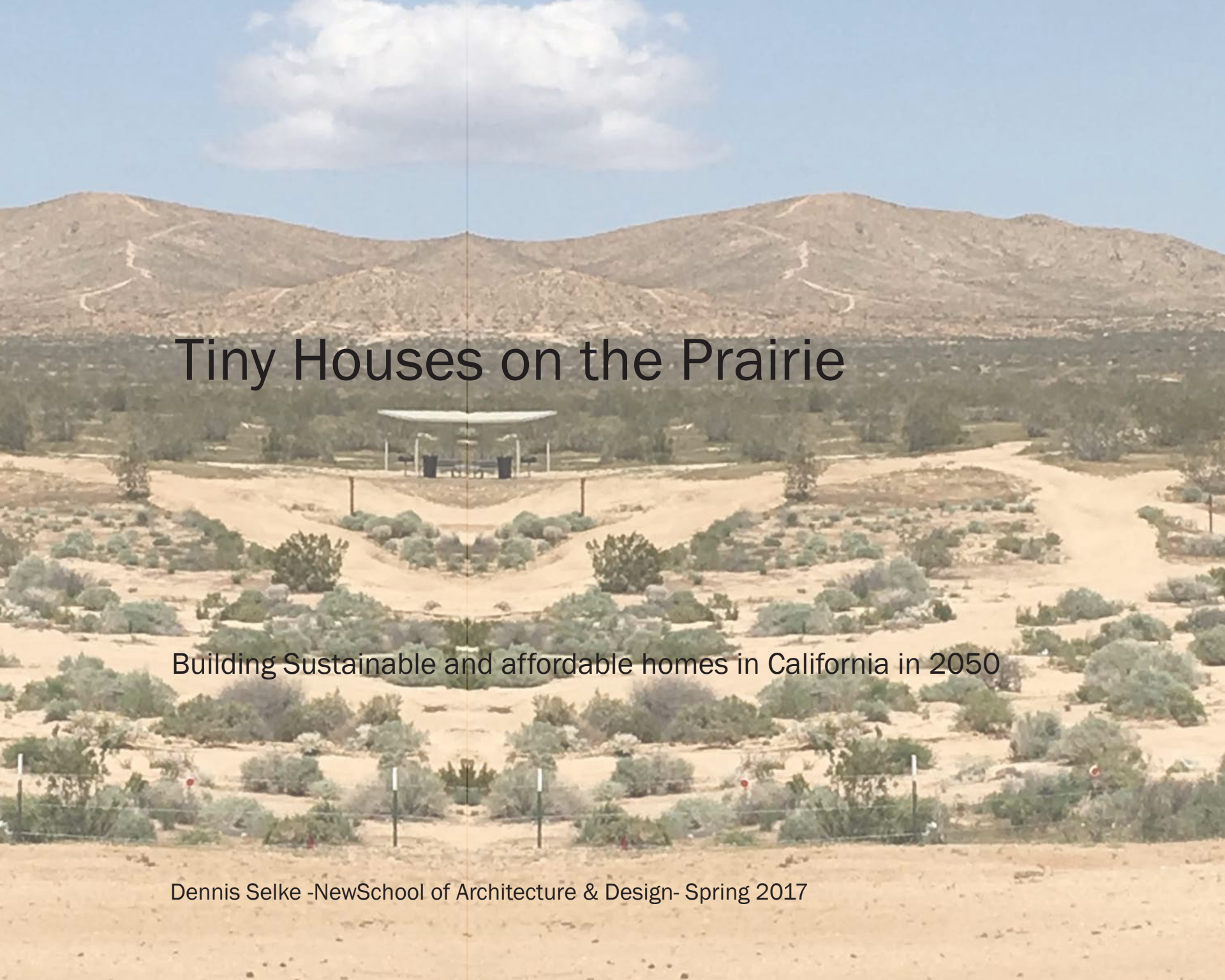

Tiny Houses on the Prairie

Building Sustainable and affordable homes in California in 2050

Dennis Selke -NewSchool of Architecture & Design- Spring 2017

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Tiny Houses on the Prairie

Building Sustainable and affordable homes in California in 2050

A Study presented to the Faculty of NewSchool of Architecture & Design

In partial fulfillment of the Requirements for the Degree of Master of Architecture

By Dennis Selke, San Diego, 2017

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Abstract

The need to consider building homes in remote and harsh places has increased through time. Each time a city reaches its' limits as to how many people want to live and work there, the spread of population continues outward in a ring to locate the new places that can be economically developed into the next city for people to set up their households in a way that is affordable and livable.

As time moves forward it is expected that the way we commute, live and work will continue to evolve when new technologies are widely established. Introducing techniques that help households use less resources in every way possible and produce what they need will begin the process of building sustainable living practices. By 2030 it is highly probable that our roads will be occupied with vehicles that autonomously gather and deliver passengers to their destinations and many people will not need to own vehicles. The new cars will likely be electric or hybrid as the use of gasoline fuels is phased out and eliminated throughout the world. This will affect gas stations, requiring pumps and storage tanks to be replaced with electric charging stations through time. This will affect parking in the form of reduced requirements, due to autonomous cars going to a central charging lot or garage.

Since the population of Earth is expected to reach 9.7 billion by 2050, the resources that we have on the planet will be in high demand and key commodities may be depleted if we continue with current usage trends. The need to conserve resources will continue to increase as the sources of oil and other key elements are depleted and more efficient energy use, water use and petroleum use are expected to be required.

The unaffordability of homes in California for the average person has reached a staggering level. In 1975 an average earning person could afford the median home on their monthly income. By 2000, there was a deficit of $1000 per month for a median home with a mortgage payment of one percent of the home price per month. As of 2015 the deficit was $3,200 per month for a median home price of $498,000 and a household income of $64,000 annually. This lack of affordability forces families to double up in existing units and leaves many people out of the opportunity to own their home.

This study will address the key issues that we are facing; creating economically affordable homes for an average income person, employing sustainable building techniques to conserve resources for future generations and using net zero water and energy technologies to allow for utility free living. Food supply is another vitally important issue with such a highly-populated planet. To ensure food security, it is good practice for each household to be skilled in actively growing their food. Building prototype homes in such a harsh place proves that the techniques could be used in less difficult climates and allow homes to be built economically, sustainably and energy independent in many of the places in California and worldwide that need more housing to support their growing populations.

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NewSchool of Architecture & Design

Dennis Selke

Michael Stepner, Chair of Architecture Programs, Thesis Advisor

Vuslat Demircay, Ph.D., Graduate Level Coordinator

Tatiana Berger, Thesis Research Advisor

Dedications

For Marlene and Alexandra

The two great aims of industrialization are replacement of people by technology and concentration of wealth into the hands of a small plutocracy. - **Wendell Berry**

Acknowledgments

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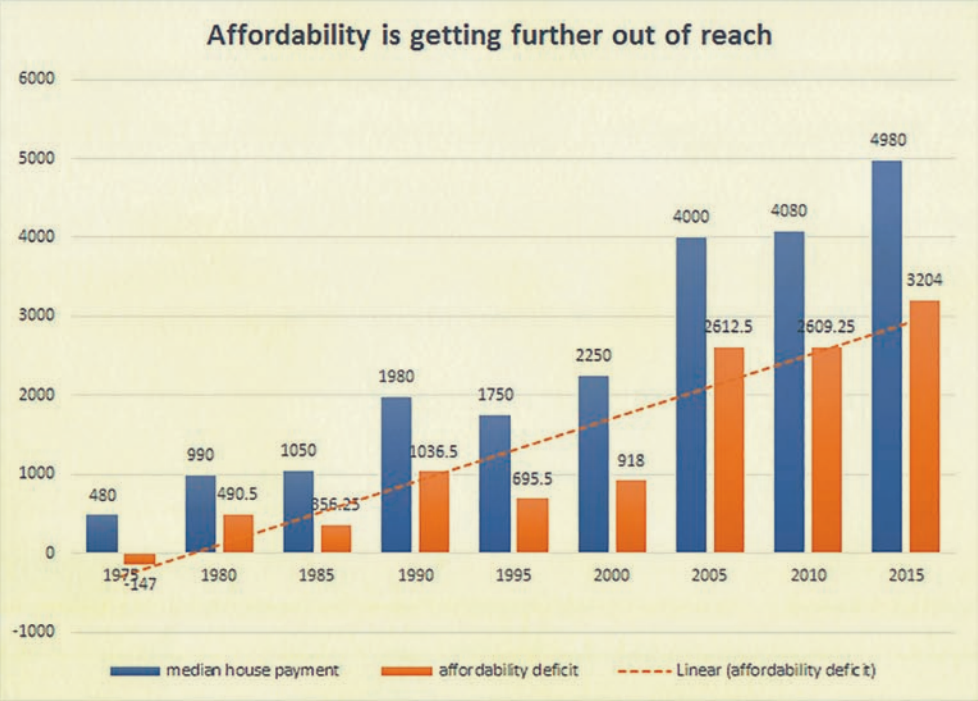
1.1 Introduction to the Thesis

In the U.S. and other developed countries the supply of livable homes is nearly completely occupied and in desirable areas the costs exceed the ability of most people to reasonably afford the rents or costs of owning a home. The situation causes multiple families to move in together, causing a higher density in single family neighborhoods than is expected, this puts strain on the public services and facilities. Previous generations were able to be homeowners and maintain a single family home in an area close to a workplace. Rising costs with stagnant wages have caused people to travel further to find an affordable home, creating the classic pressure of sprawling suburbs that move further and further from the locations of jobs. The problem can be addressed through creative thinking that will allow an adequate and good quality supply of homes to address the demand expected.

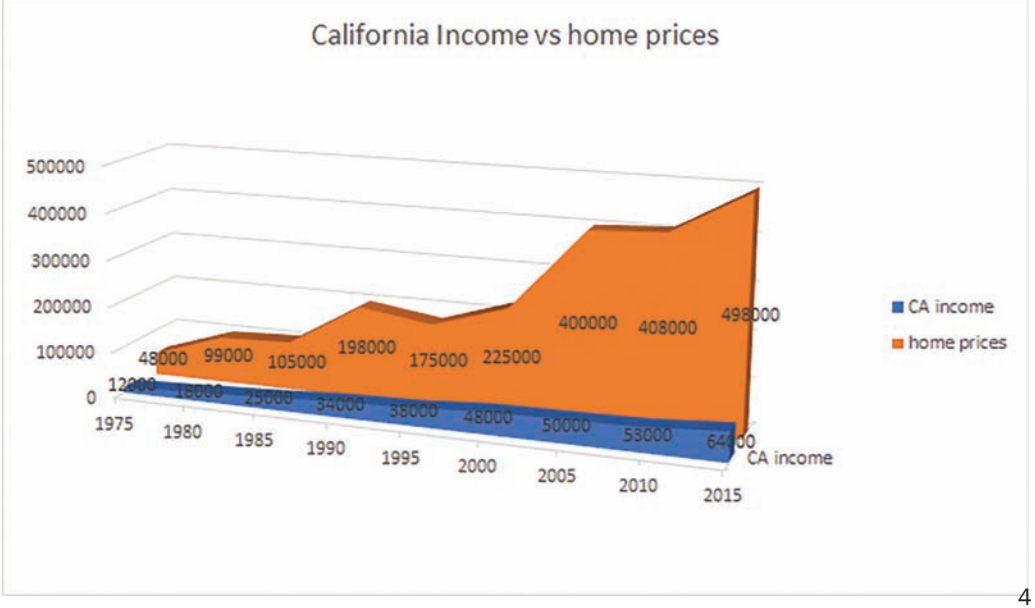


1.2 Challenge

Statement of Challenge

How can we create housing that works with nature and is sustainable over the long term? Housing that is affordable and carbon neutral is a rare combination. To create an adequate supply of homes to keep up with expected population growth will require a new way of developing housing. Many of the needed homes will be located in urban areas and can be expected to be infill and rehabilitation projects.

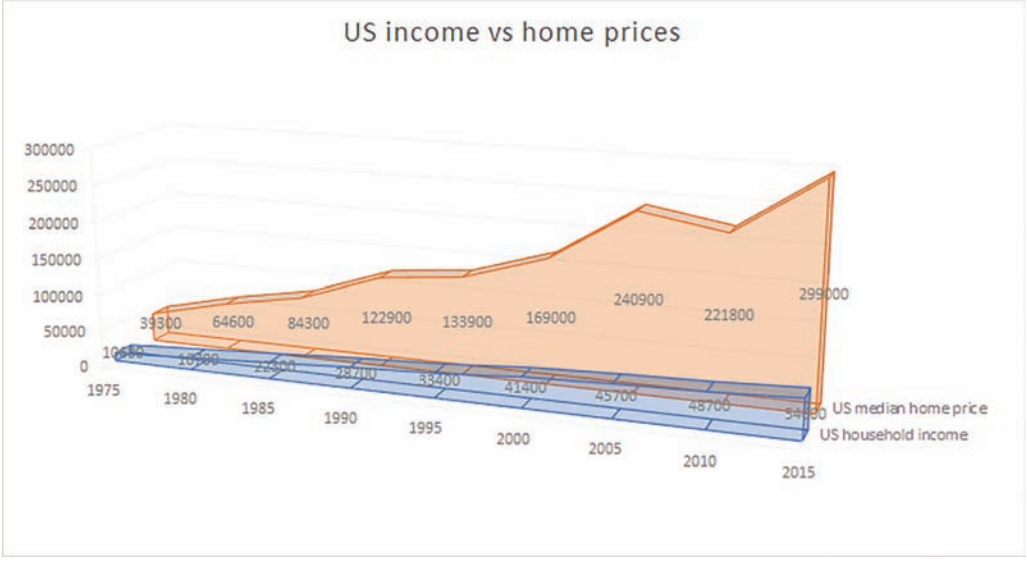
In urban settings mitigation includes adding granny flats to existing homes, getting the homes to be net zero water and energy as well as insulation and passive methods to save energy. Part of the problem in the cost and ability to build homes is the requirement to run grids of power, water and other utilities the other huge cost is in obtaining the land to do a project. Individuals rely on development companies to build the houses and utility companies to build the grids to create a large part of the supply. The Earthship concept by Michael Reynolds looks to create a home which can be located off the grids where none are available. These homes rely on recycled materials for much of the projects massive walls. The projects are typically built by lower skilled labor combined with the owners sweat equity. All water can be collected and used on-site. Power is generated at the source using photovoltaic and wind power to charge batteries. Food is grown indoors and outdoors to allow a family to grow all their own vegetables and fruits on-site. By using resources wisely and frugally, an owner can have low operation cost and in the long term avoid higher and higher utility bills each year. The positive impact on landfill discards can eliminate many tons of waste tires, metal and other trash from being buried.



1.3 Importance of the Challenge

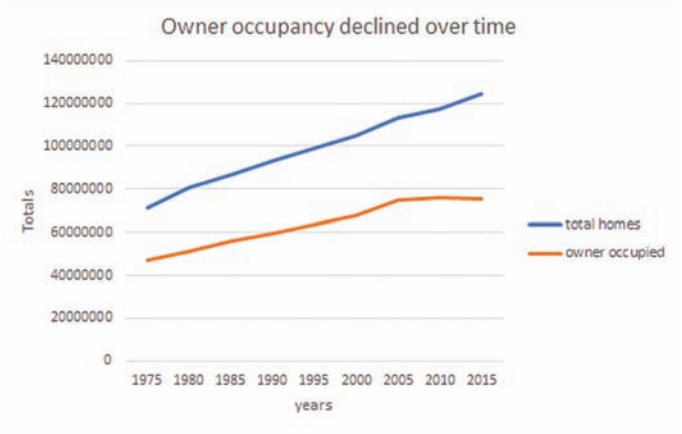
Populations in the world are growing constantly larger, by 2050, there is expected to be 9.7 billion people that will need food, water and homes.

In the U.S. we can expect have 431 million people by 2050, with California having 60 million of those people. (Retrieved from www.un.org) The pressures on the land are immense, for housing and supporting all the needs of so many people. Land costs are already very high in many of the cities where jobs are located. For example, in 2017 prices from popular websites such as www.zillow.com, realtor.com and landwatch.com show that even undeveloped land is very expensive in most areas. A parcel in Los Angeles in March 2017 was listed at $101,000 for a 6,000 s.f. lot, San Jose has a 14,000 s.f. lot offered for $650,000.San Diego has over 40 current listings and one 16,000 s.f. lot is selling for $1,600,000.



By going further out from the city, we can find the source of our sprawl problem; the cheaper land is more and more remote. With the world now interconnected we can work from anywhere that has internet, power and water, so it is less of a problem to be located in a more remote area.

The transportation systems of 2050 should also include many improvements that will help so many people travel to the places they will need to go. Land that is located in Lancaster (just north of Los Angeles) for example is lower priced and even less costly than that is the third largest city in California - California City in Kern County. For example there are 40 acres for sale in Lancaster for $650,000 and a 53,000 s.f. lot in California City for $15,000.



1.4 History of the Challenge

The potential of California City to become home to half a million residents or more by 2050 is high if the current projections of population growth are close to the actual growth that will occur. California is expected to have 60 million people by then, the cities of Los Angeles and San Jose are expected to reach 5.1 million and 1.5 million respectively. (Retrieved from www.uscensus.gov) The United Nations projects a total of 9.7 billion people to feed and house overall by 2050. (Retrieved from www.un.org) The innovation in sustainability for housing is in using recycled tires, cans and bottles to create the building blocks for walls. (www.earthship.com) The land in California City is low priced compared to many places in California. (Retrieved from www.landwatch.com, www.zillow.com and www.realtor.com) Residential prototypes can be created as small as 500-600 sf to advance the tiny house philosophy of living, the resulting house will be able to generate its own power, recycle and collect all its water and to grow food sufficient for the owner.

Housing to study:
Single family homes
Multi-family homes
granny flat additions

Building smaller results in less cost to build and maintain the home

Los Angeles

Four Million now

potential 5.1 million by 2050

San Diego

One point Three Million now

potential 3.1 million by 2050

California City

17,000 now

potential half million by 2050

San Jose

One point One Million now

potential 1.5 million by 2050

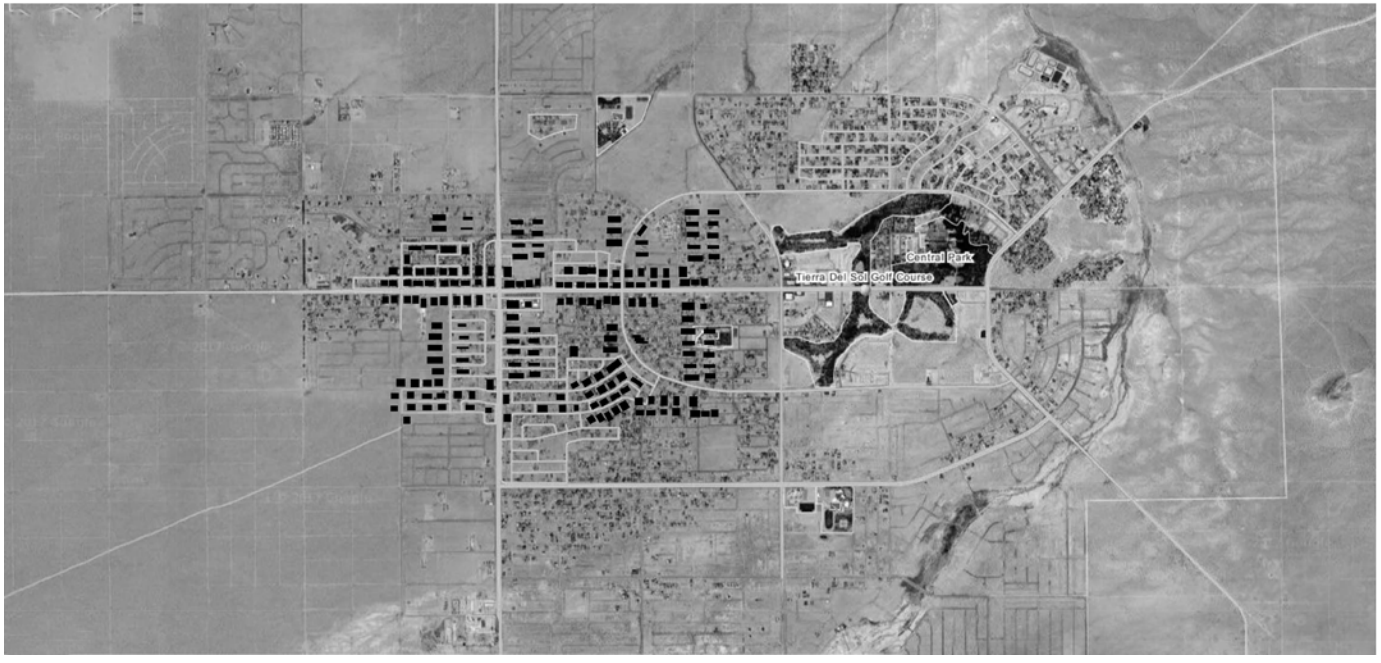


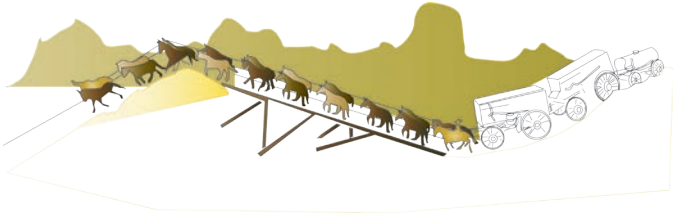
Figure ground of current city density

Kern county has been growing at the rate of 24% per year for 3 decades, California city has grown from 1500 to 15000 over that time.

By projecting 24% growth, an idea can form of where the growth might occur.

Historical - California City

California City Early Years: 1958-1959
The historical chronology of California City begins in May 1958 when the first parcels of property were marketed. The man who envisioned this new city was Nat K. Mendelsohn, a dreamer and president of a corporation called the California City Development Company. Mendelsohn had been a sociology professor at Columbia University and had his finger in several other smaller scale developments.
The corporation began planning a new city and buying up desert land as early as 1956. The chief purchase was a big chunk centered by the Mendiburu and Rudnick farming interests. The M&R Ranch as it was known, grew large expanses of cotton and alfalfa watered by nine large capacity water wells.
By March 1958 the company had purchased 82,000 acres and work was begun on the first subdivision. Planning was accomplished by Wayne R. Williams, a master planner from South Pasadena. The first unit of 876 lots were sold out within days after they became available in May. Total original investment was $500,000. Lots were originally priced under a thousand dollars.
In June 1958, the second unit of 427 lots sold out quickly. Construction started on the first 20 homes and a recreation center. Also in that month, the California City Community Services District covering more than 100,000 acres in and around the city, was approved by the Kern County Board of Supervisors, to provide municipal services. Property sales that month amounted to over 900 lots adding to $1 million dollars, by month's end.



20 mule teams brought borax from the mines to the train station

The company tried all sorts of innovative sales techniques to lure buyers out to the High Desert. Bus-loads of prospective buyers were brought in from all over the west. At one point a DC-3 was flown in and landed on a crude desert landing strip near the present corner of Neuralia and California City Blvd. During July, grading on the first 23 miles of road was completed in three weeks by the Fremont Construction Company.
Also, a civil engineer and water expert, O.R. Angelillo, was hired to check out the nine wells that came from the ranch and also report on the water potential of the area. The report came in that there was a virtual lake of water under the City that was fed by fissures from the Sierra Nevada.
In August, the development company donated 10 acres to the Mojave Unified School District for the City's first school. The Robert P. Ulrich Elementary School was built later and was completed in 1966.
In September, the first 20 homes were completed with 28 more under construction. Property sales passed the $2 million mark with the opening of the 5th tract.
By October, 45 miles of city streets were completed and the 6th section of property opened for sale.
In November, the first family, Mr and Mrs Marion Lee and their three children moved into their new home becoming the first permanent residents of the new city.
As 1958 was coming to a close, a Gold Ribbon Days was proclaimed with the opening of the new recreation center complete with swimming pool, motel, restaurant, and test gardens to see what would grow in this area. An administration building also opened at Neuralia and California City Blvd. At that time, CCB was called Randsburg-Mojave Road.
In January 1959, there were 36 families either living in the city or about to move in. There were 65 homes either completed or under construction.
The 11th tract was opened for sale and over 3,000 property owners had invested in the new city. Total sales had passed the $4 million mark.

"In February, Mr Angelillo issued his report showing more than a million acre feet of water available annually in deep rock fissures under Boron Valley. In March, total property sales soared past $5 million. The Company started an ambitious 1,000 tree planting program which called for 100,000 trees over a ten year period. Trees included Modesto ash, elm, and fruitless mulberry. By April, Construction was underway on a market, gas station, 18 unit motel, and four stores to make up the City's first shopping center. By mid month some 60 miles of city streets and water lines were completed and 67 new homes were under construction. By month's end property sales exceeded $7 million. Nat Mendelsohn had a great month of ribbon cutting and posing for cameras at new openings.

Nat Mendelsohn

The following citation on the life of Nat Mendelsohn, was written by Glenn Stevenson, at one time a member of our Historical Society. Glenn has since passed, but his writings and love for California City, lives on:

It is strange that there is not a street, park, school or anything named for the founder of California City, Nathan (Nat) K. Mendelsohn. No, he was not a bewhiskered old prospector looking for desert gold or a Basque sheepherder roaming the desert. He was, in fact, a handsome dapper gentleman, usually dressed in a Brooks Brothers suit, a Homburg hat, white gloves, and a gold tip cane presenting a striking figure of erudite gentility.

source:East Kern historical Society

In June the City's population passed the 100 mark and there were over 5,000 investors owning $8 million in property. Construction began on 20 more homes.

July saw the organization of the California City Community Club to foster civic improvements. The volunteer fire department was formed and plans were laid for a city museum. In August the 18 unit motel opened for business.

In September amid much fanfare, plans for a huge 60 acre Central Park were unveiled. Centerpiece of the park was a planned 20 acre lake for boating and fishing, a 40 foot waterfall, an 18 hole golf course, picnic grounds, sport areas, tennis courts, a riding trail, tavern-on-the-green and a motel.

By October, 90 families had moved in raising the population to 250. Property investments soared past the $10 million mark. Dr Paul Hwang opened an office to become the community's first doctor. Towards month's end a Richfield service station opened for business.

Borg's Market opened in November becoming the town's first supermarket. Marion Lee opened the first barber shop. Mr Lee and family were also the first residents of California City, having moved in a year earlier in 1958.

December saw the first telephone service and the California City nursery opened. By January 1960, giant earthmovers were shaping the proposed lake and golf course.

It would be another 5 years before the city grew to size, to incorporate in 1965. James Riley became the first elected mayor."

Ghost suburb or opportunity?

(Retrieved from www.latimes, article by Mike Anton, August 14, 2010) “Nathan Mendelsohn, a professor turned developer, believed California City would become the state’s next metropolis. Instead it’s a sleepy outpost that exists largely in the imagination. The imagination. Drive its wide boulevards and cozy cul-de-sacs. Listen to squealing children splashing in backyard pools. Watch men glide by in their steel behemoths and stay-at-home moms push strollers along tree-lined sidewalks.

It’s all a mirage.

In 1958, Nathan Mendelsohn, a Columbia University sociology instructor turned developer, acquired 82,000 acres of desert in eastern Kern County, 100 miles from Los Angeles.

Mendelsohn called his vision California City and, despite the fact it was 10 miles from any highway, he believed it would become the state’s next metropolis. The next San Fernando Valley.

Today 17,000 residents call California City home. Most are clustered at one end of the massive tract. It’s a sleepy outpost with its own school district and public bus service but not many hotels or chain grocery. The police chief is also the director of parks and recreation, and the Rite Aid is the busiest place in town.”

A 20 mule team of the late 1880s was actually 18 mules and 2 horses

source:East Kern historical Society

California city Strengths Weaknesses Opportunities and Threats

Strengths:
Mining of Borax

Edwards AFB once housed NASA launch center and shuttle landing center

Cal city has research business base

Test tracks for Hyundai – KIA and Honda

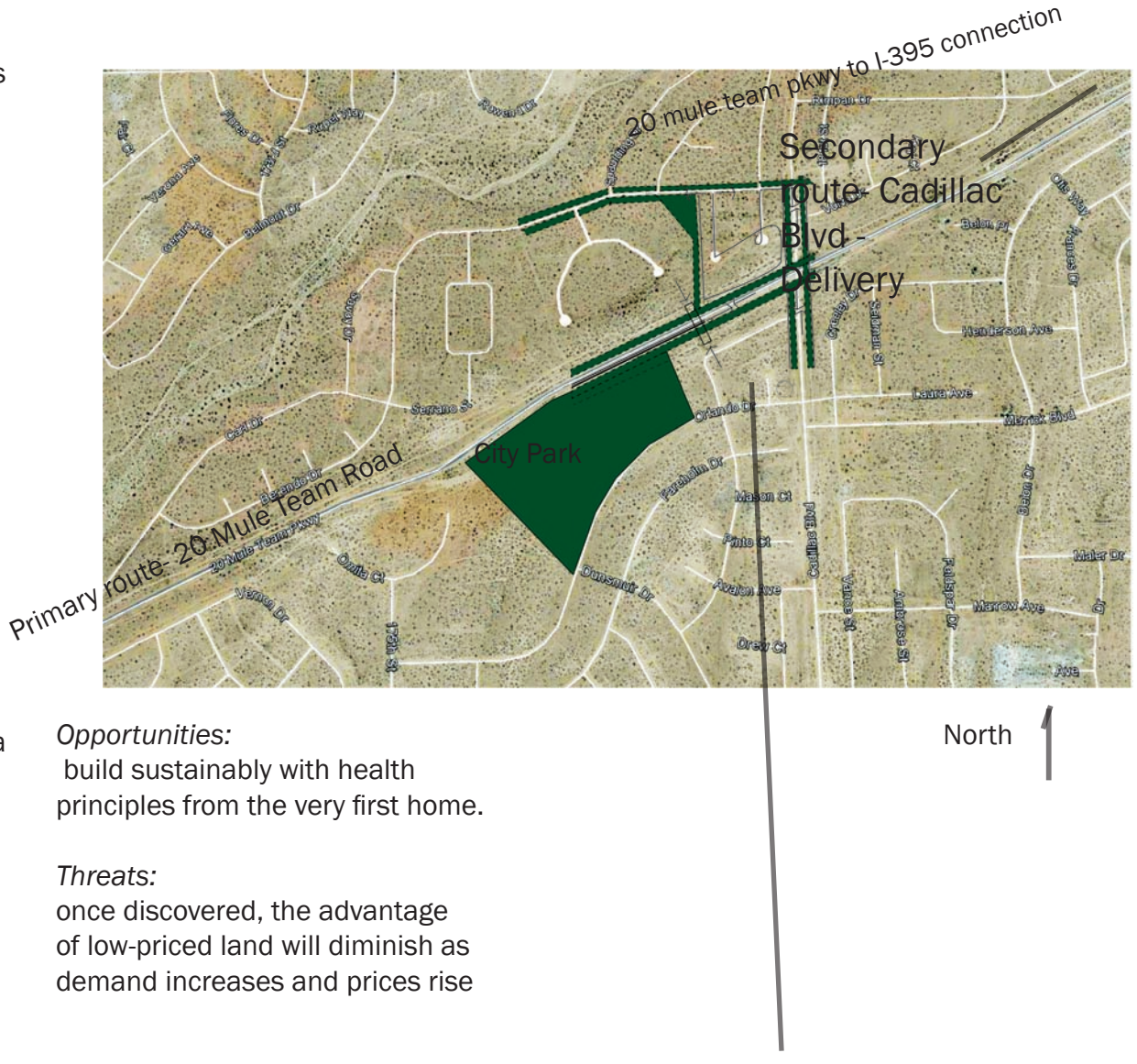
Airport is used by rocket designers

Prison is an employer

Solar Power Farm is expanding and a solid employer

Land is cheap

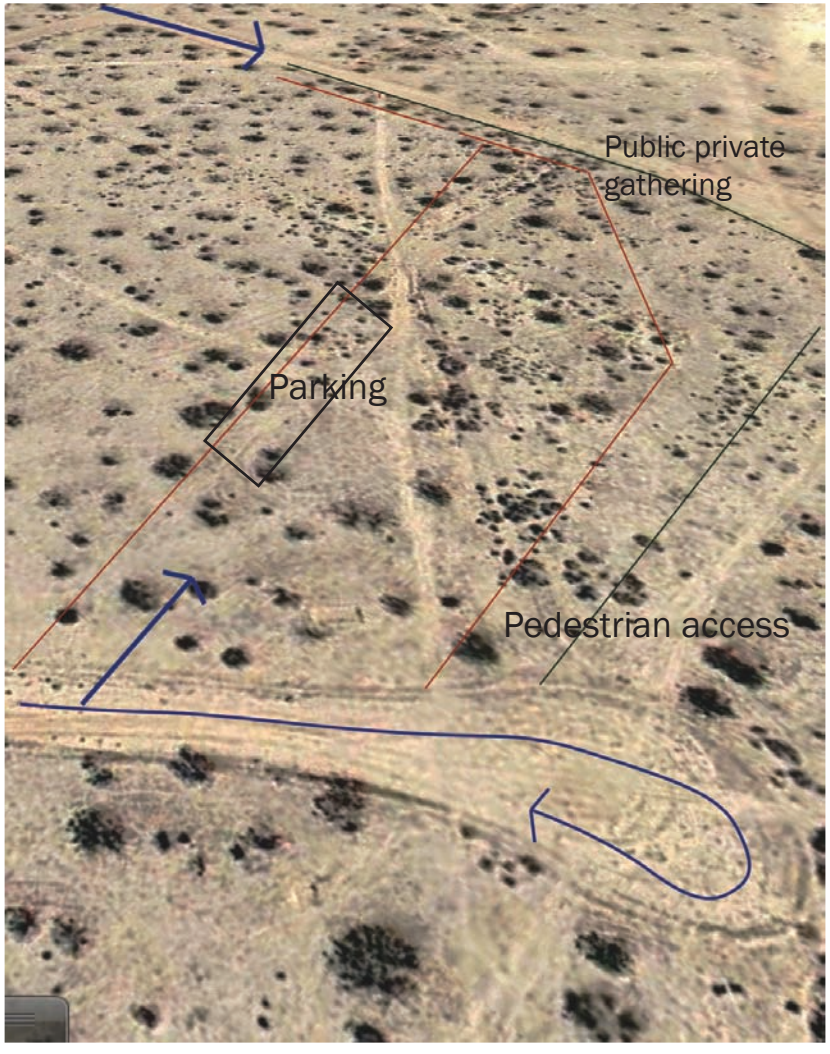
Weaknesses:
Harsh climate
Remoteness
Not landscaped
No bus services
Septic required
Propane used if gas needed



Opportunities:
build sustainably with health principles from the very first home.

