

WALKING
TOWARD
A HEALTHY
FUTURE



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WALKING TOWARD A HEALTHY FUTURE

Improving Public Health with Walkable Streets

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Senior Project

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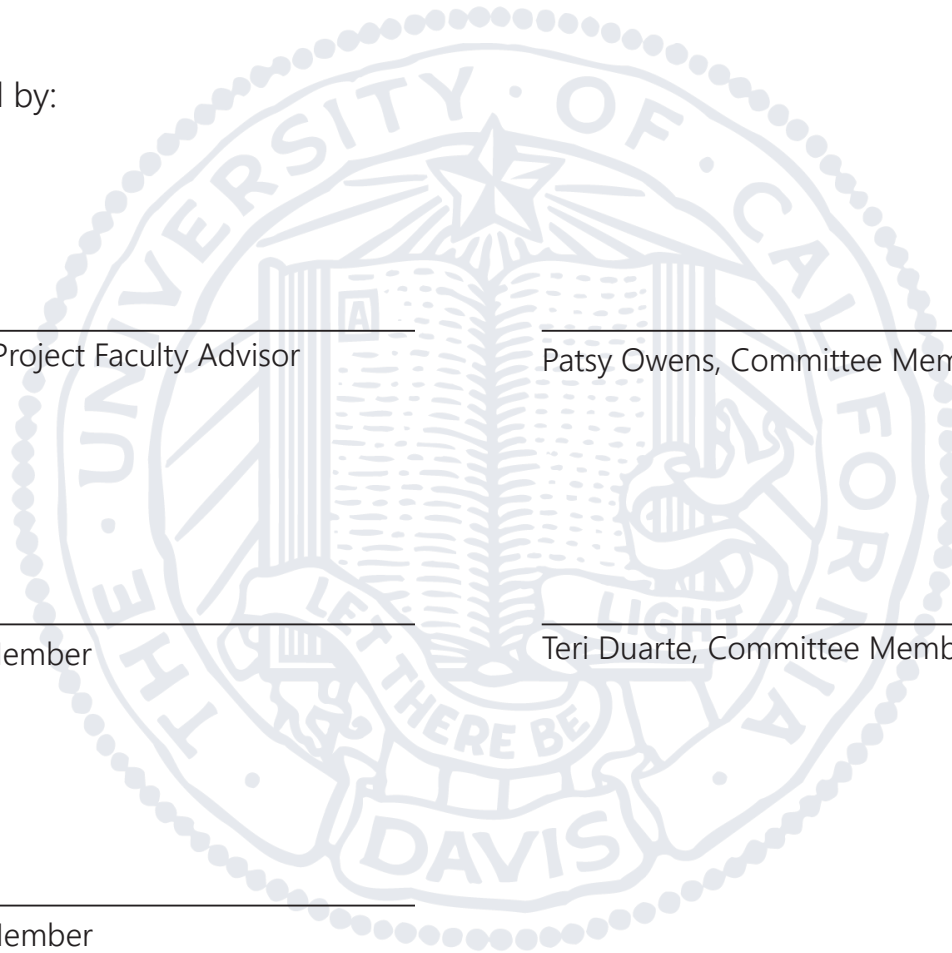
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Abstract

Americans face many health issues, and obesity is one of big health problems. The obesity rate in the United States increases every year and it leads to other diseases such as diabetes. Due to the vehicle oriented development in cities and suburbs, people in the U.S. choose cars as the primary mode of transportation in daily life. This project analyzes the issues of the current situation and suggests potential solutions for achieving safe, walkable neighborhoods in the Sacramento region. It is an example of how walkable streets can encourage people to walk and can reduce the risk of health problems, especially concerning obesity. This project provides general plans as a framework for the overall neighborhood around Stockton Boulevard and Fruitridge Road as well as specific site design in chosen locations.

Dedication

Thanks to my family for supporting me.

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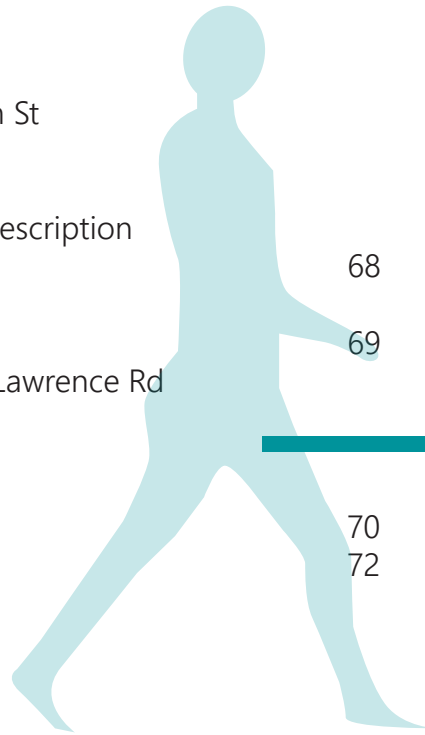
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Part One :
INTRODUCTION

Introduction

The United States has a low level of public health; this includes increased incidences of obesity and diabetes. A big reason why Americans have these problems is that people do not tend to walk, which means a large number of people use vehicles as a transportation method. It impacts on people's life styles. A low level of physical activity in a daily life directly relates to the public health; however, U.S. public health can be improved by creating walkable streets in neighborhoods. A good way to lower the obesity rate is to make a walkable community. However, in order to do this, the city must have the environment to allow for walking. The current urban layout encourages the use of cars as it separates the neighborhoods and city. In the neighborhood, people have nowhere to walk to other than houses. How can designers change this? A great land use mix is a big solution to encourage people to walk since the proximity to the stores from their residences is much closer than the distance from stores to a residence in the current zoning plans. Also, green streets and complete streets with a goal of achieving safety can boost the number of pedestrians and provide many benefits as well.



Figure 1.1 Walking

Objectives

The main objective of this project is to decrease obesity rates in the United States by encouraging exercise with an idea of increasing walkability of city streets. The aim is for Sacramento to be a model of a pedestrian-friendly city by implementing site designs in specific areas.

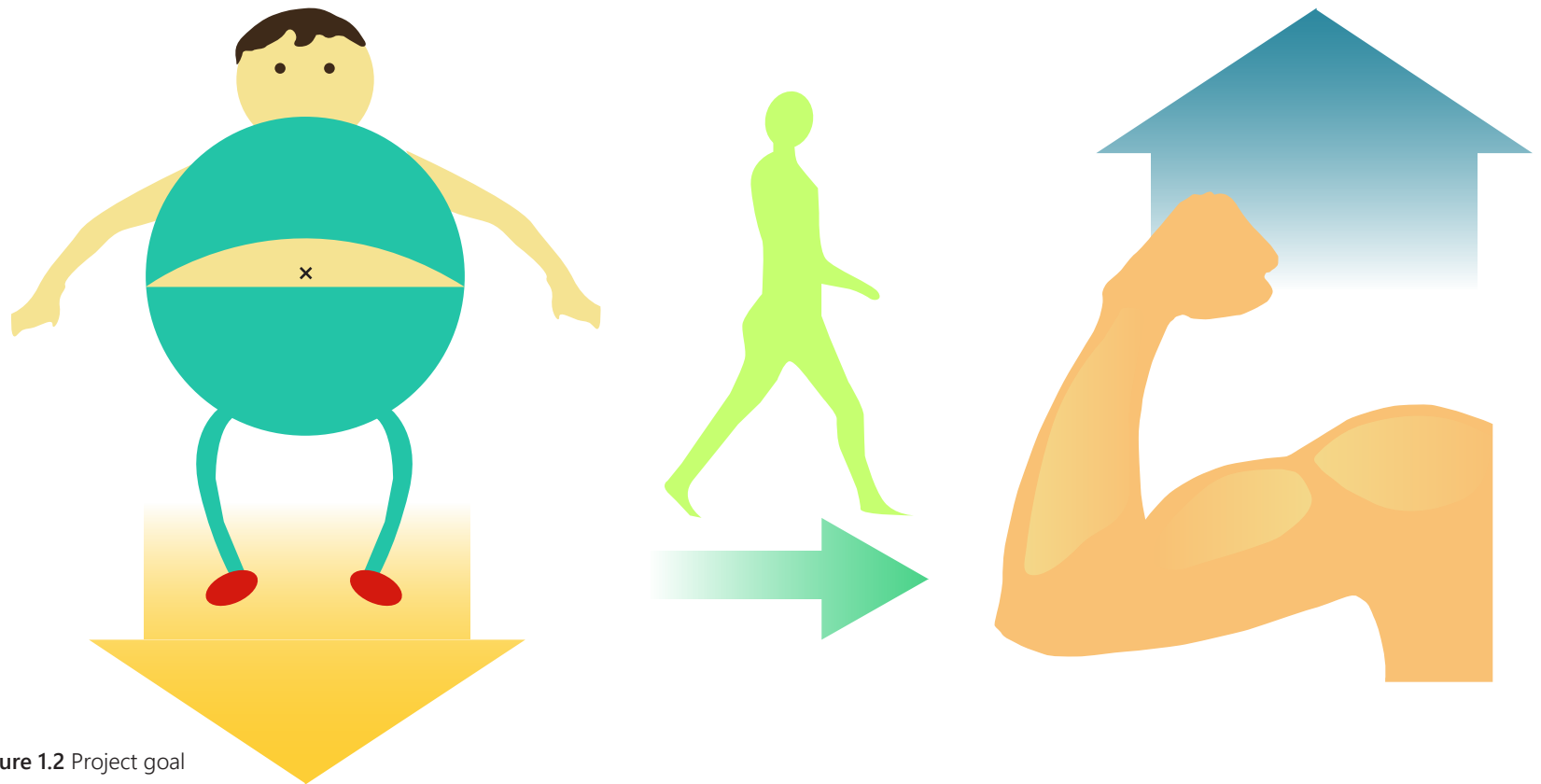


Figure 1.2 Project goal

Part Two :
ISSUES



Today's Landscape



Figure 2.1 Vehicle oriented plan



Figure 2.2 Shopping mall parking lot

Today, America's landscape is all about vehicles and drivers. People are dependent on automobiles instead of walking. Many residential areas are located miles away from work places, shopping districts, schools, recreation places, and cultural venues. This model of a city plan makes people spend less time walking on streets. The majority of shopping malls and retail shops are oriented toward automobiles instead of pedestrians. Typical suburbs often have a long, wide block of retail stores in one central location with an enormous parking lot that promotes automobile access. The parking lot size is often similar to the size of a football field. It is always located between a sidewalk and giant stores. Even the sidewalks are unpleasant, narrow, and usually dangerous. A long distance between these two is one reason why people hardly walk to the shopping center from the sidewalk. Many sidewalks also lack street trees that can provide shade as a resting place for pedestrians. In this condition, people do not want to walk on the streets especially in summer when the sun is hot.

In addition, parks, squares, and similar open spaces are often missing from today's commercial and residential districts. They are sometimes located or designed inappropriately and do not encourage pedestrian access. In the mid-20th century, many cities contributed funds to major park systems, but around the same time, residents were moving out of cities to suburban areas for a higher quality of life. Many of these suburbs lacked public facilities such as parks. Furthermore, the people who moved to the suburbs did not support their cities' decision to create recreation/public spaces by using public funds. This led to the suburbs having lower rates of walkability because people assumed there was nowhere within walking distance to visit or to have fun in their neighborhoods. This inappropriate development continues today and affects people's lives (Schmitz and Scully, 2006).

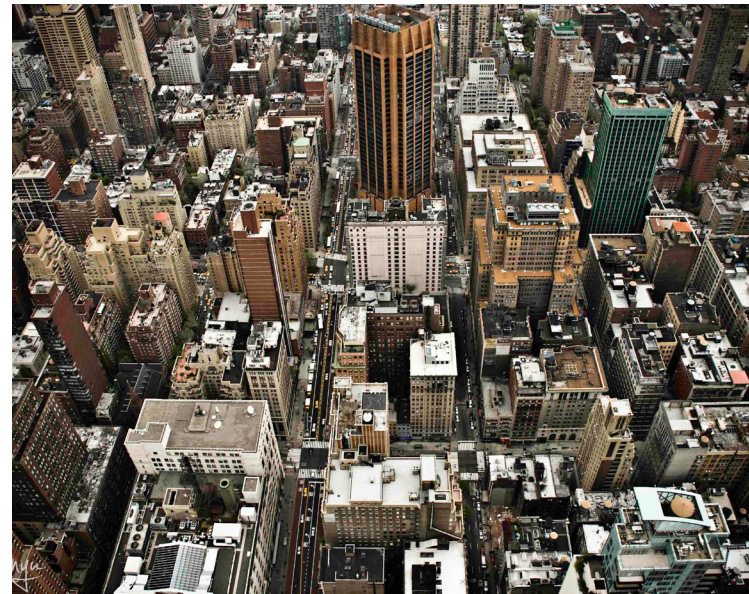


Figure 2.3 Aerial view of a city

Inactive Lifestyles



Figure 2.4 Inactive lifestyle

Less walking means people have less active lifestyles. Generally, 60 percent of Americans do not tend to participate in a physical activity on a regular basis, and 25 percent of them do not engage in any physical activity at all. Why do they not exercise more? Due to time constraints, people limit their physical activity and trying to find the fastest method of transportation, which is generally driving (Schmitz and Scully, 2006). Since 1950, sedentary jobs have increased about 83% compared to 25% of existing active jobs. Also, Americans' average work hours are about 47 hours a week which is 164 more hours a year than 20 years ago (American Health Association, 2013).

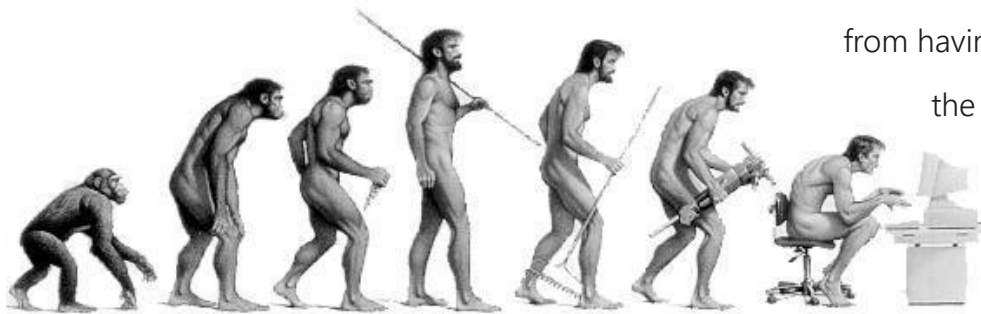


Figure 2.5 Sedentary lifestyle

Innovative technology plays a big role in discouraging people from having an active life. People watch television and surf the Internet for hours every day. Since people today can use technologies as faster transportation and leisure, they can easily be inactive at home. People unconsciously forget to care about their health, which involves walking.

The number of people who walk has declined in the last 50 years. In 1960, 9.9 percent of workers walked to work, but the percentage of walking decreased to 3.9 percent by 1990. By 2000, less than three percent of workers walked. This trend does not only apply to adults in the U.S.; children also walk less. Only about 13 percent of children walk to school (CDC, 2012). Parents point out that excessive distance, a poor walking environment, and unsafe sidewalks affect their children.

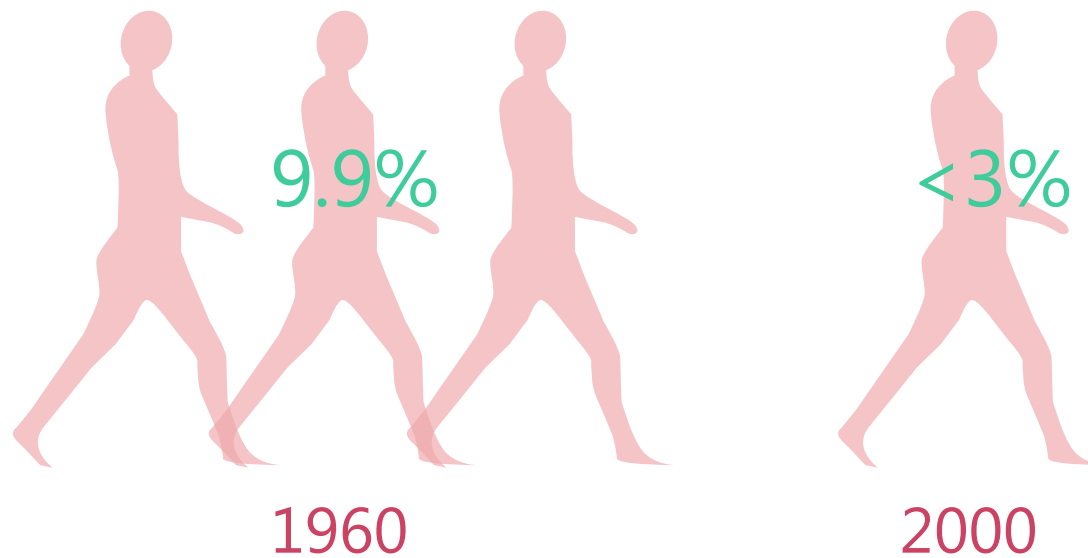


Figure 2.6 Decline of walking

Health Crisis

The United States faces a public health crisis. Vehicle oriented development contributes to inactive lifestyles, and this causes unhealthy body conditions. It has resulted in a rise of the percentage of the population in the U.S. that is overweight or obese (Schmitz and Scully, 2006). Obesity is a huge issue in this country because it is linked to a number of serious health problems such as diabetes and heart disease and can increase those risks by 20 to 30 times over people with a healthy weight. According to the Centers for Disease Control and Prevention, about 35 percent of U.S. adults are obese, and this number keeps increasing. California has lower rates of obesity than many other states, but if the current

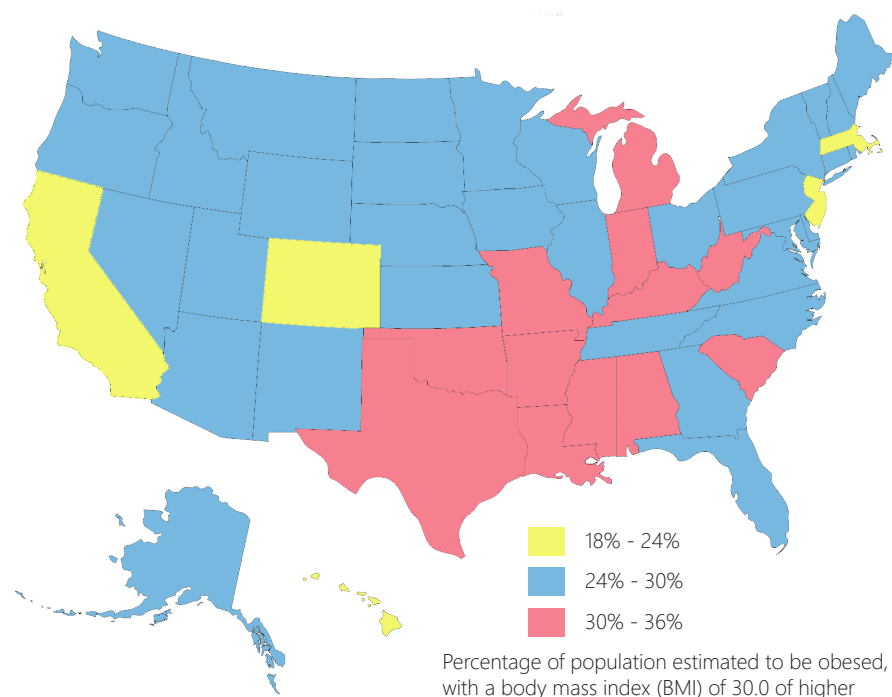


Figure 2.7 2012 US obesity map

trends continue, the obesity rate in California is expected to increase to 46.6 percent in 2030. The U.S. will face more type 2 diabetes, five million new cases of coronary heart disease and stroke, and more than 400,000 new cases of cancer associated with obesity (California Health Line, 2012).

