

Giving Order to the Edge: a New Framework

Design of a Station as a Town Center

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Submitted to the Department of Architecture in Partial Fulfillment of the Requirements for the Degree of Master of Architecture at the Massachusetts Institute of Technology, February 2000.

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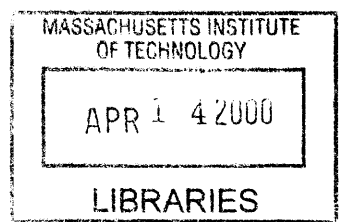
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ROUCH



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Abstract

In 1956, in reference to San Juan, Puerto Rico, Eduardo Barrañano anticipated that:

"...unless a drastic solution is taken, the former tendency will prevail, and the gigantic mass of urban uses will expand, eliminating all open spaces, all the semirural areas and nearly all the small centers with a personality and physiognomy of their own, converting it into a gigantic and anonymous urban octopus."

Fifty Years later, the San Juan periphery has become an edge city. The prediction was accurate.

The challenge now is to correct this existing condition. This thesis is an exploration in developing a physical form to provide a framework that will organize the diverse parts. By exploring the connections within an edge city condition and defining a new town center, the thesis attempts to formulate a physical strategy that will give cohesion to the area through the infrastructure. The subject for this exploration is the design of the Degetau Station, a subway station along the Carolina Corridor, a new line that is part of the Tren Urbano, a heavy rail transit system currently being constructed in Puerto Rico.

The investigation occurs at three scales: the urban, the site and the station. At the urban scale, the region will be seen as a new entertainment node. At the site scale, the area will be conceived as a new town and interchange transit center. At the architectural scale, the station will be perceived as a plaza, with strong connections between the landscape and a series of layered spaces that connects the subway to the street level.

Thesis Advisor
Jan Wampler, Professor of Architecture

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room 7-401 buddies for all the laughter, intensity and music
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Introduction

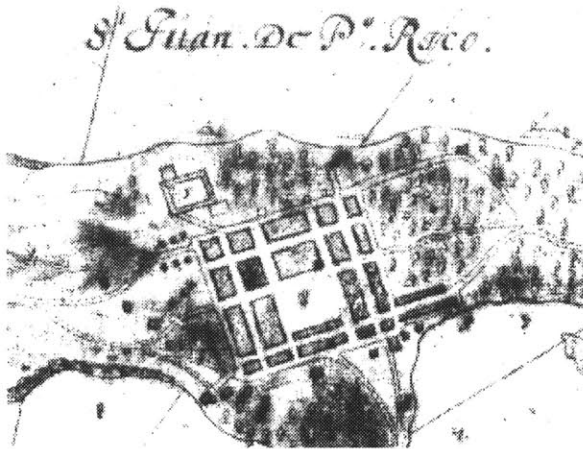


Figure 1
Law of Indies Map, City of San Juan, Puerto Rico.

The insertion of the Tren Urbano in the San Juan Metropolitan Area presents a unique opportunity for the re-development of the urban fabric. After years of a suburban development that is not contained, a loss of a city culture and an urban quality of life, and a change in the urban pattern, the introduction of the new rail system brings a chance to re-structure the city and revitalize decayed urban areas. The drastic and fast paced developments of the 1960's, when Puerto Rico was looking at "new" development patterns that emphasized the use of the automobile for the movement of people can now be altered and refocused. By looking at different urban design patterns that center on

a new city life and at old city structures that offer new options to the dweller, the existing urban mass can be defined and contained, preventing the current exponential growth of an amorphous mass from expanding.

This is the challenge: how to create and reorganize the existing urban mass through the introduction of the rail system? How to create nodes along the existing routes while defining new town centers within the suburban areas? How to start a chain reaction that drastically alters the way we are thinking, perceiving and designing the urban context?

This thesis focuses on the design of a subway station as a mean of

developing a new framework. Using the notion of the Law of Indies and the idea of settling on the land through a defined structure, this thesis defines a backdrop through which organize the rest of the city. The strategy deals with the edge city condition and the invention of a set of physical forms that stretch into the city giving an order and are defined as ways to re-organize the existing mass.

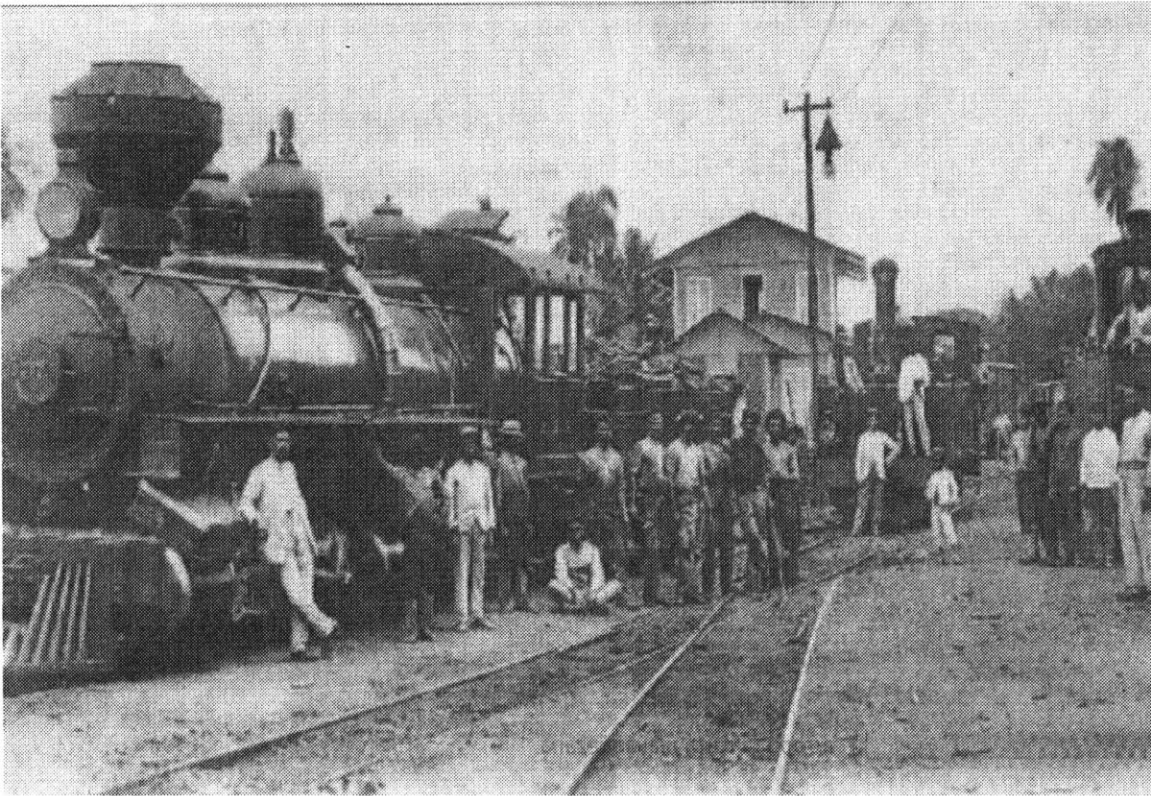
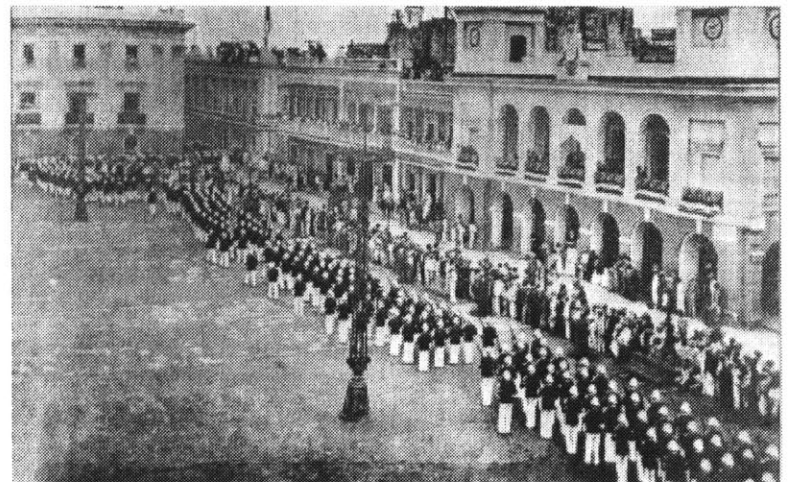


Figure 2
Train in Sector Playa de Mayaguez

At the end of the 19th Century, for the year 1891, Puerto Rico was building a massive train system. Built by the American Railroad Company, it became a coastal train that traveled the Island from San Juan, to Ponce and Mayaguez. For the year 1900, there were already 270 kilometers built. The line between Caño Martín Peña in Hato Rey, and Manatí, was built in 1891, and it was later extended towards Carolina on the East, and Arecibo and Camuy on the West. In 1904, both Hormigueros and Yauco were serviced, and in 1907, a line from San Juan to Ponce on the South was finished. In 1957, the Puerto Rican Railroad Company was bankrupt and the train stopped working. Now, at the end of the 20th Century, Puerto Rico is again building a massive train system, the Tren Urbano.

Figure 3
*Military Parade celebrating the First Civil Puertorrican
Government under the Foraker Law, May 1st, 1900.
Celebration was held at the Plaza de Armas in Old San Juan.*



Objectives

1. To develop a framework that consists of a physical form which will organize the diverse parts of the edge city. By exploring the connections within and edge city condition and defining a new town center, the thesis attempts to formulate a physical strategy that will give cohesion to the area through the infrastructure. The basic idea of the Law of Indies, settling in the land using an ordering device that is physical, will be explored.
2. The subway station will be the primary element to give cohesion and a particular sense of place to the area.
3. **At a Regional Level:** The Tren Urbano Stations will be catalysts for the creation of urban nodes along a strip/linear development, increasing the density of the area and preventing sprawl. The region will be seen as a Transit Region.
4. **At a Local Level:** The Station will be designed as a node of mixed-use development with an interchange function. The area will be seen as a Transit Oriented Development.

Motivation

1. Need to re-develop and re-conceptualize the way we are designing and building residential and mixed-use neighborhoods, as well suburban areas and infill projects.
2. Use the opportunity of the Tren Urbano construction and its insertion in the urban fabric to catalyze the improvement of the areas around the station and the urban fabric as a whole.
3. Re-develop old areas with a conscious notion of creating a Transit Oriented Development.
4. Use the proposed Degetau station, the site to be designed, as a Transit Oriented Development. The station will be the catalyst to improve the area and become the center of the neighborhood.
5. “Difficult but known Site” - The construction of an overpass on the PR-181 will change the character of the road turning it into an expressway, eliminating several intersections. Even though a subway station is proposed at the intersection, the emphasis is still given to the use of the car and not to the pedestrian. The traffic will be going faster and the area will be bisected by the elevated overpass, creating yet another barrier to the pedestrian. The sense of place of the area, which is already non-existent, will be adversely augmented, and the opportunity of unifying the area through the introduction of the transit system can be lost. The intersection is also known and perceived in the mental map of the inhabitants as the intersection of the Trujillo Alto Expressway (PR-181) and the 65th Infantry Avenue (PR-3). This shows that the area has an importance in the region, and is a location strategically

Figure 4
Transit system in the De Diego Avenue.



placed within the Metropolitan area, with a direct connection to the Airport, Río Piedras and Carolina.

6. There is a need to improve the transportation connections and access to the area.

7. The transportation in Puerto Rico:

- < San Juan today features one of the worst traffic congestion having three times more motor vehicles per lane-mile of road than any city on the United States. There are 146 cars per lane-mile of road.
- < San Juan's Metropolitan Region has 4,286 cars per lane-mile of road.
- < There are more than 3.2 millions of daily trips being generated in San Juan's Metropolitan Region. For the year 2010, this number is expected to rise 45%.
- < It is estimated that in 2003 there will be 400,000 more inhabitants for a total of 4 millions, and 210,000 more cars for a total of 1.86 million cars.



Figure 5
Traffic congestion in PR-3.

The Tren Urbano Project

The Tren Urbano is a Heavy Rail Transit System that will link and unify the San Juan's Metropolitan Area. It is the back spine of a regional system that will also include buses and other feeder systems for the whole Metropolitan Region. The new transit strategy is expected to reduce the ever increasing traffic congestion to levels lower than those of 1990. It is assumed that in the year 2010, it will absorb 45% of the projected trips. While offering a more efficient mode of transportation it also offers an opportunity for the revitalization of strategic nodes along its route. Through the introduction of new markets, and the creation of more jobs, the train also offers the possibility of revitalizing the city both economically and socially.

The complete Tren Urbano system will have an "H" pattern 40 kilometers long. Composed of several lines, it will extend through the Metropolitan Region. The first line being built, known as phase I, will connect the towns of Bayamón, Guaynabo, Río Piedras, Hato Rey and Santurce. This phase is 17.2 kilometers long and has 16 stations. The rails are mainly elevated, but there are some at grade and a shorter segment located in the heart of Río Piedras, a traditional town, is underground.

The Carolina Corridor is the southernmost and eastward extension, and it is the line where the Degetau Station, the station which this thesis focus, is located. The Carolina Corridor will be 12 kilometers long, and extends from Río Piedras to Carolina.

The Tren Urbano has several principal considerations. One of them is the integration with

other transportation systems currently under use, maximizing the movement of people to and from the “Tren”. Also, in order to adhere to the existing urban context, each station is being design according to the potentials of its surroundings, making possible special transformations within the area. Each station will represent the character and the usage of its context.

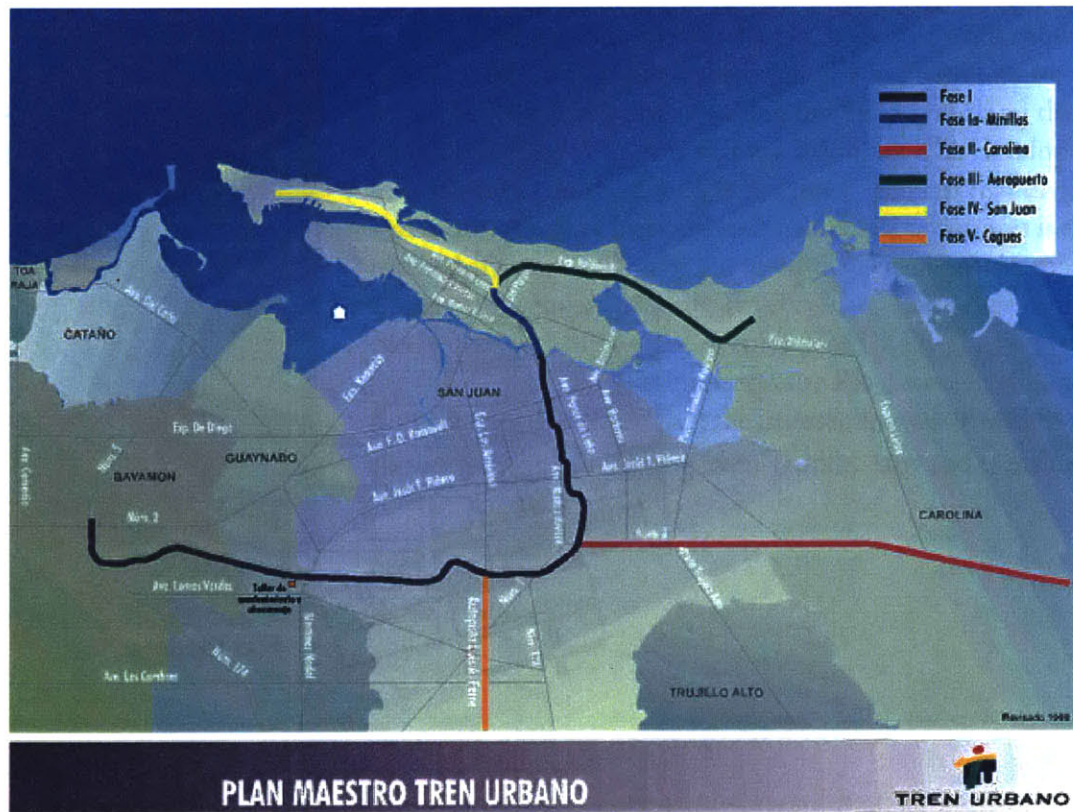


Figure 6
Tren Urbano Master Plan

Site Aerial Photos

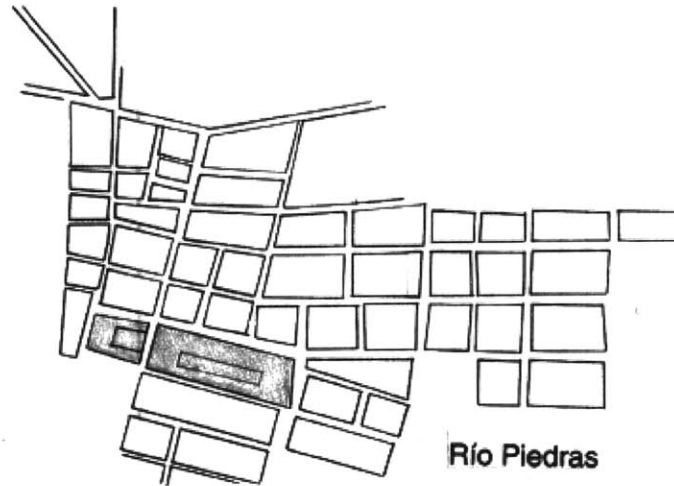


Figure 7
Río Piedras

The town began as an agricultural area. In the 19th Century, when railroads and trolley services linked Río Piedras with San Juan, it became a strong commercial center. During the first part of the 20th Century, the area developed along the main avenues and highways, forming a unified and continuous built area between the two centers of San Juan and Río Piedras.

1937



This aerial photo was taken in the year 1937. It shows a rural landscape and a nodal development, the town of Río Piedras, at its left corner. There are some strip developments along the PR-3 and along the PR-181 heading towards Trujillo Alto, but these are minimal. The development that can be seen is located north of the PR-3, a linear element that divides the area north and south. Another important characteristic of the area is that the PR-181 is marked by trees and very scattered development. At that time, there was already movement towards Trujillo Alto. The other important street that can be seen is the PR-47 or Avenida José De Diego. This one runs parallel to the PR-3, north of it. It intersects the PR-3 west of the site. The site at this time was not developed, but the intersection was already a main intersection connecting people moving from Trujillo Alto and Carolina to Río Piedras.

Figure 8
Aerial Photo 1937

1962



Twenty five years after the previous picture was taken, the site appears much more developed. For the year 1962, when this picture was taken, the site or intersection is already seen as a developed area. The neighborhoods of Villa Capri (south-west of the site), San Agustín (north-east), Gonzáles Seijo and San Antonio (north-west) were already established. They were developed during the post war years, when massive movements of people moved from the rural areas towards the city. The picture also shows how the north section of the area, between

the San Juan Lagoon and the PR-3, was developed with big projects done almost at the same time. These look like new areas of multi-family houses, surrounded by single family housing.

Figure 9
Aerial Photo 1962

1973



This picture shows the site fully developed. At this time, the necessity of acquiring less expensive land to build more and bigger developments was forcing people to move out of San Juan and south along the PR-181. Movements of land show the Villa Andalucía neighborhood under construction. The only two open spaces that appear in the picture are the San Juan Capistrano Hospital and surroundings, west of the PR-181, and the Botanical Gardens further east of it. The Concordia Gardens, Park Gardens, and Town Park were already developed.