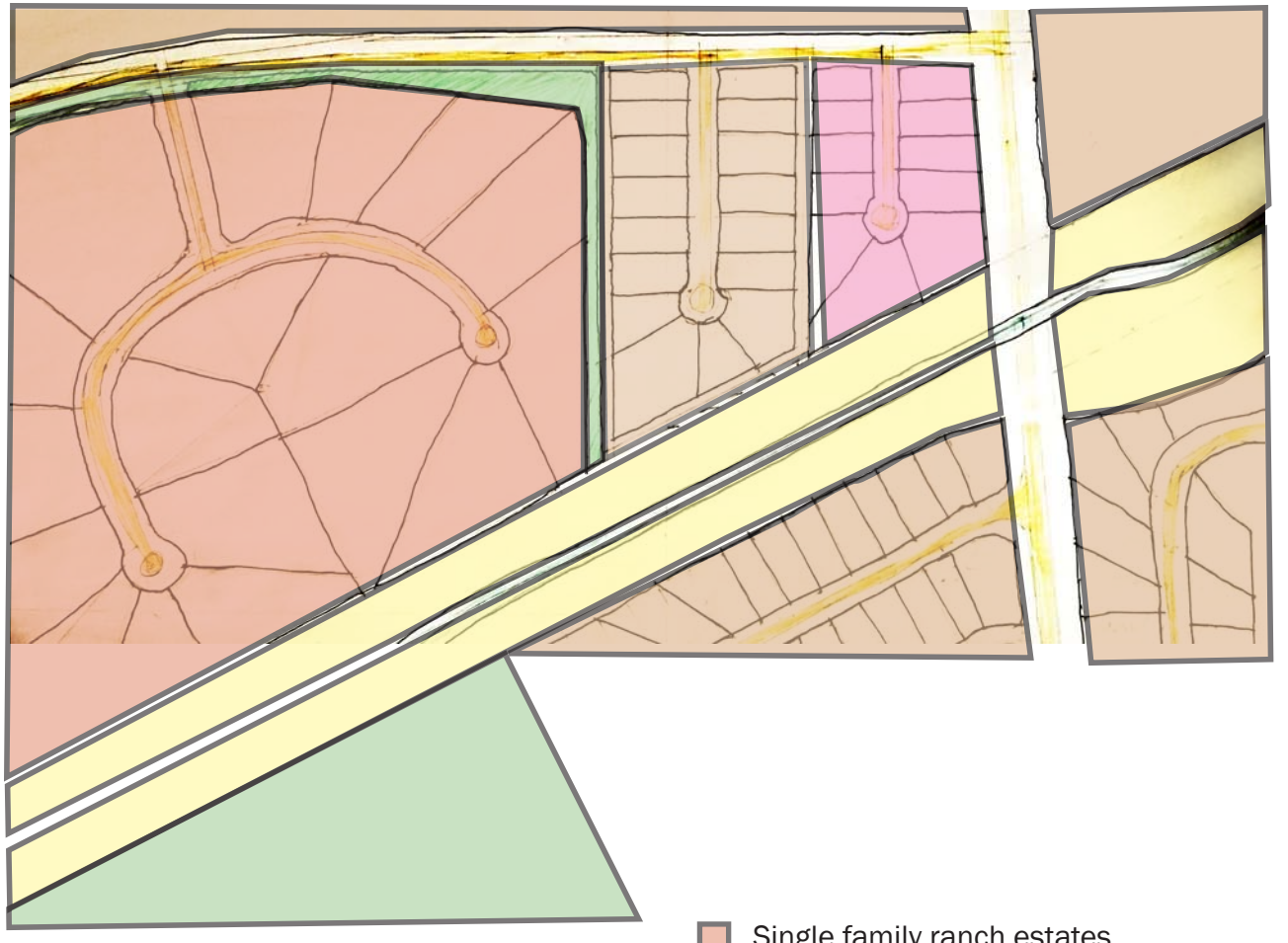
Threats:
once discovered, the advantage of low-priced land will diminish as demand increases and prices rise

Point of entry



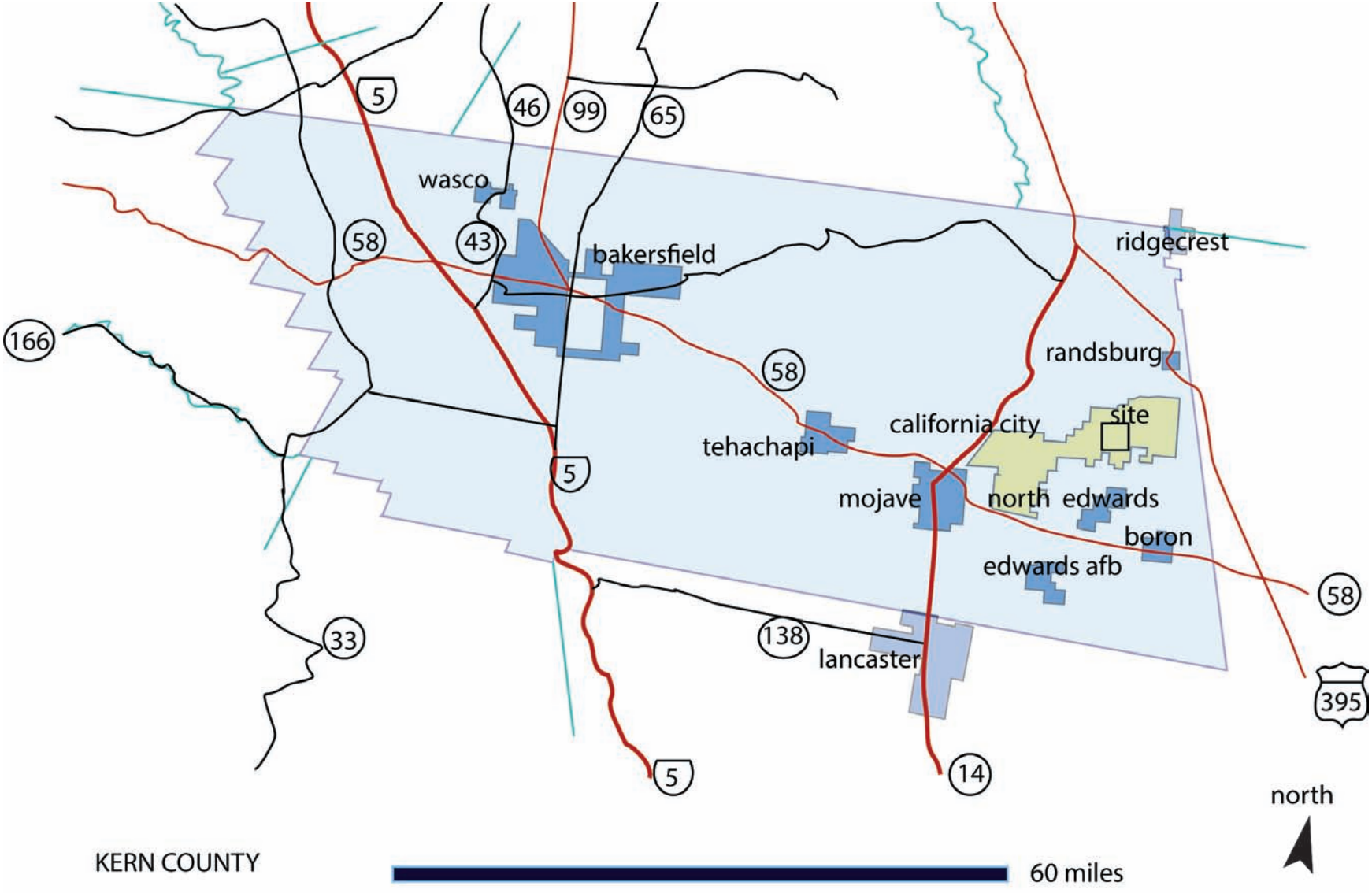
Point of entry

Circulation - Sycamore Court

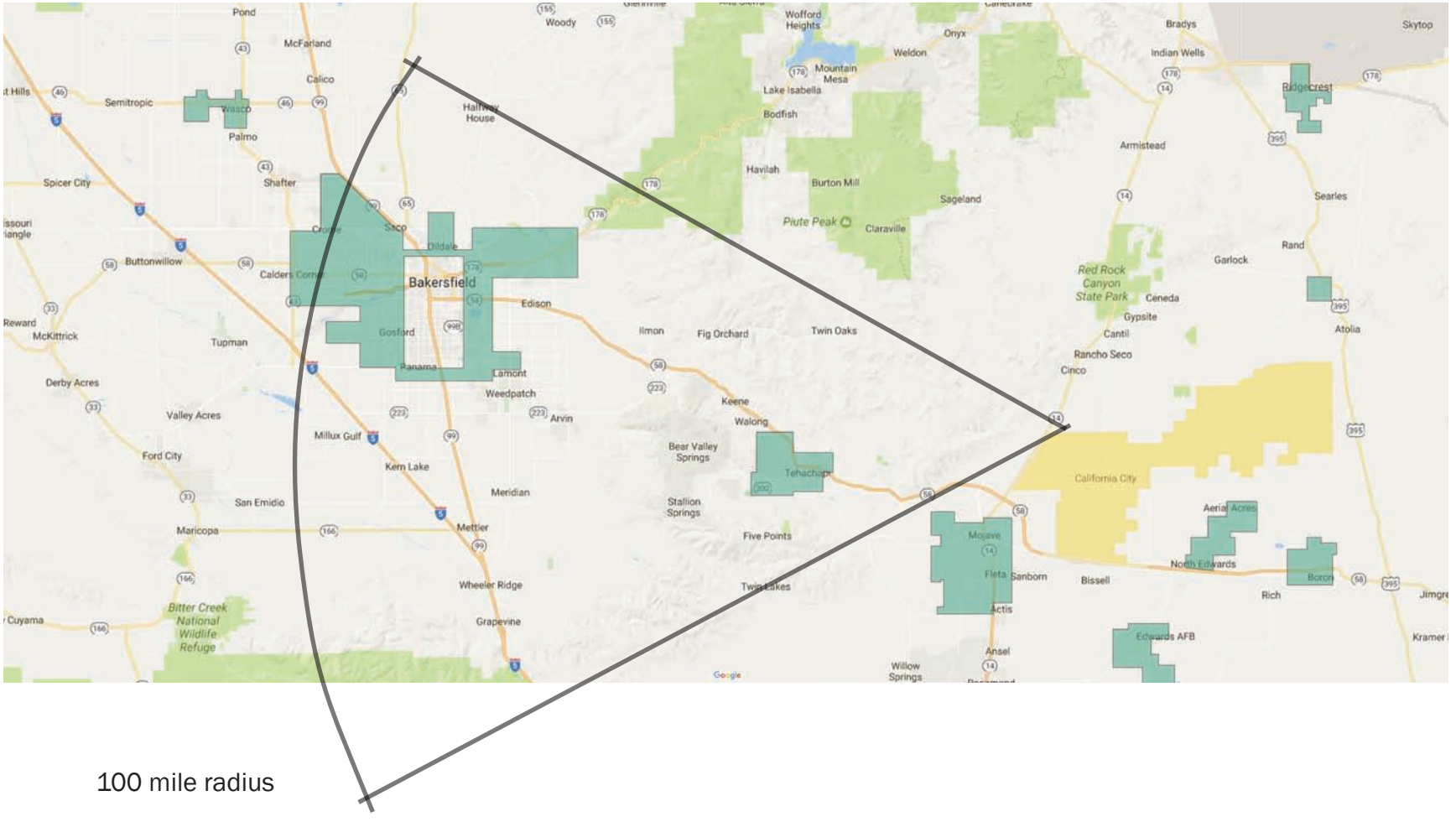


Land uses - existing zoning

- Single family ranch estates
- Single family residential and community
- Multi- family residential
- Commercial
- Park



Connecting local cities:
Lancaster, Bakersfield, Ridgecrest, Randsburg



100 mile radius

Relative size and distance major local cities

1.5 Thesis Statement

With the current populations' full utilization of the existing housing supply, the growth projected in developed and developing countries will require a large number of homes to be built that do not currently exist. Can housing be created sustainably and humanely in both urban and rural environments, engaging with nature instead of fighting it? It is important to use techniques and ideas that allow us to build these residences in a repeatable, sustainable way. Every measure that we take now may help to increase the housing supply and extend the life of the resources of the planet for future residents. Engaging re-useable materials to construct the buildings is a way to keep useful elements out of landfills and reduce initial cost of construction.

By approaching the challenge with a focus on human scale and healthy communities we can enhance the health of the residents. If we prototype and build homes in a harsh, remote area we can develop more universal homes that can be used in any climate condition or harsh climate in a suburban area. By shifting the neighborhood focus away from the automobile and creating regional transportation links, car free living can occur in an economically feasible way and a healthy community can be created. Urban applications include adding insulation, passive techniques, water and solar collection to existing structures, adaptive re-using items such as abandoned freeway overpasses can create land for housing in areas of high density.

Within existing cities such as Los Angeles, CA there are transportations links that are being improved and proposed to create more effective connections with the existing urban fabric. San Diego is also working on improving the quality of the transportation system through the "Quickway" plans and Kern county associated government response to climate change as well as SANDAG plans for carbon reducing through public transport to replace individual trips with the "Climate Action Plan". The specific site is located one-hour north of Los Angeles in the "ghost suburb" of California City. The town already has the electrical, water and telephone grid nearby, the second community is likely to be built on by 2050 and by presenting a healthy growth plan we can develop the facilities in time. While California City currently requires a home to be built in the standard 2-car garage plus 1200 s.f. minimum, the city is now open to projects which phase in the square footage over time and allow smaller homes to be created that are planned to be expanded within 20 years of initial build.

Homes built on existing roofs, photo credit 1

1.6 Statement of the method of Investigation

Background of the challenge

Socially – Helpful

Poverty is an issue that needs to be addressed in both the rural and urban contexts of the planet. In the book "Small is Beautiful, economics as if people mattered" author (Schumacher E.F. 1973) brings up the concepts to help, the need for some villages to have an economy and all work together. Schumacher brings up innovative solutions to keep rural communities economically healthy and connected. The intermediate technologies are starting to become available to help establish smaller economic centers with affordable basic equipment and tools

Political – Achievable

The Taos neighborhood built by Reynolds in New Mexico was built on donated land, with all recycled materials. At the time, solar panels and wind generators were just a future thought and he had to fabricate his own solar and wind systems. In the U.S. we are not alone in discovering this in just the last 20 or 30 years, Roman societies and homes used passive solar, convection and natural water collection in most of their cities.

Environmental – Sustainable

Architect Richard Neutra expressed, analyzed and used his design skills to enhance the basic human need to live in harmony with nature. In his book "Survival Through Design"(Neutra R,J, 1969) several chapters of his book, particularly 22 and 37, he rails against the popular methods of building new houses because of their inhumane configurations. With little or no connection to nature

Advanced Technical – Wind, Solar, Water, Insulation

Measure current population, expected growth by 2050.In The 2014 AIA Foresight study, urban growth is currently increasing at a 1% level, there is a great potential that the urban influx for the next 10 years may slow from the rates of the last 30 years or reverse.

Current housing, gaps in sustainability, supply and affordability

New ways of efficiently building like zero energy net-use and wasting little or nothing are becoming integrated into the work architects perform. Water collection and recycling are a need in the current extended drought. Recycling material into home building is also another sustainable technique to reduce the quantities going into burial landfills. Architect Mike Reynolds has over 35 years' experience in the realm of biomimetic homes and living. The Earthship sits nestled as lightly on the land as a dwelling can, creates its own power, has the capability to grow all of its owners' food and treats its own waste as a fertile asset to grow lush food plants.

Earthship photo credit 3

Current Population supply utilization and urban/ rural patterns

In many of the more desirable US urban areas such as San Francisco, San Diego or Los Angeles, the infrastructure is taxed to its limits and beyond, future population growth and immigration may pressure them to continue to accept residents as the population pressure grows or a more sustainable rural economy could develop. In the 2014 AIA Foresight study, urban growth is currently increasing at a 1% level, there is a great potential that the urban influx for the next 10 years may slow from the rates of the last 30 years or reverse.

Urban-inflow, rural – outflow

To better utilize expensive urban land, we can build upward. This is common in urban areas where we can carve building into tiny flats such as New York, San Francisco L.A. Or other dense cities.

"Temporary Shelters or low cost alternatives often go hand and hand with buildings that are ecologically friendly" Rene Dubois . Tiny homes are a becoming a more popular technique that can save resources in initial build and over the life of the structure by having a tiny space to maintain, heat or cool. Many of these tiny home concepts are also easily relocatable when an owner move occurs.

Solution scalable and repeatable internationally

In the Netherlands there has been a similar movement to reuse all materials. In the "Miele Space Station" in Rotterdam, the team from 2012 Architecten built a home out of appliance metal and parts.

Trash disposal is at its limits and beyond with many areas exporting of trash to other states, counties or countries; with the tires and many other recovered objects, we divert tons from the landfill with each global model type Earthship built. A tiny version will use 200 tires as wall bricks, a huge structure like a classroom building will use thousands.

Technical advances and design methods

The California City local standards are very specific and owners in the area known as the "second community" are currently required to build a 2 car garage and a minimum of a 1200 s.f home on the site. It can be argued that if the home is used and is a net zero energy house it should be sustainable.

Philosophy: Net zero water and power systems, recycled building materials, low skills required to build, grow food, be a work of architecture

A home which is as close to nature as possible, waste nothing, use no fossil fuel, produce the majority of food for the home through aquaculture and greenhouse, collect water from the sky, recycle all water to grow your own food and plants and generate a net positive electricity. In this extreme sustainability concept home I want to produce a zero-carbon home re-using as many materials as possible from local sources. The home will be artistically pleasing and completely self-sufficient for the occupants.

10'x12' tiny hut shed for wind and solar generators

While a tiny house will require an adjustment in lifestyle to many people, it offers the opportunity for freedom from excessive financial burdens and traditional cost of mortgages that are in the hundreds of thousands.

The tiny hut is intended as a prototype to demonstrate the strength of the tire wall rammed earth systems of wall structure to the local building department.

Interior of movable tiny house

Quonset hut style mobile tiny house

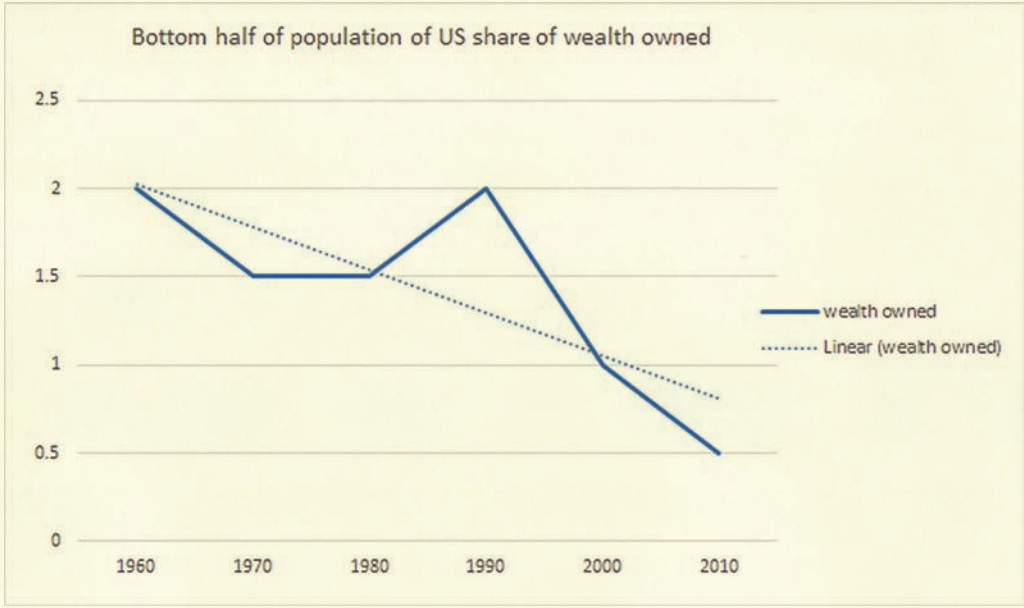
The shipping container house can be constructed from different size standard containers, similar size and other infill to assemble a group together or two with a roof between.

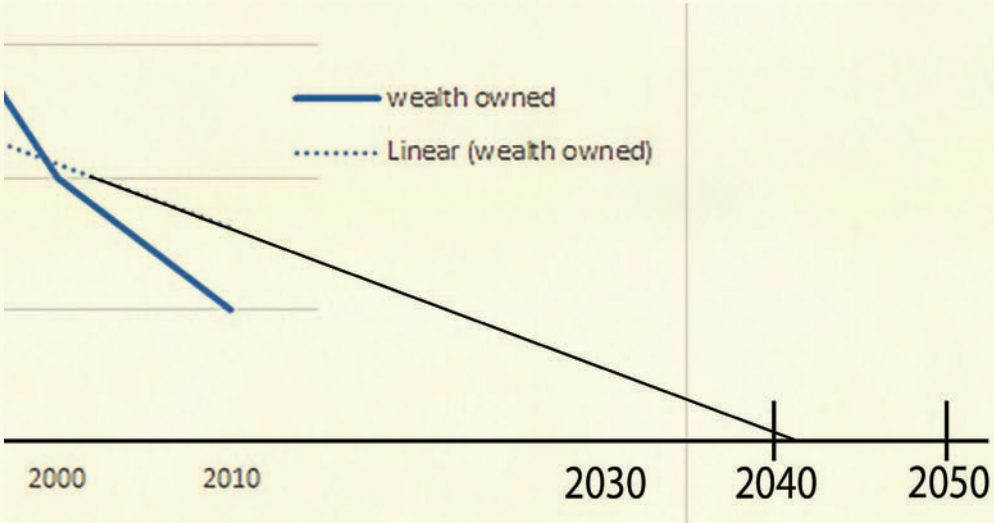
The shipping container is a strong structure that can be adapted for residential use by altering and adding the kitchen and bath functions

Modified shipping containers in a “village

photo by swmobilestorage.com

The economic upheavel caused by the great recession of 2008 has exacerbated the housing and homeless situation. Jobs being replaced with automation and relocated to other areas distributed throughout India, South America and lower cost areas of the U.S. have eliminated or moved opportunities in some of the more expensive cities. At the same time, more homes are owned by businesses instead of owner occupied, creating a rental which will likely raise their rates every year to keep up with the costs of doing business. Increasing costs of basic commodities and the soft costs of fees to construct the homes are rising. Overall the costs of renting and owning in large cities such as San Digo and Los Angeles have caused families to have to double up and triple up in rental homes to keep up with the market. At the same time, income levels are dropping or stagnant for more than half the population for over 30 years. A solution to the high cost is to build less square footage to buy and maintain to avoid getting a mortgage which is too expensive to afford in a reasonable career.





With the current trend, the bottom half will own near zero wealth after 2041

CHAPTER TWO: RESEARCH STUDIES

2.1 Theoretical Framework
2.2 Literature Review

2.1 Theoretical Framework

Areas of research:

The main goal of this research is to explore, prototype and prove that cost effective homes can be created in southern California that allow more people to participate in homeownership and in doing so also help create a sustainable supply of living places for the expected population boom by 2050.

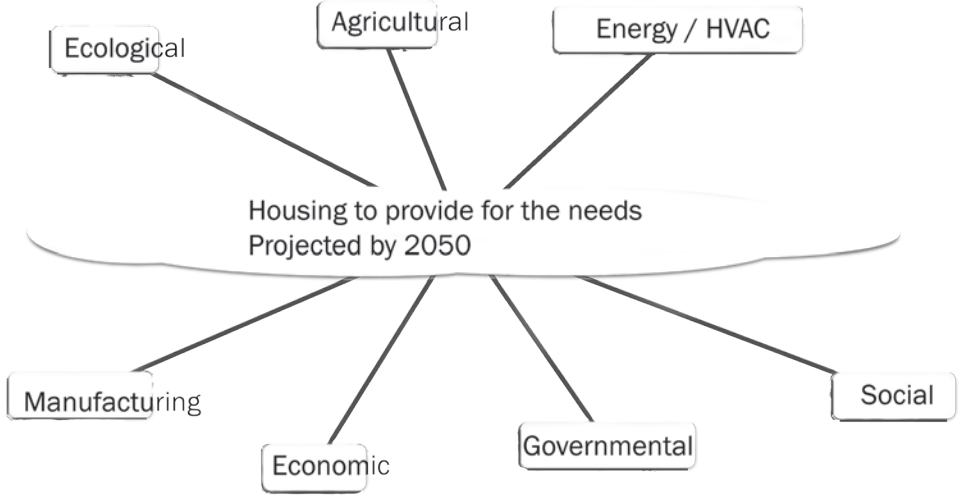
Socially, the tiny house may have some issues and not everyone wants to get rid of all their stuff. The exploration will include research into co-housing and movable homes to look at alternatives to the traditional home. Shipping containers and re-purposed vehicles are being used by some people as their homes. In New Mexico, an Architect named Michael Reynolds has espoused a way of building that he calls Earthships. The innovation may be too much for some US city building departments to understand due to the lack of current use of the system in their area. One of the places that currently have not been proven to be open or not open to the concept is Kern county, CA. In the research project the intent is to ultimately be able to build tire-wall houses in earth sheltered configurations that could stand alone even if not grid connected. To do this in the past Reynolds has built a small shed or "hut" about ten feet in diameter to prove to building officials that the system is structurally sound, safe and can be a durable place to reside.

For the research the project will be broken down into sections; prototype hut, shipping container unit, relocatable tiny house and Earthship-like main house on an existing 1-acre site in California City, when all that is built, the future vision is to create a small community that can share some of the facilities that everyone needs, but only use sometimes such as a major shop or a large community gathering space.

Common gardens and plaza spaces are also a desirable part of co-housing with all owners invested a participating in the processes.

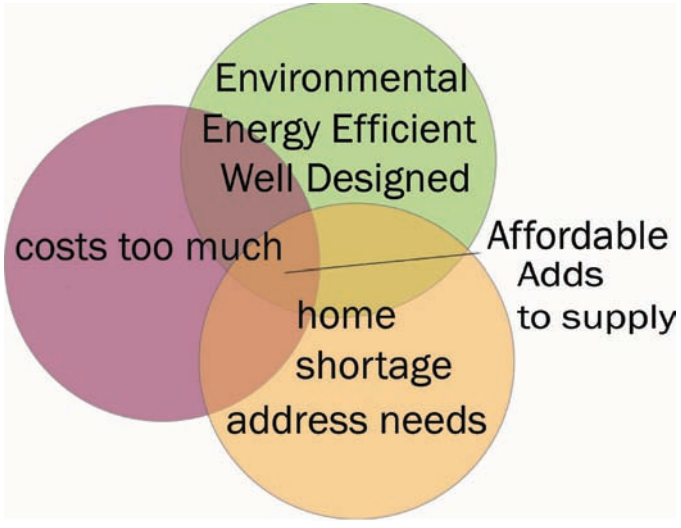
Variables

Landscape design that creates a calming environment for the residents using principles of



variables of the study

environmental design.
The landscape and growing of food is one of the priorities of the sustainability, the food is grown and consumed without transportation energy and expenses. The energy of shopping and parking is also saved for food grown and consumed in the same place. The growing of food indoors helps the health of the resident by generating fresh air directly in the home from the plants. Recycled water is rich in nutrients, requiring only compost for plant food. The landscaping is used to create a shady and cool environment around the exterior. Plants that grow food and drought tolerant exterior plantings can further cool the site and create a peaceful grove-live area for the residents



Theoretical framework

Energy efficiency' and incorporating electrical, plumbing and ventilation designs that are advanced are strategies that need to be addressed both passively and actively.
The prototype home produces a net energy gain over use that can be sold back to the utility. Water is used in a contained manner and not wasted, it is collected in enough quantity to not require hookup to utilities. While it is possible to build homes completely separate from the grid, it makes sense to connect to be able to take advantage of the ability to sell back power to certain utility companies. Wind generation, photovoltaic and an inverter will likely be able to create more than enough of the right types of power

Recycling materials and incorporating used items for reuse incorporates ecologically sound principles.
Materials can be had for free or low cost and are kept out of the landfills. Materials are sourced locally and have smaller transport cost. Tires are a major part of the wall systems in Earthship like homes. Shipping containers and recycled metal and wood are flexible and can be adapted for uses in homes as building materials and the framework of a home. Recycled telephone poles can become ceiling beams, bottles and cans can be used like bricks to create concrete matrices, saving concrete and re-using the beverage container as a brick

Economics that allow homes to be built affordably using innovative techniques that shave costs while still providing a pleasant place to live. How can the benefits realized from building small and sustainable be economically brought into a more prominent position and drive the supply of houses to be increased in a large enough scale to help work on the problems of lack of affordable housing? If the cost is low enough it can help stem the trend of dropping ownership rates by individuals relative to commercial entities. With older wood items, there are patinas and aging that is a valued part of the materials used and can create design opportunities and challenges. Recycled items require stockpiling and may need processing to remove nails and clean up ends that may not be squared off. During the dismantling of the old structure some damage may occur to boards and may have to be dealt with by being discarded if the damage is too much. Most of the quality control is during the gathering phase of the materials and not everything will be a desirable find.

Tactics include reviewing further reports and books on creating healthy homes in an environmentally sound way and in mass production techniques to meet a great need. Survey of the site is part of the project and current photos will be taken before or during winter term 2017.

Designs for the hut will be prototyped and planned and documentation will be combined and presented to prove to building officials that this is a valid technique.

Designs for a shipping container home will be prepared the discover the possibilities to laser cut custom units to be inserted into a standard shipping container to provide a mass produced way to fabricate homes from shipping containers.

Relocatable tiny house will be designed to provide the base home to live in during the main house construction.

Design of the main home will be prepared to a schematic level to work out the phasing with the city officials and establish the ability to build a smaller than standard home and not be required to build a two-car garage at least initially.

Collapse by Jared Diamond (5th edition 2005)
We have the benefit of advanced forensic investigations done of the eating and plant life of past societies. Our examples of advanced societies that self-destructed or otherwise suffered collapse from bad societal decisions run from as close as Montana and as far away as a Pacific Island society can be. Diamond shows a huge change in the US farming environment due to damaged salinized soils. Societies like the Aztecs, Mayans, Easter Islanders and Norse Greenland all suffered from the environmental disasters as a consequence of their stubborn habits. In The book, the first nine chapters are historical examples; the next four go into current situations, which are heading down the same bad pathways of past collapsed societies. In the end we have suggestions on how we move forward; anticipate our looming disaster, stop rationalizing bad environmental stewardship, work to remove irrational values of unsuccessful solutions.
Tiny Houses Built from Recycled materials by Ryan Mitchell(2016)
20 examples of tiny houses, both fixed and mobile. The process for designing with recycled materials has a layer of complexity and has to be dealt with in gathering, storing processing and reinstalling the material. Design issues and time schedules are discussed in detail. Processes for taking only useful materials are laid out.
The Place of Houses by Charles Moore, Gerald Allen and Donlyn Lyndon (1979)
The case study houses highlight the need to carefully look at the site conditions and incorporate them into the design. The order of rooms determines the look and feel of the building. Neutra appears influenced by Mies Van Der Rohe in the plan for Kaufmann House. Long gallery layout with historical connections to galleries of Versaiiles. Moores' team has a organizational focus on the machines and placement of the necessary items. The order of dreams considers how the owner will have a joyous experience of the space. Making the space wondrous and organizing with careful placement as to use and feel to have an elegant assembly of overall harmony with the site and location.

Earth Sheltered Houses by Rob Roy (2006)
The energy savings in the earth sheltered

archetype come from the direct connection of the structures' mass to the earth to get a cool, stable temperature. Author Roy gives us an overview of the traditional ways and improvements from experience. Dirt floors, tile concrete and wood are the most common in earth sheltered living. With his 20 years of building the type, he has lessons learned in water control, green roofs and other earth shelter techniques. Step by step process for sedum roof is a great example. Low maintenance and moisture control are a must. Even when a furnace is installed, it is rarely if ever needed.

Water from the sky by Michael Reynolds (2005)
By the designer of the Earthship, it details the specific systems and how the biomimetic processes work together.

Earthship series I, II and III,(Reynolds, M 1990,1992,1993) How to build your own Earthship, Systems and Beyond Economics, The complete manual of techniques to build an earthship, the design thought process, even the contracts for the co-housing aspects of the development

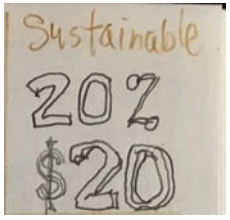
Natural Solar Architecture by David Wright AIA(1984)
Wright discusses passive, active solar and natural wind ventilation techniques. Design parameters for solar gain are well documented in the book as well as the design approach to siting, natural features and wind. Simple high performance methods are used to achieve high-energy performance architecture. Design of generation, storage, and integration in a historical manner. Shading, solar mass, ventilation, conservation and generation are detailed. Key issues of earth sheltered architecture are addressed

Comfort in any Climate by Michael Reynolds (2012)
An overview book details the philosophy behind the earth-sheltered homes that Reynolds has developed.
XS Small Structures, Green Architecture, Universe publishing
When being small helps to be sustainable, Loft housing concepts for many urban roof situations. Houses built from metal appliance panels and other recycled items from landfills.

Eco-Architecture,(2008,Taschen) by Opposing viewpoints series. Integration with a green standard gives an important way to measure green performance. LEED is the big established system. Is it enough to do or is more needed? Authors argue both ways. Also, if a house is net zero energy using and it is producing power to the grid is the size important, can large homes be just as good? Authors argue for both sides

CHAPTER THREE:DESIGN RESEARCH AND ANALYSIS

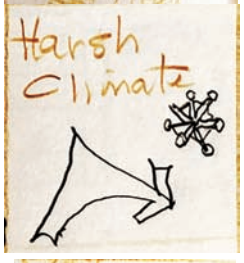
Economic affordability is a long term challenge due to increasing cost of home purchases.



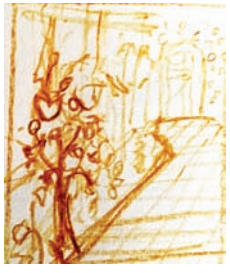
Sustainability is the using tadays' resources in a way which conserves them for future generations.

Net zero energy is the creation of all of a homes' needs onsite and generating more energy to sell back to a utility.

Water collection and conservation methods help alleviate the municipal needs and grid maintenance costs.



Growing food helps the long term food security of the planet.



In San Diego county alone, the gross amount of homes built lagged the new job creation by over 4,000 units per year from 1996 to 2007 and the gap continues to widen. Affordability has been going down 20% for the past ten years. By the time 2050 comes, the costs in urbanized areas will have continued to rise to unaffordable levels. As the largest cities fill up, the pressure will continue outward to the inland empire from the coast in a North Easterly direction along areas where there is currently utility services offered. A variety of methods will be needed to house the over 60 million people expected in California by 2050. The tiny house is a low cost option if the city is open to smaller size units than they are accostomed to. The usual minimum footprint they desire for a home is 750 square feet. The city of California City encourages bulk on residential properties with 25' front and 10' side and back setbacks for 2 story homes. The solution will also involve adding "granny flats" to existing residences to helpp build more units, this is also a conforming use. The lagest pure number of units can be achieved in the multi-family resential area which allows 45' heights and 25' front and 10' side and backyard setbacks. By combining prcels in the zone, a 20 unit building can be achieved in a smaller footprint four stories tall.

Project: Indian Wells Villas

Indian Wells, CA, public housing, low income seniors

Location: Palm Desert California

Built in 2015

91 residential units on 7 acres

Basic Organization: six plex single story one bedroom units with paseos between and landscaping to provide shade cooling towers provide natural passive cooling

Client type:

Architect: Studio E, San Diego

Special Features: passive ventilation

Physical context is Riverside County California near Palm Desert

Site conditions: Desert Valley, low rainfall, hot summers, temperate winters

National Honor Award for Architecture from American Institute of Architects, Washington DC

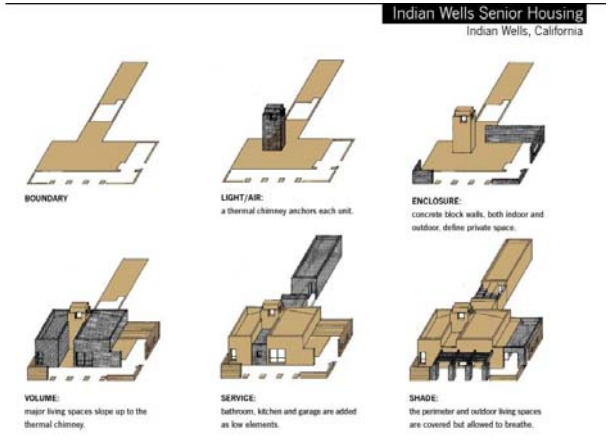
World Habitat Award Finalist from Building & Social Housing Foundation, Leicestershire, United Kingdom

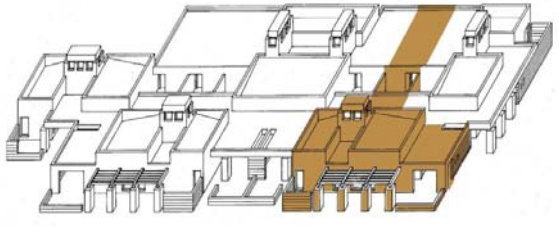
Honor Award from American Institute of Architects, California Council

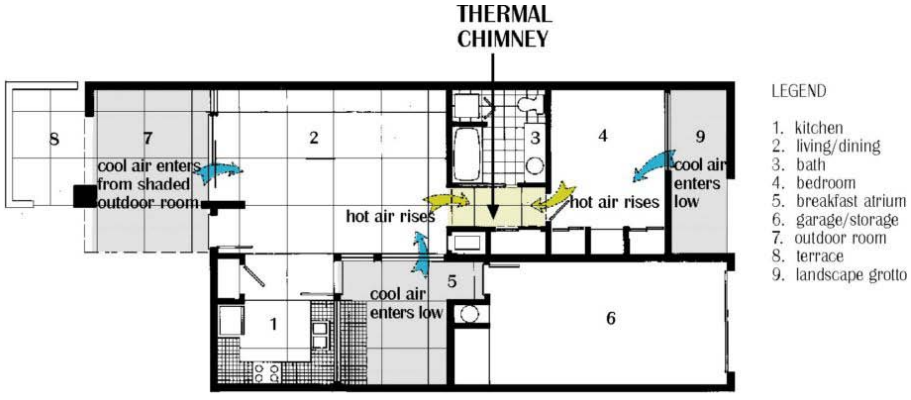
Sources, http://www.studioearchitects.com/work/indian-wells-villas/

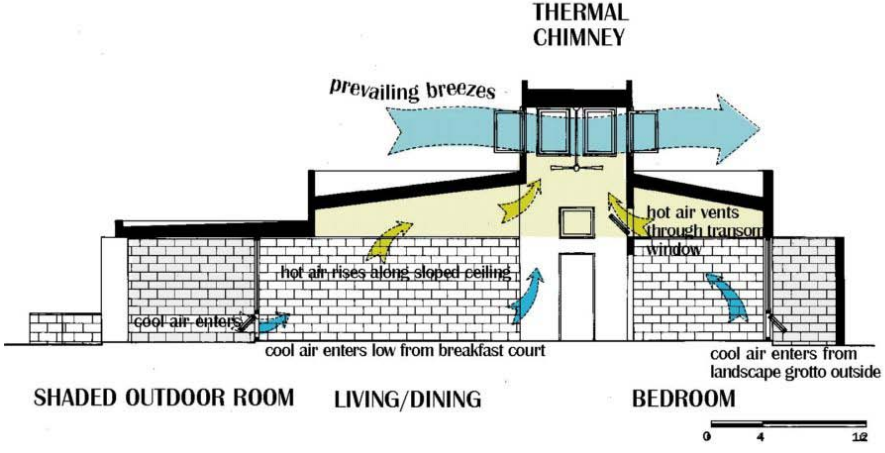
Exterior and courtyard by studio e

Landscaping and exterior photo by studio e









plan and section by studio e

Lessons learned include the use of permeable surfaces, sparse native landscape with large rock accents. Water collection ponds and cooling towers provide natural passive cooling features that require no extra power to cool the structures. Shade trellises help keep the sun from heating up the interiors.

Landscaping and exterior photo by studio e

Project: Brisas de Paz

Desert Hot Springs, CA

Desert Hot Springs, CA, public housing, low income families

Location: Palm Desert California

Built in 2015

62 units of affordable housing, four and sixplex buildings with a central lawn play space in between with the buildings organized around the lawn

Basic Organization: six plex single story one bedroom units with paseos between and landscaping to provide, shade cooling towers provide natural passive cooling

Client type: Coachella Valley Housing Authority

Architect: Studio E, San Diego

Special Features:

Physical context is Riverside County California near Palm Desert

Site conditions: Desert Valley, low rainfall, hot summers, temperate winters

Sources, http://www.studioearchitects.com/work/brisas-de-paz/

Lessons learned include the use of permeable surfaces, sparse native landscape with large rock accents. Water collection ponds and cooling towers provide natural passive cooling features that require no extra power to cool the structures. Shade trellises help keep the sun from heating up the interiors. Gather areas are well designed and ply areas prove a place for children to play right onsite.

Playground area - photo by studio e

Parkways and plazas photo by studio e

Parking and exterior photo by studio e

Studio E used the plazas to create play spaces in a series of parkways that connect the common buildings and tie the site together.

Unit plans and site plan by studio e

Project: Greater World Earthship community

Sustainable development of earthships

Location: Taos New Mexico

Built in: ongoing

Homes built to be coupled with the earth, collecting their own water, growing their food and producing their energy while recycling elements from landfills for building materials

Basic Organization: natural passive cooling and heating provided by atrium skylights and cooling tubes buried in the earth.

Client type: private developer

Architect: Michael Reynolds

Special Features:

Physical context New Mexico desert

Site conditions: Desert Valley, regular rainfall, hot summers, cold, snowy winters

Sources, http://www.earthship.com

Lesson learned: recycled materials can be highly integrated into the home, creting an aesthetically pleasing composition. Mosiac walls and green roof material help the home blend into the local landscape. Food is grown onsite and power is generated to sell back to a utility. Water is conserved, collected and treated in one system.

Lemuria Earthship greenhouse interior photo credit 3

Earthships are comfortable homes in any climate

Green roof , Lemuria Earthship, Photo credit 3

Lemuria Earthship -Kitchen photo credit 3

Earthship Quarry project, Taos New Mexico

Greater world and quarry projects are earthship based development which allow the builder to get low cost land if they commit to carbon neutral home building and advanced water collection techniques. This is a cost effective way to build a home in Taos NM, a very expensive place to build ordinarily.

Interior bottle wall Lemuria Earthship, Photo credit 3

Lemuria Earthship greenhouse interior photo showing mosaic bottle walls credit 3

Exterior bottle and can wall, Lemuria Earthship, Photo credit 3

“Focus on what is most difficult” Alejandro Aravena

Project: Quinta Monroy, public housing

Location: Iquique, Chile

Built in 2003-2004

45 residential units totaling 57,000 square feet

Basic Organization is residential buildings in a figure eight pattern designed around courtyards, patios and parking and integrated into the urban grid

Client type: Public agency; Chile Barrio Serviu

Architect: Alejandro Aravena of Elemental Chile

Special Features: Half the house is left unfinished so that each owner can built custom improvements over time. By leaving open space to expand into, the owners can attain a middle class home through their own sweat equity and future improvements. This creates a unique character over time as each person built their own ideas out.

