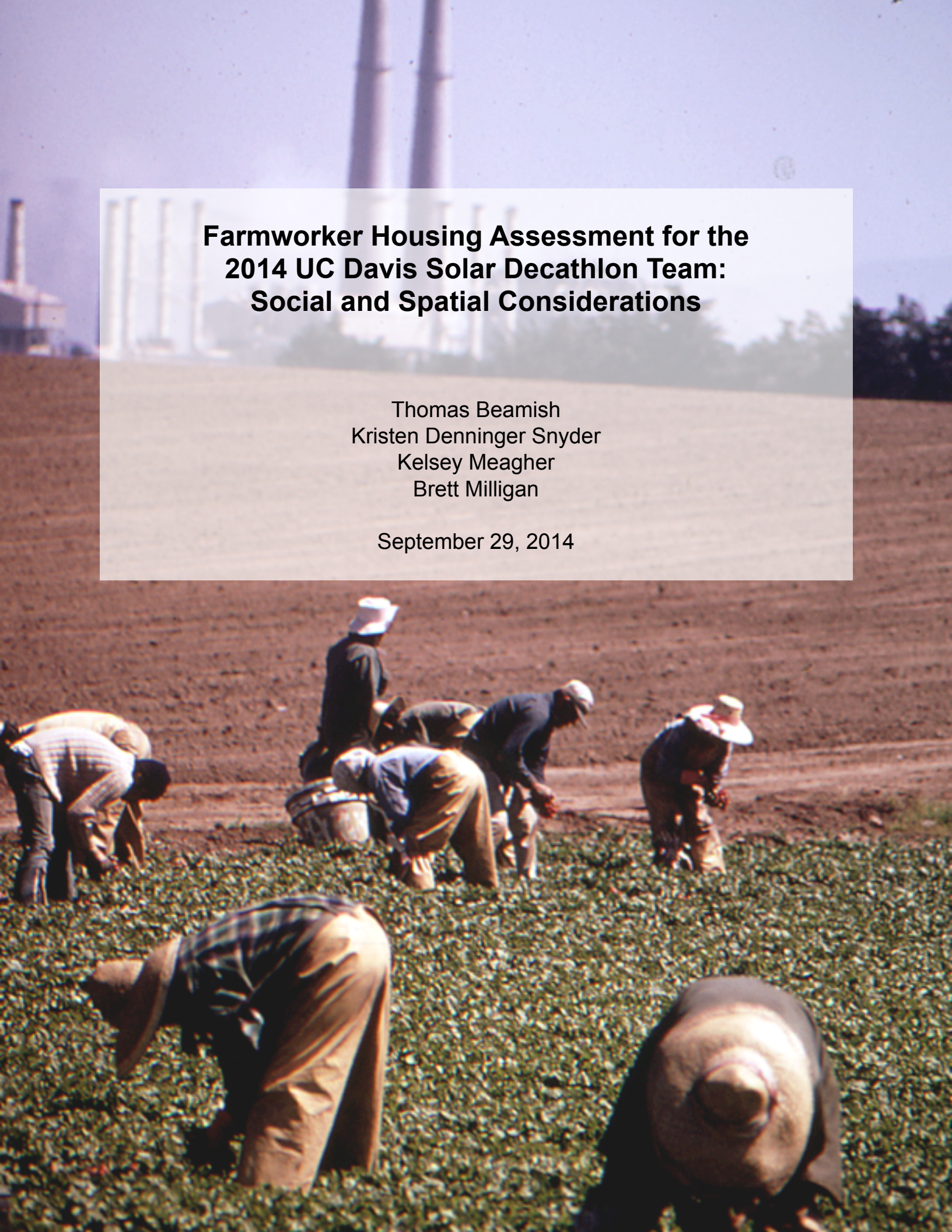

Farmworker Housing Assessment for the 2014 UC Davis Solar Decathlon Team: Social and Spatial Considerations

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Executive Summary

In the fall of 2015, a team of students from the University of California, Davis will compete in the U.S. Department of Energy's national Solar Decathlon Challenge. The challenge pits twenty teams from colleges and universities across the United States and Europe to build a home that outperforms the other entries on ten different performance measures as well as comfort and livability.

The UC Davis entry, called "M-Power," is conceived as a modular housing solution that seeks to address issues of energy efficiency while simultaneously meeting the needs of migrant farmworkers, an underserved group in California and the U.S. in general. The project planned by UC Davis therefore seeks to advance not only worker health and dignity, but also California's leadership in zero-net construction and reflective of its Zero-Net Energy Action plan, which targets all new residential construction to be zero-net energy (ZNE) by the year 2020.

In order to design a home that will improve the quality of life for migrant farmworkers, it is important to understand the social demographics of the farmworker population as well as the range of conditions under which the proposed home would be occupied and utilized. The following report outlines the demographic profile of farmworkers in California and the United States, noting the distinct housing needs of unaccompanied workers and farmworkers living with their families. Based on an extensive literature review and interviews with advocates, government regulators, and researchers, we've articulated a number of design considerations for the Solar Decathlon team.

The second half of this report presents a spatial analysis of California migrant farmworker housing to better understand the demographics, environmental conditions, and structural aspects of current farmworker housing. It is hoped that this information can inform the design process in determining how to construct homes that improve upon these current conditions.

Current migrant farmworker housing conditions vary considerably, ranging from state-run centers that contain permanent structures, water, sewer, road infrastructure and landscape amenity features, to unofficial farmworker housing located on privately owned land. Across all of California there are only 24 state-run centers, which although may represent the best housing options currently available to migrant farmworkers, only a very small percentage of workers actually live in these centers.

Privately owned facilities that unofficially cater to migrant farmworkers (on reservation lands and private parcels) are typically lacking in basic structural amenities, including community and open spaces, paved roads, and shade (basic infrastructural services, such as water and sewer, may also be lacking, but fall outside of the remote sensing methods deployed in this study). Many of these housing arrangements consist only of crowded together mobile homes and improvised shelters. The examples presented in this study include examples of all three types of housing: state run centers, housing on private lands, and housing on non-regulated reservation lands.

Any designs for migrant farmworker housing should also take into consideration common, or systemic environmental issues, such as air quality (dust and pesticides in proximity to agricultural production), extreme seasonal fluctuations in air temperatures, and a lack of safe and community-enhancing outdoor features.

Social Demographics of U.S. Agricultural Workers

Farmworkers play a critical role in U.S. agriculture, yet they consistently face enormous social and economic challenges. Below we have compiled some basic information about farmworker demographics, migratory patterns, and housing challenges in order to assist the Solar Decathlon team in designing an appropriate living space for this underserved population.

Number of Farmworkers

According to the National Agricultural Statistics Service, the average number of hired farmworkers in the United States is a little over 1 million. Around 350,000 of these farmworkers are employed in California.

Country of Origin

Two-thirds of all farmworkers in the United States were born in Mexico, and 29% were born in the U.S. or Puerto Rico. Less than three percent of all farmworkers were born in Central America and the Caribbean.

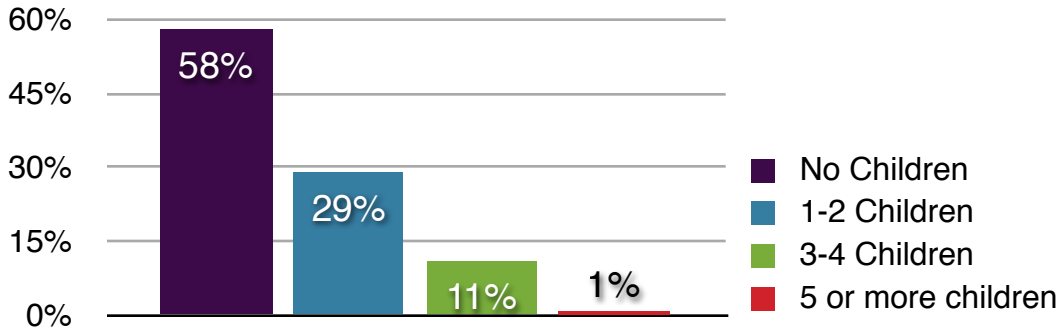
Almost all of the farmworkers in California (96%) were born in Mexico. Many of these workers (around 20%) are of indigenous descent. Indigenous workers typically have lower levels of education and economic resources than their non-indigenous counterparts. Many speak indigenous languages, and they speak Spanish as a second language (or not at all). Indigenous farmworkers face additional discrimination and stigma even among other farmworkers. Their limited proficiency in Spanish and English makes them especially vulnerable to unfair labor practices and substandard housing conditions.

Gender and Family Structure

The vast majority (76%) of all hired farmworkers in the United States are men. In California, 73% of farmworkers are men and 27% are women. Over half (59%) of all farmworkers are married. Women farmworkers are more likely than men to be married; around 72% of women surveyed in the National Agricultural Workers Survey were married.

In California, 54% of farmworkers are parents. Most of these parents choose to bring their children with them rather than leave them with family in their country of origin. Around 95% of mothers and 62% of fathers live with their children. Farmworker parents have an average of two children, and 96% of their children are under the age of 18.

Figure 1. Number of Children Under 18 in Farmworker Households



Source: National Agricultural Workers Survey, 2009-2010.

Age

The median age of farmworkers is 34. Twenty-seven percent of all workers are under age 25, 43% are between 25-44 years old, and 30% are over 44 years old. The grueling nature of agricultural manual labor prevents many workers from working into old age.

Legal Status

Around half of all farmworkers do not have legal authorization to work in the United States. About 30% of farmworkers are U.S. citizens, and the remaining 20% possess green cards or other forms of authorization to work. Most farmworker households have mixed immigration status; children born in the United States are citizens, while their parents are often undocumented.

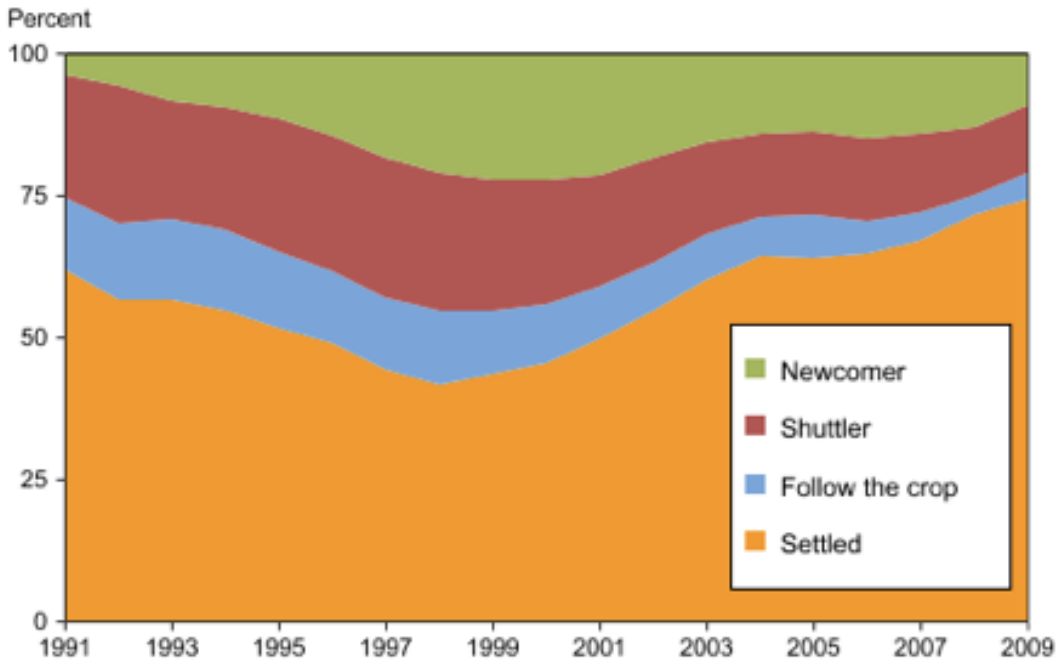
Undocumented workers face a number of challenges, including difficulty finding housing, lack of access to social services available only to U.S. citizens, and discrimination from citizens in the communities where they work. Undocumented workers also have a higher risk of labor abuses on the farm; fear of deportation causes many of these workers to silently suffer through substandard wages, working conditions, and living conditions. Additionally, the widespread availability of undocumented workers pushes down wages and working conditions for all farmworkers, regardless of legal status.

Migratory Patterns

The migratory patterns of farmworkers have shifted in recent decades. Fewer and fewer farmworkers “follow the crop,” migrating from state to state to harvest different crops in different growing seasons. Only five percent of all farmworkers follow this migratory pattern. (See Figure 1 below.) Instead, the vast majority (around 75%) of farmworkers have “settled” in a single location. These workers typically work on a single farm within 75 miles of their home, or for a single labor contractor who works with many farms in the region. Growing seasons for field crops in California are long but not year-round, so settled farmworkers typically endure a few months of unemployment each year between growing seasons.

Many farmworkers travel great distances to reach their place of employment. Farmworkers who travel more than 75 miles to reach work are called “shuttlers,” and they make up 12% of the total farmworker population. The final eight percent of farmworkers are newcomers to the United States whose migratory patterns cannot yet be determined.

Figure 2. Migration Patterns of Hired Farmworkers, 1991-2009



Note: Values for each year are rolling averages of three years of data to smooth fluctuations.
For example, the figures for 2009 are 2007-2009 averages.
Source: USDA-ERS analysis of National Agricultural Workers Survey data.

One of the reasons that farmworkers have increasingly settled in the United States rather than traveling back to Mexico during the winter is the tightened security at the Mexico-United States border. Most farmworkers migrate to the United States out of economic necessity; many would likely prefer to return home during the winter months to see their families if that were possible. However, because they fear capture by border patrol agents on the return trip to the United States, many have now opted to stay in the United States year-round.

Another reason that increasing numbers of farmworkers have settled in the United States is that demand for seasonal agricultural labor now stretches over more months of the year. Crop patterns have shifted toward crops that require more hand-labor, and growing seasons have gradually lengthened due to the development of early-season and late-season varieties as well as the expanded use of commercial greenhouses. As a result, seasonal farmworkers now have shorter periods of unemployment during the off-season, also leading many to stay in the United States year-round.

Housing

Many Americans imagine that farmworkers live in small shacks trailers on their employer's farm, yet however minimal even these kinds of accommodations have historically been, fewer and fewer farm owners provide such housing for their employees. A survey in 2012 found that less than 4% of farm owners provide housing for seasonal employees, down from 21% in 1986. Year-round workers are more likely than seasonal workers to receive housing from their employers, yet even these workers have seen a decline in employer-provided housing over the last three decades.

The decline in employer-provided housing can be traced to several factors. Housing codes have been more strictly enforced in recent decades, and many farmers have chosen to close on-site housing facilities rather than bring them up to code. The increased use of farm labor contractors has also contributed to the decline of employer-provided housing, as employers have shifted many risks and responsibilities of employment to third parties. Farmers in the state of California are allowed to build up to twelve units of farmworker housing on their farms without seeking additional land use approvals, but fewer and fewer farmers are taking advantage of this option.

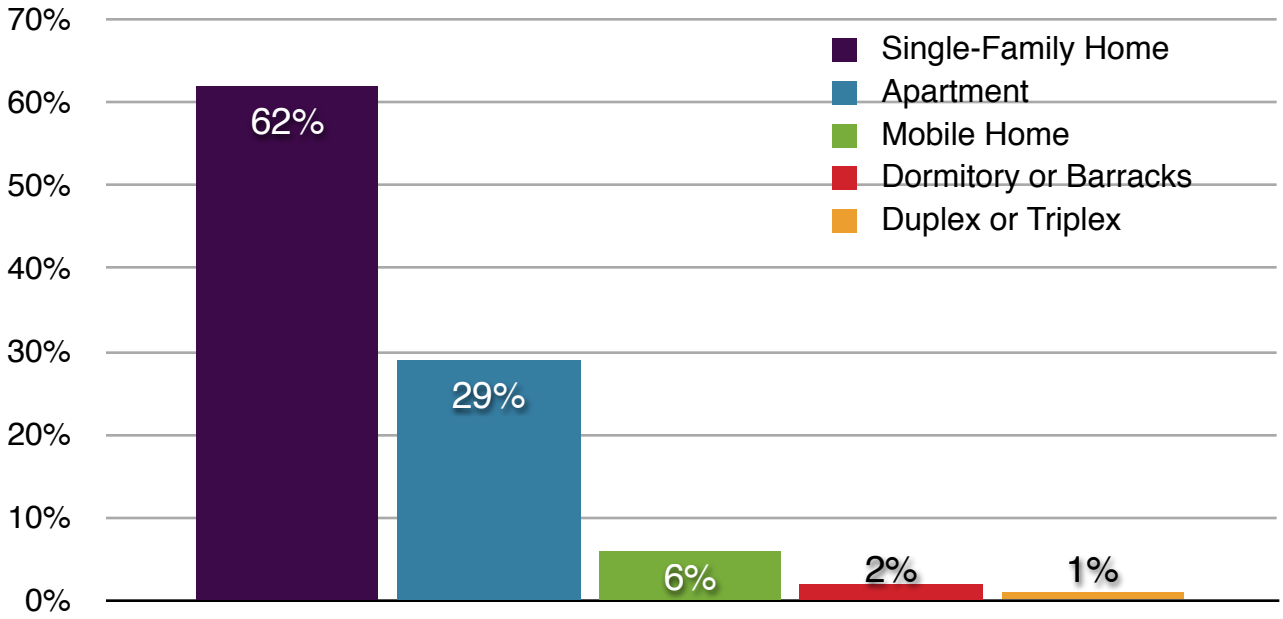
The desirability of employer-provided housing among farmworkers is under debate. Several of the experts we interviewed noted that farmworkers might prefer to live in subsidized housing near their work (even if it is in substandard condition) rather than commute from more-expensive housing or be homeless. However, a number of advocates also argued that employer-provided housing perpetuates a paternalistic relationship between farm owners and farmworkers, making farmworkers more vulnerable to discrimination and abuse. Furthermore, many farmworkers -- especially those with families -- enjoy living in urban areas due to the proximity of social services such as schools and health care. It may be that unaccompanied workers prefer employer-provided housing more than farmworker families due to their lower demand for social services, but future research is required.

Today, most farmworkers live in cities. In California, farmworkers are clustered in cities within agricultural valleys, such as Bakersfield, Fresno, Stockton, and Salinas. According to the 2003-2004 wave of the National Agricultural Workers Survey, around 60% of farmworkers who live in residential structures report living in single-family homes. (See Figure 3.) Thirty percent of workers said they live in an apartment, and six percent live in mobile homes. Many farmworkers live in non-residential structures, however, such as garages, cars, and tents. Some farmworkers are categorized as homeless and sleep out in the open.

Most farmworkers rent their dwellings from someone other than their employer. Finding a place to live can be especially challenging for undocumented workers who have no credit history. This, combined with their extremely low incomes, leads many farmworkers to share their dwellings with multiple families or unaccompanied workers. The California Agricultural Workers Health Survey found that the average number of adults per dwelling was 4.4. Around half of all dwellings surveyed were considered

crowded, and one quarter of the dwellings were “extremely crowded.” Overcrowding is associated with a number of health and safety concerns.

Figure 3. Type of Dwelling Inhabited by California Farmworkers, 2003-2004



Source: National Agricultural Workers Survey

A small number of farmworkers live in subsidized housing operated by the government or non-profit organizations. Government housing is typically the highest quality housing available to farmworkers because it is well-maintained and affordable. The state of California operates twenty-four migrant housing centers in agricultural areas, containing around 1800 total housing units. These housing centers are open only to families (not to unaccompanied workers), and they are available during the growing season from April to October.

Working Conditions

The majority of farmworkers (around 60%) work with field crops, and the remainder work in livestock production. Crops requiring hand labor include fruits, nuts, vegetables, and ornamental plants. In Yolo County, farmworkers tend to 30-40 different crops, rotating between farms as their labor needs fluctuate. Farmworkers’ daily tasks include planting, weeding and thinning, pruning, pesticide application, and especially harvesting.

Farmworkers are increasingly being hired by third-party farm labor contractors (FLCs) rather than directly by farm owners. Somewhere between one-third and one-half of all farmworkers are employed by FLCs in California. Farmers find FLCs attractive because they offer cheap and flexible labor, reduce farmers’ legal liabilities, and take responsibility for almost all aspects of labor management, including recruiting,

supervising, and paying workers, providing safety trainings and field sanitation, and following relevant labor and immigration regulations.

As noted above, the rise in contract labor has contributed to the decline in employer-provided housing on the farm.

Farmworkers endure difficult working conditions, including low wages and few benefits, seasonal employment, intense manual labor, exposure to severe weather and hazardous chemicals, and racial and class-based discrimination from employers, supervisors. and other employees. Agricultural workers are exempted from many federal labor standards that apply to workers in other industries, such as minimum wage, overtime, and worker's compensation requirements.

On average, farmworkers make about $10 an hour. However, many farmworkers are not paid by the hour but by a piece-rate system of remuneration. Farm employers prefer piece-rate wages because they encourage workers to work faster, yet piece-rate payment systems have also been found to hold important health and safety consequences. For example, piece-rate workers have been found to frequently skip lunches and breaks in order to make required minimum production quotas, and also work while sick or injured, and therefore risk further injuries by working too long, too quickly, or in hazardous conditions (i.e., extreme heat and/or without water or food).

