Westwood/Mar Lee Bus Stop Assessments

Fall 2019

Prepared for:

CU Denver URPL5040, Sec. 002

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Chapter 1: Project Context

PROJECT INTRODUCTION

Team Westwood was tasked with assisting the City and County of Denver's planning team with the Bus Stop Inventory project. The clients - Denver Public Works, Denver Public Health and Environment along with WalkDenver - are in the early stages of implementing a recently adopted transit plan called *Denver Moves: Transit*. Bus stops are vital components of a city's transit system, as this is where riders begin and end their daily journeys; thus, bus stop amenities impact a rider's transit experience, overall usage and success of the transit system. The purpose of this project and plan was to inventory all bus stops in the city including their amenities, features, and present condition.

With this inventory, Denver will maintain a comprehensive database of the conditions and amenities of each bus stop in the city. The Planning Methods class, specifically, focused on Federal Boulevard, as it is one of the city's busiest transit corridors and has been prioritized for early implementation under *Denver Moves: Transit.*

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Course Information: Planning Methods Section 002, Professor Kenneth Schroeppel, Th 9:30a-12:15p

The study area as depicted in Exhibit 1 and Exhibit 2 on the following pages, is Westwood and Mar Lee, a neighborhood located in southwest Denver. Westwood & Mar Lee stretch north to south from West Alameda Avenue to West Jewell Avenue and East to West from Federal Boulevard to Sheridan Boulevard. Westwood & Mar Lee are dense, predominately single-family residential neighborhoods in southwest Denver.

Throughout the entirety of this project, the group explored the study area's general characteristics and the larger context within which bus stop assessments also took place. The researchers examined the study area's land uses, transportation, urban fabric, and demographics. As a group, field investigations were conducted to collect data on each stop's amenities, quality, and physical surroundings. Also, intercept interviews with transit riders were organized to gain additional perspectives on the bus stops in our study area. An important part of this project was to analyze the data collected along with what was learned about the study area, identifying existing gaps and developing recommendations for improving the bus stops and the transit/pedestrian infrastructure.

To accomplish these steps, primary planning data was collected through site investigations and intercept interviews. Secondary planning data has been collected from government reports and databases and other reliable sources. Different formats and media organized and managed the planning data. From this, the intention was to communicate the narrative in a compelling way through written, verbal, and graphical techniques. For this, the group gathered, created organized, illustrated, displayed and presented the findings using a variety of applications like Excel, Access, ArcGIS, PowerPoint, Illustrator, Photoshop, and InDesign. Overall, these methodologies helped put together the tasks and finish with a cohesive and concise project.
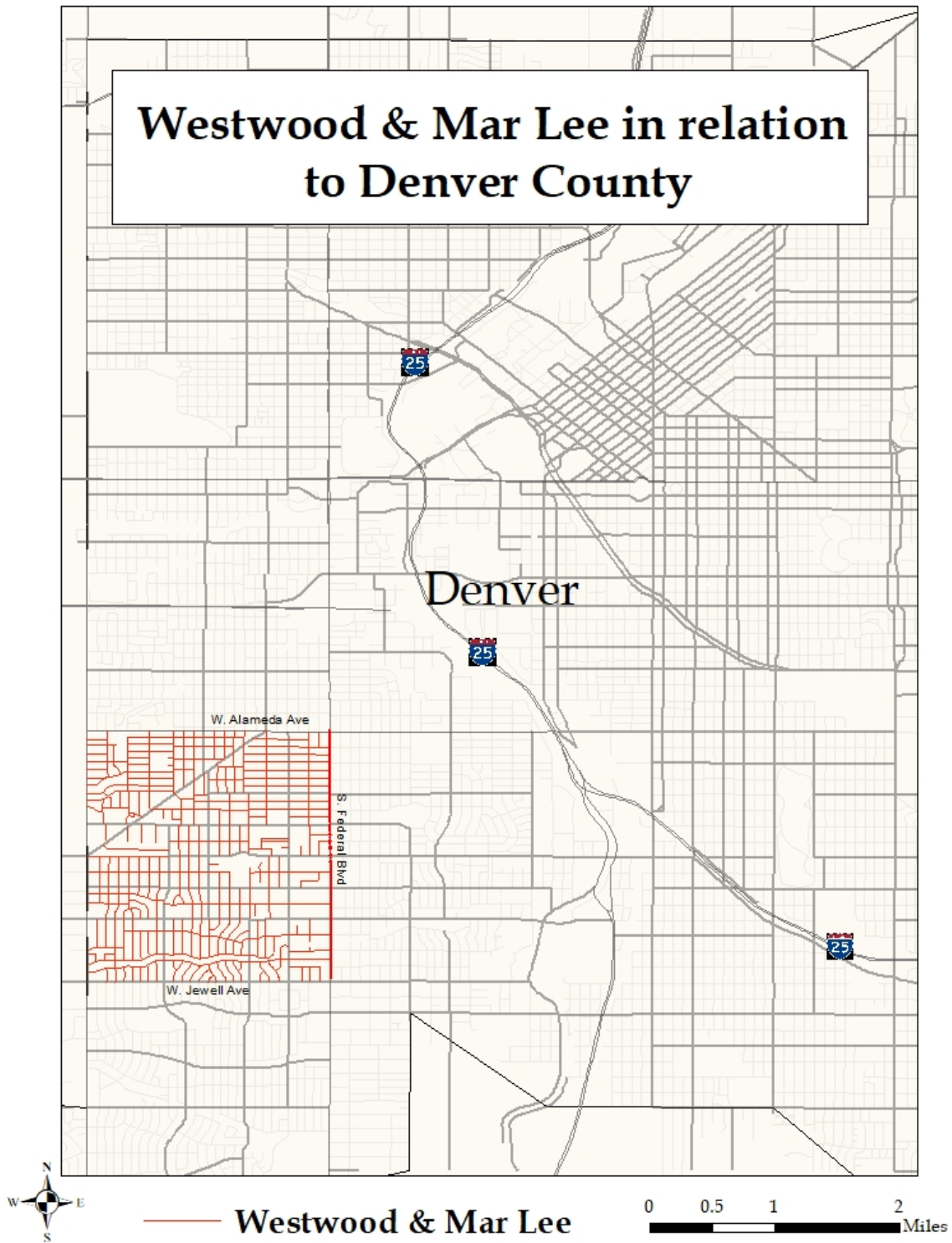
Source: services5.arcgis.com RTD Denver Open GIS Data

Exhibit 1: Study Area Location Map

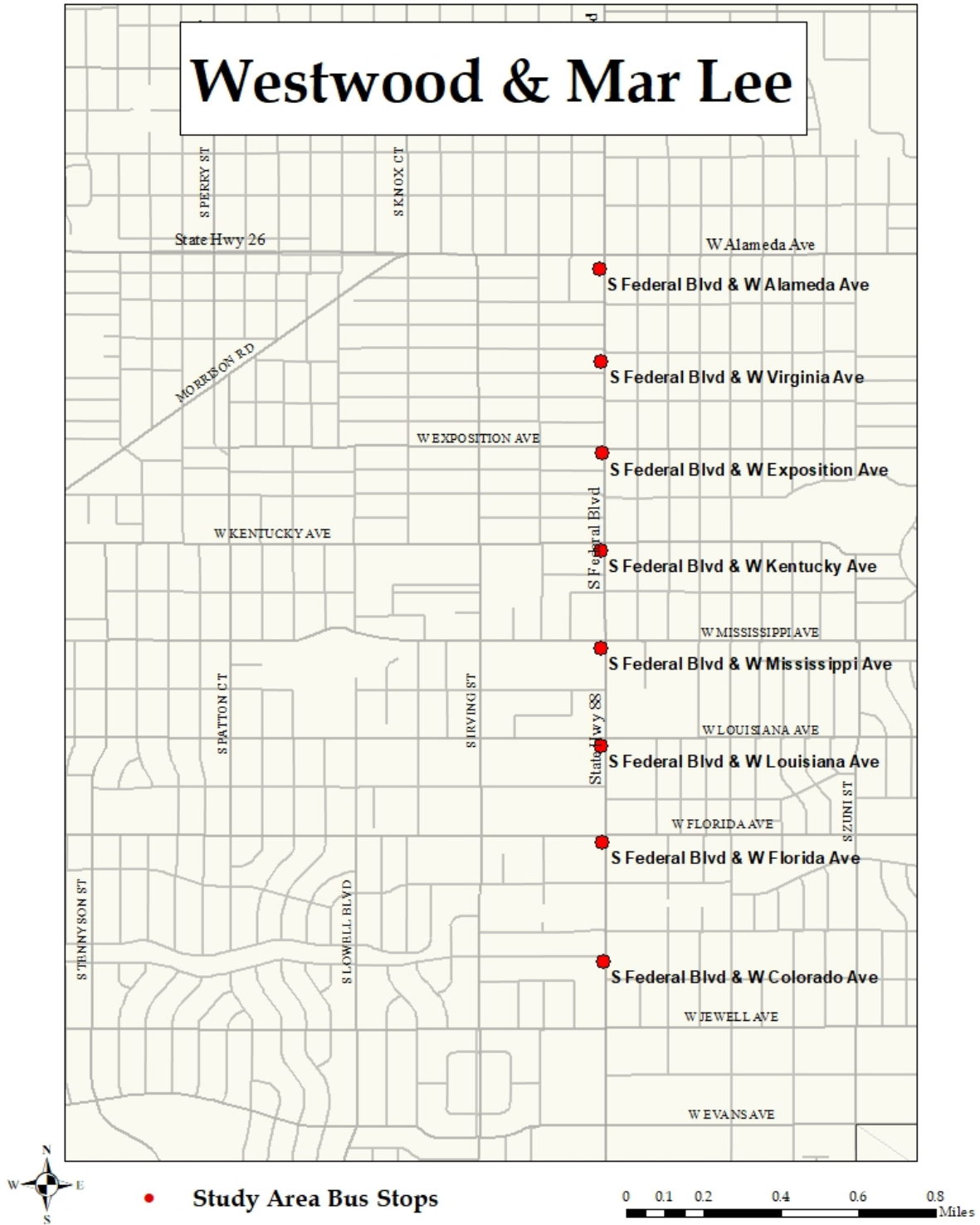Source: services5.arcgis.com RTD Denver Open GIS Data

Exhibit 2: Study Area Detail Map

DEMOGRAPHIC PROFILE

In order to establish efficient transit stops within the Westwood and Mar Lee neighborhoods, there first must be knowledge of the people who already live there. Being said, the demographic profile should be made up of racial, income, age, and transportation data; all representing this population in an effective way. Upon extracting this data from the American Community Survey (ACS) in 2017, some disparities within the data were found. As a result, the group individually combined ethnic housing unit counts, using the race by tenure data, in order to better represent the population of the study area.

