Envisioning Bus Rapid Transit Along Greater Sacramento's Sunrise Boulevard

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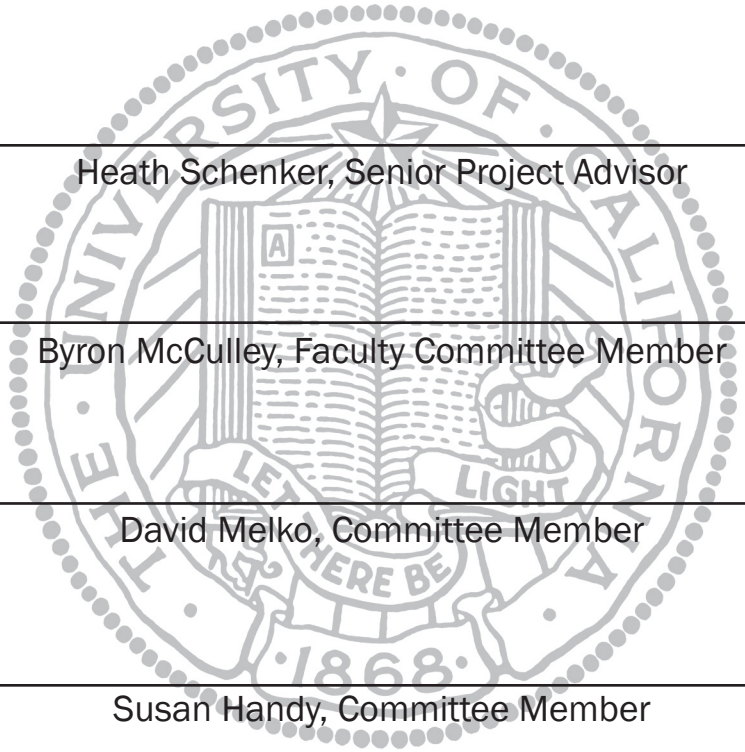
Envisioning Bus Rapid Transit Along Greater Sacramento's Sunrise Boulevard

A Senior Project presented to
the Department of Environmental Design at
the University of California, Davis

In partial fulfillment of the requirement for
the degree of Bachelors of Science in Landscape Architecture

Accepted and Approved by



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June 15, 2012

This project is dedicated to my Father,
Michael Chursenoff,
a man who inspires a work ethic and character through example.

Abstract

One of the key distinctions which city builders need to make about 21st century circulation and land use is that there is no distinction. The fundamentals of mobility and activity or deeply linked in the paradox of people generally wanting to travel less between events but participating in events hosted at greater and greater distances. While our post-war roadways have done an efficient job at speeding up urban travel, it is clear that we can no longer afford the great costs associated with a system developed around the autonomous driver.

Public transit, while providing a clear and logical strategy for circulating massive amounts of people with a smaller footprint, is not without its own modern critiques. Light rail is found in many cases to be too expensive to provide the public while standard bus is found too ineffective. Bus Rapid Transit, an infrastructure-based mode of bus transportation, is founded upon the opposite extremes: rail-like effectiveness at the lower costs associated with bus. While Bus Rapid Transit, or BRT for short, has been effective in many dense urban centers, it hasn't quite found a toehold in the surrounding car-congested suburbs.

This report envisions a 14 mile Bus Rapid Transit line not amongst the dense towers of Chicago or around the open crowds of Seattle but in the lowly dense, auto-oriented suburbs of Sacramento's Greater Metropolitan area. There is a challenge in providing BRT service to the 2 counties and 4 cities which this line is proposed through but an even greater opportunity in moving these residents from car to bus.

The research question which this senior project works to answer is "To what extent can Bus Rapid Transit fit within the suburban landscape?" We know in many precedent systems that BRT holds the capability of effectively serving hundreds of thousands of daily riders in seemingly elegant precision. But what happens when the environment served exists in the several thousand? Can BRT be scaled downward and still reap a net positive outcome for its community?

The following study incorporates site-specific and study area analysis, UC Davis sponsored interviews and 3D visualization in order to answer such questions along Greater Sacramento's Sunrise Boulevard. What the findings that follow reveal is that through a combination of certain planning and design strategies, BRT can quite possibly not only survive in the harsh landscape of single family homes and 5 lane arterials, but in fact flourish in a manner which should make decision-makers question how cities should invest be investing in their transportation systems.

Acknowledgements

I would like to thank 6 individuals for their great contribution to my understanding of the following subject matter:

My Senior Project Committee:

David Melko, Senior Transportation Planner for the Placer County Transportation Planning Agency,
for introducing me to what I hope becomes a deep understanding of the way city agencies operate.

Byron McCullley, Landscape Architecture faculty for the University of California, Davis
for teaching me about transit design protocol and, in a broader context, how to design buildable things.

Susan Handy, Environmental Science and Policy faculty for the University of California, Davis
for providing me with a basic foundation for studying Urban and Regional Planning

I would also like to thank a group of design and planning professionals who went out of their way to provide me with invaluable information regarding Los Angeles' transit system:

Martha Butler and Michael Richmai of the Los Angeles Metropolitan Transportation Authority

Steve Smith and Jennifer Salazar of Gruen Associates

David Tatsumi of Tatsumi and Partners, Inc.

Preface

My study in the disciplines of the built environment has its origins in a small, hillside community on the East side of Folsom, CA called American River Canyon. Throughout the latter half of my High School years I had grown an attachment to this insular little neighborhood situated on a 1.8 mile collector loop anchored by the most memorable park which I have ever experienced. It was through my love of distance-running which had changed my perspective of the city. It's a strange phenomenon understanding a place in entirely different terms; on one end behind the windshield of a car and on the other in shoes worn down by more miles forgotten than remembered.

This is perhaps where my interest lies for this Senior Project topic. I grew up in the study area which this report will be focusing on and when I came of the age where I could start exploring the environment of my own free will I never once considered doing so through my regions local transit. Why was the car at the age of 16 the only thing which I had registered for mobility; not decided on using, but registering as my only transportation option? The answer is that like in most suburban environments like the one I grew up in, transit is kept in a perception of financial need and not a choice of convenience or desire. I believe that transit should be as engrained in the individual lifestyle in Sacramento as it is in New York City, Chicago or Los Angeles. Bus Rapid Transit I contend is the agent for such a notion.

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Definitions

BRT	Bus Rapid Transit
Express	Operating with very few stops; typically intended to take riders downtown
Far-side	On the opposite side of an intersection which you are facing
Grade Separated	Not meeting at the same elevation
Headway	The time interval between two buses
Land Use	The designated activity occuring within a parcel
Local	Typically all-stop service that is operated at the municpal level
LRT	Light Rail Transit
Mid-block	In the middle of a city bock, not overtly closer to any one side
Mixed Flow	Traffic lane not exclusive to any type of vehicle
Near-side	On the same side of an intersection which you are facing
Queue	A line of vehicles
RIT	Rede Integrada de Transporte
RT	Roseville Transit
SRT	Sacramento Regional Transit
Setback	The space left inbetween buildings and the curbs of streets
Turf	Typically non-descrpt grass
TSF	Transit Signal Priority

Bus Rapid Transit I.

Bus Rapid Transit is an emerging mode of public transit that has its roots in the heavily populated regions of South America; principally Brazil, but is up and coming in many transit-invested countries around the world, including the United States. The Federal Transit Administration gives the most concise and principled definition of Bus Rapid Transit or BRT being "a rapid mode of transportation that can combine the quality of rail transit and the flexibility of buses" (Clinger 2002). The Transportation Research Board of the Academies gives a more detailed definition being:

> *BRT is a flexible, rubber-tired rapid transit mode that combines stations, vehicles, services, running way, and ITS elements into an integrated system with a strong positive image and identity. BRT applications are de signed to be appropriate to the market they serve and their physical surroundings and can be incrementally implemented in a variety of environments.*
> *In brief, BRT is a permanently integrated system of facilities, services, and amenities that collectively im prove the speed, reliability, and identity of bus transit.*
> *In many respects, BRT is rubber-tired light rail transit (LRT), but with greater operating flexibility and potentially lower capital and operating costs.*

Figure 1.1 Rede Integrada de Transporte BRT System - Curitiba, Brazil

Figure 1.2 Transmilenio BRT System - Bogota, Columbia

Components of BRT - Runningways

Figure 1.3 Grade-Separated Transitways

Figure 1.4 At-Grade Transitway

Figure 1.5 Transit Signal Priority

The basic premise to cutting down travel time for buses is allowing them to move faster down their designated routes like rail cars do. Because the bus typically travels along surface streets in the city, this requires consideration along the segments inbetween intersections as well as at the intersections themselves.

For road segments, dedicated travel lanes that are exclusive to any vehicle other than buses allow BRT vehicles to travel as fast as their prescribed safety levels and not at the speed of the surrounding traffic. This becomes especially useful during rush hour when roads are found at their highest levels of congestion.

Running ways can come in many different styles. There is a hierarchy in inverse correlation amongst running way types between their associated costs and travel speeds. Typically, the more separation which is being achieved from surrounding traffic and therfore the greater the speed, the more costly it is to implement.

Grade-Separated Transitways allow a bus the maximum possible speed along its route by physically separating both the road segments and intersections from surrounding traffic (Fig. 1.3). These running ways may use old railway right-of-ways, travel in the middle or alongside major freeways, travel in underground tunnels, along major arterial roads, or any possible combination. When major arterial intersections are unavoidable, buses may operate on flyovers or underpasses to avoid conflict. (VTA Transit 2007). This is as close as a bus can possible get to mimicking the operations of a typical Rail Transit vehicle and is therefore the most expensive remedy.

At-Grade Transitways are the next best solution providing bus dedicated lanes but allowing these lanes to cross at the same grade as surrounding traffic (Fig. 1.4). While less effective as grade-separation, possible red light delays

Figure 1.6 Designated Bus-Only Lane

Figure 1.7 Converted Bus-Only Lane

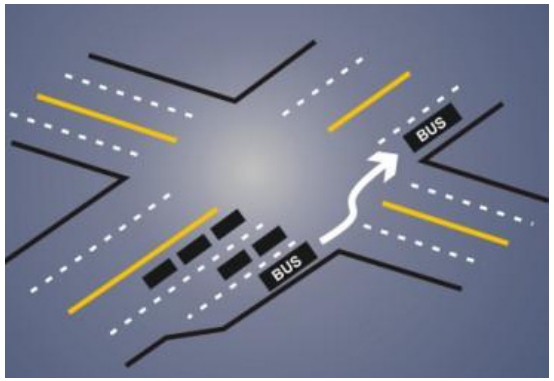


Figure 1.8 Queue Jump Lane

can be reduced by providing Transit Signal Priority at intersections (Fig. 1.5). This technology tracks the position of BRT vehicles and extends the green light along the bus' direction provided it's within a certain proximity to the intersection or conversely shortens the length of it's red light when stopped.

Designated bus-only lanes are even cheaper to implement as they can be installed using an existing lane along a major arterial road (Fig. 1.6). The designation can be through physical separation using road bumps or bollards, signage or pavement striping letting cars know that they cannot use the lane.

The next step below designation is conversion. When speed is only crucial durring specific times of the day like rush hour, curbside lanes can be converted for only part of the day (Fig. 1.7). This requires faith on the side of other vehicles and possible enforcement for assurcances but is capable of providing higher bus speeds at very low capital costs.

Mixed-Flow running ways are the cheapest and least effective method for BRT vehicles. These allow existing traffic to drive in the same lane as BRT vehicles but incorporate certain traffic improvements like queue jump lanes to allow buses to jump ahead of surrounding traffic at red-light intersections (Fig. 1.8).

Despite the variety in operating speeds, when correctly implemented BRT can achieve massive improvements compared to traditional bus and in many cases even rival light rail (Fig. 1.9).

