ABSTRACT

Title of Thesis: SONORAN REVIVAL: DEFENDING TEMPE BUTTE

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Tempe Butte is an anchor for its surrounding community in the city of Tempe, Arizona. The Native American culture, the Hohokam, once called Tempe Butte their home. When the prehistoric Hohokam eventually vanished from the area, they left behind remains of their origins and culture. As new settlers moved to the area of what is now Tempe, Arizona, they began encroaching on this archaeological site. The goal of this thesis is to defend Tempe Butte. Tempe's rapid development has abused the butte, destroying and disturbing not only archeological artifacts, but bothering the native Sonoran Desert landscaping that once flourished in the area. This thesis proposes a building to protect, preserve, and bring awareness to the threatened state of Tempe Butte. The building educates the public, so they do not lose value of the diminishing remains of the prehistoric Hohokam and the Sonoran Desert landscape where they once lived.

SONORAN REVIVAL: DEFENDING TEMPE BUTTE

by

Peyton Leigh Jackson

Thesis submitted to the Faculty of the Graduate School of the
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Professor Carl Bovill, Chair
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Preface

“Arizona needs its own architecture… Arizona’s long, low, sweeping lines, uptilting planes. Surface patterned after such abstraction in line and color as find “realism” in the patterns of the rattlesnake, the Gila monster, the chameleon, and the saguaro, cholla or staghorn – or is it the other way around—are inspiration enough.”

- Frank Lloyd Wright

Dedication

I would like to dedicate this thesis to my parents and grandparents. Without the love and support of these important people, I would not be where I am today. They have supported me throughout my entire education, and the completion of this thesis is as much for them as it is for me.

Acknowledgements

I would like to thank Brian Kelly, Jana VanderGoot, and James Tilghman for serving as my thesis committee members and critics during the development stages of this thesis. I would like to especially thank my thesis chair, Carl Bovill, for his ongoing support and motivation that pushed me to continue to work hard week after week.

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Chapter 1: The Sonoran Desert

"This region is an environment quite unique. It is a warm dry land of strong color and deep shadow, painted mountains and broad valleys, turquoise sky and long distances. A land of sunlight – bright and shining."[1]

Location

The Sonoran Desert stretches across the southwestern United States and northwest Mexico, occupying approximately 100,387 miles. The vast region includes the southern half of Arizona, a southeastern portion of California, and the majority of the Mexican states of Sonora and Baja California. To the east, the Sonoran Desert is neighbored by the Chihuahuan Desert, and to the west, the Mohave Desert. The Sonoran Desert is a subtropical desert, a type of ecosystem that experiences high temperatures with low amounts of precipitation and warm soils.[2]

Figure 1: Map of the Sonoran Desert |The Sonoran Desert stretches across Arizona, Mexico, and a portion of California (Source: Author)

[1] Paracheck, *Desert Architecture*, 7.
[2] National Park Service, "Sonoran Desert Ecosystem".

<u>The Harsh Climate</u>

The Sonoran Desert's climate is one of its greatest defining characteristics. The Sonoran Desert is *hot*. Temperatures in the summer regularly range from 104°F to 118°F in extreme conditions. In opposition of the harsh summers, the winter season experiences mild temperatures, with the low valleys sometimes experiencing frosts, and the high mountain elevations maybe receiving snow. During the days, temperatures are likely to rise about 30 degrees above the low from the previous night. Chilly winter evenings are followed by warm winter days, and hot summer days are followed by cool nights. This type of temperature change occurs in all seasons, most drastically in the winter.[3]

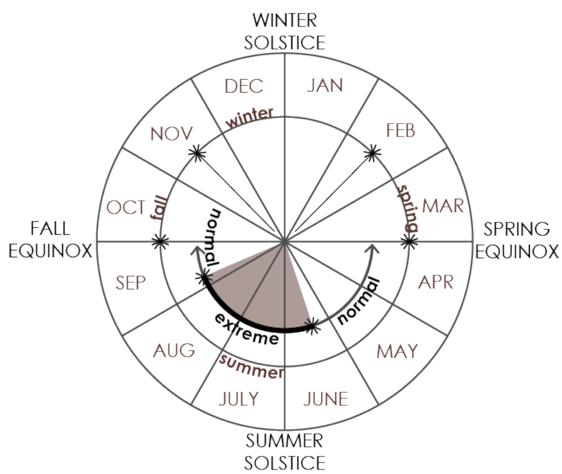

Figure 2: Mapping the Sun's Path | Mapping the seasons throughout a year in the Phoenix Metropolitan Area (Source: Author's figure based on work by Guthrie)

The rain seasons in the Sonoran set it apart from many other deserts. During December and January, the Sonoran receives mild winter rains coming from the Mohave desert. In the summer months of July and August, the neighboring

[3] Paracheck, *Desert Architecture*, 7.

Chihuahuan Desert sends the forceful monsoon rainstorms.[4] Average rainfall throughout the desert averages between 3 to 20 inches, depending on location and elevation.

Desert Materials and Resources

The Sonoran Desert is made up of sedimentary, igneous, and metamorphic rocks. The ages of these rocks date as far back as 2 billion years ago, with the most recent developments being produced by volcanic origin in 700 A.D. Volcanoes were active in the Sonoran Desert between 20 to 40 million years ago. The active volcanoes in the area caused a great amount of tectonic activity, that when mixed with the extreme heat of the climate, produced much of the basins and mountain range topography of the region.[5]

The soils found in the Sonoran Desert are as unique as its other redeeming attributes. While much of the desert floor is covered in stone and gravel, a variety of soils exist at the surface. These soils vary in textures, some dry and sandy, while others resemble sticky clay.[6] The colors of these soils are what help distinguish the awe-inspiring, picturesque views of the Sonoran Desert. Gray, brown, white, red – the shades of the soil contrast with the cloudless blue skies and green skins of cacti. Perhaps the most distinct color of the Sonoran Desert is the rusty brick red of the older soils. The oxidation and blending of iron-bearing minerals in the soil are what

[4] National Park Service, “Sonoran Desert Ecosystem”.
[5] National Park Service, “Sonoran Desert Ecosystem”.
[6] McAuliffe, “Desert Soils”.

create this rusty shade of red. Only mature soils bear this rich color, while younger soils lacking iron oxides and minerals are usually a light brown shade.[7]

Along with the variety of rock and colorful soils, the Sonoran Desert is the source of a great supply of copper in this arid climate. Early pioneers in Arizona came to the area for mining, settling around the copper ores. Mining towns started developing, and the metal became one of the dominating factors to the growing economy.[8]

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[7] McAuliffe, “Desert Soils”.
[8] National Park Service, “Sonoran Desert Ecosystem”.

Chapter 2: Native Flora and Fauna

The Saguaro

The saguaro cactus is unique to the Sonoran Desert. The great columnar cactus can be found throughout Arizona, Sonora, Mexico, and in an area of California just west of the Colorado River.[9] In the lower Sonoran Desert, saguaros grow abundantly from northwestern Arizona all the way south to southern Sonora, Mexico, covering a total distance of about 1,000 kilometers.[10] These giant plants stand tall above the dust and clay of the desert floor, boasting a grandeur that has captivated the desert dwellers that encounter them. This plant forms a "natural landmark", acting as a cultural anchor to its desert home.[11]

Figure 3: Map of the Saguaro Cacti | Saguaro cacti grow and flourish in parts of Arizona, Mexico, and the very Southeastern edge of California (Source: Author)

[9] Yetman, *The Great Cacti*, 51.
[10] Yetman, *The Great Cacti*, 51.
[11] Yetman, *The Great Cacti*, 13.

Living in the Sonoran Desert, saguaros have adapted to withstand the extreme climate of its origin. The saguaro, a columnar cactus, thrives in seasonally dry deserts, areas that have hot climates and prolonged periods of drought.[12] When saguaros live in areas of higher levels of rainfall, they typically grow among rocky surfaces, so that the increased amount of rain water runs off the rocks and does not clog up the cactus' root system.[13]

The life cycle of a saguaro is long and slow. After ten years of growing, a saguaro cactus may only reach 1 in in height. Young saguaros are delicate and vulnerable, so the existence of "nurse" plants can be important during the initial stages of the plant's development. "Nurse" plants, such as palo verde or mesquite trees, provide protection for the cactus as it grows underneath the branches of the much older and mature plant. Between 20 to 35 years of age, a saguaro may begin to produce white flowers. After 45 to 70 years, a saguaro can be about 6.5 feet tall, and begin to sprout arms. Saguaros may continue to grow arms throughout the rest of their lifetime, while some live their entire lives as a straight stalk without a single arm. The average lifespan of a saguaro is 100-200 years old.[14]

[12] Yetman, *The Great Cacti*, 17.
[13] Yetman, *The Great Cacti*, 33.
[14] Yetman, *The Great Cacti*, 51.

Crassulacean Acid Metabolism

One characteristic of cacti, including the saguaro, that sets them apart from other plant families is that they utilize the Crassulacean acid metabolism (CAM) pathway of photosynthesis to produce new growth.[15] Rather than shutting down their pores at night like other plants, cacti and succulents open their pores (stomata) and continue to collect carbon dioxide at night (Figure 4). By employing CAM photosynthesis, cacti can store water vapor during the hottest hours of the day, reducing evapotranspiration, while the stomata are shut down. While the stomata are open, CAM plants lose less than a third as much water as non-CAM plants. This process of CAM photosynthesis evolved in plants as they adapted to hot, arid climates.[16]

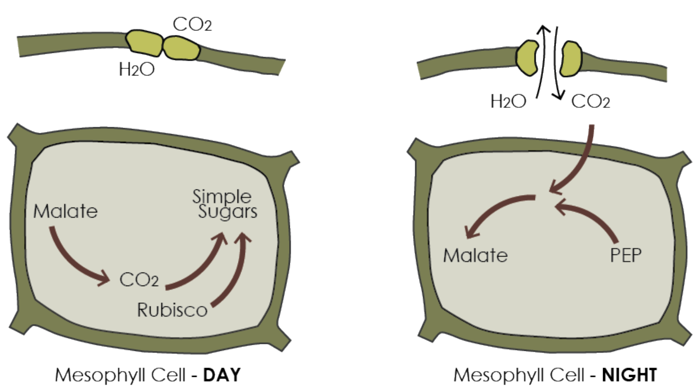

Figure 4: Photosynthesis in CAM plants | During the day, cacti stomata remain closed and photosynthesis takes place in the mesophyll cell. At night, the stomata open, allowing CO_2 to come into the plant. While the stomata are open at night, the plant loses less water than it would have during the day. (Source: Smith)

[15] Yetman, *The Great Cacti*, 29.
[16] Yetman, *The Great Cacti*, 29.

Spines

Like other species of cacti, the saguaro has modified leaves that are known as spines. While these axillary buds are sharp like thorns, they have a leaf-type origin. The saguaro can cut back on the amount of water loss and leaf wilt it would have experienced having true, flat leaves, and instead, use that stored water to protect itself from high temperatures and times of drought.[17] Sprouting from “wartlike buds”, called areoles, the spines of the saguaro protect the plant from potential herbivores that could feast on the exterior flesh of the plant. The spines also act as protection against freezing and sunburning. The minimum temperatures the cactus can withstand at the growing point of the spines are increased by as much as 10°F, while the highest temperatures are decreased by as much as 18°F.[18]

Roots

The saguaro, like many other desert cacti, has a very shallow root system that does not go more than 4-6 inches into the ground. The plant does have a tap root that extends more than 2 feet into the ground, the deepest of all the roots.[19] Since saguaros can grow to be massively large and tall plants, their roots extend out horizontally in order to stabilize the plants and keep it from toppling over. This shallow root system is especially effective during rainfall, because the roots are stretched out close to the surface, easily ready to collect water.[20]

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[17] Yetman, *The Great Cacti*, 29.
[18] Yetman, *The Great Cacti*, 31.
[19] Yetman, *The Great Cacti*, 37.
[20] Yetman, *The Great Cacti*, 37.

Ribs

All columnar cacti, including saguaros, have vertical ribs that can vary in number from 3 to about 30. These ribs are arranged like the baffles of an accordion.[21] The organization of these ribs allows the cactus to expand as it absorbs large amounts of water after a heavy rainfall, and also shrink during times of drought. This flexible construction of the cactus makes it possible for the skin to fluctuate without damaging the exterior skin.[22] When a cactus dies, what remains of the ribs are tall wooden like structures that are the actual skeleton of the plant. These wooden remains were widely used, and still are today, by Native Americans for building construction and furniture because of their strength, durability, and authenticity.[23]

Flowers, Fruits, and Desert Dwellers

Like the saguaro, native desert plants have adapted to be able to flourish and thrive in the natural Sonoran Desert. They must be able to withstand the heat and prolonged periods of drought. Water intake is just as crucial for other desert plants as it is for the saguaro, because they must be able to survive short spurts of limited water, and large amounts of rain at once during monsoon seasons.[24]

There are two flowering seasons for the plants in the Sonoran Desert. The first takes place in the spring, beginning mid-way through February and lasting until mid-June. Then summer flowering season begins after the first rain of the summer, and

[21] Yetman, *The Great Cacti*, 32.
[22] Yetman, *The Great Cacti*, 32.
[23] Yetman, *The Great Cacti*, 58.
[24] Dimmitt, "Plant Ecology of the Sonoran Region".

continues until the end of fall.[25] Many birds, insects, and mammals rely on these flowering plants, using their flowers and fruits as primary sources of nutrients and survival during the most part of the year.[26] Some of the native dessert dwellers that feast on these products are long-nosed bats, nectar eating moths, the Gila Woodpecker, the White-Winged Dove, Coyotes, and a variety of insects. Even after these desert plants die, they remain crucial to the survival of species living in their environment. This is especially true for desert cacti. Once a cactus is dead, their rotting carcasses become the home to an entirely new ecosystem made up of bacteria, fungi, arthropods, reptiles, and small mammals.[27]

The Sonoran Desert is home to more than 2,000 species of plants, 60 species of mammals, over 350 species of birds, 20 amphibian species, and over 100 species of reptiles.[28] The Sonoran Desert offers such a diverse landscape of lifeforms that vary from "columnar cacti to conifers, Gila monsters to pygmy owls, cyanobacterial soil crusts to native ferns".[29] For a region with such an extreme climate, it is extraordinary that, so many living organisms are able to survive in this expansive desert.

[25] Dimmitt, "Plant Ecology of the Sonoran Region".
[26] Yetman, *The Great Cacti*, 13.
[27] Yetman, *The Great Cacti*, 13.
[28] National Park Service, *"Sonoran Desert Ecosystem"*.
[29] National Park Service, *"Sonoran Desert Ecosystem"*.

Chapter 3: The Hohokam and History Around Tempe Butte

The Hohokam

Native Americans were the first people to live in the area which is now Tempe. The area surrounding Tempe Butte became the home to the Hohokam beginning as early as 1 AD.[30] This Native American settled around the base of the butte in a community known as La Plaza (Figure 5).[31]

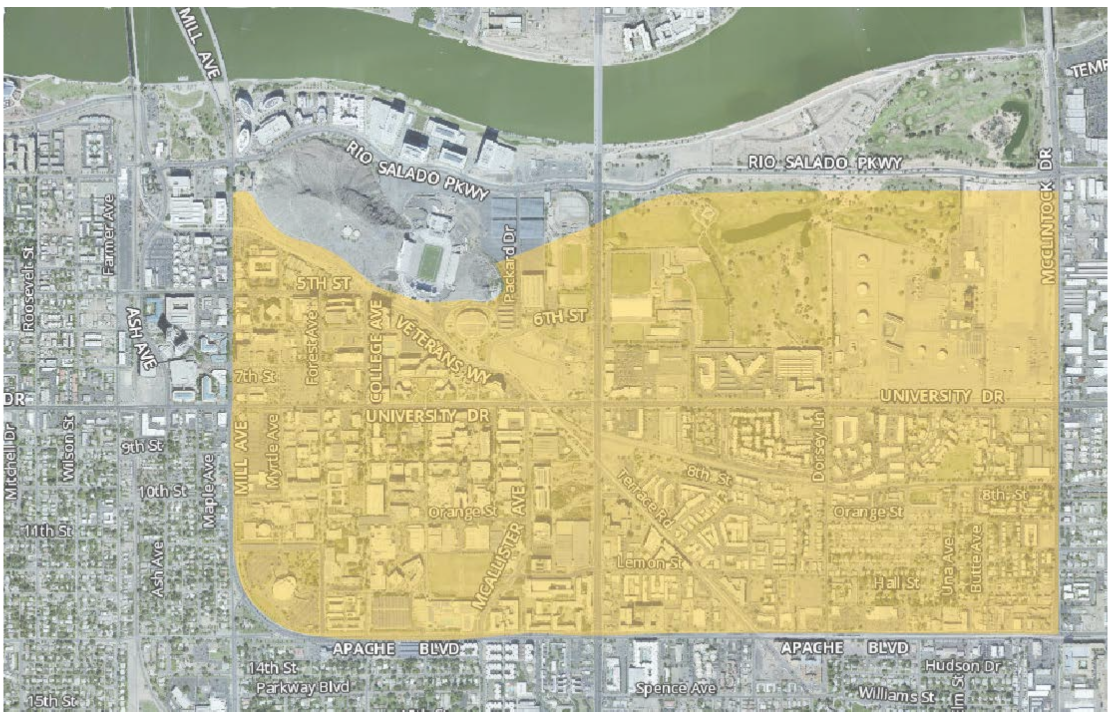

Figure 5: La Plaza Community | The shaded area distinguished the Hohokam's settlement which stretched to the southern outskirts of Tempe Butte reaching Apache Blvd, and extending out east to reach McClintock Dr. (Source: Author)

[30] The City of Tempe AZ, "Hayden Butte Preserve."
[31] The City of Tempe AZ, "Hayden Butte Preserve."

The Hohokam remained in the area until 1450 AD, where they then left behind remnants of their culture and beginnings. Not much is recorded about La Plaza because as the area which is now Tempe continued to rapidly develop, much of the remains of the community were either lost or destroyed. While the prehistoric Hohokam no longer exist, they are now recognized as the Four Southern Tribes of Arizona: the Gila River Indian Community, the Salt River Pima-Maricopa Indian Community, the Ak-Chin Indian Community, and the Tohono O'odham Nation.[32] The local Indian Communities today hold Tempe Butte with a high respect because of its importance to their ancestors.[33]

The Hohokam were a creative and resourceful people. They made pottery, stone tools, and woven textiles, and also constructed an extensive canal system.[33] When the Hohokam eventually vanished from the area, they left behind remains of their large community. Pottery sherds (Figure 6), stone tools, metate, and petroglyphs have been found and are still located around Tempe Butte.

[32] The City of Tempe AZ, "Hayden Butte Preserve."
[33] The City of Tempe AZ, The Hohokam."