It is also important to collect income data because these neighborhoods have a high number of low-income households. Consequently, low-income households are more likely to use public transportation due to their lack of economic resources to own a personal vehicle. Additionally, age data is important because younger populations are less likely to own their own personal vehicle for the same reason, and thus are more likely to use public transportation. Lastly, Means of Transportation to Work data provided insight into the percentage of study area residents that use public transportation. However, the group decided to delve deeper by deriving this data by tenure, since most of the households in the study area are predominately renter occupied. In any case, by using these four data estimates, the demographic profile of the Westwood and Mar Lee neighborhoods are represented in a more well-rounded manner.

Race
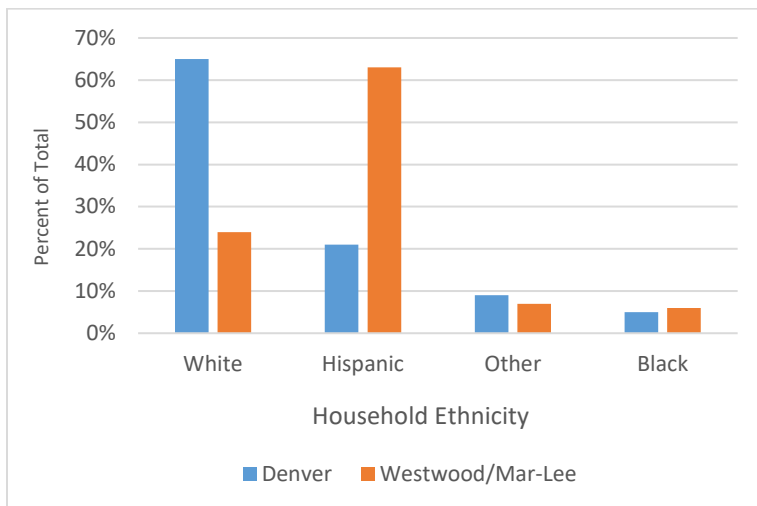
Exhibit 3: Population by Ethnicity

	Denver			**Westwood/Mar-Lee**	
Race	Count	Percent		Count	Percent
White	185,617	65%		1,109	24%
Hispanic	61.029	21%		2,871	63%
Other	24,872	9%		330	7%
Black	15,744	5%		258	6%
Total	**287,262**	**100%**		**4,568**	**100%**

Table 1: Population by Ethnicity

To understand fully who is actually in our study area, race is especially important when representing their demographic profile. As seen in Exhibit 3 above, the Hispanic population takes up more than 63 percent of the housing units in the neighborhood, whereas the white population only takes up about 24 percent. However, compared to the city of Denver, the demographic profile almost flips. In fact, the population of Denver is predominately White and takes up about 65 percent (Table 1 above) of the housing units within the city, whereas the Hispanic population only takes up 21 percent. Additionally, the African American population is significantly bigger in Denver than in our study area. As a result, the group has reason to believe that this neighborhood has strong Latino roots, and that the people of this neighborhood are more likely to take public transportation than the city of Denver as a whole, due to its low-income and renter-occupied residents.

Income

Information about household income in a neighborhood can be very useful when discussing transit and walkability. Differences in household incomes could mean variances in types of transit utilized or accessibility to transit and walkability in the neighborhood. Often, lower-income areas are at a disadvantage when it comes to accessible transit and walkability, compared to areas of higher-income. As depicted graphically in Exhibit 4 and numerically in Table 2 below, the Westwood neighborhood consists mostly of household incomes below $25,000 and between $45,000 and $99,999 at 34 percent and only 11 percent of household incomes at or above $100,000. Similarly, 34 percent of households in Denver County have an income between $45,000 and $99,999, followed by 29 percent have household incomes of $100,000 or above.
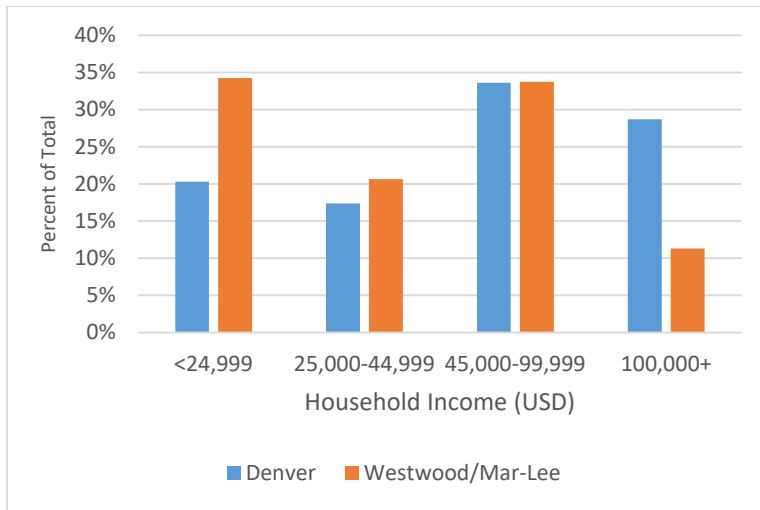
Exhibit 4: Population by Household Income

| Income	Denver		Westwood/Mar-Lee	
	Count	Percent	Count	Percent
<24,999	58,278	20%	1,566	34%
25,000-44,999	49,967	17%	944	21%
45,000-99,999	96,571	34%	1,542	34%
100,000+	82,446	29%	516	11%
Total	**287,262**	**100%**	**4,568**	**100%**

Table 2: Population by Household Income

Denver County and the Westwood neighborhood have similar age structures. For example, both areas have a larger population of younger people than it does older people. This is because the majority of Westwood residents are under the age of 18, they may be more likely to use public transportation since they may lack personal vehicles, or do not travel on their own. Additionally, because most people in the Westwood neighborhood are of working age (18 – 64), they could feel more inclined to use public transit to commute to Denver to avoid the traffic congestion seen in Denver. These highlights raise some questions about transit and walkability in the Westwood neighborhood. The researchers became interested in how accessible public transit in Westwood is to all age ranges, and if there are barriers to walkability and public transit usage because of age.

Age

Age happens to be a key factor that may help describe the transit ridership and walkability of a neighborhood. Working aged people (about 18-64) are the most likely to use some form of public transportation to get around and desire walkability. On the other hand, the group infers that those who are considered the non-working population (younger than 18 and older than 65) are less likely to utilize public transit due to their lifestyles. The Westwood neighborhood in Denver has a large working aged population which makes up more than half the population and is similar to that of Denver County's population overall.
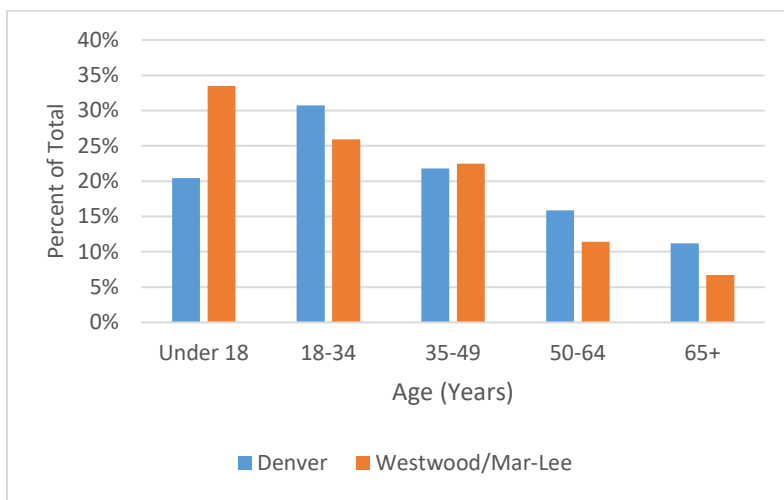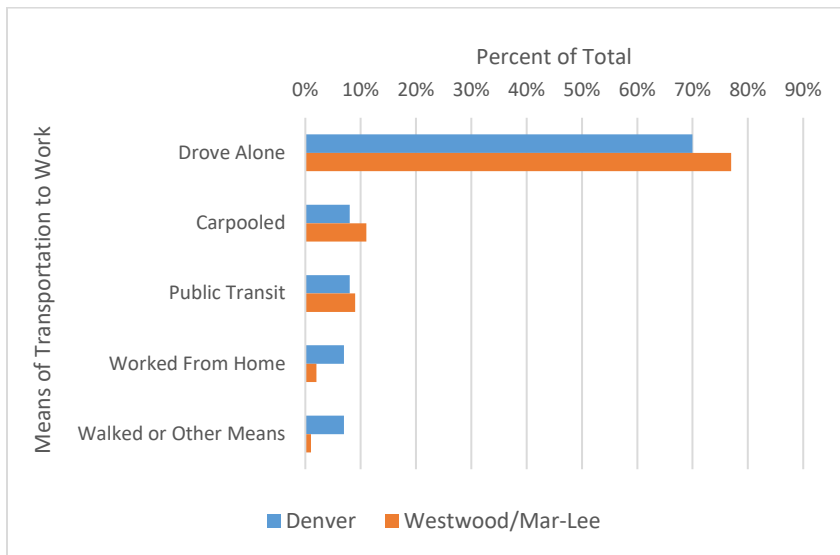

Exhibit 5: Population by Age

The majority of Westwood's population, however, is under 18 year olds, which is 13 percentage points higher than Denver's residents under the age of 18 (Exhibit 5 above). This is compared to Denver where the majority of its population is within 18-34 years old, which makes up almost 31 percent of the total population, as seen in Table 3 below.

Age	Denver		Westwood/Mar-Lee	
	Count	Percent	Count	Percent
Under 18	138,624	20%	5,437	33%
18-34	208,580	31%	4,206	26%
35-49	147,770	22%	3,649	22%
50-64	107,534	16%	1,857	11%
65+	75,959	11%	1,087	7%
Total	**678,467**	**100%**	**16,236**	**100%**

Table 3: Population by Age

Means of Transportation to Work

Exhibit 6: Population by Means of Transportation to Work

Means of Transportation to Work	Denver		Westwood/Mar-Lee	
	Total	Percent	Count	Percent
Drove Alone	255,652	**70%**	5,151	**77%**
Carpooled	29,662	**8%**	770	**11%**
Public Transit	27,328	**8%**	569	**9%**
Worked From Home	27,066	**7%**	142	**2%**
Walked or Other Means	24,466	**7%**	101	**1%**
Total	**364,174**	**100%**	**6,733**	**100%**

Table 4: Population by Means of Transportation to Work

As some concluding interpretations for the demographic profile of the study area, it is increasingly important to portray the different means of transportation within the neighborhood. As seen in Exhibit 6 above, mostly everyone in the neighborhood is using their own personal vehicle to get to work (77 percent), whereas only 9 percent of the residents are using public transportation. Compared to the Denver, the trend is entirely the same, with a few exceptions. In fact, mostly everyone in Denver is using their own personal vehicle to get to work (70 percent), whereas only 7 percent of the city's population uses public transportation. Table 4 above represents this. A larger share (9 percent) of Westwood residents take public transportation to work than Denver residents (7 percent). Subsequently, the residents of the entire city are seven percentile points more likely to work at home than those living in Westwood. This leads the team to believe that there are more lower-income residents living (in comparison to higher-income residents) in the study of interest than in the entire city of Denver, due to higher rates of renter-occupancy and public transit usage in the Westwood neighborhood, as well as a significantly lower rate in residents working from home.

