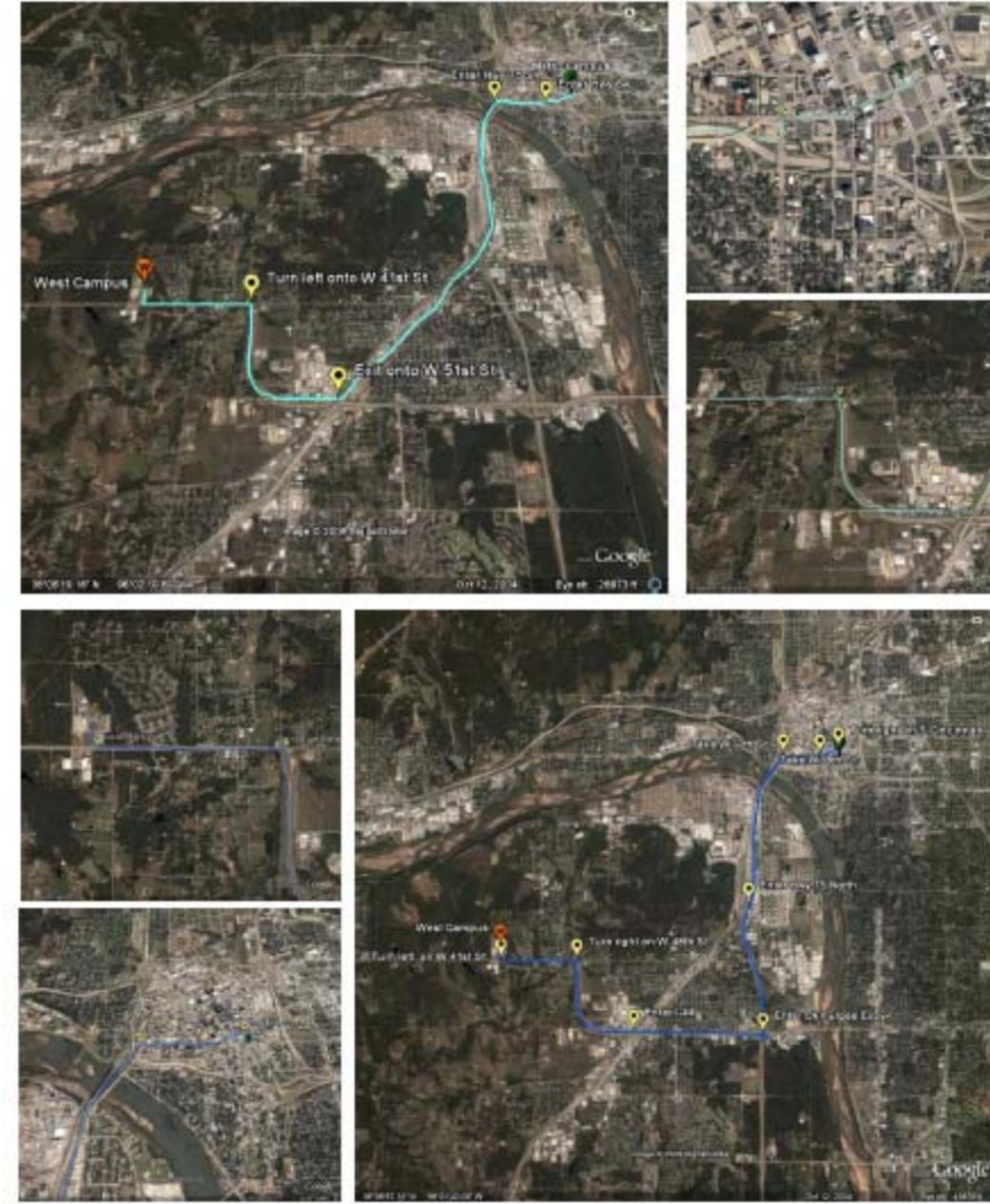


Figure 2



Bus Shelter Architecture

Tulsa Community College

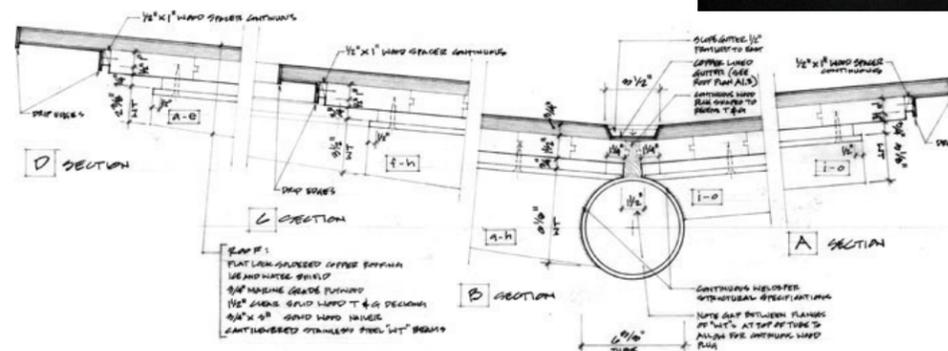
Many transit companies are beginning to expand design, function, and social settings of traditional bus shelters.

Bus shelters can be more than a bench on the side of a street. They can be a symbol of innovative design almost playing a role as public art. An option for bus shelter design could include Tulsa Community College students taking an active role, perhaps engineering students could help with the design or art students could paint a mural on the shelter. This interaction with transit systems encourages a sense of ownership and pride.

This could also be technological atolls. Use of Global Position Systems (GPS) can allow waiting passengers to view exact bus locations in real time from an LCD screen located in the bus shelter. This allows the rider to know if the bus is running behind schedule and that they have not missed the bus.

Another capability using GPS is to have a system installed that would send notices to riders who have signed up for such a service to be sent a text message via cell phone if a bus is running later than expected.

Bus shelters can also serve as a focal point for social settings promoting a sense of community. This can be achieved by having a service available to the public such as coffee or a wireless internet connection at the bus shelter. In a college setting, especially for Tulsa Community College which is a commuter college, promoting a sense of unity between students and faculty is key to the university experience.



Photos provided by www.ladallman.com, www.yankodesign.com, www.girlfromimpanema.com, www.object.com,



Bus Shelter Location

Tulsa Community College

Bus shelter location at TCC has an important role to allow easy access to the transit system. Not only should bus shelters be easy to access for students and faculty, but buses themselves should have easy access on and leaving campuses.

Only Metro Campus proved to be a challenge in locating a proper location for a bus shelter and bus stop. Other campuses had clear advantages and disadvantages for a bus shelter location.



Figure 1: Proposed bus shelter location at TCC Northeast Campus. This proposed location utilizes front entry on the east side of campus orientated to student services. This location would provide easy entrance and exit of Northeast campus in a well lit, safe environment. Tulsa Transit currently uses the same bus shelter location.



Figure 2: Proposed bus shelter location at TCC West Campus. This proposed location utilizes main entry on the south side of campus. This location would provide a safe, easy entrance and exit of West Campus. Design of the entry road at West Campus provides wide turns excellent for bus travel, addition of limited parking with the entrance loop would be beneficial.



Figure 3: Recommended bus shelter location for TCC Metro Campus is along S. Cincinnati Ave. on the east side of campus. This location provides the easiest path for buses to enter and leave the area downtown Tulsa. This location also would provide patrons opportunity to wait inside and view arrival of a transit bus during inclement weather.



Figure 4: Proposed location of the bus shelter at TCC Southeast Campus would be the north side of campus in the circle drive. This would provide a safe loading and unloading passenger area and easy access on and off campus. The circle drive has a sharp turning radius but use of a cutaway bus would provide a solution.

Grants & Financing

Federal Transit Administration

Grants at Federal and State levels are typically awarded to local transit authorities as well as independent operators. The Federal Transit Administration (FTA) is a major contributor of transit related grants. The FTA is a division of U.S. Department of Transportation headquartered in Washington, DC.

The FTA provides eligible transit agencies with grant monies totaling more than \$10 billion for transportation projects. At the local level, the FTA provides both capital and operational costs authorizing purchases of new buses, route planning, bus facilities, and more recently, environmental adjustments for public transit. With the addition of the American Recovery and Reinvestment Act (ARRA) FTA expects to see additional funding for transportation. The FTA distributes financial awards in accordance to Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU.)

SAFETEA-LU authorizes specific dollar amounts for each program. Each year Congress provides an annual appropriation which funds the programs specified in SAFETEA-LU. Upon receiving this appropriation, FTA apportions and allocates these funds according to formulas and earmarks. These FTA apportionments are published annually in the Federal Register. (www.fta.dot.gov/grants_financing.html)

Upon receiving a grant, the grantee is responsible for adherence to FTA grant guidance. Safeguard regulate awarded monies and ensure that grantees use the money as specified. The grantee is subject to oversight by the FTA.

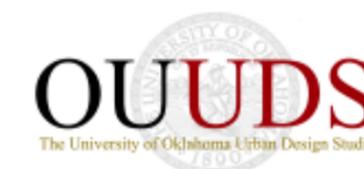
- Metropolitan & Statewide Planning (5303,5304,5305)
- Large Urban Cities (5307)
- Clean Fuels Grant Program (5308)
- Major Capital Investment (New Starts & Small Starts (5309)
- Bus and Bus Facilities (5309,5318)
- University Transportation Centers Program (TEA-21 5505)
- Job Access and Reverse Commute Program (5316)



Photo provided by FTA via www.kcata.org



Photo and Data provided by FTA



Report by Nathan Kuntz

Financial Estimates

TCC Transit Fees

To support a transit system, I recommend that Tulsa Community College establish a transit fee to finance a TCC transit service.

This transit fee would be a \$5 fee assessed to everyone. Students will have an additional fee in their tuition costs while TCC faculty and staff will have the fee deducted from their paycheck. TCC manages the parking fee in a similar manner.

A proposed \$5 fee is less than typical transit fees at other universities; however, TCC does not require the same amount of overhead as large transit services. TCC Transit fee would be affordable while providing financial support to TCC Transit.

This \$5 fee is estimated to equal \$134,445/semester. If TCC were to form a partnership with Tulsa Transit, this fee would cover the estimated transit costs and Tulsa Transit would heavily subsidize the purchase of new buses and bus shelters. On the other hand, if TCC were to implement their own transit service, the fee would not initially cover the costs. I recommend TCC explore the possibility of receiving grant money from the Federal Transit Administration, specifically grants directed toward transit start-up and university transit. According to estimated TCC Transit operating costs, a \$5 fee would pay for the initial startup costs in about four years. At this point, a TCC Transit fee would be able save funds for purchase of new equipment and maintenance.

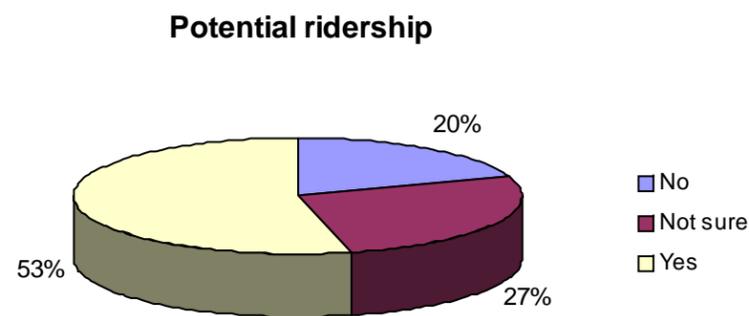


Figure 1: Data from TCC Transit survey

TCC Transit Fee Estimates	
Total student enrollment =	24,540
Total employees =	2,349
Total =	26,889
Scenarios:	
\$1/semester fee (everyone) =	\$26,889
\$5/semester fee (students only) =	\$122,700
\$5/semester fee (everyone) =	\$134,445
\$10/semester fee (students only) =	\$245,400
\$10/semester fee (everyone) =	\$268,890

Figure 2: Enrollment and employee totals with transit fee estimates

Figure 1: Graph depicting data from TCC Transit survey that asked, “if a transit service were available, would you use the service?” 53% of respondents said “yes,” and another 27% answered “maybe.”

