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Enhancing the Effectiveness of the Santa Fe Bus System

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An Interactive Qualifying Proposal submitted to the faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of the Bachelor of Science.

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Abstract

This Interactive Qualifying Project dealt with improving the effectiveness of the Santa Fe Trails public bus system in Santa Fe, NM. Using on-board cameras, bus ridership data, traffic data, and survey response of bus system riders, our team was able to develop recommendations for bus system improvements such as rerouting several bus lines, and changing the bus schedules to create better connection times. To further effectiveness of the system we designed a mobile application, incorporating a Google Transit feed, to help passengers find buses and pay for their trips. It is our hope that these recommendations help the bus system become more convenient for riders of the bus system and encourage more people to ride the bus.

Acknowledgements

Executive Summary

The Santa Fe Trails bus system carried 860,811 passengers in 2010, a 4.6% increase from 2009. Although the most integrated system throughout Santa Fe is its bus system, many citizens do not actually ride the bus, leaving it underutilized. Santa Fe Trails has grown to include 10 routes, 470 bus stops, and 34 compressed natural gas (CNG) buses.
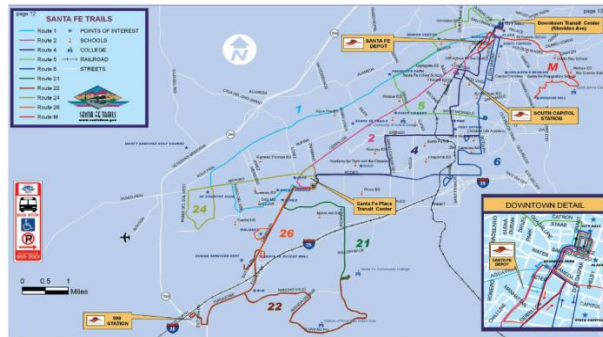
Figure 1: Route Map

Our project is intended to make the public transportation system more convenient for bus riders through the use of technology, including a mobile application and Google transit. To achieve this goal, there were four main objectives:

1. To compile and organize existing bus system infrastructure information.
2. To investigate Santa Fe Trails usage.
3. To explore the Santa Fe Ride system.
4. To develop a Smartphone application.

First we compiled and organized the existing data from the bus system. This data is provided by Santa Fe Trails Bus Company, collected through passenger surveys and the analysis of on-board bus camera footage. We use this data to populate a new database of bus passenger usage trends. Next we analyzed the bus stops and routes using this database, traffic models obtained from the Santa Fe Metropolitan Planning Organization and specialized Global Information Systems maps. We then determined origin and destination information of bus passengers, which routes had highest and lowest passenger ridership, as well as which bus stops were the most and least used. Finally we created the Google Transit Feed, which allows all bus stop locations and bus routes to be viewable directly through the online Google Directions search. Google transit data was also implemented into the mobile application to allow for bus stop and route GPS locations.

To help gauge the convenience of the bus system the team created a passenger survey to collect data directly from the bus riders. The passenger survey consists of 25 questions. These questions helped collect data such as: origin and destination of passengers, most frequently used routes, smartphone ownership, distance traveled to bus stop etc. Overall we received 77 results.

We were also tasked with finding the 50 most used stops by Santa Fe trails. The top 50 bus stops will receive upgraded shelters. Santa Fe Trails has been allotted $500,000 that will be used for these upgrades.
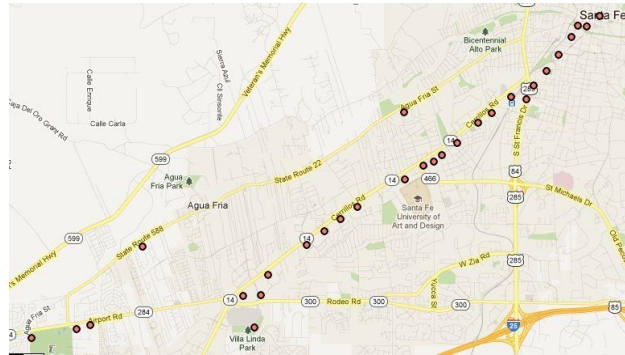
Figure 2: Top 50 Stops

After thorough analysis of our bus stop database we located the top 50 stops on a GIS map. The top stop is located the Santa Fe Place Mall, the second is Sheridan Transit Center, and the third is the University of Art and Design. These three stops are all located on Route 2, so we propose to make this an express route that runs every hour and only hits those three stops.
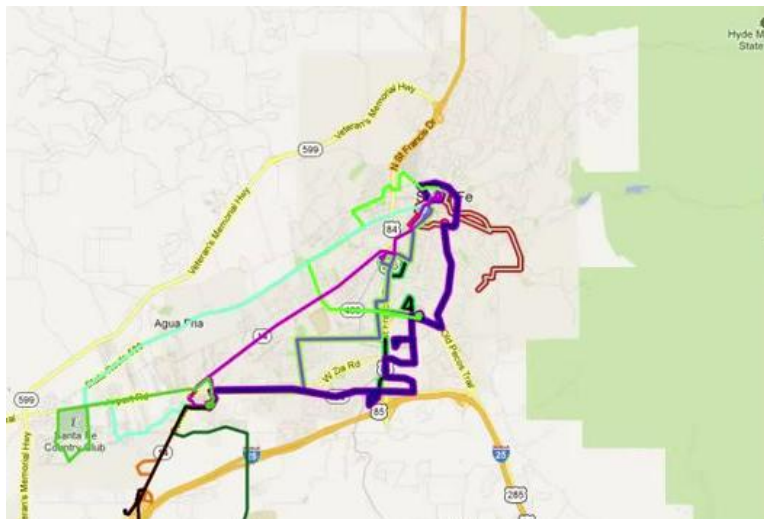
Figure 3: New Route Map

Re-routes were explored after analyzing overall route usage. Figure 3: New Route Map shows our proposed new route map; double lines identify all new routes. The new route map was composed using the data we received from the SFMPO traffic model, our bus stop usage analysis, road knowledge, as well as new route information from Santa Fe Trails. Route M received the biggest change overall, we decided to combine the Santa Fe Pick-Up service and Route M into a single route. Currently Santa Fe

Trails and Santa Fe Pick-up are in the preliminary stages of a negotiation to combine their services. Route M bus stops all fell in the lowest percentile of bus stop usage and most of the Santa Fe Pick-Up route already overlaps Route M, except Museum Hill, which is our main reasoning for combining both services.

Route 6 also displayed low ridership and bus stop usage. We used traffic models to locate the roads that saw the highest vehicle per day volumes in Santa Fe. Route 6 currently runs down highly residential sections of Santa Fe, parallel to a route which runs down more commercialized sections. We propose to reroute Route 6 down this parallel street, Old Santa Fe Trail. The proposed change should increase ridership of Route 6. After analyzing the passenger survey, we saw a high demand for a new bus center hub located at the

Figure 4: Updated Schedule

Hospital. Route 4 already runs close to the Hospital and has high ridership volumes; an additional 1.8-mile loop to Route 4 would create the new Hospital hub. This hub would then allow for Route 4, 5, and 6 connections.

A reoccurring issue that surfaced in the passenger survey was missed connection times between buses. After mapping the entire schedule of all routes for one day during the week, we

Figure 5: Proposed South Capital Station Feeder

looked at all bus route connection points to determine where missed connection times were present. We identified multiple missed connections, which resulted in extended waiting periods for passengers. After adjusting bus departure times by just a few minutes, we were able to remove a total of 356 minutes of passenger waiting time (The time passengers wait between bus

connections).

To further optimize Santa Fe Trails, we suggest a van feeder system that brings passengers to and from their home to the public transportation systems be established. This would greatly increase the convenience of the public transit system because passengers that live further away from the bus system would now have the ability to be fed to the closest bus stop. We used Santa Fe Pick-Up as a model to potentially improve other feeder systems in Santa Fe. South Capitol Station Shuttle is feeder system that is already established in the heart of Santa Fe. It displayed fairly low ridership according to our surveys, so we proposed a new route in Figure 5: Proposed South Capital Station Feeder, which would make an additional loop to bring passengers more directly to their destinations.

To improve communication with bus users we have developed a mobile application that runs off of our Google Transit feed. There currently is not a Google transit option for the City of Santa Fe, thus passengers are unable to use Google directions if they plan to take the bus. To allow users to use Google directions to navigate the bus system, we uploaded the arrival and departure times of every bus as well as all bus stop GPS locations to create a Santa Fe Trails Google Transit feed. The feed has been imported into General Transit Feed Specification Data Exchange (GTFS) for verification.

The mobile application is a tool for passengers to view the Santa Fe trails bus system via their Android or IPhone device. The bus schedule can be viewed for every stop and the buses can be tracked in real time; all buses will be equipped with tablets. The mobile app will also display amount of time before the next bus arrives.

Through these many improvements in routes, bus stops, bus connection times and the mobile application, we hope to see an increase in ridership on all bus routes. The top 50 stops will receive upgraded shelters, the interpolated schedule have been
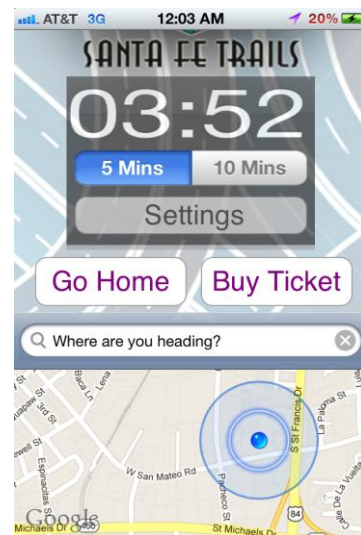
Figure 6: Mobile Application Home Screen

posted to our website and linked to Santafedia.org as well. We suggest more in-depth surveying to be done by Trails in order to further identify bus system improvements. All street signage should be equipped with "You Are Here" arrows and we recommend that once our mobile app is completed it be released to the public.

Authorship Page

Cynthia Chelius – Introduction (1/4), Background (1/4), Methodology – Objective 4, Results (1/4), Analysis and Recommendations (1/4), Executive Summary (1/2)

Tyler Koloski – Introduction (1/4), Background (1/4), Methodology – Objective 1, Results (1/4), Analysis and Recommendations (1/4), Abstract

Peter Wallace – Introduction (1/4), Background (1/4), Methodology – Objective 3, Results (1/4), Analysis and Recommendations (1/4)

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1 INTRODUCTION

The United States of America has one of the largest public transportation infrastructures, although its underutilization continues to be a problem.[1] Nearly 90% of working Americans commute to work, spending an average of 100 minutes driving per day. Only about 5% of American workers actually use public transportation as a way to travel to and from work.[2] A recent study indicated that if all commuters used public transportation over cars, the United States would reduce carbon dioxide emissions by 37 million metric tons per year giving passengers more incentive to switch to public transportation.[3] Of the forms of public transportation available in America today the most utilized is the bus system, accounting for
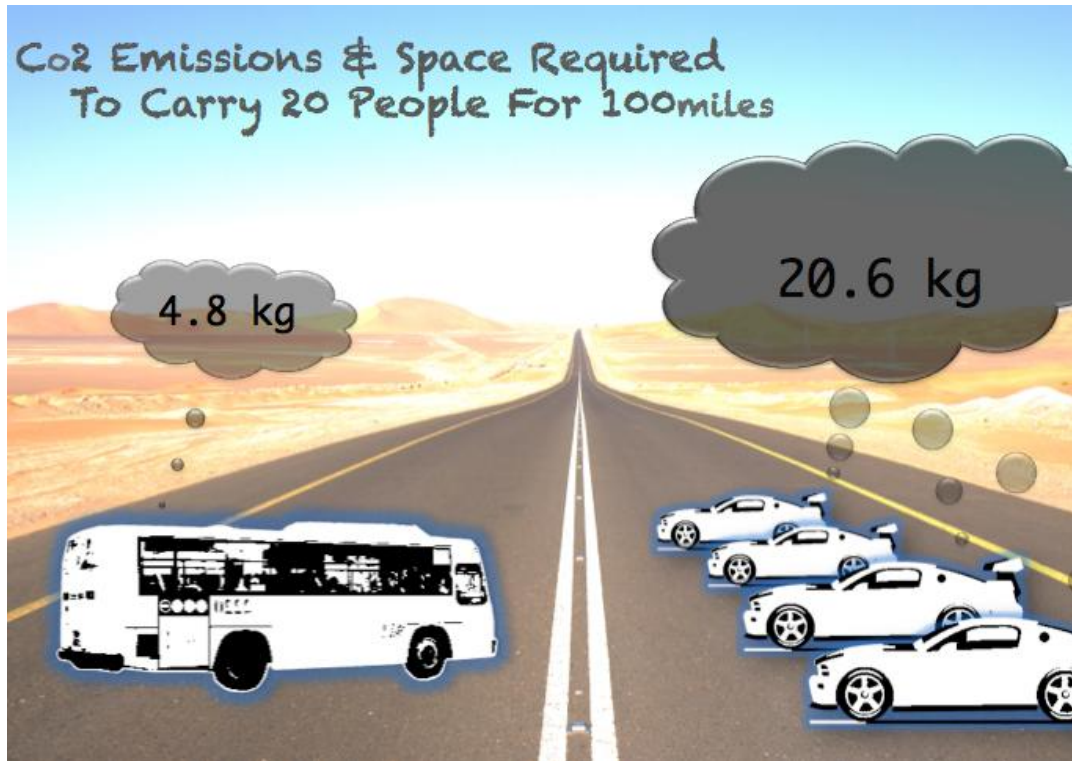
Figure 7: Emissions Bus vs. Cars

[1] (431 Anonymous)
[2] (ABC News 2012, 2)
[3] (Dickens and Neff 2011, 41)

52.5% of all public transportation use.[4] In 2012 it is estimated that about $129 billion dollars will be allotted to the Department of Transportation, this is a 66% increase from 2010. About 20% of these funds will go toward public transportation, totaling $10,707,000.[5] Although the public transportation systems are well funded and offer many incentives, they still remain underutilized.

In the Southwest the overall population density is relatively low. Due to the low population density there are often less successful, in terms of ridership, public transportation systems in the Southwest compared to the North. The population trends in the Southwest are dependent on resources such as water, agriculture, and mining. These resources are scarce in the region causing a low population density overall. The areas with more abundant resources, such as Santa Fe, are more populated and therefore have more established public transportation systems.[6]

Santa Fe, New Mexico offers a wide variety of public transportation, whether it is buses, taxis or trains. The Santa Fe Trails bus system carried 860,811 passengers in 2010, a 4.6% increase from 2009.[7] Although the most integrated system throughout Santa Fe is its bus system, many citizens do not actually use the system, leaving it underutilized.[8] Santa Fe Trails has grown to include 10 routes, 470 bus stops, and 34 full-sized compressed natural gas (CNG) buses.[9] The Santa Fe Trails bus system, Rail Runner Express, Blue Bus, and the Santa Fe Pick-up have made transportation to and around the city of Santa Fe more convenient for travelers.

The city of Santa Fe has improved its public transportation system with the implementation of cameras and GPS in all city buses; however the full potential of the transit data has not been used to increase the utilization of the bus service. Only partial ridership counts were taken by the bus drivers. Santa Fe Trails bus system currently has route maps and schedules available. These schedules do not show times for every stop, thus the user is required to interpolate between stops. Santa Fe Trails is trying to provide a more user-friendly transit system which implements GPS data to create a reliable schedule and allow passengers to monitor the bus times.

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[4] (Dickens and Neff 2011, 41)
[5] (U.S. Department of Transportation 2012)
[6] (Chourre and Wright 1997)
[7] (City of Santa Fe New Mexico)
[8] (City of Santa Fe New Mexico)
[9] (City of Santa Fe New Mexico)

Our project is intended to make the public transportation system more user-friendly and technologically advanced. First we plan to compile and organize existing ridership data from the bus system and use this data to populate a new database. Next we will investigate the feasibility of taking ridership counts with the bus cameras. Our third objective is to improve communication with the bus and its users through the use of a mobile app, new printed materials, and Google Transit. Also, we will investigate a reorganization of the bus system as a whole. We will accomplish this by analyzing the possibility of integrating a van service into the bus system, as well as locating the underutilized bus stops and routes.

2 BACKGROUND

Commuting to work is a daily occurrence for many working Americans. The United States government, as well as many public transit agencies, has recognized the need to increase ridership of public transportation systems. President Obama has made a plan to increase the public transit budget by 127% over six years, bringing the total to $119 billion.[10] Following the national trend, the State of New Mexico has also recognized low ridership volumes and is actively improving its public transportation systems. The city of Santa Fe, New Mexico in particular is trying to implement a strategy to lower the city's reliance on privately owned vehicles, while giving more support to bicycle and pedestrian routes, as well as public transportation.[11] To accomplish this goal, the city of Santa Fe has worked with the 2011 WPI Project Center to investigate all forms of public transportation, such as bus, trains, shuttle, and taxi services within the city and improve the coordination of these services. To continue with the process of improving ridership of their public transportation systems, currently the city is trying to improve the Santa Fe Trails bus system by incorporating the techniques and technologies of western cities that have successful public transportation systems.

2.1 Bus and Train Services in Santa Fe

New Mexico has a wide spread population ranking 47th in the nation making it one of the states with lowest population density. The state population is 2,059,179, with about 17 persons per square mile. Because New Mexico is so widespread, transportation is required for people to travel easily to various areas of the state without using a private vehicle. Santa Fe has three main public transportation systems that connect the rest of the state to the city. These systems are the New Mexico Rail Runner Express, New Mexico Park and Ride, and the NCRTD Blue Bus.

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[10] (U.S. Department of Transportation 2012)
[11] (City of Santa Fe Housing and Community Development Department 2011)

2.1.1 **New Mexico Rail Runner Express**

The New Mexico Rail Runner Express is a rail system that runs throughout New Mexico. The New Mexico Department of Transportation and the Mid-Region Council of Governments are responsible for developing the rail system. Currently there are 13 operating stations, with two more due to open soon. The Rail Runner Express operates five locomotives that have the capability of travelling at 100 miles per hour.[12] Although this service has enabled many travelers faster and more convenient trips, ridership is down 15% from 2009. This may be due to the fact that the Rail Runner Express was free for its first three months of operation in 2009, but then began charging its passengers. Now the rail runner costs $3 daily or $35 monthly.[13]
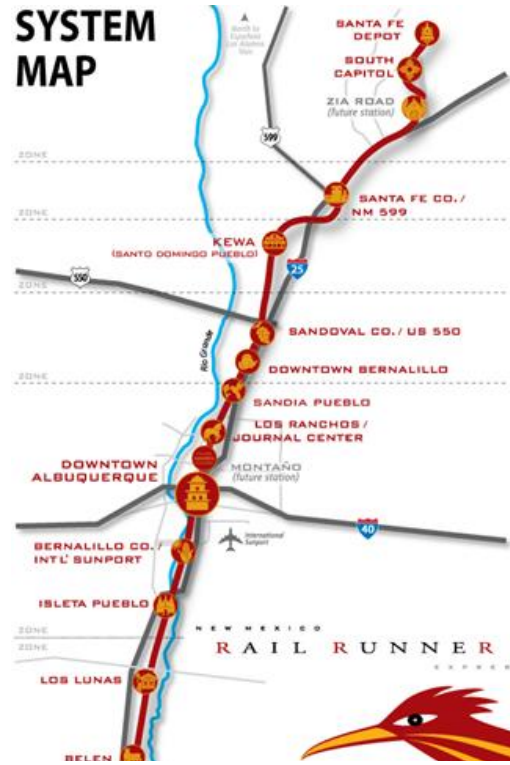
Figure 8 Rail Runner Express Route Map

2.1.2 **New Mexico Park and Ride**

The Park and Ride public transportation system is a bus system that operates in the
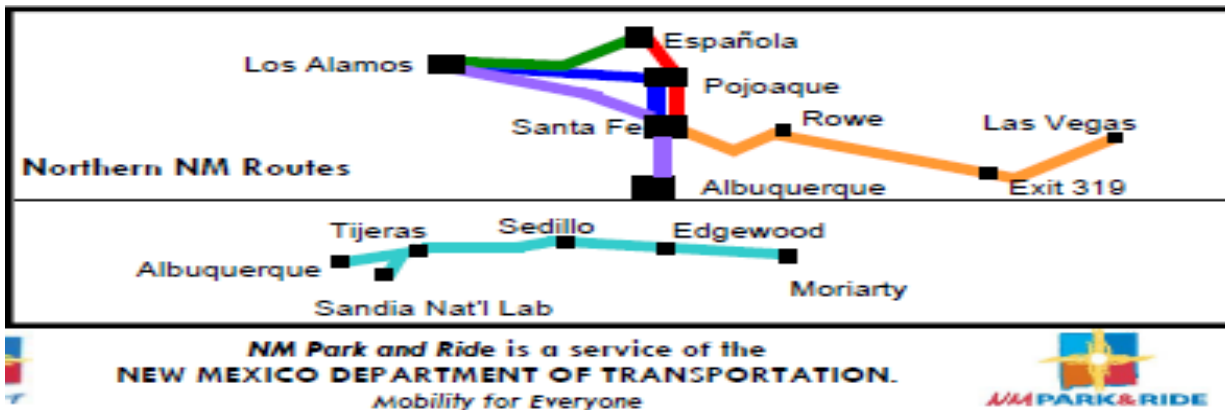
Figure 9: Park and Ride Map

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[12] (New Mexico Rail Runner 2010)
[13] (New Mexico Rail Runner 2010)

northern region of New Mexico. This service started in May 2003 and consisted of 9 buses and 3 routes. The system has since grown to include 26 buses and 10 routes. Park and Ride is currently the fifth largest public transportation operation in New Mexico. There are approximately 130 departures and 320 miles traveled daily. Park and Ride is a fairly affordable mode of transportation for passengers, averaging at a cost of about 7 cents per mile. In 2011 Park and Ride has decreased traffic congestion by removing 9.2 million vehicle miles during rush hours. Also in 2011, carbon dioxide emissions were reduced by about 4,500 tons and the Park and Ride system saves passengers $655 per month as opposed to driving their cars.[14]

2.1.3 **NCRTD Blue Bus**

The North Central Regional Transit District (NCRTD) was founded in 2004, and was the first RTD certified by the New Mexico Transportation Commission.[15] The Blue Bus contains 21 fixed routes and 45 buses throughout central New Mexico. This is a free bus service which operates in four main counties including: Santa Fe, Espanola, Los Alamos, and Taos. It also operates in five northern Pueblos including: Ohkay Owingeh, Pojoaque, Santa Clara, San Ildelfonso, and Tesuque.[16] In 2006 NCRTD updated its service plan, which included an updated mission statement as well as their goals. The Mission of the NCRTD is now "to provide safe, secure and effective public transportation within North Central New Mexico, in order to enhance the quality of life of our
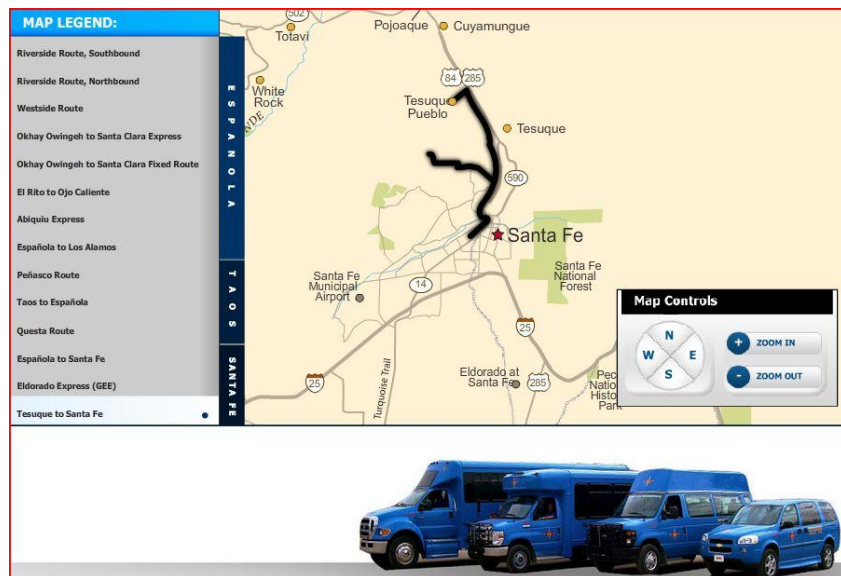
Figure 10: NCRTD Blue Bus Santa Fe County

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[14] (New Mexico Department of Transportation 2011, 1)
[15] (North Central Regional Transit Division)
[16] (North Central Regional Transit Division)

citizens, by providing mobility options and to spur economic development throughout the region."[17] The annual budget in the service plan is $10.3 million.[18] The Blue Bus service also transports passengers from their homes to both the Rail Runner and Santa Fe Trails.[19]

2.2 Shuttle and Van Services in Santa Fe

The city of Santa Fe hosts several forms of public transportation services geared to shuttling tourist, commuters, and residents in Santa Fe. Some of these services, Santa Fe Ride and the City of Santa Fe Senior Van, are only available to the elderly or the disabled while others are open to the general populace. These open services provide connection points to statewide public transportation systems. Santa Fe Pick-Up, the New Mexico 599 Station Shuttle, and the South Capitol Shuttle connect to stations of the New Mexico Rail Runner Express providing a way for passengers to get to the train or their destinations. The Sandia Shuttle Express travels to several locations in Santa Fe and brings passengers to the Albuquerque International Airport or the reverse to form a connection point between Santa Fe and rest of the world through public transportation. Capital City Cab can be used to transport passengers to any of these connection points as well as anywhere else in Santa Fe.

2.2.1 **Santa Fe Ride Paratransit Program**

The Santa Fe Ride Paratransit Program is a request-respond public transportation service, run by Santa Fe Trails, for those with disabilities or those who are over the age of 60. The service is intended to pick up eligible passengers from their residences and transport them to a destination point that is within 3/4 mile of a regular Santa Fe Trails bus stop. In addition to carrying passengers to bus stops, the service can also make trips to the Santa Fe Factory Outlets, Santa Fe Community College, and the Santa Fe Municipal Airport.

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[17] (North Central Regional Transit Division 2006, 34)
[18] (North Central Regional Transit Division)
[19] (North Central Regional Transit Division 2006, 34)

The fare for riders is $2 for disabled and $5 for elderly. If the rider is joined by a companion riders must pay for the companion to ride.[20]

2.2.2 **City of Santa Fe Senior Van Service**

Senior citizens of Santa Fe are entitled to several benefits through the New Mexico Aging and Long-Term Services Department, among these benefits is a transportation service. The senior van service allows for seniors aged 60 or older to create appointments 24 hours in advance and to be transported throughout the city between 8:00AM and 4:30PM free of charge. Although the system is free, trips have a recommended donation of 50 cents or $10.00 for every 25 rides. To schedule an appointment, seniors should call (505) 955-4700. Trips to medical appointments are given priority over all other rides. The system is managed by Robert Chavez and employs 10 transit operators to transport seniors throughout the city.

2.2.3 **Santa Fe Pick-Up**

The Santa Fe Pick-Up provides transportation between the Santa Fe Depot and the downtown area of Santa Fe. Santa Fe Pick-Up began operation with 15 passenger vans on December 17th, 2008; the same day that the New Mexico Rail Runner Express began service between Santa Fe and the Albuquerque area. This start time was intentional as stated by City Parking Director, Bill Hon who said, and "Our whole intent of this system was to complement the train."

On February 2, 2009 the city Parking Division reworked their system with three new Pick-Up shuttles. These vans have a carrying capacity of 14 passengers and cost approximately $190,000 with an additional operating cost of $275,000 per year. The shuttle operates in coordination with the arrival and departure times of the Rail Runner Express at the Santa Fe Depot station to allow passengers to transfer easily from one public transportation system to another. The shuttle travels in a counter clockwise loop that includes 8 stops. It takes 20 minutes to travel a full lap. All stops are clearly marked with the "Pick It Up Here" logo. The most popular stops include: the Capitol/PERA building, the Cathedral Basilica of St. Francis of Assisi,

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[20] (City of Santa Fe New Mexico)

the Main Library / City Hall, the Santa Fe Community Convention Center / Santa Fe Plaza, Eldorado / Hilton Hotel, Canyon Road, and Alameda and Paseo de Peralta. Santa Fe Pick-up is a free service that operates Monday through Friday 6:30 am to 6:30 pm and Saturday 7:30 am to 4:30 pm.[21]

Figure 11: Santa Fe Pick-Up Map

2.2.4 **NM 599 Station Shuttle**

The New Mexico Shuttle service is provided by NM Department of Transportation and is run for the Park and Ride. NM 599 station shuttle helps to pick up passengers from the Rail Runner Express and transport them to six locations throughout Santa Fe or transport passengers from the six locations to the Rail Runner station. These locations are: PNM, Rancho Viejo, New

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[21] (City of Santa Fe New Mexico)

Mexican Plaza, Jaguar, Camino Entrada and the Santa Fe Place[22]. If the passenger has a NM Park and Ride Monthly pass, NM Rail Runner Express Monthly pass, or a Santa Fe Trails monthly pass, they can ride the shuttle for free. Otherwise the shuttle fee is one dollar each way.

