



Redeveloping Saint Michael's Drive in Santa Fe, NM

An Interactive Qualifying Project submitted to the faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science

Submitted By:

Nghia Hoang
Kristen Leigher
John Mulhern
Xiying Zhang

Sponsoring Agency:

The Santa Fe Complex
The City of Santa Fe Long Range Planning Commission

Submitted To:

Project Advisor:
Fabio Carrera

On-Site Liaisons:
Lee Depietro
Katherine McCormick

Date: September 22, 2010
<http://www.sf10plan.wordpress.com>
SF10-Plan@wpi.edu

Table of Contents

Table of Figures.....	4
Executive Summary.....	6
1. Introduction.....	10
2. Background.....	13
2.1 Santa Fe Foundation: Trails and Trading.....	13
2.1.1 El Camino Real	15
2.1.2 The Santa Fe Trail	16
2.1.3 New Role of Trails.....	16
2.1.4 Arrival of the Railroad.....	17
2.2 Urban Growth after the Railroad	17
2.2.1 A Growing Population.....	18
2.2.2 Road Development to Satisfy Urban Growth	18
2.3 The Development of Saint Michael's Drive	19
2.3.1 Current Issues with Saint Michael's Drive	19
2.3.2 Saint Michael's Drive Charrette Trends.....	21
3. Methodology	23
3.1 Collect, Organize, and Integrate Saint Michael's Drive Data	23
3.1.1 Databases and Categories of Collected GIS Layers	24
3.1.2 Storage and Usage.....	25
3.1.3 Advantages, Disadvantages, and Alternatives	25
3.2 Identify Relevant Issues and Local Preferences	26
3.2.1 Survey the Locals	26
3.2.2 Profile Businesses in the Area	27
3.3 Identify Measurable Indicators to Assess Current and Future Designs.....	27
3.4 Visualize Impacts of Current and Future Designs	28
4. Results and Discussion	29
4.1 Collect, Organize and Integrate Data.....	29
4.2 Identify Relevant Issues and Local Preferences	30

4.2.1 Local Suvey Results	30
4.2.2 Business Profiling Results	34
4.3 Identify Measurable Indicators to Assess Current and Future Designs	34
4.3.1 From Urban Planning Literature	34
4.3.2 Common Themes	35
4.3.3 The Measurability of Identified indicators	37
4.4 Visualize Impacts of Current and Future Design Choices	41
4.4.1 Interactive Platform – Ambient Computing	41
4.4.2 Demonstration of the Platform	42
4.4.3 Implementation Method	45
5. Conclustions and Recommendations	47
5.1 Transportation Design	47
5.2 Green Amenities	48
5.3 Visual Satisfaction	48
5.4 Business Variety	48
5.5 Innovation and Integration of Technology	48
Appendix A	50
Figure 1: Saint Michael’s Drive Resident Survey	50
Figure 2: Letter from the City Regarding Saint Michael’s Drive Redevelopment Research	51
Figure 3: Complete List of Collected GIS Layers	52
Appendix B	57
1. ¡YouthWorks!	57
Work Cited	58

Table of Figures

Figure 1 The Formation of St. Michael's Drive	6
Figure 2 Common themes in collected local preferences	8
Figure 3 Traffic model as a planning tool	9
Figure 4 Ambient Computing Room	9
Figure 5 Santa Fe Railyard Redevelopment.....	10
Figure 6 1950s: Modern position of trade routes and roads	11
Figure 7 Local "Adobe Theme" building	13
Figure 8 1598-1610: Moving to Santa Fe.....	14
Figure 9 Santa Fe in its founding period	14
Figure 10 Elcamino Real.....	15
Figure 11 Santa Fe Trail.....	15
Figure 12 Santa Fe Trail.....	16
Figure 13 Santa Fe Rail Runner	17
Figure 14 Census data - Population of the city	18
Figure 15 Transportation Landscape in Santa Fe.....	18
Figure 16 An issue on St. Michael's Drive - the frequency of curb cuts	19
Figure 17 St Michael's Village West.....	20
Figure 18 Saint Michael's Drive Charrette Designs.....	21
Figure 19 Categories of GIS Layer Collection	24
Figure 20 Groups of Data Collection.....	29
Figure 21 Traffic Information of Santa Fe (with St. Michael's Drive Highlighted)	30
Figure 22 Previous City Survey and Results	31
Figure 23 Survey Results	32
Figure 24 Business Profiles	34
Figure 25 Common Themes of Survey Results	35
Figure 26 Common Themes of Survey Results	35
Figure 27 Grouping the Common Themes.....	36
Figure 28 Common Theme Groups.....	36
Figure 29 Indicators	37
Figure 30 Measurable Attributes for Walkability	37
Figure 31 Walkscore.....	37
Figure 32 Number of Curb Cuts	38
Figure 33 Sidewalk Width	38
Figure 34 Buffer width	39
Figure 35 Walkability Score in a Nutshell	39
Figure 36 Measurable Attributes for Green Public Space	40

Figure 37 Measurable Attributes for Business Vitality	40
Figure 38 Measurable Attributes for Vehicular Mobility.....	41
Figure 39 Crossing off 2 Curb Cuts.....	42
Figure 40 St. Michael's Drive with 4 Curb Cuts.....	42
Figure 41 Buffer Added	43
Figure 42 Community Space Availability.....	43
Figure 43 Community Space with More Parks.....	44
Figure 44 Ambient Computing Room Setting	44
Figure 45 Sample NetLogo Operating Page	46

Executive Summary

Santa Fe, NM is a city that is known for its rich culture and history, due in large part to the establishment of the city 400 years ago. Since 1610, Santa Fe has been a provincial capital of Spain's "Kingdom of New Mexico", and - upon annexation of the New Mexico territory to the United States in 1912 - a state capital. Presently, Santa Fe is a center for art, and its unique blend of ancient culture and natural beauty make it a tourist attraction that experiences over 1 million visitors each year. Santa Fe is the only city in the United States that holds the distinction of being one of nine UNESCO Creative Cities, and is commonly referred to as the "City Different".¹ While trying to maintain the traditions of the ancient Spanish, Mexican and Native American influences, Santa Fe mandates adobe structures that limit modernization and architectural variety. A compromise between the ancient influences and the modern world of art and architecture is found in some parts of Santa Fe, such as the railyard district, but other well traveled areas experience an inconsistent combination of modernity and preservation.

Large distances between metropolitan centers and surrounding areas in the American southwest creates the desperate need for a vehicle or reliable public transportation. Santa Fe lacks efficient public transportation; therefore, vehicles are the main mode of travel and essential to daily life in the city. The main corridors of Santa Fe: Agua Fria Street, Cerrillos Road, St. Michael's Drive and St. Francis Drive, experience a total volume of over 160,000 vehicles on

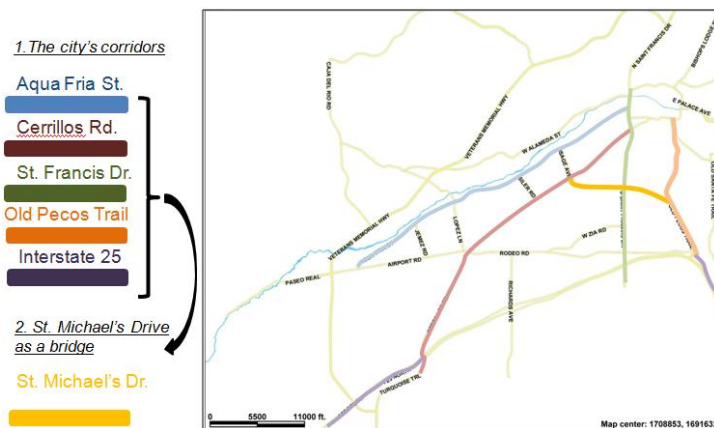


Figure 1 The Formation of St. Michael's Drive

a daily basis. Though these roads provide the quickest routes of transport through the city, they lack a pedestrian and bicycle friendliness that the downtown area so elegantly combines with vehicular accommodation. Also, public community green space is at a premium on such typical byways that handle cars well

but are not designed to leave space for much else. St. Michael's Drive is a great example of the lack of pedestrian friendliness and public green space that allows residents to feel more secure about travelling without a car.