Figure 6: Prehistoric Hohokam Pottery Sherds | The Hohokam decorated their pottery with geometric designs and references to the nature that lived around them. (Source: Author)

The most sacred of these remains are the petroglyphs, which are dispersed throughout the Hayden Butte Preserve. There are over 500 of these ancient rock carvings around the mountain, making Hayden Butte one of the largest areas with the densest collection of Native American rock art in Arizona.[34] The petroglyphs are rock carvings that the Hohokam carved and etched into the volcanic rock found around Tempe Butte. Figure 7 shows some of the designs of petroglyphs that can be found around the butte.

[34] MOORE / SWICK, "Hayden Butte Preserve: Management Plan," 18.

Figure 7: Prehistoric Hohokam Petroglyph Designs | Many of the petroglyphs at Tempe Butte are geometric shapes, including series of circles or swirls, but some of them reference human and animal life. (Source: Author)

Along with the petroglyphs, baskets, metates, pottery and ceremonial offerings have been found on the land that once was home to the prehistoric Native Americans. Figure 8 highlights the location of some of these artifacts, including the remains of what had been terraced gardens on the north and west sides of the mountain.[14] Hohokam artifacts and a series of ancient terraced gardens were unfortunately destroyed during the excavation and construction of ASU Sun Devil Stadium.[35]

[35] MOORE / SWICK, "Hayden Butte Preserve: Management Plan," 24.

Figure 8: Hayden Butte Preserve | Cultural Resources (Source: MOORE / SWICK)

Early Settlers

During the 1700's, Hispanic settlers moved to the area of what is now Tempe. Explorers coming from Mexico stated that the area was not inhabited at the time of their arrival, perhaps because the Hohokam had already ceased to exist in the area.[36] In 1852, the first description of Tempe Butte was written by John Russel Bartlett.

[36] MOORE / SWICK, "Hayden Butte Preserve: Management Plan," 19.

Bartlett, the United States Boundary Commissioner at the time, wrote about the "mountain at the edge of the river" and "the ruins of prehistoric canals and villages scattered across the broad plain to the south and east."[37]

In the late 1800's, Charles Trumbull Hayden made the base of Tempe Butte his home. Hayden was a pioneer who is considered to be one of the founders of the city of Tempe. He developed an entire community around the butte, including a general store, the Hayden Flour Mill (which remains today), a series of warehouses, and a ferry service.[38] The community continued to grow and prosper, while the butte remained a constant focus to the new inhabitants of the area.

In 1918, the students of Tempe Normal School collected loose rocks towards the top of Tempe Butte and made a large letter "N". When the school changed its name to Tempe State Teachers College, the "N" was then changed to a "T". Not until 1938 did the first letter "A" come about on the side of Tempe Butte, thus receiving its well-known nickname, "A" Mountain.[39] The years following, a tradition began when students painted the "A" white every fall. In 1995, the college changed its name for the last time to Arizona State University. At this time, a new 60-foot-long, concrete "A" was poured on "A" Mountain.[8] Three years later, the ASU Sun Devil Stadium was designed to be built on the east side of Tempe Butte. To build the football stadium, a portion of the east side of the butte had to be excavated.[8] With this excavation came the destruction of hundreds of ancient petroglyph rock carvings and the remains of terraced farming.

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[37] MOORE / SWICK, "Hayden Butte Preserve: Management Plan," 20.
[38] MOORE / SWICK, "Hayden Butte Preserve: Management Plan," 21.
[39] The City of Tempe AZ, "Hayden Butte Preserve/A Mountain."

While many local residents recognize the butte as “A” Mountain, it is also referred to as Hayden Butte (coming from the namesake, Charles Trumbull Hayden). In 1973, The City of Tempe declared Hayden Butte a 25-acre park. The butte was designated as a preserve by the City of Tempe in 2002.[8]

Condition of Tempe Butte

Hayden Butte and the area surrounding its base is covered in native Sonoran Desert vegetation. The plant types that are most commonly found on the butte are Palo Verde trees, Mesquite trees, Saguaro cacti, Bursage, Creosote Bush, and a variety of cacti including Barrel, Cholla, and Prickly Pear.[40] Figure 9 is taken from MOORE / SWICK’s Hayden Butte Preserve Management Plan.

[40] MOORE / SWICK, “Hayden Butte Preserve: Management Plan,” 13.

Figure 9: Hayden Butte Preserve | Flora (Source: MOORE / SWICK)

The diagram highlights the major areas where the native flora can be found on the butte. There are two plants that have invaded the Hayden Butte area. These non-native plants, Bufflegrass and Fountain Grass have spread uncontrollably throughout the area and pose a threat for wildfires.[41] Along with fire hazards, these invasive plants take water and nutrients away from the native desert landscaping.

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[41] MOORE / SWICK, "Hayden Butte Preserve: Management Plan," 15.

While there are no longer larger mammals such as coyotes or javelina roaming Hayden Butte, a few smaller species of desert dwellers still call the area home. Lizards, snakes, and a variety of native birds including the Red-Tailed Hawk, the Gambel's Quail, the Peregrine Falcon, and the Mourning Dove can be found in the environment. Smaller mammals in the area include the Merriam Kangaroo Rat, the Black-Tailed Jackrabbit, and the Western Pipistrel Bat.[42]

Because of Hayden Butte's rather steep incline, drainage off of the mountain is a factor that must be dealt with for the surrounding developments. Most of the water runoff occurs as sheet flow, but there are also a series of medium to large-sized channels dispersed around the butte.[43] Figure 10 shows the location of these channels, many of which are collected around the northern side of the mountain.

[42] MOORE / SWICK, "Hayden Butte Preserve: Management Plan," 16.
[43] MOORE / SWICK, "Hayden Butte Preserve: Management Plan," 13.

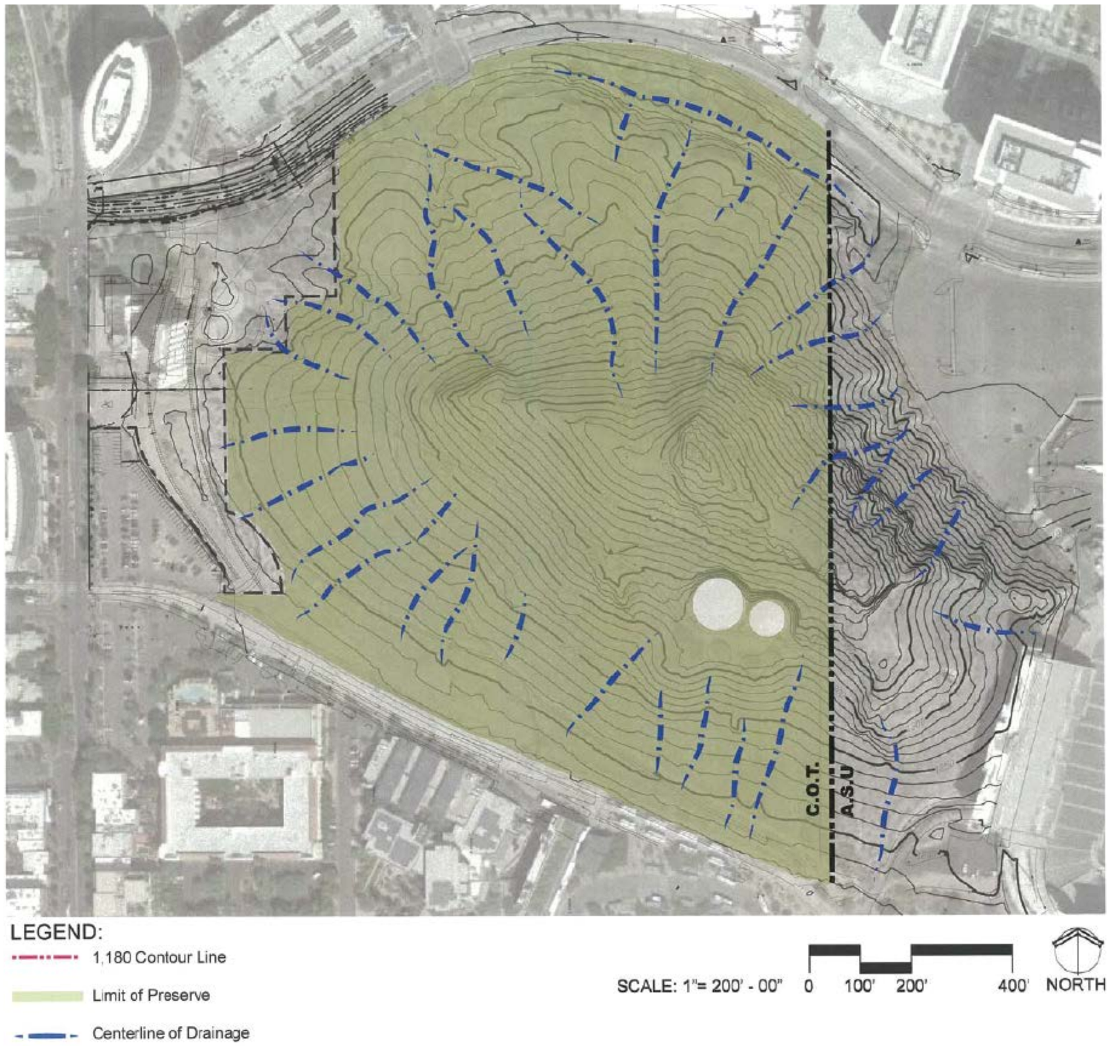

Figure 10: Hayden Butte Preserve | Drainage (Source: MOORE / SWICK)

Hayden Butte also handles water with man-made water tanks located towards the southeast side of the mountain. These water tanks are represented in Figure 10. Two steel reservoirs are located on the butte, the first was constructed in 1949, and the second in 1956. The reservoirs hold 1,000,000 gallons and 2,000,000 gallons of water respectively.[44] These water tanks are still in use today and service the City of Tempe.

[44] MOORE / SWICK, "Hayden Butte Preserve: Management Plan," 26.

One of the greatest threats to Hayden Butte Preserve is the people that flock to the area for recreational activities. A series of trailheads and trails cover the butte, which attract local residents and tourists. The designated trails are meant for the protection and preservation of the butte, and hikers that disobey the rules are only harming the area. Hikers can disturb the native desert vegetation when they leave the trails, and they also risk erosion of the desert rock.[45] A serious problem with maintaining the butte is the destruction of ancient petroglyphs that have been ruined by physical abuse and graffiti.[15] The City of Tempe attempts to restore the harmed artifacts, and Boy Scouts and Arizona State students organize groups to clean up the landscaping.[46]

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[45] The City of Tempe AZ, "Hayden Butte Preserve/A Mountain."
[46] The City of Tempe AZ, "Hayden Butte Preserve/A Mountain."

Chapter 4: Site Analysis

Site Exploration

The beginning of site exploration began with the study of two areas in the Phoenix Metropolitan Area. With a program not yet distinguished, the site for the project needed to be in an area immersed in an environment rich with culture, education, and connection to the natural landscaping of the Sonoran Desert. Another key factor for site consideration was the proximity to the Valley Metro Light Rail. The Light Rail system is still developing in the Phoenix area, so the project site aims to utilize this growing form of public transportation.

The first area of study was located at the Arizona State University Tempe Campus. Figure 11 highlights the potential area of study. Immersed in ASU's Tempe Campus, the project site is surrounded by university buildings. To the north and northwest of the project site, there are ASU sports facilities, and a natural landform, Tempe Butte. Tempe Butte has a unique position in the city, because development encroaches upon it on all sides. This small isolated hill serves as an anchor or beacon to the downtown Tempe area, providing a strike contrast between nature and human development. These features all attract Tempe residents and ASU students to the area, making the project site a popular spot. The site is also bordered on the southwestern edge by the Light Rail tracks.

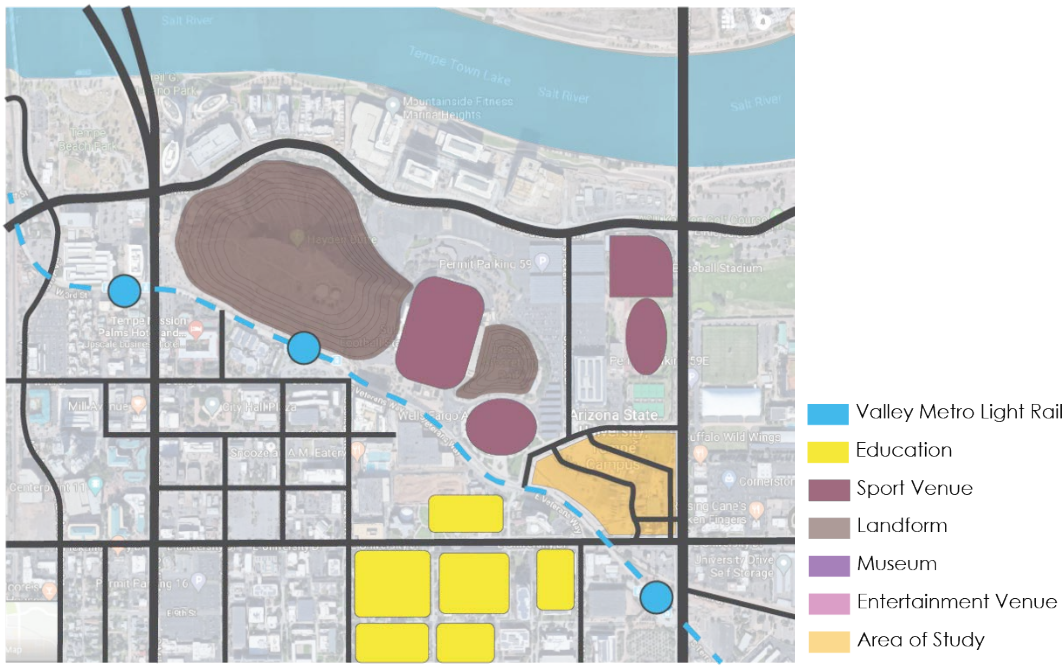

Figure 11: Analysis of Arizona State University Tempe Campus | Exploration of the Area of Study and the Surrounding Site Context (Source: Author)

The second area of study was in Downtown Phoenix. Figure 12 highlights the potential area of study. Museums, cultural centers, entertainment venues, university buildings, and high schools are scattered throughout this portion of the Downtown area. The Light Rail also makes its way through these features, making the area accessible.

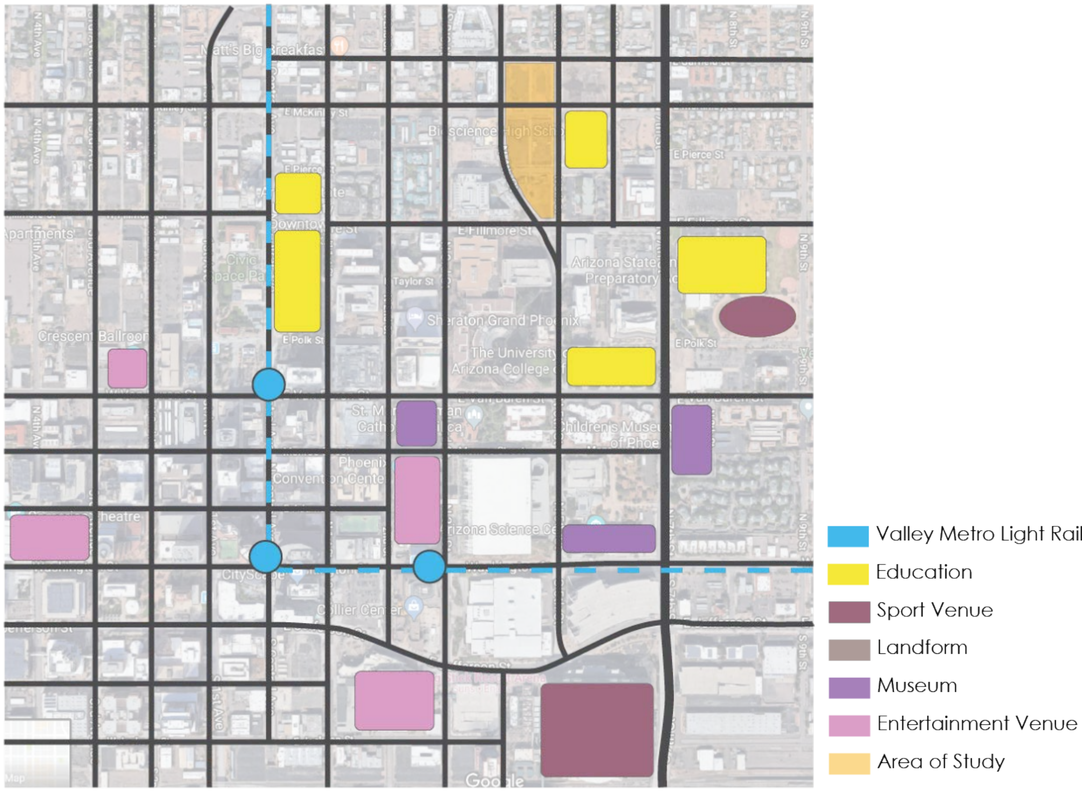

Figure 12: Analysis of Downtown Phoenix | Exploration of the Area of Study and the Surrounding Site Context (Source: Author)

While comparing the two potential project sites, Figure 13 shows how the Tempe location met all the requirements that the project was asking for.