2.2.5 **South Capitol Station Shuttle**

The South Capitol Station Shuttle is a shuttle service designed to transport people to and from South Capitol Station to 6 locations around the city. These locations are Alta Vista, San Mateo, the Hospital, Galisteo, and ARK/ Pollon. The fare for using the shuttle is one dollar one way or a valid NM Park and Ride Monthly pass, NM Rail Runner Express boarding and monthly pass, or a Santa Fe Trails monthly pass will be honored. Each weekday eight trips are made from the station and seven trips are made to the station.
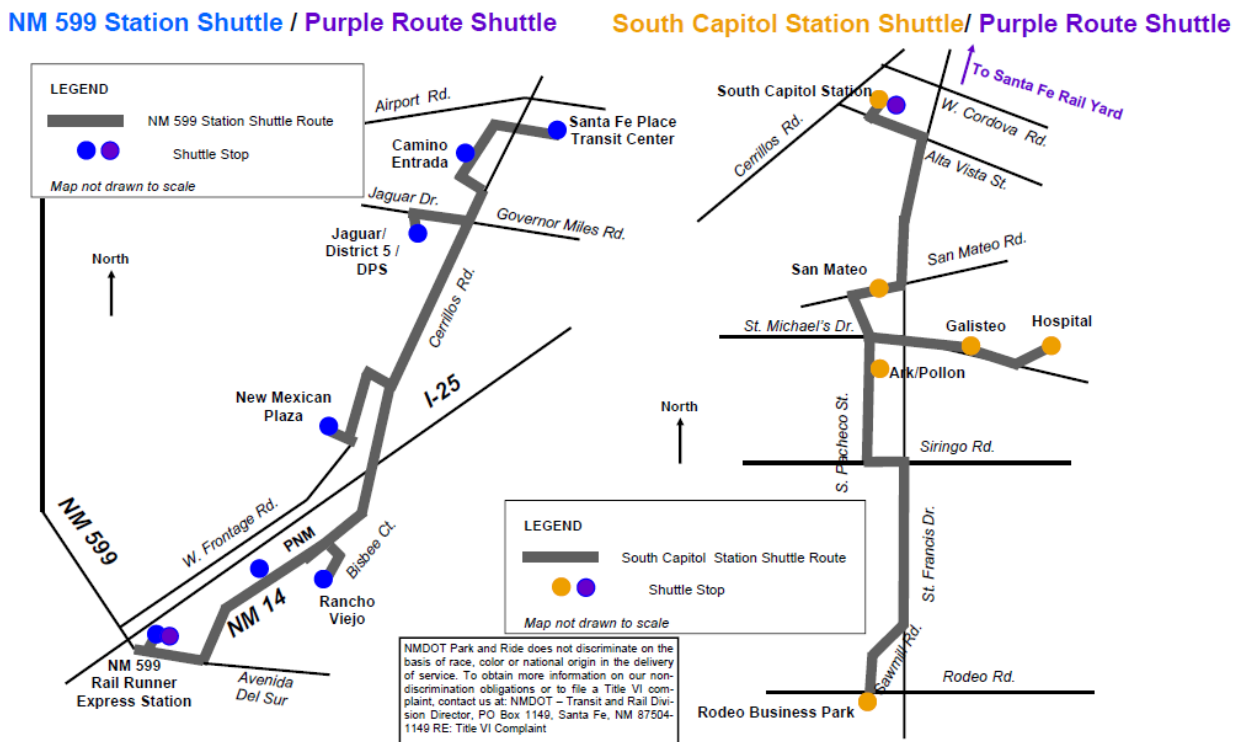
Figure 12: South Capital Station and NM 599 Shuttle Routes

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[22] (New Mexico Department of Transportation 2011, 1)

2.2.6 **Sandia Shuttle**

The Sandia Shuttle Express is a shuttle service between Santa Fe and the Albuquerque International Airport. The shuttle runs from 5am until 11:45pm. The shuttle makes about 30 trips daily with the average travel time of 70 minutes each way. Pricing of the shuttle is $27 one way per person and $47 round trip per person. One can make reservations ahead of time to be picked up or dropped off at all

Figure 13: Sandia Shuttle Express

Hotels, Motels, Bed and Breakfasts, Colleges, and other locations.[23]

2.2.7 **Capital City Cab**

Capital City cab is the single taxicab service within Santa Fe. Capital City Cab is available 24 hours a day, seven days a week and will transport passengers anywhere

Figure 14: Capital City Cab

in Santa Fe including the airport, and all casinos. Capital City Cab offers a special weekend deal in which all rides cost $5 for two people or $10 for 3 or more. This special runs on Friday and Saturday nights. The service can also be used commercially for food, beverage, or package deliveries.[24]

2.3 Santa Fe Trails Bus Service

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[23] (507 Sandia Shuttle Express)
[24] (Capital City Cab)

For people in Santa Fe who want to use public
transportation to travel throughout the city who are
unqualified to take the Senior Shuttle or Santa Fe
Ride there is the Santa Fe Trails Bus System. Santa
Fe Trails began bus service in January 1993, it has
since grown to become one of the leading forms of
public transportation in the city.[25] The system has
enjoyed an increase in ridership over the last several
years. In 2010 alone the bus system had 893,000 passenger trips (a trip is defined as one person
riding in one direction including all transfers). This number constitutes a nine percent increase in
passenger trips from 2009 to 2010, this was largest level of ridership the company has
experienced since its formation.[26]

2.3.1 Santa Fe Trails Fleet

The Santa Fe Trails bus system makes use of several different types of buses which each
have unique features and carrying capacities. The Santa Fe Trails bus fleet roster (See Appendix
D: Fleet Roster) contains a list of all of Santa Fe Trails buses and includes the make, model,
year, fuel type used, capacity, wheelchair lift or ramp, mileage, date of starting service, and
replacement date. In total, Santa Fe Trails operates a fleet of 36 full-sized Compressed Natural
Gas buses comprised of three types of buses, ElDorados, Gilligs, and Bluebitds. The distribution
of the buses is there are sixteen ElDorados four of which are Passports which seat twenty-six
passengers and the remaining twelve are E-Z Rider IIs which seat twenty-seven, two Gilligs,
which can hold up to twenty-five passengers, and eighteen BlueBirds which seat twenty-eight
and are equipped with wheelchair lifts. At peak business hours twenties of these buses will be in
active use.[27] The bus specifications sheet contains information about all of the amenities on the
bus. For example it tells of the engine type, filter types, brakes, steering wheel, heaters, the
doors, etc.

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[25] (City of Santa Fe Housing and Community Development Department 2011)
[26] (City of Santa Fe Housing and Community Development Department 2011)
[27] (City of Santa Fe Housing and Community Development Department 2011)

Each bus in the Santa Fe Trails bus system fleet makes use of several technological systems, whose locations can be seen in **Error! Reference source not found.** and **Error! ference source not found.**. These systems include the onboard cameras, the fare box, the compressed natural gas canisters, as well as tablets and an announcement speaker that will be incorporated by RouteMatch. The systems within the bus are not integrated and work independently of one another.
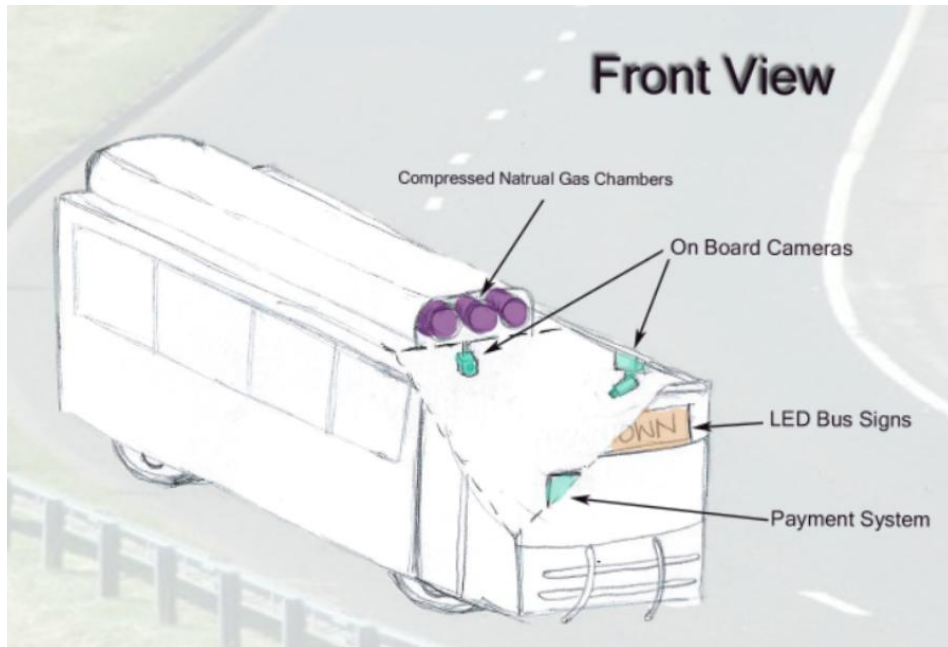
Figure 15: Front View Bus System Diagram
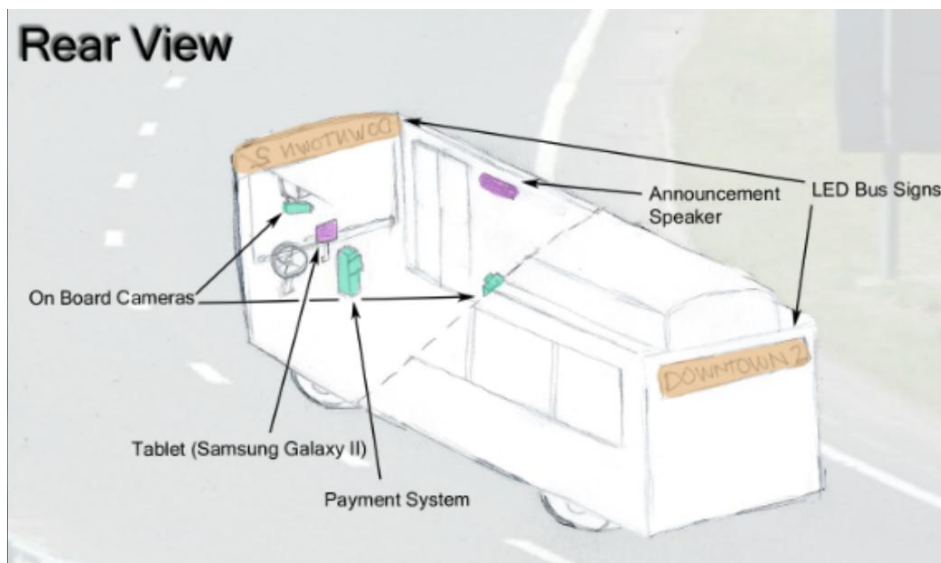
Figure 16: Rear View Bus System Diagram

2.3.2 __Santa Fe Trails Bus Routes and Schedules__

In order to provide service to as much of the city as possible, Santa Fe Trails operates a total of ten bus routes which generally operate between the hours of 5:00 AM and 10:00 PM on weekdays.[28] The routes include: Route 1 which operates along Aqua Fria, Route 2 which travels along Cerrillos Road, Route 4 which operates Southside, Route 5 that travels Crosstown, Route 6 which travels down Rodeo Road, Route 21 that goes to Santa Fe Community College, Route 22 which travels along HSD/ Rancho Viejo, Route 24 which travels to the Country Club, Route 26 which goes to Santa Fe Place and South Cerrillos, and Route M which travels to Museum Hill.[29] Overall the most used route is Route 2 which operates along Cerrillos Road, one of the busiest roads between 4 and 6 PM.[30] Weekend schedules change frequently. Routes 21 and 22 do not operate on Saturday, and Routes 5, 6, 21, and 22 do not operate on Sundays.[31]
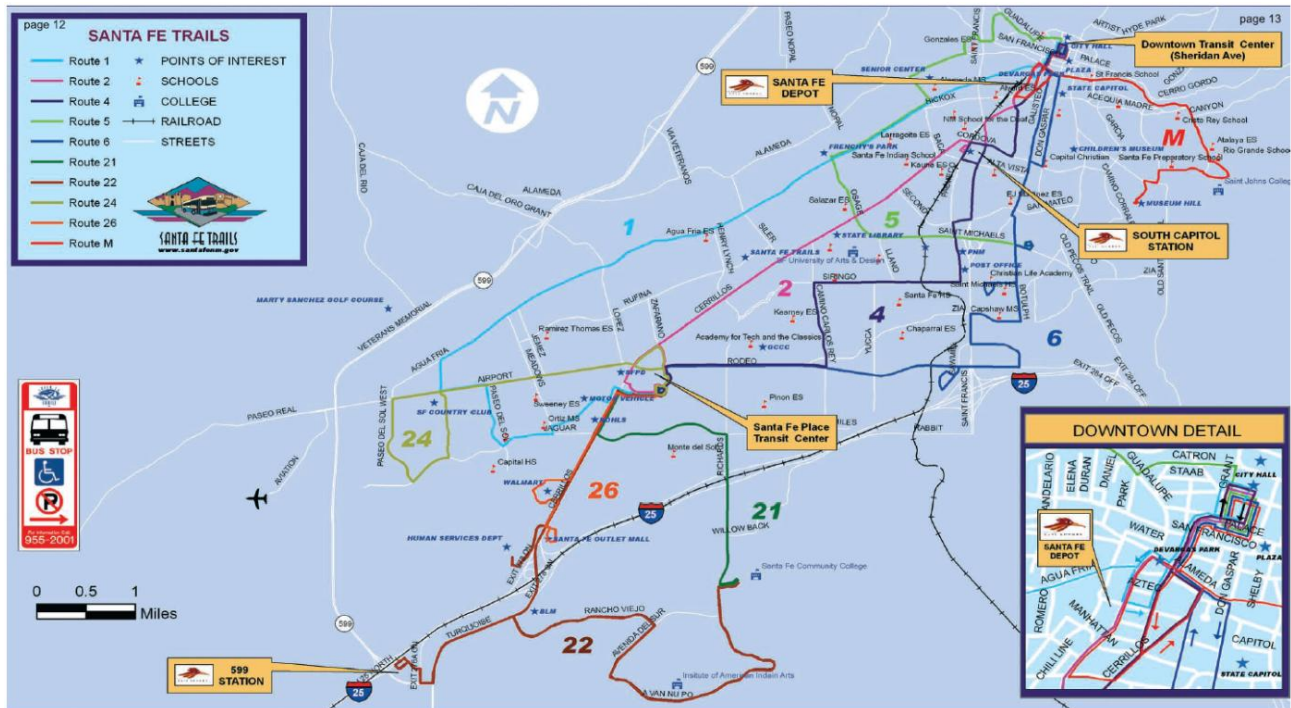
Figure 17 Santa Fe Trails Bus Route

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[28] (Santa Fe, NM and its representatives 2012)
[29] (Santa Fe, NM and its representatives 2012)
[30] (City of Santa Fe Housing and Community Development Department 2011)
[31] (Santa Fe, NM and its representatives 2012)

2.3.3 <u>**Santa Fe Trails Fares**</u>

Fares for riding the bus vary depending on the age of the passenger. Passengers aged 18-59 are charged $1.00 per trip or $2.00 for a day pass. Passengers 60 and over are charged 50 cents per trip or $1.00 for a day pass. Passengers under 18 ride for free. Month passes may also be purchased for $20 for the 18-59 year olds or $10 for those 60 and older. These passes can be purchased on the bus, at the main office of Santa Fe Trails, and the Santa Fe Place Mall business office. The payment system on the bus includes a fare box that takes cash or a swipe card. There are no options for credit card payment. [32]

2.3.4 <u>**Santa Fe Trails Ridership Data**</u>

In Appendix A there is ridership data from May 2011 for each inbound and outbound line. An outbound bus has left its terminal and is on route to its furthest point. An inbound bus has reached its furthest point and is on route back to its terminal. The ridership data shows how many passengers were onboard throughout the following time periods: Early, AM peak, Midday, PM peak, Evening, and Owl (11pm-5am). Route 2 is by far the most used route, with route 1, 5, and 24 closest behind. Route M is barely used according to the data. Routes 4, 6, 21, and 22 all have much lower ridership then the others.

Time Periods		
Begins	**Name**	**#**
12:00 AM	**Early**	1
6:00 AM	**AM**	2
9:00 AM	**Midday**	3
3:00 PM	**PM**	4
6:00 PM	**Eve**	5
9:00 PM	**Night**	6
12:00 AM	**Owl**	7

Table 1: Santa Fe Trails Time Periods

2.4 **Santa Fe Trails Technology**

As previously stated all Santa Fe Trails buses are equipped with several technological systems (See **Error! Reference source not found.** and **Error! Reference source not found.**). rrently the buses are equipped with security cameras that have an integrated non-live GPS as well as a payment system that works out of a central tower at the bus entrance. Through a contract with the software company RouteMatch, each bus will soon be equipped with Samsung Galaxy Tablets. These tablets will be used as an AVL (Automatic Vehicle Location) system and

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[32] (Santa Fe, NM and its representatives 2012)

an announcement speaker will list all stop locations as the bus arrives at them. Our 2012 WPI project team was tasked with designing a mobile application that will complement the AVL system to help make a make effective system for passengers. The team also looked at Google Transit as another successful tool that will further benefit Santa Fe Trails through improved passenger communication. [33]

2.4.1 **Camera System**

Currently every bus in the Santa Fe trails bus system has been outfitted with 7 security cameras: two curbside, one driver view, two driver area payment monitors, and two covering the inside of the bus. All the camera data must be downloaded manually at the end of the day in order to be reviewed. The camera footage includes the time, date and the latitude and longitude geographic coordinates.

2.4.2 **Payment System**

The Santa Fe Trails buses have a fare box that allows cash, coins or bus pass to be collected. Upon payment a confirmation sound is made. Since the bus system allows passengers to ride for free if under the age of 18, there is a button on the side of the payment box that the driver presses to log the entrance of an underage rider. Overall, the fare box is capable of performing a rough passenger count.

2.4.3 **Tablets**

Currently there are no tablets on the buses, but Santa Fe Trails has signed onto a contract with RouteMatch in which Samsung Galaxy Tablets will be installed onto each bus. Our project group has purchased a tablet and is looking into placing this on a bus as an experiment to receive real time GPS location. The tablets will be used by drivers to log on at the beginning and the end of their shifts as well as to export the buses' location in real time.

2.4.4 **Signs (LED)**

The Santa Fe buses are equipped with LED signs on the front and the entrance side as well as on the back. The front and side signs display which route the bus is serving as well as the time

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[33] (Bulthuis 2012)

point stops. The back sign does not give information on stops, it just displays the route number. The signs can be controlled manually by the driver whenever there is a switchover of routes.

2.4.5 **Mobile Applications and Google Transit**

The cell phone market is one of the fastest growing technology industries today. It is projected that by 2015 smart phone users will grow to 70% of all mobile consumers.[35] Smart

phones have become so popular due to their ability to download applications. In 2010 alone, there were about 5.7 billion apps downloaded, amounting to $7 billion dollars in revenue. The number of apps downloaded is estimated to reach 23 billion by the year 2014.[36] As shown in
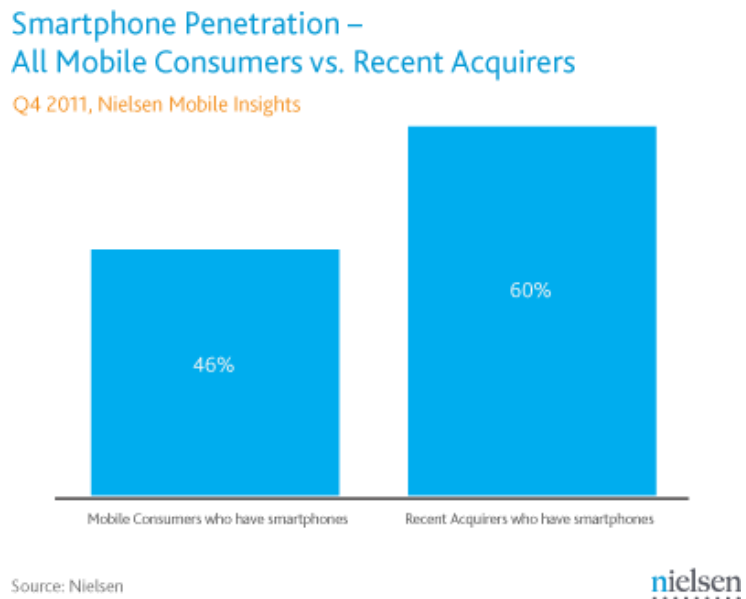
Figure 18: Smartphone Growth[34]

Figure 18: Smartphone Growth, there is a large increase in the number of Smartphone users. This shows great incentive to make a mobile application for any purpose.

There are many mobile applications currently available on the mobile markets that help provide bus routes and schedules for cities around the United States. Most of these applications are made by individual developers, unrelated to the city or state. Some of these applications use GPS functionality to show the exact location of buses, providing the option to see what time the bus will arrive at every station. The Southwestern United States is an android dominant region, with New Mexico remaining neutral as seen in Figure 19: U.S. Smartphone Map.

[34] (Neilsen Mobile Insights 2012)
[35] (IBISWorld)
[36] (IBISWorld)

States That Over-index Toward Android, iOS and Blackberry

Android dominance
iOS dominance
Blackberry dominance
Neutral

Jumptap
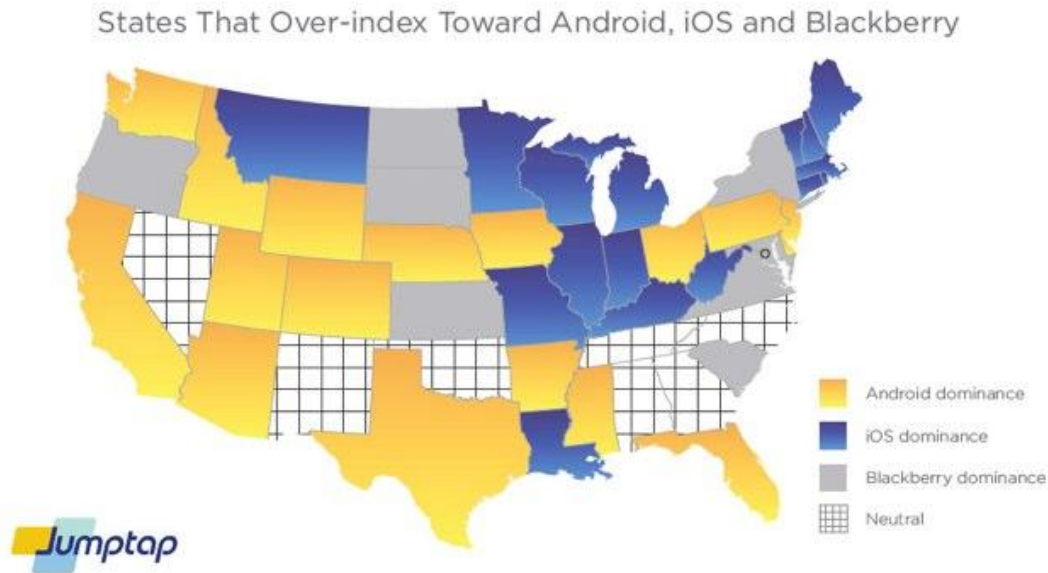
Figure 19: U.S. Smartphone Map[37]

One application that we think will be very similar to the one which we want to develop is called "Catch the Bus." This application was specifically designed to be used in Boston, MA. The application allows users to select specific routes and find the bus stops which are closest to them, as well as display the scheduled arrival and departure of all buses.[38]

In 2011, WPI students created Google Transit data relating to the Santa Fe Trails bus infrastructure.[39] Google Transit is an extension of Google maps that incorporates public transportation. Google Transit claims that participation can benefit your agency by: raising awareness of public transportation to attract new riders, helping seasoned riders discover new routes, directing users to your agency website to increase rider awareness, connecting neighboring agencies' data to improve inter-agency connectivity, decreasing traffic congestion and environmental effects while increasing mobility, providing trip planning on both desktop and mobile devices, and doing it all for free.[40] Google Transit data can now be uploaded to GTFS (General Transit Feed Specification) and read by an app. Last year's data pinpoints

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[37] (JumpTap 2012)
[38] (Catch The Bus 2102)
[39] (Socha,Rebekah K.Student author -- MGE and others 2011)
[40] (Google)

every bus stop in Santa Fe on Google maps, shows all bus routes, and includes bus stop and operational timing.
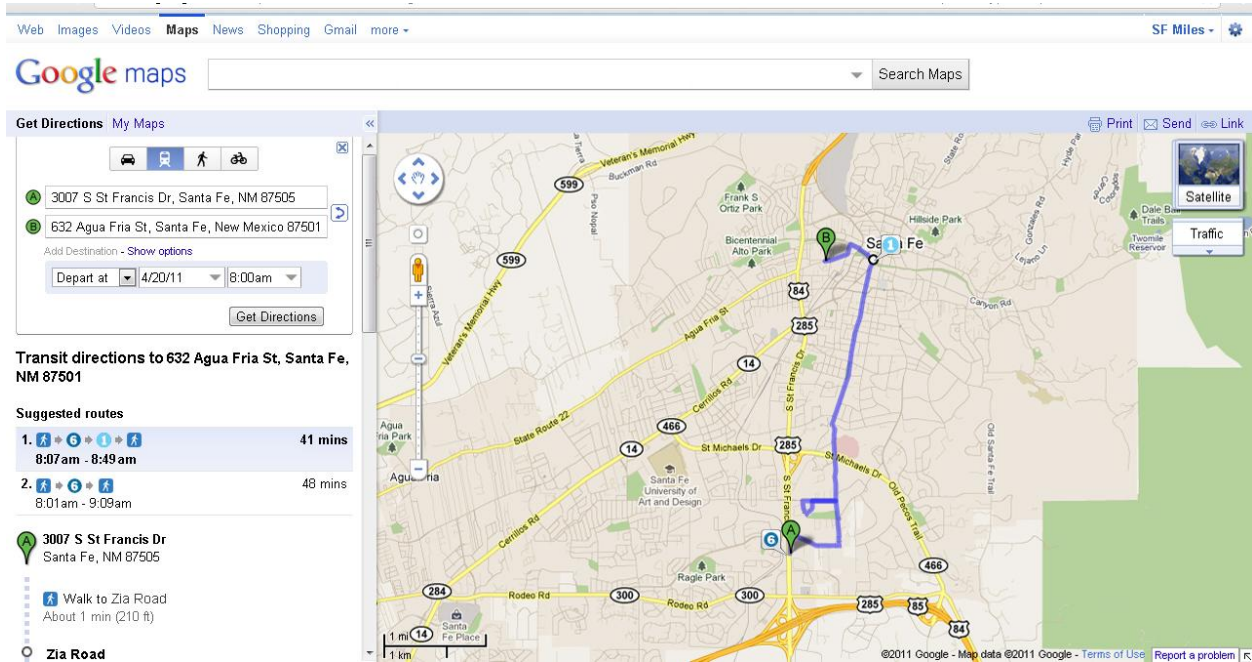
Figure 20: Google Transit 2011[41]

2.5 Camera Software Companies

There are many different types of surveillance software available online for many different applications. Our project is mainly to investigate the potential of incorporating software into the security camera system of Santa Fe Trails Bus system that will allow for people tracking and passenger counts. Due to the constraints on the system, multiple options of software must be researched in order to have an idea of what is needed and which company could serve Santa Fe Trails the best. Different software options that were reviewed are discussed in the following sections.

2.5.1 __VeriLook Surveillance 2.0 SDK__

VeriLook Surveillance is made by Neurotechnology, which is a company that provides algorithms and software development products for biometric recognition, computer based vision

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[41] (Socha,Rebekah K.Student author -- MGE and others 2011)

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and object recognition to security companies, system integrators, and hardware manufacturers. Neurotechnology has more than 2,500 system integrators in over 100 countries to install the company's technology.[42]

VeriLook Surveillance SDK is software that performs facial recognition on high resolution security cameras with live video streams. This software is for passive biometric identification which is defined as when people pass by the cameras without making any attempts to be recognized. Some possible uses include: law enforcement, security, attendance control, visitor counting, and other commercial applications. Applications of the software are compatible with Microsoft Windows and Linux platforms. VeriLook Surveillance 2.0 SDK is the latest version of the software and has features such as: real time performance, multiple face tracking, automatic operation, large surveillance systems support, and video file processing.[43]

For facial recognition accuracy, VeriLook depends on the quality of the facial image. One recommendation when using VeriLook is to have similar quality cameras. It is also recommended that the distance between the eyes for a face on a video stream at least 40 pixels in order to perform a face template extraction. Direct frontal or diffused light is preferred because it allows an equal lighting distribution on all sides of the face. VeriLook Surveillance 2.0 SDK costs about $1,200 for the software. Licenses also need to be bought for each unit that the software is used on. If we are operating 34 different buses each license will cost about $280.[44]

2.5.2 __Vizualize__

Vizualize Limited is a Hong Kong based company that develops software that allows businesses to count and track customers as well as watch product interactions in order to manage queues more effectively. Of the software that the company develops there are two that could be utilized for bus passenger origin and destination counting across the Santa Fe Trails Bus system.[45]

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[42] (NEUROtechnology 2011, 1)
[43] (NEUROtechnology 2011, 1)
[44] (NEUROtechnology 2011, 1)
[45] (481 Vizualize Limited 2011)

The first software offered is IntelliCount. IntelliCount is designed to use cameras to count individuals moving in any direction across a specified field. The program can have multiple count points from the same screen and use up to nine cameras per server. This program could be applied to the bus doors and count the passengers entering and exiting the bus at each stop.[46]

The second software offered is 3IRD-3D infra-red people counting software. This software is similar to IntelliCount, but has a few unique features. When a person is recognized through this software they are labeled as a solid colored form allowing a person to be easily tracked throughout the bus, and their route to be determined. Passengers are colored a separate shade in order to preserve their anonymity. Also 3IRD-3D imaging technology performs better than IntelliCount in low light situations.[47]

Both of these software's can be tied into a third product known as VisitorTrends. VisitorTrends compiles the data collected from the software and creates interactive charts and diagrams allowing the company to organize and visualize their data. This data can be exported to other programs like Microsoft Excel, or leading Business Intelligence applications.[48]

2.5.3 Rhonda Software

Another company we found that may be able to provide the necessary software is Rhonda Software. This company focuses strictly on software that can be integrated into nearly any camera surveillance system, to help with the tracking and recognizing of human beings.[49]

Looking at all of their products, one that looked to be the best option was the PTZ camera software, that enables people tracking on a moving camera. This would be best Rhonda software in our case, because the cameras on all buses will have moving backgrounds when en route. Moving backgrounds can cause complication in people tracking because cameras will accidentally track the background instead of the people.[50]

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[46] (481 Vizualize Limited 2011)
[47] (481 Vizualize Limited 2011)
[48] (481 Vizualize Limited 2011)
[49] (483 Rhonda Inc. 2012)
[50] (Rhonda Inc. 2012, 5)

2.6 RouteMatch

RouteMatch is a software company that integrates all the different bus systems into a computer program. The software collects the data and is capable of producing reports to determine efficiency and passenger ridership information. Santa Fe Trails is in current contract with RouteMatch to incorporate their system software for the fixed routes. Santa Fe Ride has been using RouteMatch software for about 4 or 5 years. Appendix G: Database of Santa Fe Ride shows two days' worth of trips so it can be evaluated later. The Ride vehicles all have Ranger units that track the vehicle location, give turn by turn directions to the next destination and can send messages to the drivers from the dispatch office. Santa Fe Trails will be using RouteMatch to incorporate the GPS of the buses into their system and take passenger counts using an automatic passenger counter.