Figure 2: Chart showing current enrollment and employee totals at Tulsa Community College. This chart also shows scenarios on estimated transit fee totals depending on the dollar amount of transit fees.



Financial Estimates

TCC Operates transit system - using cutaway buses				
Capital Costs				
			Low	High
Cost per bus (new)	60,000 - 150,000	3 buses =	180,000	450,000
Average lifespan of bus	6 years = 10,000/year			
Cost per bus (used)	25,000 - 80,000		75,000	240,000
Bus shelter	20,000 - 50,000 each		60,000	150,000
Bus Storage				
Bike Racks				
Estimated Total (new) on a two bus system for two semesters			240,000	600,000
Estimated Total (used) on a two bus system for two semesters			135,000	390,000
Operational Costs				
			Low	High
Contract maintenance	1 bus @ \$70/hour			
Fuel per semester	2,500 - 4,000		36,000	42,000
One bus at \$2/gallon averaging 12 mpg				
Drivers salary	\$28,000 - \$33,000		84,000	99,000
13-15\$/hour + taxes, health insurance				
Student drivers				
cheaper option				
Insurance per year	9,000 - 10,000/bus		27,000	30,000
Supervisor				
Telephone				
Estimated Total on a two bus system for two semesters			147,000	171,000
Estimated Total Costs on a two bus system for two semesters			387,000	771,000

Figure 1:

Figure 1: Chart depicting estimated transit costs by using a university owned and operated system by Tulsa Community College.

TCC and Tulsa Transit form partnership	
1 bus @ \$45/hour	FTA will pay 80-83% cost of new bus
	FTA will pay 80% cost of shelters
1 bus @ 8 hrs/day = \$360	
1 bus for 1 week(5 days) = \$1,800	
1 bus for 16 wks = \$28,800	
2 buses @ 8 hrs/day = \$720	
2 buses for 1 wk(5 days) = \$3,600	
2 buses for 16 wks = \$57,600	
3 buses @ 8 hrs/day = \$1,080	
3 buses for 1 wk(5 days) = \$5,400	
3 buses for 16 wks = \$86,400	
6 buses for 16 wks = \$172,800	
Estimated cost on 2 bus system for two semesters	\$115,200

Figure 2:

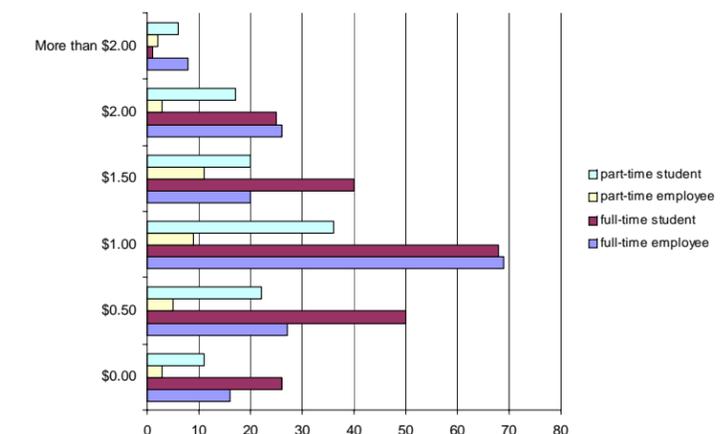


Figure 3:

Figure 2: Chart depicting estimated transit costs if Tulsa Community College were to form a partnership with Tulsa Transit to operate a transit service for the college.

Figure 3: Graph displaying data from TCC Transit survey representing how much people would be willing to pay per ride.



Benefits

Tulsa Community College

Studies have proven how effective a well utilized transit system can be to help reduce carbon dioxide (CO2) emissions. Shown here, are several visuals to demonstrate large sources of CO2 emissions, advantages that public transportations have, and CO2 emission comparisons.

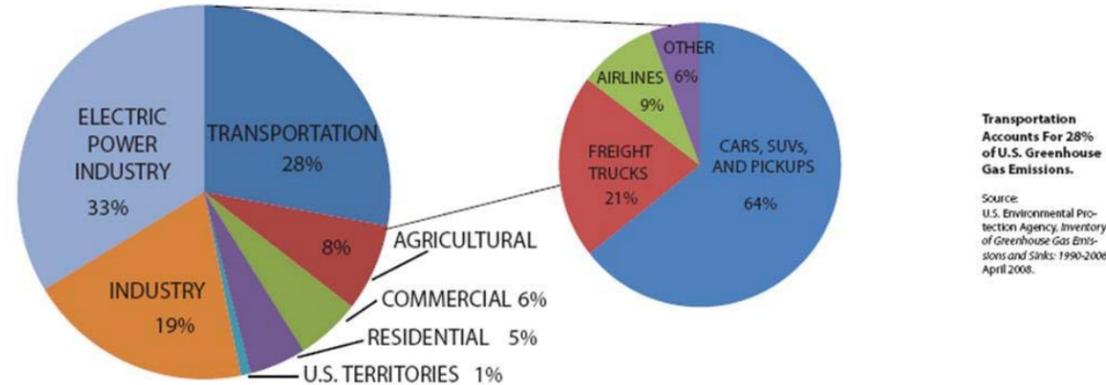


Figure 1: Data provided by U.S. Department of Transportation, Federal Transit Administration

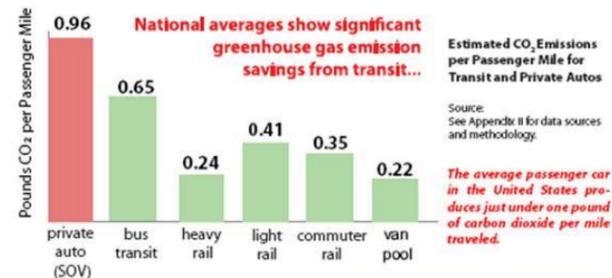


Figure 2: Data provided by U.S. Department of Transportation, Federal Transit Administration

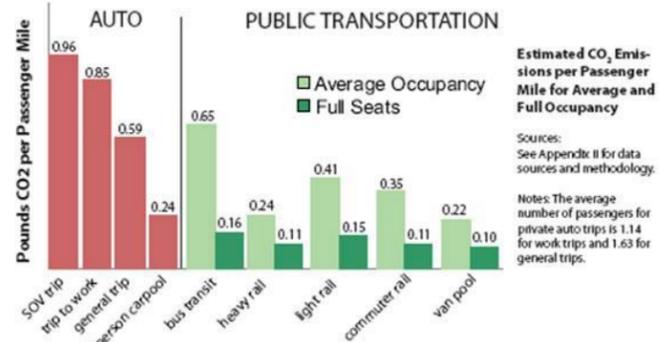


Figure 3: Data provided by U.S. Department of Transportation, Federal Transit Administration

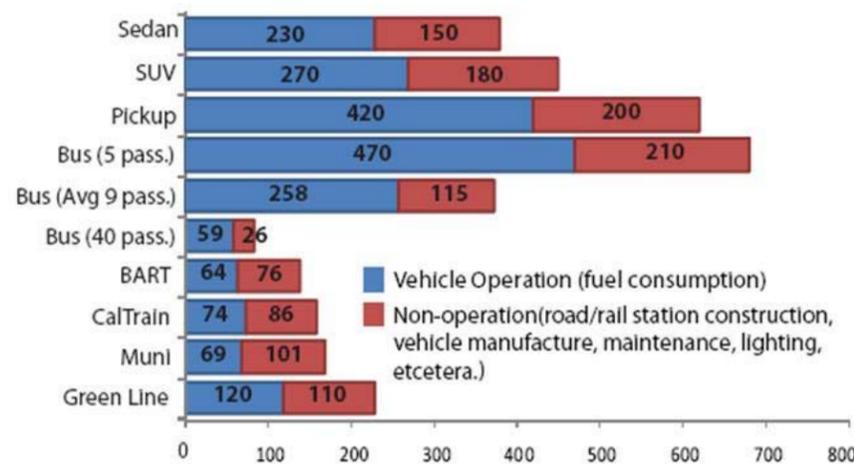


Figure 4: Data provided by U.S. Department of Transportation, Federal Transit Administration

Figure 5: This graph is generated from data from the Tulsa Community College transit survey, the question asked is, “what would be your reason for using the TCC transit system.” TCC full time employees chose “support eco-friendly means of transportation” for the most common choice. Overall, the number one reason for using the system would be to save money, but environmental reasons are a close second.

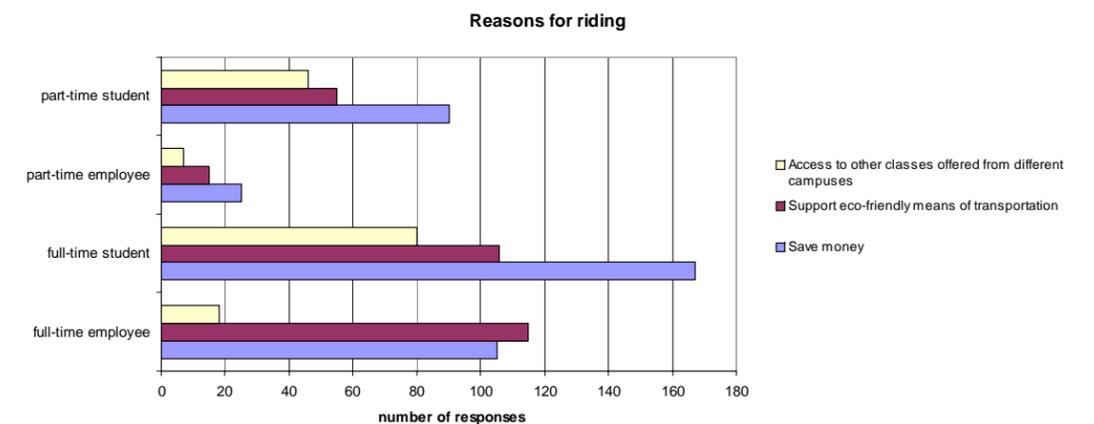


Figure 5: Results of TCC Transit survey



Environment

Tulsa Community College

If Tulsa Community College were to implement a transit service using two buses connecting each campus in a hub and spoke system with Metro Campus operating as the hub, substantial CO2 emissions could be eliminated.

For one day, if TCC operated this transit service at full capacity for two buses connecting each campus, the total saved pounds of CO2 would be just shy of 18,000 pounds of CO2.

If the system operated at capacity for Fall and Spring semesters, total saved emissions would be well over 2,800,000 pounds of CO2.

Figures 1,2, and 3: Spreadsheets depicting estimated amount of CO2 emissions saved by using the proposed TCC transit system among campuses. These figures are based on the possibility that 25 people could ride on a bus and that there would be two buses for each TCC route. The following calculations determine riding time and distance in miles. With this data we can determine how many cars would essentially be removed from the road if students and faculty were to use TCC Transit service.

According to www.coloradotrees.org, "a single mature tree can absorb carbon dioxide at a rate of 48 lbs./year." According to these estimates, using a TCC transit system operating at full capacity for one year could essentially be equal to having an additional 58,330 mature trees in Tulsa.