It simply indicates that many Americans have a higher chance of health problems than those who have healthy life. For example, over 6.3 percent of the U.S. population is already diagnosed with type 2 diabetes which is one of the leading causes of death in the country (CDC, 2012).

Lack of physical activity not only causes physical health problems, but it also affects the mental health of people. As desirable places are located farther away from an individual's home, people more engage in indoor activities, blocking physical interaction. People with inactive lifestyles are more likely to have depression or dementia than people with active lifestyles (Gutierrez, 2008). Yet, drivers who travel more distances also are affected by this trend. As vehicles are the main mode of travel, this leads to more congested roads which affect a person's stress level (Untermann, 1984). Factors that make drivers get stressed are heavy traffic, making the brain work harder and traffic congestion that makes drivers annoyed.



Figure 2.8 Depression



Figure 2.9 Driving stress

A low level of mental health can influence physical health as well. There are many negative symptoms from high stress levels. The symptoms include obesity, headache, fatigue, and more, and the most common physical symptoms of stress are irritability (45 percent), fatigue (41 percent) and lack of energy or motivation (38 percent). According to the American Psychology Association, two-fifths of adults overeat or eat unhealthy food due to stress. A surprising fact was that about 38 percent of the people responded that they lost energy. It can be interpreted that people who polled experience a high

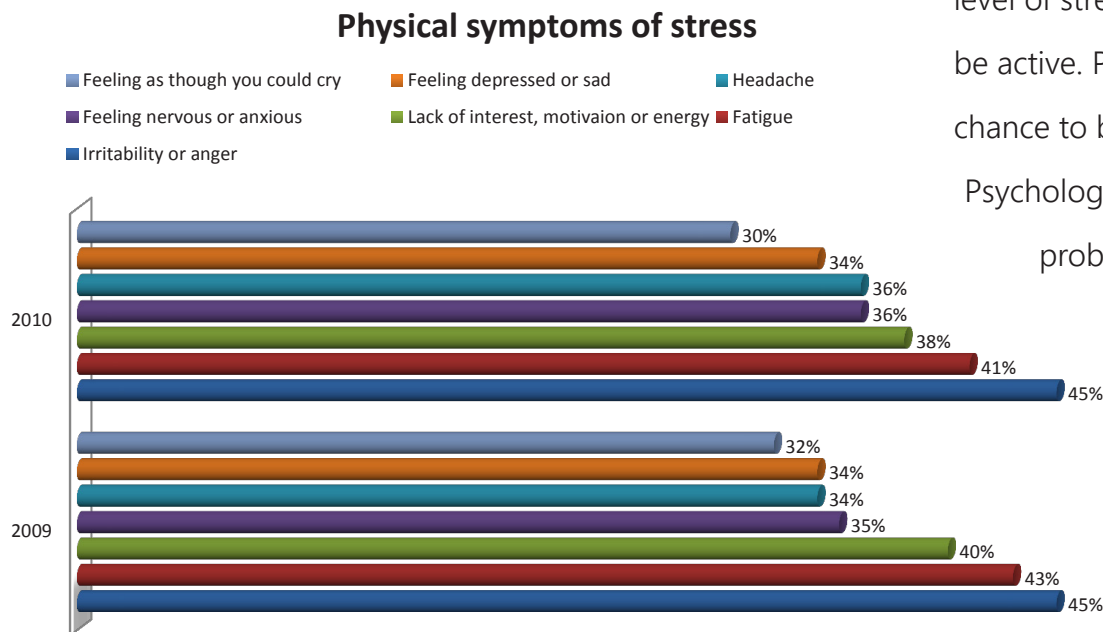


Figure 2.10 Graphs of physical symptoms of stress

level of stress easily lose motivation to exercise or be active. People in this situation can have a greater chance to become overweight and obese (American Psychological Association, 2010). This can be a problematic continuous cycle from inactive lifestyles to physical and mental health problems that lasts for decades.

Traffic Injuries and Fatalities

Less physical activity is not the only risk factor to the public health. A large number of pedestrians are injured or killed in automobile accidents in the United States. This is one of reasons that people do not tend to walk anymore. The current road system basically threatens pedestrians and they are afraid of walking on unsafe sidewalks. In 2010, there were 4,280 fatal accidents and 70,000 people were injured in car accidents involving pedestrians in the United States. On average, every two hours a pedestrian was killed and a person is injured every eight minutes.

In the relationship between land use patterns and traffic accidents, approximately 73 percent of pedestrian fatalities happened in an urban area versus a rural area. During the night, about 68 percent of the pedestrian fatalities occurred versus 32 percent occurred during the daytime (NHTSA, 2012).



Figure 2.11 Unsafe walking environment

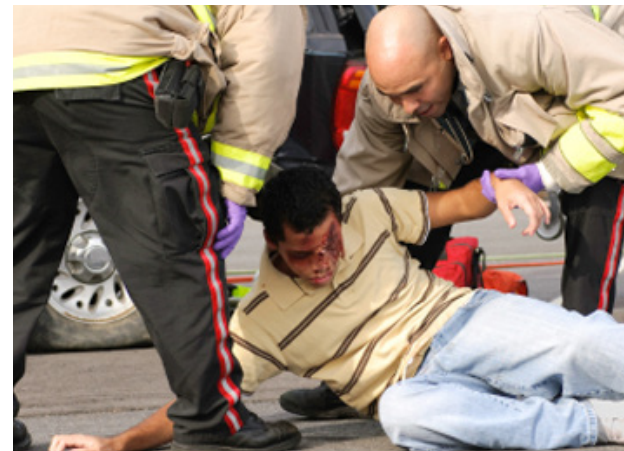


Figure 2.12 Pedestrian-car accident

How Much Activity Is Enough?



Physical activity is one way to increase people's well-being life. In this way, people do not need to worry about getting sick and will become healthier. To relieve the stress levels and other physical symptoms, people need to be active. How much activity is necessary to actually reduce these symptoms? According to Centers for Disease Control and Prevention, people need at least moderate-intensity aerobic activity, such as walking fast, about 2 hours and 30 minutes every week (CDC, 2012). It is suggested that people maintain active life styles, but this is not the case for most of the people, most of the time. It is not necessary for people to exercise all the suggested hours all at once. Ten to twenty minutes of walking a day can prevent health related problems. If their neighborhoods are more walkable, it will provide people with an opportunity to participate in physical activity on a daily basis.

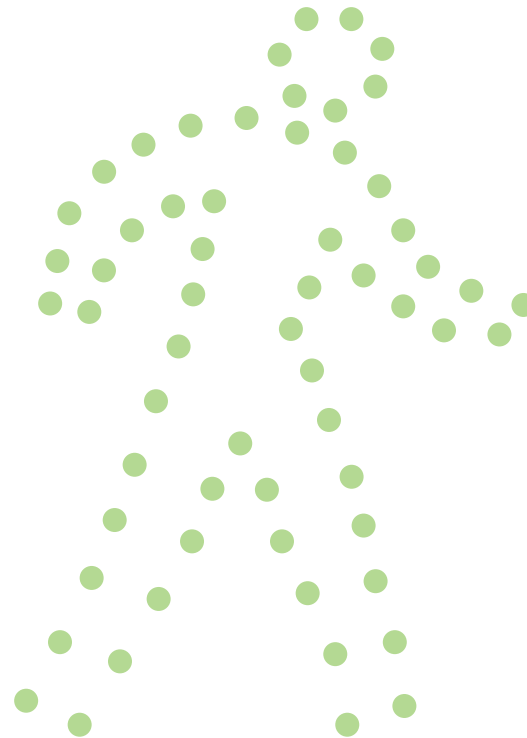
Figure 2.13 Required physical activity minutes

Part Three :
WALKABILITY



What is Walkability?

Walkability can be defined that “the physical distance an individual is willing to walk to get to places in their neighborhood including transit stops, parks, and shopping centers” (Walkabilitytool).



Walking is Important

Walking is a basic form of physical activity that is appropriate for all groups of people regardless of sex, ethnic group, age, education, and income level. It does not require any type of expensive equipment, skills, or special facilities. People can walk indoors, such as in shopping malls and on treadmills, or outdoor. (Lee and Buchner, 2008).

Walking is an effective method to improve public health. It helps to lose weight, strengthens hearts, and improves blood circulation through body. People who live in pedestrian-orientated areas tend to walk more and live healthier life styles than people who live in places where walking is difficult. It was found that residents in highly walkable neighborhoods engage in more physical activities that ultimately lead to weight loss. There were also weight differences between the residents of two different neighborhoods. Sixty percent of the people in a low-walkability area were overweight, compared to thirty five percent of the residents in a walkable neighborhood. Thirty five percent of the population in the walkable area is not a low number, but this research shows that walkable neighborhoods can encourage people to become involved in more physical activities. A walkable neighborhood plays a large role to improve people's health (Schmitz and Scully, 2006).

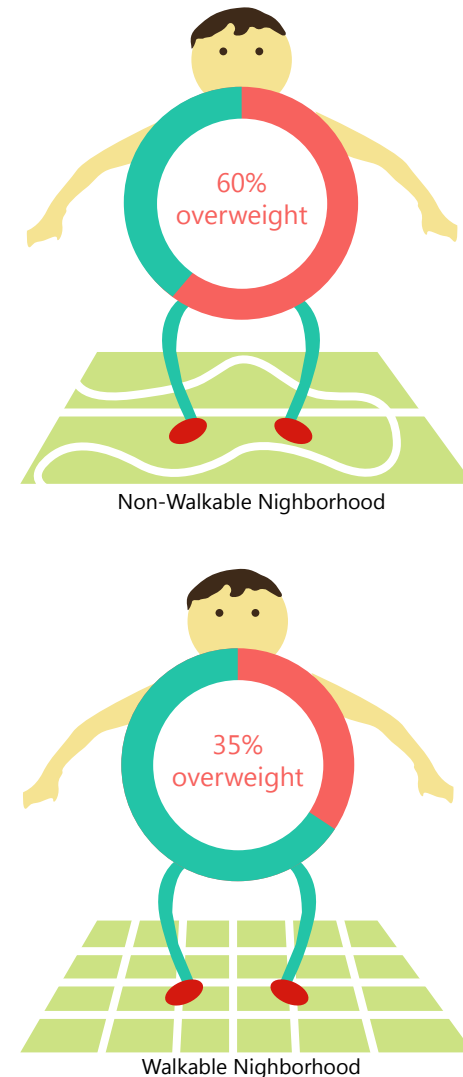


Figure 3.1 Overweight in walkable vs. non-walkable neighborhood

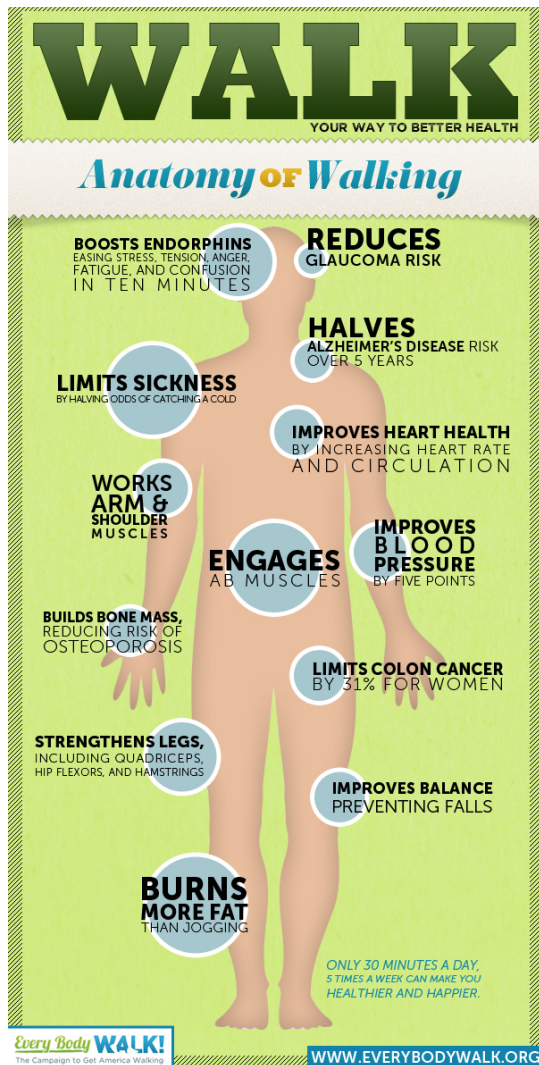


Figure 3.2 Effectiveness of walking on diseases

Walking not only can prevent obesity, but it also reduces the chances of getting other diseases such as type 2 diabetes and heart disease. Walking can prevent heart diseases. A heart is a muscle, and walking can strengthen that muscle, making it pump more efficiently, which means that the heart can carry more oxygen and nutrients to other body parts and organs (Beth Israel Deaconess Medical Center, 2010).

Also, adults with diabetes who walk at least a mile each day are less likely to get worse than inactive adults with diabetes. Further studies are needed for mental health outcomes related to walking, but a few studies indicate that walking can relieve mental symptoms such as depression and anxiety. For example, it can be associated with better cognitive performance at school or work (Collaborating For Health, 2012).

Since many studies found that physical activity, including walking, positively impacts people, researchers believe that blending exercise into daily routines—in the form of walking or biking to a certain destination—is the best method to get the daily activity needed (Schmitz and Scully, 2006). In this way, walking can reduce many health issues and people can enjoy their healthier life.

Other than health benefits, walking brings many economic advantages. People can save money on the cost of fuel. Today's gas prices are expensive but people cannot stop using a car due to vehicle oriented communities. If people save money on gas, they can spend it on other necessities like purchasing healthier food. Increased pedestrian circulation in community shopping areas can have benefits too. People will buy goods, shops get more business, and it creates more jobs (Untermann, 1984). Improving walkable communities also effects property values. Homebuyers are willing to pay more money for a house in walkable neighborhoods compared to a similar house in less walkable areas. For example, downtown Sacramento has higher property values than many other Sacramento areas. Downtown is more walkable compared

to South Sacramento because it has a grid system with a variety of green spaces, and there are many activities in which to participate. People want to live in a walkable neighborhood that has better connectivity to their desired places, has more green space, and safe streets with many pedestrians to socialize (Duarte, 2013). Walkable communities can also attract visitors or tourists. They come to the walkable places to experience views and entertainment. Many stores along walkable routes also have benefits from increased pedestrians.