Freeway-Busway	Speeds
Non-Stop	40–50 mph
All-Stop	25–35 mph
Arterial Streets	
Express, Bogotá, Curitiba	19 mph
Metro Rapid bus, Ventura Blvd., Los Angeles	19 mph
Metro Rapid bus, Wilshire Blvd., Los Angeles	14 mph
All-Stop—Median Busways, South America	11–14 mph
Limited Stop—New York City	8–14 mph

Figure 1.9 Typical BRT Operating Speeds

Components of BRT - Stations

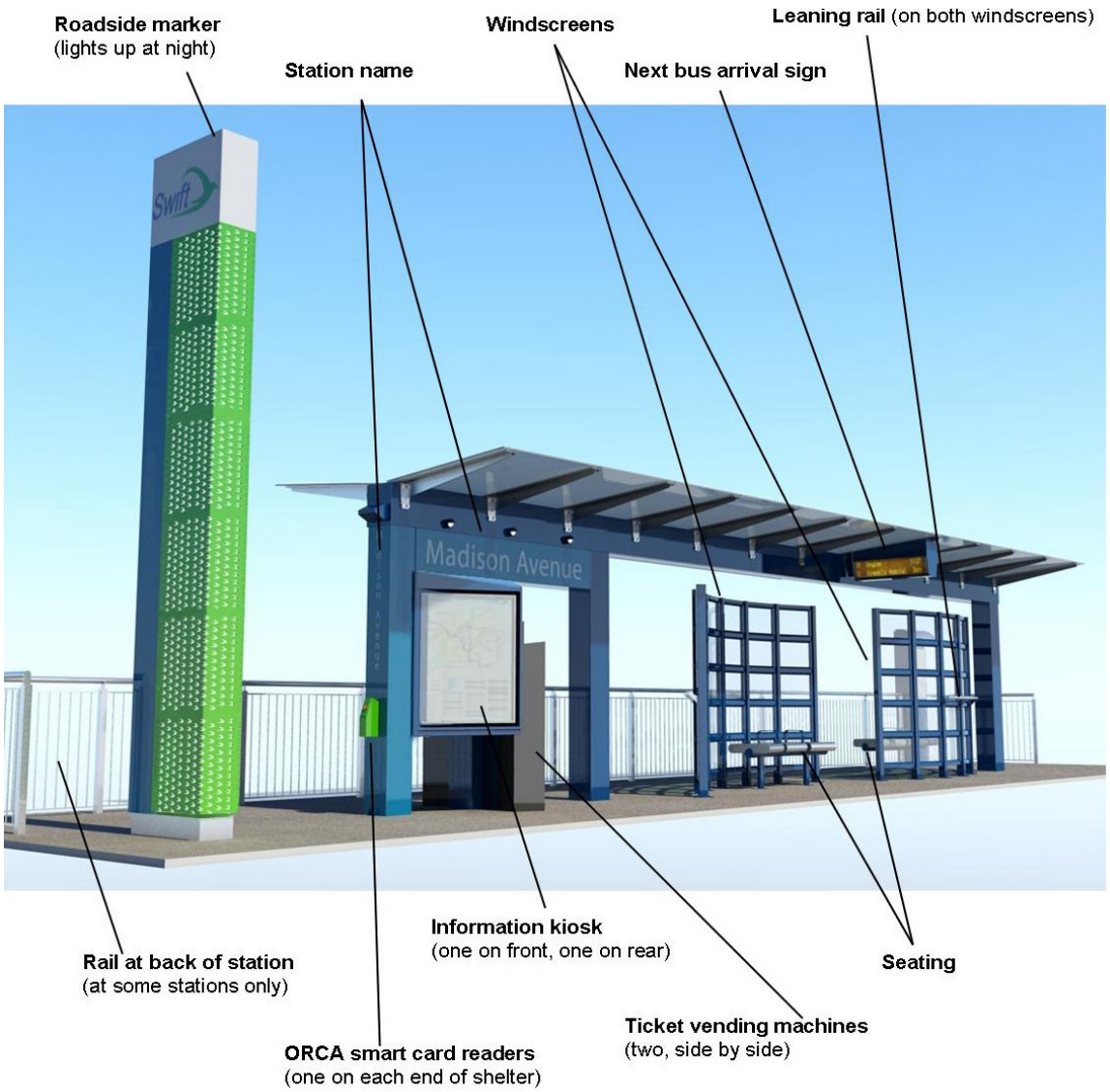


Figure 1.9 BRT Station Diagram

Stations are the second major component to any bus line, whether rapid or conventional, and are the most influential source of a service's rider experience and public image and second-most influential source of a service's operational speed.

As stated by Los Angeles-based Gruen Associates, any BRT station can, from a design standpoint, be broken down into 3 constituent components:

1) Vertical Marker
2) Canopy
3) Artwork (typically in the form of seating or screening)

(Fig. 1.9)

Like a swiss army knife, a designated BRT stop can have any bundle of passenger and site amenities serving individual purposes. The only question becomes what is the right combination given the allowable cost to build and the intended experience of the station.

Figure 1.10 Level Boarding

Figure 1.11 Pre-Paid Ticketing

BRT stations reduce the overall travel time for riders in 3 primary ways. The first is the idea to elongate the queue area and disperse crowds along the platform. Specialized BRT vehicles are typically 60 feet in length, a full 20 feet longer than your conventional 40 foot bus. This provides the opportunity to have multiple points of entry and exit reducing the dwell time the bus must incur at the station (Fig. 1.12).

Additional to the number of passengers who must be serviced are the individuals who are of special circumstance. The elderly typically take much longer to board and unboard a bus given the difficulty they experience in moving up and down steps. Likewise, a fair amount of time must be devoted to quadraplegics who must be given special attention by the bus driver in getting onto the bus. Both of these time-consuming constituents are better served by level-boarding buses whose floors meet at the same grade as the station's platform (Fig. 1.10).

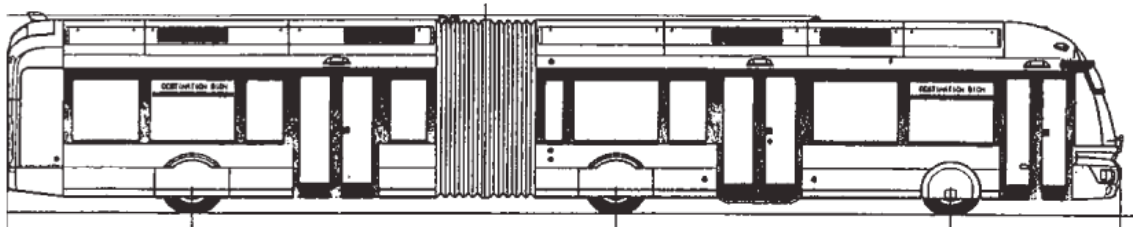


Figure 1.12 Articulated Buses

Finally, like that of light rail, fare is typically collected before entry, usually in the form of pre-paid cards (Fig. 1.11). The advantage to pre-board fare is that riders won't get congested by individuals who must scrounge around for loose change or i.d. to board. The disadvantage is that you have more opportunity for free-riders to take advantage of the fact the they aren't required to prove purchase to the bus driver. This is typically mitigated with random inspections on board by vehicle attendants and hefty fines for those who are caught.

Convenience Elements

Figure 1.13 Bike Lockers

Figure 1.14 Site Design/Art

Figs. 1.15 & 1.16 Telephone & Canopies

Time-reduction is only one piece of the puzzle that makes an enhanced station successful. Public Transit is a unique phenomenon that is subject to the self-fulfilling prophecy where if it is seen as run-down, uncomfortable and unsafe, the resulting lack of investement and ridership will turn it into just that. Public image becomes a big part of a station. If it is identified as just another bus stop with a few extra panels and bright colors, the surrounding neighborhood won't adopt it as a real community asset worth bringing into one's daily life.

Like a basket of eggs, a station can comprise of many different amenities which enhance the overall ride (Figs. 1.13 - 1.18). Bike lockers and personal storage lockers allows one to ride the bus despite the constraints of distance or luggage. Real-time tracking of buses can warn a mother of when she needs to collect her scurrying children. Well-spread lighting, survaillance cameras and open sight lines to surrounding travellers and businesses can all deter deviant and criminal activity from making the station an unsafe place. The most important concept is that notion of BRT be separated from some of the more disinviting perceptions of modern bus (Fig. 1.16)

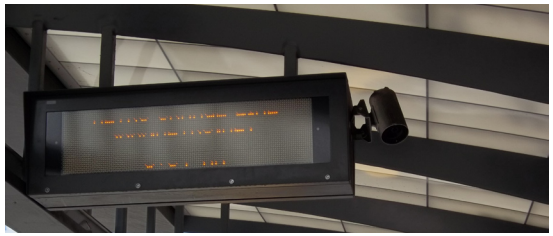


Figure 1.17 Electronic Signage and Survaillance

Figs. 1.18 & 1.19 Station Marker & Bus Shelter

Although the modern application of Bus Rapid Transit is fairly recent, it is important to note that the concept of BRT as an effective way of providing rapid transit is neither new nor particularly breakthrough. Various plans and studies calling for an infrastructure-intensive bus-based system can be traced back all the way to the 1930's in the United States. A 1937 Chicago Plan called for the conversion of three west-side rail lines into an express bus operation distributing from superhighways to the central areas and downtown. Between 1955 and 1959 Washington D.C. saw design studies for BRT within the freeway medians of its National Capital Region. Also within the year 1959 St. Louis saw the vision of an 86-mile system, 42 of which would be grade-separated. These busways would encircle part of the downtown as a 60-foot-wide opetrating deck including a sidewalk which would act as a passenger-loading platform located on the inner side of the loop. These platforms would mesh with a one-way clockwise flow of buses circling on a 37-foot right-of-way (Levinson 2002).

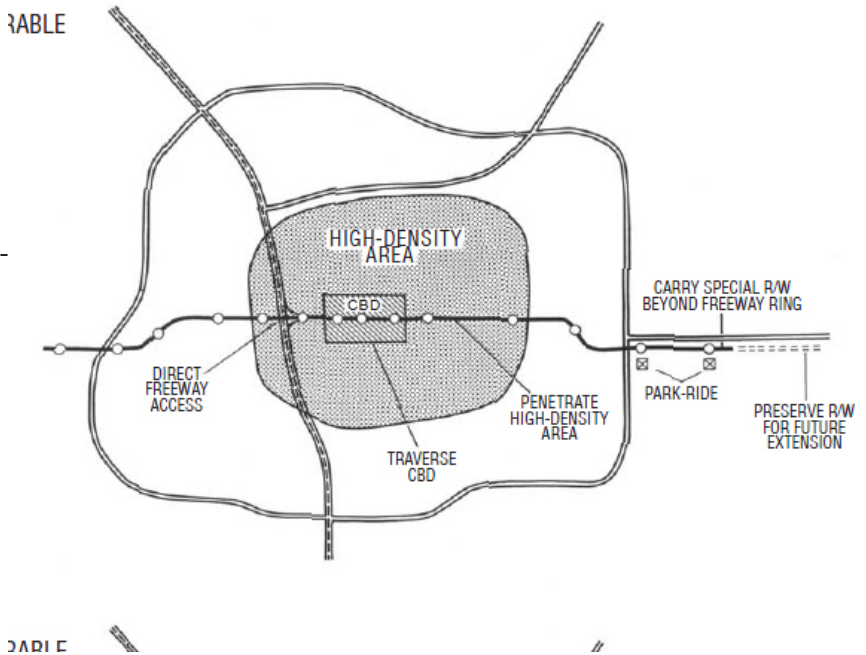


Fig. 1.20 Early Conceptual Diagram for BRT Application in the U.S.

Despite the numerous planning efforts, both on the side of municipalities and research authorities in the U.S., it took the exemplar case of the Rede Integrada de Transporte, or RIT system, in Curitiba, Brazil to really convince public officials of BRT's effectiveness in public transportation. Cited by many as the first modern application of systemized BRT, the RIT today is estimated to carry anywhere from 1.9 to 2.1 million passengers a day. It has seen an annual 4.5% increase in ridership from its original 1971 daily load of 580,000 (Curritiba).

Curitiba is really known as a success story in modern transportation planning theory above all else. A comprehensive plan for Curitiba developed in 1943 had planned to accomodate an expected explosion in population growth with the expansion of boulevards radiating from the cities core to accomodate higher automobile traffic. After witnessing the kind of congested, pedestrian unfriendly streets and unchecked development which had characterized similar growth in neighboring cities to the

Curitiba, Brazil - City on a Hill

North like Sao Paulo, Curitiba had adopted a new Master Plan in 1965 which had turned to transportation growth along a select few boulevards emanating from Curitiba's core with mass transit at the base of the boulevard's design. The overall system was designed so that a hierarchy of transit vehicles could usher residents from the surround metropolitan area into the downtown core. Small mini buses circulate the individual neighborhoods of the region and feed passengers into the conventional bus routes which encircle the central core. From here 5 main arterials feeding into the core similar to a spoke and hub wheel-like fasion offer express services to zip passengers in directly to Curitiba's downtown. These arterial roads have a trinary route structure. The middle route offers high-capacity express service in its center two lanes while the outer lanes are used for mixed flow and parking. The outer two routes about a block away are mixed, one-way streets that have exclusive bus lanes running direct service with limited stops (Federal Transit Administration).

BRT has been found to have been very successful in Curitiba. Today approximately 75% of the metropolitan region's commuters use the RIT system. The direct line service is estimated to save riders an average of 15 minutes on a given work trip. However, despite Curitiba's great success, by the late 1970's, the emphasis in transit planning in the U.S. had shifted away from BRT and onto HOV lanes and LRT (Curitiba).

Fig. 1.21 Route Map for RIT

Fig. 1.22 Middle Route of Arterial Road

Fig. 1.23 Tube Design for Stations

Fig. 1.24 Jaime Lerner, Curitiba's Former Mayor

Time Savings with respect to the transit rider's trip is perhaps the most sought-after benefit of BRT. Some of the most successful systems utilizing grade-separated transitways have been able to achieve over 40% reduction in passenger trips. However, routes more similar to the one being proposed for Sunrise Blvd. operating instead along major arterial roads and in some cases even within mixed traffic have still been able to cut anywhere from 23 to 28% off of existing trips in the case of Los Angeles and up to 32% in the case of Bogota, Columbia. Careful attention paid to wider station spacing and signalized intersection crossings are the primary contributors to these dwell reductions (Levinson 2003 (1)).

Increases in ridership is another documented benefit with BRT and as noted later in this document a major goal for this proposed line. The provision of added service, reduction in travel times, improved facilities and overall population growth are all major contributors to this phenomenon. When Houston rolled out its BRT up to 30% of the ridership was new to transit and up to 72% were noted as being diverted from automobiles. Los Angeles was able to boast a 33% increase in riders with the unveiling of its MetroBus Service, many of which were either new transit riders or more frequent transit riders (Levinson 2003 (1)).