Because farm work is seasonal, many farmworker families earn wages only during 7-8 months of the year and live off their savings for the remaining 4-5 months. Around one-quarter of farmworker families fall below the federal poverty line.

Access to medical care is also extremely limited due to farmworkers' geographical isolation, seasonal mobility, low incomes, legal status, discrimination, language barriers, and simply time constraints. One quarter of farmworkers do not have any sort of medical insurance, yet farmworkers suffer five times the fatalities of all other industries combined. Finally, while residents of government-operated migrant housing centers have greater access to health care through local programs and philanthropy, the majority of farmworkers do not receive these or related benefits.

Migrant Labor: Two Scenarios

Most seasonal farmworkers fit one of two demographic profiles: either they live with their families (hereafter **Farmworker Families**), or they live apart from any nuclear family members (parents, spouses, or children) (hereafter **Unaccompanied Workers**). The vast majority of unaccompanied workers are men. Families and unaccompanied workers have unique housing needs, which we have briefly highlighted below. The Solar Decathlon design team may wish to design a living space that is adaptable to each group's needs.

Farmworker Families

In 2002, 43% of all migrant crop workers were living with nuclear family members (parents, spouses, or children). The majority of these workers were married and had children. In families with two parents, both parents are usually employed. Often, both parents will work together in the field. Sometimes, the mother will work at a nearby processing facility while the father works in the fields.

Farmworker families have different housing needs than unaccompanied workers. Children of farmworkers are typically young -- 96% are under 18, and many are much younger than that -- so childcare is a major concern. Many farmworkers take advantage of local after-school and summer programs. These families will also be looking for housing communities with playgrounds and recreational facilities, and proximity to schools will be important. Many farmworker families worry about raising children in unsafe neighborhoods, so community designs should include protected areas for children to play.

If families are to share their dwellings with extended family members or unrelated families, it will be important to ensure adequate privacy in the bedrooms and extra storage in the bathrooms and kitchen. Multiple bathrooms may be a good idea, as well as multiple "stations" in the kitchen for different families to prepare separate meals. Locked storage in the bedrooms and kitchen may prevent disputes between unrelated individuals over lost belongings.

Unaccompanied Workers

In 2002, 57% of all migrant crop workers were unaccompanied. Most of these workers (61%) were unmarried and had no children. Around 31% of unaccompanied workers were parents who lived apart from their spouses and children. Among these workers, around 90% had at least one child or spouse living in Mexico. A small percentage had family members who resided in other parts of the U.S. Only 8% of unaccompanied workers were married and had no children.

Undocumented, unmarried men from Mexico are most likely to be unaccompanied workers. Women, authorized workers, married persons, and domestic migrants are much less likely to live apart from nuclear family members.

Unaccompanied workers have a harder time finding housing than accompanied workers. The government-administered migrant housing centers are open only to families, not to unaccompanied workers. Some landlords prefer renting to unaccompanied workers because they can charge higher rents to many wage-earning adults than they can to one or two families. However, many landlords are wary of leasing to unaccompanied workers because they are much more likely to engage in risky behaviors such as binge drinking and violence. Many unaccompanied workers end up living in their cars.

California housing surveys have found that unaccompanied workers consistently live in the worst housing conditions. Many of them live in overcrowded dwellings with no privacy; they lean mattresses against the wall during the day because otherwise they'd cover the entire floor. Such overcrowding presents health concerns such as increased disease transmission and mental health issues.

Unaccompanied workers are a more transient population than farmworker families, so housing designs should be flexible enough for continuously changing occupants. Unaccompanied workers typically live together in large groups, so housing designs should be sturdy enough to withstand heavy use and also provide as much privacy as possible for individual occupants. Common areas, such as the bathrooms and kitchens, should have ample storage space. Designs should also include communal areas for unaccompanied workers to gather with friends and meet new people.

Informant-Inspired Design Considerations

During our interviews with researchers, advocates, and government officials, we asked our informants for suggestions about designing modular housing for farmworkers. Their advice is summarized below:

1. **Affordability and accessibility should be a top priority.**
   Farmworkers are a very low-income population due to low wages and seasonal employment. The advocates we interviewed shared stories of several well-intentioned housing developments that were underused by farmworkers because even with subsidies, the rent was too high for most to afford. Many advocates recommended minimizing building costs and operational costs wherever possible. Additionally, they encouraged us to draft a solid business plan because farmworker housing rarely succeeds without deep and ongoing subsidies.

2. **Design a structure that respects farmworkers rather than stigmatizes them.**
   Make sure the design is comfortable, attractive, and resembles "normal" living spaces. Housing farmworkers in shipping containers, yurts, or tents may further contribute to their social exclusion.

3. **Design flexible housing for different types of households.**
   The best designs will serve the needs of nuclear families, extended families, and groups of unaccompanied workers. Perhaps the bedrooms and living room could contain room dividers to accommodate different types and sizes of households. If the dwellings will house unrelated individuals, the advocates recommended providing locked storage in the kitchen and bedrooms to avoid disputes over lost belongings.

4. **Design comfortable outdoor spaces with ample shade.**
   Farmworkers enjoy gathering outdoors when the weather is nice, but lack of shade is a common challenge. Farmworkers receive a great deal of sun exposure on the job, so sun protection in recreational areas is especially important.

5. **Create a clear separation between indoor and outdoor spaces, with an area to transition between them.**
   Agricultural work can be very dirty, so it is important to provide a space for farmworkers to remove dirty clothing and wash off dirt and pesticides before entering the rest of the living space. Perhaps designs could include a mud room, where residents could store clothing, work boots, and scarves in cubbies or on hooks. Outdoor showers (with adequate privacy) or washing facilities just inside the entrance would also be a good idea.

6. **Design living spaces with privacy in mind.**
   Farmworkers often live in households with several families or many unaccompanied workers. For example, three families might occupy a three-bedroom apartment, or a group of six to eight unaccompanied workers might sleep on a row of mattresses in a single bedroom. Ideally, housing designs will make the bedrooms private from each

other and include ways to divide the bedrooms into smaller, private spaces. Soundproofing the bedrooms as much as possible would be ideal.

7. Design for large households.
Because farmworkers often migrate with their families and live in households with multiple families, designs should be appropriate for larger households. The advocates we interviewed said that one-bedroom designs would not be as useful as two- or three-bedroom designs. They also recommended choosing living room furniture that can be converted into mattresses or beds.

8. Provide residents with a large kitchen and room for a garden.
Farmworkers come from a culture that values food and cooking. Farmworkers often cook large communal meals and enjoy growing traditional vegetables which are sometimes difficult to find in American grocery stores. A large, open kitchen and a garden would be appreciated by farmworker residents. A greenhouse might be another welcome addition.

9. Design for the community, not just the individual household.
Designs should include community spaces, such as places for meetings and dance classes, recreational facilities, places to store tools, and childcare.

10.Provide residents with a garage and a place to work on their car.
Farmworkers often drive older cars that need continual repairs. If designing an enclosed garage is not feasible, at least provide shade for residents to work on their cars out of the sun.

11. Design for intensive laundry needs.
Farmworkers usually wear several layers in the field to protect themselves from sun and pesticide exposure. Consequently, their laundry needs are more intensive than those of the average American family. Laundry appliances should be able to handle frequent use and heavy loads. A clothesline would also be a good idea.

12. Design with the local community in mind.
Many proposed farmworker housing projects have never been built due to opposition from local community members. In part, their resistance stems from issues unrelated to the housing design, such as discrimination, fears about increased traffic congestion, and concerns about converting agricultural land to residential use. However, rural communities have also resisted nonconventional housing designs (i.e., tents, trailers, yurts, etc.) because of aesthetic concerns or fears that such developments would reduce local property values. Many advocates recommended that designs for farmworker housing look like existing housing in the community in order to reduce local opposition.

Spatial Analysis of California Farmworker Housing

Statewide Analysis

The large majority of California's state-run housing projects for migrant farm workers (OMS centers) are located within the Central Valley, a couple are positioned more closely to the coast, while one is also found in the northeastern corner of the state in Modoc County. The distribution of these centers across the state likely reflects a similar pattern in the intensity of agriculture in California (Figure 2).

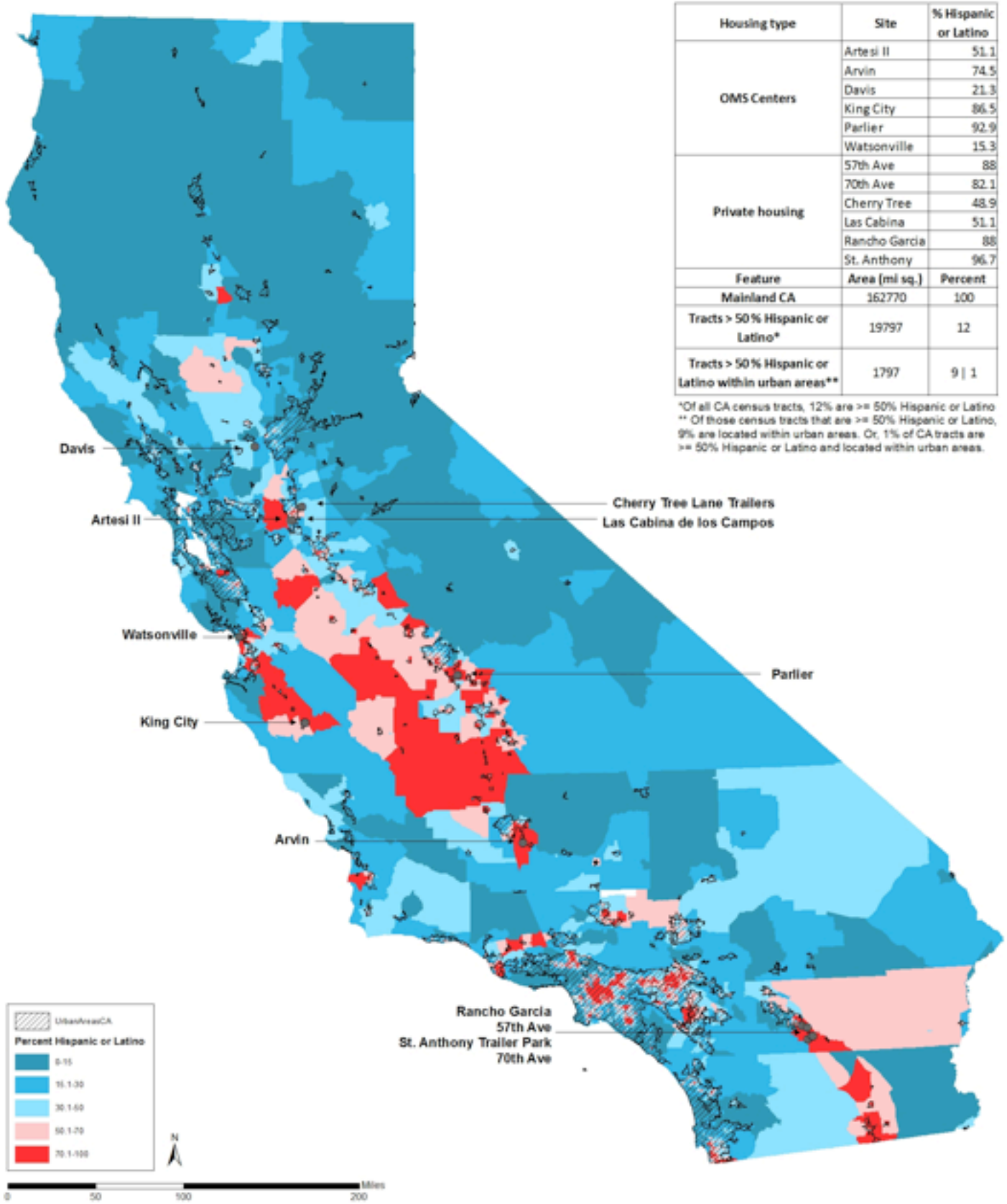
Unfortunately, little is known about the availability and distribution of other forms of housing for migrant farm workers. Other forms of non-government housing include privately run trailer parks and complexes that may unofficially cater to migrant farmworkers, housing provided on agricultural land by farmers (12 unit limit, monitored by the state), and unregulated camps situated on reservation land. Limited knowledge or concerns for privacy have limited the analysis of private or unofficial sites in this report to six within Riverside and San Joaquin counties.

Although we cannot be sure that experiences or local environments will be the same across all sites, it appears that some conditions, such as land use, summer temperatures, and certain demographic aspects, may be similar across sites located within the areas of California where agriculture is most intense. These aspects include a high density of farmland, few urban areas, Hispanic and/or Latino dominated communities (>50% Hispanic or Latino), and high summer temperatures (>100 degrees F) (Figures 1-3).

California MFW Housing & Demographics

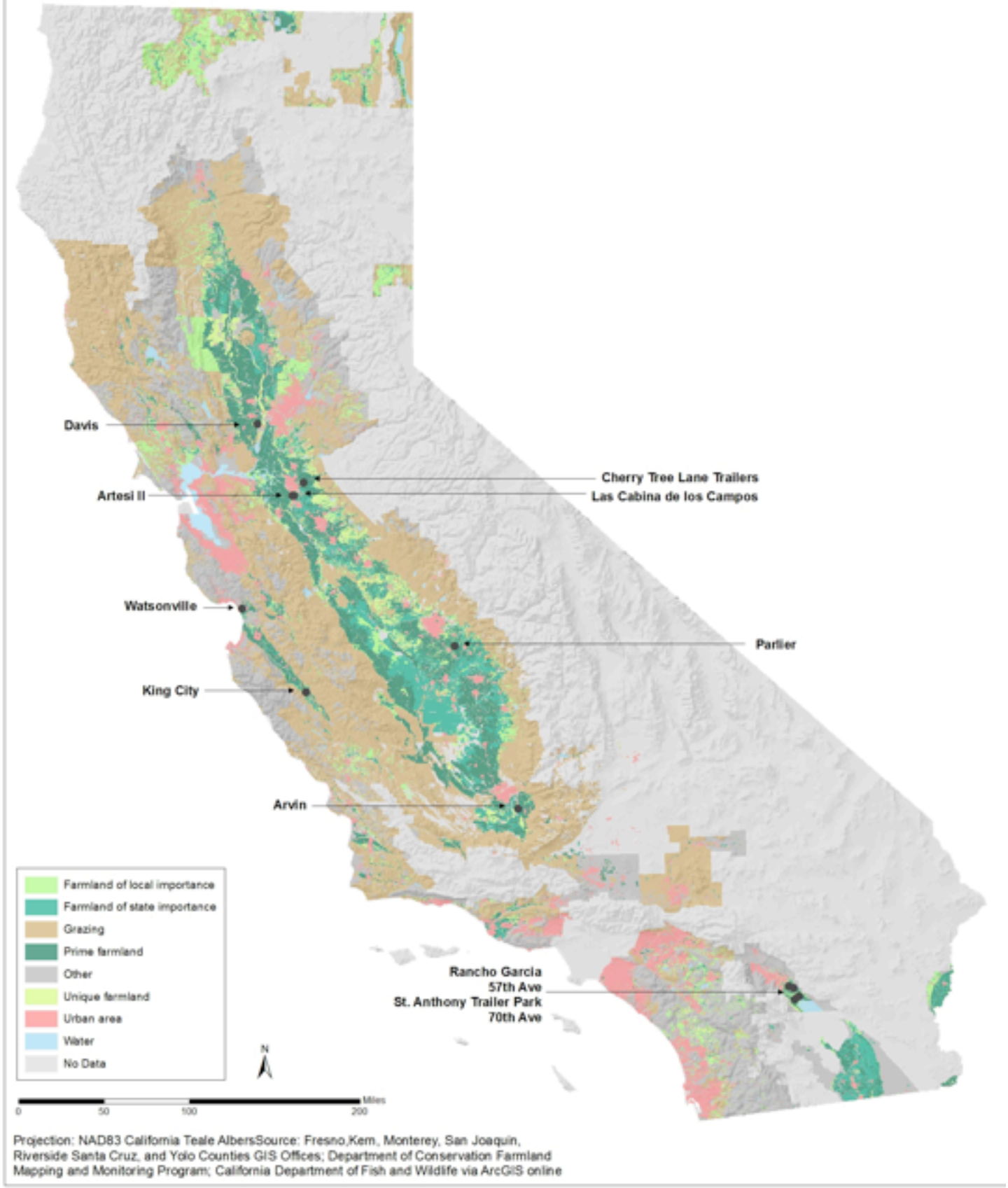
Housing type	Site	% Hispanic or Latino
OMS Centers	Artesi II	51.1
	Arvin	74.5
	Davis	21.3
	King City	86.5
	Parlier	92.9
	Watsonville	15.3
Private housing	57th Ave	88
	70th Ave	82.1
	Cherry Tree	48.9
	Las Cabina	51.1
	Rancho Garcia	88
	St. Anthony	96.7
Feature	Area (mi sq.)	Percent
Mainland CA	162770	100
Tracts > 50% Hispanic or Latino*	19797	12
Tracts > 50% Hispanic or Latino within urban areas**	1797	9 | 1

*Of all CA census tracts, 12% are >= 50% Hispanic or Latino
** Of those census tracts that are >= 50% Hispanic or Latino, 9% are located within urban areas. Or, 1% of CA tracts are >= 50% Hispanic or Latino and located within urban areas.



Projection: NAD83 California Teale AlbersSource: Fresno,Kern, Monterey, San Joaquin, Riverside Santa Cruz, and Yolo Counties GIS Offices; US Census Bureau

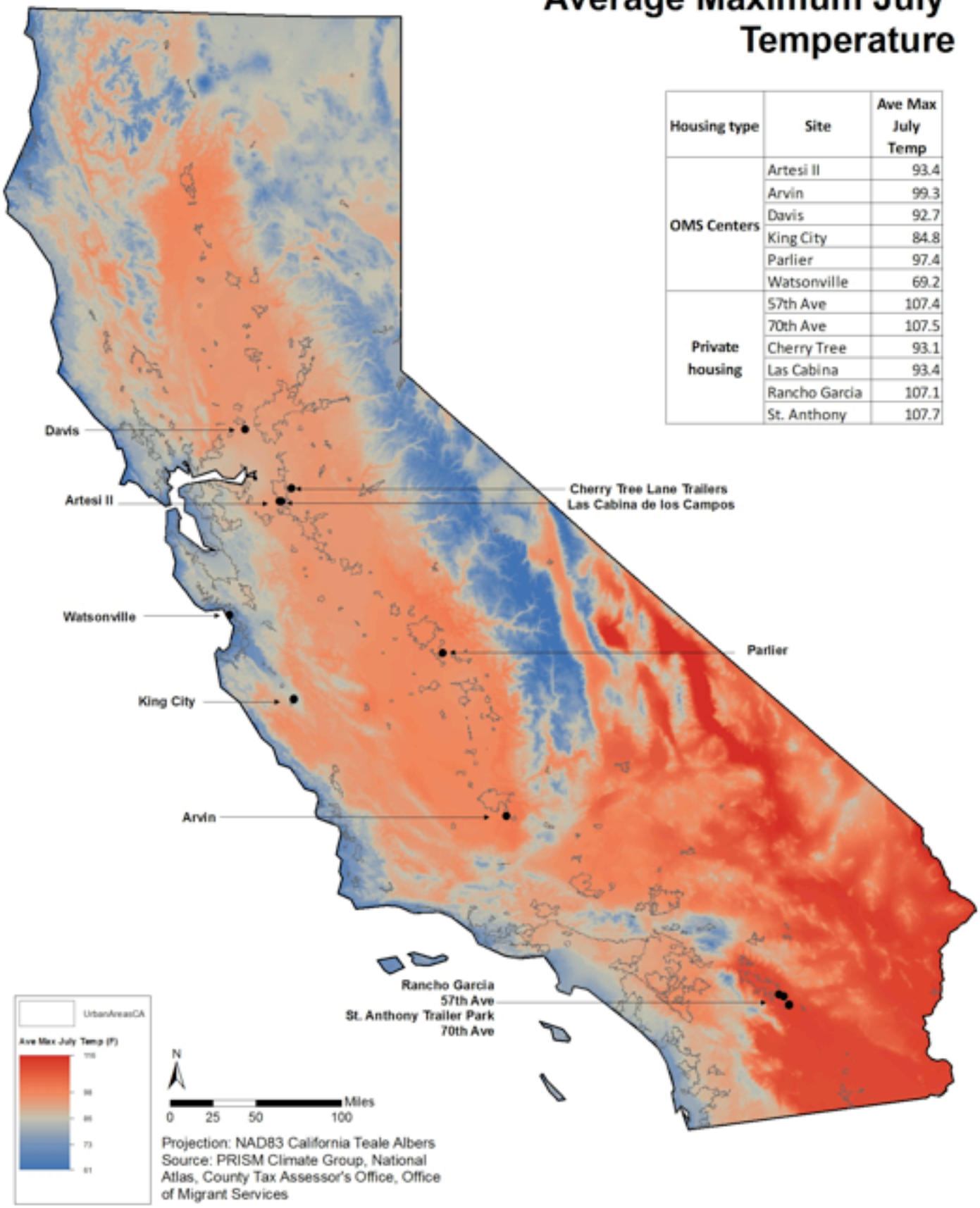
California MFW Housing & Land Use



Projection: NAD83 California Teale AlbersSource: Fresno,Kern, Monterey, San Joaquin, Riverside Santa Cruz, and Yolo Counties GIS Offices; Department of Conservation Farmland Mapping and Monitoring Program; California Department of Fish and Wildlife via ArcGIS online