Metro and Southeast connection @ 2 buses (25 passengers) operating 30 minute headways	
1 bus = 25 cars	
2 bus = 50 cars	
1 trip = 13 mi	
1 rd. trip = 26 mi	
1 rd. trip = 1 hour	
8 hrs = 8 rd. trips	
8 rd. trips (one bus) = 208 mi	
8 rd. trips (two bus) = 416 mi	
25 cars @ 1 rd. trip = 650	
25 cars @ 8 rd. trip = 5,200	
50 cars @ 1 rd. trip = 1,300	
50 cars @ 8 rd. trip = 10,400	
8 rd. trip (two bus) = 1356.44 pounds of CO ₂ produced	
50 cars @ 8 rd trip = 10022.94 pounds of CO ₂ produced	
8,666.5 pounds of CO ₂ saved per day by connecting Metro and Southeast	

Figure 1

Metro and Northeast connection @ 2 buses (25 passengers) operating 30 minute headways	
1 bus = 25 cars	
2 bus = 50 cars	
1 trip = 5 mi	
1 rd. trip = 10 mi	
1 rd. trip = 1 hour	
8 hrs = 8 rd. trips	
8 rd. trips (one bus) = 80 mi	
8 rd. trips (two bus) = 160 mi	
25 cars @ 1 rd. trip = 250	
25 cars @ 8 rd. trip = 2,000	
50 cars @ 1 rd. trip = 500	
50 cars @ 8 rd. trip = 4,000	
8 rd. trip (two bus) = 521.71 pounds of CO ₂ produced	
50 cars @ 8 rd trip = 3854.98 pounds of CO ₂ produced	
3,333.27 pounds of CO ₂ saved per day by connecting Metro and Northeast	

Figure 2

Metro and West connection @ 2 buses (25 passengers) operating 30 minute headways	
1 bus = 25 cars	
2 bus = 50 cars	
1 trip = 9 mi	
1 rd. trip = 18 mi	
1 rd. trip = 1 hour	
8 hrs = 8 rd. trips	
8 rd. trips (one bus) = 144 mi	
8 rd. trips (two bus) = 288 mi	
25 cars @ 1 rd. trip = 450	
25 cars @ 8 rd. trip = 3,600	
50 cars @ 1 rd. trip = 900	
50 cars @ 8 rd. trip = 7,200	
8 rd. trip (two bus) = 939.07 pounds of CO ₂ produced	
50 cars @ 8 rd trip = 6,938.96 pounds of CO ₂ produced	
5,999 pounds of CO ₂ saved per day by connecting Metro and West	

Figure 3



Concepts

Wind Power

Wind energy has been growing increasingly popular and economically feasible during the past few years. In fact, “Oklahoma Wind Power Initiative” established in 2000, contains goals and objectives set to encourage use of wind power and educate the public in long-term benefits.

One potential concept for use of wind energy at TCC is to create an innovative system that could recharge batteries of a hybrid diesel-electric bus. Thomas Henderson, Assistant Professor of Electronics at TCC, has established a program at Northeast Campus that focuses on wind energy and its potential. This concept idea would be a very beneficial learning research tool for students and researchers.

If one 15 kW, horizontal wind turbine were erected at the Northeast Campus it is expected to generate enough energy to recharge the batteries on a single hybrid diesel-electric bus overnight. One turbine of this power costs around \$25,000 and can be as tall as 20 meters.

There are increasing number of schools in the United States that have implemented wind turbines to help reduce utility costs and allow students hands on experience of how wind can produce energy. Most schools using wind turbines are extremely pleased with their system and are looking forward to expanding programs.



Photo provided by cnet; www.news.cnet.com

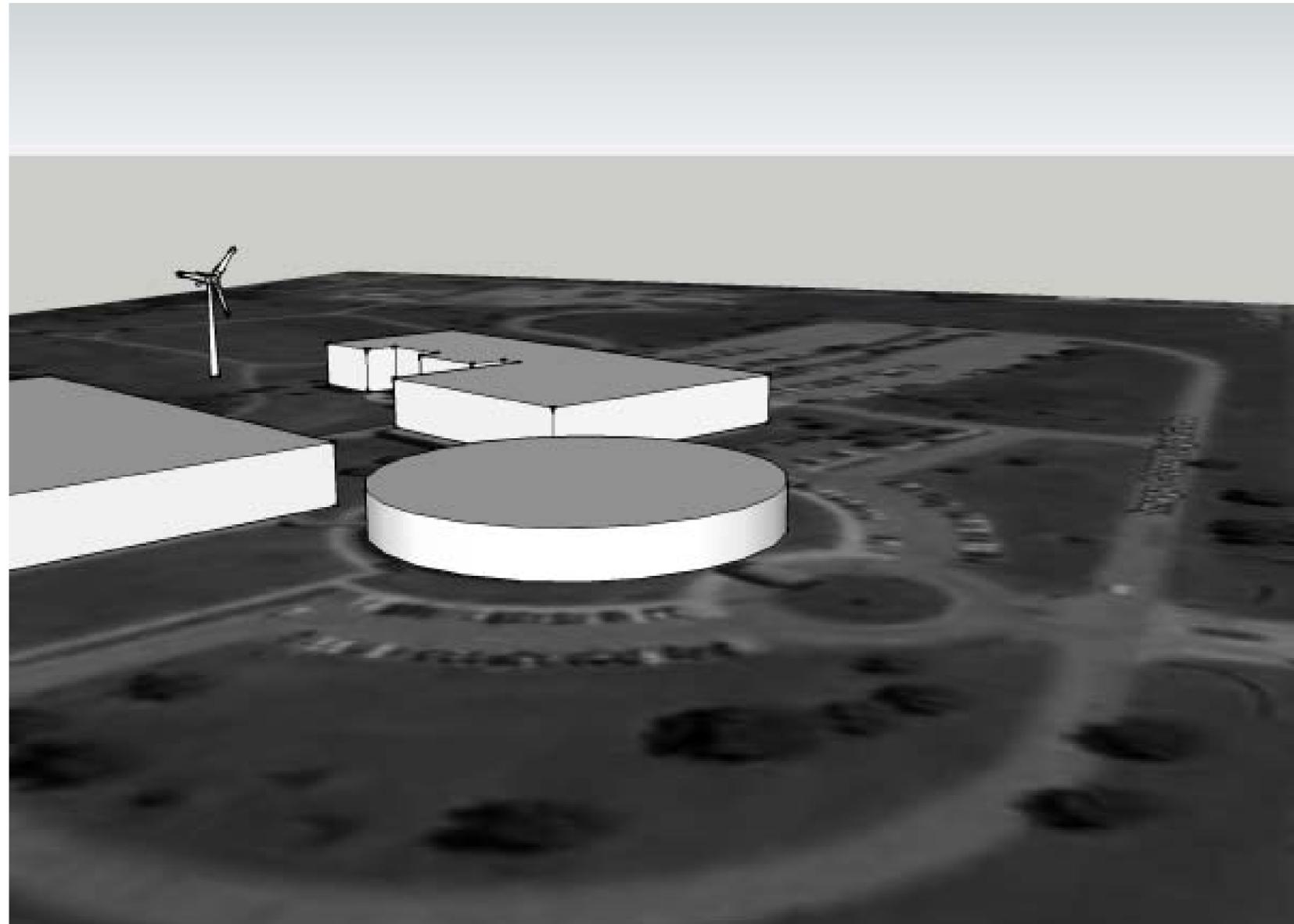


Figure 1: Conceptual model portraying a wind turbine at TCC Northeast Campus

If this concept were to be implemented, not only would it be a valuable asset to TCC, but it could also help improve infrastructure. If an excess amount of energy were created by using a wind turbine, TCC could use this energy to power facilities among Northeast campus. Another alternative would be to sell excess energy to local generation plants.



Report by Nathan Kuntz

Concepts

Riding Experience

Tulsa Community College through this potential transit service has an opportunity to reach a captive audience during their commute among TCC campuses.

While riding on a TCC bus, students and faculty could have an experience much greater than sitting and watching out the window. A growing number of cities throughout America are outfitting their transit buses with wireless internet capability. This is a process that will cost between \$1,000 and \$2,000 dollars to install per bus, but many systems such as Southwest Ohio Regional Transit Authority's Metro system in Cincinnati does not pay for a monthly service charge. This capability would allow riders internet access while traveling on the bus.

Another concept idea is to make available via television a TCC tutorial. Currently, TCC is adopting a new TCC Educational Database (TED). This system involves students enrolling in courses through a new format. If TCC were to implement this system, it would be an excellent opportunity to demonstrate to students and faculty a tutorial of how to navigate the new system, TED. A new approach to sound systems is also available that use ultrasonic waves allow listeners to be specifically targeted within a small space. This new system uses flat speakers with ultrasonic emitters allowing for lighter, cheaper, smaller speakers. This system would allow a listener the audio only if he/she were sitting in the targeted area. (www.woodynorris.com)

Applying these concept ideas to the transit system would provide riders with "a one of a kind" riding experience that would go far beyond the stigma associated with public transportation.



Photos provided by www.frontrangeexpress.com, www.tcrp.com, www.usatoday.com, www.nextbus.com, www.i.pbase.com, www.itsmybus.com



Concepts

TCC Metro Campus Transit Cafe

An innovative design and operational change may include establishments such as a TCC Transit Café.

This idea would use the current under-utilized student lounge and gaming room, SC-110, a large room on the building's east side first floor. Here, at the TCC Transit Café, students, faculty, and general public may gather and enjoy a cup of coffee and a healthy snack while waiting for bus service. This facility may bring more students and faculty together and perhaps promote a sense of community and belonging among TCC students and faculty.

The TCC Transit Café would have wireless access available along with television monitors tracking incoming and outbound buses granting students the ability to know where buses are and if they may be behind or ahead of schedule.

Another advantage of the TCC Transit Café is its location. Riders would be able to wait inside the building in a comfortable environment especially during inclement weather and be able to view through east facing windows when the bus has arrived.

This concept of a TCC Transit Café is an excellent opportunity to encourage student collaboration, hold student functions, and have a positive social influence within the community.



Report by Nathan Kuntz

Figure 1: A view looking northeast from inside the TCC Transit Cafe provides a clear view of arriving buses

Figure 2: Facing northwest toward the entrance and exit of the TCC Transit Cafe

Figure 3: Looking south toward the bar area of the TCC Transit Cafe and amenities



Figure 1: TCC Transit Cafe



Figure 2: TCC Transit Cafe



Figure 3: TCC Transit Cafe

Significance

A Tulsa Community College transit service would have a dramatic impact within TCC itself involving granting students and faculty an alternative mode of transportation among campuses, access to classes, along with alleviating parking congestion.

However, this transit system could also have an impact beyond Tulsa Community College. With the average college student age around 20 years old, this younger generation may become comfortable and more adept to public transit. This will instill a shift in public opinion of public transportation. One reason that people are reluctant to use public transportation is that they don't know how. If we encourage the younger generation to use public transportation, we may be able to become less and less dependent upon personal automobiles.

Another large scale impact of a transit system is the environment. Several studies have concluded that using public transportation can dramatically reduce production of CO2 gases. As students are becoming increasingly involved in the "green movement," the opportunity to participate actively in "going green" through transit ridership could become important. Recommending that TCC buses be equipped with bike racks would allow students who live near one campus to ride their bike to the campus nearest them and then travel with their bike by a TCC transit bus to their campus destination. This addition may allow students an option to eliminate the need for a car entirely.

The riding experience itself may have significant impact. I recommend that TCC take the opportunity to reach riders while in transit. This involves creating a "bus learning environment." Riders would be able to view educational videos on a wide range of subjects. For example, there could be a TCC website tutorial, how to enroll using TCC's new educational database, or a Microsoft Word tutorial. This is an opportunity TCC has to easily reach a captive audience. Also, a recent trend is to outfit buses with wireless internet capabilities. With wireless internet available to riders using the transit system, it would help improve overall opinions of transit service and draw larger ridership. Technological improvements have also been applied to public transportation. Global Positioning System (GPS) are being used for bus tracking. This bus tracking can be displayed by a monitor at the bus shelter or send a text message to riders alerting them of possible bus delays.

Granting public access to TCC Transit would be a valuable opportunity for TCC to support Tulsa and surrounding areas. Core values of TCC state the importance of student success, excellence, stewardship, innovation, and diversity, all of which, can be improved by using a TCC Transit system.



Recommendations

As a result of several meetings with transit professionals, studying other university transit systems, and meeting with students and faculty at Tulsa Community College regarding a proposed transit system, I believe the following recommendations be made regarding a TCC Transit System.

Topology: I recommend that TCC use the “Hub and Spoke” topology utilizing Metro Campus as the system hub. Creating the system hub at Metro Campus capitalizes on its geographic location spatially as the “middle” of the campuses helping reduce riding times among campuses and maximizing system efficiency while reducing operating costs. Using Metro Campus as the system hub will encourage student usage the transit service providing minimum riding times and granting other TCC campuses easy access to downtown Tulsa, restaurants, and entertainment venues.