Figure 10
Aerial Photo 1973

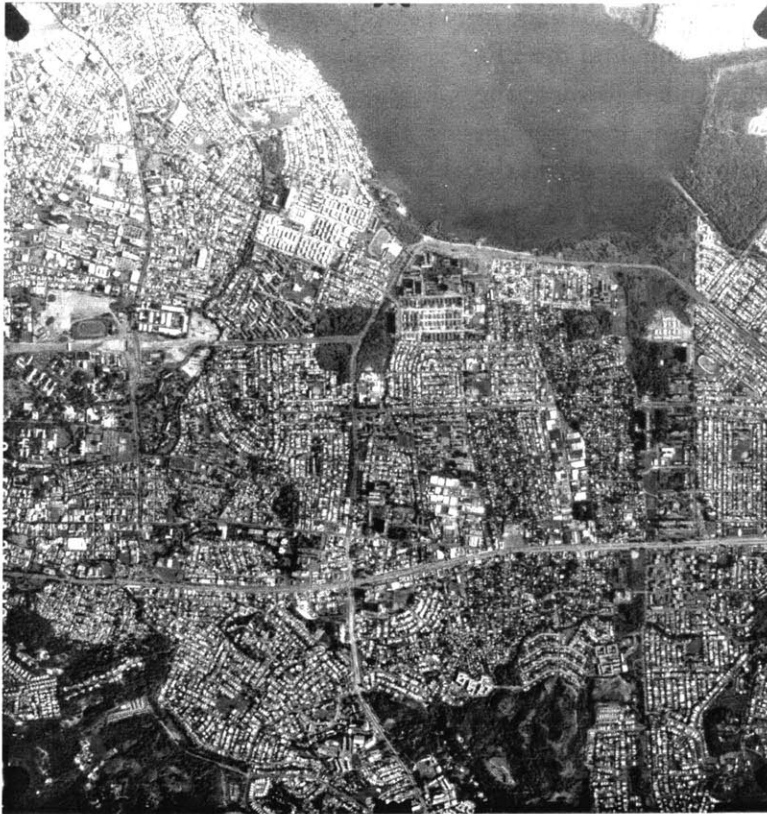
1981



This picture is very similar to the previous one. It shows a more developed view of the area, and the site looks tight. There are no new developments but the area was already fully built, predominantly with multifamily housing and big projects conducive to sprawl. The PR-3 still appears to be a divider between north and south, but now, the southern area looks fully developed except the two zones mentioned before as open spaces. The Puerta del Sol building is already built, just south-west of the intersection.

Figure 11
Aerial Photo 1981

1991



Like the year 1981, the area now looks as developed as before and the site is tight. The only area that appears to be not developed is the intersection of the PR-17 and PR-181, north of the site. Later we will see that this area gets importance as the Teodoro Moscoso Bridge gets built and the PR-17 or Piñero Avenue gets extended. The area will later be known as the “Face of San Juan”. The site now looks like an area surrounded by development. Definitely, the area has become an important part of the Metro Region.

Figure 12
Aerial Photo 1991

1997



The Teodoro Moscoso Bridge is already built, and the PR-17 has been extended to meet the PR-181 north of the intersection. The area is fully developed and the intersection is clearly seen as a main intersection along the PR-3 and PR-181.

Figure 13
Aerial Photo 1997

Station Area and the Carolina Corridor

The Carolina Corridor is one of four proposed corridors that will extend the Tren Urbano system across the Metropolitan area of San Juan. The complete system is supposed to resemble an “H”, or have an “H” pattern 40 kilometers long. The Carolina Alignment will be the southernmost and eastward extension, and will be 12 kilometers long. As preliminary designed, it will begin at the Río Piedras station and extend eastward to Carolina, mainly along the PR-3. It will finish at Carolina Centro, in the town center of Carolina.

Some other options for the alignment were studied. Vertical and horizontal extensions between Río Piedras and Trujillo Alto along the

PR-181 were analyzed, as well as other alignments along the PR-47 and the PR-8 to Carolina. But the PR-3 route was chosen due to higher ridership levels, among other reasons. According to the Carolina Corridor Study (September, 1998) this extension to Carolina will represent an increase in daily ridership of about 85,700 riders over the entire system. Even though a small disruption in the existing development will be necessary, the introduction of the transit system is likely to reinforce and intensify the commercial and high density already present.

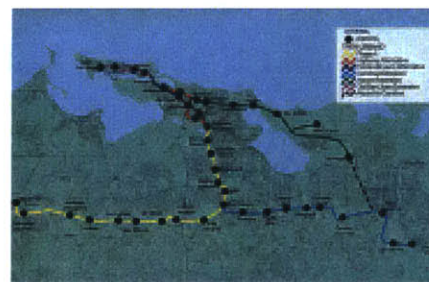


Figure 14
Tren Urbano System



Figure 15
Carolina Corridor

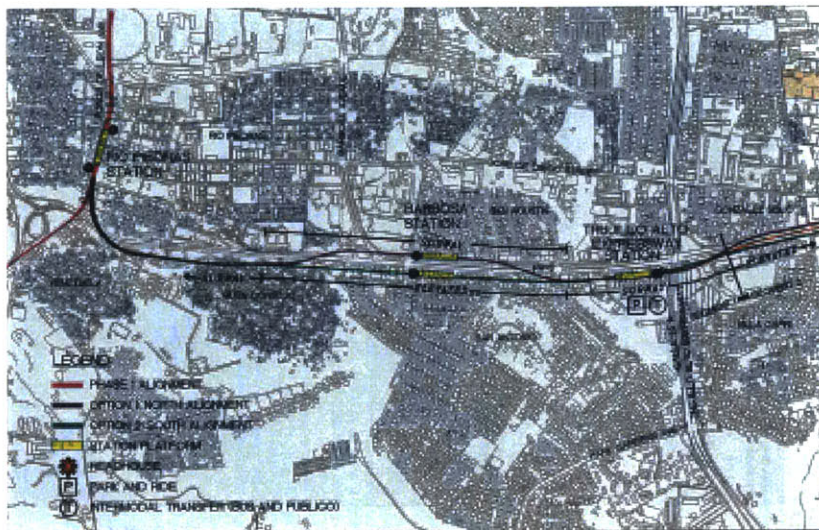


Figure 16
Carolina Corridor, segment 1.

This corridor has several transportation and urban design issues that should be addressed in order to keep and enhance the urban development of the area. They include “vehicle and pedestrian circulation, visual impacts related to the elevated portion, and some opportunities for transit-induced development” (CCS, September 1998). To better serve the community and increase ridership levels, vehicle access and circulation must be improved, particularly at areas that have been selected for modal transfer points between “públicos”, buses, and park and ride areas. One of the proposed modal transfer points is the area of study, at the intersection between the PR-3 and the PR-181. Campo Rico, La

Victoria and Carolina Centro are also planned to serve as intermodal stations. All stations will require pedestrian facilities to be improved or designed were they are nonexistent.

The existing land use along the corridor has a strong component of commercial and residential uses. The area of study, especially in the portions of the barrios Sábana Llana Norte and Sur, is characterized by high density urban neighborhoods, commercial areas related to car sales and maintenance as well as commercial centers, and offices. It can be said this area “is a commercial frontage backed up by residential development” (CCS, September, 1998). The rest of the alignment, has

a stronger suburban character mixed with industrial sectors, some educational institutions, commerce, one mixed-use development and vacant land. The end of the alignment in Carolina has another character, being a typical “pueblo”.

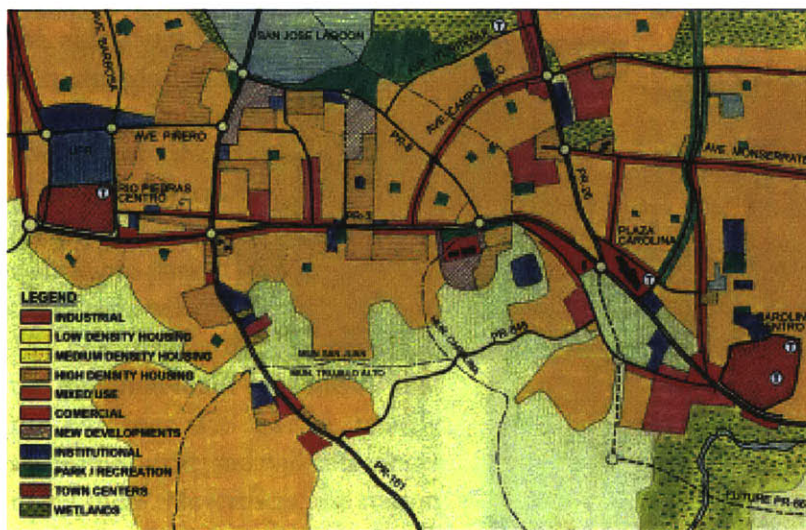


Figure 17
*Land-use along the Carolina
Corridor Area*



Figure 18
*PR-3 West, 65th Infantry Avenue,
towards Carolina*



Figure 19
*PR-3 East, 65th Infantry Avenue, towards Río
Piedras*

Station area description

The Degetau station is the second station along the Carolina Corridor. Following the method of construction (cut and cover) used at the Barbosa Station, it will be an underground station. The Degetau is intended to serve several neighborhoods around the PR-3 and the PR-181 intersection. They are the San Antonio and Park Gardens neighborhoods, the Puerta del Sol and Concordia high-rises and Villa Capri. The possibility of serving Jardines del Paraíso to the South is also being explored. As proposed, an at-grade crossing across the PR-3 towards the De Diego street will make possible the expansion of the area of service to the commercial and residential areas located north of the station.

One of the most important aspects of the station is its location. The intersection of the PR-3 and the PR-181 is a major interchange that will be altered with the construction of an overpass over the PR-3. This change in the character of the intersection will make very difficult the access to it. The proposed access is from exit south of PR-3 taking PR-181 and turning on Park Gardens Avenue, into the marginal road west of PR-181, street 25A. As proposed, the persons coming from the PR-3 wanting to park at the station to use the system, will need to enter the PR-181 and make a turnaround along the marginal road. This means that the entrance will not be readily accessible by car, and will take longer to get there. Nevertheless, the station



Figure 20
*25A street, Park Gardens.
Marginal road proposed as
the entry access into the
station.*

Figure 21
De Diego Avenue



Figure 22
*PR-3/PR-181
intersection,
looking to the
Southwest*



Figure 23
PR-3 West, 65th Infantry Avenue, Concordia Gardens Commercial Center

will take advantage of the site and accessibility. The station has been thought of as an inter-modal station with park and ride facilities and a 500 cars parking lot.

In the Carolina Corridor Study (September, 1998) the site is seen as a possible area for a mixed-use development. It can include high density residential, commercial, and office uses. This concept has the advantage of using the already existing developments around it. It can be seen as a

compliment to the Concordia Gardens located east of it, and a buffer zone for the single family developments south of the station. The bridge that will be built over the PR-3 will create a disrupting element bisecting the areas east and west of it. A development that plans to take advantage of the existing conditions will need to carefully design pedestrian access under the elevated viaduct, and possible ways to unify both areas.

Other aspects that will need to be considered are of an environmental nature and the acquisition of property. Near the site there is a creek that might be altered by the construction

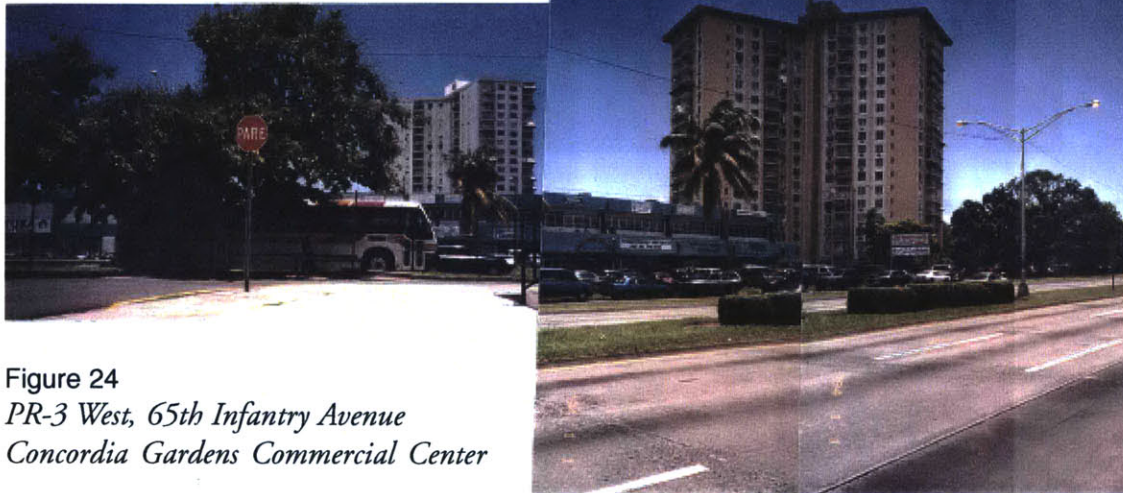


Figure 24
*PR-3 West, 65th Infantry Avenue
Concordia Gardens Commercial Center*

Figure 25
*25A Street, Park Gardens, and
vacant lot south of the station block.*



Figure 26
Station block along PR-3, 65th Infantry Avenue



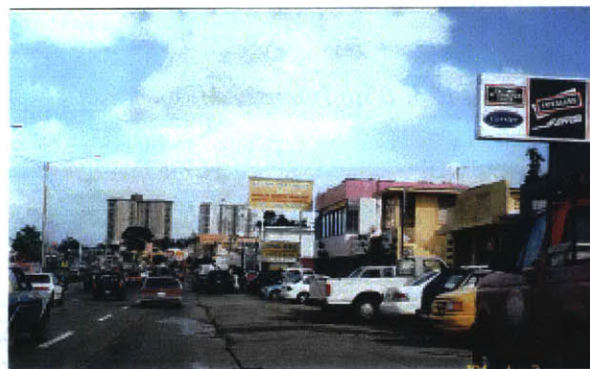
of the station. The properties that will need to be acquired will depend on the extension of the area to be built. All of the properties along PR-3 are commercial, but in the back of the Avenue, there are two rows of houses, that will also had to be bought. The rest of the land towards the back of the area (south) is vacant, except for a high-rise building called Puerta del Sol, and townhouses at the southernmost tip.

Figure 27
Station block along PR-3, 65th Infantry Avenue





Along the PR-3, the area shows a peripheral pattern of development. It has a continuous growth along the main avenue that once demarcated the periphery and now is part of the urban mass. All commercial buildings face the street and the parking is frontal, worsening the traffic condition. At the same time, this impedes the pedestrian from walking along the street. Usually there is no sidewalk and if it exists, it is in bad condition or used by parked cars.



West of the intersection, the PR-3 main character is commercial. It is catered to the use of the car. In the background you can see the two Concordia Gardens Buildings. They are located on the west side of the intersection. They are surrounded by at grade parking and both have separated entries.

Figures 28 and 29
Sidewalk along PR-3

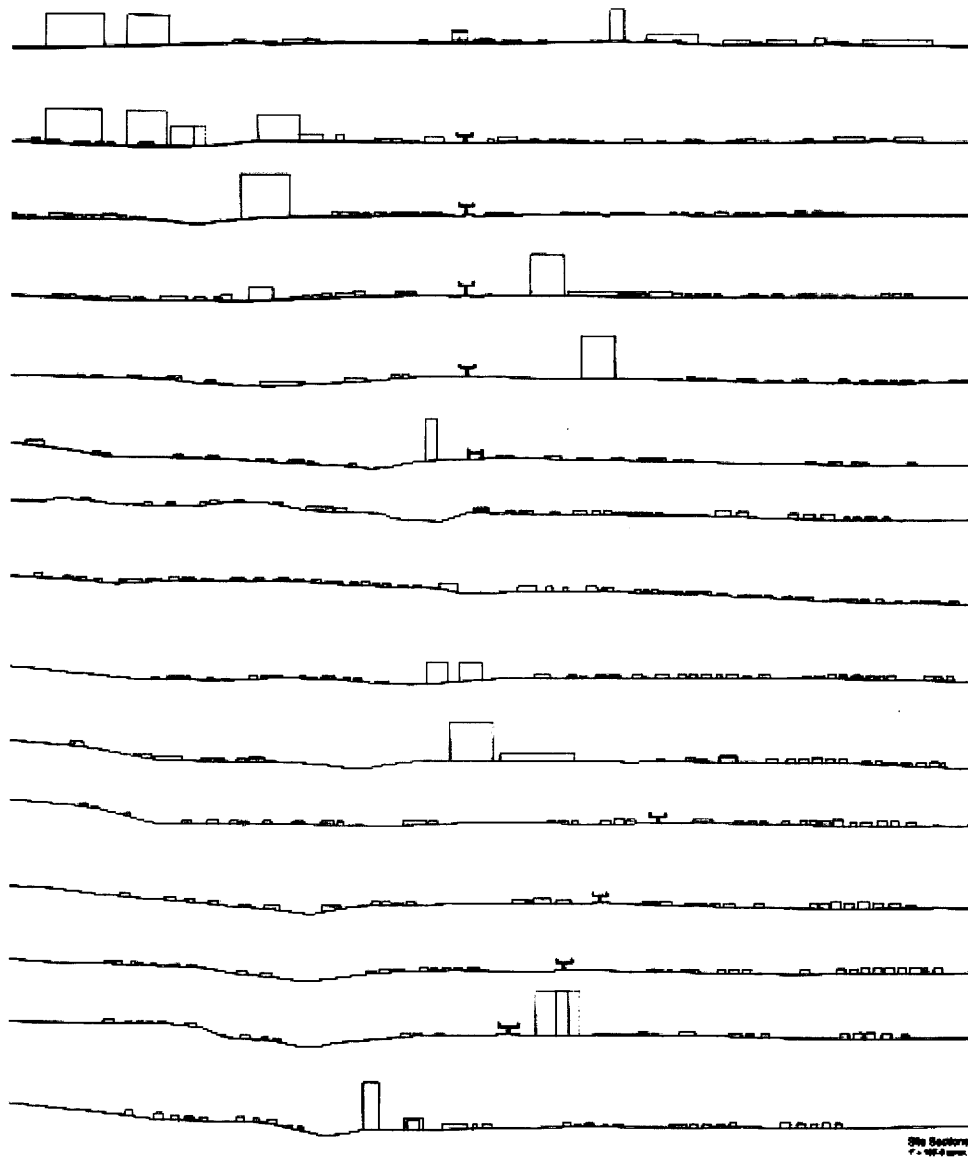


Figure 30

*Site sections.**Another way of understanding the bigger site area was by drawing sectional cuts along it.*

Mid-density residential building. There is a vacant lot in front of this area that can be designed as a park ending the greenbelt that will be developed on the back of the station.

Figure 31

Southwest of the intersection. Park Gardens Townhouses south of the station area.



Figure 32

Pedestrian Barrier between east and west of PR-181



Along the PR-181, where the overpass will be built, the development is different. The PR-181 is more of an expressway to Trujillo Alto and lacks a commercial strip development like the one present in PR-3. There are more residential developments with a suburban character and more residential highrises. Some of the neighborhoods have become “gated

communities” i.e. Villa Capri, and lack a commercial development of their own. They are not sustainable communities. The character of the PR-181 also lacks a pedestrian environment and in some areas, it has become a barrier between east and west.

Along the De Diego Avenue, there is another type of development. In the

Figure 33

Villa Capri. Northeast of the intersection. The Villa Capri Norte is another neighborhood close to the intersection. It is a middle income residential area. In the background, you can see the Concordia Gardens Buildings and the Concordia Commercial Center.