The development of the road system can be traced back to the 16th Century when the Spaniard Don Juan de Onate first brought settlers across the Rio Grande River and a settlement was established in Santa Fe. Travelling the El Camino Real from Mexico to the northern part of

the territory, Onate established the first route that could bring goods back and forth from Mexico to Santa Fe. During the 19th Century, after Mexico gained independence from Spain, trade was opened with the United States. The creation of the Santa Fe Trail established the city of Santa Fe as a vital trading post that connected the United States and Mexico. The El Camino running south, and the Santa Fe Trail running east, provided the basis for development within the city. With the addition of the railroad, and major thoroughfares such as Cerrillos Road and Interstate 25, the need for a connecting byway that could simplify travel within the city arose.

Originally designed in the 1950s as a connecting byway between Cerrillos Road and Old Pecos Trail, St. Michael's Drive was widened in the 1970s to accommodate the growing numbers of vehicular traffic. Today, St. Michael's is one of the busiest roads in Santa Fe, and is in need of redevelopment to be considered aesthetically consistent with the rest of the city. Large parking lots, wide lanes, and fast moving traffic are aspects of St. Michael's that residents have become disenchanted with. As a result of the growing calls for a second look at St. Michael's, the City of Santa Fe asked seven urban designers to create their own version of what St. Michael's Drive could look like in the future. St. Michael's has the potential to have transit connections between the bus system and a local train that extends through the heart of the road. This transformed "boulevard" could be lined with new office, retail and arts-related spaces, accompanied by pedestrian walkways connecting new living areas of higher density, and more affordable residential units for rent and ownership.

To aid the city in their attempts to redevelop St. Michael's Drive, we conducted extensive background research before arriving in Santa Fe. In conjunction with the Santa Fe Complex, we worked to develop modeling techniques that can aid the city in determining real world, interactive solutions to the St. Michael's redevelopment problem. Additionally, we involved the community surrounding St. Michael's by working closely with students from De Vargas Middle School to better understand the intricate issues regarding redevelopment and residential preferences.

The ultimate goal of our project was to establish baselines and set targets for the redevelopment of St. Michael's Drive. To accomplish this goal, we had identified four objectives:

1. Collect, organize and integrate pertinent data about St. Michael's Drive and surrounding areas
2. Identify relevant issues and local preferences about future development along St. Michael's Drive
3. Develop measurement techniques for current and future designs
4. Visualize impacts of current and future design choices

The first step was to collect, organize, and integrate all possible data we could find with respect to St. Michael's Drive. We garnered information from city officials on traffic counts and census data and through Geographical Information System (GIS) software were able to process multiple layers that detailed land and business parcels. Additionally, we profiled every business on Saint Michaels Drive from the College of Santa Fe to Sixth Street. This was helpful to determine the business types that exist in that short span of Saint Michaels and aided in determining what questions to ask locals. The particular area previously mentioned lacks a variety of entertainment offerings, and consists mostly of banks, fast food restaurants and one-stop-shopping destinations. After acquiring all pertinent information regarding St. Michael's, we compiled all collected data in an organized, accessible database.



Figure 2 Common themes in collected local preferences

The next step in accomplishing our mission was to identify relevant issues and local preferences regarding the redevelopment of Saint Michael's Drive. To do this, we conducted intercept surveys of citizens who had come to St. Mike's for one reason or another. Our survey was based in large part on a previous intercept study done by

the City of Santa Fe's Long Range Planning Commission. However, our survey was tailored to get a more in depth perspective on what was actually important to locals and what their ideas of redevelopment included (see Figure 2). After compiling data and examining the previous survey results during the first objective, we were able to conduct surveys that attempted to tackle the most pressing issues for redevelopment, according to the locals. Also, we were interested in observing differences between various demographics of subjects, if there were any at all.

Following our collection of information and identification of relevant issues and local preferences, we sought to develop measurement techniques for current and future design choices. Closely aligned with the charette designs the city asked of urban planners, our mission was to find ways to quantify the impact of changes to the urban environment of St. Michael's. We did this by identifying factors and indicators and devising measurement techniques for each. An example of a factor is walkability where factors include, but are not limited to, curb cuts and path width. Units of measurement could be pieces of path for example. Another example of an indicator that we can measure units of factors for is green public space. A unit of measurement is how much green space would be within a block. For all of the indicators we identified (walkability, green public space, vehicular mobility, business variability, public

mobility, housing availability, job availability, and visual appearance). There are methods of measurement that can be quantified in a similar way to walkability and public green space mentioned above. For the duration of our project, we focused mainly on measuring walkability and green public space because those were the issues identified by locals that held precedence.

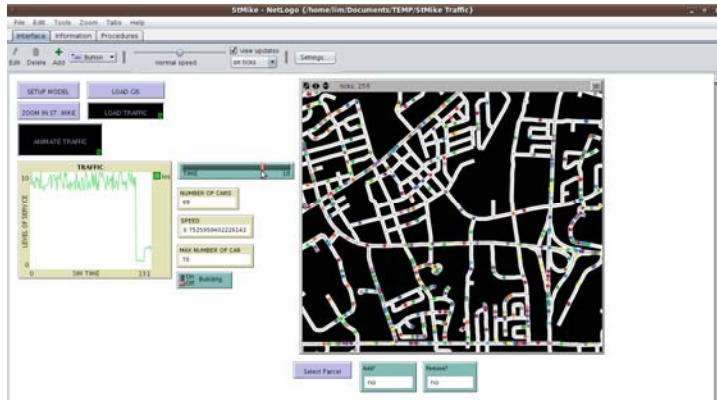


Figure 3 Traffic model as a planning tool

In conjunction with the Santa Fe Complex, we have developed interactive tools that allow anyone to manipulate St. Mike’s characteristics – such as adding a rotary or widening sidewalks – to observe the impact such changes would have on vehicular and pedestrian traffic, as well as on things such as business visibility and variability. Again, the charette designs are intrinsic to the

visualization, as they are the examples provided to the city that we have based our project on, and the ideas presented by the urban planners are the basis for our measurement and visualization techniques. Ideas presented in the charette designs can be visualized through modeling, and real world impact on phenomena such as traffic can be considered (see Figure 3).

The development of St. Michael’s Drive is a complex subject that involves many constituencies and requires a great deal of data gathering to determine what is preferred and what is feasible for redevelopment. St. Michael’s Drive has the potential to be the heart of a centrally located district in Santa Fe that showcases modern amenities while maintaining the traditional influences of the culturally rich city. Our project hopes to provide the city with a better understanding of the local preferences, and tools that allow city officials, as well as the public, to visualize real world impact of implementing various design choices. A recommendation for such a tool would be an interactive urban platform constructed with ambient computing technology which is being developed by the Santa Fe Complex.

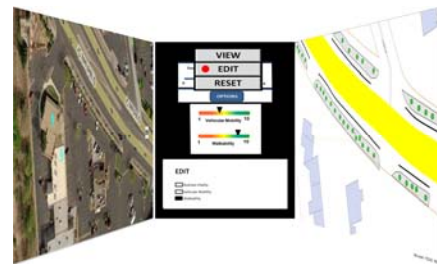


Figure 4 Ambient Computing Room

1. Introduction

Post World-War II urbanism in the past twenty years has produced problems regarding the development of cities and societies worldwide. In some developing countries such as Vietnam, a fast industrializing process with the construction of many new manufacturing companies in urban areas has caused an alarming increase of traffic accidents¹. On the other hand, developed countries such as The United States of America are no exception. The first urban issue in America is its increasing dependence on vehicular travel, because sprawl demands more frequent and longer distance commutes^{2,3}. Another concern is urban segregation which has led to highly stratified societies with cultural and economic separation. The disharmonious combination of the slum, commercial center and mixed district - three components to a typical American city – is an example. Finally, the appearance of big box retail being out of place in its surrounding environment causes additional concerns regarding traffic, pedestrians, and citizen comfort.

With that being said, many people are drawn to the American West for a better quality of life, more open space, less congestion and increased recreational opportunities⁴. Specifically, the population of the Southwestern United States has increased by approximately 1,500% over the last 90 years, while the population of the United States as a whole has grown by just 225%⁵. Along with the amazing growth has come an increasing dependence on vehicular travel. Industrialization, mining and the lure of jobs in cities transformed what was once a largely agrarian society in New Mexico into a society increasingly dependent upon the automobile to travel the great distances from the isolated villages to Albuquerque and the mines in central Colorado⁶. The rapid growth of the American southwest region has created several issues for urban societies including whether or not economies based on land development and housing construction can grow indefinitely, and how the benefits and costs of growth are distributed. Additionally, rapid growth in the urban centers of the Southwest has created suburban sprawl

in order to accommodate the increasing number of residents drawn to the area.