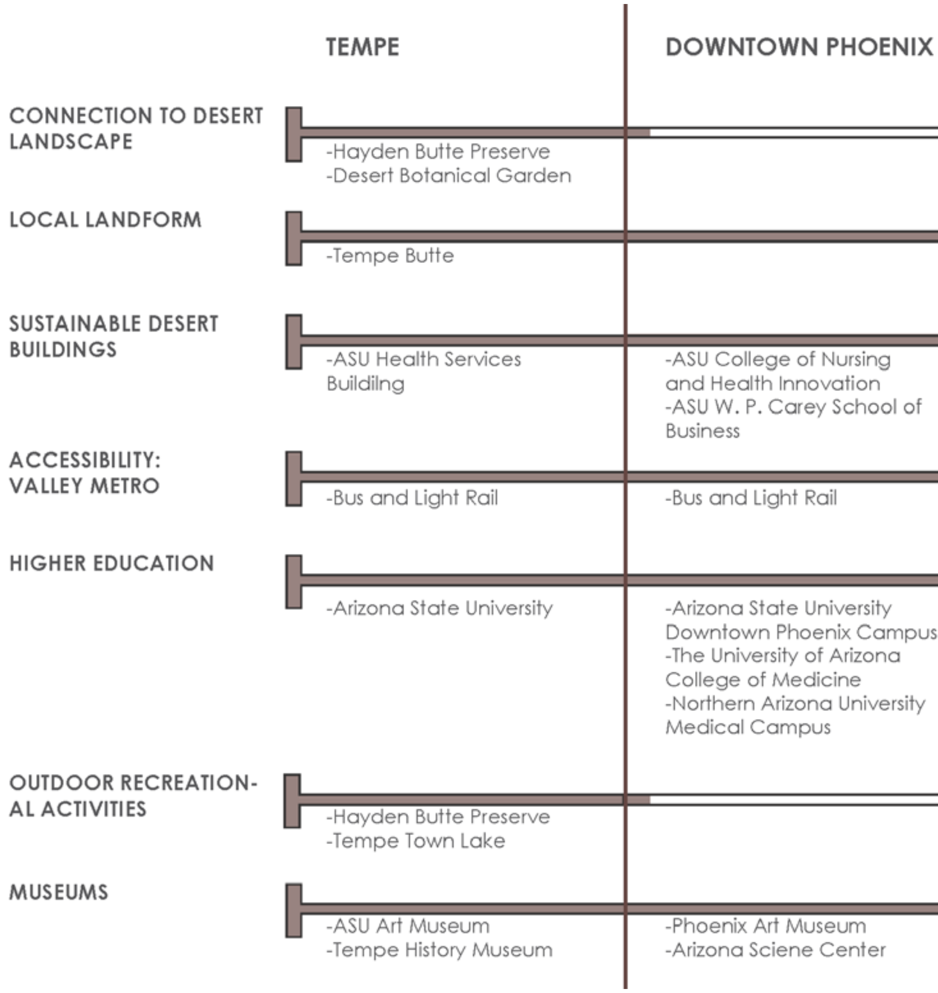

Figure 13: Site Selection Matrix | Comparisons of the Tempe site versus the Downtown Phoenix site to determine which area is best suited for the project proposal (Source: Author)

While the Downtown Phoenix area was culturally and historically rich, it lacked an actual connection to the native landforms and landscaping of the Sonoran Desert.


Figure 14: View of Tempe Butte | View coming from the Northwest (Source: GoogleMaps)

After analyzing the Tempe area further, the area of study for the project site was moved from the original location, to western base of Tempe Butte (Figure 15 and 16). This location allowed for a building that has a direct connection to the butte, allowing for a stronger relationship between the city of Tempe and its prominent landform.

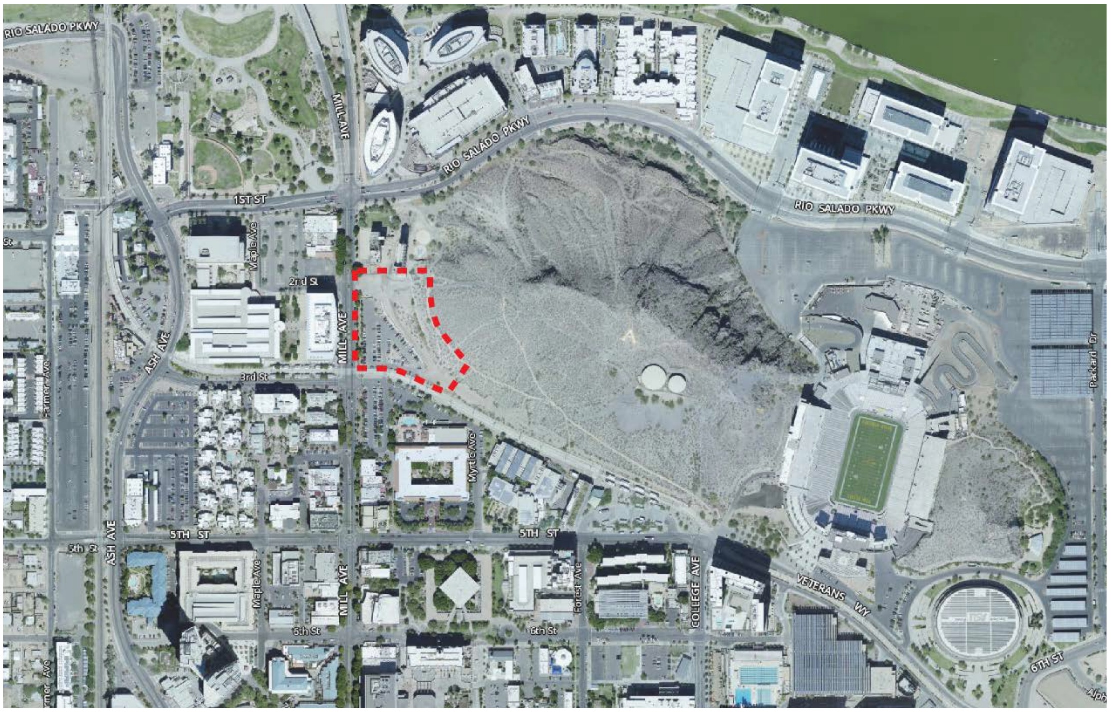

Figure 15: Aerial View of Tempe Butte | Tempe Context (Source: ArcGIS)

Figure 16: Aerial View of Tempe Butte | Zooming in on the Proposed Building Site (Source: ArcGIS)

Settling in Tempe, AZ

The majority of land area in the state of Arizona is covered by the Sonoran Desert. This thesis is situated in the city of Tempe, which is located at the center of the Greater Phoenix Metropolitan Area.[47] Tempe is a city rich with education, history, and a sense of community. Home to a population of 161,000 people, the city has a wide range of attractions including outdoors activities, the Desert Botanical Gardens, commercial districts at Mill Avenue and Tempe Town Lake, and the Arizona State University's campus.[1] While Tempe is located on relatively flat terrain, Tempe Butte draws people to the area because of its prominence in the community. The butte, an isolated hill smaller than a mesa or plateau, is of volcanic origin and has steep side, almost vertical at some points. Covering an area of about 59 acres, the butte has a base at 1,180 feet above sea level and a summit of 1,496 feet.[48] This mountain serves as a landmark in the city, holding a place of importance to the people of Tempe because of its cultural history.

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[47] The City of Tempe AZ, "Community Profile."
[48] MOORE / SWICK, "Hayden Butte Preserve: Management Plan," 3.

Figure 17: Map of Arizona | Locating the City of Tempe (Source: Author)

<u>*Site Context*</u>

The site for this thesis is located at the western side of the base of Hayden Butte. Figure 18 highlights the site location within the surrounding context. The major cross streets around the site are W 3rd Ave and Mill Ave. Valley Metro Light Rail travels down 3rd Ave, to cut across Mill Ave and continue around the southern base of Hayden Butte. A Light Rail Station is located at the intersection of the building site.

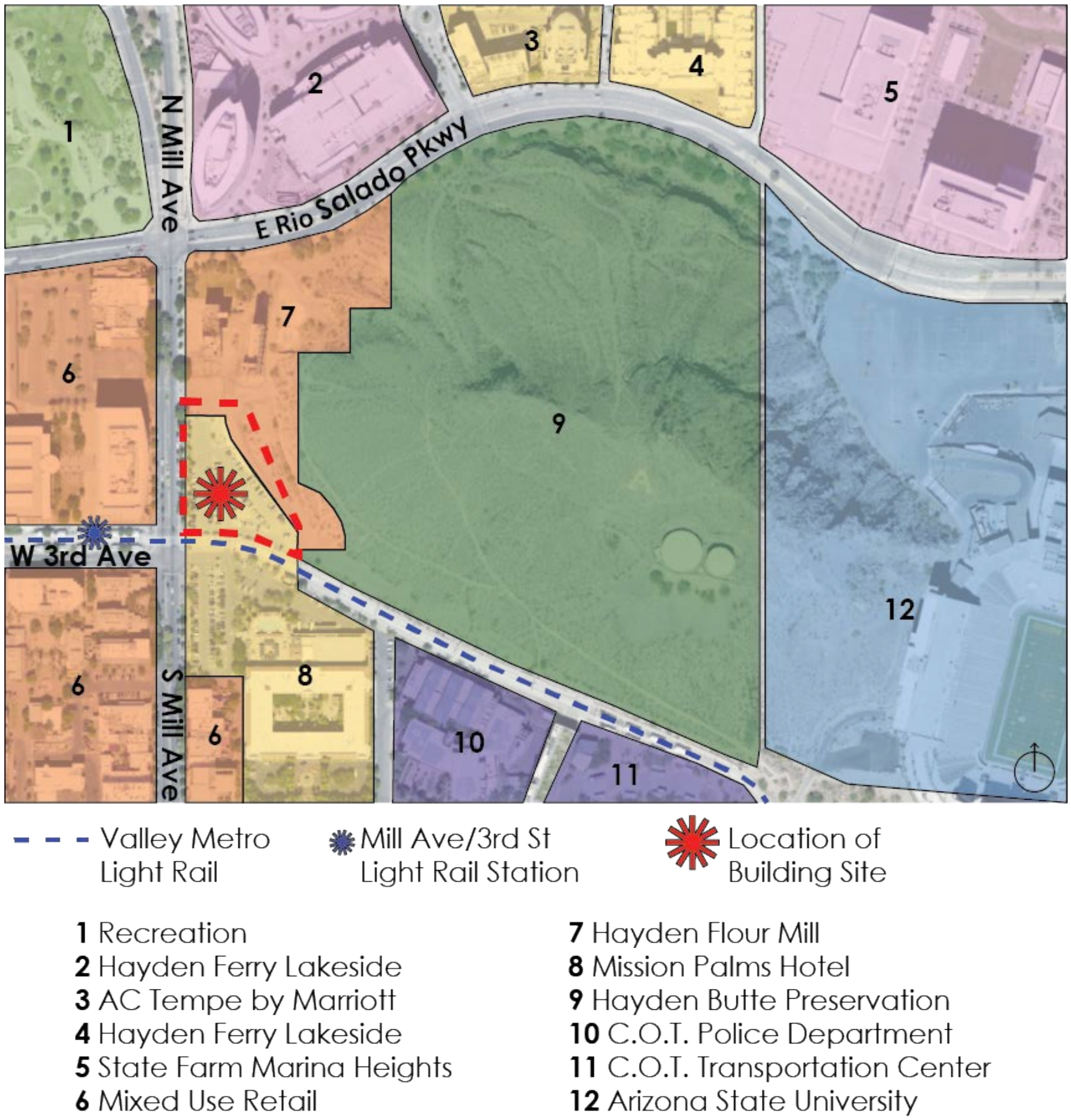

Figure 18: Development and Site Context (Source: Author)

Surrounding the site is a variety of development and land use. Figure 19 highlights the current zoning regulation of the area. The building site is encompassed by a variety of residential, mixed-use commercial, city center, and industrial zoning. Mill Avenue, the street that runs north-south to the west of the project site, is made up of retail and restaurants. Mill Avenue continues to develop, becoming more of a community staple to the city of Tempe. At certain times throughout the year, festive events take place on Mill Ave. For example, after Thanksgiving, Tempe closes off a portion of the street to cars, and puts on a holiday parade for the people in the area.

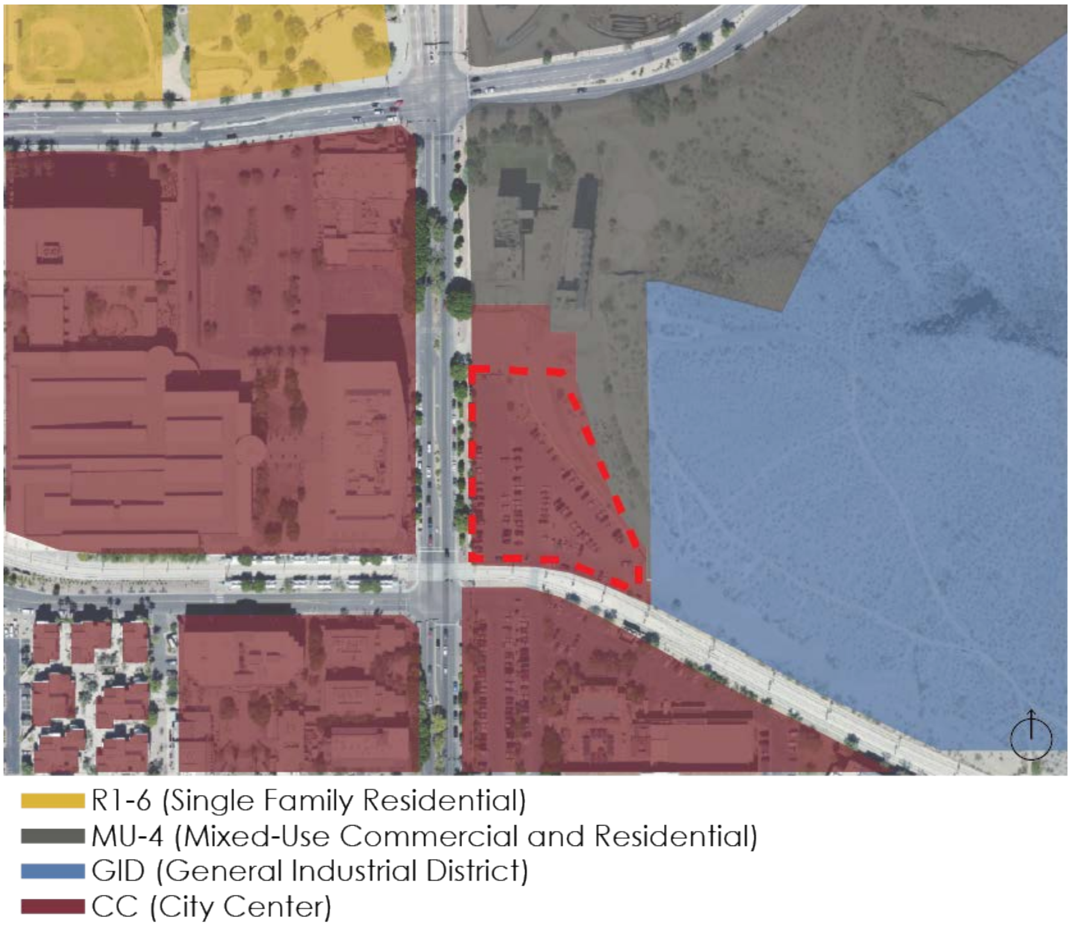

Figure 19: Site Context Zoning (Source: City of Tempe ArcGIS and Author)

Figure 20 illustrates explorations of building footprints on the site. The area is currently a metered parking lot that services hikers that come to Tempe Butte and the Mission Palms Hotel just south of the Light Rail tracks. The parking lot also has access to the paved driveway that leads up to the steel water reservoirs located on Hayden Butte. With an overall footprint of over 75,000sqft, constructing a building on the site will still leave area for necessary parking.

Figure 20: Site Dimensions | Exploring Potential Building Footprints (Source: Author)

At street level, the site provides straight on views of Hayden Butte. Immersed in the rich historical resources of the area, the site is also adjacent to the original Hayden Flour Mill. Figures 21, 22, and 23 depict the conditions of the site and the invaluable views that is has to offer.

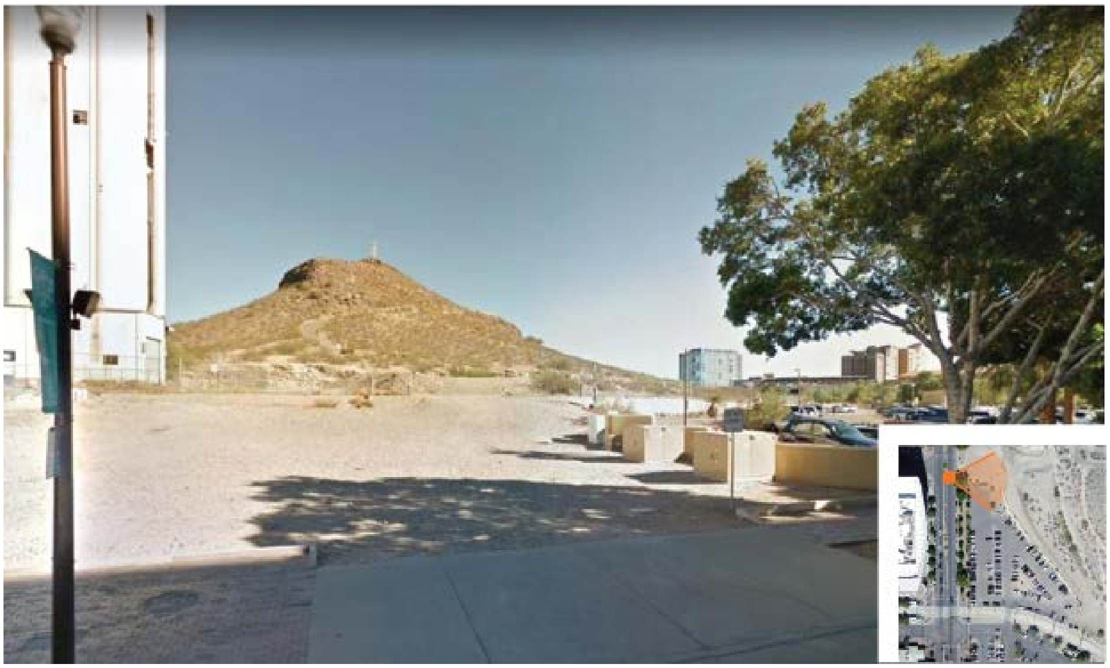

Figure 21: Site Street View | Looking East Toward Tempe Butte (Source: Google Maps)

Figure 22: Site Street View | Looking East Toward Tempe Butte and Valley Metro Light Rail Tracks (Source: Google Maps)

Figure 23: Site Street View | Looking Northeast Across Valley Metro Light Rail Tracks Toward Tempe Butte and Hayden Flour Mill (Source: Google Maps)

<u>Site Visit</u>

Exploring the site allowed for further exploration and discovery regarding the current condition of Tempe Butte and its surrounding areas. Figure 24 shows a collection of ancient petroglyphs that are scattered around the butte. There is nothing protecting these ancient artifacts, and they are not clearly marked. The only indication of the petroglyphs is a sign at the base of the butte that gives a description of their origin. Some of the rocks containing these carvings are covered in graffiti, potentially causing harm to the artifacts.

Figure 24: Petroglyphs | Hohokam petroglyph remains on the rocks on Tempe Butte (Source: Author)

Figure 25: On Tempe Butte, looking west down towards the building site (Source: Author)

Once at the top of the butte, the peak is blocked off with a chain linked fence. Behind this fence is a tall utility and transmission tower (Figure 26). Many people come to Tempe Butte to hike to the top to experience the 360-degree view of the city and desert around them. Unfortunately, the utility tower interrupts this scenic experience, distracting from the awe-inspiring view.

Figure 26: Condition of the peak of Tempe Butte (Source: Author)

Figure 27: Looking east at the butte from the access road that leads to the water tanks (Source: Author)

Figure 28 shows the connection of the parking lot building site and the base of the butte that gradually begins to slope upwards. At the eastern end of the parking lot, the ground level is raised a few feet. Between the grade change and the point at which the butte's slope begins to increase, a portion of an old railroad track is left from early settlers of the area, as well as a drainage ditch that can service water runoff from the butte.