Figure 34
Highrises along the De Diego Avenue.
“Towers in the Park” area along the De Diego Avenue. The Casa Klumb is in front of this area.

central part of Río Piedras it is a typical commercial street, with a lot of pedestrian activity and life. It then turns into a highrise area with different high density developments and a hospital. This area is referred to as the “towers in the park area”. The De Diego Avenue rapidly changes its character again and becomes a dilapidated area with commercial activity, simi-

lar to the one found along the PR-3, but with a stronger pedestrian movement. The area is catered for a different population with a lower income. It has a stronger identity and works as a “barrio”. It can be said it is more of an independent area that does not relate to the other neighborhoods surrounding it.



Figure 35
Local street
A street off the De Diego Avenue shows a very typical residential “barrio” with mixed use buildings facing the street.



Figure 36
De Diego Avenue
Different types of developments are present in this area. The De Diego Avenue is the main artery for movement.



Problems

1. How to give definition to the site as a node?

The challenge is how to create a node that can become the center of a new development within the existing context taking in consideration the urban mass that is characteristic of the area, and the unconnected areas of the site. This new development has to reactivate the urban area, bringing commercial and recreational activities that will emphasize the pedestrian movement. The urban character and life of the area has to be increased in order to create a healthy and active neighborhood that is part of a transit system and exists within a framework.

2. How to deal with the overpass and the traffic situation? How to deal with the introduction of the overpass? How to bridge over and connect with the existing surroundings?

As the area is being developed and the traffic increase, there is another element that will become a barrier within the site. The construction of an overpass along the PR-181, running north-south, will adversely affect the relationship between the areas east and west of it. Having the high-rises on one side and the station on the other side will create a situation where both elements will be disconnected both visually and physically. The challenge is how to unify the sides using the subway station as the element that will become the connecting part.

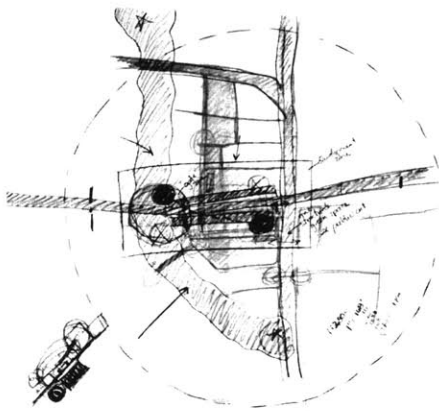


Figure 37
Conceptual greenbelt diagram.

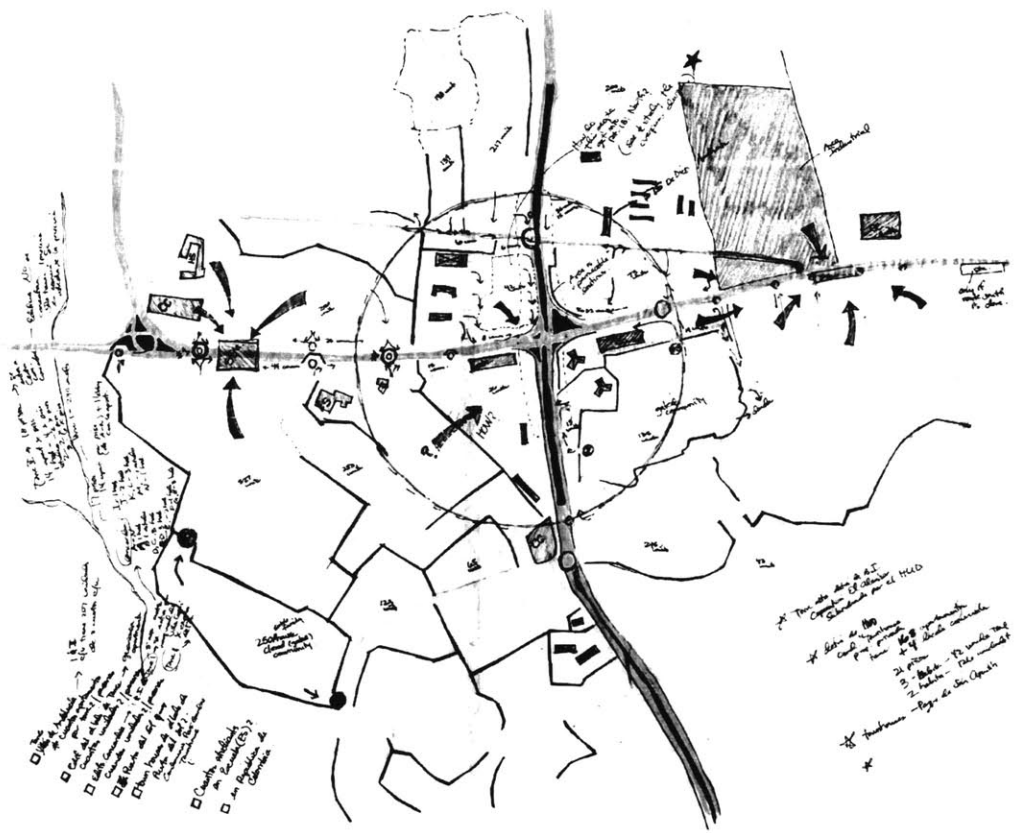
3. How to deal with the two scales while designing the station? One being the local/pedestrian scale, and the other being the scale of the infrastructure, the overpass.

If the station is thought of as the center of the area, as the heart of the development, and as a town center, it has to deal both with the scale of the pedestrian and the local inhabitant and the scale of the overpass being built next to it. The challenge of the design is how to unify this two scales and relate the station with both of them, while at the same time emphasize the smaller human scale. Even though the station is located at the heart of a main intersection, it is being design with a human scale and primarily for pedestrians.

4. How to pull the area together making a framework?

If the way to redefine the area and create a healthy community with the station as its heart is through the introduction of a framework, the challenge is how to design the framework so it can be extended through the area unifying it.

Figure 38
Regional diagram. Stations will form a string of nodes along the PR-3.



Southwest of the intersection, the prevalent street pattern is the cul-de-sacs. This street pattern does not favor the pedestrian and creates boundaries within the neighborhood. The car use is emphasized and the connections are made circuitous. The cul-de-sacs also help in the creation of "gated communities". They usually depend on one main arterial streets that connects them and that can be closed with one gate.

Three scales / Three Interventions

1. Regional scale / Urban scale: Regional Attraction.

“One of the things that we are trying to articulate here is that the development will not be homogenous like if we were trying to built similar buildings along the transit line all the way to Santurce, similar to a Great Chinese Wall of dense buildings and high rises ... More likely, the stations will be a combined development of nucleus designed according to the characteristics and potentials of each zone.” (Elmo Ortiz, Urban Design Manager for the Tren Urbano Office)

The station is seen as one of many different nodes along the line. At a larger scale, the particular use of this node will be that of entertainment. Because of the station location at a major intersection that is directly linked with the airport and the tourist area of Isla Verde through the Teodoro Moscoso Bridge, to Carolina and San Juan through the PR-3, and Trujillo Alto by the PR-181, the site offers the potential of a node that can have a regional impact and act as center of the area. Instead of fighting with the other entertainment complexes that exist elsewhere, this one can be focus on a different theme or topic, and have a particular mix of restaurants, specific shops, galleries, among others. Moreover, it can use as a main attraction the fact that it is linked with the Tren Urbano and the landscape in a particular way, through the creation of a plaza, a boulevard, and a town center.

The Degetau Station will be developed as the center of a revitalized area. It will have a green belt from the “towers in the park area” on the Avenida José de Diego and the Casa Klumb towards the site area and on the back of the station all the way to the PR-181. The green belt will end with a small park that can be the beginning of a pedestrian path, a linear park for bicycles, or a landscaped

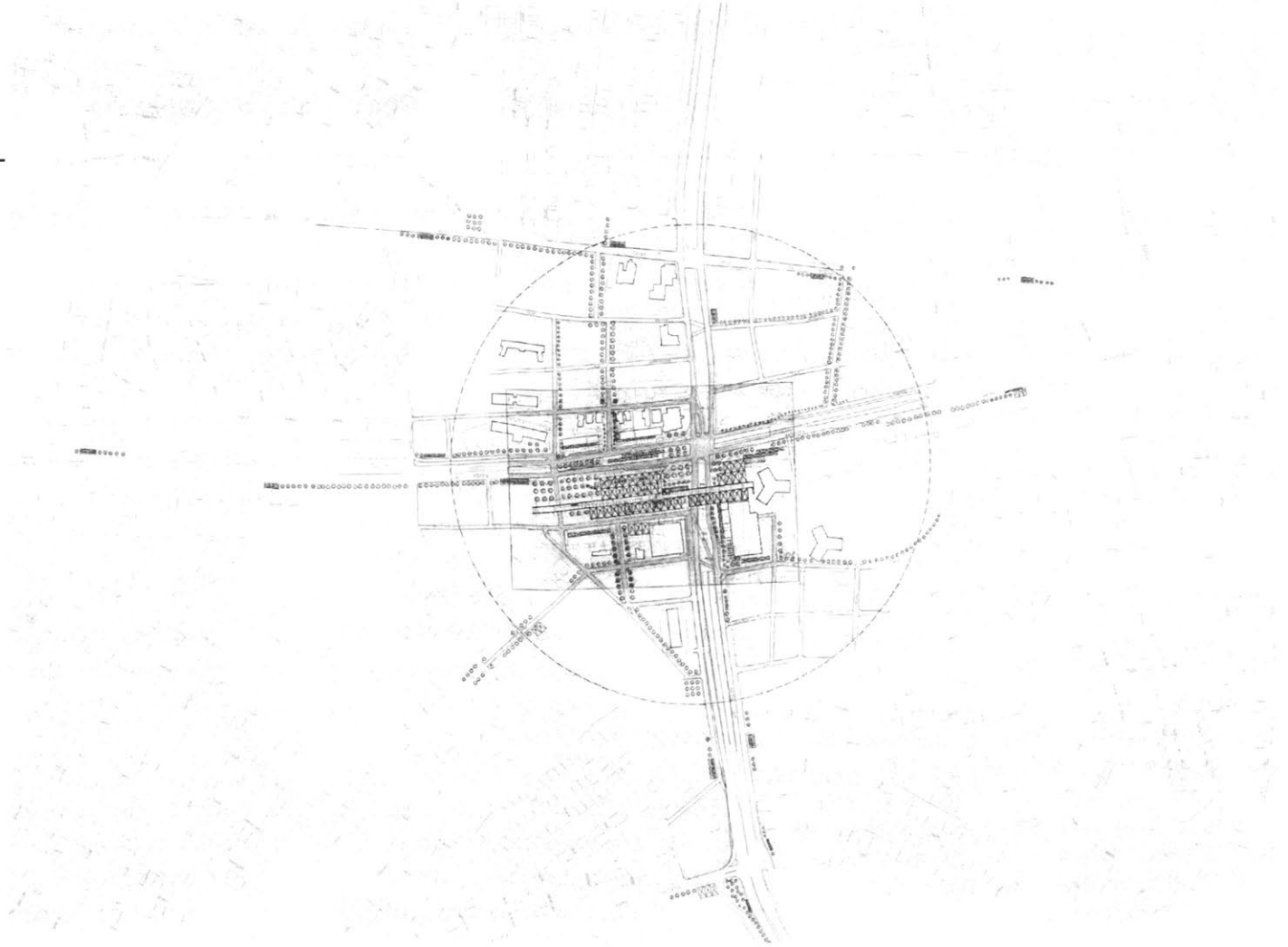


Figure 39
Framework Diagram

connector between the area. The green belt can also be conceived as a boundary/buffer zone/connector between the station area and the existing houses on the southwest side. Crossing this greenbelt, there will be a bridge, connecting the Park Gardens neighborhood with the station area. This bridge will be the main and direct access route from this neighborhood towards the station. The greenbelt also expresses the notion of bringing nature into the site. The landscape is brought in as part of the framework that will be developed, and a boulevard is created and understood as nature extending into the station.

In order to revitalize the area, there will be a framework extending over

the site. The framework will consist of architectural elements that are brought from the station into the urban landscape, and a built landscape that is extended through the boulevard into the station. By use of the framework, the city fabric will be knit together.

To deal with the existing traffic, the pattern of the street will be altered. It will be tamed so the pedestrians have a better control of the street and perceive the area as their territory. The framework will also establish connections with the existing urban environment, and will emphasize new paths and roads that will reactivate the commercial and living areas. By altering the low density pattern, the framework will enable

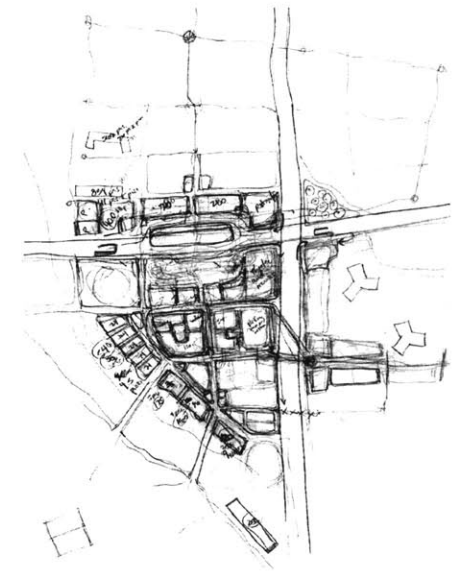
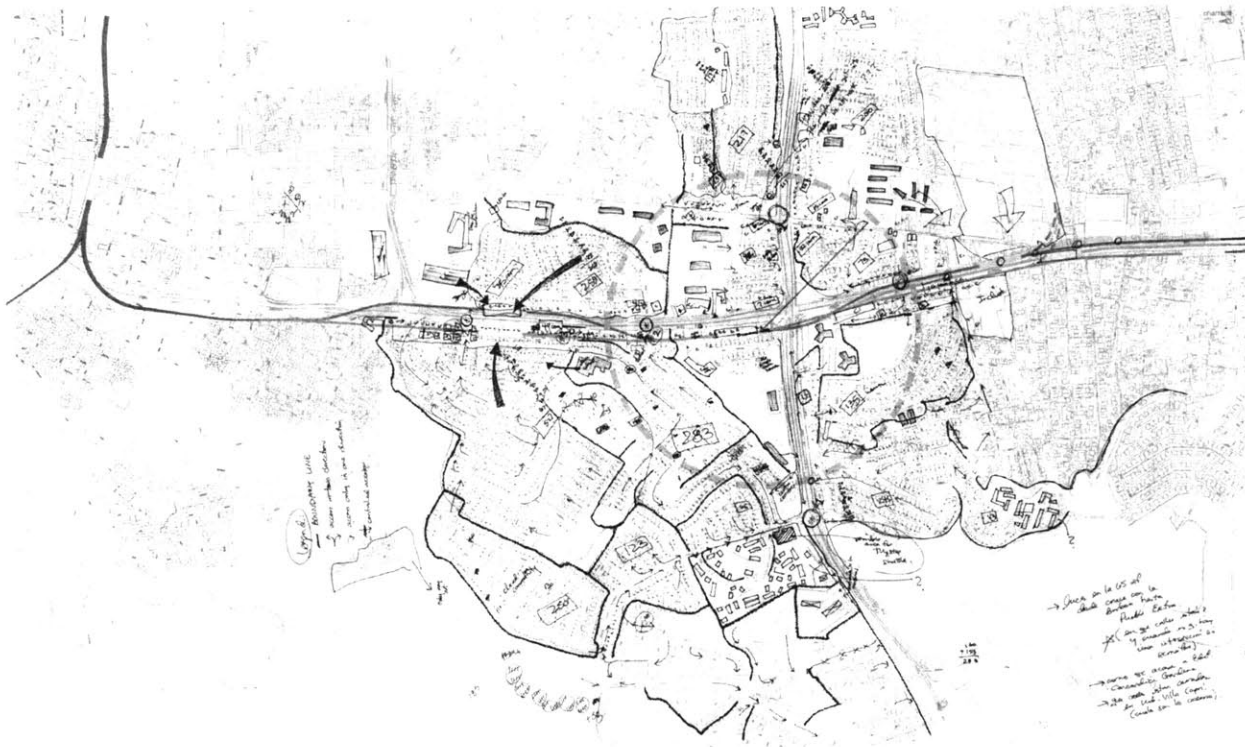


Figure 40
Station Area Diagram



denser development to happen
changing the character of the urban
area.

Figure 41
Regional Diagram.

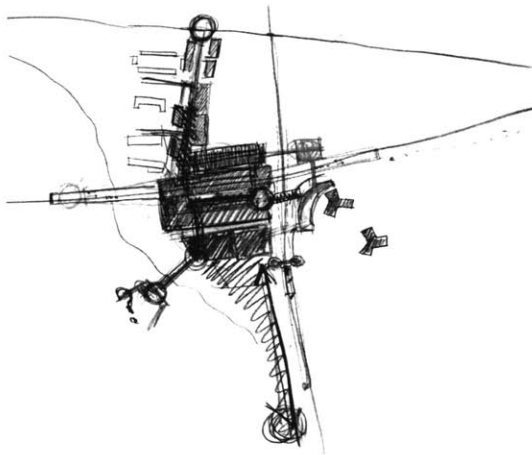
The site area can be developed with the notion of the “Law of Indies” in mind. A bigger understanding of the area should become the driving force for the new development. A central plaza area can become the focus of the development and from it, new streets can be extended through the whole site creating the structure for a vibrant neighborhood and a new way of designing the places where we are living.

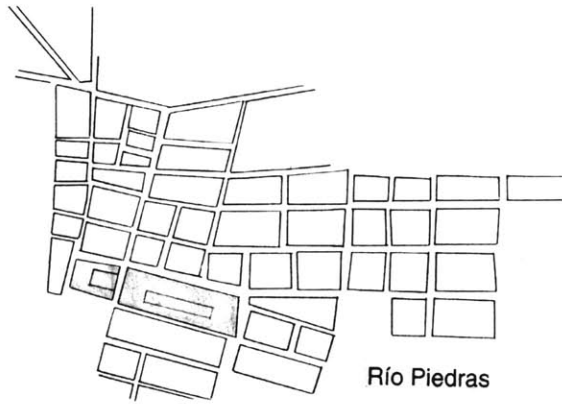
2. Local site area, Transportation Interchange & Town Center

At the same time the area is developed with a regional scale, it will need to serve the existing community in a different way. Some of the area’s problems result from a small resident population and a city form that does not relate to the inhabitants neither physically nor economically. The high density buildings located near the site are not supported by commercial activity. The economic activity located near the site responds to a different market, that of the car. It has become a specialized zone catered to a non-community population. Its main places are associated with private interests, not with the community. All the commercial buildings have to be accessed by car, and are fronted by parking. The area does not have a center of activity and does not have a sense of place that represents the needs of the inhabitants.

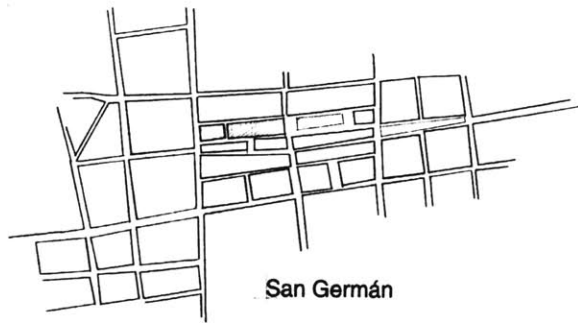
In order to revitalize and improve the area, people has to be brought into the site. And in order to do it, the public realm has to be emphasized. It is the domain that relates to all interests. One way of doing it is through the introduction of high density residential buildings that are sustained by local commercial activities and recreational facilities. Through the insertion of denser residential buildings around the station, commercial and recreational areas, shops, weekend markets, and the design of a built landscape that invites the inhabitants to dwell in the area and use the system, the station will be the node of the whole development. A development that focuses on the needs of the inhabitants through the introduction of diverse uses. New mixed-uses should be established. But how to spark the change? How to make the area cohesive? By creating a public framework that changes the existing city structure and creates a set of public spaces unified by corridors.