Santa Fe, the capital of New Mexico, is among the southwestern cities experiencing such difficulties with urban development and planning. Initially a trading outpost, Santa Fe was only accessible by three separate trails that helped define the initial development of

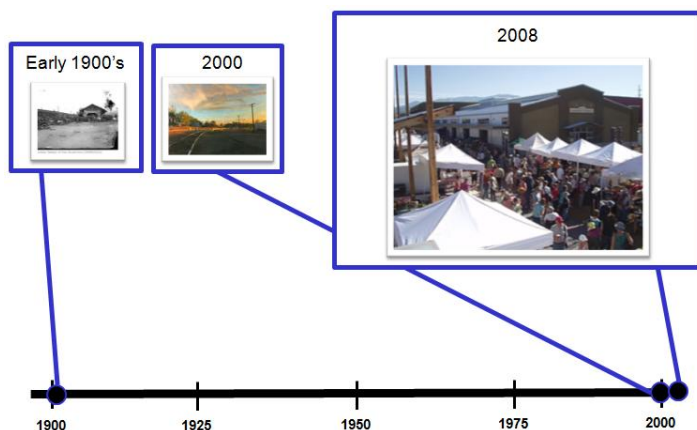


Figure 5 Santa Fe Railyard Redevelopment

the city; namely the El Camino Real, the Santa Fe Trail, and the Old Pecos Trail. The railroad came to Santa Fe in 1880, bringing with it tourists and new residents eager to experience the West. With the addition of the train, the treacherous journey by horseback, covered wagon or stage coach on the Santa Fe Trail came to an end, and an era of economic and social change began⁷. Today, the flow of the city depends too heavily on a few major corridors: Cerrillos Road, Agua Fria St, St. Francis Drive, Interstate 25 and St. Michael's Drive. Lacking efficient



Figure 6 1950s: Modern position of trade routes and roads

public transportation with limited public infrastructure and space for pedestrians on these main roads, the city struggles with a decreased quality of life⁸. One of the most important factors to solving this problem is St. Michael's Drive as the bridge connecting Cerrillos Road and Old Pecos Trail.

Originally designed in the late 1950s as a 2-lane "bypass highway" connecting Cerrillos Road and Old Pecos Trail, St. Michael's Drive was widened

in the mid-1970s to accommodate the city's reliance on automobiles and has become one of the city's most important routes of transportation⁹. St. Michael's Drive could be the heart of a new, centrally-located district that would be lined with new office, retail and arts-related space accompanied by pedestrian walkways connecting new living areas of higher density, more affordable residential units for rent and ownership, and showcases for local art¹⁰. Certain requirements of redevelopment are: preservation of historic character, improvement of the retail framework of the city, encouragement of local-serving housing downtown, and promotion of the unique artistic culture of the city¹¹. Planners hope for mixed-use commercial buildings and medium to high density residential buildings alongside traffic calmed roads and aesthetically pleasing green public spaces¹². Though the City of Santa Fe has defined the problem of urban redesign, there are many variables in implementing a plan that need quantifying. There is currently neither a catalyst nor a clear set of guidelines to encourage development in general and regarding St. Michael's Drive in particular¹³. Whether it be the design and construction of mixed-use or residential buildings, alterations to parking and recreation space, or the development of a neighborhood access way, quantifying these issues is important to the redevelopment of Santa Fe.

To aid the city in the quantitative process mentioned above, we propose four objectives that will help identify and define solutions to the current redevelopment problems. First, we will determine the most relevant issues involved in the revitalization of Saint Michaels Drive. We will accomplish this by surveying locals and collecting the opinions of decision makers within the city. Secondly, we shall collect all existing, available data concerned with the revitalization project and archive it so that it can be accessed quickly and efficiently. After compiling all existing data pertinent to redevelopment, we will begin to identify what non-existing or unavailable data will be relevant by performing field studies guided by our onsite liaison, Lee Depietro and our sponsor the Santa Fe Complex. Once we have gathered all data, we will apply that information to determine a feasible design solution. When we decide upon a particular design solution, it will be necessary to estimate the overall impact of the project, so cost figures as well as population and traffic migrations due to redevelopment must all be weighed against current proposals.

2. Background



Figure 7 Local "Adobe Theme" building

With a population of 70,000 primarily Hispanic, Anglo and Native American people, Santa Fe, which means Holy Faith in Spanish, is New Mexico's fourth largest city behind Albuquerque, Las Cruces and Rio Rancho. Situated at 7,000 feet in the foothills of the southern Rocky Mountains, it was founded between 1607 and 1610, making it the second oldest city as well as the highest and oldest capital in the U.S.¹⁴

The Spanish laid out the city according to the "Laws of the Indies", town planning rules and ordinances which had been established in 1573 by King Philip II. The fundamental principle was that the town be laid out around a central plaza.

An important style implemented in planning the city was the radiating grid of streets centering from the central Plaza. Many were narrow and included small alley-ways, but each gradually merged into the more casual byways of the agricultural perimeter area.¹⁵

Today, Santa Fe is recognized as one of the most intriguing urban environments in the nation, due largely to the city's preservation of historic buildings and a modern zoning code, passed in 1958, that mandates the city's distinctive Spanish-Pueblo style of architecture, based on the adobe (mud and straw) and wood construction of the past. Also preserved are the traditions of the city's rich cultural heritage which helps make Santa Fe one of the country's most diverse and fascinating destinations.¹⁶

2.1 Santa Fe Foundation: Trails and Trading

Santa Fe is the oldest capital of the nation, celebrating its 400th birthday in 2010. However, despite its significant historical importance, little is known about the city beginning. The reason why the city became the capital of New Mexico appears to be strongly related to its protective and stable location.¹⁷

Before Santa Fe, the capital of New Mexico in the early 1600s was Villa de San Gabriel, located on the west bank of the Rio Grande, opposite San Juan Pueblo. This arrangement was carried out by New Mexico's first governor and founder Juan de Onate. However, in 1608, Onate realized the lack of defensibility in Villa de San Gabriel, and the inconvenience of the constant conflict between his followers and the local Pueblo Indians. Therefore, he immediately proposed to Mexico City a plan of relocating his settlers in the Valley of Santa Fe River. This vicinity was said to have been more defensible, and more importantly, not inhabited by any Pueblo Indians; actually, people from San Gabriel had already been migrating to the

valley as early as 1607. Another reason for this transfer would be the scarcity of farmlands in the old capital.¹⁸

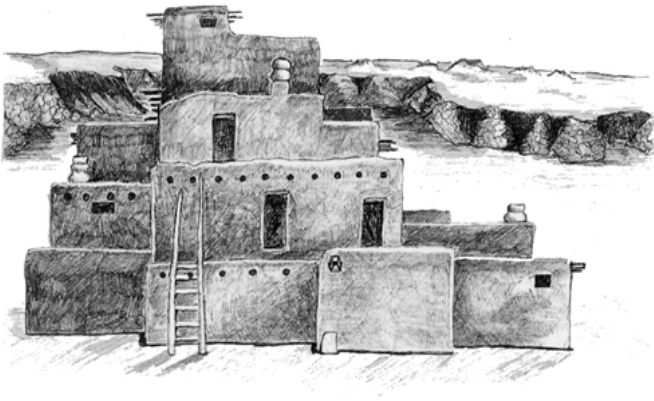


Figure 9 Santa Fe in its founding period

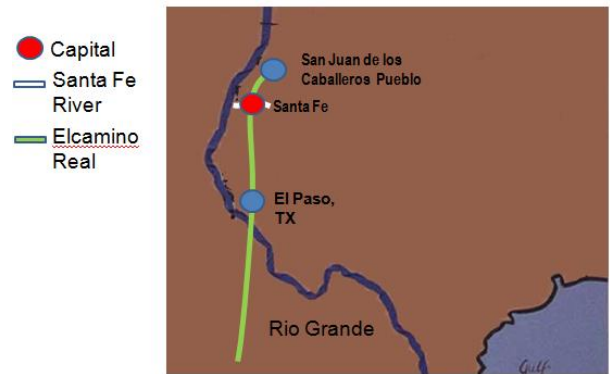


Figure 8 1598-1610: Moving to Santa Fe

This plan was not executed until the arrival of New Mexico's second governor, Don Pedro de Peralta, in January 1610. Entrusted by Onate with his plan to move the provincial capital to a better site, Peralta completed the relocation of Onate's people from San Gabriel to the Valley of Santa Fe River in late 1610. Since the place was named Santa Fe by the pre-existing settlement, Peralta left the name unchanged. This name also indicates the defensive location of the place through an analogy with another town named Santa Fe in Spain. That town was built as a walled military camp outside the last Moorish stronghold of Granada. Its design was based on the Roman grid plan and proved so successful that it became the model for towns in cities built throughout the Spanish Empire. Therefore, it is reasonable to assume that Peralta highly appreciated the valley as a safe land by keeping its name as Santa Fe¹⁹.

