

ABSTRACT

Title of Document: mending a whisper: Adaptive Reuse of a 19th Century Sugar Refinery in Puerto Rico.

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Within the island of Puerto Rico one can come upon remnants of any sort. Rather than a single individual narrating its history, the land itself serves as witness and raconteur of events. Introduced into the island by the Spaniards during colonization, the sugar industry became the driving force for the overall economy until mid 20th century. The desire to modernize brought not only a better way of life to its citizens but also a move from an agricultural-based economy to a more industrialized one focused on the manufacturing of goods. Once production was brought to a halt, the agrarian way of life was put aside along with the cities that served as headquarters.

Today, a great amount of these factories still stand although in terrible disrepair. What remains lingers in time and place and has stayed as a vague memory to those whose lives were touched by that epoch. This thesis proposes to adaptively reuse one of these structures and convert it into a public park and interactive museum. This project intends to revive a locale by giving it new purpose, immortalize the memory of a given period, and to educate on what once was, what is and what could be of this significant part of our culture and history.

mending a whisper:
ADAPTIVE REUSE OF A 19th CENTURY SUGAR REFINERY IN PUERTO RICO.

By:

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Dedication

Esta tesis va dedicada a mis padres, en especial a mi papá. Papa, tus historias de antaño, aunque algunas un poco tristes, siempre me demostraron lo mucho que valoras y aprecias las cosas más sencillas en la vida y la alegría que te brindan. Fueron esas anécdotas las que me llevaron hasta este proyecto. Gracias por inculcar en mí esa misma emoción ante los “viejos tesoros” pues ella me permite imaginar las posibilidades que al igual que tú veías en las latitas de galletas, yo hoy día puedo ver en edificaciones y como aquí en ruinas.

Preface

Photos, drawings, computer models, and other graphics in this document are by the Author, except where noted. All satellite map images are copyright free screen captures from Google Earth and have been manipulated by the author.

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Introduction

The sugar industry's role in the development of Puerto Rican culture and overall history is one of notable importance. From the *trapiches* pulled by horses, oxen and slaves, the *haciendas* and finally the great *centrales* founded by American companies, these structures dominated the island's landscape throughout the four cardinal points. Today, they remain as a vague reminder of what once was an epoch of great value and rich memories.

Throughout the island, efforts have been made so as to preserve many edifices of cultural significance; endeavors which focus on structures built during early colonial times neglecting those erected in subsequent periods. Unfortunately such is the case in the vast majority of the island's municipalities. Instead of perceiving the distinctive character of a city, visitors are confronted by a series of simple, life-less concrete facades and structures of modernist appearance built in place of the past. Contrary to Puerto Rico's capital, San Juan, and the city of Ponce, the rest of the island doesn't encourage, support and reinforce building codes that regulate new construction and the possible preservation or adaptation of older ones. Ponce, located in the southern region of the island, serves as an example of a city with the drive to preserve a great deal of its cultural heritage. Not only its leaders but also the inhabitants have helped maintain their town as a live narration of their story as a whole.

Once the industry began closing its doors from the 1940's onward, the *centrales* were abandoned; their surrounding lands were not. The company towns, existing only in several municipalities, have survived the many hardships brought about with time. Today the once self-sufficient and lively settlements remain inhabited but lifeless. Despite limited efforts performed so as to preserve these structures and offer a representation of their time, in Puerto Rico there has not been a formal interest that would enable their preservation as part of our overall cultural heritage. Locations such

as the Jardín Botánico y Cultural in Caguas and the Castillo Serrallés in Ponce partially capture what this industry entailed.

As an example of a vision and formal attempt to preserve an industry contemporary to that of sugar, one can mention La Hacienda Buena Vista, a large coffee complex located in the mountainous region of Ponce. The *hacienda* was acquired by the Fideicomiso de Conservación de Puerto Rico (Conservation Trust) in 1984 and was restored to represent the period in which the coffee industry served as the main economic activity in the island. The *hacienda*, founded by the Vives family during the nineteenth century, serves as a museum and account of the cultivation and production of the good. It also represents the way of life of the founding family during said period. Today, the complex serves as an educational and cultural attraction.

The sugar industry in Puerto Rico is represented by a series of *haciendas* and *centrales* distributed throughout the island. From the latter, the following excelled in sugar production (enumerated from less to greater production): Cambalache in Arecibo, Plata in San Sebastián, Mercedita in Ponce, San Vicente in Vega Baja, Coloso in Aguada, Fajardo in Fajardo, Aguirre in Salinas and Guánica in the town of Guánica. This thesis focuses on Central Aguirre in Salinas.

Recognized as one of the most important refineries in the island, Aguirre was recorded as a Historic District under the National Register of Historical Places in Washington, DC. The mill complex was included on October of 2002 as the only example of a “company town” in island of Puerto Rico. Unfortunately, despite its recognition, the majority of the structures associated with sugar production remain in total deterioration.

This thesis proposes to adaptively reuse this forgotten industrial site, the sugar refining complex at Central Aguirre in the municipality of Salinas, Puerto Rico. The purpose of this proposal is to save most of the site’s physical appearance thus restoring its cultural value. By means

of the adaptation and transformation of one of the remaining structures into an interactive museum of the industry in Puerto Rico as in the greater Caribbean, the project intends to return a lost era to the Puerto Rican society in addition to bringing life back to the site's adjacent company town. The museum complex will encompass the history of sugar cultivation and production as well as serve as a representation of the way of life during such epochs through the town.

Site grounds will be utilized as a cultural, educational and tourist attraction. This proposal is to serve as the initial step of a series of future considerations for the site's development and improvement of the socio-economical well being of its inhabitants. This thesis promotes the interest on prolonging the life of these structures; the development and preservation of others throughout the island that although deemed significant have been set aside. Through this what remains to be explored is how does one preserve something which cannot be destroyed and cannot be rebuilt?

Chapter 1: Background

“White Gold”

Throughout history, sugar has played a vital role in the development of the vast majority of countries around the world. Today, it is a good that can be seen as a high globally-consumed product as well as the means by which the economy of many of the countries in the New World developed and flourished.

Sugarcane, the plant from which sugar is extracted from, has been known for more than a thousand years. Its origin can be traced back to the South Pacific where the plant grows in the wild in countries such as eastern and northern Africa, the Middle East, India, China, Taiwan, Malaysia, and New Guinea.¹ Crystallized sugar can be traced back to India around 500 BC.² For centuries, natural barriers within the Middle East prevented the spread of sugar to other parts of the world. In 510 BC, Persian Emperor Darius invaded India and discovered “the reed which gives honey without bees”.³ When the Arabs invaded Persia during the seventh century, they acquired the knowledge of sugar and the process by which to obtain it from the cane.⁴ The Arab expansion across western Europe and northern Africa during the middle ages brought about many cultural and technological advances including this new agrarian ‘novelty’.

Significant events, such as the Crusades in the eleventh century AD, introduced other countries in Europe to the product. This “new spice”, viewed as a luxurious good until 1874, led to expansion of the western European trade with the East.⁵

1 Sharpe, Peter. Ethnobotanical Leaflets: sugar cane: past and present. Southern Illinois University Carbondale. <http://www.ethnoleaflets.com/leaflets/sugar.htm> (accessed October 2009-January 2010).

2 Steward, Robin. History of Sugar: a brief history on sugar, its values, and production. Essortment. http://www.essortment.com/all/historyofsugar_rzow.htm (accessed October 2009-January 2010).

3 Webb, Rachel L. 2007. The History of Sugar Cane – Museum. Suite 101. November 25. http://spain-travel.suite101.com/article.cfm/sweet_tooth_for_sugar (accessed November 25, 2009).

4 SKIL. How Sugar is Made - The History. <http://www.sucrose.com/lhist.html> (accessed November 27, 2009).

5 SKIL.

In the fifteenth century, sponsored voyages to the new world introduced sugar cane to the lands being conquered. Genovese Christopher Columbus transported the plant into the Caribbean where its cultivation thrived due to the region's climate and soil conditions.⁶ Portuguese explorers brought it to Brazil, from which sugar production spread to other areas of South America, as well as newer European colonies in Africa and the Pacific.⁷

In 1516, the first sugar cane mill in the New World began to work in the island of Hispaniola (now Haiti and the Dominican Republic). By the end of the 1500's the production spread to the Greater Antilles: Cuba, Jamaica, and Puerto Rico.⁸ The Spanish Crown's economic crises and social-political wars in conjunction with an oversaturated sugar market drove the industry in the American Hemisphere through a series of 'ups and downs'. In some of these territories, the episodes led to the eventual decline and end of the sugar industry.

Sugar cane was introduced to the United States during the eighteenth century.⁹ Cultivation of the plant was initiated in New Orleans. Around 1690, the first refinery was built in New York. For a period of forty-two years, unfruitful attempts were made to initiate the industry in several states. Harsh climate conditions prevented success. It wasn't until 1872, when a factory was built in California, that the sugar refining industry in the continental US was able to produce sugar and profit from it.¹⁰ At the end of the century, over thirty sugar refineries were in operation. After 1898, as a result of the Spanish-American War, the United States gained control over several territories throughout the Western Hemisphere (Hawaii and Puerto Rico to name a few), thus also inheriting their existing sugar production.

The industry's development in the New World was parallel to the advances achieved during

6 SKIL.

7 (*Wikipedia*, s.v. "History of sugar," http://en.wikipedia.org/wiki/History_of_sugar [accessed November 27, 2009]).

8 Sharpe.

9 Steward.

10 Steward.

the Industrial Revolution. Between the eighteenth and nineteenth centuries, the sugar industry experienced noticeable changes in terms of operation and production. The evolution of the machinery utilized in the process in conjunction with the new refining methods being applied, helped increase the overall manufacture and quality of the sugar being produced. The success of these advances eventually resulted in an oversaturated market that brought negative repercussions onto some countries, Puerto Rico being one of them.

The sugar refining industry today is not tied to mainly producing sugar for consumption (in the ways of refined sugar, jaggery, molasses, rum, etc.) nor to obtaining sugar solely from the cane plant. Sugar beet has been utilized world-wide as an alternate source for sugar production since 1747 but has remained second to that from sugar cane.¹¹ Ethanol, paper, cardboard and eating utensils figure as some of the by-products derived from the sugar production.¹²

Sugar Industry in Puerto Rico

Viewed in a larger context, the island of Puerto Rico, regardless of its small size (13,790 sq. km), is a live example of economic development in the western hemisphere. From its early settlements until present day, the island's economic phases have been linked to the sociocultural branch of its history.

Puerto Rico was discovered on November 19, 1493 as the island of San Juan Bautista, on Christopher Columbus' second voyage to the New World.¹³ Juan Ponce de León, one of his lieutenants, obtained permission and the title of "adelantado" from the Spanish Royal Crown which allowed him to conquer and colonize the island. During this process, which began in 1508, the island's first economic activity emerged, mining and melting of precious metals: gold and silver.

11 SKIL.

12 (*Wikipedia*, s.v. "Sugarcane," <http://en.wikipedia.org/wiki/Sugarcane> [accessed November 27, 2009]).

13 Picó, Fernando. 2008. *Historia general de Puerto Rico*. San Juan: Ediciones Huracán, Inc.

Among the four Greater Antilles, Cuba, Hispaniola, Puerto Rico and Jamaica, only the first three produced some gold. Puerto Rico was the second largest producer of gold per square mile; second to the island of Hispaniola.

Through this industry, the aboriginal population of the island was almost completely annihilated. The natives were relocated from their villages (“Yucayeques” in the Arawak language) to the rivers along which gold had been sighted. The population went from an agrarian one to one enslaved as mineworkers for the Spanish colonizers. Many of the aborigines perished not only because of arduous labor, malnutrition and armed encounters between both bands, but also from epidemics brought into the island by the Spanish. Between 1508 and 1530, the alluvial gold sources were depleted. By 1508, the aboriginal population of Puerto Rico was at an estimated total of 30,000, by 1530, only 1,500 remained. Because of the vast decrease in natives, the introduction of African slaves as a labor force became crucial for any future type of economic development in the island. Although some African slaves had arrived during the early years of colonization mostly through Spain, by 1518, they began arriving directly from Africa. By 1530, the African population of Puerto Rico surpassed the remainder of the indigenous population and the Spanish minority.

After 1530, because of the small quantities of gold being extracted from the land, sugar cane began to emerge as a possible alternate lucrative resource for exportation. The sugar industry in Puerto Rico is one that has been subjected to the many hardships felt by the Spanish metropolis and that of the land being colonized. During the second half of the sixteenth century, the drive to maintain ownership over Puerto Rico rested solely upon the island’s strategic position in relation to Spain’s growing American empire and on the conquistador’s desire to produce sugar for export to Europe. Overall, the sugar production in Puerto Rico went through three cycles, each experiencing a peak and a decline; the third decline, being its definite end.

First Sugar Cycle (1540-1640)



Figure 1. Image depicting the refining process in the Americas during the colonial era.
(<http://www.smithsonianmag.com/multimedia/photos/?c=y&articleID=81263472&page=2>)

The economic crisis left behind by the gold mining industry, led the Spanish crown to develop measures in order to keep the island from depopulating. The First Sugar Cycle encompassed the initial attempt to develop an agrarian, industrial and commercial activity of exportation in the economic history of Puerto Rico.¹⁴ Because of the circumstances at the time, the emergence of a new economic activity incurred in a larger expense than it would in a country that is already colonized and developed. The sugar refining process is indeed an expensive one. The many stages of production and export as well as the labor force needed to perform the operations need a solid financial fund from which to feed off of and flourish. In order to set the foundation for this endeavor, a number of loans were approved in 1535 to aid in the construction of two sugar refineries in the

island. As a result of these joint measures between the colonos and the Spanish crown, twelve sugar

¹⁴ García Leduc, José M. 2003. *Apuntes para una historia breve de Puerto Rico*. San Juan: Editorial Isla Negra.128

refineries were constructed since 1540 and the second half of the sixteenth century in which they produced and exported sugar to Spain.

The first sugar refinery in the island was San Juan de Las Palmas. It was founded around 1523 in the municipality of Añasco by Genovese Tomás de Castellón and Spaniards, Andrés de Haro, Jaime Cáncer and Blas de Villasante. The first mill pulled by horses was established at the site. In 1548, the refinery of Santa Ana was built in Bayamón by Don Gregorio de Santaolaya. The following year, he founded Nuestra Señora de Valle Hermoso in the vicinity of San Juan. Both refineries housed the first water-operated trapiches (mills) for the production of moscabad sugar. By 1581 there were already eleven refineries in the island, all located along riverbanks. Two were operated through water and the remainder nine were pulled by animals. Even though there were refineries in other areas of the island, the vast majority of them were located along the north. Security issues (raids brought about by the Caribe natives) in addition to cost of transportation made the proximity of the refinery to the main official port a necessity for success.

Sugar, between 1550-1650, constituted the largest source of income in Puerto Rico.¹⁵ The first peak of the industry was recorded from 1560 until the 1570's when it experienced a decline that prolonged until 1590. During this time frame twelve refineries were in operation simultaneously. In 1568, the largest quantity of sugar known from Puerto Rico during this first cycle was exported to Spain. In 1570, quantities for export experienced their first decline. Beginning in 1590, sugar production noticeably increased until the first decade of the seventeenth century when it declined once more. By 1607, of the twelve refineries that were built, only 7 remained.¹⁶

The reasons for the rapid decline of the first sugar industry in Hispaniola and Puerto Rico at the end of the sixteenth century are not well known. It is speculated that the factors that contributed to the industry's demise were among many, the migration of colonizers to the new settlements

15 Picó, 68.

16 Picó, 69.

in Mexico and Perú, the priority Spain gave to the production of mineral resources over sugar, the extreme regulations laid by the Spanish crown to all private companies in the New World, and the shortage of capital for investment.¹⁷ In addition, naval transportation between Spain and its colonies had become scarce. Sugar production in Brazil had grown to levels that surpassed that of both Hispaniola and Puerto Rico together. Contrary to the two Antilles, Brazil was greatly financially sponsored and marketed in Europe. By 1550, Brazil already had 70 refineries being augmented to 230 in 1670.¹⁸ The lack of support demonstrated by Spain towards the first industry developed in their colonies rendered some territories incapable of competing with the other sources in the European market.

The first agrarian industry for export in Puerto Rico went bankrupt during mid seventeenth century. As a consequence, the island's inhabitants resorted to other resources that would earn them profit during this time of crisis: ginger cultivation, stock breeding, forest extraction, and illicit commerce or contraband with other territories in the Caribbean. Ginger was introduced to the island by the Spanish in the early colonization years. As José Manuel García Leduc states in his book, *Apuntes para una historia breve de Puerto Rico: desde la prehistoria hasta 1898*, "from 1580, in order to confront the sugar crisis, farmers and the 'men of the refineries' began to cultivate ginger as a new agro-commercial product."¹⁹ The plant was cultivated and treated as an additional alternative for export; it was not intended to substitute sugar. As with the sugar industry, it wasn't long until other countries in the Americas began to also cultivate the plant, over saturating the European market, thus bankrupting the industry within the smaller territories.

The poor and inexistent naval transport between Spain and Puerto Rico during the first half of the seventeenth century deprived the island from any type of socio-economic growth. The

17 García, 135.

18 García, 138.

19 García, 147.

island's economy went from export of goods to a self-sustained one that lasted from 1640 until 1750.²⁰ Illicit commerce became the way for Puerto Ricans to sell their products (mainly cattle and wood) and obtain what they needed from outside sources.

Second Sugar Cycle (1825-1873)



Figure 2. Image depicting the “plantation era” in Puerto Rico during the 1830s (http://www.pbs.org/wgbh/masterpiece/americancollection/woman/timeline_1830.html)

The period between 1750 and 1825 was characterized by a change in the way Spain performed with the rest of the world. When the French Bourbon's occupied the Spanish throne around the end of the seventeenth century, they focused their attention on ways in which not only to bring Spain to be the powerful nation it once was but also to reignite the trade and commerce with their colonies.²¹ Their main drive was to make “the island of the Caribbean more productive“.²² Projects geared towards the economic development of Puerto Rico proposed to establish a specialized commercial type of agriculture for global export, mainly through the production of sugar and coffee. This was an activity that tried to transform the island's dependence on self-sufficiency and illicit

²⁰ García, 148.

²¹ (*Kalipedia*, s.v. “Reformismo Borbonico,” http://www.kalipedia.com/historia-espanola/tema/edad-moderna/reformismo-borbonico.html?x=20080802klphishpr_47.Kes&ap=1 [accessed November 27, 2009]).

²² (*Kalipedia*, s.v. “Reformismo Borbonico,” http://www.kalipedia.com/historia-espanola/tema/edad-moderna/reformismo-borbonico.html?x=20080802klphishpr_47.Kes&ap=1 [accessed November 27, 2009]).

commerce that had emerged during mid-seventeenth century.²³

Wars and revolutions that took place through the Atlantic ocean from 1776 until 1825 generated favorable economic and political conditions to aid in the development of Puerto Rico's new economic activities.²⁴ Through these, the island was able to 'expand' its name past Spain. After Spain relinquished their sole right of accepting and managing the goods exported from the island, Puerto Rico was able to do commerce both directly and indirectly with other countries and was officially opened to accept immigrants from them. The Spanish government set a decree in 1815 (the Real Cédula de Gracias) officially stating the conditions for migration to the island favoring those that were economically affluent and possessed applicable skills towards the commercial agriculture being developed.²⁵ At the end of this period, only two islands remained colonies of Spain, Cuba and Puerto Rico.

During the Second Cycle, sugar production was predominant along the southern flat lands (Ponce and Guayama) and western valleys (Mayagüez) in the island's coast due to good physical and geological conditions (fertile soils and good ports for export).²⁶ Coffee remained second to sugar as an exported product. Because of the dominance and importance sugar cultivation and production exhibited, coffee was displaced to the mountainous interior of the island. "This was the second time that the production of sugar for export had become the main economic activity of Puerto Rico."²⁷

Several circumstances are accounted for in the return of the sugar industry to the island during the first decades of the nineteenth century.²⁸

1. Given the relationship between demand against offer, sugar prices in the

23 García, 187.
24 García, 187.
25 García, 188.
26 García, 191.
27 García, 190.
28 García, 190.

global market were 'good'. The Haitian Revolution in 1794 was the principal factor in the market change, with its collapse, the industry in Cuba and Puerto Rico greatly benefited from it.

2. The migration of foreigners-- who possessed the economic means, technological knowledge and external contacts to obtain financial capital-- interested in dedicating themselves to the production of sugar in the island.

3. The introduction of an unprecedented amount of slaves from Africa and some of the Minor Antilles (French and British) which accounted for the main labor force in the refineries.

4. The Spanish state in conjunction with the colonial authorities in the island collaborated in the development of sugar production and above all with the foreign authorities that controlled it.

Until after mid-nineteenth century, the great majority of the sugar and honey produced in Puerto Rico was exported to the United States. Commerce with the US was based upon the production of moscabad sugar (black sugar). Unlike white sugar, this type is not refined, was less expensive to produce and did not require the use of sophisticated and expensive machinery for production. Moscabad sugar allotted the industry in Puerto Rico to compete against other producers in the world with better facilities, machinery and greater production capacities.²⁹

Between 1840 and 1873, the sugar refining industry in the island underwent a second crisis.³⁰ The industry declined after 1873. The introduction of beet sugar to the refining market in Europe eventually caused a decrease in profit for the producers of cane sugar. In response to this, Cuba, who exported refined and semi-refined sugar to the European market, shifted gears and began producing moscabad sugar for export to the US. Puerto Rican moscabad sugar was now

29 García, 193.

30 García, 194.

in competition with Cuba's, who in addition, had a much greater production capacity than Puerto Rico.

The loss in profit created additional problems in relation to the labor force utilized in the industry: slaves. Since its initial development, the sugar industry was one highly dependent on slaves. The plantations, being unable to afford the high prices set by slave traders in addition to a cholera epidemic (1855-56), were greatly affected by the reduction in the work force population in the island.³¹

As sugar entered another crisis, coffee, was slowly being introduced into the export market as an alternate lucrative product. The inability to replace their slave resources drove the landowners to turn to the island's government for help. As a desperate means to save their refineries they proposed the creation of coercive legal mechanisms that would require the free and destitute population to work in the plantations as wage-earning employees. In 1849 governor Juan de la Pezuela established the Régimen de la Libreta de Jornaleros.³² Jornalero, as the registry denoted, was all person lacking arable land and a skilful job. Such declaration obliged the individual to enroll himself in the registry and work in the sugar plantations along the coast while providing an inexpensive and alternate workforce to that of the slaves.

So as to free themselves from becoming part of the registry, many destitute chose to migrate towards the interior of the island beginning in 1849. Puerto Rico's central region hardly had begun colonization during mid-nineteenth century. During the years prior to 1870, those fleeing the coast were the ones in charge of the preparation of the interior lands for the cultivation of coffee; product that took sugar's place as the island's main economical activity. The situation for the refineries was further complicated when slavery and the Régimen de la Libreta de Jornaleros became

31 Picó, 203.

32 García.

abolished in Puerto Rico in 1873.³³ This marks the end of the Second Sugar Cycle.

During the last three decades of the nineteenth century, coffee production became the main industry in the island given favorable worldwide circumstances: Cuba's first war for independence from Spain and the increase of coffee prices in the international market beginning from 1885.³⁴ The success of the coffee industry solely benefited a few who were in fact foreigners. A great amount of the profit generated by the industry did not stay in Puerto Rico. Because the majority of the land proprietors were Spanish, all profit made was sent back to Spain thus impeding any possible funding and sponsoring of other economic activities within the island to take place.

Third Sugar Cycle (1898-2000)

The years that followed the abolition of slavery in Puerto Rico until the North American occupation in 1898, encompassed a period of greater changes that further defined Puerto Rican society. The fields of art, politics, religion, and social studies figure under such. A broad financial crisis which affected the countries focusing on single-crop farming during 1886-87, brought about an awareness of the economic fragility of these territories.³⁵ The crisis demonstrated how incapable both the Spanish and the territories' own governments were of maintaining and protecting their land's economy.³⁶ In Puerto Rico, the effects of this crisis further aggravated the social conflicts already taking place throughout the island. Many of the political parties that emerged during the previous century were developing into ones following the causes of several of the countries that had once been territories of the Spanish crown, that of obtaining independence from Spain or an autonomous government still within Spanish rule. From 1888 until 1898 the debate for the status of the island was still undergoing careful consideration.

In 1895, another economic crisis struck the Spanish colonies in the western hemisphere.

33 García, 196.

34 García.

35 Picó.

36 Picó.

Given the circumstances, Spain's remaining colonies in the Caribbean, Cuba and Puerto Rico, united forces in order to re-ignite the War of Independence and liberate both islands from Spanish rule. The North American government, having long withstood Cuban revolutionary activity from New York and Florida, was forced to consider intervening in the conflict beginning in 1895.³⁷ Their interest and business in the sugar industry was invested on the western side of Cuba, area directly affected by the revolution's pursuit. The anonymous sinking of the U.S.S Maine off of the Havana coast in 1898 triggered the beginning of what is known today as the Spanish-American War (which began on April of said year).³⁸

On the 10th of December of 1898, the treaty in which Spain gave up the island of Puerto Rico and also those on the Western Indies still under their rule, the Treaty of Paris, was signed thus formally ending the war. In Puerto Rico, the imposed sovereignty change brought with it a number of adjustments both of political and economical aspect. The island's economic activity was still to be driven by agriculture; however, production was to change, once more, from coffee to sugar and tobacco. The damages caused by hurricane San Ciriaco in 1899, were felt all around the island, especially in the mountainous interior where coffee production was held.³⁹ The level of destruction in addition to the time it took the crops to ripen didn't help alleviate the predicament the industry found itself in. A new crop takes approximately five years to ripen.