Physical context is a Chilean village low income housing project that had a very small budget

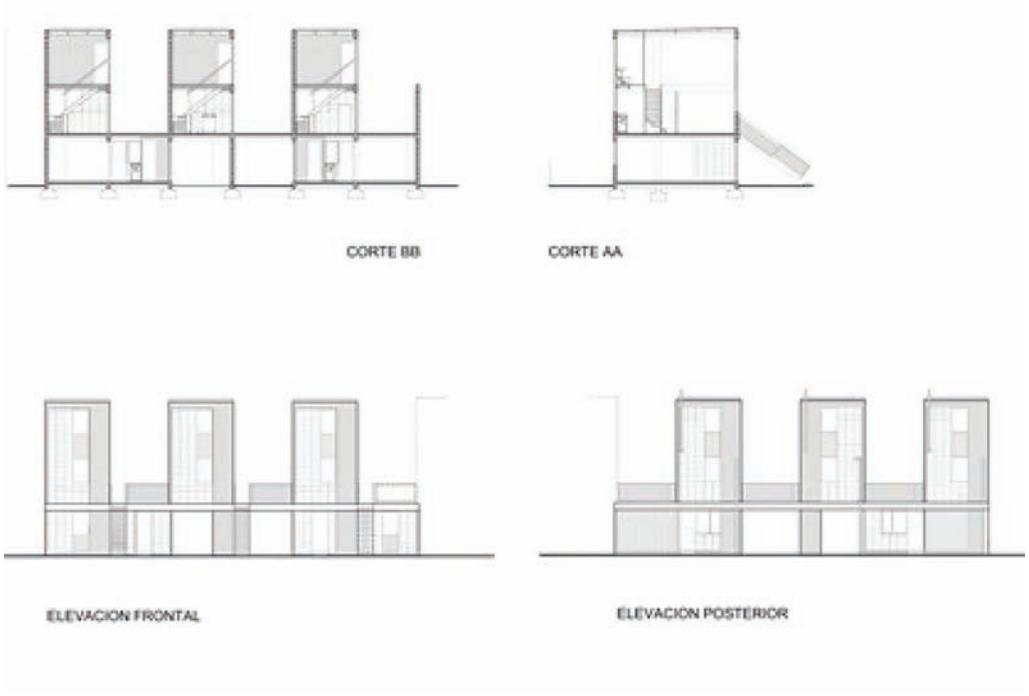
Site conditions: A middle class family in most places can live comfortably in 830 square feet. The government and markets can support building 430 square feet, by doing this initially it allows the population to grow from poorer to middle class.

Sources,Plans and images by Alejandro Aravena of Elemental, photos by Cristobal Palma retrieved from www.elementalchile.cl, Elemental home page then projects tab

Exterior before in-fill has been added -photo by Alejandro Aravena

Exterior after in-fill has been added -photo by Alejandro Aravena

Quinta Monroy project in Iquique, Chile



sections and elevations by Alejandro Aravena

Significant view exterior photo by Alejandro Aravena

plans by Alejandro Aravena

Path of travel / circulation into units

Plan organizing principles:Square within a square

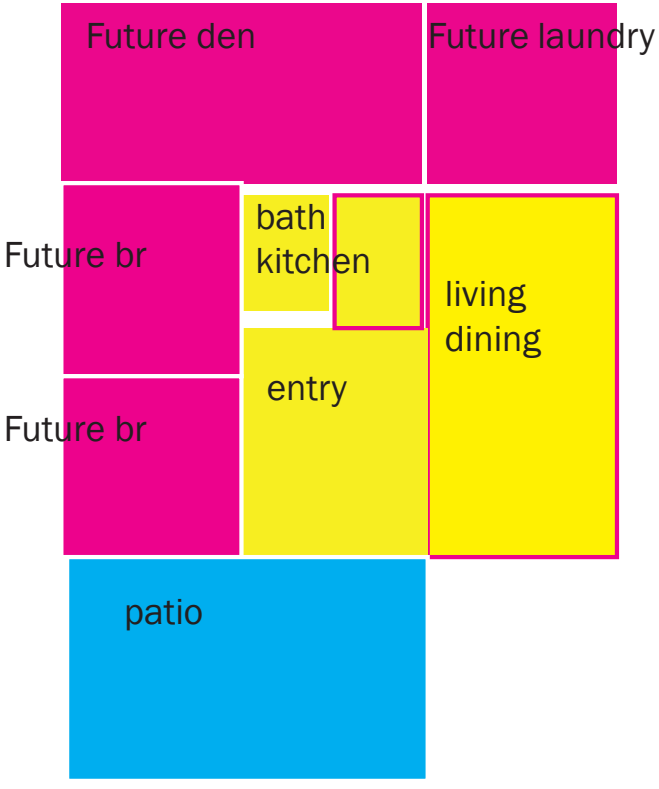
Program relationship diagram:

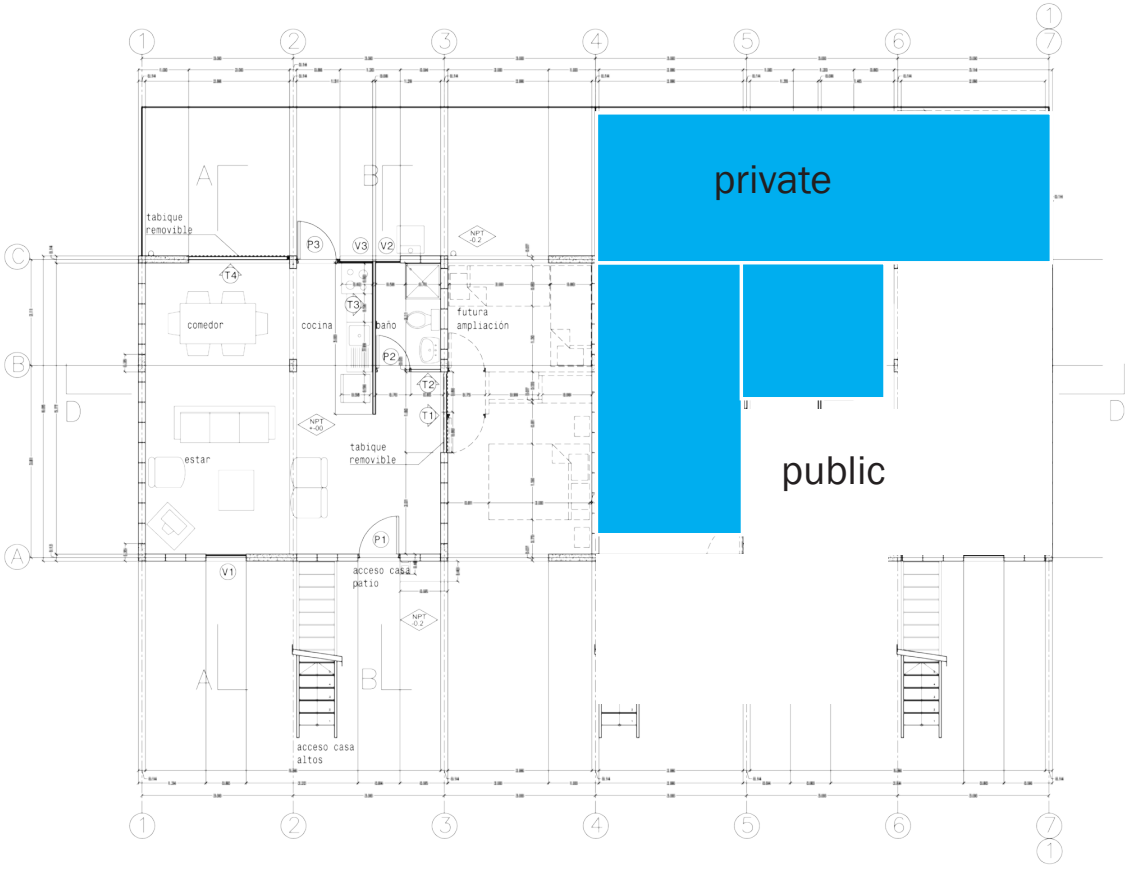
Circulation diagram:

Public and Private zones:

Concept section, spatial hierarchies:

Structure: Concrete cast in place, cmu and wood infill





PLANTA PRIMER NIVEL
SCALE: 1:50

plans by Alejandro Aravena

Project: Europa City Development in Paris

Location: Triangle de Gonesse, France

Built in: Expected start 2019, expected opening 2024

Typology: public urban planning expansion

Basic Organization; Developer: Immochan and the Chinese Group Dalian Wanda announced that they reached an agreement over an investment contract to develop EuropaCity together in Feb 2016

Client type: City urban plan and Developer partnership

Architect: BIG, Bjarke Ingels

Special Features: Ski Resort, Hot Pools, Housing, Hotels and Mixed use

Physical context; Suburb of Paris France

Site conditions: Agricultural to be developed as green open spaces and a city center combined

Sources: retrieved from www.europacity.com, http://triangledegonesse.fr/europacity/, Irina Vinnitskaya. “BIG Wins Europa City Development in Paris” 15 Apr 2013. ArchDaily. Accessed 23 Jan 2017. <http://www.archdaily.com/359796/big-design-wins-europe-city-development-in-paris, BIG website, https://big.dk/#projects, “Hot to Cold” by BIG, Published by Taschen

Significant view exterior by BIG

Elevation by BIG

Context / site by BIG

Conclusions: an undeveloped suburban parcel can be designed and developed in an environmentally pleasing way, the city can expand to the edges and still have a nice landscaped feel to it

Relevance to inform thesis research: creating the catalyst for development is key, Paris is extending the metro line to this suburb at the same time of the expected opening in 2024

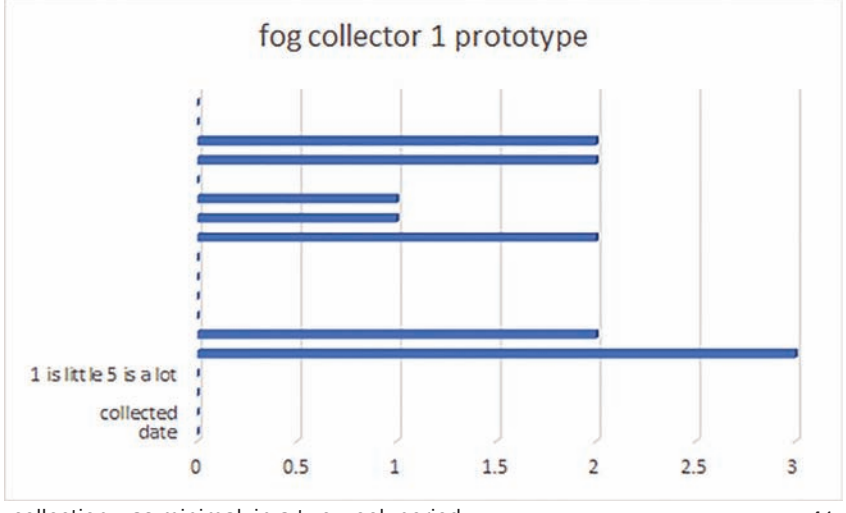
Opinions: The green spaces create a dense but pleasant environment for the residents, guests and workers. The mix of entertainment, retail, homes and civic follows good urban planning practices in creating a walking cityscape that residents can live work and play in.

Context / site by BIG

Significant view interior by BIG

3.3 Experimental Data

Fog water collection was attempted by building a structure all out of recycled materials. The fog collector was ineffective and will need improvements to be useful. Metal should be used in a grid to cause the water vapor to drip when the cool temeperature of the evening allows the dew point to reach a collection range of temp and humidity in the early morning.



collection was minimal, in a two week period

Code Analysis

The location is in a hrash climate in the Mojave Desert, the largest desert in California. The high desert rolls from 200 feet above sea level up to 500 feet. The climare is a transition between the hot Sonoran Desert to the south and the cold Great Basin Desert to the north. The extreme temperatures of the day come with strong winds and clear skies most of the time. All time low is recorded at 8 degrees F and High temp. was 119F. (retrieved from www.blueplanetbiomes.org)

types allowed I through V A and B

Max. bldg. area: Residential; Type I A Unlimited, II A 24,000 sf, III A 24,000 sf, IV 20,500 sf, type V A12,000 sf. Storage; Type I A Unlimited, II A 48,000 sf, III A 26,000 sf, IV 25,500 sf, type V A14,000 sf. Utility; Type I A Unlimited, II A 19,000 sf, III A 14,000 sf, IV 18,000 sf, type V A 9,000 sf.

Max number of stories: Residential; Type I A Unlimited, II A 4 stories, III A 4 stories, IV 4 stories, type V 2 stories. Storage; Type I A Unlimited, II A 4 stories, III A 3 stories, IV 4 stories, type V 3 stories. Utility; Type I A Unlimited, II A 4 stories, III A 3 stories, IV 4 stories, type V 2 stories.

City specific design criteria:

Snow load – 5psf, wind speed design 110 mph, topographic effects, yes, Seismic design category D-2, frost line depth 12”, termites: frequent and very heavy, Winter design temp 40 degrees f, mean temp. 70 degrees.

Sprinklered buildings - yes

Building Separations 1 hour for r-1 and U and 2 hour required for s-1, buildings required to be separated from each other by 6‘min. Fire Ratings: 1 hour and 2-hour fire separation distance between 10 feet and 30 feet

Smoke barriers not required this project.

Wall section required to achieve conformance, one-hour wall - 2x stud with type ‘x’ drywall each side taped and mudded, 2-hour wall requires 2-layers of type ‘x’ board on each side and 2-sets of staggered studs. Tire walls are rammed earth with stucco inside and out.

Area separations required every 1000 sf.

Exiting:

Occupant loads: less than 49

Number of exit stairs required: 1

Max. length of dead end corridors: 20’

Min. Corridor width:4’

Min Door width: 3’

Recessed doors required? no

Direction of swing: out

Panic hardware required? no

Accessibility is to be designed in, paved paths will provide proper slopes for ADA access, 1:12 max. longitudinal slope and side slope of no greater than 1:49.

Designated parking and design standards parking lot minimally graded, residential project, access to be provided to ADA facilities indoors.

Path of travel to and from front entry and designated parking and public facilities

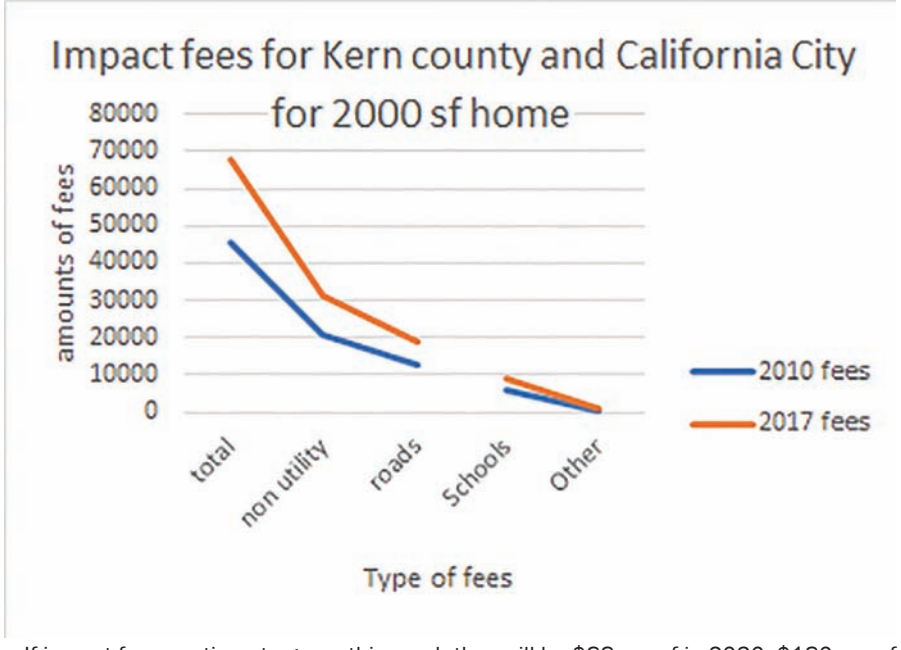
Bathroom door swings and clearances to be ADA compliant

Ramps. Slopes, landings, rails, wheel guides if needed will be compliant

In order to create affordable homes consideration is needed as to what constitutes affordability. An arbitrary comfortable amount is 20 percent of a $20 per hour job. If a home can be built for this, we will have met the goal to create a house with an economically sustainable house payment. This amounts to $700 per month or less and is about $8,000 per year. Good lending standards want people to have a payment of less than a third of income. The average person earns $32,000/year and the $8,000 would be a quarter of the income of that persons income.

California City will be attractive to develop as long as the lots remain affordable and the city is open to dense development of the town. The attraction of the area is as a recreational area as well as a place to live at low cost. The project seeks to develop 20 mule team blvd as a mini Route 66 attraction with restaurants, gas stations, public facilities, campgrounds, agriculture and entertainment nodes along the length of the road spread out from west to east from downtown California City.

Work in the supply chain of the economy can be performed almost any where where there there is power, transportation and water to sustain the community. The central location of California City allows opportunities to work from home in areas such as manufacturing, high tech, sevices and agriculture. Food is grown onsite and excess power is sold to the utility to generate a positive income from the home and to reduce transportation costs and impacts.



National Impact fee study, 2010 by Duncan associates

“Banks are not lending like they should, 5/30/13 Forbes Magazine,by Richard Finger

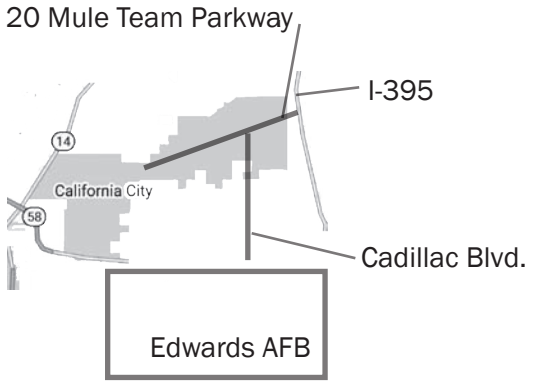
If impact fees continue to go up this much they will be $88 per sf in 2030, $180 per sf in 2040 and $360 per sf in 2050

Cost Estimates

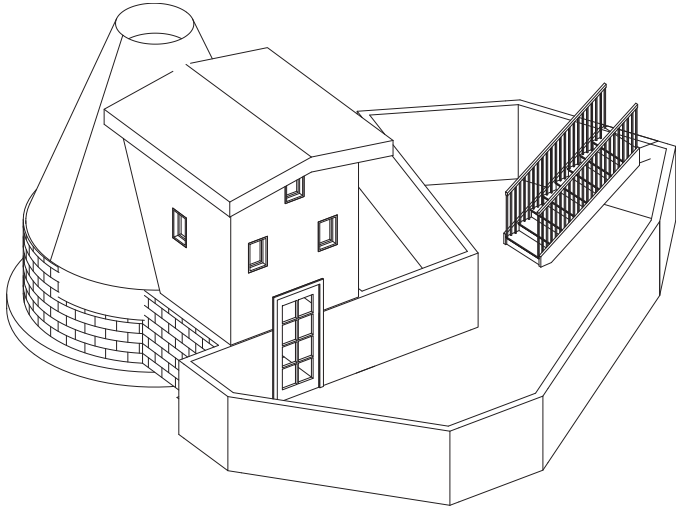
20 mule team from 395 to paved portion of 20 mule team

	miles	cost per mile	
san bernardino section	10	2500000	25000000
mill and repave the existing road	15	625000	9375000
pave cadillac and neuralia north south connections	30	2500000	75000000

build bike lanes	miles	cost per mile	
	55	390000	21450000

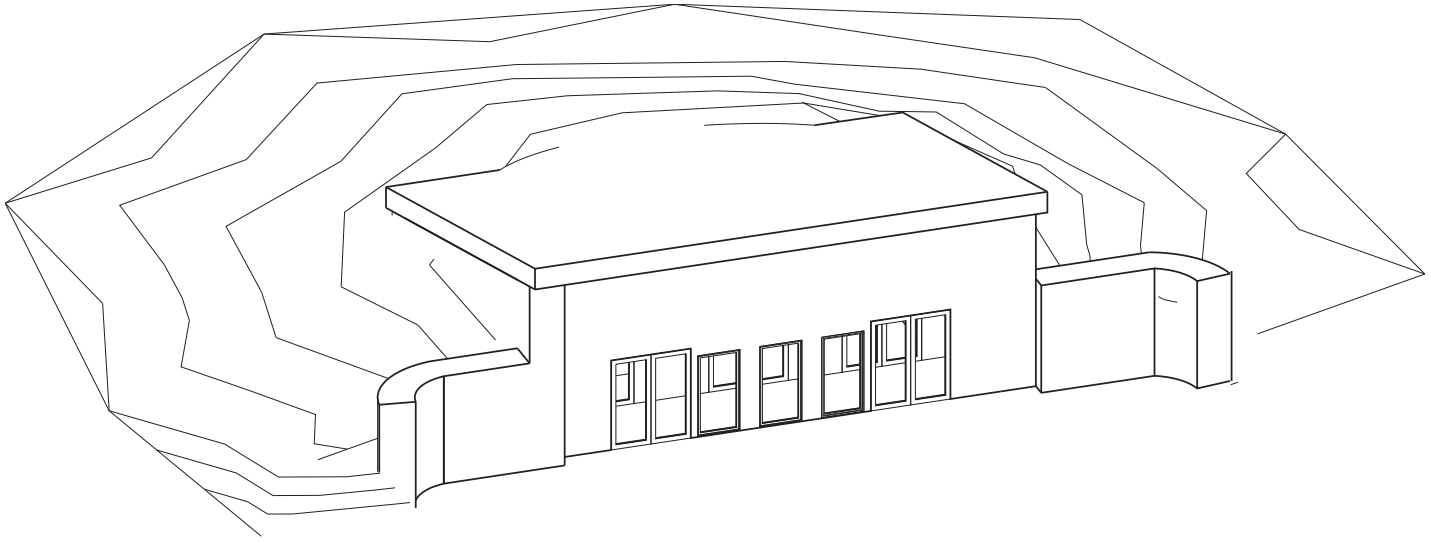


Roads and bike lanes connecting California City to I-395 and to Edwards AFB to create a gateway at 395 and work connection to Edwards



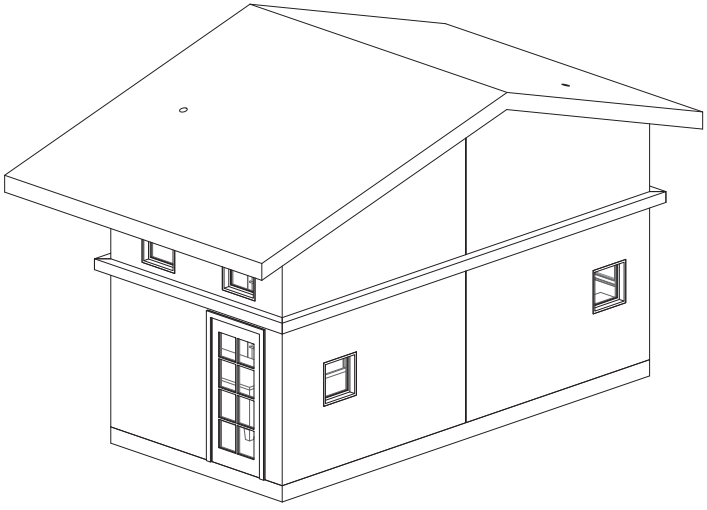
110	5500
impact fees	3740
permit and plan ck	900
land cost - existing	10140

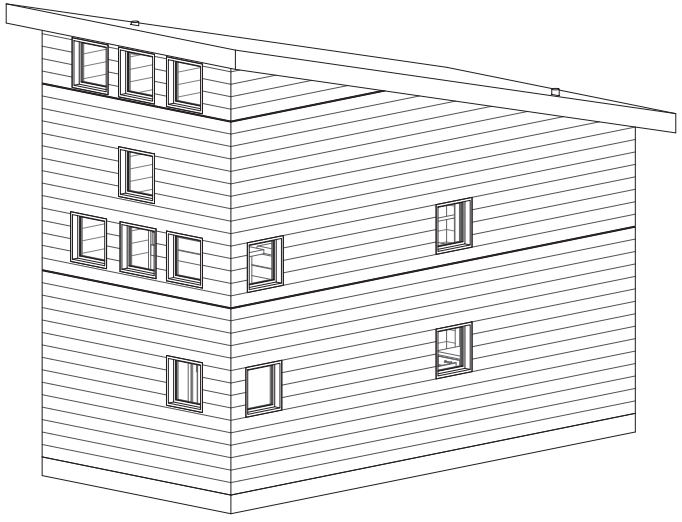
110 sf Utility Hut built from tirewalls and bottlewalls with concrete shell roof - wind generator additional cost



800	48000
impact fees $34 / sf	
	27200
land cost 1/5 acre	5000
other fees	3000
	83200

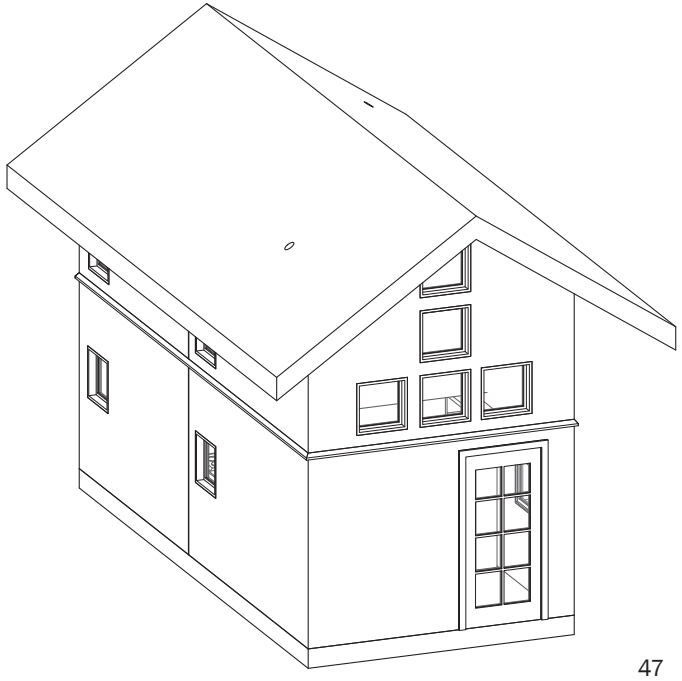
Estimate for 800 sf Earthship home





square feet	budget
725	79750

impact fees 34 /sf 24650



combining lots and tiny house parking and cohousing facilities

lot	combining	
5000	5	25000

other soft costs 3000

total budget 132400

Estimate for 725 sf tiny home

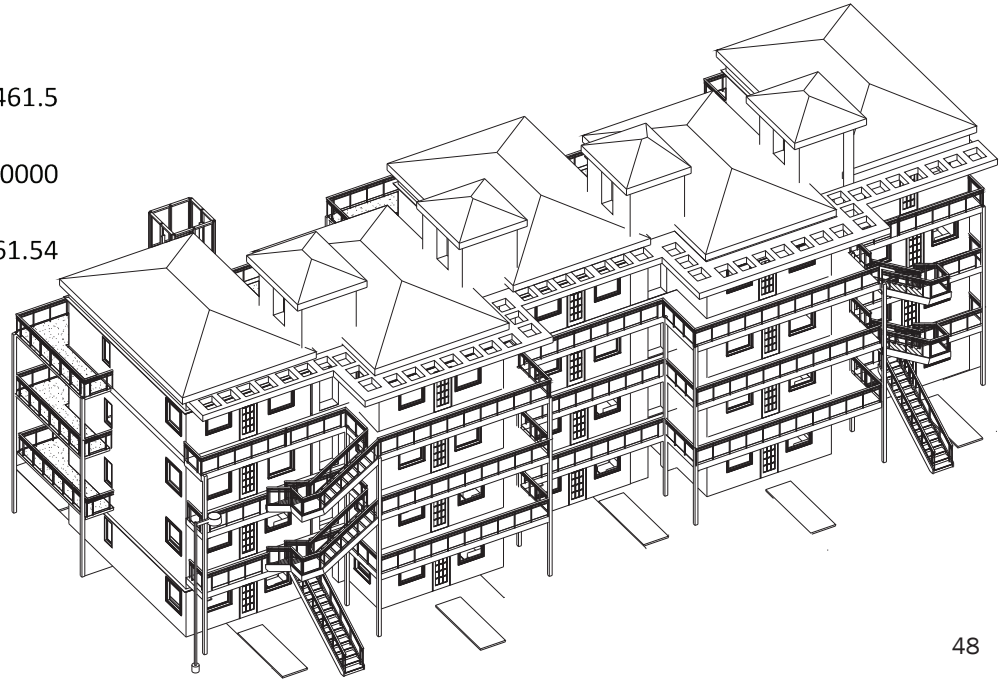
	11	600	6600
	2	1200	2400
			9000
cost of construction			945000
impact fees 34/sf			306000

combining lots

lot	combining	
5000	8	40000

other soft costs	15000
Total expected budget	1306000
13 units cost per unit	100461.5
10 percent down payment	10000
mortgage amount	90461.54

Estimate for 13 unit multi-family building (12,000 sf)



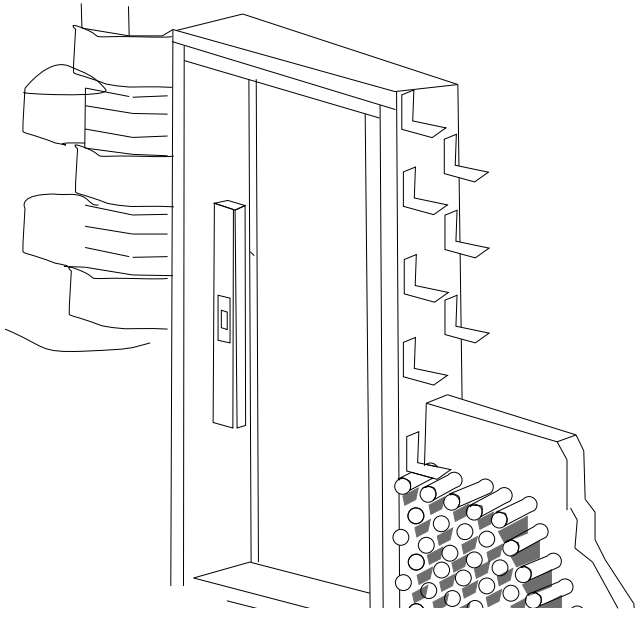
3.6 Building Systems

Sustainable building systems include tire bricks that are used to contain rammed earth, pounded to 90% compaction in a wall then covered with stucco and insulation, building of the roof systems, follwed by earth backfill and growing the green roof.

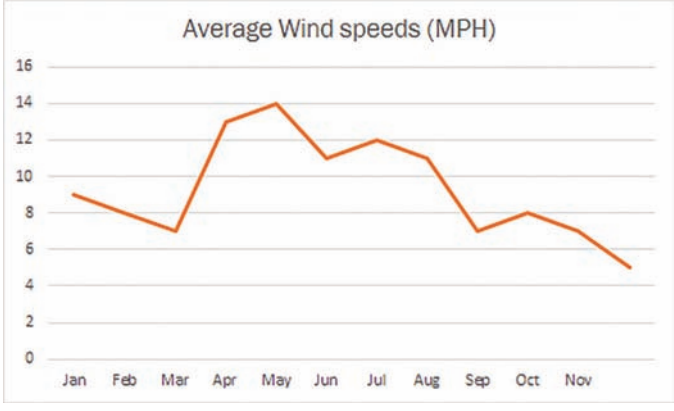
Water collection, conservation, recycling and treatment are done on-site to use as little municipal water as possible. Solar panels generate the homes' electricity and wind generators charge batteries that will carry through the house during stormy weather,

Most months achieve 10 plus mph average wind speeds, the mean is 10 mph wind

Prevailing winds are from the west- southwest seasonally

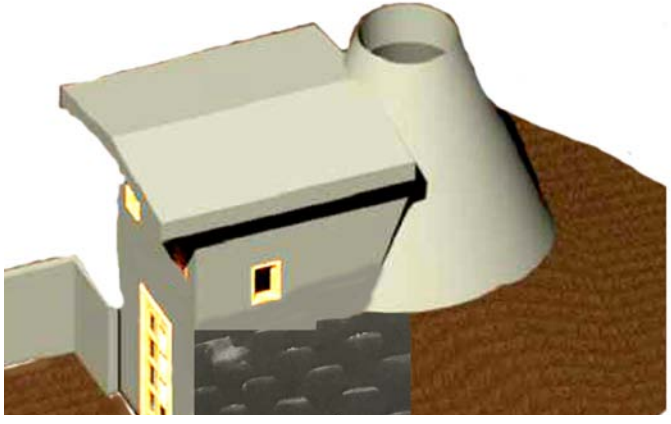


Bottle and can Wall Details, tire wall, door opening connection

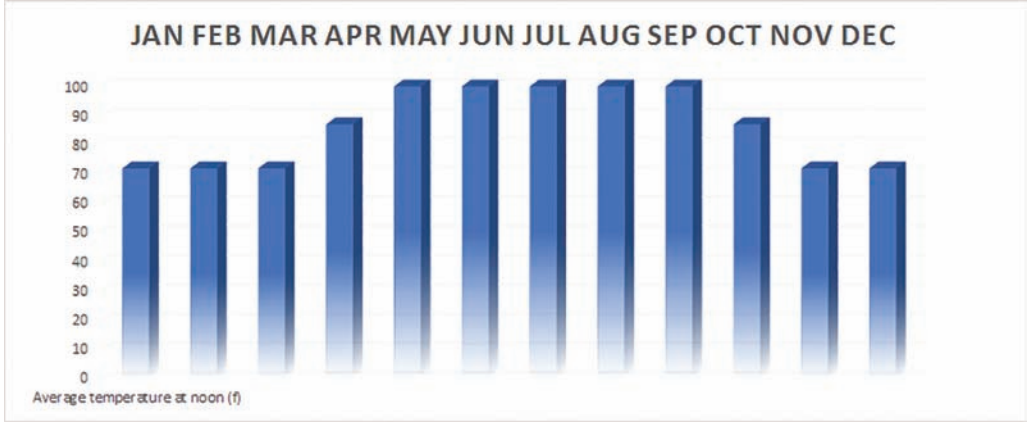


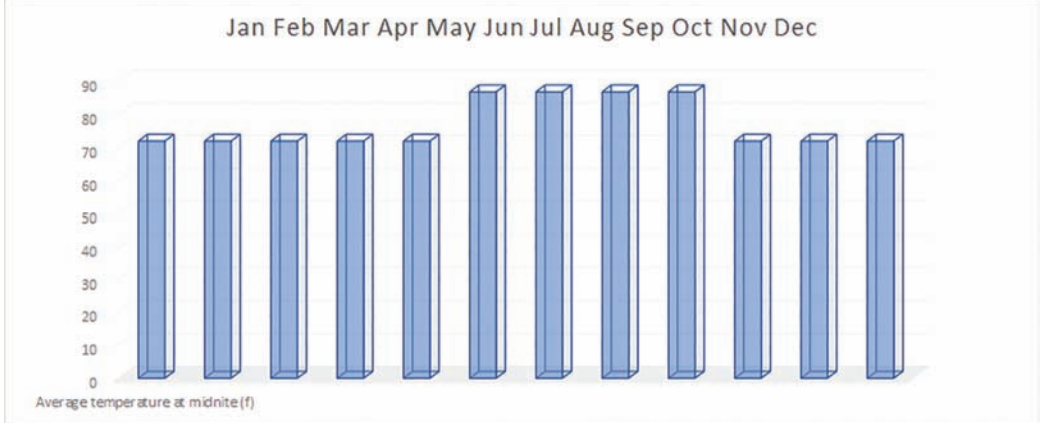
Maximum wind speed is 110 mph

Some days temperatures in the Winter can be below 32, half the time temperatures are between 32 and 68. Some summer days can exceed 100 and a quarter are between 75 and 100. Snow occurs most winters in light accumulation of less than 1/2”



By using earth sheltering, wind and temperatures are moderated, photo credit 3





Temperatures - noon and midnight

3.8 Parking

R-1 requires a minimum 2 car garage, 3 car allowed and an RV is allowed to be parked onsite. Commercial requirements vary by type of commercial from 1 car per unit and up based on expected patronage of businesses contained in building, multifamily requires 1 car per unit; these are the current requirements and can be expected to be relaxed in the next few years as the impact is felt of driverless cars as taxi services.

by 2050 we can expect to need less onsite parking due to autonoumous cars and their ability to be located offsite and not even owned by each person, storage will be in a more central facility when the vehicles are inactive.

Photo by Christie Hemm Klok, https://www.wired.com/2017/04/mercedes-promises-self-driving-taxis-just-three-years

Autonomous cars by Daimler are expected by 2020, https://www.wired.com/2017/04/mercedes-promises-self-driving-taxis-just-three-years

3.9 Pre-design and Field Work

location in CA

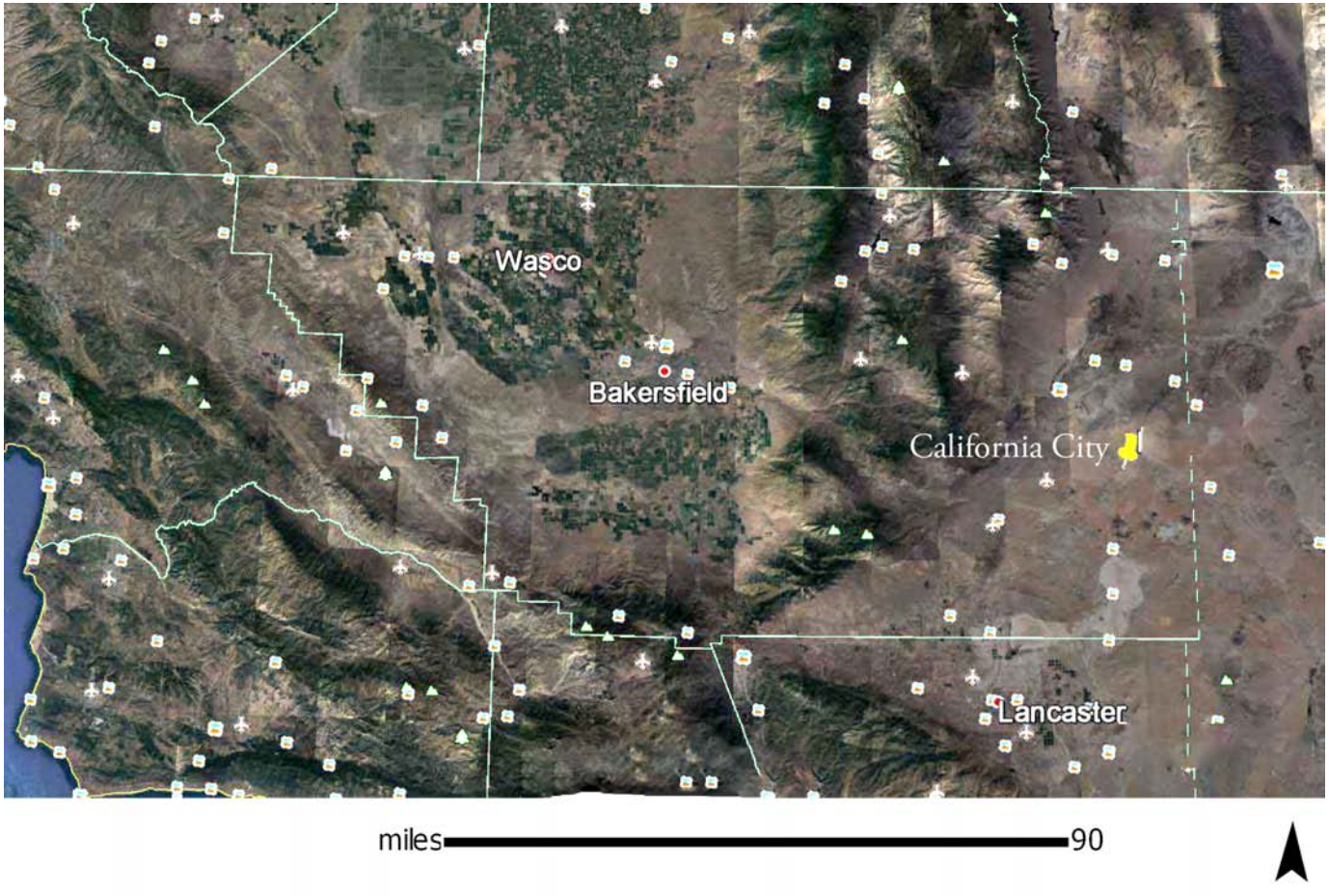
View to East along West property line site 1

California City was identified as a source of cheap land due to the ongoing low costs for purchasing parcels in the town. Parcels have access to city water andthe existing power grid along 20 mule team parkway. The land prices have been fluctuating little through time and the cost of 1 acre is $15,000, currently. Other lots can be purchased from the county during the annual tax auctions and can be bought for $100-2000 depending on the tax leins.