2.1.1 El Camino Real

The history of trading in Santa Fe initially depended on El Camino Real. In 1598, Don Juan de Onate led 500 colonists through remote and unfamiliar country, encountering people with vastly different languages and cultures, not knowing what awaited them at the end of the journey. Onate followed what became known as El Camino Real, "the royal road", which up until then only reached the frontiers of northern Mexico. Onate's journey was the beginning of almost three centuries of travel and commerce in New Mexico on the Camino.²⁰



Figure 10 Elcamino Real

To elaborate, approximately 1,500 miles long, the trail started in México City and ended in the Spanish town of Santa Fe. During its first two centuries El Camino Real brought settlers, goods and information to the province. It carried crops, livestock and crafts to the markets of greater Mexico. When Mexico gained its independence from Spain in 1821, its northern frontier was opened to foreign trade. New Mexico soon became the destination of U.S. and French Canadian traders carrying goods from Missouri on the newly blazed Santa Fe Trail. Once El Camino Real connected with the Santa Fe Trail, Santa Fe became the important link between

the growing U.S. economy and the long-established Mexican economy. For 60 years El Camino Real served as the principal route for both Mexican and U.S. traders traveling into the interior of Mexico²¹. Presently, renamed as Agua Fria Street, it leads into the heart of the modern City of Santa Fe. Sculptures in Frenchy's Field Park (Agua Fria and Osage Avenue) and Santa Fe River State Park (Agua Fria and Guadalupe Street) commemorate the centuries of travel through Santa Fe on El Camino Real.



Figure 11 Santa Fe Trail

2.1.2 The Santa Fe Trail

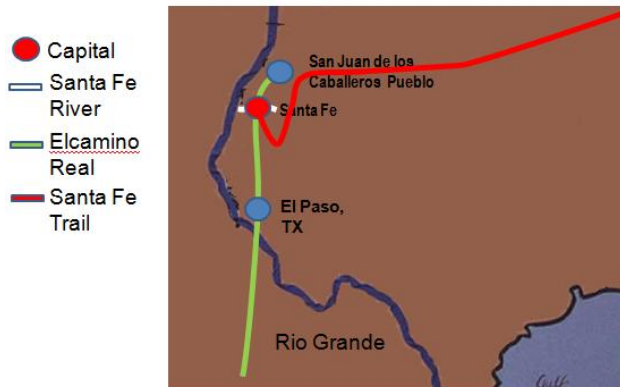


Figure 12 Santa Fe Trail

The Santa Fe Trail (aka, Santa Fe Road) was an ancient passageway used regularly after 1821 by merchant-traders from Missouri who took manufactured goods to Santa Fe to exchange for furs and other items available there. As noted above, the trade route was not opened up until trade with the United States was opened by Mexican authorities shortly after gaining independence from Spain in 1821. Mexican traders also provided caravans going to western Missouri in this

international trade.²²

In western Kansas a Santa Fe-bound caravan had the choice of two routes: The Mountain Route (Long Route) of the Santa Fe Trail was the 230 miles of unprotected campsites between Fort Larned and Fort Lyon in Colorado. It followed the Arkansas River into Colorado before turning south. The Jornada Route was the water-less (dry or desert route) stretch cutting southwest at Cimarron Crossing and other Arkansas River crossings. This route saved ten days and would carry 75 percent of all future trade.²³

2.1.3 New Role of Trails

Many communities grew along the Santa Fe Trail in northeastern New Mexico in order to provide goods, services, food, shelter and water to the many wagon trains passing through. As the wagon trains gave way to the railroad, mining and cattle became important to life on the trail. Today, cattle remain, but traveling the highways and byways by automobiles is now the main mode of transportation, whilst art, recreation and culture are major attractions²⁴. El Camino Real, first traveled in 1598, provided news, supplies, and travel to the first capital of the New World²⁵. In modern days, the major use of both the Santa Fe and El Camino Real trails are that of tourist attractions. Though the trail routes themselves still exist and can be traveled by foot, bike, or even covered wagon, they are most often traveled by vehicles that allow passengers to stop at certain important sightseeing points along the trails. The end of El Camino Real remains at St. Francis Cathedral in Santa Fe, NM, one of the most frequently traveled roads in the city. Although the trails are now tourist attractions, they still contribute to the overall structure of Santa Fe.

2.1.4 Arrival of the Railroad

On February 9, 1880, the Atchison, Topeka and Santa Fe Railway Company pulled its first train into the Santa Fe, New Mexico depot, its arrival celebrated by colorful speeches and a grand parade. Artists hired by the rail line drew and photographed images of Santa Fe to entice faraway Easterners to come see the West. Local Native American and Hispanic arts and crafts were created to market to rail travelers. Building materials brought in on the rail, such as galvanized tin and bricks, added metal roofs and Victorian brick buildings to the pueblo style architecture of Santa Fe. New neighborhoods were created around the Railyard to house the workers and their families involved in the new rail economy. Santa Fe's Railyard became a



Figure 13 Santa Fe Rail Runner

center of activity, its station a greeting place for visiting politicians and celebrities as well as the sentimental point of departure. The site remained a central hub until rail transportation began to be eclipsed after World War Two by the interstate highway system and the airlines.²⁶ The convenience of communicating with the outside after this particular emergence of the railroad has moved Santa Fe into a new era of growing as an urban area.

2.2 Urban Growth after the Railroad

In the city of Santa Fe, approximately 5-6 acres are developed for every 100,000 square feet of commercial floor area constructed²⁷. As a result, 135-162 acres of land have been commercially developed in the city since 2000. Annual growth averages for the city of Santa Fe include approximately 84,000 square feet of new office space (31%), 143,000 square feet of new retail-related development (53%), and 27,000 square feet of new industrial/ warehouse development (10%). Schools and churches, central components of the community, only comprise the remaining 6%. As is evidenced by the percentage devoted to growth of business and retail space, Santa Fe is a city that is expanding commercially while compromising the traditionally close knit community based urban plan. This is characteristic of urban sprawl.

One example of urban sprawl currently taking hold in Santa Fe is the average amount of time it takes to commute to the workplace, which is 17.5 minutes. Of workers aged 16 years and older, 72.4% commuted to work by driving alone, while an additional 13.3% took advantage of a carpool system. As noted before, the evidence of vehicular dependence, as well as distance to travel to work, are issues that redevelopment hopes to eliminate. A combined 5.6% of the employed population either walked or used public transportation to get to their workplace, something redevelopment also hopes to reverse.²⁸

2.2.1 A Growing Population

In 2000, the population in the City of Santa Fe was 62,203, and it was estimated that it would grow to 72,056 in 2006 with a growth rate of 14.5%. At that time, the percentage of people who were 65 years old and over was 13.9%. However, Santa Fe's population is aging

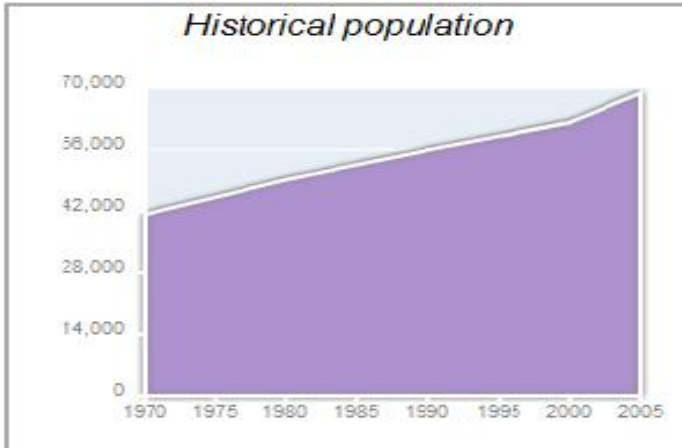


Figure 14 Census data - Population of the city

with a rapidly shrinking population of individuals under 45 years old. This aging population will lead to a disadvantage when attempting to attract potential company recruits that seek young, innovative individuals. People at a young age might also be interested in entrepreneurship, and more likely to start their own businesses. But the growing base of seniors reverses the character of the city and results in a negative impact on the city finances.²⁹