Neighborhood	Fall 2005 Median Value	Spring 2012 Median Value	Percentage Depreciation	Walkability
City of Sacramento	\$363,333	\$149,100	-59.0%	Auto-Dependent
Newton Booth	\$410,900	\$296,233	-27.9%	Highly Wlkable
Midtown/Winn Park/ Capitol Ave	\$450,300	\$292,700	-35.0%	Highly Wlkable
New Era Park	\$393,433	\$246,833	-37.3%	Somewhat Walkable
Hollywood Park	\$350,000	\$208,967	-40.3%	Somewhat Walkable
Upper Land Park	\$466,967	\$274,967	-41.1%	Somewhat Walkable
Brentwood	\$312,067	\$107,167	-65.7%	Auto-Dependent
Robla	\$329,000	\$109,833	-66.6%	Auto-Dependent
Hagginwood	\$267,767	\$76,167	-71.6%	Auto-Dependent

Figure 3.3 Walkability and property values

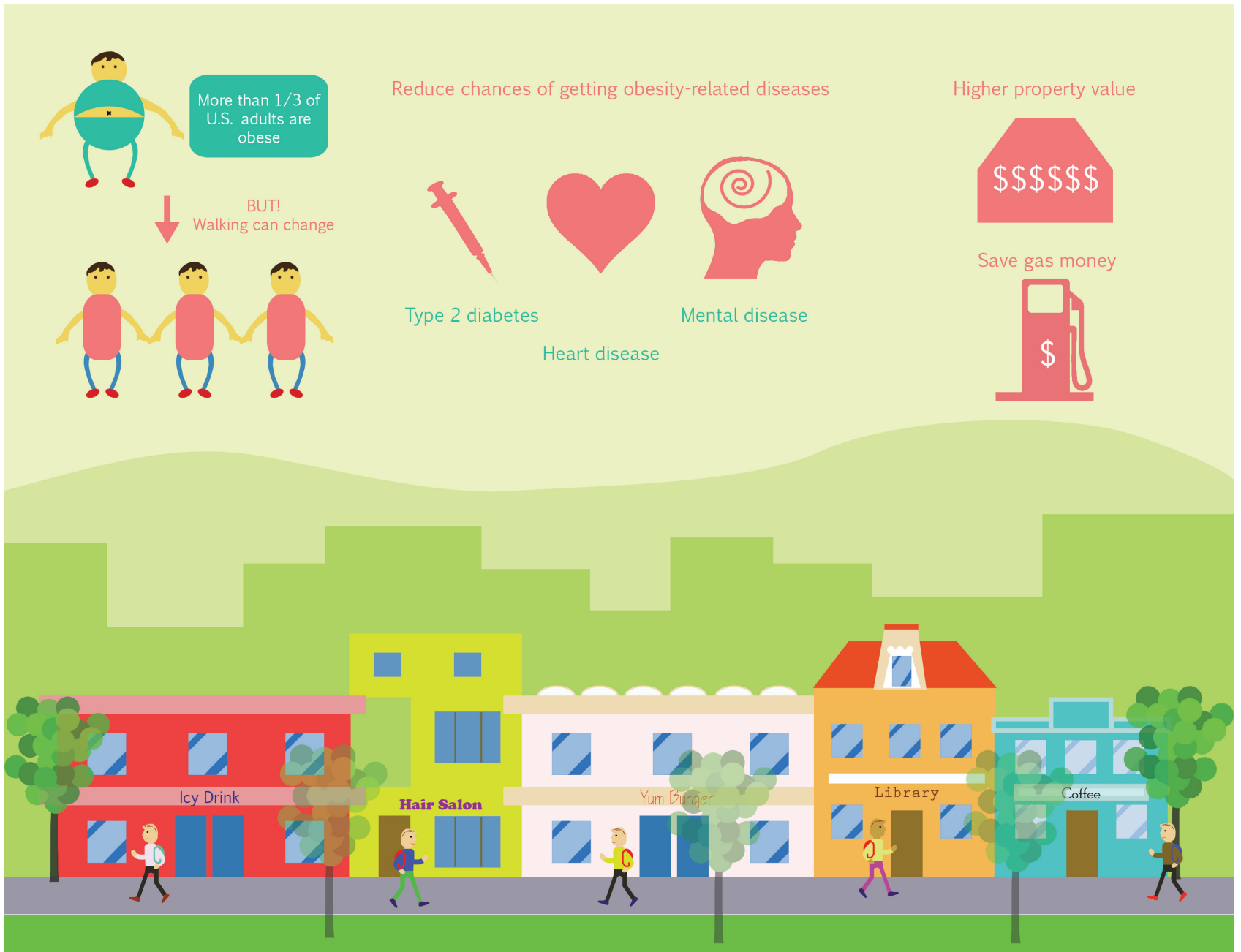


Figure 3.4 Benefits of walking

Part Four :
STRATEGIES



What Makes Walkable Places?

What makes a street and neighborhood walkable? To know how to make walkable streets, a landscape architect first should understand of means of streets and walking. From a book, Urban Design: Street and Square says that a street is not only a means of access, but also an area for social expression. People use a street as a social space in their community to talk with other people. This can lead to engaging and walking with other people (Moughtin, 1999). It is also important to understand what pedestrians need.



Figure 4.1 Social aspect of streets

Walking is simply done every day. People tend to walk if attending to a location where they want to go is easier, faster, or cheaper. Accommodating the Pedestrian says people walk because “walking can increase socialization, enhance health, contribute to recreation, and allow relaxation” (Untermann, 1984). Most people enjoy walking, sitting, watching other people, and talking in streets as long as the streets are safe and livable. People generally like to walk if other people walk on a street.

There are many ways to make streets walkable.

Destinations should attract people, walkers should be provided with safe street conditions, and distances from place to place should be close enough to walk (Schmitz and Scully, 2006).

More people prefer to walk in neighborhoods where there are safe sidewalks, mixed-use buildings, and activity involving people to people. Simply, enhancing walking experience can make people engage more in walking. Improving safety, convenience, and pleasure can motivate people to come out onto streets. Again, many of U.S. pedestrians get injured by vehicles each year. Thus, streets should convey a sense of safety to pedestrians. An example of safe streets includes plants as a boundary between the vehicles and pedestrians. Also, walking can be enhanced by removing obstacles on sidewalks and providing short access to desirable destinations such as shopping and work. Pedestrian furniture like benches, planters, and fountains can improve the visual experience and please pedestrians. In that way, a street will be a more vibrant public space (Untermann, 1984).



Figure 4.2 Safe walkway

Many books contain great ideas of how to make a walkable site. One of the resources is [The Smart Growth Manual](#). This gives technical guidelines on what factors a developer should consider when designing a street. A complete street is one example that shows how to make livable streets (Duany and Speck, 2010). They are designed for everyone to provide safe access. Complete streets contain three main ideas that include safe, comfortable, and convenient. [Great Streets](#) by Allan B.



Figure 4.3 Aesthetic street art

Jacobs, for example, mentioned that the street should be a comfortable place for people. They should provide pedestrians warmth or sunlight when it is cold and coolness when it is hot (Jacobs, 1993).

A video called, "Insight into a Lively Downtown" by Ann Arbor has a great observation of downtown Michigan. The main focus of her study was to bring people to the streets of downtown Michigan. She mostly used interviews and observation as methods to come to her conclusions. Her findings included that people tend to walk on the street if there are restaurants, coffee shops, or shopping stores. This emphasized that people need a purpose to walk, which means that people need a destination point. A lot of people are drawn by visual diversity on the street. For example, displays in stores and light decoration can grab pedestrians' attention. The bottom line is blocks should have vibrant and lively places to visit. In this way, the street can be livable and be a gathering place for people.

Characteristics of Walkable Community

Safe environment

Pedestrians should feel safe on the street. Sidewalks should be protected from automobiles. Cross walk signals should provide enough time for pedestrians to cross the intersections. Low vehicle speed is the key factor of safety.

Traffic calming examples include: Buffers or planting strips (Physically separates walking area from automobile, provides space for utilities, trees, or benches), curb extensions, speed bumps/tables, median strips, traffic signs, and well assigned street parking.



Figure 4.4 Median plant strip



Figure 4.5 Curb extension



Figure 4.6 Street parking as a barrier between cars and pedestrians



Figure 4.7 Mixed use buildings in Canada



Figure 4.8 Mixed use example

Mixed use zoning

Mixed use zoning is a blending of residential, commercial, institutional, and some of industrial uses. It generally increases density that provides more compact development.

It is efficient because this development reduces energy consumption, transportation costs, and vehicle uses. It creates unique places where people can live, work, play and meet everyday needs within a single neighborhood.

People are ultimately encouraged to walk and even bike in a neighborhood.

Retail stores such as coffee shops, restaurants, hair salons, dry cleanings, bakeries, clothing stores, and flower shops are located on the first story of buildings, and the upper levels of the buildings include offices and apartments where people work and live.

Public space

There are many places for people to play and associate with others within their neighborhood. The best neighborhoods have public space such as a park within 700 feet of all homes. It can be a focal point in a neighborhood where people gather.

Continuous systems/Connectivity

The walkways should be completely interconnected to destination points.

Short block

Block length is an important element of streets to increase walkability. Pedestrians prefer short block lengths that allow for increased opportunities for crossing and give more routes. An average of 200 to 400 feet of block lengths is recommended (Perry, 2013).



Figure 4.9 Public park in a city

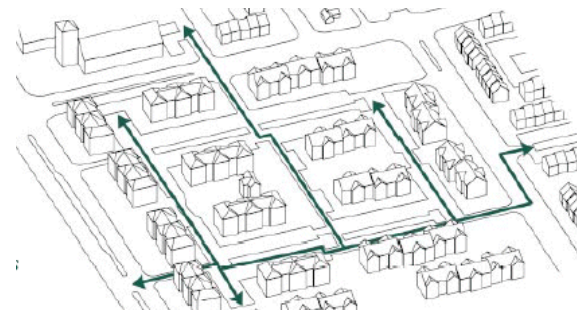


Figure 4.10 Connectivity

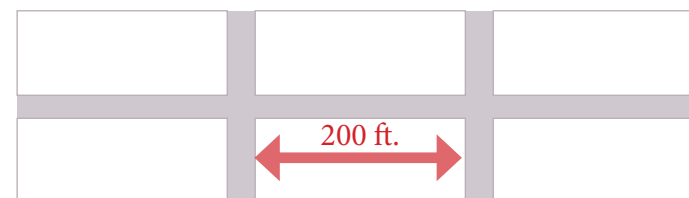


Figure 4.11 Block distance



Figure 4.12 Street furnishings



Figure 4.13 Stormwater planter

Pedestrian furnishings

Street furnishings are important amenities that welcome pedestrians and provide a comfortable place. A good street has furnishings such as benches, lightings, drinking fountains, artwork, and architectural building facades. Attractive features can attract pedestrians' eyes.

Trees

Street trees provide many benefits. It enhances streetscape character, provides safe and pleasing pathways, and improves environment.

Environmental aspects

- Provide habitat for wildlife
- Reduce stormwater runoff
- Provide shade
- Improve air quality

Transportation

- Slow down traffic speed

Aesthetics and beauty

- Add visual interest
- Soften the urban landscape
- Remind us of natural cycles and changing seasons

Part Five :

CASE STUDIES

A few case studies can be used as a guideline for this project to improve walkability in the area of Stockton Blvd and Fruitridge Rd in Sacramento CA.

Baxter Village in Fort Mill, South Carolina



Figure 5.1 Baxter Town Center



Figure 5.2 Baxter Village

Baxter Village is one of walkable communities that provide all residents' daily needs within the neighborhood. It is located in Fort Mill, South Carolina. In 1997, the Clear Springs Development Company started to develop Baxter Village with an idea of Traditional Neighborhood Design (TND). TND and New Urbanism projects are pedestrian oriented developments. This neighborhood has a shopping, restaurants, and all other facilities in a walking distance. Also, a design goal was to minimize the environmental impact of the development. People wanted Baxter Village to blend into the natural surroundings. This pedestrian friendly community has narrow vehicle roads. Sidewalks have planting strips on both sides of almost all streets. All homes have an easy access to the town center, the elementary school, and recreational venues. The design of Baxter Village is a successful case of improving walkability in the community (Baxter Village, 2013).

City Height Urban Village in San Diego, California

Another case study is found in San Diego, California. City Height Urban Village is a successful mixed-use development project that improves walkability. City Height was developed in the early 20th century as a neighborhood of single family homes. But, after the 1980s, middle class residents left the town and City Height became a lower-income community. This led to higher levels of crime and drugs in the area. In the early 1990s, the City Height Urban Village project was developed to change these declines. Its plan was to create a focal point for the community, a safe place, accessible retail, and community services. Since this community used to have high rates of crime, making a safe place was a big challenge (Schmitz and Scully, 2006). Designers included large open spaces to increase a sense of “eyes on the street” to reduce the crime rates. This Urban Village is a case study that lowers the crime rates and increases the number of pedestrians both in the daytime and in the evenings. This can give an effective guideline for South Sacramento, as it has similar conditions to those of the City Height neighborhood.



Figure 5.3 City Height Urban Village



Part Six :
DESIGN

The Site

The site of this senior project is an area in Sacramento located on Stockton Boulevard between the Morrison Creek and P Street. The design portion primarily focuses on a concept design of a few sites around Stockton Blvd and Fruitridge Road.

According to data from the US Census, Sacramento County has a population of approximately one million. The primary age group is 18 and over, and Caucasian is the dominating race in the study area (Census, 2010). The average income of households in the area is generally low, but some districts—in this case districts are based on zip codes—have a higher average income than others (City Data, 2009).

By observing the site, it seems like the current condition of Stockton Blvd and the surrounding neighborhood discourages people to walk. Toward Fruitridge Rd from

Stockton Blvd, some planter strips and median strips are located, but it seems that they do not create a safe atmosphere for pedestrians. The sidewalks are narrow, unsafe, and unpleasing. Stores on Stockton Blvd are often closed down and not near the sidewalk, so people have to travel farther to get to the stores. Also, there is not a main destination in the area. Stores are scattered, so shoppers have to drive instead of walking. The neighborhood seems menacing because a lot of homeless or poor people that ask for money from anyone walking on the street. The vehicles actually travel faster than the speed limit, 35 miles/hour, so pedestrians feel unsafe walking along or crossing the street. This area currently has poor conditions, but this provides various opportunities to improve Stockton Blvd into a walkable and livable place.

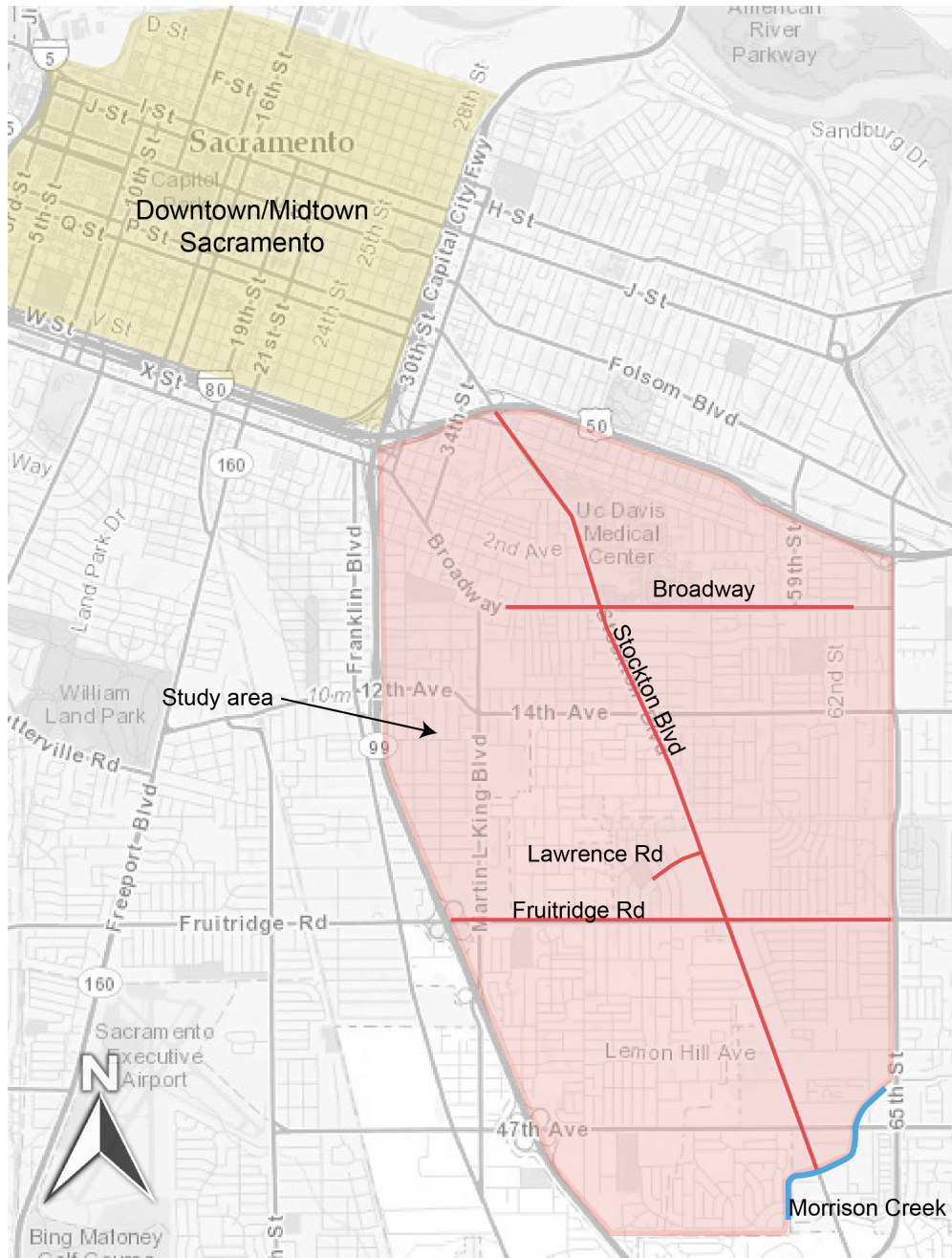
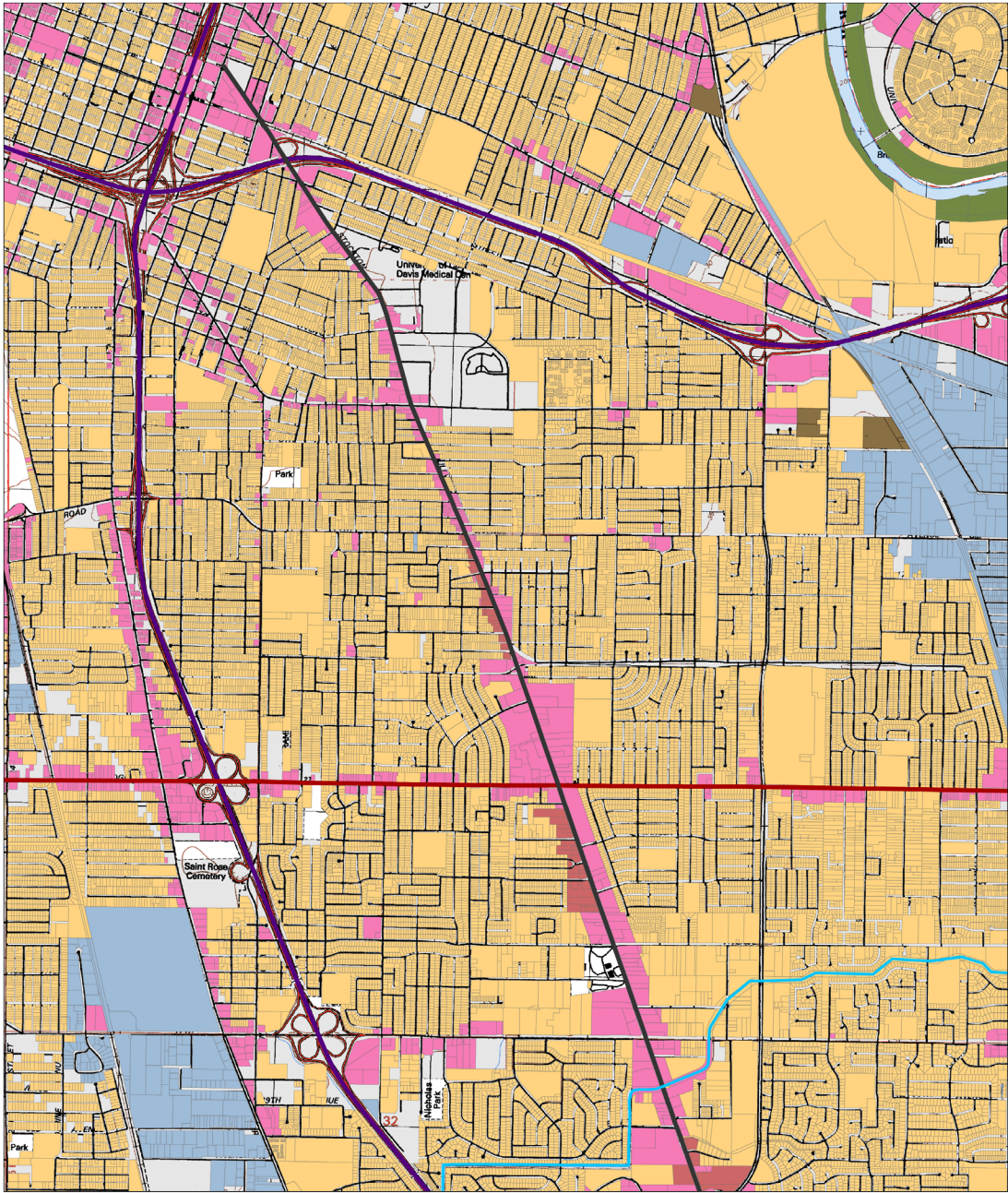


Figure 6.1 Context map of the study area (Sacramento)



Figure 6.2 Existing conditions in the study area



Legend

- Residential Land Use Zone
- Agricultural Land Use Zone
- Agricultural-Residential Land Use Zone
- Commercial Land Use Zone
- Special Land Use Zone
- Industrial Land Use Zone
- Fruitridge Rd
- Stockton Blvd
- Freeways



Land Use Map

Figure 6.3 Land use map (GIS)

Site Analysis

Public parks play an important role in a neighborhood as a function of improving human life. People have more opportunities to walk and exercise to enhance their physical and mental health because a park is a destination point for many people to gather. The green represents the existing parks in the study area. The neighborhood in the area has a low number of public parks. It means that people do not have places to go to relax and enjoy their spare time with green nature.