The low cost associated with BRT, both in construction and in operation is the third and perhaps most crucial benefit in considering this transportation mode. Average costs associated with building arterial busways range from 1 to 10 million dollars per mile when designed for 12 to 20 m.p.h. speeds (Levinson 2003 (2)). In comparison to its formidable couterpart light rail, BRT can average 10 times cheaper than light rail when comparing the most basic tenants of both, exclusive ROW for rail and pavement striping for bus (Freemark 2011). Maryland Transit Administration estimated that a medium light rail project designed for 62,600 daily riders would cost over twice as much to build at $1.2 billion and significantly more to operate than a similarly-scaled BRT alternative serving 51,800 daily riders (Levitt 2009). While significantly lower in capital costs, BRT also has the advantage of being operational amnogst different phases. A bus can drive down the road whether it has its own busway, TSP, enhanced stations or any combination thereof and not left out whereas typically 100% of a light rail project must be complete before it can be used to transport riders.

Impacts of BRT

Aside from the direct benefits afforded by Bus Rapid Transit are the indirect impacts which BRT systems are found to have on the immediate built environment surrounding them.

One such impact is on land value and development potential on property surrounding transit stations. It has been known for many years that proximity to light rail stations tends to not only increase the property value for surrounding land parcels, but to also attract new urban development for the perception of the station as being a real community asset with compensatory character. However, BRT has a more flexibility to its route design and, unlike light rail, can change the routes it takes based on changing land use characteristics of the city. Many have used this element of BRT as a way to critique it as having a lack of permanence to a neighborhood and therefore incapable of spurring any kind of economic benefit.

A recent study on the Pittsburgh East Busway serving the downtown area proves the opposite by finding a positive correlation between property values and their proximity to BRT stations. After accounting for likely confounding variables, the National Bus Rapid Transit Institute in conjunction with the University of South Florida found higher rates of increasing value as you observed properties closer to BRT stations. An example given was that moving 101 feet to 100 feet away from a station yielded a $19.00 increase in property value whereas moving the same 1 foot in length from 1001 feet to 1,000 feet away from a station yielded a scanter $2.70. On the supply side, surveys of 12 developers and seven transportation/ planning agencies found positive attitude of BRT on associated property specifically citing a perception of permanence from the developers point of view as being a crucial factor on development potential and one influenced by the special care taken to the dedicated running ways, sizeable ridership, streetscape improvements and station quality associated with BRT's infrastructure (McConville 2010).

The consideration of property value impacts should be taken from a non-investor's perspective as well. Several studies coming out of Bogota, Columbia look at the asking prices of apartment units within the context of BRT proximity. One study done by Rodriquez and Targa found that within a 1.5 km area of influence along two TransMilenio corridors, on average amongst 494 multifamily properties, asking prices increased anywhere from 6.8 to 9.3 percent for every 5 minutes of walking distance closer to BRT Stations. On the flip side, properties near busways not associated with station stops associated with lower asking prices, presumed due to noise and pollution effects of the bus traffic. A second study done by Munoz-Raskin had fleshed busway-proximate values even further finding that properties along trunk lines meant to move riders regionally had negative associations with value as opposed to feeder lines meant to collect riders to the trunk lines had a positive association (Mojica 2008).

Next to economy, the environment provides a sound stage for positive impact with the introduction of rapid bus-based transit systems. America's great outdoors has seen

great political support within the past decade with respects to environmental legislation; specifically with the intent of reducing vehicle-emitted greenhouse gas emissions. Air pollution is a critical urban issue that exists within a unique dynamic of being locally produced yet globally consumed. BRT systems have been recognized as a feasible way of reducing these vehicle emissions by providing a more efficient mode of moving passengers around and taking large quantities of private autos off the road.

Bogota's Transmilenio system alone was able to reduce 40 percent of certain pollutants between December 2000 and May 2001. This included 250,000 tons of CO2, a pollutant of global concern. Environmental due dilligence can be measured in resource extraction as well as waste production. It is estimated that two rapid bus lines in Los Angeles manages to save the city from consuming 19,000 barrels of oil per year and that its more recently introduced Orange Line is circumventing an additional 18,600 barrels.

This concept of using mass transit as a GHG reduction strategy managed to make its way onto the agenda of the Kyoto Protocol and has developed into a model for a transport-related CDM (Clean Development Mechanism) initiative. Under this initiative, approved systems like Bogota's Transmillenio can convert its emissions reductions into environmental credits which it can then sell to other countries like the Netherlands. The establishment of this market-based incentive to provide mass transit cleverly uses monetary greed into environmental stewardship.

Despite the several benefits of Bus Rapid Transit, negative impacts have been called into question with many of these systems. AC Transit's proposal for a new BRT line in the East Bay of California is one particular example of certain residents' skepticism of taking lanes out of public use and given exclusive rights to BRT vehicles. The Final Environmental Impact Report for the project anticipates a 22 percent decrease in peak driving speed amongst mixed traffic along Telegraph Ave. due to the conversion of two travel lanes (AC Transit). In urban centers like the Berkeley-Oakland area, it is also very difficult to get around eliminating facilities like parallel parking stalls and delivery zones which may be found in the path of a busway or station. Concerned residents like Mary Oram also express valid concern over the source of new riders. There is no guarantee that Bus Rapid Transit can entice people out of their vehicles and if similar transit lines like local bus or light rail parallel BRT, you may just see a reallocation of transit riders which could be construed as a net neutral increase in ridership.

There is no doubt that many of these impacts as well as others not mentioned would have a strong presence on Sunrise Boulevard's surrounding fabric. It is on strong recommendation that any further study emanating from this conceptual report further investigate what these comprehensive effects may be and how they can best be swayed for the positive gain of the communities within the study area.

Sunrise Boulevard II.

Other Document

Other Document

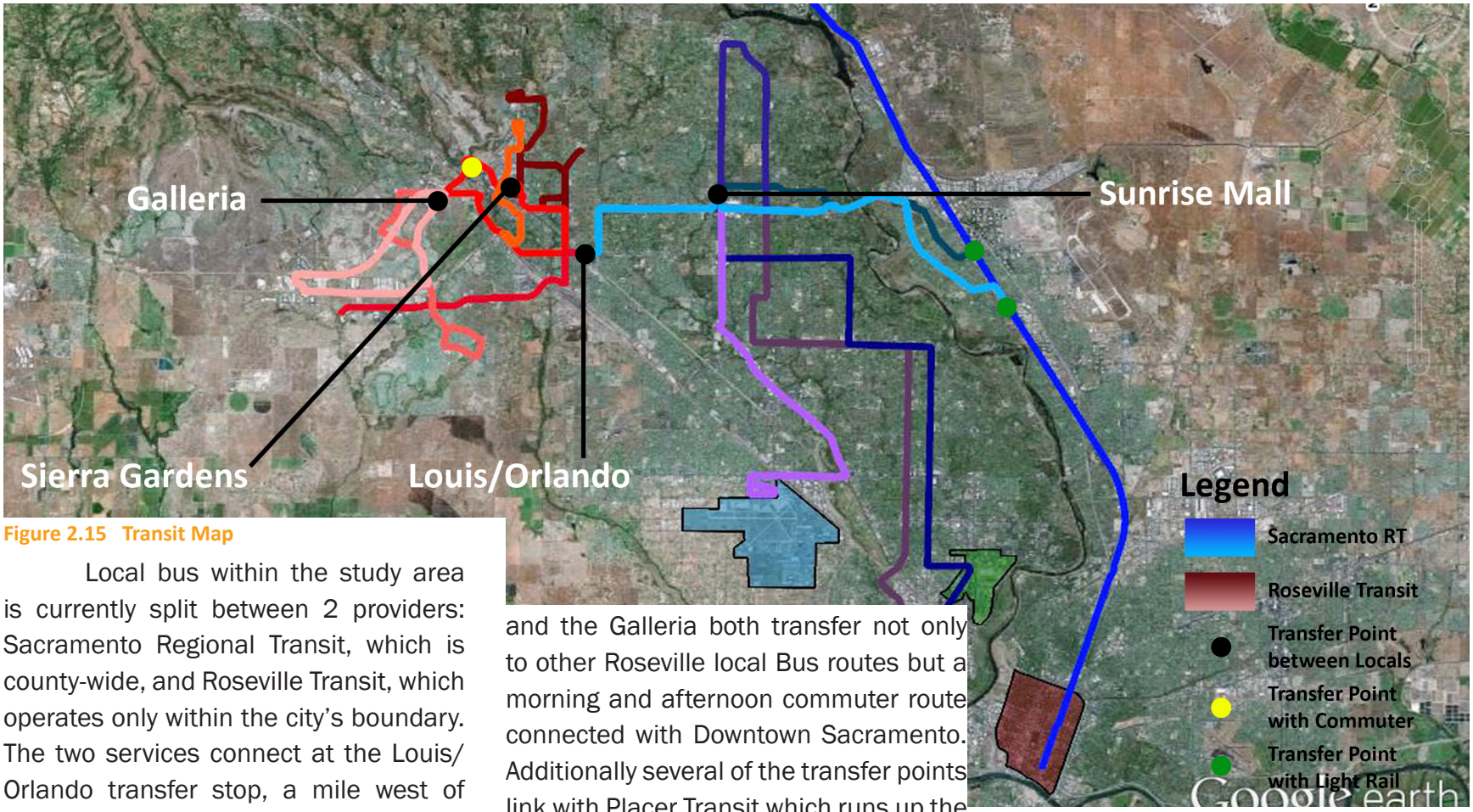


Figure 2.15 Transit Map

Local bus within the study area is currently split between 2 providers: Sacramento Regional Transit, which is county-wide, and Roseville Transit, which operates only within the city's boundary. The two services connect at the Louis/ Orlando transfer stop, a mile west of Sunrise Boulevard (Fig. 2.16).

3 other transfer points interconnect the individual local bus lines that are found within direct proximity to Sunrise Blvd. Sierra Gardens and the Galleria both transfer not only to other Roseville local Bus routes but a morning and afternoon commuter route connected with Downtown Sacramento. Additionally several of the transfer points link with Placer Transit which runs up the mountain along Interstate 80.

The Sunrise Mall transfer point connects all of the North-South running SRT lines incorporating all of the communities west of Sunrise Blvd. Finally, several Light Rail stations along SRT's Gold Line connect with some of the North-South-running SRT bus lines.

	California	Citrus Heights
Workers 16 years and over	16,275,764	39,633
Car, truck, or van	84.60%	90.80%
Drove alone	72.90%	78.10%
Carpooled	11.70%	12.70%
Public transportation (excluding taxicab)	5.20%	2.20%
Walked	2.80%	1.30%
Bicycle	1.00%	0.40%
Taxicab, motorcycle, or other means	1.40%	1.30%
Worked at home	5.10%	4.10%

Figure 2.16 Means of Transportation to Work for Year 2012

Transportation within suburban environments such as the Sunrise Boulevard study area must always be analyzed within the context of the private automobile. With low density development and wide-set right-of-ways the areas which Sunrise Boulevard runs through were quite literally designed to accomodate a pro-automobile and anti-alternative transportation (transit, bicycle, walking) lifestyle. Figure 2.17 shows how the average distance to daily activities from the home in the City of Citrus Heights are well-beyond the threshold for any transportation mode other than private vehicles. Figure 2.16 breaks down the percentages of Citrus Heights residents who commute to work within each respective mode of transportation and further compares that to the State percentages. Not only does Citrus Heights have more drivers than California at 9 out of every 10 residents, but the percentage of residents taking public transportation isn't nearly enough for a long-term full-build out scenario for BRT. Figure 2.18 argues against the myth that public transit is a transportation mode primarily for the lower-income economic bracket. Only 57% of public transit riders earned less than $35,000 per year, a clear majority but a slight one at that. Additionally only 51% of single-occupant drivers earned more than $35,000 per year suggesting that the ability to drive to work as opposed to taking transit is in no clear way influenced by wage earnings.

California
Citrus Heights

	Total		Drove alone*		Carpooled**		Public Transit	
Workers 16 and over with earnings	16,274,284	39,633	11,863,042	30,940	1,905,455	5,028	846,329	858
$1 to $9,999 or loss	13.00%	11.40%	10.70%	10.30%	15.90%	14.20%	19.50%	12.90%
$10,000 to $14,999	8.50%	6.90%	7.40%	6.70%	10.50%	10.30%	14.60%	0.00%
$15,000 to $24,999	16.00%	19.40%	15.00%	17.60%	19.80%	24.30%	19.60%	15.20%
$25,000 to $34,999	12.70%	14.70%	13.10%	14.30%	13.20%	18.60%	9.60%	29.80%
$35,000 to $49,999	15.00%	20.00%	16.10%	22.20%	13.80%	10.40%	10.40%	7.70%
$50,000 to $64,999	11.00%	13.80%	12.00%	14.50%	9.70%	11.90%	7.40%	13.50%
$65,000 to $74,999	4.90%	5.40%	5.30%	5.80%	4.20%	5.00%	3.50%	6.20%
$75,000 or more	18.90%	8.50%	20.30%	8.70%	12.90%	5.30%	15.20%	14.70%
Median earnings (dollars)	34,700	32,525	37,431	35,617	27,159	25,320	22,155	31,349

*Car, truck, or van
**Excluding Taxicab

Figure 2.17 Means of Transportation by Earnings for the Year 2012

Design III.

The key idea which drives the overall scheme with which the Sunrise Blvd. BRT route fits into is connectivity. Time is the primary barrier to urban connection with regards to mass transit. There are set time limits by which discretionary transit riders are not willing to cross and the role of an enhanced transit scheme should be to reduce travel time as much as possible.