Figure 28: Looking north at the butte and the project building site (Source: Author)

The visit to the project site revealed that the overall conditions of the butte need to be greatly improved. While there are trailheads around the southern edge of Tempe Butte, the conditions of the actual trails are outdated. The steps and railing that lead up to the peak of the butte are rusty and unstable, and do not provide hikers with the safest or best access to the top. The amount of litter and graffiti that covers this revered landform is concerning, especially since it is the home to so many ancient artifacts and native plants.

Chapter 5: Building for the Desert

Located in the Sonoran Desert, Central and Southern Arizona lie in low, hot, dry climates. These parts of the state correlate more with the climate of Mexico, it's border to the south, than the rest of the United States.[49] The climate for these parts of the state, including the Greater Phoenix Metropolitan area, require much more cooling than heating to stay comfortable in a home or a building.[50] This region of the Sonoran Desert should have unique technologies that deal with its extreme climate. In his book titled *Desert Architecture*, architect Pat Guthrie explains that this desert region requires "Climate Responsive Design", using certain methods, materials, and systems that cater to the exact needs of the Sonoran Desert.[51]

Protection from the Sun

The Phoenix Metropolitan Area, including Tempe, experiences a high percentage of average days of sunshine when compared to other cities around the United States. The information provided in Table 1 proves that the Phoenix/Tempe area requires a great deal of sun protection based on the steep percentages of seasonal sunshine and lack of cloud cover.[52] When considering developing a building in this part of the state, it is crucial to track the sun's path because orientation to it's rays will have an impact on the performance of the building. Figures 29-32 map out where the sun is located throughout the year. Analyzing these diagrams, it is evident that protection of the roof and southern façade of the building is crucial, because those are

[49] Guthrie, "Desert Architecture", 2.
[50] Guthrie, "Desert Architecture", 2.
[51] Guthrie, "Desert Architecture", 4.
[52] Guthrie, "Desert Architecture", 28.

the two sides that are receiving direct sunlight all year round; the roof receiving the highest solar loads in the summer, and the south receiving the highest solar loads in the winter.[53] The east and west facades are also to be protected, because they receive strong rays during the sunrise and sunset. That leaves the northern façade as the ideal side of the building, especially in this climate.

	PHOENIX	MIAMI	NEW YORK	MINNEAPOLIS
Winter	82%	69%	54%	50%
Summer	89%	64%	63%	63%

Table 1: Percentage Sunshine | Comparing the seasonal sunshine in Phoenix with other cities around the US. (Source: Guthrie)

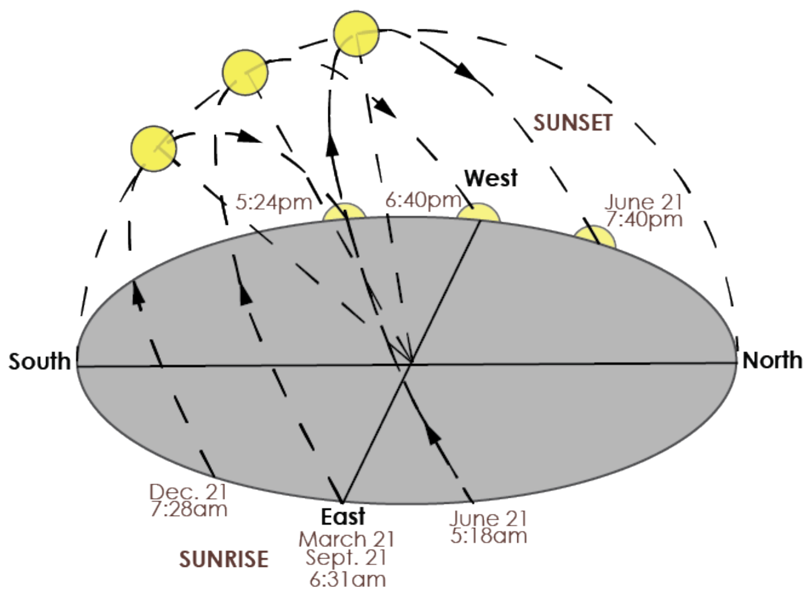

Figure 29: Solar Geometry | Mapping the sun's path throughout a year in the Phoenix Metropolitan Area (Source: Author's figure based on work by Guthrie)

[53] Guthrie, "Desert Architecture", 43.

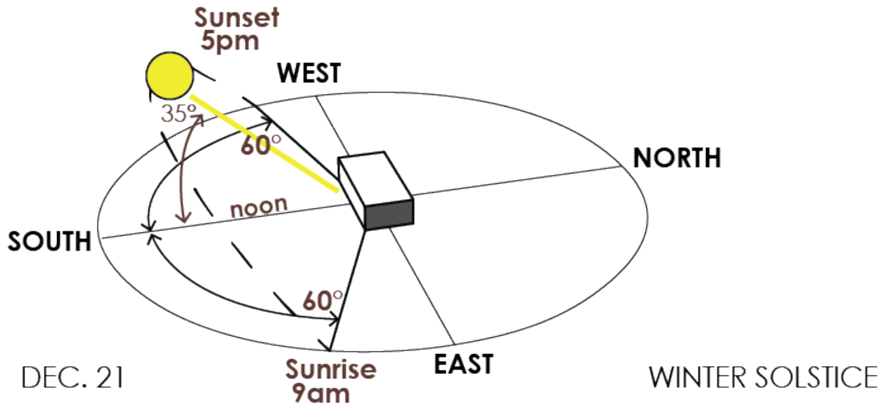

Figure 30: Winter Solstice | Diagramming the Phoenix Metropolitan Area Winter Solstice (Source: Author's figure based on work by Guthrie)

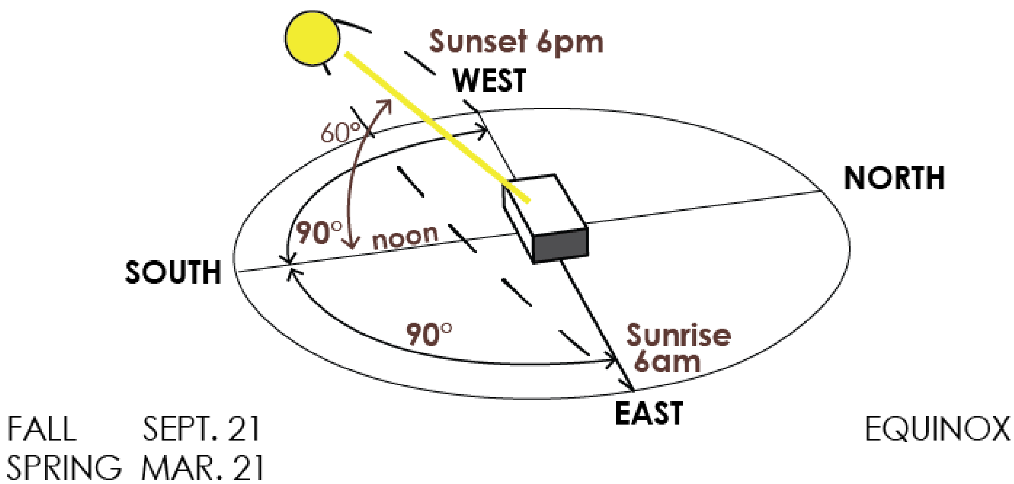

Figure 31: Equinox | Diagramming the Phoenix Metropolitan Area Equinox (Source: Author's figure based on work by Guthrie)

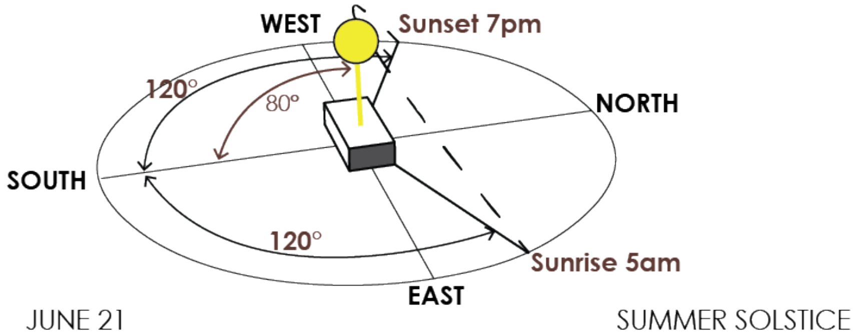

Figure 32: Summer Solstice | Diagramming the Phoenix Metropolitan Area Summer Solstice (Source: Author's figure based on work by Guthrie)

As the Phoenix/Tempe area experiences about a six-month summer, the use of shading techniques are needed to protect from the strong sun. The ideal sides of a building to shade are the east and the west facades, while also including the south.[54] While the southern facing glass façade is traditionally the best use for heating during the winter, this is not the same for a building in this region of the Sonoran Desert. So much exposed glass can let in an uncomfortable amount of heat during the long summer months. In response to this extended period of warm summer, overhangs can be built to protect southern facing glass. Figure 33 diagrams how the extent of the overhang needs to reach out to a certain degree so that the sun's angle is not able to reach the southern facing glass.

[54] Guthrie, "Desert Architecture", 49.

NEED	PHOENIX	MIAMI	NEW YORK	MINNEAPOLIS
SUN				
Time heat needed:	37%	12%	72%	76%
Time shade needed:	63%	88%	28%	24%
WIND				
Time protection needed:	37%	0%	72%	76%
Time breezes comfortable:	19%	62%	7%	4%
Time of shaded comfort:	16%	26%	21%	15%
Mech. cooling need:	28%	-	-	-

Table 2: Climatic Needs of a Comfortable Building | Comparing Phoenix with other cities around the US to analyze what how the different climates affect the needs of a building. (Source: Guthrie)

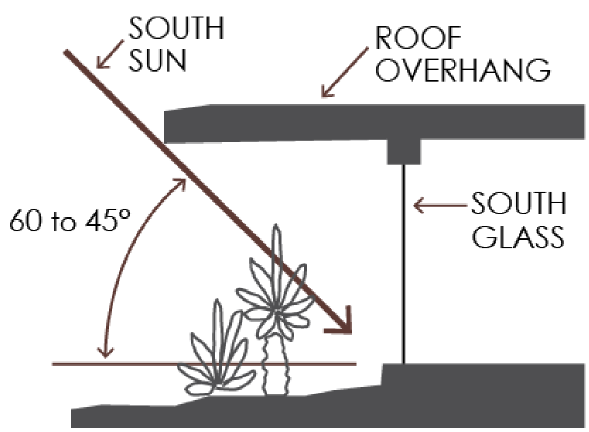

Figure 33: Southern Sun Shading | Diagramming the roof overhang that is able to shield a south facing façade from the southern sun. (Source: Author's figure based on work by Guthrie)

<u>*Keeping the Building Cool*</u>

Phoenix and Tempe are located in a low desert, an area that experiences extremely hot summers days and mild winters days.[55] With temperatures able to reach 90-115 degrees Fahrenheit during the summer months, it is important that the interior of a building uses technologies to make the space comfortable and cool.

[55] Guthrie, "Desert Architecture", 26.

These summer days require shading a building and its windows as much as possible. During the spring and the fall, cool days allow buildings to open and naturally ventilate. The winter season brings average to mild days, when a building can remain opened, and cold nights. The air remains dry for most of the year, unless it is the summer monsoon season.[56]

A traditional building technique used by early Arizona Native Americans is adobe construction. These massively thick earth walls would delay and store the heat flow that tried to work its way from the warm and hot exterior of the building, to the interior (Figure 34). During a hot day, solar heat and convection would work from the outside towards the interior of the wall. By the time the sun had gone down and the temperatures dropped, the flow of heat would reverse, working back towards the exterior again. Since the adobe walls could be as thick as 2 feet wide, their storage capacity was so great that the heat would hopefully never even be able to reach the inside of the building.[57] The use of rammed earth construction shares the same type of characteristics as adobe, thermal mass walls. Both of these building techniques are ideal for the desert because they perform well in the climate, and they can be constructed using local materials.

[56] Guthrie, “Desert Architecture”, 30.
[57] Guthrie, “Desert Architecture”, 78.

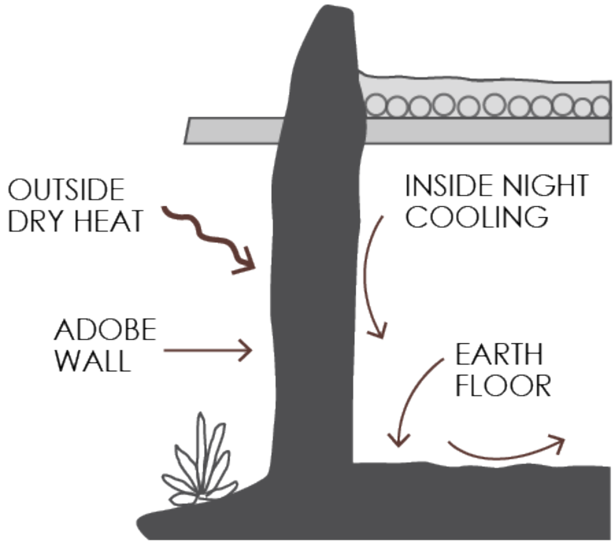

Figure 34: Adobe Wall | Adobe construction is able to delay and store heat flow during the warm and hot days, keeping the interior of the building cool (Source: Author's figure based on work by Guthrie)

Chapter 6: Precedent Studies

Chandler City Hall

Chandler City Hall is a collection of government buildings located in downtown Chandler, AZ. Figure 35 diagrams the mixture of 1-story to 5-story buildings that surround an outdoor courtyard and plaza in the center. Designed by SmithGroupJJR, and completed in 2010, Chandler City Hall is innovative in how it deals with the harsh desert climate.[58] At one end of the project site, there is a cooling tower and water feature attached to the large parking structure. While channeling winds and evaporative cooling from the water tower, the central outdoor courtyards benefit from cool breezes that help to ease the warm and hot environment.[59] Figure 36 diagrams a section of the cooling tower/water feature, and the southeast and westerly breezes that carry cooled air through the campus of buildings. Chandler City Hall is successful in their bioclimatic design that allows for water features to naturally cool spaces in such a harsh climate.[60]

[58] AIA, "Chandler City Hall".
[59] AIA, "Chandler City Hall".
[60] AIA, "Chandler City Hall".

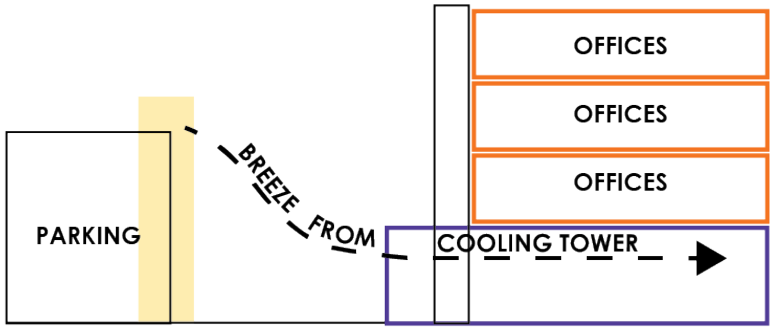

Figure 35: Chandler City Hall Section | Diagramming the cooling effect of the cooling tower and how it reaches the adjacent buildings. (Source: Author)

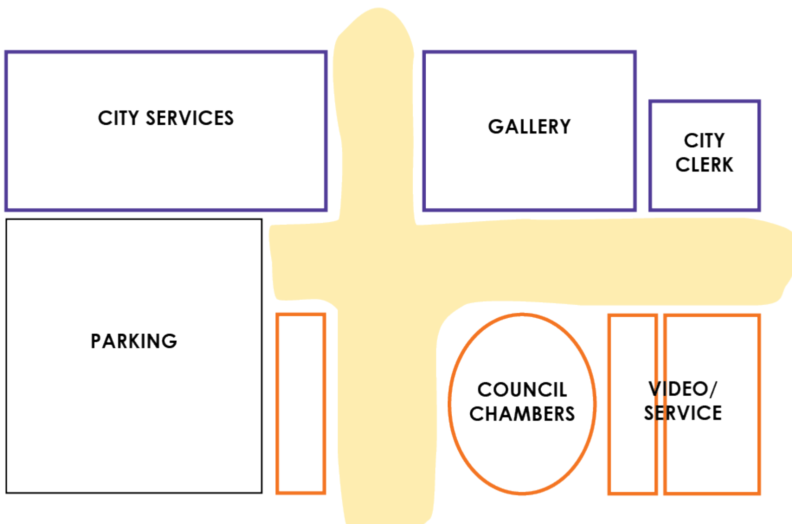

Figure 36: Chandler City Hall Plan | Diagramming the "campus" of buildings and the outdoor plaza area connecting them all together (Source: Author)

<u>*Tucson Mountain Retreat*</u>

The Tucson mountain retreat is a private residence completely immersed in the natural landscape of the Arizona Sonoran Desert. Designed by DUST, an architecture firm based out of Tucson, AZ, the building was completed in 2004.[61] Figure 37 diagrams the compelling section of the house. The building features

[61] Mathews, "A Desert House".

rammed earth technology, creating thick barrier walls that range from 18 to 36 inches thick. The plan, depicted in Figure 38, shows how the thick thermal mass walls separate the three areas of the home: the music recording studio, the living area, and the sleeping area. Not only are the rammed earth walls extremely durable, but they were made using local soils, or soil found on-site.[62] The native Sonoran Desert soils in the walls reflect the colors in the surrounding landscape, picking up the hues found in the ground, the rocks, and the landforms around the home. This rammed earth construction works much like the ancient adobe walls that were built by Native Americans in the prehistoric Southwest; the massive walls helping in keeping the temperatures cool in a house undergoing a harsh, hot climate.

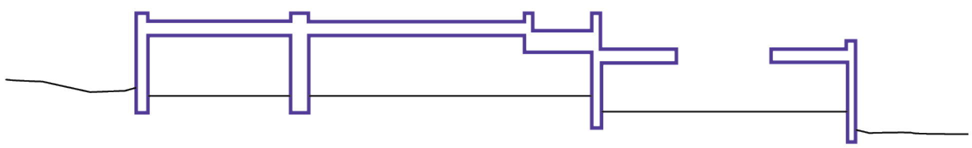

Figure 37: Tucson Mountain Retreat Section | Diagramming the thick outlines of the rammed earth construction (Source: Author)

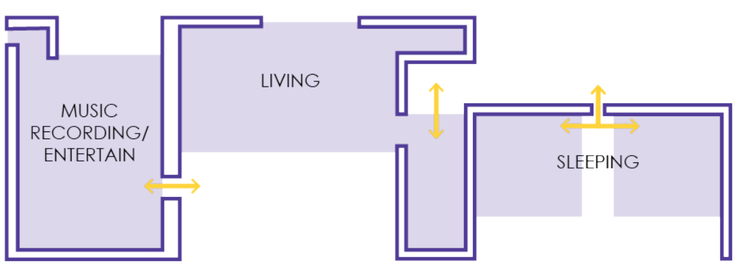

Figure 38: Tucson Mountain Retreat Plan | Diagramming the rammed earth walls that divide the home into three distinct areas (Source: Author)

[62] Mathews, "A Desert House".