The sugar industry in Puerto Rico, beginning in 1900, underwent a dramatic expansion given the influx of foreign capital into the island.⁴⁰ Larger refineries, called centrales, were established through this new cycle along the coast, of which Aguirre and Guánica are examples of. These new structures introduced a more modern and mechanized way of sugar production. Through the first decade of the twentieth century, the number of these rose until arriving approximately at forty-

37 Picó.

38 Picó.

39 Picó.

40 Picó.

four refineries in 1930.⁴¹

The development of the industry was based upon four large corporations: the Fajardo Sugar Company, the South Porto Rico Sugar, Central Aguirre, and the United Porto Rico Sugar Co.⁴² As a main objective, these entities focused on the attainment of profit through the production of sugar for export at a much larger scale than what had been previously achieved in the island. Their ambition, along with the great political power they possessed, allowed for the purchase of the terrain surrounding the refineries. Such action, once more, led the island into the dependence of a single-crop manufacturing industry.



Figure 3. Image depicting living conditions within company town
(Source: public realm)

The incorporation of new medical and technological advances into the island and the decrease in the mortal rate of the population didn't change the way of life of the workers in the sugar industry. Wage-earning employees worked between ten to fourteen hours a day during crop season; the dead season, brought them unemployment. Overly low salaries didn't compare with production costs and profits made. As a consequence of the situation within the interior of the island and

41 Enciclopedia de Puerto Rico. <http://www.encyclopediapr.org/esp/article.cfm?ref=08111801> (accessed December 13, 2009).

42 Proyecto Salón Hogar. <http://www.proyectosalohogar.com/azucar/indice.htm> (accessed November 28, 2009).

the sole focus on sugar production, a great number of workers fled down to the coasts in search of job opportunities. Company towns were built around the refineries as an attempt to resolve the augmenting housing dilemma given the population move from the mountains to the shore.

The first decades of the twentieth century witnessed the successful development of the sugar industry. Despite the establishment of larger refineries, some centrales of Puerto Rican ownership demonstrated a thriving capacity in regards to the milling. By 1930, forty-four centrales were in operation. From the 1940s on, several factors caused these complexes to lose their momentum. Through the following decades, the decline of sugar prices, poor management, credit restriction towards the tenant farmers, as well as sugar strikes, created the unsettling circumstances that drove these refineries to decay and subsequent close.

The sugar industry experienced an accelerated decline following the record harvest of 1952.⁴³ Sugar production in the island became of secondary importance at the site of the industrialization project envisioned for the country. Seventeen refineries ceased operations between 1951 and 1968.⁴⁴ The Land Authority acquired a significant number of these territories and though it created the Sugar Corporation of Puerto Rico in 1973. Even though the government became the main sugar producer in the island, the remaining centrales, whether of public or private ownership, continued to close. In 2000, the last refineries in operation at the time closed down: Central Roig in Yabucoa and Central Coloso in Aguada (which remained in operation for almost a hundred years). Some of these plantations were indeed refineries and manufactured white sugar. The quality of the grain produced in the island by Puerto Rican ‘sugar men’, introduced the workers as true artisans, knowledgeable in the technical art that is the production of sugar from beginning to end.

43 Enciclopedia de Puerto Rico. <http://www.encyclopediapr.org/esp/article.cfm?ref=08111801&highlight=%2Bindustria%20%2Bazucarera%20%2Ben%20%2Bpr> (accessed December 13, 2009).

44 Enciclopedia de Puerto Rico. <http://www.encyclopediapr.org/esp/article.cfm?ref=08111801&highlight=%2Bindustria%20%2Bazucarera%20%2Ben%20%2Bpr> (accessed December 13, 2009).

Sugar Refining Process

From its early development in India around 500 BC⁴⁵ until the more modernized technology utilized today, sugar production, in its many forms, has played a significant role within the general manufacturing industry. Sugar refining was the first process to employ chemical procedures in the food industry. To obtain sugar from the cane plant, a strict chemical and technical understanding of this compound needed to be possessed; this type of knowledge far preceded the ideas and methods being used in modern day industries.

The sugar refining process varies between natural sources, beet and the cane plant, by means of a step in their production, the filtration and charring of liquor. The main end product of both processes, crystallized sugar, remains fairly similar. The byproducts that develop naturally from the refinement of cane sugar (moscabad sugar, molasses, syrup, etc) are not attainable when processing beets. Based on the scope of this thesis project, the refining process that would be elaborated upon through this document will be that of the sugar cane plant.

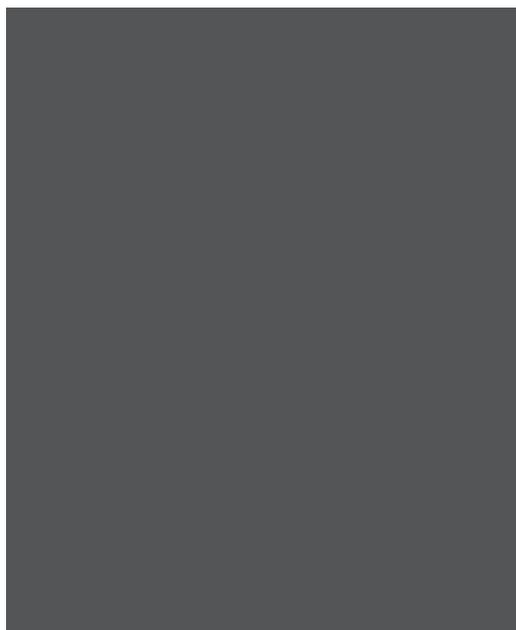


Figure 4. Sugar Refining Process

(<http://www.monografias.com/trabajos65/variedades-azucar/variedades-azucar2.shtml>)

⁴⁵ Essortment. The History of Sugar. http://www.essortment.com/all/historyofsugar_rzow.htm (accessed October 2009).

The essence of the sugar refining process has remained unchanged for centuries. The technological advances introduced throughout the course of its existence have been its thriving force. The change from machinery operated by manual force, to that powered by water, steam, and later electricity, impacted not only production percentages but also the quality of the product. Detailed below is the sugar refining process as performed in the large centrales in Puerto Rico.

Milling⁴⁶

Prior to the processing stages, the cane plant has to be prepared in order for the sugar to be extracted from it. Once the stalks are brought into the refinery from local or outside sources, they are sent through a series of revolving blades, which cut it into smaller pieces, and through a shredder, where the extraction of liquid begins. Afterwards, the shredded cane is sent through mills which help to further extract the liquid from the plant by constantly mixing in cane juice or guarapo and at the final mill, water. The remaining bagasse (fiber leftover after sugarcane juice extraction)⁴⁷ from the final mill is sent to the boilers to serve as fuel; this is done by the workers either instantaneously or after it being stored.

Guarapo Purification⁴⁸

The cane juice pressed by the mills is an acidic, musky substance of dark green pigmentation. Lime and heat are utilized as purifying agents, through this stage of the process, in order to remove both soluble and insoluble impurities from the liquid. The application of heat until the guarapo reaches its boiling point coagulates the albumin and some of the fat, wax and rubber in the substance. This causes the guarapo's natural acidity to neutralize by forming insoluble calcium salts which by means of sedimentation become separated from the now pale liquid. The impurities extracted from the process are stored and later used as fertilizer.

46 Colación Inc. 1990. *La central azucarera en pr (1898-1952)*. San Juan, Puerto Rico: Oficina Estatal de Preservacion Historica de Puerto Rico.

47 World Centric. Plant Fiber. <http://worldcentric.org/biocompostables/bagasse> (accessec November 2009).

48 Colación Inc.

Evaporation⁴⁹

In order to achieve the necessary concentration of sugar saturation and be able to proceed to the crystallization stage, a large percentage of the water in the raw guarapo has to be lowered from around eighty-five to thirty-five percent. This change would convert the liquid into syrup by means of vacuum “evaporators of multiple effects”. The system consists of a series of cells (from three to five) that sequentially boil under a vacuum environment, each at varying temperature.

Crystallization⁵⁰

Once the great majority of the moisture of the liquid has been evaporated, an amount of syrup is placed into a separate container where it continues evaporating until it is oversaturated with sugar and in a state that allows for the formation of grains. The crystallization of the syrup is rushed by means of the addition of fine grains that have already been through the crystallization process. These act as an agent to incite the growth of sugar grains.

As the viscosity of the transformed syrup increases, more syrup is added as the water continues to evaporate. The original crystals in the mixture continue to grow as material from the boiling mass is deposited into them. The addition of a controlled amount of syrup that maintains the correct level of oversaturation prevents new crystals from forming. This growth stage continues until the full capacity of the container is reached, the grains have attained a predetermined size, and the substance has completely transformed into masacocida (the mixture of sugar crystals and syrup obtained during the crystallization stage of sugar refining).⁵¹ Once the liquid is transformed, the product is unloaded into a crystallizer; tank in which, by means of mechanical agitation and cooling, the growth process of the grain is completed.

49 Colación Inc.

50 Colación Inc.

51 Answers.com. Masecuite. <http://www.answers.com/topic/masecuite> (accessed November 15, 2009).

Purge⁵²

The final process in the fabrication of sugar is that of separating the grains from the molasses. The masacocida is passed into centrifugal machines that spin the substance until the force exerted by the rotation of the vessels extract the liquid from the solid grains. Once complete, both the molasses and the grain are sent to separate destinations. The molasses, depending on their quality, are sent either to the crystallization process yet again, or to tanks where they wait to be given to a buyer. In regards to the grain, the centrifuges expel the sugar towards a sugar conductor that takes it to an automatic scale. Once weighted, another conductor then takes it into a warehouse where it accumulates in bulk and awaits to be refined.

Chapter 2: Site

Selection

The growth and success of the sugar refining industry, not only during Spanish rule but also under North American sovereignty, has left the island's landscape scattered with these grand industrial buildings. The present state and survival of these structures is not the problem of a few municipalities but of the vast majority of them. Their remains throughout the island serve as landmarks that evoke memories of a time long gone but not forgotten. This thesis proposition envisions reviving and enhancing these memory-filled sites by means of the restoration of one of them. Such program would grant the site and its surroundings new purpose while recapturing a past image and preserving it for future generations.

In order to select an appropriate site for this proposal, a series of comparisons were done to determine the best option within the eight largest refineries on the island. This initial selection, based upon overall sugar production, encompassed the following centrales: Cambalache in Arecibo, Plata in San Sebastián, Mercedita in Ponce, San Vicente in Vega Baja, Coloso in Aguada, Fajardo in Fajardo, Aguirre in Salinas and lastly Guánica, located in the municipality of Guánica. By means of a ranking system, each refinery was objectively evaluated through two main categories, proximities and the characteristics of the refinery as a unit, and relevant subcategories.

Proximity

Even though Puerto Rico is a small island (13,790 sq k [5,320 sq mi])⁵³, that takes two, maximum, three hours to traverse from east to west, distance still plays an important role in its everyday life and transportation. As someone's initial concern, distance becomes an important factor in determining the success or failure of the project's envisioned program. The first observation

⁵³ CIA World Factbook. Puerto Rico. <https://www.cia.gov/library/publications/the-world-factbook/geos/rq.html> (accessed October 15, 2009).

was based on the proximity of each refinery to the most important cities in Puerto Rico: Arecibo, located on the North West region of the island, San Juan to the North East, Ponce to the South and Mayagüez to the West. Once ranked, each refinery was then evaluated based on the distance of the complex to key points inside the cities that housed them. The main city plaza, adjacent neighborhoods, museums, natural reserves, and beaches figure as such.

Refinery as Unit

As the concluding category examined for site selection, certain aspects were considered in regards to the refinery complexes. Did the sugar refining factory commission the construction of a village or company town to house their workers? What was their production rate? In what state is the industrial complex found today?

Conclusion

As seen in figure 5, based on the scores obtained through the pre-determined categories, the Central Aguirre sugar refining complex serves as the appropriate site for this project. Its proximity to the major cities in Puerto Rico, including the capital, San Juan, renders it accessible from all regions. The site's immediacy to key places in the city of Salinas provides a window of opportunity to better incorporate the town to one of its initial sources of income during the twentieth century. It offers an alternate means by which to revitalize the city while bringing new life to it.

	cambalache, Arecibo	plata, San Sebastián	mercedita, Ponce	san vicente, Vega Baja	coloso, Aguada	fajardo, Fajardo	aguirre, Salinas	guánica, Guánica
city population	100,131	43,514	194,636	63,355	42,042	40,712	29,831	21,889
proximity 5 pls.								
major cities in pr								
Arecibo	N/A	55mins	1h 31mins	31mins	1h 3mins	1h 34mins	1h 29mins	1h 51mins
Maveaguez	1h 23mins	5 mins	57mins	1h 46mins	30mins	2h 27mins	1h 21mins	41mins
Ponce	1h 40mins	1h 32mins	N/A	1h 31mins	1h 21mins	1h 35mins	29mins	30mins
San Juan	55mins	1h 37mins	1h 15mins	33mins	1h 49mins	54mins	52mins	1h 40mins
city								
Plaza	1.51 miles	1.54 miles	3.34 miles	1.44 miles	1.81 miles	0.33 miles	5.24 miles	1.43 miles
Neighborhoods	1.41 miles	0.37 miles	0.20 miles	0 miles	0.80 miles	0.22 miles	0.19 miles	0.18 miles
Museums	8.40 miles	None	3.62 miles	1.52 miles	2.04 miles	4.34 miles	5.71 miles	None
Natural Reserves	Arecibo Observatory 7 miles	3 miles	14.06 miles	Casa Pueblo 3.15 miles	Aguada Museum 12.58 miles	Cabezas de San Juan 10.75 miles	Albany Olimpic	3.29 miles
Beaches	1 mile (N)	10 miles (NW)	3 miles (S)	4 miles (N)	2.5 miles (NW)	1.3 miles (E)	2 miles (SE)	2 mile (S)
refinery 3 pls.								
company town								
production	5000 tons/day	5000 tons/day	5500 tons/day	5600 tons/day	6000 tons/day	6250 tons/day	7000 tons/day	8600 tons/day
condition	poor	poor	stable	poor	poor	ruin	poor	poor
total	37	31	39	35	40	33	44	37

Figure 5. Site Selection Matrix
(Image by Author)

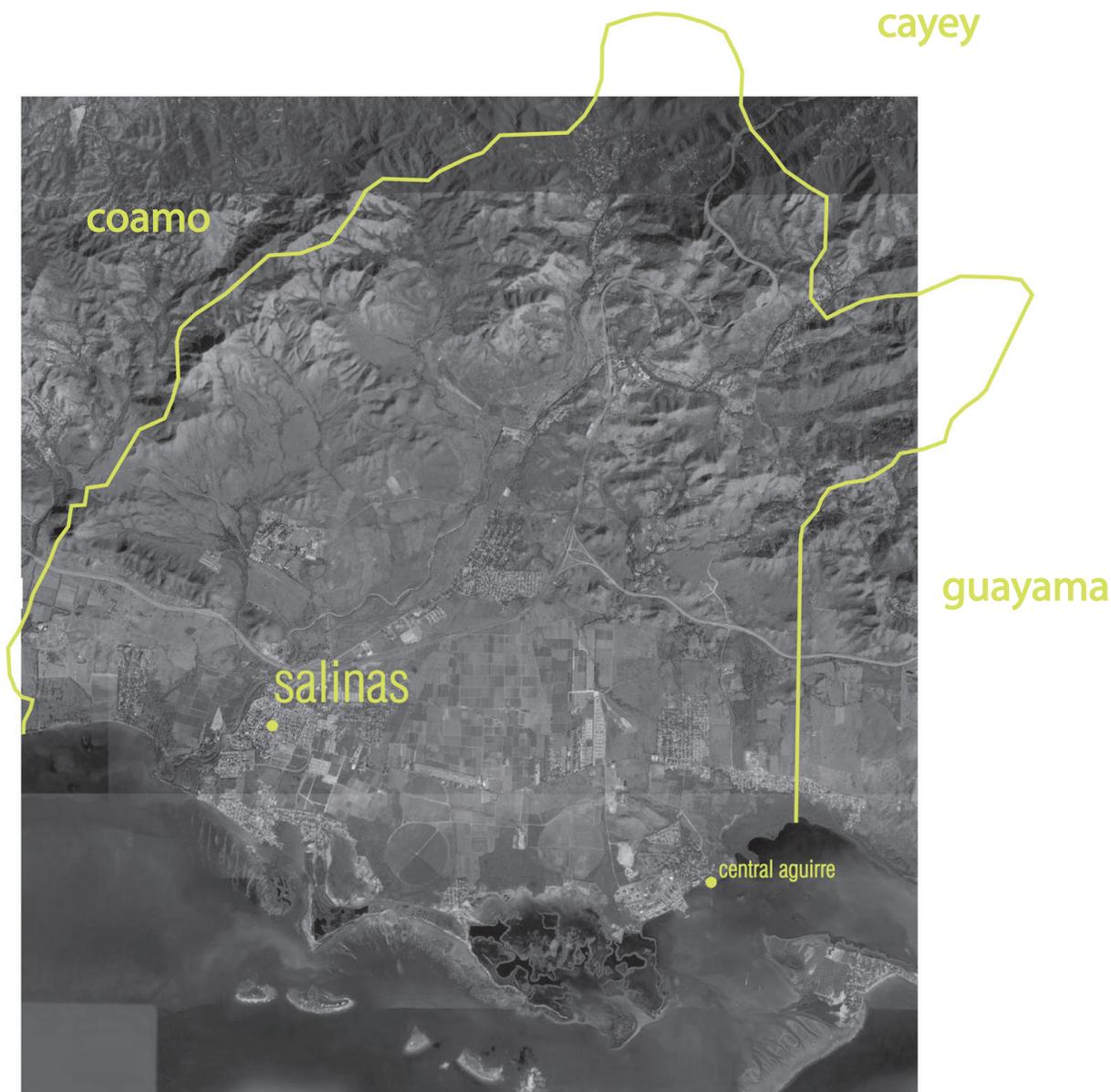
Location



**Figure 6. Site in broader context, Central America and the Caribbean
(Image by Author)**



**Figure 7. Site in context within the island of Puerto Rico
(Image by Author)**



**Figure 8. Central Aguirre in relation to the city of Salinas
(Image by Author)**



**Figure 9. Central Aguirre complex
(Image by Author)**

Birth of Aguirre



Figure 10. Aerial Photograph. Central Aguirre and surrounding cultivated land.
(AACUPR)

In 1898, after the United States acquired the island of Puerto Rico, a group of investors from Boston, Massachusetts went to the island with hopes of establishing a banking firm.⁵⁴ Their success as Ford And Company led the US government to appoint them as district attorneys in charge of changing the currency from Spanish to American. As time went on, the firm grew more interested in the business surrounding the sugar industry in Puerto Rico and the profits that could be generated from it rather than that in commercial banking.

In February of 1899, the firm bought a property of approximately more than two-thousand acres along the Jobos bay in the municipality of Salinas.⁵⁵ This was the old hacienda Aguirre. The purchase of this vast parcel of land was the cornerstone for what would become one of the larg-

⁵⁴ Reserva Nacional de Investigación Estuarina. Comunidad Aguirre. http://ctp.uprm.edu/jobos/sobre_reserva/comunidad_aguirre.html (accessed October 17, 2009).

⁵⁵ Reserva Nacional de Investigación Estuarina. Comunidad Aguirre. http://ctp.uprm.edu/jobos/sobre_reserva/comunidad_aguirre.html (accessed October 17, 2009).

est producers and manufacturers of sugar in the island. Following the initial purchase, a series of properties were added to the land owned by Ford and Company. These new acquisitions were done through rent with the intent of having the landowners cultivate the land thus growing sugar cane for the corporation's benefit. As a joint venture, twelve miles of railroad (including two small locomotives and fifty wagons for cane) were bought in order to transport the cane from the surrounding plantations to the mill.

The growth generated by the company in addition to the necessities brought about by their property's increase in acreage made the organization seem incapable of dealing with the plantation's affairs. Such conditions led to the establishment of the Central Aguirre Syndicate on July 1st, 1899.⁵⁶ Throughout the development and existence of the industrial complex, the administrative branch in charge frequently changed. The corporate structure of the company was always under frequent re-organization.

The new Central was erected in 1899 within the lands purchased by the members of the Ford and Company firm.⁵⁷ Contrary to the original mill, the new structure was built along the coastline of the Jobos Bay allowing for direct access to the water. Aside from the mill, a company town, modeled after the nineteenth-century industrial towns in the US, was built to house the workforce employed by the refinery. As discussed by Enrique Vivoni-Farage in his article *Americanization south of the Border: the Architecture of the Central Aguirre Sugar Company*, "The company town was segregated into three major zones: La Central, the mill and its administrative buildings; Aguirre, the American residential sector with hotel, recreational and social facilities; and Montesoria, the residential sector of the Puerto Rican sugar mill workers (Figure 11)."⁵⁸ The complex further emphasized the segregation qualities of the epoch and society therein.

56 Central Aguirre. *50th Anniversary Anual Report, 1949*. Central Aguirre Sugar Company, 1950.

57 Oficina Estatal de Conservación Histórica. <http://www.gobierno.pr/OECH/AreasProgramaticas/Registro/Salinas/Distritohistoricocentralaguirre.htm> (accessed December 15, 2009).

58 Vivoni-Farage, Enrique. 2007. *Americanisation South of the Border: The Architecture of the Central Aguirre Sugar Company*. In *Prospero's Isles: The Presence of the Caribbean in the American Imaginary*, ed. Diane Accaria-Zavala and Rodolfo Popelnik, 47-85. Oxford: Macmillan Publishers Limited.

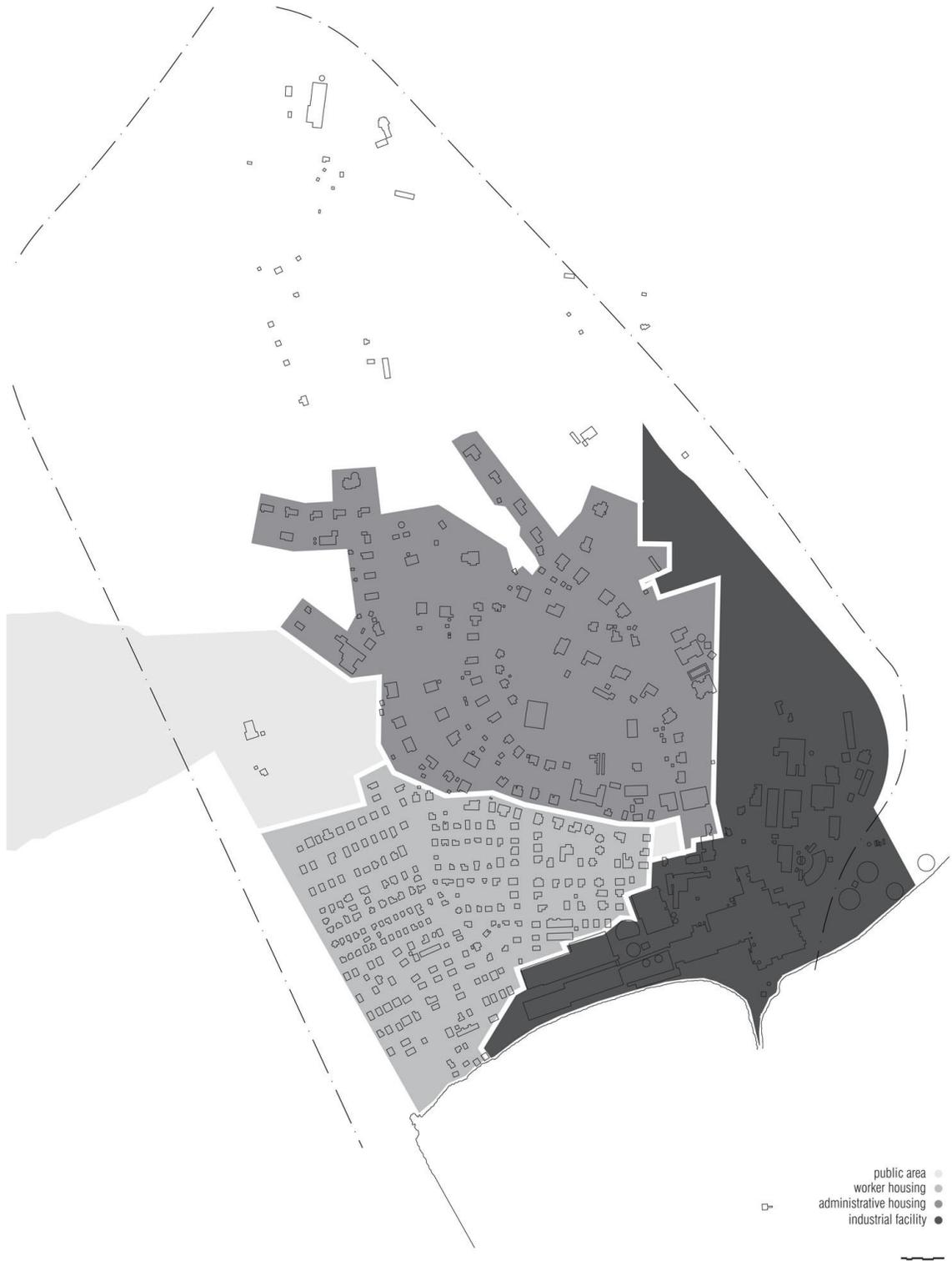


Figure 11. Site Zones.
(Image by Author)

In order to stay afloat in an industry of extreme competitiveness, Central Aguirre relied in the constant development and application of new production and distribution techniques to all phases of sugar production.⁶⁰ This was mainly through advances of scientific and technical nature.