California OMS Centers & Average Maximum July Temperature

Housing type	Site	Ave Max July Temp
OMS Centers	Artesi II	93.4
	Arvin	99.3
	Davis	92.7
	King City	84.8
	Parlier	97.4
	Watsonville	69.2
Private housing	57th Ave	107.4
	70th Ave	107.5
	Cherry Tree	93.1
	Las Cabina	93.4
	Rancho Garcia	107.1
	St. Anthony	107.7

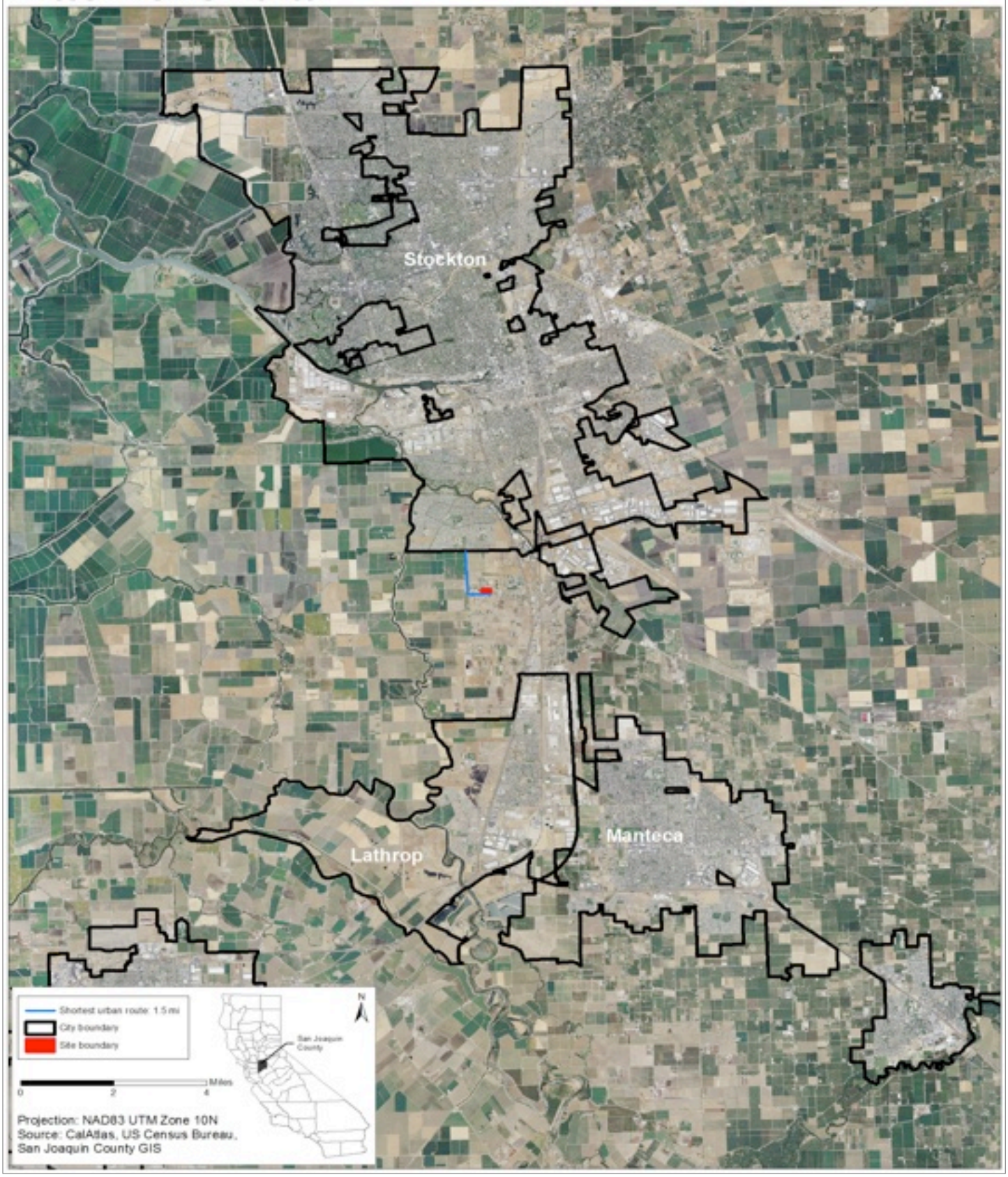


Projection: NAD83 California Teale Albers
Source: PRISM Climate Group, National Atlas, County Tax Assessor's Office, Office of Migrant Services

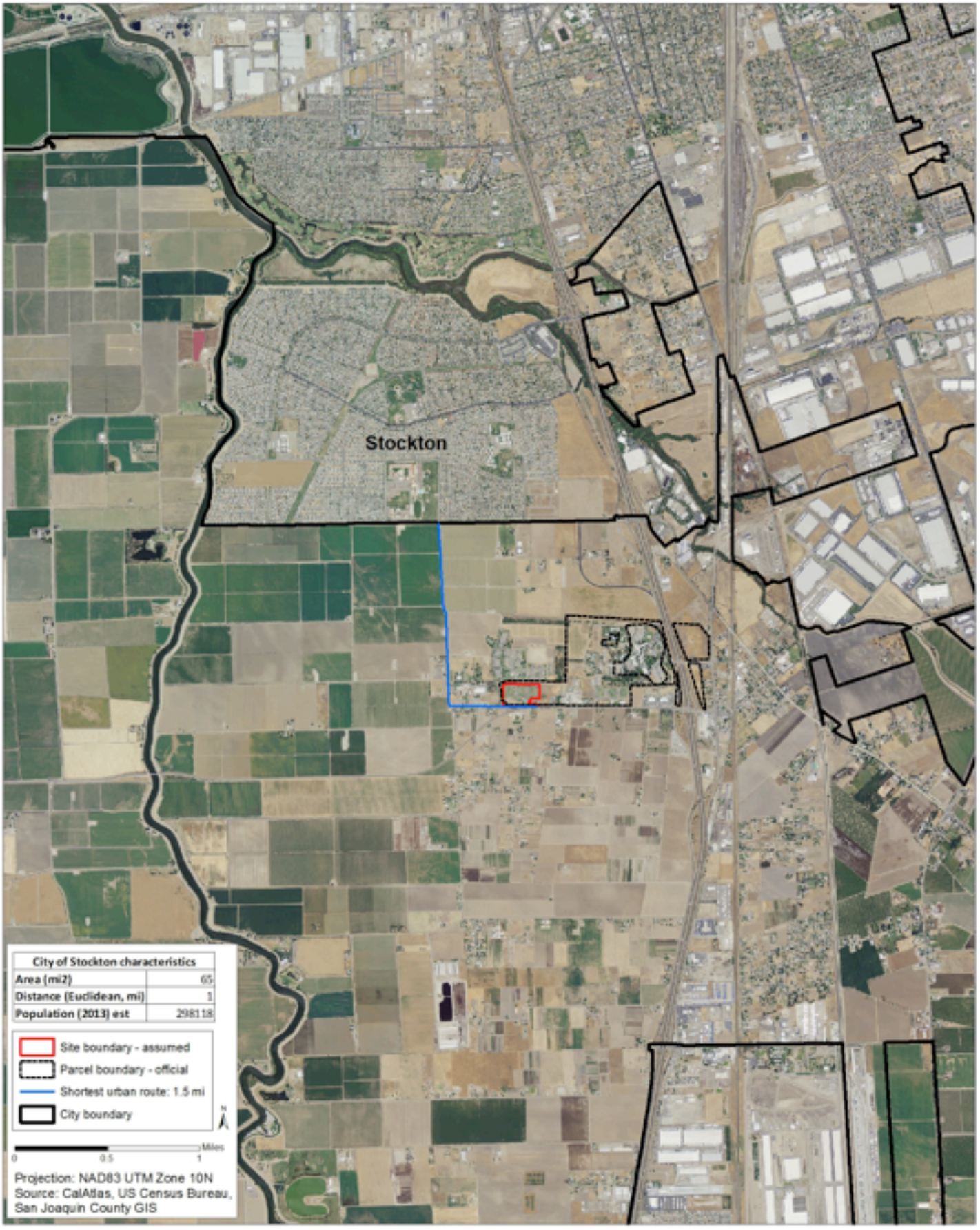
Office of Migrant Services Maps and Statistics

The six Office of Migrant Services centers included in this analysis are distributed across six different counties – Fresno, Kern, Monterey, San Joaquin, Santa Cruz, and Yolo. Despite their distribution across the state, the centers are remarkably similar to one another. All of the sites include some form of community space – most commonly a daycare center, playground, and a basketball court or soccer field. With a few exceptions, the arrangement and coverage of primary feature types remains consistent across sites (Table 1).

Artesi II OMS Center



Artesi II OMS Center



Artesi II OMS Center

Artesi II OMS Center

Artesi II Center Site Characteristics		
Feature	Area covered (ft2)	% Total
Asphalt	152348	26
Building	85642	15
Community Space	69284	12
Open Space	99598	17
Tree Canopy	25860	4
Site	582561	100

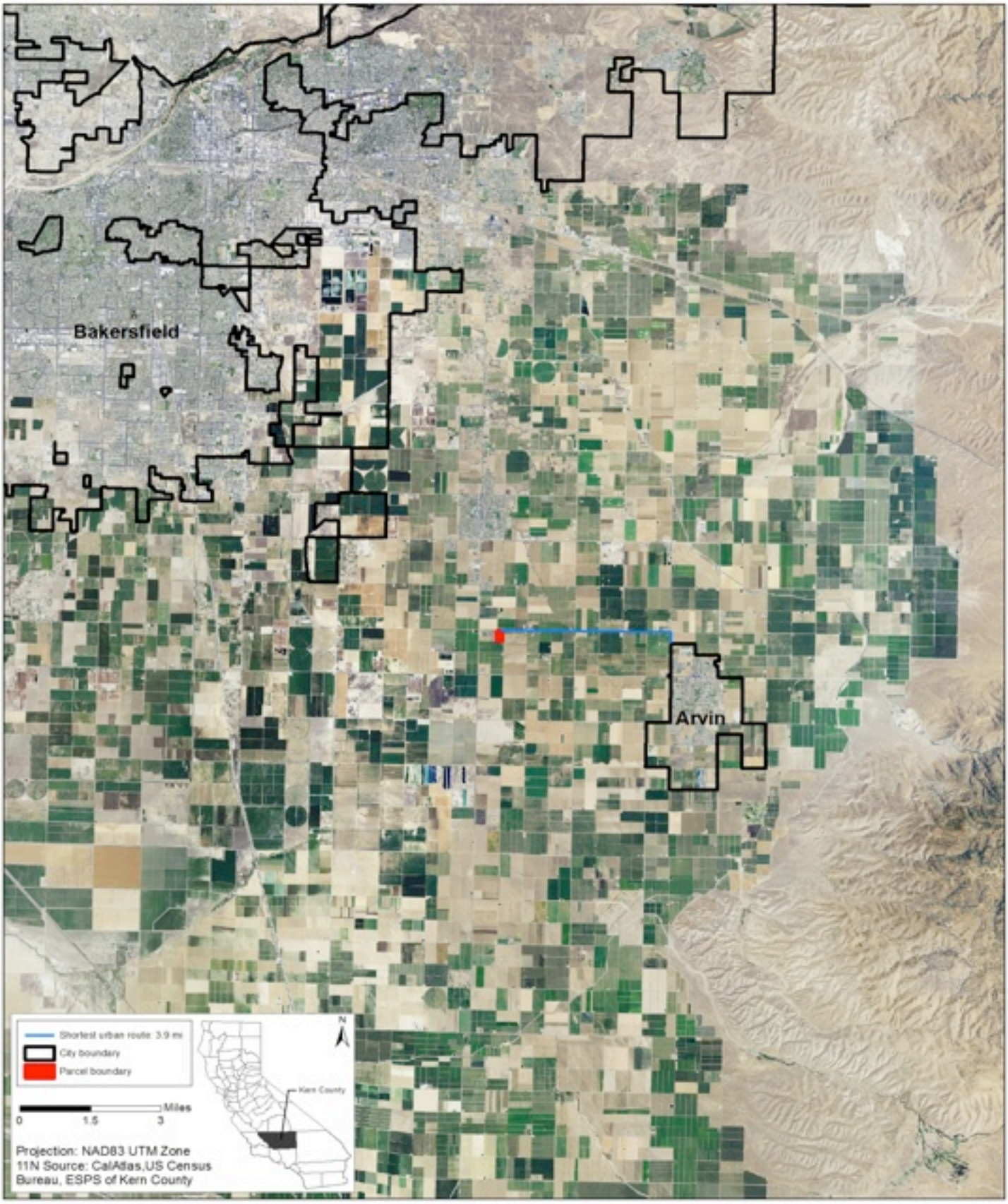
Site boundary
Buildings
Tree canopy
Community space
Asphalt
Open space

0 100 200 Feet

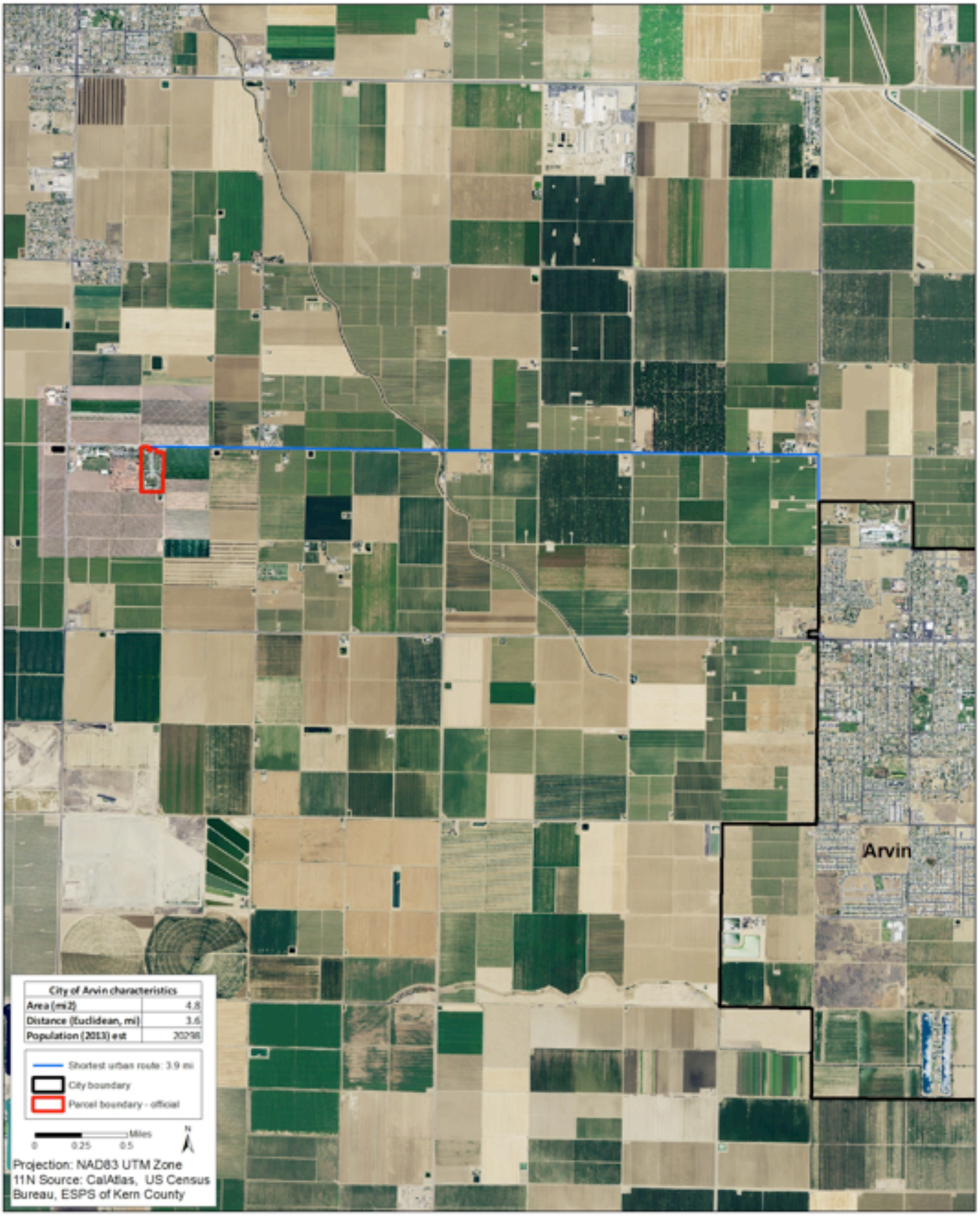
N

Projection: NAD83 UTM Zone 10N Source: USGS National Map Viewer, San Joaquin County GIS

Arvin OMS Center



Arvin OMS Center



Arvin OMS Center

Arvin OMS Center

Arvin Center Characteristics		
Feature	Area covered (ft2)	% Total
Asphalt	191307	21
Building	97167	11
Community Space	26339	3
Open Space	371206	41
Tree Canopy	23288	3
Parcel	899636	100

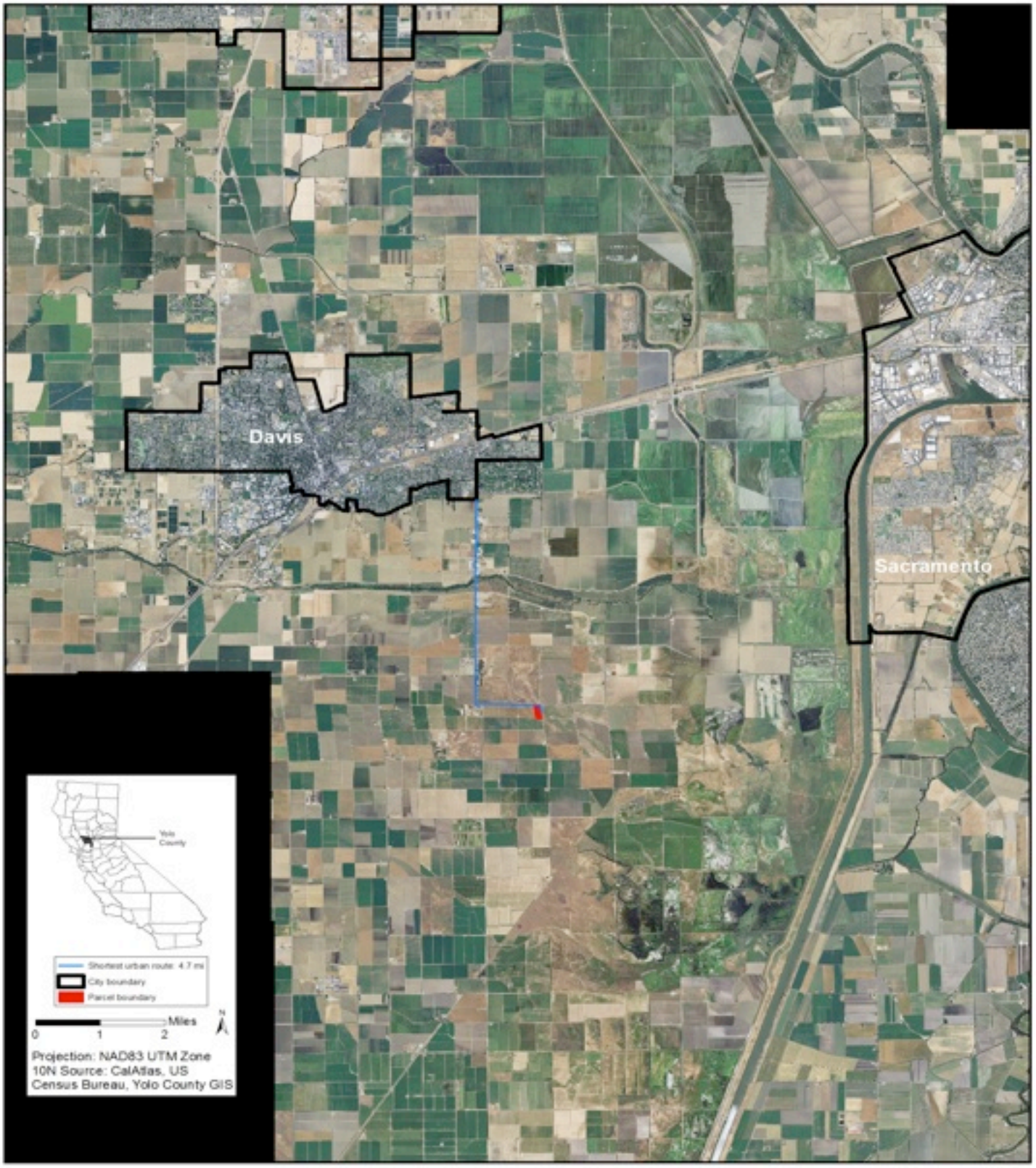
Asphalt
Building
Community space
Open space
Parcel boundary - official
Tree canopy

Projection: NAD83 UTM Zone 11N Source: USGS national map viewer, ESPS of Kern County