Biomedical Partnership Building

An environment as unique as the Sonoran Desert requires building materials that can withstand the extreme climate throughout the year. Natural materials to the desert have evolved over time, and can survive in the warm and hot temperatures of the long summers in the Phoenix Metropolitan area. The Biomedical Partnership Building (BSPB) at the University of Arizona's Phoenix Biomedical Campus makes use of one of Arizona's most famous natural resources: copper. Since before statehood, copper played a key role in Arizona's growing economy, and it is still being mined today.

The exterior of BSPB is made up of folded and bent copper panels. The recycled copper creates a cladding system for the building, that reflects light and casts shadows around the site. The conductive qualities of the metal work well in the extreme Phoenix heat, minimizing heat that can enter the building.[63] The exterior cladding system works as a type of "sunscreen" that protects the interior from direct exposure to the sun. Not only is the copper beneficial to the performance of the building, but the material reflects the mountains surrounding the area.[64]

Brock Environmental Center

The Brock Environmental Center in Virginia Beach, Virginia, is diagrammed in Figures 39 and 40 because of the organization of its program. While the Center is located in a climate completely different from the Sonoran Desert, the organization of the site is successful in incorporating the surrounding landscape and connecting to the

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[63] Robins, "Iconic Arizona Inspiration".
[64] Robins, "Iconic Arizona Inspiration".

ecosystems where the building exists. The design of the building had a focus to "do less harm" to its unique environment, aiming to develop a building while protecting the valuable and natural resources of the Chesapeake Bay.[65]

Shown in Figure 37, the layout of the building is mostly single loaded along a slight curve. Starting with the lobby, the areas to the right get more private as they reach the office and meeting room spaces. To the opposite side of the lobby, the areas are geared more towards the public, offering a large conference room gathering space and outdoor areas that look out onto the Chesapeake Bay.[66] Figure 36 depicts a section cutting through the continuous circulation path and the meeting room and office space. The intervention of natural ventilation moves through these two spaces, creating a sustainable method of cooling.

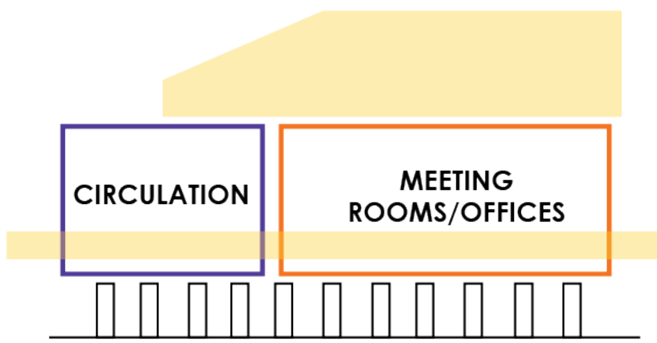

Figure 39: Brock Environmental Center Section | Diagramming the program of the building and the intervention of natural ventilation moving throughout and above the space (Source: Author)

[65] AIA, "Brock Environmental Center".
[66] AIA, "Brock Environmental Center".

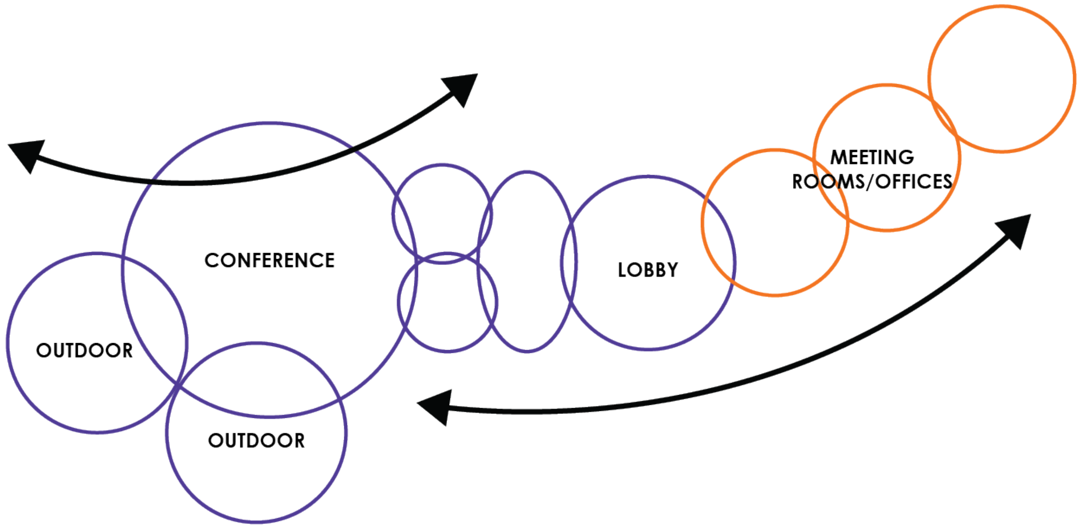

Figure 40: Brock Environmental Center Plan | Diagramming the organization of program while keeping a focus on the views and relationships to the exterior landscape of the site (Source: Author)

<u>*Exterior Building Materials*</u>

The extreme heat and solar rays in the Sonoran Desert require the exterior of buildings to be treated with particular materials in order to protect the people inhabiting the interior space. Loloma 5, by will bruder+PARTNERS, is a project located in Scottsdale, Arizona. The west façade of the building features a ribbed gray Rheinzinc cladding that serves as a shield against the sun. These perforated screens still allow the ability to see inside and outside of the building (Figure 41).[67]

[67] ArchDaily, “Loloma 5 / will bruder+PARTNERS”.

Figure 41: Perforated Shading Screens | Loloma 5 will bruder+PARTNERS exterior cladding protects the interior of the building from the sun. (Source: Bill Timmerman)

Figure 42 depicts the exterior of the Arizona State University College Avenue Commons building. The building is in the heart of ASU’s Tempe campus, serving as a multipurpose center including classrooms, offices, food service, and a school spirit store. The terracotta tiles decorating the exterior of the building make reference to the natural reds and oranges that can be found in the dirt and soil of the Sonoran Desert. The College Avenue Commons building takes advantage of its regional location, and uses the appearance of its façade to refer back to the natural colors found amongst the desert.

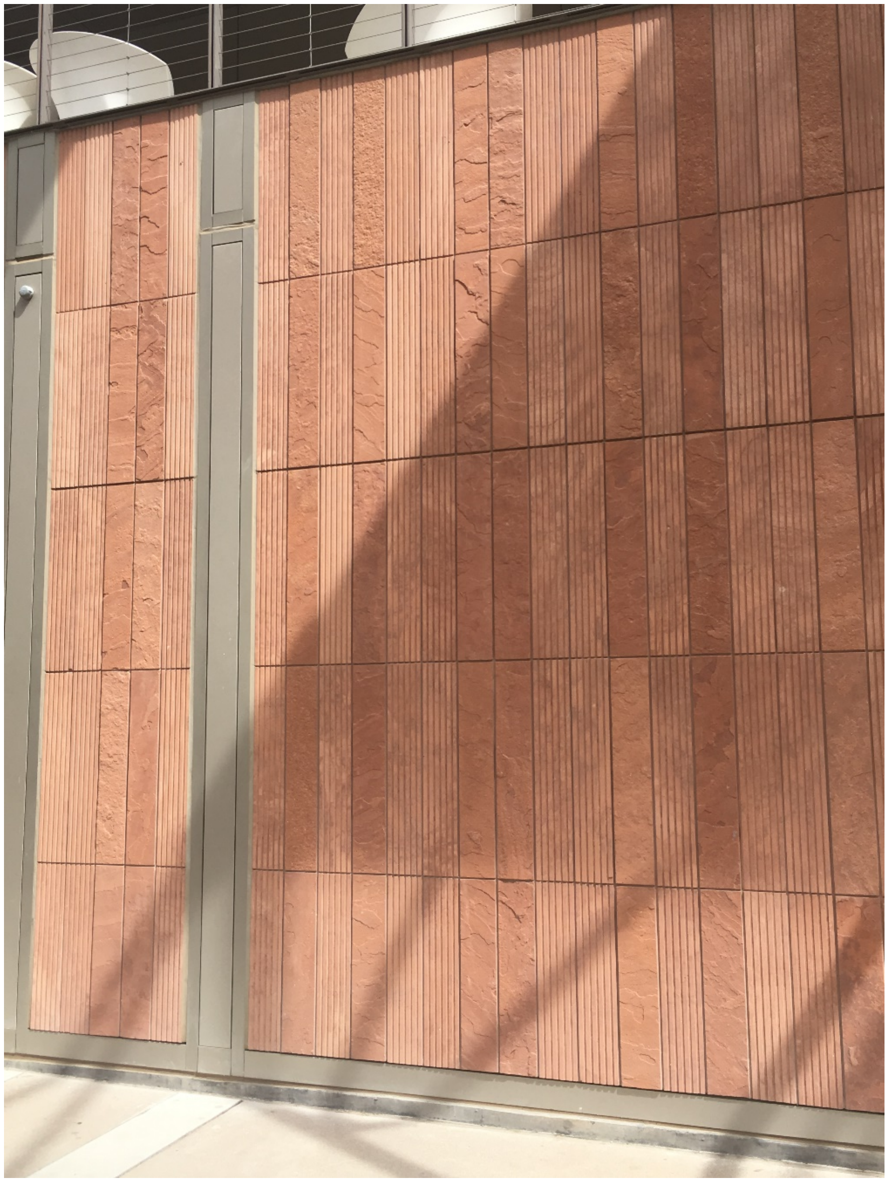

Figure 42: Exterior Terracotta Tiles | Loloma 5 will bruder+PARTNERS exterior cladding protects the interior of the building from the sun. (Source: Author)

Chapter 7: Design Development

What Does the Butte Need?

Tempe Butte is not only a protuberant landform serving as a beacon to the city of Tempe, but it is a site of rich culture and history. Over the years, the butte seems to have lost its significance in the eyes of some of its visitors, as it is covered in trash, empty bottles, graffiti, and unsightly city services such as the water tanks and the transmission tower. The general environment of the butte needs to be improved. The city of Tempe has encroached on the butte and it continues to do so. With rapid development of the city, the archaeological site of the prehistoric Hohokam is being destroyed and abused. Human interaction and infrastructure on the actual slopes of the butte have only made this matter worse. Infrastructure such as the radio communications tower and the water tanks were placed on top of the land. They take away from the natural landscape and harm the areas where artifacts have been found.

There are groups of people that make an effort to clean up the butte and preserve the history that is has to offer. ASU’s School or Sustainability and the Julie Ann Wrigley Global Institute of Sustainability partner with the City of Tempe for an annual “clean-up” day for the butte.[68] ASU students and local Tempe residents volunteer on Earth day for this organized event where trash in picked up and graffiti is cleaned off of surfaces. The Tempe History Museum also is involved in the restoration and preservation of the butte, specifically regarding the Hohokam petroglyphs covering the area.

The proposed building for the site benefits these groups of people that work

[68] MOORE / SWICK, “Hayden Butte Preserve: Management Plan”

and volunteer for the betterment of Tempe Butte. This building can serve as a repository for the artifacts that are discovered and preserved on Tempe Butte and the city of Tempe. Rapid development has unfortunately destroyed too much of the past, and the proposed building will help to piece together fragments to distinguish a more defined place in history for the original settlers in the area. Located at the base of the landform, the building's site is integrated into the natural landscape, but must not disrupt the ecosystems or existing artifacts that cover so much of the area. To reduce the amount of disruption on the butte, the existing trails must be restored, along with introducing a new trailhead that explores the north side of the butte. Currently there is not a direct pathway for hikers to go around the north side of the butte, resulting in corrosion, trampled plants, and disrupted artifacts.

Concepts

As a basis for beginning scheme developments, the building site is analyzed in Figure 43. The location of the Light Rail stop is indicated, as well as the tracks that continue around the southern edge of the building site. Regulatory lines are marked around the boundaries of the parking lot, as well as the point of the base of the butte where the ground begins to slope up. Pink dashed lines indicate the existing hiking trails, and the road that leads up to the water tanks.

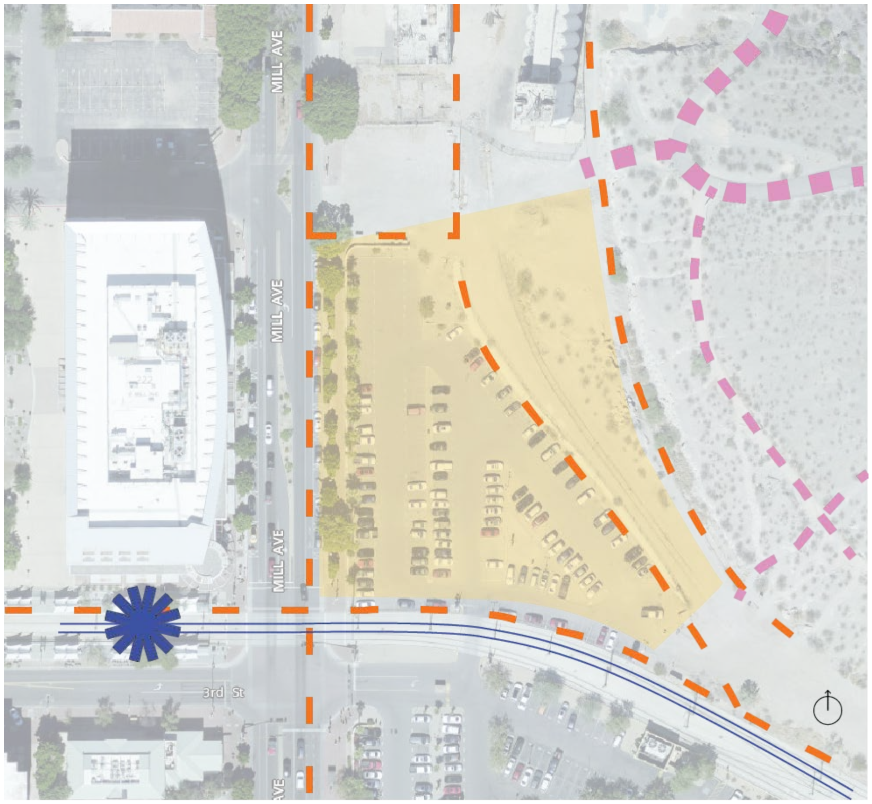

Figure 43: Concept Analysis (Source: Author)

Concept 1 (Figures 44 and 45) explores a building aligned with the wall that marks the ground level grade change at the western end of the parking lot. A rectangular building, then stepping up into a curved space, the program within this concept is organized from more private to public. Access off of Mill Ave and 3rd Street is diagonally directed towards the building because of its alignment on the site. The “back” of the building then relates to the nature of the butte, opening up to the northeast views.

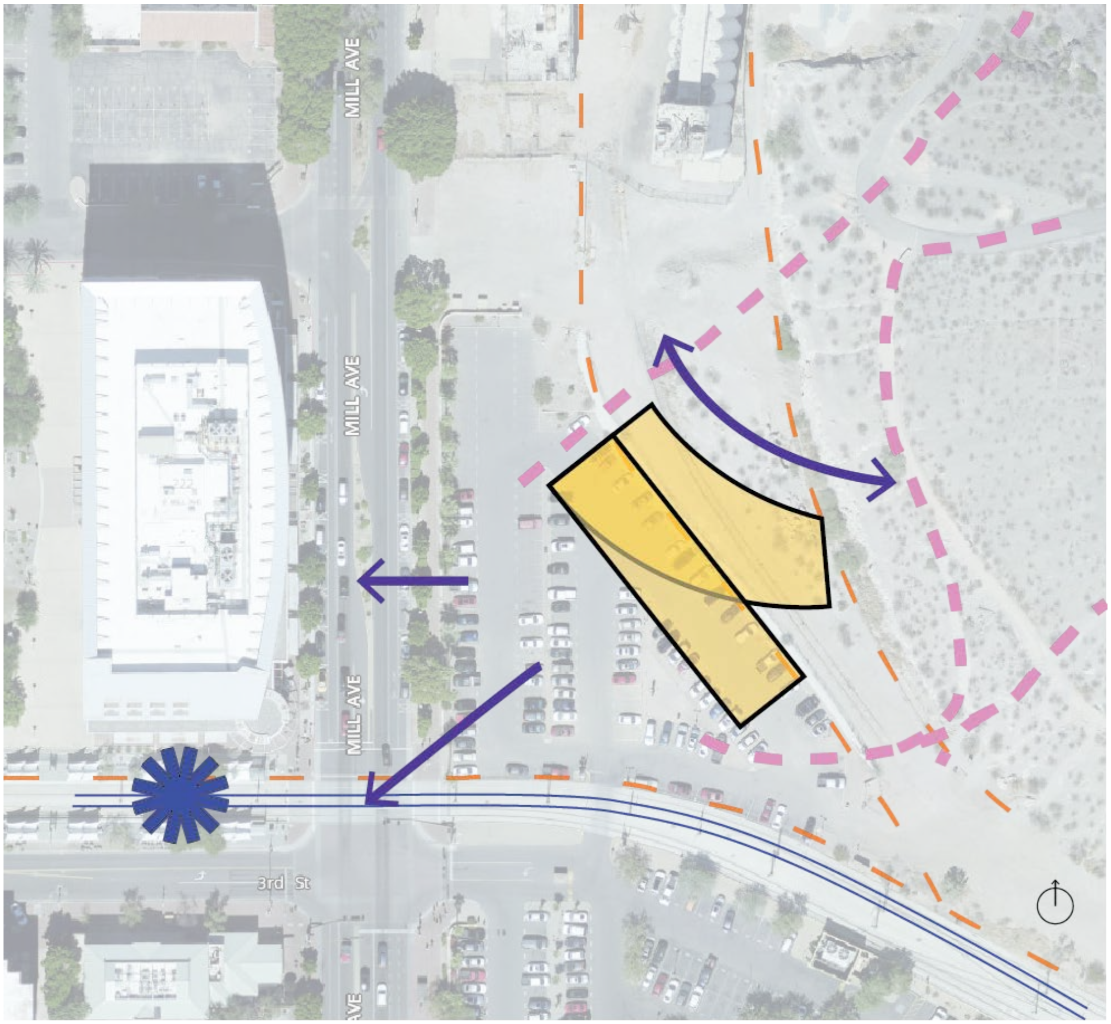

Figure 44: Concept 1 (Source: Author)

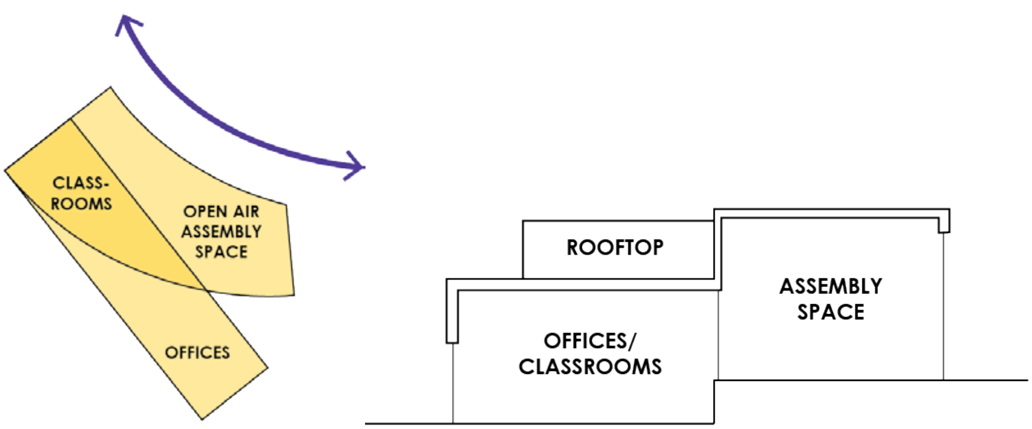

Figure 45: Concept 1 Plan and Section (Source: Author)

Concept 2 (Figures 46 and 47) explores a building separated by a threshold. Program is divided between the two buildings, as a pathway works its way between to become the beginning of a new trailhead onto the butte. The building acts as a gateway that draws visitors into the building, but also through the building to enter an experience of a different typology: the natural landscape of the butte.