Figure 3.1a shows the connection between land use and stop spacing. As land use is less active as typically is in residential settings, stop spacing can be kept at a minimum in order to provide thorough access to riders. Once bus vehicles reach a certain saturation station spacing can distance which increases travel speed. Vehicles can still maintain a healthy mixture of inflows and outflows if density is kept relatively higher along transit corridors and nodes which are in close proximity to the transit stations.

Figure 3.1b reveals how highways can be utilized for rapid express service which pipes riders directly into the central business district.

The overall theme with a regional transit strategy is adhering to a hierarchy in transit mode. Cars operate very efficiently within cities because they adhere to a hierarchy of roadways from less trafficked local roads which form collectors and eventually heavy arterials. Transit should work the same only under the principle of speed and capacity. This highlights the fact that BRT is not in competition with rail or loca bus. The very notion limits the opportunity present in BRT.

Figure 3.1a Typical BRT Route

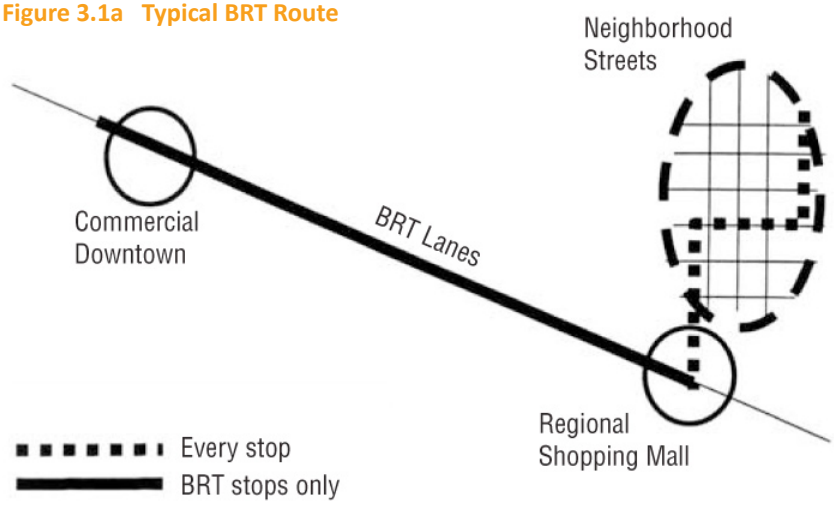
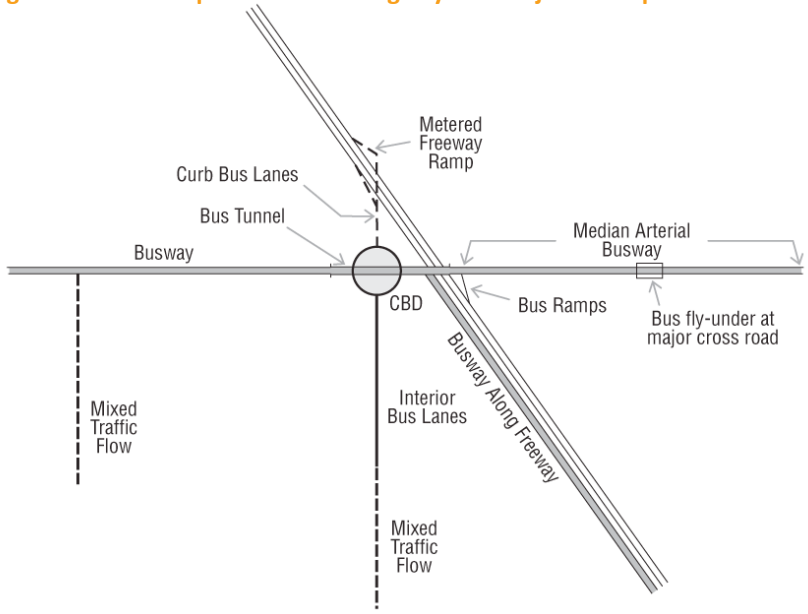


Figure 3.1b Conceptual BRT Runningways for Major Metropolitan Area



Goals

Given the well-documented capabilities of Bus Rapid Transit and the existing state of the study area, 3 Goals are determined to best define the framework by which the proposed BRT line should take shape.

1) Facilitate commute to Downtown Sacramento for Rancho Cordova and Fair Oaks residents via connection with the SRT's Gold Line.

2) Foster quicker transportation between cities within the Greater Sacramento region.

3) Improve the image and experience of the area's local transit in order to encourage higher ridership.

Issues

The remainder of this report proposes a combination of Planning, Urban Design and Site Design strategies which could be used to collectively achieve the 3 stated goals for the BRT line.

1) Speed: How does BRT match up to it's foremost competitors in the transportation arena, Light Rail and Automobiles?

2) Convenience: What kind of experience is necessary in order to entice discretionary drivers out of their cars?

3) Perception: How can BRT be used to change some of the common notions the publc has about transit?

Other Document

Other Document

Near-Side Stop: Copperwood Square (Southbound)

Figs. 3.8 - 3.10 Existing Site Photos

Copperwood Square (Southbound) was chosen as a nearside stop for a variety of reasons.

Like many of the curbside conditions in the area, this location is characterized by a generous 30 foot setback between the curb and the adjacent corner building. This setback space has a standard 6 foot wide sidewalk meandering between the roadside and building side (see Fig. 3.12). The 1,500 square feet of empty turf space found within the concave side of the meander provides a perfect setting for an added transit facility.

- In addition to the turf space, the curbside lane is a drastically underutilized right turn lane that hardly ever has any queuing making it prime for a fully stopped bus.

- The far side of the intersection is the current location of an SRT local stop making transferring between rapid bus and local bus an easy cross over.

- The nearside location requires only one street crossing in order to get to Copperwood Square.

- The intersection of Woodmore Oaks Drive and Sunrise Boulevard holds a Grade D Level of Service with an average 36.8 second dwell time during peak hour conditions. This lower rating makes a nearside location more cost-effective in relation to the Transit Signal Priority needed to move the bus through the intersection.

The only major constraint for this location is the fact that it is in front of a 2 story office building which typically places advertisements and signage behind the proposed location for this facility. Possible mitigations for this issue are visual analysis which would inform a shelter design which would obstruct as little as possible these visual elements or possibly integrating these elements

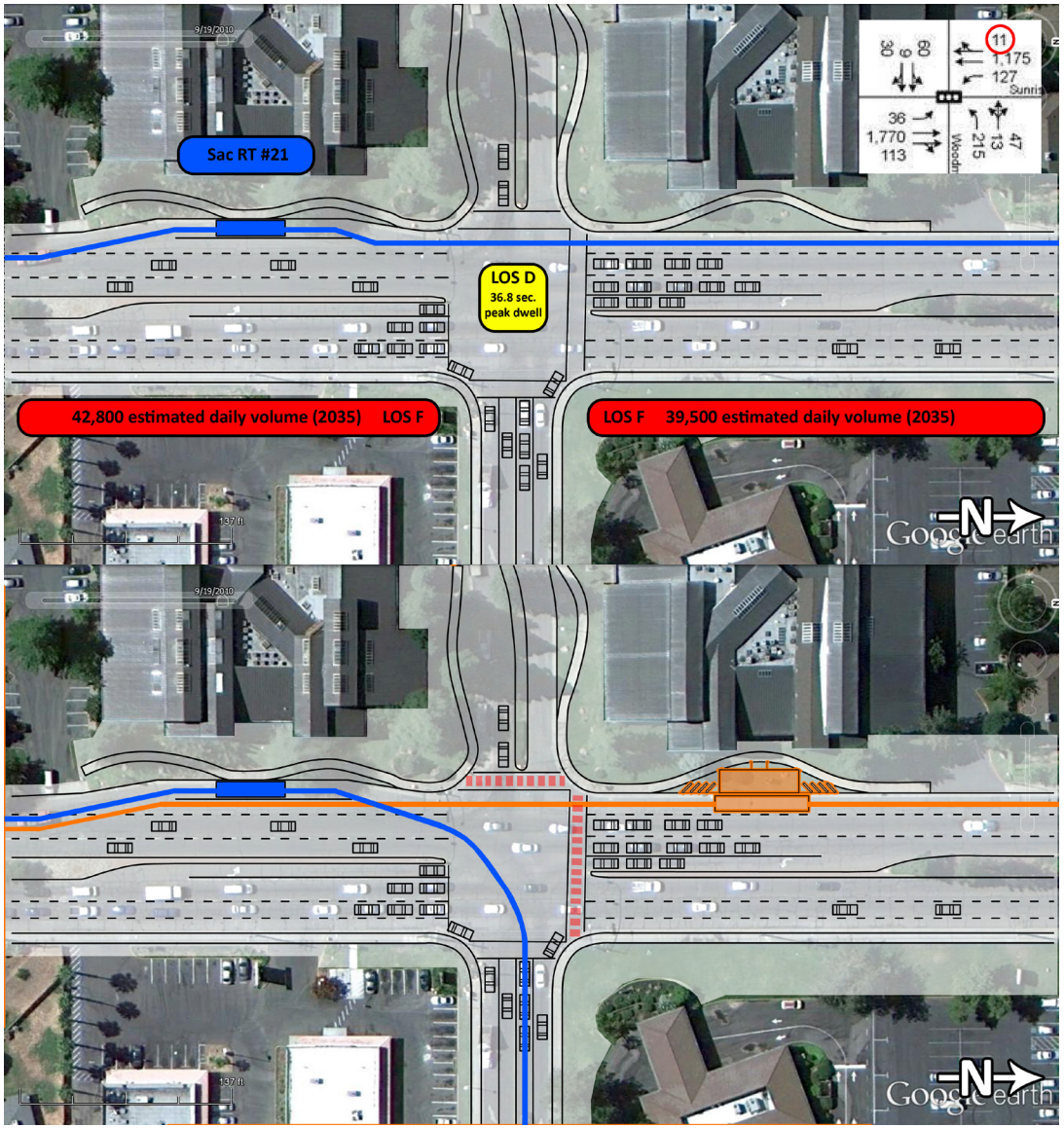


Fig. 3.11 Site Plan - Existing Roadway Conditions

Fig. 3.12 Site Plan - Proposed Design Intervention

Far-Side Stop: Sunrise Cirby Plaza (Southbound)

Figs. 3.13 - 3.15 Existing Site Photos

The Sunrise-Cirby intersection has a level of service F rating according to the city of Roseville's General Plan Background Report. With a stated 108 percent volume-to-capacity ratio, this intersection is more likely than not going to cause severe delays for any Southbound BRT vehicles. With a plaza entrance 200 feet from the nearside corner of the intersection and heavy right-turn traffic, a far-side stop linked with a nearside queue jump lane is proposed for rapid travel (see Fig. 3.17).

- By providing a lane in-between the road's right-turn lane and second leftmost through lane, a BRT vehicle is able to jump to the front of the queue and pass through the intersection before any of the adjacent lanes. This allows the bus to pick up passengers across the street and remain ahead of traffic during rush hour conditions.

- Vehicles are still able to make right turns under this scenario.

2 issues arise with this far-side scenario. The first is that a bus must conceivably stop twice at a given intersection in order to make it though, once at the queue jump and again at the station. Another is the existing right yield turn from Cirby onto Sunrise Southbound. Vehicles making right turns now have to watch out not only for crossing pedestrians but buses as well. Solutions to these problems include the implementation of rapid boarding measures at the BRT station in order to offset the added delay of stopping at the intersection and placing the BRT stop far enough from the intersection so that right turn vehicles can still pass through without being blocked by a stopped bus.