Another recommendation to help maximize efficiency of the hub and spoke system is to “stagger” class schedules among TCC campuses. Currently, there is no specific guideline to campuses scheduling class times. I propose that Metro Campus start classes on the hour while the West Campus, Northeast Campus, and Southeast Campus hold classes on the half-hour. This staggering of class times among TCC campuses would allow students travel time among campuses while limiting waiting time between classes. Students would be able to create class schedules among all TCC campuses helping to unite and establish a sense of “one college.” Fine tuning of class schedules can be achieved once specific rider demands become more available among campuses.

Tulsa Community College operates transit system: After several meetings with TCC administration I feel that an independently operated transit system is the best option for this service. Independently operating a transit system allows TCC to meet its specific needs and make responsive adjustments that other transit alternatives could not meet. Service ownership would again promote a sense of pride in the system and allow it to be specifically tailored to TCC’s needs creating a unique riding experience. Students will gain sense of community with one another and reflect back on the college’s goal of establishing “one college.”

Vehicle Purchase: I recommend that Tulsa Community College purchase cut-away vehicles. Cut-away vehicles are smaller than buses, but still comfortably transport 12-18 passengers. Cutaways are generally 20’-25’ long and can be outfitted to meet ADA requirements. They can also be equipped to run on alternative fuels or a diesel-electric hybrid. A new cutaway bus costs around \$60,000. With this less expensive option and reasonable seating capacity, I recommend that a cutaway is the best option for TCC.

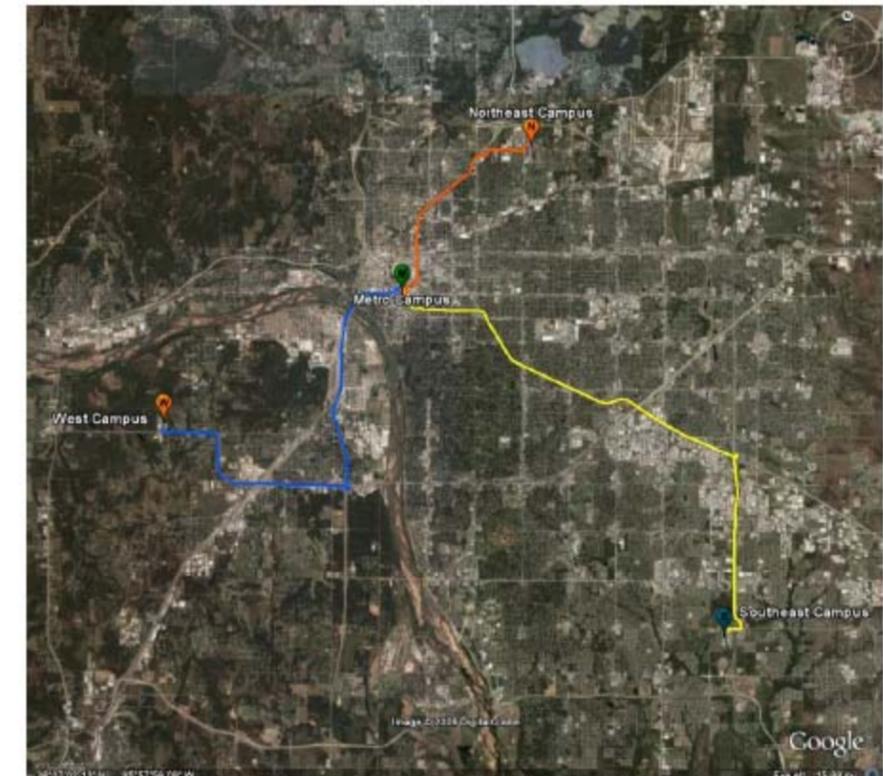


Figure 1: Map displaying TCC Transit routes to be implemented by phases

Recommendations

Implementation: Implementation of TCC transit would be best served in phases. I recommend that TCC phase the transit system into place. The first phase of the transit system would establish a route between Metro Campus and Northeast Campus and operate on 30 minute headways each direction. To achieve this goal, TCC would need three cutaway buses, two cutaways for current operation and another on reserve in case of needed repairs. The reason I recommend a Metro-Northeast connection as phase one is because Northeast Campus is in higher demand for a transit service, thus being more beneficial to students and persons living nearby Northeast campus.

The second phase would establish a route between Metro Campus and Southeast Campus which would also operate on 30 minute headways. An additional two cutaway buses would be added to the system, and depending upon needed frequency of the reserve bus, another reserve bus may be needed.

The final transit system phase would establish a route between Metro Campus and West Campus. Again this route would operate on 30 minute headways in each direction and require the addition of two more cutaway buses and a possible third reserve cutaway. Minimum vehicle operation for this system would be seven cutaway buses and seven drivers.

Advantages of implementing the TCC transit system in phases would be having the opportunity to forecast ridership with minimum costs. Staggering of the class times among campuses, this would greatly increase the transit systems overall efficiency.

Transit Fee: Financing of the transit system would come from an additional Tulsa Community College fee. This fee would be paid in portion by all TCC members, similar to the parking fee assesment. This transit fee would be five dollars per semester. Current estimates using fall 2008 statistics would generate \$134,445 per semester. Initial transit system implementation would require subsidizing costs, but would be recovered quickly while providing TCC members an inexpensive transit service. Riders would have access to all routes by showing their TCC ID card.

Schedule: Route implementation would be a by-semester process. Upon reviewing ridership analysis of the initial route (Metro – Southeast) the second phase connecting Metro to Northeast would be established the following semester. This by-semester process would establish routes to all campuses in less than two years duration granting all two-year students at TCC availability of TCC Transit.

Public Ridership: This system would also be available for public use. However, the general public would be assessed an additional parking fee and a separate TCC Transit fee. Opening the system to the public is a great opportunity for TCC to promote their core values and community outreach.

Parking: Use of TCC Transit would be beneficial toward relieving parking congestion among TCC parking lots. Many students travel to Southeast Campus from farther destinations, this excess traveling creates a need for a park-and-ride system. Using the TCC Transit system, students would be able to park at the nearest campus and then ride the transit system to their destination. With most students traveling to Southeast campus, the use of a park-and-ride system would help reduce parking congestion at this campus.

Student Jobs: Creation of a TCC Transit system would also create opportunity for new jobs at TCC. I recommend that whenever possible, TCC employ students to fill these transit jobs. Whether students are employed as bus drivers, mechanics, or administrative staff, TCC would be able to essentially provide money from the student transit fee back to students while reducing operating costs.

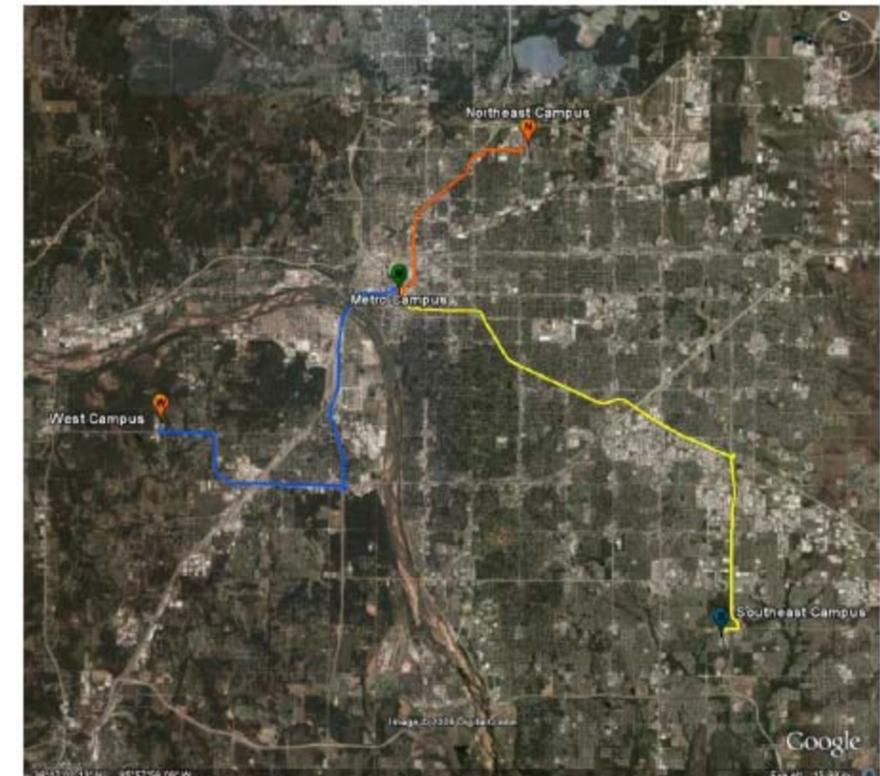


Figure 1: Map displaying TCC Transit routes to be implemented by phases

References

- Meyer, Michael and Miller, Eric, *Urban Transportation Planning*, McGraw-Hill Series in Transportation, New York, 2001.
A broad overview covering the history of public transportation and its focus on impacts, analysis methods, and evaluation of transportation systems.
- Booth Wayne, Colomb, Gregory, and Williams, Joseph, *The Craft of Research*, The University of Chicago Press, Chicago, 2003.
An approach to writing a report and managing your research findings, as well as, where to search for your data and writing tips toward your targeted audience.
- Dverk, Donna, *Architectural Programming*, Information Management for Design. John Wiley & Sons, Inc. New York, 1993
Methods and examples of conducting architectural programming for research studies so that, improved overall design and user expectations are exceeded.
- Map of Tulsa, Oklahoma. *Metropolitan Tulsa Area Corporate Limits*, Territorial and Jurisdictional Limits. Prepared by INCOG, June 2007.
Map of Tulsa and surrounding areas depicting county lines and major roads, railway, and geographic identifiers.
- The Tulsa Area Green Directory, Sustainable Tulsa. 2007
A service listing in the Tulsa Area that are geared toward healthy environmental stewardship.
- Safdie, Moshe. *The City After the Automobile*. Westview Press, Boulder, 1997
A futuristic vision of how the city will be shaped according to transportation needs, lighting, agriculture and other necessities that have evolved to be more advanced.
- Hensher, David and Golob, Thomas. *Bus rapid transit systems: a comparative assessment*. Transportation. Amsterdam, July 2008. Vol. 35, Iss. 4: pg 501
A study over established bus rapid transit systems that examines cost, effectiveness, use, and operations maintenance.
- Sohn, Pam. Chattanooga: *Green Report Calls for Transit Options*. McClatchy – Tribune Business News. Washington: July, 2008.
Current report from Chattanooga’s Green Committee that calls for reduction of carbon footprint by means of public transit options.
- Calthorpe, Peter. *The Next American Metropolis*, Princeton Architectural Press, New York, 1993
Design suggestions for improving the effectiveness and practicality of urban transit systems. Including pedestrian walkways and parking.
- Fulton, William and Calthorpe, Peter. *The Regional City*, Island Press, Washington D.C. 2001.
Discussion of the issues regarding transit systems entering into suburbs and metropolitan areas, focusing more on reasons why transit is needed rather than the “how to.”
- Moughtin, Cliff and Shirley, Peter. *Urban Design-Green Dimensions*, Architectural Press, Massachusetts, 2005.
An environmental approach to the necessity of public transit including case studies.
- Lotti, Jemina. Tulsa Community College. Personal interview. 26 June 2008.
Conversation describing the initial thoughts and goals of the research study for Tulsa Community College and the data that the college would be willing to share.
- Smith, Dane. Sunline Transit Agency. Personal interview. 24 June 2008.
Discussion of transit system operation, planning, and cost. A brief overview of data acquisition methods for predicting ridership. Also discussed alternative fuel use and funding sources.
- Armer, Tim. INCOG. Personal interview. 8 July 2008.
Meeting in which route management was discussed and possible partnership with Tulsa Transit to service Tulsa Community College. The use of GIS was also discussed.
- Cartwright, Bill. Metro Tulsa Transit Agency. Email. 14 July 2008.
Email regarding the use of computer software for demand analysis, past attempts of partnerships with Tulsa Community College, and operating costs for Tulsa, OK.
- Muller, Hugh. Transportation Management and Design, INC. Personal interview. 21 July 2008.
Discussed use of HASTUS software as well as fare study research methods and possible case studies with hybrid systems of public and student ridership.