In conclusion, it is inferred that there are lower-income residents in the study area, and that these residents are more likely to use public transportation to work due to its affordability. However, there is a prediction that most likely a lack of access to this public transportation in the neighborhood since the residents are choosing to drive rather than take public transit.

LAND USE, TRANSPORTATION, AND URBAN FABRIC

Land Use

In the Westwood and Mar Lee neighborhood, much of the area is comprised of single-unit, residential homes. In Mar Lee, over 93 percent of the land use is Single-Unit residential homes. Westwood is overall the same, where 71 percent of the land use are Single-Unit homes. Although, Westwood is overall the same it differs slightly in the type of residential units. Westwood is made up of mostly Residential (over 90 percent). The drastic disparity between Residential land use and all other land uses are highlighted in the following tables.

As the map displays, this is where most of the commercial/retail land use resides in both the Westwood and the Mar Lee Neighborhoods and where there is hardly any residential usage. Mostly everything West from Federal Boulevard is land that is being used for residential purposes, and just about fully covered, with hardly any Vacant lots within the two neighborhoods. The little vacancy areas make up less than two percent of the total land use (combined) in both areas of study. This highlights that the urban fabric of these neighborhoods is residential as can be seen in the following map (Fig. A3-3). Most of the land-use coverage along the two neighborhoods are made up of residential units; whether that is single-unit, two-unit or multi-unit. The only exception to this general land use coverage is the area along Federal Boulevard, which runs north-south.
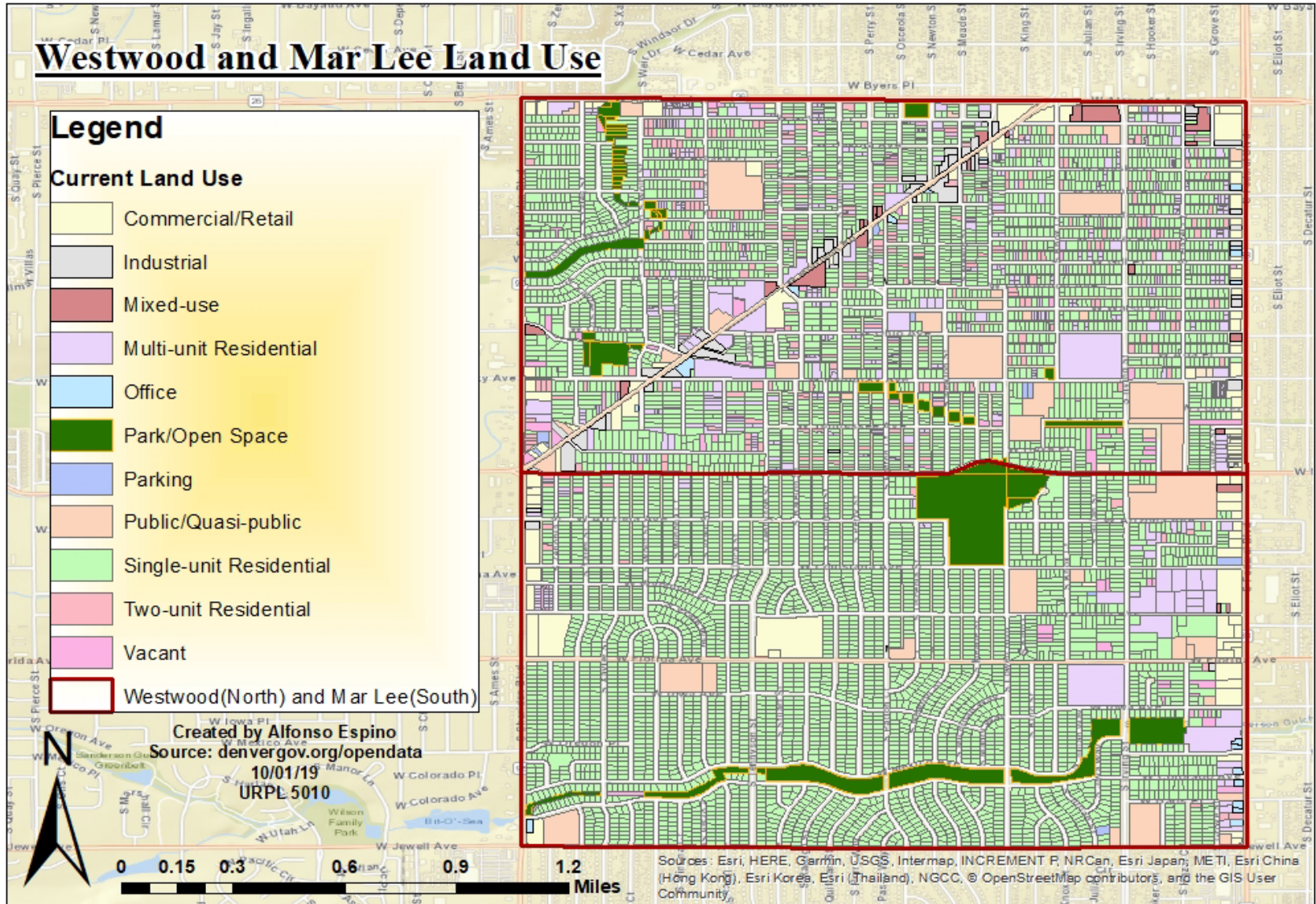
Exhibit 7: Westwood and Mar Lee Land Use

Transportation

The Westwood and Mar Lee area contains a plethora of routes and points of access to diverse types of transportation. A main reason for this is the gridded organizational system that connects the majority of the neighborhoods. The main streets include Sheridan Boulevard and Federal Boulevard running north-south; Alameda, Kentucky, Mississippi, Louisiana, Florida, and Jewell Avenues running east-west; and Morrison Road running diagonally from Alameda Avenue at South Knox Court to Mississippi Avenue at Sheridan Boulevard. The study area is located roughly two miles West of I-25 and a little over a mile south of 6th Avenue.

With the exception of a few, there is a bus route running horizontally on every major street; Route 3 services Alameda Avenue, Route 4 services Morrison Road, Route 11 services Kentucky Avenue, and Route 14 services West Florida Avenue Both Sheridan Boulevard and Federal Boulevard have routes 36 and 51, respectively, which provide transit in the north-south directions. Each street on which bus service is available, there are frequent bus stops along their routes. Currently, there does not seem to be any transit access for patrons in central Mar Lee along West Louisiana Avenue or West Mississippi Avenue. Furthermore, travel in the general area seems to be limited in the north-south direction due to lack of larger streets on which public transit could transport passengers. For this reason, both Sheridan Boulevard and Federal Boulevard act as major players in connecting the Northern regions to the Southern regions of the surrounding neighborhoods including the study area. Nevertheless, being in a fairly accessible location, the routes/lines running east-west connect with other major regions and transportation modes, such as Alameda and I-25/Broadway stations.

Another common mode of transportation in the Westwood/Mar Lee area is bikes. Bike lanes are present throughout the study area, but more could be installed. Currently, only Morrison Road and West Florida Avenue have designated bike lanes within the study area. The majority of the other roads have shared lanes, where bicyclists are mixed in with the rest of the commuting population. There is also one multi-use trail in the neighborhood, Sanderson Gulch Trail. It travels east-west from the South Platte Trail, providing easy access to downtown.

Sidewalks are common in the neighborhood but vary in condition and quality. Protected sidewalks are present on Federal Boulevard between West Exposition Avenue and West Ohio Avenue. On the Eastside of Federal Boulevard, there is a buffer of grass between the pavement and the sidewalk. Similarly, there is a border made of trees on the Westside of the same block. However, three blocks down, neither side of Federal Boulevard has protected sidewalks. In fact, the pedestrians walk through parking lot entrances for most of this block between West Tennessee Avenue and West Mississippi Avenue.

With Westwood and Mar Lee being heavily residential areas, multiple modes of transit are present along the grid-like arrangement of streets, as is seen in Exhibit 8 below. Connections between these modes also are prominent, as people have needs of travel on local and regional scales.
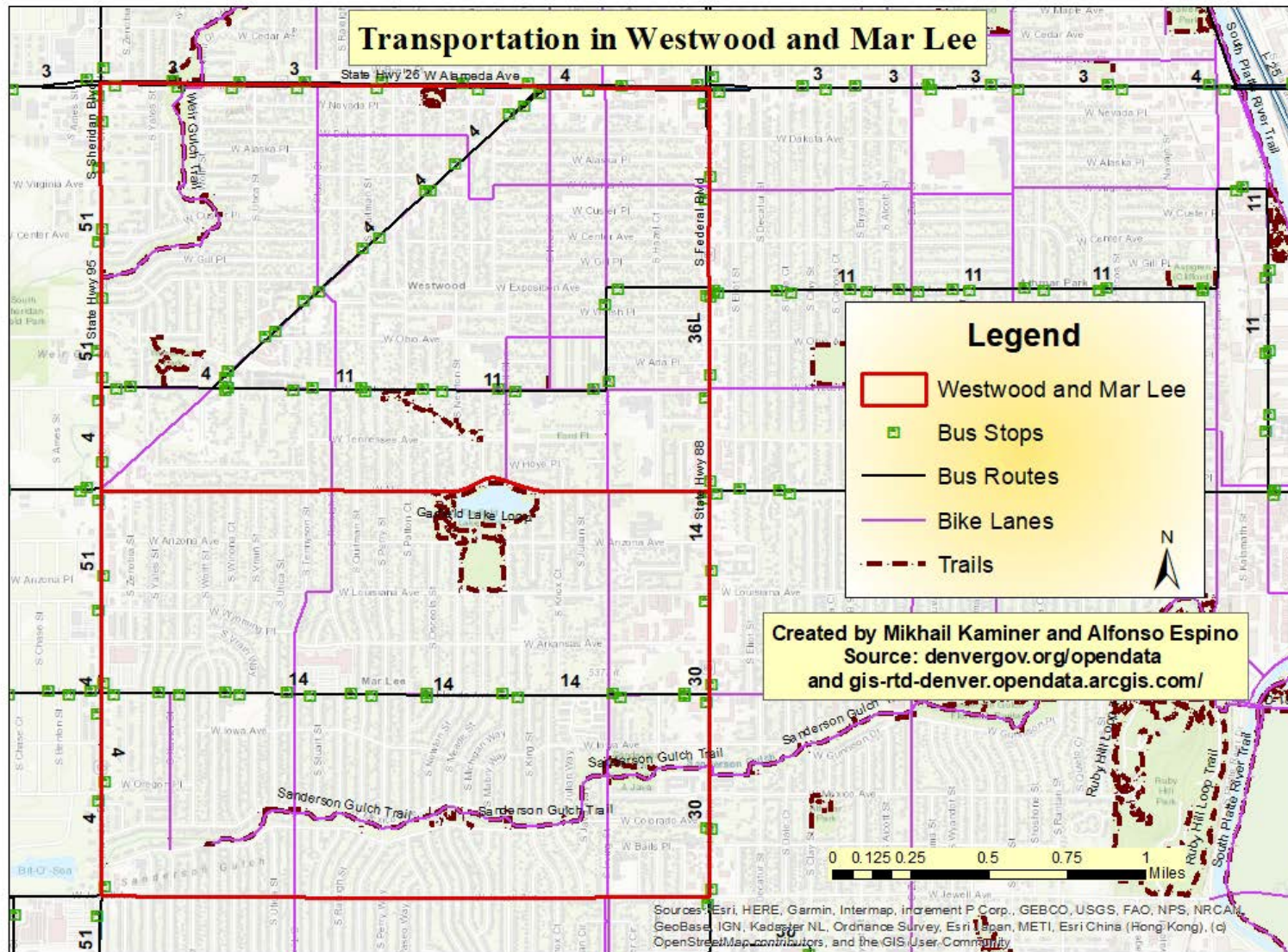
Exhibit 8: Transportation in Westwood and Mar Lee