Based on the damage brought by the Great Depression in the US, the island's dependence on single-crop farming, and the constant fluctuation of market sugar prices, the state decided to take charge of the situation and search for ways in which to bring the population from the misery they had been living in for decades. The industrialization of the sugar refining process was to blame for the island's current predicament. During the final decade of the 1940s, the island's industrialization process was replaced by a system of incentives and tax breaks aimed at attracting private US capital to Puerto Rico.⁶¹ Operation Bootstrap, the program designed for the industrialization of the island, was developed together with an agrarian reform program geared towards the sugar industry.⁶²

During the decade between 1960 and 1970, Central Aguirre continued production even though it experienced great losses in both profit and income. Such elements only increased as time went by. In order to help reinstate the decaying sugar industry, in 1969, the government of Puerto Rico approved a legislation that would provide it with economic and technical help. Since then, in addition to the remaining four refineries still in operation, Aguirre was under government administration. The government's lack of experience and vision towards the bettering of production and condition of these structures brought the industry's decline one last time. Central Aguirre concluded its production in 1990.⁶³

60 Central Aguirre.

61 Emilio Pantojas García. 1990. *Development Strategies as Ideology: Puerto Rico's Export-Led Industrialization Experience*. Boulder: Lynne Rienner Publishers

62 Pantojas.

63 Oficina Estatal de Conservación Histórica. <http://www.gobierno.pr/OECH/AreasProgramaticas/Registro/Salinas/Distritohistoricocentralaguirre.htm> (accessed December 15, 2009).

Analysis



Figure 13. Existing Figure/Ground Diagram.
(Image by Author)

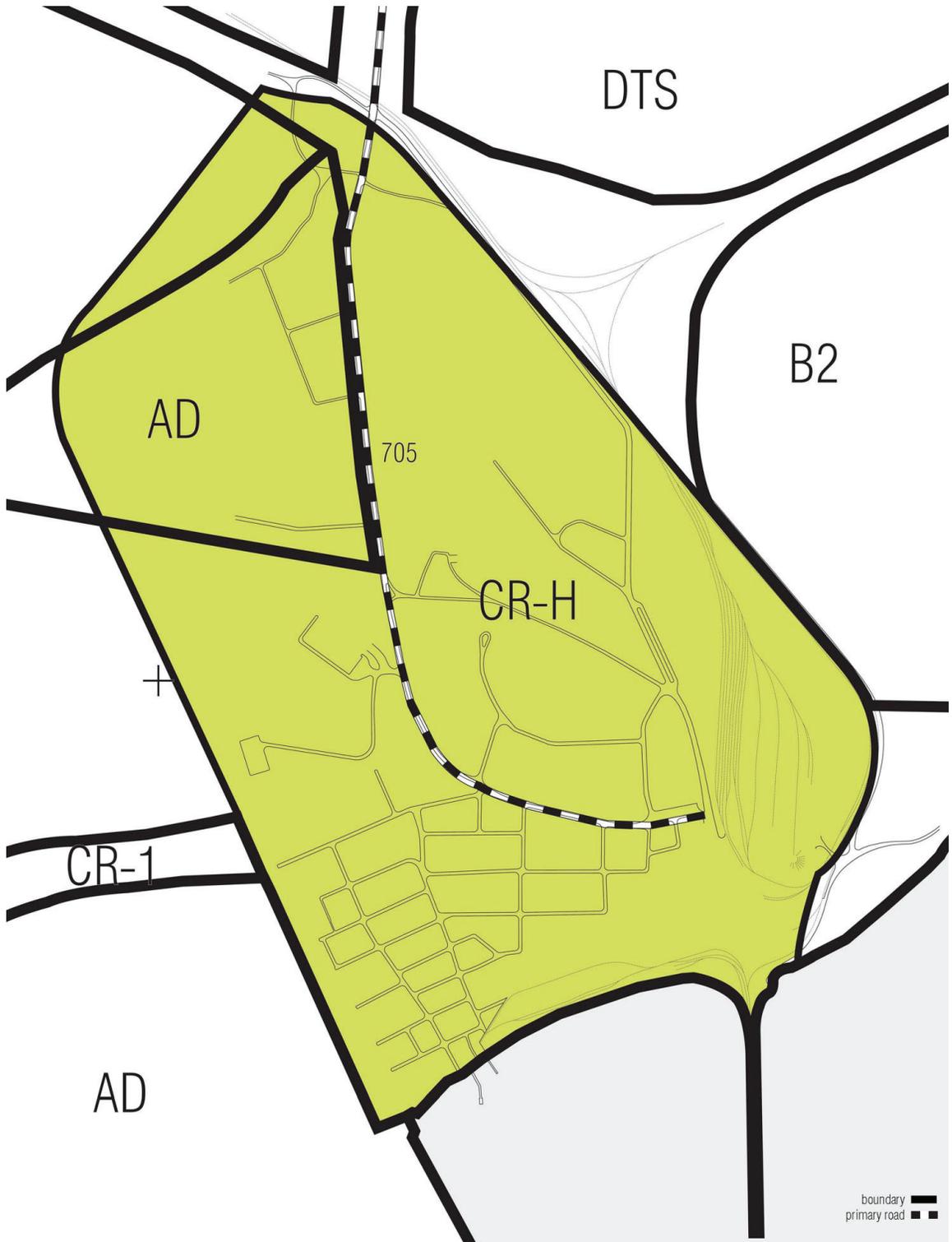


Figure 14. Site Zoning Diagram. Site falls under special Historic District regulations
(Image by Author)

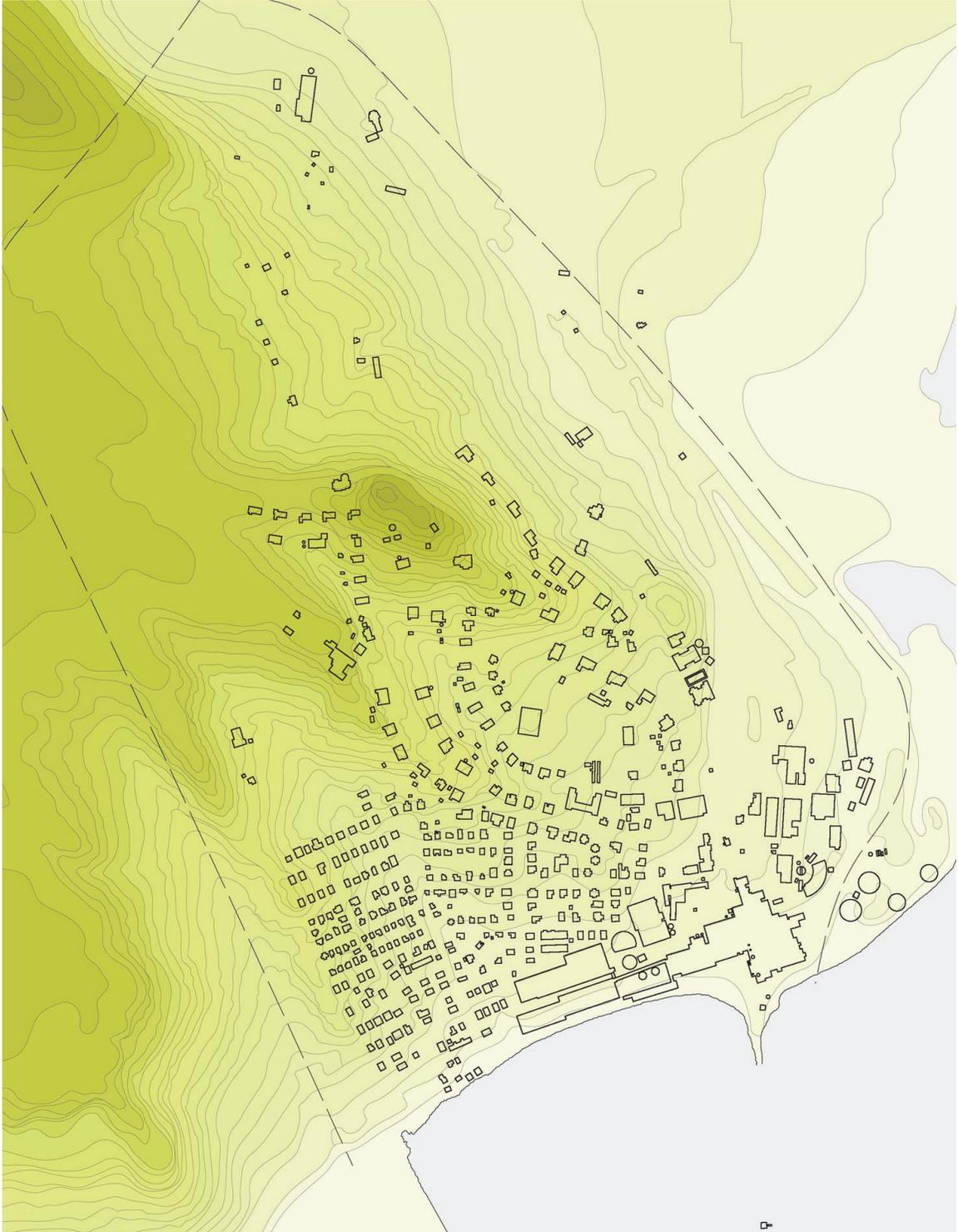


Figure 15. Site Topography Diagram. Highest point within site boundaries is 42' above sea level.

(Image by Author)

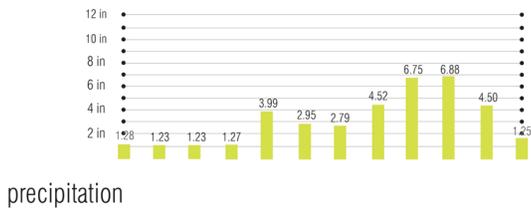
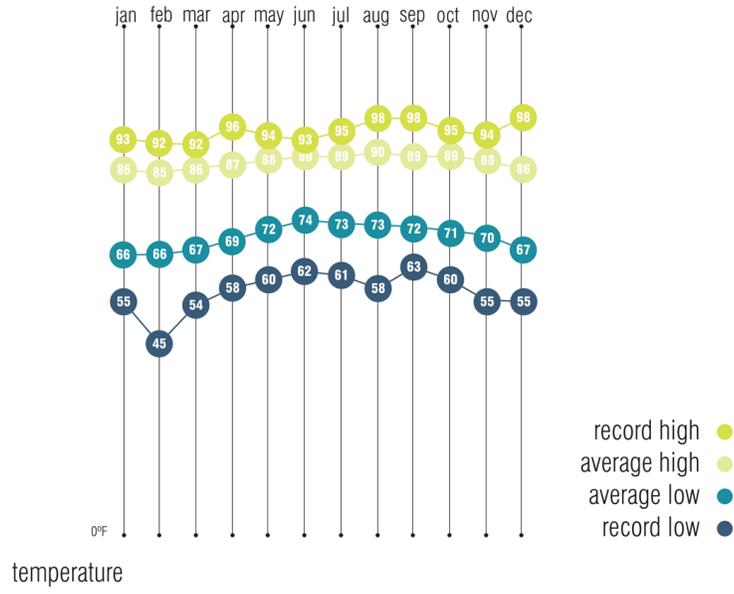


Figure 16. Site Climate Data.
 (Image by Author [Data taken from <http://www.weather.com>])



Figure 17. Sun Path through Site
 (Source: Enfoque Biotropical)



**Figure 18. Wind Velocity Map.
(Source: Enfoque Biotropical)**



**Figure 19. Typical Wind Direction Map.
(Source: Enfoque Biotropical)**



Figure 20. Flood Data Map.
(<http://www.jp.gobierno.pr/avi/>)

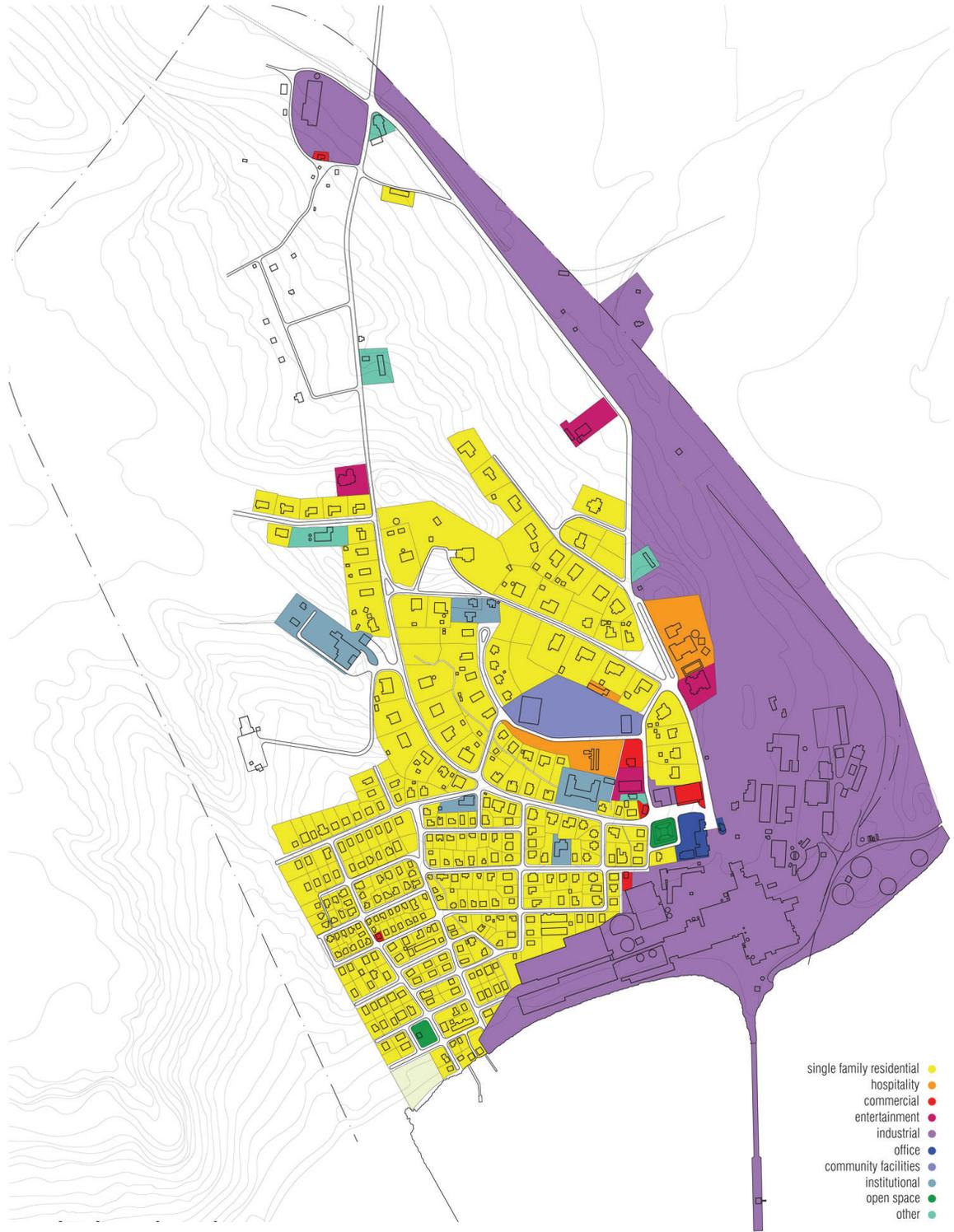


Figure 21. Existing Land Use Diagram.
 (Image by Author)

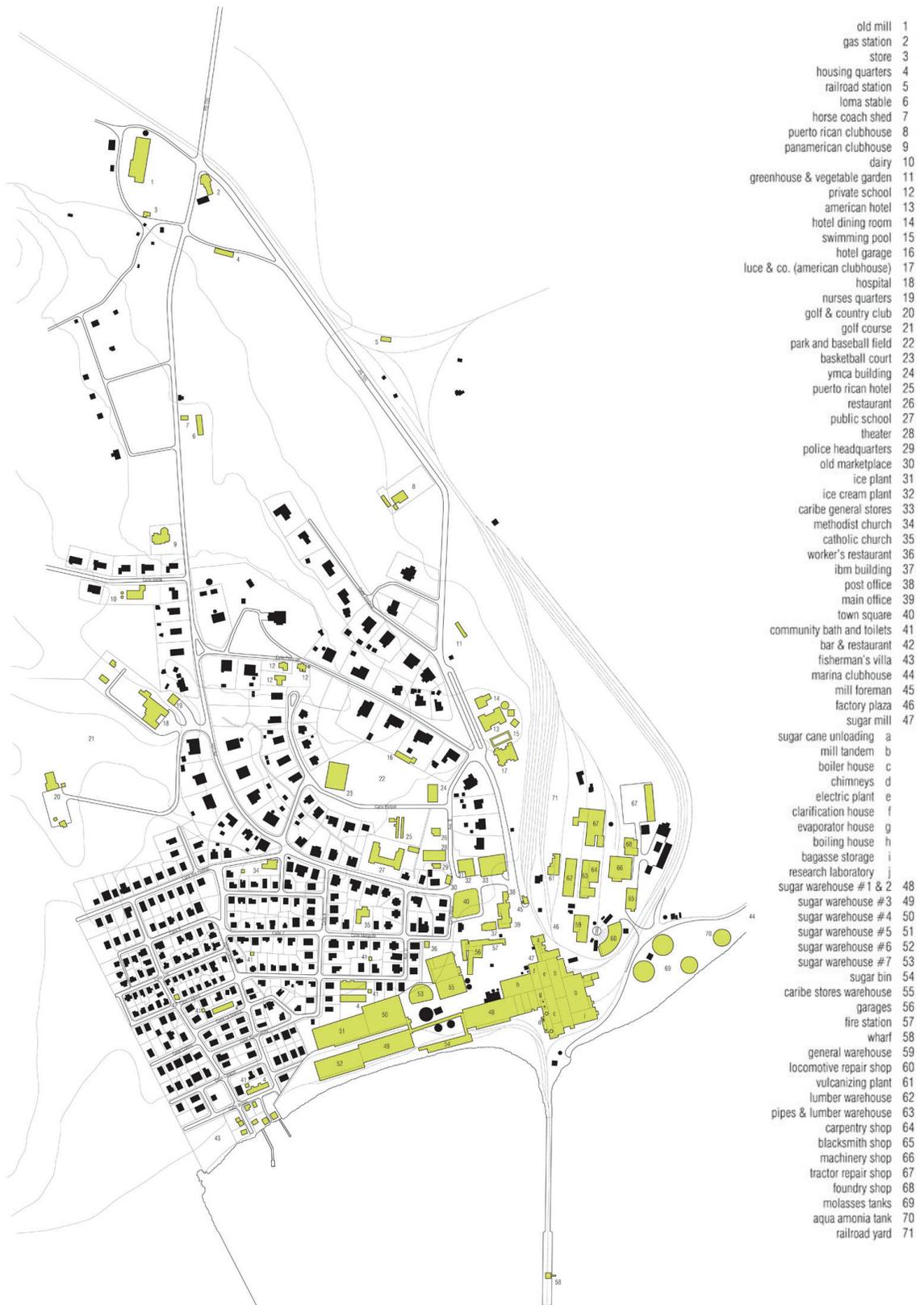


Figure 22. Site Places Diagram. Breakdown of building functions within the Aguirre Company Town.

(Image by Author)

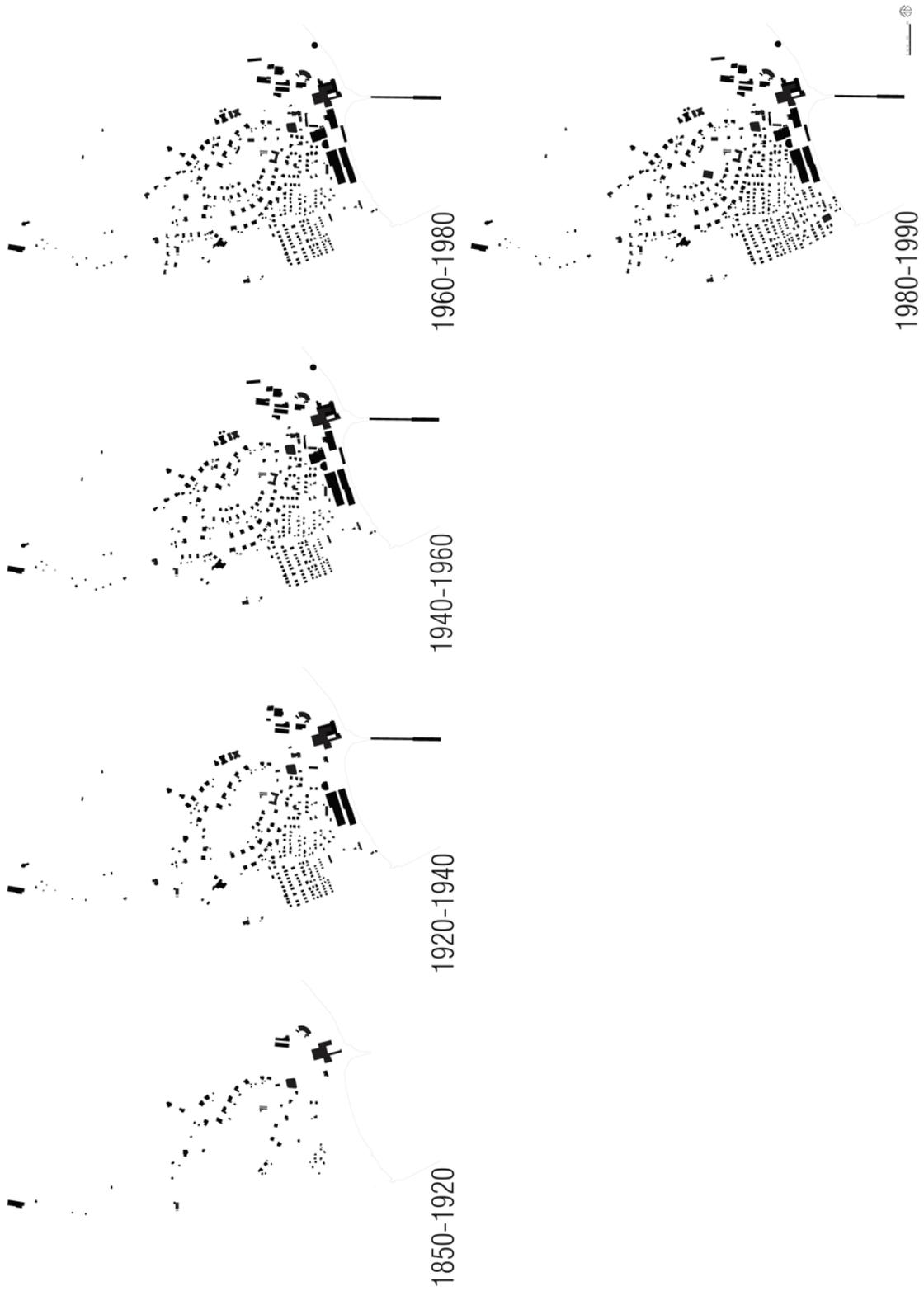


Figure 23. Historical Assessment Diagram. Growth of complex since original *hacienda* was built.
 (Image by Author)

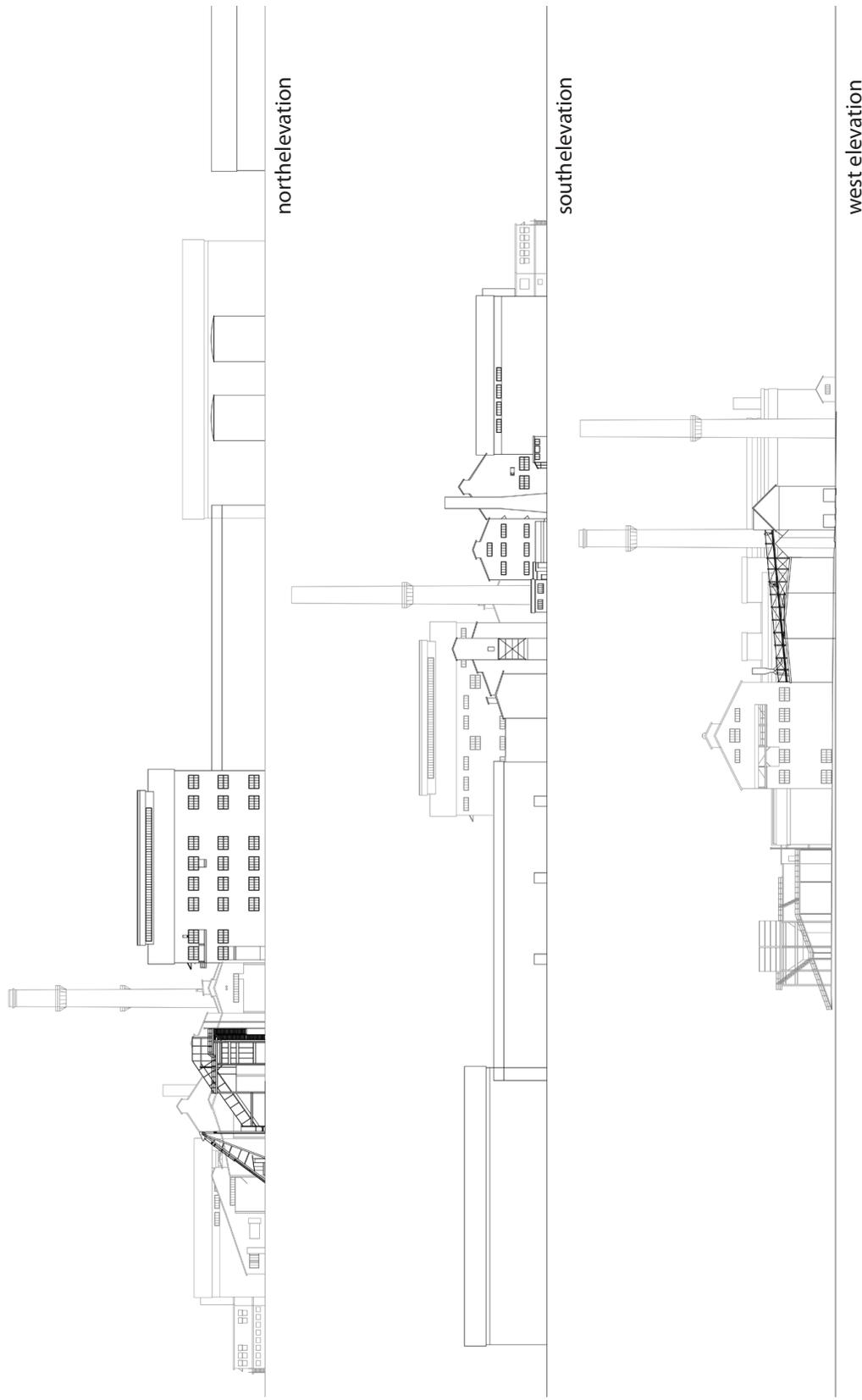


Figure 24. Site Elevations. Tallest building on the site is 70' high; the rest fluctuate between 25' and 40'.