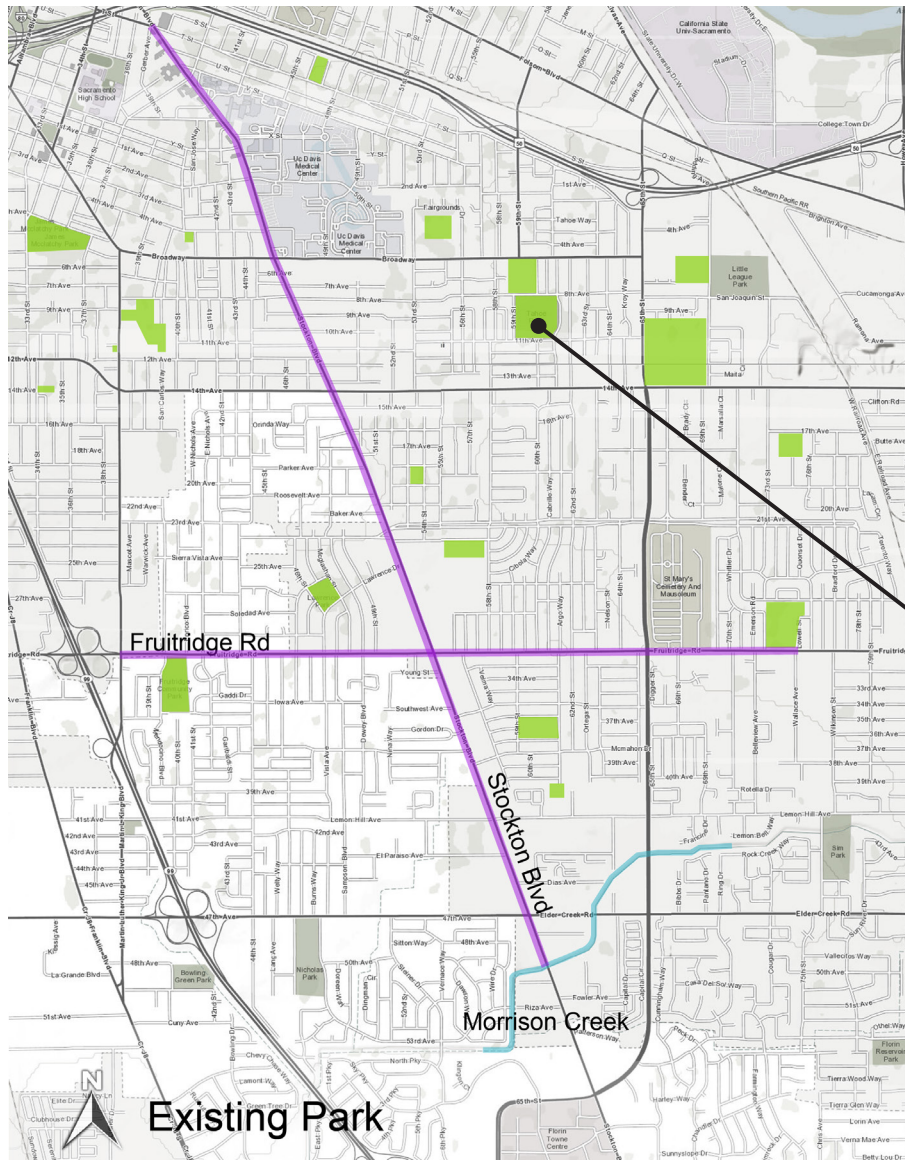


Figure 6.4 Map of existing park



Figure 6.5 Tahoe Park in Sacramento CA

Site Analysis

- UC Davis Medical Center is located along Stockton Boulevard, close to downtown Sacramento, and its surrounding has a fairly clean and healthy condition of streets. For example, the street around the medical center has more plants than the other parts of the study area.
- There is only one public library in the neighborhood.
- The farmer's market opens every Thursday at 8 AM to noon at the parking lot of Florin Sears and it is open all year.



Figure 6.6 Florin farmer's market

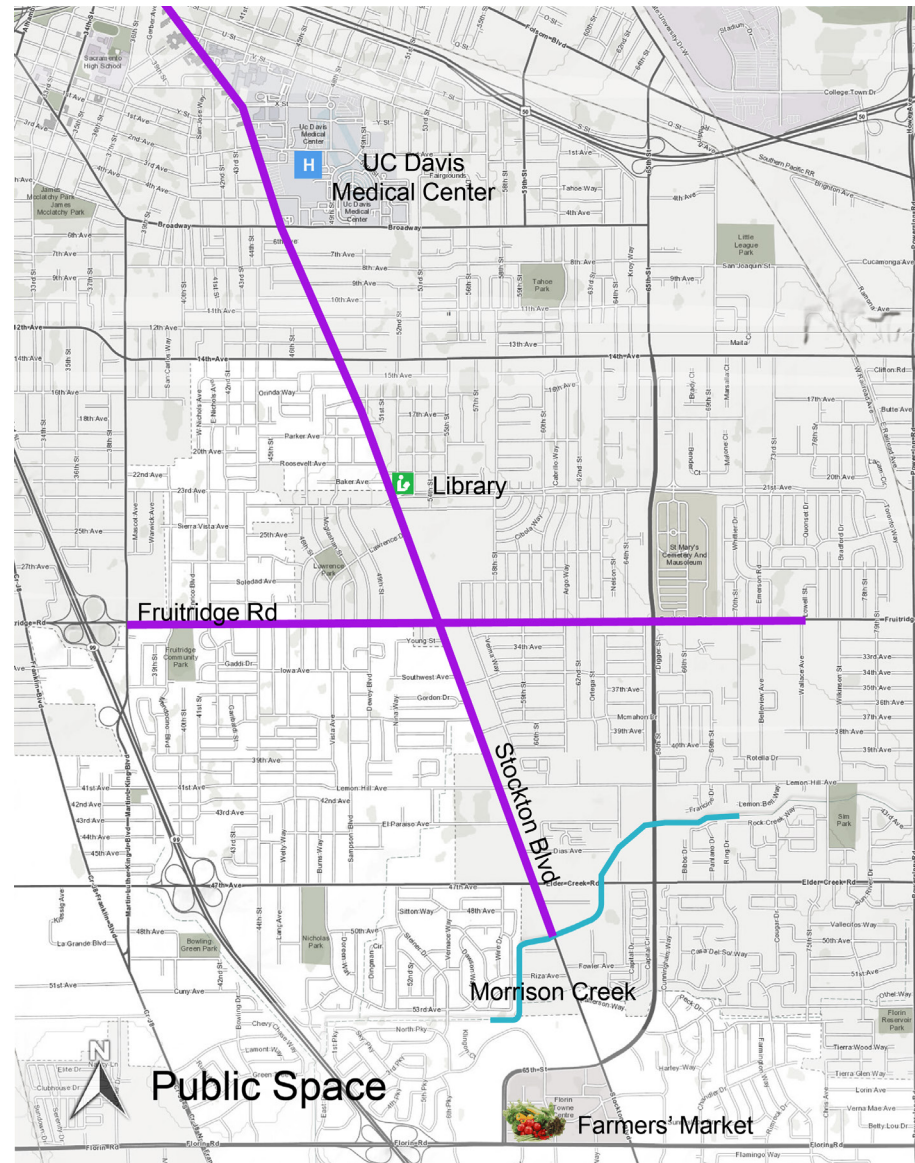


Figure 6.7 Map of public space

Site Analysis

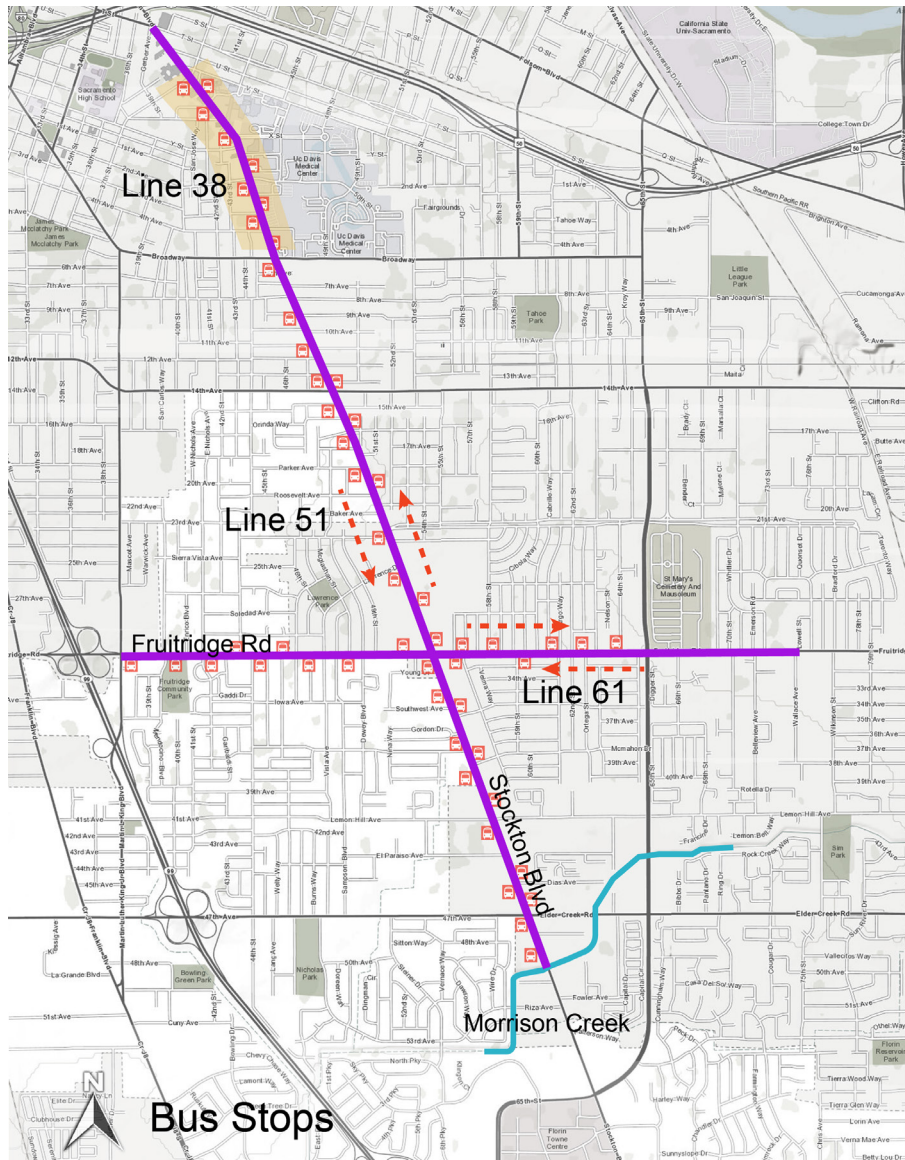


Figure 6.8 Map of bus stops

Line 51 runs on Stockton Boulevard and it stops frequently. Many bus stops are missing shade structures and some do not even have a bench. Also, the bus stops occupy a lot of space of narrow sidewalks so one person can barely pass through.



Figure 6.9 Bus stop without a shade structure

Site Analysis

Many schools are located in the study area, especially in residential areas. Sidewalks usually do not include planter strips or trees to provide a safe tract to school from home. Thus, students have a high possibility of getting in a vehicle-pedestrian accident. There are warning signs and speed bumps to slow down the speed of vehicles to protect the students. But, there was a fatal accident recently.