Figure 42
Land Use and framework diagram

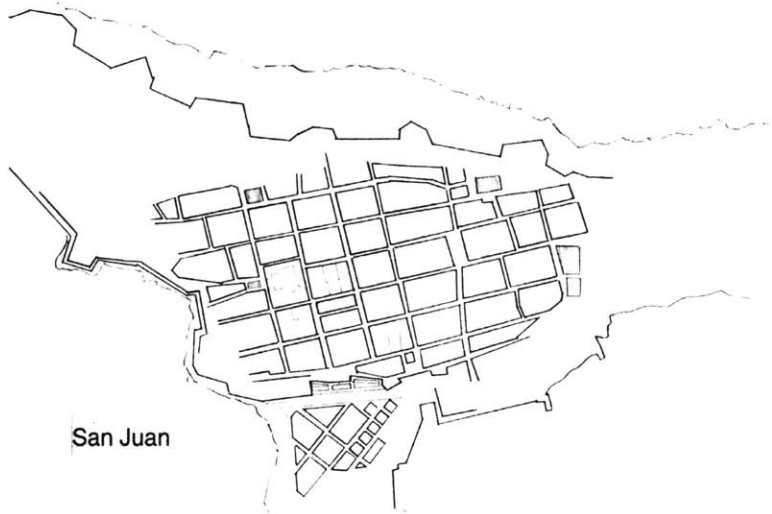




The towns of Río Piedras, San Germán and San Juan were settled following the “Law of Indies”. They got developed by extending the initial pattern. Even though today they show similar economic problems, they still have a strong structure that can be revitalized. The structure of the traditional towns can still be used to revamp the economic and social characteristics they once had.

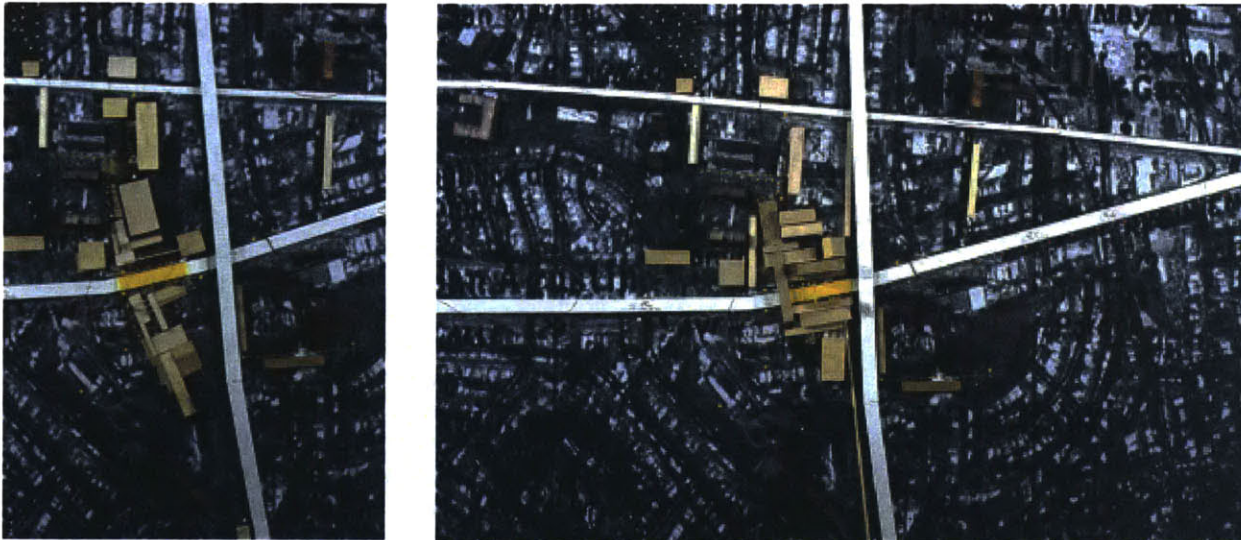


The framework for the site can be thought of as an organizing device like the “Law of Indies”. Designed for a military purpose, it was a way of relating the different powers of the time: the church, the government and the military. Unlike the traditional Roman towns that used the *cardo* and the *decumanus*, the “Law of Indies” divided the area in nine squares, the central one being the Plaza de Armas. On one side of the Plaza was the Government Hall, and on the opposite side was the Church. All the commercial activities were located around it. This device was a two-dimensional framework that became the infrastructure for the town development.



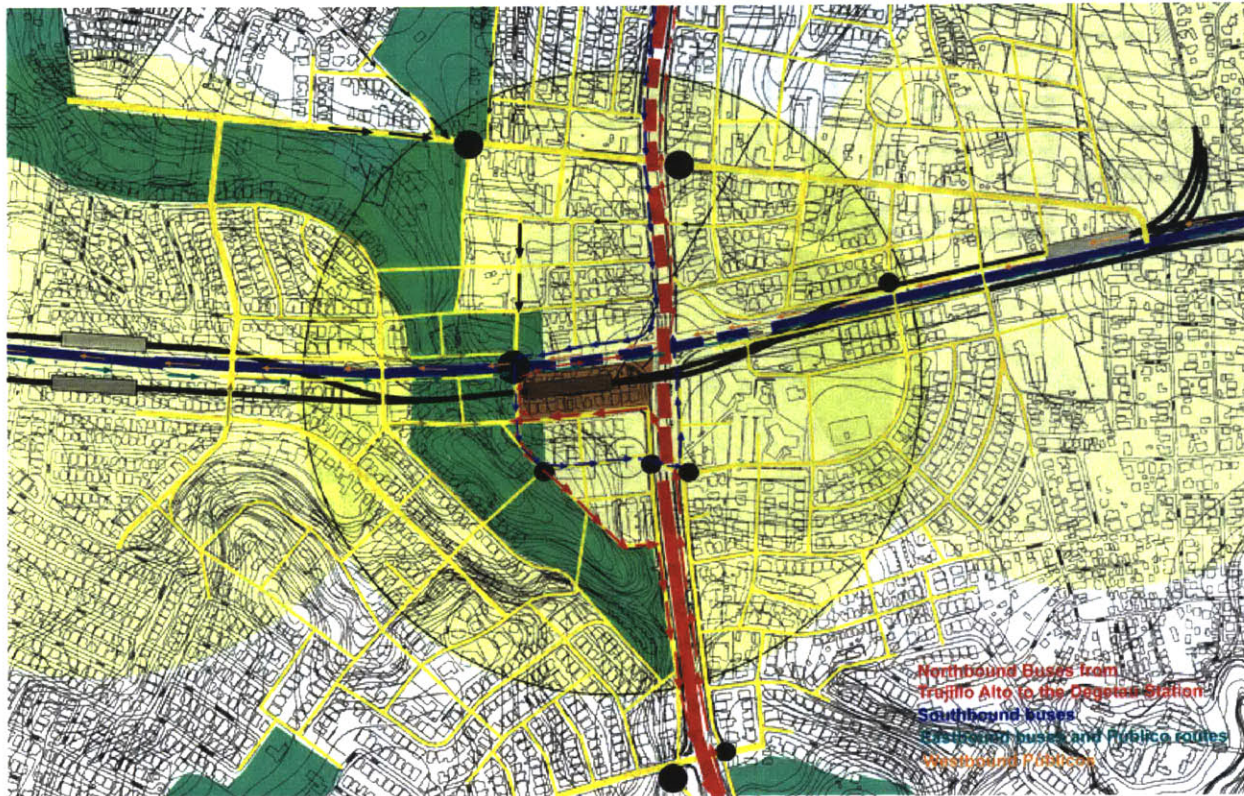
The different towns later got developed following the premises established by the “Law of Indies”. The framework was extended, creating several smaller areas that followed the same pattern or a deviation of it. This way, smaller plazas that were linked to the initial one were created. The town was connected.

Figures 43, 44, 45
Río Piedras, San Germán and San Juan.
Street pattern and town structure.



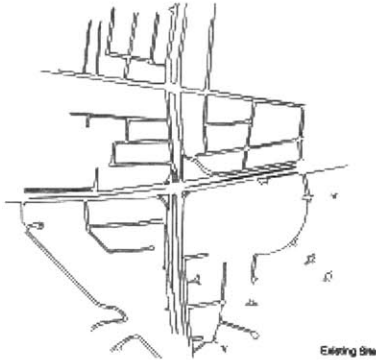
Figures 46 and 47
Framework Concept site models.

Models of site area and initial framework extending through it. They show the intersection of PR-3 and PR-181, as well as the De Diego Avenue to the north. On both models, the main development is located west of the intersection, creating a plaza area right on the PR-3. There are two different possibilities. The first one (to the left) shows a development extending north-south along a new street almost parallel to the PR-181 and west of it. This one emphasizes the connection between the Casa Klumb and the area south of the station block. The model to the right has a more nodal development around the station area. This one is formed with a structure parallel to the station block. On both models there are smaller nodal developments around the area, connected by landscaped streets.



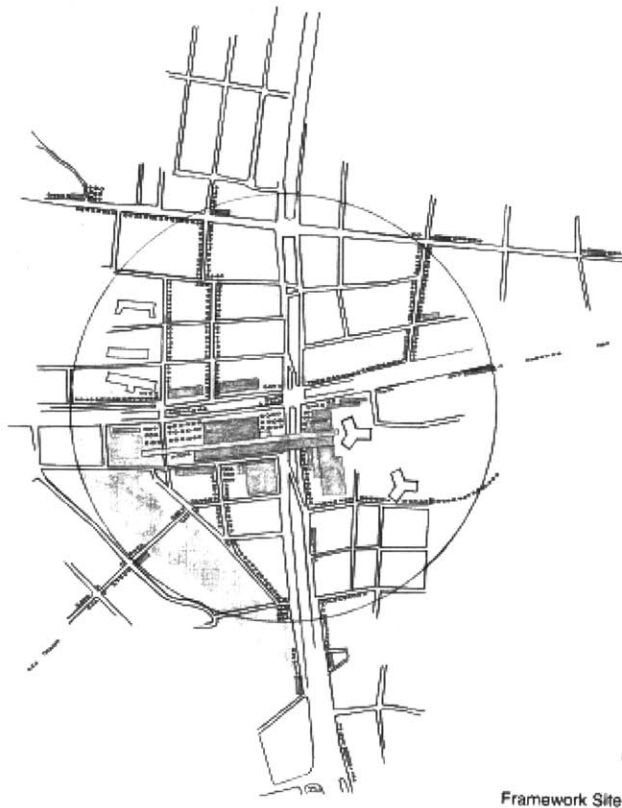
Site area diagram showing the greenbelt on the back of the Degetau station lot and the main locations for the smaller plazas within the framework. These are shown with black dots. The station lot is the same size of the Plaza de la Convalecencia in Río Piedras. The circle around the area represents the primary area for the development, and has a 1/2 kilometer radius. This is an approximate distance that can be walked in 10 minutes. The other colored areas are the areas around the other stations, the Barbosa and the Sábana Llana stations. The diagram also shows the new street pattern that was developed as part of the framework.

Figure 48
Greenbelt Diagram showing the greenbelt and the main location for the smaller plazas.



The existing area is formed of unconnected streets and cul-de-sacs. The neighborhoods are both divided and contained by the PR-3 and PR-181 into four different zones, each at one corner of the intersection.

Figure 49
Diagram showing the existing street pattern.



The station is designed to be the central plaza of the development. It is conceived as a big open space that is fronted by tall buildings zoned for both commercial development and residential use. It is also seen as a spine that will unify the two sides divided by the overpass, the areas east and west of the PR-181. This will allow for connections within the area.

Figure 50
Diagram showing the extents of the framework and the station location.

Model shows the station area and its relationship with the greenbelt. The boulevard can be understood as an extension of the greenbelt.

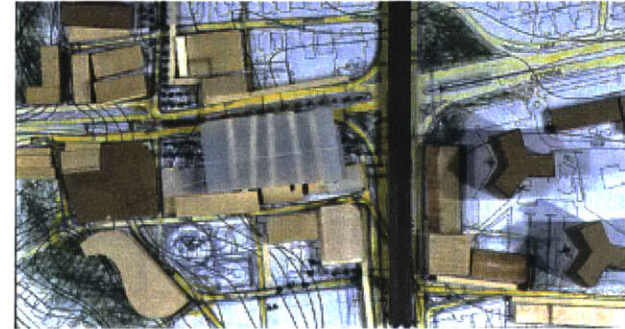


Figure 51
Conceptual Model

Model shows the station lot and the existing streets in white, and the important connections needed within the area.

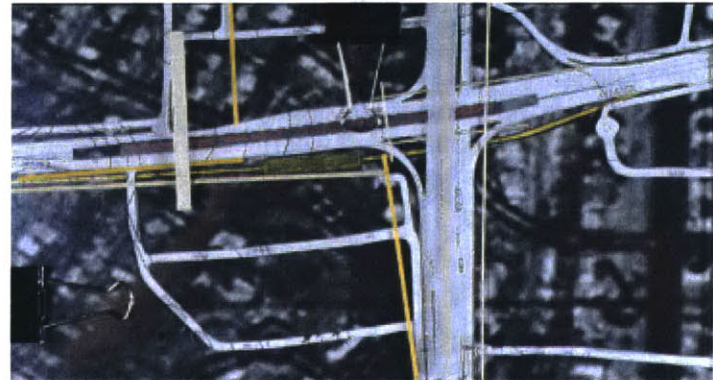


Figure 52
Plexiglass Model

At the local scale, the framework will provide a strong physical identity. With the plazas, the retail shops, and the architecture, the local identity will be emphasized. It will also include a variety of small scale elements in the public areas that will be brought from the architecture of the station. This will enhance the sense of comfort and place of the area, and at the same time will provide for a sense of security. A pedestrian network with open spaces, pathways and public functions can enliven the plaza and its surroundings.

As part of the framework, the subway station will also have a transportation interchange. It will include an area for the buses, drop and pick up areas, parking areas, shops/stores, special days markets or activities, among others. The transportation interchange is based on the following ridership table.

Ridership Assumptions for Degetau Station

Current Ridership

Total Riders w/o Park & Ride	6785
With Park & Ride (add 10%)	7464

Mode Share (assuming Martinez Nadal Station Modal Split)

Mode	Mode Share (%)	Mode Share (#)
Walk	30	2239
Drive	16	1194
Transfer	54	4030
Total		7464

Walking

Radius (miles*)	Actual Population	Pop. New Dev.	Actual % TU	Add. % TU	Rid. Act. Pop.	Rid.Add.Pop.	Total
(*people living in 1/4 mile bands around the station)							
1/4	3,167	2,000	38	50	1200	1000	2200
1/2	10,800	1,000	14	25	1039	250	1289
Total					2239	1250	3489

The actual people living 3/4 of a mile from the station is 26,390. This total was not included in the ridership assumptions estimates.

Transfer (from Bus or Publico)

Boardings* from South of Degetau Station	% using Bus	Bus Transfer South	Transfers N, E & W of Station	Total Transfer
26,000	33	8700	1000	9700

* Assuming a Rapid Transit Line from Trujillo Alto to Degetau Station

Final Ridership Numbers by Mode

Mode	Mode Share (#)
Walk	3489
Drive	1194
Transfer	9700
Total	14383

This data shows that a new development that brings people to the area can signify a considerable amount of new riders to the system. If the population of a 1/4 mile radius area around the station is increased by 2,000 persons, and 50% of those use the system, that will mean 1,000 new riders. If the population that lives 1/2 a mile from the station is raised by 1,000, and 25% of them use the system, that will mean 250 new riders. The assumed actual riders are 2,239, and after adding the assumed riders from the new development the total is an estimated 3,489. If we also add to the assumed actual riders using a RTL from Trujillo ALto to the Degetau Station of 26,000, and estimate that 33% of them are going to use an express Bus service from the South, that turns out to be 8,700 new transfers from south of the station. If we add the estimated 1,000 transfers from N, E, and W of the station, that gives us a total of 9,700 new transfered persons from a bus service. The new ridership numbers are increased from 7,464 to 14,383, a considerable amount.



Figure 53
*Plaza de la Convalecencia,
Río Piedras*

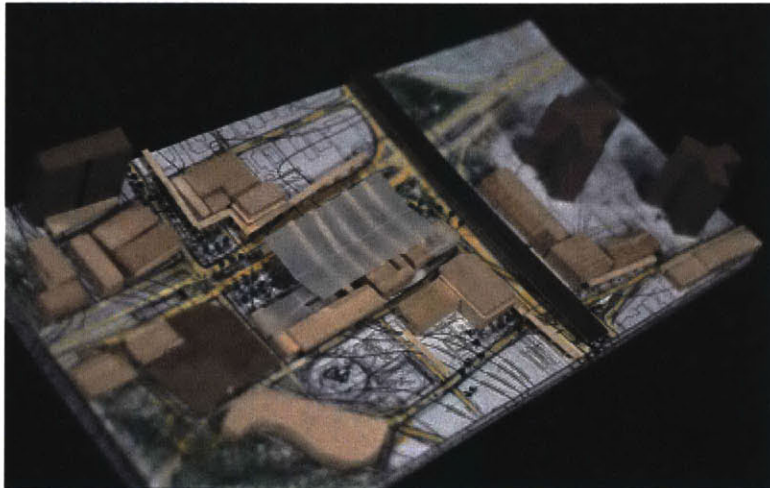


Figure 54
Initial concept model showing the idea of the central plaza/station becoming the core of the framework. The framework extends from the station towards the whole development, influencing it. On both sides of the station there is a smaller size plaza covered with trees. These trees are placed in a grid that extends through the station.



Figures 55 and 56
Initial model showing the first station organization within the site and the boulevard concept. Station and boulevard are designed as a plaza. The station also has connections to the greenbelt and to the Concordia Gardens Buildings over the overpass. Figure 56 shows the station as a gate to the Plaza/boulevard space. View of the model is towards the east.



Figure 57
*Plaza de Armas,
Old San Juan*

3. Architectural Scale, Plaza Concept



Figure 58
Site Framework

Traditionally, the plaza is a symbol of identity, a center in where to converge, a reminder of towns from which the urban activity was generated. The design of this station was focus in this idea. The station was designed to be the plaza, the central area of the development and the catalyst for the revitalization of the area. The station is where the framework begins and stretches towards the rest of the area. Like the Plaza de Armas in the “Law of Indies”, the station now becomes the center of the town.

How to design the station as a plaza? What are the characteristics that make a plaza a public and civic space which enhances social and commercial activities? How to design a framework as an architectural device that brings out a particular aspect of the area?