Borax Bill park, 2 miles west of node, has paramedics, police, camping and public showers open for use currently.

Water is scarce in the area, city water is available to the site and is located along 20 Mule Team Parkway. Site Averages 2 inches of precipitation per year.

View at west looking North along property line site 1



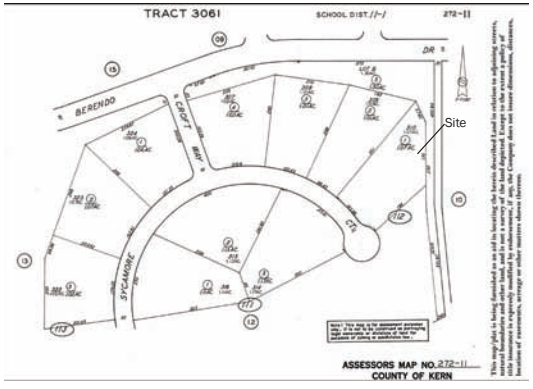
Location in Kern County

The Environmental character is high Mojave desert, hot in the summer and cold in the winter with possible snow in winter. The vegetation is grease wood scrub bushes year-round with wildflower growth in spring.

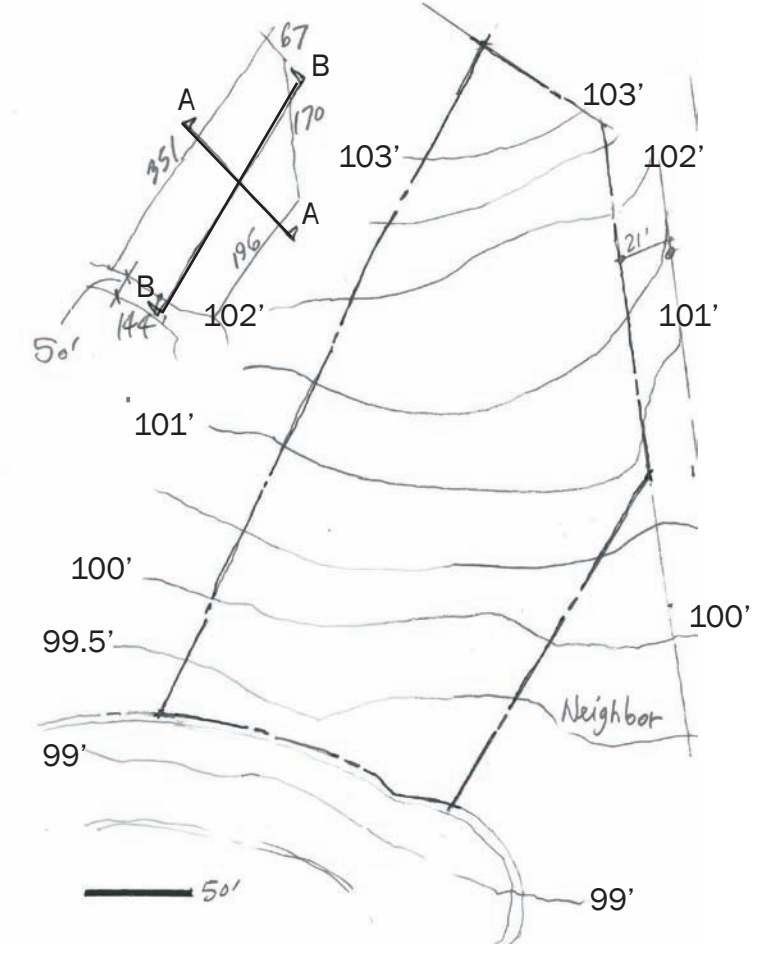
Local Features include Galileo Hill and the foothills of the Sierras. The High Desert is a harsh micro-climate with little vegetation and wildlife. The Desert Tortoise and Hare are present.

Lot Location and roads- retrieved from www.earth.google.com

By combining lots, the multi-family units can be constructed in a cost effective way that respects the low prices in the Kern County real esyte market.

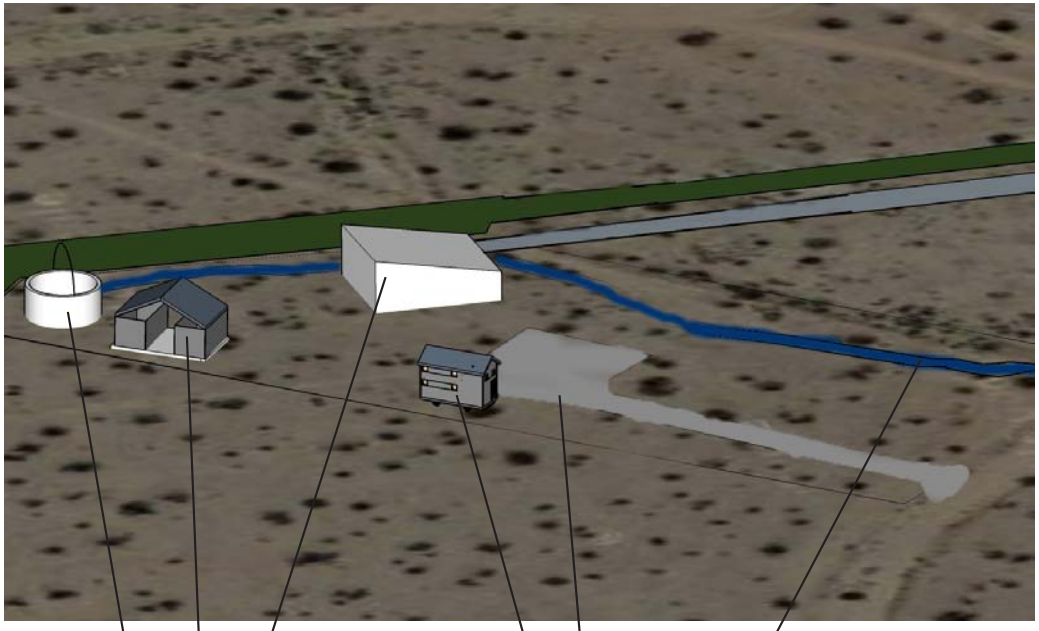


Tract Map retrieved from www.ctic.com



Topo single family site

3.10 Program



utility hut

container shop

Earthship phase 1

water collection

parking

tiny house on wheels

Site 1 program

Layout on site 1

Phases of program

Initial catalyst by 2020

Individuals

Growth of the second community 2030-2040

Tiny House Community

California City at 500,000 people 2050

Larger Scale Multi-family needed after 2040

Healthy principles to be incorporated:

Connection to parkways

Hiking in nature

Add landscaping and street furniture to the public parkway. Create a public transit route on 20 mule team parkway that connects all the way to Silver Saddle Ranch and ultimately to Hwy.395 once established as a destination.

The 20 mule team connection to 395 is controlled by San Bernardino County, who currently have no published plans to improve the dirt raod. For California City to take on more people , the connection should be improved from 395 to town with a paved roadway and bike lanes. Cadillac Blvd is a direct route to Edwards AFB and should be improved to a 2-lane asphalt road with dual bike lanes.

Program Analysis

The catalyst: Parts one two and three.
In order to plan for the growth of California City, the potential third largest city in California, critical thinking can be applied that can help demonstrate the value of certain practices and ways of building housing that address the economic, social and sustainable home problem. The city of California City is likely to grow to a population of over 500,000 residents by 2050. The attraction of the area is cheap land with access to the main utilities in the Primary road “20 mule team parkway”. The city water, power and telephone are in place in the public utility easements along the primary road and will need to be connected for a distance of approximately 400 feet through the proper easements to get to the property.

The city allows a 120’ max. square foot shed structure to be built without a permit. The purpose of the structure is to house the batteries, wind generator tower and photovoltaic solar panels for the property. The city requires it to have a setback of 60% of the property depth (property is 351’ on the west, 196’ on the east) for a setback from 210 feet on the west to 118 feet on the east. Part One is the utility building that also demonstrates the concept of the rammed earth tire walls designed and developed by Michael Reynolds over the last 40 years.

The Earthship residence will proceed as part two and include the kitchen, bath and living facilities along with the greenhouse and advanced technology to collect and distribute water in the manner which uses and re-cycles all gray water into the greenhouse and a special black water planter system which allows the growth of trees such as banana and others directly on-site.

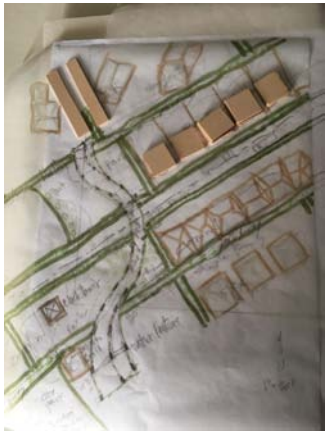
Part three will be the garage, shop and storage rooms made out of two 20-foot shipping containers that have been placed on a foundation and reconfigured for the purpose with doors and a metal roof overhead to create a loft space on each side above the shipping containers.

The future in 2030-2040

With innovative thinking, the city can get a lot of homes built for lower costs than other areas in California. By allowing granny flats, the city could solve the growing problems of the aging population as well as the millennial problems of not being able to afford to buy a home.

California City 2050

If the population does reach 500,000 by that time there will be a need to have public facilities such as senior housing and civic functions, the future could see the neighboring sites build out multi-family units and parkways to create the walkable city parkways and parks which have been allocated to the areas.



Exploration of node scheme at Cadillac and 20 mule team with bridge for 2050, it was determined that a bridge is unlikely to work

Buildings:

Utility hut
100sf

shop/ storage / garage
750sf

earthship
1000sf initial

Phase 1 - Initial catalyst specific site potential layout

Project parcel address: Number not assigned, Sycamore Court, California City CA,

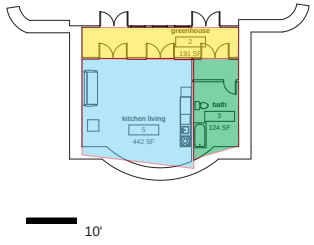
Assessor's parcel 272-112-01 Kern County

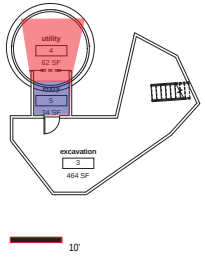
Local Zoning and Planning Contacts: 760-373-7163, Joe Barragan, inspector, (jbarragan@californiacity-ca.gov), 760-373-7152, Hazel Munoz, technician, (ccbldg-code@californiacity-ca.gov); Building and Planning dept. California City, City Hall, 21000 Hacienda Blvd, California City, CA 93505, June Sides, planning and public works

Project Zone: R-1, lot size 1.07 acres

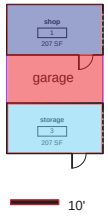
Front yard setbacks: 25' for home and 90' or 60% minimum setback for storage and utility buildings

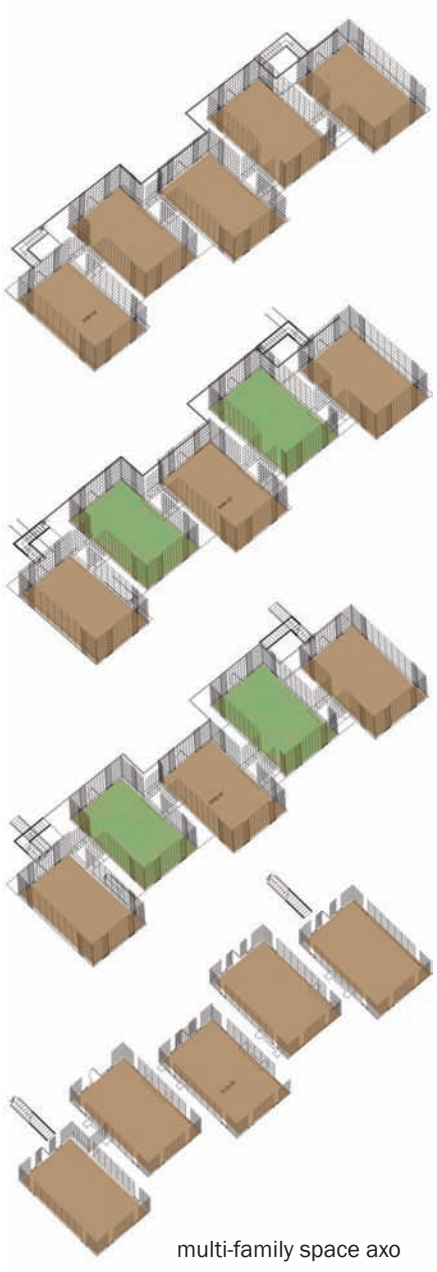
Side Yard setbacks, 5' for single story, 10' for 2 story





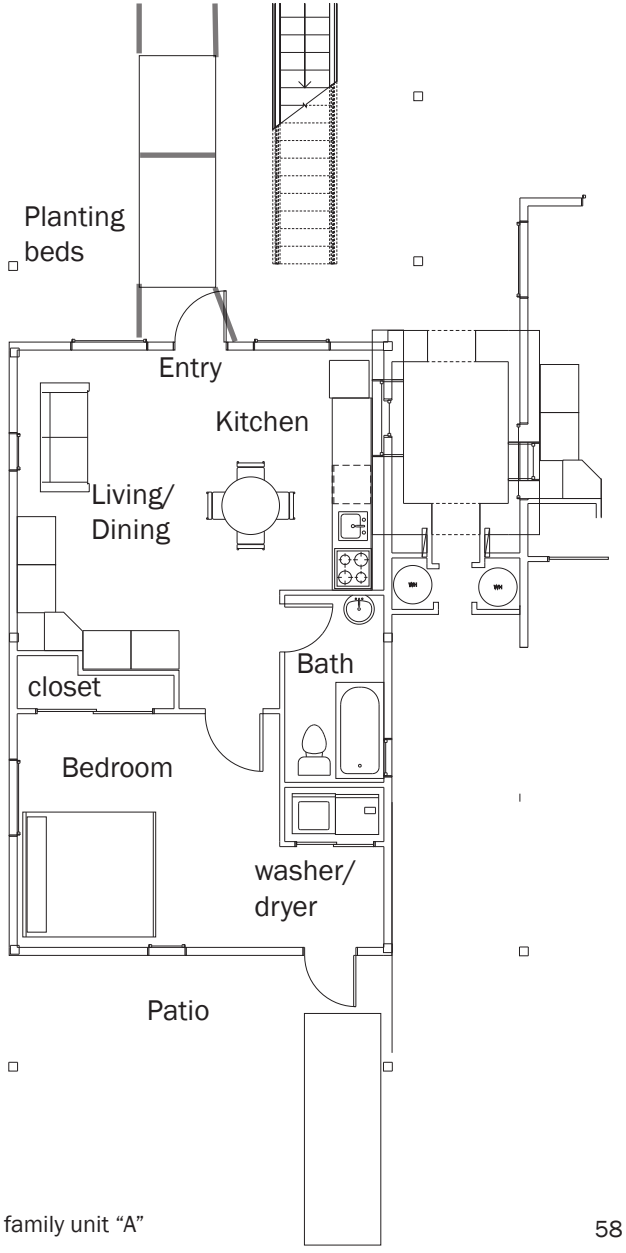
Site 1 Program diagram





multi-family space axo

Multi-family program ground floor units fully accessible 16 - 600 sf units 2 -2 story 1,200 sf units



multi family unit “A”

Rear Yard setbacks, 5’ for single story, 10’ for 2 story

Accessory buildings to be up to 15’ tall, must be set back from front by min. 90’ or 60% of lot depth whichever is greater and 10’ from rear lot line. One 25’ RV is allowed to be stored on site if not occupied.

Adjacent undeveloped city owned parkway and Alley directly adjoin parcel on north and east property lines, utility easement exists on east boundary of site for water, telephone and power.

Height limits: 2 ½ story / 35’ limit

Allowable coverage: 45%

FAR: Ground floor minimum size 1000 sf, min 2 car garage of 400 sf, min., max 3 car garage. One story detached buildings less than 120 sf are exempt from permit.

Parking: Minimum 2 car parking, 3 car allowed, 25’ RV allowed to be stored on site not occupied.

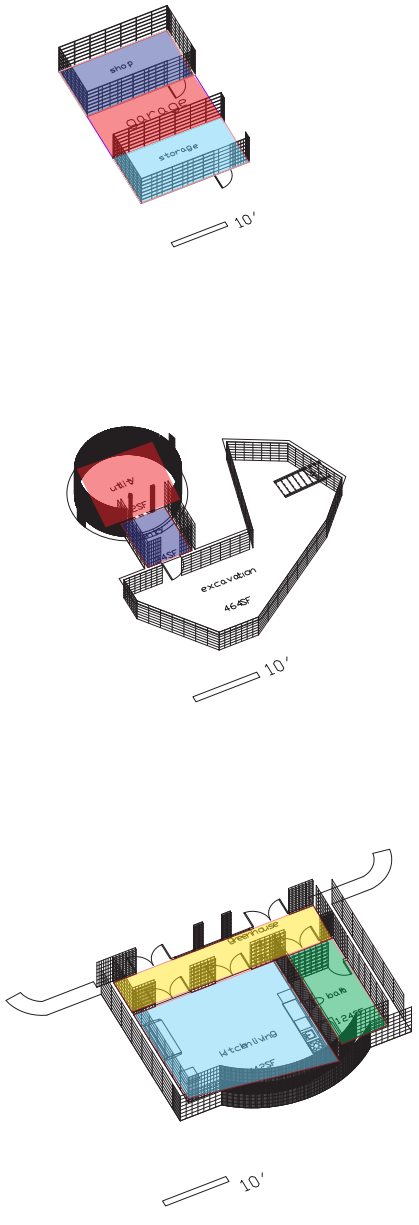
Overlay zones, C-1 activities are permitted where code inspector approves and no exterior impact is visible, with few clients visiting. Assume sprinklers required

Occupancy groups: Residential R-1, Utility U-1 and Storage S-1

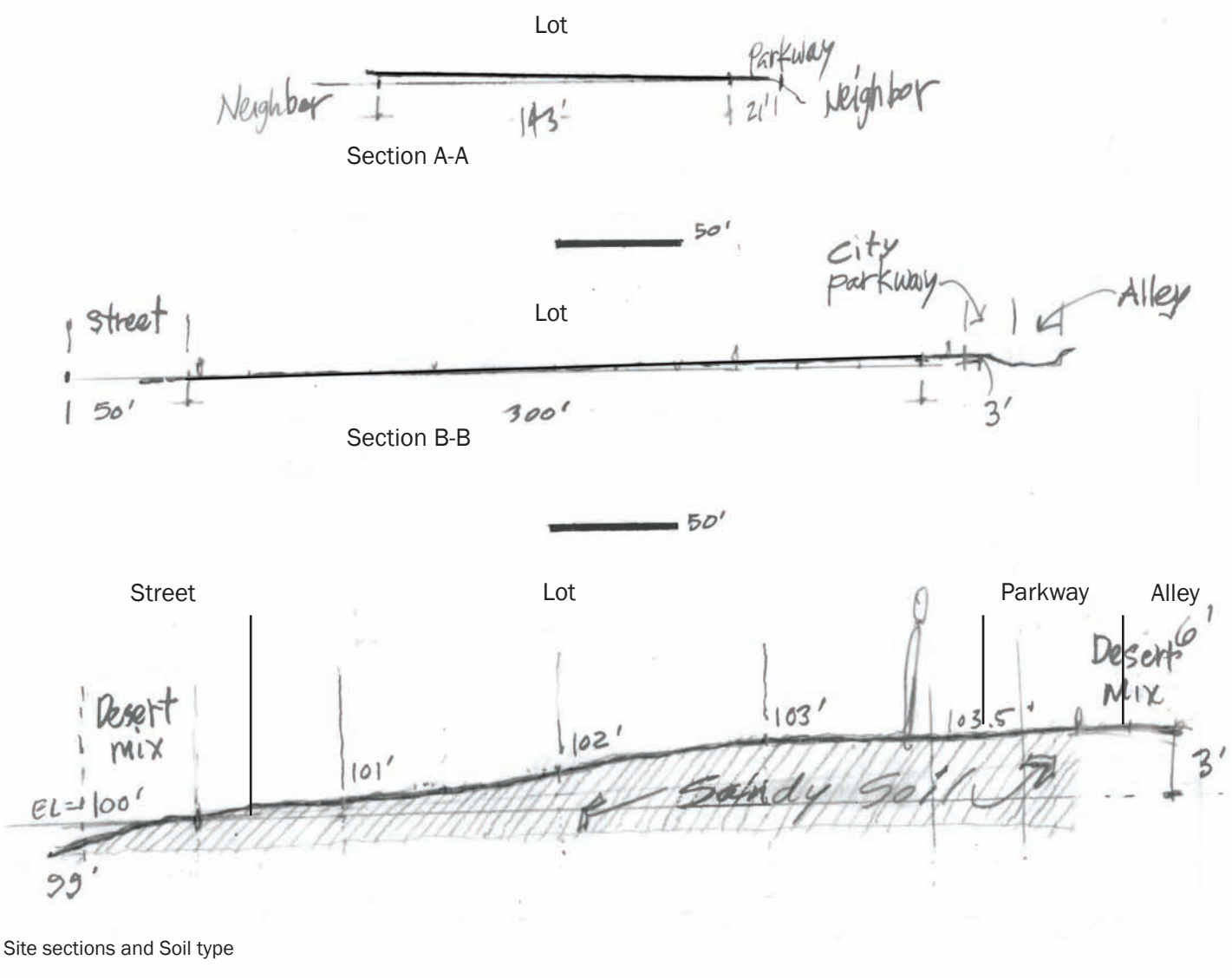
Allowable construction types: Residential; all types allowed I through V A and B, Storage; all types allowed I through V A and B, Utility; all

3.11 Site Model

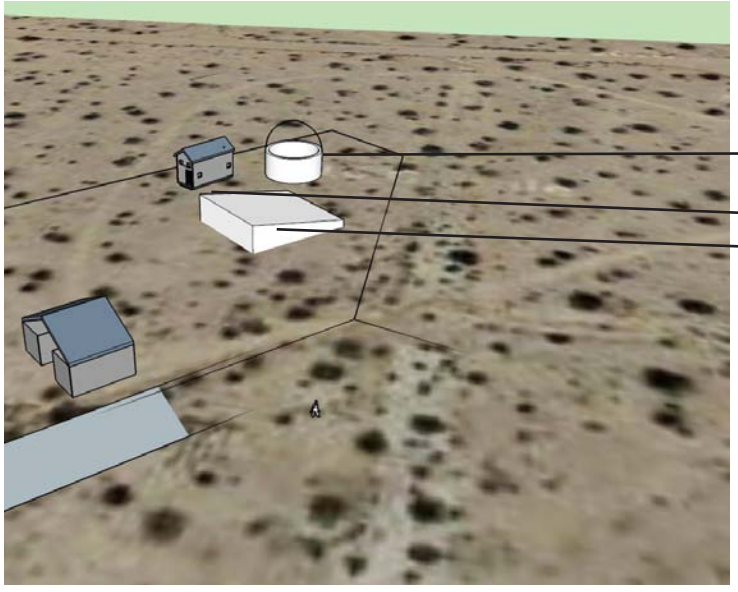
The site currently has no buildings in 2017, there are power poles nearby and a two lane asphalt road,municipalwater runs along the main asphalt road the side streets are graded and not paved. The large park, parkways and commercial properties are currently owned by California City.



earthship space axo for site 1



Site sections and Soil type

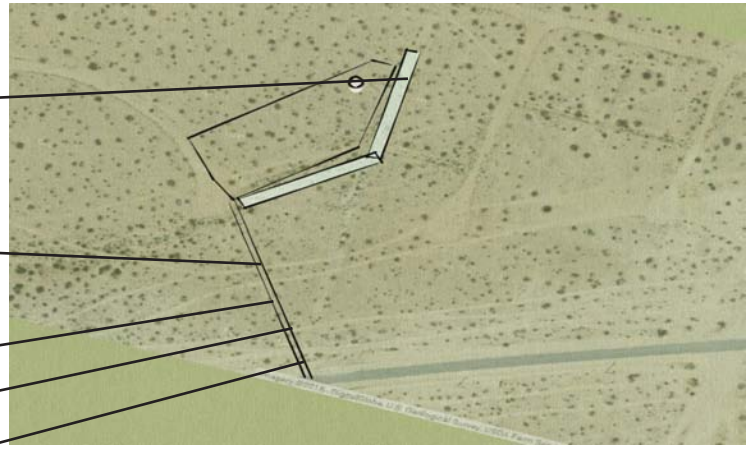


Site 1 Square footages

Building phases:

Earthship hut - 100 sf -budget $5000
Container shed shop - 750 sf budget $25000
Tiny house on wheels - 500 sf budget $8000
Earthship - 1000 sf -budget $120000

Program



California City Parkway

Utilities:
Water easement
Sewer - 5 miles away- now septic
Storm drains - none
Gas-propane
Electric easement
Telephone easement
CATV easement
Data - wireless

Connections to man made environment
- none existing on site currently
Infrastructure - In 20 mule Team Parkway, Water, Electric, Phone and CATV

Zoning Residential
Code limitations Max 2-SFR, 30'ht.
Easements- Utility and Parkway
Setbacks - 15'
FAR 50%

One half hour drive to Lancaster One and a half Hour to Los Angeles

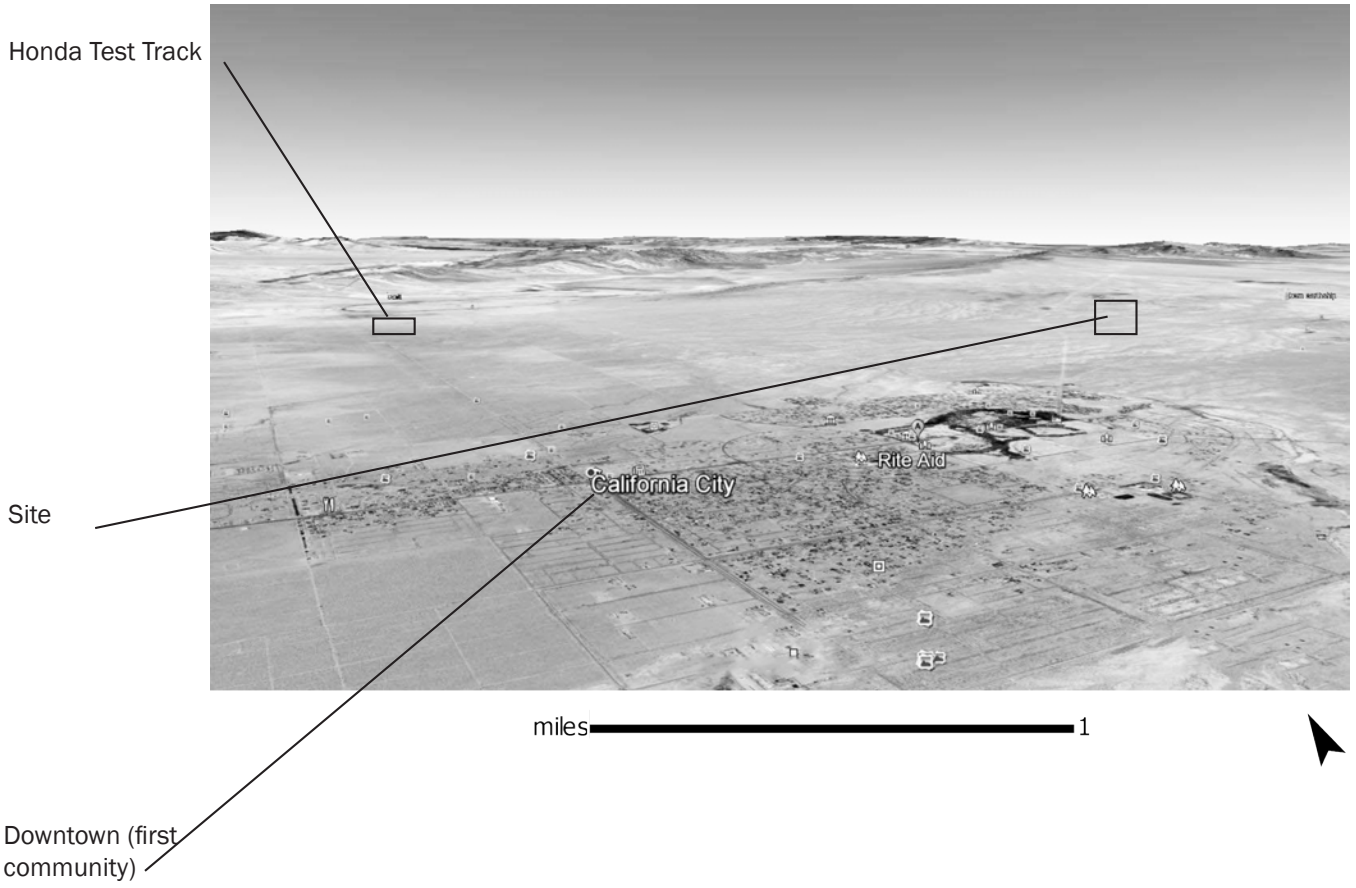
Noise factors:
Edwards Air Force Base Aircraft

Honda Test Track
Solar Farm
KIA Test Track
Desert Tortoise research reserve Edwards AFB aircraft testing
California City Airport with Space x

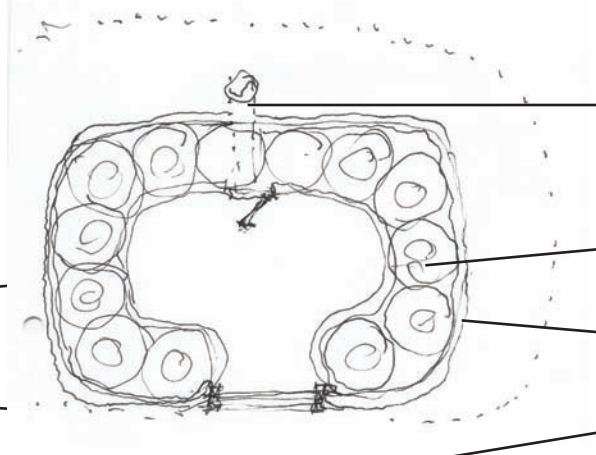
California City First Community Map

Research based economy

Near Highway 14, 395 and 58 for convenient access



2nd community is 7 miles East of First Community



Built by five people in five days

cooling tube for AC

Tire walls with rammed earth

Earth shelter berms

Expandable with greenhouse front

landscaped courtyard

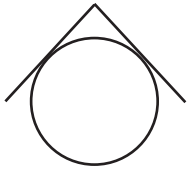
Expandable Earthship

Shop and storage

Utility Hut for solar and wind power

parking

Water Collection and earth shelter boxes in landscaped courtyard

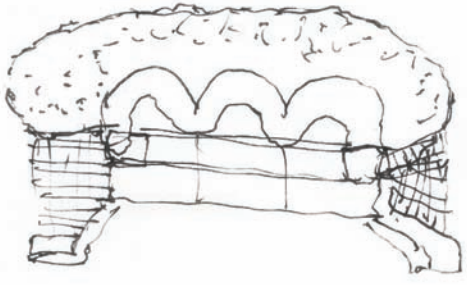


Utility hut, Shop, then Earthship built over a 3 year period

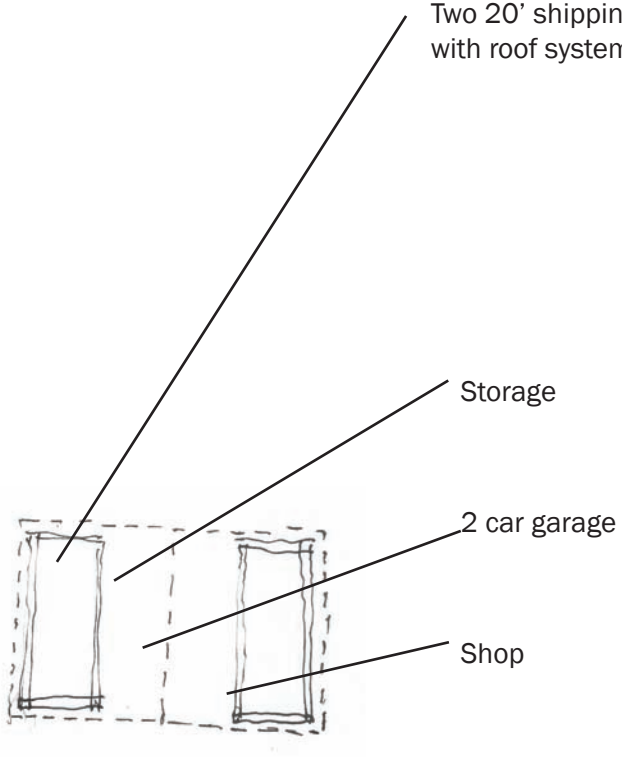
Phase 1 - one “u” module

Phase 2 - two “u” modules and greenhouse

Phase 3 - three “u” modules and greenhouse



Phase 4 - three “u” modules and greenhouse with wing walls and courtyard

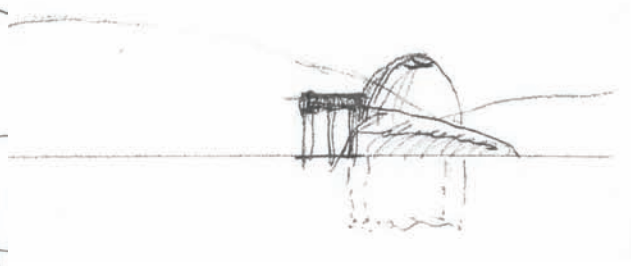


Shop and storage

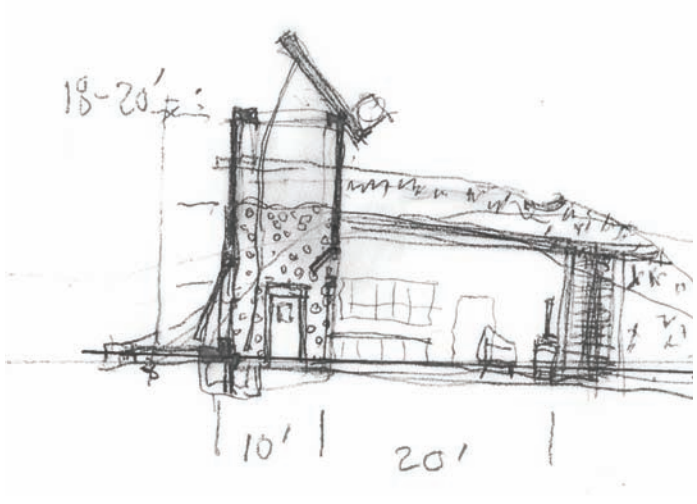
Expandable Earthship Phasing

north

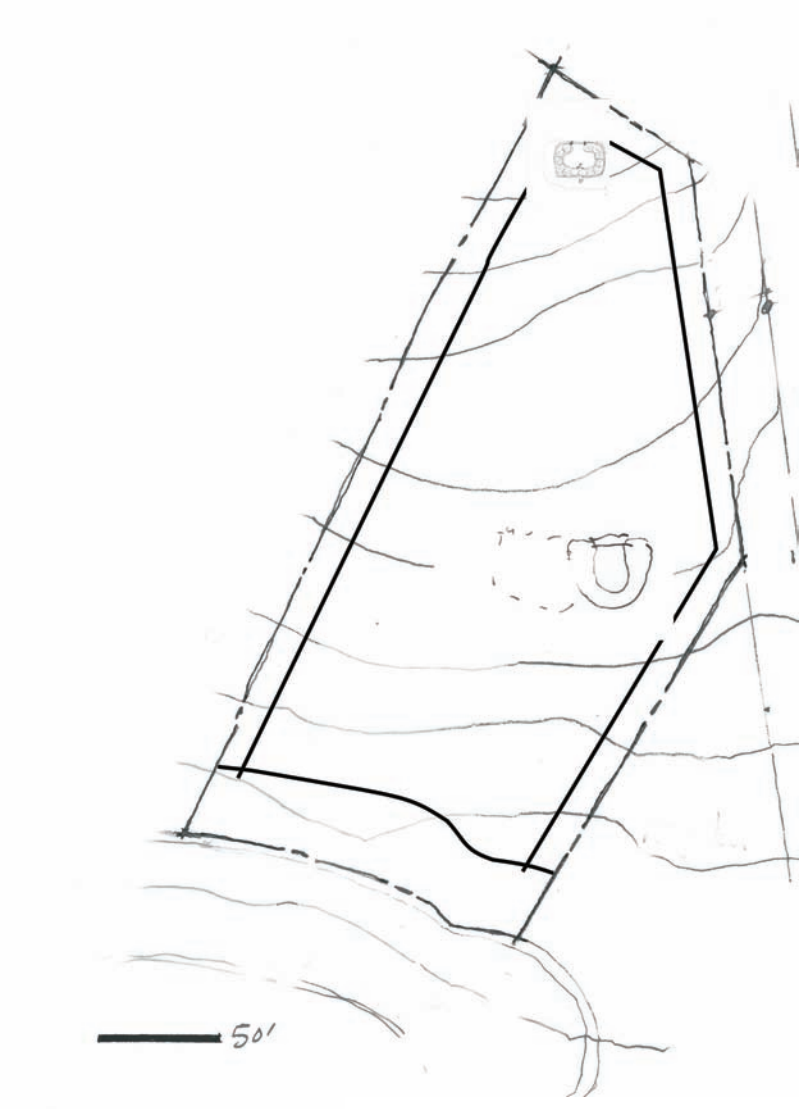
Hut and Earthship with Shop and storage



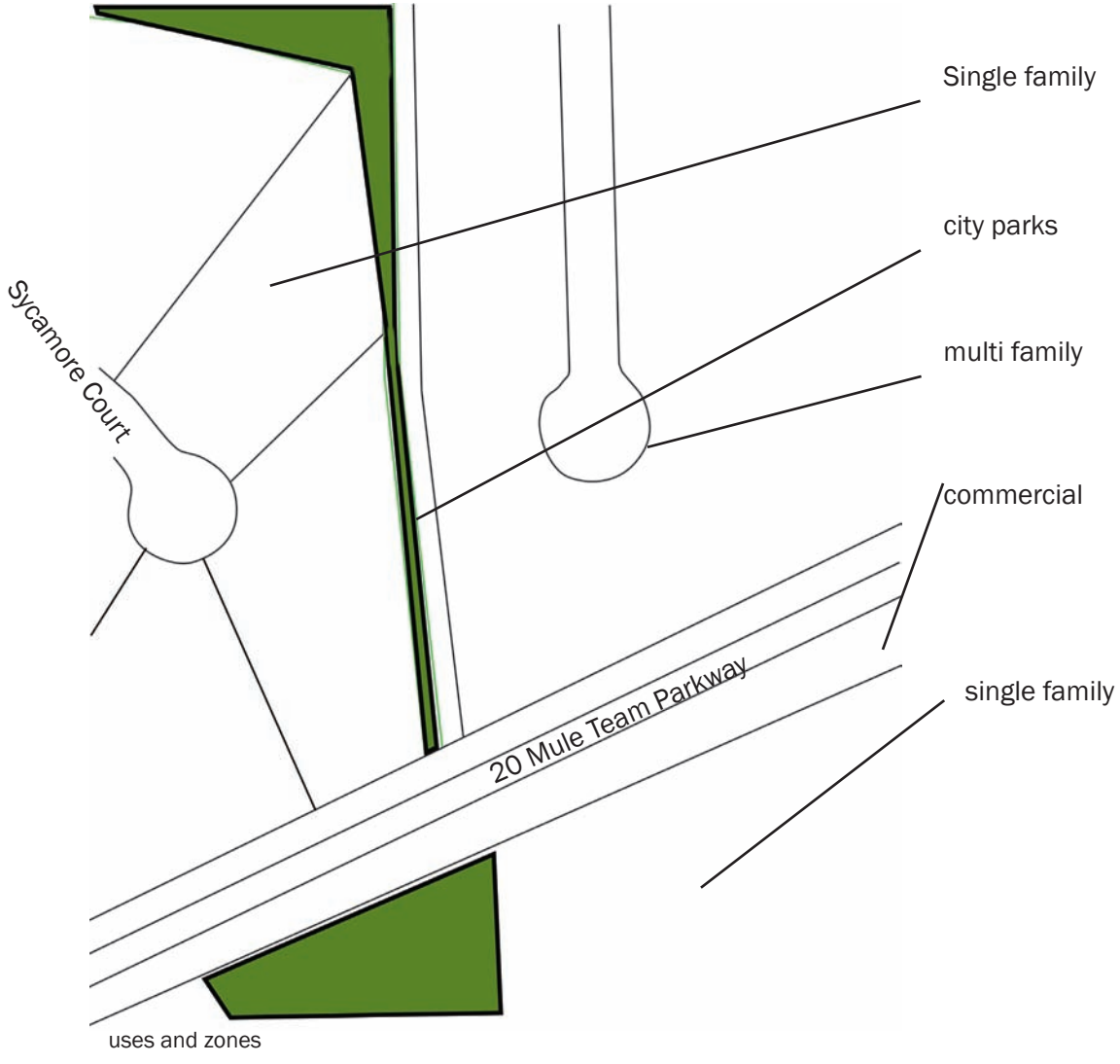
Initial hut configuration - Elevation



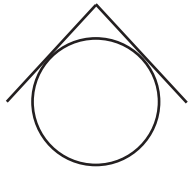
Initial Earthship configuration - section