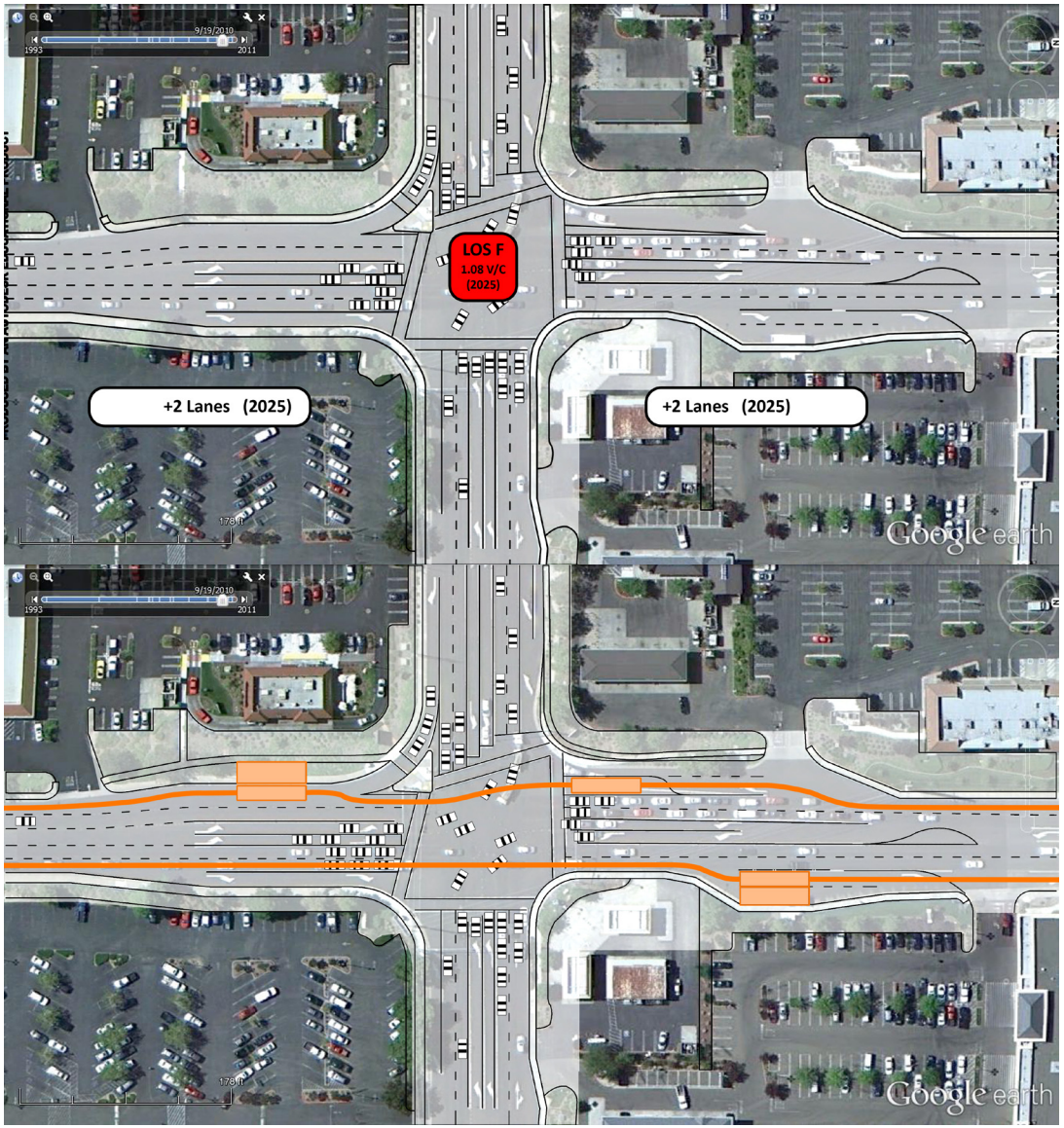


Fig. 3.16 Site Plan - Existing Roadway Conditions

Fig. 3.17 Site Plan - Proposed Design Intervention

Midblock Stop: Placer Town & Country Village (North & Southbound)

Figs. 3.18 - 3.20 Existing Site Photos

Placer Town & Country Village is a prime location for a midblock BRT stop for several reasons.

- Next to the Roseville Galleria, Douglas Boulevard is the city of Roseville's primary commercial area and employment center. Businesses along this major East-West running thoroughfare include the Kaiser Medical Center along with high-end restaurants and office buildings. Locating the BRT stop along the middle section of this northern-adjacent block provides plenty of staging area for transferring to local bus. From Roseville's local bus, a rider could travel east along Douglas or West connecting to the Interstate 80 onramp (see Fig. 3.22).

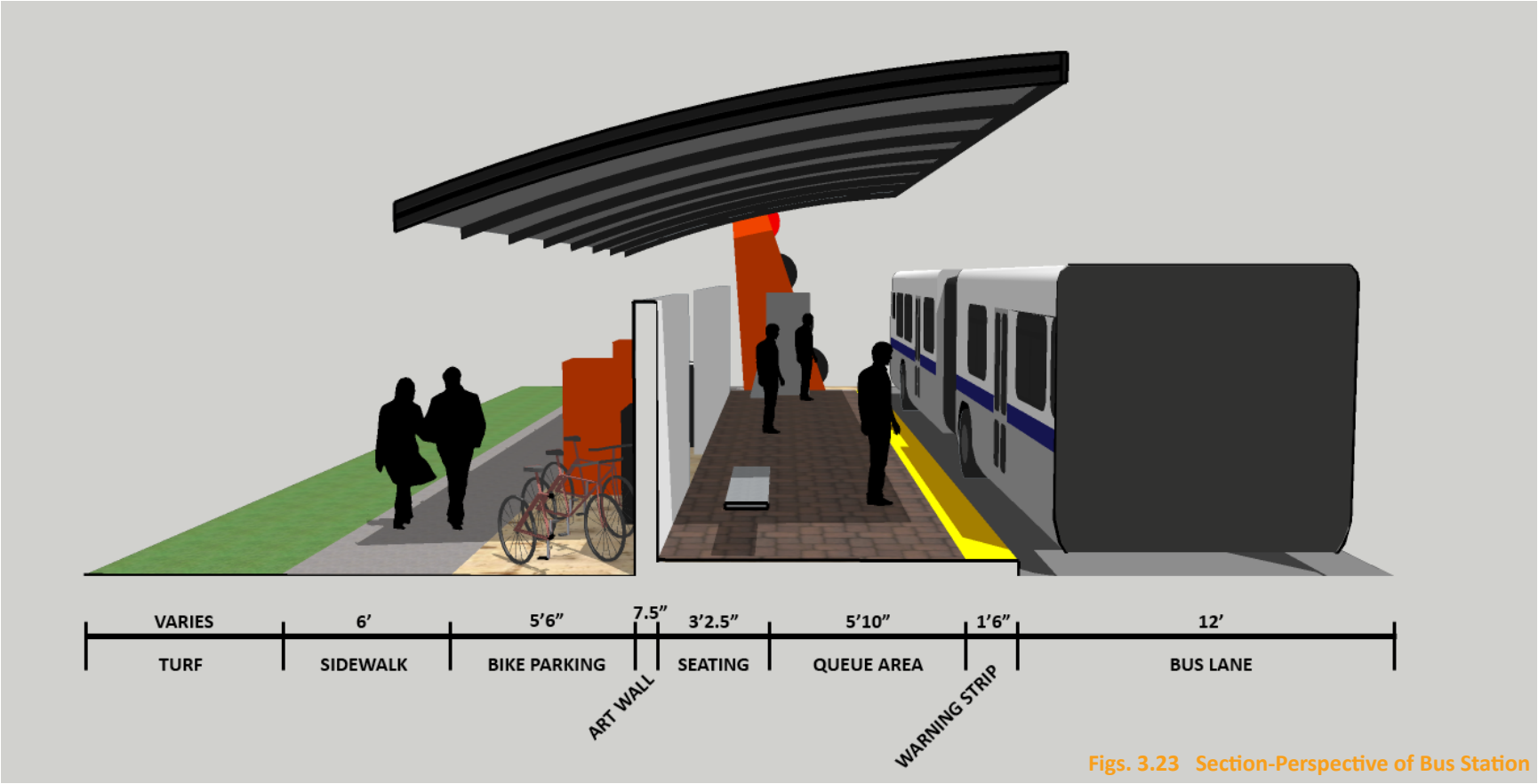
- Due to the lack of setback space and the drastic curvalinearity of Sunrise Blvd. as it intersects with Douglas Blvd., any near or far-side stops at the intersection would come with a set of major logistical issues

- This location being in the middle of the block makes arrivals and departures at the platform independent of traffic signal timing in the preceding and following intersections.

The only conceivable disadvantage with this location is the possible incentive for riders to J-walk who wish to cross the street without having to walk 600 feet down to the end of the block, cross the designated crosswalk and walk back up the block. The design for this location mitigates this risk by placing a pedestrian cross walk with manual signaling within close proximity of the midblock stop. This walk is aligned with the entrance of an undeveloped parcel of land on the road's west side.

Fig. 3.21 Site Plan - Existing Roadway Conditions

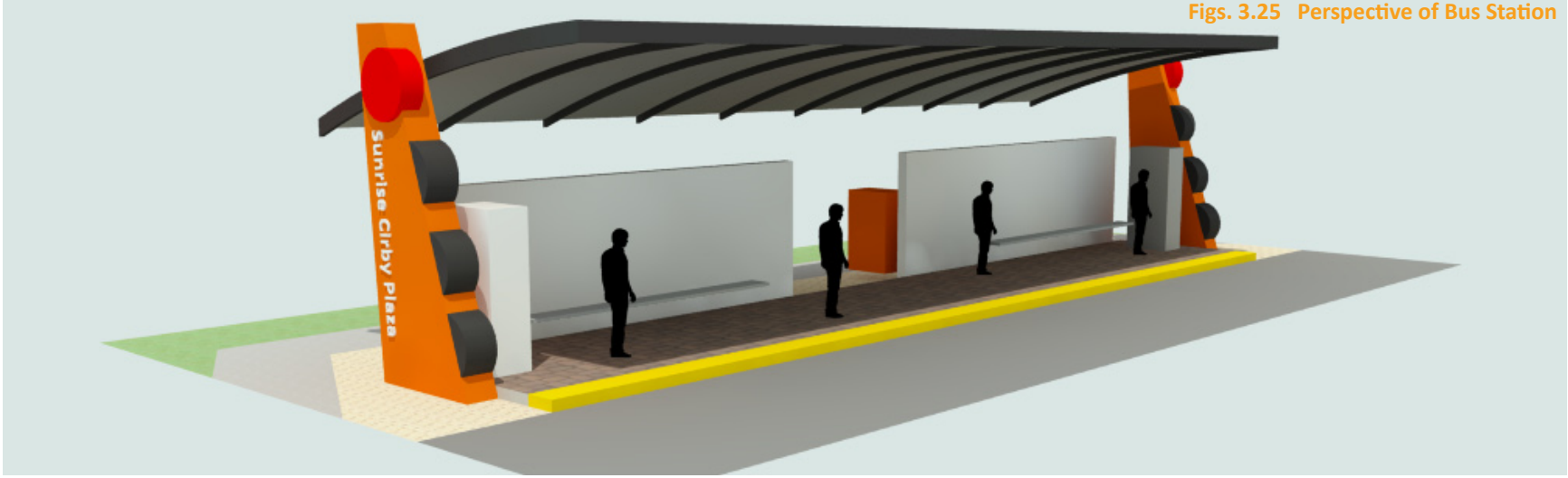
Fig. 3.22 Site Plan - Proposed Design Intervention



Figs. 3.23 Section-Perspective of Bus Station

The stations are conceptually designed to be universally applicable within any possible location along Surnrise Blvd. An emphasis is also placed on the aesthetic as well as a sense of permanence about the station that will attract the levels or ridership necessary to support this line. Because the limiting constraint to the construction of these stations will be depth from the road and not necessarily the width along it, the station is designed to keep its width at a maximum 16.5 feet measuring from the curb of the station platform to the edge of the bike parking and entrance into the shelter. Sitting at a C level of service rating constituting 7-10 square feet of personal space between passengers, one standard lenth of station has a designed max capacity of 48-54 people.

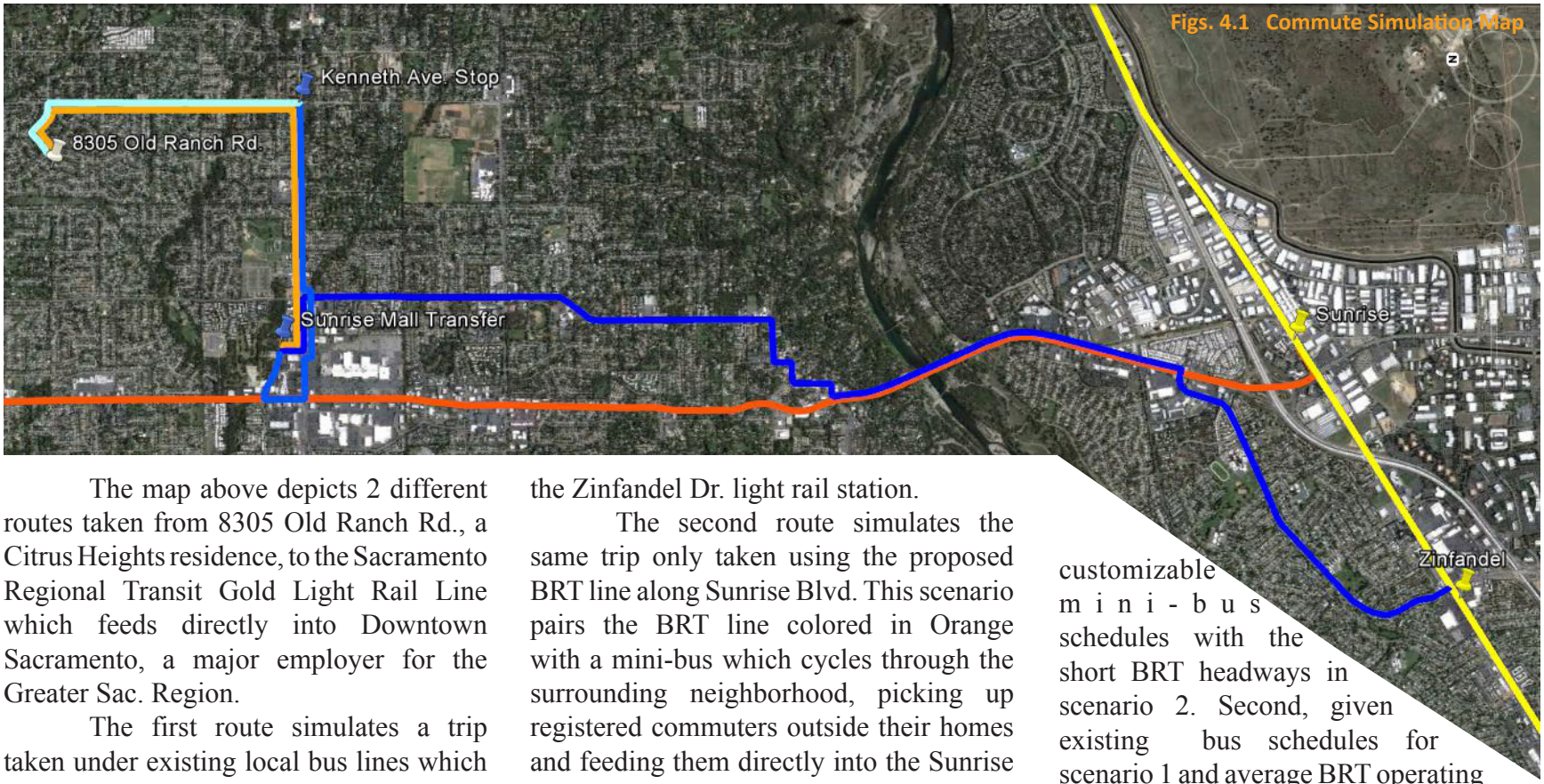
Figs. 3.24 Perspective of Bus Station



Figs. 3.25 Perspective of Bus Station

Analysis IV.