Views and Character of Site



**Figure 25. View of hotel and main road towards refinery
(Image by Author)**



**Figure 26. View of existing public plaza and adjacent streets
(Image by Author)**



**Figure 27. One of the remaining dwellings from the original worker housing complex
(Image by Author)**



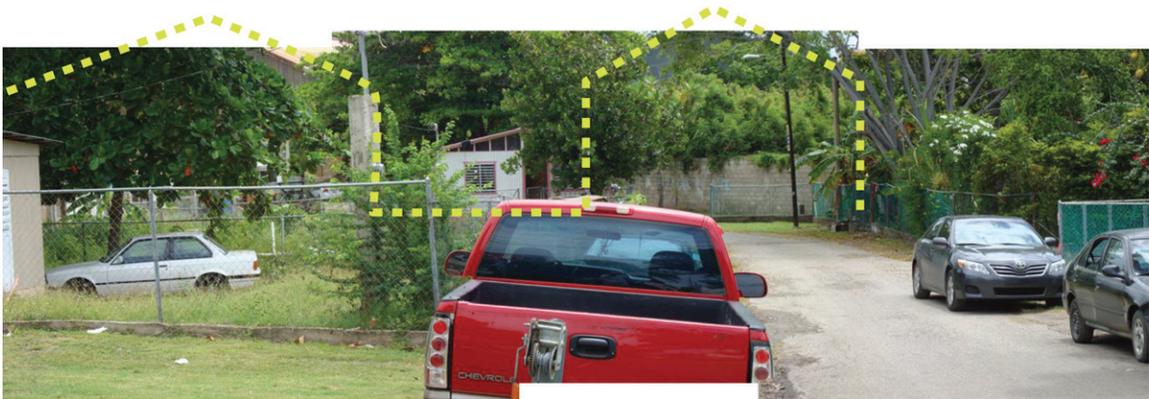
**Figure 28. Housing typology for the administrative employees
(Image by Author)**



Figure 29. Abandoned Theater
(Image by Author)



Figure 30. Old Hospital Wing
(Image by Author)



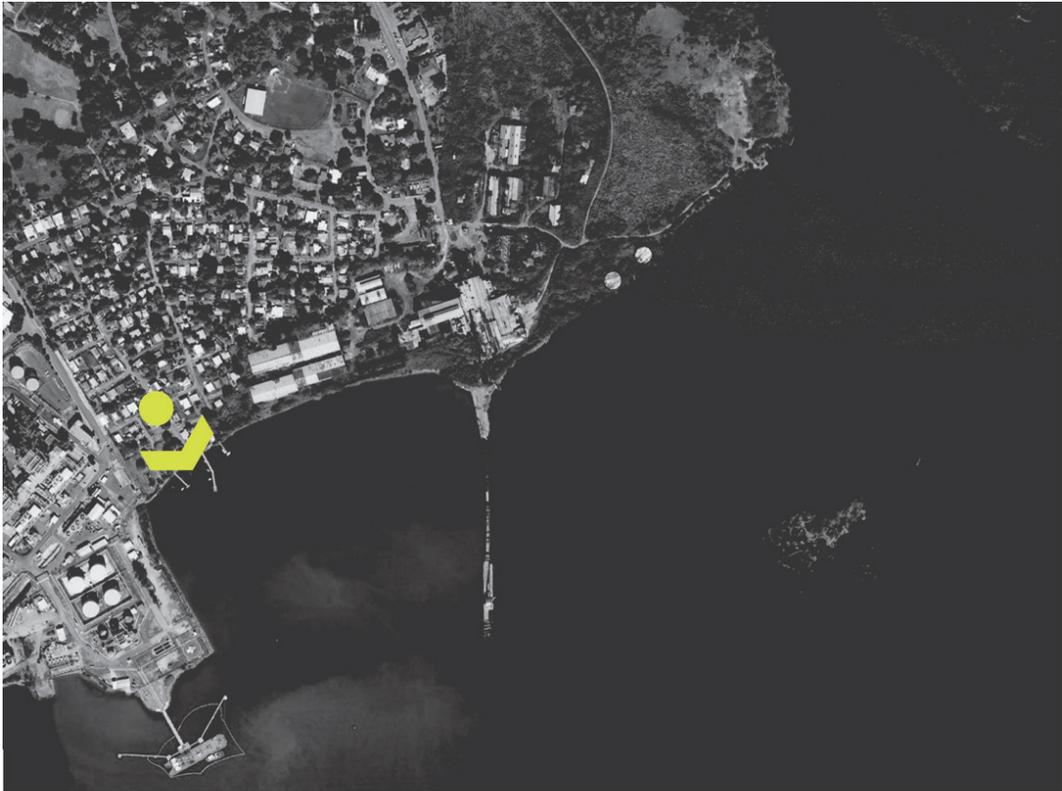
**Figure 31. Existing street condition
(Image by Author)**



**Figure 32. Existing street condition
(Image by Author)**



Figure 33. Existing street condition
(Image by Author)



**Figure 34. Existing street condition
(Image by Author)**



**Figure 35. Existing street condition
(Image by Author)**



**Figure 36. View towards support area
(Image by Author)**



**Figure 37. View between workshop ruins
(Image by Author)**



Figure 38. Store Warehouse
(Image by Author)



Figure 39. Train Shed
(Image by Author)



**Figure 40. View towards industrial plaza
(Image by Author)**



**Figure 41. View towards mill tandem building (middle), warehouse (L) and laboratories (R)
(Image by Author)**



**Figure 42. panoramic view towards boiler house (L)m warehouses #1 and #2, conveyor building and warehouses #3 and #4
(Image by Author)**



**Figure 43. Panorama of Site from Fisherman's Villa
(Image by Author)**



Figure 44. Structural Assessment Diagram.
 (Image by Author)

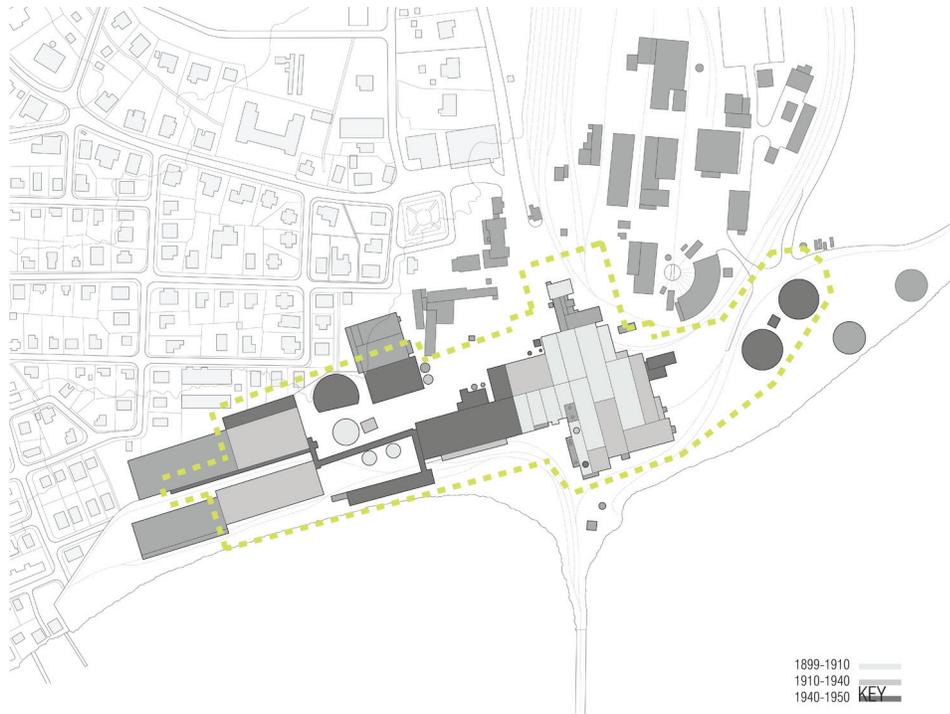


Figure 45. Historic Chronology of Main Industrial Buildings
(Image by Author)



Figure 46. Building Square Footage within Industrial Complex
(Image by Author)

Chapter 3: Vision

Precedence

Preservation and Landscape Design

Parc del Clot, Barcelona, Spain

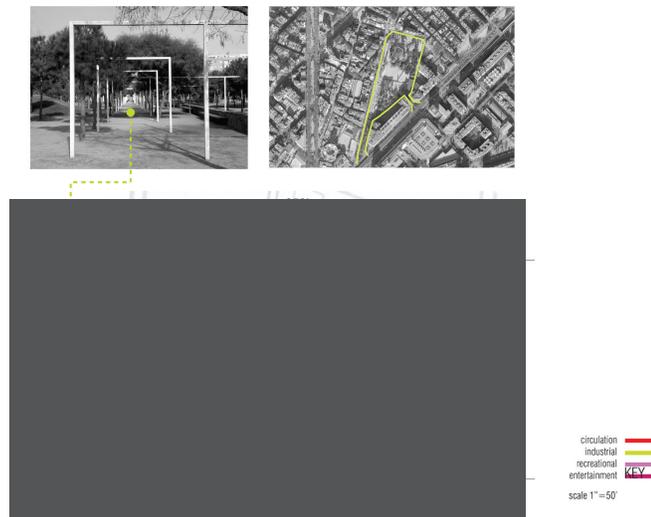


Figure 47. Park within broad city context. (Plan underlay obtained from [<http://urban.arch.virginia.edu/lar602-2001/2001Projects/8ParcadelClot/8ParcadelClotPlan.htm>]. Modified by Author)

Parc del Clot in Barcelona figured as part of an urban renewal project set out for the city of Barcelona during the 1980's by then Mayor Maragall. Because of the nature of the area in which it sits in, the mixed-income neighborhood of Sant Marti, the park needed to be designed in a way that all age ranges could inhabit the space and enjoy it to its fullest potential.

The park rests on the site formerly utilized as the RENFE train station. Remnants of what used to be not only the station but also warehouses and workshop buildings have been incorporated into the design achieved by Daniel Freixas and Vicente Miranda. The usage of these structures and the addition of elements such as green areas, and variance of surfaces and level changes have denoted the site as one who's functions can be interchangeable based on the public's needs and desired activities at the moment of their visit.

Adaptive Reuse of Industrial Facility

Rheinische Industrial Museum, Oberhausen, Germany

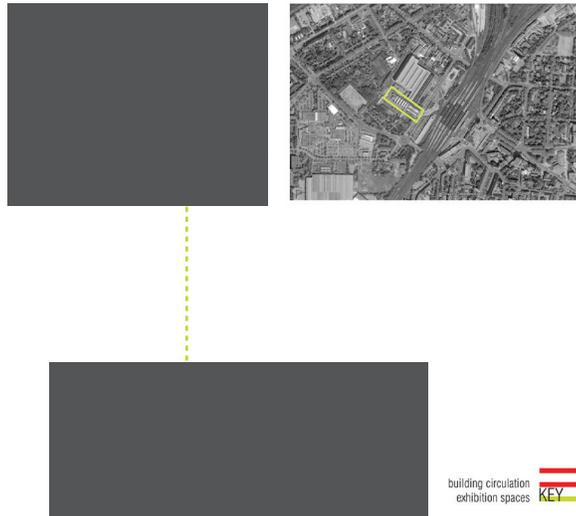


Figure 48. Museum within broad city context. (Plan and elevation underlay obtained from *Technique and Architecture* periodical. Modified by Author)

The Rheinische Industrial Museum is a six-site complex throughout the Rhineland region in Germany that intends to document, preserve and showcase the area's important industrial heritage. These scattered sites cover the region's stages of industrial development from the past one hundred and fifty years by means of their most important industries (metallurgy, textile manufacture, paper production and electricity). As was feasible, the factories have been preserved to their authentic states.

The commission to build the Rheinische Industrial Museum in Oberhausen was won by firm Baucoop Köln in 1984. The site was once the Altenberg zinc factory. The museum showcases the industry while educating the public on how production went about and the varied goods were obtained. As mentioned in the periodical, *Techniques & Architecture*, "An important criterion was to integrate the original uses of the different buildings to create a 'working' museum able to tell its own story and that of industrial development and cultural change."⁶⁴ The design incorporates the

⁶⁴ Tréand, Véronique. 1997. Musée rhénan de l'industrie, Oberhausen. *Techniques et architecture*, n.432 (June-July): 40-43.

old crushing mills, furnaces, and pipelines as well as the arched windows and brick construction.

Adaptive Reuse of Archaeological Site

Museu d'Història de Barcelona, Conjunt Monumental de la plaça del Rei, Barcelona, Spain

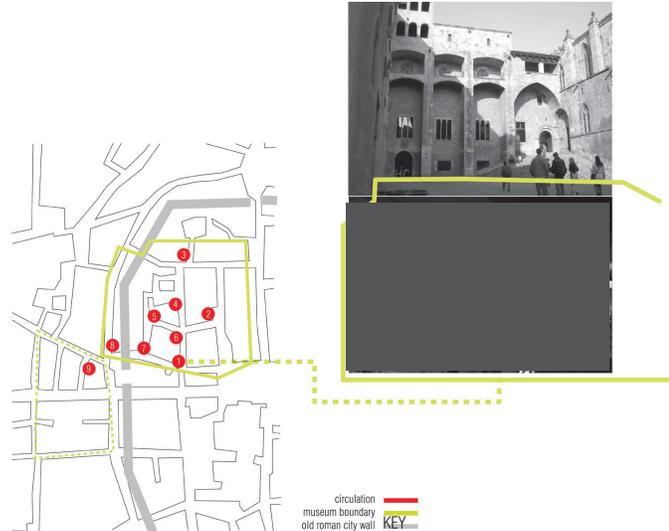


Figure 49. Museum within broad city context. (Plan underlay obtained from [http://w3.bcn.es/V64/Home/V64XMLHomeLinkPl/0,4468,335907851_335946902_2_532961552,00.html?accio=detall]. Redrawn by Author.)

The location of this museum in Plaça del Rei within the Gothic quarters of the city of Barcelona, serves as the birthplace of the Barcelona City History Museum (1943). The overall network comprises approximately seven sites across the city with the intention of preserving its extensive cultural, industrial, and economic history. This particular site houses the remains of the Roman Barcino city dating back to the first century B. C. until the Barcelona existed during the thirteenth century A. D. The complex ends inside the Royal Palace, the Saint Àgata chapel, and the Gothic Padellàs residence. The latter houses the temporary exhibits of the museum, which figures the 'modern' Barcelona.

The design of the museum, being of over 43,000 sq ft, is one meant to take the public on a journey through time. Primarily one goes through the temporary exhibits located at the ground floor of the main building. Once this journey is complete, one descends into what are the remnants of the

Roman settlement of the city. From part of the city wall and watchtowers, to textile, fishing, winery complexes, the viewer is completely immersed in this period. The interconnected pathways that hover over the ruins take oneself from one part of the exhibit to the other until reaching its end and directing the viewer to the medieval and Gothic buildings, which further continue the narrative.

Program

Museum Program Description

Visitor

Area that encompasses the spaces open to the general public. This portion of the museum includes the main lobby area, a museum shop, and the areas geared towards the educational aspect of the program. The area would also house direct access to the administrative area, a small assembly room and theater.

Administrative

Area designated for administrative purposes and possible activities regarding the organization of the museum as a complex. In its entirety, the spaces should be located in close proximity to the visitor section of the program while allowing for clear access to the gallery areas.

Exhibition

The exhibition portion of the program encompasses two galleries: one geared towards the socio-cultural aspect of the refining industry in Puerto Rico and one that showcases the technological development of the machinery utilized throughout the refining process. These structures, even though separate in terms of enclosure, might lend possibilities of creatively treating the connections between both exhibition spaces. A third exhibition would entail a guided walk through of the sugar mill buildings.

Service

Main functional elements of building construction. This area includes restrooms, horizontal circulation and its vertical components (elevator, egress stairs, etc.), freight elevators, mechanical equipment, and any IT infrastructure needed.

Study Center Program Description

Visitor

For the study center, the visitor area will encompass two areas that would serve as lobbies, one of them operating as the main entry point of the building and the other, as a direct connection to and from the museum building. This general area will house a small exhibition space for the display of archival material and a small café. The café should be located in an area that would serve both the study center and patrons from the museum.

Library

This portion of the program will serve as the main circulation area of the building. It will house the main body of material existent and remaining from the sugar industry and should possess the character that would enable scholarly behavior. This space should have direct access to the main circulation elements in the building as well as to the café. Given the nature and orientation of possible buildings on the site, special consideration should be taken so as to take advantage of natural light when designing the space. The other areas within this category can be located on alternate stories in the building depending on the level of control required by their content.

Archive

This portion of the building should be protected from not only direct sunlight but also from temperature fluctuations. Given that the material contained in this space is of a delicate nature and requires control in every aspect, the space should be designed in close proximity to the library; however, it should function separately.

Service

Main functional elements of building construction. This area includes restrooms, horizontal circulation and its vertical components (elevator, egress stairs, etc.), freight elevators, mechanical equipment, and any IT infrastructure needed.

Visitor		
Entrance Lobby	500	
Museum Shop	750	
W.C.	tbid	T=1,250 sq ft

Administrative		
Reception	200	
Director	150	
Secretary	100	
Administrative Assistant	150	
Conference Room	500	
General Files	50	
Office Storage/Photocopy/Mail Area	200	
W.C.	80	
Kitchenette	30	T=1,460 sq ft

Study Center		
Vestibule	150	
Patron W.C.	80	
Study Area	750	
Reference Collection	500	
Photographic Collection	300	
Archive	1,000	
Librarian	150	
Library Work Area	160	
Archivist	150	
Archival Work Area	200	
Study Center Storage	40	
Staff W.C.	80	
Photocopy/Files/Shipping & Receiving	200	T=3,760 sq ft

Exhibition		
Socio-cultural Gallery	3,000	
Technology Gallery	10,000	
Lecture/Video Presentation Room	500	T=13,500 sq ft

Service		
Exhibit Storage/Preparation	400	
Kitchenette	200	T=600 sq ft

(following for both museum and study center)		
Janitor's Closet	20	
Supply Storage	30	
H.V.A.C.	600	
Trash Room/Loading Area	500	T=1,150 sq ft

MUSEUM SUB-TOTAL=17,960 sq ft

LIBRARY SUB-TOTAL=4,910 sq ft

Chapter 4: Design

Theory

In response to the amount of structures left in decay throughout the island's footprint, this thesis will consider the appropriate means and techniques of preservation so as to not only protect one of these industrial sites, part of Puerto Rican cultural heritage, but also stand by the notion of the necessity of these practices in the island.

In searching for a means by which to preserve a building or site, it is important to understand what the field of historic preservation encompasses. How many options does one have before opting to tear down a structure? Can both the past and future be embraced through the process? Throughout history, architecture and construction have been driven by development and application of new technologies. Progress gave way to new ways of life; that which was from past generations turned 'obsolete' thus unimportant. The awareness of these sites being uncared for brought with it new points of view as to what was to be done with them.

In their book, *Historic Preservation: An Introduction to its History, Principles, and Practice*, the authors describe how two philosophies arose, during the seventeenth century, in relation to the historic preservation debate. French architect, Eugène Emmanuel Viollet-le-Duc presented the standpoint that a structure "should be rebuilt not necessarily as they originally were but as they 'should have been'."⁶⁵ His work disregarded a structure's true identity while bestowing upon it elements alien to it and its intended design.

Contrary to le-Duc's perspective, nineteenth century writer and critic, John Ruskin spoke of the natural evolution of a building. To restore a building meant to "falsify the original"⁶⁶ ; to erase the meaning and art of the period to which such structure belonged to.⁶⁷

65 Ligibel, Ted J., Ilene Tyler and Norman Tyler. 1994. *Historic Preservation: An introduction to its history, principles, and practice*. New York: W. W. Norton & Company, Inc.

66 Ligibel, Tyler and Tyler, 22.

67 Ligibel, Tyler and Tyler, 22.

No restoration should ever be attempted, otherwise than... in the sense of preservation from further injuries.... Anything beyond this is untrue in art, unjustifiable in taste, destructive in practice, and wholly opposed to the judgment of the best Archaeologists.⁶⁸

Even though both philosophies are at extreme end of the spectrum, they leave us with the query of what is to be at the middle. Today, areas deemed historically significant are, in most cases, frozen in time. Although it is important to preserve past technologies embedded in these sites, it is also important to ask oneself, how would progress and innovation intervene in their preservation? The quest for that middle ground is best described by the architectural firm CUBE as part of their efforts to generate a stance where both past and future, through the act of preservation, can coexist and complement each other.

Traditional preservation strategies promote a nostalgic approach that glorifies buildings as though they are museum artifacts. An alternative approach would be to ensure that a building remains relevant, whatever style, so that it holds functional and aesthetic merit for future generations. Preservation in this sense would be characterized by transformation and adaptation as opposed to retention and isolation.

... all places and buildings have a continuing history; they are used, damaged, repaired, and bear the markings of actions and events throughout time. As modern culture moves forward, our environment expands, is re-inhabited, and is altered with invention.... To continuously encapsulate our built environment through the act of preservation is counter-productive; we face increasing risk of endangering invention and even forgetting the intentions of history. If we are to live with our history while embracing our future, we must rethink the very idea and standards of preservation. Culture cannot thrive in a preserved state; if all is encapsulated, then all is forgotten.⁶⁹

68 Ligibel, Tyler and Tyler, 22.

69 CUBE design + research, LLC blog. <http://www.modernpreservation.com/> (accessed March 27, 2010).

As previously mentioned, in Puerto Rico, historic preservation principles have been applied to those structures deemed culturally significant; however, their adaptation to present time and innovations have been somewhat limited. Structures are given either a superficial transformation, are restored, or demolished. The notion of adaptively reusing an edifice, or its shell, has only been applied a number of times in the island. Projects such as the new school of architecture at the Pontificia Universidad Católica de Puerto Rico in Ponce or the Museo de Arte de Puerto Rico in Santurce serve as examples of the great potential this type of intervention has to offer. Both projects rehabilitated structures built during the first quarter of the twentieth century innovatively incorporating new technologies catered to the each program's needs.

The premise of this thesis is to work and embrace the site as is. Its inherent beauty is found in the many alterations and modifications applied to its varying structures through time. Its preservation as an important cultural complex will be through the incorporation of new uses, materials and technologies that will not only better the present conditions of the remaining structures but also enable their ongoing existence and adaptation. Via the application and study of various degrees of preservation this thesis will explore interventions at both an urban and architectural scale.

Considerations

Preservation as Monument

mon·u·ment⁷⁰

- 1: (a) lasting evidence, reminder, or example of someone or something notable or great
(b) distinguished person
- 2: a memorial stone or a building erected in remembrance of a person or event

The overall volume created by the different structures that make up the sugar mill building at Central Aguirre is a landmark in and of itself. The building's size, and preponderance over its neighboring structures not only denote its architectural importance and significance but also help

70 (Merriam-Webster Online Dictionary, s.v. "Monument")

with enhancing the memory and sense of place that overcomes oneself when at the site.

Preservation as Integration

in•te•grate⁷¹

- 1: to form, coordinate, or blend into a functioning or unified whole : unite
- 2: to find the integral of (as a function or equation)
- 3: (a) to unite with something else
(b) to incorporate into a larger unit
- 4: (a) to end the segregation of and bring into equal membership in society or an organization

The act of integrating the old with the new, based on the previous discussion, plays an intrinsic role in the lifespan of a structure. A building should adapt to the constantly evolving environment it was built on. The art of preserving a building, an artifact, a work of art and bringing them back to life is a notion that has driven the public's appreciation for the field; without it, we would not be able to experience the great sites that remain across the globe. To experience the integration of past and present through their preservation and design is somewhat surreal.

By means of the use of new materials or simply the way the intended intervention will treat the remaining structures, this thesis will create an experience unique to the site and geared towards the enhancement of its importance. Will the program respect the original structure? To what degree does it embrace it? The present conditions of the buildings throughout the site will further denote their degree of intervention.

Preservation as Dissection

dis•sect⁷²

- 1: to separate into pieces: expose the several parts of (as an animal) for scientific examination
- 2: to analyze and interpret minutely

The way in which a structure can be manipulated so as to showcase or conceal certain aspects of it is one of the most important elements in the process of developing a design. When

71 (Merriam-Webster Online Dictionary, s.v. "Integrate")

72 (Merriam-Webster Online Dictionary, s.v. "Dissect")

working with old structures, how does the architecture mold to their footprint, their own physical attributes? How do the structures mold to accommodate the architecture? Through this project, the dissection of these existing buildings would entail the analysis of not only their state but in which ways their previous usage or simply its existence can be better enhanced by what is later designed for them to adapt to.