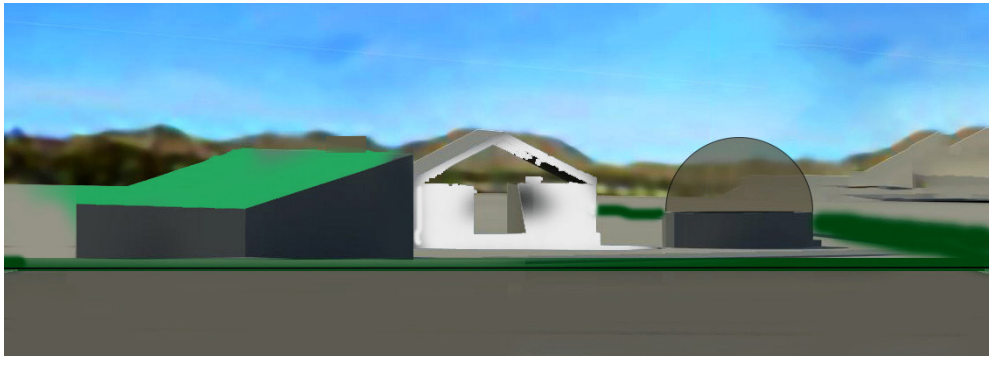


Hut and Earthship placement



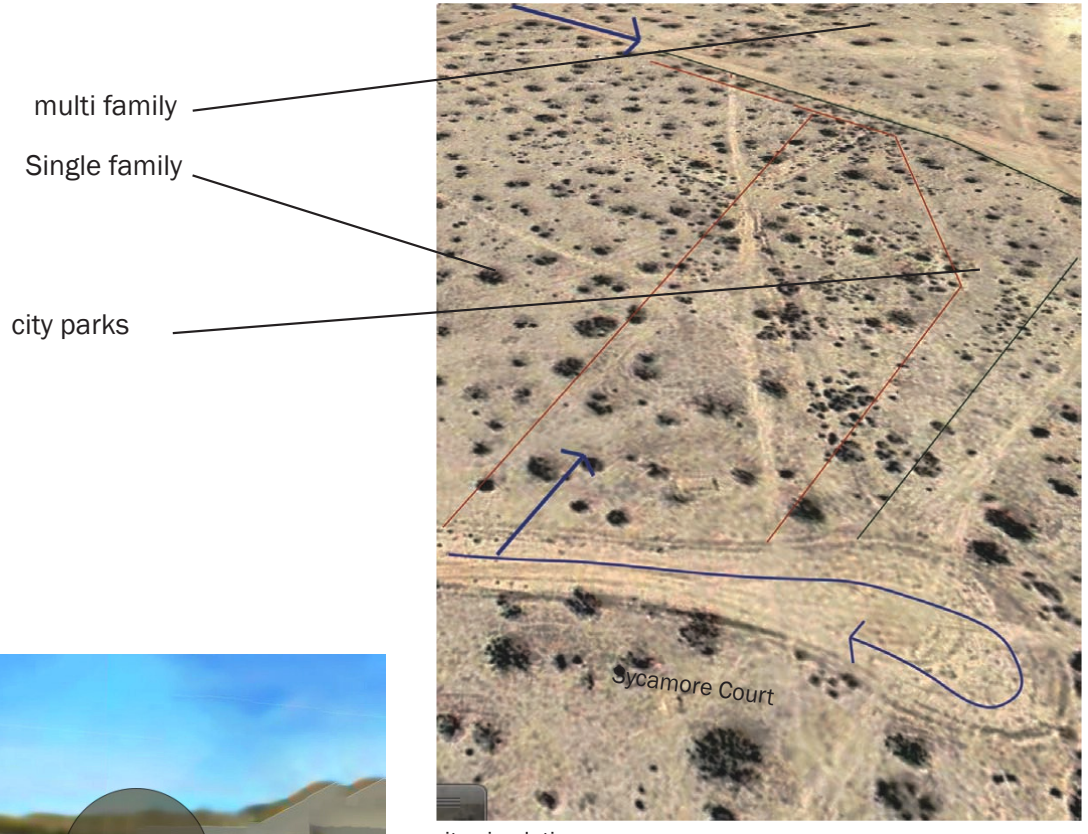
uses and zones



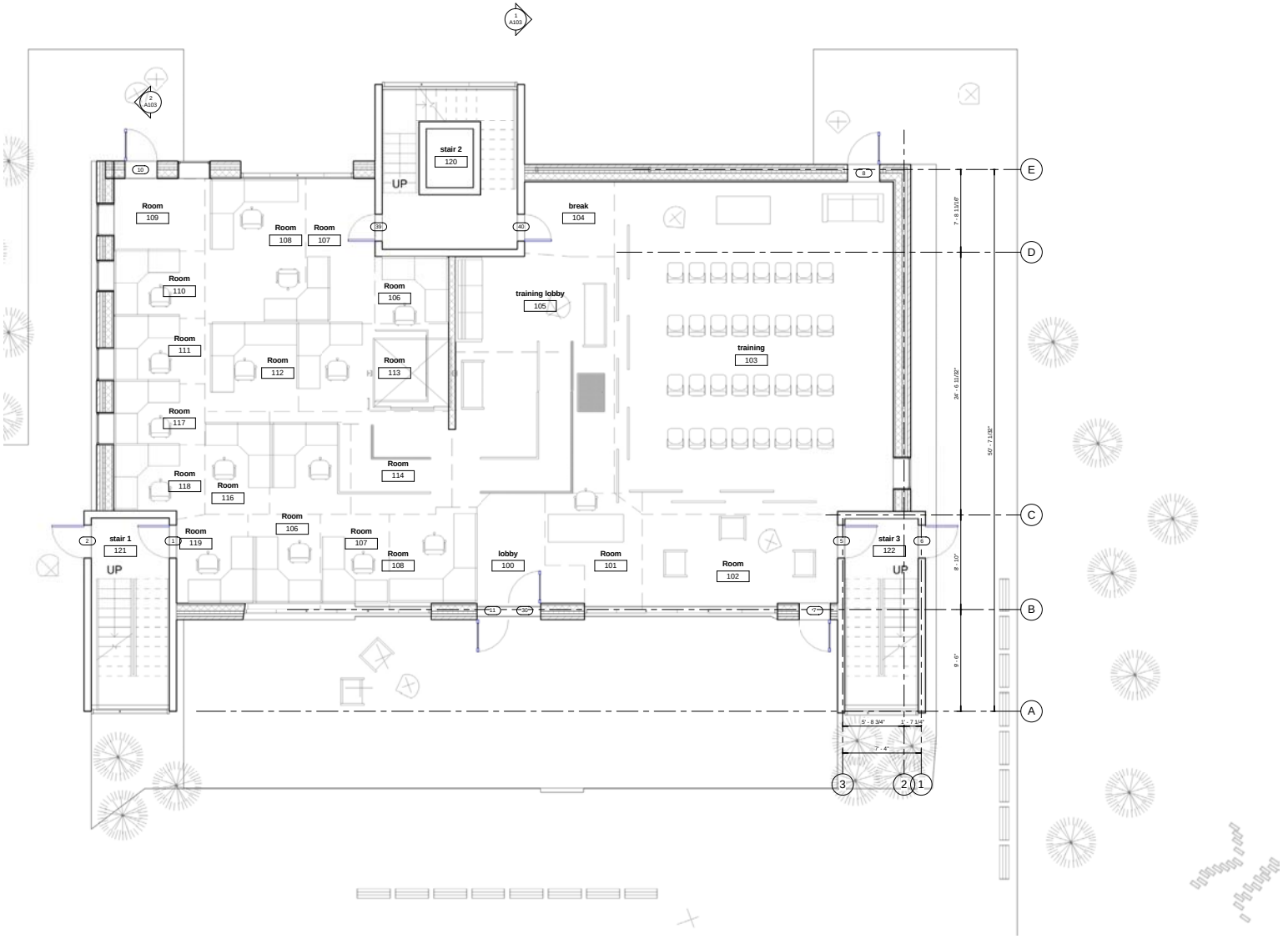


Views framed

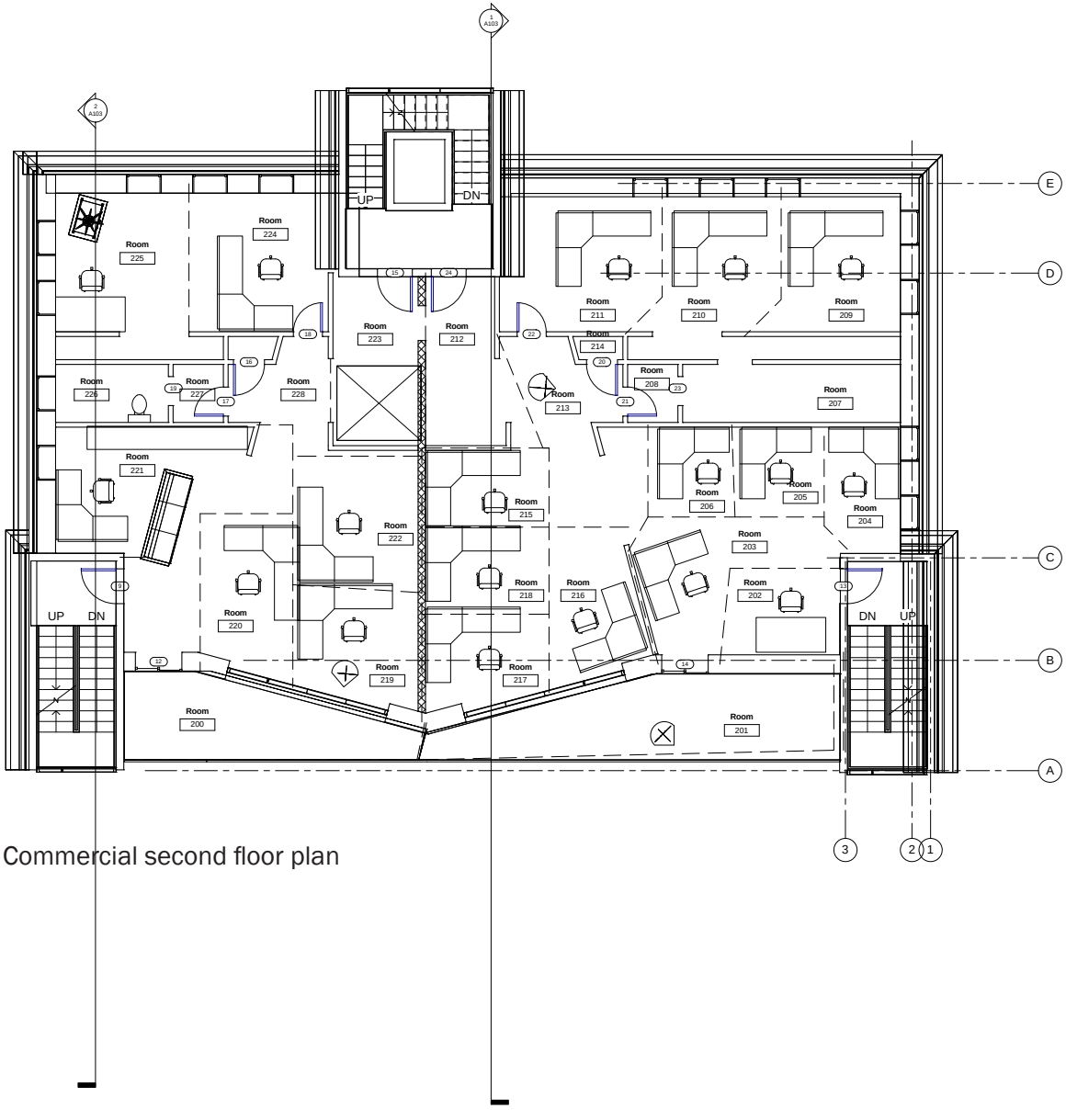
Earthship phase 1



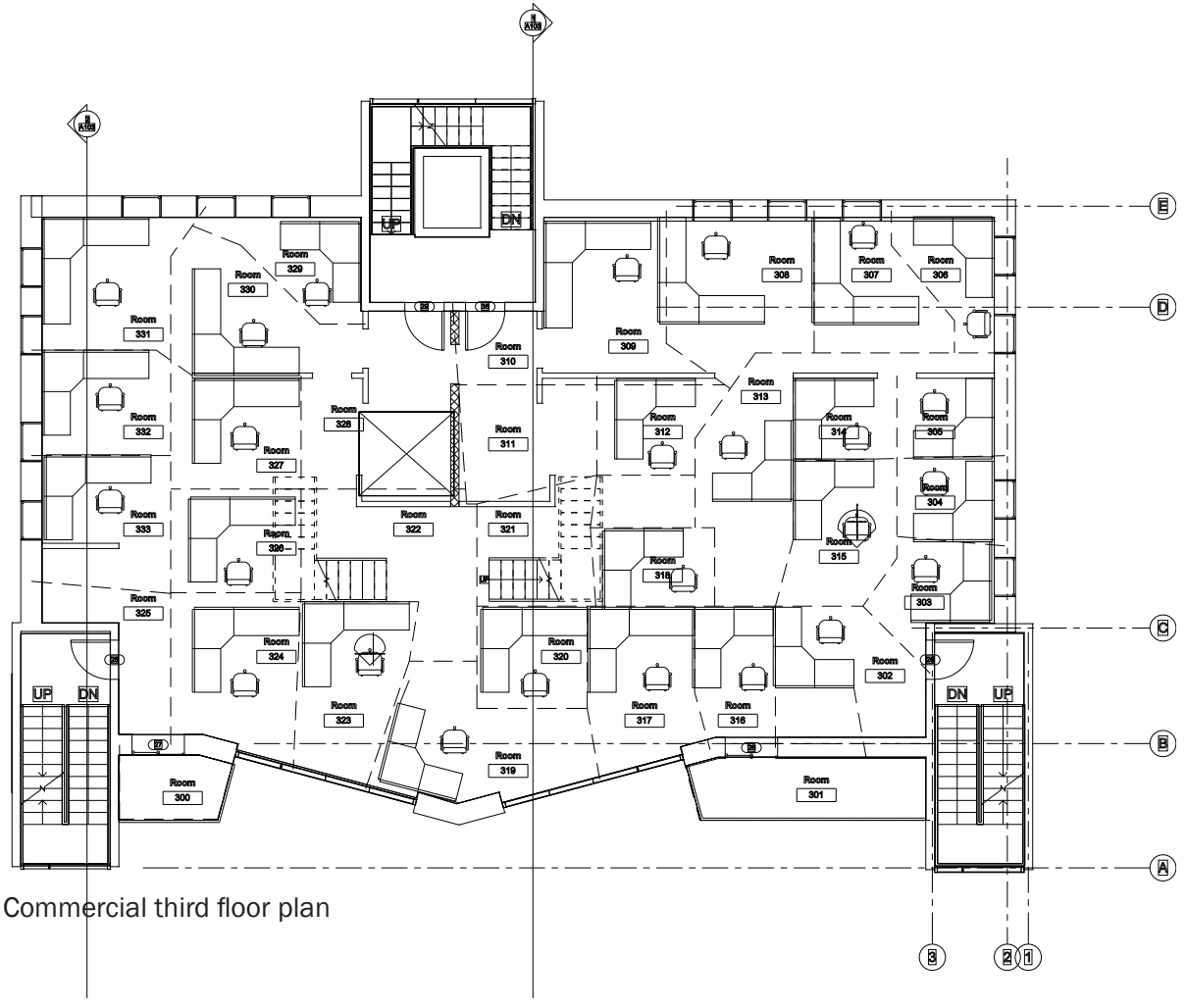
site circulation



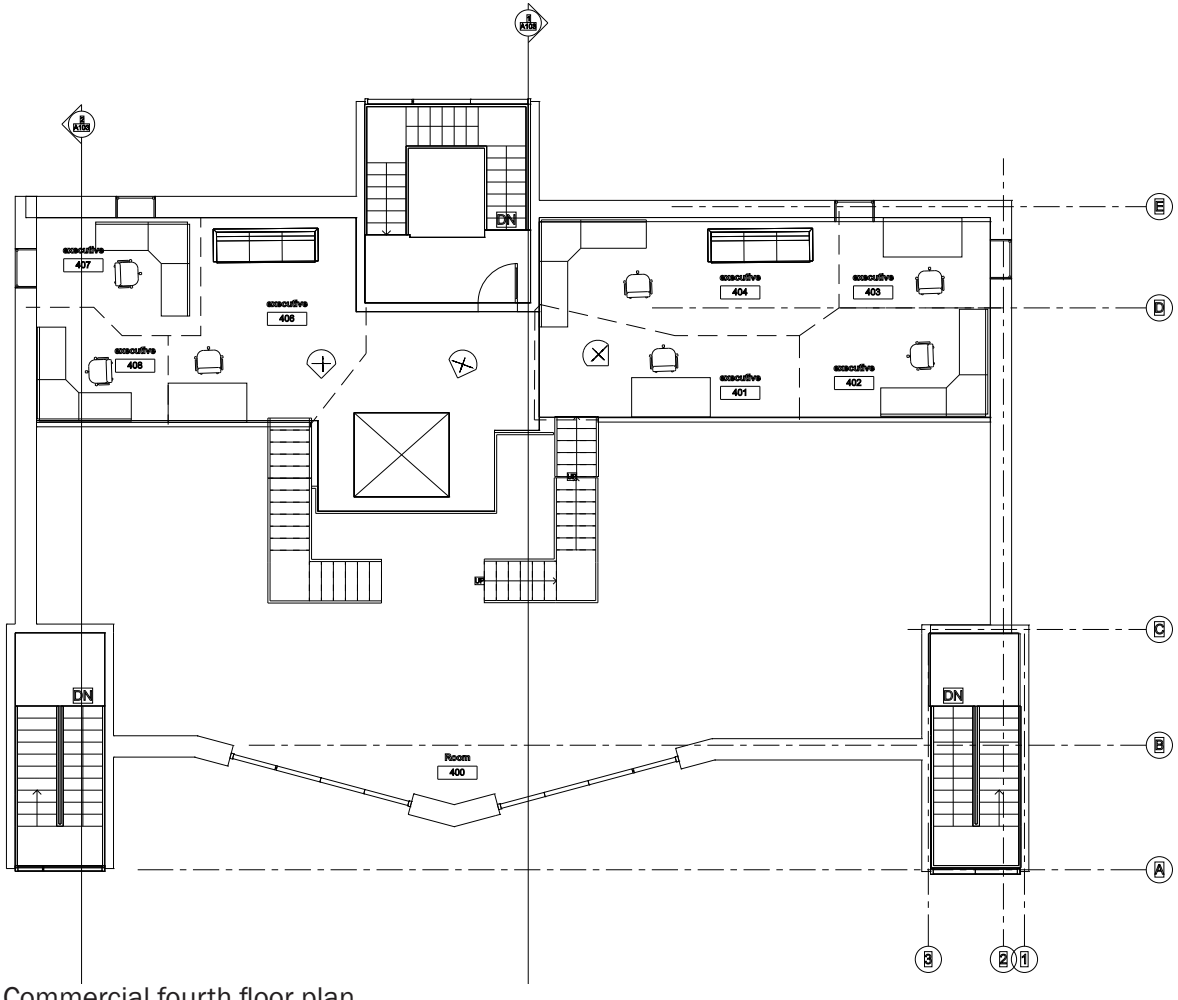
Commercial ground floor plan



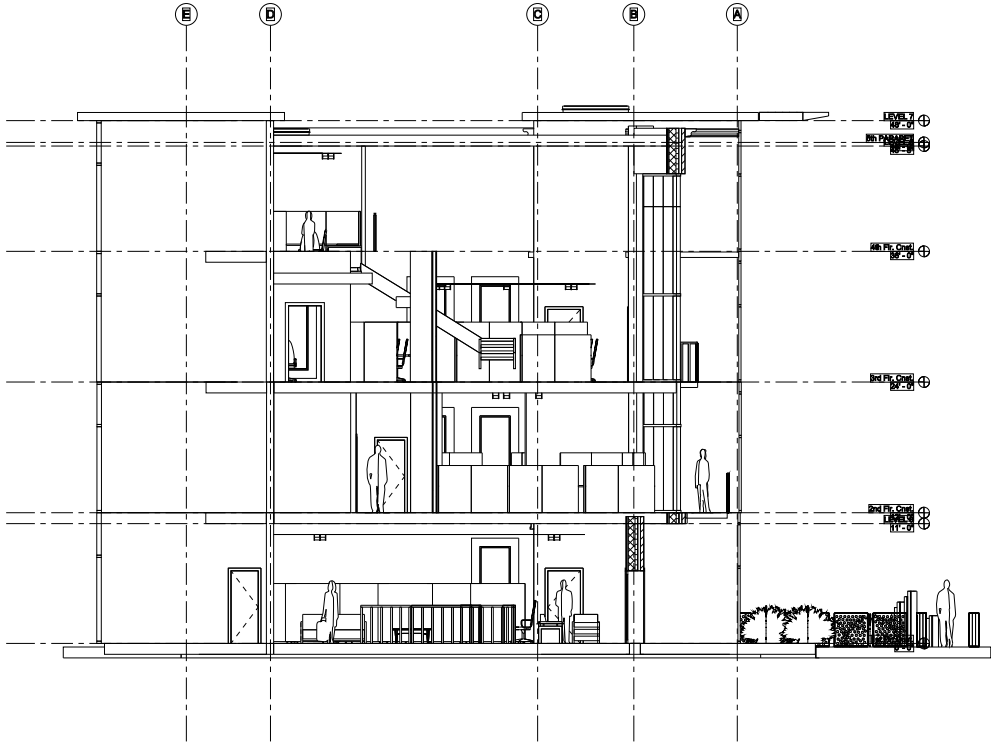
Commercial second floor plan



Commercial third floor plan

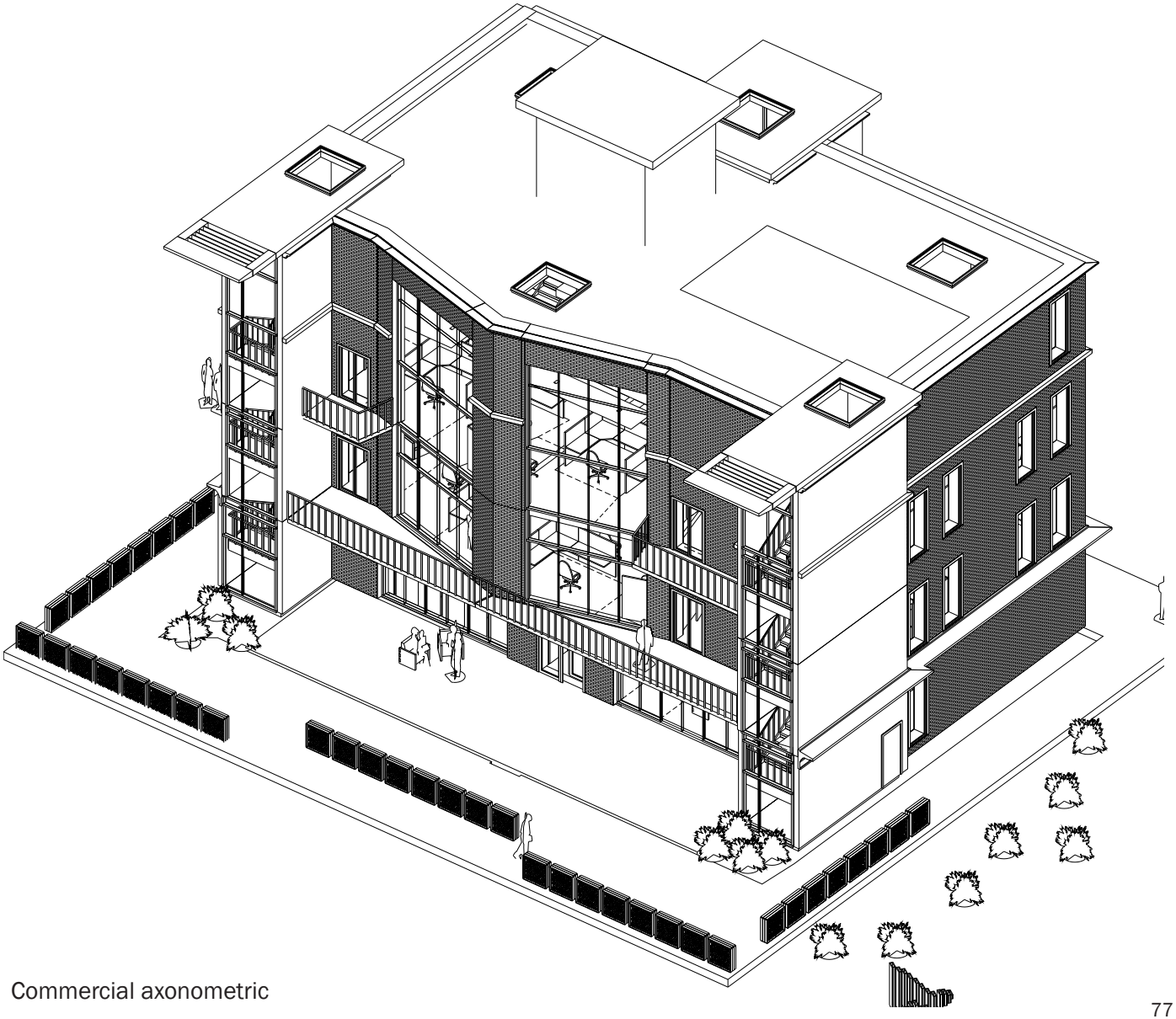


Commercial fourth floor plan

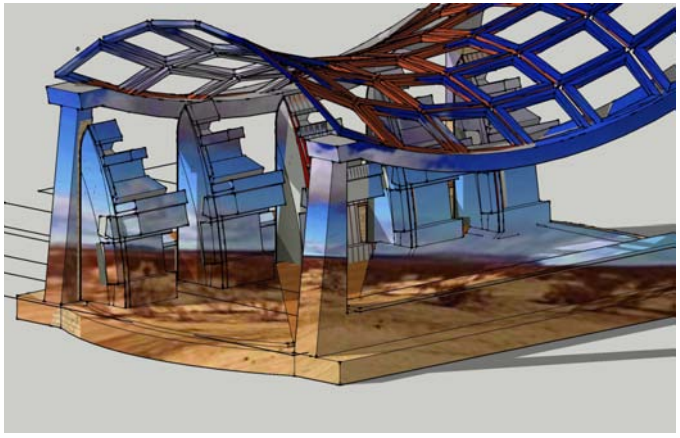


Commercial cross section

Commercial south elevation

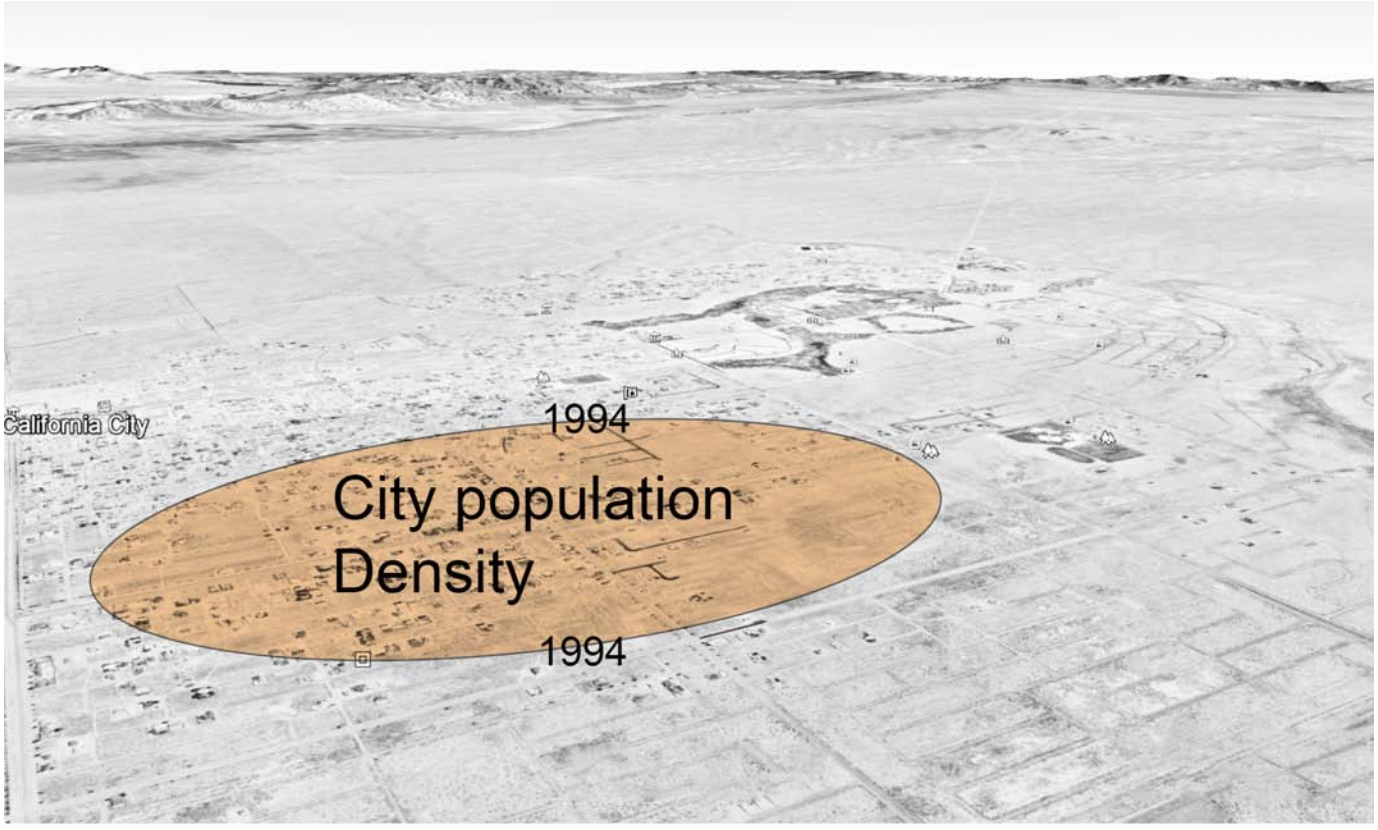


Commercial axonometric

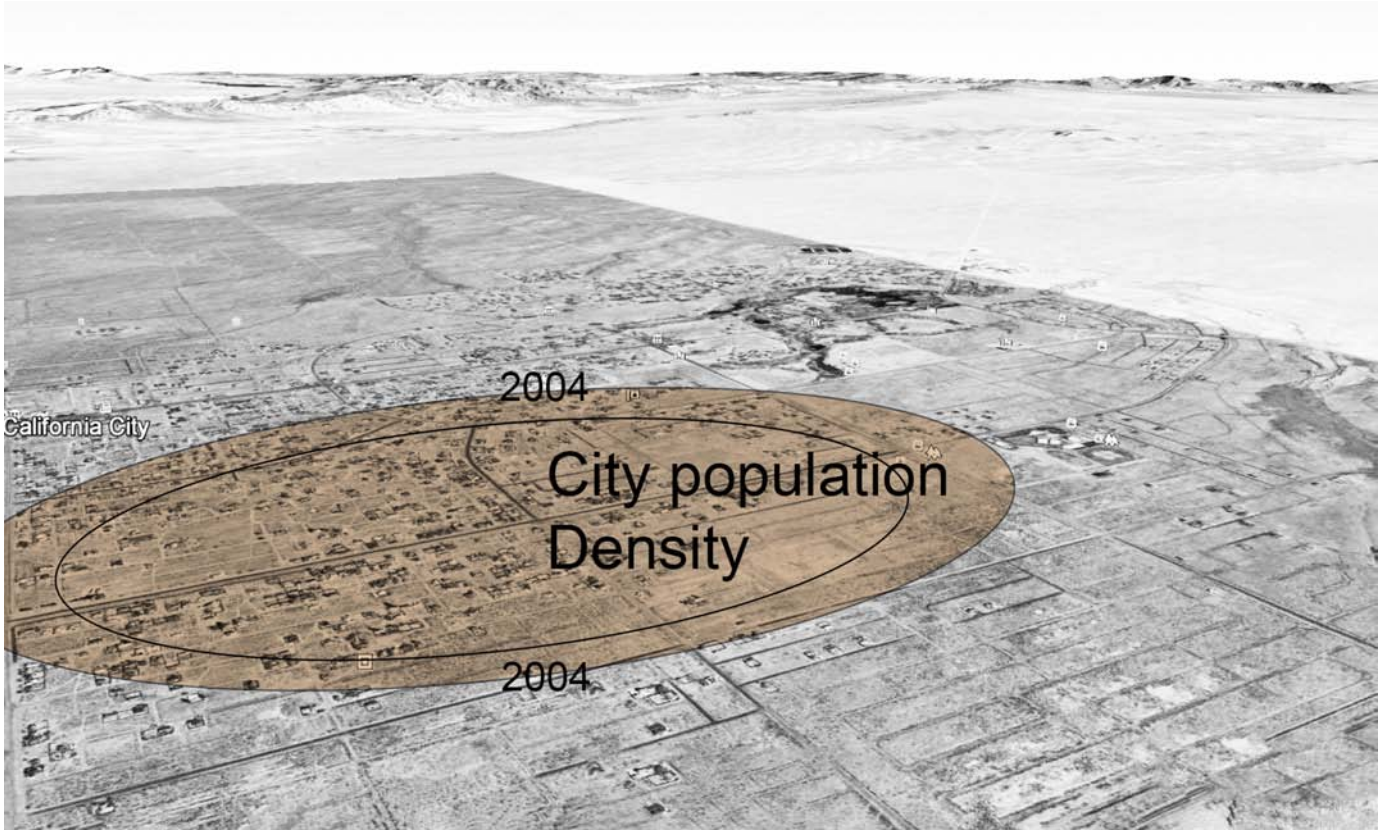


Health - Medical testing kiosk center- city facility

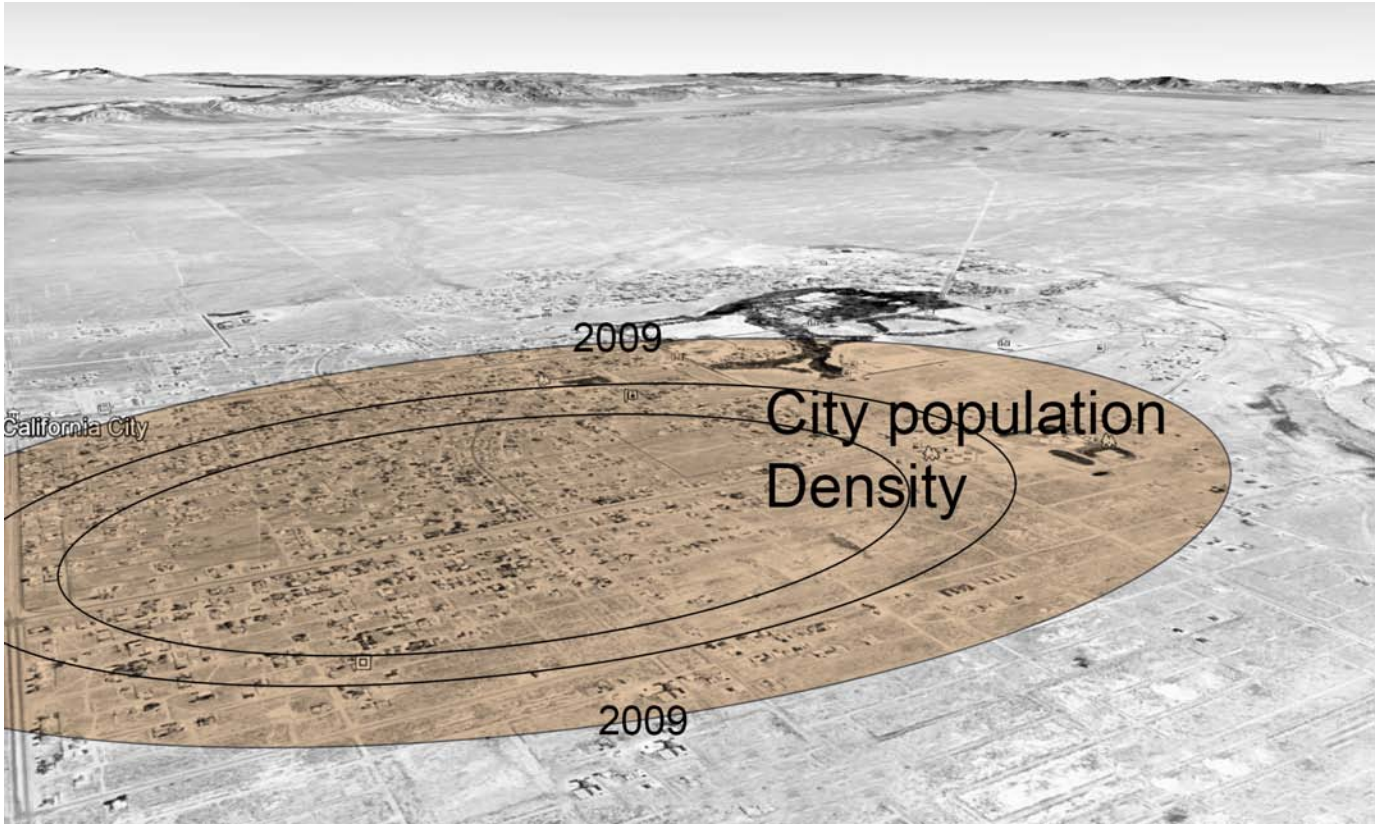
Possible scenario, multifamily housing mixed with single family residences and granny flat additions, parkways developed with walking and biking paths, landscaping and street furniture added to parkways.