2.2.2 Road Development to Satisfy Urban Growth

The history of many cities and towns can also be traced by the origin and development of urban thoroughfares. That's certainly the case with Santa Fe, where many widely used existing roads were once frequently traveled trade routes. Additionally, the cultural intersection of Native American, Spanish, and Anglo-Saxon traditions provided the basis for the diverse naming and development of the streets of Santa Fe. The honor of being the oldest street in Santa Fe probably belongs to what is now San Francisco Street; originally it bore the name Calle Real and was in effect the tag end of El Camino Real, the trade route that began in Mexico City. The old Camino Real (modern day Agua Fria Street) crossed the Santa Fe River and narrowed to become



Figure 15 Transportation Landscape in Santa Fe

the Calle Real leading to the Santa Fe Plaza. By the early 20th Century Anglos had introduced Agua Fria Street, the name taken from the small community just south of Santa Fe. St. Francis Drive is to this day a portion of the old El Camino Real trail. A movement got started about 20 years ago to return Agua Fria Street to its historical first name, El Camino Real, but residents and businessmen resisted the change, and Agua Fria remains.³⁰ The

development of the road system in Santa Fe is closely tied to the population explosion that the southwest United States has experienced in the last 50 years.

2.3 The Development of Saint Michael's Drive

Originally designed to serve as a connecting suburban “truck by-pass” highway around what was then the southern edge of Santa Fe, St. Michael’s Drive has since become a commercial corridor at the center of Santa Fe’s Urban Area containing nearly 90,000 residents. St. Michael’s Drive is one of the city’s busiest streets and has become essential to the urban fabric of the city.³¹ St. Michael’s Drive has seven lanes of traffic and it handles approximately 25,000-30,000 vehicles per day³².

St. Michael’s was first built in the late 1950s connecting the two legs of then-State Highway 85 heading to Albuquerque and Las Vegas, respectively. St. Michael’s Drive predates construction of St. Francis Drive, Paseo de Peralta and Interstate 25. An urban interchange was added as St. Francis Drive bridged St. Michael’s Drive on its way south to connect with the newly built I-25. Though St. Michaels Drive has become a hub of travel, it has been identified in public forums as lacking a redeeming urban form or aesthetic. St. Michael’s Drive has the potential to be transformed into a truly great pedestrian / shopping / mixed use street. To encourage that change, buildings must be allowed, even required, to be built near the street so that storefronts are easily accessed by pedestrians, bicyclists and bus riders, not just cars.³³

2.3.1 Current Issues with Saint Michael’s Drive



Figure 16 An issue on St. Michael's Drive - the frequency of curb cuts

number of curb cuts that one may encounter along the street. These curb cuts are formed at the intersection of the drive with other roads or serve as a tunnel leading drivers into the local strip malls. They pose serious safety problem for pedestrians each time a car cross their paths through a curb cut. For example, on only a small portion of St. Michael’s Drive, there are six curb cuts preventing pedestrian from having an uninterrupted walk.

Certain requirements of redevelopment are: preservation of historic character, improvement of the retail framework of the city, encouragement of local-serving housing downtown, and promotion of the unique artistic culture of the city.

First, apart from the heavy traffic mentioned above, St. Michael’s Drive does not favor pedestrian particularly because of the large

Another concern regarding St. Michael's Drive is its shape, dictated by the strip malls around, as a sprawl of single-use building. A great example of St. Michael's Drive suburban



Figure 17 St Michael's Village West

sprawl is St. Michael's village west. Saint Michael's Village West Shopping Center is located in the geographic center of the city of Santa Fe at the intersection of Saint Michael's Drive and Llano Street, between Cerrillos Road and Saint Francis Drive. As seen in Figure 17, there is a large parking lot adjacent to St. Michael's that is an eyesore and does not fit in with the city's redevelopment goals. St. Michaels Village West serves the local community as a plaza that houses many different retail stores, similar to many American strip malls.

Last but not least, regarding the consistency of St. Michael's Drive with the character of the cities, certain requirements of redevelopment emerged, namely the preservation of historic character, improvement of the retail framework, and promotion of the unique artistic culture of the city in the local area³⁴. Planners hope for mixed-use commercial buildings and medium to high density residential buildings alongside traffic calmed road and aesthetically pleasing green public spaces³⁵

2.3.2 Saint Michael's Drive Charrette Trends

To paint a better picture of what St. Michael's Drive could look like in the future, the City of Santa Fe asked seven urban designers to create their vision of what St. Michael's Drive could be including the roadway design and land use designs/options for the adjoining areas. Out of this urban design charrette, or effort to catalyze real architectural redevelopment, several common themes were drawn. St. Michael's will be multi-modal with transit connections between the Santa Fe Trails bus system and a local train that extends through the heart of this district. As with so many higher volume roadways built in the 1950s and 1960s, St. Michael's Drive has little redeeming value for pedestrians or bicyclists; it was built almost entirely with the automobile in mind. The roadway width, alone, makes it imposing for pedestrians or wheelchairs to cross St. Michael's anywhere along its length. Transforming this roadway into a great boulevard that is beautiful, pedestrian-friendly, bicycle-friendly, and transit-oriented, while serving well-designed urban places along its length, is the goal of the "Santa Fe Boulevards" program.

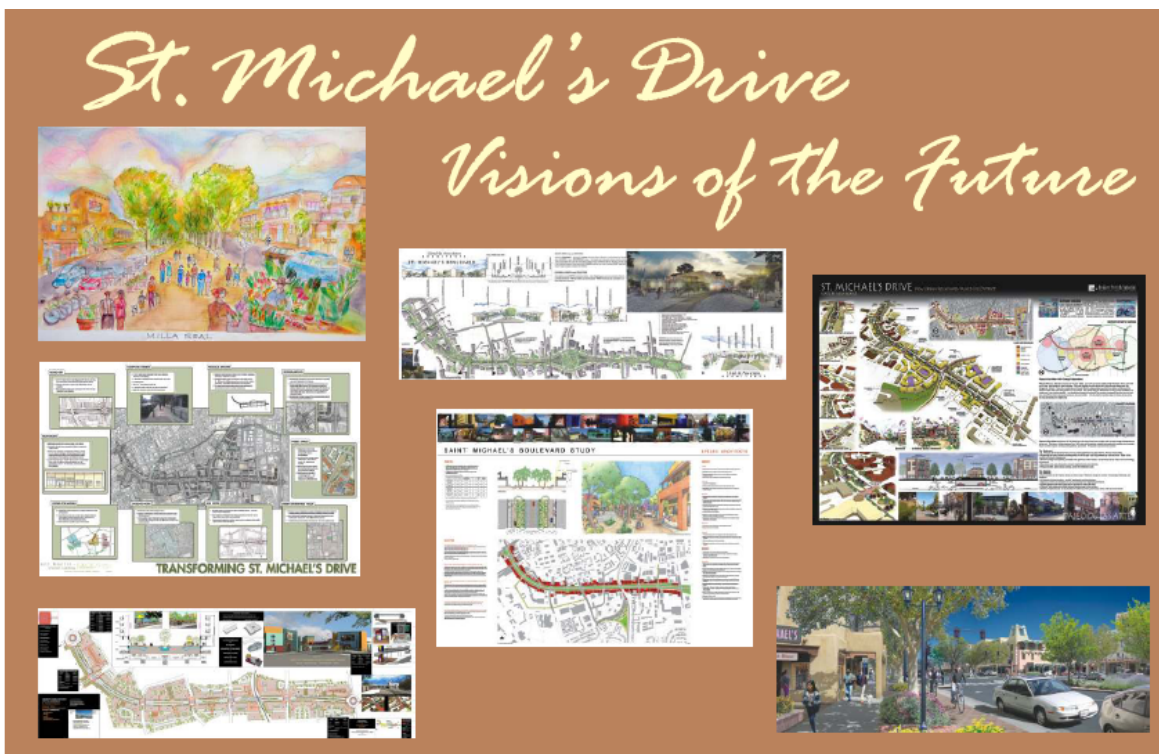


Figure 18 Saint Michael's Drive Charrette Designs

In order to achieve the goal of the program, there are several themes that form the larger redevelopment goal. For instance, medians should be widened and re-landscaped to separate traffic better as well as to provide scenic boundaries. Sidewalks must be widened and driving lanes either decreased in number or narrowed in width to promote pedestrian friendliness. The city of Santa Fe has the right to do whatever it pleases with public areas such

as streets and sidewalks, and the implementation of such ideas is likely to be easier than those of private development. With respect to private development along St Michaels, restrictions are necessary to ensure buildings are located next to the street with parking in the rear, essentially the opposite of most common modern strip malls. Possibly the biggest issue concerning private redevelopment is the creation of multi-story, mixed-use buildings. Also, large windows and easier access to the street for tenants of privately owned buildings should be incorporated. In a city such as Santa Fe, where the "adobe theme park" has long been the norm, encouragement of high density as well as tall structures is something not previously considered.³⁶

3. Methodology

The ultimate goal of this project is to assist the City of Santa Fe in establishing baselines of the current state of Saint Michael's Drive and providing tools to visualize the future redevelopment of the area. To accomplish this goal, four objectives were developed that would lead to the most ideal redevelopment design that meets the set targets and goals. The objectives are:

- Collect, organize, and integrate Saint Michael's Drive data.
- Identify relevant issues and local preferences.
- Identify measurable indicators to assess current and future designs.
- Visualize impacts of current and future designs.