Preservation as Public Art

Architecture is in itself an art form. The way in which spaces are designed to showcase the play of light, are inspired and mimic the leaves of a tree, a ruin, or simple platonic forms, create ones that go beyond the basic column, wall and roof system. As does an artist, an architect creates a work that is sensible to the many facets of everyday life while applying new meaning and dimension to the spaces we perceive and inhabit.

Through this premise, this thesis intends to treat these structures as what they are, a work of art left from a previous generation and will explore ways in which to treat them as such. Their texture, arrangement and intervention will render them as public art piece to be displayed and enjoyed by the surrounding town in addition to the greater population of the island.

Preservation as Remnant

rem·nant⁷³

- 1: (a) a usually small part, member, or trace remaining
(b) a small surviving group —often used in plural))
- 2: an unsold or unused end of piece goods

The condition in which this site is found, if not treated, will further deteriorate until only indistinct foundations remain. Based on a critical analysis of the state each structure is in, this thesis will evaluate the ways in which they are to remain on site.

73 (Merriam-Webster Online Dictionary, s.v. “Remnant”)

Approach

Architecture, even when devoid of size and physical attributes, has a significant impact on its surroundings. As important as it is to design a structure that will cater to the needs and desires of its respective inhabitants, its relationship with the context in which it sits on is also detrimental to its further success in society. It is this notion of the importance of a site's surrounding and the future impact a design will have over it that has guided the initial explorations of the context surrounding Central Aguirre.

Given the design and current state of the urban context of the site, a series of diagrams were developed so as to better understand the problems and design possibilities inherent in it (Figure 50). Three exploratory urban schemes were developed based upon the analysis of several alternate means of accessing the site (Figure 51).

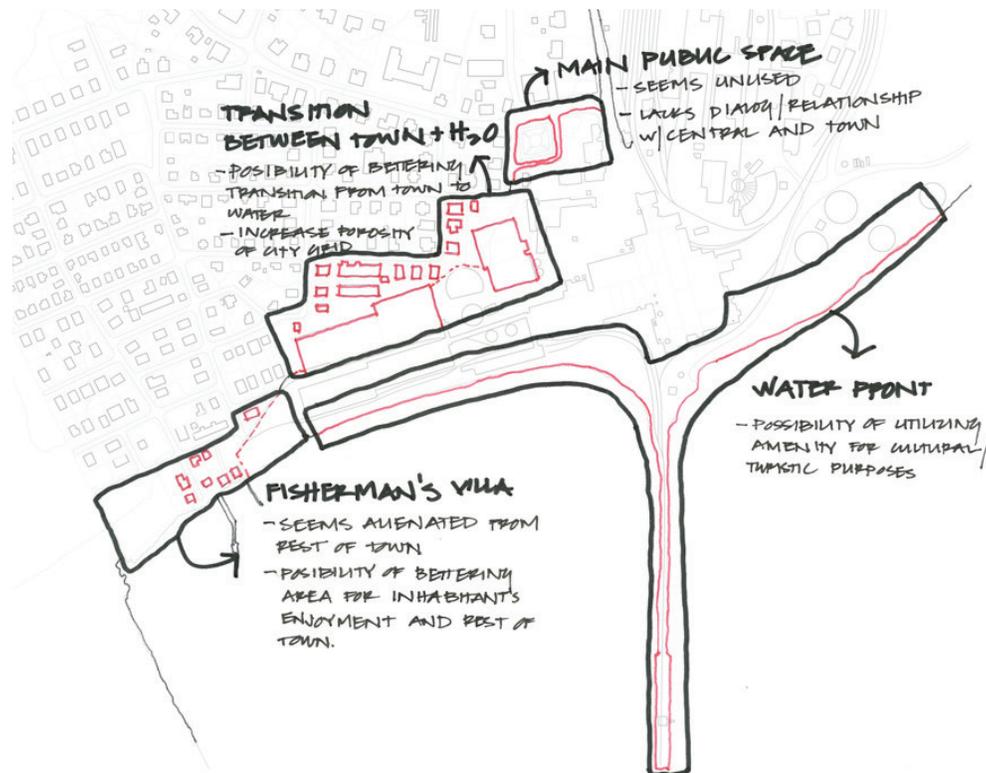


Figure 50 . Diagram of Problematic Areas on the Site.

(Image by Author)

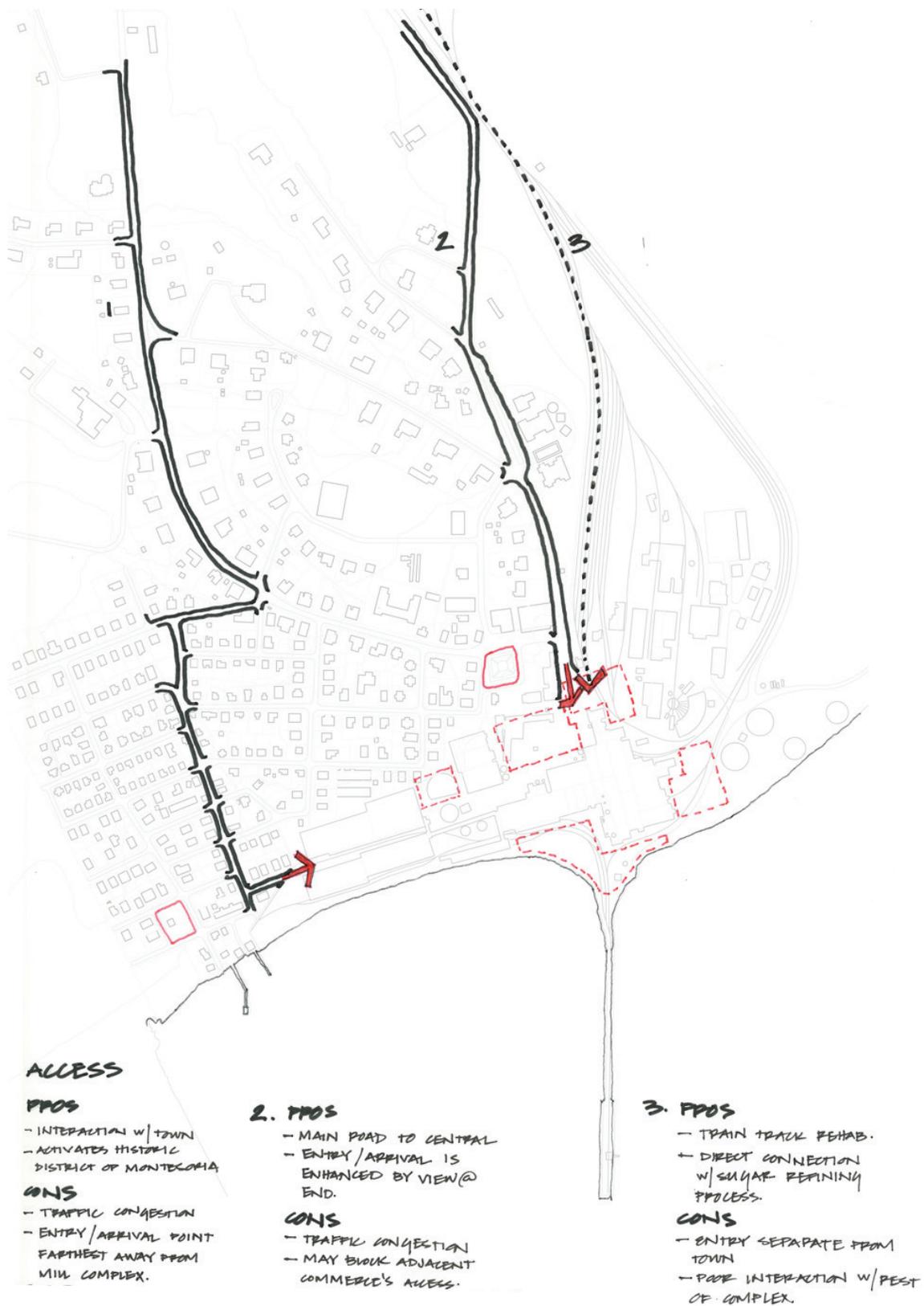
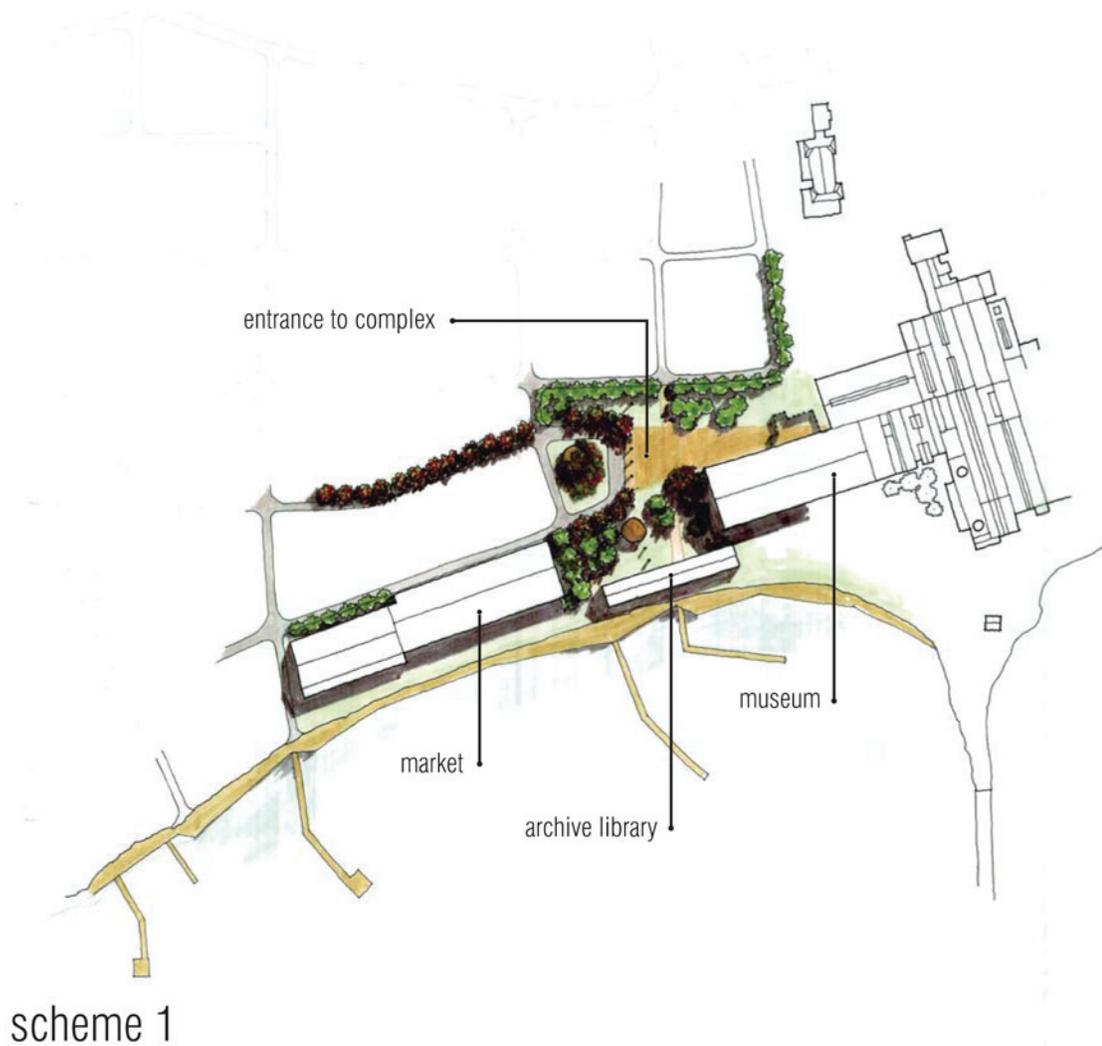


Figure 51. Site Access Possibilities Diagram.

(Image by Author)

Urban Intervention Studies



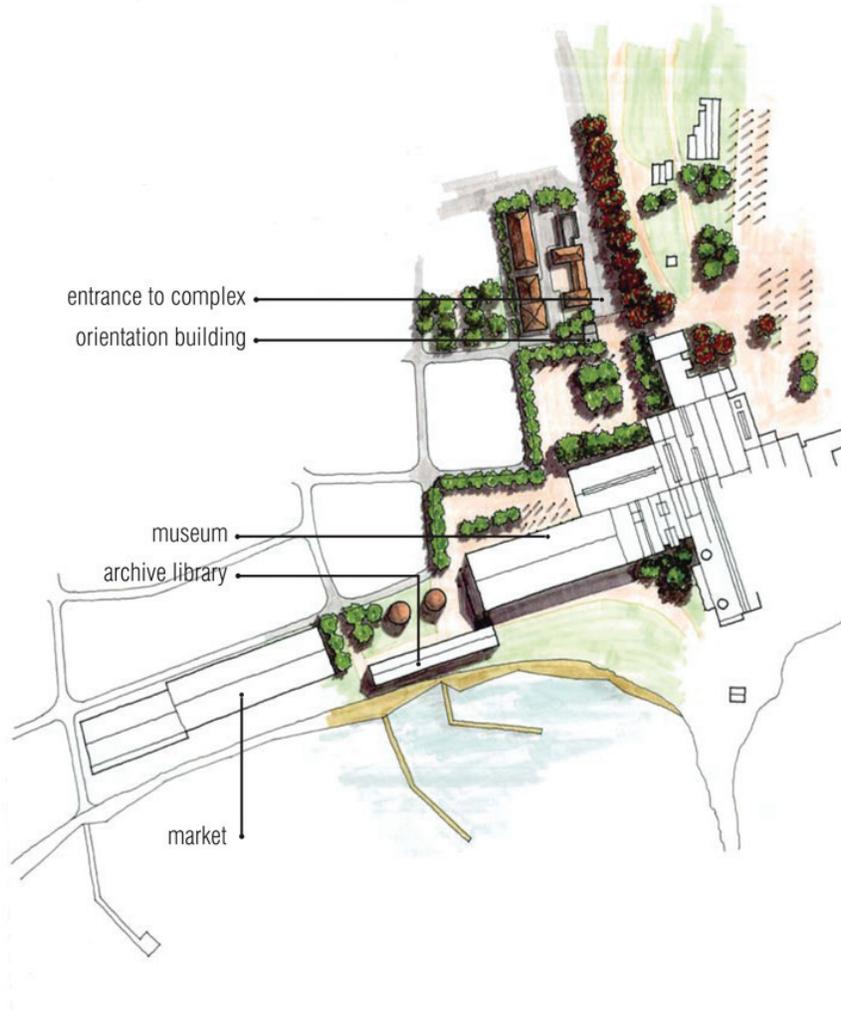
**Figure 52. Scheme based on access route 1.
(Image by Author)**

PROS

1. Interaction with rest of town
2. Activates historic district of Montesoria (worker housing zone)

CONS

1. Traffic congestion
2. Lack of privacy for residents
3. Entry/arrival point for museum is farthest away from mill building comple



scheme 2

**Figure 53. Scheme based on access route 2.
(Image by Author)**

PROS

1. Main access road to *Central* (PR-705)
2. Entry/arrival sequence is enhanced by view of refinery at the end
3. Most direct access to mill building complex

CONS

1. Traffic congestion
2. May block adjacent commerce's access



scheme 3

**Figure 54. Scheme based on access route 3.
(Image by Author)**

PROS

1. Rehabilitation of rail tracks
2. Direct programmatic connection with sugar refining process (how cane was brought in to refinery from other *haciendas*)
3. Great views to nearby landscape (what used to be cane fields)

CONS

1. Entry/arrival completely separated from rest of town
2. Poor interaction with rest of complex



**Figure 55. Combined urban scheme based on analysis of previous explorations.
(Image by Author)**

Concept Visualization

The section of the gallery geared towards the historical aspect of the sugar industry is meant to fully immerse the visitor in the periods showcased in the exhibit (Figure 56). Whether through images, artifacts or structure mock-ups these exhibitions are focused on the humane reality the industry once encompassed and left behind. The exploration of how the architecture of the museum will further reinforce this notion will be carefully evaluated.

The beauty of architecture lies in the way that a structure can be manipulated and acted upon based on a principle, a function, a state of mind, etc. The artifacts exhibited in the gallery focused on the technology achieved throughout the industry's existence will help guide and morph the architecture that surrounds it (Figure 57). Such stance in design will showcase and articulate the diverse language that remains in the site. The remaining structures in the complex are to be considered as remnants of the period in which they were active on. Their preservation will transform them into a work of public art utilized as a cultural landmark to educate the public on the industry's history and social implications. The structures will be restored back to a stable structural state but will retain their aging character.

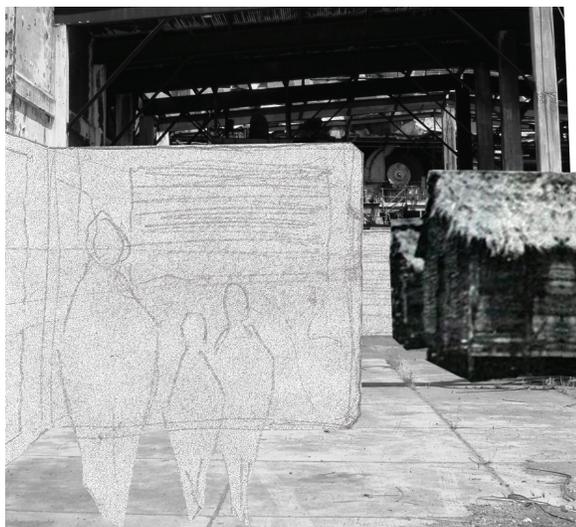


Figure 56. Conceptual perspective of historical gallery.
(Image by Author)

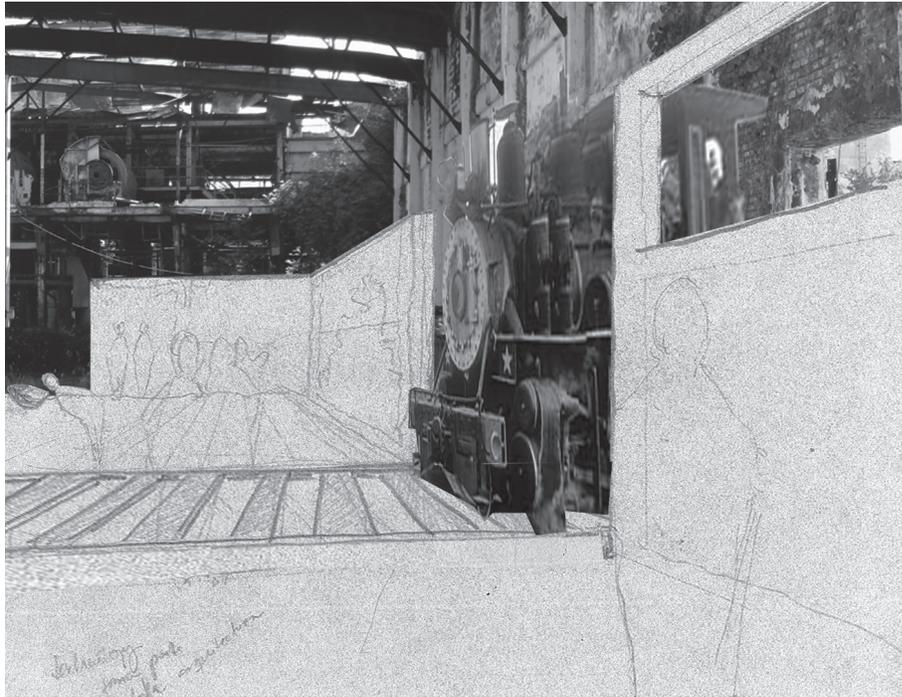


Figure 57. Conceptual perspective of technological gallery.
(Image by Author)

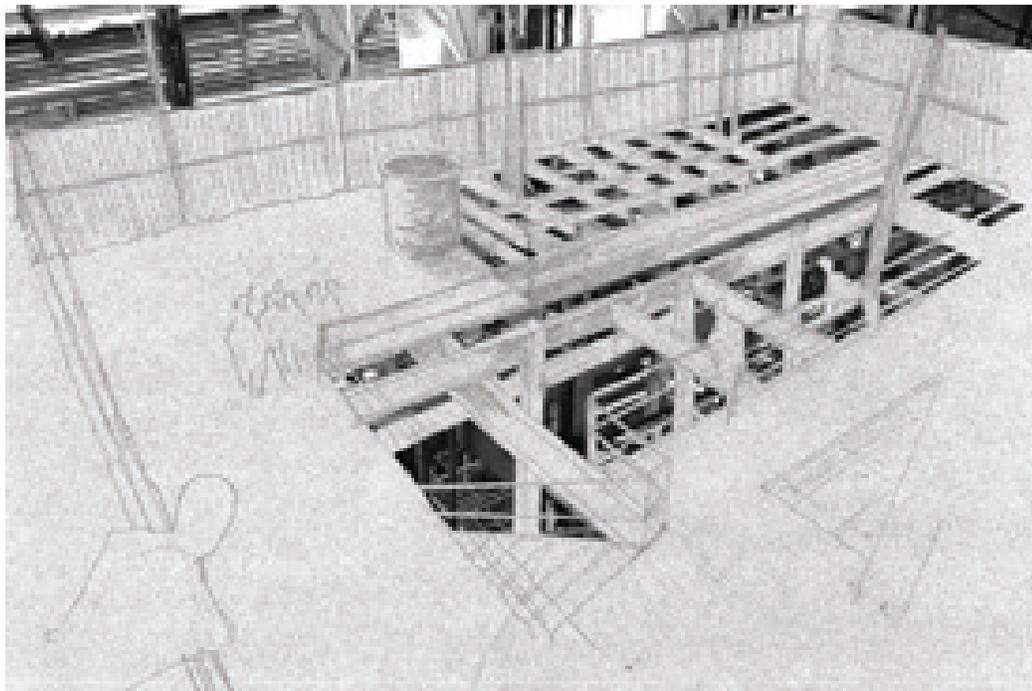
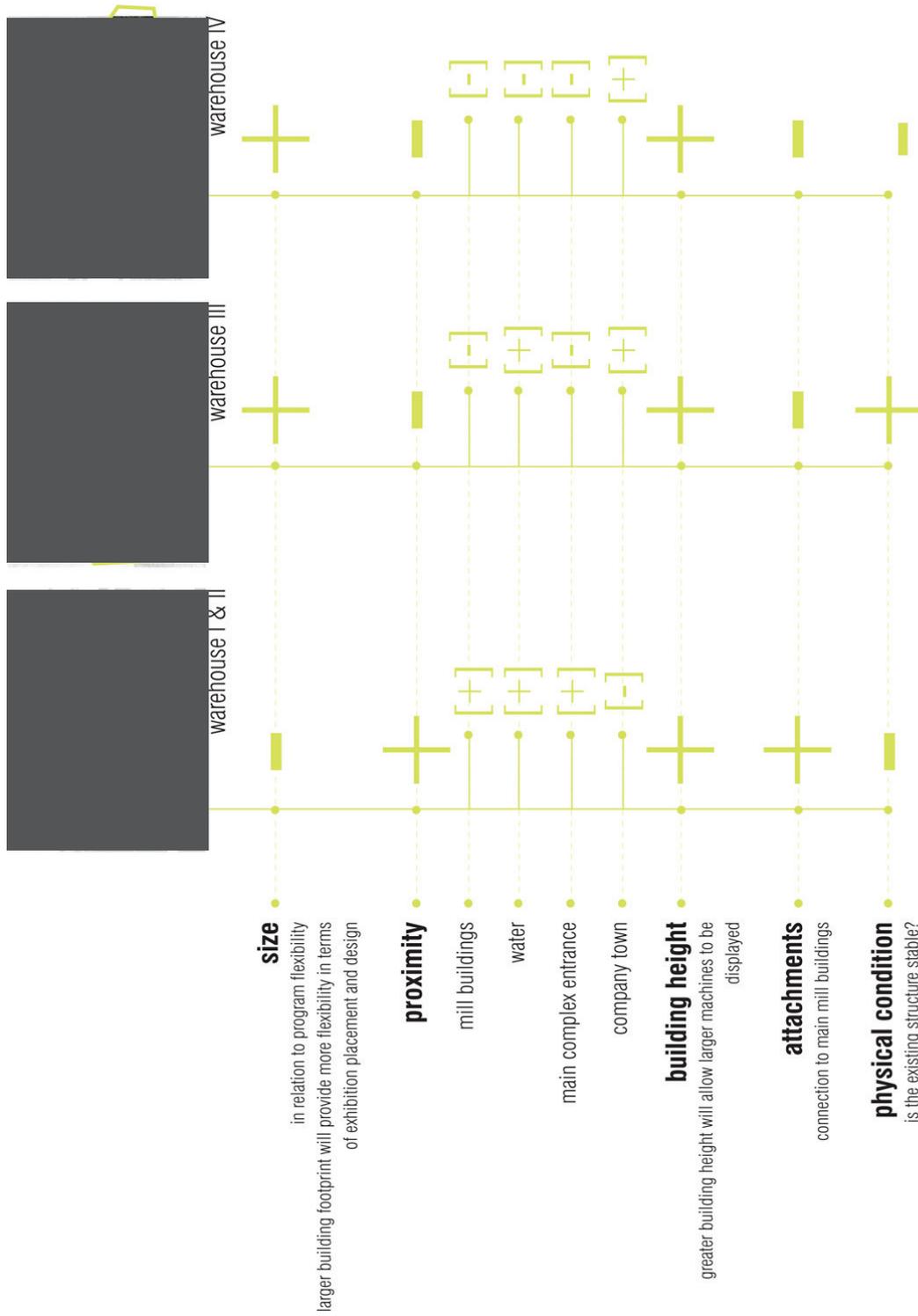