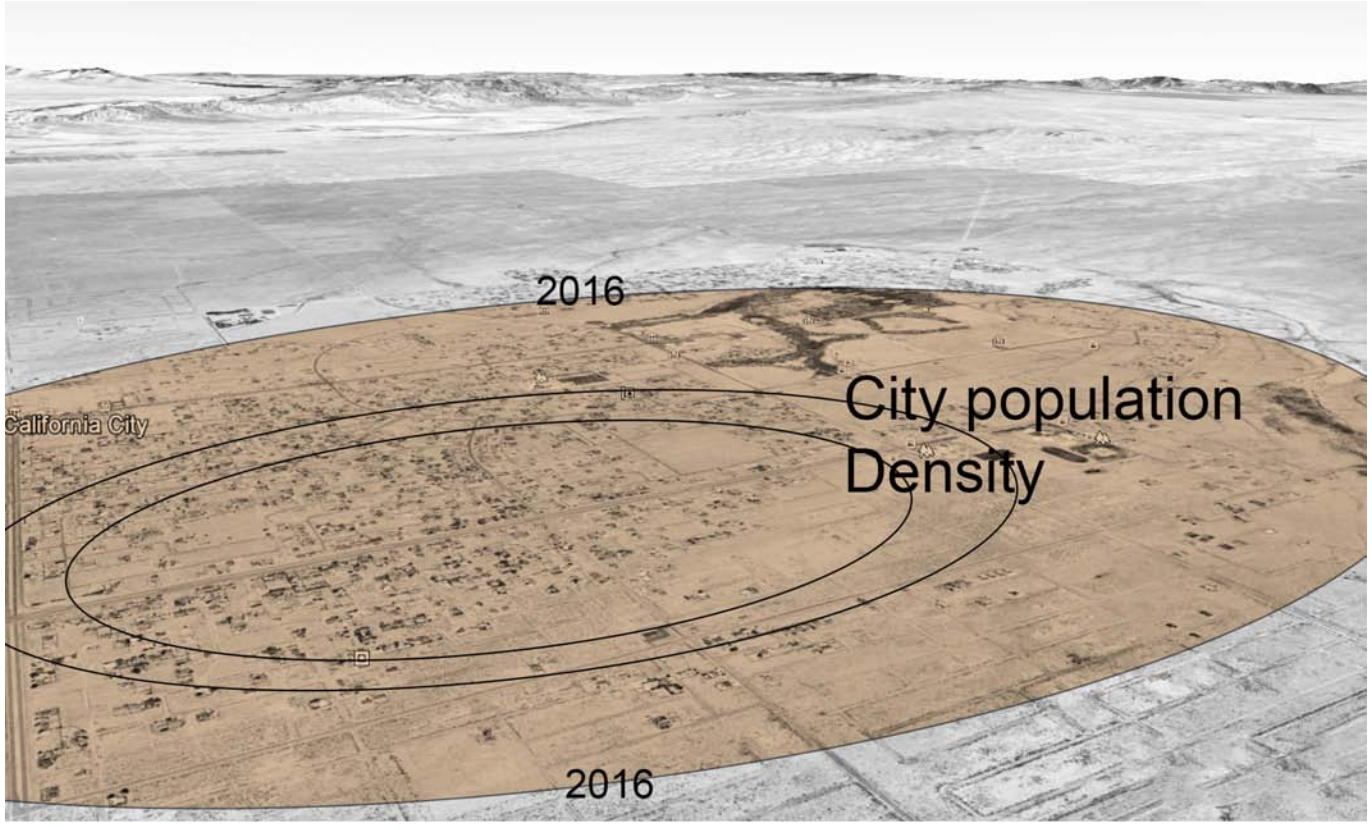
Area occupied in 1994



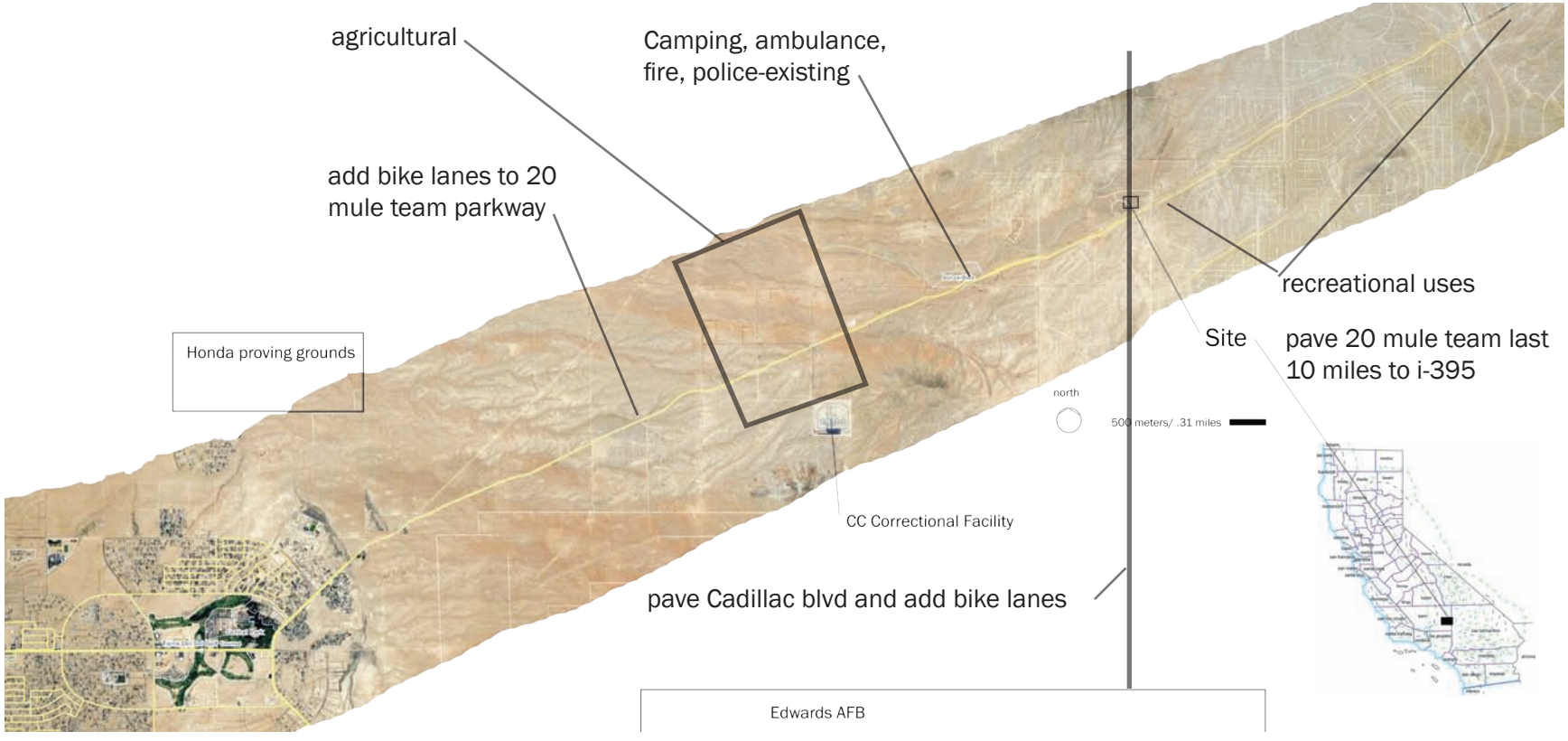
Area occupied 2004



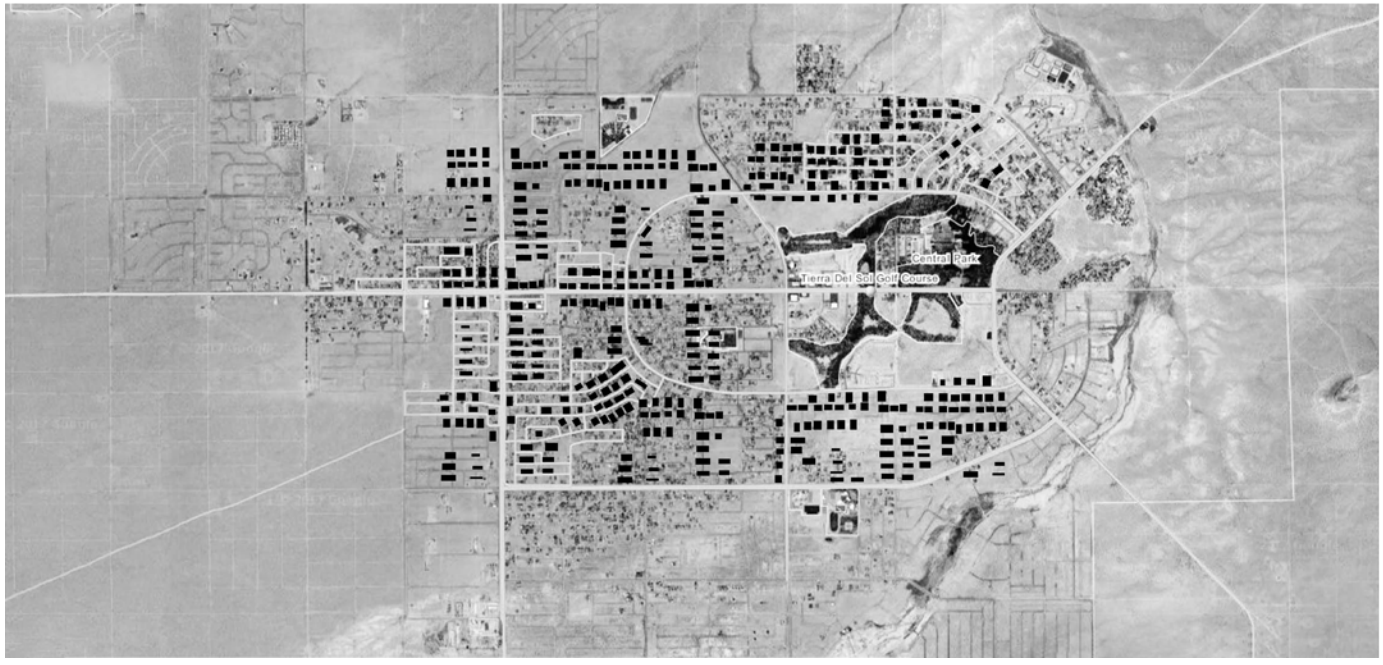
Area occupied 2009



Area occupied now



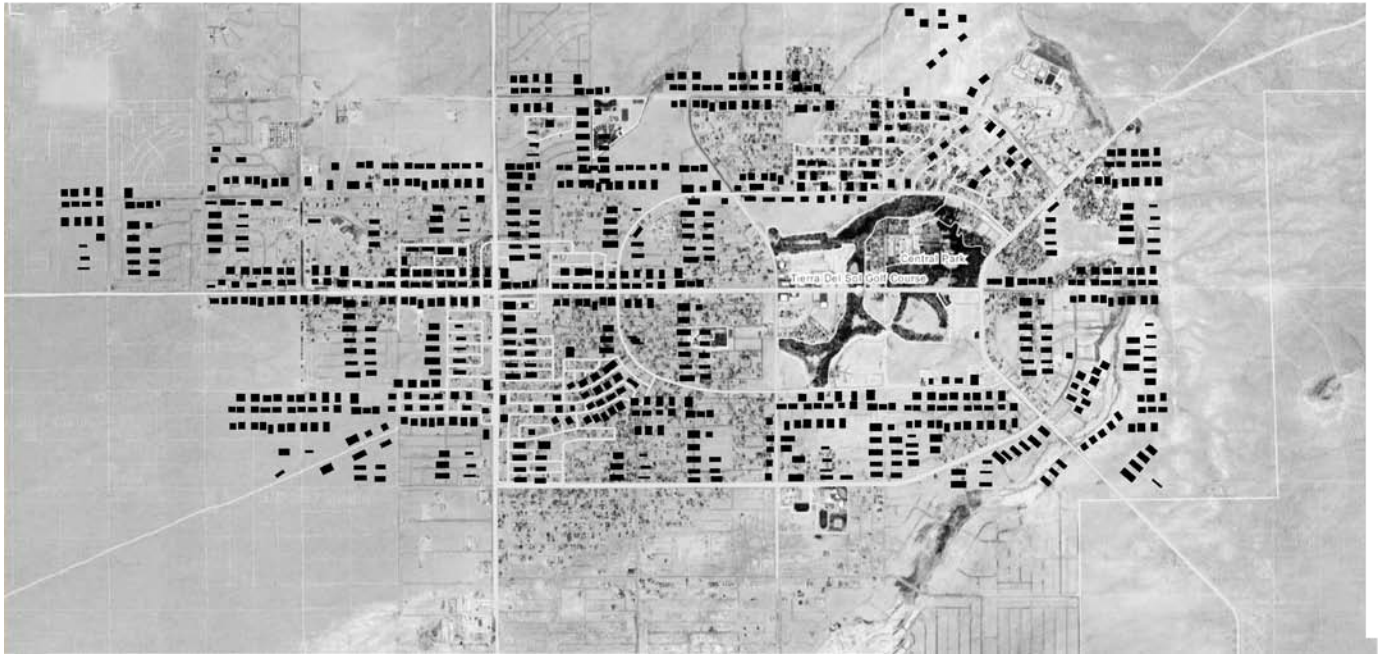
Area east of town now



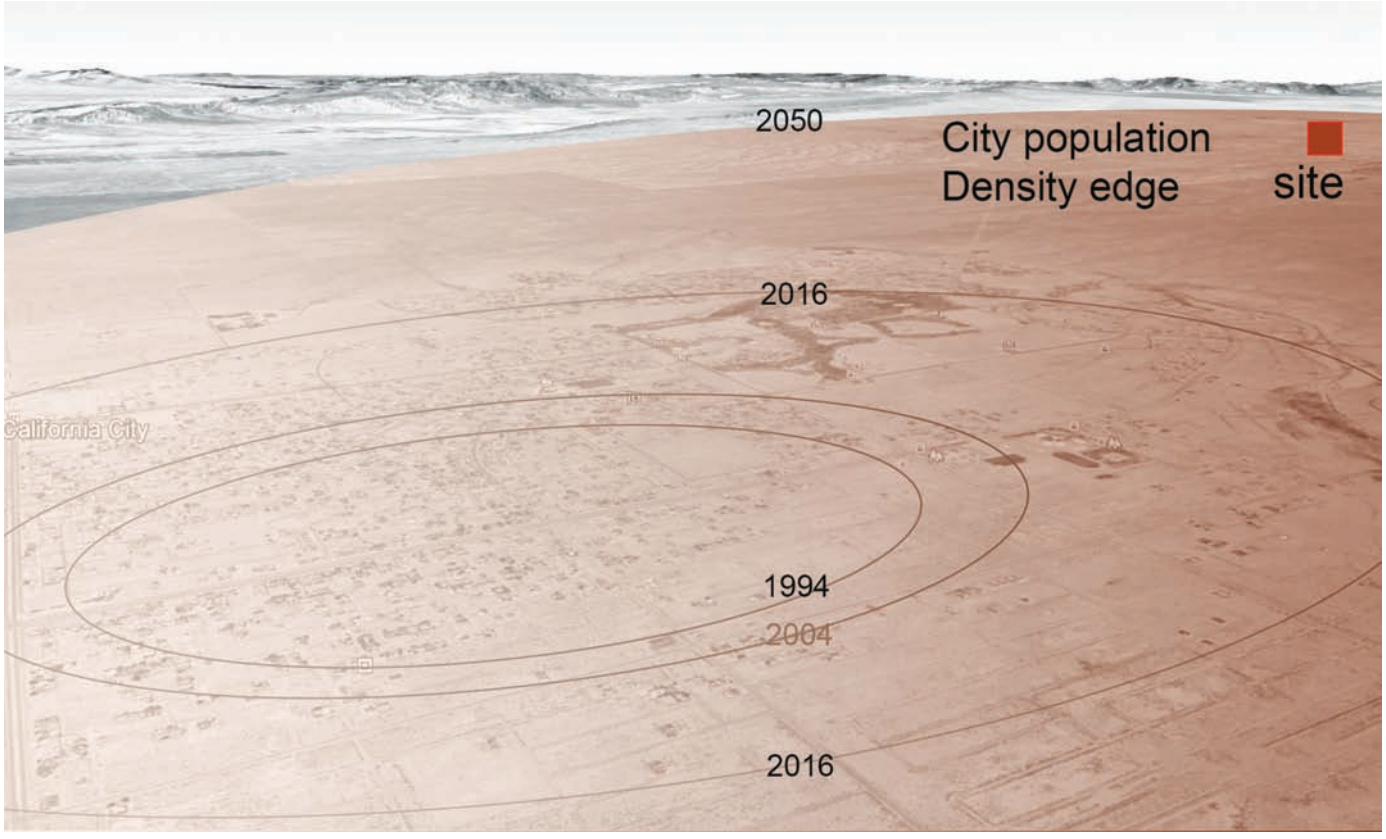
Projected figure ground 2030

The city has historically grown at a slow and steady rate, moving outward along the main roads and expanding in an increasing radius from the center of town with a north east direction due to pressures of growth coming from the dense west edge of the state toward the east in a move toward the cheaper land. To do this better we may be able to create nodes every mile or so where the people in the area have access to healthy foods and activities within a mile walking distance.

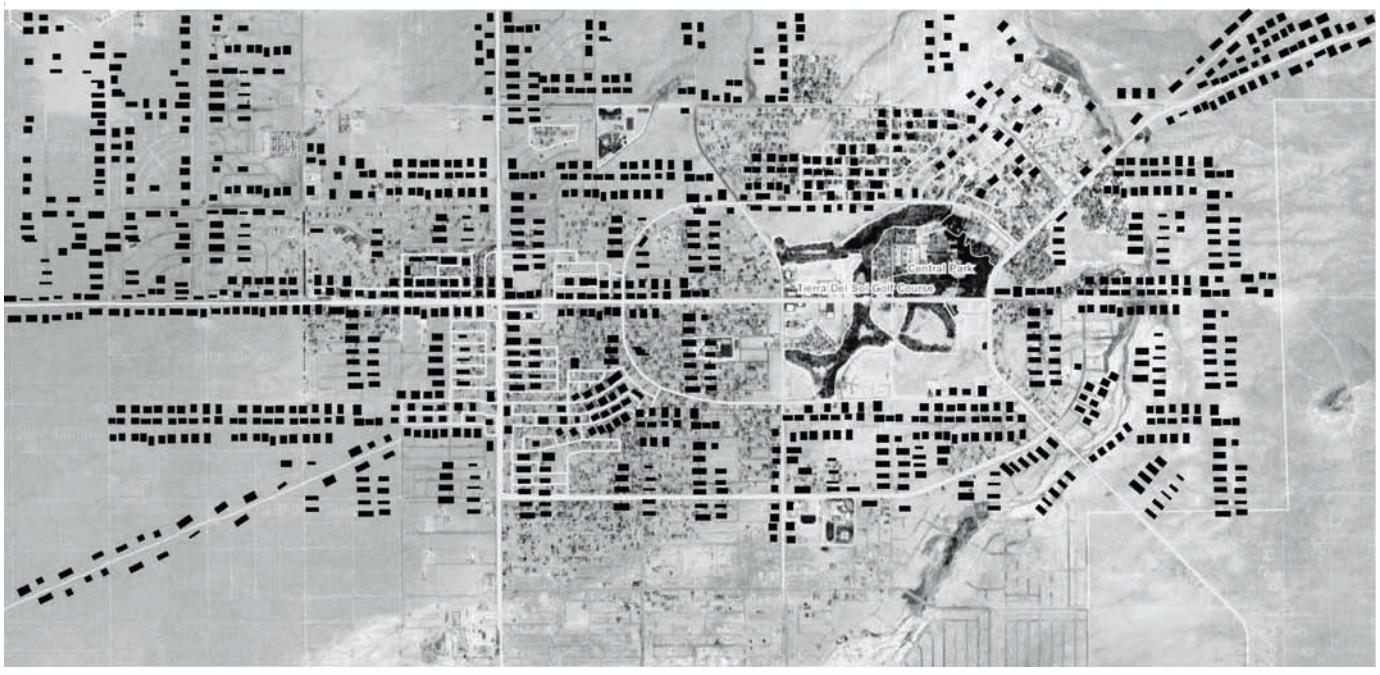
Future growth is nearly impossible to predict, yet low land prices and proximity to Los Angeles give us an idea that growth will occur over a time period and we may predict that it will occur along main roads with utilities first.



Projected figure ground 2040



Projected occupied area 2050

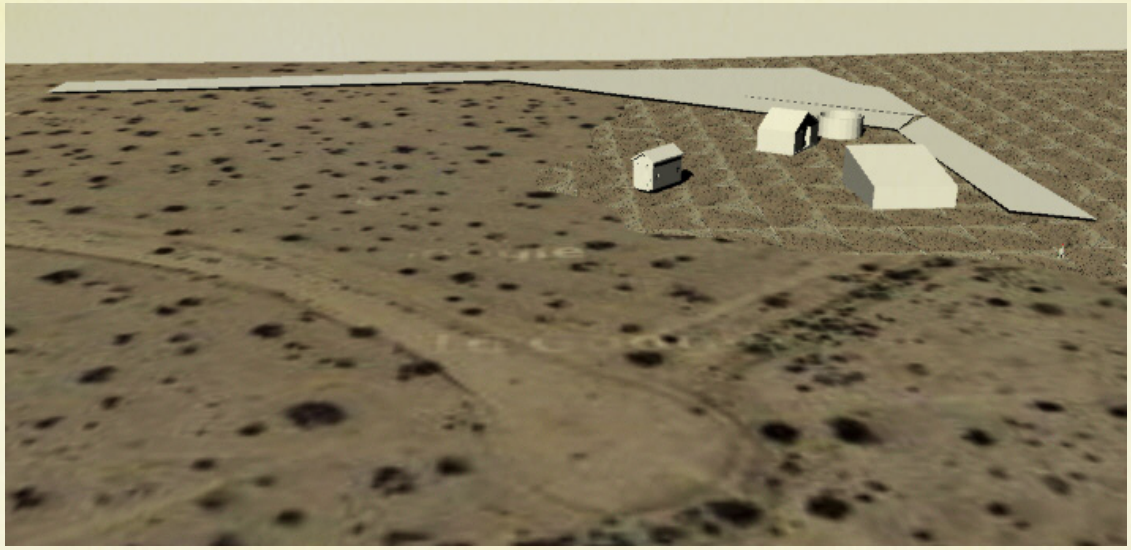


Projected figure ground 2050

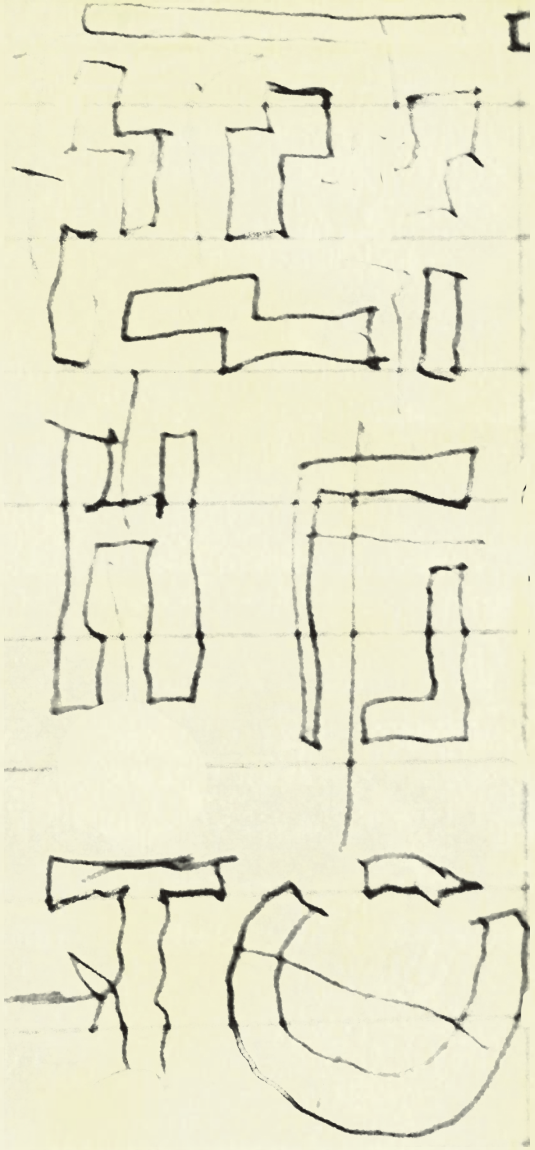
With a population of 500,000 people, the city will need services, shops and food. By creating nodes every mile, we can assure the walk-ability between areas of interesting activities and healthy food.

CHAPTER FOUR:DESIGN PROCESS

4.1 Schematic Design



site1 program looking to the North West



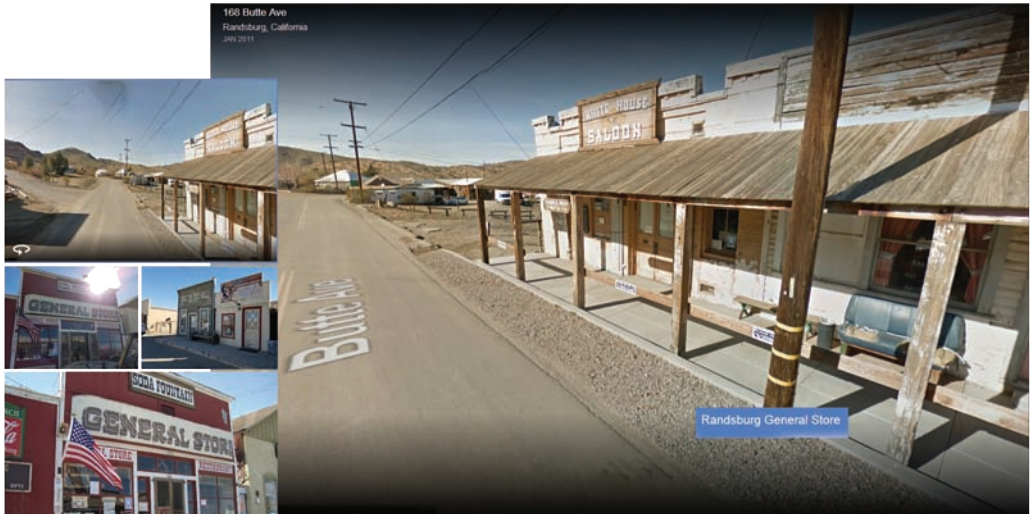
diagramming sketch

Cultural regionalism

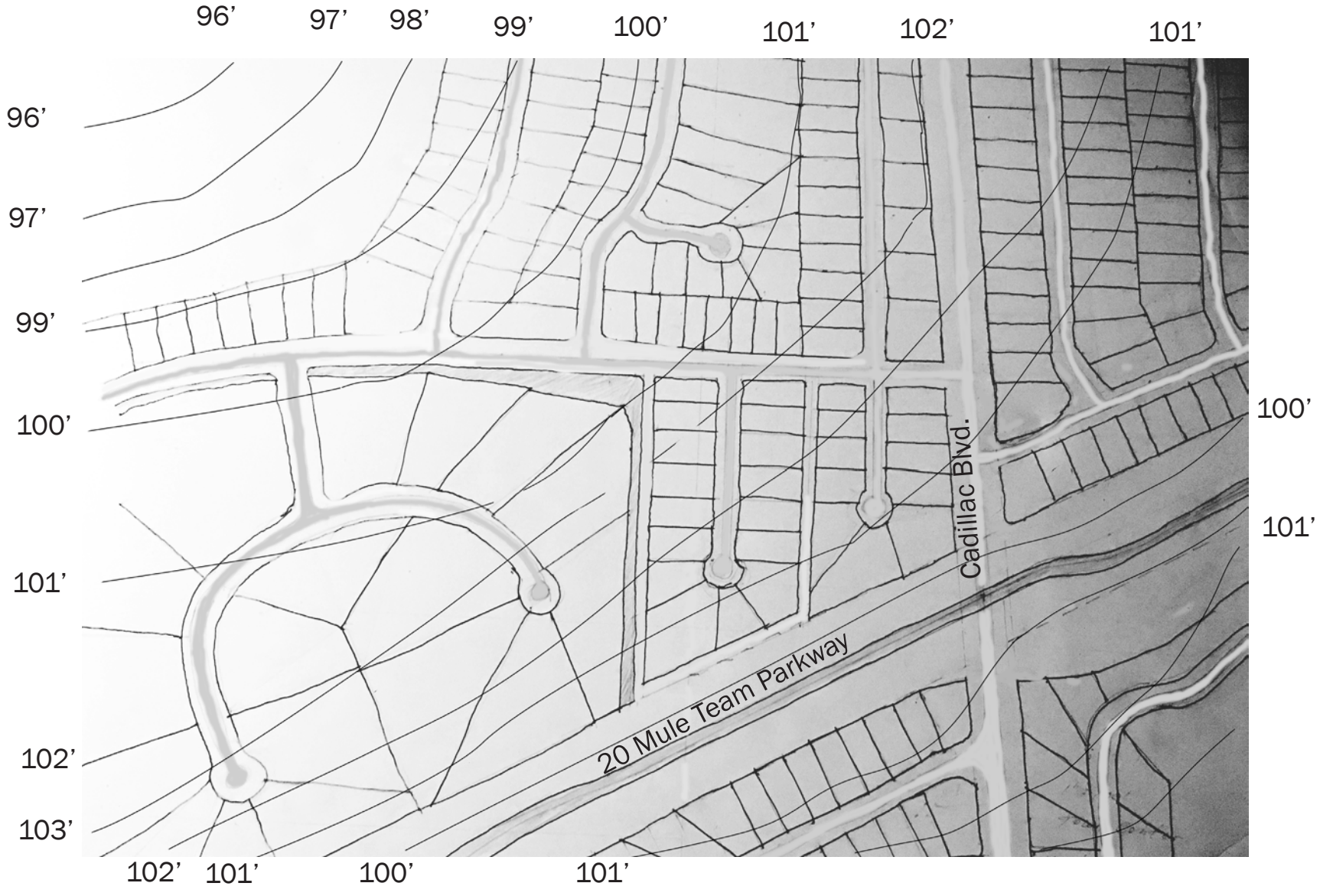
The high desert has a very rough climate and that is the starting point for determining what materials to build a building out of. The local buildings are vernacular of the wild west; weathered, worn and some rough edges smoothed down by wind, sun and time. Solid and permanent materials need to be used, paint is blown off the buildings by the constant wind. Roofs need to be highly secured and protection against sand storm infesting the home need to be offered.

The **Silver Saddle Ranch & Club** is the ideal solution for quality away-time. Located in the high desert near the foot of the majestic Sierra Nevada Mountains, **Silver Saddle Ranch & Club** is a 130-acre resort oasis getaway with fully-equipped professional facilities, as well as crowd-pleasing recreational **activities** and resort **amenities**.