3.1 Collect, Organize, and Integrate Saint Michael's Drive Data

The group has done a significant amount of research before arriving on-site. The problems of suburban sprawl and apparent issues surrounding Saint Michael's Drive were examined. Our investigation indicated that the area of Saint Michael's Drive suffered from several flaws including, but not limited to, the heavy traffic due to 7 traffic lanes, the poor pedestrian walking service level, and the inaccessibility of Saint Michael's Drive without a car.

In addition to the background information of Saint Michael's Drive, the group has also acquired similar redevelopment projects. By referencing and researching similar projects, the team gained an understanding of the complexity that the Saint Michael's Drive redevelopment project could present. Similar projects are also meaningful because the team can see the consequences of redevelopment on a population, and relevant methods and ideas may be applicable to the Saint Michael's Drive redevelopment.

To fulfill this objective, the group started with demographical research. Demographical data like population growth, traffic counts, and maps of interest can be found on the official city of Santa Fe website. Meanwhile, the group collected quantitative data from the City of Santa Fe government to apply to the redevelopment plans of Saint Michael's Drive by requesting all of the data pertaining to the project from city officials. More specific data pertaining to Saint Michael's Drive was accessed through city official contacts the team was directed to. The group received many Geographical Information System (GIS) layers to work with for developing visual aids. An example of a GIS map the group used can be found in [Section 5.1](#).

The group also received results from a previous Saint Michael's Drive redevelopment specific survey. This previous survey was the basis of our second objective – identify relevant issues and local preferences.

3.1.1 Databases and Categories of Collected GIS Layers

As explained above, in order to perform any further analysis regarding the redevelopment of St. Michael’s Drive, collecting relevant and useful GIS Layers of the city is essential. Furthermore, the group has categorized and constructed easily accessible databases of all these layers for convenient inquiries in analyzing processes as well as future reuses.

GIS is an abbreviation for Geographic Information System – any system that captures, stores, analyzes, manages and presents data that are linked to a location. In this case, the locations of interest are the city of Santa Fe and generally the state of New Mexico. With the aid of these GIS layers, the group was able to analyze interactively and visually, in real-time, the complexity of many geographical, demographical and ecological aspects of the project. Besides, GIS has helped the group greatly in critical processes, be it presenting the results to the city officials or communicating with De Vargas middle school students and teachers. The following sections will demonstrate how we integrated this technology into the project.

Thanks to the help of GIS managers in the city, Stephen Guerin from the RedFish group, city energy specialist Nicholas Schiavo and Andrew Harner from the WPI Renewable Energy IQP team, the group has collected 300 megabytes of 14 detailed layers from a broad range of

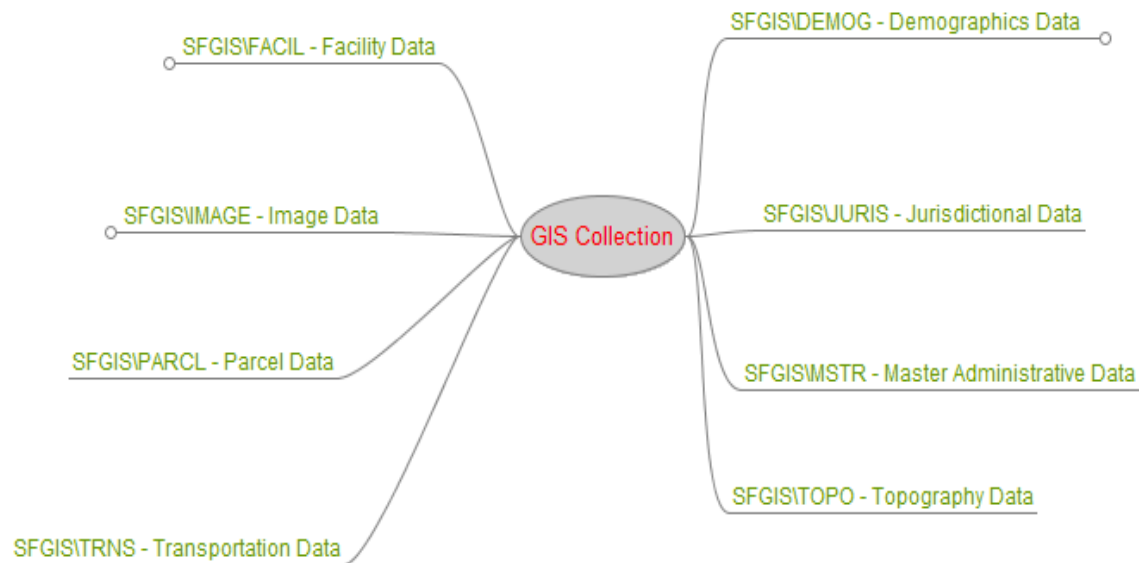


Figure 19 Categories of GIS Layer Collection

important categories such as Demographic and Transportation (see Figure 19). For a complete list of all layers, please see the [Appendix A](#). Also, the group frequented an Internet Mapping Service provided by the city at <http://maps.geocortex.net/imf-5.2.2/imf.jsp?site=citysantafe> for a quick visualization as well as printable raster layers. These printed layers were mainly used in commercial profiling and local surveying.

3.1.2 Storage and Usage

Accessibility issues emerged from such a detailed collection of layers. First, a multi-user platform was required to share the layers amongst group members as well as the sponsors. Second, as one pioneering team from WPI in the Santa Fe project center, the group was aiming to develop a reusable platform for coming teams and city officials to reexamine and expand the project in the future. Finally, since the last objective of the project is to provide tools for city planners to make decisions, the project has been carried out in line with the development of ambient computing technology at the Santa Fe Complex, and thereby, posed a need for programming environments to load layers from online computing clouds. After careful research, the group has settled with a Beta GIS server at <http://giscloud.com/>, which supports both online GIS interacting and local inquiries from computing tools.

GIS Cloud is the world's first full featured web based Geographic Information System (GIS) powered by Cloud Computing with advanced capability of creating, editing, uploading, sharing, publishing, processing and analyzing geospatial and attribute data. Its purpose is to help in making the best possible life and business decisions, and to tackle problem solving through data visualization and geo-processing. Until now, full featured GIS existed only in the world of classic desktop applications. GIS Cloud is Software as a Service (SaaS) available in free and pay-per-use model.

GIS Cloud allows basic interactions with GIS layers similar to traditional GIS softwares such as ArcGIS or qGIS. Besides, it has the properties of an online server with sharing options for other collaborators, and embedded codes to integrate the layers into Google Map API. The next section will discuss some advantages, disadvantages and an alternative for GIS Cloud.

3.1.3 Advantages, Disadvantages, and Alternatives

Apart from the advantages of a full server and an intuitive interface mentioned above, it also has several desirable extended functions. First, users can embed the GIS layers stored in GIS Cloud to any other website using JavaScript and OpenLayer service. It can be helpful for publishing information about the redevelopment of St. Michael's Drive and design ideas to the city's official website.

On the other hand, programming environments such as NetLogo can communicate with GIS Cloud to load existing layers for further modification. This function will aid developers of ambient computing at the Santa Fe Complex to easier construct urban models for professional planners..

Unfortunately, there are two current disadvantages in the Beta Version of GIS Cloud service. On one hand, since it is a free startup server, the price of their pay-per-use service in the future remains unknown. On the other hand, the cloud does not support downloading vector layers.