2.7 Successful Transportation System Model for Santa Fe Trails

In the process of trying to improve the Santa Fe trails Bus system our project group found a successful public transportation system in the West. This model system is the Colorado RTD. This Regional Transit District has a user friendly website, with news updates on transportation and tutorials for all the different types of the transportation in Boulder and Denver, Colorado. There is also an online trip planner with links to system maps and fare schedules; this allows users to choose the correct pickup and destination locations.[51] There are also instructions on how to

Figure 21: Denver's MySTOP

plan your trip over the phone or where to purchase tickets. The RTD has also implemented a text bus schedule that can be sent to any mobile phone. There is also a Mystop automated telephone

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[51] (RTD)

information system,[52] which allows a user to call a stop specific 5 digit number to receive information about the route info and schedule.

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3 METHODOLOGY

Our project is intended to help Santa Fe Trails make the public transportation system more user-friendly and convenient for its users. In the process of working toward this goal we are only dealing with the Santa Fe Trails bus system within Santa Fe, New Mexico. The system is being analyzed from mid-march into early May. In addition to data we collect ourselves; we are reviewing past data from both Santa Fe Trails and the previous WPI project group.
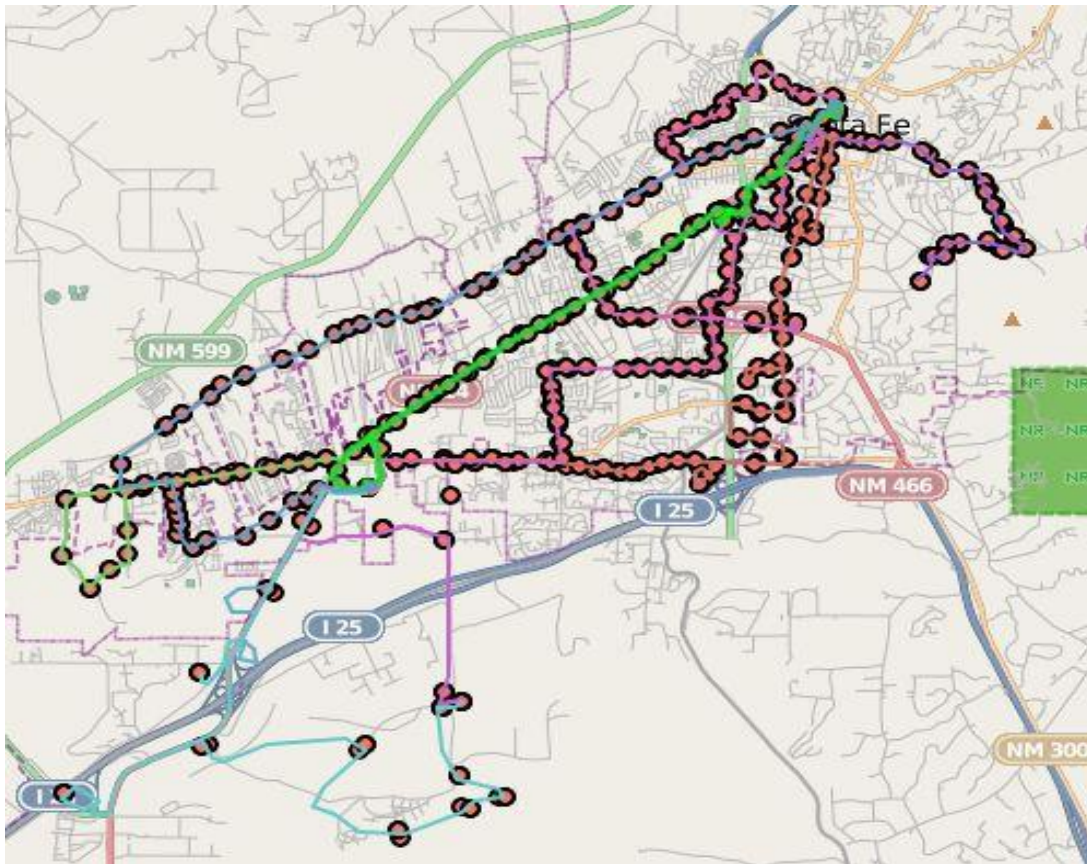
Figure 22: GIS Route Map

3.1 Compiling and Organizing Santa Fe Trail Infrastructure Information

      The first objective of our project is to compile and organize all of the existing Santa Fe Trails infrastructure information. This includes the fleet, bus stop, bus route, and schedule information. We will accomplish this by acquiring pre-existing data and also by adding any new information. In order to accurately assess the infrastructure of Santa Fe Trails we must first gather and organize information about all the different aspects of the infrastructure.

3.1.1 <u>Acquiring Fleet and Bus Stop Knowledge</u>

      Santa Fe Trails has information concerning all of their bus stops. They have conducted a ridership study over a week in May 2011 and this study includes all of the bus stops with their location with an identification code. This only includes stops that were present at that time. In addition to this they has an updated stop roster which also includes the GPS coordinates of all locations. Another form available through the previous WPI groups' website has information about bus stops and the type of shelter or lack thereof at each stop. Through this we are able to see which stops have shelters and which simply have a street post. We will need to analyze all of these forms in addition to looking for any additional bus stop information and come up with a final version that includes all stops. A complete roster is needed for an accurate infrastructure representation. This finalized version will then be plotted on an interactive map through the use of GIS cloud. Once this is done then all of the stops and their corresponding identification numbers will be available online.

      In addition to all the bus stop information the fleet roster is also important. We will need to obtain information from Santa Fe Trails concerning all available data about each van and bus that Santa Fe Trails operates. This data will include the size of bus and amenities of each bus as well as the systems contained on each, such as the onboard camera system. In addition we will collect data by evaluating each bus and van, and by speaking with the employees of Santa Fe Trails.

3.1.2 __Acquiring and Analyzing Bus Schedules__

Santa Fe Trails has many brochures and pamphlets available to the public which depict the various bus routes and schedules. The schedules are all available of Santa fe Trails website as well as on all of the buses. These schedules only show the time points at which the bus will arrive. There are many bus stops in between these time points which are not included. There is also an interpolated schedule posted on last year's WPI groups' website that we will use in correlation to the printed material to see if there are any improvements to be made. We will use the schedules to analyze how well they fir to the actual arrival and departure times of the bus and we will attempt to make the schedules easier to read and use.

3.2 Investigating Santa Fe Trails Usage

The next step to take in order to improve Santa Fe Trails bus system is to investigate the usage of the bus. According to last year's report they had found that the bus system is underutilized and in order to determine the reasons behind this we first needed to identify which specific parts of the system are underutilized. How we will go about doing this is to acquire ridership volumes from Santa Fe Trails and last year's group and to supplement these counts with ridership counts of our own. We will then organize all of the counts into a single database making it possible to accurately analyze the ridership information.

3.2.1 __Acquiring Ridership Volumes__

After requesting data during a phone conversation with Jon Bulthuis of Santa Fe Trails we received ridership volumes for all routes at every stop from the May 2011 study. These counts show every time someone entered or exited the bus at the corresponding location and time. Last year's WPI students took counts of their own by sitting on the bus and counting every time a passenger got on or off and at which stop. The students were only able to take counts on three different routes and for a day each. We propose to take our counts by sitting at Santa Fe Trails and watching the video surveillance footage of as many different routes for as many days as possible that time allows for. We will take down every instance that someone enters or exits the bus at the specific location and time.

3.2.2 <u>Integrating and Organizing Ridership Information</u>

We will pool all of the different ridership counts into a database that will be created in Microsoft Access and list the time, day, date, route, stop number, direction (inbound or outbound), stop location and passengers on, off and onboard. The first step in doing so is to convert all the different ridership count formats into a single format. Once this is completed we can produce pivot tables comparing different data sets from the Access database.

3.2.3 <u>Analyzing the final ridership count data</u>

Since we now will have a single database to pull information from we will be able to analyze the information for specific usage trends. One specific challenge given to us by Santa Fe Trails was for us to locate the top 50 most used bus stops. Examining the database will allow us to pinpoint the 50 bus stops with the greatest passenger use, as well as the stops with the lowest passenger use. We want to make sure that everything is normalized so our next step would be to normalize the counts based on hours of operation of each route. Every route has slightly different operating hours, so for our counts to be fair we need to take hours into consideration. We will plot the ranked stops on our GIS map and we will also plot the stops based on percentile. Hopefully through these two methods we can accurately visualize the most and least used stops to display usage trends. The most heavily used routes and least used routes will also be determined.
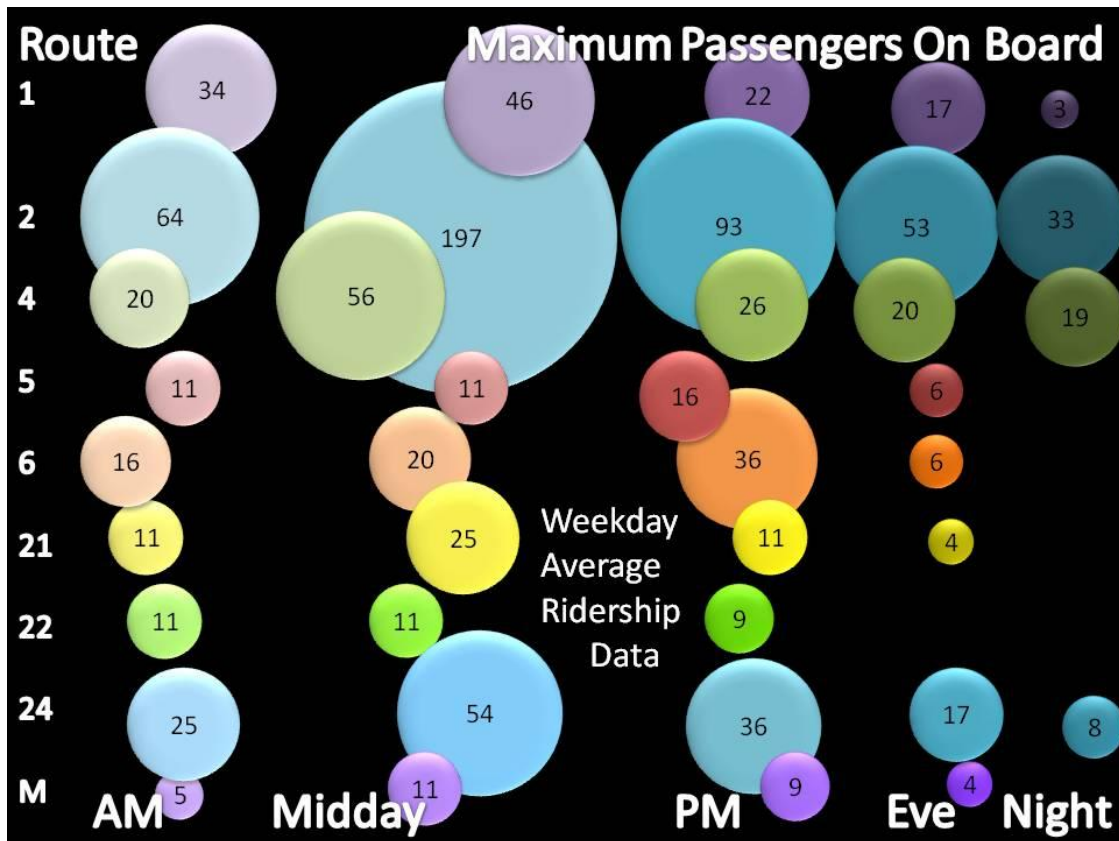
Figure 23: Actual Passenger Ridership

3.3 Exploring Santa Fe Ride System

In addition to learning about the operations of the fixed route system (Santa Fe Trails Bus System) we also want to learn about its paratransit system (Santa Fe Ride). We want to explore all parts of public transportation associated with Santa Fe Trails and we are looking into Ride just for this reason. Ride is used as a point to point van service for the disabled and elderly of Santa Fe. We want to evaluate and learn about how it works in order to determine if there is the potential of Ride to supplement Santa Fe Trails in bringing passengers to the bus stops from their homes. In order to do so we first need to explore Ride infrastructure as well as acquire and compile ridership information.

3.3.1 Identifying Ride Infrastructure

In order to find out about the existing infrastructure of Santa Fe Ride we will schedule meetings to sit down with their staff and discuss the system. From doing so we hope to gain

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knowledge on the process of its scheduling, the amount of drivers it employs, number of vans involved and the capacity of these vehicles.

3.3.2 Acquiring and Compiling Ride Usage

We will ask Santa Fe Ride for records concerning its ridership. Ideally we would like to obtain ridership for an entire year and this would include all trips and its daily usage. The efficiency of Santa Fe Ride is one of the major pieces of information we will use in our analysis of whether or not it is suitable as an assisting vehicle for Santa Fe Trails. We will take all of the ridership counts and place these into a single database so trends can be assessed. Obtaining these counts along with the infrastructure information will allow us to see if Ride is available for use by passengers other than the disabled and elderly or if it is highly used and no alterations are possible.

3.4 Developing a Santa Fe Trails Smartphone Application

The goal of our fourth objective is to make the bus system more convenient. We will do this by improving communication with passengers through the implementation of a mobile application. To do this we will need a Google Transit Feed that the app can read. Next the application will be designed so each setting and page is created. Once this is done a working prototype can be created and implemented for the bus users in Santa Fe.

3.4.1 Integrating an Interactive Trip Planner with Google Transit

All Google Transit data from the 2011 bus team will be reviewed and updated to work for the new routes, stops, and times. Once the data has been reviewed and updated it can be tested through the Google feed tester and schedule viewer. This is where any errors in the data can be found. After errors are corrected, this data will be sent to Google and Santa Fe Trails. Google will review the data, and then send a preview to Santa Fe Trails and our group. If everyone agrees on the data, then Google will implement Santa Fe Trails bus information into Google Transit, which will then be available for public use.

Since we need the transit feed for the mobile application and Google Transit can't be live in seven weeks' time, there is a GTFS Data Exchange server. Once the transit feed is complete, it

can then be uploaded to this website. This will be where our website application can read the feed and translate it into the interactive map, and trip planner.

3.4.2 **Designing a Mobile Application**

After we do extensive research of how to create an app, we are going to design a mock-up

of the app. Using Photoshop and other computer programs; we will put together images of how we want the app to look. In creating this mock-up, we will also create a flow chart of how all the pages of the app will be linked together. This flow chart will help us visually see the layout of our app and how many pages are necessary in order to complete a successful app. In designing our application we will be in contact with Peter Small who is coding for the project. We need to make sure what he is able to produce corresponds to the different functions that we are designing for. We want our mock-up to design to represent as closely as possible what the application will be capable of when it is completed.
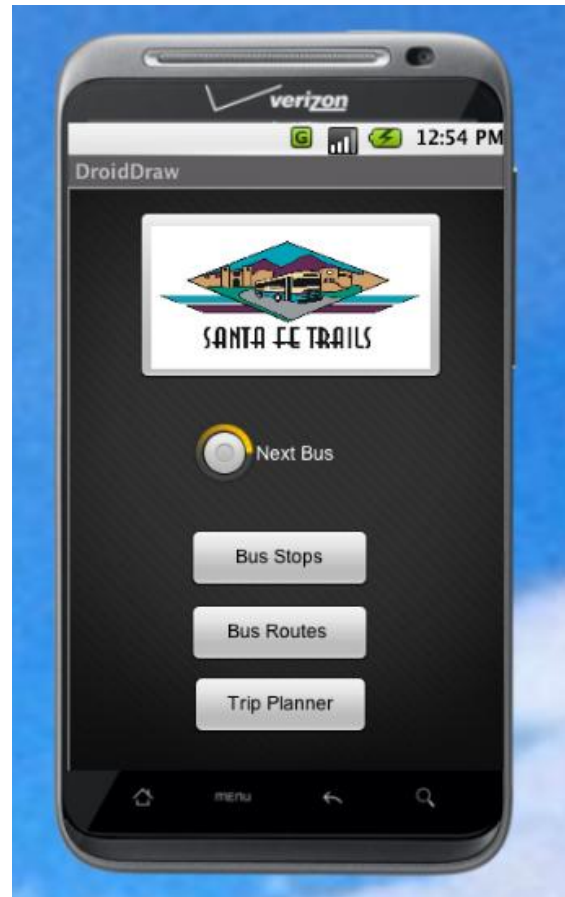
Figure 24: Mobile Application Design

3.4.3 **Developing a Mobile Application Prototype**

Next we will create a working prototype. We are working with Peter Small, programmer from the Santa Fe Complex, to accomplish this. He will handle all of the coding and we are responsible for providing him with an accurate Google Transit feed in which his application will pull information from. We will do this following Section 0. This prototype must include all needed functionalities: current bus schedules, bus routes, bus times, stop locations and live GPS locations of all buses. After creating a working prototype, the app must go through extensive testing to work out any issues.

4 RESULTS

After following our methodology we have developed the according results. For this project we examined the existing Santa Fe Trails infrastructure in order to make appropriate recommendations or improvements. We took ridership data to determine usage of the routes and stops. Also, we have compiled Santa Fe Ride data to analyze for its potential as a feeder to the Santa Fe Trails bus stops. The Google Transit and Mobile application has been made.

4.1 Santa Fe Trail Infrastructure

Santa Fe Trails has many different aspects that all need to be recorded and compiled in order for any analysis of the system to be done. We have done this by breaking down the system into multiple parts including: fleet, routes, stops, schedules, and fares.

4.1.1 **Routes**

Santa Fe Trails bus system has 10 routes with its newest being Route 26. We mapped all of the routes on GIS Cloud which is a tool that uses GPS locations and maps them onto a Google Map. GIS uses multiple layers so we have made all of our routes different layers. Doing this enabled us to turn off different routes, while keeping others visible so we could do more in depth studying. We used last year's routes layers. This did not include Route 26 so we made our own using Google Maps and importing the file into GIS. The following is our route map, which is interactive on www.giscloud.com.
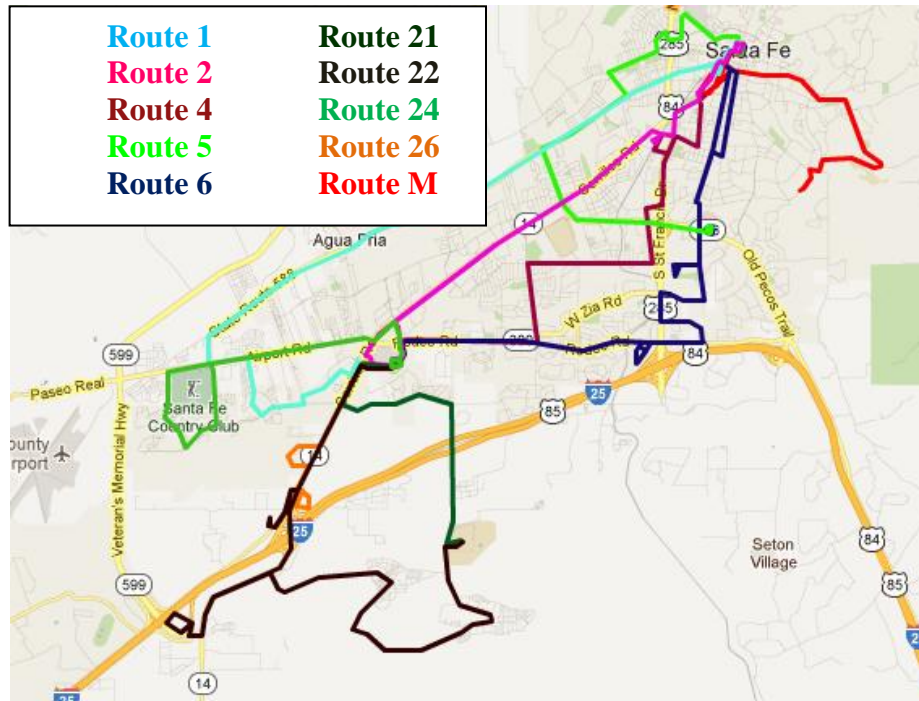
Figure 25: Santa Fe Trails Bus Routes

4.1.2 **Stops**

After receiving the roster data containing all GPS coordinates of all bus stops from Santa Fe Trails, the team organized all bus stops into a Microsoft Excel sheet. We compared the roster received from Santa Fe Trails to the data collected from the May 2011 Santa Fe Trails survey, to help identify any discrepancies. The team then eliminated duplicate stops from the data as well as added missing stops to the current schedule. This resulted in a map displaying all Santa Fe Trails bus stops on a single layer.

Importing these stop locations into GIS gave us the ability to visually analyze which stops were the most used and which were least used.
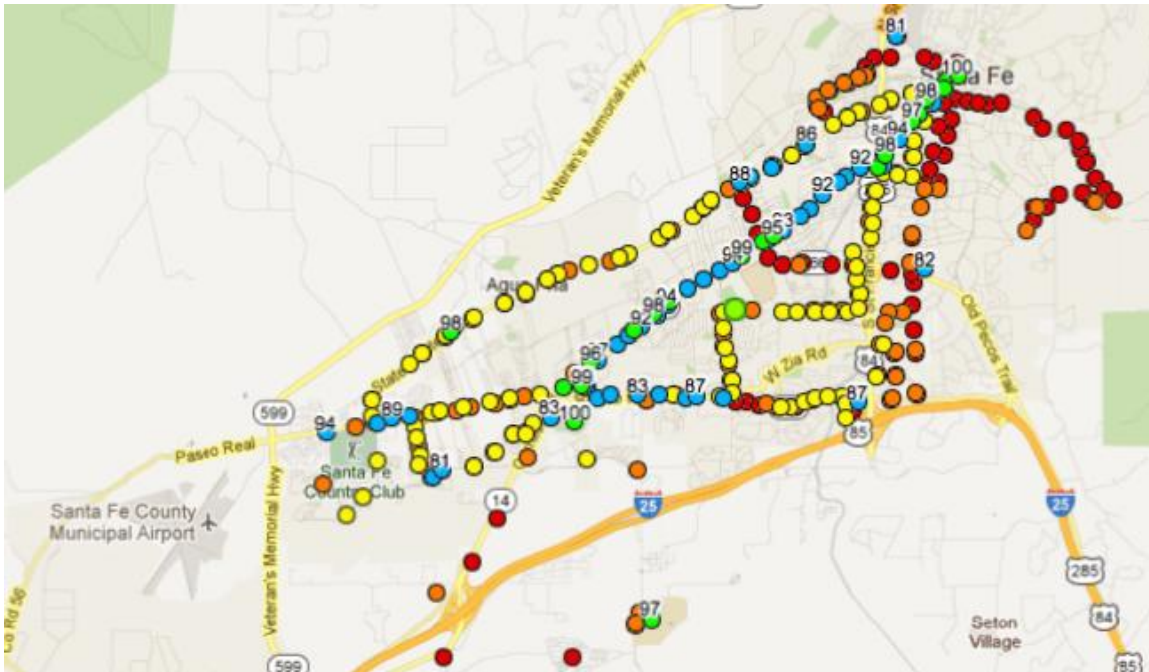
Figure 26: Santa Fe Trails Bus Stops

4.1.3 <u>Schedules</u>

In its current state, Santa Fe Trails has schedules for each line. These schedules use time points to allow passengers to gauge the time that the bus will come at for every stop. For example there are 11 stops in between time points 3 and 4 on route 4 (see Figure 27: Route 4 Schedule).

ROUTE 4 - DOWNTOWN - ST. FRANCIS - SIRINGO - CAMINO CARLOS REY - SANTA FE PLACE													
WEEKDAY OUTBOUND							WEEKDAY INBOUND						
Downtown Transit Center ❼	Saint Francis & Cordova ❻	South Capitol Station ❺	Saint Michaels & Pacheco ❹	Siringo & Carlos Rey ❸	Rodeo Plaza ❷	Santa Fe Place ❶	Santa Fe Place ❶	Rodeo Plaza ❷	Siringo & Carlos Rey ❸	Saint Michaels & Pacheco ❹	South Capitol Station ❺	Saint Francis & Cordova ❻	Downtown Transit Center ❼
-	-		-	-	-	-	5:41a	5:47a	5:52a	6:00a		6:08a	6:18a
-	-		-	-	-	-	6:11a	6:17a	6:22a	6:30a		6:36a	6:46a
6:00a	6:09a		6:15a	6:25a	6:30a	6:38a	6:41a	6:47a	6:52a	7:00a		7:08a	7:18a
6:35a	6:44a		6:52a	7:00a	7:05a	7:12a	7:19a	7:25a	7:30a	7:38a		7:44a	7:54a
7:05a	7:14a		7:20a	7:28a	7:33a	7:40a	7:49a	7:55a	8:00a	8:08a		8:14a	8:24a
7:35a	7:44a		7:52a	8:00a	8:05a	8:12a	8:19a	8:25a	8:30a	8:38a		8:44a	8:54a
8:05a	8:14a		8:20a	8:28a	8:33a	8:40a	8:49a	8:55a	9:00a	9:08a		9:14a	9:24a
8:30a	8:39a		8:45a	8:53a	8:58a	9:05a	9:14a	9:20a	9:25a	9:33a		9:39a	9:49a
9:00a	9:09a		9:17a	9:25a	9:30a	9:37a	9:44a	9:50a	9:55a	10:03a		10:09a	10:19a
9:30a	9:39a		9:45a	9:53a	9:58a	10:05a	10:12a	10:18a	10:23a	10:31a		10:37a	10:47a
10:00a	10:09a	Timer Insert	10:15a	10:23a	10:28a	10:35a	10:42a	10:48a	10:53a	11:01a	Timer Insert	11:07a	11:17a
10:30a	10:39a		10:45a	10:53a	10:58a	11:05a	11:08a	11:14a	11:19a	11:27a		11:35a	11:45a
11:00a	11:09a		11:15a	11:23a	11:28a	11:35a	11:42a	11:48a	11:53a	12:01p		12:07p	12:17p
11:30a	11:39a		11:45a	11:53a	11:58a	12:05p	12:12p	12:19p	12:24p	12:31p		12:37p	12:47p
12:00p	12:09p		12:17p	12:25p	12:30p	12:37p	12:42p	12:49p	12:54p	1:01p		1:07p	1:17p

Figure 27: Route 4 Schedule

4.2 Santa Fe Trail Usage

In order to explore possible improvements to Santa Fe Trails we needed to find out how much the bus system is used and the reasons behind its ridership status. In order to do this we used ridership counts as well as conducted a survey of bus users. From this we could analyze the system and try to make it more convenient for users.

4.2.1 __Bus Ridership__

First we tackled the task of collecting and organizing ridership counts and placing these into a database. We have taken multiple sources of ridership counts as well as taken a survey to gauge the bus use and patterns of passengers.

4.2.1.1 Ridership Counts

We have received a weeklong study done by Santa Fe Trails. It tells of every time a passenger got on or off the bus for the first week in May of 2011. This report includes all stops and routes except for route 26. The WPI team last year took a couple of ridership counts but they were only for routes 2, 4, and 6 and for only a couple hours of one day. We found these records unhelpful since they were not uniform for all routes or times of day. We used only the counts provided by Trails since they were much more complete and fair representations of the stops' usage.

The next issue was the formatting of the files. They were not useful for any type of analysis in their original format. We transformed the files so every time a passenger came on or off the bus we made an entry. The new excel contains the bus stop sequence number, the date, day of the week, time, route, direction, ID number, location, the number of passengers on, off, or onboard. The total number of entries is 67,657. We then imported this into Microsoft Access to be able to sum the ridership at each stop over the entire week. Now there is an existing database where additional counts can be added.