In order to design the station, there were some basic ideas that were considered. First of all, the size of the plaza needed to be similar to the size of the Plaza de Armas. Recognized as a size that feels public and civic, and is already uncounsciously present in the minds of the people, it was understood as a size that could be used for this design. Interestingly, the size of the station lot that was given was similar to the size of the Plaza de la Convalescencia in Río Piedras. But how to design a plaza in this location when PR-3 divides the area? This issue is solved by introducing a tunnel for the through traffic along PR-3. This allows for the transformation of the existing road into a pedestrian boulevard. Second, the plaza and the station are going to be understood as almost the same thing. This way, the boulevard designed on PR-3 is unified with the area and becomes an extension of the station area. The “plaza” becomes wider and has a stronger presence

in the neighborhood. Third, to define the edges of the station and the plaza area, the street facades of the adjacent buildings are used. These edges are high enough to define the area and give a strong presence to the “station building”. Fourth, in order to bring social and commercial activity to the area, public spaces, recreational facilities and commercial buildings are introduced as part of the framework and architecture of the station. The buildings that define the area edges are designed as mixed use buildings that have commercial activity at grade and residential spaces on the upper floors. Also, to further improve the activities, stores are included at the different levels of the station. Fifth, the circulation pattern within the station needs to be similar to the circulation pattern of the public spaces. In order to do so, the circulation pattern begins outside of the station, specifically, in the boulevard and the greenbelt. This circulation pattern is reinforced by the framework which invites the people to enter the station as if it is part of the outside area. Sixth, the station needs to address the movement of people who are arriving in other transit modes or on their cars. Emphasis is given to the people using other modes of public transportation. Seventh, the station is designed with a central spine that divides the area in two main areas: the area for the buses and stores and the open area that is used as the main pedestrian entry. This spine also connects the entertainment center located east of the overpass at one side, and a smaller scale plaza which is part of the greenbelt at the other side. It can be understood

as the main circulation area within the station. Eight, in order for the station to complement the scale of the overpass and not look small next to it, the station is designed as a building that incorporates the overpass within it. In this way the overpass becomes part of the station and not an exterior element that divides the station in two areas. Ninth, an entertainment complex is designed as part of the station. It is located east of the overpass, and acts as an anchoring element that gives the station a regional presence. It also activates the station by bringing people in at different hours and for different purposes creating a vibrant and active space. Tenth, since the entertainment complex is designed in a lot presently used for at grade residential parking for the Concordia Gardens Buildings, a new parking structure has to be built. This new parking structure will activate the ground level by incorporating commerce and stores with products and services oriented mainly for the residents. These stores incorporate part of the framework that extends along PR-181, having similar architectural elements. Eleventh, to activate the pedestrian crossing under the overpass, a smaller scale plaza is also designed. This space can be used for special markets or different daily activities.

Following are the model pictures and architectural drawings that represents these ideas.

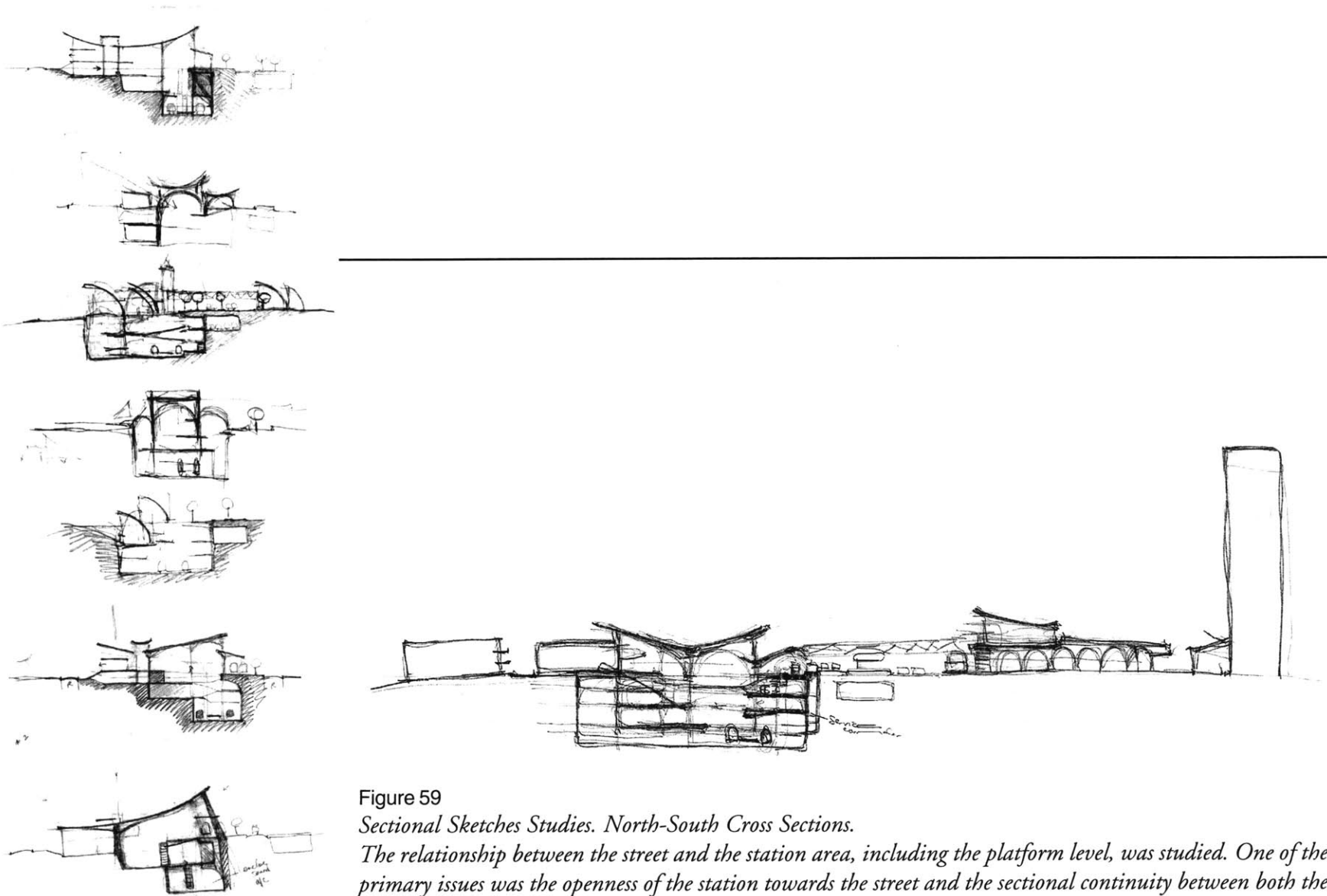


Figure 59

Sectional Sketches Studies. North-South Cross Sections.

The relationship between the street and the station area, including the platform level, was studied. One of the primary issues was the openness of the station towards the street and the sectional continuity between both the grade level and the platform level.

Figure 60
Sectional Sketches Studies.
North-South Cross Sections.

The sketches show different ways of conceiving the roof of the station and ways of relating the street and the subway. These were drawn during the initial design development.

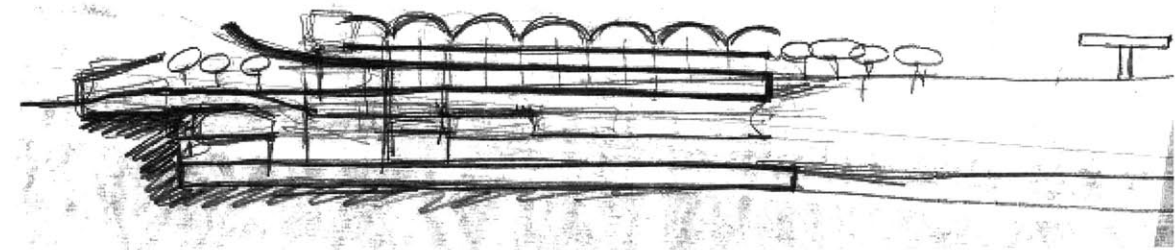
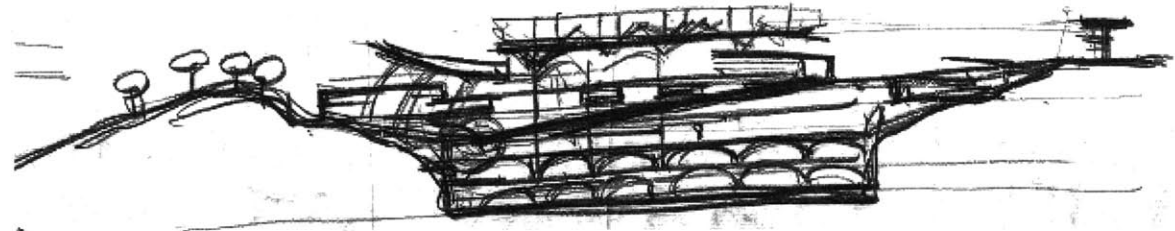
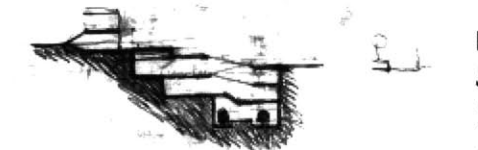
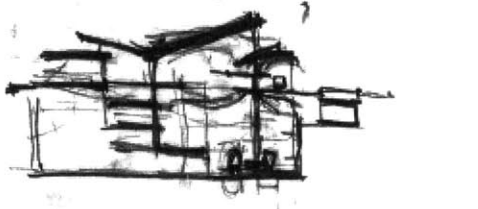
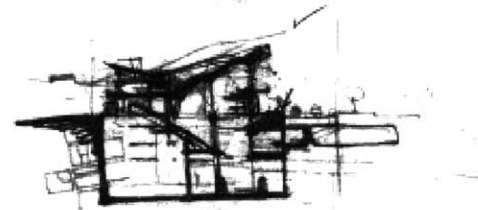
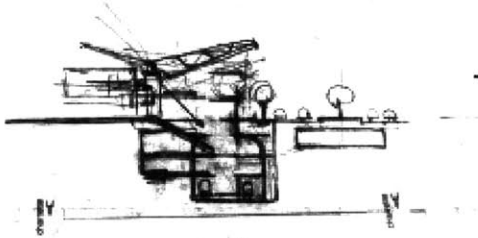
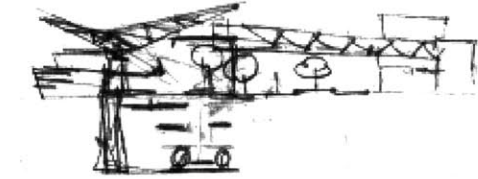
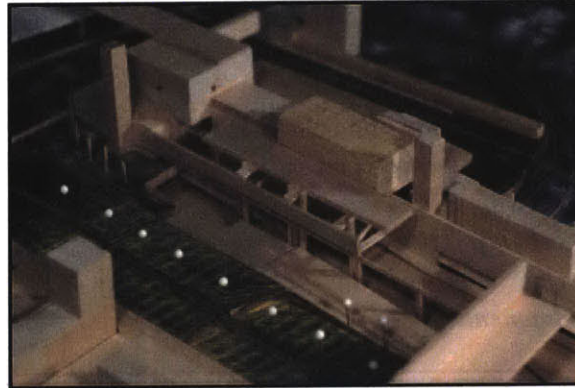


Figure 61
Sectional Sketches Studies. East-West Longitudinal Sections.

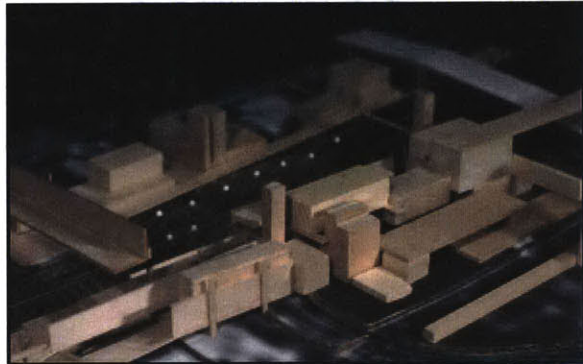
The sketches show initial ideas of how to relate the two ends of the station, one being the main pedestrian entry connected to the greenbelt, and the other being the overpass.



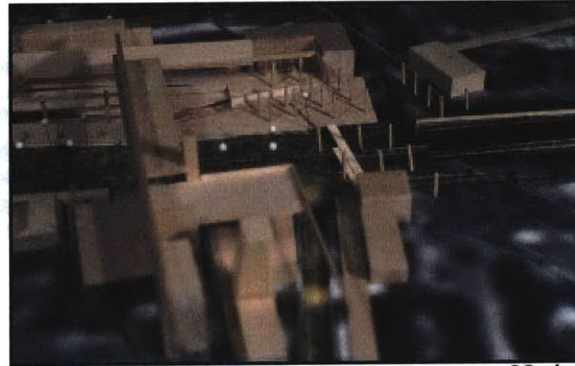
62-a



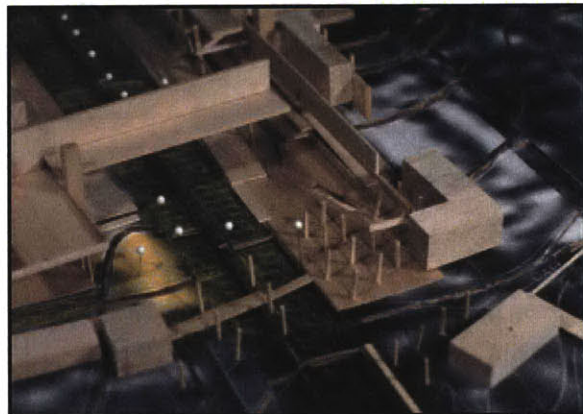
62-b



62-c



62-d



62-e



62-f

Figure 62

Initial model showing the architectural idea for the station and the primary volumes. At the beginning the PR-3 was thought of as the plaza.

62-a Station and street forming the central area.

62-b Station open to the street.

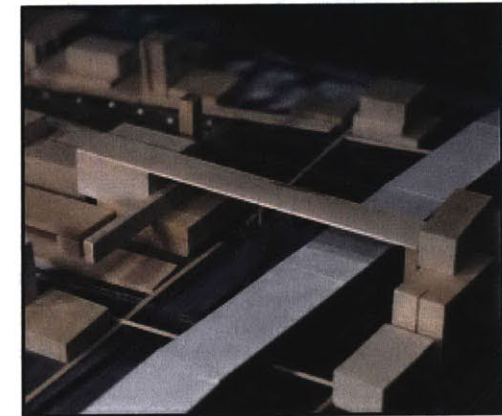
62-c Massive edge on the back of the station, defining its boundaries.

62-d Extension north of the station. Initial notion of framework extending towards key areas.

62-e Smaller scale plaza located at entry. Pedestrian scale is emphasized.

62-f Station bridges over the PR-3, defining the plaza/street area and creating a gate.

62-g Initial bridge over the overpass. An attempt in connecting the other side of PR-181.



62-g



Figure 63

*The station is an open space, a plaza defined by the two flank-
ing street facades of the buildings adjacent to it. The Station is
the whole area.*



Figure 64 and 65

*Strong relationship between the street level
and the station platform. This was
achieved by using a strong sectional
continuity between both elements. Because
the plaza is sunken, the subway has a
sectional continuity with the street level.
At the same time, because the ground level
is coming down into the ground, and the
green is coming in, the connection between
these elements is emphasized. The
greenbelt is brought in also.*

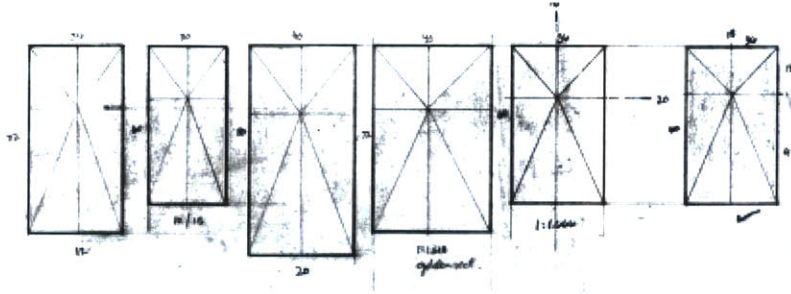


Figure 66

Proportions studies for the size of one roof unit.

The roof is made of several tree-like structures. These structures are made by one column/one tree trunk, and a thin shell/tree canopy. The total units made up a built landscape that becomes an extension of the green belt.



Figures 67 and 68

The roof of the station becomes a metaphor for the tree canopy, sheltering the plaza from the elements and introducing the notion of having nature at the site. The nature becomes part of the framework. The trees in the plaza are part of the structure of the station. They are a built landscape coming in and becoming the columns and the roof shell of the plaza, creating the different levels of the station.



Figure 69

Visual continuity of the spaces through the plaza. The structure forms a series of layers that have to be passed through by the user and can be perceived from the exterior of the station. The visual continuity is heightened by the circulation system.

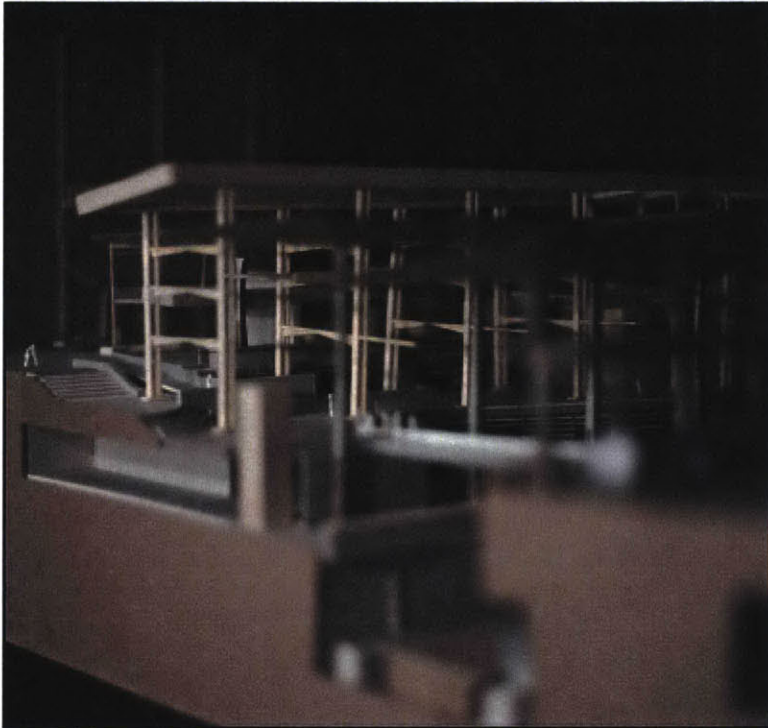


Figure 70

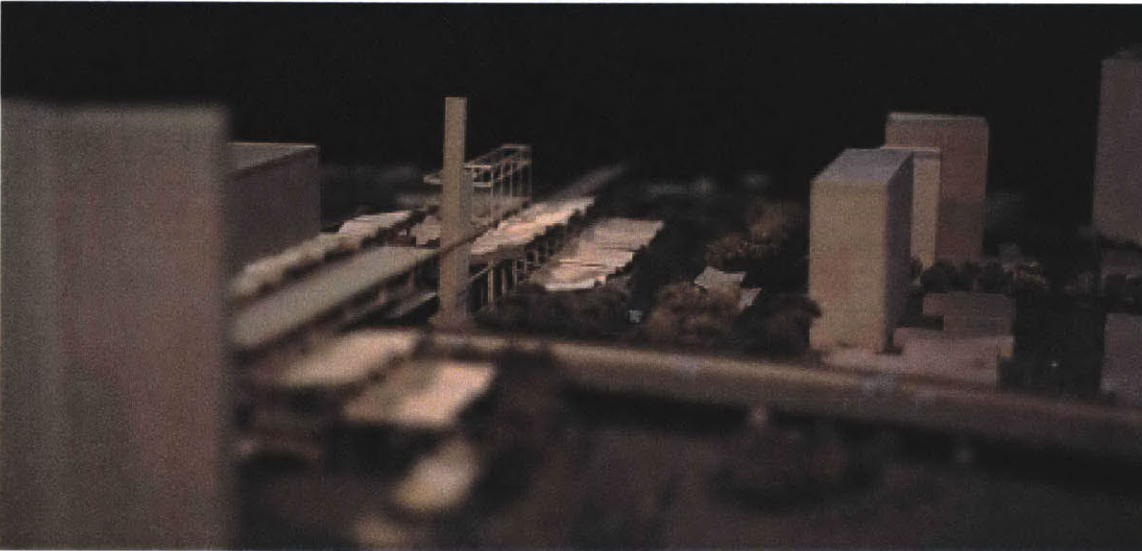
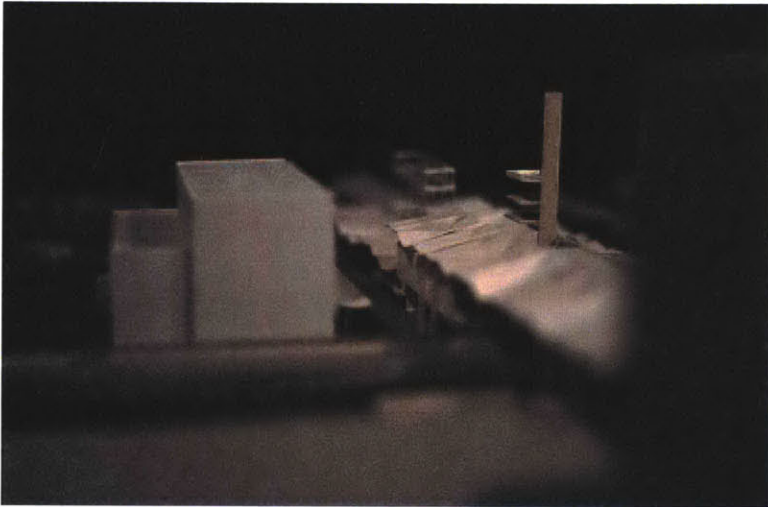
Visual continuity is also achieved by introducing a system of layers. People move through these layers in order to inhabit the spaces. They perceive these along the different paths and areas.