The only feature that can be transferred from GIS Cloud to OpenLayer via JavaScript or to NetLogo via programming call is raster layer. This fact hinders developers from accessing the full benefits of GIS stored in vector data. Additionally, the path to layers in the cloud will not be visible without the help of qGIS or ArcGIS.

A possible alternative and/or supporting service for GIS Cloud could be Geosever. It allows users to store as well as download Web Map Service files. Used in parallel with GIS Cloud it provides an option to both locally and remotely access a wealth of data in GIS layers.

3.2 Identify Relevant Issues and Local Preferences

After meeting with city officials and conducting research, the next step would be to interact with locals and pinpoint issues and preferences regarding Saint Michael's Drive. The purpose of this objective is to learn the needs of the Saint Michael's Drive community according to residents. In order to attain the mission, the team employed two methods: local surveys and business profiling. The residents and employees along Saint Michael's Drive will deliver a local insight into improvements that should be made to the area of interest. Communication between the locals and the team representing the City of Santa Fe mutual benefits both sides. By consulting the locals about the redevelopment plan they will feel involved in the community in a decisive role specifically regarding the redevelopment project. Contact with locals brought the team closer to the City of Santa Fe and its residents as opposed to not integrating ourselves into the local life and just relying on preliminary research.

3.2.1 Survey the Locals

A survey to collect local opinions and preferences was compiled by the group based off of the previous survey results the city provided, along with other specific questions inquired by city officials. The survey can be found in [Appendix A](#). An official letter from the local government in [Appendix A](#), was carried by group members at all times to explain to interviewees the purpose of the project and the team's affiliation with the local government, and this letter was used for the business profiling as well.

The survey was first tested during mid-week around 1:00pm. The trial was overall very successful after approaching willing participants. The method of approaching seemed to be a very effective method to receive random samples, and the results of the sample surveys were satisfactory too.

More surveys were conducted after the trial ones. The locals of interest were employees that work in the strip malls on Saint Michael's Drive, school aged children who go to schools around the area, college students that frequent the area, citizens that access Saint Michael's Drive during lunch time and after work, and residents near the area. The team targeted each group during the day on various days at various times and tried to interview them without

being overly disruptive to their routine. Subjects were approached by one or two students and asked to take a five minute survey. The survey generally took anywhere from five minutes to ten minutes depending on the interest level of the subject and any time constraints they may have had. The survey was designed to collect as much feedback as possible in a short period of time.

The survey results the team collected were added to the previous results from the city surveys, and the following objectives were based off of the combined results.

3.2.2 Profile Businesses in the Area

The survey results touched upon inefficient land use and a lack of certain business types in the area. To get a sufficient picture of the businesses in the area, the team performed a profiling of the businesses that were located on three blocks of Saint Michael's Drive. The team first constructed a profile that will result in a short description of each store or business in the area of interest. This profile can be applied to any new commercial business that may come in or out of the area. The stores were profiled in an organized manner by using GIS maps of the area as a template for the profiling order.

When the profiling was complete, the profile information was documented in a fashion that is easily accessible to people that may have interest in the data, and it is easily updatable to ensure updates as businesses close and open in the area of Saint Michael's Drive to keep a current index of the types.

3.3 Identify Measurable Indicators to Assess Current and Future Designs

In order to establish a series of indicators for the measurement of charrette designs, it is crucial to translate the survey results from the second objective into characteristics and urban design indicators. These indicators will be the outline for any extended project corresponding to the redevelopment of Saint Michael's Drive. The indicators were chosen from common ideas presented and brought up during the survey period. Furthermore, they were cross referenced with similar ideas in the Saint Michael's Drive charrette designs, and all of the charrette design topics fit into the indicators the group pieced together.

After indicators were set, the group broke down each indicator into factors that defined the indicator. Moreover, the factors are defined to make measurements more explicit and straightforward. Each indicator's factors were derived from studies in urban planning magazines and definitions from experts in the field of city planning. Once factors were set, units of measurement were established for all factors and then the indicators of present and future plans will be ready to be measured.

3.4 Visualize Impacts of Current and Future Designs

Visualizing city plans and changes in urban development in the past may have proved to have been very difficult or tedious, but the group has been working with the Santa Fe Complex to mock up the outlook of urban design and city planning. Ambient computing is a style of interactive computing that the group applies in this project. It is essentially a presentation and interactive modeling method that can make a surface into a screen to present and interact with. With this type of computing the options will be innumerable, and it has the chance of changing urban redevelopment and advancing planning methods for the better.

The group took the indicators and factors determined in objective three and applied them to ambient computing. Using real data and scenarios, the group made examples of ambient computing that could be eventually programmed and used in scenarios like board meetings, in the field, and general public use. The idea of mocked up examples of ambient computing is to get the city and the public considering this new technology. The team used the redevelopment of Saint Michael's Drive to also introduce new methods of planning and visualizing future design.

The future computing will be interactive to the point where the operator(s) will be able to see real time results as indicators are changed. The programming portion of the ambient computing will use mass amounts of city and related data to predict and follow trends in indicators changes, and the technology will eventually intertwine many different indicators to make a complete and comprehensive planning tool.

4. Results and Discussion

Through the extensive literature research and interviews the group obtained a great deal of information regarding St. Michael's Drive. The following section will show the results from the data analysis, and it will also discuss the modern technological tools developed by the team.

4.1 Collect, Organize and Integrate Data

The group has collected data for seven weeks (see Figure 20) and has set a baseline for the current state of St. Michael's Drive. First of all, the group has set a geographical baseline that the group collected from GIS layers discussed in the methodology. The GIS Location of St. Michael's Drive starts at the intersection with Cerrillos Road at (1721456.8601, 1696574.4308) and ends at the intersection with the Old Pecos Trail at (1732884.0437, 16936683232), which marks a physical length of 2.4 miles. St. Michael's Drive has two endpoints connected with Cerrillos Road and Old Pecos Trail with 15 intersections in between. The biggest and busiest

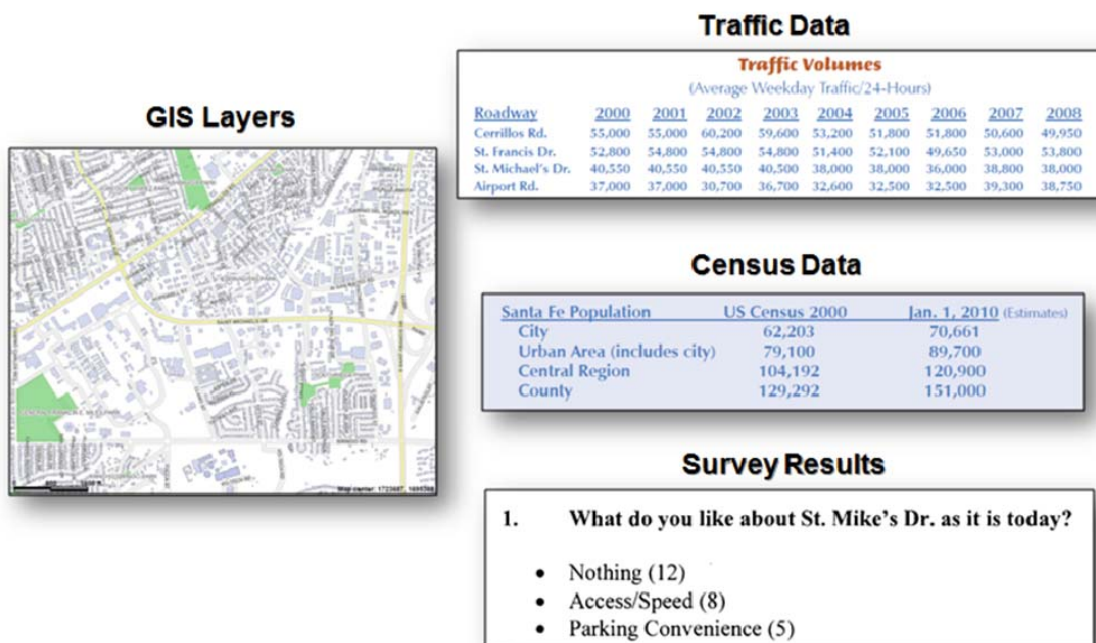


Figure 20 Groups of Data Collection

intersection occurs at the center of the street where it meets St. Francis' Drive.