	A	B	C	D	E	F	G	H	I	J	K
1	Sequence Number	Date	Day	Time	Route	Direction	ID Num	Location	On	Off	Onboard
2	0.33	5/1/2011	Monday	7:13 AM	0	Inbound	94001	Sheridan Transit Center	0	0	0
3	0.33	5/1/2011	Monday	8:13 AM	0	Inbound	94001	Sheridan Transit Center	0	1	0
4	0.33	5/1/2011	Monday	9:13 AM	0	Inbound	94001	Sheridan Transit Center	0	0	0
5	0.33	5/1/2011	Monday	10:13 AM	0	Inbound	94001	Sheridan Transit Center	0	1	0
6	0.33	5/1/2011	Monday	11:11 AM	0	Inbound	94001	Sheridan Transit Center	0	0	0
7	0.33	5/1/2011	Monday	1:43 PM	0	Inbound	94001	Sheridan Transit Center	0	0	0
8	0.33	5/1/2011	Monday	3:43 PM	0	Inbound	94001	Sheridan Transit Center	0	0	0
9	0.33	5/1/2011	Monday	4:04 PM	0	Inbound	94001	Sheridan Transit Center	0	0	0
10	0.33	5/1/2011	Monday	4:43 PM	0	Inbound	94001	Sheridan Transit Center	0	1	0
11	0.33	5/1/2011	Monday	5:43 PM	0	Inbound	94001	Sheridan Transit Center	0	1	0
12	0.33	5/1/2011	Monday	6:43 PM	0	Inbound	94001	Sheridan Transit Center	0	0	0
13	0.33	5/1/2011	Monday	7:43 PM	0	Inbound	94001	Sheridan Transit Center	0	0	0
14	0.33	5/2/2011	Tuesday	7:13 AM	0	Inbound	94001	Sheridan Transit Center	0	0	0
15	0.33	5/2/2011	Tuesday	8:13 AM	0	Inbound	94001	Sheridan Transit Center	0	0	0
16	0.33	5/2/2011	Tuesday	9:13 AM	0	Inbound	94001	Sheridan Transit Center	0	1	0
17	0.33	5/2/2011	Tuesday	10:13 AM	0	Inbound	94001	Sheridan Transit Center	0	1	0
18	0.33	5/2/2011	Tuesday	11:11 AM	0	Inbound	94001	Sheridan Transit Center	0	0	0
19	0.33	5/2/2011	Tuesday	1:43 PM	0	Inbound	94001	Sheridan Transit Center	0	1	0
20	0.33	5/2/2011	Tuesday	3:43 PM	0	Inbound	94001	Sheridan Transit Center	0	0	0
21	0.33	5/2/2011	Tuesday	4:04 PM	0	Inbound	94001	Sheridan Transit Center	0	0	0
22	0.33	5/2/2011	Tuesday	4:43 PM	0	Inbound	94001	Sheridan Transit Center	0	3	0
23	0.33	5/2/2011	Tuesday	5:43 PM	0	Inbound	94001	Sheridan Transit Center	0	0	0
24	0.33	5/2/2011	Tuesday	6:43 PM	0	Inbound	94001	Sheridan Transit Center	0	0	0
25	0.33	5/2/2011	Tuesday	7:43 PM	0	Inbound	94001	Sheridan Transit Center	0	0	0

Santa Fe Trails Ridership Datab / WPI 2011 Counts

Figure 28: Excel Database

Sequence N	Date	Day	Time	Route	Direction	ID Number	Location	On	Off	Onboard
1.13	5/5/2011	Friday	3:19 PM	1	Outbound	94012	Aqua Fria OPS	0	5	0
1.13	5/5/2011	Friday	3:49 PM	1	Outbound	94012	Aqua Fria OPS	0	5	0
1.13	5/5/2011	Friday	4:19 PM	1	Outbound	94012	Aqua Fria OPS	0	5	0
1.13	5/5/2011	Friday	4:49 PM	1	Outbound	94012	Aqua Fria OPS	0	5	0
1.13	5/5/2011	Friday	5:19 PM	1	Outbound	94012	Aqua Fria OPS	0	1	0
1.13	5/5/2011	Friday	5:49 PM	1	Outbound	94012	Aqua Fria OPS	0	5	0
1.13	5/5/2011	Friday	6:20 PM	1	Outbound	94012	Aqua Fria OPS	0	0	0
1.13	5/5/2011	Friday	6:20 PM	1	Outbound	94012	Aqua Fria OPS	0	2	0
1.13	5/5/2011	Friday	6:50 PM	1	Outbound	94012	Aqua Fria OPS	0	3	0
1.13	5/5/2011	Friday	7:20 PM	1	Outbound	94012	Aqua Fria OPS	0	4	0
1.13	5/5/2011	Friday	8:20 PM	1	Outbound	94012	Aqua Fria OPS	0	0	0
1.13	5/5/2011	Friday	9:20 PM	1	Outbound	94012	Aqua Fria OPS	0	1	6
1.13	5/6/2011	Saturday	8:30 AM	1	Outbound	94012	Aqua Fria OPS	0	1	0
1.13	5/6/2011	Saturday	9:30 AM	1	Outbound	94012	Aqua Fria OPS	0	2	1
1.13	5/6/2011	Saturday	10:30 AM	1	Outbound	94012	Aqua Fria OPS	0	4	0
1.13	5/6/2011	Saturday	11:30 AM	1	Outbound	94012	Aqua Fria OPS	0	2	0
1.13	5/6/2011	Saturday	12:30 PM	1	Outbound	94012	Aqua Fria OPS	0	8	0
1.13	5/6/2011	Saturday	2:30 PM	1	Outbound	94012	Aqua Fria OPS	0	3	0
1.13	5/6/2011	Saturday	4:30 PM	1	Outbound	94012	Aqua Fria OPS	0	5	0
1.13	5/6/2011	Saturday	5:08 PM	1	Outbound	94012	Aqua Fria OPS	5	0	0
1.13	5/6/2011	Saturday	5:30 PM	1	Outbound	94012	Aqua Fria OPS	0	5	0
1.13	5/6/2011	Saturday	6:30 PM	1	Outbound	94012	Aqua Fria OPS	0	12	0
1.13	5/7/2011	Sunday	8:30 AM	1	Outbound	94012	Aqua Fria OPS	0	1	0

Figure 29: Access Ridership Database

4.2.1.2 Ridership Survey

After counting the passengers on the bus we set out to learn more about why people rode the bus as well as which routes and to gauge the passenger's overall opinion of the bus system. We went about this by conducting a survey (see Appendix G: Survey) at four major locations; the Sheridan Transit Center downtown, the Santa Fe Place Mall Transit Center, South Capitol Station, and on a few buses going to these locations on Route 4.

When we looked into why people were riding the bus we got the response distribution seen below in Figure 30. This shows that the primary reason that surveyed passengers did not ride the bus system was mostly due to the fact that they did not own a vehicle and relied upon the bus system to get around the city. The second most often occurring answer was that the price of gas has driven them to ride the bus suggesting that if gas prices continue to rise bus system ridership may increase as well.

Why Do You Use The Bus System?		
Do Not Own Car	45	71%
Price of Gas	23	37%
Vacation	5	8%
Work	12	19%
Day Trips	8	13%
To Avoid Traffic	2	3%
Other	8	13%

People may select more than one checkbox, so percentages may add up to more than 100%.
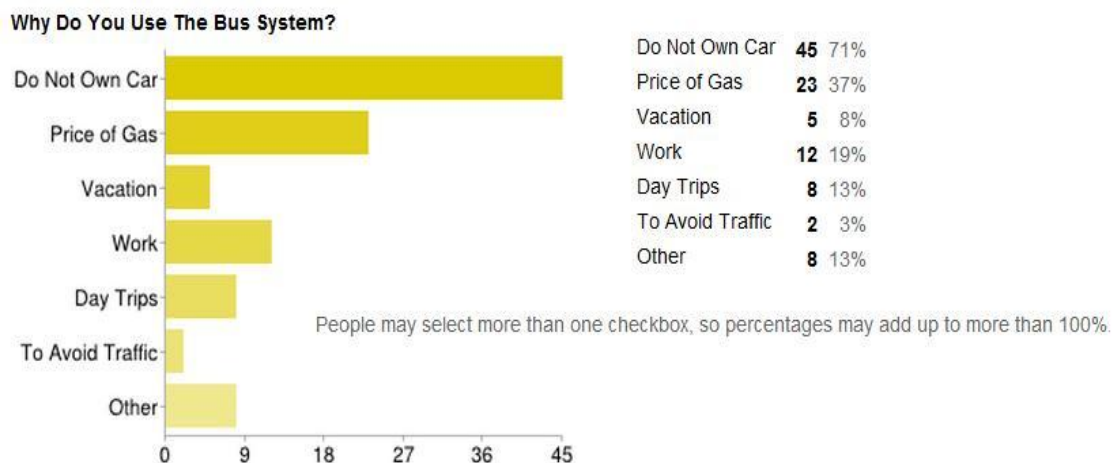
Figure 30: Bus Transfer Survey Results

When we asked passengers about what routes they rode most often we got the distribution seen below in Figure 31. The distribution shows strong ridership for Route 2 which is indicative of the system. Routes 4 and 1 also show strong ridership through our survey similar to the overall ridership trends reported on earlier. However this is where comparisons end as many of the passengers surveyed said they rode route 6 which has been shown through earlier

analysis of ridership to have a much lower ridership than Route 1. This may have been indicative of the time and place the surveys were taken, since the surveys were only given over two days from the hours of 11:00AM-3:00PM. Also, we mainly conducted the surveys at the Sheridan Transit Depot where not every route feeds into.

Which Bus Routes Do You Use On A Regular Basis?

Route	Count	Percent
Route 1 (Agua Fria)	17	24%
Route 2 (Cerrillos)	45	63%
Route 4 (Southside)	34	48%
Route 5 (W. Alameda)	10	14%
Route 6 (Rodeo Road)	14	20%
Route M (Museum Hill)	6	8%
Route 21(Community College)	8	11%
Route 22 (Rancho Viejo/ IAIA)	1	1%
Route 24 (Country Club)	5	7%
Route 26 (Santa Fe Place, South Cerrillos and Fashion Outlets)	3	4%
I Do Not Regularly Use The Bus System	2	3%

People may select more than one checkbox, so percentages may add up to more than 100%.

Figure 31: Route Usage Survey Results

We attempted to gain origin and destination data through our surveys through questions about what intersection the passenger took to get on the bus and what intersection they were getting off at. Not every one of the seventy-seven people who took our survey answered this question due to the inherent time constraint of surveying people who were waiting to get on buses. In fact of the seventy-seven surveyed in all locations only twenty-eight origin and destination pairs were answered with Sheridan Transit Center being the location of eighteen of the answers. These answered are summarized here in

Table 2. Seven of the origins and destinations at this site were the same suggesting that passengers of the bus system use it to go downtown for the day and then go back home, but as this sample is very small we would suggest more data collection be done through our survey before any noticed trends in the data can be analyzed with a higher degree of certainty.

Table 2: Origin-Destination Results

Sheridan Transit center Origin and Destination Survey Responses	
What Intersection (Bus Stop) Did Your Trip Originate From?	What Intersection (Bus Stop) Will Your Trip End At?
Cerrillos and St. Francis	Cerrillos and St. Francis
W Zia Rd and Camino Carlos Rey	Camino Carlos Rey and W Zia Rd
St Michaels Cerrillos	Agua Fria at Osage

Carlos Rey and Zia	W Zia Rd and Camino Carlos Rey
St mikes	Cerrillos and 2nd
Cerrillos and Camino Consuelo	Wal-Mart
Sheridan Transit Center	S St Francis Dr. and W Cordova Rd
Cerrillos Rd and Siler Rd	Cerrillos Rd and Siler Rd
Cerrillos and Fifth St	Cerrillos and Fifth
Monsignor Patrick Smith Park on East Alameda St	Rodeo Park Road East
Cerrillos and Siler	Folk art museum
Cerrillos and Siler	Folk art museum
Country Club	Country Club
Agua Fria and Osage	Sheridan Transit Center
Agua Fria and Siler	Cerrillos and St Francis
Cerrillos by the Regal Hotel	Sheridan Transit Center
St mikes and Cerrillos	Agua Fria and Sanysidro
St. Francis Dr. NS Cordova Rd.	St. Francis Dr. NS Cordova Rd.

We looked into seeing how far passengers of the bus system had to travel in order to get to a bus stop and then how far away their destination was from where they got off of the bus. The results of both are summarized below in Figure 32. This showed that of the people surveyed the vast majority lived within a half of a mile from a bus stop. And through speaking with the surveyed individuals most of the time they lived within a few blocks from a bus stop. Furthermore most passengers got off the bus with their destination within half of a mile.

How Far is Your Point of Origin From a Bus Stop?
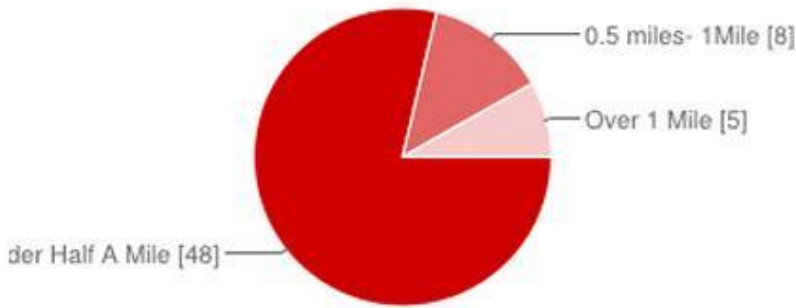
Under Half A Mile	**48**	66%
0.5 miles- 1Mile	**8**	11%
Over 1 Mile	**5**	7%

How Far is This Place From the Bus Stop?

Under Half A Mile	**46**	63%
0.5 miles- 1Mile	**5**	7%
Over 1 Mile	**4**	5%

Figure 32: Origin Survey Results

We then asked the passengers who had to go over a half of a mile to either a bus stop or from a bus stop if they'd be willing to pay an extra fee for a feeder service to bring them the first or last mile. Their responses are shown below in Figure 33. Overall the majority of the people asked would not pay for a feeder service while those who said yes said they would pay from fifty cents up to three dollars. This would suggest that any first-last mile program set up by Santa Fe Trails would not get very high usage. However since only a small amount of bus riders were surveyed and already make do with the bus system, this question is biased since we are not asking potential passengers that live a further distance away from the bus system.

If They Answer Over 0.5 Miles Would You Be Willing to Pay An Additional Fee for A Feeder Service to Bring You From Your Point of Origin to The Nearest Bus Stop?

No [11]

Yes 4 5%
No   11 15%

Yes [4]

If They Answer Over 0.5 Miles Would You Be Willing to Pay An Additional Fee for A Feeder Service to Bring You From the Bus Stop to Your Destination

No [5]

Yes 3 4%
No   5 7%

Yes [3]

Figure 33: Pay for Feeder Survey Results

At the request of our sponsor, we gauged passenger's opinions of different aspects of the bus system using a 1 to 5 scale where a 1 meant poor and a 5 meant excellent. The results of this questioning are summarized below in Figure 34. Overall passengers feel pretty good about most aspects of the bus system with the bus fare and bus drivers being complimented the most. The largest areas of descent in the system, while still being overall positive, are the buses and the bus schedule. The schedules of the buses were criticized for having connection times that lead to long waits for a bus to arrive and for having routes, such as 5, to run on during the weekend. Many people surveyed found that the bus system was convenient for them but as these are already the people who use the bus to get around their opinions were biased as the system being inconvenient.

Tell Us How You Feel About Your Last Trip On The Bus. Select the Number that BEST Represents Your Opinion On The Following: - Driver

1	0	0%
2	0	0%
3	4	5%
4	11	15%
5	52	71%

Tell Us How You Feel About Your Last Trip On The Bus. Select the Number that BEST Represents Your Opinion On The Following: - Bus

1	1	1%
2	4	5%
3	6	8%
4	18	25%
5	37	51%

Tell Us How You Feel About Your Last Trip On The Bus. Select the Number that BEST Represents Your Opinion On The Following: - Bus Schedule

1	1	1%
2	5	7%
3	14	19%
4	15	21%
5	32	44%

Tell Us How You Feel About Your Last Trip On The Bus. Select the Number that BEST Represents Your Opinion On The Following: - Fare

1	1	1%
2	0	0%
3	1	1%
4	7	10%
5	58	79%

Tell Us How You Feel About Your Last Trip On The Bus. Select the Number that BEST Represents Your Opinion On The Following: - Convinience

1	1	1%
2	2	3%
3	5	7%
4	12	16%
5	46	63%

Figure 34: General Bus System Content Survey Results

Through the opinion and comments section of the paper, summarized below in Figure 35: Survey Comments, we were able to look at the bus system in a more analytical way and

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focus our suggestions to the bus system with the opinion of the passengers in mind. However we do recognize that surveying only current bus system riders makes many of our responses bias, especially in terms of feeders and convenience of the system as the people who actively use the bus now use it because it works for them. We also recognize the bias in only looking in the transit centers not during rush hours as this doesn't look at those who use the bus in the morning to get to work or school. Also two days of testing on a Wednesday and Thursday are unlikely to have given us a full view of the system and its potential problems.

Figure 35: Survey Comments

4.2.2 **Stop Usage**

From our Access database we summed all of the ridership at each stop. From this we have made a list that ranks each stop by the amount of use,s the total number of people that got on and off of the bus at that stop over an entire week. In this rank spreadsheet we put the GPS locations of the stops and imported this into GIS Cloud. GIS Cloud then mapped all of the bus stops. We grouped 1-10, 11-25, 51-100, 101-200, and 201-420 and attached a color to each group. When the different colored stops were displayed it was clear that most of the unused stops were located along Route M, 6, and 5. We also saw that the most used stops were located along Route 2, and then Route 4.

Figure 36: Stop Usage Based on Rank

In addition to basing the stop usage off of rank we wanted to normalize by hours of operation. Since every route has different hours of operation it is important to figure that in when determining how many people use particular stops during a week. Especially because some routes do not operate on Sunday and some the entire weekend. After doing this we ranked them based on percentile and mapped this onto GIS Cloud. We again grouped them by color having the most used as blue and the least as red.
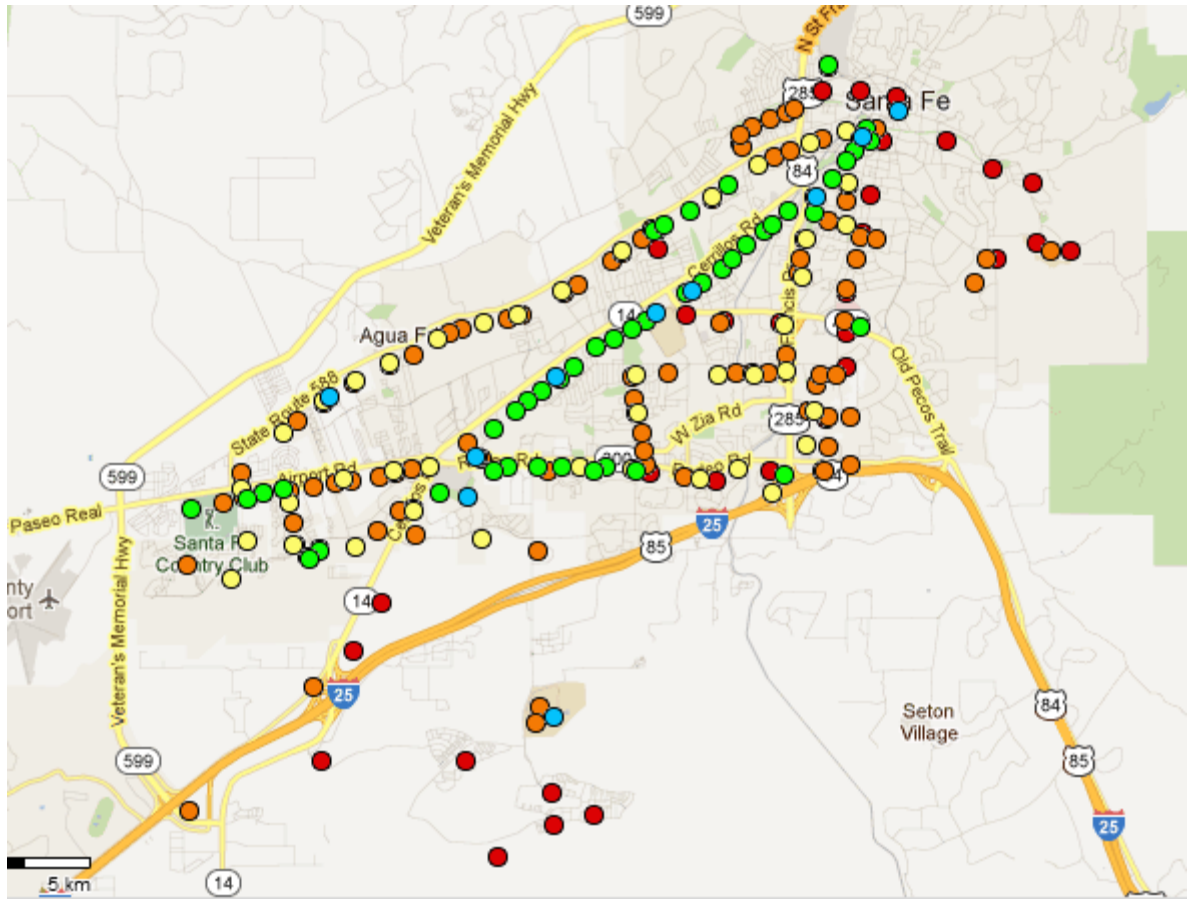
Figure 37: Stops Based on Percentile

4.2.2.1 Top 50 Stops

We have ranked all the stops based on passenger use. Then we reduced this list to the top 50. These stops will be upgraded to have artistic shelters that Santa Fe Trails will be spending $500,000. The file of the top 50 stops also tells if there is already an artistic shelter at any of those stops. There is an artistic shelter at the 7th ranked stop (Agua Fria and Santeros Place) which will be excluded from the upgrade as well as Santa Fe Place Transit Center (1st) and Sheridan Transit Center (2nd). Sheridan and Place Mall will be excluded because Sheridan is against a building wall and Place Mall contains multiple shelters (although no artistic) so it would require multiple upgraded shelters. The following is a map of the top 50 stops.
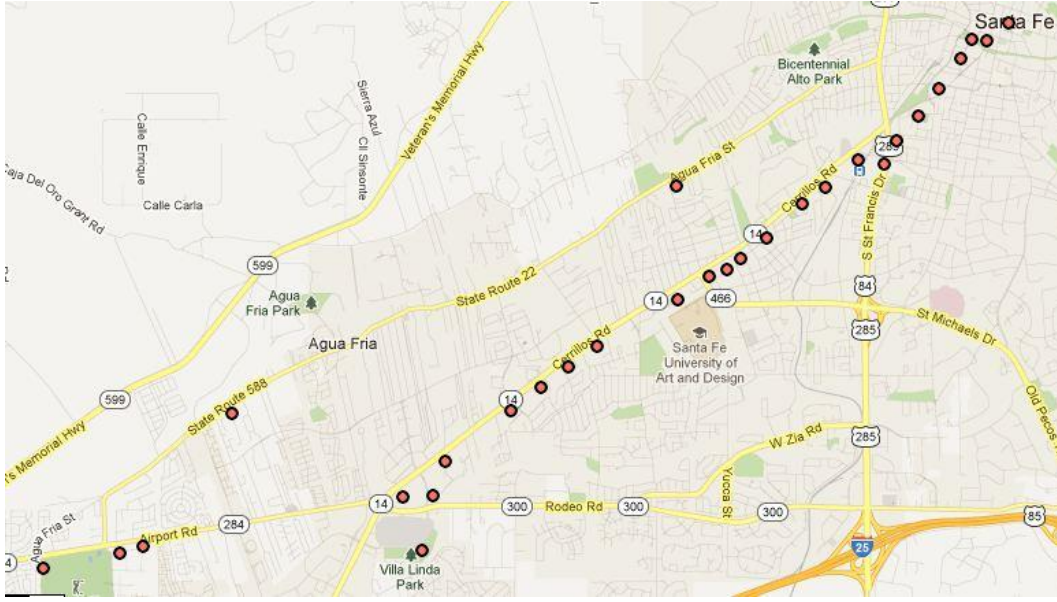
Figure 38: Top 50 Stops

4.2.3 **Route Usage**

Another piece of received data for the bus system was the fair box total which estimated daily ridership of each route from January 1, 2011 to March 31, 2012, as seen in Appendix F: Daily Ridership: Jan 2011-Dec 2011. In order to look at this data in a more useful way the total ridership for each month was calculated and then graphed in Figure 39: Ridership on All Routes to show the monthly ridership of each route compared to one another. It is evident from this figure that ridership of Route 2 is several thousand people greater than every other route even outside of the summer months when ridership of Route 2 reaches its highest levels.
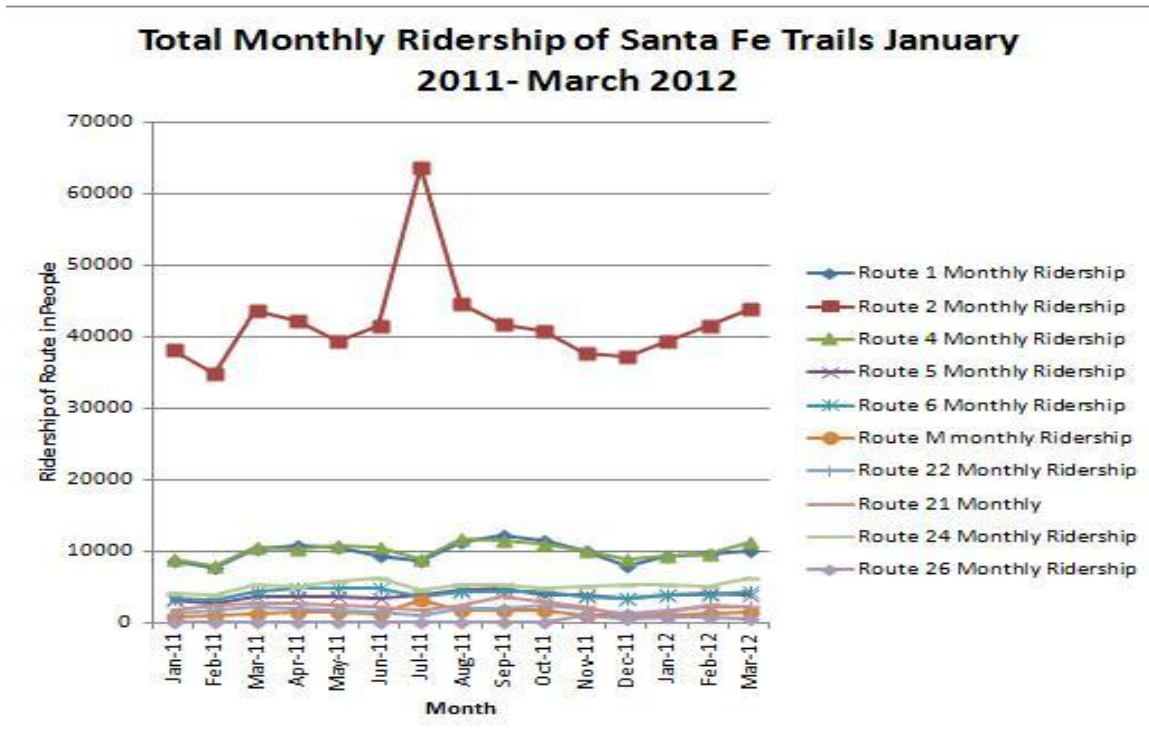
Figure 39: Ridership on All Routes

To analyze the other routes more accurately we re-graphed the same data but without Route 2, see figure below, so as the remaining system could be more accurately viewed. From here it became more noticeable which routes had peaks within which times of the year and gave an overall level of average monthly ridership for each bus route. As seen by the graph the month Santa Fe Trails conducted their ridership counts in, May, the bus system routes were around their most average levels supporting that the data was a good sample of average bus ridership on the system. However while this data provides a good general view into the ridership of the Santa Fe Trails bus system it does not provide a look into which parts of the bus routes are getting the

most ridership. In order to see this we had to look into the usage of each bus stop in the system.
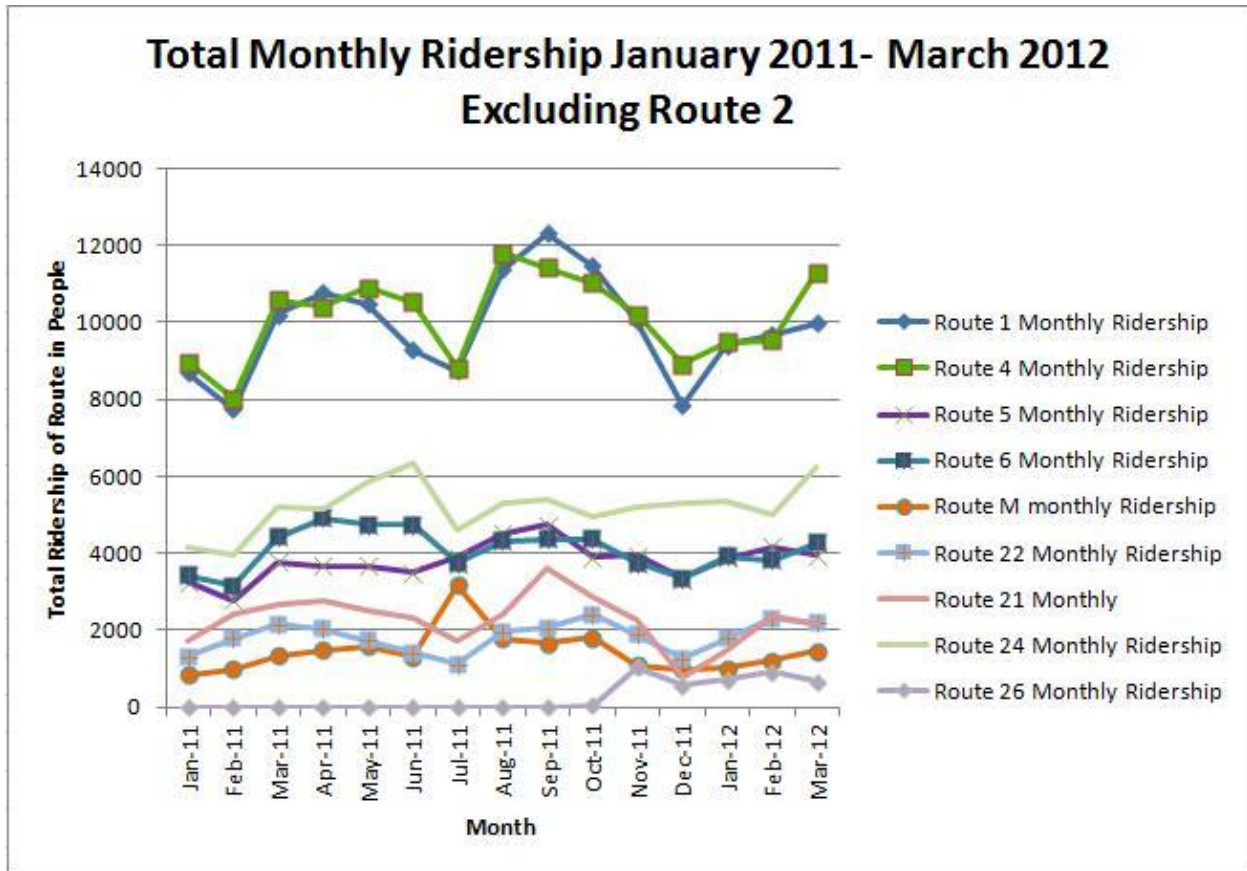
Figure 40: Ridership Excluding Route 2

4.2.3.1 Using Cameras to Determine Origin-Destination

Having a system in place to count and identify passengers as they get on and off the bus would provide a great benefit to the bus system and allow it the ability to recognize trends in bus stop use faster. First we believed we could make use of the cameras on the bus to take passenger counts along with origin and destination information. In order to test the capabilities of the cameras we analyzed different software and got a quote from the leading company Flonomics which gave a quote for $50,000 for one bus and then $10,000 for each additional bus. As this was too expensive for our purposes we had to look into open source technologies to see what could be done.

With open source software in mind we turned to open-CV to work on identifying passengers since the software is free, but it requires coding in order to make it work. The Open-

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CV software was able to detect blobs of moving shapes on the cameras as passengers entered the bus, but at this point in time the cameras were unable to accurately distinguish and identify a single person and track them over time. More coding hours need to be put into Open-CV if origin and destination is be properly determined this way.

4.3 Santa Fe Ride System

Santa Fe Ride is a Paratransit program that is a door to door service for the ADA approved. We looked into how they operate as well as their efficiency to see if this could complement the bus system. We also wanted to use this information to decide if it has the potential to be a feeder system for the bus.

4.3.1 **Infrastructure**

Santa Fe Ride is under contract with RouteMatch which is a company that provides software for transit systems. RouteMatch has Ranger tablets installed into all of their vehicles. This allows for live GPS feed into the call center located at the Santa Fe Trails Headquarters at Rufina Street in Santa Fe. In addition to watching the vehicle live time, the GPS is saved and every day the route that a vehicle takes is stored in the system.

RouteMatch also schedules trips to the vehicles. The trips are designated to different drivers based upon the length of the trip, whether the passenger requires any special equipment (such as a wheelchair lift), and number of passengers involved in the trip. The system automatically assigns the trips and the call center employee has the ability to change the vehicle schedules if need be (for example due to a breakdown). When a call is made for an immediate trip the call center director assigns them to a route. RouteMatch gives recommendations on which route the trip should be assigned to, but overall the employees can make any adjustments as necessary.