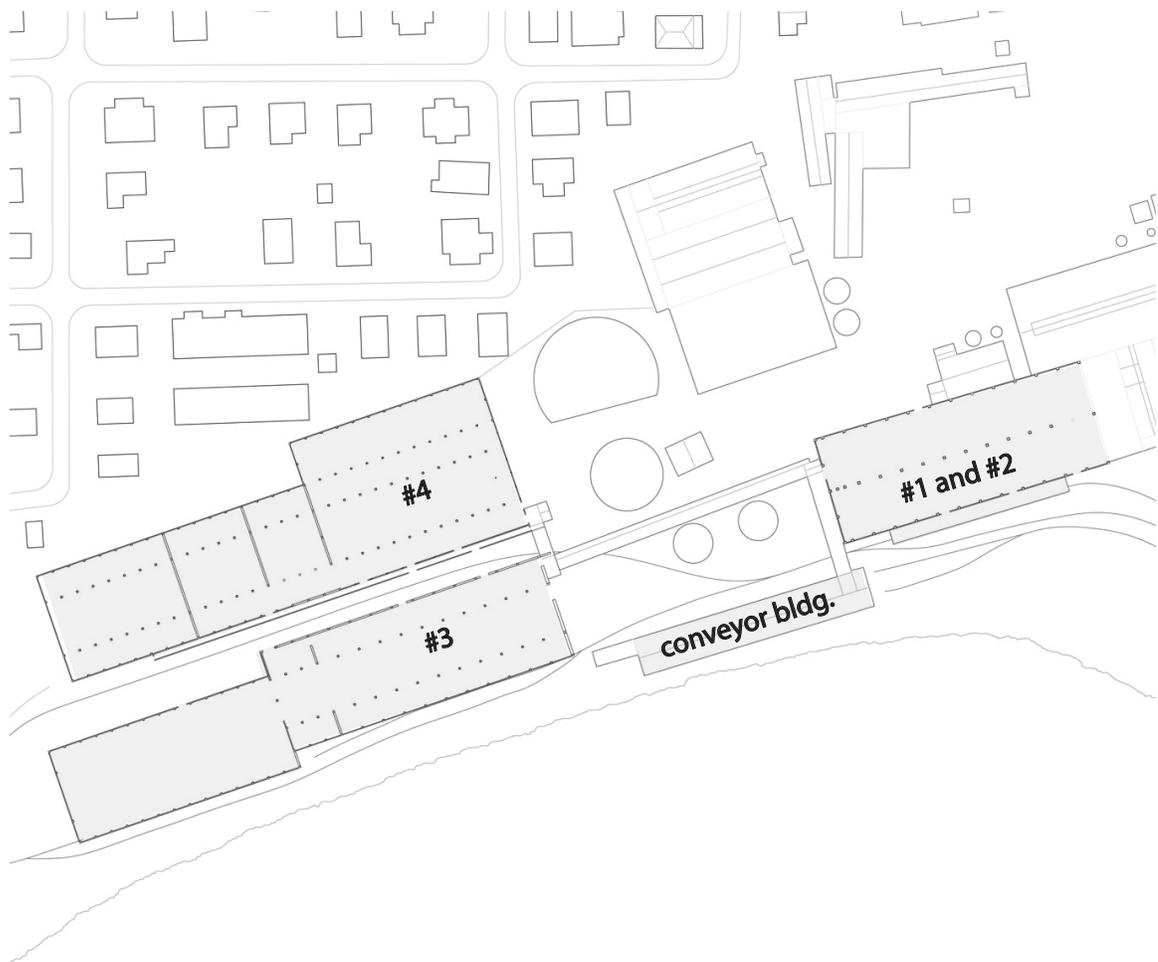
Figure 58. Conceptual perspective of mill walkthrough.
(Image by Author)

Building Selection

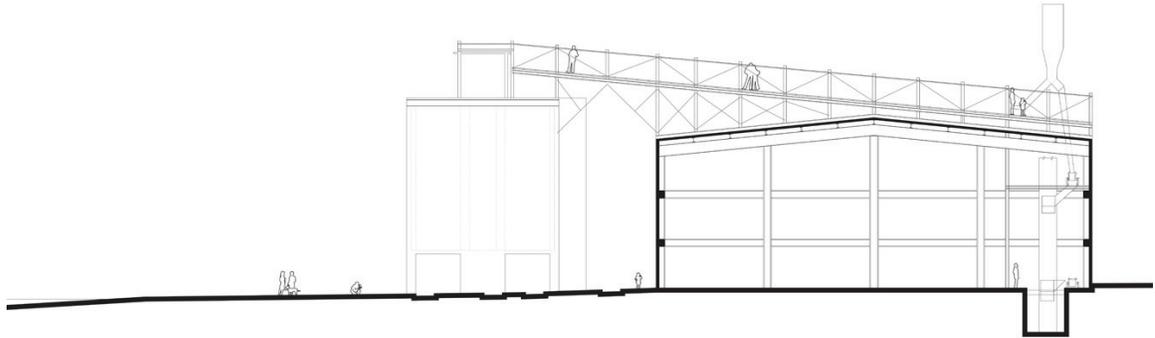


**Figure 59. Selection Matrix for building that would house museum.
(Diagram by Author; images taken from study by SHPO)**

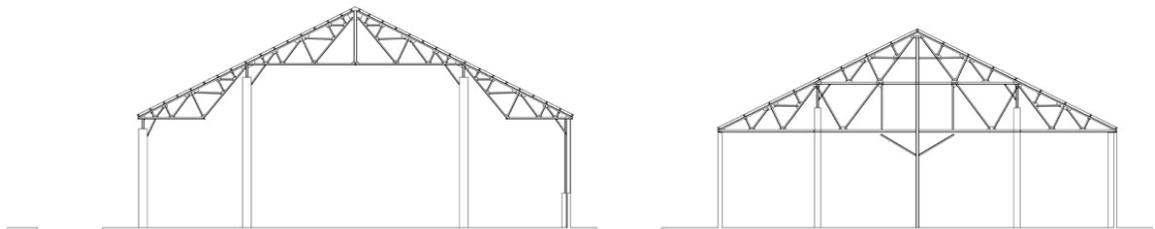
Based on the information gathered from the building selection matrix (Figure 59), the remaining structure of warehouses 1 and 2 will house the museum. Warehouses No. 3 and No. 4 will alternate parts of the program focused on public activities. A historic preservation assessment will further determine the extent to which the new intervention will interact with the original building.



**Figure 60. Detailed floor plan of buildings within second scope of project (shaded in gray)
(Image by Author)**



**Figure 61. Detailed cross-section through warehouse (R) and conveyer building (L) facing west
(Image by Author)**



**Figure 62. Detailed cross-section through warehouses at the western end of the site facing east
(Image by Author)**



Figure 63. Present conditions of warehouse #1 and #2
(Image by Author)



Figure 64-65. Views of east and west end of warehouse #1 and #2
(Image by Author)



**Figure 66. View towards conveyor building (L) and south wall of warehouse #1 (R).
(Image by Author)**



**Figure 67-68. Views of conveyor building; bottom view is through the train tunnel on the ground level
(Source: <http://s70.photobucket.com/albums/i93/chelopr/07-13-08%20Corrida%20Central%20Aguirre/#!/cpZZ4QQtpZZ20>)**



**Figure 69-70. Existing conditions of warehouse #3
(Image by Author)**



**Figure 71-72. Existing conditions of warehouse #4
(Image by Author)**



Preservation Assessment

		HS	S	N	NS
Physical Attributes	structural grid		X		
	structural typology			X	
	walls		X		
	roof shape		X		
	roof construction				X
	foundation			X	
	door openings			X	
Physical State <small>(of remaining phys. elements)</small>	columns			X	
	walls	X			
	roof		X		
Architectural Aesthetic	materiality			X	
	style				X
Spatial Quality		X			

HS-highly significant S-significant N-neutral NS-non-significant

“RULES OF ENGAGEMENT”

Physical Attributes

1. The amount of physical elements to be kept from the original structure will be determined by the component’s character and its contribution to the **preservation of the memory** of the building, its sense of place.
2. The elements kept will remain in their current state. Structural reinforcement will be given to those in need of it; however, no part of the ruins will be fully reconstructed.
3. The new construction/intervention will not touch the old.

Architectural Aesthetic

1. The architectural aesthetic of the new structure will take as inspiration elements from the original but will not be tied to replicating the exact model.
2. Industrial materials will be used in the new construction in response to the surrounding context of the site and its previous use.

Spatial Quality

1. The spatial quality of the original structure will be preserved so as to give the public an idea of what the original structure used to be; however, the design of the new building will not be strictly tied to representing this feature to the fullest.
2. The original height of the warehouse will be honored. The new building’s height can vary past the height of the original structure; however, in keeping with the context of the neighboring structures, it should not exceed past the height of the tallest building on the site.

Figure 73. Preservation Assessment.

(Image by Author)

This document was developed as a guide from which to continue with the historic preservation aspect of this thesis proposition. The data under study is based on the remains of warehouses #1 and #2 since they are to house the museum part of the program. The rules created therein will serve as the background from which the interventions of the other structures within the scope of the project: the market, housing and study center will take shape from.

Building Parti Studies

Programmatic Relationships

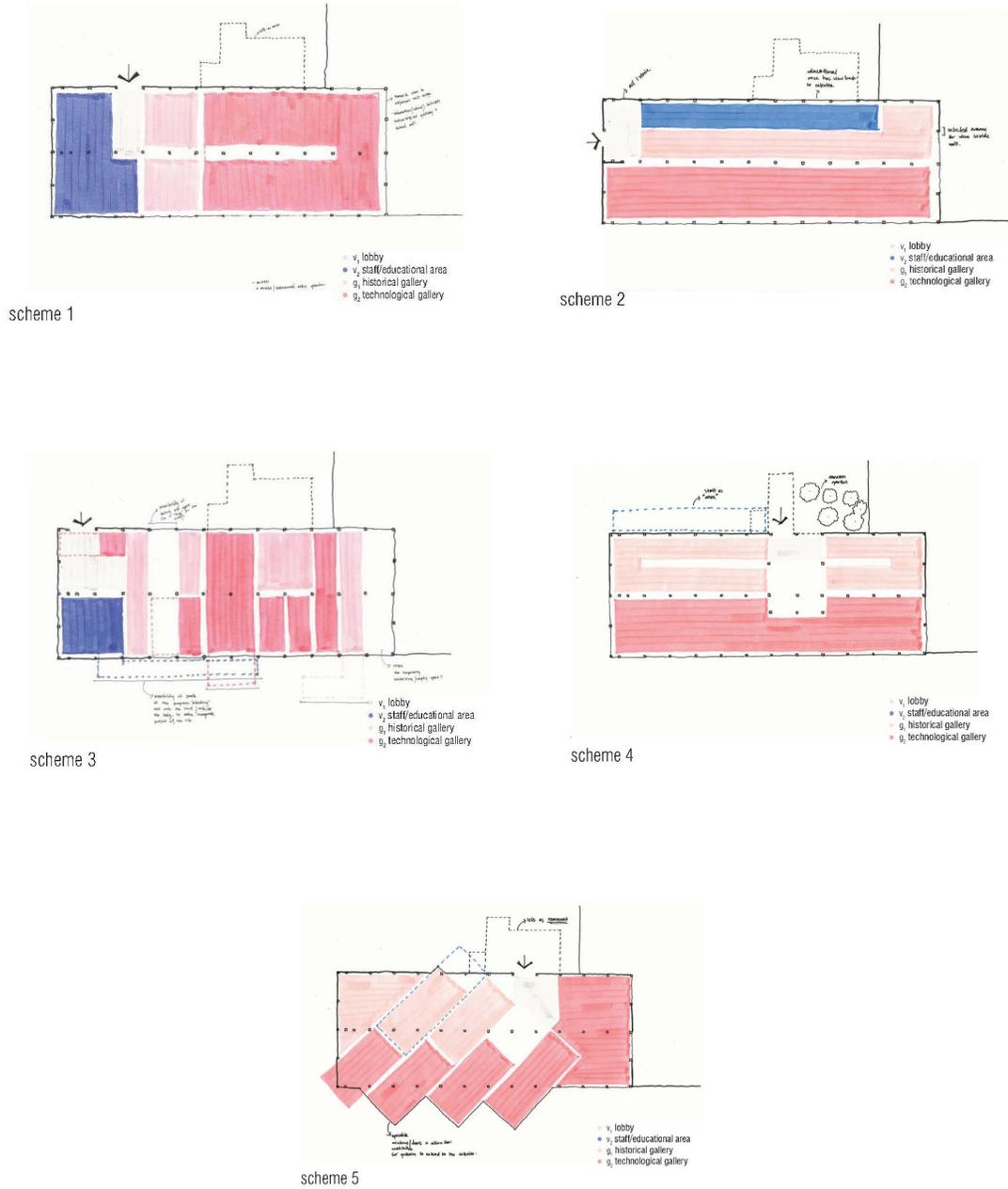


Figure 74. Schematic partis of possible programmatic connections in museum building (Image by Author)

Old vs. New

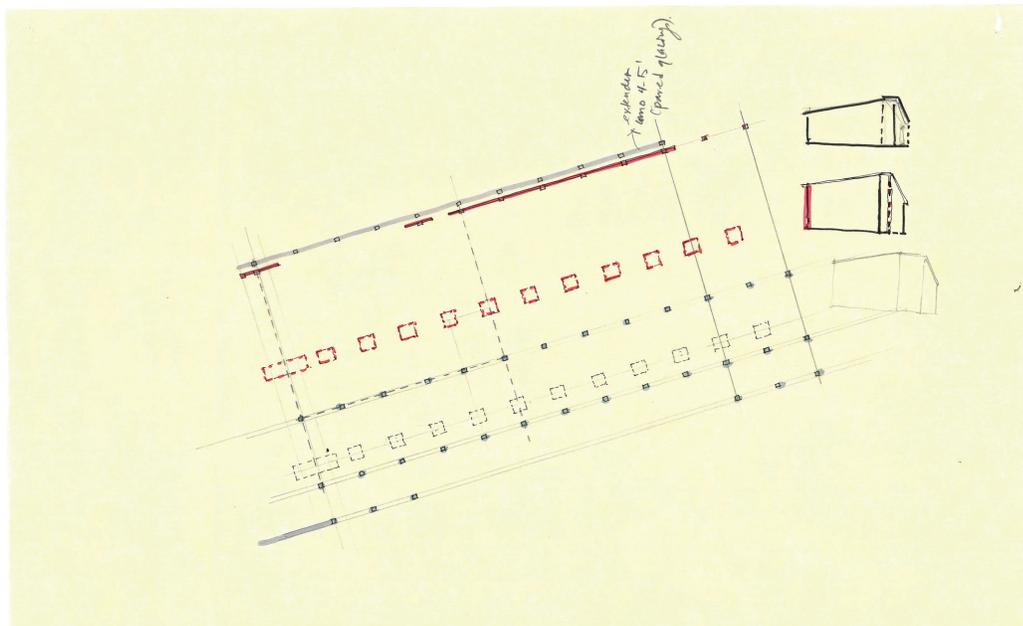
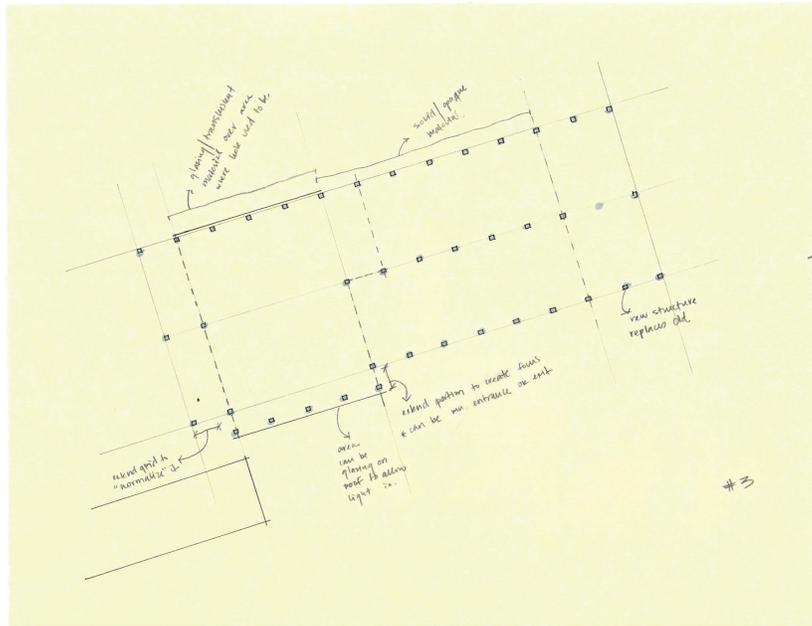


Figure 75-76. Diagrams portraying initial studies of possible relationships between the new structure and the old. Blue tone stands for new construction and red for the existing part of the building. (Image by Author)

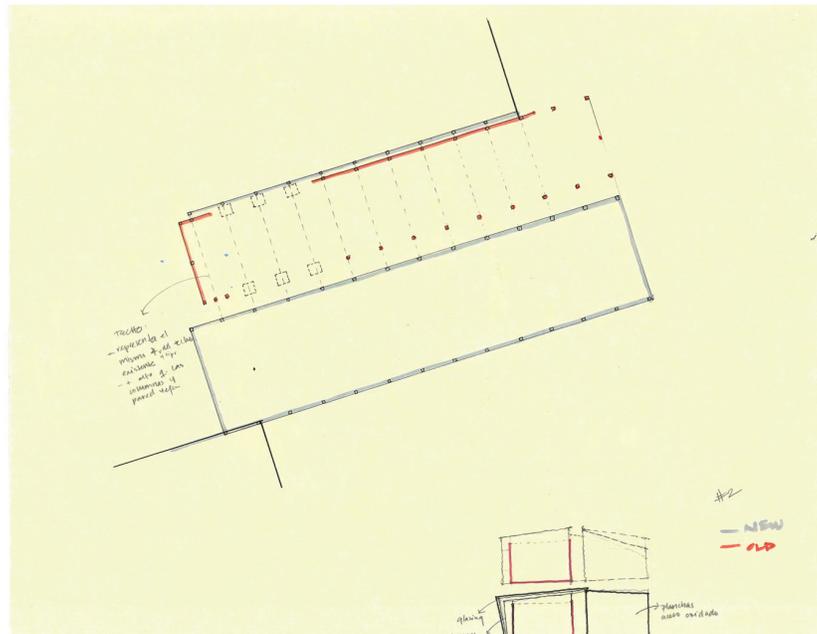
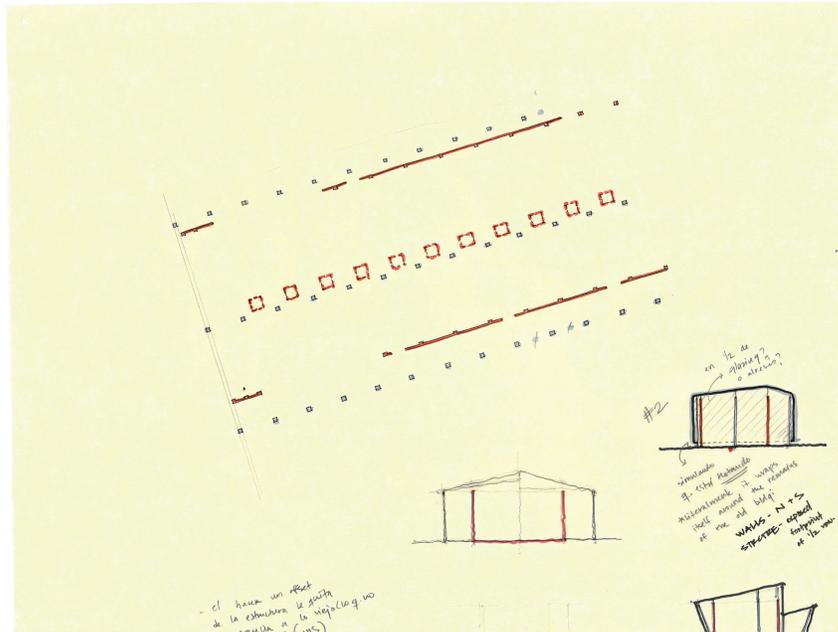


Figure 77-78. Diagrams portraying initial studies of possible relationships between the new structure and the old. Blue tone stands for new construction and red for the existing part of the building. (Image by Author)

Massing Relationships

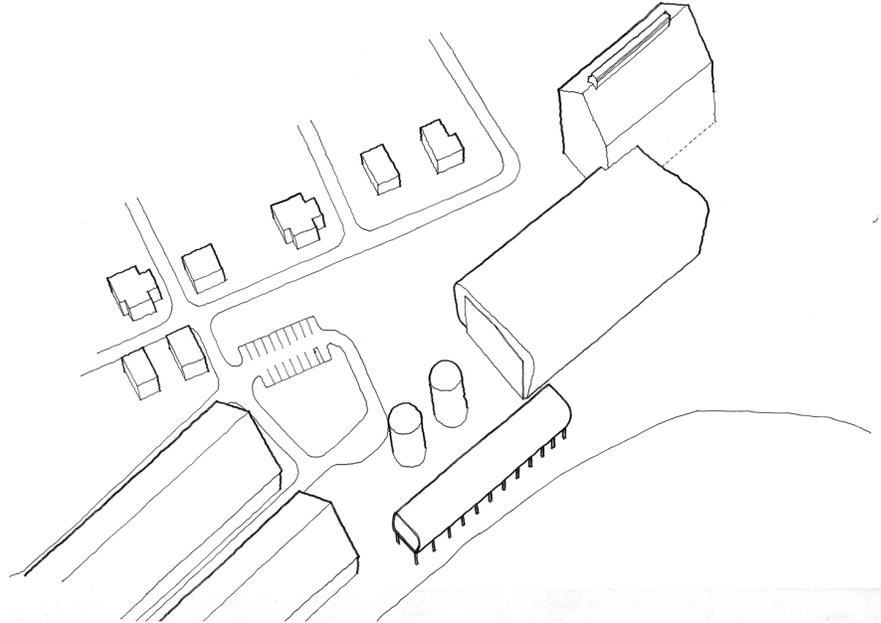


Figure 79. Massing study portraying possible relationship between museum and study center buildings. This case study explores the notion of a new structure wrapping itself around the existing building and mimicking through both the overall form of the structures in the site.

(Image by Author)

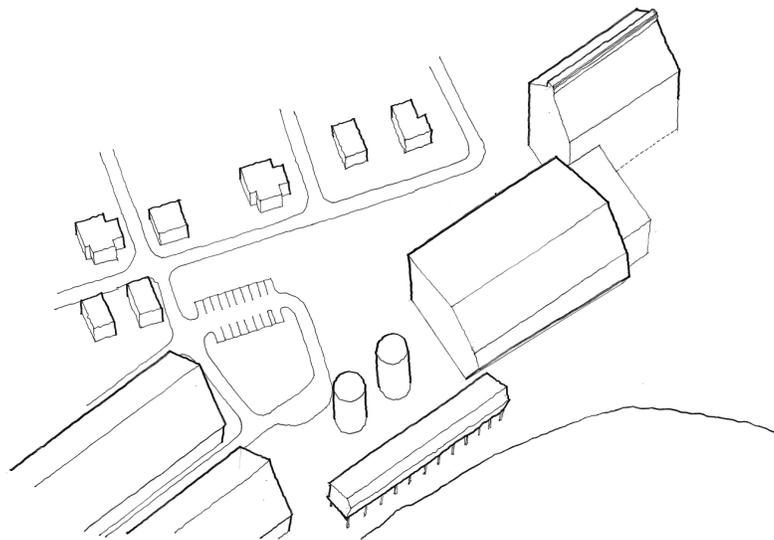


Figure 80. Massing study portraying possible relationship between museum and study center buildings. This study explores a structure that somewhat resembles that of the original building but also incorporates the various angles present in the architecture around the site thus not only celebrating the warehouse it sits on but also the rest of the complex.

(Image by Author)

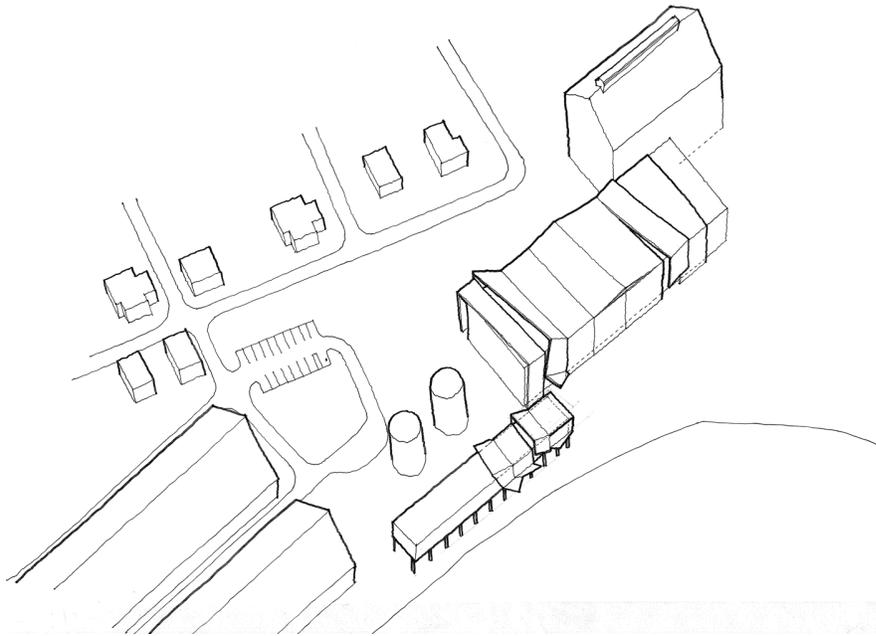


Figure 81. Massing study portraying possible relationship between museum and study center buildings. This case study explores the concept of peeling away. The new structure would envelope the old but strips away at specific areas to denote either the entrance/exit or to showcase something happening within the building. This is also symbolic of the reality of the site, as with time, the structures have slowly deteriorated and lost parts of their facades, roofs, etc.