Goal 1: Commute line for Rancho Cordova, Fair Oaks and Citrus Heights



Figs. 4.1 Commute Simulation Map

The map above depicts 2 different routes taken from 8305 Old Ranch Rd., a Citrus Heights residence, to the Sacramento Regional Transit Gold Light Rail Line which feeds directly into Downtown Sacramento, a major employer for the Greater Sac. Region.

The first route simulates a trip taken under existing local bus lines which rely heavily on long dwell times between tranfers. Each trip segment inbetween transfers is divided by color, green representing a 1.5 mile bike ride to the SRT 24 Kenneth Ave. Stop, mid-blue showing the tail end of route 24 which terminates at the Sunrise Mall Transfer Stop and dark-blue representing Route 21 transfering at the Zinfandel Dr. light rail station.

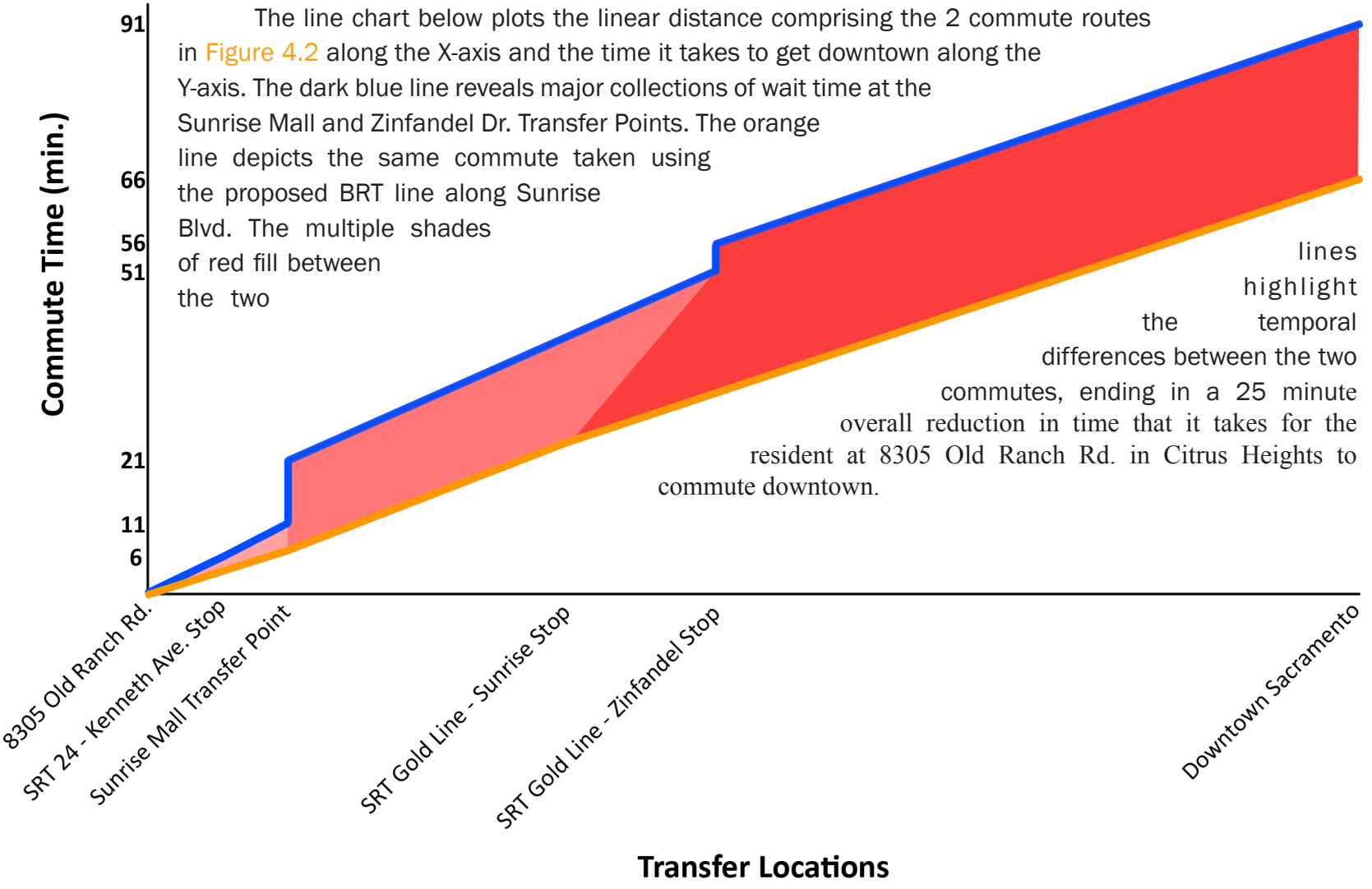
The second route simulates the same trip only taken using the proposed BRT line along Sunrise Blvd. This scenario pairs the BRT line colored in Orange with a mini-bus which cycles through the surrounding neighborhood, picking up registered commuters outside their homes and feeding them directly into the Sunrise Mall Transfer Station.

Both simulated routes are nearly equal in horizonatal length. However, a deeper analysis in Figure 4.1 takes 2 key differences into consideration.

The first is an assumed elimination in dwell time at the Sunrise Mall Transfer Station by strategically matching the customizable mini-bus schedules with the short BRT headways in scenario 2. Second, given existing bus schedules for scenario 1 and average BRT operating speeds for scenario 2, there is an estimated 5.5 m.p.h. difference between the standard buses and the BRT vehicles. The results show that the BRT route in scenario 2 is able to cut 25 minutes off of the resident's average commute from the Old Ranch Rd. address to their connection with light rail.

Figs. 4.2 Commute Simulation Line Graph

The line chart below plots the linear distance comprising the 2 commute routes in Figure 4.2 along the X-axis and the time it takes to get downtown along the Y-axis. The dark blue line reveals major collections of wait time at the Sunrise Mall and Zinfandel Dr. Transfer Points. The orange line depicts the same commute taken using the proposed BRT line along Sunrise Blvd. The multiple shades of red fill between the two lines highlight the temporal differences between the two commutes, ending in a 25 minute overall reduction in time that it takes for the resident at 8305 Old Ranch Rd. in Citrus Heights to commute downtown.

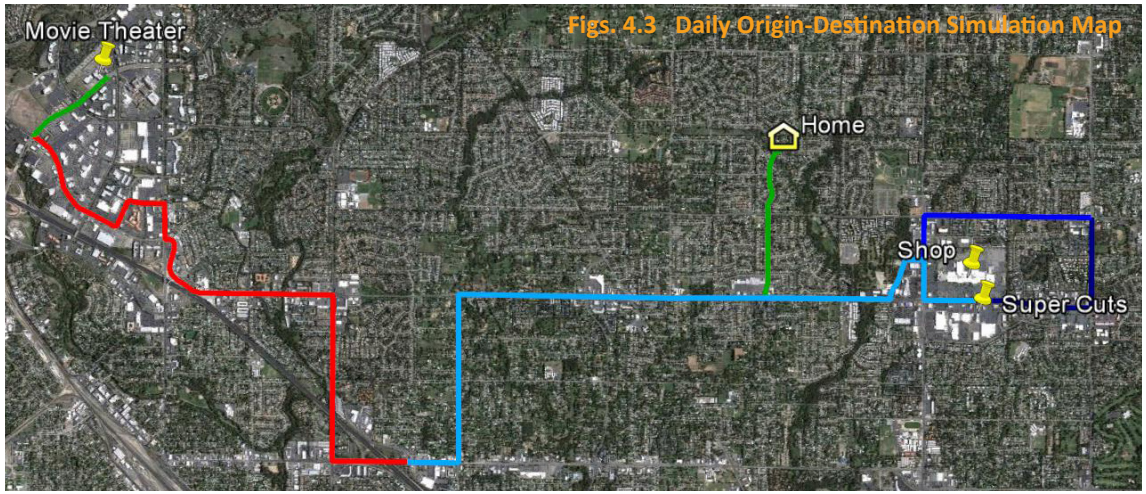


Goal 2: Quicker Transportation Between Adjacent Cities

Figure 4.3 maps out a simulated route which the resident at 8116 Hardwood Court in the town of Orangevale might take on some daily errands throughout the study area. This particular scenario has the resident make 3 consecutive stops, one at the closest barber: Supercuts, one at the closest footwear retailer: FleetFeet, and finally ending at the nearest movie theater: Century 14.

The challenge for this hypothetical resident is that they must take the local bus routes to each appointment. The only time the individual is allowed to deviate from transit is in biking to the nearest bus stop from his home and in walking any distance under a quarter of a mile between destinations.

Starting from his home, the individual must bike 1 mile west until he reaches the Southbound Locher Way stop on SRT's route 21. After experiencing a 3 minute delay the individual takes the 21 bus all of the way to Supercuts several miles down Sunrise. After a 30 minute haircut, the individual must wait 3 minutes before the next bus on route 24 picks



Figs. 4.3 Daily Origin-Destination Simulation Map

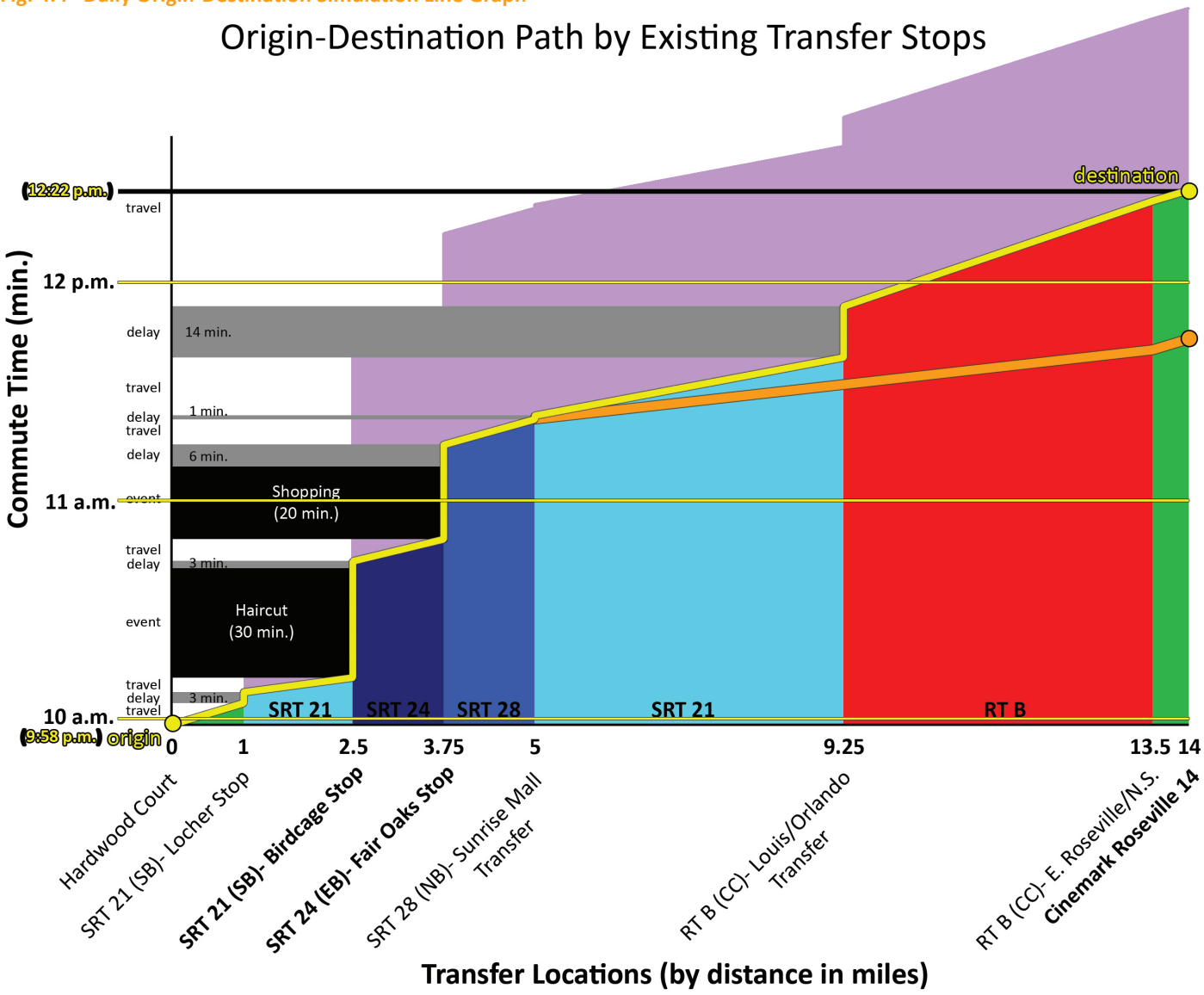
him up and takes him to Fleet Feet several miles East of Sunrise. After spending 20 minutes shopping for some new running shoes, the rider must wait 6 minutes before the next bus on the 28 line comes to take him to his next transfer stop at the Sunrise Mall. After a slight delay the rider is able to take SRT's 21 bus all the way down the line until it terminates at a connection stop with Roseville Transit. There is a 14 minute transfer before the rider is able to take Roseville's B route from the Louis/Orlando stop. Route B takes the rider to within several hundred feet of his final destination, Century 14 in Roseville.