4.3.2 **Usage**

RouteMatch can be used to make reports based on about almost every aspect of the system such as completed calls, number of missed appointments, off time, and printouts of all of the schedules of any day. These can be made to be daily, weekly, monthly or yearly. Below is an example of a schedule of one vehicle on a single day.

Schedule Validation Report - Santa Fe Rides

For time period: 03/28/2011

Printed: 03/27/2012 10:31 am

Early Windo	PU Time	Late Window	Variance (minutes) -: early	Customer	Mobility	PU Address	DO Address	DO Time	Type	Schedule Method	Est. Distanc	Travel Time
Vehicle Pool: Santa Fe Rides												
Veh: 2143v - Run: 201101												
7:00	7:15	7:30	0	Trujillo, Diane	Ambulatory	2329 Calle Luminoso	2300 Ridgetop Rd N	7:45	SO	Unknown	5.44	30
7:45	8:00	8:15	0	Kearns, Amy	Ambulatory	825 Calle Mejia	1600 Saint Michaels Dr	8:15	SO	Unknown	3.78	15
13:45	13:50	14:15	0	Spindel, Seth	Ambulatory	1382 Vegas Verdes	1059 Camino Vista Aurora	14:05	SO	Unknown	1.82	15
13:00	13:05	13:30	0	Martinez, Andrea	Ambulatory	6401 S Richards Ave	630 Gomez Rd	13:30	SO	Unknown	7.85	25
10:15	10:15	10:45	0	Caleb, Rita	Ambulatory	3811 1/2 Cerrillos Rd	6401 S Richards Ave	10:31	SO	Unknown	4.04	16
8:30	8:30	9:00	0	Montano, Olivia	Ambulatory	1106 Calle Del Cielo	2960 Rodeo Park Dr W	8:46	SO	Unknown	3.34	16
6:00	6:05	6:30	0	Yarnell, Chris	Ambulatory	3774 Agua Fria St	1190 S Saint Francis Dr	6:16	SO	Unknown	5.17	11
10:45	10:45	11:15	0	Jimenez, Delfino	Lift	1200 Camino Consuelo	641 Harkle Rd	11:01	SO	Unknown	3.53	16
11:45	11:45	12:15	0	Campos, Eloisa	Ambulatory	641 Harkle Rd	1801 Espinacitas	12:01	SO	Unknown	1.49	16
13:15	13:15	13:45	0	Zmeskal-Shanahan, Kate	Wheelchair	3221 W Rodeo Rd	1382 Vegas Verdes	13:45	SO	Unknown	2.16	30
6:50	6:55	7:20	0	Quintana, Georgia	Ambulatory	4181 Big Sky	605 Letrado St	7:25	SO	Unknown	5.47	30
Trips on Vehicle 2143v/Run 201101: 11												
Veh: 2142v - Run: 201102												

Figure 41: RouteMatch Daily Schedule of One Vehicle

We wanted to look at the usage of the paratransit program to see if it could be used to transport bus passengers to the bus stops from their homes. We first begun this by mapping out a daily route to see what it looked like. Below in Figure 42: RouteMatch Daily Route of One Vehicle, blue lines represent a trip and the red lines are when the driver is in between calls driving to the next trip origin. After plotting multiple schedules we realized that the routes generally matched the routes of the buses. Then we looked into the time off of the drivers. It varied every day, but it seemed as if the average off time was only a couple of hours. We reasoned that this time off is due to worker break time (such as lunch) and would not be feasible to use for bus passenger pickup and drop offs. As it stands Ride is 92% efficient and we believe this should be used as a model of a successful transportation system instead of altering it. It should not be adjusted because it is very successful at serving the demographic that it is intended for and that should not be compromised.
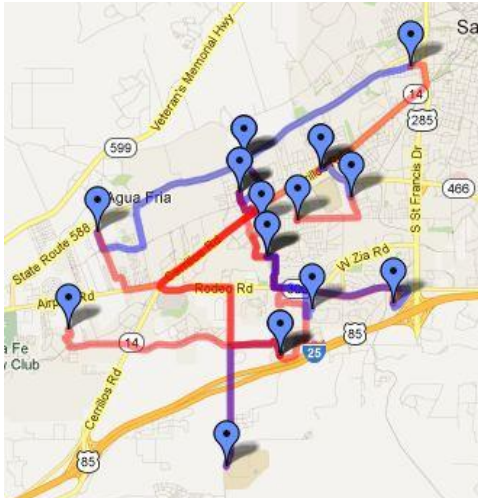
Figure 42: RouteMatch Daily Route of One Vehicle

4.4 Santa Fe Trails Smartphone Application

To improve communication with bus users and to entice car users to start using the bus system, we wanted something that would make the bus easier and more convenient to use. We have done this through the use of a mobile application. Passengers will be able to find the nearest bus and the time that it will arrive for every stop of Santa Fe trails. To do this we took multiple steps including producing a Google Transit feed, making the mobile application design and then the prototype.

4.4.1 <u>Google Feed</u>

A Google Transit Feed was made for Santa Fe Trails. The Transit Feed needs to be in a zip file that contains trips, stops, stop_times, routes, calendar, agency. First to start off the agency file, this included the Santa Fe Trails website, phone number, and time zone. The calendar file gives the dates of service for Santa Fe Trails. Next the routes had to be defined with a color code and area of service. With the routes file we could then create the trips file. The trips file contains the code of the trip with WD= weekday, SA=Saturday, and SU=Sunday. For example in **Error! eference source not found.**, the route 1 weekday outbound trip 1 is 1WDO1.

```
route_id,service_id,trip_id,trip_headsign,direction_id
1,WD,1WDO1,Agua Fria   Outbound,0
1,WD,1WDO2,Agua Fria   Outbound,0
1,WD,1WDO3,Agua Fria   Outbound,0
1,WD,1WDO4,Agua Fria   Outbound,0
1,WD,1WDO5,Agua Fria   Outbound,0
1,WD,1WDO6,Agua Fria   Outbound,0
1,WD,1WDO7,Agua Fria   Outbound,0
1,WD,1WDO8,Agua Fria   Outbound,0
1,WD,1WDO9,Agua Fria   Outbound,0
1,WD,1WDO10,Agua Fria   Outbound,0
1,WD,1WDO11,Agua Fria   Outbound,0
1,WD,1WDO12,Agua Fria   Outbound,0
1,WD,1WDO13,Agua Fria   Outbound,0
```

Figure 43: Google Transit Trips

This file includes all trips of the day and codes it correctly to be used later in the feed. Then the bus stop file was made by GPS locating all stops and placing them all into one CSV text file. This file also contained the address or intersection. In order to make the stop_times file we used an excel sheet that interpolated schedule times. It bases each stop time off the distance and average bus speed along with the posted time points. In order for this to be done correctly an interpolated schedule was needed.

Bus Stop #	94001	94131	94132	2002	2004	94135
Location	Sheridan Transit Center	Grant Ave. NS Catron St.	Catron St. NS Guadalupe St.	Sabino FS Guadalupe St.	Perimeter Rd NS Paseo de Peralta	Rio Vista FS El Camino de las Crucitas
Distance (miles)	0	0.2	0.5	1	1.3	1.6
Time (minutes)		1.4	3.5	7	1.588235294	3.176470588
Speed (mph)	8.571428571			11.33333333		
	Route 5: Crosstown - Weekday Outbound					
	Downtown Transit Center	Grant Ave. NS Catron St.	Catron St. NS Guadalupe St.	DeVargas Mall	Perimeter Rd NS Paseo de Peralta	Rio Vista FS El Camino de las Crucitas
	7:29 AM	7:30 AM	7:32 AM	7:36 AM	7:37 AM	7:39 AM
	8:27 AM	8:28 AM	8:30 AM	8:34 AM	8:35 AM	8:37 AM
	9:29 AM	9:30 AM	9:32 AM	9:36 AM	9:37 AM	9:39 AM
	10:44 AM	10:45 AM	10:47 AM	10:51 AM	10:52 AM	10:54 AM
	11:57 AM	11:58 AM	12:00 PM	12:04 PM	12:05 PM	12:07 PM
	12:57 PM	12:58 PM	1:00 PM	1:04 PM	1:05 PM	1:07 PM
	1:57 PM	1:58 PM	2:00 PM	2:04 PM	2:05 PM	2:07 PM
	2:57 PM	2:58 PM	3:00 PM	3:04 PM	3:05 PM	3:07 PM
	3:57 PM	3:58 PM	4:00 PM	4:04 PM	4:05 PM	4:07 PM
	4:57 PM	4:58 PM	5:00 PM	5:04 PM	5:05 PM	5:07 PM
	5:57 PM	5:58 PM	6:00 PM	6:04 PM	6:05 PM	6:07 PM
	6:57 PM	6:58 PM	7:00 PM	7:04 PM	7:05 PM	7:07 PM
	Route 5: Crosstown - Saturday Outbound					
	Downtown Transit Center	Grant Ave. NS Catron St.	Catron St. NS Guadalupe St.	DeVargas Mall	Perimeter Rd NS Paseo de Peralta	Rio Vista FS El Camino de las Crucitas
	10:00 AM	10:01 AM	10:03 AM	10:07 AM	10:08 AM	10:10 AM
	10:55 AM	10:56 AM	10:58 AM	11:02 AM	11:03 AM	11:05 AM
	11:55 AM	11:56 AM	11:58 AM	12:02 PM	12:03 PM	12:05 PM
	12:55 PM	12:56 PM	12:58 PM	1:02 PM	1:03 PM	1:05 PM
	1:55 PM	1:56 PM	1:58 PM	2:02 PM	2:03 PM	2:05 PM
	2:55 PM	2:56 PM	2:58 PM	3:02 PM	3:03 PM	3:05 PM
	3:55 PM	3:56 PM	3:58 PM	4:02 PM	4:03 PM	4:05 PM
	4:55 PM	4:56 PM	4:58 PM	5:02 PM	5:03 PM	5:05 PM

Figure 44: Interpolated Time Schedule

Every stop within each trip as well as arrival and departure time was needed to complete this file. Figure 45: Google Transit Stop_Times ended up being about 25,000 lines of text just for this one file.

```
trip_id,arrival_time,departure_time,stop_id,stop_sequence
1WDO1,6:50:00,6:50:00,94001,1
1WDO1,6:51:00,6:51:00,94002,2
1WDO1,6:51:00,6:51:00,94003,3
1WDO1,6:52:00,6:52:00,96001,4
1WDO1,6:53:00,6:53:00,94004,5
1WDO1,6:54:00,6:54:00,94005,6
1WDO1,6:55:00,6:55:00,94006,7
1WDO1,6:56:00,6:56:00,94007,8
1WDO1,6:57:00,6:57:00,94008,9
1WDO1,6:58:00,6:58:00,94009,10
1WDO1,6:59:00,6:59:00,94010,11
1WDO1,7:00:00,7:00:00,94011,12
1WDO1,7:00:00,7:00:00,94012,13
1WDO1,7:01:00,7:01:00,94013,14
```

Figure 45: Google Transit Stop_Times

4.4.2 **Application design**

The Santa Fe Trails bus App has four main features including, Instant User GPS Location, Bus Arrival Alarm Alert System, "Go Home" Option and In-App Payment options.
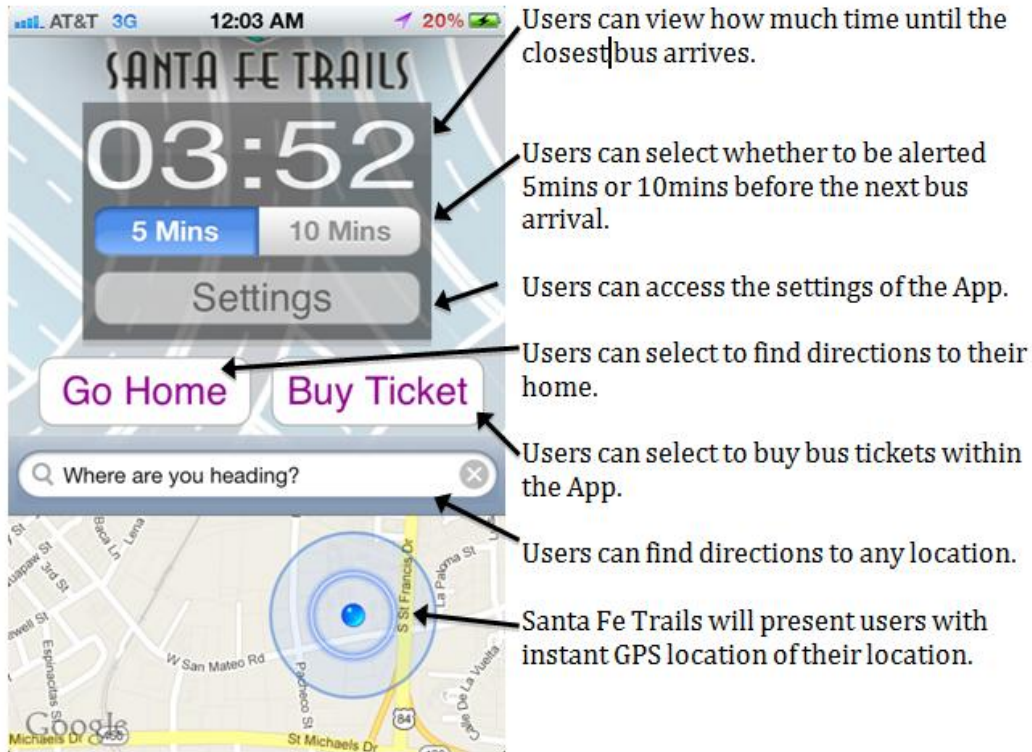
Figure 46: Santa Fe Trails Autobus App Home Screen
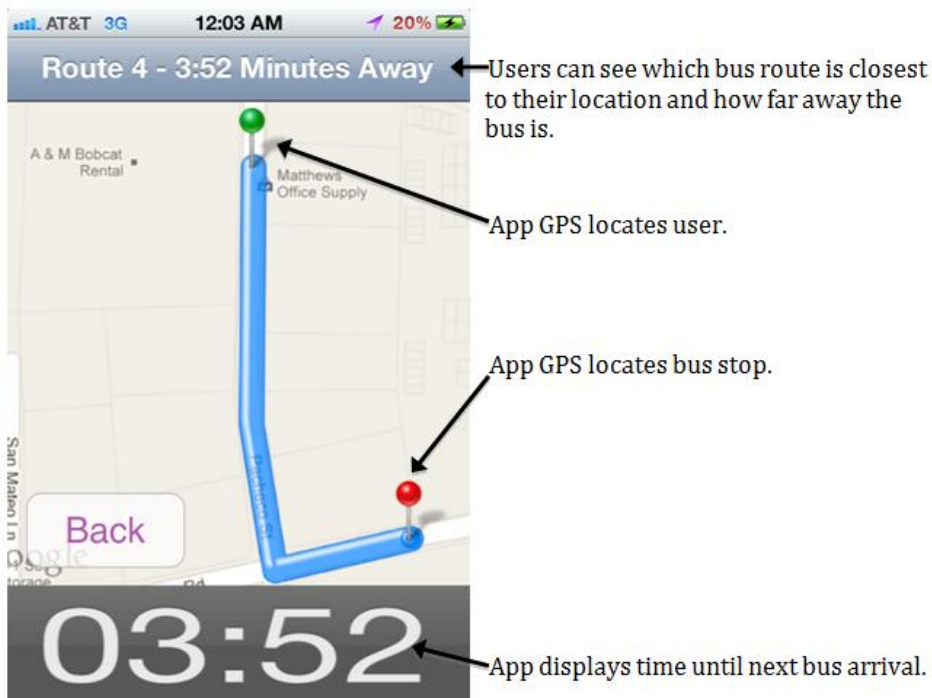
Figure 47: Santa Fe Trails Autobus App "Go Home" Screen

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Users can toggle on/off alarm vibrate.

Users can turn toggle on/off alarm sound.

Users can adjust alarm sound volume.

Users can login to accounts connected to PayPal or credit card accounts.
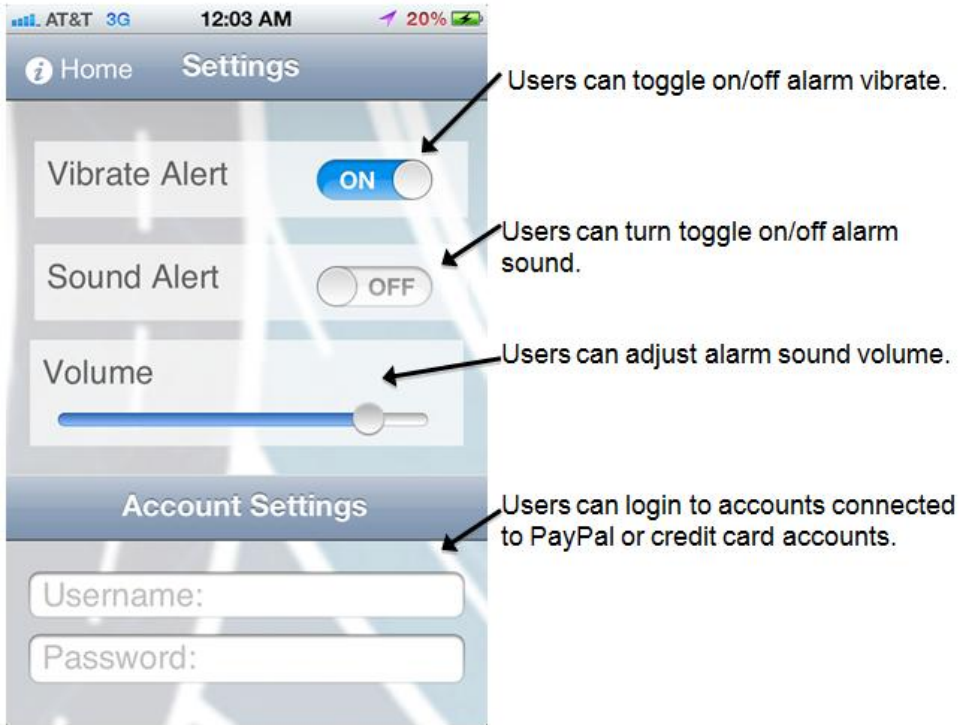
Figure 48: Santa Fe Trails Autobus "Settings" Screen

Users can purchase a monthly bus pass.

Users can decide how many tickets they want to buy, and what kind of tickets they want.

Users can add money to their account using PayPal or their credit card.

Users can add funds to their account through PayPal or credit card.
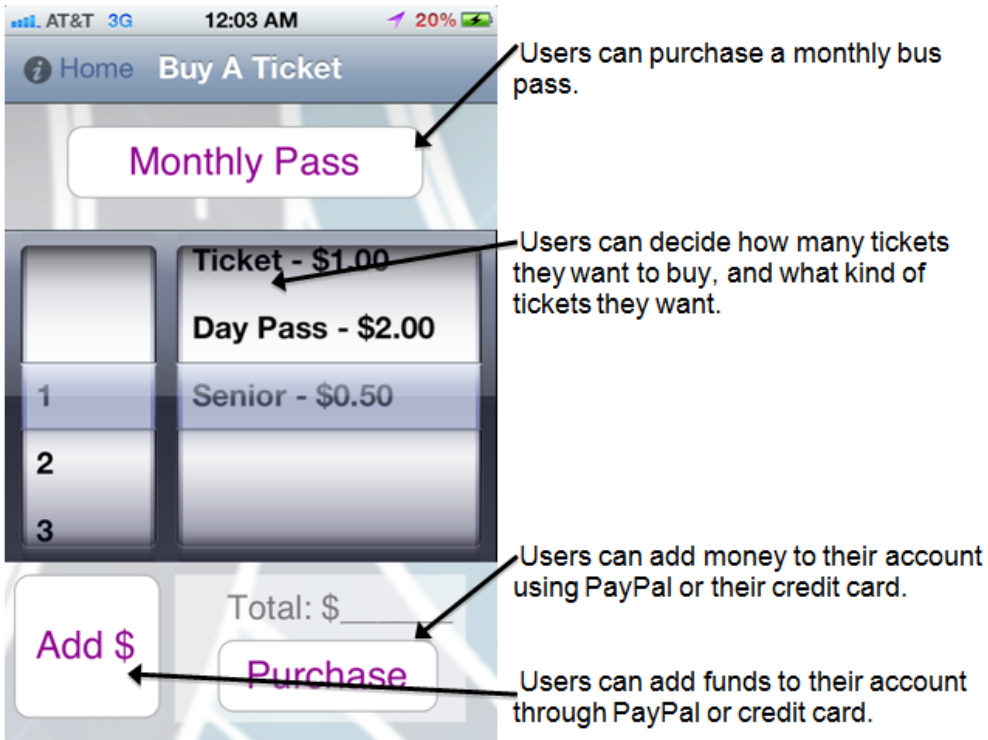
Figure 49: Santa Fe Trails Autobus "Purchase Ticket" Screen

Instructions for App ticket proof of purchase.

Image displayed for proof of purchase.
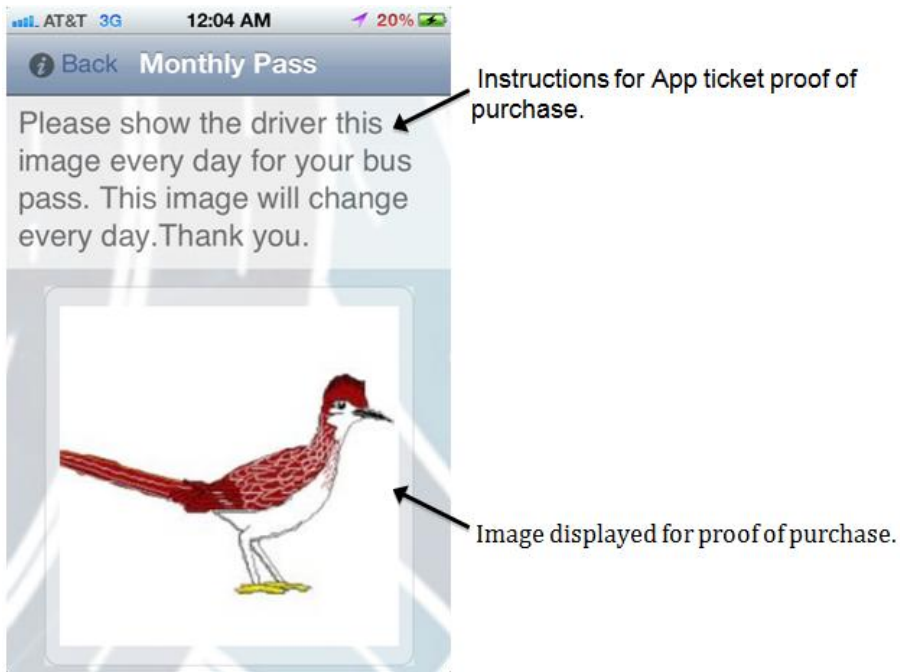
Figure 50: Santa Fe Autobus Proof of Purchase Screen

4.4.3 **Application Prototype**

Map of all routes.

Users can select a specific route to view.
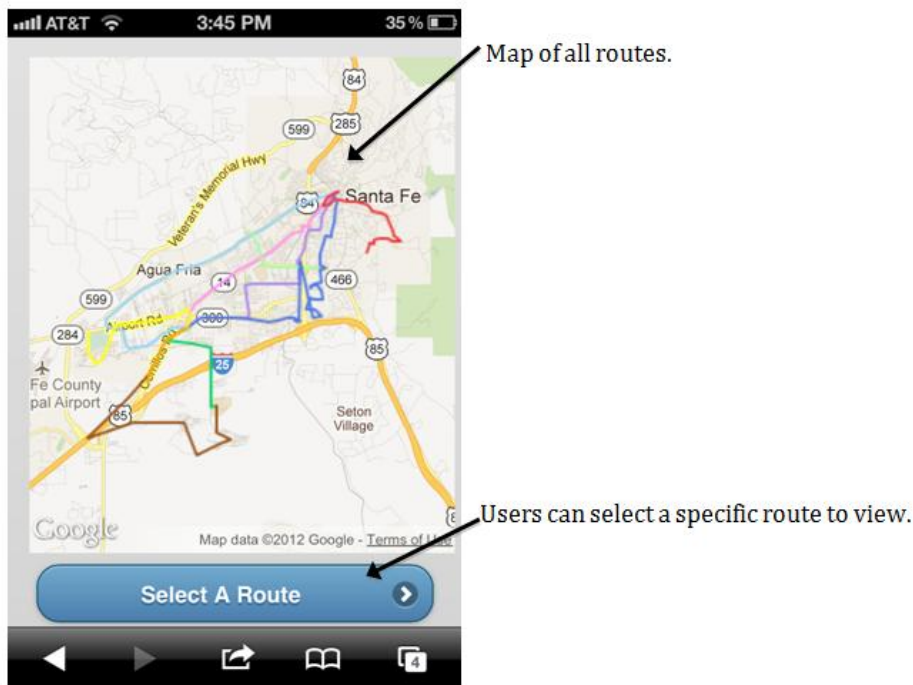
Figure 51: Home Screen of Santa Fe Autobus App

Users can select a specific bus route.
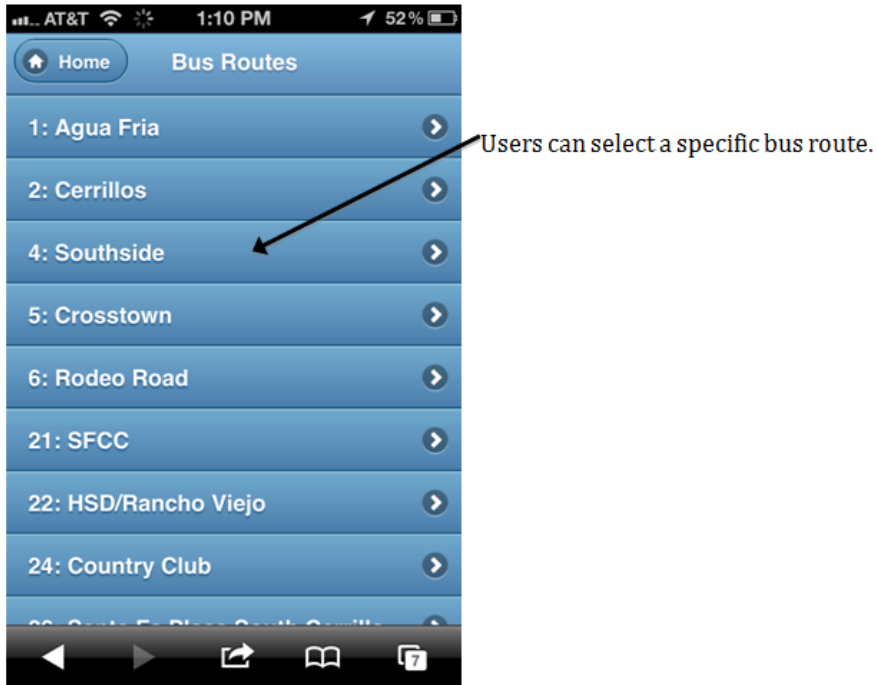
Figure 52: Route Selection Screen of Santa Fe Trails Autobus App

Route name.

Bus stops.

Route Path.
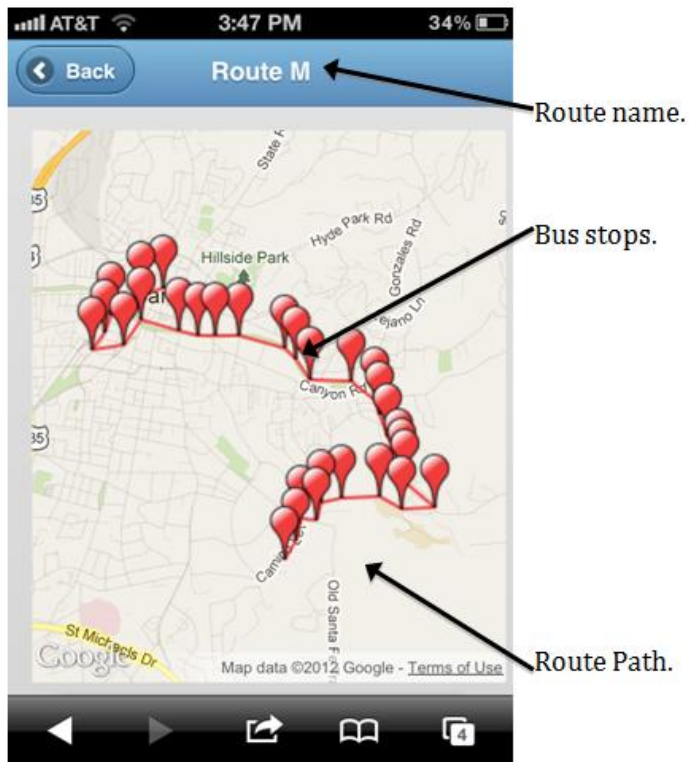
Figure 53: Route Map Screen of Santa Fe Trails Autobus App

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5 ANALYSIS AND RECOMMENDATIONS

After collecting all of our results concerning Santa Fe Trails Bus System we analyzed it and came up with multiple recommendations and improvements for Trails to potentially incorporate into their system. We looked into system integration, bus usage, feeders, and a mobile application. Our goal is to make the system more convenient and we did this through the survey and exploring what issues passengers found with the bus system.

5.1 Santa Fe Trails Infrastructure Integration

In order to make Santa Fe Trails a more convenient system for the passengers we recommend improved street signage as well as connection times and integrating camera counting.

5.1.1 **Improved Signage**

The Santa Fe Trails schedules only show multiple stop times so we recommend that there be markers added to signage to allow for improved readability. The mock-up of what we are suggested is seen below in Figure 54: Map Mock-Up and Figure 55: Schedule Mock-Up. This is mostly to aide passengers unfamiliar with the area to be able easily locate their position between time points. We believe this to be a simple fix and make the bus system more convenient and entice the tourists to use it.