Figures 71 and 72

In order to create a pedestrian environment and lower the scale of the PR-3 and the at grade traffic volume, a through traffic tunnel under PR-3 was inserted in the design. The through traffic tunnel under PR-3 was emphasized by the boulevard designed over it. This way the pedestrians are able to take control over the area and inhabit it. Figure 71 shows an aerial view of the tunnel entry located east of the overpass in front of the Concordia Gardens Buildings. Figure 72 shows a sectional cut of the tunnel, the new at grade boulevard, and its relationship with the station.



Figures 73 and 74

From the distance the area is defined by a tall element that becomes the icon for the whole development. A tower marks the area as a civic space and gives a strong identity from afar. The tower is placed within the station block and almost at the intersection of PR-3 and PR-181. It is next to one of the smaller plazas located at the ends of the station.



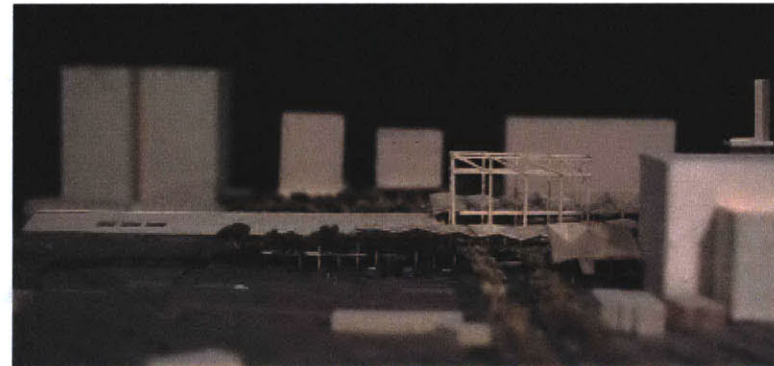
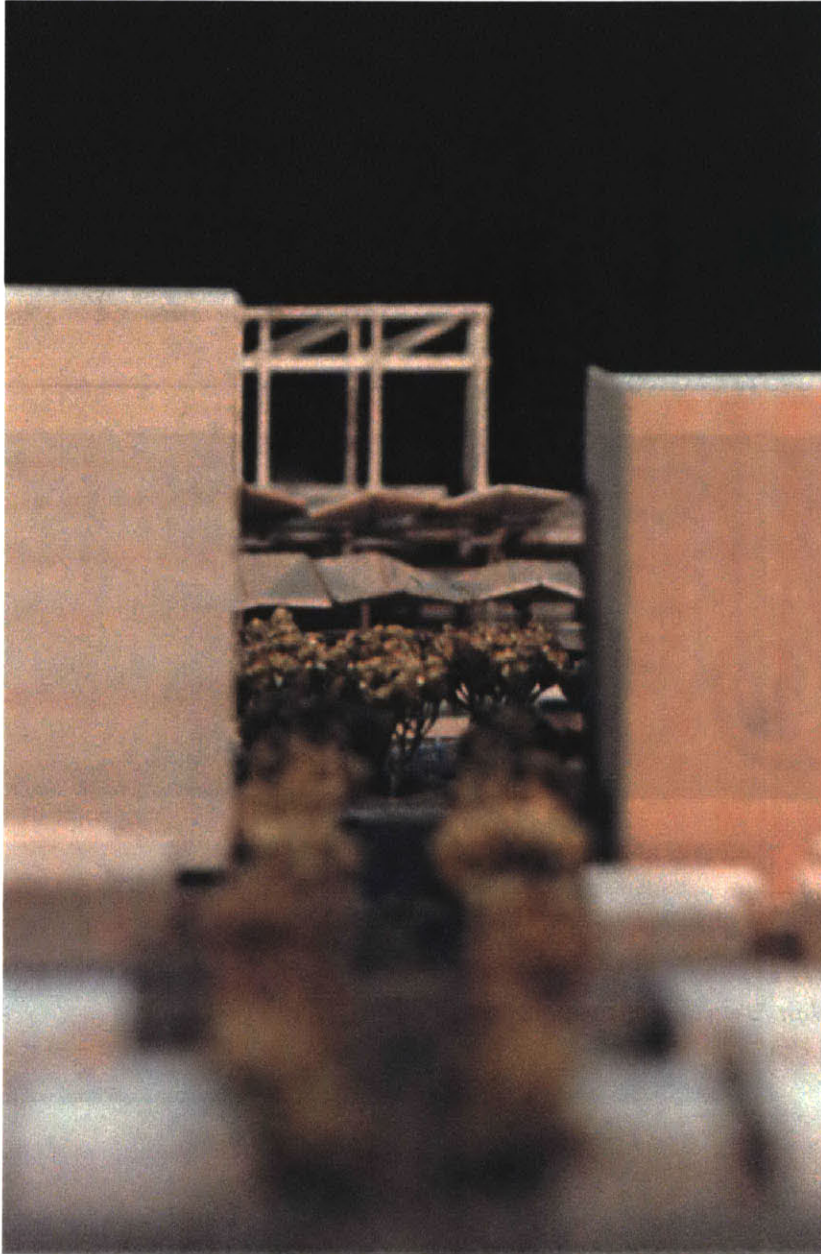
Figures 75 and 76

The station can be seen from several streets pulling people towards it. It invites the users to inhabit it. These views are taken from the streets perpendicular to the station block. Glimpses of the station structure can be seen from the surrounding area.



Figures 77, 78 and 79

The main pedestrian path and streets are emphasized by a taller element within the station. A structural frame located almost at mid-station acts as a marker for direction and movement. Visually, it pulls people towards the station and demarcates the main north-south pedestrian path.



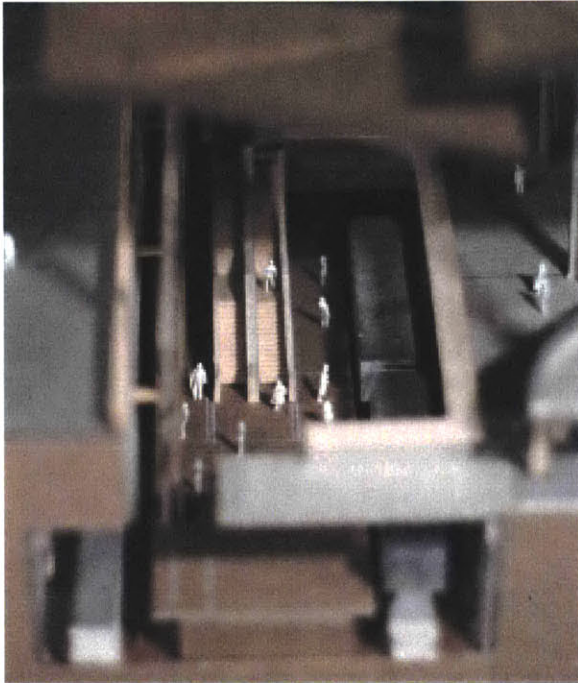


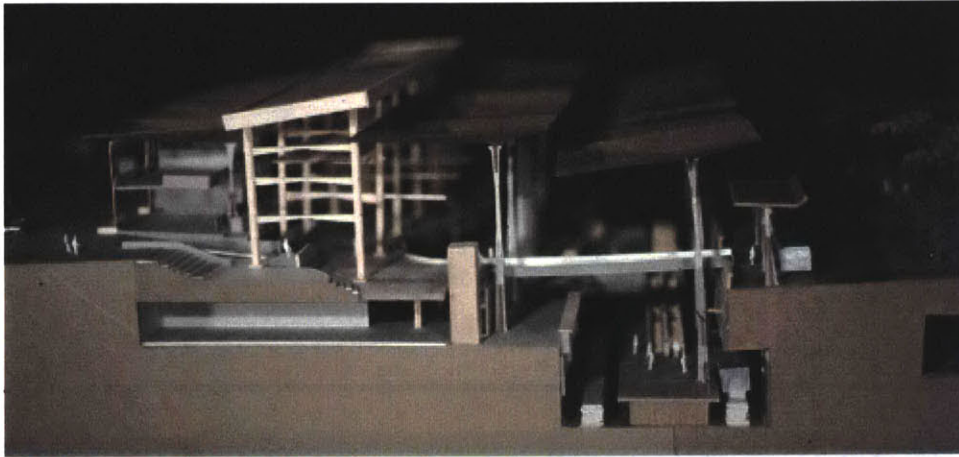
Figure 80
The fare collection booths are located at the mezzanine level and can be seen from the street.

Figure 81
The escalators to go to the platform are located parallel to the street, establishing an interesting relationship between the movement of the cars and the movement of the people. The circulation system allows different areas be seen and related through several key views. Perception of movement and a good orientation within the area are also important.



Figures 82, 83 and 84

The location of the bus stops was also important. There is a small bus stop at the boulevard. The main bus interchange area is located on the back of the station. A central spine divides this area from the open/central space. Next to the main bus area there is one pedestrian entry and stores.



Figures 85 and 86

To emphasize the connections within the station and from the boulevard to the back of the station, an interior bridge was placed inside. It bridges over the open area and connects the boulevard and the main pedestrian entry on the back. This main pedestrian entry is located between the stores and the entertainment complex.



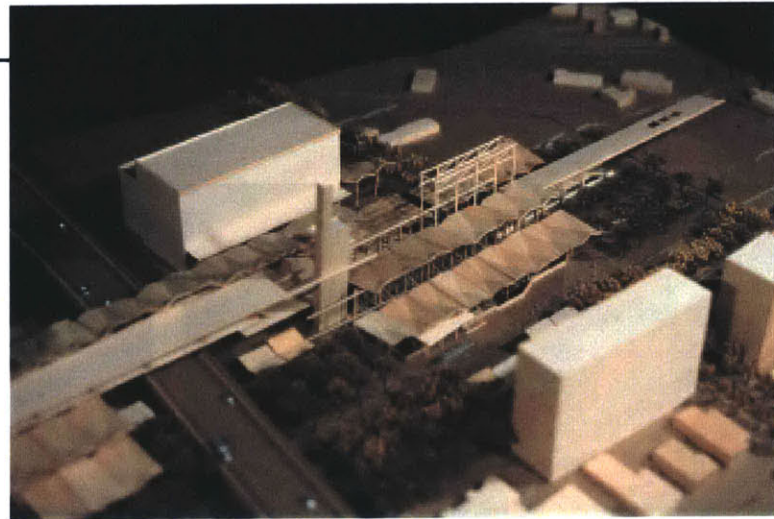
Figure 87

Because the entertainment complex located next to the Concordia Gardens Buildings will take up space currently being used for parking, there is a new structure parking located next to it. This parking will include stores catered for the regional and local inhabitants. This area is also part of the framework extending over the neighborhood.



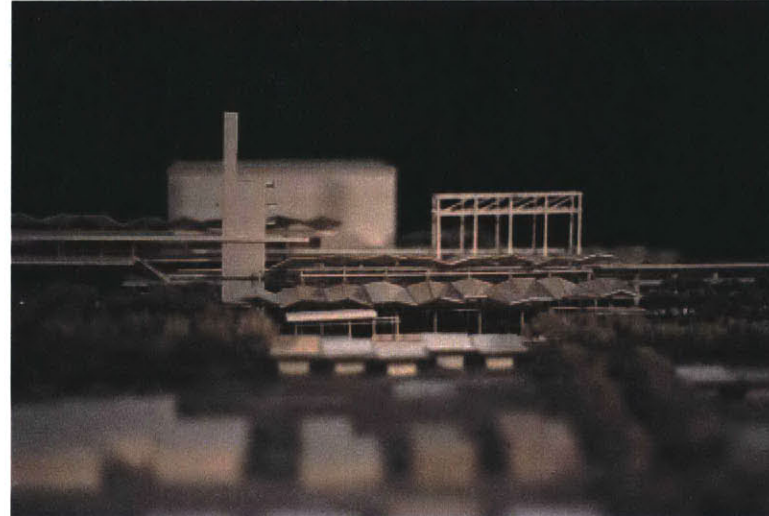
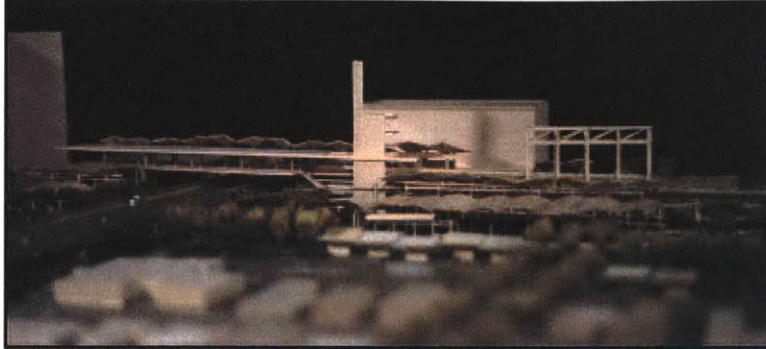
Figures 88 and 89

There is a bridge over the overpass that connect the two sides of it, the Concordia Gardens Buildings and the station block. It is not meant to be understood as a foot bridge, but as part of the station building. This way, it is the station that bridges over connecting the two sides. This area has the entertainment complex and can also be seen as a gate. Even if you go under it with your car, you enter the station zone. The left slide shows an aerial view of the bridge area, and the right slide shows a view from the north.



Figures 90, 91 and 92

The boulevard is a continuation of the station. By using similar architectural elements and the framework that extends over the area, the boulevard is perceived as part of the station. It is also perceived as a finger of the greenbelt area located at the back of the station coming in. It is through the plaza that nature is brought into the station.



Figures 93, 94 and 95

Main body of the station. The top figure shows the central area of the station and the north facade. The boulevard and the market stalls can be seen in the middleground. These are part of the framework and use a similar architectural style. The left figure shows an aerial view of the central station area, and the left figure shows the north facade of this same area. The station tower can be seen as a marker while the structure frame demarcates the main pedestrian path.

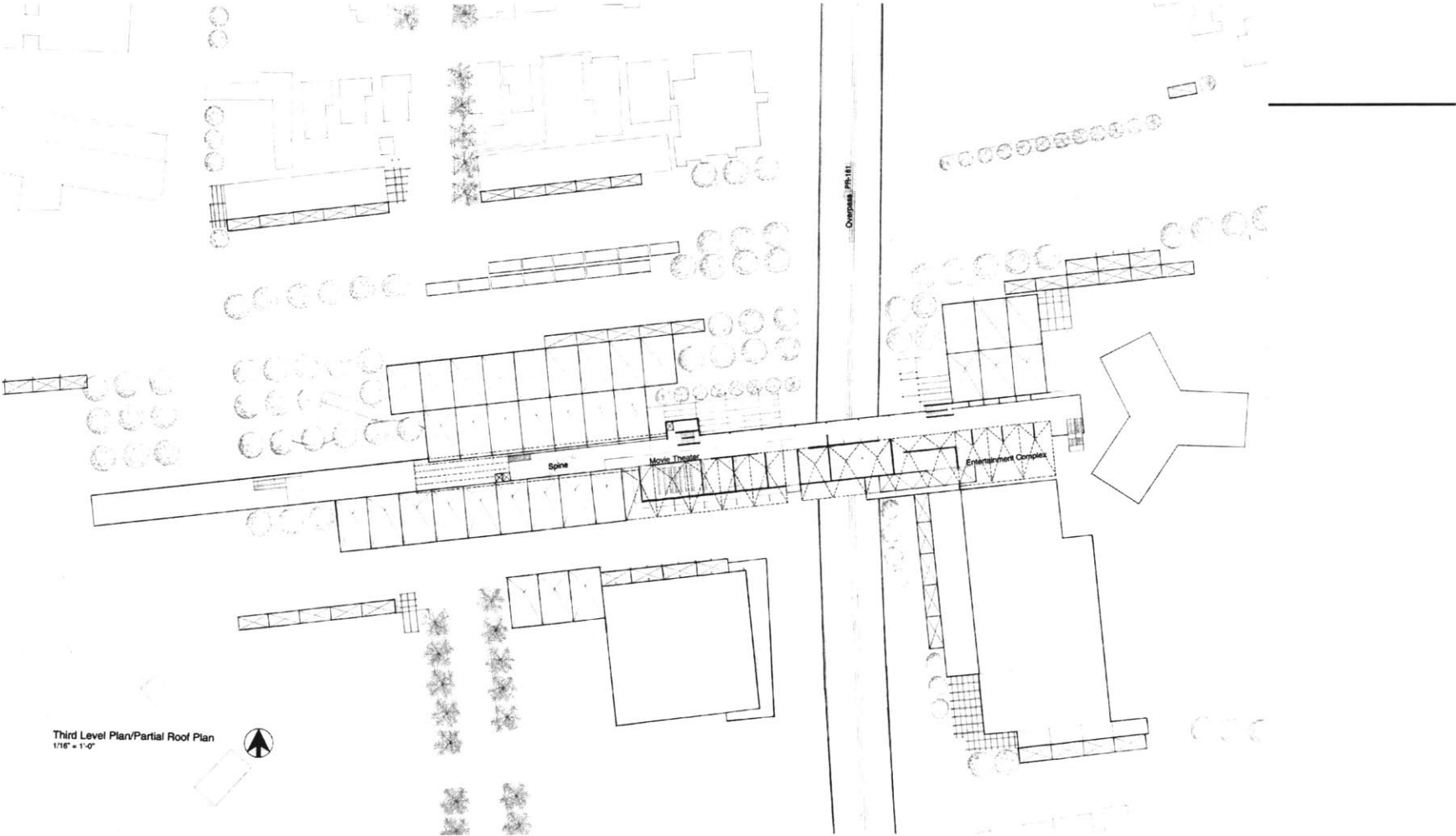
Figure 96
Final model, aerial view



Architectural Drawings . . .