Figure 6.10 Street near West Campus High School

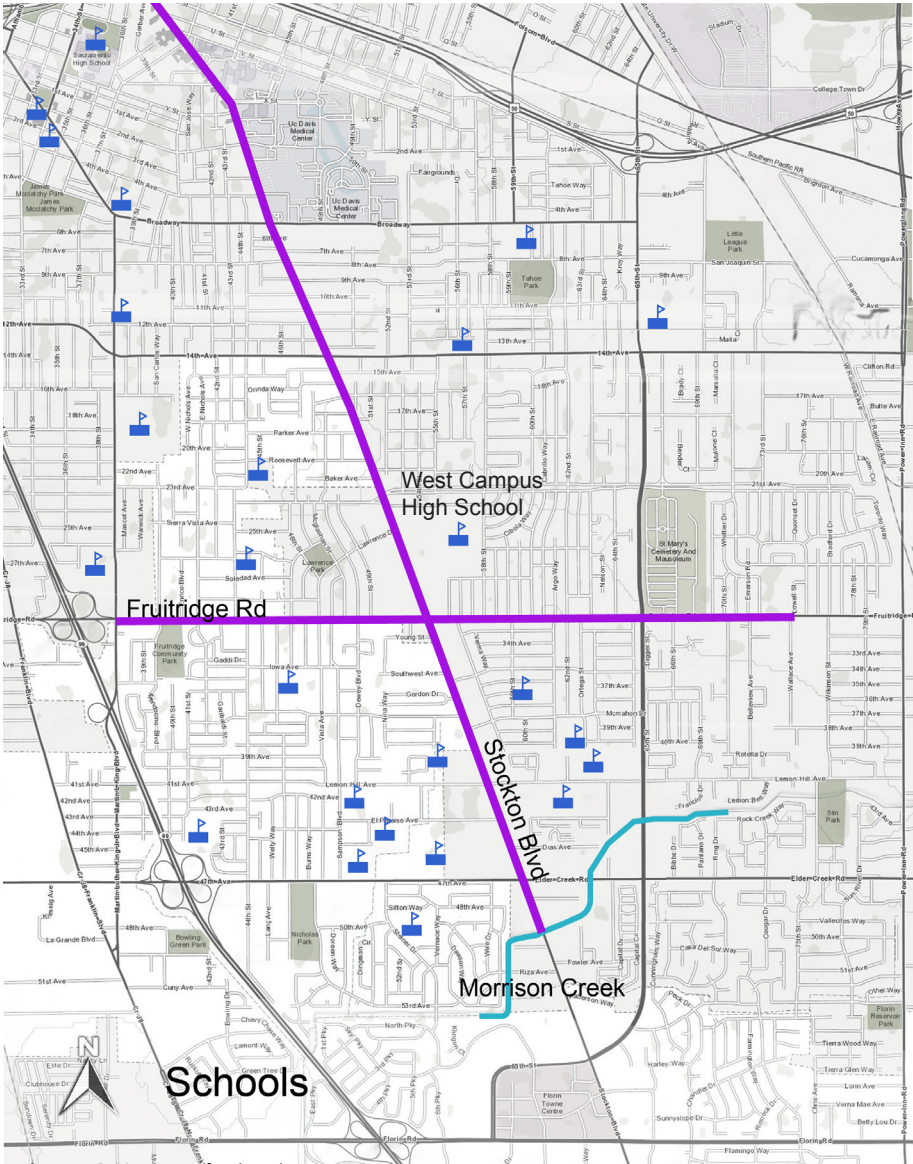


Figure 6.11 Map of schools

Site Analysis

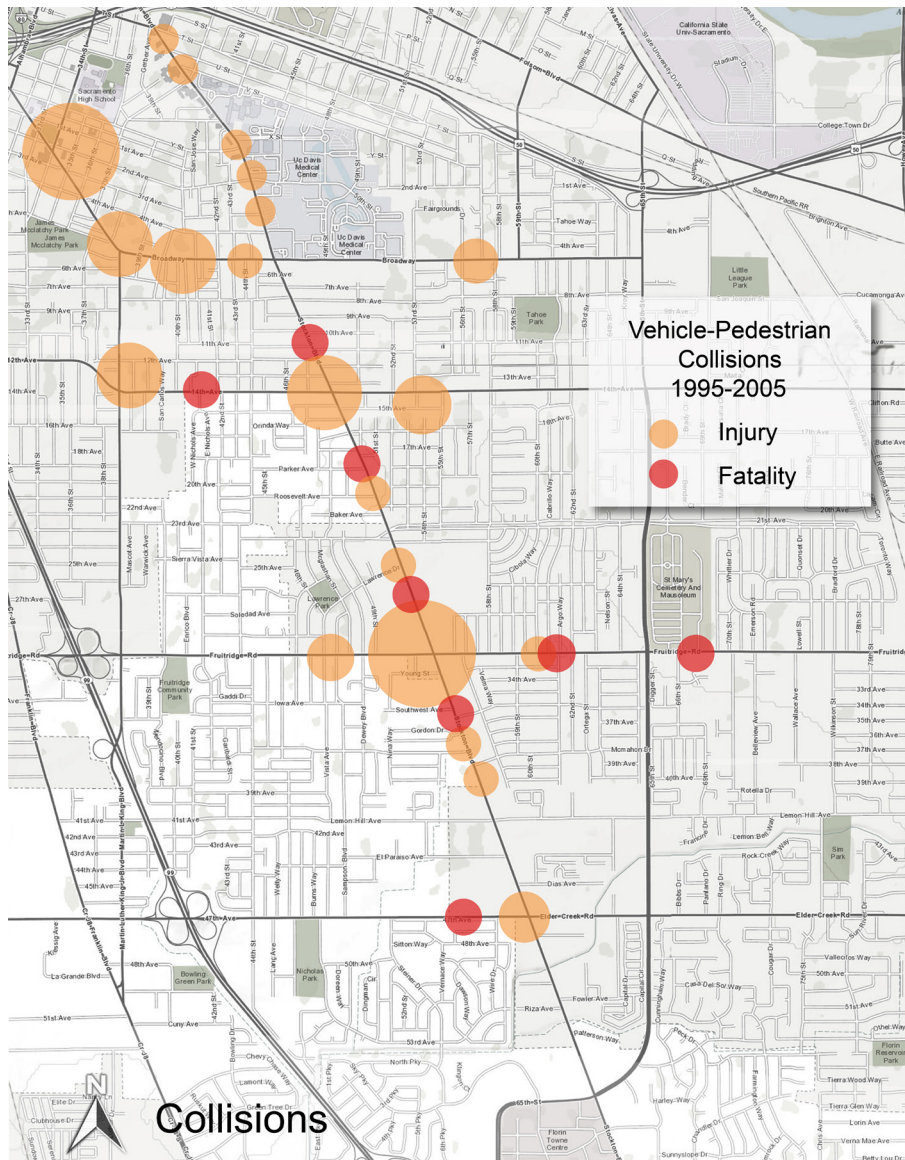


Figure 6.12 Map of collisions

Over the ten-year period between 1995 and 2005, more than 50,000 collisions were reported. About 2,500 of those were vehicle versus pedestrian. Collisions between automobiles do not usually result in an injury or fatality. However, vehicle-pedestrian accidents have a high rate of injuries and fatalities since pedestrians are more vulnerable than drivers. Approximately 100 fatalities of vehicle-pedestrian accidents occurred over the ten-year period. 70 percent of collisions occurred when a driver did not yield to a pedestrian (City of Sacramento, 2006). The dots indicate locations of collisions, and the bigger dots mean that there were a large number of accidents occurred. These represent a group of data of collisions and may not indicate a single collision. The study area has many collisions, which means that pedestrians are exposed to safety issues while walking.

Site Analysis

According to the city data, California has about \$58,931 median household income and Sacramento has about \$47,107 median household income in 2009 (City Data, 2009).

In the study area, there are various ranges of median household incomes. Most parts in the area have lower incomes than the average of California and Sacramento's.

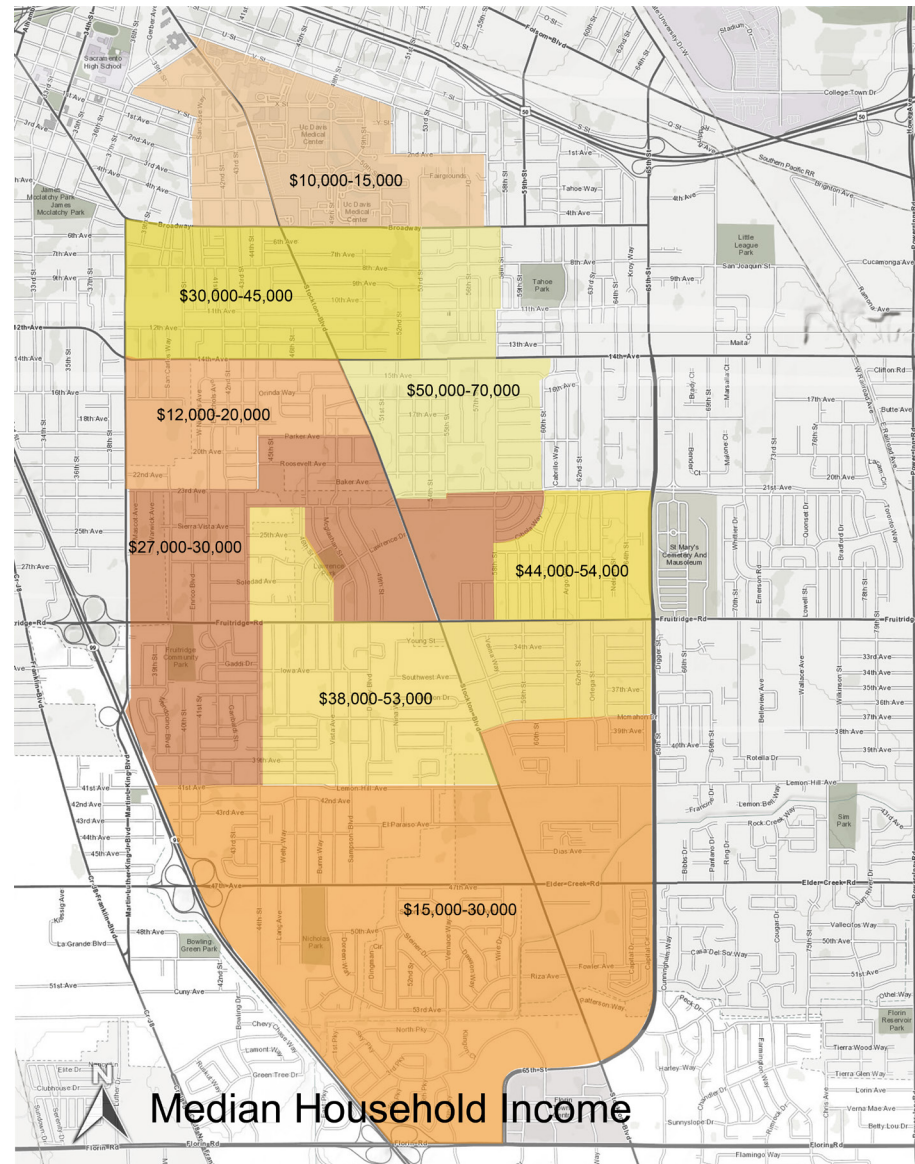


Figure 6.13 Map of median household income

Concept Ideas

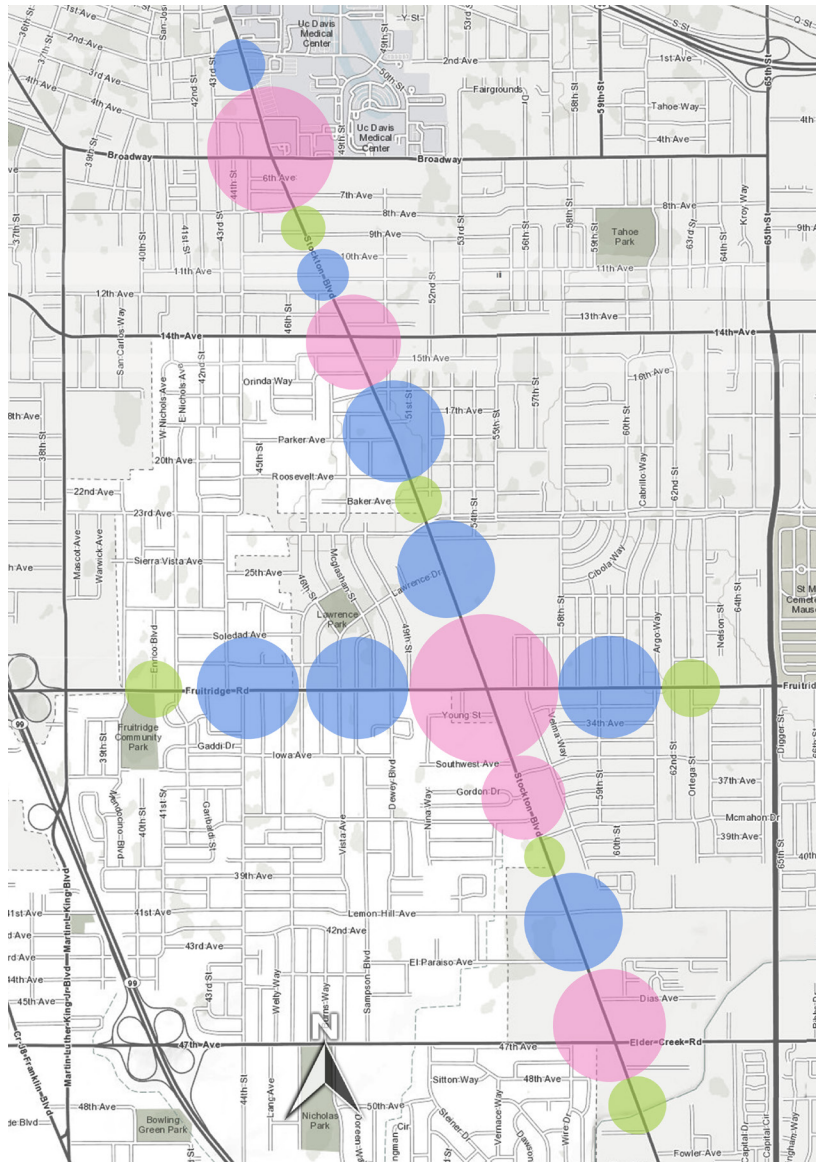





Figure 6.14 Map of concept ideas

One idea to meet a goal of the project, which is to create more walkable neighborhood, is to change the current zoning to a new type of development. Currently, there are many commercial stores distributed along the major streets, Fruitridge Road and Stockton Boulevard. The residential areas are far away from the commercial areas. This discourages people from walking to their destination points such as a grocery store, a coffee shop, or a restaurant. However, a new zoning concept can improve walkability.

-  Main commercial zone: Superstores (Target, Kmart), shopping centers (Brand name clothings), department Stores (Macy's), restaurants, arcades, movie theaters, etc.
-  Mixed use zone: Apartments, coffee shops, hair salons, dry cleanings, ice-cream shops, fast food, restaurants, grocery stores, convenience stores, offices, etc..
-  Public space: Public parks, libraries, etc.

Concept Ideas

In the study area, a general plan is to make a safe environment to motivate people to walk. Features that can create a sense of safe areas include:

- 
- Street lights
 - Plants
 - Street benches
 - Attractive architectures
 - Wider sidewalks and bike lanes
 - Designated crosswalks
 - Signage
 - Short distance of blocks

Focus Areas

AAA Broadway & 44th St

BBB Stockton Blvd & Lawrence Rd

CCC Fruitridge Rd & 55th St - 58th St

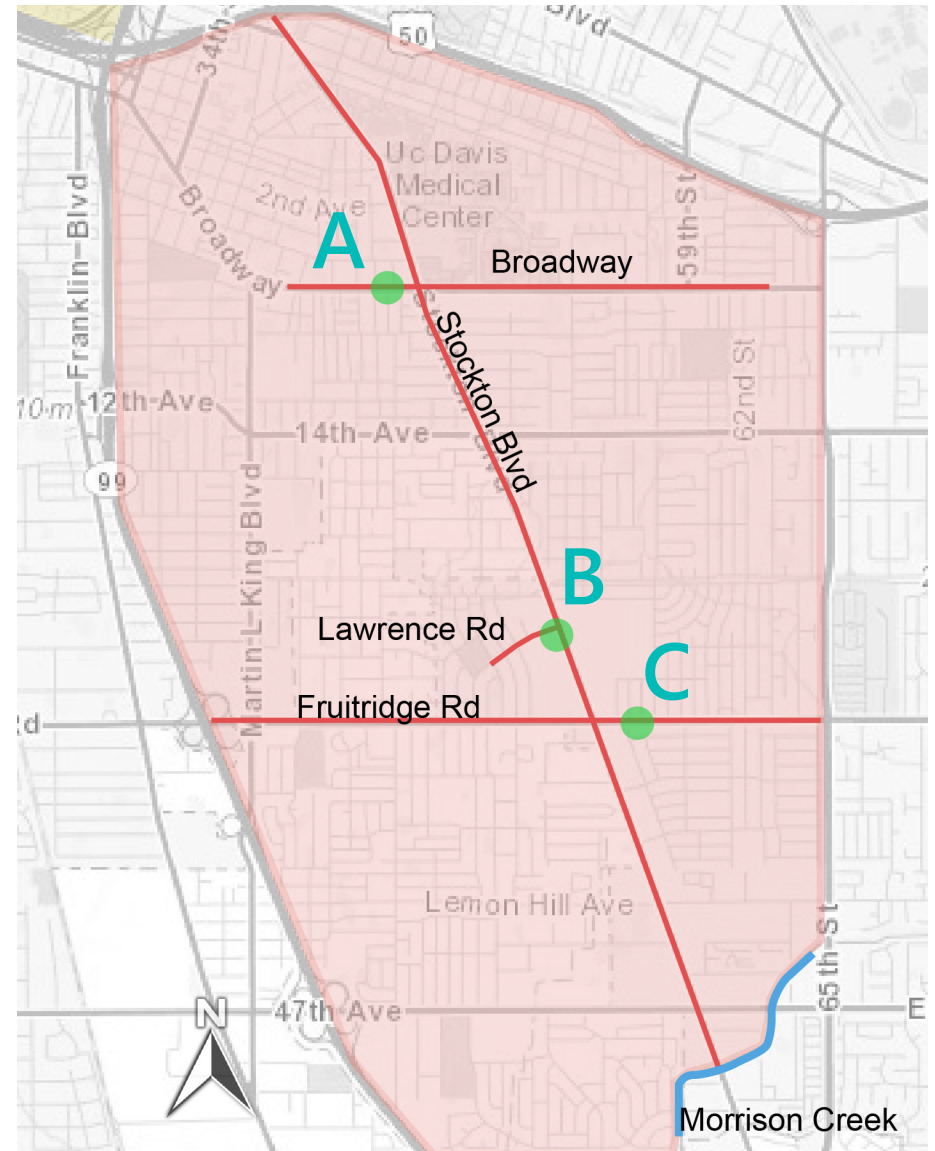


Figure 6.15 Focus Areas

Design A: Broadway & 44th St



Figure 6.16 Aerial map of Broadway and 44 Street

The first site-specific design area is on Broadway and 44th Street in Sacramento. Based on the collisions map, there were a few accidents where pedestrians were injured.

A grocery store, Food Source, is located there and many residential houses are distributed in the area.

A main goal of the design is to create a walkable place for people and increase feelings of safety for both pedestrians and bike users by implementing design features.

Existing Conditions



Figure 6.17 Crosswalk



Figure 6.18 Sidewalk



Figure 6.19 Travel lane and no bike lane



Figure 6.20 Turning lane



Figure 6.21 Barber shop



Figure 6.22 Open space next to the sidewalk

Site Analysis

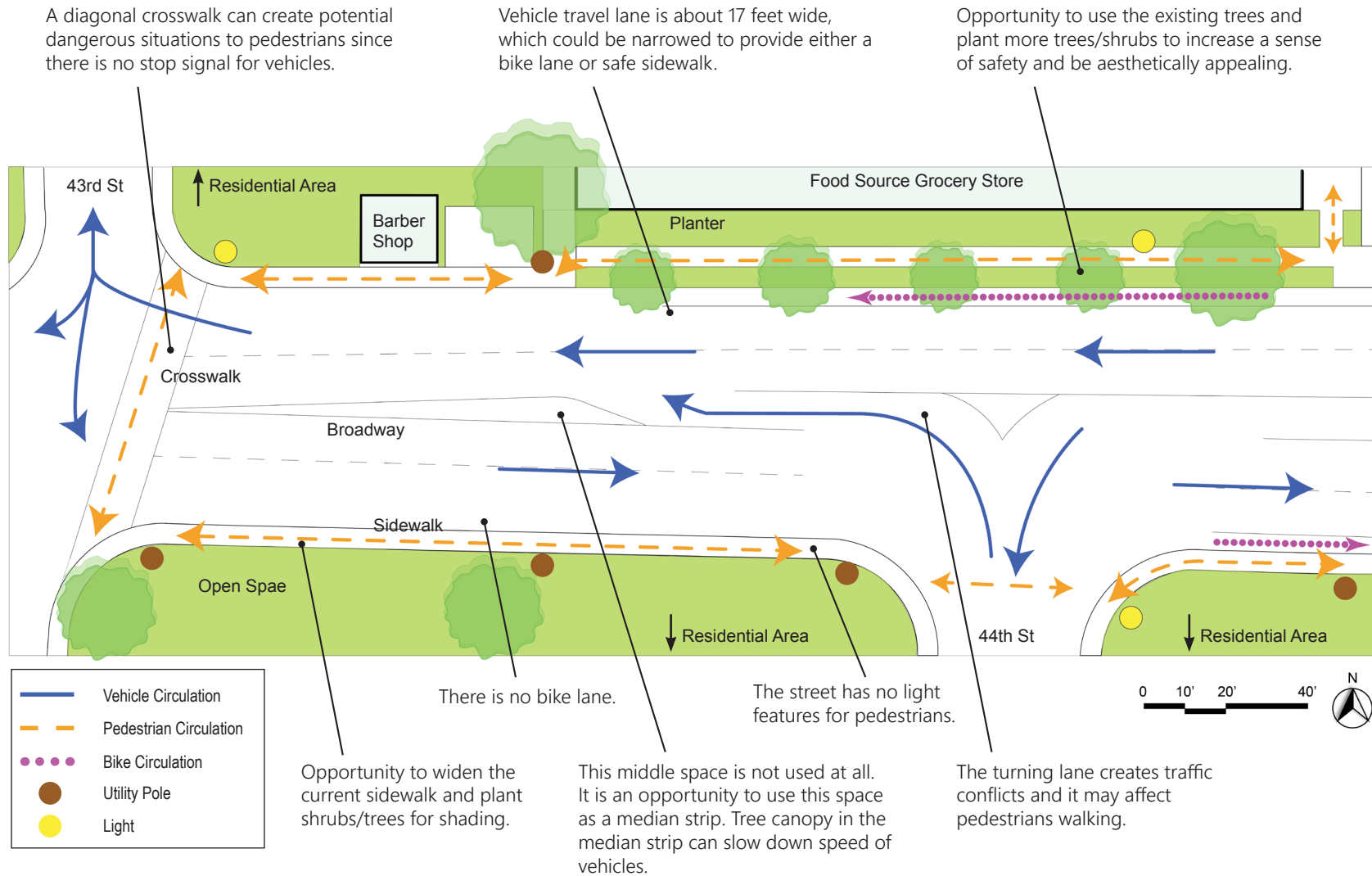


Figure 6.23 Site analysis of Broadway and 44th St

Design Elements & Description

Since the site has a history of vehicle-pedestrian collision, the key purpose of the design is to make a safe, walkable street for pedestrians and bike users. Elements include:

Speed table, designated crosswalk, lights, widen sidewalk with plants, and a bike lane



Figure 6.24 Speed table



Figure 6.25 Hybrid traffic signal

The new design of the site can provide pedestrians a safe walking experience. By narrowing the width of the vehicle travel lanes, both pedestrians and bike users can have a wider space with plant barriers. More trees and shrubs increase a sense of aesthetics and improve environments. The location of the crosswalk is changed toward 44th Street; this can improve connectivity between the grocery stores to a residential area. The crosswalk system has a hybrid traffic signal. The signal lights up and starts flashing yellow, causing drivers to slow down and to stop when pedestrians push a button to cross. Also, the crosswalk is a speed table to assist in slowing down vehicle speed.