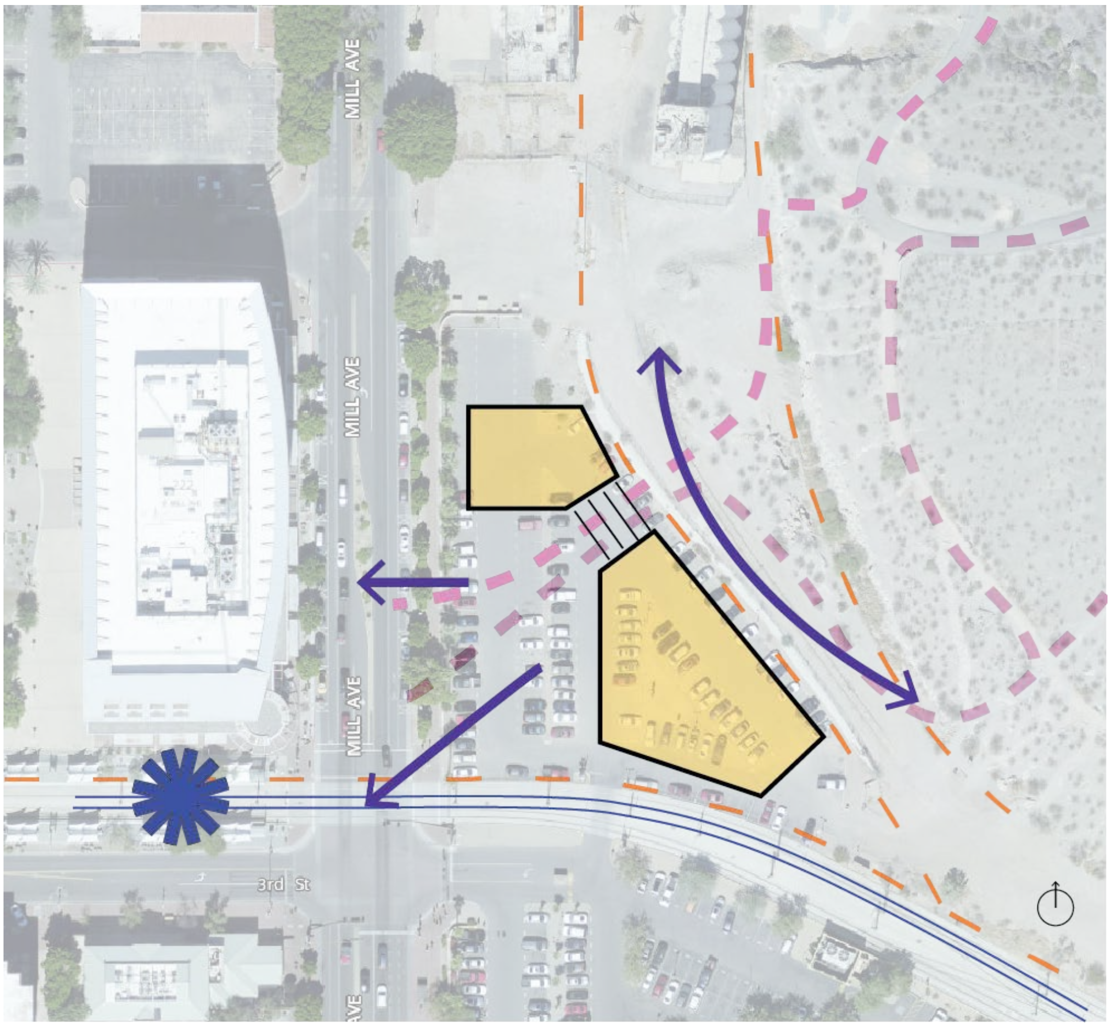

Figure 46: Concept 2 (Source: Author)

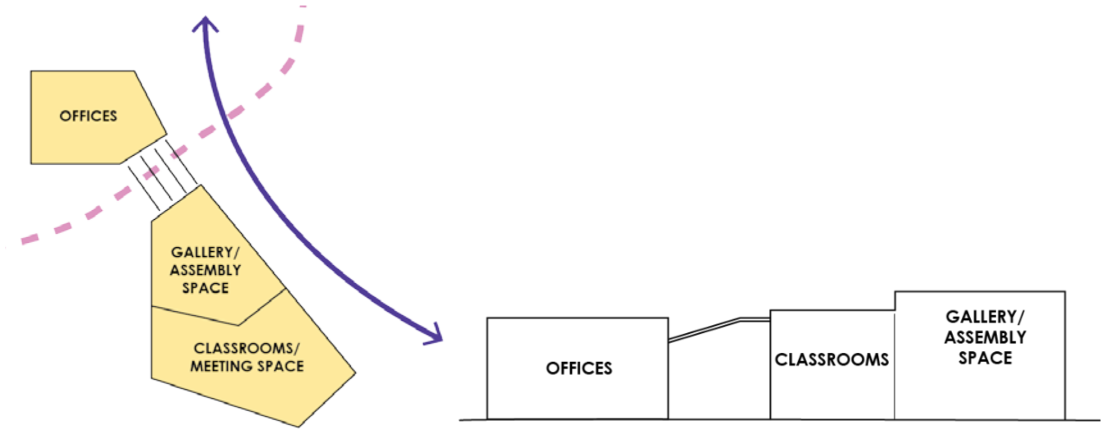

Figure 47: Concept 2 Plan and Section (Source: Author)

Concept 3 (Figures 48 and 49) explores a compartmentalized building accompanied by a patio and series of terraced planters. This scheme plays with the idea of terracing and laterally spreading out across the site. The design for this scheme is inspired by the roots of the saguaro cactus; shallow yet wide stretched. A system of terraced patios and planters can act in a comparable way as the shallow roots of the saguaro during the rain seasons. Outstretched, the terraces can collect rain water at the surface and as it runs off from the butte.

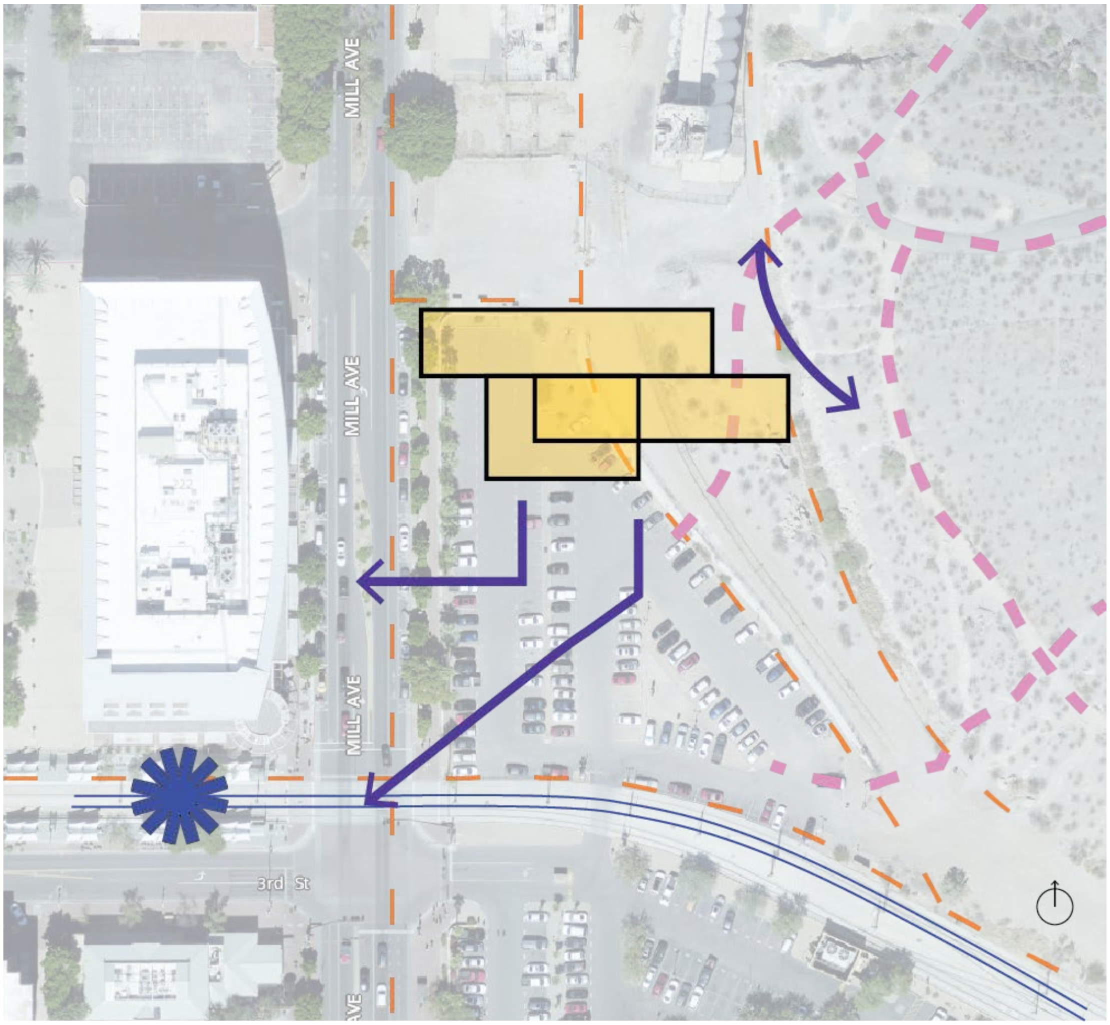

Figure 48: Scheme 3 (Source: Author)

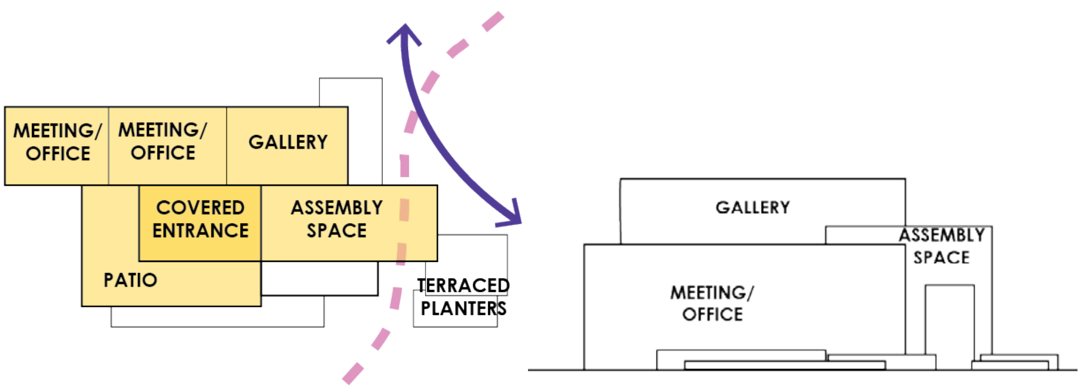

Figure 49: Scheme 3 Plan and Section (Source: Author)

Defend the Butte

The goal of this project is to introduce a building programmed to preserve and educate the community about the history and culture of the butte. To much of the area has been abused by human interaction and development, and the butte is losing value and history. Along with introducing innovative design and program, the water tanks and utility tower are to be removed for the betterment of the site. Tempe Butte is rich with native plants that can be utilized in landscaping the areas of development. The building does not have the intention of being just another encroachment on the site, such as the water tanks. The proposed building must not simply be built *on* the site, but rather *with* the site. The building must incorporate the desert climate and environment, so it is able to survive and flourish just as the native plants do.

Building Massing

Further development of the building massing changed the location of the building site. Figure 50 highlights how the building is to be built higher up on the base of the built, interacting with the sloping incline.

Figure 50: Building Site Location (Source: Author and GoogleEarth)

Moving the building higher up on the butte allows for a stronger intervention with the slope of the hill and the natural landscaping. As the building site shifts east, the massing of the building has to accommodate the gradual slope of the base of the butte. Figure 51 diagrams a building arrangement that incorporates three massing pieces that stack on top of each other, complementing the natural slope of the land.

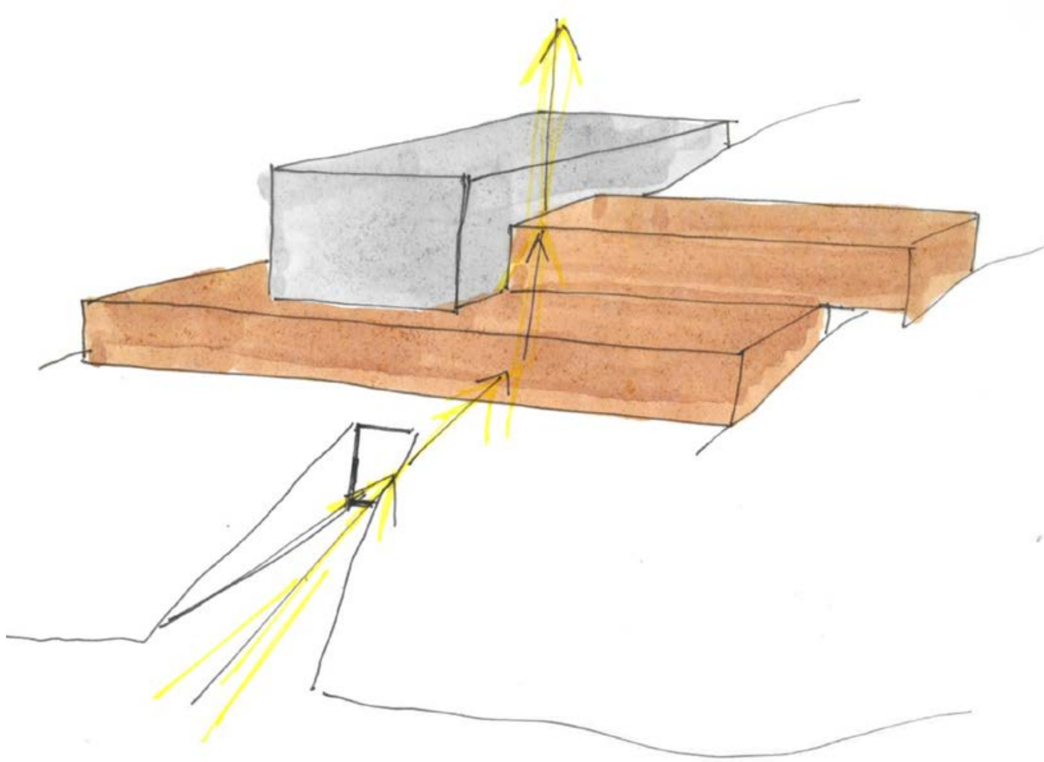

Figure 51: Building Massing Incorporating the Slope | An underground entry would allow for easy access into the building, which could then move through to the top floor of the space. (Source: Author)

The axonometric diagram in Figure ___ introduces an underground entry that then begins a vertical circulation that makes its way from the ground floor up to the top level of the building. The following drawings and diagrams progress with this concept of a central vertical circulation and three building masses stacked on top of each other to accommodate the natural slope of the butte.