Urban Fabric

Being mostly an older residential area of Denver, Westwood and Mar Lee consists of homes built in the second half of the twentieth century on wide streets with large setbacks. As seen in both Google Maps images below in Exhibit 9 and Exhibit 10, houses are normally one story and have large front yards with developed shade from tall trees.

Exhibit 9: North Westwood at South Vrain Street and West Exposition Avenue

Exhibit 10: South Mar Lee at South Wolff Street and West Mexico Avenue

A similar pattern is seen in the areas of public spaces. In the residential areas on the edges of Garfield Lake Park, there are still wide streets, short houses, and lots of green space. Although Garfield Lake Park is one of the only main green spaces in the neighborhoods, the consistent presence of greenery evokes the sense of close nature.

Exhibit 11: North Garfield Lake Park at West Mississippi Avenue and South Newton Street

The exceptions to these lie on the busy streets like Morrison Road and Federal Boulevard. There is much more variety in the type of housing and building structure, since it is not only residential, which changes the urban factor. There are even a few instances where on one side of the road, there is a modern apartment complex with multiple stories, but on the other side, there is open space with one-story, businesses. Federal Boulevard is a large commercial corridor, with wide parking lots separating buildings from the street. The building heights in these commercial areas are diverse as they accommodate various types of industries.

Westwood & Mar Lee have distinct characteristics that make this neighborhood rely on transit and walkability often. Through the demographic of 81 percent of the population being Latino/Hispanic, single-unit residential and office land uses, grid like system of transportation with multiple modes of transit, along with a typical, simple, and subtle urban fabric, the relationship to this neighborhoods transit usage and walkability go hand in hand. This neighborhood is heavily reliant on transit and walkability as the context and characteristics of Westwood & Mar Lee suggest.

Chapter 2: Site Assessments

STUDY AREA WINDSHIELD/WALKING SURVEY

As the group ventured out to the Westwood/Mar Lee area for a Windshield/Walking survey, a few initial observations were collected. Specifically, the observations compiled from the *Chapter 1: Project Introduction and Context* were solidified and placed into perspective. The group first conducted a windshield survey in which they understood the traffic patterns of Federal Boulevard and how the traffic tends to interact with the buses. Most cars tend to change lanes if behind a bus because the bus stops are not separate from the boulevard. Furthermore, the initial survey showed the unevenness in bus stop amenities, with certain stops having shelters, and others only indicated by a sign, a pole, and a bench. To speak for the topography, the group's study area contains a few slope changes, making it obvious why choosing to ride the bus even for a few blocks is beneficial. The group was able to find a parking spot, and walked the study area on foot. This assisted in understanding the human aspect, and how it feels to walk along Federal Boulevard. A major observation was that – like seen in the unevenness of bus stop amenities – there are also major differences in the level of comfort as one walks down the sidewalk. There are certain spots where the sidewalk is right up against the road with traffic zooming by, and in other parts, there is ample room between the road, the sidewalk, and the closest building. Organizing a windshield and a walking survey established a sense for expectations throughout the site assessment portion of the project.

EXECUTION AND SAFETY PLAN

In order to ensure an efficient use of time and a harmless outcome, an Execution and Safety Plan has been developed for the Site Assessments of the Westwood/Mar Lee study area including both the bus stop assessment procedure and the intercept interviews. The following plan aims to identify logistics, data collection methods, and safety precautions that will be conducted throughout the field investigation.

Bus Stop Assessments

The group plans on conducting multiple bus stop site assessments of the study area in order to better understand the nature of the study area, specifically where the area lacks bus stop amenities. Being said, there will be a total of three separate times when the team will venture out: Wednesday, October 23rd from 3pm to 6pm; Thursday, October 24th from 3pm to 6pm; and Friday, October 25th from 11am to 2pm. The different days and times will allow for the group to gather more well-rounded data, and to disperse data collection between the bus stop assessments and the intercept interviews. In other words,

about half of the time will be spent collecting data on bus stops, while the other half of the time will be spent interviewing stakeholders, described further in the safety plan. Gabrielle Sigar will be responsible for obtaining pictures throughout each bus stop assessment. Macario Torrez and Noah Hammer will evaluate the circumstances of the bus stops through the use of the online tool. Mikhail Kaminer and Alfonso Espino will help take group notes and provide overall analysis.

Alfonso Espino will be the reliable driver for all three of the field dates, so he will get the group to and from the study area. Because the study area is located south of the Auraria Campus (the group's "basecamp"), the group will travel from north to south along Federal Boulevard to evaluate the bus stops, trying to balance between evaluating the bus stops and the intercept interviews.

When the group arrives at each bus stop, the photographer, Gabrielle Sigar, will take an initial overview photograph. Then, the group will begin evaluating the bus stop by having the note-takers write down any defining features on notepads or the "notes" section of their phones, and the members in charge of the specific data will fill out the online form provided by the City and County of Denver on their phones. After this, the group will come together and make sure that all of the significant details have been recorded and cited.

There are certain issues that may occur throughout the process, and the group is prepared to adapt to them. One potential problem is that there could be disagreement among the members over the condition of the bus stop. To combat this disagreement, the group plans on getting input from every member, even if each member is not assigned to evaluate each bus stop. A clear discussion and on-the-spot analysis should help determine a consensus. Another potential problem is that there may be too many commuters at the bus stop, and the group members may not be able to collect full-quality data. In this case, the group plans on delaying the evaluation of this bus stop to another day, or later in the site analysis. This can be a perfect opportunity to switch over to interviewing commuters. If delaying the analysis is not possible, the members plan on waiting for the next bus to come and pick up commuters. The goal is to collect data true about the bus stop, so fewer people present during the bus stop assessment will help understand the condition of the bus stop more objectively.

A priority for the group is personal safety. Because bus stops tend to be on the side of a busy boulevard, the group will always be aware of the traffic. The photographer, specifically, will be able to look out for any potential dangers that come with cars passing by. When the photographer is busy taking pictures, the other members will be responsible for making sure that she is safe. The group has also agreed to constantly stay together in the vicinity of the same bus stop at any given time. Because the study area is in Colorado, which tends to have unpredictable weather patterns, the group is willing to postpone data

collection to one of the other days that has been allotted, when the weather will hopefully be more suitable.

Intercept Interviews

As described in the bus stop assessment portion, the team plans on collecting data on a total of three separate days, out of which half of the time will be spent evaluating bus stops, while the other half will be spent conducting intercept interviews. For these tasks, Gabrielle Sigar will continue to capture pictures, Alfonso Espino and Macario Torrez will directly interview the commuters, and Noah Hammer and Mikhail Kaminer will focus on taking the group notes that describe further detail besides the survey itself. In each case that the members encounter a stakeholder who prefers to speak Spanish, Alfonso Espino will be responsible to interview that person in Spanish, as he is fluent in the language. This will help reach a broader demographic of the community.

The group plans on interviewing at the busier bus stops because there is a higher chance for broader input of opinions. Based on the preliminary transportation research completed in Task A, the group plans on interviewing at the following bus stops: #13782 at West Alameda Avenue and South Federal Boulevard, #13837 at West Mississippi Avenue and South Federal Boulevard, and #13832 at West Louisiana Avenue and South Federal Boulevard.

To identify which stakeholders to interview, the group will attempt to receive responses from a variety of people. Being said, the members sense that they will have more success with people waiting for the buses, rather than those who get off and are trying to arrive somewhere. Furthermore, the group will always keep track of the demographics of the people who have already been interviewed. If one demographic, such as older individuals, have already been interviewed, the group will attempt to approach younger people. When approaching potential interviewees, the group will smile, present themselves as CU Denver students, and quickly explain that they are helping implement better bus stops and would like the public's opinions.

As discussed before, the interview metadata will be collected by the observing members who are responsible for group note-taking, while the members in charge of interviewing the people will record the interviewee's responses. In cases where there are few people at the bus stop, one of the interviewers will directly speak to the stakeholder, while the other assigned interviewer will record the direct responses on the survey sheet.

Once again, personal safety is a priority. As discussed in the bus stop assessment portion of the safety plan, the group will constantly be aware of traffic patterns, and if the weather inhibits the group from

going a certain day (or part of the day), the group will postpone data collection to another allotted day. To address safety in interacting with people, the group will politely ask if a person would like to be interviewed, and if not, then the group will smile and wish the person to have a good day. Similarly, the group will never force stakeholders to give a response, as they reserve the right to not answer a certain question. This approach should help ease any tensions that may occur during the interviewing process. Unruly people are also the reason why the group plans on sticking together throughout the entire data collection period.

The Westwood/Mar Lee team will do its best to follow the above execution and safety plan to ensure a smooth data collection process.