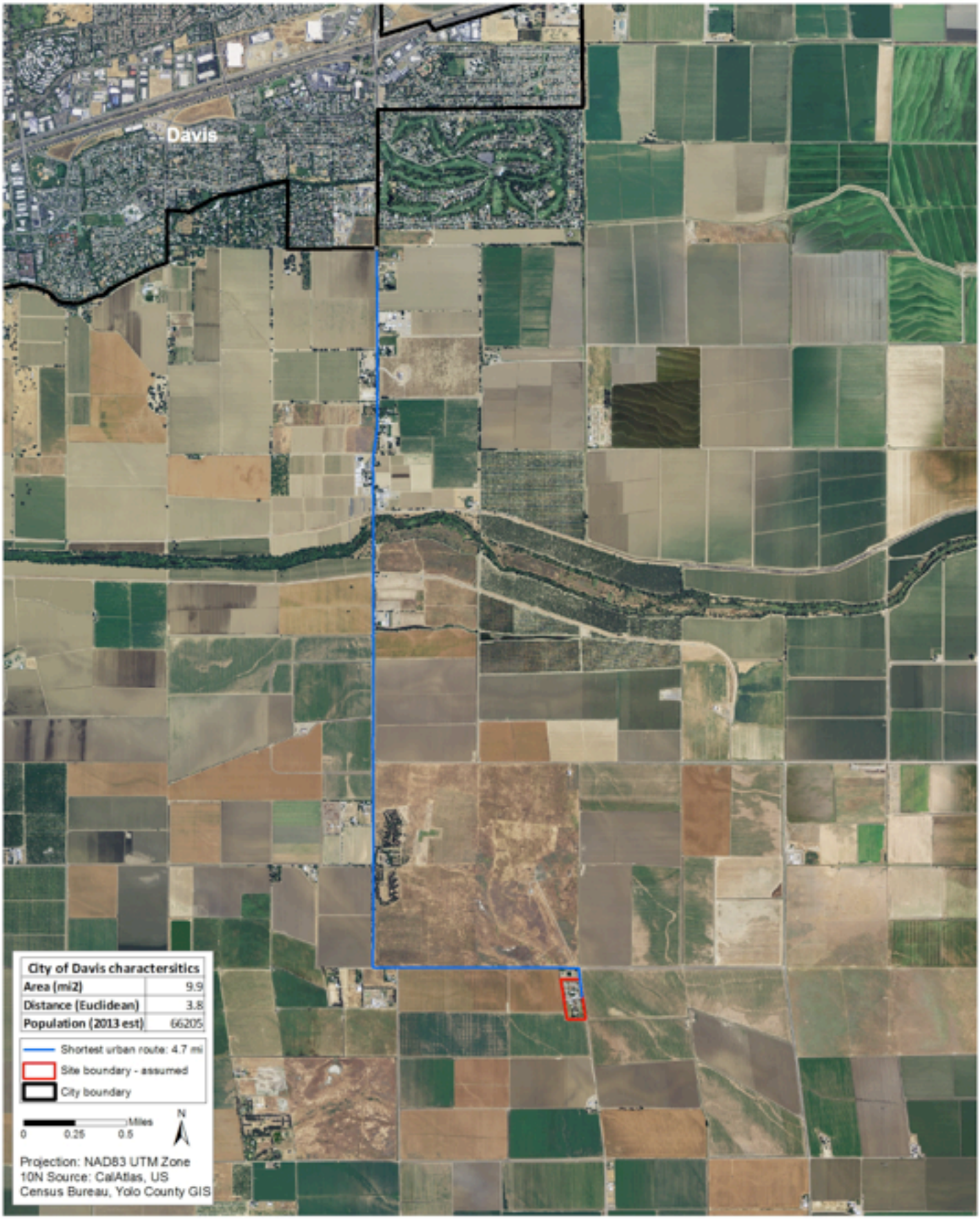
0 100 200 Feet

N

Davis OMS Center



Davis OMS Center



Davis OMS Center

Davis OMS Center

Davis Center Site Characteristics		
Feature	Area covered (ft2)	% Total
Asphalt	89484	18
Building	84397	17
Community Space	68208	13
Open Space	134835	27
Tree Canopy	56353	11
Site	505893	100

Asphalt
Buildings
Community space
Open space
Site boundary - assumed
Tree canopy

N

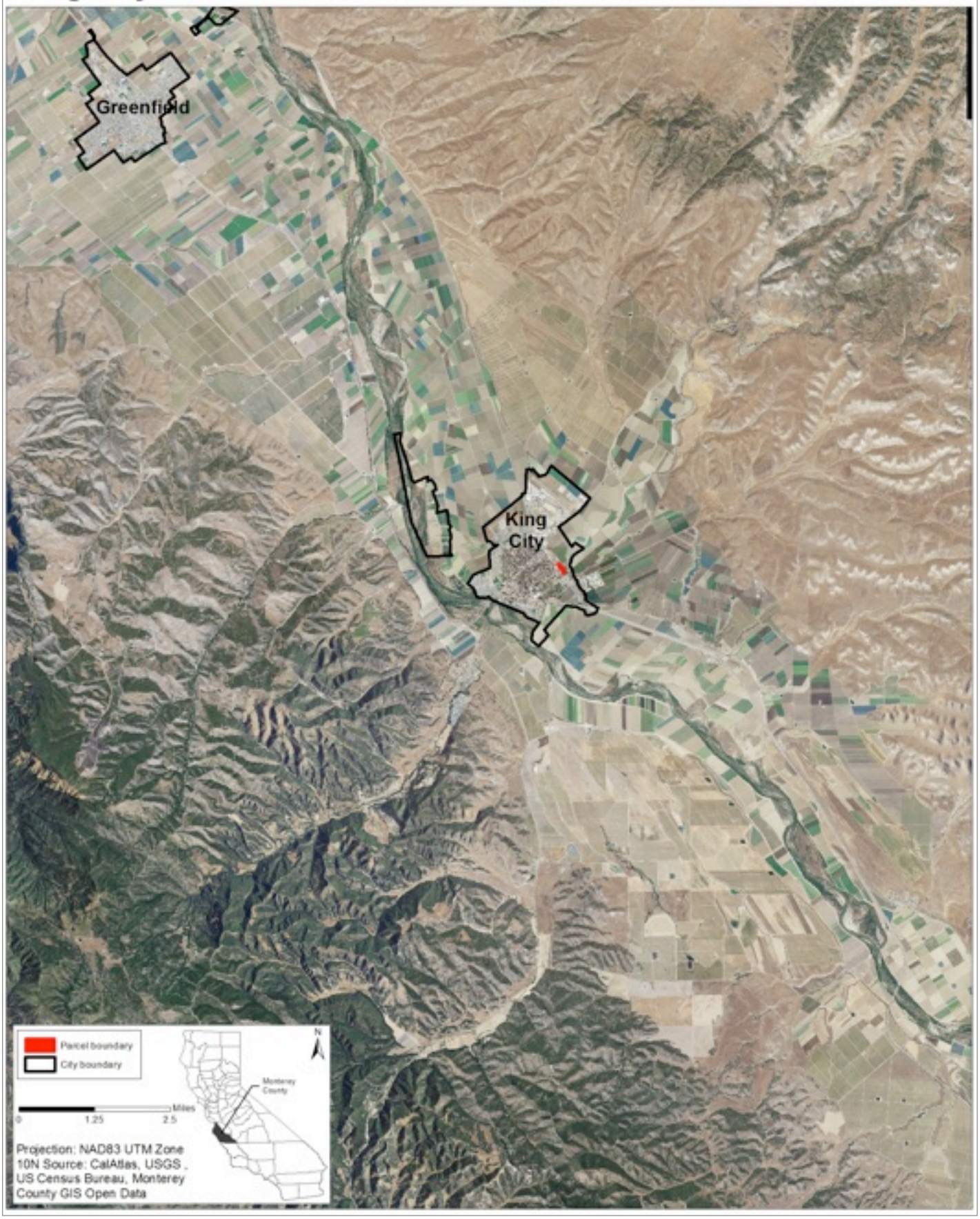
0 100 200 Feet

Projection: NAD83 UTM Zone 10NSource: USGS National Map Viewer; Yolo County GIS

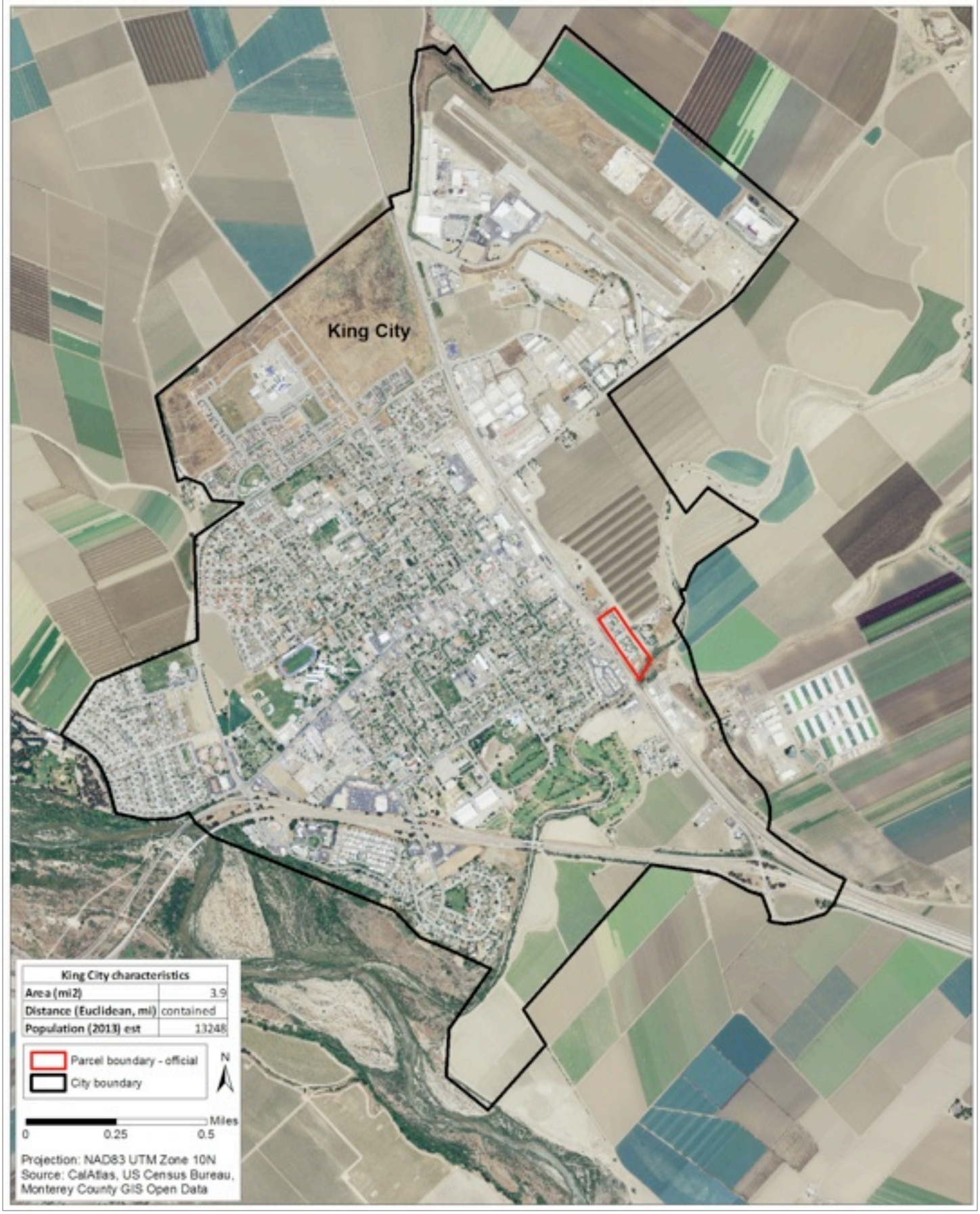
Davis OMS Center – Site Visit Photos

Clockwise, from top left: 1. View down street and sidewalk network; 2. View from road of courtyard area; 3. Unit entrance and front of building; 4. Playground; 5. Soccer field and open space west of residences
Photos and site information courtesy of Greg Webber, UC Davis LDA

King City OMS Center



King City OMS Center



King City OMS Center

King City OMS Center

King City Center Characteristics		
Feature	Area covered (ft2)	% Total
Asphalt	90194	31
Building	40909	14
Community Space	23898	8
Open Space	53275	18
Tree Canopy	13893	5
Parcel	288768	100

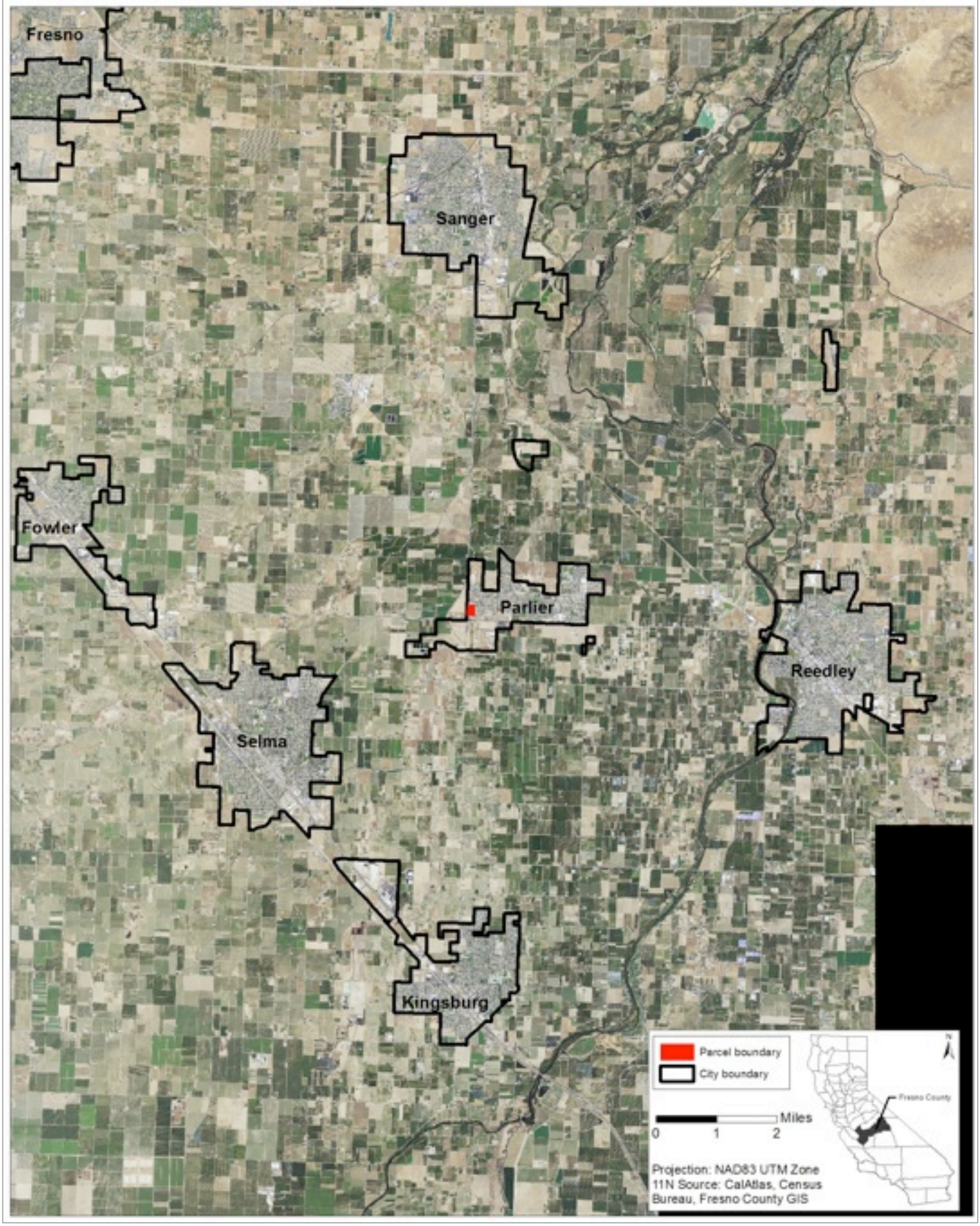
Asphalt
Building
Community space
Open space - dirt / scrub
Parcel boundary - official
Tree canopy

0 150 300 Feet

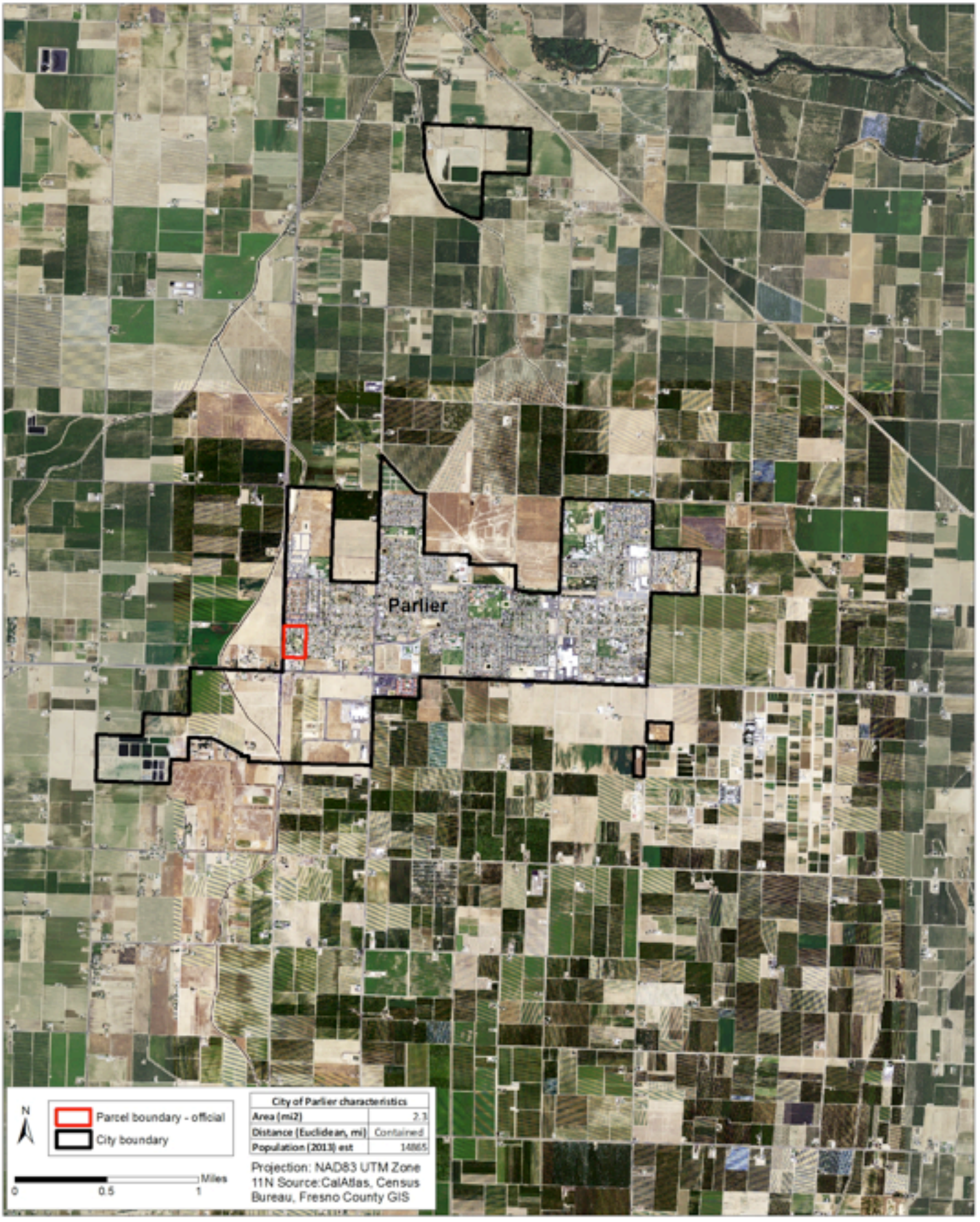
N

Projection: NAD83 UTM Zone 10N Source: USGS imagery (viewer.nationalmap.gov), Monterey County Open Data GIS