Silver saddle ranch and club nearby entertainment

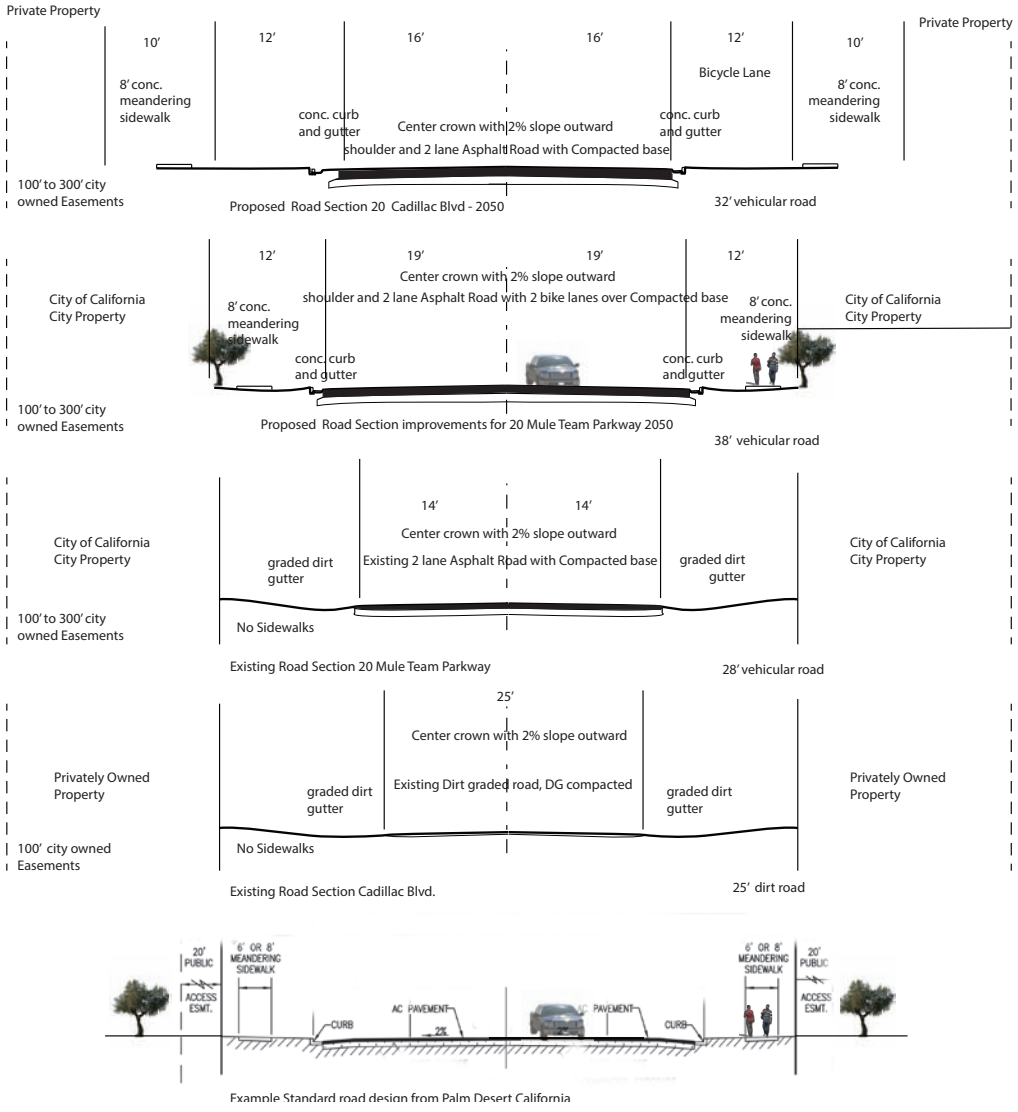


Randsburg - nearby ghost town



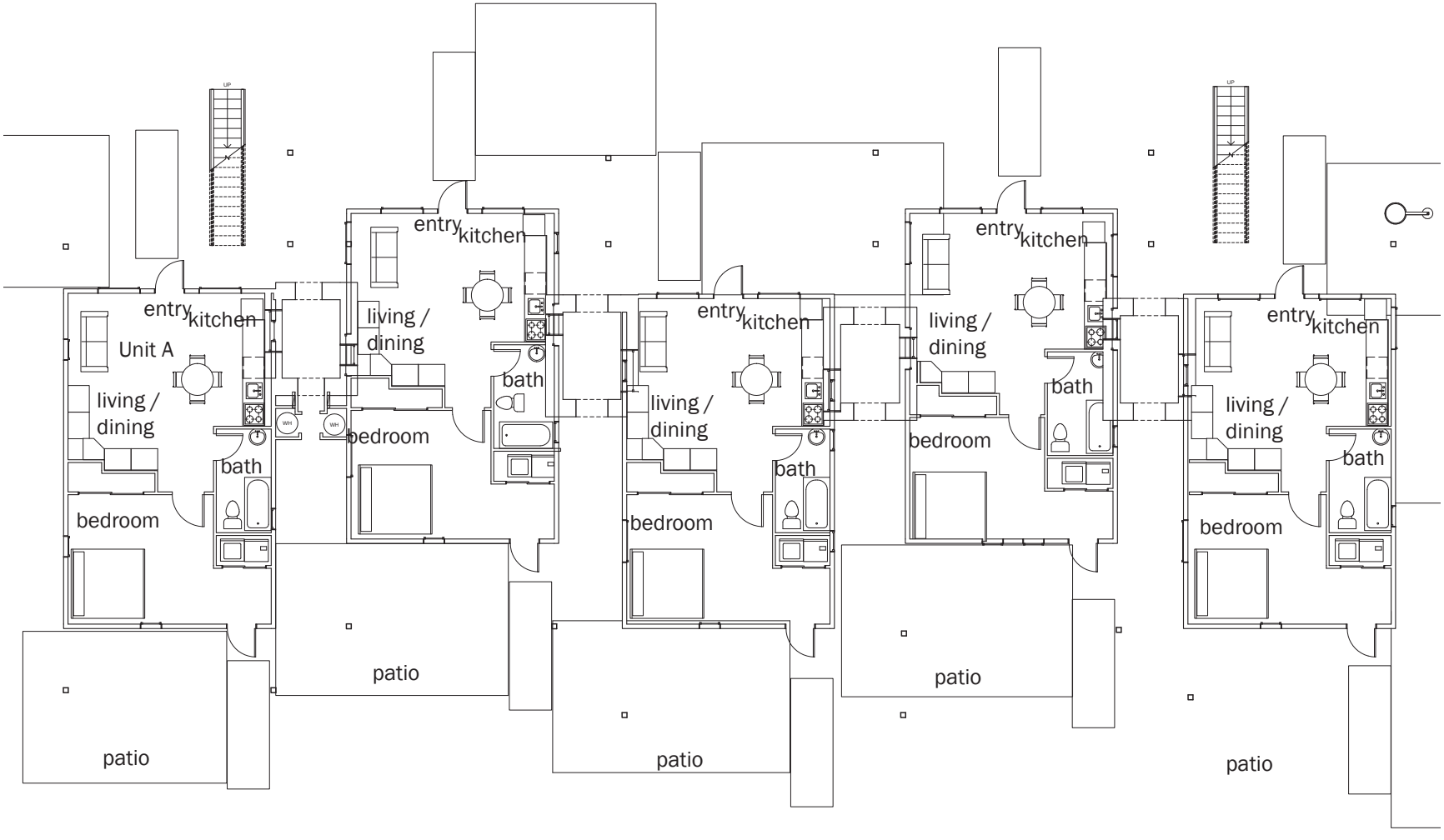
Site Topo - Existing

4.2 Design Development



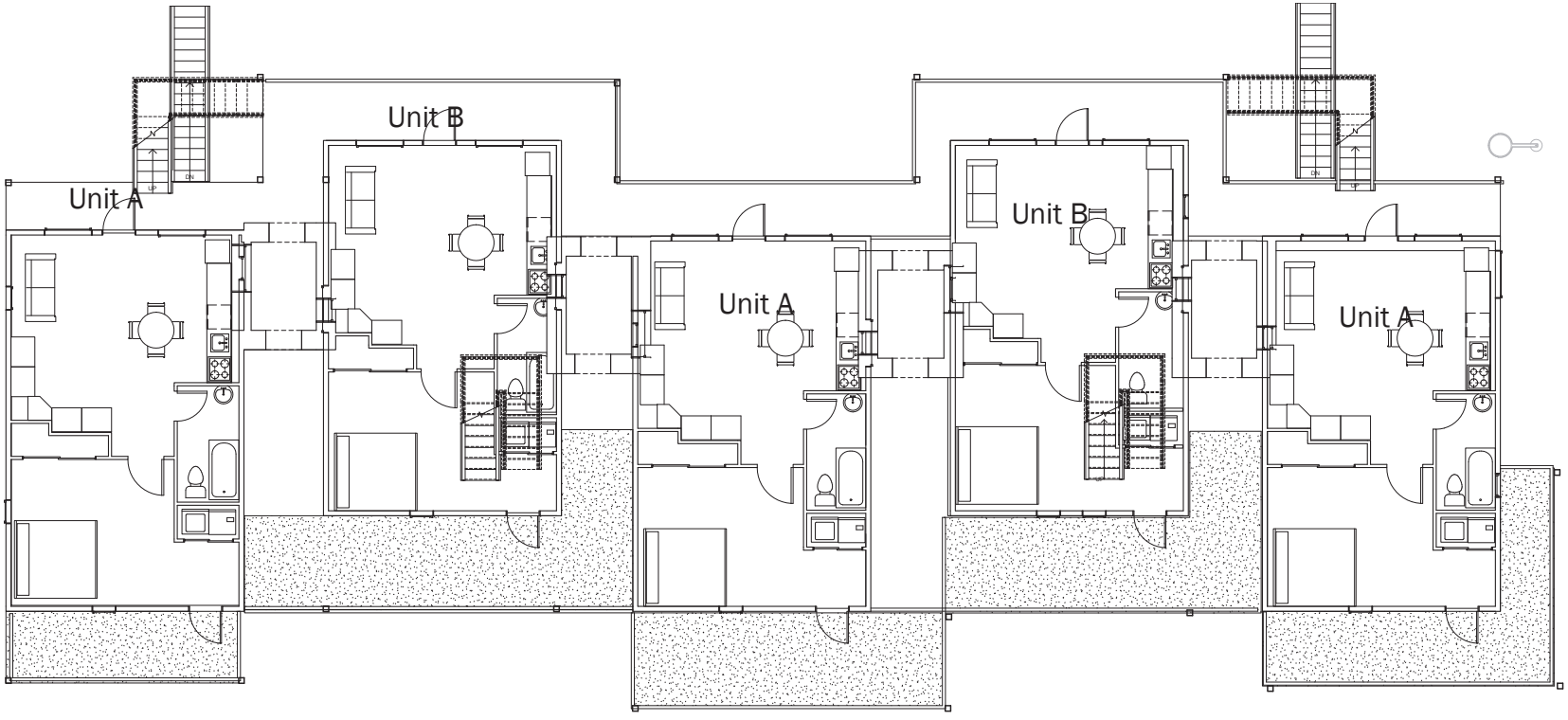
20 mule team multifamily 20 unit building, section, rendering

The site is connected to city parkways wrapping around the north and west sides of the site. This city has allocated parkways travling throughout the city and the corner parcel has the potential to house a civic function such as clinic.

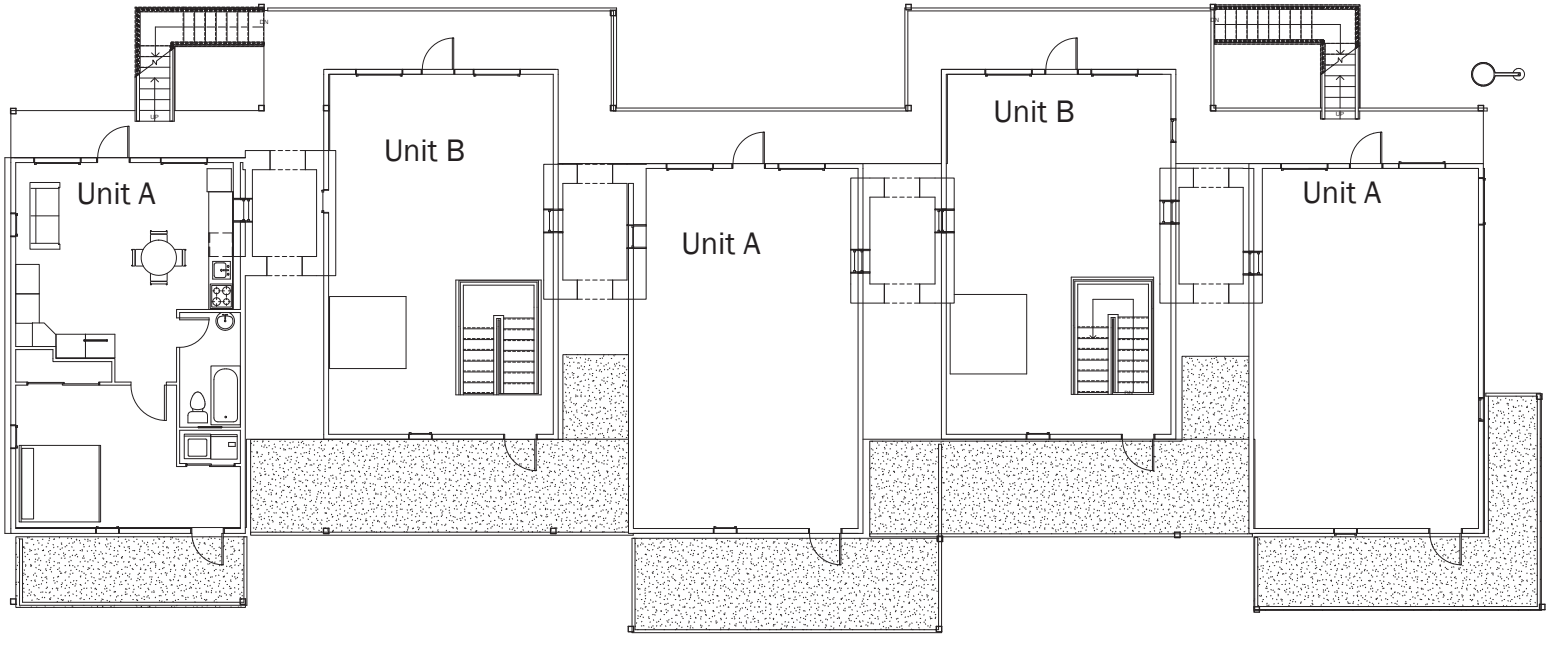


Ground Floor Plan

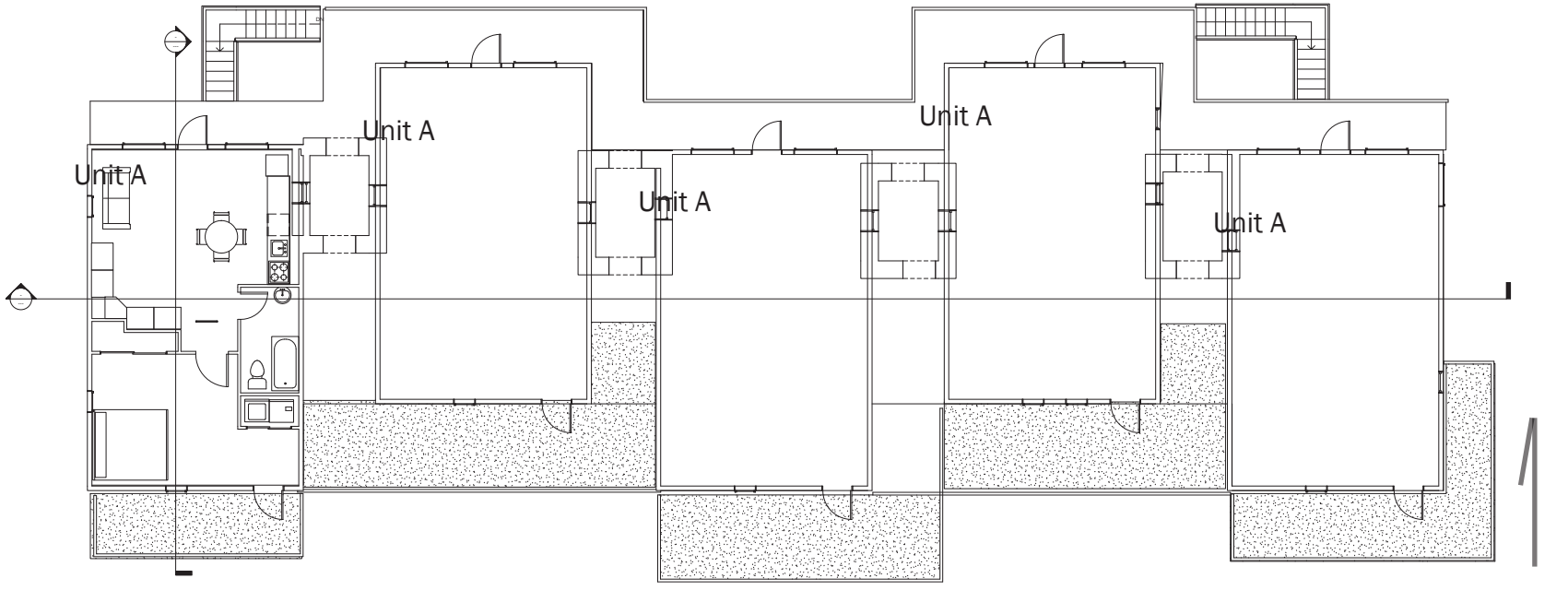
20 mule team multifamily 20 unit building, ground floor plan



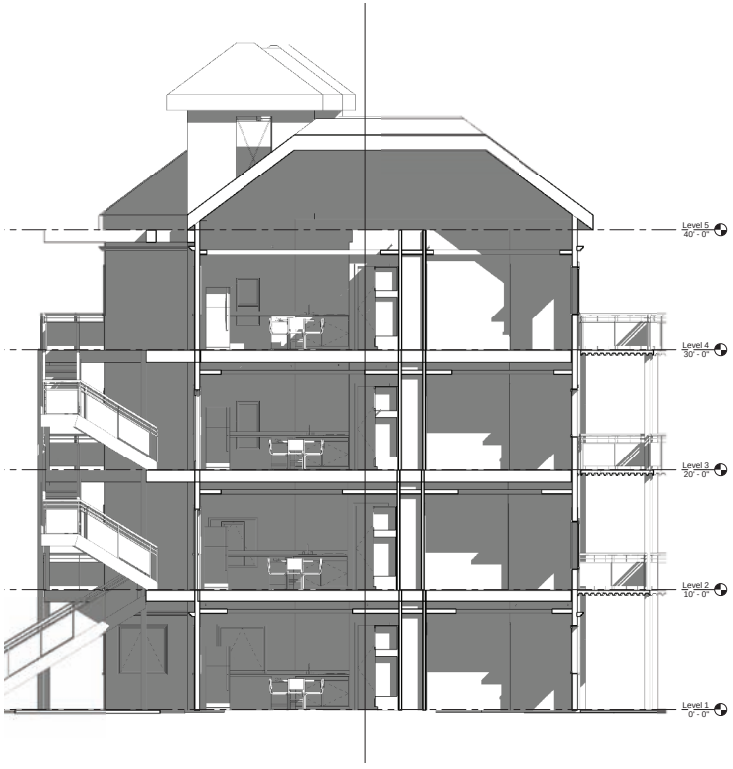
Second Floor Plan



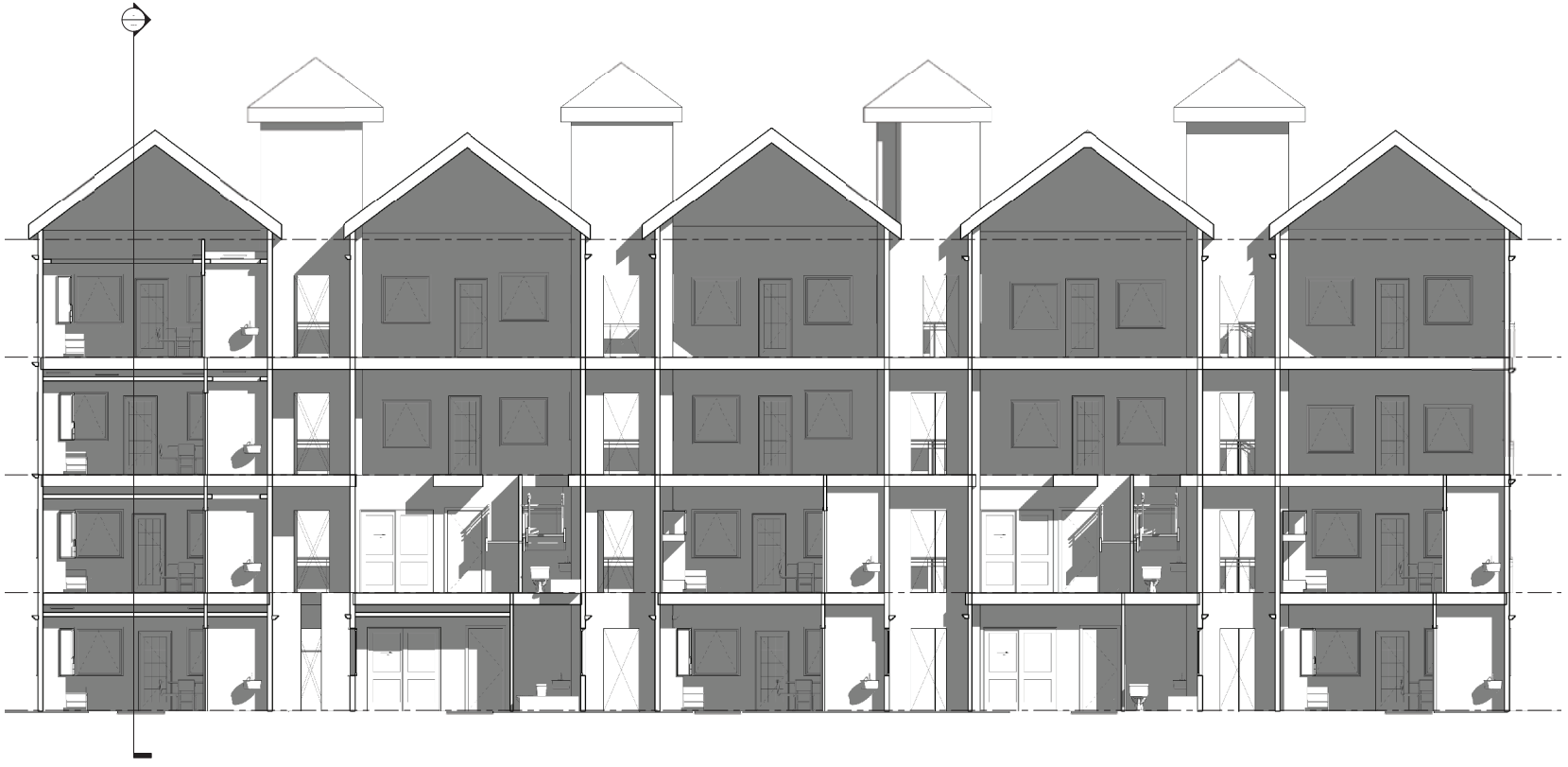
Third Floor Plan



Fourth Floor Plan



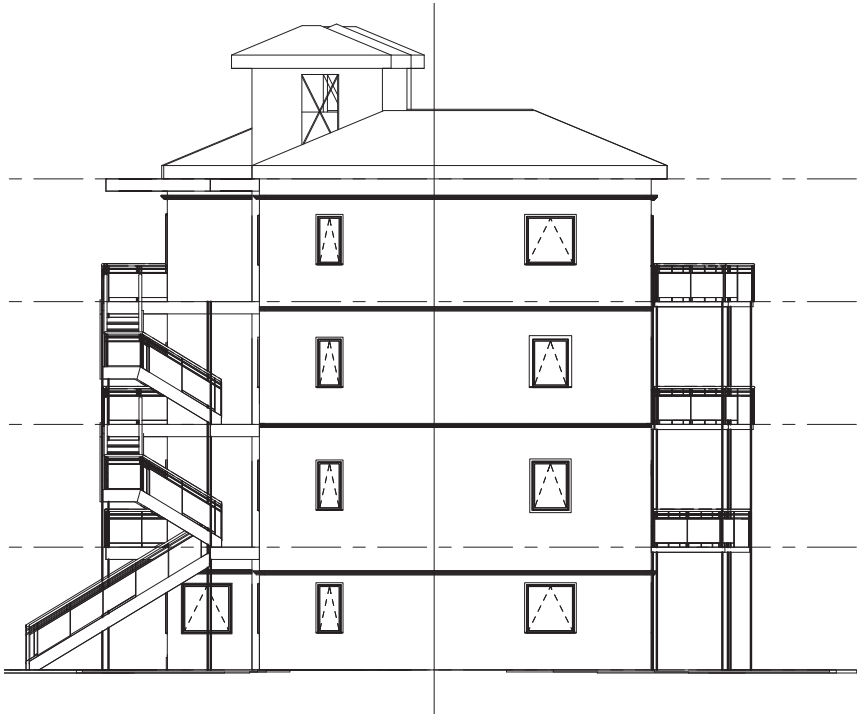
Section



Multi family longitudinal section

west Elevation

north Elevation



east Elevation

south Elevation

Multi-family south perspective

process renderings

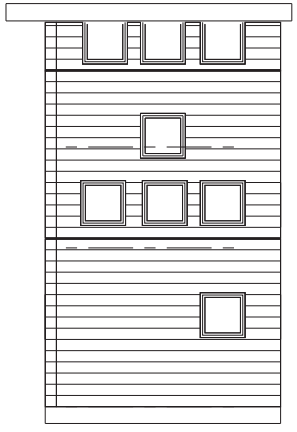
20 mule team looking west


Dirt road
Dirt road
Dirt road
Cadillac Blvd.
Single Family
home lots
Paved 2-
Lane Road
commercial
Multi family
home lots
City owned
lots
Single Family
home lots
20 Mule Team Parkway
multi-family
tiny houses
City owned
lots
Single Family
home lots
Dirt road
Dirt road
Unoccupied
lots
Unoccupied
lots
Dirt road

tiny house setting - color scheme 1

tiny house setting

Tiny House Sections

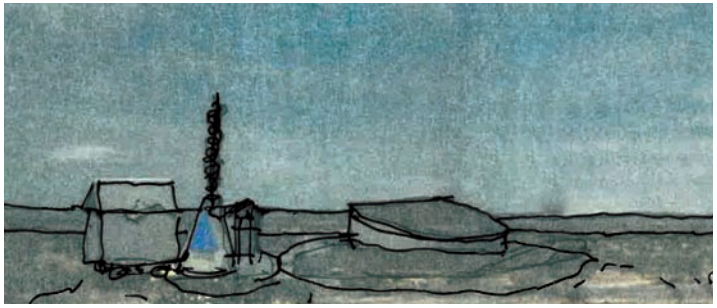


Tiny House East Elevation

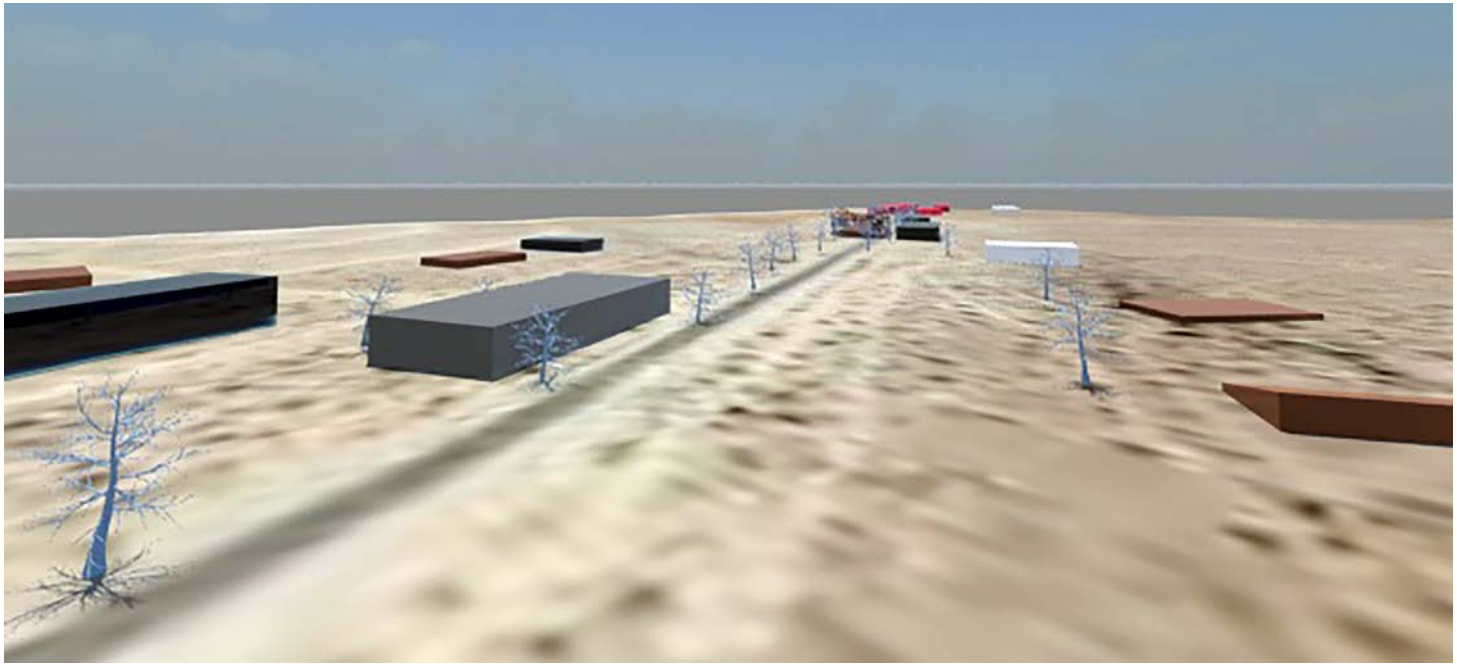
Tiny House Elevations

West

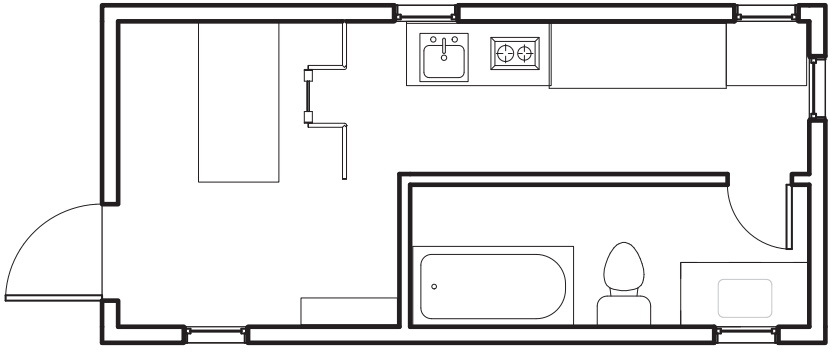
South



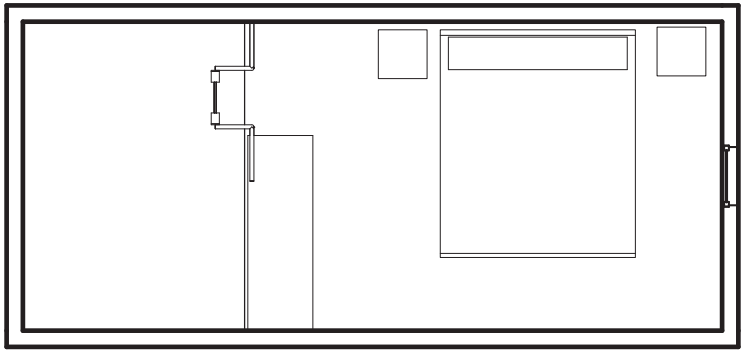
Early tiny house design ideas



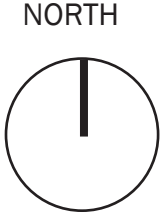
Linear nodes should be developed to respect to desert and bring a route 66 spare style to the node



Tiny House Ground Floor

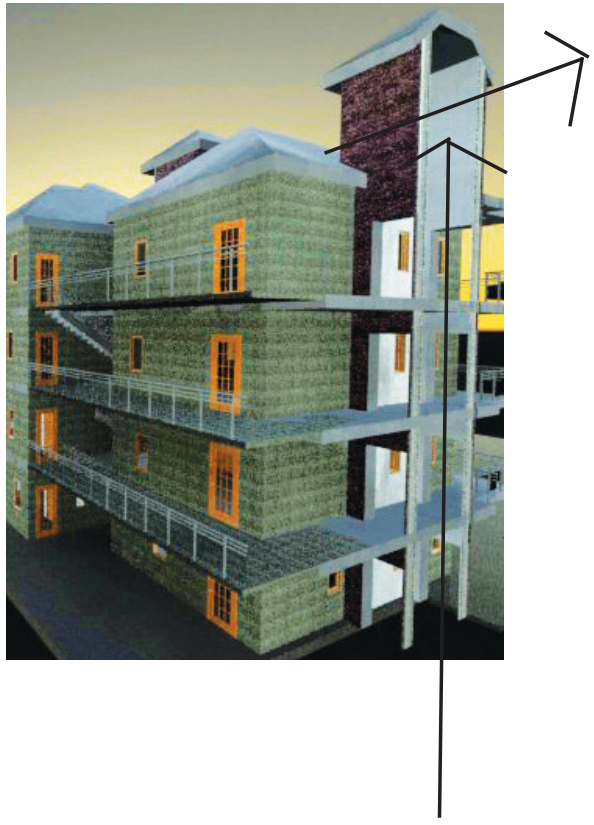


Tiny House loft



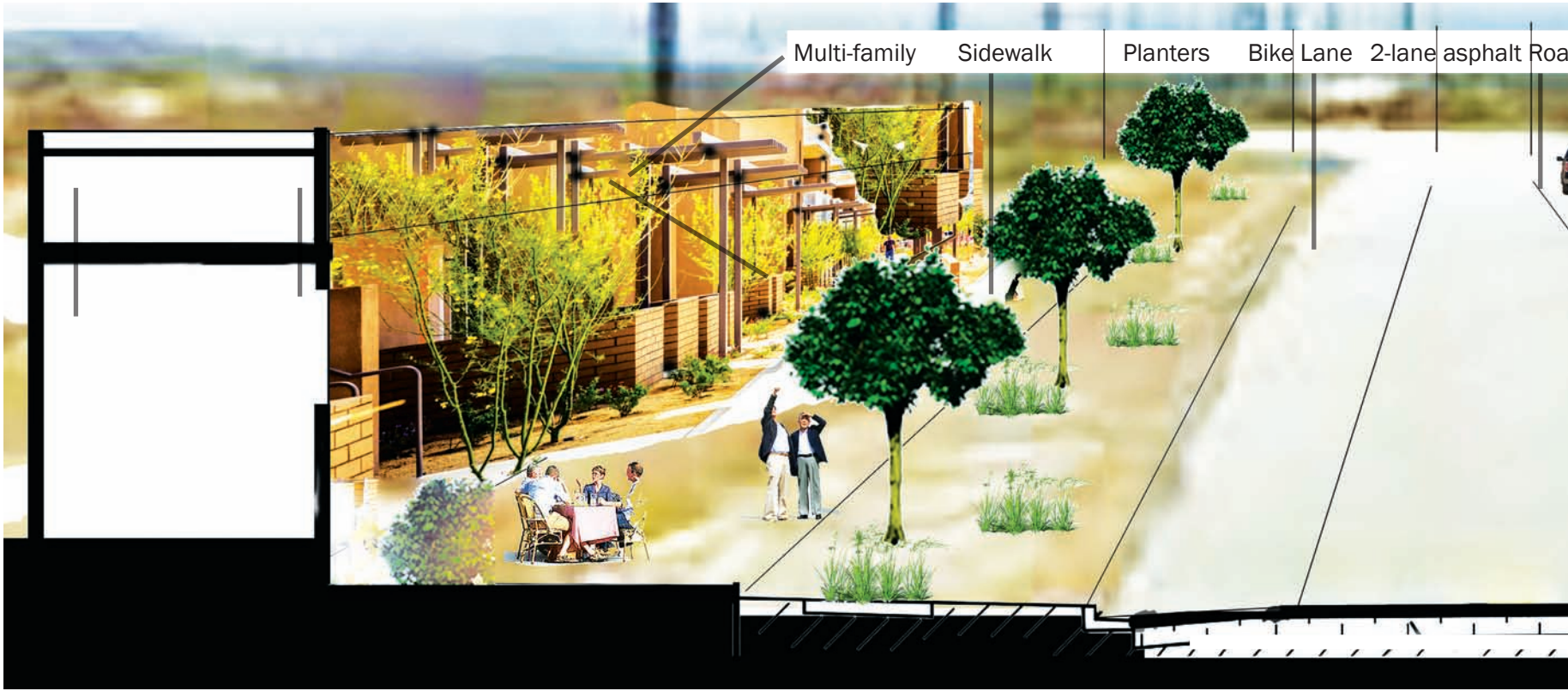
color scheme 2

Prevailing wind also helps create a cooling effect

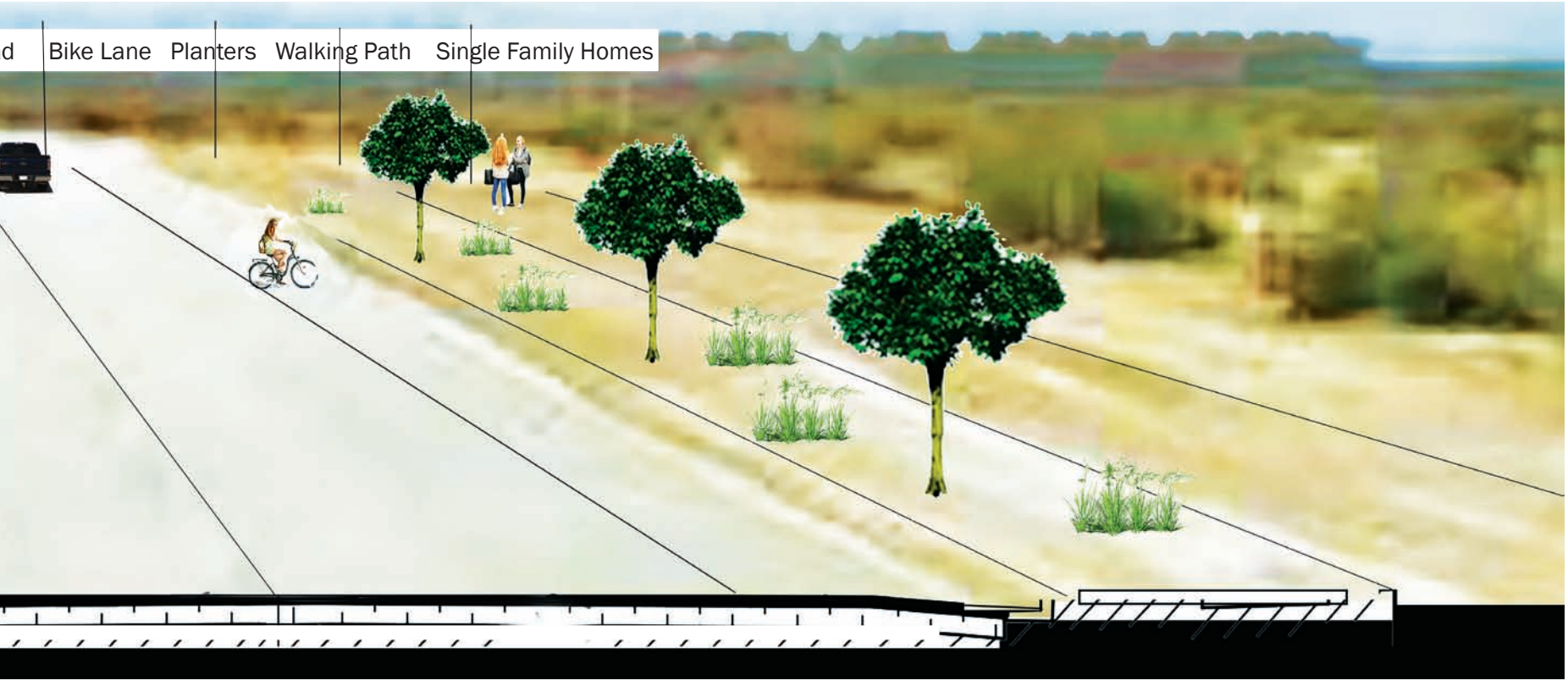


Hot Air Naturally Rises creating a cooling suction effect when unit windows are open

cooling tower section



Sectional Perspective looking East on 20 Mule Team Parkway -2050


d
Bike Lane
Planters
Walking Path
Single Family Homes

CHAPTER FIVE:CONCLUSIONS

5.1 Conclusions

5.1 Conclusions

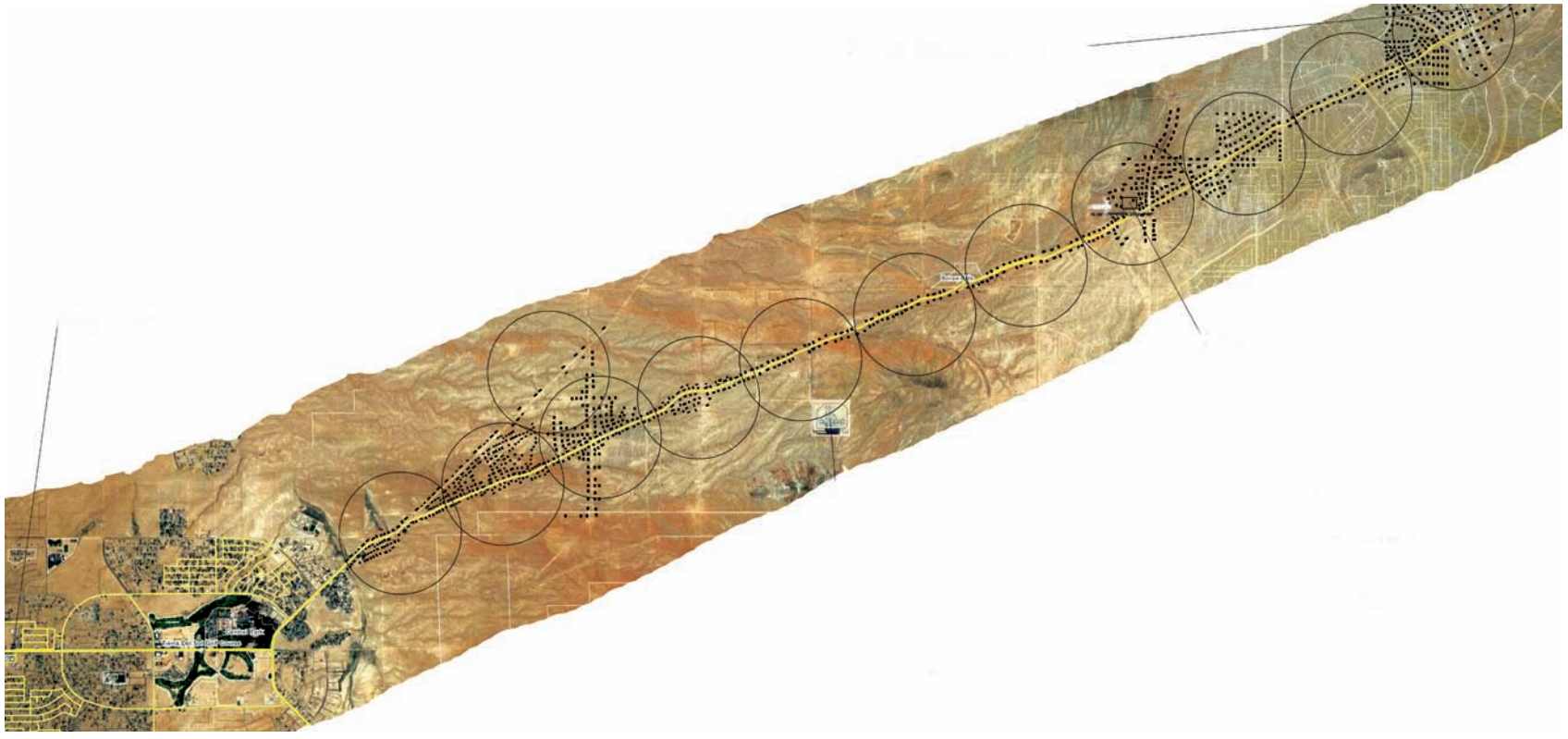
This study looked at the buildup of demand and shortage of affordable home supply. In proposing solutions, it studied three areas: tiny houses, to be a viable financial and ecologically sound part of the solution. Granny flat additions to existing homes are offered as an additional help in creating supply quickly. High density residential to create effective and large scale solutions to the housing shortage. Economics of housing are a challenge for three quarters of the population. Social issues include living in less square footage overall and living more densely packed due to high land costs. Sustainability is the use of resources in such a way as to allow the continued use by future generations without depleting the supply. California City can build out while maintaining the recreational nature of the city. By developing along the roads where there is an existing grid, the city can control utility costs to provide the water, and the power company can add customers without significant expansion of the power grid system.