BUS STOP ASSESSMENTS SITE INVESTIGATION

The bus stop assessment portion of this task included attending each bus stop in the given study area and evaluating its condition on the website given by CCD/WalkDenver. This allowed the team to collect well-rounded data that represented each bus stop within the study area. The group rated the bus stops on ground surface, amenities, distance to crosswalk, physical condition, cleanliness, accessibility, connectivity, safety, and an overall rating. Most of the ratings were on a 1 to 5 scale, with 1 being the lowest quality of the attribute and 5 being the highest. The other ratings were based on physical amenities present. The way that the team went about collecting this data was through a group effort and judgement. As outlined in the execution and safety plan, each time the group arrived at each bus stop, an initial overview photograph was taken. Then, the group conversed and evaluated the bus stop by entering the attributive information on the website, and wrote down any other contextual notes each person had. The bus stop summaries below are presented in geographic order from north to south along South Federal Boulevard within the Westwood/Mar Lee study area.

Bus Stop #13782: South Federal Boulevard & West Alameda Avenue

This bus stop (Exhibit 12) is the northernmost stop in the study area, and it is located at the intersection of two prominent Denver streets. Being said, it is one of the more developed bus stops in the study area. Located on a concrete pad, there are multiple benches, an official trash can, shade trees, route information on the sign, and even public art in the form of a mural of a lily pad and a hummingbird. It is located close to the crosswalk from West Alameda Avenue, and its widened sidewalk gives room for commuters to feel comfortable. However, being on a slight slope puts the stop at a disadvantage in terms of accessibility to people with disabilities. Another factor is that the bus stop has an issue with cleanliness. Although the group rates it at a 3, there is much more room for improvement as there is sewage running off of the nearby building and there are many cigarette butts. Safety is also rated at a 3

due to a lack of lighting and no shelter. Overall, the group rates the bus stop as a 4 because it is one of the more advanced stops, but it still does not meet all of the quality measures.

Exhibit 12

Exhibit 13

Bus Stop #13854: South Federal Boulevard & West Virginia Avenue

The next bus stop south (Exhibit 13) is radically different from the first one. This is because it has a total of three amenities: a broken bench, a communal trash can, and a sign to indicate the bus stop. The surface under the bench is a concrete pad, but the rest of the stop is made up of asphalt. There is a close crosswalk, so it is in a convenient location; however, the rest of the attributes are rated on the low end of the scale. The physical condition, accessibility and connectivity are given a 2, cleanliness and safety receive a 1, and overall, the group rates the stop a 1. Something to note is that the stop seems to be placed on an already existing sidewalk. In other words, it seems to be a filler of space more than a useful necessity, as it is located at the forefront of a carwash as part of the setback from the busy boulevard.

Bus Stop #13811: South Federal Boulevard & West Exposition Avenue

The following bus stop (Exhibit 14) is one of two of the best bus stops within the Westwood/Mar Lee study area, and the group gives it an overall rating of 5. Just like the majority of the bus stops, the bus stop is on a concrete pad. As for its amenities, it has multiple benches, a large trash can, a standard (but fairly large) shelter, a system map, and route information. There is close access to the crosswalk, and the bus stop has plenty of sidewalk space where commuters can wait for the bus; this also improves the

pedestrian connectivity and accessibility for those with disabilities. This bus stop has a low Cleanliness rating, but it is only due to accumulated cigarette butts and debris in the corners of the shelter from the effects of wind. Due to the plethora of amenities, space, and considerate distance of the shelter from the boulevard, the bus stop is given a 4 for safety, only lacking lighting.

Bus Stop #13830: South Federal Boulevard & West Kentucky Avenue

This bus stop (Exhibit 15) is one of the lower-scoring bus stops with an overall rating of 2. There are only two benches present in front of a dirt construction zone, and the two benches need repair. As seen frequently in the study area, the crosswalk is close to the bus stop giving easy access and connectivity (score of 4), but the accessibility for people with disabilities is rated as a 3 due to the stop being part of the sidewalk. This also is why the physical condition was given a 1. However, the sidewalk is wide in this part of the study area, which heavily impacts the rating of a 4 for the safety of the bus stop. The bus stop does not have a trash can, which reduces the score of cleanliness to a 2. At the time that the group was there, there was even debris such as medication left on the bench. The plethora of issues brings the overall score to a 2.

Exhibit 14

Exhibit 15

Bus Stop #13837: South Federal Boulevard & West Mississippi Avenue

With one of the highest overall ratings in the team's area, bus stop #13837 (Exhibit 16) has a full range of amenities with benches, a raised concrete border that can be used as a bench, a shelter, route information and a schedule, and a trash can. The bus stop is also fairly accessible for those with disabilities and highly accessible in terms of connectivity. Many of these help contribute to a safety score to a 4. Unfortunately, cleanliness is a concern, as the group rates it at a 1. The shelter exists, but it is soiled with urine inside and out, and the small trashcan is not enough for the traffic that uses this stop, as seen by a large amount of trash. This factor impacts the score of 3 for the physical condition, and drops the overall rating to a 4.

Exhibit 16

Exhibit 17

Bus Stop #13832: South Federal Boulevard & West Louisiana Avenue

This bus stop (Exhibit 17) is the second of two to receive an overall score of 5 on its assessment. It has various amenities including a bench, an official trash can, a shelter, route information and a schedule, and it is one of the only stops in the area with reliable lighting provided by the Federico F. Peña Southwest Family Health Center. Lighting is a clear issue at the other bus stops, but thankfully this one has plenty. With the described amenities, the team rates connectivity, disability accessibility, physical condition, and safety all at the rating of 5. The only category in which a 4 is given instead was the cleanliness, and this is due to natural debris and cigarette butts found inside of the shelter. Another notable feature is the width of the bus stop that is given in addition to the present sidewalk.

Bus Stop #13814: South Federal Boulevard & West Florida Avenue

Bus stop #13814 (Exhibit 18) at the intersection with West Florida Avenue receives an overall rating of a 3 because it is exactly that— an average bus stop with some amenities, but room to improve. It contains two benches, two official trash cans, and reliable street lighting. Theses amenities, however, are located as part of the sidewalk, and there is only a small widening to give space to pedestrians. It does help a little bit with people who need extra accessibility, and it provides more clear connection to the bus stop and the near crosswalk. For this location, safety is closely tied to cleanliness because although there is street lighting (indicating safer conditions) and plenty of opportunity for trash to be picked up, when the team evaluated this bus stop, there was glass everywhere. This brings the cleanliness rating to a 2 and the safety to a 3. From this, the physical condition is rated as a 3.

Exhibit 18

Exhibit 19

Bus Stop #13801: South Federal Boulevard & West Colorado Avenue

The final bus stop (Exhibit 19) in the study area does not inspire much from the team, as it only has two benches and the sign that indicates the presence of the bus stop. The surface is more developed here with solid concrete and even a brick section. Accessibility and connectivity are rated highly with a 5 and 4, respectively, because the area is mostly flat, and the crosswalk is close. For cleanliness, due to the rainy weather, there was natural debris around, but there was little man-made trash, so it is given a rating of 4, and with much lighting from nearby buildings, the safety is rated as a 4. Once again, the lack of amenities lowers the overall score down to a 3.
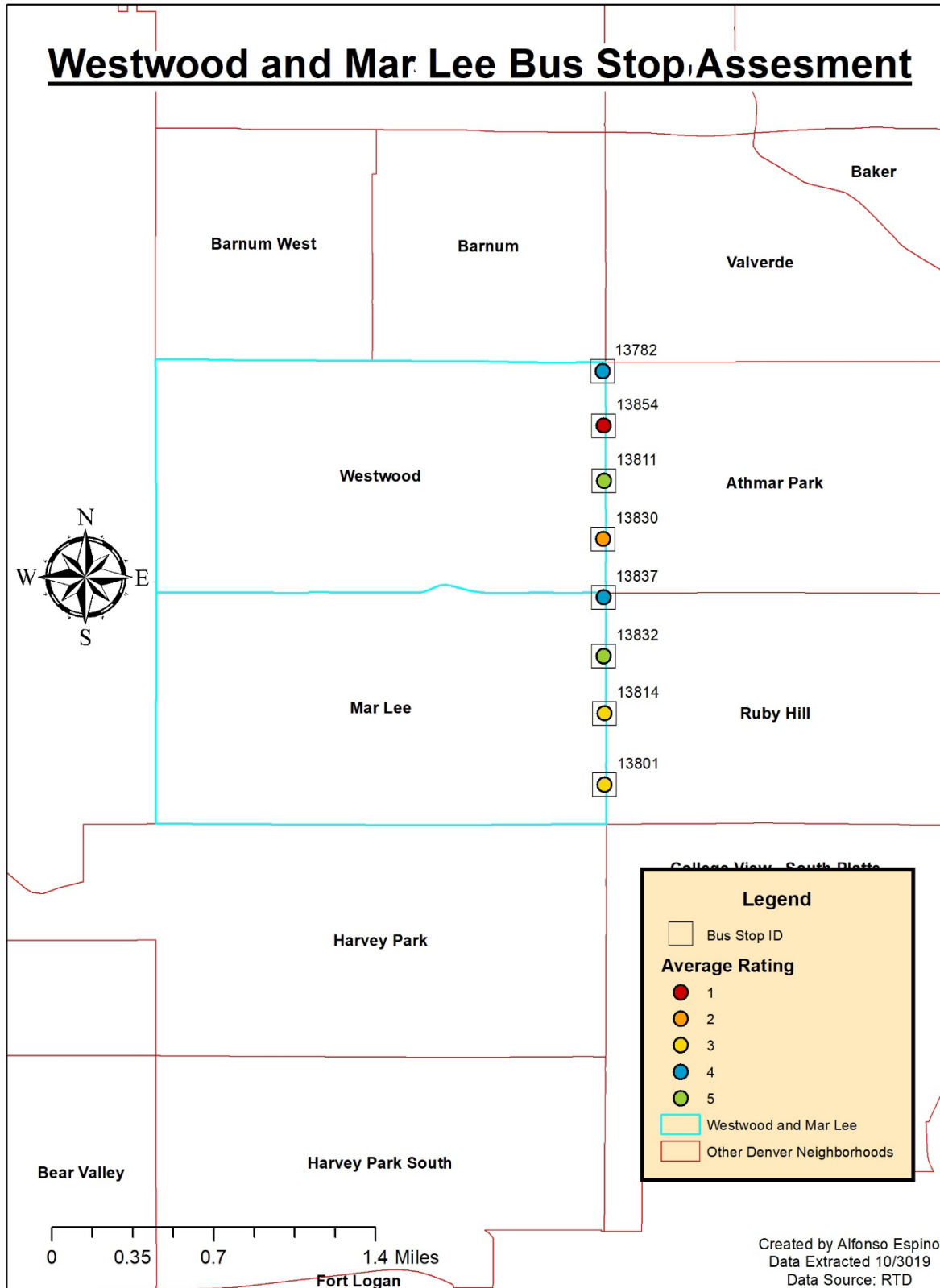
Exhibit 20: Westwood and Mar Lee Bus Stop Assessment

INTERCEPT INTERVIEWS

Intercept interviews were conducted by speaking with people who came in contact with the bus stop both from people departing and arriving. The team asked commuters questions provided by Denver, and occasionally people also elaborated on their concerns. The gathered information was then compiled and analyzed.