Parlier OMS Center

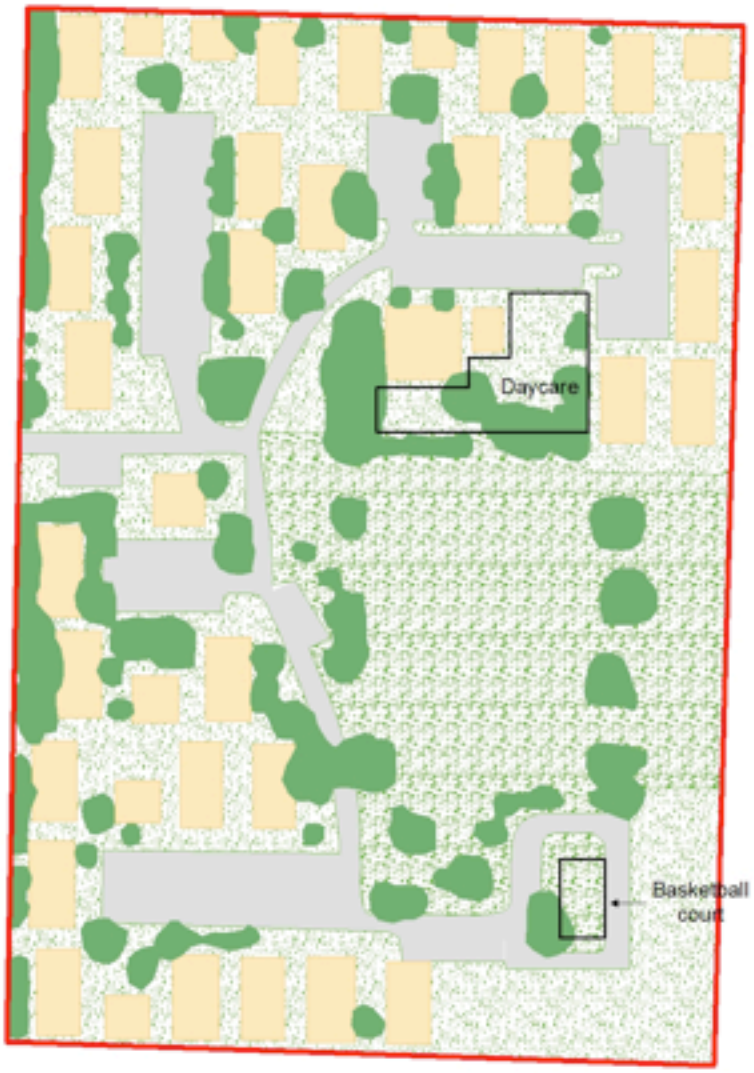


Parlier OMS Center



Parlier OMS Center

Parlier OMS Center



- Asphalt
- Building
- Community space
- Open space
- Parcel boundary - official
- Tree canopy

Parlier Center Characteristics

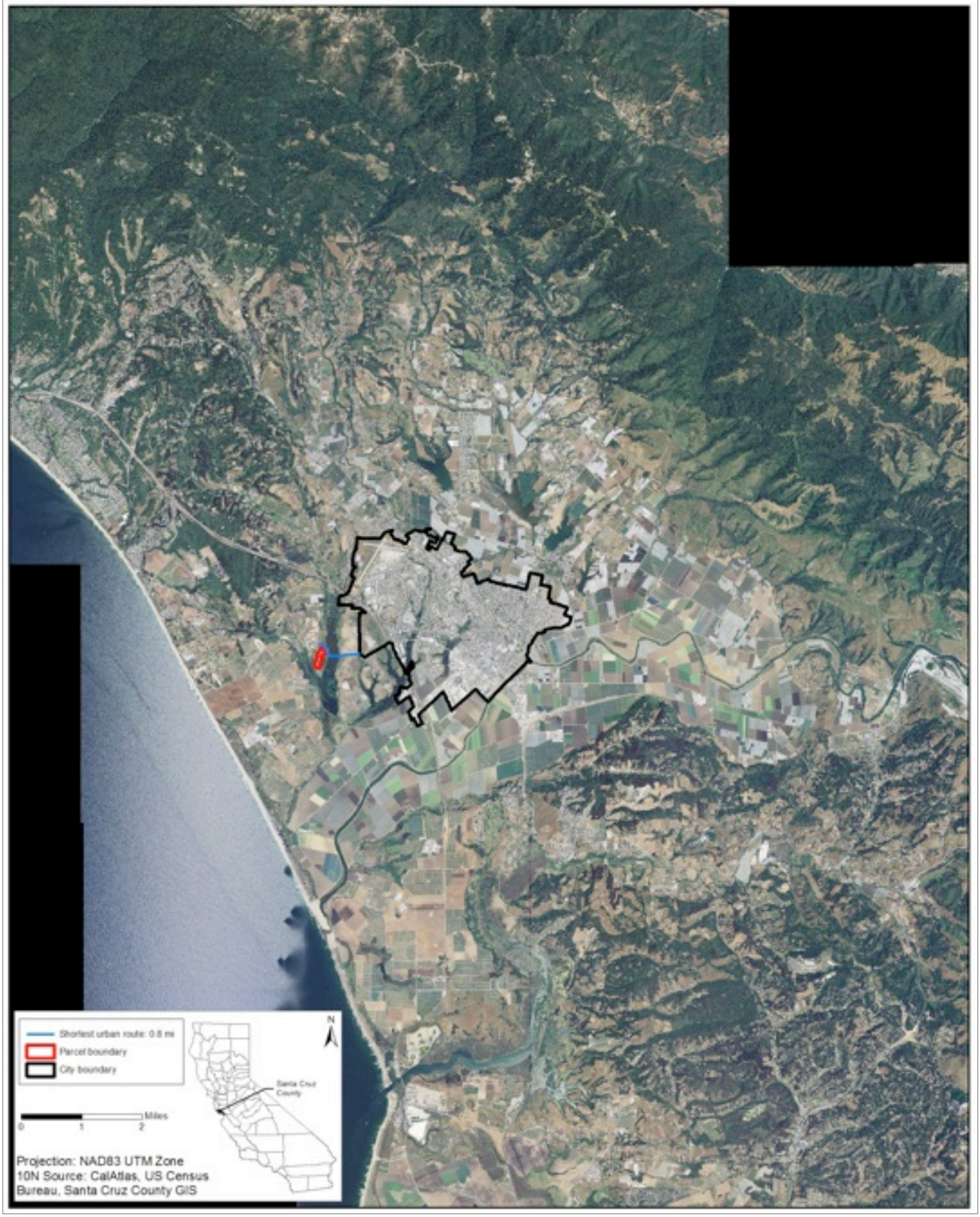
Feature	Area covered (ft2)	% Total
Asphalt	95237	16
Building	105889	18
Community Space	16965	3
Open Space	136842	24
Tree Canopy	104326	18
Parcel	580811	100

Projection: NAD83 UTM Zone 11N Source: USGS National Map Viewer, Fresno County GIS

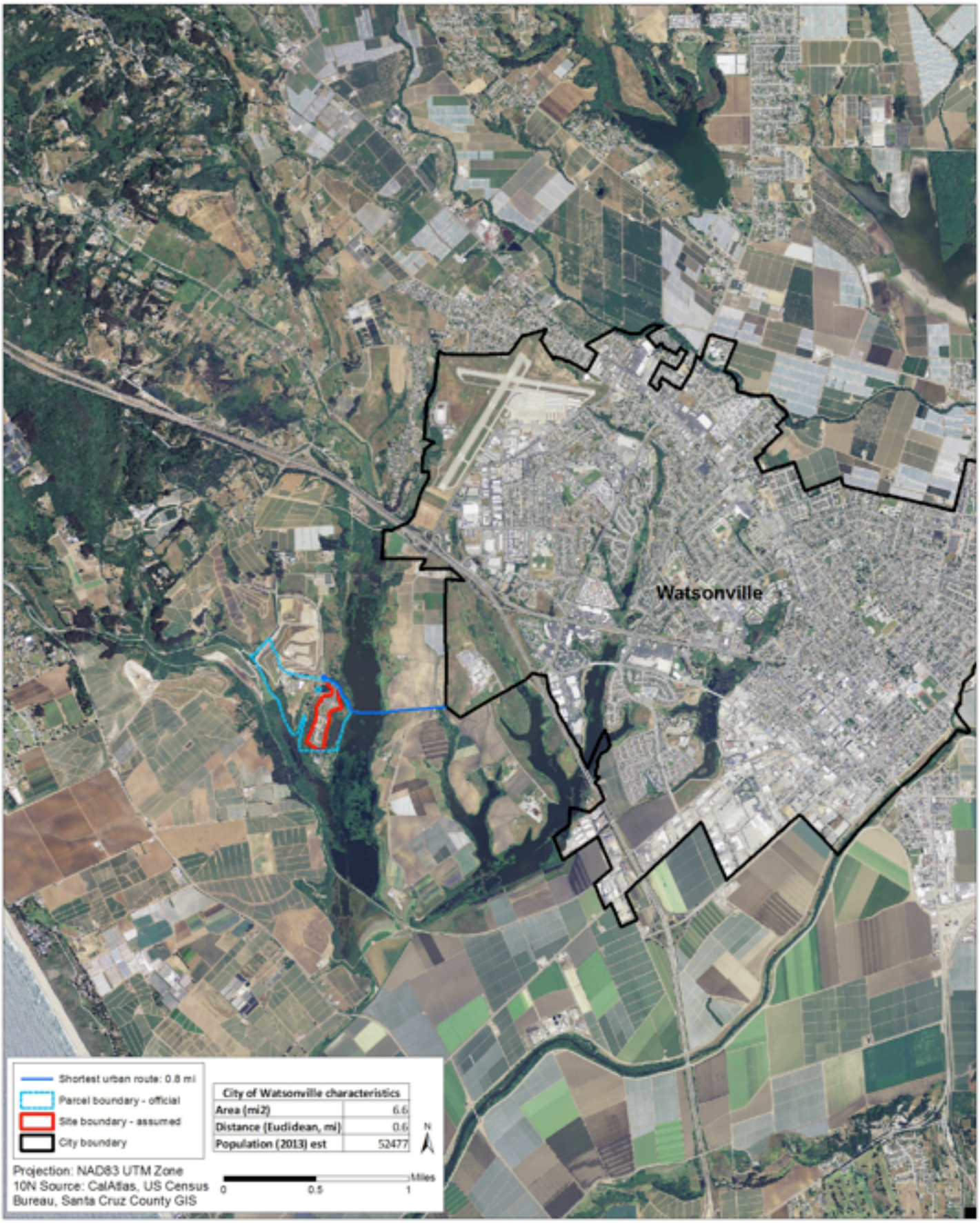
0 100 200 Feet

N

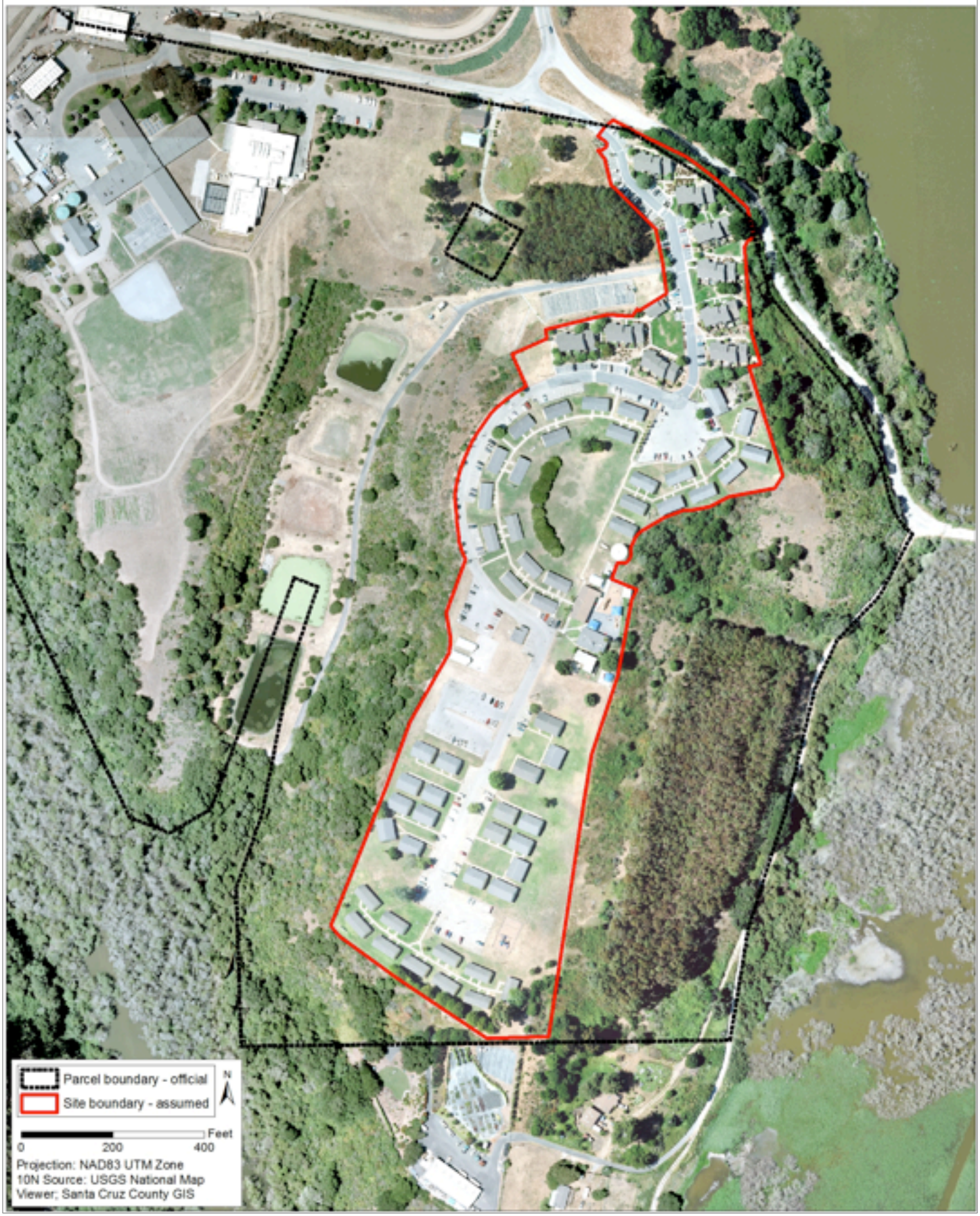
Watsonville OMS Center



Watsonville OMS Center



Watsonville OMS Center



Watsonville OMS Center

Watsonville Center Site Characteristics		
Feature	Area covered (ft2)	% Total
Asphalt	157197	20
Building	124298	16
Community Space	15769	2
Open Space	118579	15
Tree Canopy	62446	8
Parcel	791320	100

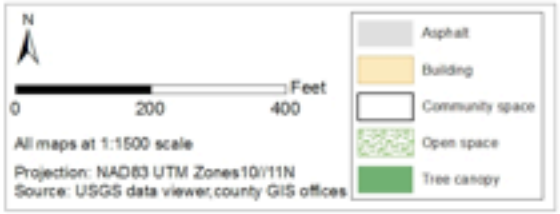
Asphalt
Building
Community space
Open space
Site boundary - assumed
Tree canopy

Projection: NAD83 UTM Zone 10N Source: USGS National Map Viewer; Santa Cruz County GIS

0 200 400 Feet

N

OMS Center
Major Features



OMS Center Major Features

Parlier

King City

Watsonville

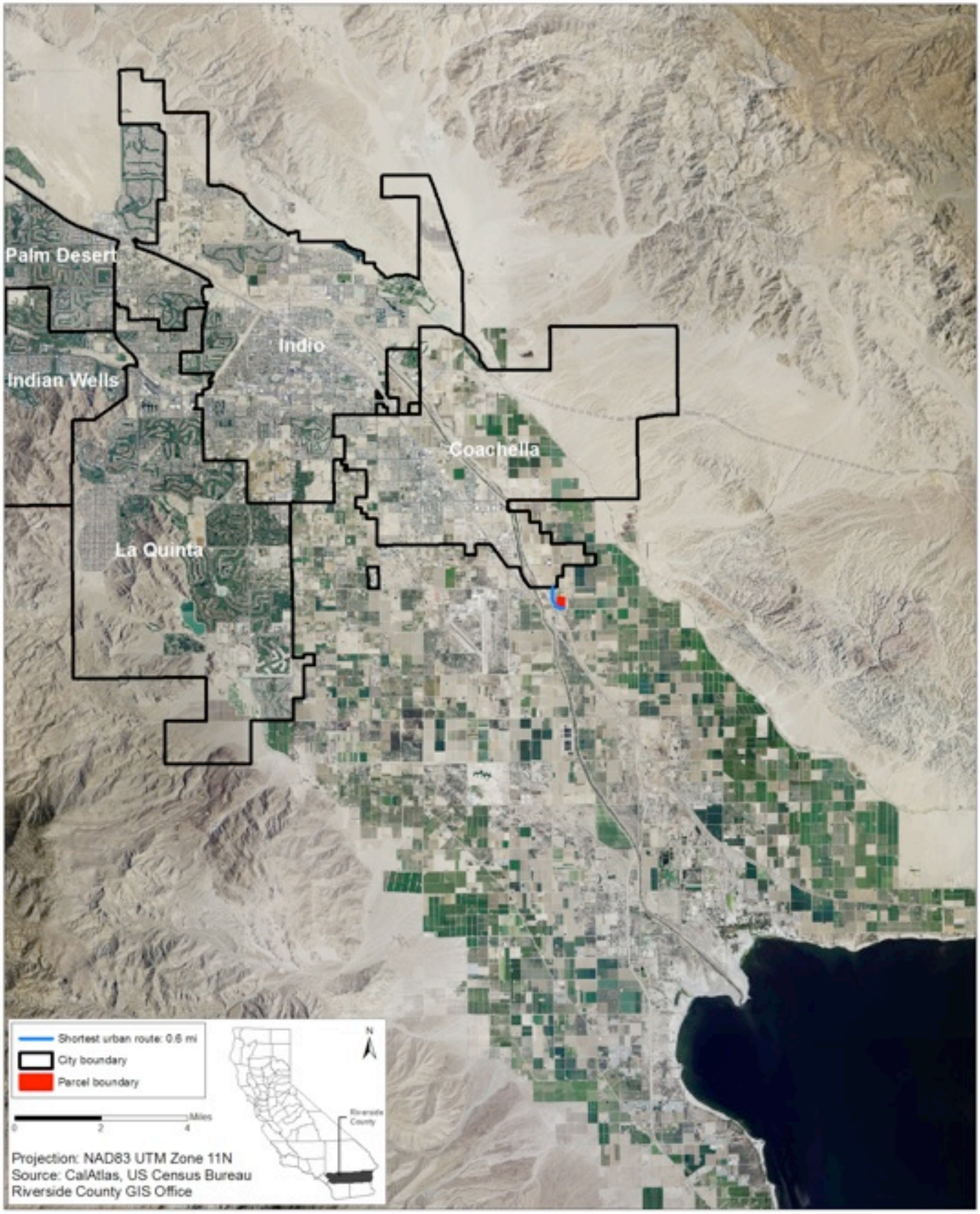
Private or Unofficial Farmworker Housing

The “unofficial” MFW housing sites – those run privately or located on farm or tribal land – are highly variable, even considering that four of the six sites analyzed here are located within a few miles of each other in Riverside county. The first site, 57th Ave, is located on farmland, while the second site, 70th Ave (actually two sites across the street from each other and managed by the same individual), is located on tribal land. The four remaining sites appear to be owned and managed privately, although two of these (Rancho Garcia and St. Anthony Trailer Park) are firmly embedded within a dominantly agricultural landscape, but apparently are not located on land provided by a farmland owner.

All of these unofficial sites are located outside of city limits, all but one occur in census tracts which are primarily occupied by those of Hispanic or Latino ancestry, only one incorporates community space, and all but two contain only dirt roads (Tables 1 and 2). Otherwise, there is a high degree of variation in site size, number of structures, and the presence of open space (Table 1).