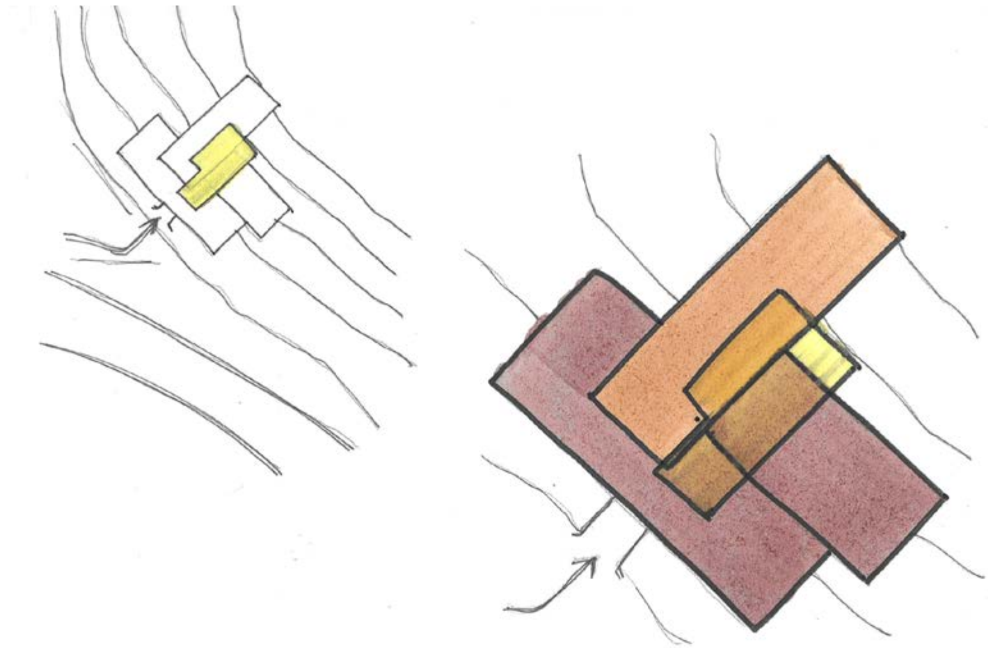

Figure 52: Building Massing Plan | A highlighted yellow core demonstrates the location of the vertical circulation throughout the three massing portions of the building. (Source: Author)

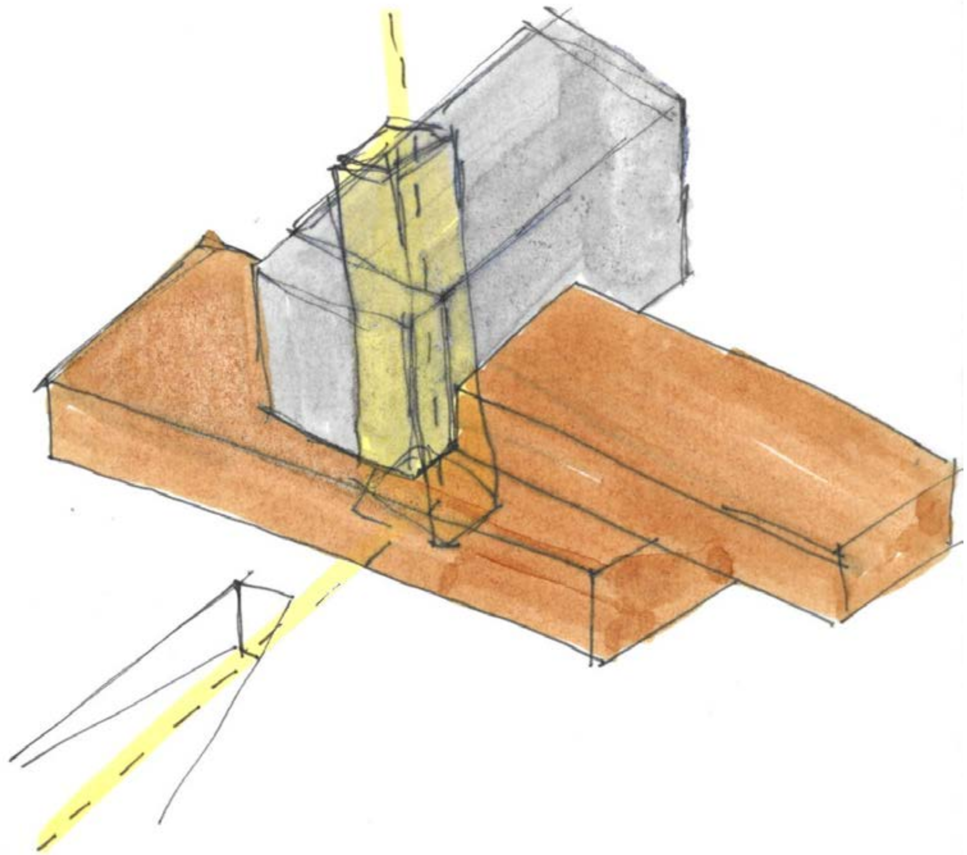

Figure 53: Diagramming the vertical circulation through all levels of the building. (Source: Author)

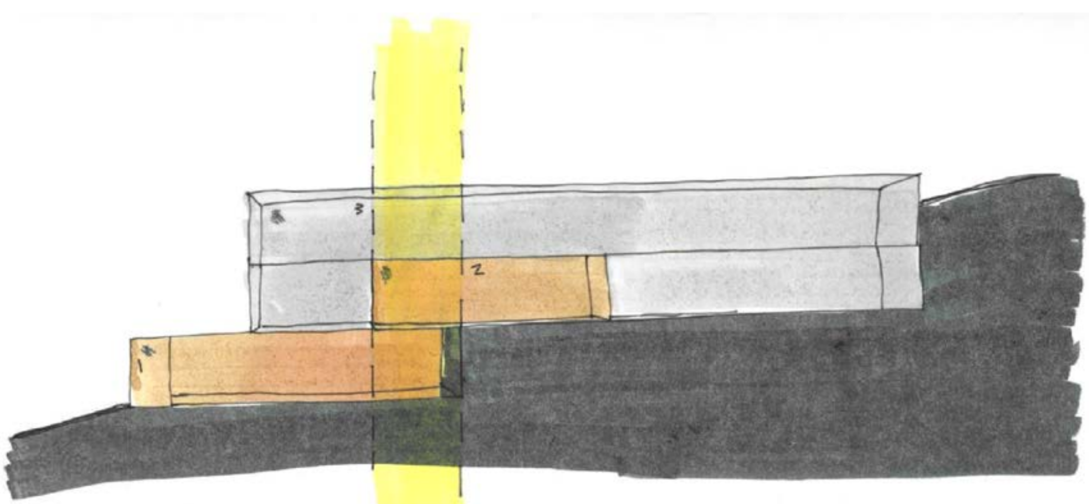

Figure 54: A section diagram showing how the vertical circulation could cut through all levels of the building, potentially bringing light from the roof all the down to the underground levels. The section cut demonstrates how the building is set into the base of the butte, carving into the rock earth. (Source: Author)

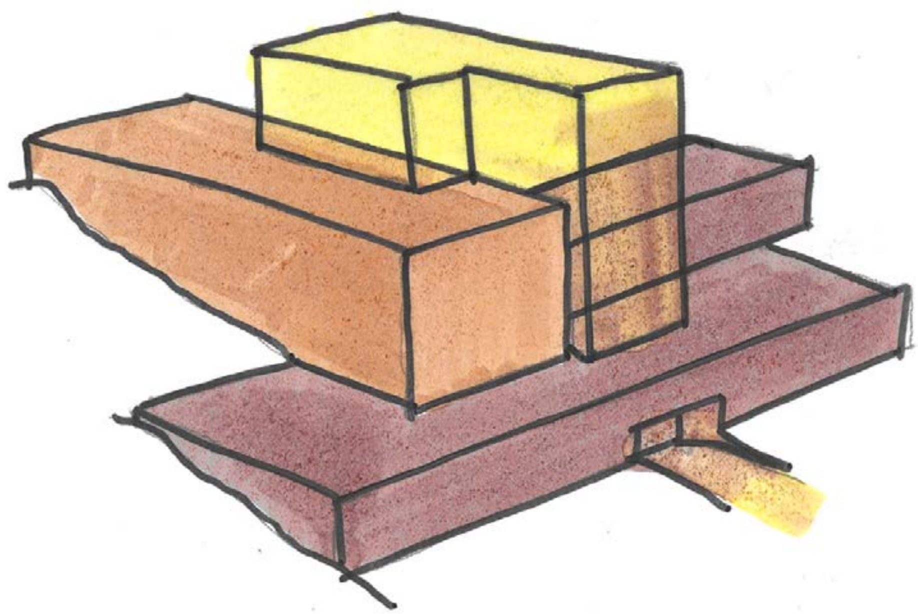

Figure 55: Building Massing Diagram | A larger central circulation core could allow even more light into the building, allowing it to travel through to all levels of the building. (Source: Author)

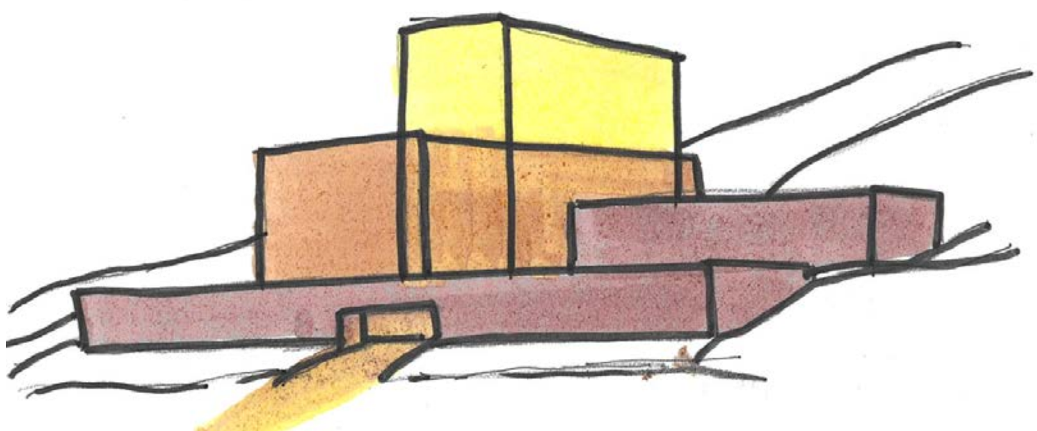

Figure 56: Building Massing Diagram | A larger central circulation core could allow even more light into the building, allowing it to travel through to all levels of the building. (Source: Author)

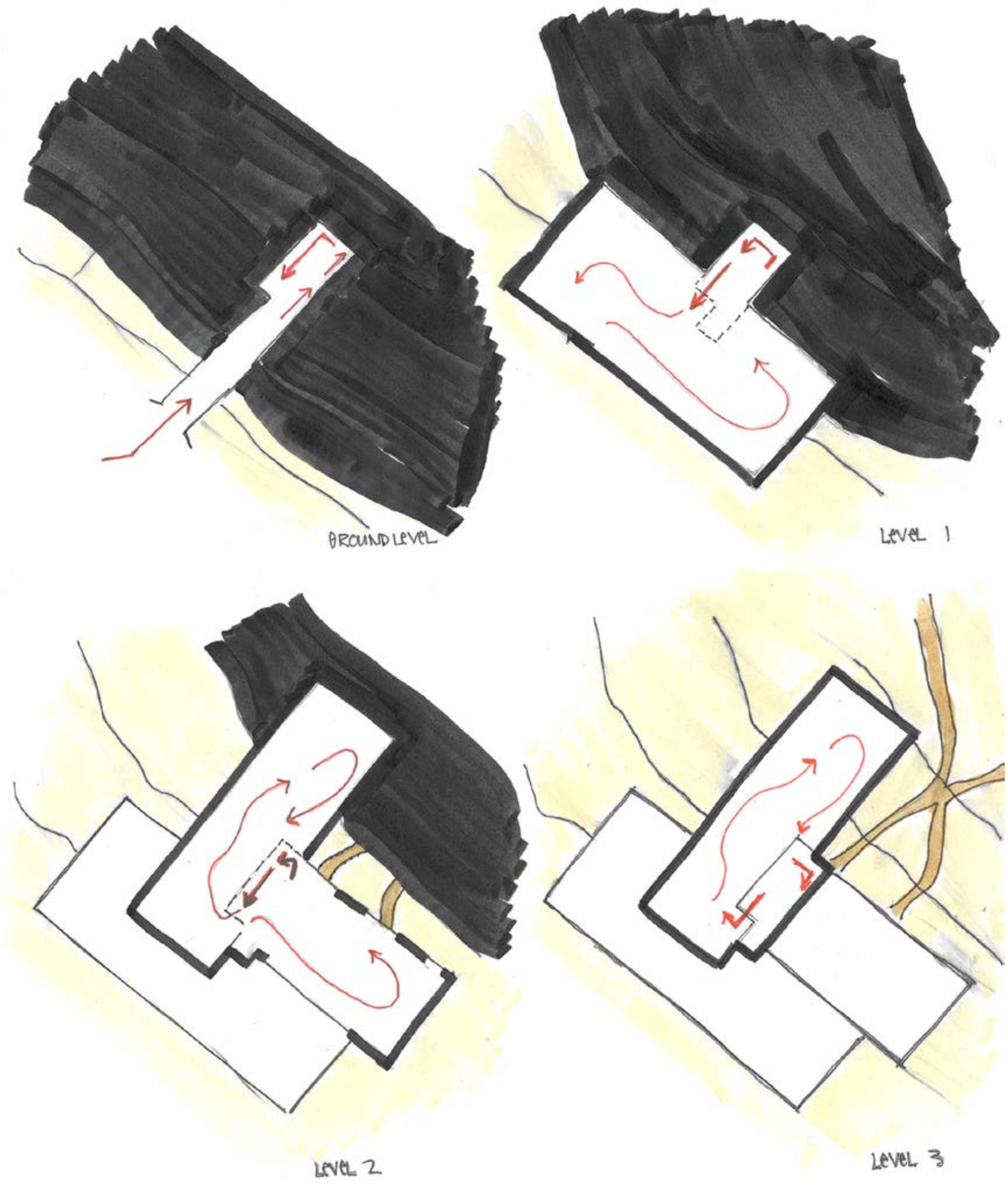

Figure 57: Building Massing Plan Diagrams | The plan sketches demonstrate the central circulation that moves from Ground Level up to Level 3. As each floor gets high up in the building, the less earth is being cut through, allowing access to the sloping land at Level 2 and 3. (Source: Author)

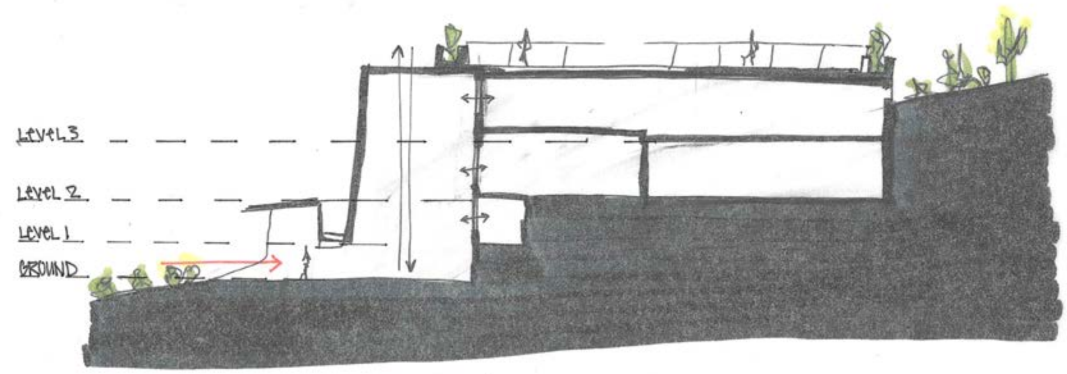

Figure 58: Building Massing Section Diagram | The section diagram cuts through the topography of the butte, making the building more a part of the landscape, rather than a building placed on top of the land. (Source: Author)

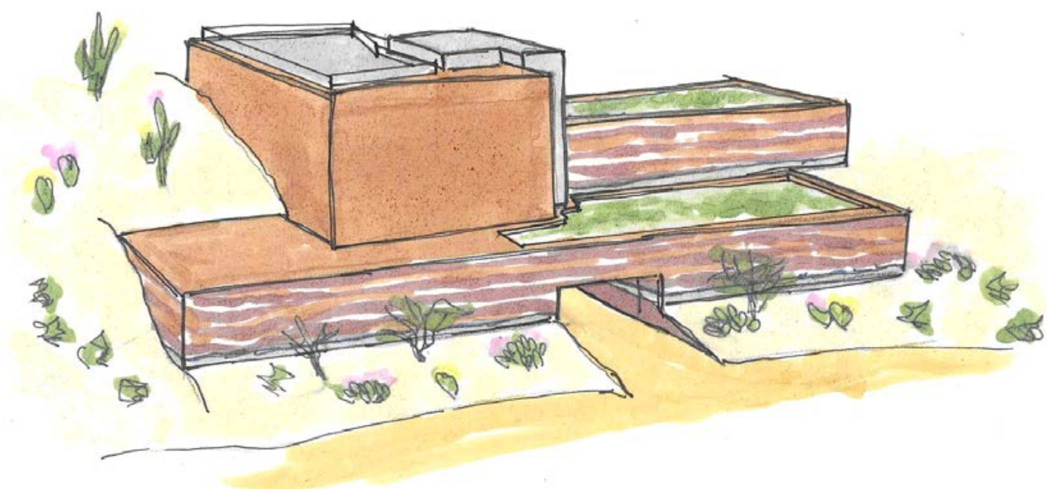

Figure 59: Building Massing Axon Diagram | Demonstrating the potential colors of the building facades and how they can relate back to the reds and greens and oranges of the Sonoran Desert. Green roofs and natural Sonoran Desert plants are introduced in the design. (Source: Author)

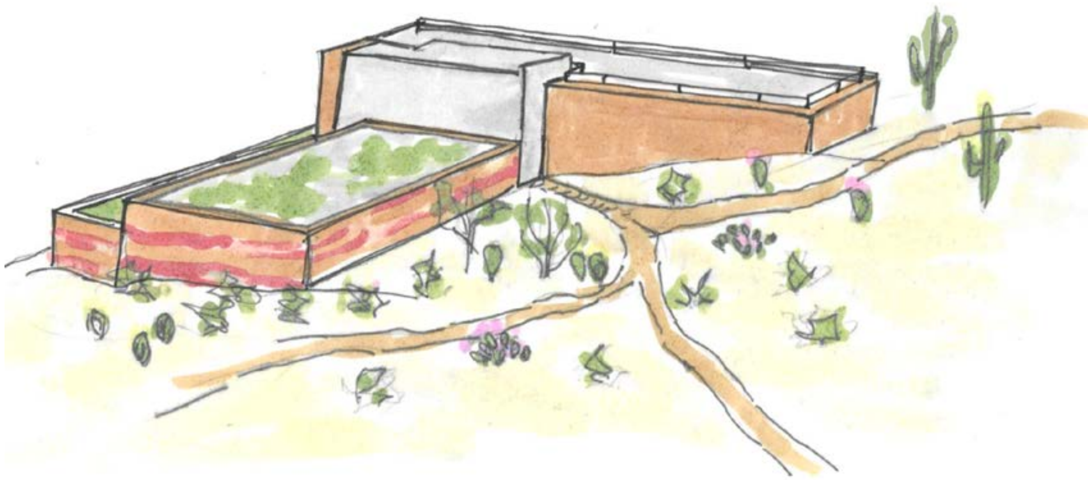

Figure 60: Building Massing Axon Diagram | The back side of the building diagramming a landscape garden along with improved hiking trails that access the north and south side of Tempe Butte. (Source: Author)

Chapter 8: Proposed Design

The final proposed Design consists of a single building located at the southwestern edge of Tempe Butte. A four-level building, each floor is dedicated to a particular piece of the program. Entering at the at grade Ground Level, a visitor of employee enters through a tunnel-like space, greeted with a central staircase at the center of the space. A welcoming desk and gift shop are arranged off to the side, along with elevators for accessibility.

Moving up the central staircase, one then arrives at Level 1. Level 1 is dedicated to the employees of the building. A row of offices and conference rooms lines the southwestern edge of the building, with a large workspace dedicated to the researchers and preservationists that must deal with the archaeologist artifacts that have been discovered on Tempe Butte and in the surrounding areas. Storefront windows allow visitors to the building to see what is going on in this private space dedicated to the workers.

The central circulation staircase wraps around again, bringing a person to Level 2. At this point in the building, there are visuals to Tempe Butte to the east, and the glazing of the circulation core allows plenty of natural light into the building. Level 2 serves as a lobby and event space that can be rented out by organizations. Level 2 incorporates a back of house loading dock area and also a café. Level 2 does not cut into the topography as much as the lower levels, so access out to the landscape garden connects people back to the natural Sonoran Desert plants that can be found covering the butte. The landscape garden incorporated terraced planters along the sloping of the ground, referenced back to the prehistoric Hohokam’s terraced farming infrastructures. The landscape garden is open to hikers at the butte, introducing them to a new trail that goes along the north side of the butte.