The total trip is 14 miles in length, starting from 8116 Hardwood Court and ending at the Roseville theater. It took the rider 1 hour and 44 minutes in travel time and consisted of 4 different transfer throughout the journey, all of which grossed a total 27 minutes in dwell time waiting for the next bus, approximately 26 percent of the entire time spent moving.

Figure 4.4 is a line plot graph visually depicting the inter-city jouney taken via SRT's and RT's bus systems. Each vertical shade of blue and red corresponds to a different bus line which was used to make the trip. The horixontal black bars represent events participated in and horizontal grey bars represent periods of time waiting for the bus.

The purple back shade represents the amount of time the trip would've taken if the rider had missed his first bus, all other events and bus schedules remaining equal. The orange line depicts the amount of time the Sunrise BRT would've needed to make the same trip starting from the Sunrise Mall transfer

Fig. 4.4 Daily Origin-Destination Simulation Line Graph



Conclusion V.

Summary

There are 3 fundamental components for any urban design or intervention: the problem, the solution, and the implementation.

The study area analysis within Chapter 2 of this report clearly indicates that the Greater Sacramento Metropolitan area has a core issue with its urban and regional mobility which must be addressed. Blame cannot be held to any one government, organization or individual citizen for these circulation issues. The travel patterns inherent in the cities of Roseville, Citrus Heights, Fair Oaks and Rancho Cordova while unsustainable and inefficient possess within themselves perhaps one of the greatest opportunity which any group of communities should have no reluctance in taking. Great distances provide great opportunity to experience life. Low levels of development provide expansive spatial canvases on which these cities can truly build in their collective image. It is clear that with BRT at its core, public transit can enrich the urban existence for many individuals living within these communities.

If this report has done anything it has provided a vision, not for what BRT could be along Sunrise Blvd. but for what Sunrise Blvd. could be with BRT. However, there are a great deal of questions which must be further answered in order to assess the exact form which a Sunrise Blvd. BRT line could take. What would the expected number of riders be for this line, especially after imagining how this proposed BRT line could affect their daily lives? How should every inch of running way, station and vehicle be designed in order to provide the results needed at the cost appropriated?

Finally but perhaps most crucial is how this line will be implemented. Of all the things which should come to mind in the Transportation Planner's and Designer's head, it is the role of public participation which is the absolute, hand-down cornerstone which keeps this project capable of succeeding. Like was mentioned in the beginning, Bus Rapid Transit isn't light rail. It isn't a solution of technology which can perform with on-the-dime precision so long as it's bought. Likewise BRT isn't bus. It isn't a solution of frugality which gives the city the opportunity of moving many while spending little. The subtle nuance of BRT is that it can perform reliably, it can come in under budget, but first and foremost it cannot operate and do these things without a change in normative ways of thinking. There is a city that can move people around without a sea of asphalt. There is a trip which one can take that doesn't require the essentials of the car. There is connection with urban experience which every citizen can sustain. We just have to envision it.

Appendix

21 - SUNRISE - CITRUS HEIGHTS

Click for Route Map

Monday through Friday

Louis & Orlando To Mather/Mills Light Rail

Louis & Orlando	Sunrise & Old Auburn	Sunrise Mall Main Term	Trinity River & Coloma	Mather/Mills Lig Rail
		4:38a	4:55a	5:08a
		5:08a	5:25a	5:38a
		5:38a	5:55a	6:08a
		6:07a	6:24a	6:38a
6:22a	6:31a	6:38a	6:55a	7:09a
6:52a	7:01a	7:08a	7:25a	7:39a
7:22a	7:31a	7:38a	7:55a	8:09a
7:52a	8:01a	8:08a	8:25a	8:39a
8:22a	8:31a	8:38a	8:55a	9:09a
8:50a	8:59a	9:06a	9:24a	9:39a
9:22a	9:31a	9:38a	9:56a	10:11a
9:52a	10:01a	10:08a	10:26a	10:41a
10:22a	10:31a	10:38a	10:56a	11:11a
10:52a	11:01a	11:08a	11:26a	11:41a
11:22a	11:31a	11:38a	11:56a	12:11p
11:52a	12:01p	12:08p	12:26p	12:41p
12:18p	12:27p	12:34p	12:52p	1:07p
12:52p	1:01p	1:08p	1:26p	1:41p
1:22p	1:31p	1:38p	1:56p	2:11p
1:52p	2:01p	2:08p	2:26p	2:41p
2:22p	2:31p	2:38p	2:56p	3:11p
2:50p	2:59p	3:07p	3:25p	3:41p

23 - EL CAMINO

Click for Route Map

Monday through Friday

Sunrise Mall Main Term To Arden/Del Paso

Sunrise Mall Main Term	San Juan & Greenback	Fair Oaks & San Juan	Fair Oaks & Marconi	El Camino & Watt	El Camino & Fulton
5:07a	5:13a	5:21a	5:31a	5:43a	5:47a
5:47a	5:53a	6:01a	6:11a	6:23a	6:27a
6:10a	6:16a	6:24a	6:34a	6:46a	6:50a
6:37a	6:43a	6:51a	7:01a	7:13a	7:17a
7:02a	7:09a	7:18a	7:30a	7:42a	7:47a
7:32a	7:39a	7:48a	8:00a	8:12a	8:17a
8:02a	8:09a	8:18a	8:30a	8:42a	8:47a
8:31a	8:38a	8:47a	8:59a	9:11a	9:16a
9:02a	9:09a	9:18a	9:30a	9:42a	9:47a
9:34a	9:41a	9:49a	10:01a	10:13a	10:17a
10:19a	10:26a	10:34a	10:46a	10:58a	11:02a
10:34a	10:41a	10:49a	11:01a	11:13a	11:17a
11:19a	11:26a	11:34a	11:46a	11:58a	12:02p
11:34a	11:41a	11:49a	12:01p	12:13p	12:17p
12:19p	12:26p	12:34p	12:46p	12:58p	1:02p
12:34p	12:41p	12:49p	1:01p	1:13p	1:17p
1:19p	1:26p	1:34p	1:46p	1:58p	2:02p
1:49p	1:56p	2:05p	2:17p	2:29p	2:34p
2:14p	2:21p	2:30p	2:42p	2:54p	2:59p
				3:04p	3:09p
2:44p	2:51p	3:00p	3:12p	3:24p	3:29p
3:14p	3:21p	3:30p	3:42p	3:54p	3:59p
3:44p	3:51p	4:00p	4:12p	4:24p	4:29p
4:17p	4:24p	4:33p	4:45p	4:56p	5:01p
4:47p	4:54p	5:03p	5:15p	5:26p	5:31p
5:02p	5:09p	5:18p	5:30p	5:41p	5:46p
5:32p	5:39p	5:48p	6:00p	6:11p	6:16p
6:22p	6:29p	6:38p	6:48p	6:59p	7:03p
7:22p	7:28p	7:36p	7:46p	7:56p	8:00p
8:41p	8:47p	8:55p	9:05p	9:15p	9:19p

Monday through Friday

24 - MADISON - GREENBACK

Click for Route Map

Monday through Friday

Main & Madison To Sunrise Mall Main Term

Main & Madison	Greenback & Hazel	Sunrise Mall Main Term
8:06a	8:10a	8:18a
9:06a	9:10a	9:18a
10:06a	10:10a	10:18a
11:06a	11:10a	11:18a
12:06p	12:10p	12:18p
1:06p	1:10p	1:18p
2:06p	2:10p	2:18p
3:21p	3:25p	3:33p
4:21p	4:25p	4:33p
5:21p	5:25p	5:33p

Monday through Friday

Sunrise Mall Main Term To Main & Madison

Sunrise Mall Main Term	Madison & Fair Oaks	Madison & Hazel	Main & Madison
7:41a	7:49a	7:55a	8:01a
8:41a	8:49a	8:55a	9:01a
9:41a	9:49a	9:55a	10:01a
10:41a	10:49a	10:55a	11:01a
11:41a	11:49a	11:55a	12:01p
12:41p	12:49p	12:55p	1:01p
1:41p	1:49p	1:55p	2:01p

*These Bus Schedules were used in determining the calculations necessary for the 2 Transit Simulations

28 - FAIR OAKS - FOLSOM BLV

Click for Route Map

Monday through Friday

Sunrise Mall Main Term To Cordova Town Light Rail Station

Sunrise Mall Main Term	Fair Oaks & Madison	Sunrise & Zinfandel	Cordova Town Light Rail Station
5:18a	5:23a	5:38a	5:48a
5:58a	6:03a	6:18a	6:28a
6:28a	6:33a	6:48a	6:58a
6:58a	7:03a	7:18a	7:28a
7:28a	7:33a	7:48a	7:58a
8:28a	8:33a	8:48a	8:58a
9:28a	9:33a	9:48a	9:58a
10:28a	10:33a	10:48a	10:58a
11:28a	11:33a	11:48a	11:58a
12:28p	12:33p	12:48p	12:58p
1:28p	1:33p	1:48p	1:58p
2:28p	2:33p	2:48p	2:58p
3:28p	3:33p	3:48p	3:58p
4:28p	4:33p	4:48p	4:58p
5:28p	5:33p	5:48p	5:58p
6:28p	6:33p	6:48p	6:58p

Monday through Friday

Cordova Town Light Rail Station To Sunrise Mall Main Term

Cordova Town Light Rail Station	Sunrise & Zinfandel	Fair Oaks & Madison	Sunrise Mall Main Term

Bus Starts

DEPART Civic Center Transfer Point	Vernon at Judah	Riverside at 4th	Riverside before 6th	Riverside at Kenroy	DEPART Louis/ Orlando Transfer Point	Cirby at Riverside	Sunrise at Cirby	Sunrise before Coloma
6:13 a.m.	-:-	-:-	-:-	-:-	6:23 a.m.	-:-	-:-	-:-
6:43	-:-	-:-	-:-	-:-	6:53	-:-	-:-	-:-
7:13	-:-	-:-	-:-	-:-	7:23	-:-	-:-	-:-
Mon–Fri: every :13 and :43 after the hour (6:13 a.m. to 6:13 p.m.) *Sat: every :43 after the hour (8:43 a.m. to 4:43 p.m.)*					*Mon–Fri: every :23 and :53 after the hour (6:23 a.m. to 6:23 p.m.)* *Sat: every :53 after the hour (8:53 a.m. to 4:53 p.m.)*			
5:43 p.m.	-:-	-:-	-:-	-:-	**5:53 p.m.**	-:-	-:-	-:-

Bus Ends

N. Sunrise past Douglas	N. Sunrise before Lead Hill	N. Sunrise at Auto Mall	N. Sunrise at Eurkea	Sutter Roseville Medical Center	E. Roseville Pkwy. at N. Sunrise	E. Roseville Pkwy. at Taylor Rd.	ARRIVE Galleria Transfer Point	DEPART Galleria Transfer Point	Roseville Pkwy. at Reserve	Galleria Blvd. past Roseville Pkwy.	Atlantic at Center	Atlantic at Yosemite	ARRIVE Civic Center Transfer Point
-:-	-:-	-:-	-:-	-:-	-:-	-:-	6:55 a.m.	7:05 a.m.	-:-	-:-	-:-	-:-	7:13 a.m.
-:-	-:-	-:-	-:-	-:-	-:-	-:-	7:25	7:35	-:-	-:-	-:-	-:-	7:43
-:-	-:-	-:-	-:-	-:-	-:-	-:-	7:55	8:05	-:-	-:-	-:-	-:-	8:13

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Sunrise Boulevard - Existing Land Use