Figure 54: Map Mock-Up

Figure 55: Schedule Mock-Up

5.1.2 **Improved Connection Times**

One improvement we have to increase passenger convenience is to update the schedules so there are less misconnections. From the survey we have discovered that passengers wish for better connection times. In order to analyze this we plotted the entire schedule at Sheridan Transit Center as well as at Santa Fe Place Mall. One connection issue for example is displayed below in Figure 56: Between 1pm and 2pm at Santa Fe Place Mall. Each block represents the time when a bus was idling at the Santa Fe Place Mall and the end of a block represents when a bus leaves. The beginning of a block represents when a bus arrives. As a misconnection example the Route 21 bus (dark green block) departs at 1:20pm and Route 22 bus (Brown Block) arrives at 1:22pm. This means that the Passenger on Route 22 bus arrive just 2 minutes late to make the

Route 21 bus and now must wait 68minutes for the next Route 21 bus to depart.
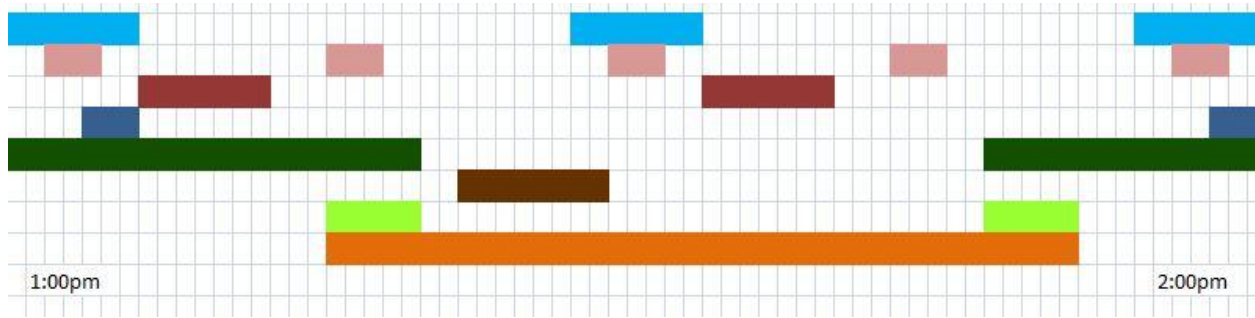
Figure 56: Between 1pm and 2pm at Santa Fe Place Mall

We have looked at every connection time and have come up with some recommendations. Each of the following schedules will say exactly what was changed with each.

Figure 57: Route 1 Schedule - Shifted 2 Minutes Later

ROUTE 4 - DOWNTOWN - ST. FRANCIS - SIRINGO - CAMINO CARLOS REY - SANTA FE PLACE

WEEKDAY OUTBOUND

Downtown Transit Center ❼	Saint Francis & Cordova ❻	South Capitol Station ❺	Saint Michaels & Pacheco ❹	Siringo & Carlos Rey ❸	Rodeo Plaza ❷	Santa Fe Place ❶
6:34a	6:43a		6:51a	7:59a	7:04a	7:11a
7:04a	7:13a		7:19a	7:27a	7:32a	7:39a
7:34a	7:43a		7:51a	7:59a	8:04a	8:11a
8:04a	8:13a		8:19a	8:27a	8:32a	8:39a
8:29a	8:38a		8:44a	8:52a	8:57a	9:04a
8:59a	9:08a		9:16a	9:24a	9:29a	9:36a
9:29a	9:38a		9:44a	9:52a	9:57a	10:04a
10:59a	10:08a		10:16a	10:24a	10:29a	10:36a
10:29a	10:38a		10:44a	10:52a	10:57a	11:04a
10:59a	11:08a		11:16a	11:24a	11:29a	11:36a
11:29a	11:38a		11:44a	11:52a	11:57a	12:04p
11:59a	12:08p		12:16p	12:24p	12:29p	12:36p

WEEKDAY INBOUND

Santa Fe Place ❶	Rodeo Plaza ❷	Siringo & Carlos Rey ❸	Saint Michaels & Pacheco ❹	South Capitol Station ❺	Saint Francis & Cordova ❻	Downtown Transit Center ❼
5:40a	5:46a	5:51a	5:59a		6:07a	6:17a
6:10a	6:16a	6:21a	6:29a		6:35a	6:45a
6:40a	6:46a	6:51a	6:59a		7:07a	7:17a
7:18a	7:24a	7:29a	7:37a		7:43a	7:53a
7:48a	7:54a	7:59a	8:07a		8:13a	8:23a
8:18a	8:24a	8:29a	8:37a		8:43a	8:53a
8:48a	8:54a	8:59a	9:07a		9:13a	9:23a
9:13a	9:19a	9:25a	9:32a		9:38a	9:48a
9:43a	9:49a	9:54a	10:02a		10:08a	10:18a
10:11a	10:17a	10:22a	10:30a		10:37a	10:47a
10:41a	10:47a	10:52a	11:00a		11:06a	11:16a
11:07a	11:13a	11:18a	11:26a		11:34a	11:44a
11:41a	11:47a	11:52a	12:00p		12:06p	12:16p
12:11p	12:18p	12:23p	12:30p		12:36p	12:46p
12:41p	12:48p	12:53p	1:00p		1:06p	1:16p

The entire schedule has been shifted 1 minute earlier

Figure 58: Route 4 Schedule - Shifted 1 Minute Earlier

ROUTE 6 - DOWNTOWN - GALISTEO - ST. VINCENT'S HOSPITAL - ST. FRANCIS DR. - RODEO RD. - CHAVEZ CENTER - SANTA FE PLACE

WEEKDAY OUTBOUND

Downtown Transit Center ❺	Saint Vincent Hospital ❹	Rodeo Park East ❸	Rodeo Plaza ❷	Santa Fe Place ❶
-	-	-	-	-
-	-	-	-	-
6:46a	7:02a	7:19a	7:26a	7:33a
7:46a	8:02a	8:19a	8:26a	8:33a
8:46a	9:02a	9:19a	9:26a	9:33a
10:16a	10:32a	10:49a	10:56a	11:03a
11:16a	11:32a	11:49a	11:56a	12:43p
12:16p	12:32p	12:49p	12:56p	1:03p
1:16p	1:32p	1:49p	1:56p	2:03p
2:16p	2:32p	2:49p	2:56p	3:03p
3:16p	3:32p	3:49p	3:56p	4:03p
4:16p	4:32p	4:49p	4:56p	5:03p
5:16p	5:32p	5:49p	5:56p	6:03p
6:16p	6:32p	6:49p	6:56p	7:03p
7:16p	7:32p	7:49p	7:56p	8:03p

WEEKDAY INBOUND

Santa Fe Place ❶	Rodeo Plaza ❷	Rodeo Park East ❸	Saint Vincent Hospital ❹	Downtown Transit Center ❺
5:42a	5:49a	5:56a	6:14a	6:29a
6:42a	6:49a	6:56a	7:14a	7:29a
7:36a	7:42a	7:49a	8:07a	8:22a
8:36a	8:42a	8:49a	9:07a	9:22a
9:36a	9:42a	9:49a	10:07a	10:22a
11:06a	11:13a	11:20a	11:38a	11:53a
12:06a	12:13a	12:20a	12:38a	12:53a
1:06a	1:13a	1:20a	1:38a	1:53a
2:06a	2:13a	2:20a	2:38a	2:53a
3:06a	3:13a	3:20a	3:38a	3:53a
4:06a	4:13a	4:20a	4:38a	4:53a
5:06a	5:13a	5:20a	5:38a	5:53a
6:06a	6:13a	6:20a	6:38a	6:53a
7:06a	7:13a	7:20a	7:38a	7:53a
-	-	-	-	-

The entire schedule has been shifted 1 minute later

Figure 59: Route 6 Schedule - Shifted 1 Minute Later

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ROUTE 21- SANTA FE PLACE - SANTA FE COMMUNITY COLLEGE

WEEKDAY INBOUND | **WEEKDAY OUTBOUND**

SFCC ❷	Santa Fe Place ❶		Santa Fe Place ❶	
-	-	We propose to alter the original 1:20pm departure to allow for a Route 22 connection.	7:30a	7:44a
7:45a	8:00a		8:40a	8:54a
8:55a	9:10a		9:50a	10:04a
10:05a	10:20a		11:00a	11:14a
11:15a	11:30a		12:10p	12:24p
12:25p	12:40p	This will prevent passengers from waiting **68 minutes**	**1:22p**	1:34p
1:35p	1:50p		2:30p	2:44p
2:45p	3:00p		3:40p	3:54p
3:55p	4:10p		4:50p	5:04p
5:05p	5:20p		6:00p	6:14p
6:15p	6:30p		7:10p	7:24p
7:24p	7:40p		8:20p	8:34p
8:35p	8:50p		9:35p	9:49p
9:49p	10:04p		-	-

Figure 60: Route 21 Schedule - 1 Time Point Adjustment

ROUTE 22- SANTA FE PLACE - HSD - IAIA - RANCHO VIEJO - SFCC

WEEKDAY INBOUND | **WEEKDAY OUTBOUND**

SFCC ❼	Rancho Viejo - Dalton Pass ❻	Institute of Amer. Indian Art Campus ❺	NM 599 Rail Runner Station ❹	Human Services Dept. (HSD) ❸	Super Wal-Mart on Cerrillos ❷	Santa Fe Place Mall ❶	Santa Fe Place Mall ❶	Super Wal-Mart on Cerrillos ❷	Human Services Dept. (HSD) ❸	NM 599 Rail Runner Station ❹	Institute of Amer. Indian Art Campus ❺	Rancho Viejo - Dalton Pass ❻	SFCC ❼
-	-	-	Refer to Rail Runner Insert	-	-	-	7:09a	7:14a	7:16a	Refer to Rail Runner Insert	7:34a	7:37a	7:41a
7:44a	7:48a	7:51a		8:01a	8:04a	8:09a	8:20a	8:25a	8:27a		8:53a	8:56a	9:00a
9:01a	9:05a	9:08a		9:18a	9:21a	9:25a	9:30a	9:35a	9:37a		9:47a	9:50a	9:54a
9:57a	10:01a	10:04a		10:14a	10:17a	10:22a	10:30a	10:35a	10:37a		10:47a	10:50a	10:54a
10:57a	11:01a	11:04a		11:14a	11:17a	11:22a	11:30a	11:35a	11:37a		11:47a	11:50a	11:54a
11:57a	12:01p	12:04p		12:14p	12:17p	12:22p	12:30p	12:35p	12:37p		12:47p	12:50p	12:54p
12:57p	1:01p	1:04p		1:14p	1:17p	1:22p	1:30p	1:35p	1:37p		1:47p	1:50p	1:54p
1:57p	2:01p	2:04p		2:14p	2:17p	2:22p	2:30p	2:35p	2:37p		2:47p	2:50p	2:54p
2:57p	3:01p	3:04p		3:14p	3:17p	3:22p	**3:35p**	3:37p	3:39p		3:49p	3:52p	3:56p
4:02p	4:06p	4:09p		4:29p	4:33p	4:38p	**4:45p**	4:49p	4:51p		5:01p	5:04p	5:08p
5:14p	5:18p	5:21p		5:48p	5:52p	5:57p	6:00p	6:05p	6:07p		6:17p	6:20p	6:24p

The original 3:32 and 4:44pm departures have been adjusted 3 minutes and 1 minute respectively later to allow for a Route 24 connection.

This would prevent a **69 and 75 minutes** wait

Figure 61: Route 22 Schedule - 2 Time Point Adjustments

Figure 62: Route 24 Schedule - 2 Time Point Adjustments

After making all of these adjustments we were able to remove a total of 356 minutes of waiting for connections. What we did to calculate this was once we updated the schedules and plotted the "new" schedule we compared them side by side. Every time a missed connection is now fixed we saw how many minutes the passenger would have had to wait for the next bus and summed these. Then we looked at all of the connections the new schedule would miss. We added up all the time that someone now would have to wait. Taking the difference between the two gave us 356 minutes. Updating these schedules with the couple of adjustments and shifting Routes 1, 4, and 6 we think the system will become more efficient for passengers.

5.1.3 **Camera Integration**

After exploring the capabilities of the on board cameras on all buses we determined that outsourcing the people counting software to company would not be feasible for our project. One of the main companies we were in contact with was Flonomics Inc. which had passenger counting as well as individual identification, both satisfied our needs. We received a quote of $50,000 for the first bus installation plus $10,000 per additional bus from Flonomics Inc. If we were to fully implement their software it would cost $380,000.

After further research we found OpenCV. OpenCV is open computer vision software that supplies pre-coded programs to overlay onto any video file. We determined that with more time coding and testing, we would be able to create a working computer vision of our own that would have the ability to count passengers as well as identify individuals.

We suggest that further time be put into perfecting the OpenCV needed for the Santa Fe Trails bus cameras. With more time and coding the cameras will be able to accurately collect daily counts of all buses, resulting in a live analysis of all bus routes and buses on a daily basis.

5.2 Santa Fe Trails Usage

Santa Fe Trails bus system has many underused sections and we believe to have found some possible improvements. These improvements include Bus reroutes, express service buses, as well as further analysis through a more in depth survey.

5.2.1 **Bus Reroutes**

The analysis of the underused routes and stops led our team to three reroutes and ideas of merging different public transportation systems in Santa Fe. The three routes we looked at most were 4, 6 and M. In Figure 63, Route 4 (Grey with Light Green outline) was looked into for a possible new hub in Santa Fe. Route 6 (Blue with Purple outline) was looked into because there was a large section of underused stops as well as a low overall route ridership. Route M (Green

with Red outline) is looked into because almost all stops as well as the route M are underused.

Figure 63: Final Bus Reroutes

5.2.1.1 Route 4 Hospital Hub

The analysis of the survey showed that more people wanted to get to the hospital. Many people asked for more routes or easier ways of transportation to the hospital. Having a central hub in the city is also another benefit to the bus system. It will allow people to make connections closer to where they live and not at either end. By looking at routes that travel close by the hospital, we found that Route 4 seemed to be the best choice. We then looked even closer into this and found that Route 4 could make a loop to the hospital with just a 1.8 mile detour as seen in Figure 64 . Route 4 also makes trips every 30 minutes throughout the day, which would improve the convenience of getting to the hospital. Although this could decrease the frequency of Route 4 we believe it will not change it enough to discourage previous riders to stop using it.

Figure 64: Route 4 Hub

5.2.1.2 Route 6 Reroute

Looking at the GIS maps of bus stop usage and route ridership, shows that Route 6 is a majorly underused route. Near the downtown section of Santa Fe, Route 6 travels down Galisteo Street, which is a one way residential street. This street has very low stop usage. Also by examining the GIS map we can see that Route 4, which runs parallel to Route 6 in this area has over 3 times as much stop usage. This made us think that there could be a possible parallel reroute that would overall benefit passengers. Our team found that Paseo de Peralta which loops north of downtown and Old Santa Fe Trails to Old Pecos Trail were very commercialized roads. Right now Santa Fe Trails places their routes based on traffic models to see where the people are going in the city. We placed the traffic model onto our GIS map and compared the section on underused stops to our new roads and found that there was a 10,000 car increase of traffic in the new roads. This is also backed up because the children's museum, CCA, and movie theatre is located on this road. The new route can be seen by the thicker line in Figure 65. The main problem with this new route is that Route 6 would now take a longer time to finish the route, which would decrease the frequency or increase the service hours of the employees. More data

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does need to be taken in order for Santa Fe Trails to make a decision but so far all the data seems promising.

Figure 65: Route 6 Reroute

5.2.1.3 Route M Reroute

Route M had the lowest overall ridership among Santa Fe Trails. We heard that the Santa Fe Pick-Up was talking with Santa Fe Trails to propose a possible merge in routes. The Santa Fe Pick-Up is a van feeder service that brings people around downtown mostly from the Rail Runner at the rail yard to the Federal Office Building. Route M and the Pick-Up do have overlapping sections and the Pick-Up is much more successful than Route M. We proposed the merge by having the Pick-Up keep its old route except it would go down Sheridan Street to make connections with the Santa Fe Trails bus system, as well as take over the Museum Hill run from Route M. The merge can be seen in Figure 66. This seems to be a good money savings for the city of Santa Fe, but should be looked into further.
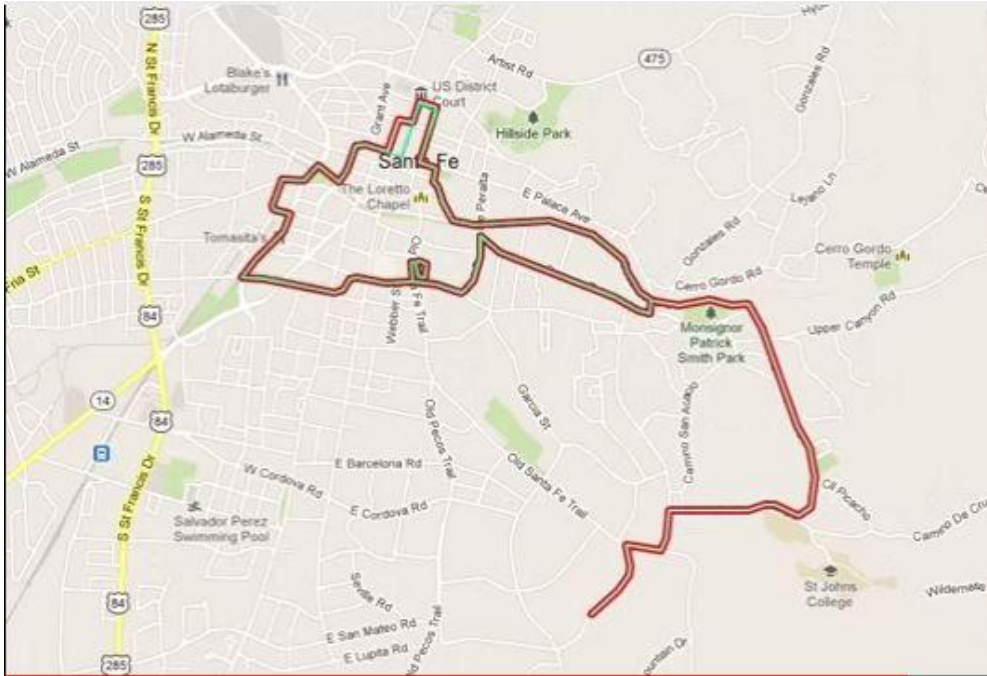
Figure 66: Pick-Up and M Merge

5.2.2 **Express Service**

After looking at all bus stops of Santa Fe Trails bus routes we sorted them by rank. We then normalized this data by comparing the stop rankings to the bus frequencies on the routes as well as the hours of operation. This resulted in locating the top ten stops used on the entire bus system.

Nine of the top ten stops were located on Route 2 on Cerrillos. After further analysis we found the top 3 stops, the most used being Santa Fe Place Mall followed by Sheridan transit center and lastly the University of Art and Design. Seeing that these three stops have the highest number of passenger use per day, we propose to have a Route 2 express bus once per hour that only stops at the three main stops on Route 2, skipping all other stops on the route. This will cut passenger travel time from about 30 minutes to 10 minutes.

5.2.3 **In-depth Survey**

Though many of our suggestions to the system are based at least in part by the results of various questions in the survey, the survey was shown to be biased due largely in part to the low number of surveyed individuals and the fact that we only surveyed riders of the bus system. We

feel it would be a good idea for Santa Fe Trails to continue surveying the bus system passengers at more times of days and in as many locations as possible. Specifically we would suggest doing more surveys in the Santa Fe Place Mall as this was observed by our group to be a location of large amounts of connections from one bus to another and any connection problems in the system could be more thoroughly observed.

Furthermore a way should be set up to survey people who currently do not ride the bus system to learn about why these people do not ride the bus. Once these reasons are learned the bus system can be more directly analyzed to find ways to fix these problems and make the system more appealing to non-riders. We suggest that these surveys take place at the train stations where many people were observed utilizing other methods of public transportation such as Santa Fe Pick-up. Other locations would be useful to look at as well such as the areas around the transit centers such as somewhere near the shopping centers downtown or in the Santa Fe Place Mall to learn why the shoppers who drove there did not take the bus.

5.3 South Capital Station Shuttle

Based on our survey we found that the South Capitol Shuttle has low ridership and isn't meeting the needs of the afternoon rush to the South Capital Station. We surveyed people waiting for the Rail Runner after work, the red dots in Figure 67: South Capitol Shuttle Reroute are the locations of their places of work. Almost all people said they walked or got dropped off. During a bad weather day this shuttle could increase ridership by adding the loop up top to pick up all the people who got surveyed. More research needs to be done in order for this to happen, but the people seemed happy when we told them we would propose a new loop to reach their places of work.

Figure 67: South Capitol Shuttle Reroute

5.4 Santa Fe trails Smartphone Application

The Santa Fe Trails Autobus App and the Google transit will make the bus system more convenient for the passengers. The Autobus App and Google transit will allow passengers to view bus routes, bus stops and bus times through live both online and on the mobile devices.

5.4.1 **Google Transit Feed**

The Google Transit Feed should be sent to Google in order for them to verify that it will work correctly and then can be implemented into the real Google maps and not GTFS exchange server. The file is complete and Jon Bulthuis will be receiving and sending the Google Transit Feed file to Google very soon. Google has said that it will take a year in order to be verified because there is a high demand for companies to get on Google Transit.

5.4.2 **Mobile Application**

The Santa Fe Trails autobus App is still in the prototyping phase. The working version of the App has basic functionality including user GPS locations, bus routes and bus times. We suggest that more time is spent adding addition features to the App. The additional features that we wish to complete are the In-App payment system, the bus alarm alert system as well as the

ability to see all buses on a live feed. Once the App is completed and all additions are fully functional, there should be advertisements onboard Santa Fe Trails buses for the App and it should be released to the public. Currently the app can be reached at www.santafeautobus.com.

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7 APPENDICIES

7.1 Appendix C: Ridership Data from May 2011

7.1.1 **Route 1:**

Route 2:

7.1.3 **Route 4:**

Inbound Direction of Travel -->

■ Early ■ AM Peak ■ Midday ■ PM Peak ■ Evening ■ Night ■ Owl

Outbound Direction of Travel -->

■ Early ■ AM Peak ■ Midday ■ PM Peak ■ Evening ■ Night ■ Owl

7.1.4 **Route 5:**

Inbound Direction of Travel -->

■ Early ■ AM Peak ■ Midday ■ PM Peak ■ Evening ■ Night ■ Owl
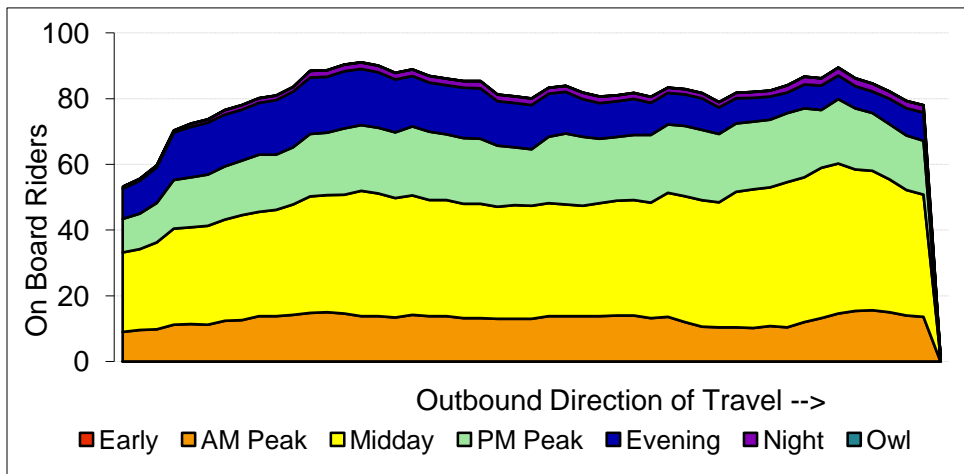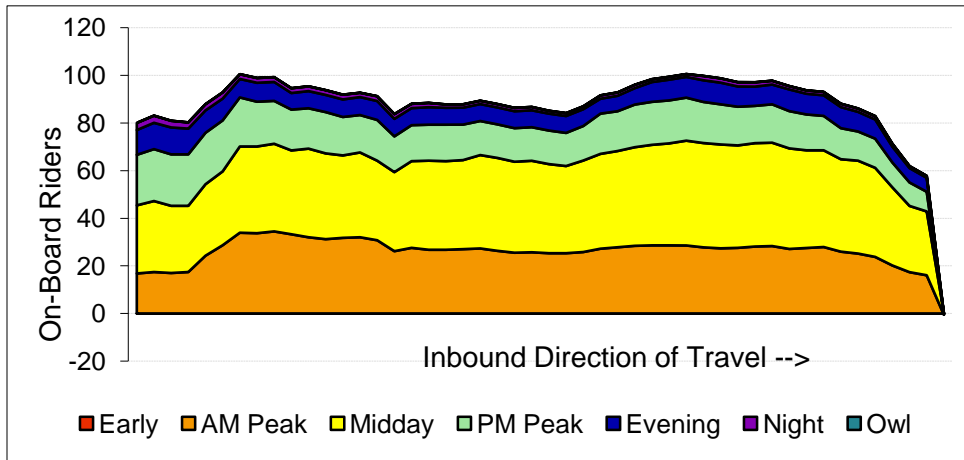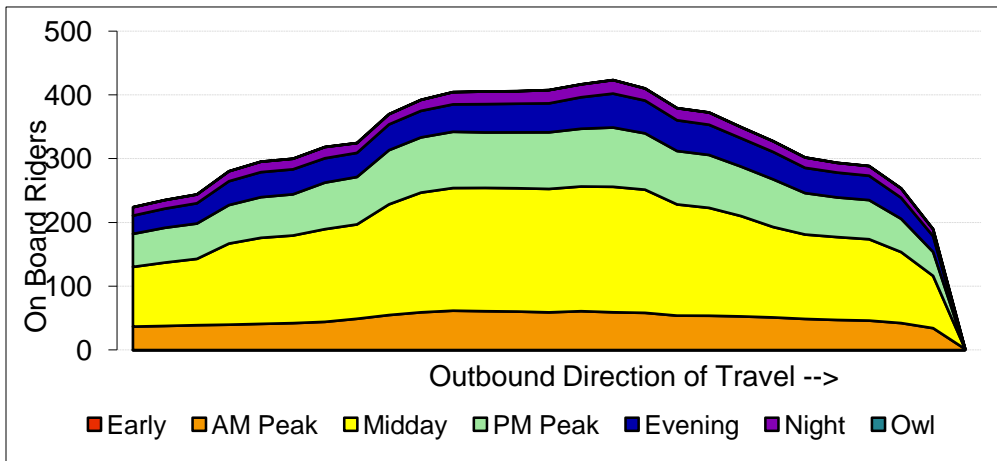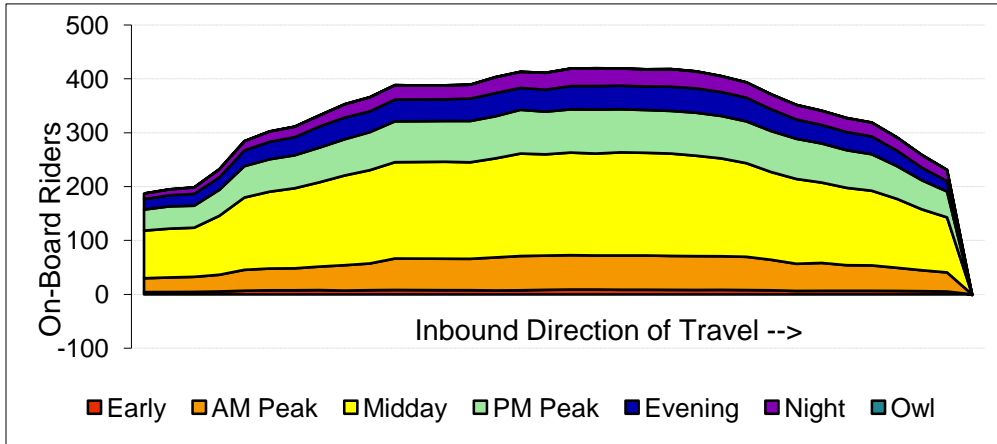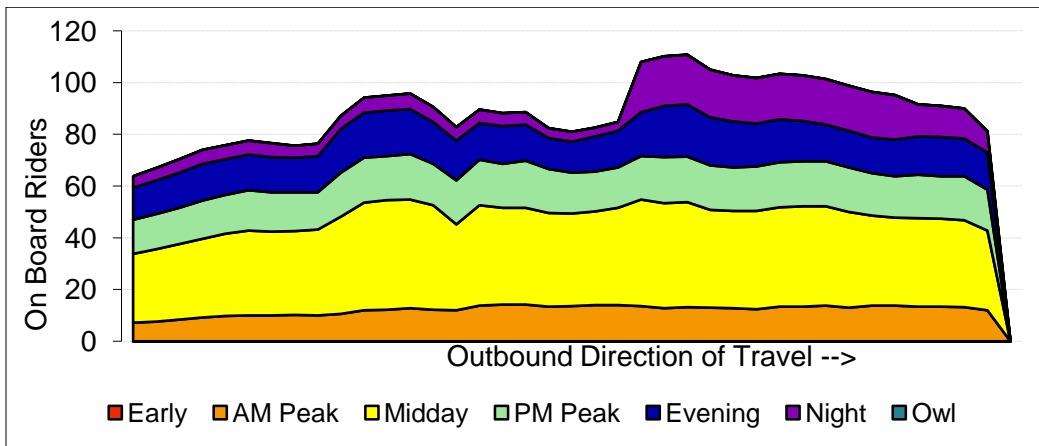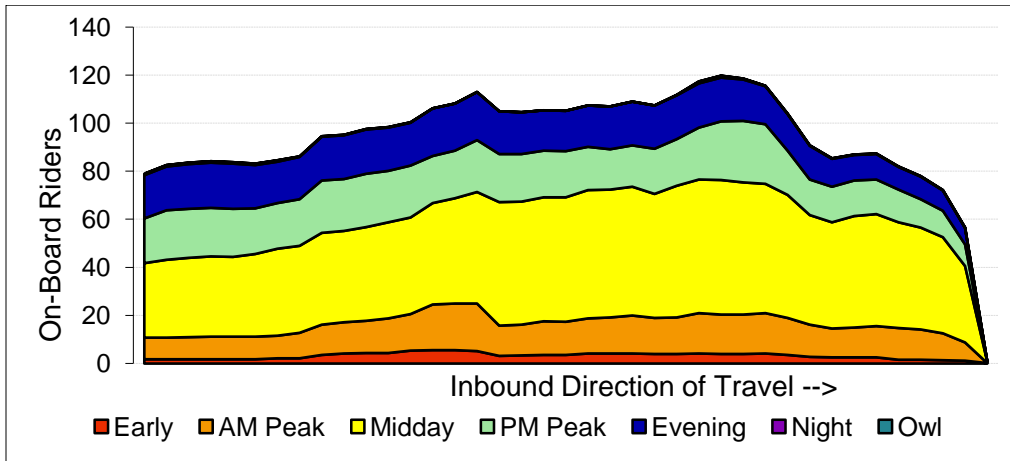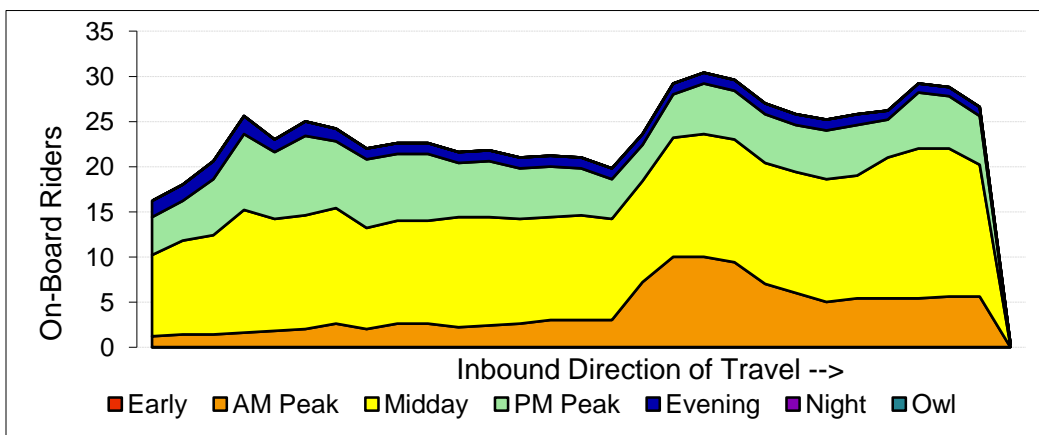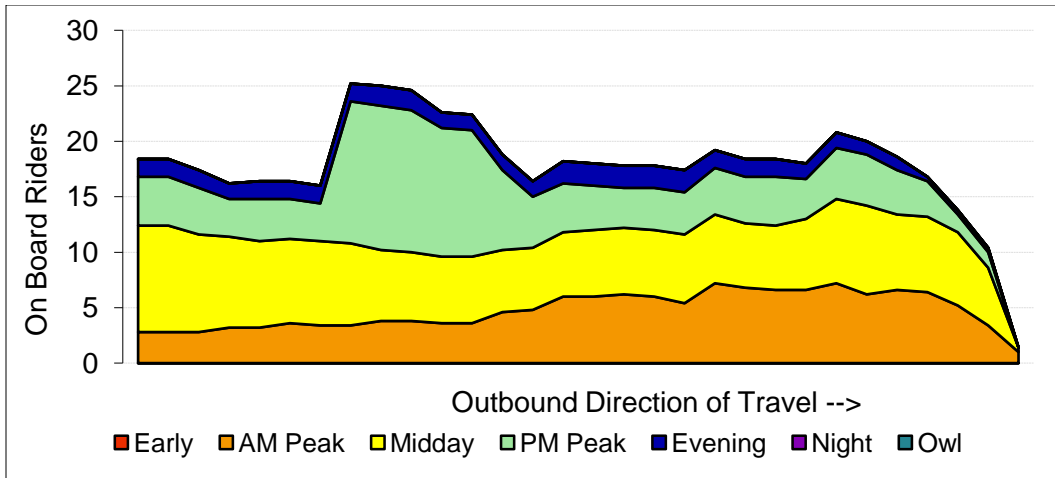
7.1.5 **Route 6:**