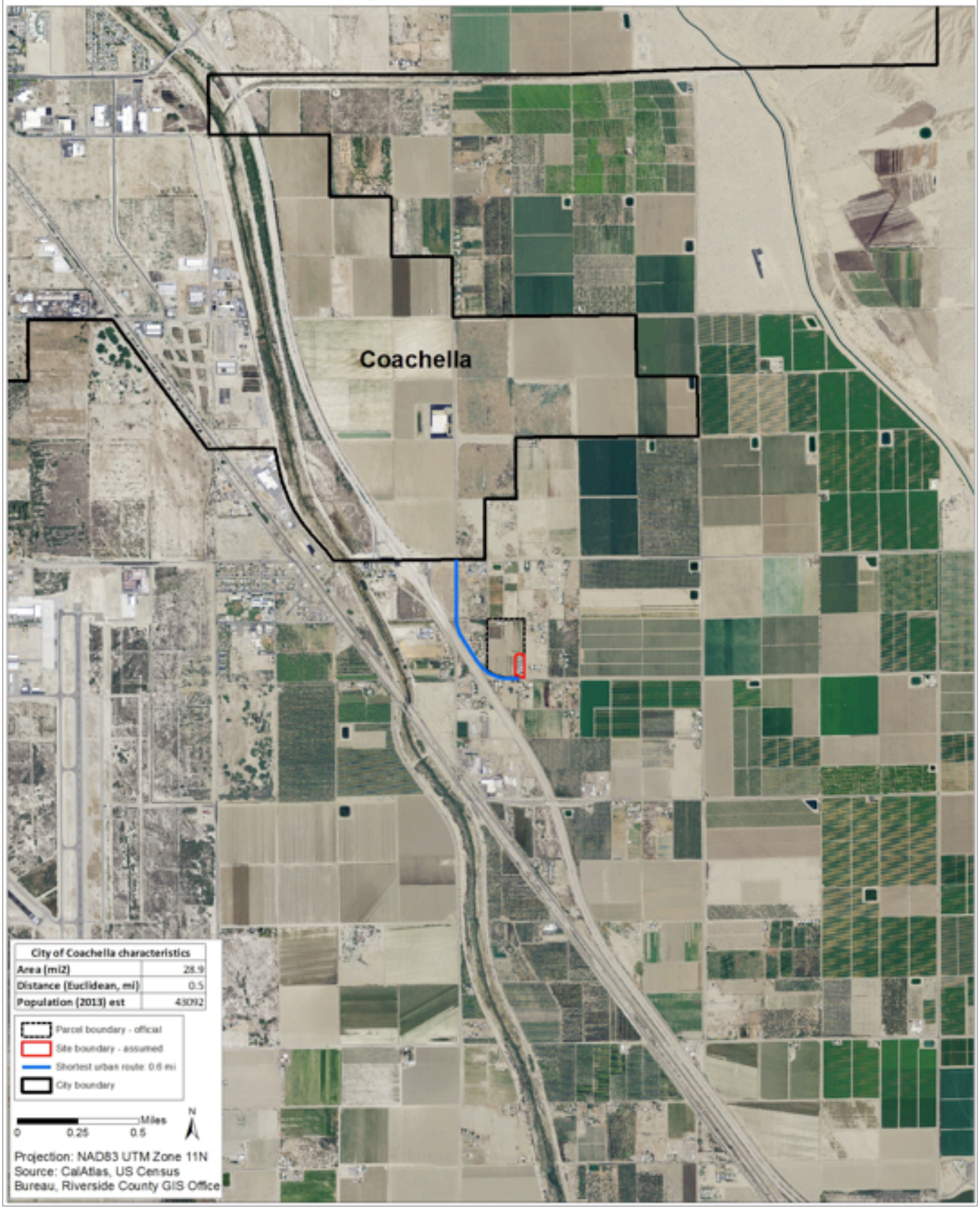
Unofficial MFW Housing: 57th Ave

Private land



Unofficial MFW Housing: 57th Ave

Private land

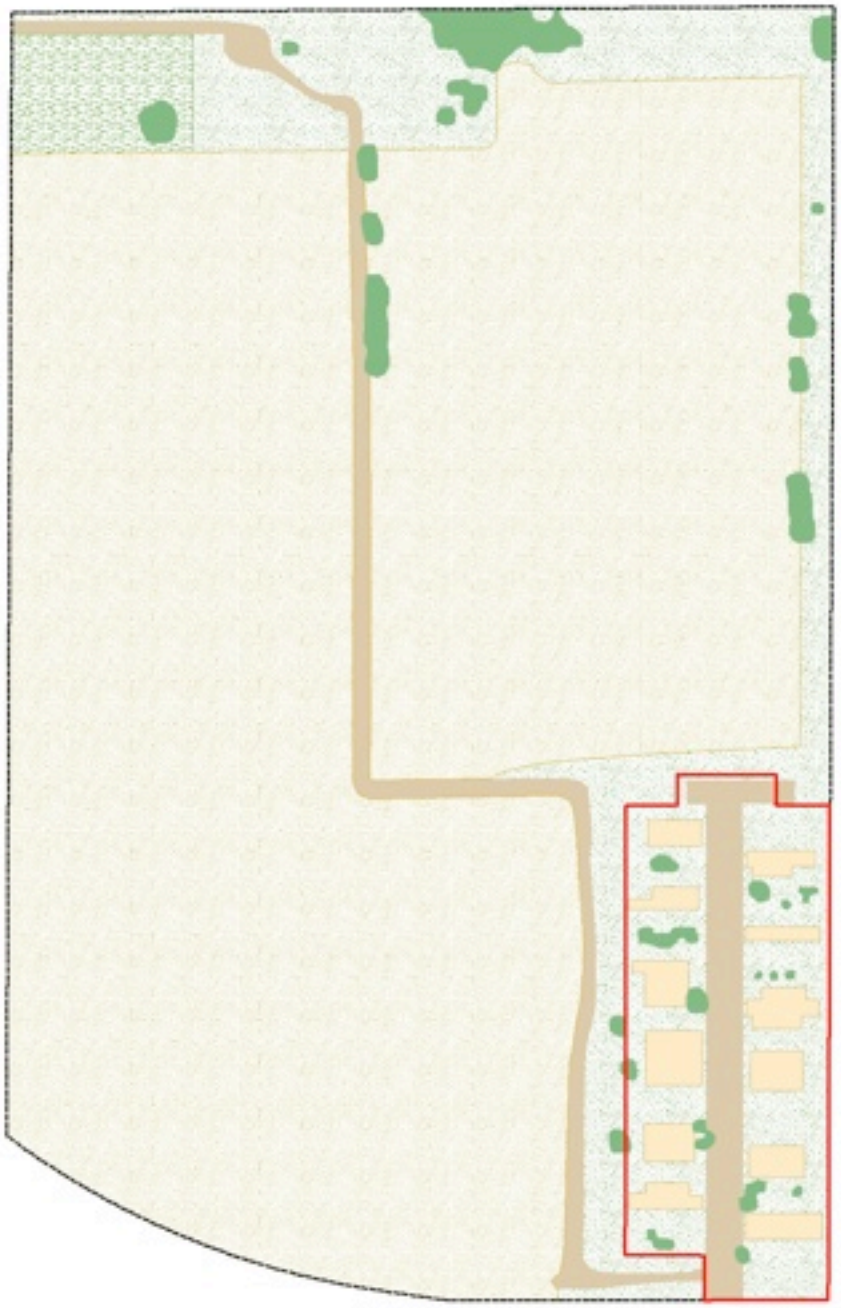


Unofficial MFW Housing: 57th Ave

Private land

Unofficial MFW Housing: 57th Ave

Private Land



Ag land
Buildings
Dirt road
Parcel boundary - official
Site boundary - assumed
Tree canopy

Projection: NAD83 UTM Zone11N
Source: CalAtlas, Riverside County GIS office

57th Ave Site Characteristics

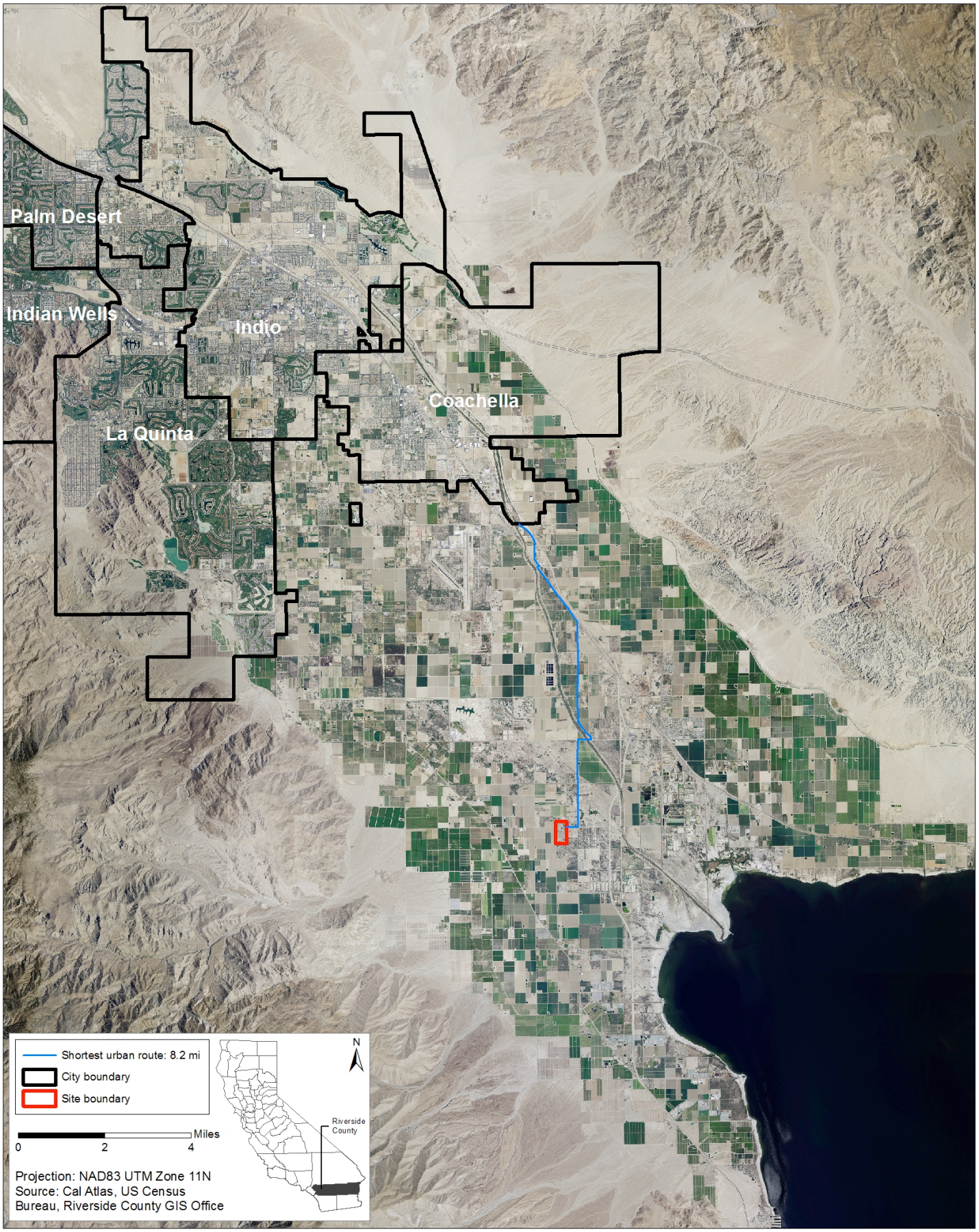
Feature	Area covered (ft2)	% Total
Building	21901	23
Dirt road	19974	21
Tree Canopy	4481	5
Site	97081	100

0 125 250 Feet

N

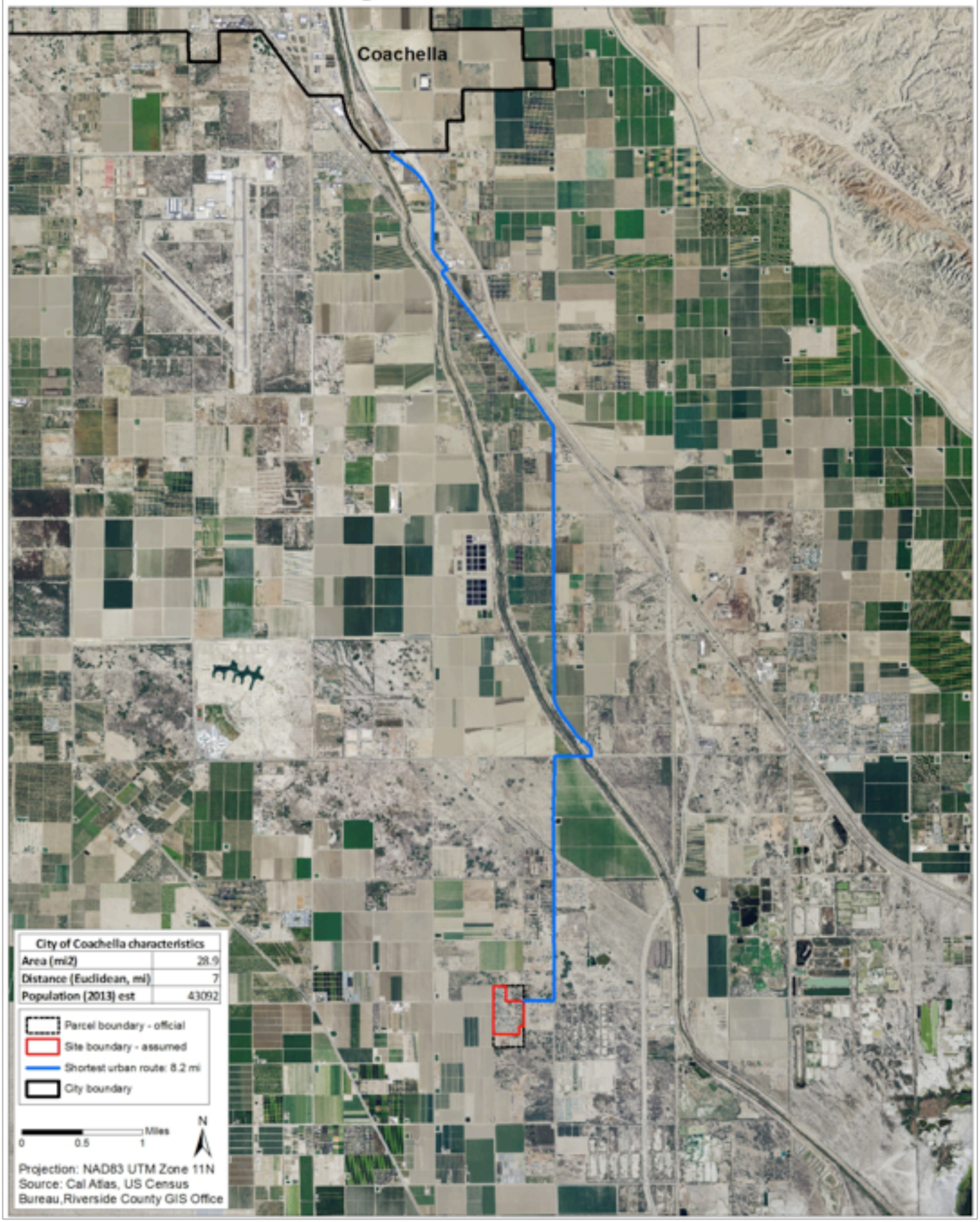
Unofficial MFW Housing: 70th Ave

Tribal land



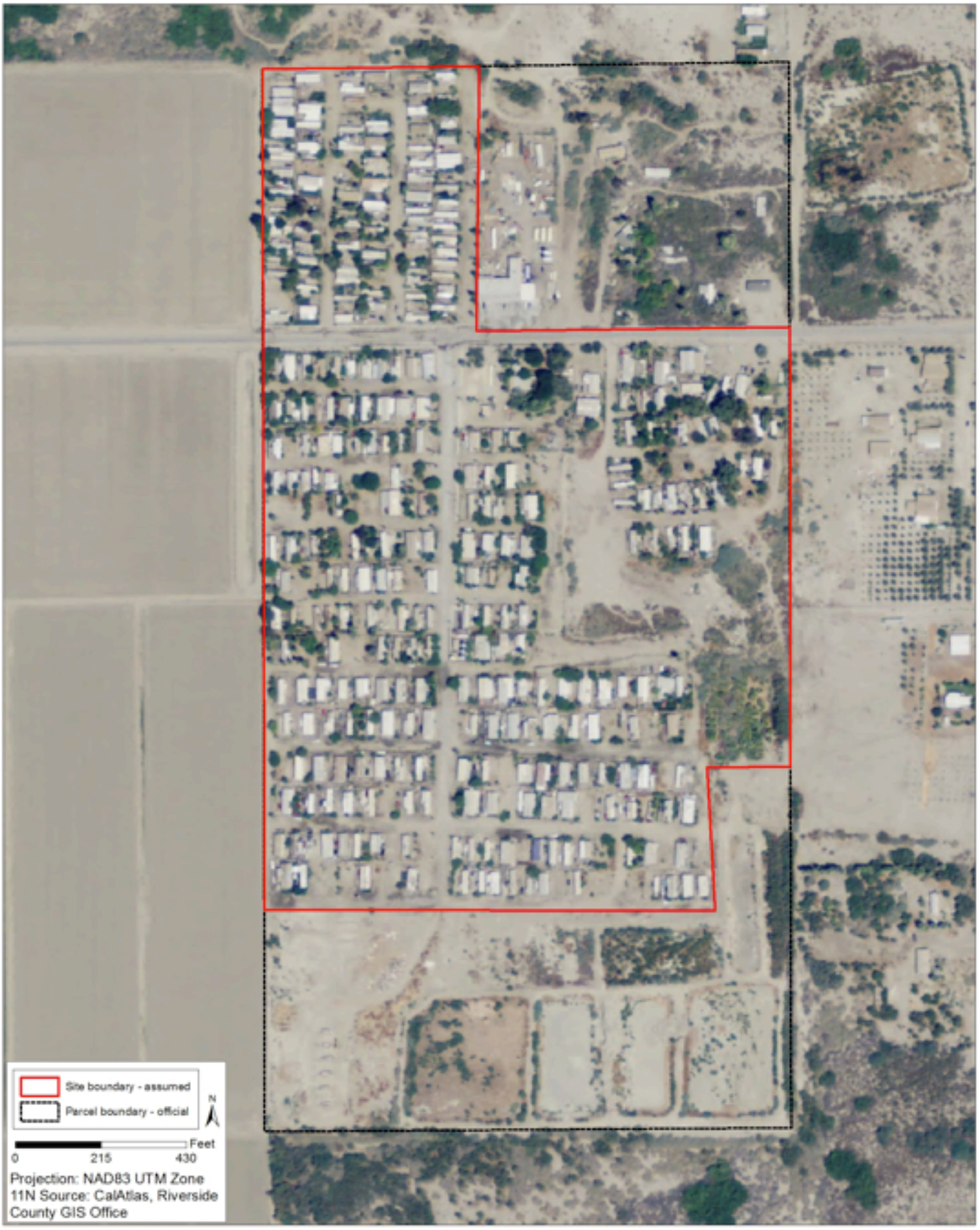
Unofficial MFW Housing: 70th Ave

Tribal land



Unofficial MFW Housing: 70th Ave

Tribal land



Unofficial MFW Housing: 70th Ave

Tribal land

Asphalt
Building
Open space
Site boundary - assumed
Tree canopy

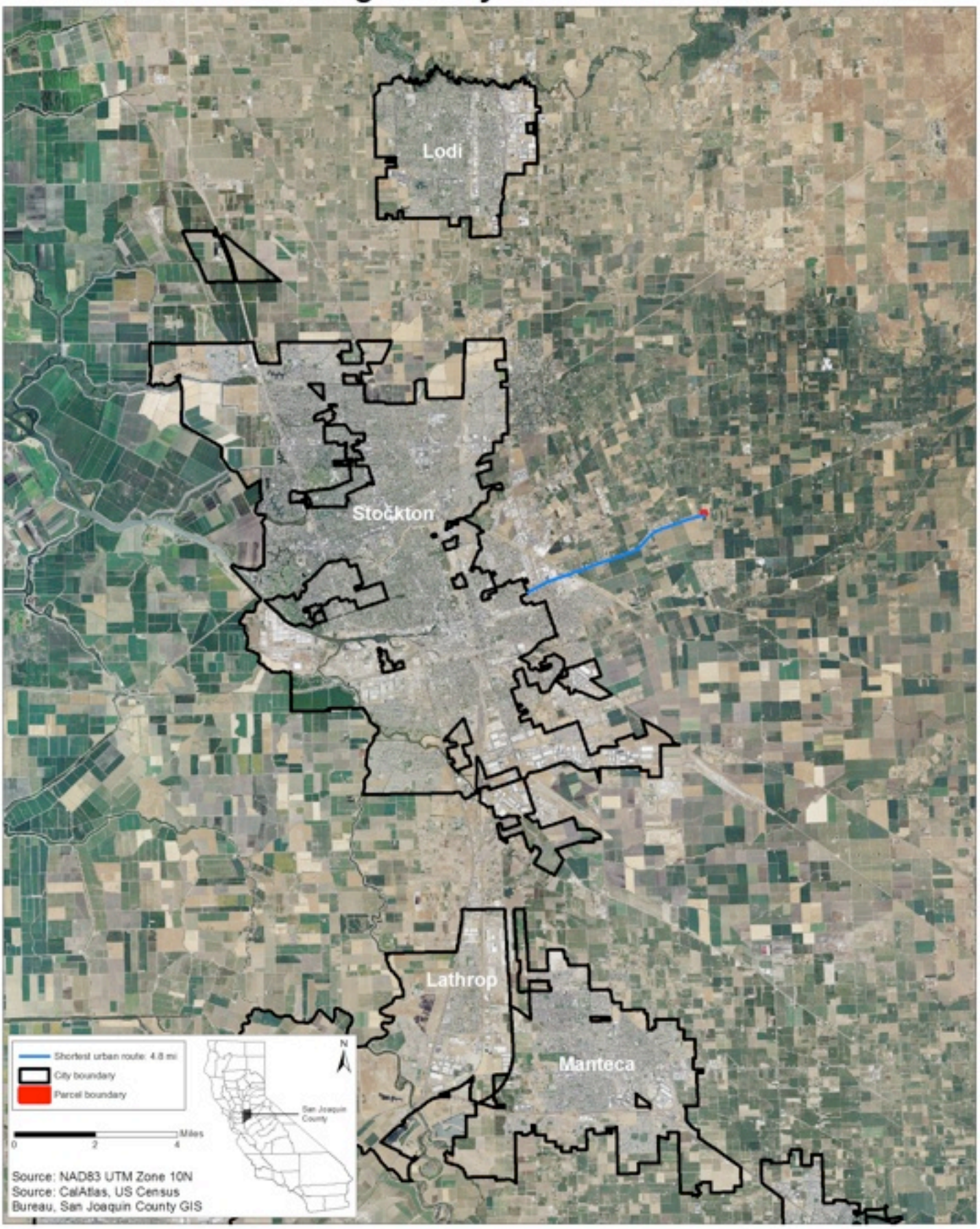
N
0 200 400 Feet

70th Ave Site Characteristics		
Feature	Area covered (ft2)	% Total
Asphalt	29428	1
Building	374305	17
Open Space	162087	7
Tree Canopy	230221	10
Site	2220664	100