Figure 97

Third Level Plan/Partial Roof Plan



Third Level Plan/Partial Roof Plan
1/16" = 1'-0"



Figure 98
Ground Level Plan

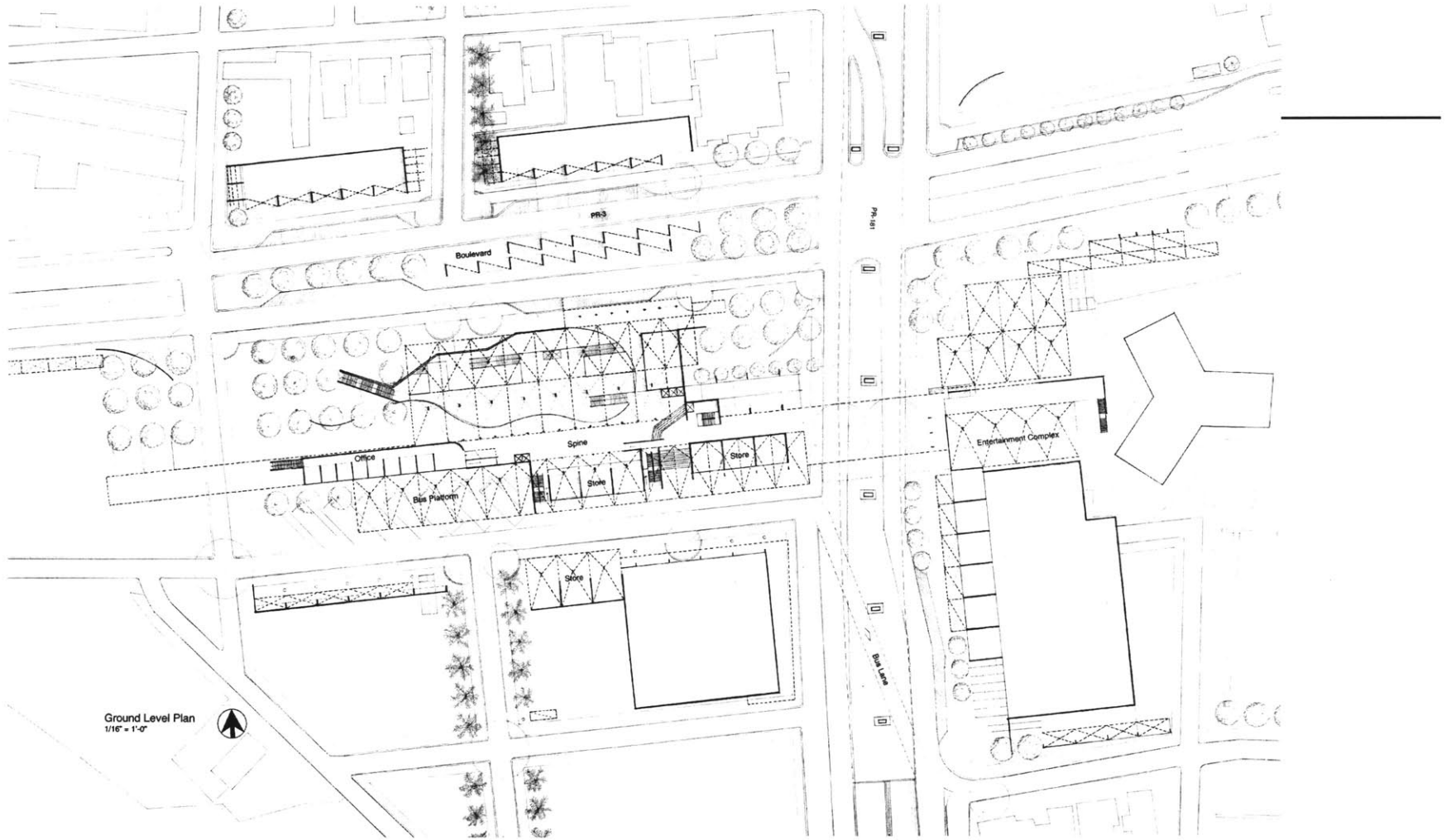


Figure 99
Mezzanine Level Plan

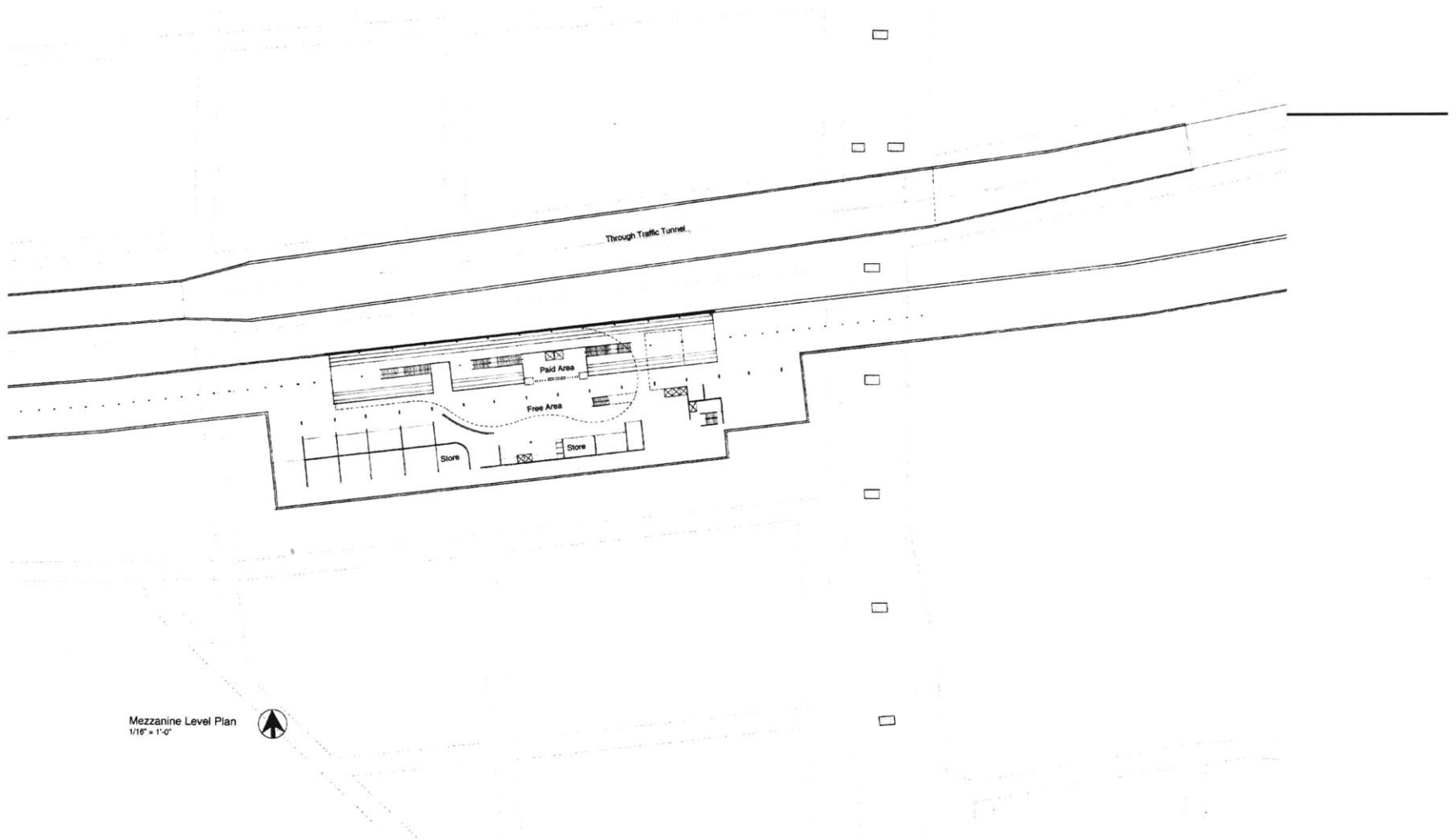
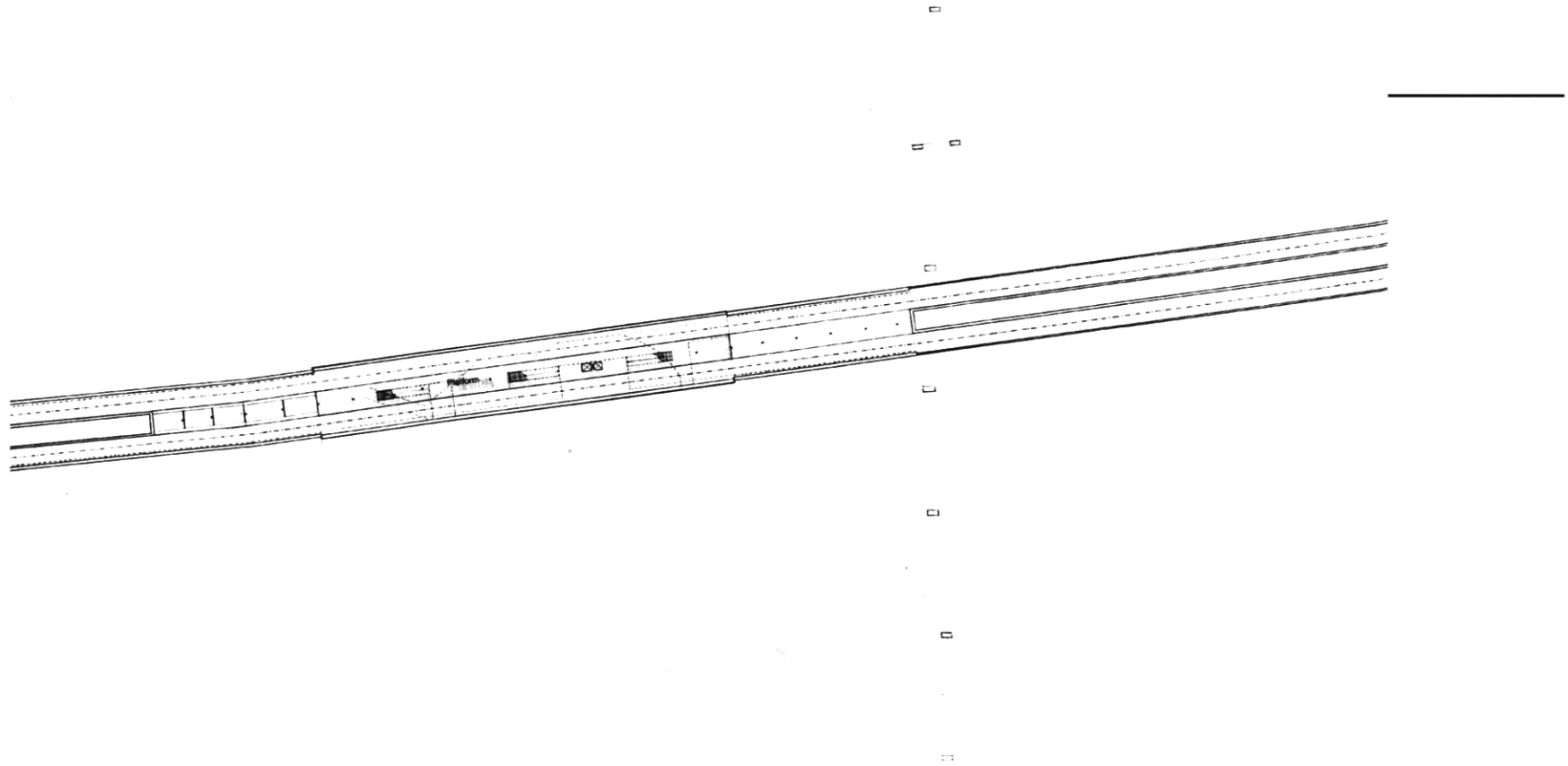


Figure100
Platform Level Plan



Subway Platform Plan
1/16" = 1'-0"