(Image by Author)

Physical Relationships

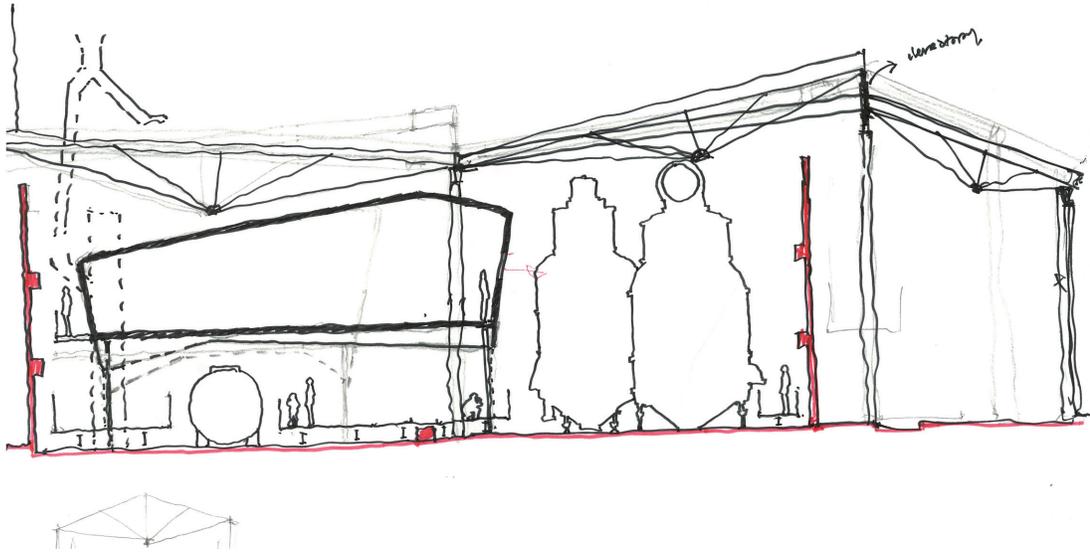


Figure 82. Sectional study of overall scalar relationship within building
(Image by Author)

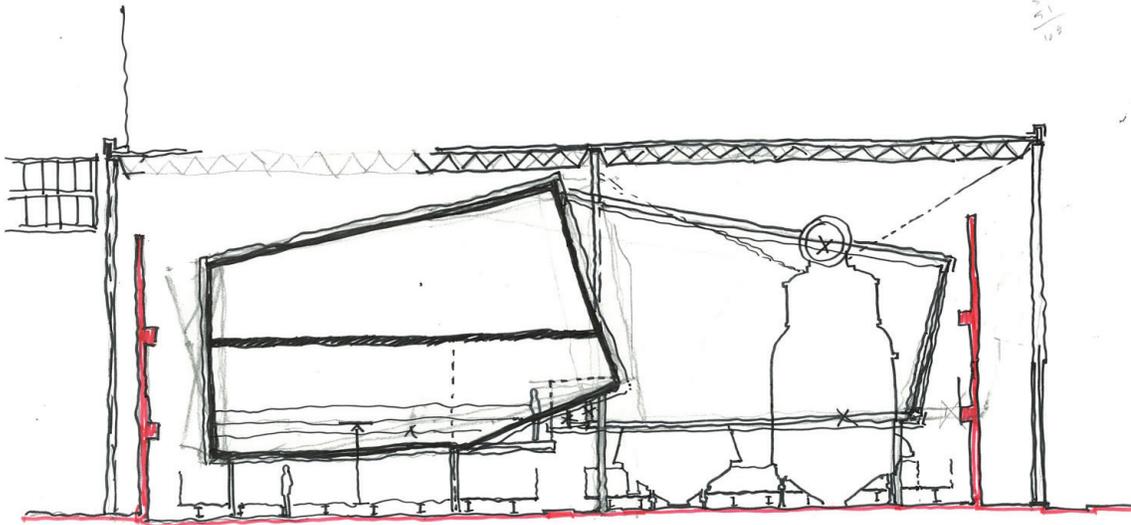
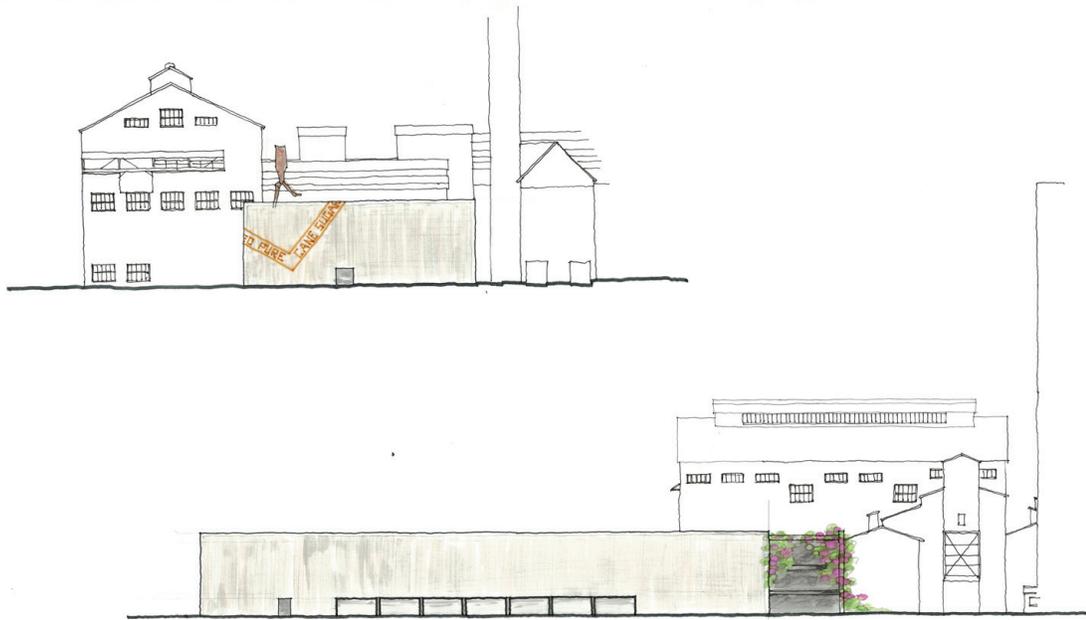
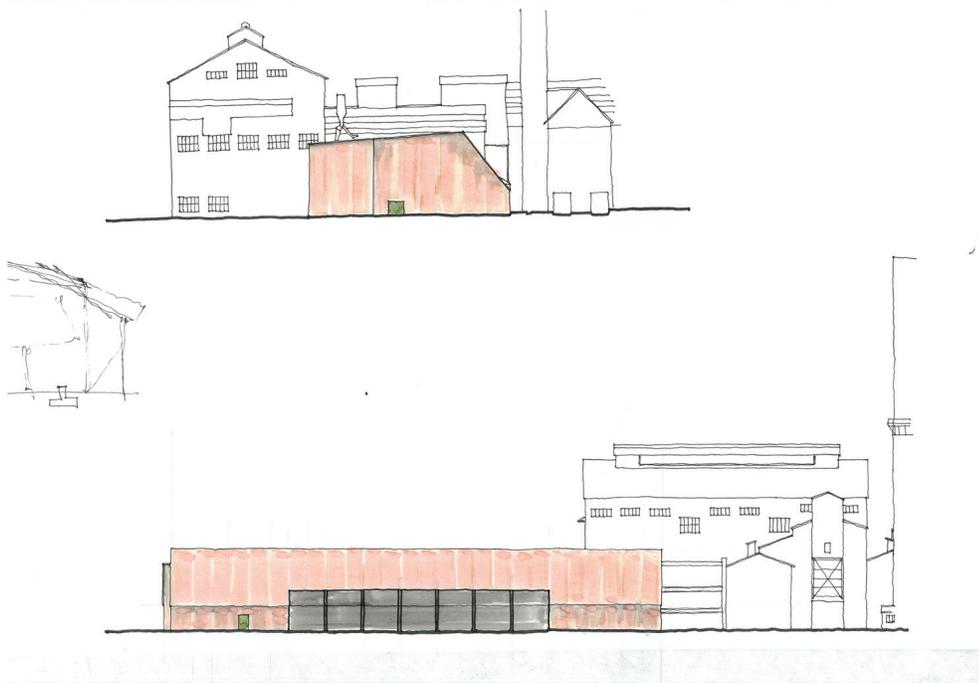


Figure 83. Sectional study of overall scalar relationship within building
(Image by Author)



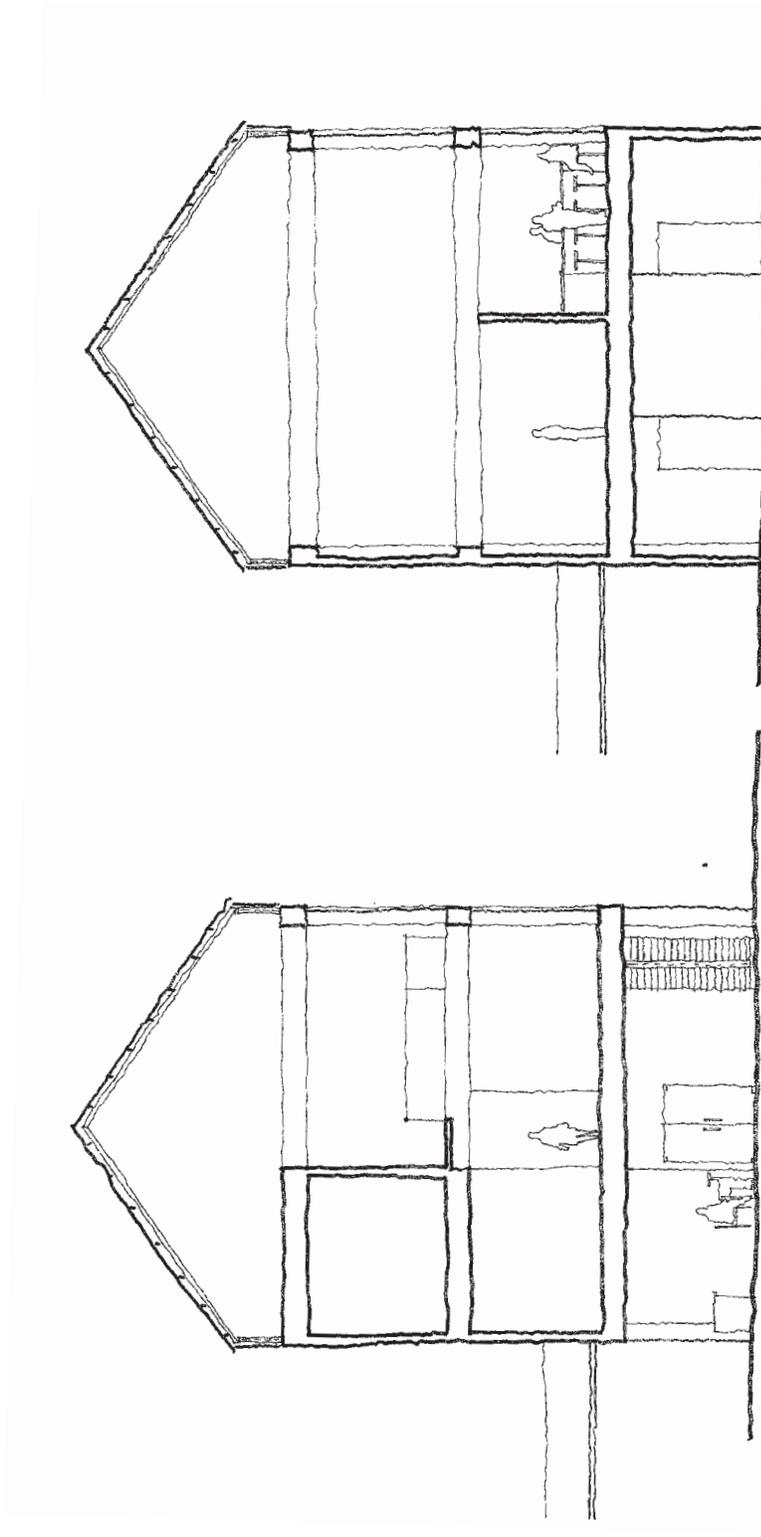
**Figure 84. Elevation study
(Image by Author)**



**Figure 85. Elevation study
(Image by Author)**



**Figure 86. Preliminary scheme of Housing and Market
(Image by Author)**



**Figure 87. Preliminary scheme of Study Center
(Image by Author)**

Chapter 5: Final Design Proposal

The final proposal of this thesis is divided into three parts: two of which are of urban nature and the third, the main intervention, being of architectural scale. Taking into consideration the notion that no project is entirely devoid from its surroundings, this thesis took the initiative of utilizing the already designated program (the museum) and tests the alternatives regarding its interaction with the company town that surrounds it. The initial urban intervention served as a base for the rest of the areas to be developed throughout the project. Its main purpose was to reconnect the town with its most important assets: the refinery and the water, and serve as a benchmark for future development on the site.

The creation of a designated area for people to arrive and park when visiting the complex goes back to the notion of maintaining the present reality of the site and its treatment as an exhibition piece. This lot further prevents any problems or possible traffic congestion along the neighborhood's narrow streets. From this area, the visitor's immersion into the industry's history begins. A small jitney bus will serve as the transportation means to get the public from this lot to the new industrial plaza at the south end of the complex. By driving through the company town, the ride serves as the formal introduction of the site to the public.

The second urban intervention is at a smaller scale than the previous one. This part of the project deals with the preservation of a group of buildings in close proximity to the mill structure: the sugar warehouses to the east of the site. Their adaptation into new public and private uses will lend to the increase in public flow not only throughout the site but also in the overall town of Salinas. The creation of residential units, a market, a study center and a museum allows for a diversified program that offers flexibility in terms of operation. The main idea is to bring activity to the site at varying time intervals throughout the day thus converting the area into more of a touristic and

cultural destination in the island. Through this node one arrives at the final scope of this thesis, the design of the industry museum and the study center.

The design of the museum serves as the core for the ideas generated and applied throughout this thesis. Its program is divided into two parts: the administrative area and the exhibition spaces. The latter also being two: one that deals with the sociocultural history linked to the development of the sugar industry, and the second displays the technological advances accomplished in the refining process.

The museum experience begins in the main lobby where the ruin of one of the sugar conveyors on the site greets the visitor and offers a glimpse of the journey they are to embark upon. From this point one heads up to the second level so as to go through the theater and the social galleries (which date from colonial times until 1898 [year in which the United States took possession over Puerto Rico from Spain]). It is in the last gallery, that the visitor has the option of either embarking on the guided tour of the mill building ruins, go down to the ground level and continue the walk through the machinery, or head towards the study center through the elevated walkway between the two structures. Both the first and second option involves the industry post- 1898, period during which these large complexes originated. The overall museum trajectory culminates with the last stage of the sugar refining process. The visitor, now at the south end of the building, has direct access to the museum store as well as to the waterfront when exiting.

The topic of preservation presents itself in the way that the ruins of this building are being dealt with. Through a series of rules, this thesis determined what parts of this structure were to be preserved, to what extent, and how the new intervention and design will interact with them. Based on this system, the architectural intervention of this project focused on the preservation of the memory of the original building contrary to completely restoring it. The materiality utilized reflects

the contrast not only against the machinery and the original materials of the buildings on the site but also subtly represents the social disparity once existent between the inhabitants of the site; patron vs. worker.

The design of the study center reflects the functional adaptation of the warehouse so as to benefit from its physical state, orientation on the site and natural elements surrounding it. The ground level houses the main lobby and the service area; the rest of the footprint has been stripped away so as to allow an unobstructed view towards the water and maintain a direct connection between the new intervention and the old part of the site. On the second level, to one end one finds a small exhibition space geared towards the display of archival material, the connection back to the museum, and the café; at the opposite end is the archive. The central area of the building accommodates the library and reading room; a double-height space facing south which showcases the original structure's character. This façade has been modified in order to allow views to the coast as well as to allow natural light into the space.



Figure 88. Final Intervention Site Plan.

(Image by Author)



Figure 89. Perspective portraying the experience of walk through ruins on the eastern end of the site.

(Image by Author)



Figure 90. Perspective portraying the experience along one of the open areas between the ruins on eastern end of the site.

(Image by Author)

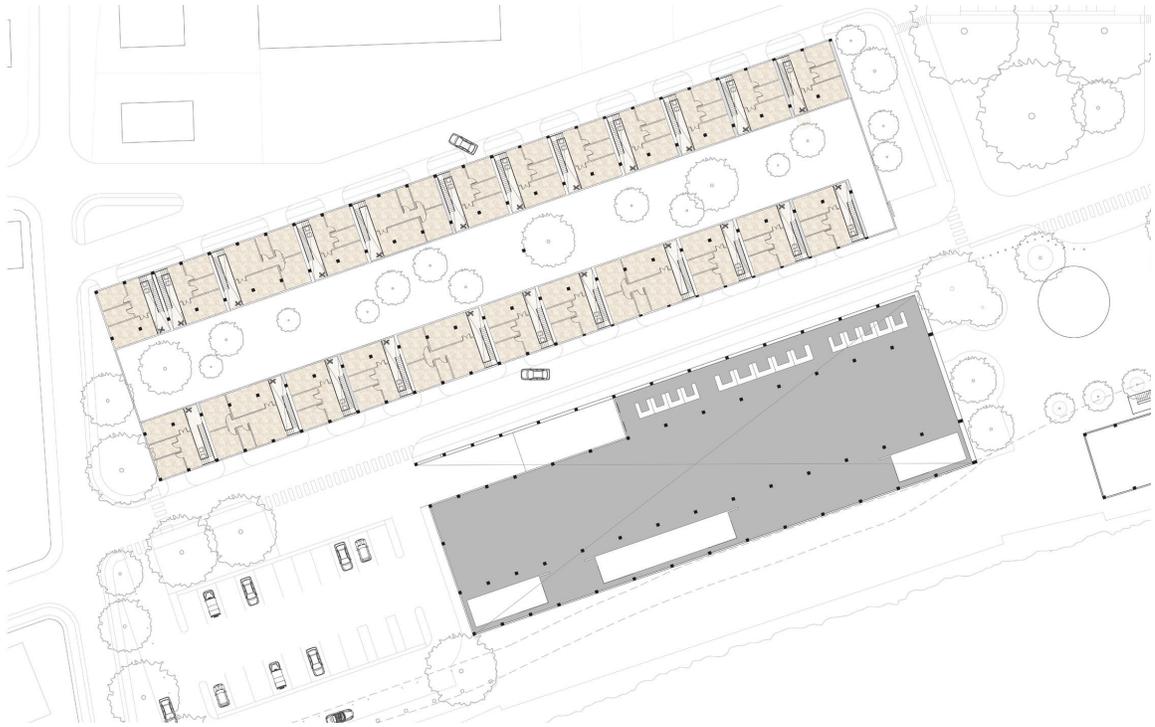


Figure 91. Apartment and Market Second Level Floor Plan
(Image by Author)



Figure 92. Apartment and Market Ground Level Floor Plan
(Image by Author)

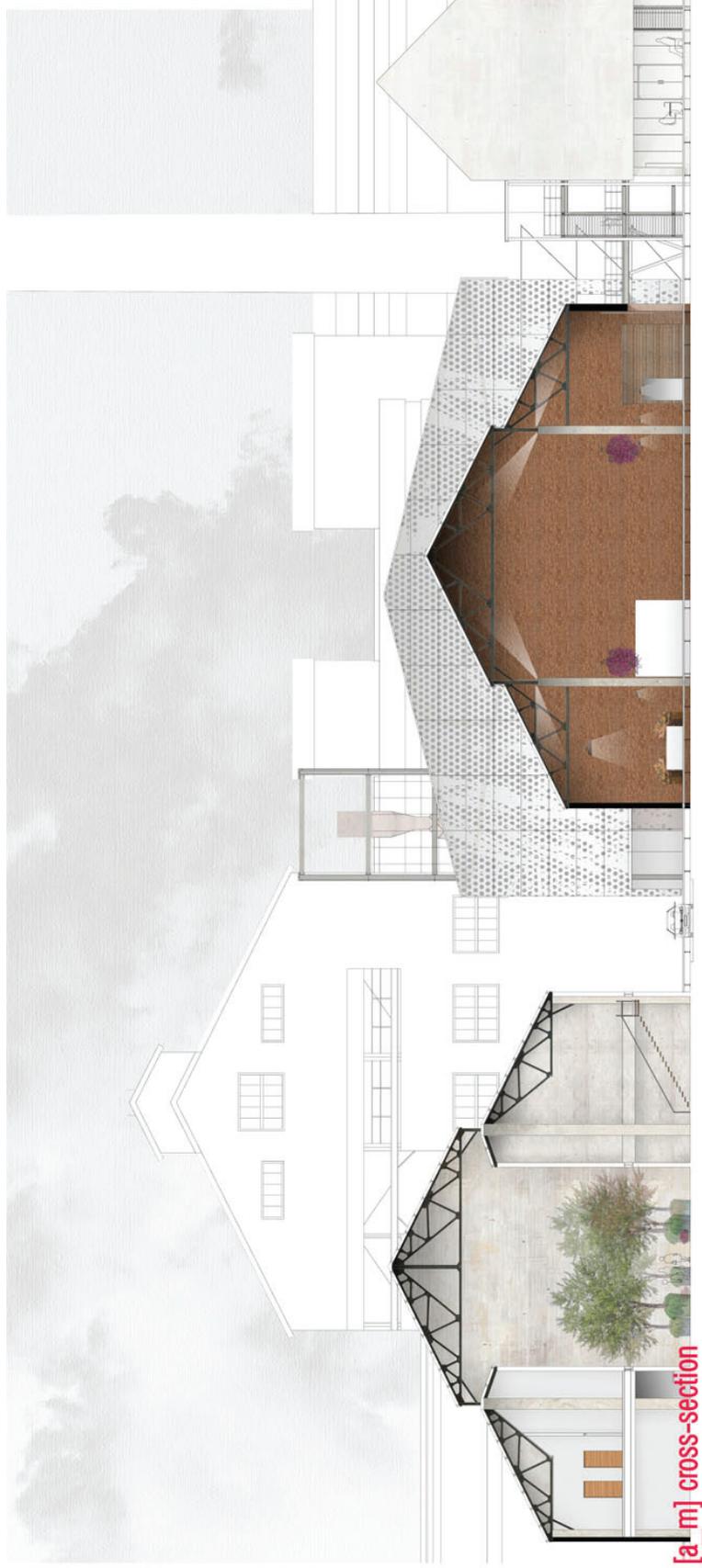
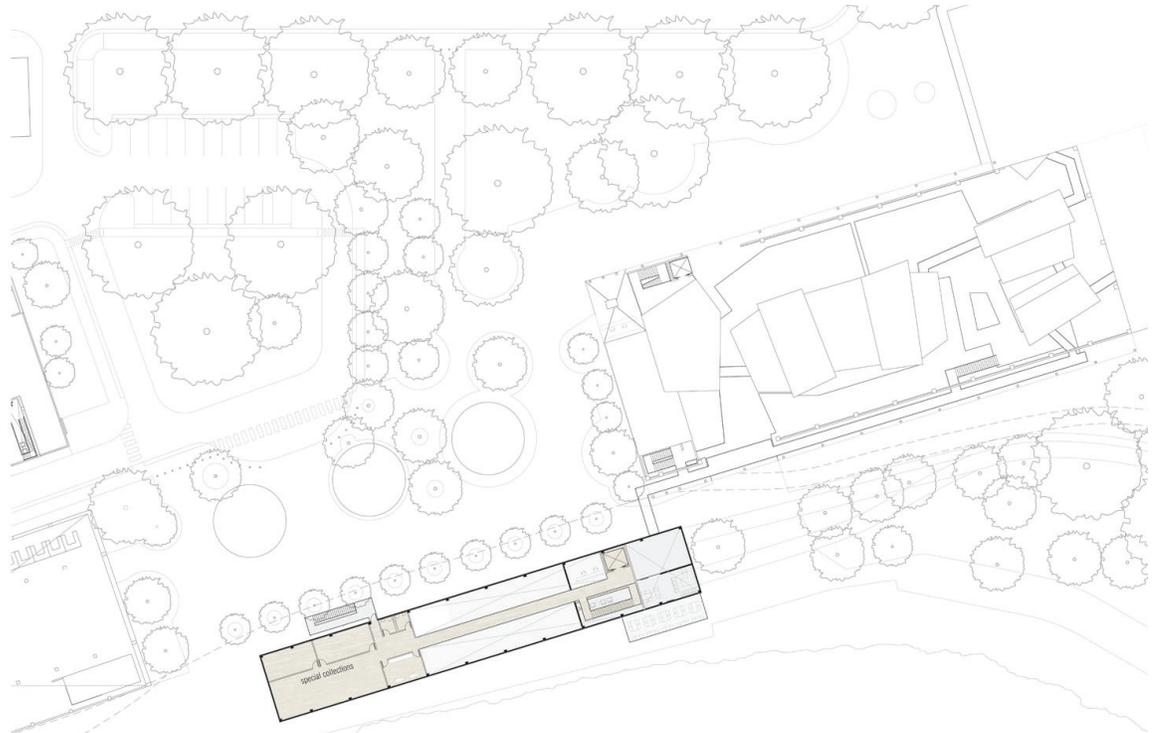
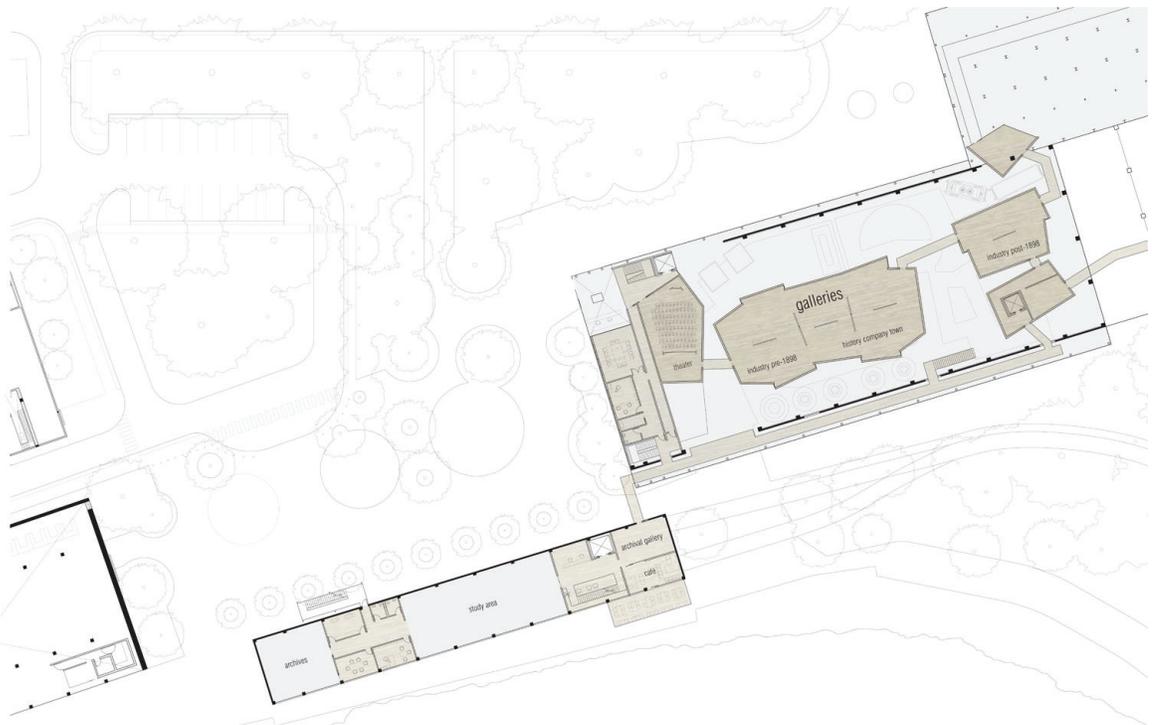