The glazed circulation core continues to move up to the top floor, Level 3. Level 3 allows views out to the city of Tempe and Tempe Butte on three of the four sides of the circulation core. Level 3 is also the floor that contains the building's gallery space. This area is reserved for artifacts from the butte and Sonoran Desert artwork.

Building Site and Floor Plans

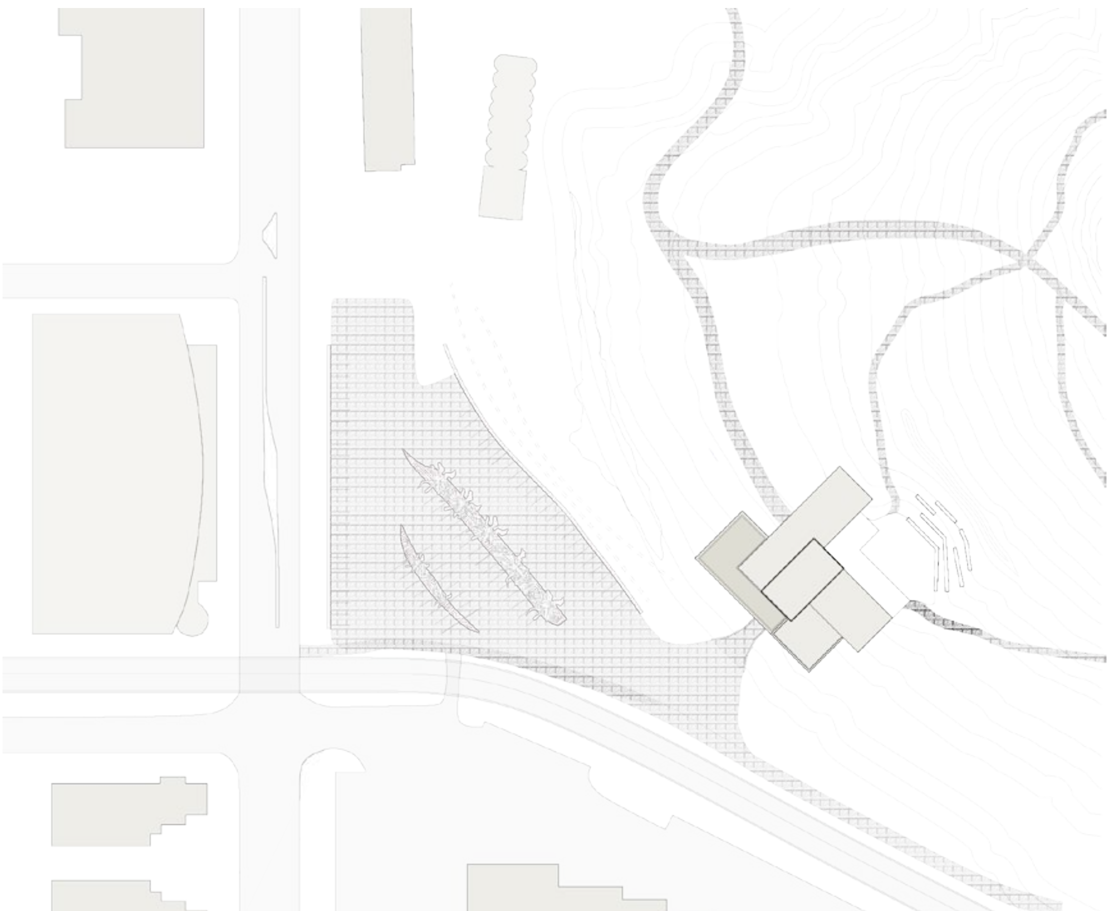

Figure 61: Building Site Plan (Source: Author)

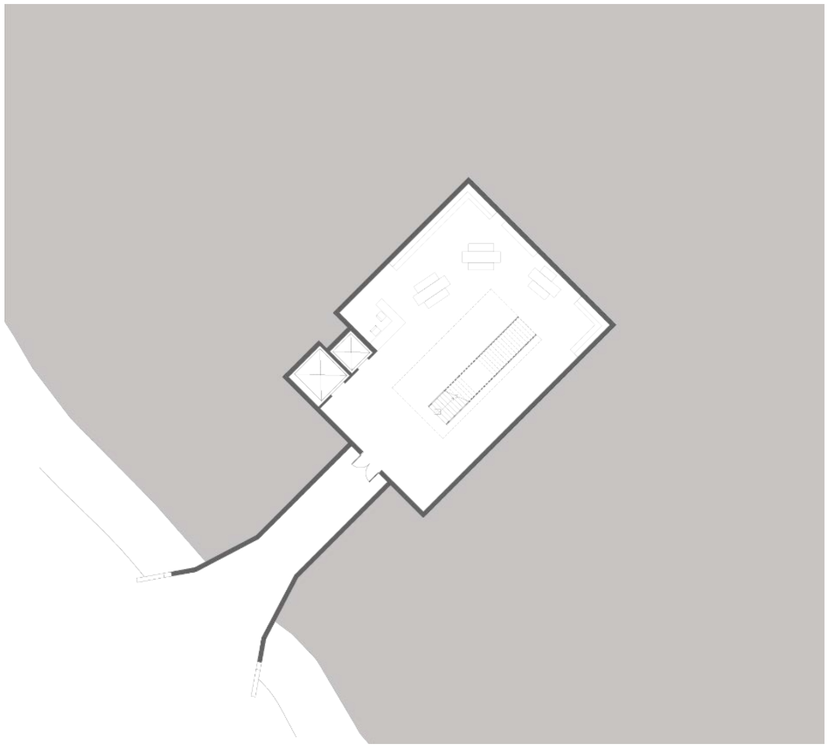

Figure 62: Ground Level Plan (Source: Author)

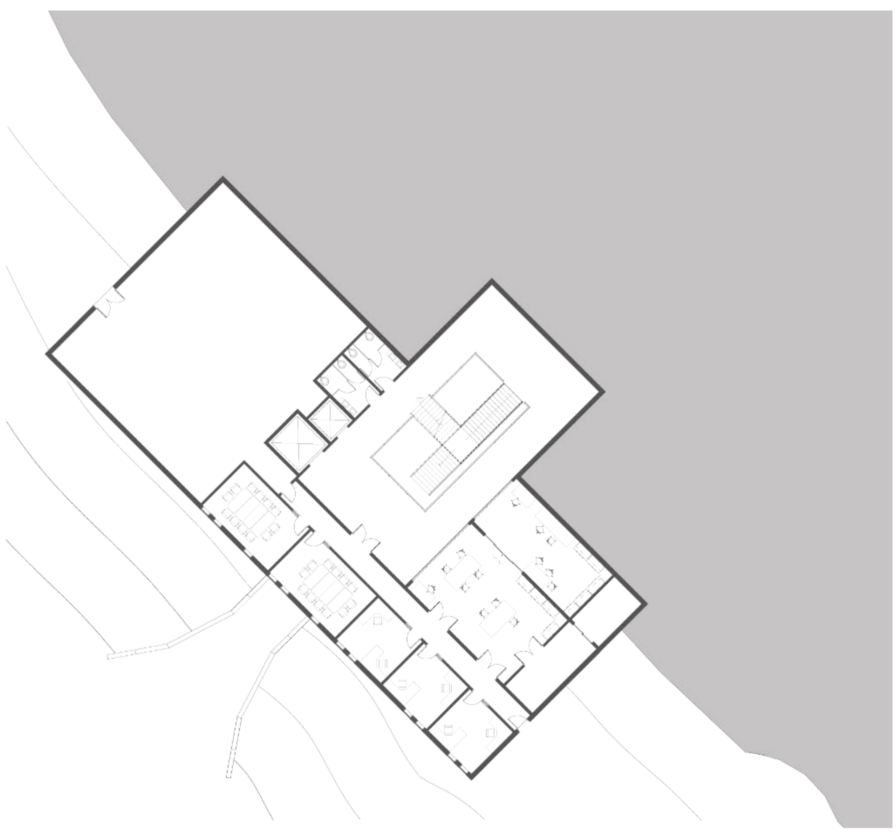

Figure 63: Level 1 Plan (Source: Author)

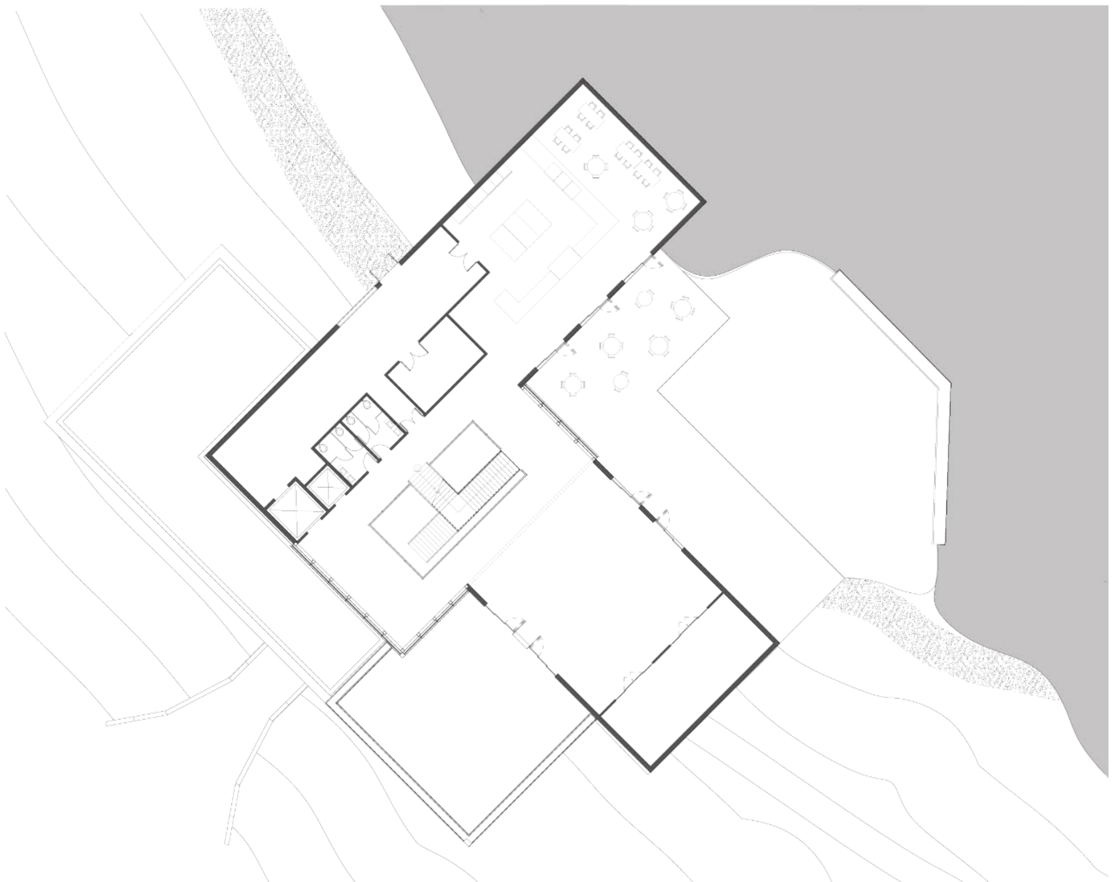

Figure 64: Level 2 Plan (Source: Author)

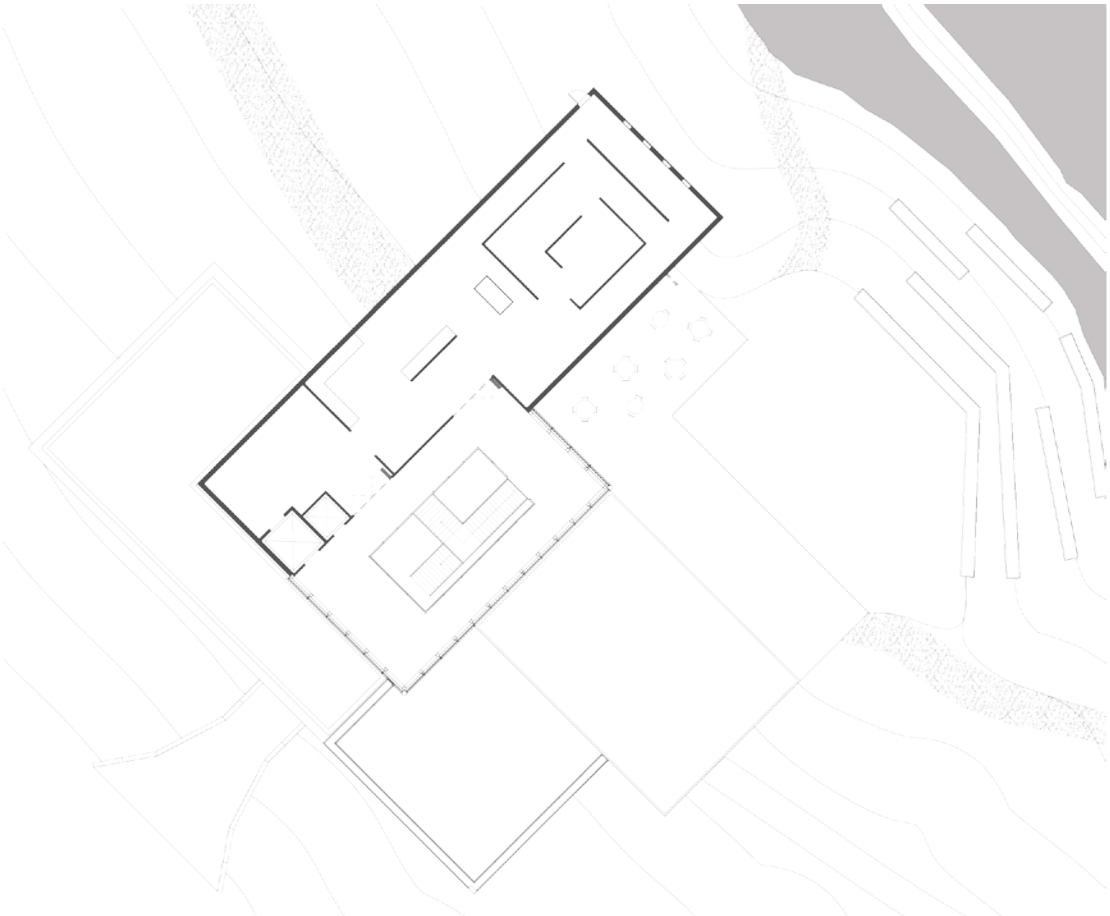

Figure 65: Level 3 Plan (Source: Author)

<u>*Building Sections*</u>

Figure 66: Staircase Section (Source: Author)


Figure 67: Zoomed In Staircase Section (Source: Author)


Figure 68: Workspace Section (Source: Author)

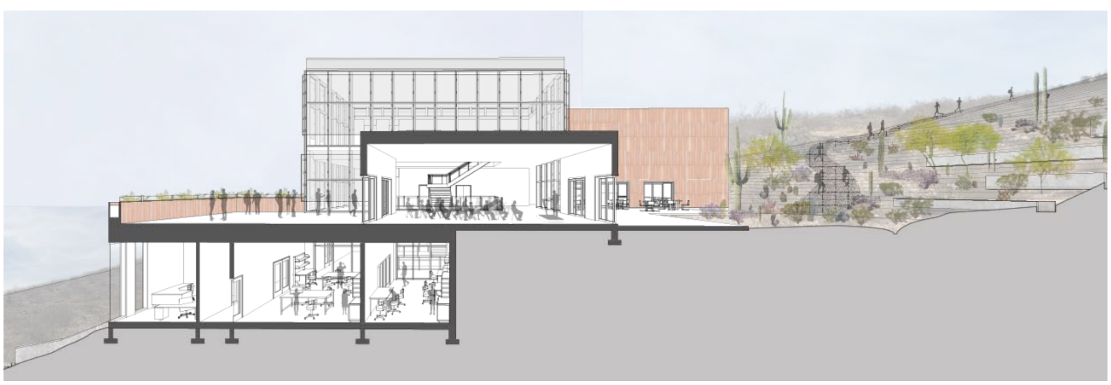
Figure 69: Zoomed In Workspace Section (Source: Author)

Perspective and Axonometric Views

Figure 70: Ground Level Entry (Source: Author)

Figure 71: Employee Workspace (Source: Author)

Figure 72: Event Space (Source: Author)

Figure 73: Gallery Lookout (Source: Author)

Figure 74: View From the Landscape Garden (Source: Author)

Figure 75: View looking out to the Landscape Garden and Tempe Butte (Source: Author)

Figure 76: Axonometroic View Looking Southwest (Source: Author)

Figure 77: Axonometroic View Looking Northeast (Source: Author)

Chapter 9: Conclusion

The goal of this thesis project is to protect, preserve, and bring awareness to Tempe Butte and the rich cultural and natural landscape history that it has to offer, not only the state of Arizona, but the rest of the world. Tempe Butte has been abused and encroached upon, and in the end, it results in history that is lost.

Through the design process it was important to not drastically disturb the butte. Through different design concepts and ideas, it was a struggle to find a balance between if the proposed design was becoming one with the site or if it was encroaching just as much as the rest of the development of the city. The reasoning for being able to locate the building at the sloping base of the butte is that it is there to bring awareness and to make a statement. The program of the building is for the betterment and protection of the butte, so why not have it immersed in the land that it deals with.

Following the public review, these concerns resurfaced regarding the actual statement that the building makes having it located and carved into the volcanic rock of Tempe Butte. Is it intruding on the butte in an offensive way just as the communications town, football stadium, and water tanks are? To help support why the proposed design is not an intrusive structure, the building could interact with the land even more. The walls that are carved into the butte can remain uncovered, allowing visitors and researchers to learn and discover even more with a hands on experience of the building. The design can reach out and collaborate with more local organizations in the area, especially groups at Arizona State University, to gain more followers and respect for the mission to make Tempe Butte a more revered site with rich archaeological history.

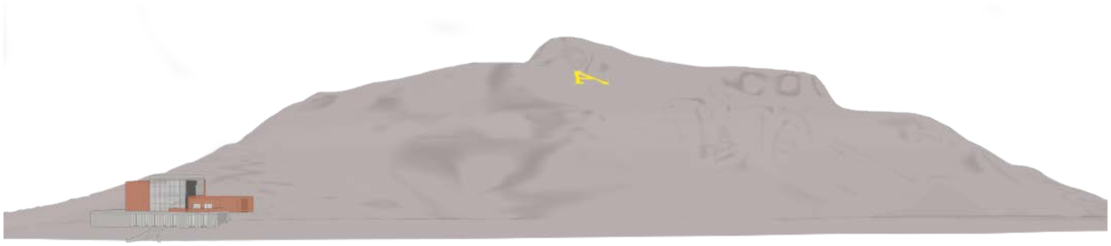

Figure 78: Southern View of Tempe Butte (Source: Author)

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