References

Federal Transit Administration (June 28, 2006). *Grants and Financing*. Retrieved February 8, 2009 from the website of the United States Department of Transportation, Federal Transit Administration: http://www.fta.dot.gov/grants_financing.html
Federal Transit Administration's website which provides general data on available grants and other transit finances.

Wilson, Nancy. Associated Students of the University of Montana. Personal interview. 3 March, 2009. Discussed how to implement a university owned and operated transit system. Suggested purchase or lease used buses.

Cox, Steven. Tulsa Community College, Assistant Director of Facilities Maintenance. Several Personal interviews 2008-2009.
Discussions of TCC's specific needs, transit options, transit facilities, and other general university transit options and considerations.

Red Carpet Charters (no date of publication). *Travel Quote*. Retrieved February 23, 2009 from the website of the Red Carpet Charters: <http://www.redcarpetcharters.com/>
Informational website about estimated costs of contracting a transit service.

Spence, Joe. Director of Physical Plant Administration. Personal interview February 24, 2009.
Discussion of the possibility of Northeastern State University contracting a transit company to operate a proposed transit route.

Daroga, Farhad, City Planner, City of Broken Arrow. Personal Interview February 26, 2009.
Discussion of partnership with Tulsa Transit to establish the express route.

Hellman, Chan. Associate Professor, Department of Human Relations. University of Oklahoma. Director, Center of Applied Research for Non-Profit Organizations. Personal Interviews 2008-2009.
Discussions involving the use of zipsurvey website, SPSS statistical software, and representation of survey data.

Alfaro, Liann. Tulsa Transit Transportation Planner. Personal Interviews. 2008-2009.
Discussions of general Tulsa Transit Operations, scheduling, route planning, and other transit planning regulations.

University of Chicago, Facilities Services (no date of publication). *Transportation and Parking*. Retrieved October 15, 2008 from the website of University of Chicago: <http://facilities.uchicago.edu/transparking/index.html>
University of Chicago's transit website providing transit route maps, safety programs, and other basic university transit information.

Hamlin, Ronald. Manage, University of Georgia Campus Transit System. Email. November 7, 2008 and February 23, 2009.
Discussions including route planning, fees, student ridership, and future needs of the transit system at the University of Georgia.

U.S. Department of Transportation. *Transportation and Climate Change, Clearinghouse*. (no date of publication). Retrieved March 3, 2009 from the website of U.S. Department of Transportation: <http://www.climate.dot.gov/ghg-reduction-strategies/index.html>
Educational website providing information on green house gases (GHG), role of transportation in production of CO2 emissions, and strategies to help reduce the release of GHG into the atmosphere.

American Public Transportation Association. *Transit Bus Fuels and Air Quality*. (published 2003). Retrieved March 13, 2009 from the website of APTA: http://apta.com/research/info/briefings/briefing_5.cfm
Informational website regarding the use of current fuels and alternative fuels, specifically in the use of large vehicles. Provide additional information on case studies.

U.S. Environmental Protection Agency. (last update: December 6, 2007). *Fuels and Fuel Additives*. Retrieved March 13, 2009 from the website of U.S. EPA: <http://www.epa.gov/otaq/regs/fuels/diesel/diesel.htm>
Informational website regarding the release of CO2 gases, specifically by transit.

Federal Transit Administration (June 28, 2006). *Carbon Calculator*. Retrieved March 3, 2009 from the website of the United States Department of Transportation, Federal Transit Administration: http://www.fta.dot.gov/planning/planning_environment_8523.html
Website containing a carbon calculator to estimate the release/savings of CO2 gases.



References

Sunline Transit Agency. *Transit Facilities Design Manual*. December, 2006. Thousand Palms, CA. Transit Design Manual listing public transportation needs including Transit-Friendly Urban Design, Route design around Streets and Intersections, and recommendations on shelters, bus turnouts, and landscape features.

Marshment, Richard. Professor of Regional and City Planning, University of Oklahoma. Email June-November, 2008.
Emails discussing transit cost estimates including “peak vehicle” variables.

Brown, Patricia. Senior Transportation Planner, INCOG. Email. March 12, 2009.
Email regarding the proposed TCC transit routes and current transit projects occurring within the greater Tulsa area.

England, Nick. President of Lasseter Bus & Mobility. Email. July 8, 2008.
Email regarding the use of alternative fuels and price quotes for new buses.

Kierig, Hugh. AICP, Director Department of Transportation and Parking. West Virginia University. Email. September-February 2008-09.
Emails in regard to WVU transit system’s operating costs, student fees, transit programs, partnership with Morgantown, WV., and transit alternatives such as the Personal Rapid Transit (PRT) system.

Glenn, Kris. Cleveland Area Rapid Transit. Personal interview. September 22, 2008.
Conversation discussing the partnership that CART has with the University of Oklahoma-Norman and other general transit operations including costs and route design. Subsequent emails provided photos and further information about CART.

Singleton, Steve. Assistant Manager, Oklahoma State University Community Transit. Email. September-February 2008-09.
Emails discussing OSU transit system general operations and the Stillwater-Tulsa route. Emails also included photos of the transit system and facilities.

Henderson, Thomas. Assistant Professor of Electronics. Personal interview. April 1, 2009.
Discussion regarding the wind power program at the Northeast Campus of TCC and the possibility of using wind power to recharge batteries used on an electric bus.

McAliney, Mike. Arguments for Land Conservation: Documentation and Information Sources for Land Resources Protection, Trust for Public Land, Sacramento, CA, December, 1993. Internet accessed May 1, 2009 from website www.coloradotrees.org.
Informational website about the benefits of planting trees in a suburban environment.

McClatchey, Brian. Cambus Manager, Parking and Transportation Department, the University of Iowa. Personal interview/emails 2008-09.
Discussion involving the University of Iowa Cambus operation, including route topologies, student fees, and student involvement with the transit system. Unique system in that students operate the transit system almost entirely.

Hodges, Tina. January 2009. *Public Transportation’s Role in Responding to Climate Change*. U.S. Department of Transportation, Federal Transit Administration.
Article analyzing the effects of using public transit in regard to climate and environmental benefits.

Bourne, Bob. Principal Bourne Transit Consulting, LLC. Personal interviews/emails November-April 2008-09.
Discussions involving transit cost estimates, route design, specific needs, analysis of route topologies, TCC needs assessment, and overall project guidance.



Appendix

Tulsa Transit Authority Independent Study

In partnership with Tulsa Transit, during the spring semester of 2009, I was able to conduct an independent study to accompany my professional project. Working closely with Mrs. Liann Alfaro, Transportation Planner for Tulsa Transit, I was able to learn more about public transit operations.

Liann and I communicated throughout the semester mostly by email and scheduled meetings when necessary. Collaborating with Mrs. Alfaro, I gained a better understanding of public transit policies, required personal, transit partnerships, and funding.

Mrs. Alfaro also demonstrated a typical quarterly schedule for Tulsa Transit operations. This schedule included bus routes (runs), duration of the run, and assignment of bus runs.

During spring 2009, Tulsa Transit increased fare rates for regular fixed routes from \$1.25 to \$1.50. During this time, Tulsa Transit held several meetings open to the public regarding the fare increase. I was also able to attend monthly board meetings held by Tulsa Transit.

In the course of this study, I was able to apply knowledge gained from my independent study and relate it toward my professional project with Tulsa Community College, taking into consideration, scenarios of Tulsa Community College and Tulsa Transit forming a partnership to operate a transit service between campuses.

I would also like to thank Tulsa Transit, William Cartwright, General Manager, and Liann Alfaro, Transportation Planner for their time and dedication toward my study.



Image provided by Tulsa Transit

Appendix

Tulsa Transit Authority

Our Services



Figure 1

Our Service Area

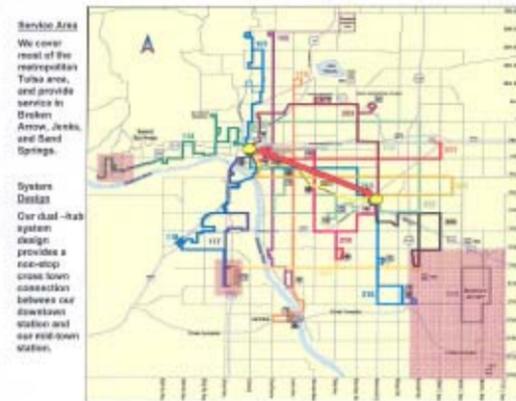
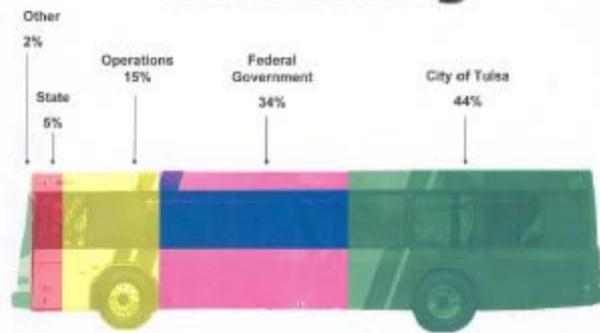


Figure 2

Our Funding



All public transit systems in the U.S. are government subsidized. No system turns a profit. Here in Tulsa, since we do not have a dedicated public transit funding source like many other U.S. cities, we are forced to spend most of our annual federal funding on day-to-day operations, rather than on system infrastructure. This inhibits the growth of our system.

Figure 3

Our Service Level is down 26% from FY02.



During the U.S. economic downturn (2002-2004), because of city budget shortages, Tulsa Transit had to cut its service level by 50% and lay off a third of its workforce. We are now in a revolving mode. It is important that we continue to increase service levels every year. On the next page see how our current service level compares with our peer cities.

Figure 4

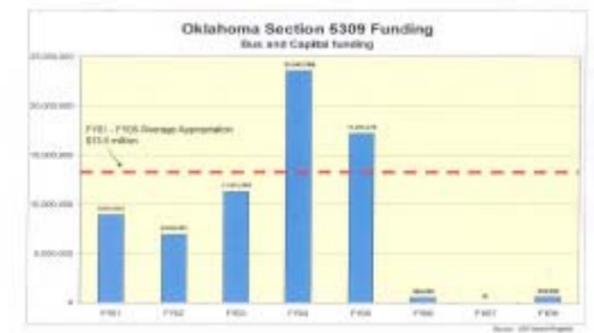
How do we compare?



As shown in this chart, Tulsa and Oklahoma City had most of our peer cities in the amount of public transit service we provide our citizens. This is due to the level of support provided by the cities and the state of Oklahoma. With the advent of rising gas prices, air quality issues, increasing traffic congestion and an aging population it is important that we seriously consider reevaluating our local commitment to our public transit infrastructure.

Figure 5

Bus Capital



Oklahoma has historically received adequate allocations of these funds, which are redistributed through TCEQ to the state's other public transit agencies. For fiscal years FY02-FY03 Oklahoma received an average of \$13.4 million annually in these Section 5309 funds. However, beginning in fiscal year FY04 Oklahoma's share of these funds means very little. The average Oklahoma annual Section 5309 appropriation for fiscal years FY04-FY06 was \$245,000 (roughly money to purchase one full-sized transit bus annually for the entire state). \$245,000/2000 is a funding reduction of 97.8%.

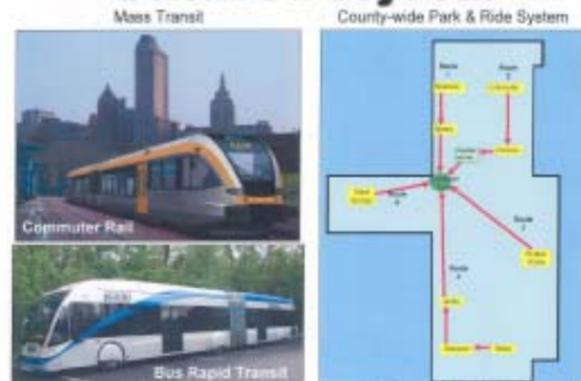
Figure 6

Why is Public Transportation important for our area?