Figure 93. Cross-section facing east taken through the Apartment and market buildings
(Image by Author)



**Figure 94. Museum and Library Third Level Floor Plan
(Image by Author)**



**Figure 95. Museum and Library Second Level Floor Plan
(Image by Author)**

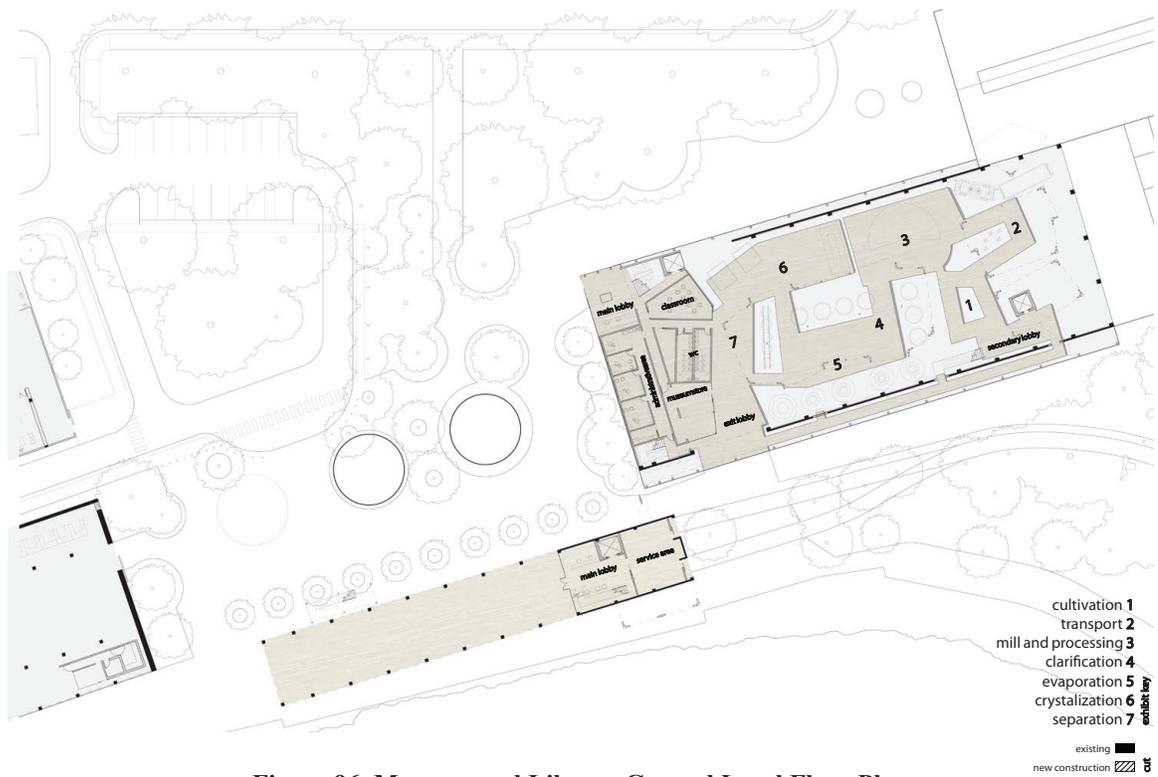


Figure 96. Museum and Library Ground Level Floor Plan
 (Image by Author)

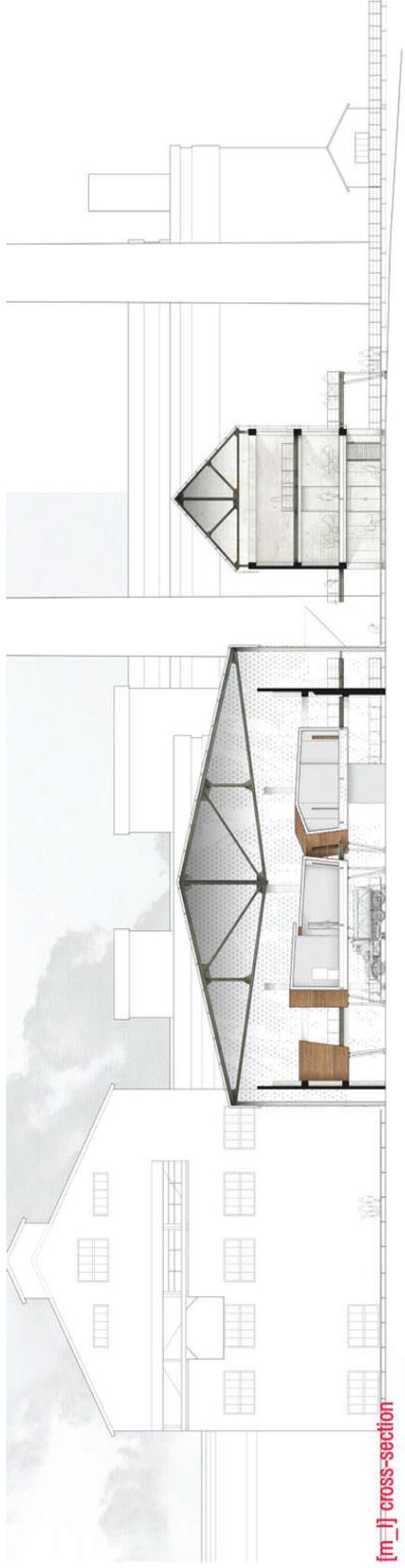


Figure 97. Cross-section facing east taken through the museum and study center buildings
 (Image by Author)

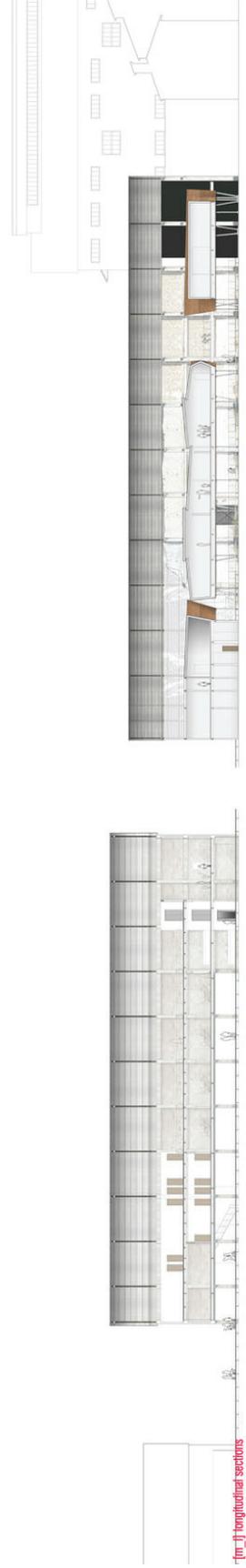
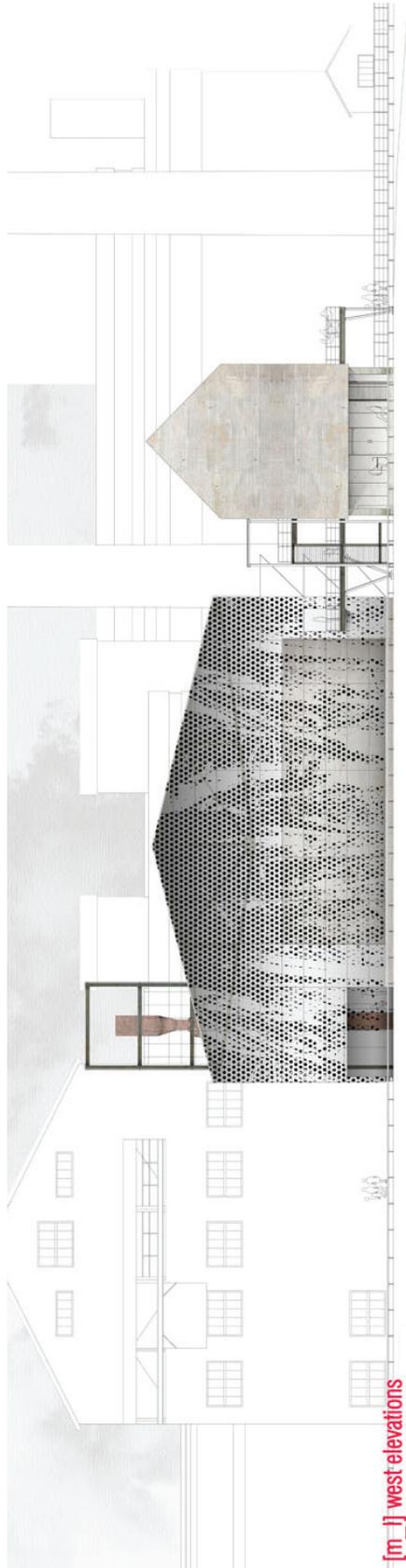
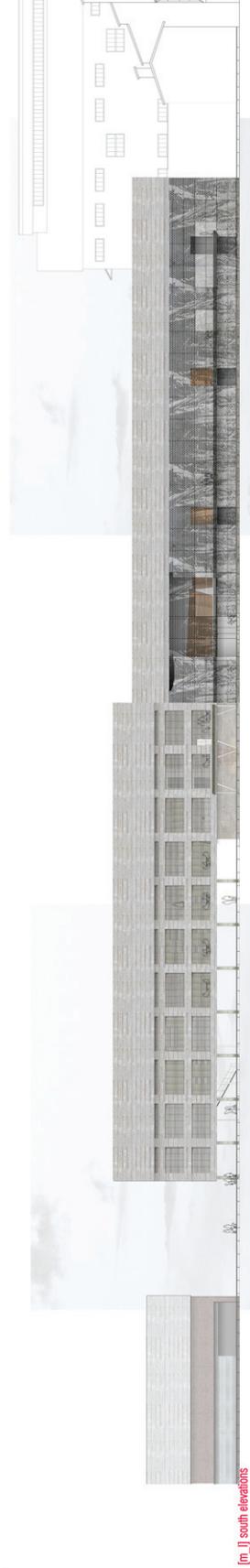


Figure 98. Longitudinal section facing north taken through the museum and study center buildings
 (Image by Author)



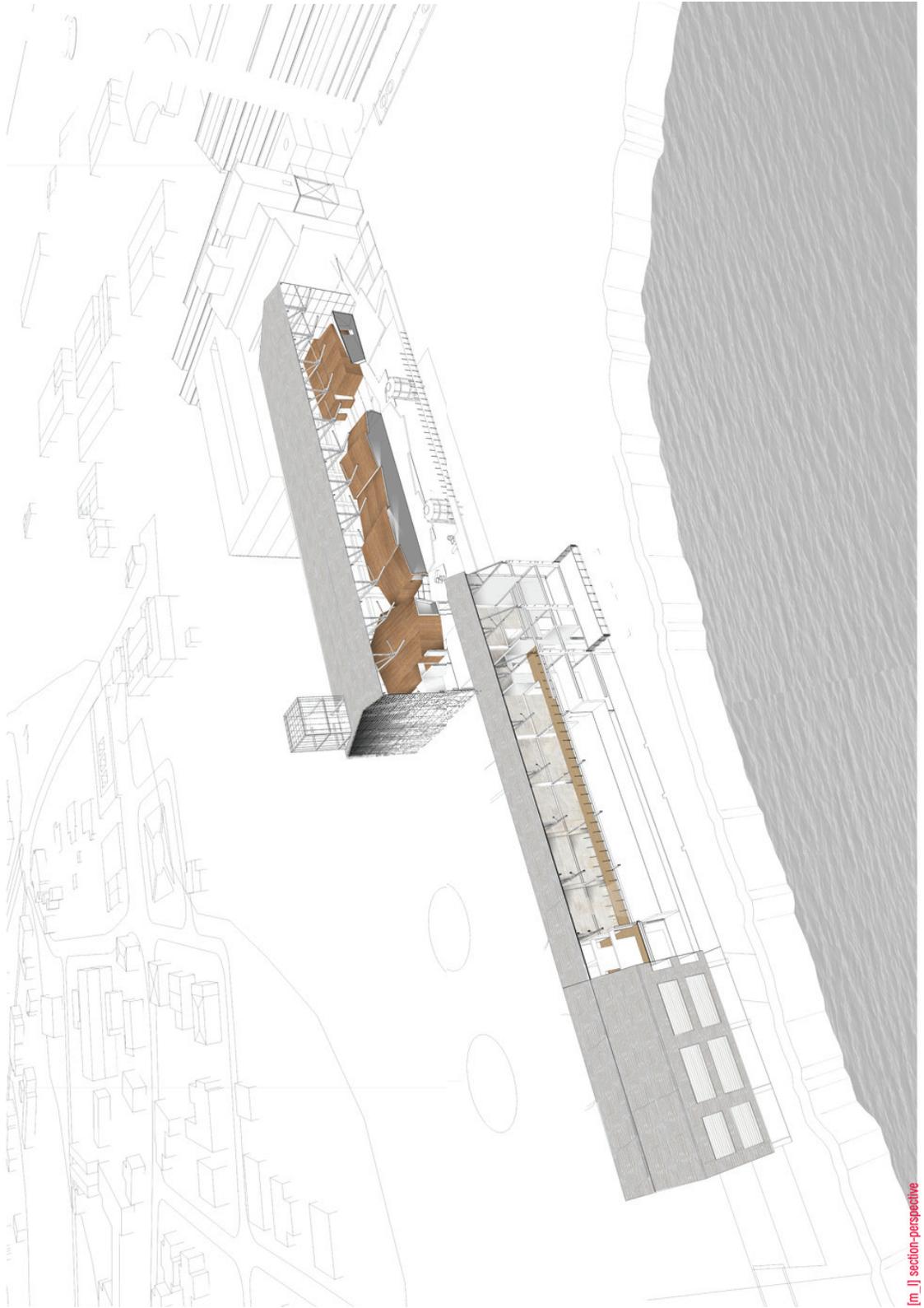
[m_j] west elevations

**Figure 99. West elevations of the museum and study center buildings
(Image by Author)**



[m_j] south elevations

**Figure 100. South elevations of the museum and study center buildings
(Image by Author)**



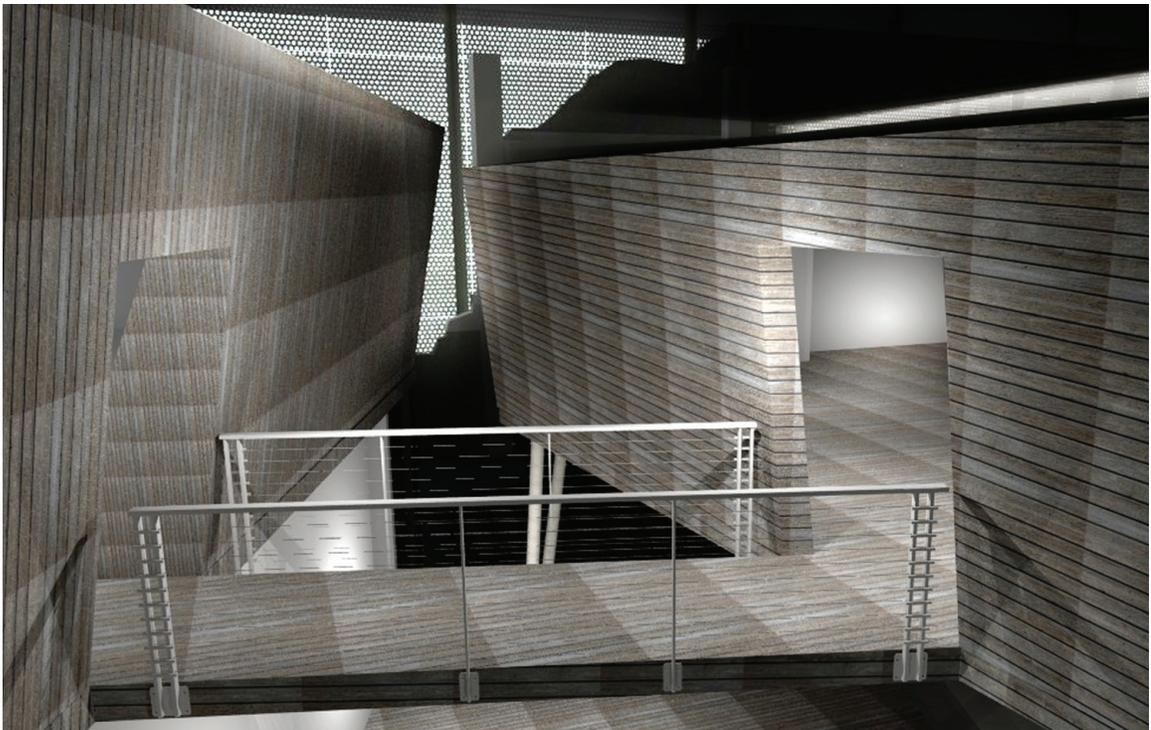
[m. II] section-perspective

Figure 101. Final Section Perspective of Museum and Study Center demonstrating relationships between both buildings as well as the experience within them.

(Image by Author)



**Figure 102. Perspective View of New Industrial Plaza
(Image by Author)**



**Figure 103. Perspective view of exhibit 'pods' in relationship to each other and the existing ruins
(Image by Author)**



**Figure 104. Perspective view of walk through mill inside boiler house
(Image by Author)**



**Figure 105. Perspective view of walk through mill inside mill tandem building
(Image by Author)**



**Figure 106. Perspective view of library reading room and mezzanine connection to the third level
(Image by Author)**

Chapter 6: Conclusions

This thesis arose from the love towards a country and the desire of contributing to the preservation of its history for future generations to enjoy and learn from. Its title entails the present reality of the industry under study. As discussed in previous chapters, the sugar industry in Puerto Rico served as the main economic activity in the island; its development tied to the social and cultural evolution of the island's inhabitants. Despite its past significance, today, sugar is only mentioned as part of anecdotes from those who in one way or another were connected to the industry prior to its definite end. Together with the closure and abandonment of these structures, the liveliness once exhibited in the company towns or cities founded under these companies, diminished. This thesis serves as an example of what can be done with these complexes contrary to simply getting rid of them or reconstructing them as they once were.

The premise of this proposal lies not in solely restoring buildings but in using the ruins of this refinery so as to exhibit the past, present and future of this industry. The study and adaptation of the theory and principles of historic preservation helped determine the extent and ways to go about with the new intervention. As perceived in the etchings by Italian artist Giovanni Battista Piranesi, there is a certain majestic and mysterious aura experienced when walking amidst ruins. The past is intertwined with the present thus demonstrating the history behind such place or space. This sensation is somewhat lost when the human hand intervenes in something that both nature and time have already taken charge of. Would the city of Pompeii evoke the same feeling if the houses were entirely reconstructed? Would Stonehenge, the Egyptian pyramids, Roman Fora, etc.? This is the premise that directed the overall intervention of this thesis in the Central Aguirre complex. The final result of this proposition preserves the memory of the place by working with and around the remains of the complex. Careful attention was given so as to properly determine the 'fate' and

treatment of the ruins. The use of the sugar warehouses to house the new program allowed for buildings that exude particular experiences based on their individual character and physical state; the museum being the most characteristic example. The notion of preservation as public art brought about a space that not only treats the ruin itself as an artifact but portrays its memory and that of the site through its use of materials and construction methods. The contrast between the old vs. the new further emphasizes this notion.



Figure 107. Ruined Gallery of the Villa Adriana at Tivoli

(Source: http://www.allposters.com/-sp/Ruined-Gallery-of-the-Villa-Adriana-at-Tivoli-Posters_i1733954_.htm)



Figure 108. View of the fountain and the Grotto of Egiria outside the Porta Capena

(Source: <http://www.galleriagrafica.com/english/inventory/piranesi01.html>)

Bibliography

- Central Aguirre. *50th Anniversary Annual Report, 1949*. Central Aguirre Sugar Company, 1950.
- Colación Inc. 1990. *La central azucarera en pr (1898-1952)*. San Juan, Puerto Rico: Oficina Estatal de Preservacion Historica de Puerto Rico.
- CUBE design + research, LLC blog. <http://www.modernpreservation.com/> (accessed March 27, 2010).
- García Leduc, José M. 2003. *Apuntes para una historia breve de Puerto Rico*. San Juan: Editorial Isla Negra.
- Iglesias García, Fe. 1998. *Del ingenio al central*. San Juan: Editorial de la Universidad de Puerto Rico.
- Kalipedia*, s.v. “Reformismo Borbonico,” http://www.kalipedia.com/historia-espanola/tema/edad-moderna/reformismo-borbonicohtml?x=20080802klphishpr_47.Kes&ap=1 (accessed November 27, 2009).
- Ligibel, Ted J., Ilene Tyler and Norman Tyler. 1994. *Historic Preservation: An introduction to its history, principles, and practice*. New York: W. W. Norton & Company, Inc.
- Mintz, Sidney W. 2001. *Taso, trabajador de la caña*. Río Piedras: Ediciones Huracán, Inc.
- Muñiz, Pedro Antonio. 1982. *Enfoque biotropical para la arquitectura en Puerto Rico*. San Juan, P.R. : Centro para Estudios Energéticos y Ambientales de la Universidad de Puerto Rico
- Pantojas García, Emilio. 1990 *Development Strategies as Ideology: Puerto Rico's Export-Led Industrialization Experience*. Boulder: Lynne Rienner Publishers.
- Picó, Fernando. 2008. *Historia general de Puerto Rico*. San Juan: Ediciones Huracán, Inc.
- Ramírez, Rafael L. and Eduardo Rivera Medina. 1994. *Del Cañaverál a la fábrica: Cambio social en Puerto Rico*. Río Piedras, PR: Ediciones Huracán, Inc.
- Ramos Mattei, Andrés. 1981. *La hacienda azucarera: su crecimiento y crisis en Puerto Rico (siglo XIX)*. San Juan, PR: Cerep.

- SKIL. How Sugar is Made - The History. <http://www.sucrose.com/lhist.html> (accessed November 27, 2009).
- Sharpe, Peter. Ethnobotanical Leaflets: sugar cane: past and present. Southern Illinois University Carbondale. <http://www.ethnoleaflets.com//leaflets/sugar.htm> (accessed October 2009-January 2010).
- Steward, Robin. History of Sugar: a brief history on sugar, its values, and production. Es-sortment. http://www.essortment.com/all/historyofsugar_rzow.htm (accessed October 2009-January 2010).
- Vázquez-Orlandi, 1998. *Jenarín. Aguirre--y su gente*. Hato Rey, PR: Publicaciones Puertorriqueñas.
- Vivoni-Farage, Enrique. 2007. Americanisation South of the Border: The Architecture of the Central Aguirre Sugar Company. In *Prospero's Isles: The Presence of the Caribbean in the American Imaginary*, ed. Diane Accaria-Zavala and Rodolfo Popelnik, 47-85. Oxford: Macmillan Publishers Limited.
- Webb, Rachel L. 2007. The History of Sugar Cane – Museum. Suite 101. November 25. http://spain-travel.suite101.com/article.cfm/sweet_tooth_for_sugar (accessed November 25, 2009).
- Wikipedia*, s.v. “History of sugar,” http://en.wikipedia.org/wiki/History_of_sugar (accessed November 27, 2009).
- Wikipedia*, s.v. “Sugarcane,” <http://en.wikipedia.org/wiki/Sugarcane> (accessed November 27, 2009).