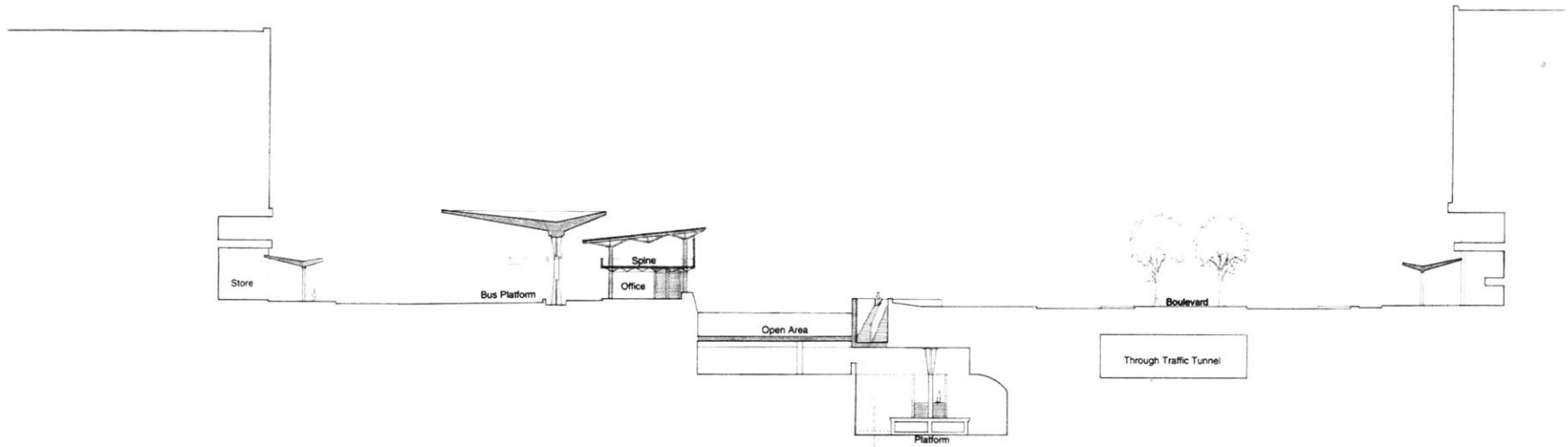


Figure 101
Cross Section A

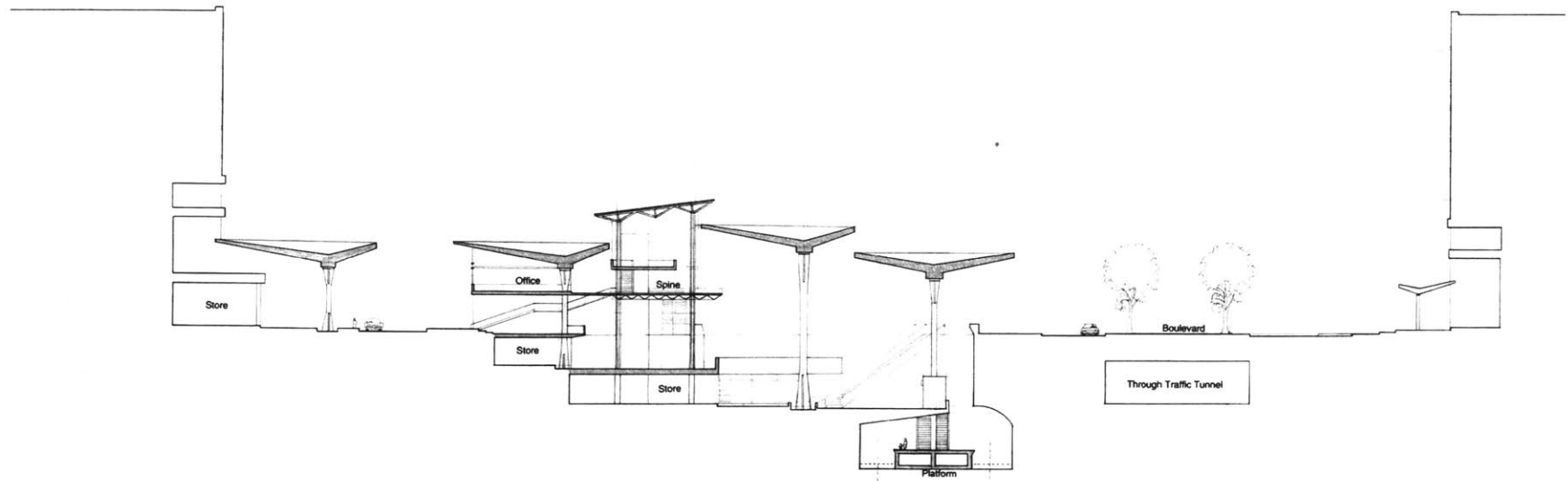


Figure 102
Cross Section B

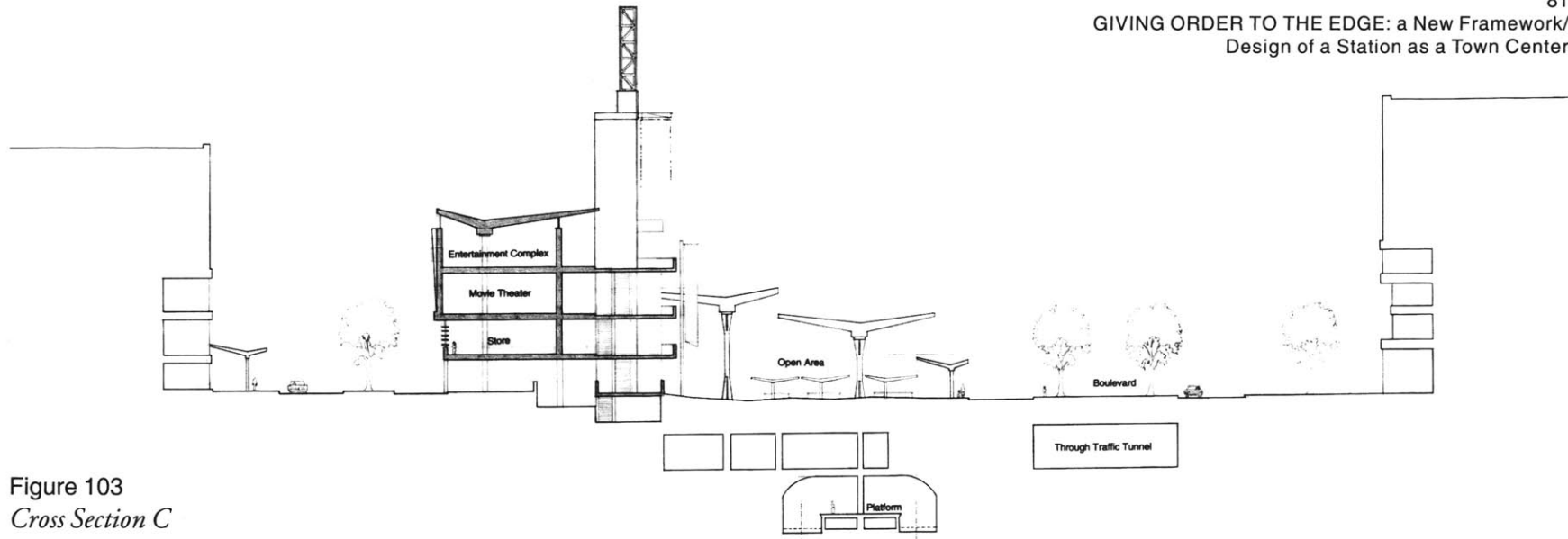


Figure 103
Cross Section C

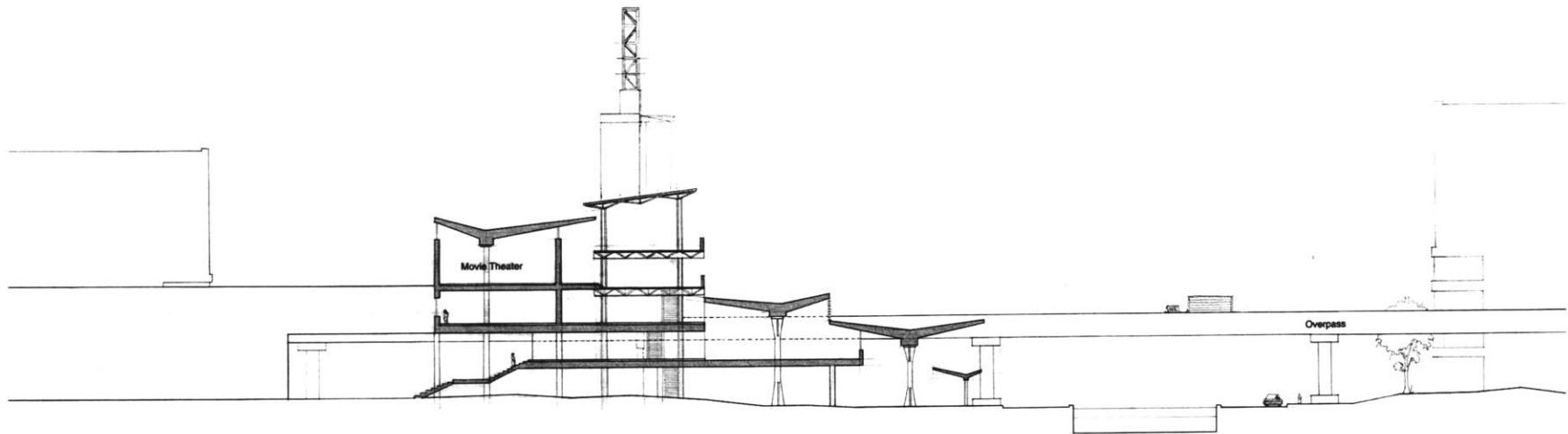
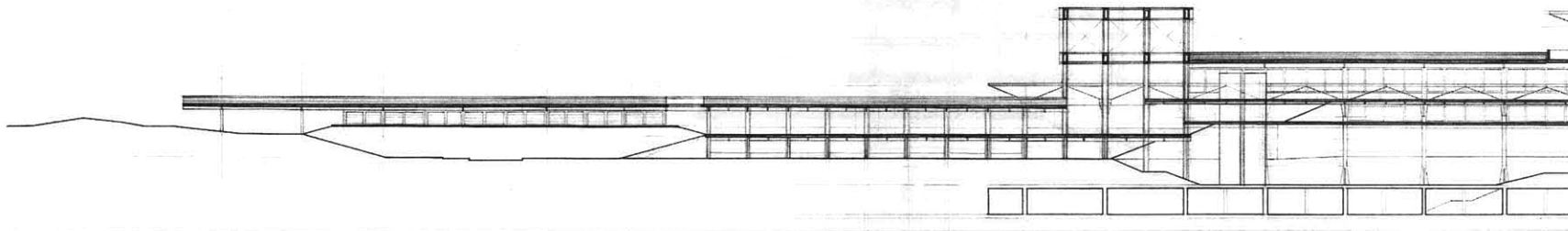
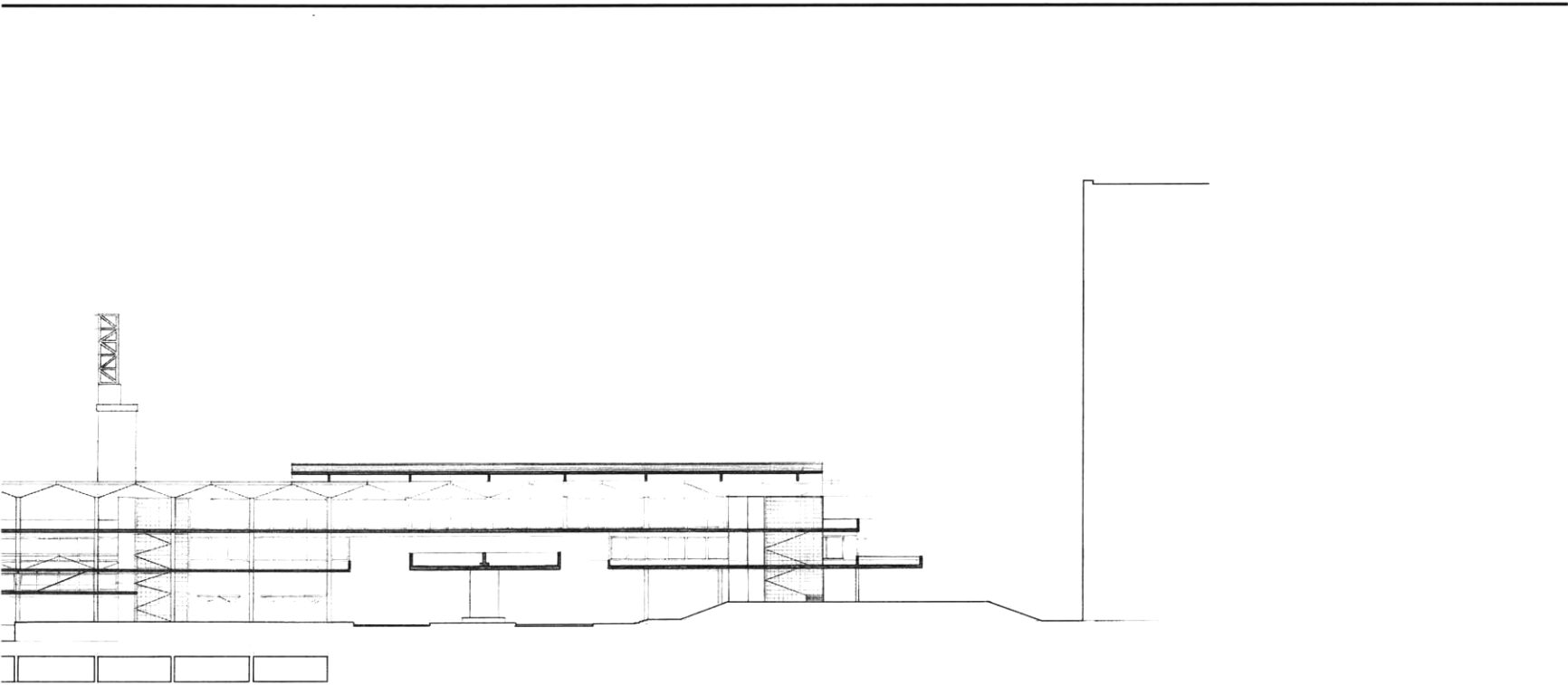


Figure 104
Cross Section D

Figure 105
Longitudinal Section E







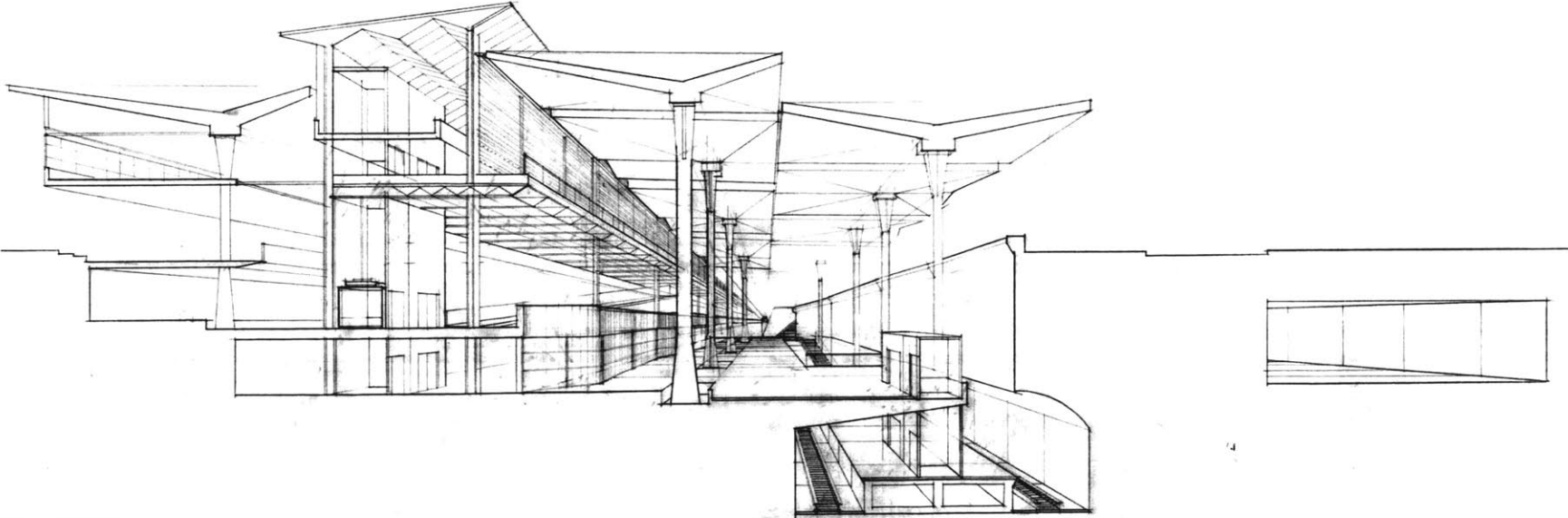


Figure 106
Sectional Perspective



Conclusions and Recommendations

This are the basic recommendations generated from this Thesis. They are an inventory of ideas to draw from when designing and building the actual project.

- 1.** Establish a design framework to revitalize the area surrounding the station. The framework has to be composed of both architectural elements and landscape elements. These two elements will create the basis for a new use of the area and more activities within it, influencing the whole neighborhood. The framework will become an infrastructure and ordering device.
- 2.** Framework has to encourage both pedestrian movement throughout the city and the use of the mass transit system being built.
- 3.** The framework also has to support the commercial and recreational areas in the neighborhood, making it more vibrant and active.
- 4.** As part of the framework, the streets should be developed with more landscaping and furniture. This will make the area more attractive and will encourage residents to walk in it. The framework can also

be understood as a security device.

- 5.** To define the area in a regional scale, a tall structure should be placed within it. A tall element like a tower can define the extents of the intervention and the station area from the distance. It can become a visual icon and demonstrate the presence of the transit system in the area.
- 6.** As part of a regional strategy, the area should also be catered for a bigger population. This can be achieved by the incorporation of an entertainment complex on one end of the station, across the overpass and next to the Concordia Gardens Buildings. This area can be thought of as an anchor element for the whole development, and a connecting device over the overpass.
- 7.** Improve the traffic system and pedestrian activity by depressing the through traffic on the PR-3 from the station area across the intersection. The ground level can then be developed as a boulevard with a wide median. The median can in turn be used as a market area for street vendors and bus stops, or just as a finger of trees coming in from the

green belt.

- 8.** As part of the urban design strategy, a greenbelt that extends from the “Towers in the Park Area” towards the back of the station should be developed. It can become a pedestrian area with an emphasis on recreational facilities. A physical connection from the station to the greenbelt should be built.
- 9.** As part of the framework and the greenbelt, a plaza and a boulevard should be developed. These two elements can be the center of the station and the town center. To emphasize them, both should have a strong sectional definition. Taller and continuous buildings on both sides of the station block will define the station area as a street with commercial activity on both sides. This will also help define the scale of the station building against the overpass as an icon for the area.
- 10.** The mass transit system has to be integrated with the architecture, and this is going to be achieved by use of the framework. The systems connection with the city has to be ensured. It can not become a

physical or aesthetic barrier.

- 11.** The different transportation modes currently under use in Puerto Rico have to be integrated to the framework. By incorporating areas for pick up and drop off of passengers, the users are encouraged to use the system. The passengers using the transit system will have priority over those using their private cars.
- 12.** Provide for a feeder system that will incorporate the passengers and inhabitants coming from Trujillo Alto to the Station. It can be a light mass transit system, an express bus service or something similar. In order to induce the use of the system and create a system identity, the transit stops should also use the framework developed for the station area.
- 13.** Integrate the bus system with the local landscape. By emphasizing the system, a spine through the city can be created.
- 14.** Disperse the bus stops throughout the area in exterior locations. Because a rise in the transit use is expected, more and better dispersed stops should be made comfortable for the passenger. They can also

-
- be distributed or separated according to the different bus routes.
- 15.** Provide for a structured parking at the back of the station. It should be provided but not made prominent.
 - 16.** Utilize vacant lots for public plazas that are part of the framework or for commercial buildings and multi-family and high rise housing. The development of the whole area as described can offer a key element and attraction for new families. The area should be made as attractive and comfortable as the suburban malls and stores now in vogue.
 - 17.** These higher density buildings will provide for the rehabilitation of the area. The scale of the new developments has to be consonant with the scale of the surrounding buildings.
 - 18.** The upper floors of the commercial buildings should be zoned for housing. This will put more people living in the heart of the commercial area, and will provide for a more stable consumer market that is not dependent on outside shoppers.
 - 19.** New housing also has to provide for a mix of residents. This will

create more and different needs, making the community a more diverse one.

20. At the same time, more open spaces have to be provided in residential areas. These spaces are essential for the support of stable and lively communities.

To conclude, this thesis began with the idea of using the Tren Urbano as a way to improve Puerto Rico's Metropolitan Region. It began with a big move, with an understanding of how a big infrastructure plan like the transit system could help in the development of the city. The thesis also started with the idea that a good development is one that creates a vibrant community and improves the urban experience of the inhabitants and has structuring physical devices, even if they are unconsciously recognized. An example of these ordering devices can be the traditional "Law of Indies".

Many questions were raised, and the thesis became an attempt in answering some of them. How to invent a way to organize the new developments around the stations? How were the stations going to improve the area? How were

they going to direct the changes needed?

By understanding that the development around the stations needed more than just the implementation of the actual project, the thesis created a way to reorganize the existing city through a defined framework. The framework became the ordering device for the whole development. With both architectural and natural elements, it became the infrastructure at the site scale. Through a balance of the elements intervening and altering the site, and an introduction of nature to the site, the area was given back to the people, to the inhabitants. A healthy public place was created.

By looking at the way in which the design of the area was approached, the thesis was also a struggle between the different scales related to the site. The larger scale issues of the urban planning processes and the smaller scale issues of the architectural elements were also defined by the framework. The design was interwoven between these two scales. It is only through this synthetic approach that an area can be designed and developed for the inhabitants. A balance between architecture and planning offers a better grasp of the problem and a better

physical solution.

I hope one day we can say that the Tren Urbano helped in the definition of the Metropolitan Region, creating a spine through which the city got organized. That it was a big move which revitalize and gave Puerto Rico's cities a coherent urban structure, different from the current development trends. I wish it gets developed with an understanding of the people and with a strong relationship with the communities it changed. I hope this thesis and the notion of using a physical framework as an ordering device is used to improve the city structure and thus helps us reinvent the way we are designing public spaces and new communities.

Appendixes

Basic Notions of a Transit Oriented Development (TOD)

1. Focus on reinforcing transit, even though transit should not be the sole and only primary concern.
2. Mixed-use developments and communities with moderate to high density housing, jobs, retail, and services concentrated along the regional transit system and in strategic nodes.
3. Created in order to provide many destinations within walking distances, allowing trips to be combined.
4. Help create a healthy and pedestrian community while increasing ridership levels.
5. Promotes alternatives to automobile use and affordable communities.
6. Structure is nodal, in contrast to the linear form that now dominates the grid towns and strip commercial centers.
7. Size is defined by an area delimited by a walking distance of approximately 2,000 feet radius (comfortable walking distance +/- ten minutes) from its center to its edge .

Best Development Practices Minimum Population Requirements

Supermarket	6,500
Dry Cleaner	5,700
Video Rental	11,400
Beauty Salon	3,700
Book Store	22,400
Laundromat	5,800
Movie Theater	29,000
Tennis Court (per court)	2,000
Neighborhood Park	5,000
Public Swimming Pool	20,000

Source: Urban Land Institute (ULI)

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Figure 107
Intersection of PR-3/PR-181

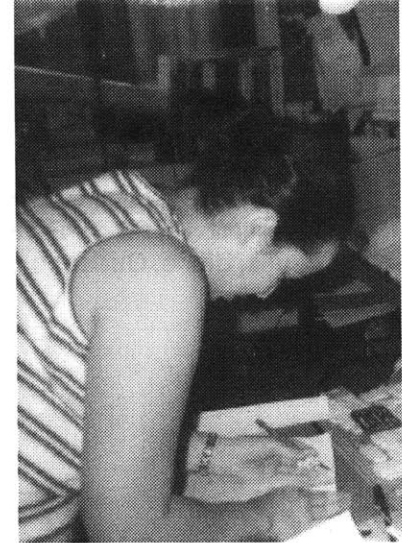
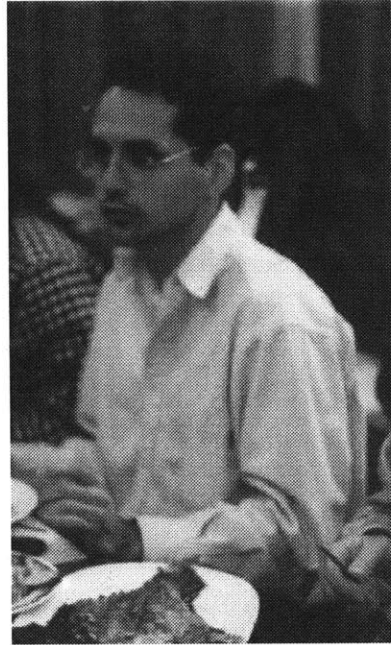
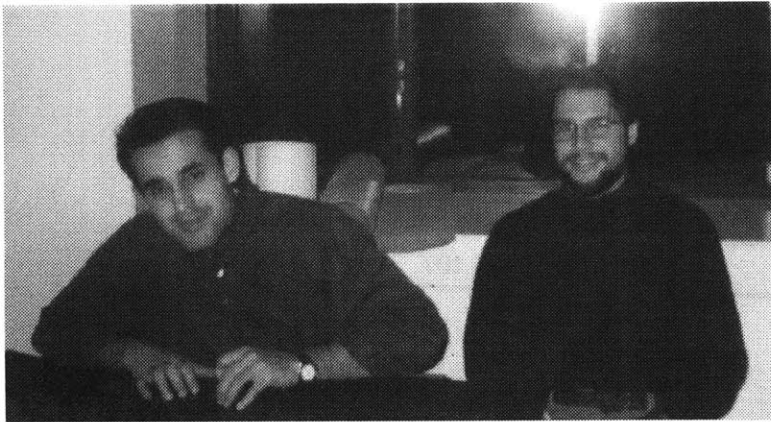
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*Sin ustedes no lo hubiera podido
hacer...*

*Carlos, Bruno, Guillermo, Iris,
Jessica, Sunitha y Mami, un beso y
un abrazo a todos... GRACIAS.*