Projection: NAD83 UTM Zone 11N Source: CalAtlas, Riverside County GIS Office

Unofficial MFW Housing: Cherry Tree Lane Trailers

Private land



Unofficial MFW Housing: Cherry Tree Lane Trailers

Private land

Unofficial MFW Housing: Cherry Tree Lane Trailers

Private land

Private land

Unofficial MFW Housing: Cherry Tree Lane Trailers

Asphalt
Building
Parcel boundary - official
Tree canopy

Projection: NAd83 UTM Zone 10N Source: USGS national map viewer, San Joaquin County GIS

Cherry Tree Lane Characteristics

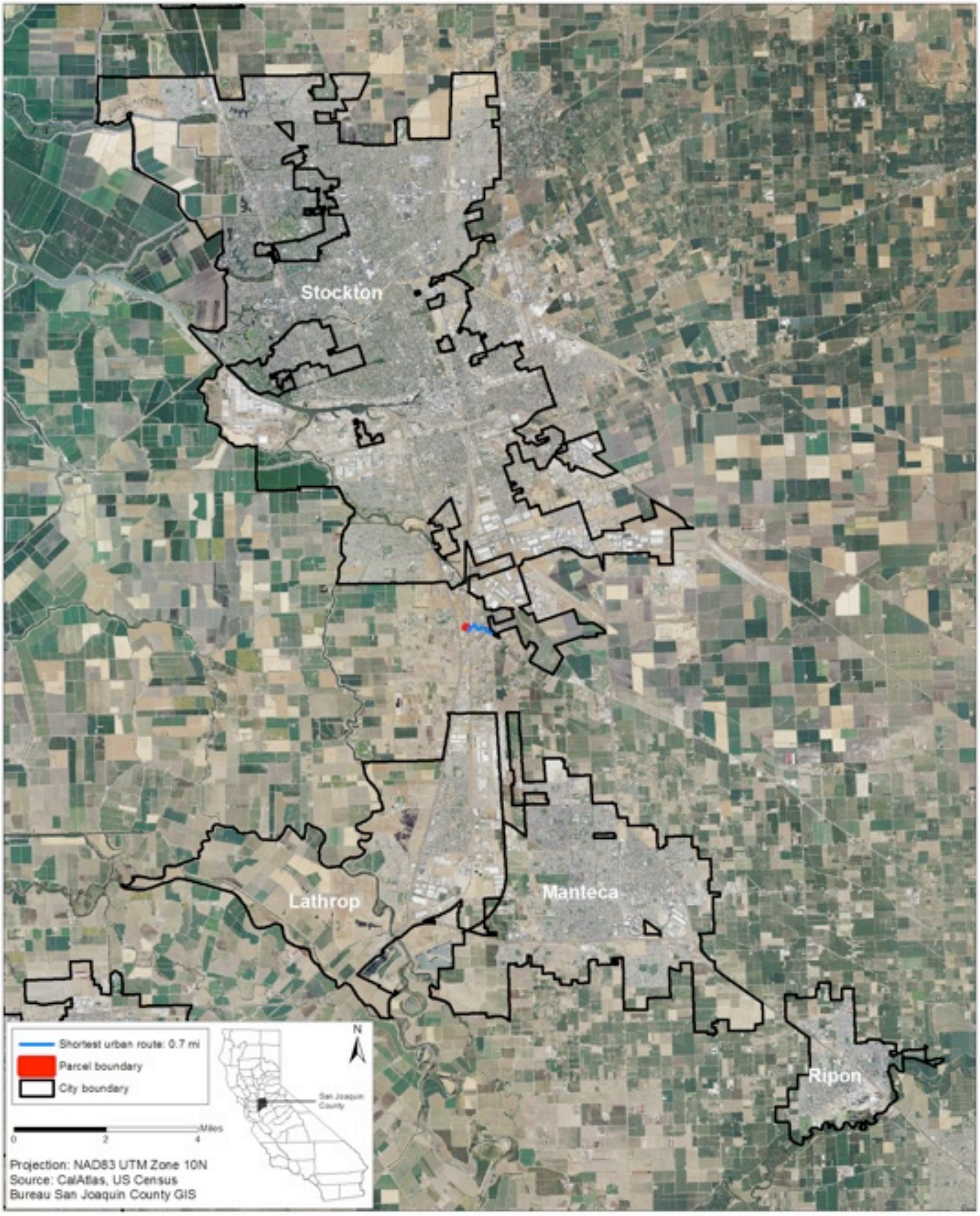
Feature	Area covered (ft2)	% Total
Asphalt	39627	27
Building	48242	33
Tree Canopy	22263	15
Site	146892	100

0 100 200 Feet

N

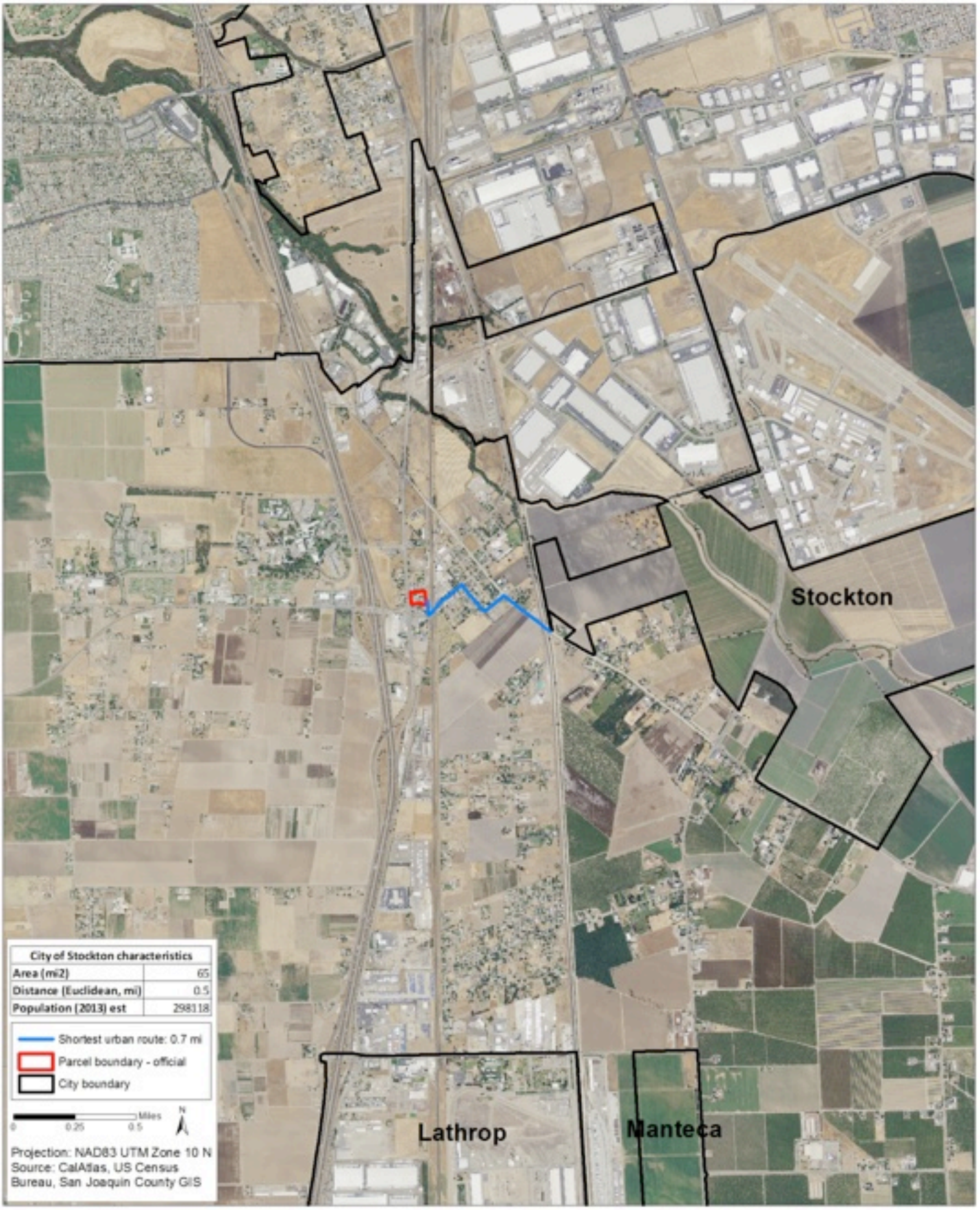
Unofficial MFW Housing: Las Cabina de los Campos

Private land



Unofficial MFW Housing: Las Cabina de los Campos

Private land



Unofficial MFW Housing: Las Cabina de los Campos

Private land

Private land

Unofficial MFW Housing: Las Cabina de los Campos

Parcel boundary - official
Tree canopy
Asphalt
Building
Open space - exposed dirt
Open space - grass/scrub

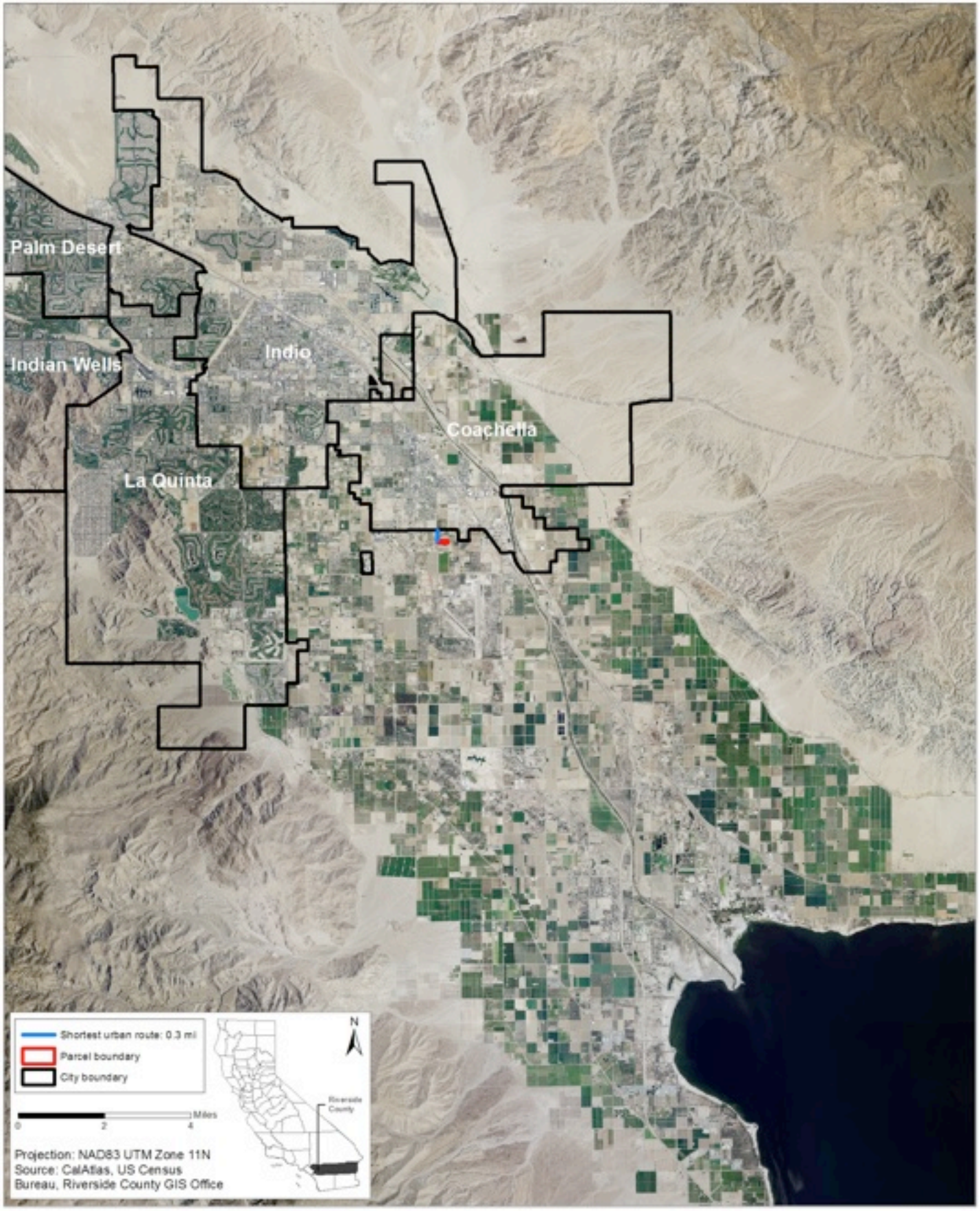
Las Cabina de los Campos Characteristics		
Feature	Area covered (ft2)	% Total
Asphalt	13247	16
Building	10368	12
Open space	28569	34
Tree Canopy	10838	13
Site	83652	100

N
0 50 100 Feet

Projection: NAD83 UTM Zone10N Source: USGS national map viewer, San Joaquin County GIS

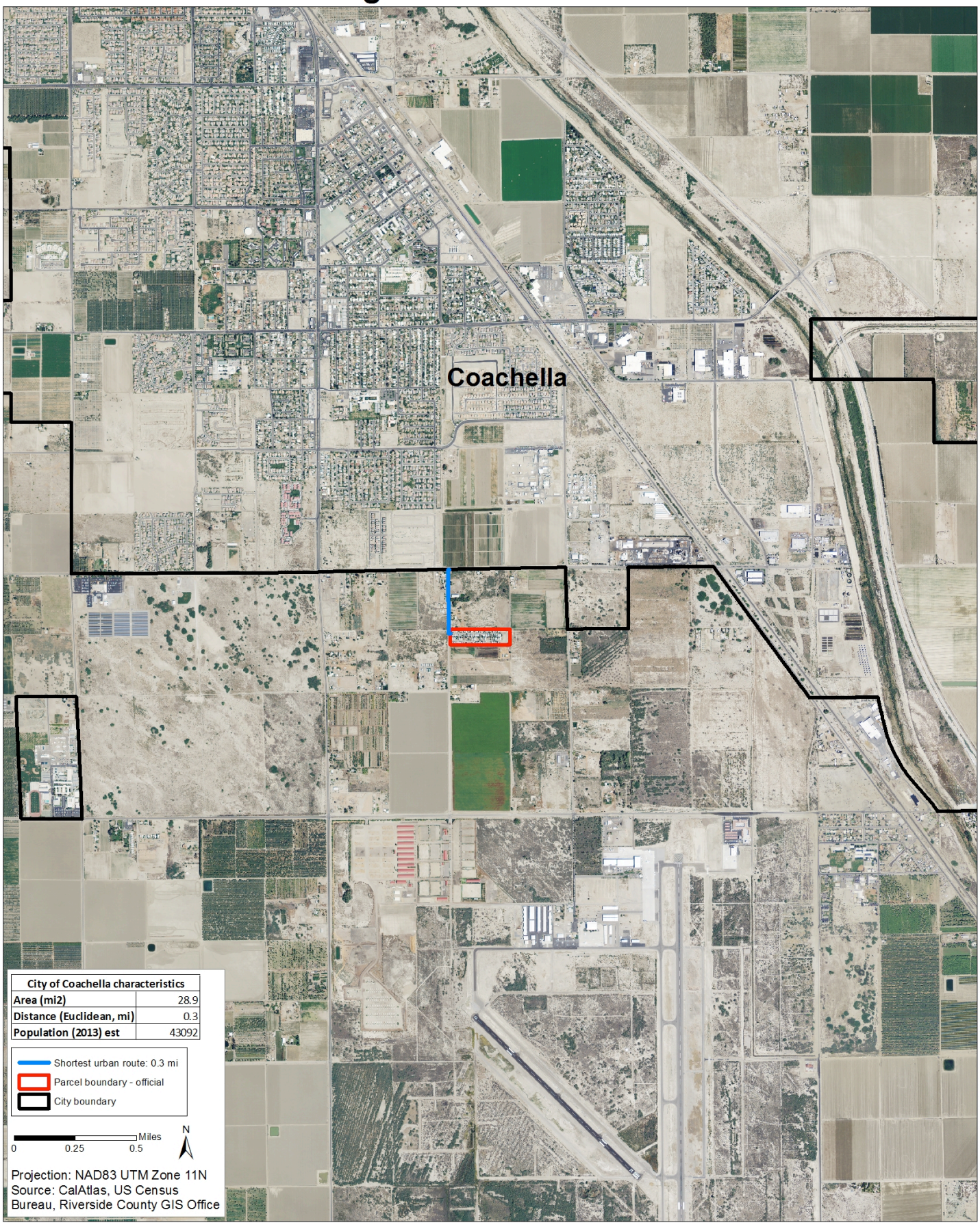
Unofficial MFW Housing: Rancho Garcia

Private land



Unofficial MFW Housing: Rancho Garcia

Private land



Unofficial MFW Housing: Rancho Garcia

Private land

Unofficial MFW Housing: Rancho Garcia

Private land

Parcel boundary - official
Tree canopy
Building
Open space - exposed dirt / scrub

Projection: NAD83 UTM Zone 11N
Source: CalAtlas, Riverside County GIS Office

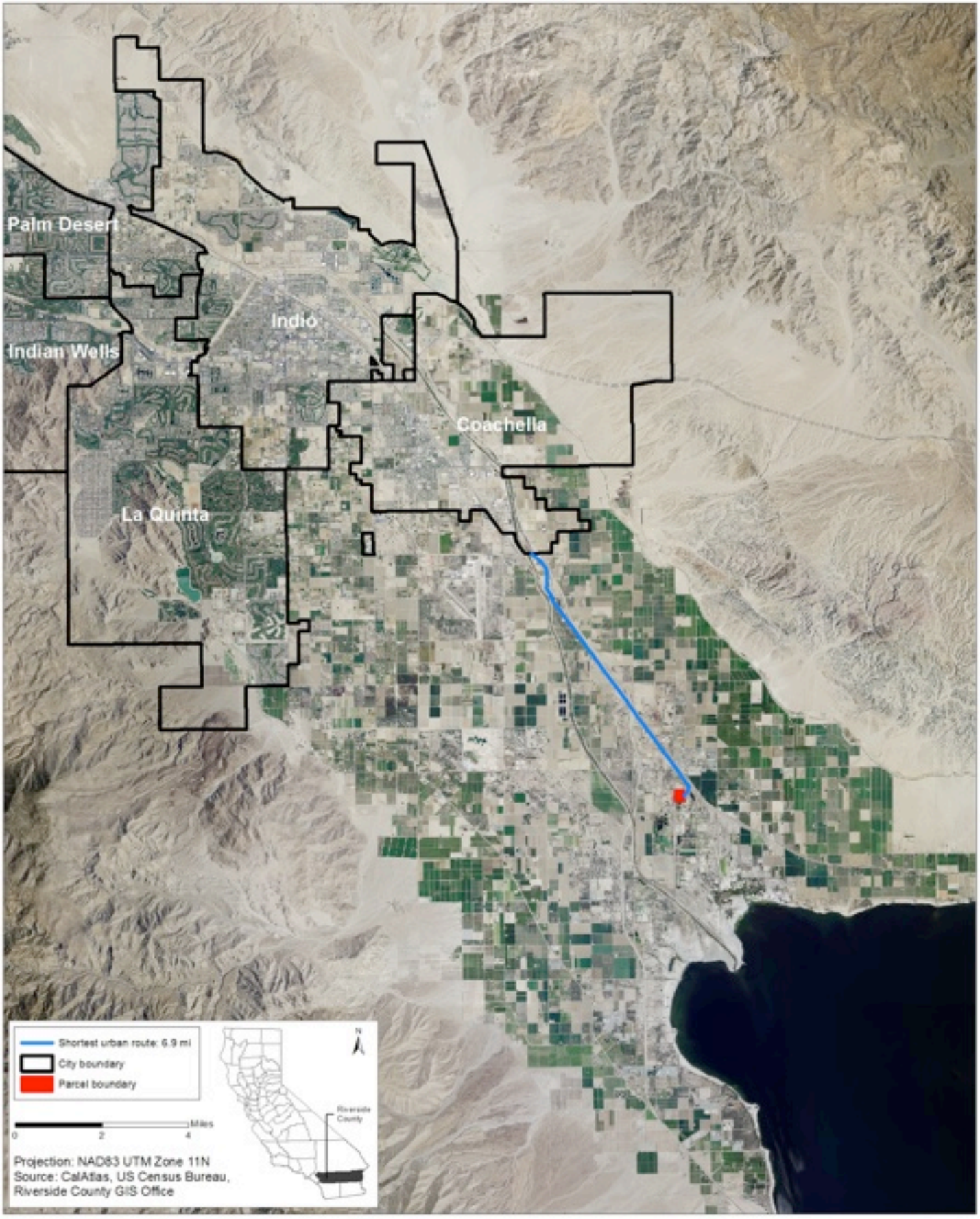
0 150 300 Feet

N

Rancho Garcia Characteristics		
Feature	Area covered (ft2)	% Total
Building	107667	25
Open Space	55304	13
Tree Canopy	74791	18
Site	424014	100