Tiny houses were explored and while they are economically viable, the scale of that solution alone does not meet the demand without additional interventions. All three work together to offer creation of additional supply to economically target a larger portion of the population and produce homes for the housing needs expected in 2050. In 2050, it is expected that larger cities like LA or San Jose will be overcrowded and have populations that exceed 5 million and one point five million respectively.

With that many people in the largest cities, a less desirable urban situation will be created for some people who will want a less dense place to work and live. The combination of low land prices and less dense living will make some rural areas more attractive. At that time, California City may have 500,000 residents. By building out in clusters along 20 Mule Team Parkway in a pattern like Route 66, there will be the chance to maintain the rural and recreational character, while at the same time providing affordable homes for average income people. The community could operate as a self-sustaining economy with individuals working together with the large employers in the area. Some may do manufacturing out of the home garage and ship the items out to the buying public and others may work remotely in service jobs from the comfort of their home offices. The citizens can grow their own food and create energy generating homes that collect and conserve water to the highest degree possible. Adding an additional unit to existing homes is a solution to building up the supply and can allow a homeowner to rent the unit out to earn income that helps support the cost of the home. Dense housing can provide relief to the supply by allowing a large quantity of units to be developed in a small footprint which keeps the monthly costs at a reasonable level that the average family can afford.

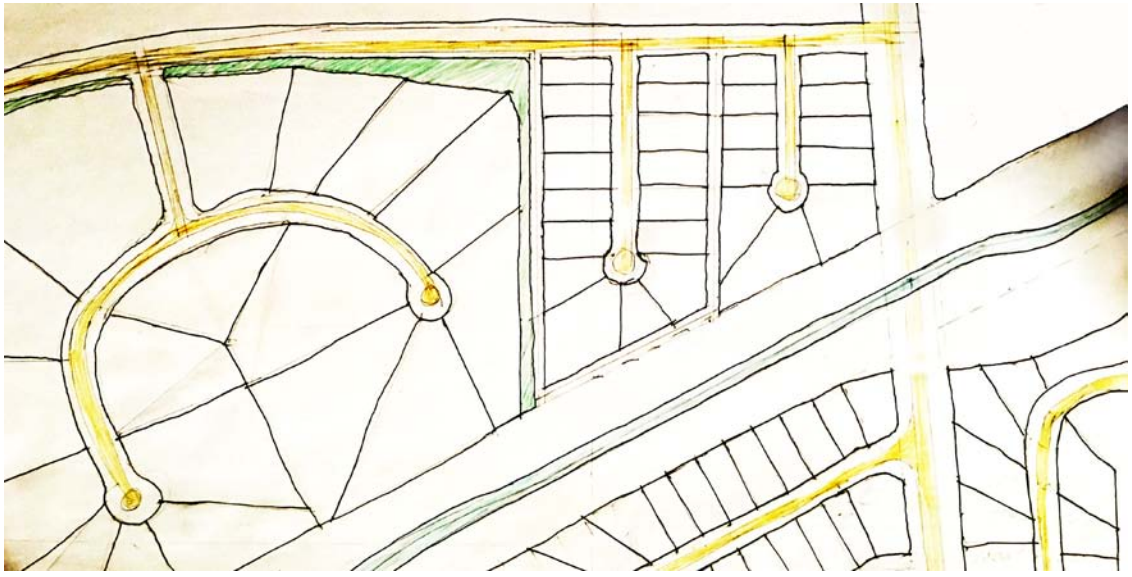
Further studies regarding the need for more sustainable homes, economically viable and a lot of them will be needed in other areas

of high demand. Additional areas may be related to improving the effectiveness of water collection, using sun and wind to enhance energy production and recycling of good building materials in creating new homes, creating small local manufacturing and food production to get a handle on the economic and social issues that are currently being experienced compared to the scale of growth expected in the future. Producing more homes will positively affect the supply and to target average people will create a large-scale market. By using Earthship techniques like tire-walls and bottle/can walls the problems of what to do with the billions of tire created every year and some of the landfill pressures can be relieved by re-using materials that may be disposed of if not captured and recycled for use in homes.



Projected nodes every mile, 2050

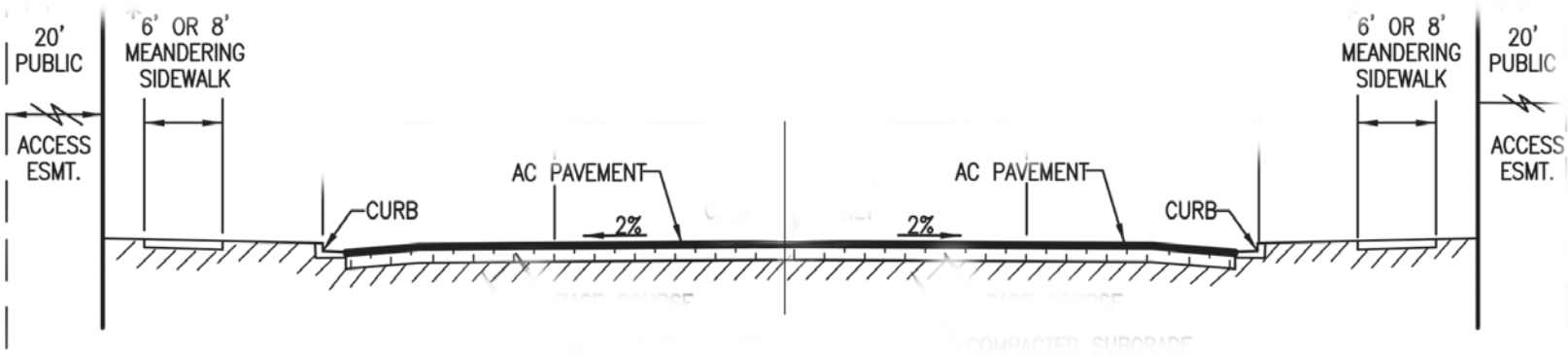
California City may mature into a large city of 500,000- given the financial and population pressures faced. If the ULI healthy principles are applied from the beginning, the city can grow into a healthy place despite being a remote suburb of the largest city in California, it can continue to grow as a research and recreational area. With nodes that have live, play and shop features, residents can enjoy a walkable experience and healthy life in 2050.



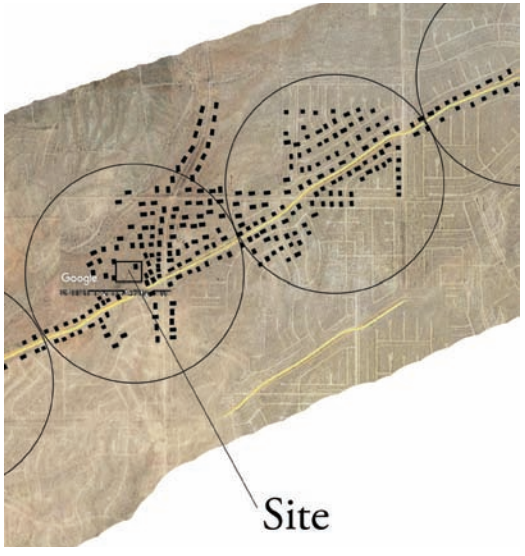
Site parcels

Render of a residence 2020

Render of a residence 2020



20 mule team road section



Enlarged view of site node in 2050

20 mule team road

Cadillac blvd.

20 mule team road

Multi-family combining lots

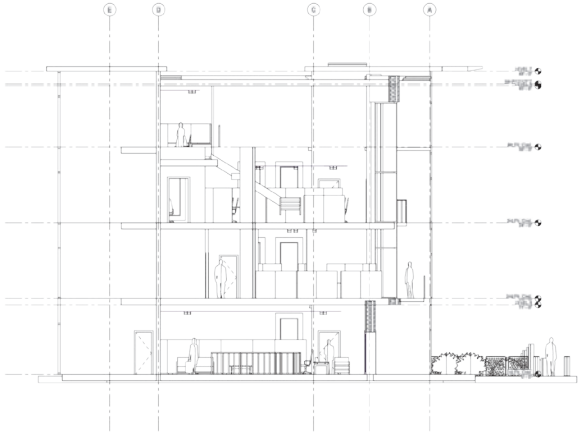
Multi-family 13 parcels combined

East multi-family site with 11 parcels combined

Multi-family 7 parcels

Multi-family option combining east lots

Commercial options



Commercial section

Commercial South Elevation

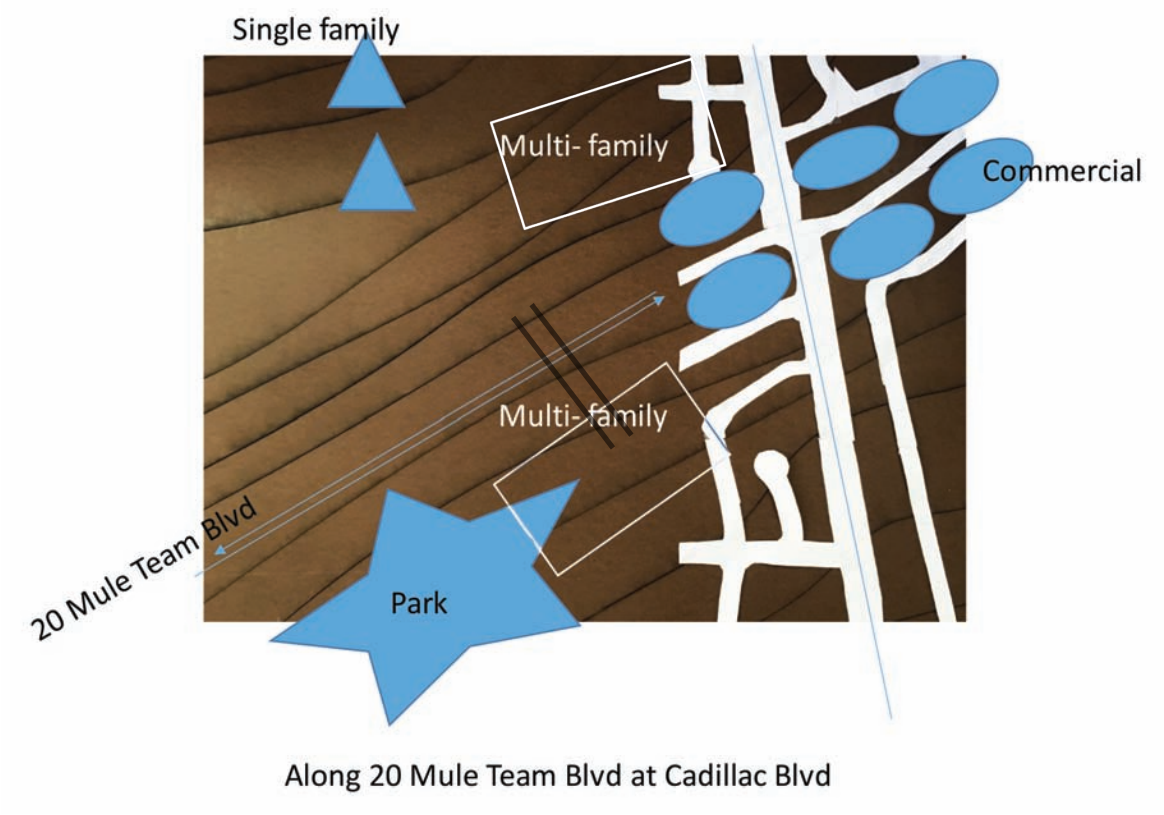
Commercial North Elevation

Tiny houses, multifamily and Commercial North perspective

Reactions to Winter final critique and action plan:
Continue to develop and fill out the book, incorporate the connection across 20 mule team parkway to the the park system.

Create a theme like route 66 for 20 mule team parkway.

Discuss the intermediate technologies that can create local jobs in any connected location and participate in the supply chain.
Show the test tracks, edwards AFb and important employers locations



North - South connection - bike and pedestrian bridge

REFERENCES

APA reference guide: Publication manual of the American Psychological Association. (2001). Washington, DC: American Psychological Association. APA standards and the current version of the style rules manual.

Ban,Shigeru (2015) Retrieved from www.inhabitat.com, Shigeru Ban, Zurich Switzerland,
Tamedia building has an interlocking wooden structure which is self-standing with no connectors or glue. When the building needs to be changed, it can be easily disassembled.
Systematic modular construction is an advantage when trying to roll out mass scale of a manufactured item, modular housing can help the situation.

Benitez, C. P., & Vidiella, A. S. (2010). Small eco houses: Living green in style. New York, NY: Universe Publishing.
When being small helps to be sustainable, Loft housing concepts for many urban roof situations. Houses built from metal appliance panels and other recycled items from landfills. Sustainable and interesting as well as saving money in the re-use of good materials that would end up in landfills

Brand, S. (1994). How buildings learn: What happens after they're built. New York, NY: Viking.
Brands' sustainability articles have been appreciated for many years. His methods look at the entire life cycle of buildings and their many transformations over time. Some of the most vernacular buildings make sense in their clean simple designs. His disciplined analysis and forward thinking designs show the good side of adaptability. Adapting, reuse and dismantling all have a place in the thought process of the life of a building. Some buildings exceed the life expectations for so long that we have to stop and consider what makes them have such timeless, tremendously long value. If 40 years was expected and it goes on for hundreds, then that is a large bonus on the longevity side.

Collins, J. (2006). Raising the Architectural Standard of Small Homes. Fabrications, 16(2), 6-27. doi:10.1080/10331867.2006.10539585
Small homes can be well crafted and look good for a reasonable cost. Where a limited supply of housing prices out the poorest of the population, creative means to solve the problem include designing the minimum of square feet needed and in a quantum level cost savings. Adaptive re-use of suitable structures.

Census: (2013) Retrieved from www.census.gov quick facts us 2013 population over 316 million people
Population projections and database of past populations. Populations in the US and Internationally will continue to strain the available housing supply and projections for 2050 are large increases

Der Nue, Pauly, (2014)Architects Foresight Report: The Changing, Context, Business and Practice of Architecture 2014, published by the AIA. (n.d.). Der Neue Pauly. doi:10.1163/2214-8647_dnp_e109270
The 5 megatrends, demographic shifts, economic power shifts, urbanization, climate change, resource scarcity, technology impacts, pg 5. Changing needs effect our design decisions and opportunities for the future. Economic power is shift toward Asia and there are huge populations to deal with. Urbanization is challenging utility and infrastructure needs for most cities, the pattern of moving away from the country and farming to the city is a huge factor in China, India and Pakistan

Diamond, J. M. (2006). Collapse: How societies choose to fail or succeed. New York: Penguin.
We have the benefit of advanced forensic investigations done of the eating and plant life of past societies. Our examples of advanced societies that self-destructed or otherwise suffered collapse from bad societal decisions run from as close as Montana and as far away as a Pacific Island society can be. Diamond shows a huge change in the US farming environment due to damaged salinized soils. Societies like the Aztecs, Mayans, Easter Islanders and Norse Greenland all suffered from the environmental disasters as a consequence of their stubborn habits. In The book, the first nine chapters are historical examples; the next four go into current situations, which are heading down the same bad pathways of past collapsed societies. In the end we have suggestions on how we move forward; anticipate our looming disaster, stop rationalizing bad environmental stewardship, work to remove irrational values of unsuccessful solutions.

Fisanick, C. (2008). Eco-architecture. Farmington Hills, MI: Greenhaven Press.
Series. Integration with a green standard gives an important way to measure green performance. LEED is the big established system. Is it enough to do or is more needed? Authors argue both ways. Also, if a house is net zero energy using and it is producing power to the grid is the size important, can large homes be just as good? Authors argue for both sides.

Hatherley, O. (2016). “These Homes Need People, These People Need Homes” heritage, modernity, and utility in British Housing Preservation campaigns. Small Interventions. doi:10.1515/9783035607185-005
Adaptive reuse is an option where the supply of fixable places is in an urban location. Good locations can become a solution to homelessness. Both the community and preservations benefits can come together to solve housing needs

Kolocotroni, V., Goldman, J., & Taxidou, O. (1998). Modernism: An anthology of sources and documents. Chicago: University of Chicago Press.
Page 605 George Orwell,
On the proper interpretations of arts and literature in relation to long term thinking. By incorporation of art and sculpture into design, we create a complete composition and to successfully integrate art, the timeless works need to be considered

Mariner(2013): The best American infographics. (2013). Boston, MA: Mariner Books.
Inspiration for layouts and creating interesting presentations of data and factual items. Documents many techniques for infographics and is an idea generator for thesis graphics and layouts.

Moore, C. W., Allen, G., & Lyndon, D. (1974). The place of houses. New York: Holt, Rinehart and Winston.
The case study houses highlight the need to carefully look at the site conditions and incorporate them into the design. The order of rooms determines the look and feel of the building. Neutra appears influenced by Mies Van Der Rohe in the plan for Kaufmann House. Long gallery layout with historical connections to galleries of Versaiiles. Moores’ team has an organizational focus on the machines and placement of the necessary items. The order of dreams considers how the owner will have a joyous experience of the space. Making the space wondrous and organizing with careful placement as to use and feel to have an elegant assembly of overall harmony with the site and location.

Oliver, Paul,(2010). Dwellings, Phaidon
Shows the struggle to create housing, tribes have been using local materials, advanced civilizations have been using local materials and building techniques due to the availability of the labor and materials. The poor are struggling to find shelter, with homeless encampments and shantytowns happening in India, Africa, the mideast and the continental U.S. The book brings out the issues to start to appreciate the efforts people with no resources make

Reynolds, M. (2005). Water from the sky. Taos, NM: Earthship Biotecture. Earthship series I, II and III
Reynolds, M. E. (1990). Earthship. Taos, NM: Solar Survival Press. ;Reynolds, M. E. (1991). Earthship. Taos, NM: Solar Survival Architecture. ; Reynolds, M. E. (1993). Earthship. Taos, NM: Solar Survival Press.
By the designer of the Earthship, it details the specific systems and how the biomimetic processes work together. How to build your own Earthship, Systems and Beyond Economics, The complete manual of techniques to build an Earthship, the design thought process, even the contracts for the co-housing aspects of the development

Reynolds, M. (2000). Comfort in any climate. Taos, NM: Solar Survival Press.
An overview book details the philosophy behind the earth-sheltered homes that Reynolds has developed. Building mass has the effect of maintaining both heating and cooling temperatures without using any mechanical equipment to heat and cool the structure.

Rocha, Veronica, (2014). Retrieved from www.latimes.com, Water use restrictions article by Veronica Rocha, July 30,2014
CA 2014 water restrictions: currently runs for 270 days, started July 30, 2014. Water restrictions and drought conditions continue, water collection and conservation is become a need in Southern California and other US regions. Individual systems are still difficult to get approved in building departments statewide.

Winnan, C. D. (2012). 3D printing: The next technology gold rush: Future factories and how to capitalize on distributed manufacturing. Charleston, SC: CreateSpace Independent Publishing Platform.
The 3d printer is the hardware part of intermediate technology. As we move forward, the industry will be quickly transforming from prototyping to finished part making. This an small CNC mills have the potential to keep rural villages intact and thriving. Part I and II discuss the technologies behind the main processes, Part III, the future will see 50% of parts will be printed locally from the 3d printer which may be printing in materials that are not even known today.

Wright, D. (1978). Natural solar architecture: A passive primer. New York: Van Nostrand Reinhold.
Wright discusses passive, active solar and natural wind ventilation techniques. Design parameters for solar gain are well documented in the book as well as the design approach to siting, natural features and wind. Simple high performance methods are used to achieve high-energy performance architecture. Design of generation, storage, and integration in a historical manner. Shading, solar mass, ventilation, conservation and generation are detailed. Key issues of earth sheltered architecture are addressed

Footnotes

"Small is Beautiful; Economics as if people mattered" E.F.Schumacher, Page 168, production by the masses can replace mass production and enhance the societies that adopt the intermediate technologies successfully. Then societies can experience less upheaval with people ale to live and support themselves in place rather than having to move to a city to find work.

Retrieved from waterhistory.org, Romans collected water since approximately 312 B.C.. Using gravity fed sources above cities to supply water. Their prowess with bringing water far distances was an early precursor of public water systems.

"Survival Through Design" by Richard Neutra,Oxford Press, 2nd edition 1969,pg 165 the importance of environmental design, Neutra wrote extensively in this book on how the environmental conditions can help of harm the buildings' occupants.

Continuing re-urbanization may not continue, page 14, David Wang, American Institute of Architects Foresight Report: The Changing, Context, Business and Practice of Architecture 2014, The 5 megatrends, demographic shifts, economic power shifts, urbanization, climate change, resource scarcity, technology impacts, pg 5.

Continuing re-urbanization may not continue, page 14, David Wang, American Institute of Architects Foresight Report: The Changing, Context, Business and Practice of Architecture 2014, The 5 megatrends, demographic shifts, economic power shifts, urbanization, climate change, resource scarcity, technology impacts, pg 5.

Small Structures Green Architecture XS, Universe publishing, page 3, quote from UN report

Small Structures Green Architecture XS, Universe publishing, page 72 Miele Space Station, 2012 Architecten photo. This design is made completely out of used appliance parts and looks like it could be on Earth or in space with the panels and washing machine windows.

Photo credit 1 Studio Asslinger, Berlin
Photo Credit 2 Michael Reynolds NM
Photo Credit 3 Dennis Selke

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6	by author	relative city sizes compiled from google earth maps, us census and United Nations
7	by author	current occupied lots in California City 2106 Google earth maps with overlays of buildings
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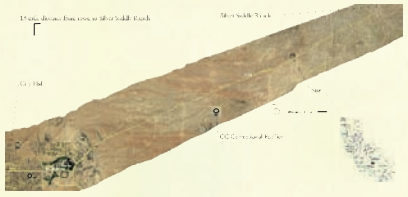
Appendix A - Presentation boards

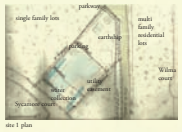
California City is the third largest city in the state by area. It is slighly larger than San Jose



View of site 1to east

Tiny houses on the Prarie for a time when the population is 9.7 Billion

View of site 1 to north



site 1 plan

Climate accions include prototyping water collection from fog, recycling resources, energy generation, community parkways and earth sheltering spaces.

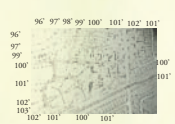
Healthy principles to be incorporated:
Connection to parkways
Hiking in nature
Add landscaping and street furniture to the public parkway. Create mixed use nodes every mile north and east of town to make sure of access to healthy food and activities,
Get a public transit route on 20 mule team parkway that connects all the way to Silver Saddle Ranch and ultimately to Hwy.395 once established as a destination.

The site is connected to city parkways wrapping around the north and west sides of the site. This city has allocated parkways travling throughout the city and the corner parcel has the potential to house a civic function such as clinic.

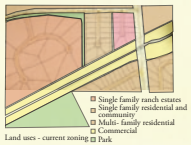
Parti diagram site 1

Program axonometrics site 1

Sites of single family and multi family



Overall Topo - Existing



Land uses - current zoning

Things I learn from Wendell Berry, farmer

To cherish what remains of the Earth and to foster its renewal is our only legitimate hope of survival.
Wendell Berry
We learn from our gardens to deal with the most urgent question of the time: How much is enough?
Wendell Berry
The atmosphere, the earth, the water and the water cycle - those things are good gifts. The ecosystems, the ecosphere, those are good gifts. We have to regard them as gifts because we couldn't make them. We have to regard them as good gifts because we couldn't live without them.
Wendell Berry
The two great aims of industrialism - replacement of people by technology and concentration of wealth into the hands of a small plutocracy - seem close to fulfillment.
Wendell Berry
Whether we or our politicians know it or not, Nature is party to all our deals and decisions, and she has more votes, a longer memory, and a sterner sense of justice than we do.
Wendell Berry

Dennis Selke
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Mike Stepner, Instructor

multi-family option 2

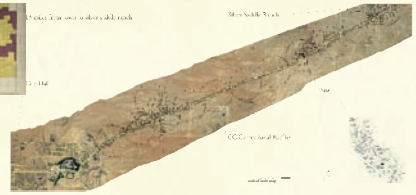
multi-family option 3

site with context for proposed 2040 plans

multi-family in context with single family residences

overall zoning -existing

Program plans site 1



Potential nodes to be developed by 2050

Parti layout on site 1

Occupied area 1994

Figure ground 2016

Projected figure ground 2020

Projected figure ground 2030

Projected figure ground 2050

Program Analysis
The catalyst: Parts one two and three. In order to plan for the growth of California City, the potential third largest city in California, critical thinking can be applied that can help demonstrate the value of certain practices and ways of building housing that address the economic, social and sustainable home problems. The city of California city is likely to grow to a population of over 500,000 residents by 2050. The attraction of the area is cheap land with access to the main utilities in the Primary road "20 mule team parkway". The city water, power and telephone are in place in the public utility easements are along the primary road and photovoltaic solar panels for the property. The city requires it to have a setback of 60% of the property depth (property is 351' on the west, 196' on the east) for a setback from 210 feet on the west to 118 feet on the east. Part One is the utility building that also demonstrates the concept of the rammed earth tire walls designed and developed by Michael Reynolds over the last 40 years.

Potential for growth by 2030

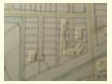
The Earthship residence will proceed as part two and include the kitchen, bath and living facilities along with the greenhouse and advanced technology to collect and distribute water in the manner which uses and re-cycles all grey water into the greenhouse and a special black water planter system which allows the growth of trees such as banana and others directly onsite.
Part three will be the garage, shop and storage rooms made out of two 20-foot shipping containers that have been placed on a foundation and reconfigured for the purpose with doors and a metal roof overhead to create a loft space on each side above the shipping containers.
The future in 2030-2040
With innovative thinking, the city can get a lot of homes built for lower costs than other areas in California. By allowing granny flats, the city could solve the growing problems of the aging population as well as the millennial problems of not being able to afford to buy a home.
California City 2050
If the population does reach 500,000 by that time there will be a need to have public facilities such as senior housing and civic functions, the future could see the neighboring sites build out multi-family units and parkways to create the walkable city parkways and parks which have been allocated to the areas.

20 mule team parkway has the potential to be connected by an existing series of parks and parkways

Potential for growth by 2050 - California city population may be at 500,000 persons then

Potential civic facility - Automated medical testing clinic kiosks

commercial options



multi-family 13 parcels combined

east multi-family site with 11 parcels combined

multi-family combining 7 parcels

With a population of 500,000 people, the city will need services, shops and food. By creating nodes every mile, we can assure the walkability between areas of interesting activities and healthy food.

Sectional Perspective looking East on 20 Mule Team Parkway

Dennis Selke
AR902 Urban Studio, Winter 2017
Mike Stepner, Instructor

California City ***Strengths, Weaknesses, Opportunities and Threats***

Strengths:
Mining of Borax

Edwards afb once housed NASA launch center and shuttle landing center

Cal city has research business base

Test tracks for Hyundai – Kia and Honda

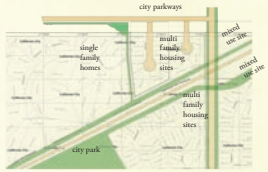
Airport is used by rocket designers

Prison is an employer

Solar Power Farm is expanding and a solid employer

Land is cheap

Weaknesses:
Harsh climate
Remoteness
not landscaped
no bus services
Septic required
Propane used if gas needed



Site context with large park and parkways showing relationship of sites to commercial mixed use

Opportunities:
Be a catalyst for growth
Become part of a research center
Learn more about harsh climate and water collection
Create a business that uses intermediate technology building tiny houses

Threats:
Lack of public facilities and infrastructure
Small population of town
Lack of interest by public

While a tiny house will require an adjustment in lifestyle to many people, it offers the opportunity for freedom from excessive financial burdens and traditional cost of mortgages that are in the hundreds of thousands.

case studies & lessons learned

Project: Indian Wells Villas Indian Wells, CA, public housing, low income seniors Location: Palm Desert California

Build using passive and active methods of cooling and shading.

Wind speeds 10-20 mph design speed 110 max.

Temperatures from freezing up to 100 degrees F light snow most winters-

Project: Brisas de Paz Desert Hot Springs, CA Public housing

Build using passive and active methods of cooling and shading. water collection

Project: Greater world Earthship community, Taos NM, single family residences

Build using passive and active methods of cooling, water collection, recycling, power generation.

Earthships solve several problems, economically they are well priced, they generate all thier own power, they collect and recycle water on site to produce food in the greenhouse and they are sustainable due to no cost needs to heat and cool the home, they are coupled with the land and can be taken off grid

10'x12' tiny hut shed for wind generator, batteries and solar panels

As the city grows, buildings and civic functions can be added that create a hub of activity, homes, medical facilities, civic facilities, churches and other business will need to be cultivated along with the residential and transportation functions. Future transportation will likely include bus routes and autonomous vehicles that can be ordered on demand.

Goals: Create walkable, landscaped spaces, use creative passive techniques to incorporate natural ventilation, collect and conserve water and energy using fully independent systems and grow food

PROJECT PRINCIPLES Put people first by visualizing a healthy city configuration of the streets. Make complete streets by adding bike lanes, parkway trail network and continuously improving public transportation.
Add to the civic functions by creating community clinic diagnostic and prescription kiosks. Create access to senior and assisted care facilities along with mixed use and a mix of housing options that include the option to have very small sleeping units in common arrangement for other major facilities. This can include growing food on site in a cohousing arrangement. Other common areas like large gathering space and shop can be combined instead of duplicated in each home, creating an economic benefit.
Future city functions in addition to fire and police can include aquatic facilities, gymnasiums, schools and medical facility in the nearby mixed use.
The economic value of a city of 500,000 will include places to be entertained, enjoy meals and drinks as well as facilitate working out, biking and active recreation. Championing health and supporting a walkable, bike able community as outlined in the surgeon generals' step it up program will allow people the option to walk places and have the option to reduce driving or not drive at all.
By developing the parkways and having a hub of activity every mile, the city can offer a unique experience and become like the area it was designed after; Palm Springs / Palm Desert.
Healthy food choices are more and more necessary to maintain and improve the health of community members, the addition of food trees to the parkways and the growing of community and local farms can save shipping carbon dioxide and offer a better choice to eat than typical suburban fast food.
Universal access will be added as the streets are improved and built out.
Mixed use with office, retail and grocery will be an added attraction and allow a resident to easily walk and get basic groceries.
Create a unique character at the parkway crossings, a pedestrian bridge and biking bridge to allow easy crossing of 20 mule team. The above access t healthy food and activities will create a healthier suburban environment as the ghost suburb of LA gets built using the techniques of the ULI and new urbanism from day one.

In the late 1950s Nat Mendelsohn developed the city of California City to be the third largest city in CA.
His vision was to create a new Palm Springs-like community in the high desert of Kern County. It has over 200 square miles of area bringing it to a size just larger than San Jose, yet smaller than LA and San Diego, the top two largest cities in California by area.
At the time when the city was started, NASA was building a launch facility to create a second shuttle launching base. The project was cancelled in the late 80s and the region's economic growth slowed down. The city was 1,500 people then and has slowly grown to the current configuration where most people reside in the central part of the town with a few homes out on the fringe near Silver Saddle ranch, a major point of entertainment in the city.
The economics have worked slowly through the years and currently the city has 17,000 residents with the potential to hold a million or more people in the future if fully developed.

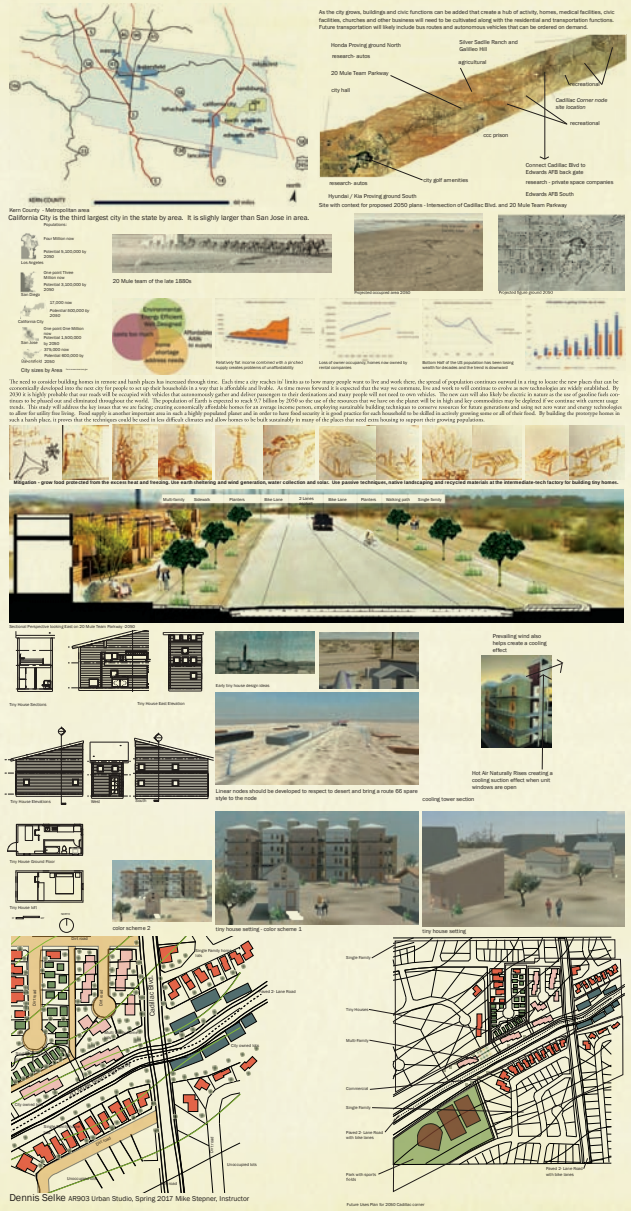
Site 1 Sections

Topography of Site 1

multi-family 13 parcels combined

Water collection research to be done at Coastal Roots farm in Encinitas, CA regarding collection of water from fog.

Tiny Houses on the Prairie



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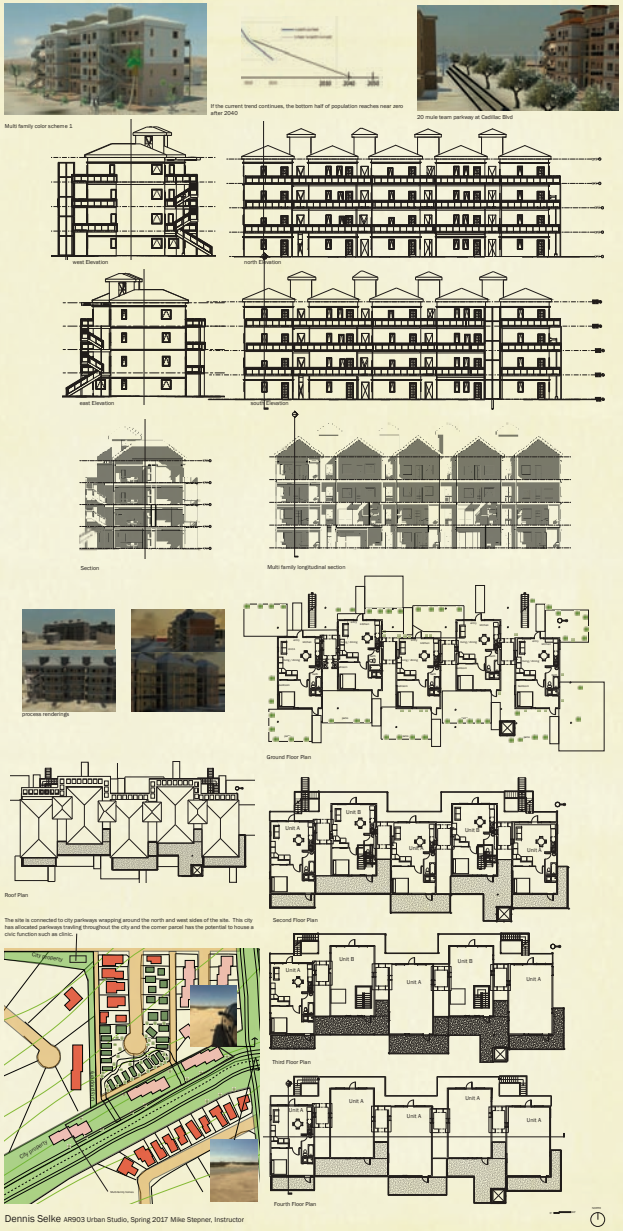
Building Sustainable and Affordable Homes in California in 2050



Dennis Selke AR903 Urban Studio, Spring 2017 Mike Stepner, Instructor

Spring 2017

Biography

Dennis Selke
Born in Detroit MI. I worked in residential design using hand drafting techniques in 1976-1980. CAD and CAD management skills were just beginning to be in demand, I did both CAD and hand drafting in industrial / institutional design from 1980-85. I worked on projects such as Domino's Pizza HQ, Ford Motor Manufacturing Buildings, General Dynamics Manufacturing Buildings and Detroit Edison facilities. We moved to San Diego 1985, I worked in office / commercial for a design build firm, 1985-1986. Next, I worked for a large Developer doing CAD drafting on large single family residential homes in California and Nevada, 1986-1987. I worked as a CAD consultant, CAD manager, and project manager doing field site analysis and drafting for Architect firms doing commercial and institutional projects from 1987-2002 in Orange, CA. I moved into Operations manager for an Accounting firm from 1998-2014 in Oceanside, CA.
I became a master's student in 2013, initially working and taking one class at a time, currently attending full time. In January 2015 I transferred into the NewSchool of Architecture and Design, Masters program. I earned my Bachelor of Science in Architecture from Lawrence Technological University, Southfield, MI (LTU). I have earned Undergraduate certificates in building information modeling and computer visualization from LTU and an Associate in Architectural Technology from MiraCosta College in Oceanside, CA.
I have been married 26 years to Marlene who is a CPA, we live in Oceanside and enjoy working in our garden, backpacking and other outdoor activities. Our daughter is a senior in Psychology at CSUSM and expects to continue on in Psychology studies after graduation.
I am getting my Masters to qualify for advanced management positions in a design firm. I plan on pursuing doctorate work after completion of my masters in June 2017.