Trip Purpose	Count	Percent
Commute	11	44%
Errands/Shopping	7	28%
No Car	7	28%
Total	**25**	**100%**

Table 5: Interviewee Trip Purpose

Reason for Transit	Count	Percent
No Car Access	17	68%
Convenience/Ease	6	24%
Cost Savings	2	8%
Total	**25**	**100%**

Table 6: Interviewee Reason for Transit

The group found that, as shown in Table 5, the primary reason why people took transit is because it is part of their commute (44% of the responses). Furthermore, Table 6 shows that transit was chosen because the people have no car access (68% of the responses). In fact, this same percentage corresponds to the responses shown in Table 7 below, where 68% of people take the bus at least once per day. This indicates a heavy reliance on public transit in the study area. Public transportation, in most cases, is the only means for citizens to be able to tend to their daily responsibilities. This is also evidence in the fact that 76% of the interviewees walked to the bus stop, and 12% were transferring buses, as shown in Table 8. This means that 88% of people interviewed are reliant on the bus for any mode of transportation.

Frequency of Bus Use	Count	Percent
At least once per day	17	68%
Once per week	3	12%
Less than once per week	3	12%
2-5 times per week	2	8%
Total	**25**	**100%**

Table 7: Interviewee Frequency of Bus Use

Mode of Arrival	Count	Percent
Walk	19	76%
Bus transfer	3	12%
Bike	2	8%
Car (including Lyft/Uber)	1	4%
Total	**25**	**100%**

Table 8: Interviewee Mode of Arrival

The aspect of walkability can further be examined with the data portrayed in Table 9, which shows data for travel distance. It appears that 60% of the people interviewed travel a distance between zero and three miles. Interpreting this alongside the idea that the primary mode of getting to the bus stop is walking, it appears that buses are a helpful tool in conveniently getting around the area more than they help with long-distance travel. This can be impacted by either the terrain that the interviewers noted could be rough at times along Federal Boulevard.

Distance Traveling	Count	Percent
Less than one mile	1	4%
1-3 miles	14	56%
3-5 miles	4	16%
5-10 miles	2	8%
10-20 miles	4	16%
Total	**25**	**100%**

Table 9: Interviewee Distance Traveling

Bus Stop Rating (1-5)	Count	Precent
1	2	8%
2	5	20%
3	10	40%
4	6	24%
5	2	8%
Total	**25**	**100%**

Table 10: Interviewee Bus Stop Rating (1-5)

Another interpretation comes from the data collected on overall ratings of the bus stops and recommended amenities. The rating that received the most votes was a rating of 3 on a 1 to 5 scale, as seen in Table 10; 40% of the interviewees answered with a 3 rating.

Recommended Amenities	Count	Percent
Better lighting	17	16%
Security cameras	15	14%
Heating	14	13%
Shelter	10	9%
Real time arrival information	8	7%
Bike racks	8	7%
Route maps and schedules	6	6%
Trash cans	7	6%
Wifi	5	5%
Benches/seating	5	5%
More space to wait	6	5%
Other	6	5%
Public art	2	2%
Total	**109**	**100%**

Table 11: Interviewee Recommended Amenities

In reference to what the citizens would like for the bus stops, the team presented the survey in which there were plenty of options that people could select. From the 25 people, the group obtained 109 individual recommendations. The top two answers were better lighting and security cameras, with 16% and 14%, as shown in Table 11. This, combined with the commentary the group collected, shines light on some of the social issues that the community is facing. With 30% of the recommendations relating to personal safety, and many responses being centered around how unsafe they feel, safety seems to be a top priority. After these two recommended amenities, health is on people's minds, with heating at 13% of the recommendations and 9% for shelter. The area's citizens are concerned with their conditions during inclement weather, and this presents a clear challenge for commuters who heavily rely on public transit.

Interviewees are also concerned with cleanliness and the homeless population. People notice that despite there being trash cans at the majority of the bus stops, the bus stops are still dirty. This is especially true for the sheltered bus stops where there is urine creating a rancid smell and discomfort. People say that most of this is related to the homeless population that uses the bus stops as a place to reside. On many occasions, in fact, many say that the homeless individuals take up space on the benches and surface surrounding the stops, which makes the bus stop inadequate for its intended use.

BUS STOP ASSESSMENT AND INTERCEPT INTERVIEW METHODOLOGY CRITIQUE

The group originally followed the methodology stated in the execution and safety plan, but was forced to adapt because of challenges encountered early on in the interviewing process. One group member was the designated driver of the group and interviews were carried out between Wednesday, October 23rd and Friday, October 25th, at varying times to collect a diverse range of data. The time spent at each bus stop was split between bus stop assessments and intercept interviews, where each group member has an assigned responsibility: photographer, note taker, or bus stop analyzer. In an attempt to reach more stakeholders, interviews were taken at busier bus stops: #13782 at West Alameda Avenue and South Federal Boulevard, #13837 at West Mississippi Avenue and South Federal Boulevard, and #13832 at West Louisiana Avenue and South Federal Boulevard. Ideally, group members would attempt to interview a variety of people and believe more interviews will be taken by people waiting for the bus, rather than those who are getting off at the bus stop. After interviews and bus stop assessments are collected, the group will discuss their findings to determine a consensus if there should be any disagreements.

Again, interviews and bus stop assessments were collected on three consecutive days at varying times between 3pm and 6pm on Wednesday/Thursday, and Friday from 11am to 2pm. Interviews taken at different times and days allowed for the group to collect data from differing types of people: those

commuting to and from work, home, school, and even those running errands. Additionally, weather is incredibly important when conducting interviews because people tend not to stay around bus stops when the weather is poor nor do they want to be interviewed, so accounting for weather when choosing times and days to conduct interviews is something the group will consider in planning.

Initially, each group member was assigned a specific job and the time spent at bus stops was divided into interviews and bus stop assessments, but group members found it more efficient and practical to share the workload and do the bus stop assessments after interviews were conducted. Many of the interviewees also only felt comfortable speaking Spanish and because only one group member (Alfonso Espino) is fluent, having a separate note taker was not feasible. Additionally, the schedules of group members made it difficult for the entire group to be available for each interview, which further justifies the decision to equally disperse responsibilities amongst the group.

Another issue the group faced was actually finding interviewees with time to take interviews. Federal is an incredibly busy street with many bus lines passing through. Most people getting off at the bus stops are usually in a hurry to get to their destination and refused to be interviewed, and at one point, six buses had passed within half an hour. This is why the group found it convenient to interview people waiting for their bus at the bus stops. However, only a few agreed to be interviewed or could speak English, which made it difficult to collect interviews. On top of that, some interviews were difficult to finish because interviewees had many insightful things to say, and politely ending the interview was challenging. Something to consider in the future would be to create an exit plan, to politely end interviews and reassuring potential interviewees that the interviews will take a short time, to try to get more interviews.

The original methodology stated in the Execution and Safety Plan was good in theory but faced many challenges when practiced during the interview process and bus assessments. Choosing different time frames for interviews and allocating the workload evenly worked in the group's favor, but there are a few things that could have been improved that the group has learned from. For example, accounting for weather in the future will be one of the first things to consider when planning interview days in hopes of collecting the most interviews. Non-ideal interviewing situations, such as long running interviews, should be considered and plans to handle these kinds of situations need to be created in the future. One of the main lessons the group has learned is that planning is an essential part of the process, but it needs to be adapted to fit the available time and the situation.

SELECTED PHOTOGRAPHS OF THE SITE INVESTIGATION PROCESS

Chapter 3: Gaps and Recommendations

TRANSIT/PEDESTRIAN INFRASTRUCTURE GAPS

After conducting a thorough process of field data collection, the researchers have compiled a set of gaps and recommendations for the study area. These are based on the preliminary information gathered for Chapter 1, the bus stop assessments, and the intercept interviews. The goal is for the team to deliver high quality suggestions, so that the City and County of Denver has a greater understanding of what steps to take in regards to the bus stops along Federal Boulevard in the Westwood/Mar Lee area.

Existing Transit/Pedestrian Infrastructure Gaps

As a general observation, the existing conditions in the study area are characterized by large unevenness. What this means is that the present features vary greatly from site to site. The first to address is the difference in sidewalks. Sidewalks are an important feature for a community where the majority of interviewees do not own a car, heavily rely on transit, and arrive at the bus stops by walking. Therefore, accessibility is closely tied to the conditions of the sidewalks. For the most part, the bus stops are near a crosswalk, so getting to and from each stop's vicinity is relatively easy. However, the space allocated to walking near the bus stop varies. At stops like #13811 located at South Federal Boulevard and West Exposition Avenue, the shelter is located in its own sidewalk-length area, the general sidewalk passes in front of the shelter, and then there is another sidewalk-length area for boarding the bus. This large space allows for greater mobility and safety from the busy boulevard, as it can be seen as a buffer from the street. At the bus stop just North, #13854 at South Federal Boulevard and West Virginia Avenue, the situation is different; the waiting area is pushed up right against the boulevard, and the main sidewalk is located behind the bench. This means that people are really close to the cars speeding by.

In regards to bus stops that are like #13854, when buses drive by next to the sidewalk on which commuters are waiting, any water the bus drives over gets splashed onto the sidewalk right onto the people. This brings up the idea of cleanliness. Cleanliness is a significant feature when addressing bus stop conditions because many people interact with each stop on a daily basis. Unfortunately, the research team observed a consistent pattern of dirty bus stops. There are currently only two of eight stops that have metal cans, two stops that do not have a trash can at all, and the other four have communal cans. Moreover, many of the bus stops are dirty due to run-off material from nearby businesses, or urine-infested shelters. At stops like #13782 at South Federal Boulevard and West Alameda Avenue, there is raw sewage that flows from the restaurant located on the hill adjacent to the

bus stop. Another example is bus stop #13837 at South Federal Boulevard and West Mississippi Avenue where the benches and sidewalks are completely taken up by urine. These bus stops are not welcoming, and elevate the concern for public health safety; when people sit or breathe in these circumstances, illnesses are spread.