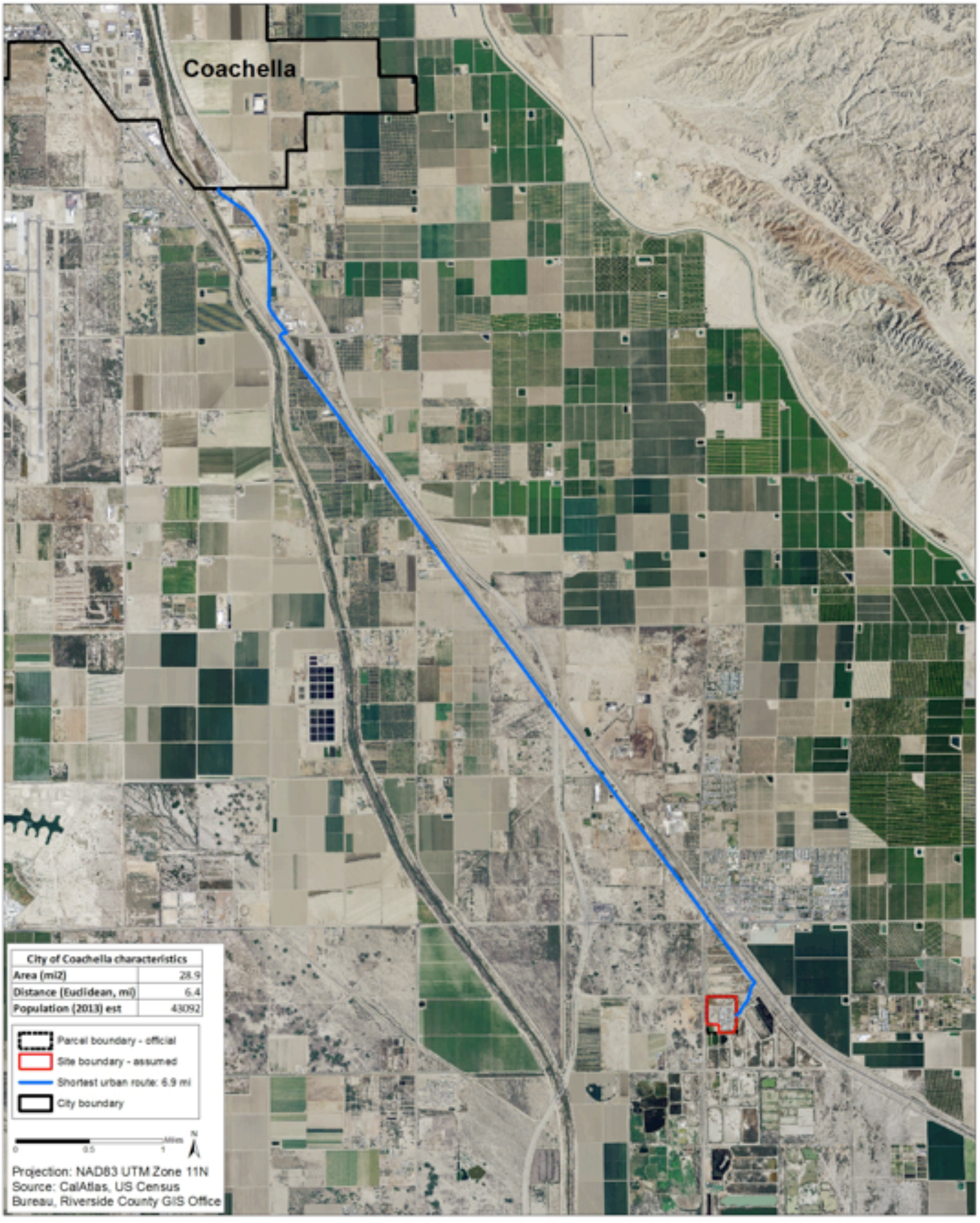
Unofficial MFW Housing: St. Anthony Trailer Park

Private land



Unofficial MFW Housing: St. Anthony Trailer Park

Private land

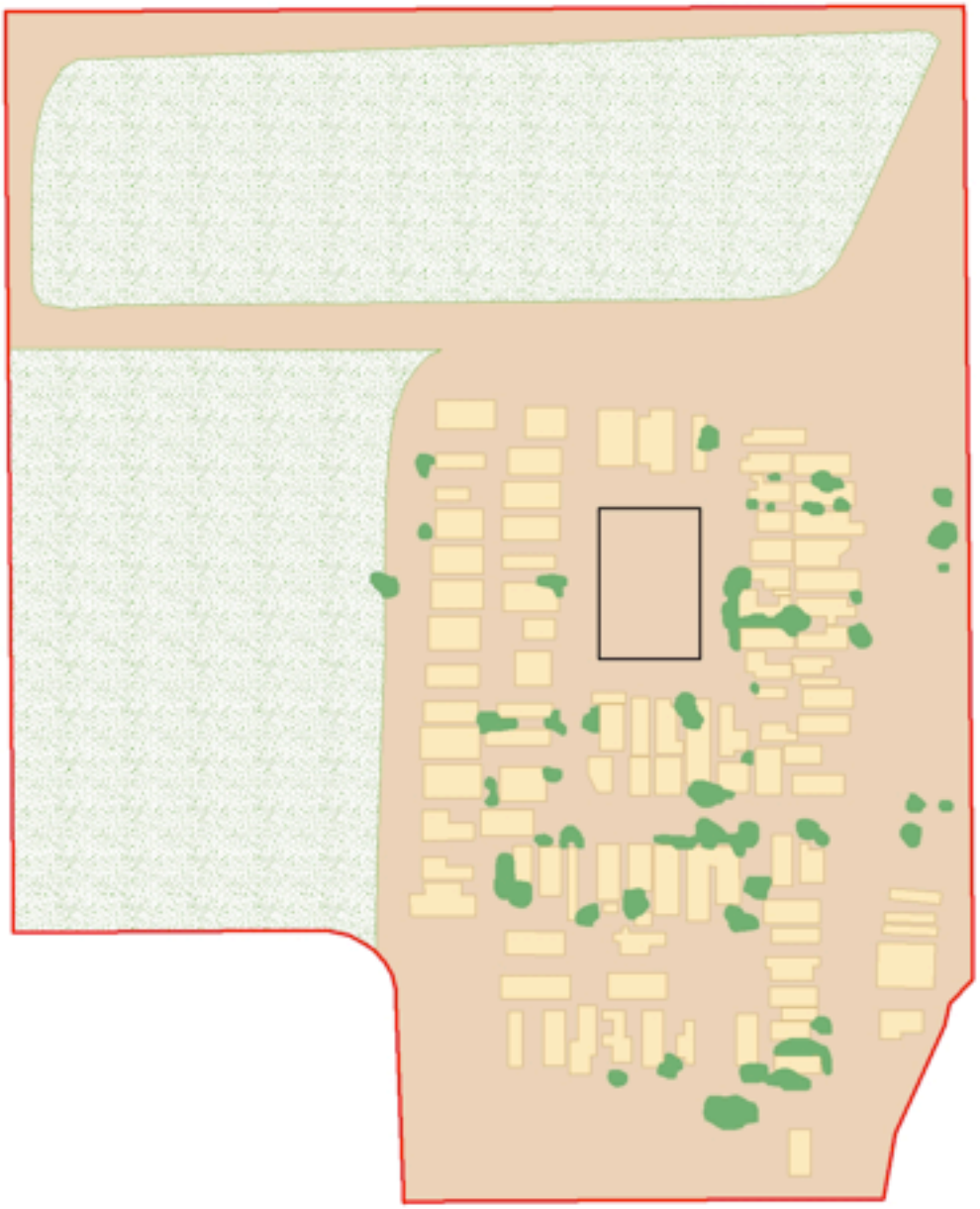


Unofficial MFW Housing: St. Anthony Trailer Park

Private land

Unofficial MFW Housing: St. Anthony Trailer Park

Private land



Buildings
Community space
Open space - scrub
Site boundary - assumed
Tree canopy

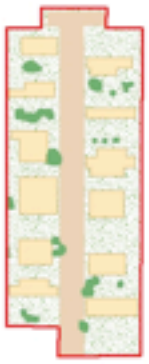
N
0 150 300 Feet

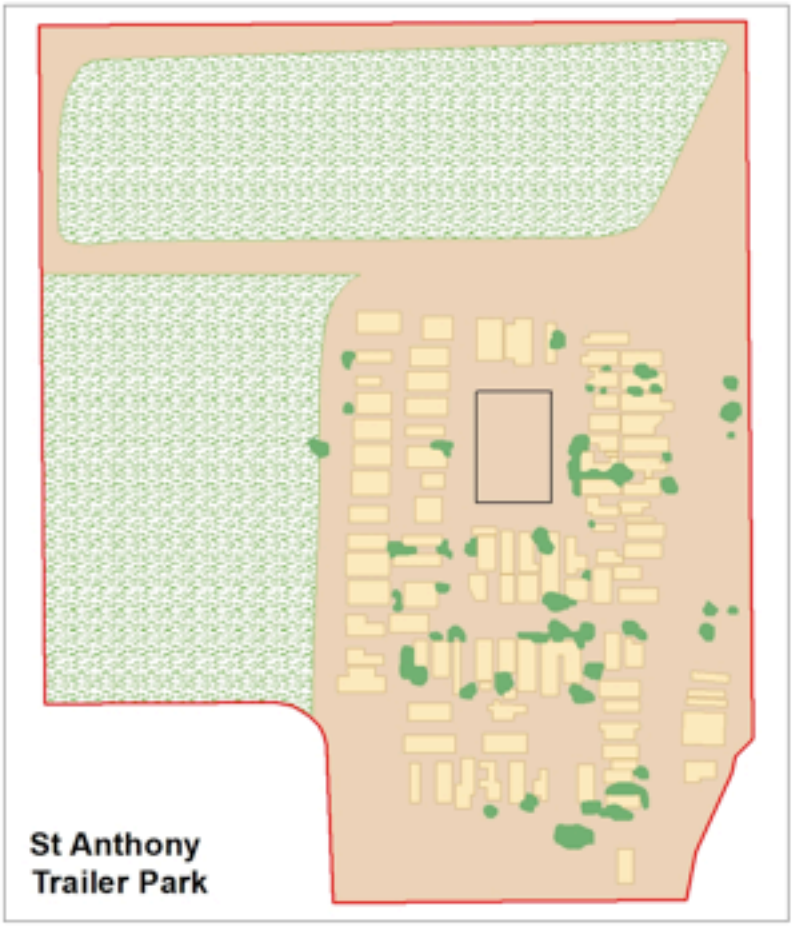
St. Anthony Site Characteristics		
Feature	Area covered (ft2)	% Total
Building	130378	11
Community space	18199	1
Open Space	519590	42
Tree Canopy	28896	2
Site	1232297	100

Projection: NAD83 UTM Zone 11N Source: CalAtlas, Riverside County GIS office

Unofficial MFW Housing Major Features

57th Ave



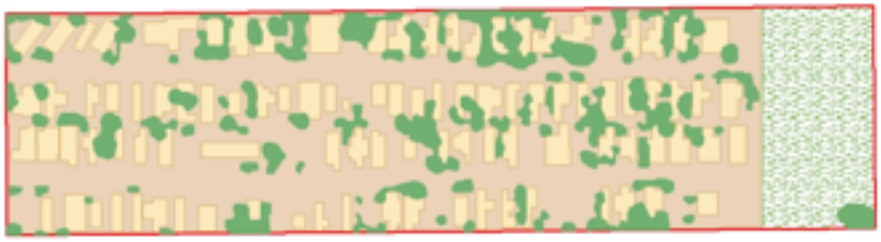


St Anthony Trailer Park

Las Cabina de los Campos

Cherry Tree Lane Trailers

Rancho Garcia



Unofficial MFW Housing Major Features

Site Comparisons and Spatial Design Considerations

Overall, several differences are apparent between the state-run OMS centers and privately run unofficial housing sites for MFW that may have significant impact on both quality of life and when considering the design process for MFW housing. These considerations include road substrate, positioning in the broader landscape, incorporation of places to build community, and permanence.

With regards to road substrate, a noticeable difference between OMS and unofficial sites is that the former always contains road constructed of asphalt, while the latter primarily contains informal dirt roads. In an extremely arid and dry climate, dirt roads can significantly impact air quality and contribute to a variety of health issues (Alarcon, A. & Rincon, B., 2013; EPA, 2012). In fact, as of 2013 the state of California was scheduled to begin paving projects at multiple sites like those considered here (Alarcon, A. & Rincon, B., 2013). In the housing design process it would be important to consider implementing features that may help to minimize the impact of poor air quality.

It is also important to consider the position of MFW housing in the broader landscape. Unofficial sites tend to be further away from urban areas, which may be less convenient for access to necessities, but more convenient for their possible increased proximity to work (Figure 1, Table 3 in Appendix II). Several OMS and unofficial sites are immediately adjacent to actively farmed land; the impacts of pesticide drift should be considered in both the design of entire sites (ie. constructing vegetative barriers) and in the construction of individual structures (ie. arrangement of building relative to prevailing winds, window placement, ideal distance from fields, building materials).

Residents have also commented on the importance of incorporating places to build community (Brown, 2014). This could be in the form of garden space, sport fields, small parks, playgrounds, or, in the case of St. Anthony Trailer Park – a stage for dancing and shade structures (Brown, 2014). While all of the OMS sites contain multiple spaces to encourage community buildings, of the unofficial sites, only St. Anthony Trailer Park contains any community spaces (Figure 2, Table 3 in Appendix II). Designing homes that encourage community building should be an important priority. This may translate to creating open floor plans that can support indoor gatherings, as well as external features, like shaded and open porches that provide safe outdoor spaces and encourage residents to interact.

It may also be important to consider differences in temporal stability of OMS versus unofficial sites. OMS centers consist of permanent structures with features that are maintained over time. The typical unofficial site, however, contains a mixture of permanent, semi-permanent, and mobile structures. As a result, within these unofficial sites, there is a tremendous amount of change over time in the arrangement and number of structures. In the design process it would be important to consider the potential fluidity of a site and how best to incorporate desirable features, like community space, over time, without necessarily being dependent upon permanent spatial arrangements.

Spatial Analysis Considerations and Limitations

There are several limitations to this analysis that should be understood before applying any of the results or data contained in this report.

- When considering distances to nearest urban areas, an “urban area” is used as delineated by the US Census Bureau, and does not include census-designated places, which may contain many features one would expect to find in a city. In addition, the distance to the nearest urban area only considers the distance from the site entrance to the nearest boundary, not necessarily where people would desire or need to go within the urban area.
- All the site maps, especially the unofficial sites, represent a snapshot in time, and not necessarily what is currently present at the respective site. This is especially true for tree canopy and building features.
- In addition, there are significant disadvantages with digitizing from 1m-resolution imagery, which was required for several of the sites. Individual buildings were discerned to the best degree possible, but often it was not possible to tell if multiple trailers represented single or multiple structures. Similarly, tree canopies were difficult to digitize due to shadows.
- The number of housing structures at each site was determined by digitizing buildings and using visual image analysis to determine the purpose of the structure. Purpose was not always determinable (i.e., difficult to distinguish between office and housing), so these should be considered estimates.

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Villarejo, Don. 2014. "California's Hired Farmworkers Move to the Cities: The Outsourcing of Responsibility for Farm Labor Housing." California Rural Legal Assistance Priorities Conference. Asilomar, CA.

Appendix I: Research Strategies & Methodologies

Social Demographics Analysis

Our research on the social demographics of farmworker communities proceeded in two stages. The first stage included a review of the literature regarding farmworker demographics, migration patterns, and housing needs. We consulted the academic literature as well as reports available on the websites of advocacy groups and governmental agencies.

In order to gain a more nuanced understanding of the major issues confronted by farmworkers today, we conducted interviews with researchers, advocates, and government officials who had expertise in one or more of the following issues: farmworker occupational health and safety, housing, legal challenges, discrimination, and poverty. We used a purposive sample of key informants identified by members of the UC Davis Solar Decathlon team, and we used snowball sampling to gather further interviewees. Interviews were semi-structured, and respondents were asked about the demographic profile of farmworkers and the major issues confronting their community in terms of housing. Each respondent was asked for suggestions regarding the design of modular housing for farmworkers, and these suggestions were compiled in chapter three of this report.

Due to the relatively small number of interviews we conducted, our findings do not represent a comprehensive overview of farmworker demographics and housing challenges. Furthermore, it should be emphasized that our interviews captured the perspectives of advocates and researchers rather than the farmworkers themselves. It is very possible that interviewing farmworkers would have revealed a different set of priorities and challenges, and we encourage the design team to consider convening focus groups with farmworkers as the project moves forward. Nevertheless, we believe that our findings represent an important collection of issues that should be considered by the Solar Decathlon team during the design process.

Spatial Analysis

Software and Data Attainment: The spatial aspects of this research relied on multiple mapping exercises and associated quantitative assessments and visual comparisons. ArcGIS (v. 10.1 for desktop, advanced) and associated extension packages (3D analyst, network analyst, spatial analyst) encompassed the primary software utilized in this work. Google earth was also used for verification purposes. Multiple data layers were attained for each county of interest. These layers included tax assessor parcels (county GIS data portal), city limits (county GIS data portal), roads (county GIS data portal or US Census Bureau), county 1m mosaic (CalAtlas), and site orthoimagery at best freely available resolution (USGS National Map Viewer).

Analysis details: Assessments were conducted at multiple scales in order to provide a multi-level perspective on the positioning and structure of migrant farmworker housing. The purpose of the small-scale analysis was to better understand how these communities are situated within the broader landscape, particularly with respect to

distance from urban areas. The purpose of the large-scale analysis was to explore the structure and arrangement of housing at the site level. A state level analysis was conducted in order to assess how sites were distributed across California with respect to land use, climate, and demographics.

The first step in the small scale analysis was to extract the parcel boundary for the site of interest, and depending on the location and accessibility, digitizing the site of interest, which may be smaller than the extracted parcel. If the site boundary differed significantly from the official parcel boundary, a dashed black line was used to represent the site boundary. Between all maps, the red boundary represents the boundary used for any site level analysis. Multiple official parcel boundaries may have also been dissolved to fully contain the site of interest, or parcel boundaries may have been adjusted to better align with image features. The next step was to conduct a proximity analysis between the site and the nearest city. This was accomplished by digitizing the site entrance, locating the nearest urban point, computing the Euclidean distance to the nearest urban point, and then computing the network distance to the nearest urban point. For visual comparison purposes, three maps were then created. The first map was constructed at the optimal scale to situate the site within the broader landscape, the second at the optimal scale to display the site location and route between the site and urban area, and the third at the optimal scale to display the site imagery and immediate surrounding area.

The large scale analysis consisted of using the best available orthoimagery to digitize main features of the site, including asphalt, buildings, community space, open space, and tree canopy. Google earth was used to verify assumptions regarding these features. After the digitizing was complete, the percent cover of each feature type within the site boundary was calculated. A map (at the same scale as the site map produced in the small-scale analysis) was then created that displayed these major features.

The statewide analysis required first obtaining data on urban area boundaries, race and ethnicity at the census tract level, land use, elevation, and average maximum summer temperatures. Data was then overlaid with site locations to create three maps illustrating how these factors vary across California, and to extract point values at site locations for comparison purposes.

Appendix II: Spatial Analysis Tables

		Feature						
		% Asphalt	% Buildings	% Community Space	% Open Space	% Tree Canopy	Site size (sq ft)	Number of discernible housing structures
Site	Artesi II	26	15	12	17	4	582561	50
	Arvin	21	11	3	41	3	899636	48
	Davis	18	17	13	27	11	505893	36
	King City	31	14	8	18	5	288768	22
	Parlier	16	18	3	24	18	580811	38
	Watsonville	20	16	2	15	8	791320	64
	57th Ave	0	23	0	0	5	97081	12
	70th Ave	1	17	0	7	10	2220664	326
	Cherry Tree	27	33	0	0	15	146892	62
	Las Cabina	16	12	0	34	13	83652	18
	Rancho Garcia	0	25	0	13	18	424014	97
	St Anthony	0	11	1	42	2	1232297	99

Table 1. Comparison of major features between sites

Site	OMS	% Hispanic / Latino	Contained within city limits?	Euclidean distance to nearest city (mi)	Network distance to nearest city (mi)
Artesi II	Y	51.1	N	1	1.5
Arvin	Y	74.5	N	3.6	3.9
Davis	Y	21.3	N	3.8	4.7
King City	Y	86.5	Y	0	0
Parlier	Y	92.9	Y	0	0
Watsonville	Y	15.3	N	0.6	0.8
57th Ave	N	88	N	0.5	0.6
70th Ave	N	82.1	N	7	8.2
Cherry Tree	N	48.9	N	4.4	4.8
Las Cabina	N	51.1	N	0.5	0.7
Rancho Garcia	N	88	N	0.3	0.3
St Anthony	N	96.7	N	6.4	6.9

Table 2. Urban characteristics of each site

Characteristic	OMS	Unofficial
Min % Hispanic / Latino	15.3	48.9
Max % Hispanic / Latino	92.9	96.7
Mean % Hispanic / Latino	58.1	75.8
% Sites external to city	67%	100%
Ave Euclidean distance to city (mi)	1.5	3.2
Ave network distance to city (mi)	1.8	3.6
Minimum site size (sq ft)	288768	83652
Maximum site size (sq ft)	899636	2220664
Average site size (sq ft)	608164.8	700766.7
Minimum number of buildings	22.0	12.0
Maximum number of buildings	64.0	326.0
Average number of buildings	43.0	102.3
Average % Asphalt	33.0	7.3
Average % Buildings	15.2	20.2
Average % Community Space	6.8	0.2
Average % Open Space	23.7	16.0
Average %Tree Canopy	8.2	10.5

Table 3. Site characteristics by housing type