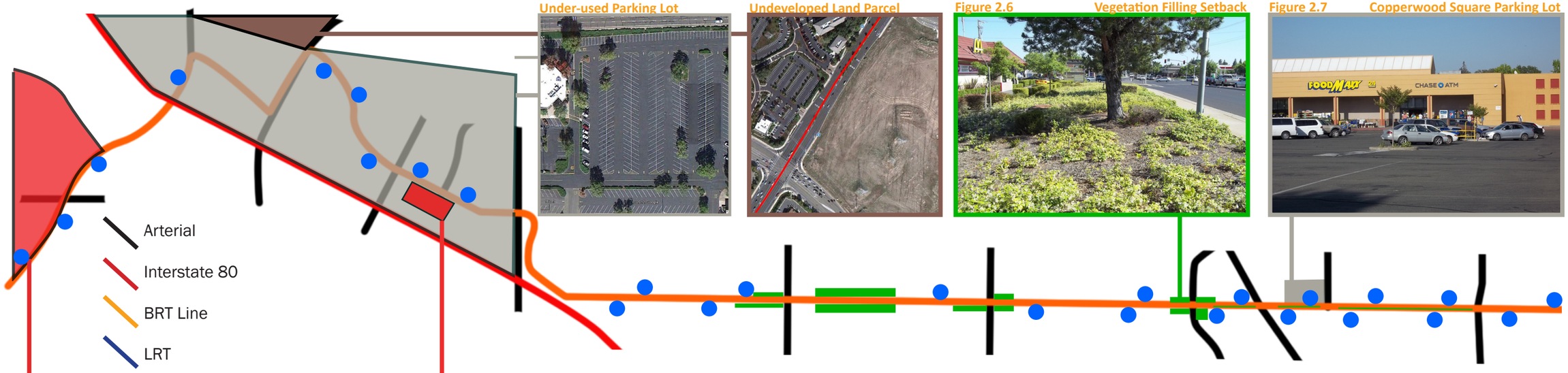


Figure 2.1 Sunrise Blvd. - Context Map

Figure 2.4
Under-used Parking Lot

Figure 2.5
Undeveloped Land Parcel

Figure 2.6 Vegetation Filling Setback

Figure 2.7 Copperwood Square Parking Lot

Figure 2.2 Roseville Galleria

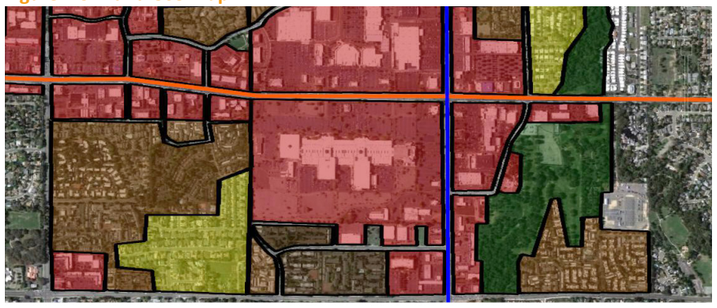
Figure 2.3 Fry's Electronics

Sunrise Blvd. runs through an area of the Greater Sacramento region that has a very suburban character with regards to land use and development. Major commercial development collects into shopping malls and plazas inside the corners of major arterial intersections (Figs. 2.7 & 2.11). Smaller retailers are further distributed along the sides of Sunrise Blvd. in the form of 6-12 retailer strip malls (Figs. 2.3 & 2.12). With commercial land use segregated towards the outer edges of urban blocks and residential subdivided within the center (Fig. 2.9), large quantities of space are devoted for automobiles in the form of multi-lane roads and parking lots which are either over congested or vacant during large portions of the day (Figs. 2.4, 2.7).

The Roseville Galleria, the region's largest commercial provider, resides at the Northern terminus of the proposed BRT route (Fig. 2.2). The route's southern end terminates at Sacramento Regional Transit's Sunrise Blvd. Light Rail Station (Fig. 2.11). This creates a direct connection between the 4 affected cities and an indirect connection between the 4 interconnected cities

Figure 2.8 Arcadia Dr. Transfer Point (SRT)

Figure 2.9 Land Use Map



and Downtown Sacramento via connection with SRT's Gold Line and a second indirect connection with the Sierra Nevada Mountain range via connection with Placer Transit.

Multiple opportunities are dispersed along the 14 miles of Sunrise Blvd. within the study area. There are numerous transit facilities in the form of shelters, transfer stations linked to other northern and southern cities and bus bays that can be converted into or used to accentuate new BRT facilities and infrastructure (Figs. 2.8 & 2.13). There are multiple acres of undeveloped and blighted land which can be developed or enhanced with this transit establishment acting as the catalyst (Figs. 2.5 & 2.10).

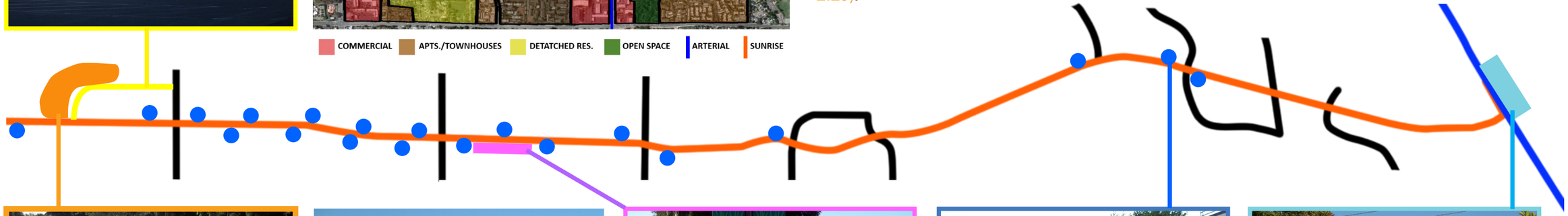


Figure 2.10 Sunrise Fun Center - Arcadia Dr.

Figure 2.11 Sunrise Mall

Figure 2.12 Sunrise Blvd./Madison Ave.

Figure 2.13 SRT Stop (Route 28)

Figure 2.14 SRT Gold Line (LRT) - Sunrise Station

The design for the Sunrise Boulevard route inherently changes the structure of the underlying transit system surrounding it. Within direct contact of Sunrise Blvd., there are 6 local bus lines operating under SRT which all converge onto the the Sunrise Mall Transfer Station and 9 local bus lines operating under RT which converge into the Galleria Station (Fig. 3.2). These lines operating in direct, all-stop services become very inefficient in travel time when spanning such one-way distances at 12 to 17 miles

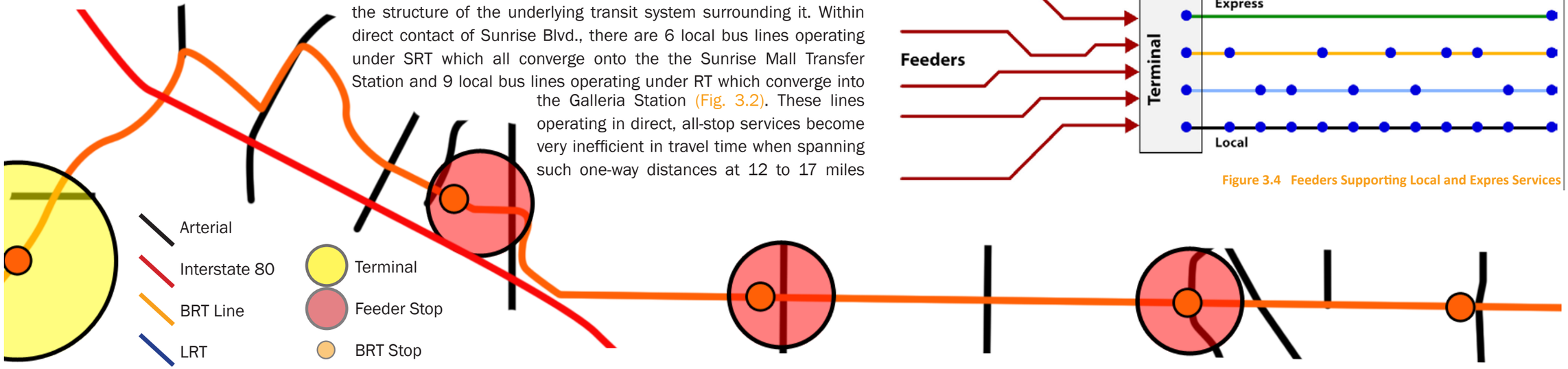


Figure 3.2 Sunrise Blvd. - Route Map

Figure 3.4 Feeders Supporting Local and Expres Services

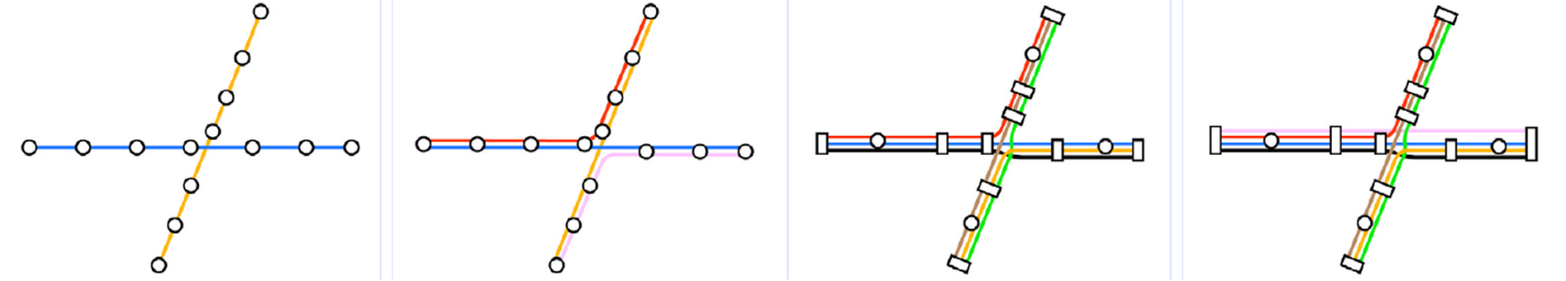


Figure 3.3a Local Service Only Figure 3.3b Added Routes Along Corridor Figure 3.3c Limited-Stop Services Figure 3.3d Express Services

(Fig. 3.3a). By inserting multiple routes (Fig. 3.3b), limited-stop (Fig. 3.3c) and express services (Fig. 3.3d) along Sunrise Blvd., those travelling many miles down the road won't have to spend extra time in getting there because of those travelling just a few miles. In this scheme, major transfer stations like the Galleria and Sunrise Mall stop become very instrumental in distinguishing transit riders by their separate travel purposes (Fig. 3.4).

With BRT at its core, in order to restructure travel patterns into becoming quicker and more convenient, service converts

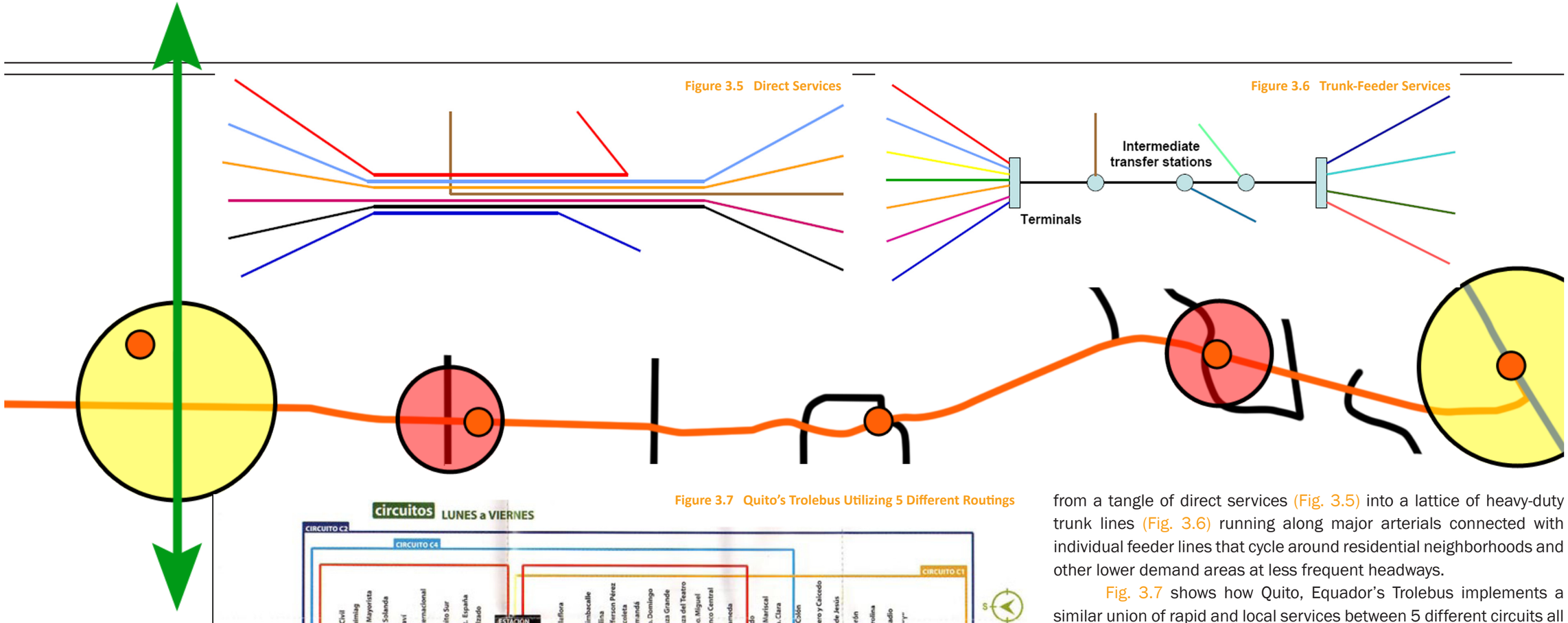


Figure 3.5 Direct Services

Figure 3.6 Trunk-Feeder Services

Figure 3.7 Quito's Trolebus Utilizing 5 Different Routings

from a tangle of direct services (Fig. 3.5) into a lattice of heavy-duty trunk lines (Fig. 3.6) running along major arterials connected with individual feeder lines that cycle around residential neighborhoods and other lower demand areas at less frequent headways.

Fig. 3.7 shows how Quito, Equador's Trolebus implements a similar union of rapid and local services between 5 different circuits all operating within the same corridor.