Missing Transit/Pedestrian Infrastructure Gaps

Throughout each bus stop along the study area, multiple bus stop elements cease to exist at certain sites. As stated in the existing infrastructure gaps section, researchers have found that cleanliness and sidewalks are an existing gap, though they also fall under the missing gaps as well. Along with the cleanliness and sidewalks missing at the bus stops, multiple standard bus stop elements such as shelter, trash cans, lighting, and sufficient seating are not present. These simple bus stop amenities are vital to a transit riders experience, as much of their time is spent waiting for the bus, so the missing seating, shelter, lighting, trash cans, and sidewalks can really affect how a transit rider views a bus stop and their experience. Transit riders must endure harsh weather conditions without a shelter, risk their safety with narrow sidewalks close to busy traffic and no lighting, and sacrifice their health with unsafe seating as well as a trash littered bus stop.

The missing gaps at the bus stops vary from stop to stop, but generally, the missing gaps is a trend for all bus stops within the study area. Several bus stops contain trash cans, though these trash cans were overflowing with trash, as other stops do not even have any waste baskets present. Seating is insufficient and missing as the researchers viewed transit riders sitting or leaning against concrete walls or the sidewalk. Shelter is missing from all the stops except for two, as those two stops shelters are mainly used for homeless shelter and not their primary intent, being transit riders. Lighting is non-existent at each bus stop, as the street lighting is the only helpful lighting for transit riders to see at night. Sidewalks are present at most sites, though a few sites have just a curb protecting them from the speedy cars on Federal Boulevard. Transit riders seem to avoid the bus stops entirely and wait either next to the bus stop or in the general vicinity, which can be attributed to the missing infrastructure at the bus stops in the study area.

Transit-Rider/Pedestrian Experience Gaps

Overall, pedestrian/transit-rider experience in the study area also varies. Major concerns that affect their experience are mainly due to safety issues and a lack of maintenance of the bus stops. As mentioned before, lack of cleanliness is an overall issue the team observed at almost every bus stop. Although the degree of cleanliness at each bus stop varies, cigarette butts and general debris and garbage are found at every bus stop in the study area, which may be because of the lack of trash cans or

maintenance of the trash cans at several of the bus stops. Aside from the litter, the team is surprised to find bodily fluids, most likely urine, at a number of bus stops. This definitely has a negative impact of pedestrian experience, as the team and transit-riders could smell an overwhelming odor at these bus stops. On the other hand, the condition of the physical infrastructure of the study areas is fair. This is in reference to the sidewalks, benches, and shelters at the bus stops. The team and transit-riders deem the sidewalks to be in acceptable condition because they do not hinder accessibility to those who are disabled or have problems with mobility. Even though many bus stops lack shelter and adequate seating, whatever benches or shelters provided at the bus stops are in sufficient-enough condition, but could be updated.

The next factor affecting pedestrian and transit-rider experience is safety. The intercept interviews highlighted major concerns about crime within the study area. For example, one interviewee recounted an instance where someone flashed a gun at him at the bus stop #13782. Another interviewee said she had been approached by a group of men at stop #13830. The team identified several bus stops that lack proper lighting or do not have any lighting at all, which poses issues for riders at night, when most people encounter unsafe situations. Additionally, the traffic on Federal is something that impacts pedestrian and transit-rider experience. Federal is an incredibly busy street with speeding cars and many of the bus stops are not set back away from the street, and the team constantly observed cars aggressively driving down the street within feet of the bus stop. One person interviewed at bus stop #13782, witnessed an incident where a car turning onto Federal drove onto the sidewalk right by the bus stop. Although somewhat uncommon, traffic does pose a serious safety concern to pedestrians. For the most part, the bus stops in the study area need large improvements to enhance the experience for riders, especially considering that the bus is the primary or only method of transportation for many of its riders.

TRANSIT/PEDESTRIAN INFRASTRUCTURE RECOMMENDATIONS

Recommendations for Existing Transit/Pedestrian Infrastructure Gaps

The two main existing gaps discussed earlier relate to sidewalk space and cleanliness. Starting with sidewalks, the big issue is inconsistency in waiting area placement. The team would like to see the City and County of Denver introduce some policy that would require standardization for bus stop placement as a general rule. This would include setting a minimal distance from the street that a bench is allowed to be placed to indicate a bus stop. The team understands that the bus stops are generally placed on the public "Right of Way" and that most times ownership of the land is given to the surrounding businesses. However, if the city took charge of this land, guidelines could be developed that would promote safety and reliability. Citizens would not have to guess as to which bus stop they are safe to wait at or not

because all stops would ideally have standard distances from the busy boulevard. A high-priority bus stop for this concern is #13854 because of its existing conditions discussed in the gaps section.

For cleanliness, the group recommends there to be a task force that can routinely clean the stops. Initially, the research team would like for the city to place official trash cans at each bus stop because this can promote commuters to dispose of trash there. Furthermore, non-commuters will have somewhere to place their trash every few blocks, which would be a highly beneficial step to overall neighborhood cleanliness. Another huge recommendation is power-washing the seats, the structure, and the surrounding sidewalk. This way, any of the raw sewage or urine will not be a concern. Similar to introducing more trash cans, the team hopes that power-washing the stops will promote overall cleanliness in the community because consistent cleaning can potentially change the culture.

Recommendations for Missing Transit/Pedestrian Infrastructure Gaps

As much of the bus stops within the study area cease to contain all general elements a bus stop should contain, the team would like to suggest some recommendations for making the bus stops more sufficient and adequate. First, much of the bus stops do not contain shelters. The team believes that shelters are an important bus stop element and would reduce the gaps highlighted above. Shelters will keep the transit riders out of the elements while keeping them safe and enclosed from traffic and harsh weather conditions. Secondly, lighting should be implemented in each shelter and bus stop as the visibility becomes more difficult later in the day it gets. Lighting can also help riders' safety and overall experience of transit. Next, the addition of trash cans at each stop would help keep bus stops clean and would help improve transit rider health and safety at the same time. Finally, the seating and sidewalks of bus stops could benefit from stable, sufficient benches and extended sidewalks. Much of the transit riders observed did not even use the seating provided, since much of the benches are faulty and not clean. The addition of bolted down, comfortable benches along with a wider sidewalk would vastly improve the appearance of the bus stops, transit rider safety and health, along with the usage of the amenities.

Generally, each bus stop has at least one or more missing infrastructures. To reduce the number of insufficient bus stop amenities, a city wide policy plan to have benches, shelters, trash cans, lighting, and large sidewalks would greatly improve not only the study area focused upon, but the bus stops in the city as a whole, improving the overall experience of transit riders across Denver. Safety and health has been the teams' primary concern, so a policy that would in turn eliminate much of the safety and health concerns would be an immense improvement and upgrade for the city and for the riders. The standardized amenities recommended by the team would in turn improve each aspect of a bus stop, and provide consistency throughout each bus stop across the city.

Recommendations for Transit-Rider/Pedestrian Experience Gaps

Based on the experience gaps mentioned before, the team would recommend a few things to address bus stop maintenance and safety. To begin with, safety is a paramount concern to both the team and the pedestrian and transit-riders. In the intercept interviews, recommendations pertaining to safety concerns, such as additional lighting and security cameras make up 30% of the total recommendations. Therefore, the team suggests that there be an increase in street lighting or general lighting at the bus stops, to hopefully hinder any crime that occurs in the study area. Additionally, surveillance cameras at the bus stops would enhance a pedestrian's personal safety, and the addition of those should be considered at each bus stop. Safety concerns related to traffic should be addressed through changes in policy. Federal Boulevard is a high traffic area and the team observed speeding cars within feet of the bus stops. The team recommends that the speed limit on Federal Boulevard within the study area be lowered to reduce the chance of traffic incidents that may involve pedestrians waiting at bus stops. Bus stops should ideally be set back away from the road to reduce the chances of accidents also, which is something the team recommends as well.

As mentioned earlier, cleanliness is something that has been stressed multiple times in this document. Again, the team recommends the standardization of amenities like garbage cans at each bus stop within the study area. This way, pedestrians and the general public can properly dispose of their garbage. Regular maintenance of the bus stops is highly recommended, as a number of pedestrians noted rarely seeing any sort of maintenance teams taking out the garbage or power washing urine-infested bus stops, as mentioned before. Maintaining the cleanliness and increasing the safety of the bus stops within the study area and in general will greatly enhance pedestrian and transit-rider experience, and may promote more ridership overall.
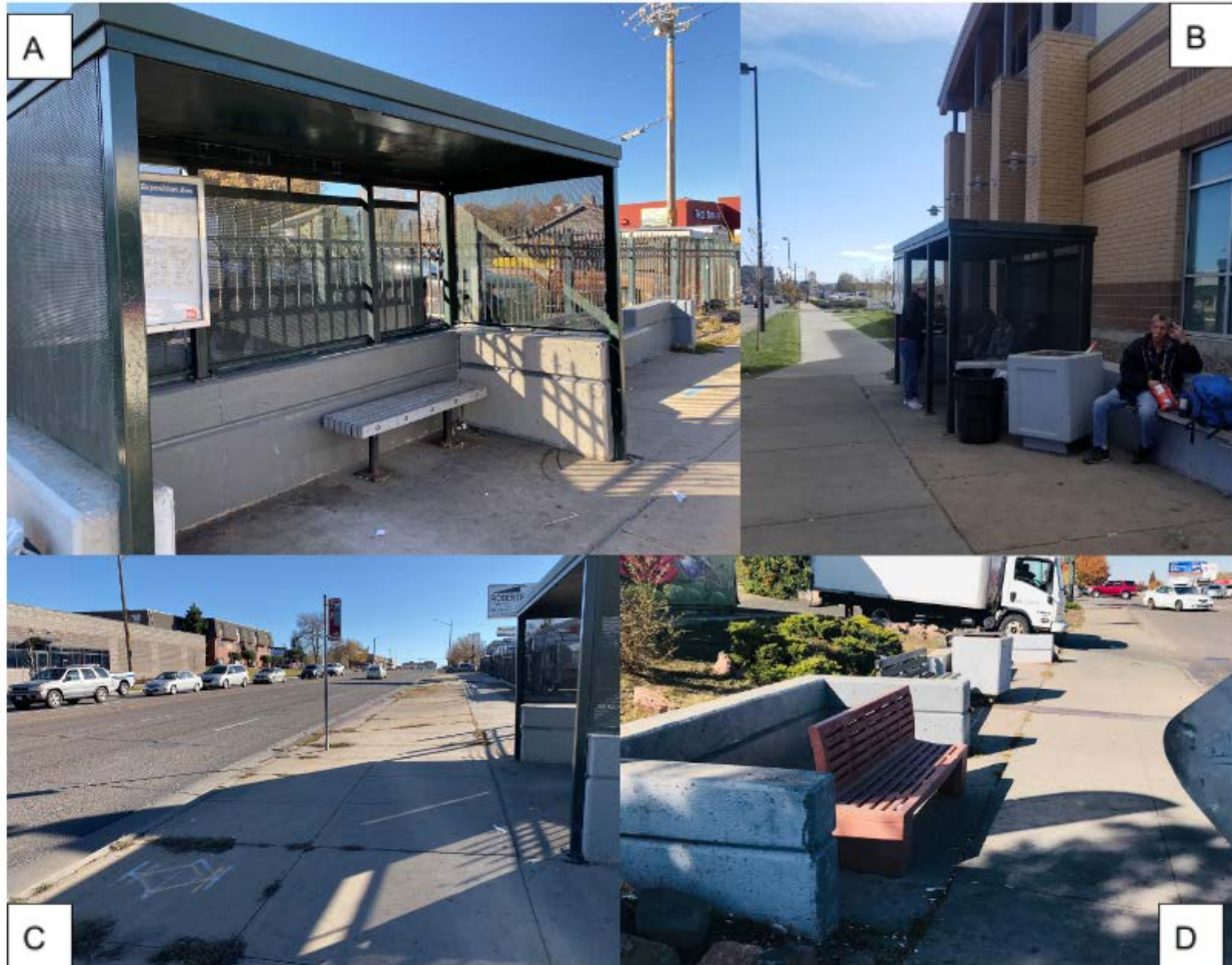
VISUALIZATIONS

Exhibit 21: Existing Transit/Pedestrian Infrastructure Gaps

Annotations

A: Lack of seating as well as trash build up and urine stains due to poor maintenance.