Plan

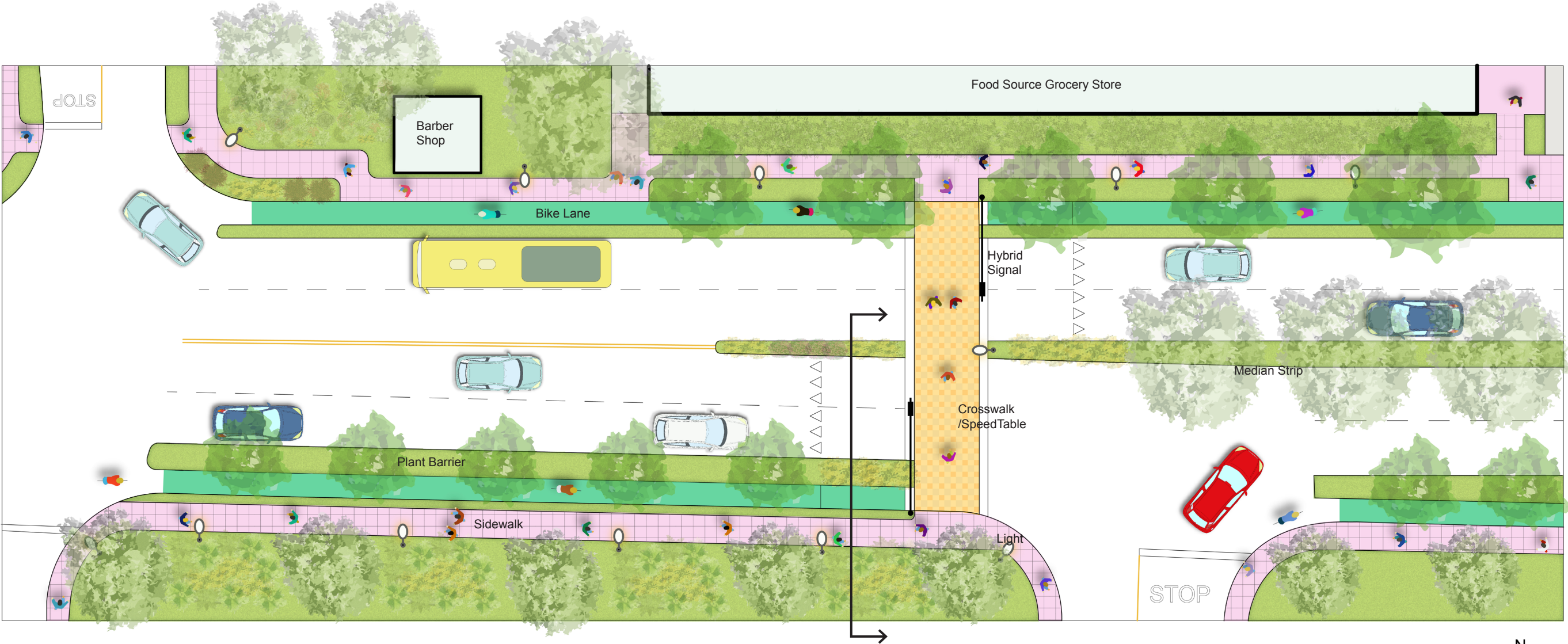
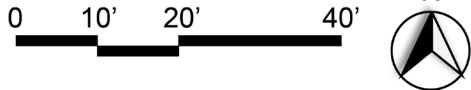


Figure 6.26 Plan

Broadway & 44th St Plan



Section

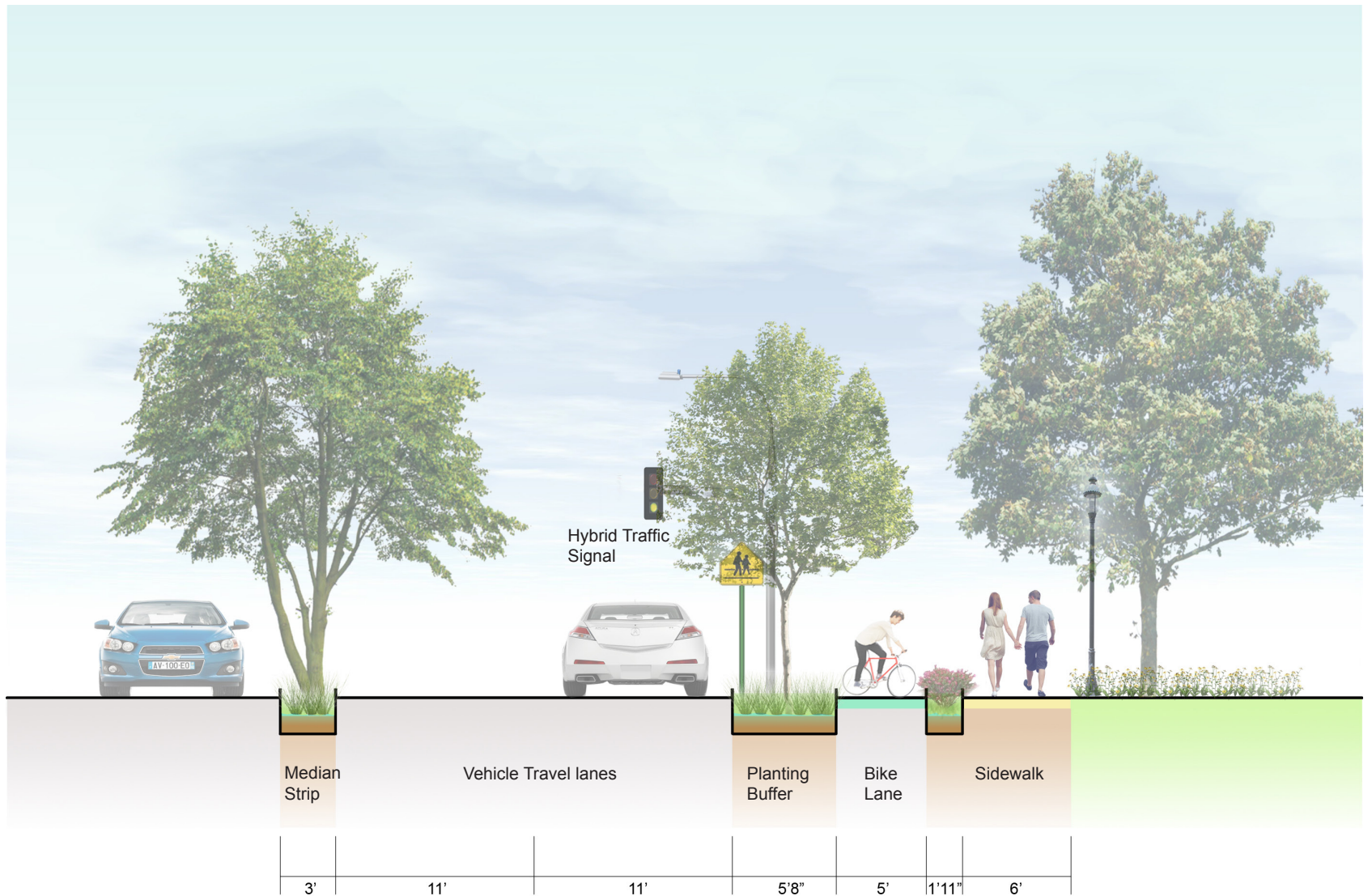


Figure 6.27 Section



Design B: Stockton Blvd & Lawrence Rd



Figure 6.28 Aerial map of Stockton Blvd and Lawrence Rd

The second site-specific design area is on Stockton Boulevard and Lawrence Road. Kmart is located in the area and various stores are also distributed in a shopping plaza. Parking lots are close to the sidewalk and this makes people drive more than walking from their home. The shopping plaza, including the parking lots, takes over an enormous block space, which means a longer distance to walk. The speed limit is 35 miles per hour on Stockton Boulevard, but drivers drive faster than the limit. The center turning lane is long and can be dangerous.

Existing Conditions



Figure 6.29 Parking lot



Figure 6.30 Sidewalk



Figure 6.31 Travel lane, center turning lane & bike lane



Figure 6.32 Restaurants

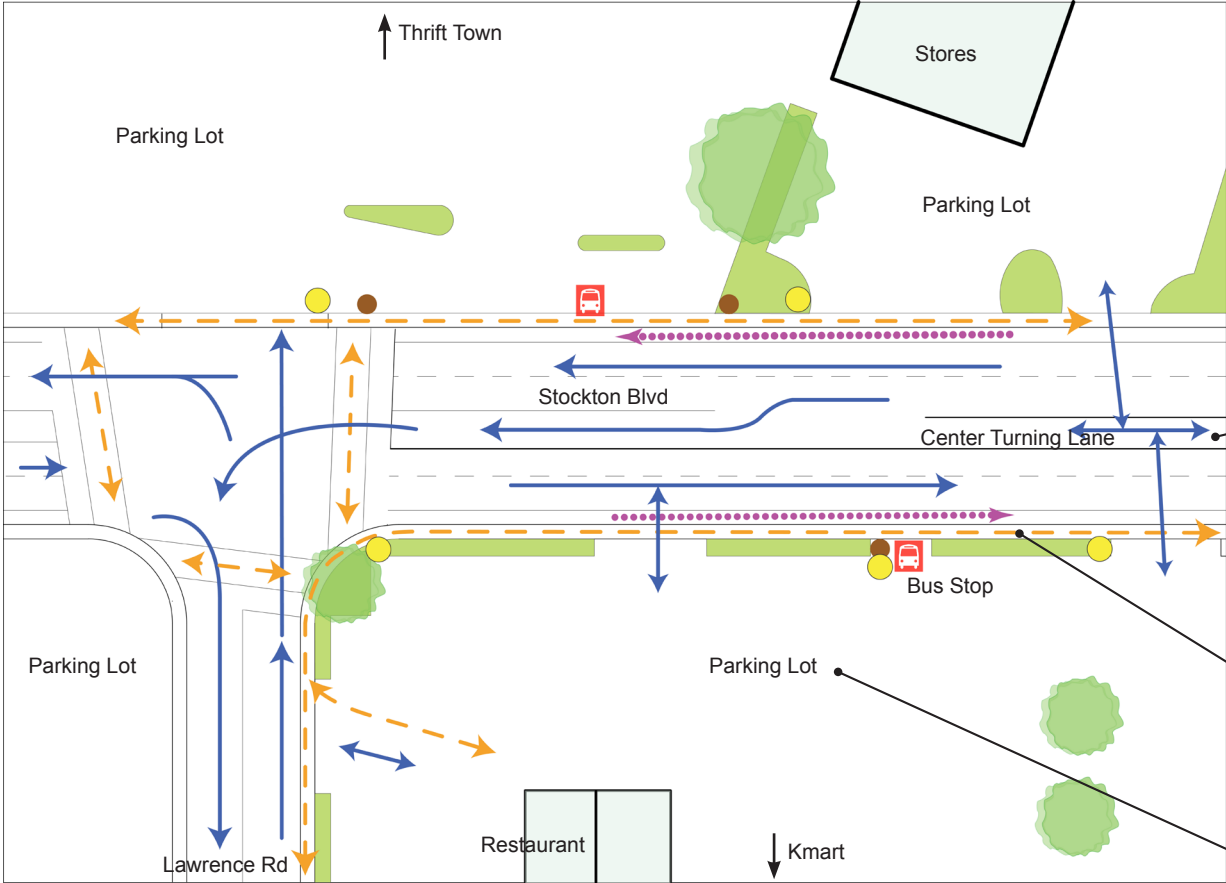


Figure 6.33 Bus stop



Figure 6.34 No shade on Lawrence Rd

Site Analysis



Stockton Blvd has a high speed and volum, and it creates a sense of danger on the road and sidewalk. It means that there is not much space for either bikers or pedestrians.

Long shared turn lane occupies space that can be transformed to other feature. Opportunity to use the shared turn lane due to the low usage of the lane.

The sidewalk has no trees and is narrow and close to vehicle lanes. There is no lighting for pedestrians on the sidewalk. Utility poles are located too close to the sidewalk and these affect pedestrians walking.

Many of the parking spots are unused.

Vehicle Circulation	Utility Pole
Pedestrian Circulation	Light
Bike Circulation	

Figure 6.35 Site analysis of Stockton Blvd and Lawrence Rd

Design Option 1

The design site consists of many commercial retail shops with large parking lots. Since the parking lots are owned by private owners, the first option of the design is to alter the existing street condition within the boundary, which is the edge of the parking lots.

A main goal of the design is to provide enough space for pedestrians and a safe route for bike users.

To achieve this, the center turning lane is removed. Drivers have to use other options such as a U-turn system. Trees and shrubs can provide shade for the pedestrians and can be a plant buffer to increase safety. All the crosswalks have a color to catch driver's eyes.

Elements:

- Street lights
- Plants
- Wider sidewalks & bike lanes
- Catchy crosswalks
- Signage
- Short distance of blocks by creating more traffic signals
- Bus stops with a roof

Plan: Option 1

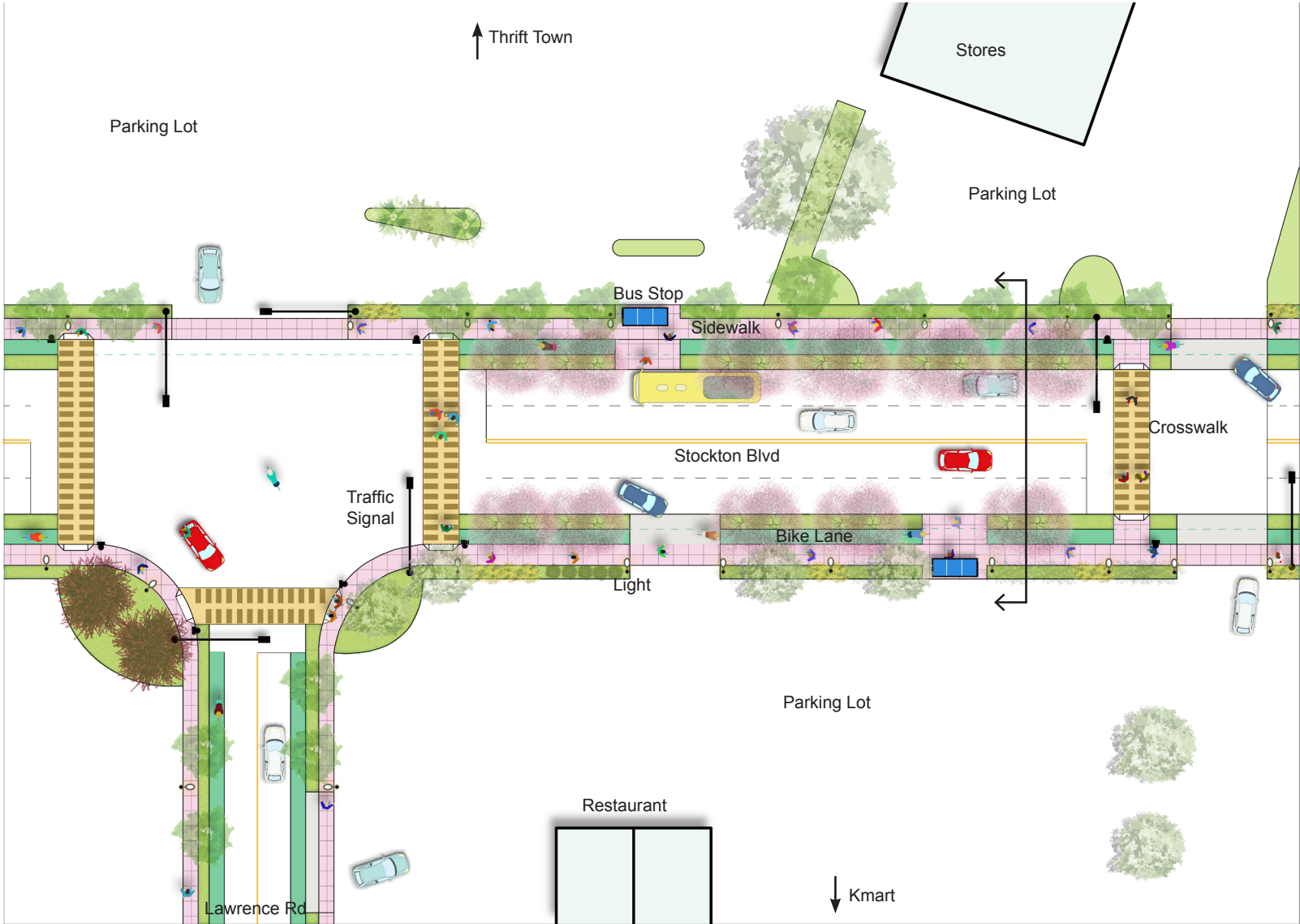
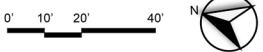


Figure 6.36 Plan option 1

Stockton Blvd & Lawrence Rd



Section: Option 1



Figure 6.37 Section option 1

10'

Design Option 2

This option is a whole new design concept if developers are open to rebuild commercial buildings and change the entire street. The main change is that all the stores are located close to the sidewalk so that pedestrians are more engaged to walk. In this case, decorative buildings and stores can attract more people. It becomes a main destination point where people are willing to walk and spend time. All the buildings are mixed-use type; that includes different kinds of functions such as offices and apartments.