- JOBS!**
- MOBILITY**
- AIR QUALITY**

Figure 7

Future Projects



These are some of very feasible ways we can improve mobility in our area. In the U.S., every \$1 invested in public transportation projects generates \$6 in economic returns. Transit projects like these will provide long-term economic and quality of life benefits for us and our children.

Figure 8

Data provided by Tulsa Transit



Report by Nathan Kuntz

Existing Tulsa Transit Routes Serving TCC

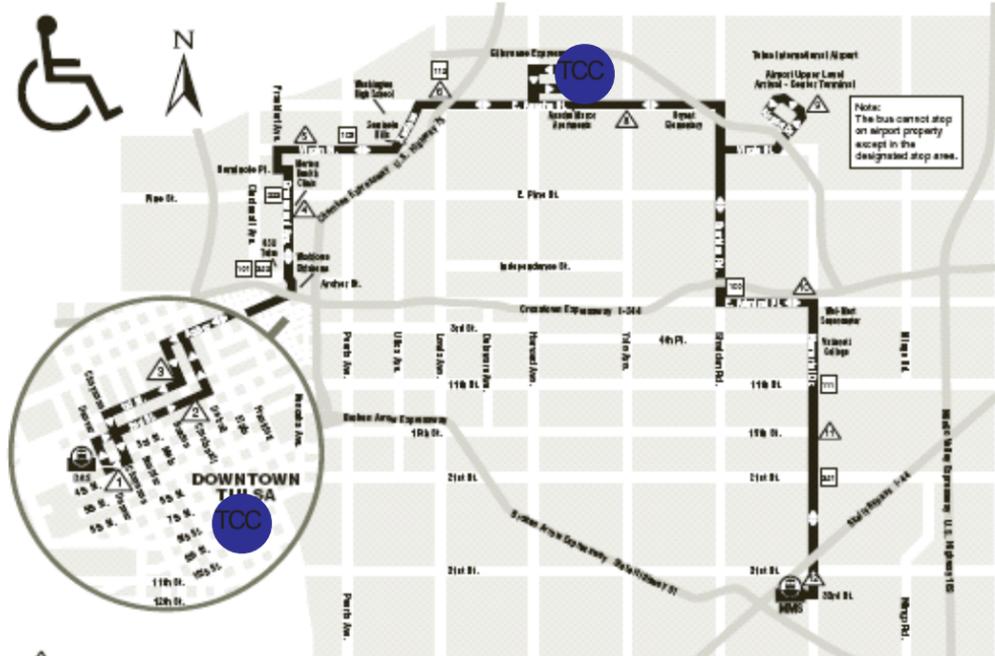
Route 203 Airport

Tulsa Transit route #203 Airport operates from Denver Avenue Station (DAS) to Memorial Midtown Station (MMS) via a northern route. This route serves Tulsa Community College Northeast as well as Tulsa International Airport. Route 203 offers students the ability to travel to Northeast Campus from either DAS or MMS.

Students traveling from MMS to Northeast campus will typically ride for 34 minutes with four stops between destinations. This route operates with one hour headways except 7:05am until 8:15 am, which totals a one hour ten minute headway. Students traveling from Northeast Campus to MMS will ride an average 34 minutes with 4 stops along the way as well.

Students/faculty who choose to travel from DAS to TCC Northeast will average riding times of 31 minutes with typical headways departing from DAS every hour. Exceptions of a one hour and ten minute headway are at times 7:05am, 8:15am, 10:25am, and 12:35pm. This route also has four stops along its route. Riders from TCC Northeast to DAS will average travel times of 26 minutes with four stops.

203 AIRPORT • MONDAY - FRIDAY / SATURDAY



- Timing Point:**
See timetables on following schedule. Timing points with two times denote both arrival and departure times.
- Intersecting Routes**
- Bus Stations**
DAS - Denver Avenue (Downtown)
MMS - Memorial Midtown Station

- Apache Manor Apts.
- Bryant Elementary
- Eastgate Shopping Center
- Morning Star Apts.
- Oak Creek Village
- OK Work Force
- OSU-Tulsa
- Salvation Army
- Seminole Hills Apts.
- TCC NE Campus
- Tulsa International Airport
- Vatterott College
- Wal-Mart Supercenter
- Washington High School
- Zebco

203 AIRPORT

203 AIRPORT • MONDAY - FRIDAY

To & From Downtown

TO DOWNTOWN

MMS Bay 6	Memorial 15th	Memorial Admiral Pl.	Airport	Yale Apache	TCC NE	Apache Lewis	Virgin Madison	Pine Greenwood	1st Cincinnati	DAS Bay 1
6:05	6:12	6:17	6:28	6:34	6:39	6:44	6:60	6:55	7:02	7:05
7:05	7:12	7:17	7:28	7:34	7:39	7:44	7:60	7:55	8:02	8:05
8:15	8:22	8:27	8:38	8:44	8:49	8:54	9:00	9:05	9:12	9:15
9:15	9:22	9:27	9:38	9:44	9:49	9:54	10:00	10:05	10:12	10:15
10:25	10:32	10:37	10:48	10:54	10:59	11:04	11:10	11:15	11:22	11:25
11:25	11:32	11:37	11:48	11:54	11:59	12:04	12:10	12:15	12:22	12:25
12:35	12:42	12:47	12:58	1:04	1:09	1:14	1:20	1:25	1:32	1:35
1:35	1:42	1:47	1:58	2:04	2:09	2:14	2:20	2:25	2:32	2:35
2:45	2:52	2:57	3:08	3:14	3:19	3:24	3:30	3:35	3:42	3:45
3:45	3:52	3:57	4:08	4:14	4:19	4:24	4:30	4:35	4:42	4:45
4:55	5:02	5:07	5:18	5:24	5:29	5:34	5:40	5:45	5:52	5:55
5:55	6:02	6:07	6:18	6:24	6:29	6:34	6:40	6:45	6:52	6:55 To Garage

Light type - AM Bold type - PM

FROM DOWNTOWN

DAS Bay 1	2nd Cincinnati	Pine Greenwood	Virgin Madison	Apache Lewis	TCC NE	Yale Apache	Airport	Memorial Admiral Pl.	Memorial 15th	MMS Bay 6
4:55	4:58	5:10	5:15	5:21	5:26	5:31	5:39	5:50	5:54	6:00
5:55	5:58	6:10	6:15	6:21	6:26	6:31	6:39	6:50	6:54	7:00
7:05	7:08	7:20	7:25	7:31	7:36	7:41	7:49	8:00	8:04	8:10
8:05	8:08	8:20	8:25	8:31	8:36	8:41	8:49	9:00	9:04	9:10
9:15	9:18	9:30	9:35	9:41	9:46	9:51	9:59	10:10	10:14	10:20
10:15	10:18	10:30	10:35	10:41	10:46	10:51	10:59	11:10	11:14	11:20
11:25	11:28	11:40	11:45	11:51	11:56	12:01	12:09	12:20	12:24	12:30
12:25	12:28	12:40	12:45	12:51	12:56	1:01	1:09	1:20	1:24	1:30
1:35	1:38	1:50	1:55	2:01	2:06	2:11	2:19	2:30	2:34	2:40
2:35	2:38	2:50	2:55	3:01	3:06	3:11	3:19	3:30	3:34	3:40
3:45	3:48	4:00	4:05	4:11	4:16	4:21	4:29	4:40	4:44	4:50
4:45	4:48	5:00	5:05	5:11	5:16	5:21	5:29	5:40	5:44	5:50
5:55	5:58	6:10	6:15	6:21	6:26	6:31	6:39	6:50	6:54	7:00 To Garage

Light type - AM Bold type - PM

56 Figure 2 Tulsa Transit Route Guide

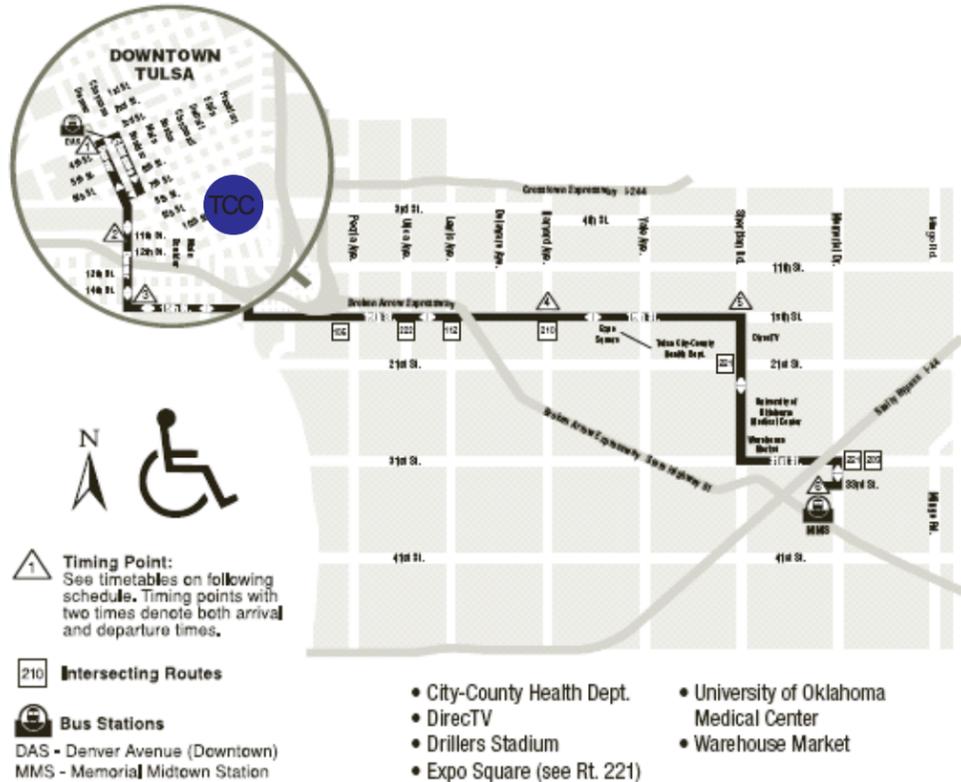
Data provided by the Metropolitan Tulsa Transit Authority Figure 1



Report by Nathan Kuntz

215 15TH STREET • MONDAY - FRIDAY / SATURDAY

MONDAY - FRIDAY / SATURDAY



68 *Tulsa Transit Route Guide*

Data provided by the Metropolitan Tulsa Transit Authority

Figure 1

TO DOWNTOWN

MMS Bay 3	15th Sheridan	15th Harvard	15th Denver	DAS Bay 8
6	5	4	3	1
5:20	5:31	5:37	5:46	5:50
5:55	6:06	6:12	6:21	6:25
6:30	6:41	6:47	6:56	7:00
7:05	7:16	7:22	7:31	7:35
7:40	7:51	7:57	8:06	8:10
8:15	8:26	8:32	8:41	8:45
8:50	9:01	9:07	9:16	9:20
9:25	9:36	9:42	9:51	9:55
10:35	10:46	10:52	11:01	11:05
11:45	11:56	12:02	12:11	12:15
12:55	1:06	1:12	1:21	1:25
2:05	2:16	2:22	2:31	2:35
3:50	4:01	4:07	4:16	4:20
4:25	4:36	4:42	4:51	4:55
5:00	5:11	5:17	5:26	5:30
5:35	5:46	5:52	6:01	6:05
6:10	6:21	6:27	6:36	6:40
6:45	6:56	7:02	7:11	7:15