Route 21:

7.1.6 **Route 22:**

On Board Riders

Outbound Direction of Travel -->

Early AM Peak Midday PM Peak Evening Night Owl

7.1.7 **Route 24:**

On-Board Riders

Inbound Direction of Travel -->

Early AM Peak Midday PM Peak Evening Night Owl

On Board Riders

Outbound Direction of Travel -->

Early AM Peak Midday PM Peak Evening Night Owl
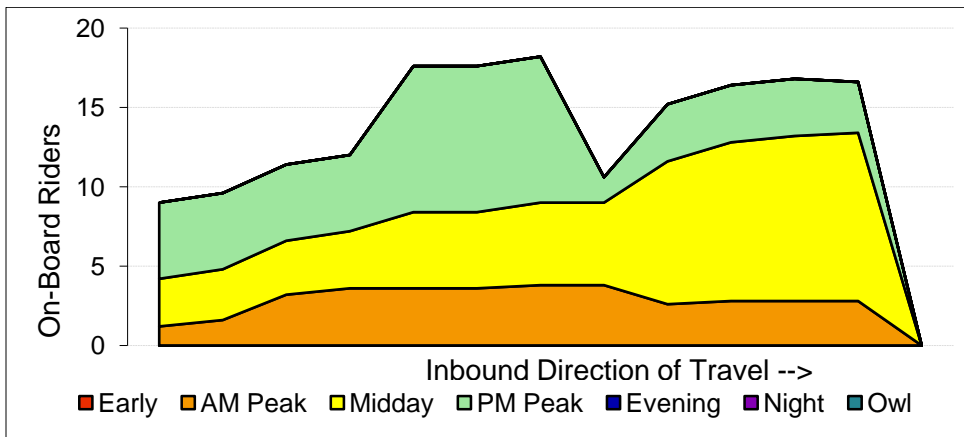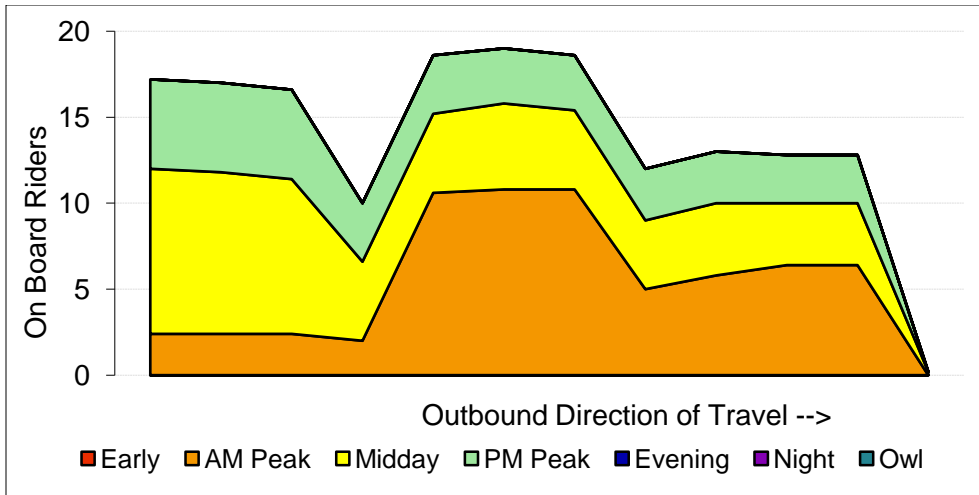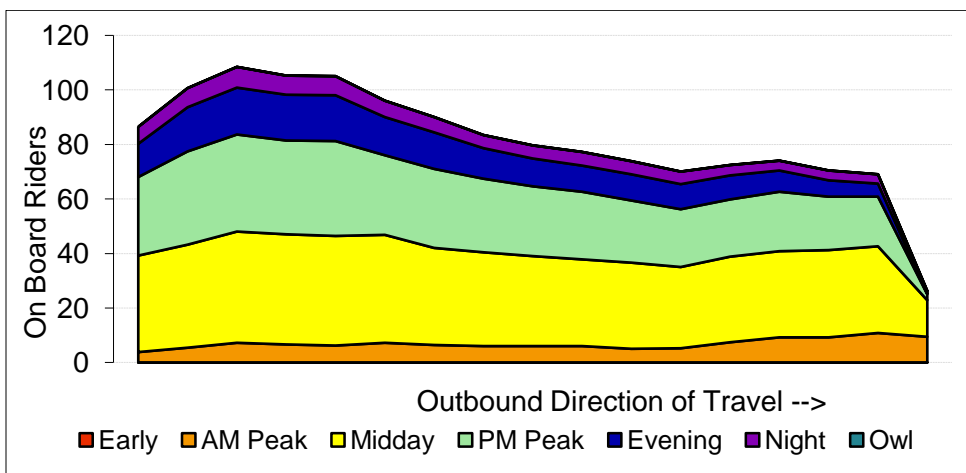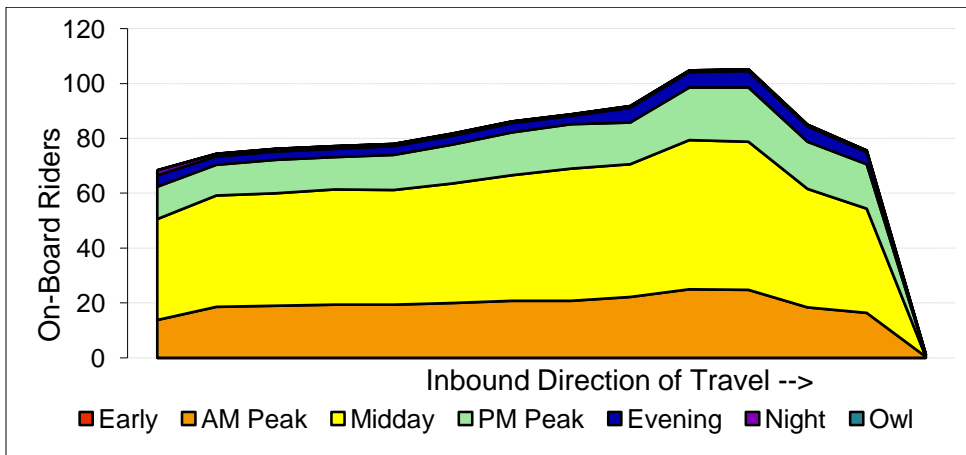
7.1.8   **Route M:**
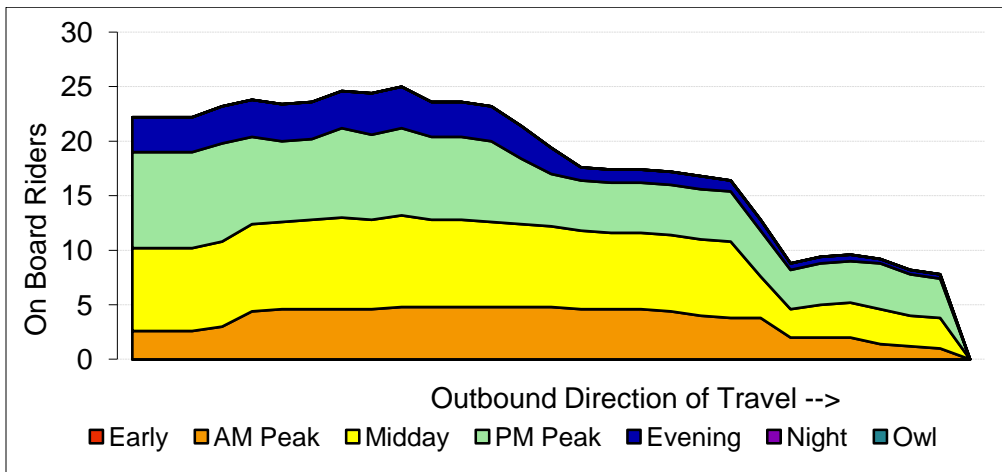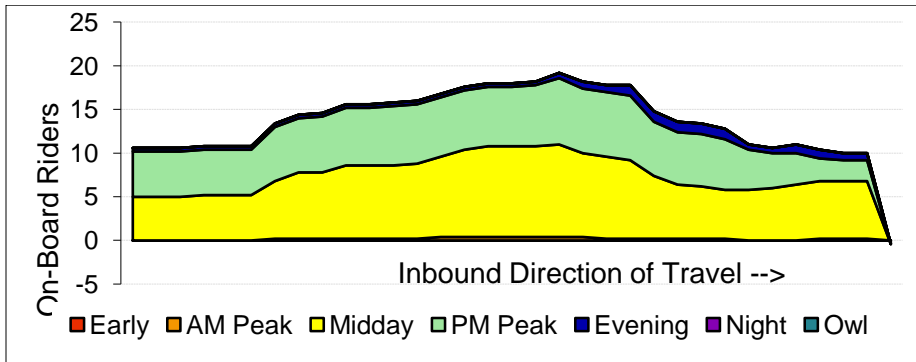
7.2 Appendix D: Fleet Roster

Santa Fe Trails   **Vehicle Roster**
1/13/2012

Fixed Route Vehicle Roster

Vehicle #	Make	Model	Year	Fuel	Seat Cap.	Lift/ Ramp	Mileage	Status	Service Life	In Service	Replace Date
801	Eldorado	Easy Rider II	2008	CNG	27	Ramp	124031	Active	12/500K	5/1/2008	5/1/2020
802	Eldorado	Easy Rider II	2008	CNG	27	Ramp	126536	Active	12/500K	5/1/2008	5/1/2020
803	Eldorado	Easy Rider II	2008	CNG	27	Ramp	105529	Active	12/500K	5/1/2008	5/1/2020
804	Eldorado	Easy Rider II	2008	CNG	27	Ramp	111244	Active	12/500K	5/1/2008	5/1/2020
805	Eldorado	Easy Rider II	2008	CNG	27	Ramp	125344	Active	12/500K	5/1/2008	5/1/2020
806	Eldorado	Easy Rider II	2008	CNG	27	Ramp	105436	Active	12/500K	5/1/2008	5/1/2020
807	Eldorado	Easy Rider II	2011	CNG	27	Ramp	19896	Active	12/500K	5/23/2011	5/23/2023
808	Eldorado	Easy Rider II	2011	CNG	27	Ramp	20144	Active	12/500K	5/23/2011	5/23/2023
809	Eldorado	Easy Rider II	2011	CNG	27	Ramp	21299	Active	12/500K	5/23/2011	5/23/2023
810	Eldorado	Easy Rider II	2011	CNG	27	Ramp	17164	Active	12/500K	5/23/2011	5/23/2023
811	Eldorado	Easy Rider II	2011	CNG	27	Ramp	10956	Active	12/500K	6/20/2011	6/20/2023
812	Eldorado	Easy Rider II	2011	CNG	27	Ramp	9835	Active	12/500K	6/15/2011	6/15/2023
901	Eldorado	Passport	2009	CNG	26	Ramp	51315	Active	10/350K	10/30/2009	10/30/2019
902	Eldorado	Passport	2009	CNG	26	Ramp	60475	Active	10/350K	10/30/2009	10/30/2019
903	Eldorado	Passport	2009	CNG	26	Ramp	67275	Active	10/350K	10/30/2009	10/30/2019
904	Eldorado	Passport	2009	CNG	26	Ramp	70980	Active	10/350K	10/30/2009	10/30/2019
1101	Gillig	G27E102N2	2011	CNG	25	Ramp	34805	inactive	12/500K	3/2/2012	3/2/2024

Vehicle #	Make	Model	Year	Fuel	Seat Cap.	Lift/ Ramp	Mileage	Status	Service Life	In Service	Replace Date
2106	Bluebird	CSRE3204	2001	CNG	28	Lift	405732	Active	10/350K	11/9/2000	11/9/2010
2107	Bluebird	CSRE3204	2001	CNG	28	Lift	448179	Active	10/350K	11/14/2000	11/14/2010
2108	Bluebird	CSRE3204	2001	CNG	28	Lift	403834	Active	10/350K	11/15/2000	11/15/2010
2109	Bluebird	CSRE3204	2001	CNG	28	Lift	404223	Active	10/350K	11/16/2000	11/16/2010
2110	Bluebird	CSRE3204	2001	CNG	28	Lift	441096	Active	10/350K	11/27/2000	11/27/2010
2112	Bluebird	CSRE3204	2001	CNG	28	Lift	427572	Active	10/350K	11/20/2000	11/20/2010
2113	Bluebird	CSRE3204	2002	CNG	28	Lift	380744	Active	10/350K	11/3/2001	11/3/2011
2114	Bluebird	CSRE3204	2002	CNG	28	Lift	357001	Active	10/350K	11/3/2001	11/3/2011
2115	Bluebird	CSRE3204	2002	CNG	28	Lift	337025	Active	10/350K	11/3/2001	11/3/2011
2116	Bluebird	CSRE3204	2002	CNG	28	Lift	367779	Active	10/350K	11/3/2001	11/3/2011
2117	Bluebird	CSRE3204	2002	CNG	28	Lift	380857	Active	10/350K	11/3/2001	11/3/2011
2118	Bluebird	CSRE3204	2002	CNG	28	Lift	360999	Active	10/350K	11/7/2001	11/7/2011
2119	Bluebird	CSRE3204	2002	CNG	28	Lift	363772	Active	10/350K	11/7/2001	11/7/2011
2120	Bluebird	CSRE3204	2002	CNG	28	Lift	237505	Inactive	10/350K	11/7/2001	11/7/2011

7.3 Appendix E: 50 Most Used Bust Stops

Rank	Stop Code	Total On and Off	Location	Artistic Shelter	Latitude	Longitude
1	96029	4413	Santa Fe Place Transit Center		35.63495	-106.013127
2	94001	4092	Sheridan Transit Center		35.68869	-105.939512
3	94118	1618	Cerrillos Rd. NS Lujan		35.66051	-105.980973
4	94085	1180	Sandoval St. NS Water St.		35.686936	-105.942181
5	94002	919	Sandoval St. NS W. San Francisco		35.688077	-105.941873
6	97057	905	Zafarano @ Target		35.640555	-106.011827
7	2064	790	Agua fria FS Santeros Pl	X	35.648895	-106.03692
8	96196	711	Cerrillos Rd. @ Walmart		35.651587	-105.99812
9	94127	633	St. Francis Dr. NS Cerrillos Rd		35.676639	-105.953475
10	94223	626	Guadalupe St. NS W. Alameda St.		35.686978	-105.94419
11	94222	598	Guadalupe St. FS Montezuma Ave.		35.685097	-105.945475
12	94107	591	Cerrillos Rd. @ Holiday Inn		35.640406	-106.015464
13	94045	584	Santa Fe Community College		35.604277	-105.99863
14	94003	572	Sandoval St. NS W. Alameda		35.686699	-105.942704
15	96066	570	Guadalupe St. FS Paseo de Peralta		35.681955	-105.948274
16	94126	562	Cordova Rd. @ Montoya Building		35.674252	-105.955039
17	94105	560	Cerrillos Rd. FS Vegas Verde		35.644061	-106.01012
18	94098	557	Cerrillos Rd. NS Lujan St.		35.660994	-105.980795
19	94103	556	Cerrillos Rd. FS Richards Ave		35.649229	-106.001948
20	96195	554	Cerrillos Rd. Budget Car Rental		35.66359	-105.974872
21	94101	541	Cerrillos Rd. NS Calle Del Cielo		35.653626	-105.994789
22	96067	515	Guadalupe St. NS Read St.		35.683082	-105.947051
23	94096	510	Cerrillos Rd. NS Osage Ave.		35.662902	-105.977013
24	3100	501	Cerrillos Rd. @ HSD		35.659423	-105.982618
25	2065	501	Cerrillos Rd NS Gilmore		35.679185	-105.950853
26	7007	500	Plaza del Sol West NS Airport Rd.		35.633175	-106.060691
27	94114	493	Cerrillos Rd. NS Calle de Cielo		35.653063	-105.995108
28	99100	490	Cerrillos Rd. FS El Rey		35.664674	-105.973043
29	96194	486	Cerrillos Rd. NS Camino Consuelo		35.651516	-105.997554
30	94121	478	Cerrillos Rd. NS 2nd St.		35.666724	-105.969805
31	94094	472	Cerrillos Rd. NS 2nd St.		35.667142	-105.969662
32	94095	471	Cerrillos Rd. FS San Jose Ave.		35.665311	-105.972286
33	97022	467	Cerrillos Rd. @ Walgreens		35.649678	-106.000448
34	94093	458	1420 Cerrillos Rd. (Indian School)		35.670207	-105.965368
35	94125	455	Cerrillos Rd. @ NMSHTD Building		35.674695	-105.958285
36	94124	450	Cerrillos Rd. NS Monterey Dr.		35.671958	-105.962465

37	94089	447	St. Francis Dr. @ Chevron Station		35.676688	-105.953883
38	3006	441	Cerrillos FS Alta Vista		35.672946	-105.960932
39	96193	438	Cerrillos Rd. FS Avenida de las Americas		35.648257	-106.002823
40	94090	434	St. Francis Dr. NS Cordova Rd.		35.674466	-105.953767
41	94164	434	Guadalupe St. FS Montezuma Ave.		35.684831	-105.945838
42	94163	431	Guadalupe St. FS Agua Fria Rd.		35.686328	-105.945081
43	96036	431	Guadalupe St. OPS Read St.		35.683192	-105.947153
44	96197	424	Cerrillos Rd. FS Ave. de las America's		35.648282	-106.003477
45	94123	414	Cerrillos Rd. @ Hostel		35.670057	-105.965166
46	94165	413	Guadalupe St. NS Paseo de Peralta		35.681905	-105.948474
47	94056	412	Airport Rd. NS Tierra Real		35.635453	-106.048197
48	94100	411	Cerrillos Rd. FS Siler Rd.		35.655742	-105.991223
49	96015	408	Airport Rd. FS Country Club Rd.		35.634721	-106.050998
50	94092	407	Cerrillos Rd. NS Baca St.		35.672536	-105.961994
51	94014	397	Agua Fria NS Osage Ave.		35.672078	-105.981197

7.4 Appendix F: Daily Ridership: Jan 2011-Dec 2011

ID	Date	Day	Route 1	Route 2	Route 4	Route 5	Route 6	Route 10	Route 22	Route 21	Route 24	Route 26
1	1-Jan-11	SA	0	0	0	0	0	0	0	0	0	0
2	2-Jan-11	SU	114	130	102	0	0	32	0	0	0	0
3	3-Jan-11	MO	440	3156	379	220	210	61	80	47	197	0
4	4-Jan-11	TU	350	1535	446	154	127	38	44	31	201	0
5	5-Jan-11	WE	300	1364	321	140	147	23	15	26	108	0
6	6-Jan-11	TH	411	966	375	150	144	20	43	24	209	0
7	7-Jan-11	FR	383	1851	387	133	99	35	74	53	149	0
8	8-Jan-11	SA	152	720	147	32	91	8	0	20	99	0
9	9-Jan-11	SU	139	481	91	0	0	53	0	0	0	0
10	10-Jan-11	MO	302	1371	328	162	143	23	59	74	141	0
11	11-Jan-11	TU	322	1041	372	146	136	29	59	42	49	0
12	12-Jan-11	WE	330	1577	308	135	128	18	46	56	194	0
13	13-Jan-11	TH	320	1687	346	128	119	30	59	39	272	0
14	14-Jan-11	FR	352	1289	153	176	140	38	74	21	137	0
15	15-Jan-11	SA	120	800	219	37	24	4	0	6	49	0
16	16-Jan-11	SU	186	775	103	19	63	0	0	3	29	0
17	17-Jan-11	MO	191	1215	235	78	107	31	0	12	55	0
18	18-Jan-11	TU	357	1854	430	158	178	35	81	91	276	0
19	19-Jan-11	WE	363	1132	458	118	142	19	108	64	234	0
20	20-Jan-11	TH	450	1568	339	203	170	43	61	26	164	0
21	21-Jan-11	FR	340	1472	448	138	150	40	69	45	179	0

22	22-Jan-11	SA	106	766	220	50	76	20	0	17	93	0
23	23-Jan-11	SU	74	656	52	0	0	11	0	0	0	0
24	24-Jan-11	MO	410	1397	352	155	158	30	82	170	170	0
25	25-Jan-11	TU	325	2146	561	115	152	28	100	158	241	0
26	26-Jan-11	WE	308	1603	399	92	135	16	86	220	226	0
27	27-Jan-11	TH	495	1282	420	176	193	49	95	179	233	0
28	28-Jan-11	FR	355	1655	406	164	183	40	75	128	199	0
29	29-Jan-11	SA	188	766	179	50	78	18	0	44	79	0
30	30-Jan-11	SU	139	710	146	12	47	27	0	0	0	0
31	31-Jan-11	MO	360	1304	246	106	80	10	0	103	160	0
32	1-Feb-11	TU	279	1527	421	165	160	24	181	146	179	0
33	2-Feb-11	WE	108	1072	142	86	103	42	31	63	128	0
34	3-Feb-11	TH	358	1209	380	112	139	37	51	41	57	0
35	4-Feb-11	FR	0	0	0	0	0	0	0	0	0	0
36	5-Feb-11	SA	108	841	92	82	58	12	0	18	90	0
37	6-Feb-11	SU	125	778	71	0	0	21	0	0	0	0
38	7-Feb-11	MO	395	1492	351	39	52	5	113	149	216	0
39	8-Feb-11	TU	340	1336	512	121	145	70	95	163	209	0
40	9-Feb-11	WE	366	1136	366	147	188	42	90	90	68	0
41	10-Feb-11	TH	291	1523	465	43	59	11	134	215	254	0
42	11-Feb-11	FR	354	1213	352	283	242	55	80	23	79	0
43	12-Feb-11	SA	158	644	164	63	75	80	0	51	174	0
44	13-Feb-11	SU	104	795	73	13	16	25	0	0	0	0
45	14-Feb-11	MO	406	1322	415	124	181	26	97	151	192	0
46	15-Feb-11	TU	457	2226	294	134	125	42	75	140	208	0
47	16-Feb-11	WE	343	1495	464	134	121	39	96	174	245	0
48	17-Feb-11	TH	447	1652	382	156	268	46	101	130	183	0
49	18-Feb-11	FR	351	1542	327	138	169	61	62	83	179	0
50	19-Feb-11	SA	120	1191	180	49	59	53	0	18	92	0
51	20-Feb-11	SU	43	367	46	0	0	0	0	0	0	0
52	21-Feb-11	MO	406	1664	381	115	101	62	24	92	277	0
53	22-Feb-11	TU	465	1904	341	153	155	54	119	91	162	0
54	23-Feb-11	WE	399	1485	374	113	117	30	80	188	251	0
55	24-Feb-11	TH	340	1558	406	164	213	43	182	114	204	0
56	25-Feb-11	FR	397	1899	338	170	153	44	76	70	187	0
57	26-Feb-11	SA	113	975	149	41	84	17	0	35	87	0
58	27-Feb-11	SU	92	505	104	0	0	18	0	0	0	0
59	28-Feb-11	MO	388	1596	421	133	173	33	98	163	216	0
60	1-Mar-11	TU	418	1565	444	85	120	17	92	99	132	0
61	2-Mar-11	WE	386	1711	435	124	187	41	120	223	286	0
62	3-Mar-11	TH	444	1983	329	298	254	69	105	90	160	0
63	4-Mar-11	FR	344	1453	506	82	96	29	59	94	273	0
64	5-Mar-11	SA	245	761	196	69	173	40	0	13	89	0
65	6-Mar-11	SU	99	541	112	0	0	27	0	0	0	0
66	7-Mar-11	MO	302	1586	296	125	98	59	126	152	192	0
67	8-Mar-11	TU	375	1095	365	0	0	0	95	154	189	0

68	9-Mar-11	WE	329	1921	387	161	111	53	134	161	200	0
69	10-Mar-11	TH	348	1493	399	213	155	68	114	141	172	0
70	11-Mar-11	FR	322	1948	330	76	72	20	57	58	188	0
71	12-Mar-11	SA	177	1043	151	67	68	26	0	30	107	0
72	13-Mar-11	SU	162	509	104	0	0	17	0	0	0	0
73	14-Mar-11	MO	436	1576	438	174	246	48	100	143	231	0
74	15-Mar-11	TU	276	1538	344	219	228	93	71	129	211	0
75	16-Mar-11	WE	427	2053	511	217	259	94	117	107	190	0
76	17-Mar-11	TH	252	1377	313	131	168	76	0	121	165	0
77	18-Mar-11	FR	691	1622	557	0	0	0	57	124	281	0
78	19-Mar-11	SA	180	1573	137	138	152	43	0	57	48	0
79	20-Mar-11	SU	50	316	69	51	34	8	0	0	0	0
80	21-Mar-11	MO	526	1771	483	235	300	86	56	32	254	0
81	22-Mar-11	TU	371	1448	353	158	175	57	85	33	168	0
82	23-Mar-11	WE	394	1615	374	125	164	25	79	60	190	0
83	24-Mar-11	TH	197	1590	324	187	219	37	63	15	329	0
84	25-Mar-11	FR	400	1630	546	160	160	40	85	23	125	0
85	26-Mar-11	SA	361	912	226	104	118	35	0	2	89	0
86	27-Mar-11	SU	99	609	124	0	0	32	0	0	0	0
87	28-Mar-11	MO	454	1641	420	121	193	64	115	152	167	0
88	29-Mar-11	TU	439	1496	276	60	123	34	124	127	226	0
89	30-Mar-11	WE	392	1696	409	206	296	69	157	200	341	0
90	31-Mar-11	TH	317	1656	617	187	243	37	145	117	207	0
91	1-Apr-11	FR	480	1503	501	203	196	63	87	198	162	0
92	2-Apr-11	SA	163	1336	256	106	108	29	0	20	86	0
93	3-Apr-11	SU	169	622	111	0	0	24	0	0	0	0
94	4-Apr-11	MO	381	1866	462	76	131	27	118	194	153	0
95	5-Apr-11	TU	601	1606	434	240	370	83	107	137	238	0
96	6-Apr-11	WE	393	1437	412	129	277	39	111	169	387	0
97	7-Apr-11	TH	350	1712	406	157	183	70	121	113	203	0
98	8-Apr-11	FR	430	1704	424	201	195	75	67	85	212	0
99	9-Apr-11	SA	153	861	101	44	117	24	0	17	93	0
100	10-Apr-11	SU	170	581	146	0	0	36	0	0	0	0
101	11-Apr-11	MO	463	1603	392	133	248	70	132	161	242	0
102	12-Apr-11	TU	282	1730	298	140	185	38	120	78	121	0
103	13-Apr-11	WE	593	1648	582	169	169	71	72	184	339	0
104	14-Apr-11	TH	0	0	0	0	0	0	0	0	0	0
105	15-Apr-11	FR	645	2744	922	307	403	118	177	168	407	0
106	16-Apr-11	SA	307	1096	189	119	210	36	0	21	98	0
107	17-Apr-11	SU	178	703	111	0	0	28	0	0	0	0
108	18-Apr-11	MO	440	2201	460	163	235	41	93	186	184	0
109	19-Apr-11	TU	457	1718	408	157	193	62	98	133	242	0
110	20-Apr-11	WE	472	1651	442	144	277	78	106	133	255	0
111	21-Apr-11	TH	512	1676	540	151	198	66	87	116	246	0
112	22-Apr-11	FR	380	1810	323	121	138	44	67	8	136	0
113	23-Apr-11	SA	108	783	120	62	50	43	0	15	78	0