Also, this option aims for creating a safe walking environment. Features such as a wider sidewalk, a designated bike lane, planting strips, parallel parking (barrier from vehicles), and a colored crosswalk can increase safety.

The new design has potential to enhance walkability as well as a benefit to businesses and environments.

Plan: Option 2

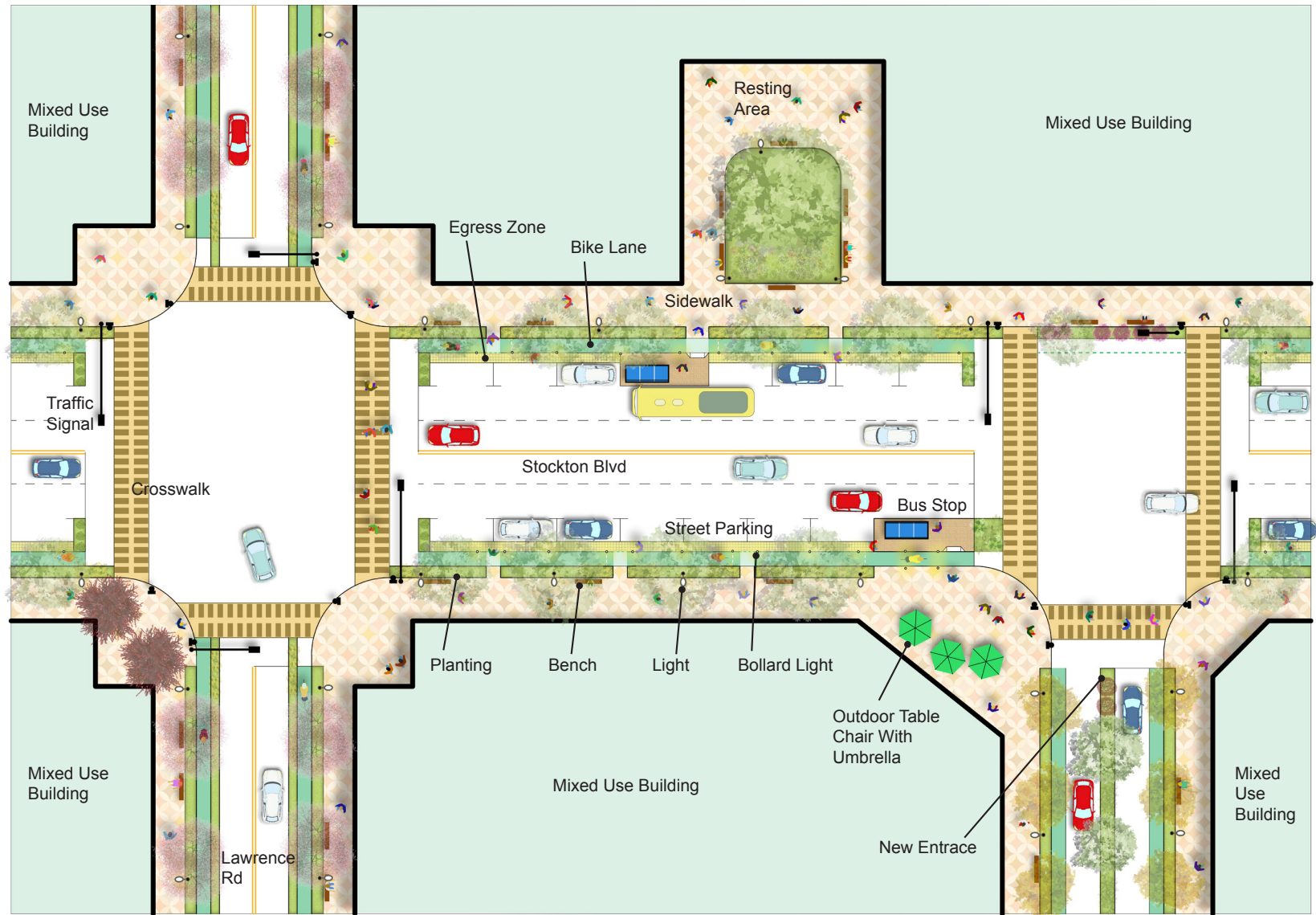


Figure 6.38 Plan option 2

Stockton Blvd & Lawrence Rd



Enlargement Plan

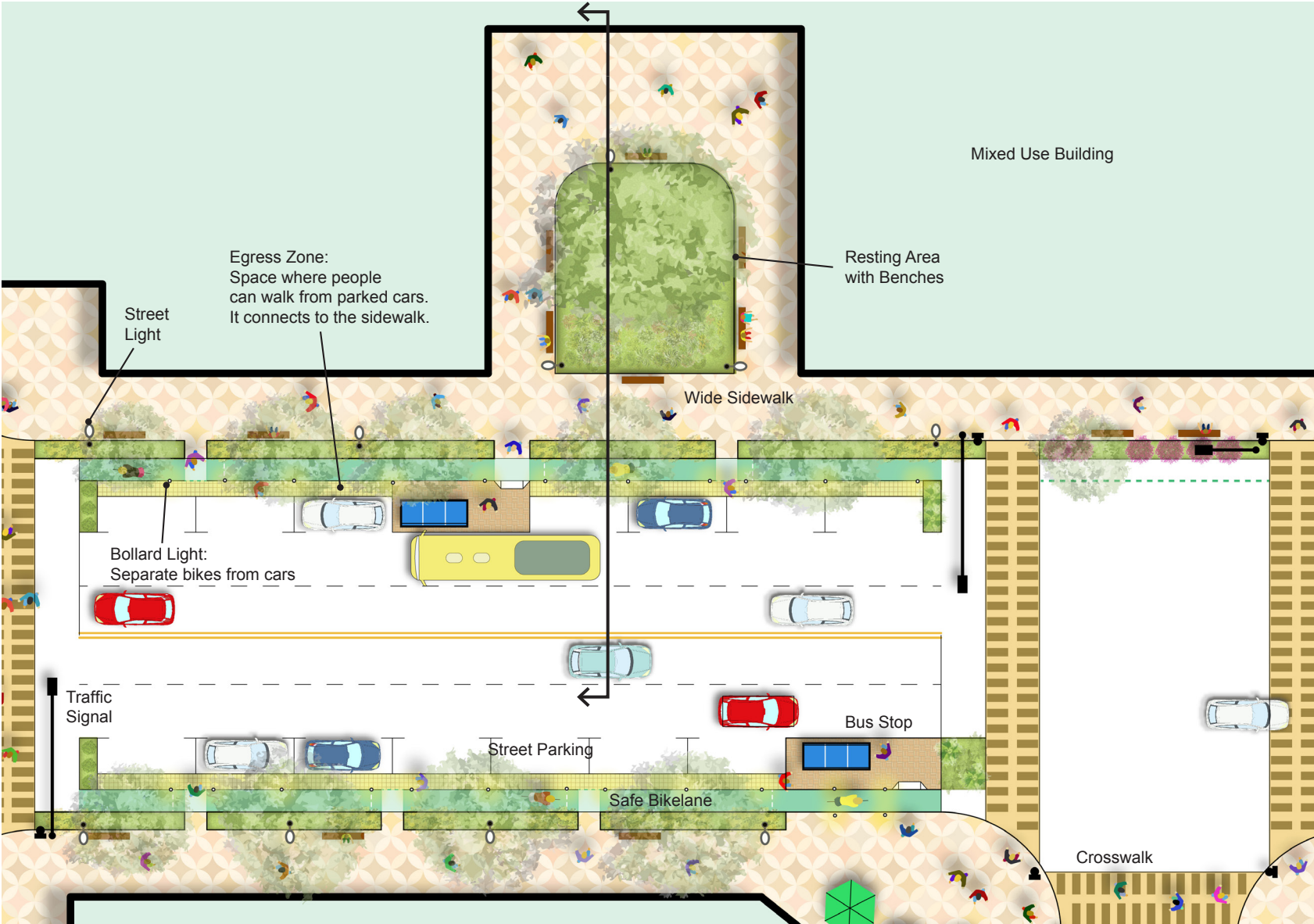


Figure 6.39 Enlargement plan

Section: Option 2



Figure 6.40 Section option 2

Design C: Fruitridge Rd & 55th St-58th St

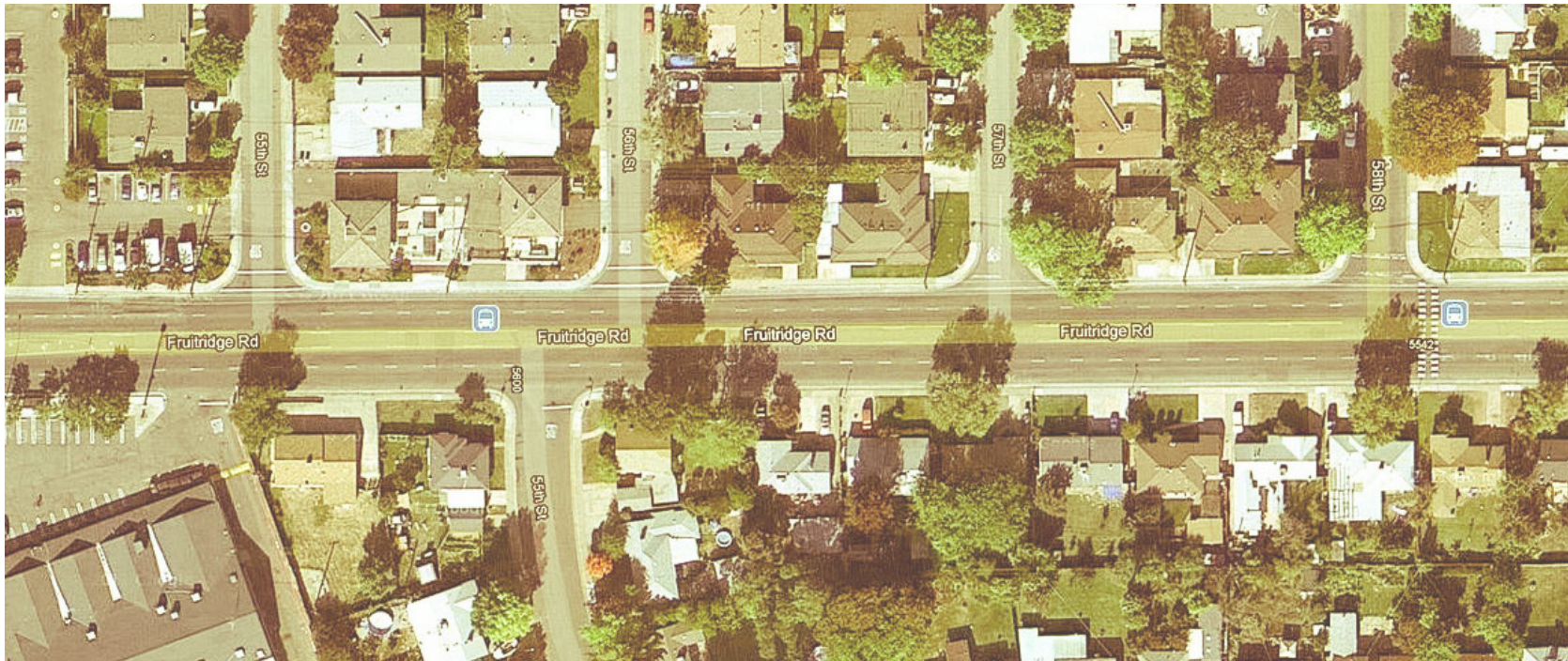


Figure 6.41 Aerial map of Fruitridge Rd

Design C focuses on Fruitridge Road between 55th Street and 58th Street. The area is close to Stockton Boulevard and has a high volume and high-speed traffic. Many residential houses are located along Fruitridge Road, and students are easily found in the area. There is a center turning lane instead of left turn signals. This can be a trigger for vehicle-pedestrian collisions. The sidewalk is lacking trees and pedestrians have a narrow width of the sidewalk right next to the vehicle travel lane. Simply, the area does not provide a safe walkable environment.

Community Meeting

One way of figuring out issues of the design site is by listening to opinions from people who live or work there. A community meeting is a great method to understand the site where a designer has less knowledge than the residents who have lived there for years. It was held in the Stockton Boulevard Partnership office on the 6th of May, 2013. WalkSacramento led the meeting with many other community members. A main topic was how to ensure safety for current and future pedestrians. Unfortunately, there was a fatal accident in the intersection of 58th Street and Fruitridge Road. Two blocks north of the site is West Campus High School, so many students walk and cross this dangerous road. A high school student, Michelle Murigi, was crossing Fruitridge Road as a car struck her on January 19th of 2012. The crosswalk has no signal, stop sign, or pedestrian median. Bus stops on Fruitridge Road result in poor visibility for drivers, when a bus actually stops. Drivers cannot see if pedestrians are crossing due to the bus. A year since Michelle's death, there has not been a change to this deadly road.



Figure 6.42 Community meeting

At the community meeting, many members complained about the current road system that causes dangerous situations for pedestrians. Residents do not feel safe walking here and they want the city to improve the walking environments. City of Sacramento Bicycle and Pedestrian Coordinator, Ed Cox, was at the meeting to hear what people want and discuss how the city can improve the poor road systems. This community meeting was helpful for the project to develop a design idea. It was a great involvement to understand what the residents want and listen to how the city will react in the future.

Existing Conditions



Figure 6.43 Crosswalk



Figure 6.44 Sidewalk



Figure 6.45 Bus stop



Figure 6.46 House next to the road



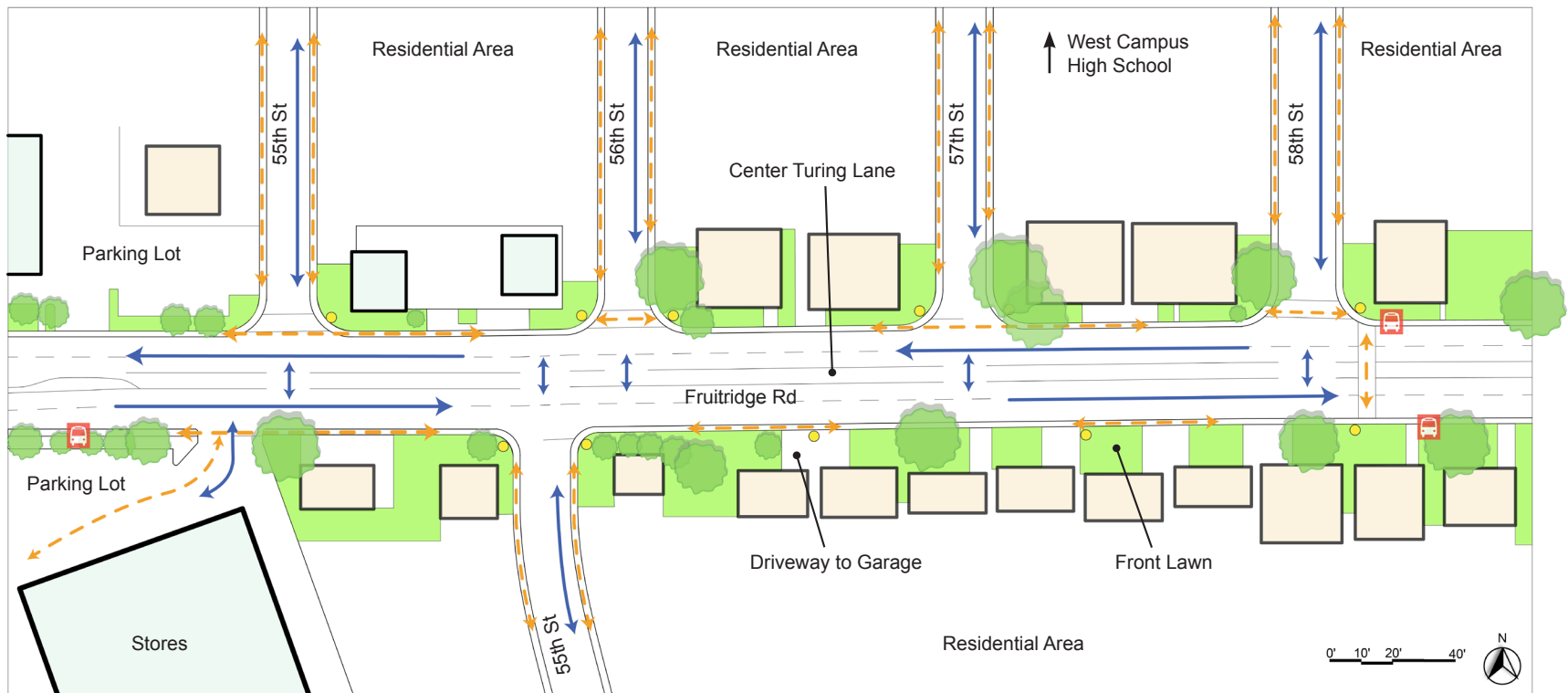
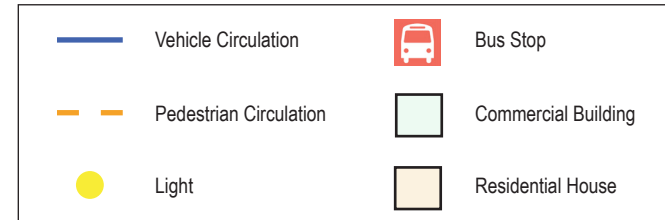
Figure 6.47 Travel lane, center turning lane & bike lane



Figure 6.48 No shade

Site Analysis

Fruitridge Road has four travel lanes and a center turning lane. The speed limit is currently 40 miles per hour, but many vehicles travel faster than the limit. This is the biggest traffic safety issue in this neighborhood. Many people here walk anyway, as they have no alternative. There was a fatal accident on Fruitridge Road at 58th Street. It is evident that the current road provides many dangerous situations. There are many outlets/entrances to residential areas along the road, and this can create conflicts between pedestrians and vehicles.