Light type - AM Bold type-PM

FROM DOWNTOWN

DAS Bay 8	Denver 11th	Denver 15th	15th Harvard	15th Sheridan	MMS Bay 3
1	2	3	4	5	6
5:15	5:17	5:19	5:28	5:34	5:45
5:50	5:52	5:54	6:03	6:09	6:20
6:25	6:27	6:29	6:38	6:44	6:55
7:00	7:02	7:04	7:13	7:19	7:30
7:35	7:37	7:39	7:48	7:54	8:05
8:10	8:12	8:14	8:23	8:29	8:40
8:45	8:47	8:49	8:58	9:04	9:15
9:55	9:57	9:59	10:08	10:14	10:25
11:05	11:07	11:09	11:18	11:24	11:35
12:15	12:17	12:19	12:28	12:34	12:45
1:25	1:27	1:29	1:38	1:44	1:55
2:35	2:37	2:39	2:48	2:54	3:05
3:45	3:47	3:49	3:58	4:04	4:15
4:20	4:22	4:24	4:33	4:39	4:50
4:55	4:57	4:59	5:08	5:14	5:25
5:30	5:32	5:34	5:43	5:49	6:00
6:05	6:07	6:09	6:18	6:24	6:35
6:40	6:42	6:44	6:53	6:59	7:10

Figure 2

Light type - AM Bold type-PM

Existing Tulsa Transit Routes Serving TCC

Route 215 15th Street

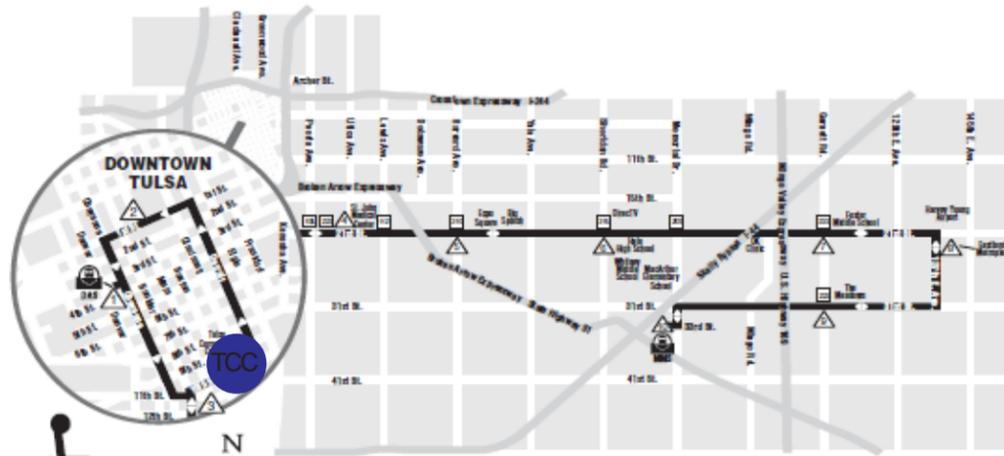
Tulsa Transit route #215 15th Street operates Monday through Friday and offers Saturday routes. This route runs mainly east and west and connects between the Denver Avenue Station (DAS) and Memorial Midtown Station (MMS) along 15th Street. This route does not have a stop at Tulsa Community College Metro Campus, but has a stop a few blocks away and riders have an option of choosing a connecting route from DAS that does serve TCC Metro. Route 215 also has fewer stops along its route than some other connecting routes.

Both routes departing from either DAS or MMS have 35 minute headways and riders in both direction will travel an average of 30 minutes. Traveling from DAS there are four stops and traveling from MMS there are only 3 stops between DAS and MMS.

Route 215 is an alternative to both route #221 and #251 Fast Track for traveling from MMS to DAS, but riding time and headways tend to nullify any time advantages.



221 21ST STREET / EASTLAND • MONDAY - FRIDAY / SATURDAY



1 **Timing Point:**
See timetables on following schedule. Timing points with two times denote both arrival and departure times.

210 **Intersecting Routes**

Bus Stations
DAS - Denver Avenue (Downtown)
MMS - Memorial Midtown Station

- Big Splash
- Blue Cross & Blue Shield
- Boulder Plaza
- Cherokee Village
- Dept. of Human Services
- DirecTV
- Eastland Metroplex
- Executive Mall
- Expo Square
- Foster Middle School
- Hale High School
- K-Mart
- MacArthur Elementary
- The Meadows
- Sears
- St. John Medical Center
- Target
- Tulsa Community College (Metro Campus)
- Utica Square
- Whitney Middle School

Data provided by the Metropolitan Tulsa Transit Authority

Figure 1

FROM DOWNTOWN

DAS Bay 6	Boulder 21st	21st Utica	21st Harvard	21st Sheridan	21st Garnett	S 137th E Ave E 24th St	31st Garnett	MMS Bay 5
5:45	5:55	6:01	6:07	6:13	6:22	6:31	6:39	6:48
6:28	6:38	6:44	6:50	6:56	7:05	7:14	7:22	7:31
7:13	7:23	7:29	7:35	7:41	7:50	7:59	8:07	8:16
7:58	8:08	8:14	8:20	8:26	8:35	8:44	8:52	9:01
8:43	8:53	8:59	9:05	9:11	9:20	9:29	9:37	9:46
9:28	9:38	9:44	9:50	9:56	10:05	10:14	10:22	10:31
10:13	10:23	10:29	10:35	10:41	10:50	10:59	11:07	11:16
10:58	11:08	11:14	11:20	11:26	11:35	11:44	11:52	12:01
11:43	11:53	11:59	12:05	12:11	12:20	12:29	12:37	12:46
12:28	12:38	12:44	12:50	12:56	1:05	1:14	1:22	1:31
1:13	1:23	1:29	1:35	1:41	1:50	1:59	2:07	2:16
1:58	2:08	2:14	2:20	2:26	2:35	2:44	2:52	3:01
2:43	2:53	2:59	3:05	3:11	3:20	3:29	3:37	3:46
3:28	3:38	3:44	3:50	3:56	4:05	4:14	4:22	4:31
4:13	4:23	4:29	4:35	4:41	4:50	4:59	5:07	5:16
4:58	5:08	5:14	5:20	5:26	5:35	5:44	5:52	6:01
5:43	5:53	5:59	6:05	6:11	6:20	6:29	6:37	6:46

Light type - AM Bold type - PM

TO DOWNTOWN

MMS Bay 5	31st Garnett	S 137th E Ave E 24th St	21st Garnett	21st Sheridan	21st Harvard	21st Utica	Boulder 21st	1st Main	DAS Bay 6
5:25	5:34	5:42	5:51	6:00	6:06	6:12	6:16	6:25	6:28
6:10	6:19	6:27	6:36	6:45	6:51	6:57	7:01	7:10	7:13
6:55	7:04	7:12	7:21	7:30	7:36	7:42	7:46	7:55	7:58
7:40	7:49	7:57	8:06	8:15	8:21	8:27	8:31	8:40	8:43
8:25	8:34	8:42	8:51	9:00	9:06	9:12	9:16	9:25	9:28
9:10	9:19	9:27	9:36	9:45	9:51	9:57	10:01	10:10	10:13
9:55	10:04	10:12	10:21	10:30	10:36	10:42	10:46	10:55	10:58
10:40	10:49	10:57	11:06	11:15	11:21	11:27	11:31	11:40	11:43
11:25	11:34	11:42	11:51	12:00	12:06	12:12	12:16	12:25	12:28
12:10	12:19	12:27	12:36	12:45	12:51	12:57	1:01	1:10	1:13
12:55	1:04	1:12	1:21	1:30	1:36	1:42	1:46	1:55	1:58
1:40	1:49	1:57	2:06	2:15	2:21	2:27	2:31	2:40	2:43
2:25	2:34	2:42	2:51	3:00	3:06	3:12	3:16	3:25	3:28
3:10	3:19	3:27	3:36	3:45	3:51	3:57	4:01	4:10	4:13
3:55	4:04	4:12	4:21	4:30	4:36	4:42	4:46	4:55	4:58
4:40	4:49	4:57	5:06	5:15	5:21	5:27	5:31	5:40	5:43
5:25	5:34	5:42	5:51	6:00	6:06	6:12	6:16	6:25	6:28 To Garage
6:10	6:19	6:27	6:36	6:45	6:51	6:57	7:01	7:10	7:13 To Garage
6:55	7:04	7:12	7:21	7:30	7:36	7:42	7:46	7:55	7:58 To Garage

Light type - AM Bold type - PM

Figure 2

Existing Tulsa Transit Routes Serving TCC

Route 221-21 Street/Eastland

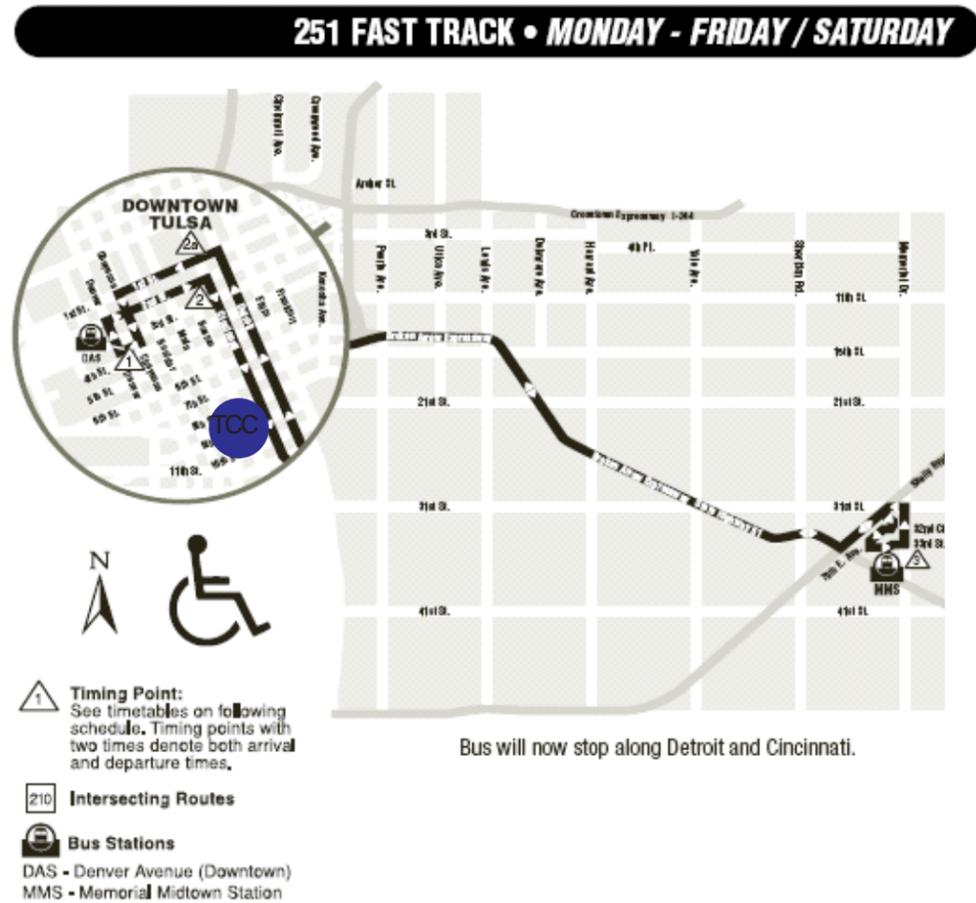
Tulsa Transit route #221 21st Street/Eastland operates Monday through Friday and offers Saturday routes as well. This route operates from the Midtown Memorial Station (MMS) to Denver Avenue Station (DAS). Route 221 operates with 45 minute headways both from DAS and MMS with frequent stops along 21st street and downtown.

Route 221 is one of two routes that has a stop at Tulsa Community College Metro Campus. The other being route 111, but it does not connect to MMS. The MMS connection is important to student riders because this allows the option of transfers to either TCC Northeast Campus or TCC Southeast Campus.

The westbound route of 221 from MMS to DAS operates from 5:25am to 6:55pm. Riders travelling from here to TCC Metro Campus would average one hour with seven stops along the way.

The eastbound route of 221 from DAS to MMS operates from 5:45am through 5:43pm. Students travelling from Metro Campus to MMS would have 6 stops on the route and average about 45 minutes.