114	24-Apr-11	SU	107	595	64	0	0	16	0	7	76	0
115	25-Apr-11	MO	504	1696	383	169	192	41	113	57	151	0
116	26-Apr-11	TU	411	1394	315	139	193	53	110	168	323	0
117	27-Apr-11	WE	391	1752	431	182	213	82	44	151	181	0
118	28-Apr-11	TH	490	1410	497	158	173	45	122	118	227	0
119	19-Apr-11	FR	505	1832	518	133	141	54	88	105	219	0
120	30-Apr-11	SA	234	876	153	82	109	27	0	9	78	0
121	1-May-11	SU	97	446	91	0	0	25	0	0	0	0
122	2-May-11	MO	466	1627	311	123	208	46	149	153	417	0
123	3-May-11	TU	39	1337	304	152	232	72	67	111	191	0
124	4-May-11	WE	347	1480	515	0	0	0	110	153	307	0
125	5-May-11	TH	732	1470	665	355	478	164	0	124	262	0
126	6-May-11	FR	655	2076	542	174	221	37	192	291	310	0
127	7-May-11	SA	136	989	154	43	53	31	0	2	106	0
128	8-May-11	SU	130	645	90	26	24	0	0	0	0	0
129	9-May-11	MO	274	1328	486	137	188	29	119	139	261	0
130	10-May-11	MO	433	1722	544	221	214	67	134	115	145	0
131	11-May-11	WE	717	1475	314	148	180	163	82	210	320	0
132	12-May-11	TH	428	1679	701	83	103	72	79	123	273	0
133	13-May-11	FR	506	1161	560	225	250	93	76	98	264	0
134	14-May-11	SA	231	1387	173	160	167	48	0	35	110	0
135	15-May-11	SU	158	492	101	0	0	35	0	0	0	0
136	16-May-11	MO	378	2045	451	171	311	53	83	82	167	0
137	17-May-11	TU	245	1632	376	188	219	82	82	131	351	0
138	18-May-11	WE	223	1469	482	168	260	56	67	87	281	0
139	19-May-11	TH	597	1447	477	164	166	47	128	91	259	0
140	20-May-11	FR	652	1371	414	140	127	49	51	99	262	0
141	21-May-11	SA	116	1037	139	83	88	40	0	19	94	0
142	22-May-11	SU	141	542	65	0	0	18	0	0	0	0
143	23-May-11	MO	613	1238	477	121	253	32	61	117	252	0
144	24-May-11	TU	251	1556	342	121	237	28	42	55	195	0
145	25-May-11	WE	475	1677	566	140	156	49	56	68	202	0
146	26-May-11	TH	307	1177	395	123	149	62	35	55	282	0
147	27-May-11	FR	247	2074	447	193	230	76	57	82	223	0
148	28-May-11	SA	371	1168	178	46	72	15	0	23	97	0
149	29-May-11	SU	182	465	238	30	13	60	0	0	0	0
150	30-May-11	MO	0	0	0	0	0	0	0	0	0	0
151	31-May-11	TU	331	1157	305	149	154	31	60	73	202	0
152	1-Jun-11	WE	346	1653	435	123	180	46	70	163	395	0
153	2-Jun-11	TH	314	1332	460	131	163	34	0	93	224	0
154	3-Jun-11	FR	447	1932	523	200	120	67	120	54	151	0
155	4-Jun-11	SA	195	867	158	114	128	21	0	30	27	0
156	5-Jun-11	SU	122	482	72	0	0	51	0	0	0	0
157	6-Jun-11	MO	388	1878	299	25	58	14	84	121	284	0
158	7-Jun-11	TU	304	1308	421	257	288	93	62	89	277	0
159	8-Jun-11	WE	293	1862	405	153	212	55	0	52	194	0

160	9-Jun-11	TH	281	1482	614	137	197	32	37	95	143	0
161	10-Jun-11	FR	176	1309	398	8	5	3	118	137	436	0
162	11-Jun-11	SA	342	1083	158	120	180	28	27	47	191	0
163	12-Jun-11	SU	147	604	145	44	131	56	0	0	0	0
164	13-Jun-11	MO	336	1700	463	158	190	49	58	86	251	0
165	14-Jun-11	TU	285	1276	460	155	252	79	0	111	295	0
166	15-Jun-11	WE	386	2368	387	167	197	52	85	165	262	0
167	16-Jun-11	TH	316	1485	306	92	180	21	120	86	219	0
168	17-Jun-11	FR	430	1576	382	213	161	48	71	50	233	0
169	18-Jun-11	SA	118	748	158	84	92	32	0	30	170	0
170	19-Jun-11	SU	159	731	132	0	0	39	0	0	0	0
171	20-Jun-11	MO	305	1437	180	131	214	41	58	119	231	0
172	21-Jun-11	TU	366	1011	602	136	241	57	48	107	466	0
173	22-Jun-11	WE	497	2488	429	127	189	68	37	102	223	0
174	23-Jun-11	TH	333	1193	470	79	102	11	78	110	274	0
175	24-Jun-11	FR	410	1525	476	116	178	37	66	46	170	0
176	25-Jun-11	SA	184	1131	197	160	202	48	0	1	28	0
177	26-Jun-11	SU	127	610	142	0	0	29	0	0	0	0
178	27-Jun-11	MO	459	1652	284	161	232	68	41	119	289	0
179	28-Jun-11	TU	378	1374	462	178	233	54	122	114	479	0
180	29-Jun-11	WE	446	1744	434	125	220	45	39	56	177	0
181	30-Jun-11	TH	391	1745	482	114	205	34	72	120	263	0
182	1-Jul-11	FR	339	1191	375	155	171	70	58	49	231	0
183	2-Jul-11	SA	238	1090	155	74	67	36	0	12	98	0
184	3-Jul-11	SU	156	650	101	0	0	43	0	0	0	0
185	4-Jul-11	MO	0	0	0	0	0	0	0	0	0	0
186	5-Jul-11	TU	381	1757	257	161	188	69	54	80	207	0
187	6-Jul-11	WE	395	2289	497	137	227	65	97	76	253	0
188	7-Jul-11	TH	369	1627	372	135	156	48	54	85	288	0
189	8-Jul-11	FR	326	3144	171	206	168	566	33	42	221	0
190	9-Jul-11	SA	209	12050	291	27	93	24	3	18	37	0
191	10-Jul-11	SU	168	11400	126	0	0	868	0	8	60	0
192	11-Jul-11	MO	299	1660	326	161	170	47	50	96	161	0
193	12-Jul-11	TU	404	1378	475	205	209	54	54	82	201	0
194	13-Jul-11	WE	306	2189	397	155	126	77	42	134	215	0
195	14-Jul-11	TH	387	1675	405	215	160	56	37	78	185	0
196	15-Jul-11	FR	305	1056	374	265	137	59	43	54	193	0
197	16-Jul-11	SA	263	1343	122	114	82	28	0	7	70	0
198	17-Jul-11	SU	108	509	152	0	0	33	0	0	0	0
199	18-Jul-11	MO	383	1682	303	191	147	42	57	91	209	0
200	19-Jul-11	TU	265	1887	408	181	185	75	13	123	217	0
201	20-Jul-11	WE	521	1562	372	178	220	380	59	71	207	0
202	21-Jul-11	TH	157	1146	500	157	165	46	48	82	170	0
203	22-Jul-11	FR	378	1817	231	180	151	51	24	63	277	0
204	23-Jul-11	SA	152	992	270	79	54	48	17	4	15	0
205	24-Jul-11	SU	161	586	79	0	0	36	0	2	16	0

206	25-Jul-11	MO	383	1150	352	145	182	41	89	78	190	0
207	16-Jul-11	TU	256	1587	447	186	194	70	85	91	212	0
208	27-Jul-11	WE	415	2028	354	158	147	38	66	87	169	0
209	28-Jul-11	TH	226	1220	405	165	153	71	79	63	185	0
210	29-Jul-11	FR	442	1912	279	204	159	62	60	78	220	0
211	30-Jul-11	SA	59	396	57	72	43	19	0	20	64	0
212	31-Jul-11	SU	278	705	163	0	0	42	0	31	57	0
213	1-Aug-11	MO	574	1632	606	191	259	55	69	69	256	0
214	2-Aug-11	TU	0	910	129	94	145	43	34	36	112	0
215	3-Aug-11	WE	554	2458	537	240	245	65	74	47	264	0
216	4-Aug-11	TH	0	0	0	0	0	0	0	0	0	0
217	5-Aug-11	FR	501	2712	29	0	0	0	93	59	390	0
218	6-Aug-11	SA	500	1405	881	192	154	85	0	78	292	0
219	7-Jul-11	SU	182	640	158	62	38	47	0	0	0	0
220	8-Aug-11	MO	494	1622	455	438	433	196	89	71	278	0
221	9-Aug-11	TU	406	1344	345	168	181	75	72	96	208	0
222	10-Aug-11	WE	340	1441	382	170	155	55	0	46	200	0
223	11-Aug-11	TH	90	2005	448	152	121	88	0	56	144	0
224	12-Aug-11	FR	450	1694	570	196	192	65	0	85	296	0
225	13-Aug-11	SA	119	852	121	48	64	33	153	6	29	0
226	14-Aug-11	SU	257	519	118	0	0	22	0	0	0	0
227	15-Aug-11	MO	577	1502	646	130	240	71	81	64	192	0
228	16-Aug-11	TU	657	1337	410	214	168	79	68	88	233	0
229	17-Aug-11	WE	199	690	181	0	0	0	0	95	94	0
230	18-Aug-11	TH	170	208	260	45	50	15	0	0	0	0
231	19-Aug-11	FR	363	89	6	33	16	10	211	0	0	0
232	20-Aug-11	SA	837	5112	1146	478	476	171	0	230	620	0
233	21-Aug-11	SU	60	1441	32	0	0	52	0	2	28	0
234	22-Aug-11	MO	555	2407	797	357	329	118	37	167	236	0
235	23-Aug-11	TU	460	1535	436	193	124	73	123	181	241	0
236	24-Aug-11	WE	534	1459	346	193	155	44	132	70	93	0
237	25-Aug-11	TH	543	1765	468	201	228	52	155	308	365	0
238	26-Aug-11	FR	322	1473	26	105	105	34	95	39	83	0
239	27-Aug-11	SA	197	1155	529	148	128	55	0	8	127	0
240	28-Aug-11	SU	264	586	145	0	0	40	111	0	0	0
241	29-Aug-11	MO	551	1725	636	139	75	17	119	203	179	0
242	30-Aug-11	TU	406	1733	501	286	215	101	0	238	264	0
243	31-Aug-11	WE	210	1117	455	38	34	21	252	90	98	0
244	1-Sep-11	TH	422	2024	382	118	77	27	46	151	195	0
245	2-Sep-11	FR	534	1188	582	489	515	105	0	132	233	0
246	3-Sep-11	SA	176	1436	79	58	79	39	149	4	29	0
247	4-Sep-11	SU	148	494	106	0	0	35	0	0	0	0
248	5-Sep-11	MO	0	0	0	0	0	0	0	0	0	0
249	6-Sep-11	TU	569	2132	445	219	188	46	165	198	283	0
250	7-Sep-11	WE	845	1333	525	236	222	90	132	176	215	0
251	8-Sep-11	TH	612	2352	603	125	122	69	0	325	310	0

252	9-Sep-11	FR	244	1111	494	250	209	53	198	132	163	0
253	10-Sep-11	SA	198	1075	169	66	51	49	22	4	133	0
254	11-Sep-11	SU	207	628	127	0	0	30	0	0	0	0
255	12-Sep-11	MO	712	1981	321	287	180	45	120	136	167	0
256	13-Sep-11	TU	531	1197	679	195	203	65	115	350	305	0
257	14-Sep-11	WE	174	1974	385	202	219	54	83	170	267	0
258	15-Sep-11	TH	231	1443	424	203	180	56	116	114	127	0
259	16-Sep-11	FR	701	1961	724	171	142	64	53	199	302	0
260	17-Sep-11	SA	165	859	110	54	57	36	0	4	83	0
261	18-Sep-11	SU	160	571	86	0	0	54	0	0	0	0
262	19-Sep-11	MO	557	1710	422	204	167	68	167	122	209	0
263	20-Sep-11	TU	576	1560	596	208	233	62	63	243	248	0
264	21-Sep-11	WE	560	1409	493	238	176	46	95	160	250	0
265	22-Sep-11	TH	457	1915	482	196	182	45	0	170	266	0
266	23-Sep-11	FR	732	1414	350	155	141	46	0	80	405	0
267	24-Sep-11	SA	207	1583	332	68	94	57	58	4	95	0
268	25-Sep-11	SU	117	631	113	0	0	38	0	0	0	0
269	26-Sep-11	MO	444	1273	294	198	192	46	81	87	125	0
270	27-Sep-11	TU	610	1791	660	205	179	109	42	223	319	0
271	28-Sep-11	WE	470	1653	324	204	220	112	111	185	206	0
272	29-Sep-11	TH	486	959	629	126	98	42	138	161	220	0
273	30-Sep-11	FR	479	2144	485	265	244	65	112	88	226	0
274	1-Oct-11	SA	229	1013	192	74	78	44	284	14	82	0
275	2-Oct-11	SU	132	506	182	0	0	51	0	0	0	0
276	3-Oct-11	MO	375	1992	449	207	186	71	98	162	218	0
277	4-Oct-11	TU	205	726	96	0	14	2	0	99	107	0
278	5-Oct-11	WE	588	2226	523	300	312	173	190	203	337	0
279	6-Oct-11	TH	515	1323	297	217	233	65	100	109	211	0
280	7-Oct-11	FR	0	151	0	0	0	0	0	0	0	0
281	8-Oct-11	SA	281	1497	277	169	203	73	0	68	209	0
282	9-Oct-11	SU	222	843	290	85	45	76	0	0	10	0
283	10-Oct-11	MO	225	1502	382	132	155	37	45	68	98	0
284	11-Oct-11	TU	734	2014	806	179	186	89	95	208	344	0
285	12-Oct-11	WE	482	1657	427	164	217	143	128	141	217	0
286	13-Oct-11	TH	573	1722	466	184	123	59	177	171	207	0
287	14-Oct-11	FR	473	1189	628	227	236	68	91	68	244	0
288	15-Oct-11	SA	216	1274	127	84	109	46	0	8	96	0
289	16-Oct-11	SU	177	616	162	0	0	29	0	0	0	0
290	17-Oct-11	MO	437	2015	565	144	189	49	105	145	260	0
291	18-Oct-11	TU	477	1691	556	152	230	67	155	169	202	0
292	19-Oct-11	WE	471	979	580	210	251	67	108	187	202	0
293	20-Oct-11	TH	482	2087	293	160	203	62	107	172	247	0
294	21-Oct-11	FR	451	1019	416	129	141	57	0	113	224	0
295	22-Oct-11	SA	224	819	151	127	134	64	0	3	132	0
296	23-Oct-11	SU	133	977	136	10	6	45	0	0	0	0
297	24-Oct-11	MO	411	1544	327	151	192	25	96	157	238	0

298	25-Oct-11	TU	980	1746	389	70	101	25	239	98	149	0
299	26-Oct-11	WE	358	1112	242	235	272	91	110	145	196	0
300	27-Oct-11	TH	345	1024	372	106	163	37	106	139	171	0
301	28-Oct-11	FR	588	1897	781	148	153	59	0	115	187	0
302	29-Oct-11	SA	267	1669	165	85	93	35	0	31	79	1
303	30-Oct-11	SU	99	648	293	0	0	62	0	0	46	12
304	31-Oct-11	MO	331	1432	455	144	145	45	180	96	215	30
305	1-Nov-11	TU	840	1316	467	104	170	30	26	179	256	0
306	2-Nov-11	WE	470	1533	443	264	251	69	95	113	173	52
307	3-Nov-11	TH	335	1518	434	189	179	37	133	112	215	37
308	4-Nov-11	FR	143	1695	510	157	183	37	18	69	324	63
309	5-Nov-11	SU	340	883	163	61	46	60	0	0	85	13
310	6-Nov-11	SU	138	474	184	0	0	43	0	0	39	16
311	7-Nov-11	MO	388	1369	461	198	181	36	122	104	205	69
312	8-Nov-11	TU	434	1703	397	123	123	71	105	154	183	35
313	9-Nov-11	WE	631	1253	458	244	189	63	134	110	204	35
314	10-Nov-11	TH	461	1255	576	209	154	46	101	136	221	23
315	11-Nov-11	FR	201	1173	224	142	68	30	98	0	0	16
316	12-Nov-11	SA	88	1207	136	109	100	42	0	0	97	27
317	13-Nov-11	SU	216	398	157	0	0	30	0	0	26	3
318	14-Nov-11	MO	445	1462	457	203	182	59	151	119	199	10
319	15-Nov-11	TU	374	1152	380	182	172	47	109	217	605	38
320	16-Nov-11	WE	541	2000	534	174	153	27	111	160	199	32
321	17-Nov-11	TH	453	2025	342	115	120	31	135	109	238	37
322	18-Nov-11	FR	114	973	565	44	50	5	75	66	156	156
323	19-Nov-11	SA	538	1334	170	232	264	73	0	0	125	25
324	20-Nov-11	SU	130	535	146	0	32	0	0	0	58	12
325	21-Nov-11	MO	435	1574	379	179	107	21	0	105	242	73
326	22-Nov-11	TU	452	2051	364	190	230	67	67	125	229	57
327	23-Nov-11	WE	227	1432	487	136	156	43	169	76	137	0
328	24-Nov-11	TH	0	0	0	0	0	0	0	0	0	0
329	25-Nov-11	FR	84	831	115	41	45	9	0	0	93	15
330	26-Nov-11	SA	278	808	197	78	75	32	0	0	88	12
331	27-Nov-11	SU	81	617	55	0	0	16	0	0	43	18
332	28-Nov-11	MO	416	1486	443	195	176	29	109	126	283	84
333	29-Nov-11	TU	435	1927	417	157	186	0	97	51	241	50
334	30-Nov-11	WE	349	1650	534	225	155	35	36	116	220	20
335	1-Dec-11	TH	368	1600	408	196	174	43	99	103	227	11
336	2-Dec-11	FR	269	1599	283	0	0	0	78	34	149	0
337	3-Dec-11	SA	139	912	265	141	140	34	0	0	120	27
338	4-Dec-11	SU	222	454	124	0	0	22	0	0	56	5
339	5-Dec-11	MO	293	1299	349	125	77	28	87	65	245	23
340	6-Dec-11	TU	230	1516	322	140	214	41	78	67	215	4
341	7-Dec-11	WE	132	1397	263	175	113	25	109	60	170	26
342	8-Dec-11	TH	570	1243	403	216	191	65	57	97	218	26
343	9-Dec-11	FR	493	1605	288	0	0	0	76	52	183	0

344	10-Dec-11	SA	158	926	248	112	103	39	0	0	125	16
345	11-Dec-11	SU	212	576	191	48	61	40	0	43	163	15
346	12-Dec-11	MO	427	1638	383	248	375	59	125	14	205	52
347	13-Dec-11	TU	193	1336	409	119	119	36	72	12	125	24
348	14-Dec-11	WE	275	1166	337	96	102	32	43	15	171	3
349	15-Dec-11	TH	390	1177	431	120	109	36	67	90	418	0
350	16-Dec-11	FR	159	1114	317	213	186	50	66	20	342	48
351	17-Dec-11	SA	380	1204	157	111	122	24	0	0	132	7
352	18-Nov-11	SU	120	629	137	0	0	19	0	0	51	9
353	19-Dec-11	MO	225	1522	481	102	65	11	28	17	111	21
354	20-Dec-11	TU	88	1423	399	125	143	28	39	17	104	0
355	21-Dec-11	WE	471	1462	306	82	92	32	36	23	202	20
356	22-Dec-11	TH	0	0	0	0	0	0	0	0	0	0
357	23-Dec-11	FR	0	0	0	0	0	0	0	0	0	0
358	24-Dec-11	SA	300	3069	297	212	189	56	44	0	281	88
359	25-Dec-11	SU	0	0	0	0	0	0	0	0	0	0
360	26-Dec-11	MO	118	788	143	81	119	68	22	0	120	11
361	27-Dec-11	TU	363	1341	525	91	75	21	0	23	387	41
362	28-Dec-11	WE	438	2084	284	309	236	63	52	16	283	55
363	29-Dec-11	TH	352	1766	662	84	166	40	43	7	255	16
364	30-Dec-11	FR	109	1489	244	121	121	52	0	10	169	22
365	31-Dec-11	SA	364	953	262	80	60	23	36	0	67	9

7.5 Appendix G: Database of Santa Fe Ride

Date	Vehicle N	Run Num	Early Win	PU Time	Late Win	Custome	PU Addre	DO Addre	DO Time	Est. Dista	TravelTim
6/27/2011	2143v	201101	7:00	7:15	7:30	Trujillo, D	2329 Cal	2300 Rid	7:16	5.44	1
6/27/2011	2143v	201101	7:45	8:00	8:15	Kearns, A	825 Calle	1600 Sain	8:01	3.78	1
6/27/2011	2143v	201101	13:45	14:00	14:15	Spindel,	1382 Veg	1059 Can	14:01	1.82	1
6/27/2011	2143v	201101	6:00	6:15	6:30	Yarnell, C	3774 Agu	1190 S Sa	6:16	5.17	1
6/27/2011	2143v	201101	10:45	11:00	11:15	Jimenez,	1200 Can	641 Harkl	11:01	3.53	1
6/27/2011	2143v	201101	11:45	12:00	12:15	Campos,	641 Harkl	1801 Espi	12:01	1.49	1
6/27/2011	2143v	201101	6:50	7:05	7:20	Quintana	4181 Big	605 Letra	7:06	5.47	1
6/27/2011	2143v	201101	13:15	13:30	13:45	Zmeskal-	3221 W R	1382 Veg	13:31	2.16	1
6/27/2011	2142v	201102	6:00	6:30	6:30	Johnson,	220 Viller	6401 S Ri	6:50	8.31	20
6/27/2011	2142v	201102	8:45	8:45	9:15	Tucker, T	465 Sain	521 Calle	9:10	2.40	25
6/27/2011	2142v	201102	11:15	11:30	11:45	Henderso	4255 Ent	128 Gran	11:45	6.87	15
6/27/2011	2142v	201102	14:15	14:15	14:45	Benfer, A	1500 Pad	1800 Old	14:31	2.09	16
6/27/2011	2142v	201102	13:30	13:45	14:00	Chase, R	1899 Pad	649 Hark	13:55	0.56	10
6/27/2011	2142v	201102	13:15	13:15	13:45	Oliver, Lis	455 Sain	1899 Pad	13:31	0.94	16
6/27/2011	2142v	201102	7:30	7:45	8:00	Eickman,	2395 Car	3251 Cerr	8:00	2.85	15
6/27/2011	2142v	201102	7:15	7:15	7:45	Ortigoza,	6600 Jag	6251 Jag	7:25	0.89	10
6/27/2011	2142v	201102	6:00	6:15	6:30	Williams,	1516 Luis	3900 Pas	7:00	6.67	45
6/27/2011	2142v	201102	8:15	8:35	8:45	Otero, La	2800 Cer	408 Galis	9:00	3.45	25
6/27/2011	2142v	201102	12:00	12:00	12:30	Trujillo, D	2300 Rid	2329 Cal	12:16	5.42	16
6/27/2011	2167v	201103	6:45	6:45	7:15	Martinez,	1923 Qua	3001 S S.	7:01	1.83	16
6/27/2011	2167v	201103	12:45	12:45	13:15	Moon, Di	4311 - B.	901 W Sa	13:25	4.79	40
6/27/2011	2167v	201103	8:30	8:45	9:00	Eickman,	3251 Cer	2395 Car	9:10	3.08	25
6/27/2011	2167v	201103	9:15	9:30	9:45	Gonzales	#4 Houst	455 Sain	9:45	7.89	15
6/27/2011	2167v	201103	12:45	12:55	13:15	Gordon,	1405 Veg	753 Cerri	13:30	4.64	35
6/27/2011	2167v	201103	8:30	8:50	9:00	Montano	1106 Calle	2960 Roc	9:15	3.34	25
6/27/2011	2167v	201103	7:45	7:50	8:15	Carlos, P	3275 Prir	10 A Van	8:30	6.07	40
6/27/2011	2167v	201103	8:05	8:05	8:35	Malec, P.	1500 Ave	455 Sain	8:21	4.25	16
6/27/2011	2167v	201103	6:00	6:15	6:30	Campos,	1801 Espi	641 Harkl	6:30	1.51	15
6/27/2011	2167s	201103	16:15	16:20	16:45	Malec, P.	455 Sain	2074 Gal	16:31	0.24	11
6/27/2011	2167s	201103	9:30	9:30	10:00	Alexandr	4439 Sar	2085 Pad	9:46	4.22	16
6/27/2011	2167s	201103	14:00	14:00	14:30	Martinez,	3001 S S.	1923 Qua	14:16	1.84	16
6/27/2011	2167s	201103	8:45	8:55	9:15	Gurule, L	3014 Call	2903 Agu	9:10	1.50	15
6/27/2011	2167s	201103	10:15	10:15	10:45	Padilla, J	1105 Hick	2018 Cerr	10:31	2.36	16
6/27/2011	2167s	201103	8:15	8:45	8:45	Sandova	3253 Niz	1205 Parl	9:05	3.28	20
6/27/2011	2167s	201103	14:45	15:00	15:15	Sandova	1205 Parl	3253 Niz	15:30	3.36	30

7.6 Appendix G: Survey

Santa Fe Trails Official Survey

Please tell us about the ONE-WAY trip you are making AT THIS TIME. If you have completed a survey today, DO NOT complete another one. Thank you!

Where Is This Survey Taking Place?
- ◉ Sheridan Transit Center (Downtown)
- ◉ Santa Fe Place Mall Transit Center
- ◉ South Capital Station
- ◉ On A Bus
- ◉ Other: [_____]

What is your Gender?
- ◉ Male
- ◉ Female

Are You A...?
- ◉ Santa Fe Year Round Resident
- ◉ Santa Fe Temporary Resident
- ◉ Visiting Santa Fe/ Tourist
- ◉ A Commuter

Why Do You Use The Bus System?
Check all that apply
- ☐ Do Not Own Car
- ☐ Price of Gas
- ☐ Vacation
- ☐ Work
- ☐ Day Trips
- ☐ To Avoid Traffic
- ☐ Other: [_____]

What Times Do you Usually Use The Bus?
Check all that apply

- ☐ Morning (8AM-10AM)
- ☐ Mid-morning (10AM-12PM)
- ☐ Afternoon (12PM-2PM)
- ☐ Mid- Afternoon (2PM-4PM)
- ☐ Night (4PM-8PM)

Which Bus Routes Do You Use On A Regular Basis?
Check all that Apply

- ☐ Route 1 (Agua Fria)
- ☐ Route 2 (Cerrillos)
- ☐ Route 4 (Southside)
- ☐ Route 5 (W. Alameda)
- ☐ Route 6 (Rodeo Road)
- ☐ Route M (Museum Hill)
- ☐ Route 21(Community College)
- ☐ Route 22 (Rancho Viejo/ IAIA)
- ☐ Route 24 (Country Club)
- ☐ Route 26 (Santa Fe Place, South Cerrillos and Fashion Outlets)
- ☐ I Do Not Regularly Use The Bus System

How Many Day(s) of The Week Do You Ride the Bus on Average?

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ I Do Not Regularly Ride The Bus

What Intersection (Bus Stop) Did Your Trip Originate From?

[_____]

How Did You GET TO the Bus Stop?
For this One-Way Trip Only

- Transferred From Santa Fe Trails Bus
- Transferred From Railrunner
- Transferred From Blue Bus
- Transferred From Santa Fe Park and Ride
- Transferred From Santa Fe Pick-Up
- Walked
- Bicycle
- Drove Alone And Parked
- Got Dropped Off
- Other: [_____]

How Far is Your Point of Origin From a Bus Stop?
For This One-Way Trip Only

- Under Half A Mile
- 0.5 miles- 1Mile
- Over 1 Mile

If They Answer Over 0.5 Miles Would You Be Willing to Pay An Additional Fee for A Feeder Service to Bring You From Your Point of Origin to The Nearest Bus Stop?

- Yes
- No

If They Answer Yes How Much Would You Be Willing to Pay Extra?

[_____]

What Intersection (Bus Stop) Will Your Trip End At?

[_____]

How Will you get to Your Destination From the Bus Stop?
For this One-Way Trip Only

- ○ Transfer to Santa Fe Trails Bus
- ○ Transfer to Railrunner
- ○ Transfer to Blue Bus
- ○ Transfer to Santa Fe Park and Ride
- ○ Transfer to Santa Fe Pick-Up
- ○ Walk
- ○ Bicycle
- ○ Get into Parked Car and Drive
- ○ Get Picked Up
- ○ Other: [_____]

How Far is This Place From the Bus Stop?
For this One Way Trip Only

- ○ Under Half A Mile
- ○ 0.5 miles- 1Mile
- ○ Over 1 Mile

If They Answer Over 0.5 Miles Would You Be Willing to Pay An Additional Fee for A Feeder Service to Bring You From the Bus Stop to Your Destination

- ○ Yes
- ○ No

If They Answer Yes How Much Would You Be Willing to Pay Extra?

[_____]

Do You Own a Smartphone? (iPhone, Droid, Blackberry, or Palm)

- ○ Yes
- ○ No

If 'They Anwser 'Yes', if there was a mobile application to tell you when a bus was coming and help you plan your trip would you use it?

◉ Yes

◉ No

Tell Us How You Feel About Your Last Trip On The Bus. Select the Number that BEST Represents Your Opinion On The Following:
1 = Poor and 5 = Excellent

	1	2	3	4	5
Driver	◎	◎	◎	◎	◎
Bus	◎	◎	◎	◎	◎
Bus Schedule	◎	◎	◎	◎	◎
Fare	◎	◎	◎	◎	◎
Convinience	◎	◎	◎	◎	◎

Comments/ Suggestions

[   ]

Submit