There is no designated bike lane on the road. The houses are closer to the road, and there is not much space to walk, which means also the sidewalk is narrow. Many utility poles stand on the sidewalk. Pedestrians are exposed to the sun directly due to lack of street trees.

The bus stops have no shade structure, and the bus blocks the drivers' views. It causes vehicle-pedestrian collisions on the crosswalk, which does not have any traffic signal nor stop signs for the vehicles.

Figure 6.49 Site analysis of Fruitridge Rd and 55th St – 58th St

Design Elements & Description

Fruitridge Road has many constraints such as limited space of the road and high speed of traffic, which negatively affect pedestrian walking. However, a new design can resolve the safety issue for the pedestrians. Even though this road has a lot of traffic, providing a safe atmosphere to people should be considered a main goal of the design.

To achieve this, Fruitridge Road should have only one vehicle travel lane in each direction and keeps the center turning lane. High speed is a key trigger to threaten people, so the road should have a slower speed limit than it currently does. One travel lane can slow down the speed of vehicles. By having one lane on each side, a bike lane can be implemented to provide a safe tract for bike users. Also, there is space for a planting strip and a wider sidewalk. Plants can improve the walking environments and give shade when it is sunny. Since a bus stop is a problem that causes collisions, the design has a designated a bus stop with a shade structure. Buses can stop in a bus pull-up space so that bikes and vehicles can still flow without causing traffic congestion.

- Street lights
- Plants
- Wider sidewalks & bike lanes
- Hybrid traffic signal
- Signage
- Bus stops with a roof
- Bus pull-up space
- Bike lane

Elements

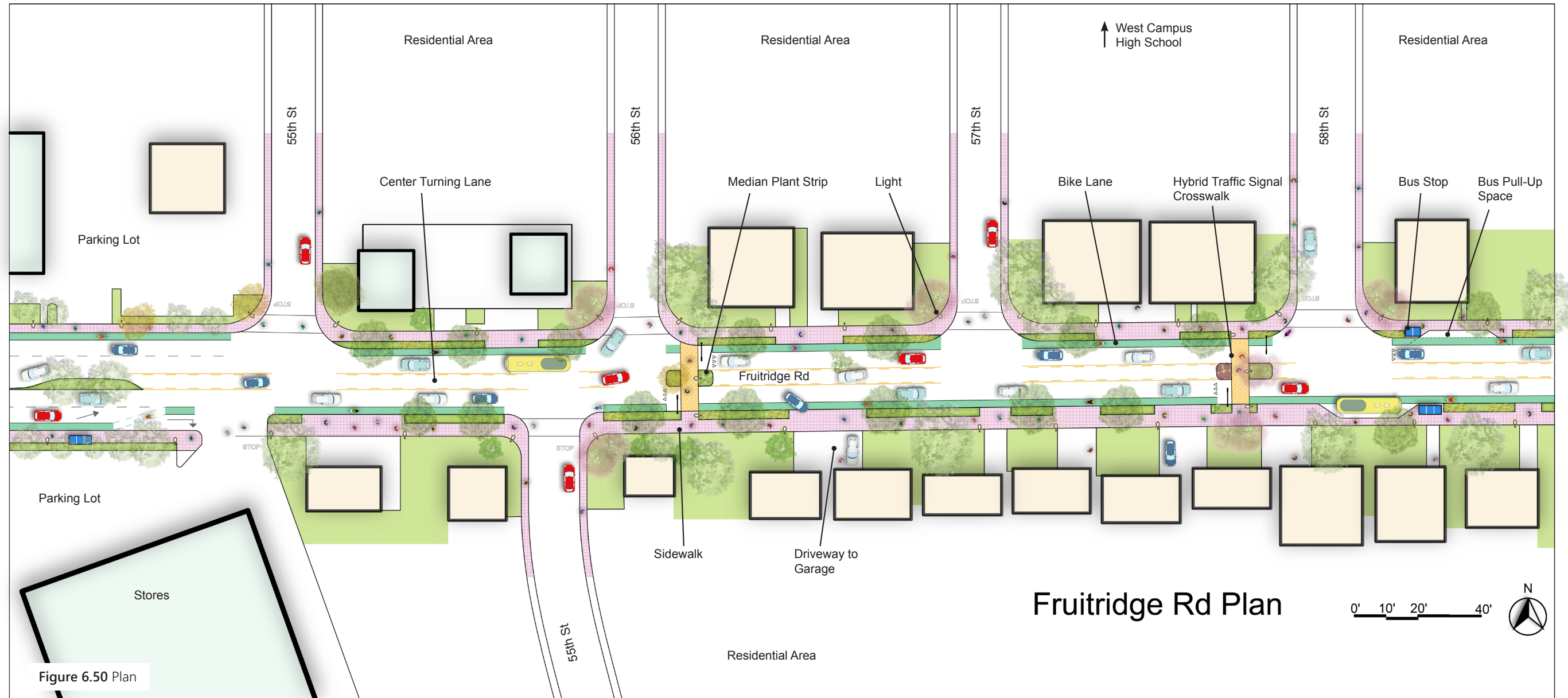


Figure 6.50 Plan

Enlargement Plan & Examples Of Design Features



Figure 6.51 Bus pull-up zone



Figure 6.52 Pedestrian median



Figure 6.53 Bike lane

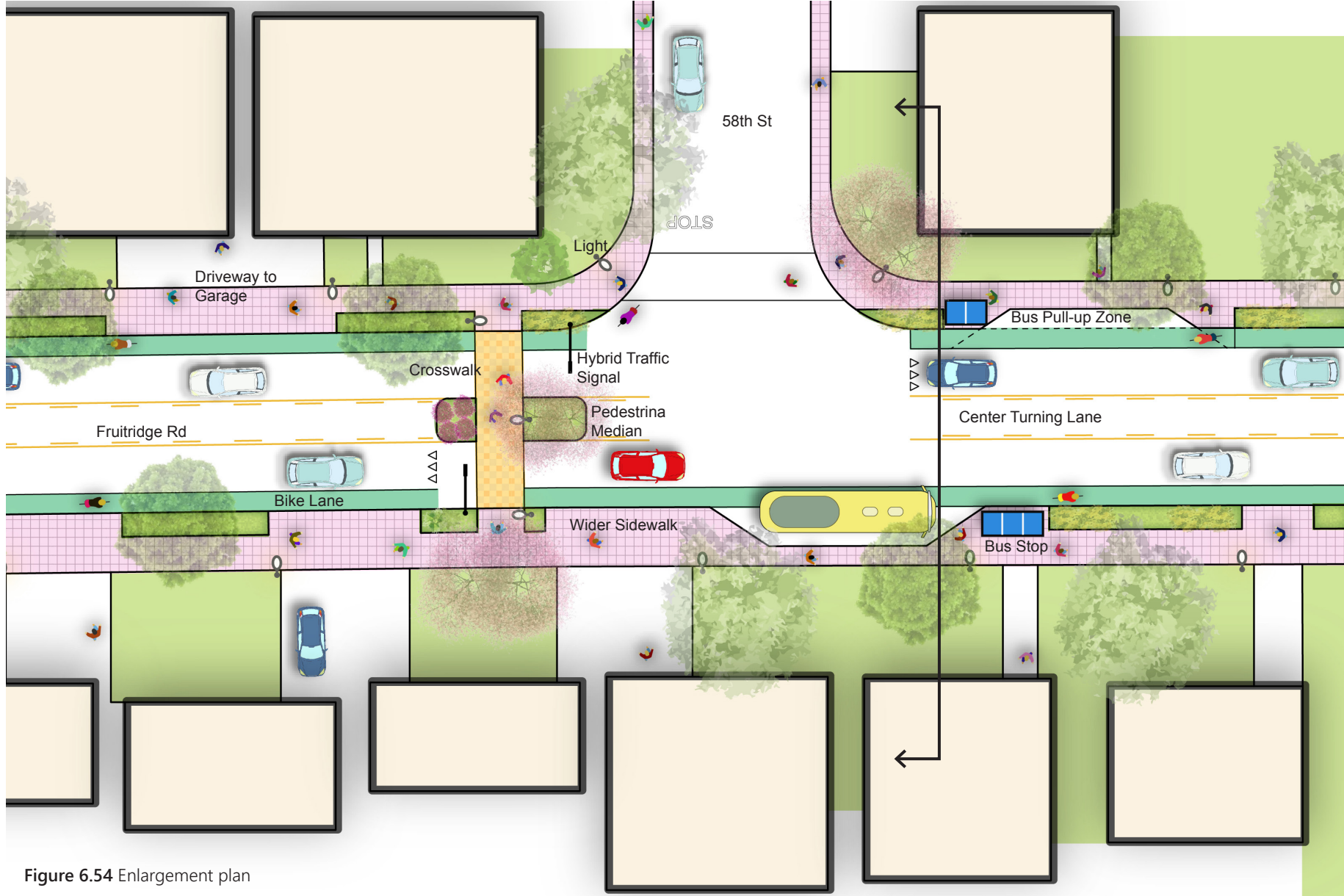


Figure 6.54 Enlargement plan

Section

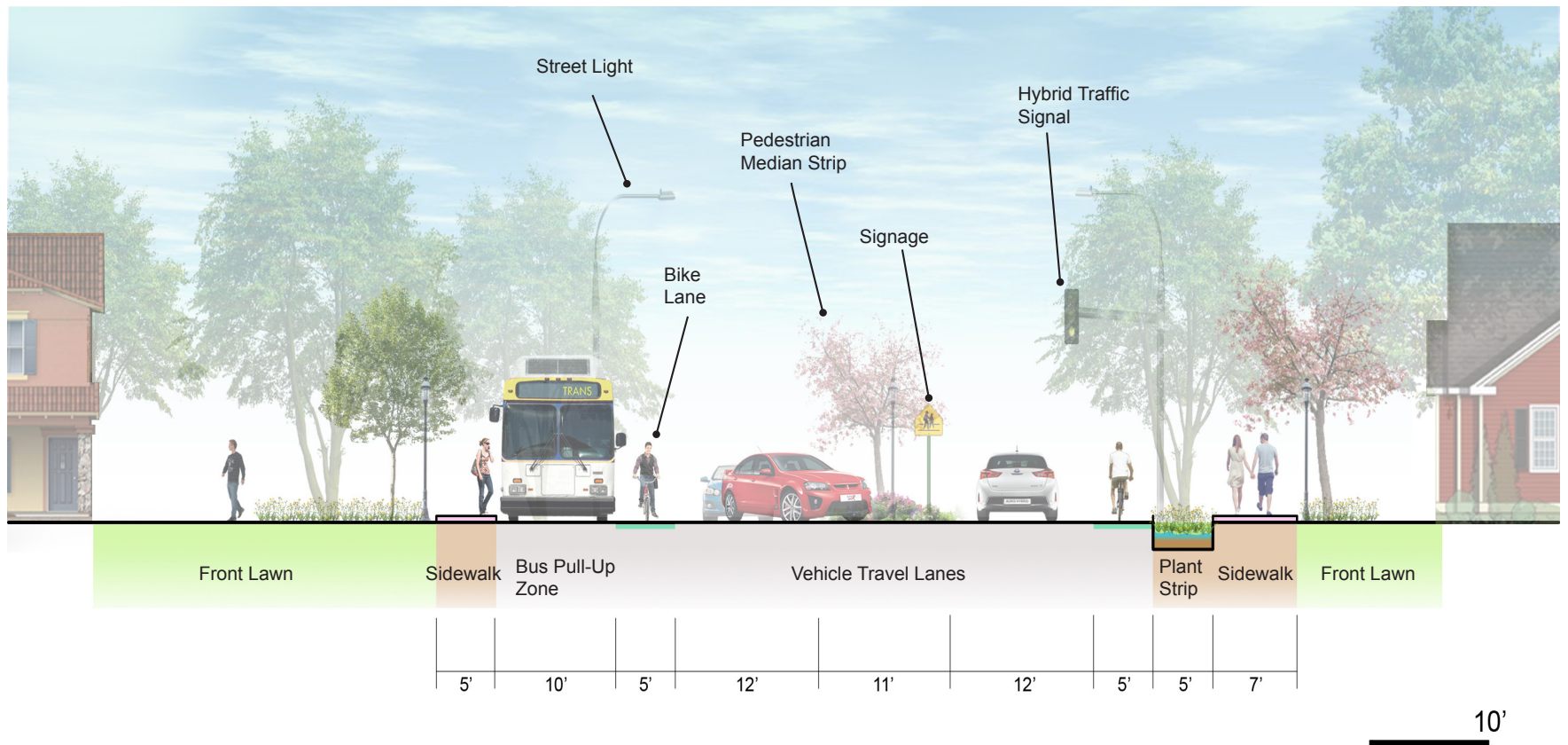


Figure 6.55 Section

Perspective



Figure 6.56 Perspective of Design Option 2

Conclusion

As the current city development keeps the unwalkable community design, the obesity population continues to increase. A high obesity rate results in various physical and mental diseases. To prevent this and improve the public health, an active life style is a key answer. Physical activities reduce obesity rates in the United States. An easy way to live an active life is walking, the most efficient method. If developers consider taking action to make a walkable community, it will bring positive benefits not only to people but also to economics and environments. Walkable communities will bring a livable, vibrant, and healthy life for all people.

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Appendix

Planting Lists

Medium Size Tree

(26 to 45 feet)

Chinese flame tree, *Koelreuteria bipinnata*
Deciduous
Height: 20'-40'
Spread: 20'-35'
Leaves: Alternate, bipinnately compound. Turn yellowish before dropping.
Fruit: Pink, salmon, red, then brown.
Water Needs: Medium usage
Air Quality: Good

Trident maple, *Acer buergerianum*
Deciduous
Height: 20'-30'
Spread: 20'-25'
Leaves: Dark green with fall color varying from red to orange or yellow.
Water Needs: Medium usage
Air Quality: Better

Frontier elm,
Ulmus parvifolia 'Frontier'
Deciduous
Height: 25'
Spread: 15'

Foliage: Green and burgundy
Water Needs: Medium
Air Quality: Best
Performs well in hot, windy conditions. Very resistant to Dutch elm disease. Showy fall color.

Loquat, *Eriobotrya japonica*
Evergreen
Height: 25'
Spread: 10'
Leaf: Wrinkled dark green
Water Needs: Low
Air Quality: Best
White flowers and edible fruit.
Drought tolerant.

Saucer magnolia, *Magnolia soulangiana*
Deciduous
Height: 20'-30'
Spread: 25'
Foliage: Green, bronze, and gold
Water Needs: Medium
Air Quality: Better
Showy pink flowers in spring and sometimes in winter.

Large Tree (46 feet and higher)

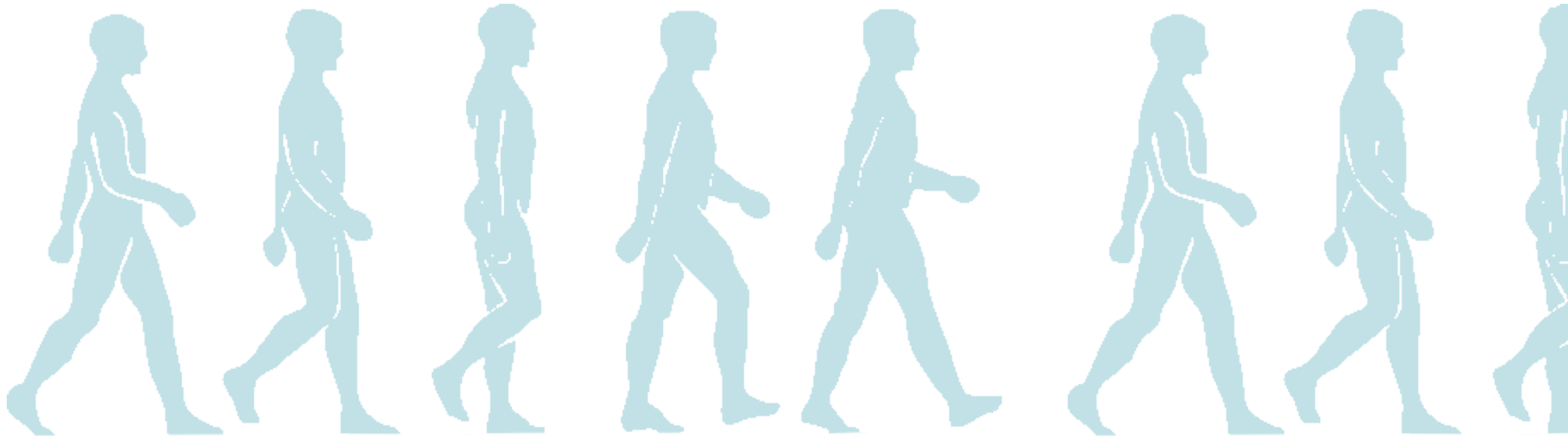
European hackberry, *Celtis australis*
Deciduous
Height: 40'-80'
Spread: 40'-50'
Leaves: Dark green and yellow color in fall
Water Needs: Medium
Air Quality: Best

Silver linden, *Tilia tomentosa*
Deciduous
Height: Up to 70'
Spread: 25'-35'
Foliage: Green and yellow
Water Needs: Medium
Air Quality: Best

Scarlet oak, *Quercus coccinea*
Deciduous
Height: 60'-80'
Spread: 40'-50'
Water Needs: Medium
Air Quality: Best

From The Sacramento Tree Foundation. Dec 2011.

Thank



YOU

WALKING TOWARD A HEALTHY FUTURE

Improving Public Health with Walkable Streets

Jihwan Kim

UC Davis Landscape Architecture

Senior Project Spring 2013