Tulsa Transit Route Guide

251 FAST TRACK

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Data provided by the Metropolitan Tulsa Transit Authority

Figure 1

TO DOWNTOWN

MMS Bay 1	1st Cincinnati	DAS Bay 2	
5:35	5:47	5:50	
5:55	6:07	6:10	
6:15	6:27	6:30	
6:35	6:47	6:50	
6:55	7:07	7:10	
7:15	7:27	7:30	
7:35	7:47	7:50	
7:55	8:07	8:10	
8:15	8:27	8:30	
8:35	8:47	8:50	
8:55	9:07	9:10	
9:35	9:47	9:50	
10:15	10:27	10:30	
10:55	11:07	11:10	
11:35	11:47	11:50	
12:15	12:27	12:30	
12:55	1:07	1:10	
1:35	1:47	1:50	
2:15	2:27	2:30	
2:35	2:47	2:50	
2:55	3:07	3:10	
3:15	3:27	3:30	
3:35	3:47	3:50	
3:55	4:07	4:10	
4:15	4:27	4:30	
4:35	4:47	4:50	
4:55	5:07	5:10	
5:15	5:27	5:30	
5:35	5:47	5:50	
6:15	6:27	6:30	
6:55	7:07	7:10	
7:35	7:47	7:50	To Garage

FROM DOWNTOWN

DAS Bay 2	2nd Cincinnati	MMS Bay 1	
5:15	5:18	5:30	
5:55	5:58	6:10	
6:15	6:18	6:30	
6:35	6:38	6:50	
6:55	6:58	7:10	
7:15	7:18	7:30	
7:35	7:38	7:50	
7:55	7:58	8:10	
8:15	8:18	8:30	
8:35	8:38	8:50	
8:55	8:58	9:10	To Garage
9:15	9:18	9:30	
9:55	9:58	10:10	
10:35	10:38	10:50	
11:15	11:18	11:30	
11:55	11:58	12:10	
12:35	12:38	12:50	
1:15	1:18	1:30	
1:55	1:58	2:10	
2:15	2:18	2:30	
2:35	2:38	2:50	
2:55	2:58	3:10	
3:15	3:18	3:30	
3:35	3:38	3:50	
3:55	3:58	4:10	
4:15	4:18	4:30	
4:35	4:38	4:50	
4:55	4:58	5:10	
5:15	5:18	5:30	
5:35	5:38	5:50	To Garage
5:55	5:58	6:10	
6:35	6:38	6:50	
7:15	7:18	7:30	

Figure 2

Existing Tulsa Transit Routes Serving TCC

Route 251 Fast Track

Tulsa Transit offers a Fast Track service from Memorial Midtown Station (MMS) to Denver Avenue Station (DAS) for a slightly increased fee of \$0.25. Route 251 Fast Track offers riders the quickest route from MMS to DAS with only one stop at 1st and Cincinnati. The route operates on the Broken Arrow Expressway / State Highway 51 with travel times averaging 15 minutes each direction. Travel times during peak traffic hours are often affected by current traffic conditions along this route.

Route 251 Fast Track operates accordingly to peak traffic hours. From MMS to DAS operating times and headways are:

- 5:35am – 8:55am headways are 20 minutes
- 8:55am – 2:15pm headways are 40 minutes
- 2:15pm – 6:15pm headways are 20 minutes
- 6:15pm – 7:35pm headways are 40 minutes

For operating times and headways from DAS to MMS :

- 5:15am – 5:55am headways are 40 minutes
- 5:55am – 9:15am headways are 20 minutes
- 9:15am – 1:55pm headways are 40 minutes
- 1:55pm – 5:55pm headways are 20 minutes
- 5:55pm – 7:15pm headways are 40 minutes

Route 251 Fast Track offers students wanting to travel TCC Metro Campus from MMS the fastest route but increased fares and headway times may be enough to prevent common ridership. Also, 251 Fast Track does not stop at TCC Metro leaving students the option of walking/biking from DAS to TCC Metro or choosing a connecting route, either 111 or 221 departing DAS.



Report by Nathan Kuntz

Existing Tulsa Transit Routes Serving TCC

Route 318 Memorial

Tulsa Transit route #318 Memorial serves Tulsa Community College Southeast Campus. This route operates Monday-Friday and offers Saturday routes as well. The route mainly operates north and south along Memorial Drive and connects Memorial Midtown Station (MMS) to the north and St. Francis Hospital to the South. Northbound routes begin at 5:30 am and operate until 7:00 pm. The Southbound route offers buses from 6:13 am until 6:58 pm. These times accommodate typical business hours and peak traffic times.

Tulsa Community College students looking to travel to another TCC campus must take the southbound bus to St. Francis Hospital, a trip averaging 18 minutes with one stop in between, before being able to ride to MMS for a connecting route. The ride from St. Francis Hospital to MMS takes an average of 37 minutes with 3 stops along the way.

Students who wish to make this trip from Southeast campus to MMS will ride an average of 55 minutes with a 45 minute headway (interval of time between buses) for time of pick up.

From MMS the student can either travel to TCC Metro Campus or Northeast Campus. If a student is traveling from Memorial Midtown Station to Southeast campus there are 45 minute headways going southbound on route 318 and take a 35 minute average to arrive at Southeast Campus with 3 stops along the route.

318 MEMORIAL • MONDAY - FRIDAY / SATURDAY



86 Tulsa Transit Route Guide

Figure 1 Data provided by the Metropolitan Tulsa Transit Authority

NORTHBOUND

St. Francis South Hosp.	Woodland Hills Mall	Memorial 61st	Memorial 51st	MMS Bay 7
5:30	5:50	5:55	6:00	6:07
6:15	6:35	6:40	6:45	6:52
7:00	7:20	7:25	7:30	7:37
7:45	8:05	8:10	8:15	8:22
8:30	8:50	8:55	9:00	9:07
9:15	9:35	9:40	9:45	9:52
10:00	10:20	10:25	10:30	10:37
10:45	11:05	11:10	11:15	11:22
11:30	11:50	11:55	12:00	12:07
12:15	12:35	12:40	12:45	12:52
1:00	1:20	1:25	1:30	1:37
1:45	2:05	2:10	2:15	2:22
2:30	2:50	2:55	3:00	3:07
3:15	3:35	3:40	3:45	3:52
4:00	4:20	4:25	4:30	4:37
4:45	5:05	5:10	5:15	5:22
5:30	5:50	5:55	6:00	6:07
6:15	6:35	6:40	6:45	6:52
7:00	7:20	7:25	7:30	7:37

To Garage

Figure 2 Light type - AM Bold type - PM

SOUTHBOUND

MMS Bay 7	Memorial 51st	Memorial 61st	Woodland Hills Mall	TCC SE	South Crest	St. Francis South Hosp.
6:13	6:20	6:24	6:34	6:48	6:51	7:00
6:58	7:05	7:09	7:19	7:33	7:36	7:45
7:43	7:50	7:54	8:04	8:18	8:21	8:30
8:28	8:35	8:39	8:49	9:03	9:06	9:15
9:13	9:20	9:24	9:34	9:48	9:51	10:00
9:58	10:05	10:09	10:19	10:33	10:36	10:45
10:43	10:50	10:54	11:04	11:18	11:21	11:30
11:28	11:35	11:39	11:49	12:03	12:06	12:15
12:13	12:20	12:24	12:34	12:48	12:51	1:00
12:58	1:05	1:09	1:19	1:33	1:36	1:45
1:43	1:50	1:54	2:04	2:18	2:21	2:30
2:28	2:35	2:39	2:49	3:03	3:06	3:15
3:13	3:20	3:24	3:34	3:48	3:51	4:00
3:58	4:05	4:09	4:19	4:33	4:36	4:45
4:43	4:50	4:54	5:04	5:18	5:21	5:30
5:28	5:35	5:39	5:49	6:03	6:06	6:15
6:13	6:20	6:24	6:34	6:48	6:51	7:00
6:58	7:05	7:09	7:19	7:33	7:36	7:45

To Garage

Figure 3 Light type - AM Bold type - PM



Appendix

Strategies and Sub-plans



Maps and Schedules

Maps – Depiction of Tulsa Transit routes including nightline routes, express routes, and inclement weather routes

Schedules – Information regarding Tulsa Transit route numbers and timing. Also includes instructions on how to ride Tulsa Transit and schedule adjustments for the holidays.

Detours – Updated webpage regarding real-time Tulsa Transit delays.

BOK Shuttles – Program established to provide free transportation for downtown shuttles during major events at the BOK Center.

Stations – Tulsa Transit operates two bus stations in their dual hub topology to provide the most efficient routes for greater Tulsa area.

Frequent Destinations – Listing of frequent destinations among the Tulsa area along with the route number which serves the destination.

Rider Alerts – Updated webpage for real-time rider updates concerning transit changes and route adjustments.



Maps and Schedules



Fares and Passes



Riding the Bus



Transit Programs

Appendix

Strategies and Sub-plans



Fares and Passes

2009 Fare Increase – An increase in Tulsa Transit fare amount. The fare increased from \$1.00 to \$1.25. This is a response to dramatic increases in operational costs. Tulsa Transit also introduced a 7-day unrestricted pass for \$12.

Cash Fares: Listing of fixed cash fares on traditional routes and express routes for adults, youth, and children. Also includes discount fares for qualified individuals.

Frequent Rider Discounts: Discount program for individuals who commonly ride Tulsa Transit routes. Use of this program can save up to 20% over normal fares.

Compute Driving Costs: Calculated estimates for potential and current riders of Tulsa Transit to estimate potential saved money by using Tulsa Transit.

How to Use Farebox: Detailed instructions on Tulsa Transit's website on how to use the farebox for ticket purchase.

Employer Bonus Bucks: Program established to encourage Tulsa Transit ridership. Employers may purchase a portion or all of the cost of bus fare and be eligible for a deduction as a business expense.

Reduced Fare: Program to reduce fares for both seniors and persons with disabilities.



Maps and Schedules



Fares and Passes



Riding the Bus



Transit Programs

Appendix

Strategies and Sub-plans



Riding the Bus

Why Ride – Tulsa Transit provides a list of incentives to encourage ridership. The opportunity to save money by using Tulsa Transit is the main focus, but other incentives including less wear and tear on your personal vehicle, safety reasons, time used more efficiently, exercise, less stressful, and environmental reasons.

Enjoy the Ride – Additional information on riding the bus, using maps, how to read the schedule, boarding and payment, bus transfers, and the bike and bus program. Additional information is provided for Tulsa Transit service to nearby cities including Broken Arrow, Jenks, and Sand Springs.

Riding Facts – List of statistics involving employment, ridership numbers, and federal investments toward public transit nationwide.

Bike and Bus – Program established to allow riders to transport their bicycle while riding the bus. Webpage includes information on how to use the bike rides while using Tulsa Transit.



Maps and Schedules



Fares and Passes



Riding the Bus



Transit Programs

Appendix

Strategies and Sub-plans



Transit Programs

Green Travelor Program – Program established to use a free carpool service.

EZ Rider Rewards – Tulsa Transit’s program to provide discount fares at area businesses. List of area merchants and discounts is also provided.

Guaranteed Ride Home – Service provided by Tulsa Transit to provide a ride in case of emergency for valid Express fare card holders.

Lift Program – Program established by Tulsa Transit to provide paratransit service for persons with disabilities.

Ozone Alert – Environmental program sponsored by Sunoco which provides 50-cent bus rides on Fridays during Ozone Alert Season.

Park and Save – Parking facilities provided free of charge to Tulsa Transit riders to increase access to public transit.

Safe Place – A program established in cooperation with Youth Services of Tulsa to provide kids a ride to a known location if they become lost or feel they are in danger.

Transit Advertising – Details on how to advertise on Tulsa Transit buses include rates and advertising policy.

Transit Security – Webpage describing security measures currently in place by Tulsa Transit and how transit riders can assist in safety measures.



Maps and Schedules



Fares and Passes



Riding the Bus



Transit Programs