B: Homeless population taking up majority of seating.

C: No buffer between speeding cars and pedestrians waiting for bus.

D: Sewage from nearby restaurant spilling sewage beside bus stop.

Exhibit 22: Missing Transit/Pedestrian Infrastructure Gaps

Annotations

A: Missing sidewalk to separate the stop from the street, as well as a lack of lighting, shelter, and efficient seating arrangements and trashcans.

B: Missing shelter for pedestrians to wait in harsh conditions, as well as lighting and trashcans.

C: Missing shelter and adequate lighting for pedestrians, as well as a buffer from the nearby construction.

D: Missing shelter, lighting, as well as any form of maintenance for trash (bike left there for weeks).
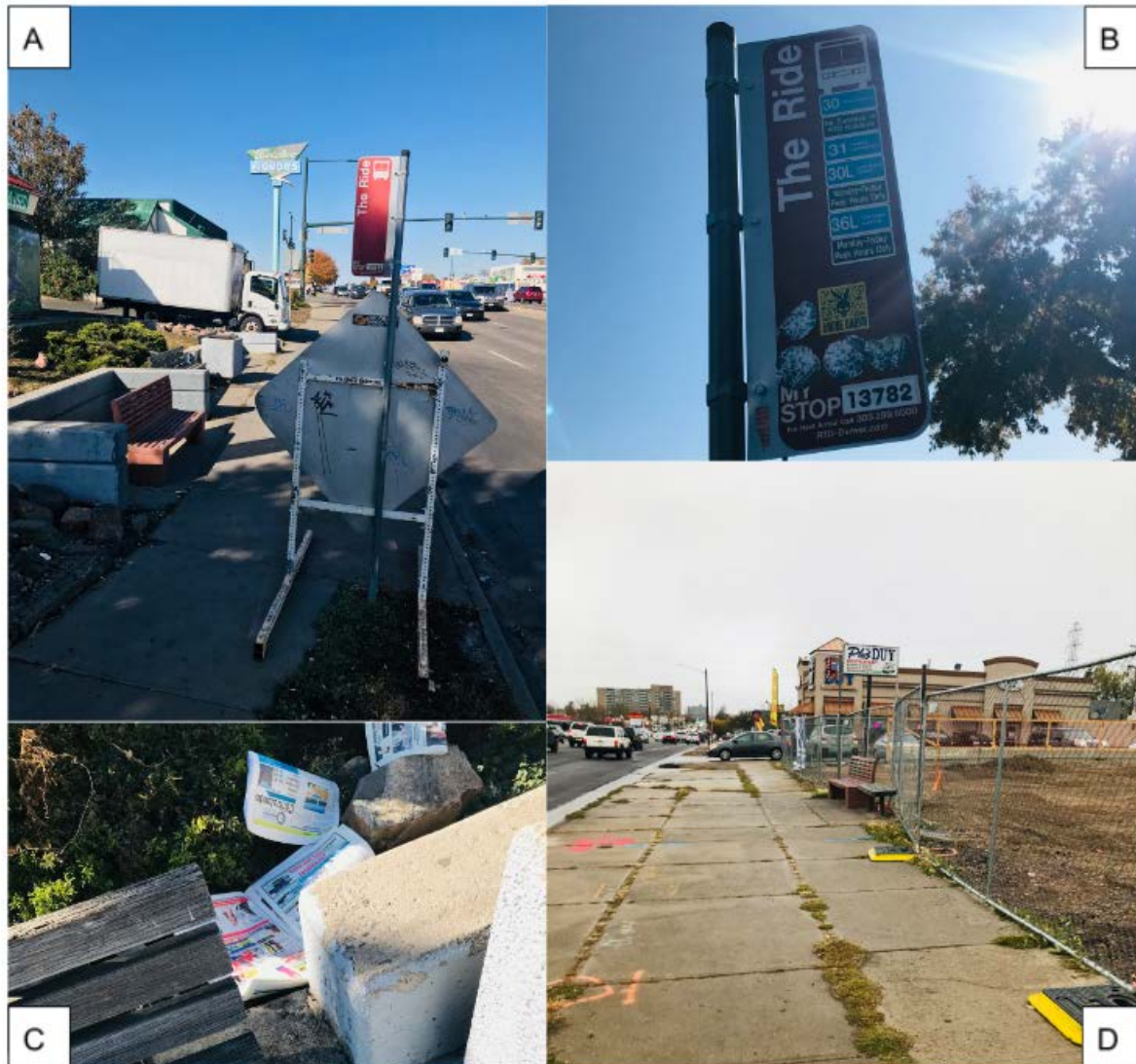
Exhibit 23: Transit-Rider/Pedestrian Experience Gaps

Annotations

A: Stops are too close to the street and makes it unsafe for pedestrians to wait at the stop.

B: The vandalism of signs and seating areas are unchecked and hinders the use of the stop.

C: Trash is a problem at almost every stop due to poor maintenance and lack of trash cans, which also hinders the overall use of the stop.

D: The cracked and spray-painted sidewalks and seating areas, as well as the nearby construction makes the stop look like it is on the verge of vacancy.

Exhibit 24: Group Recommendations (Micro-scale)

Annotations
- Shelter to protect pedestrians from harsh weather conditions.
- Better lighting to provide safer conditions at night.
- Trash cans to alleviate waste and other debris.
- Shrubs to prevent sewage runoff and protection against any splashes caused by the ensuing traffic.
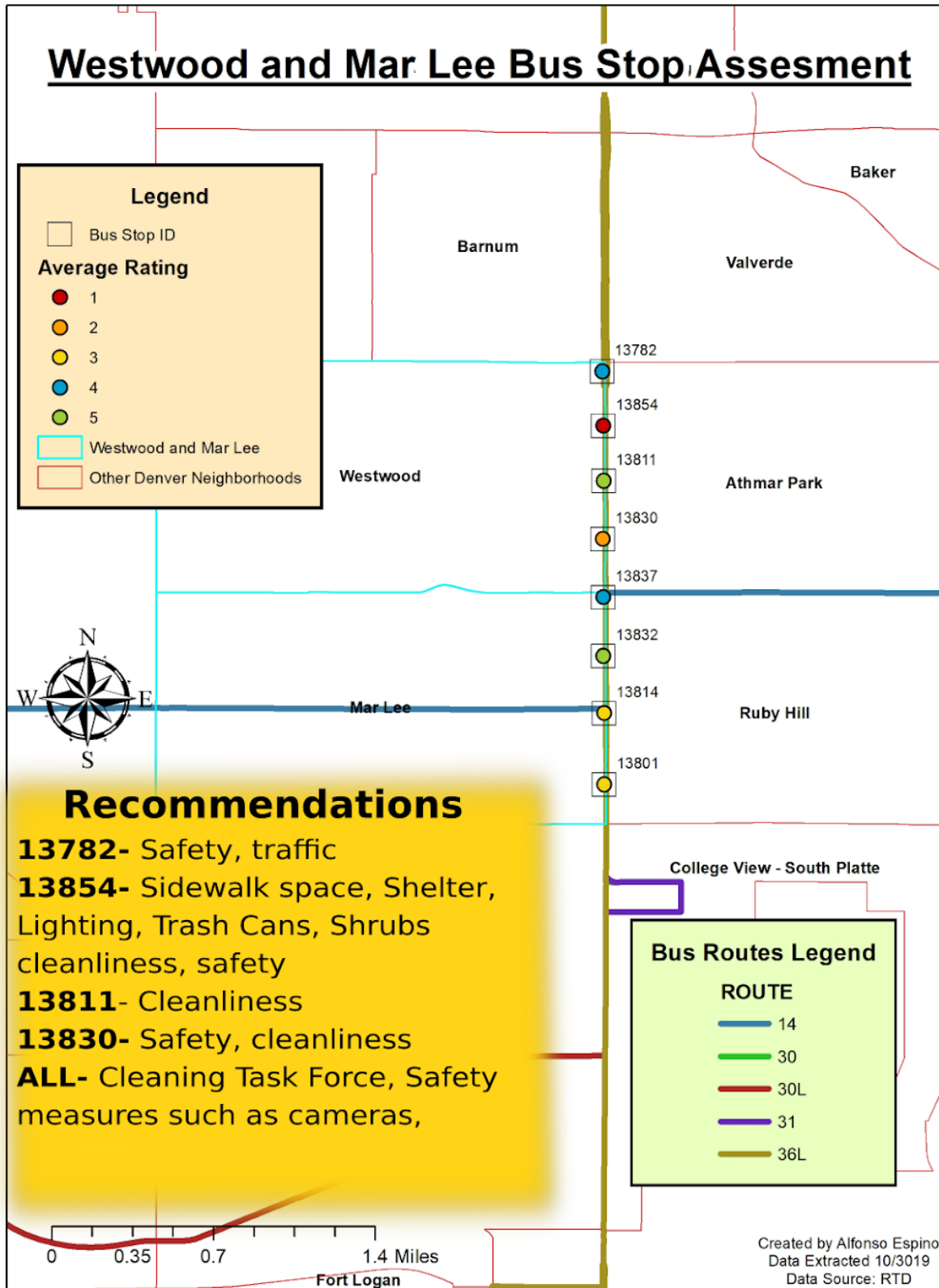
Exhibit 25: Group Recommendations (Micro-scale and Macro-scale)

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