Since the purpose of developing a demographic baseline is to setup boundaries for the intercept study in the later stage of the project, the group identified every block of census tracts - the geographic regions defined to take census - on St. Michael's Drive. (see Figure 21) Consequently, all the research, including surveying locals and profiling commercials, was then carried out on these four blocks. Additionally, for the purpose of demonstrating an urban

platform in the second part of the project, some traffic data around this area, especially the traffic accident distribution, was collected by the group. This data, indicating how busy St. Michael's Drive is compared to other streets, and how traffic generally flows within the city, helps increase the accuracy of the group's intended interactive model.



Figure 21 Traffic Information of Santa Fe (with St. Michael's Drive Highlighted)

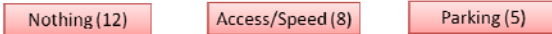
4.2 Identify Relevant Issues and Local Preferences

This section will introduce the results from the literature research, local surveys and the business profiling.

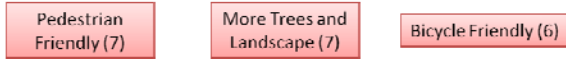
4.2.1 Local Survey Results

The identification of issues and local preferences is based largely on the survey results that the city did a while ago. For the most part, the city conducted a survey that was very similar to ours, yet verbally oriented to allow some degree of flexibility in locals' responses. The results of the city's survey emphasized the desire for more pedestrian and bicycle friendliness, as well as the desperate need for public green space somewhere along St. Michael's Drive. Essentially, locals believe that bicycle and pedestrian friendliness as well as parks are preferential when

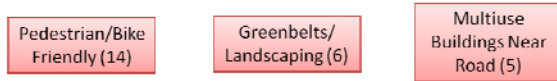
What do you like about St. Michael's Drive as it is today?



What would you change about St. Michael's Drive?



What are design aspects presented that you liked?



What are design aspects presented that you disliked?



Figure 22 Previous City Survey and Results

We created more questions that targeted both bicycle and pedestrian friendliness, as well as a question that sought to determine if public green space such as a park was actually important to locals. Beyond the preferences identified previously by the city, we developed our own questions regarding business availability and variability, as well as the most important question of all; is redevelopment worth it? Most importantly, our survey serves as a quantifiable complement to the city's survey as we introduced a scale of 1 (strongly disagree) to 5 (strongly agree) for each answer.

Our survey began with demographic questions that allowed us to get a better understanding of how opinions vary between subjects of different ages and genders. Another introductory survey section is that of frequency and use so that we could understand how often the subjects were coming to St. Michael's Drive and why. There was a large age range amongst the subjects, and the usage seemed to be pretty varied. Some would come once or twice a week; however, a majority used St. Michael's Drive 3 to 4 times at least on a weekly basis.

considering redevelopment. Some sample questions from this previous survey is provided on the left.

[This figure](#) was the survey designed for this project, and it was labeled with titles of each section and the overall scores were highlighted as well. The survey that we conducted as part of our project was tailored toward addressing the issues found by the city. The full survey can be found in Appendix A



Figure 23 Survey Results

Next, the survey delves into the issues that we identified as important in redevelopment. Our survey has several themes; individual mobility, landscape/architecture, and public green space. The first of the public mobility themed questions was pedestrian friendliness and the results of that were that most subjects disagree that St. Michael’s Drive is pedestrian friendly. Because of the width of the road, along with the heavy traffic at high speeds, St. Michael’s Drive is dangerous for pedestrian travel. Moving on to bicycle friendliness, again, subjects disagreed that the road suffices. After interviewing employees at Rob and Charlie’s bike shop, it was clear that St. Michael’s Drive could use a bike lane or wider sidewalks to accommodate both pedestrians and bicyclists. To further the theme of individual mobility without a vehicle, we ask if St. Michael’s is accessible without a car, and most subjects agreed that it was not. The lack of reliable public transit was a major determining factor in all answers themed around individual mobility.

Whether or not St. Michael’s Drive architecture is visually consistent with Santa Fe was a question we asked to fit with a theme of questions with respect to landscape and architecture.

Most answers given dealt with the adobe consistency, therefore, many believed architecturally, St. Michael’s Drive was consistent. As seen in Figure 23, the adobe theme is present in a plaza located on St. Michael’s Drive. Given the city mandate that requires an adobe

look, subjects thought the architecture was similar and not an issue. The issues with architectural consistency that some subjects expressed were the large expanses of parking lots and the lack of green space, which was another issue entirely. Along the same lines, we asked whether or not the landscape of St. Michael's Drive is appealing. Most subjects somewhat disagreed with that, because there is too much of a commercial feel and the road lacks trees or other environmental supplements.

After the issues of public mobility without a vehicle, and architectural consistency, questions regarding business availability and overall redevelopment were asked. These questions are somewhat miscellaneous and don't necessarily fall within a theme of questions, but they are important to determining the preferences of residents. Most subjects agreed that St. Michael's Drive has all of the businesses they desired, but expressed a need for additional entertainment buildings and possibly another restaurant or two.

The most important question we asked is deserving of its own theme. There is currently no green space on, or directly adjacent to, St. Michael's. The lack of community space on St. Michael's Drive is something the City of Santa Fe found to be an issue, and our surveys certainly confirmed that result. The lack of a park or any kind of recreational space that would provide the public with a place to walk a dog or have a picnic, as well as a break between the wide expanses of pavement and parking lots, was something all subjects wished was different.

Lastly, we ask subjects if the idea of redevelopment for St. Michael's Drive is a good one. Almost all subjects agree that the redevelopment is a good idea, but some expressed a concern about payment for a large project. If the financial burden falls on the taxpayers, it may not be a priority to some.

Along with the identification of local preferences and issues, and the results of our surveys, we worked with students from De Vargas Middle School to garner an alternative community perspective. Once a week we met with students to get a better understanding of what they feel is the issues. Part of the point with working with them is to get them to start thinking about a project that will affect them as they mature. We asked the students to do an activity called cognitive mapping that requires drawing St. Michael's Drive strictly from memory. The point of an exercise like that is to determine where the students frequent and what businesses or portions of St. Mike's they completely forget or do not realize exist. For the most part, the students drew typical places like K Mart, fast food joints such as BK and Sonic, and of course, the gamers lounge. The students were not aware of some businesses such as home décor that have no meaning to them.

4.2.2 Business Profiling Results

To assess the vitality of Saint Michael’s Drive and quantify some local opinions such as “the street has all the retail stores I desire but lacks entertainment destinations”, the group has profiled all the buildings on three out of four census blocks mentioned in the demographic



Figure 24 Business Profiles

baseline, regarding their types and frontage measurements. More specifically, each building’s type was determined by its associated NAICS code at <http://www.naics.com/search.htm>.

As a result, the study has effectively confirmed the local

opinions that the retail stores in the area (NAICS code 44 and 45) are very diverse as well as highly available. They assume 42% of the buildings and nearly 80% of the physical land. On the other end of the spectrum, the need for more entertainment is understandable since this type of building virtually does not exist on St. Michael’s Drive. In between, respectively the street harbors Accommodation and Food Services (NAICS code 72), Education Services (NAICS code 61), Finance and Insurance offerings (NAICS code 52), Public Administration (NAICS code 92), and Rental and Leasing (NAICS code 53).

4.3 Identify Measurable Indicators to Assess Current and Future Designs

As mentioned above, a system of measurable indicators is necessary to not only quantify the baseline of the project but also assess current and future design choices from city planners. With that being said, the group has looked into classical urban planning literature, survey results about Saint Michael’s Drive, and Charrette designs for a possible list of indicators. After finalizing a list, the group has devised methods of measurement for these indicators, which could be read afterwards by a computing model.

4.3.1 From Urban Planning Literature

As mentioned in the methodology, in the classical urban planning text “Good City Form”, Kevin Lynch mentioned five factors that contribute to a good urban form, namely vitality, sense, fit, access and control. These indicators are intuitive and not quantifiable, but they give a sense

of what the group has been looking for in the survey results and Charrette designs. Essentially, the indicators need to address how appealing Saint Michael's Drive's landscape is, compared to the city (vitality), how easily accessible it is (access), et cetera.

4.3.2 Common Themes

Essentially, since the group of indicators needs to be able to quantify the surveys' result and Charrette's design, it was most effective to study the common themes of these two subjects. The common themes are described in following two figures. The bigger the word is, the more frequent it appeared during the survey and in the Charrette.



Figure 26 Common Themes of Survey Results



Figure 25 Common Themes of Survey Results

After identifying the common themes from both local and professional opinions regarding the current state and redevelopment of St. Michael's Drive, the group quantified them by categories and developed a measurement method for each category. They are essentially the desirable indicators.

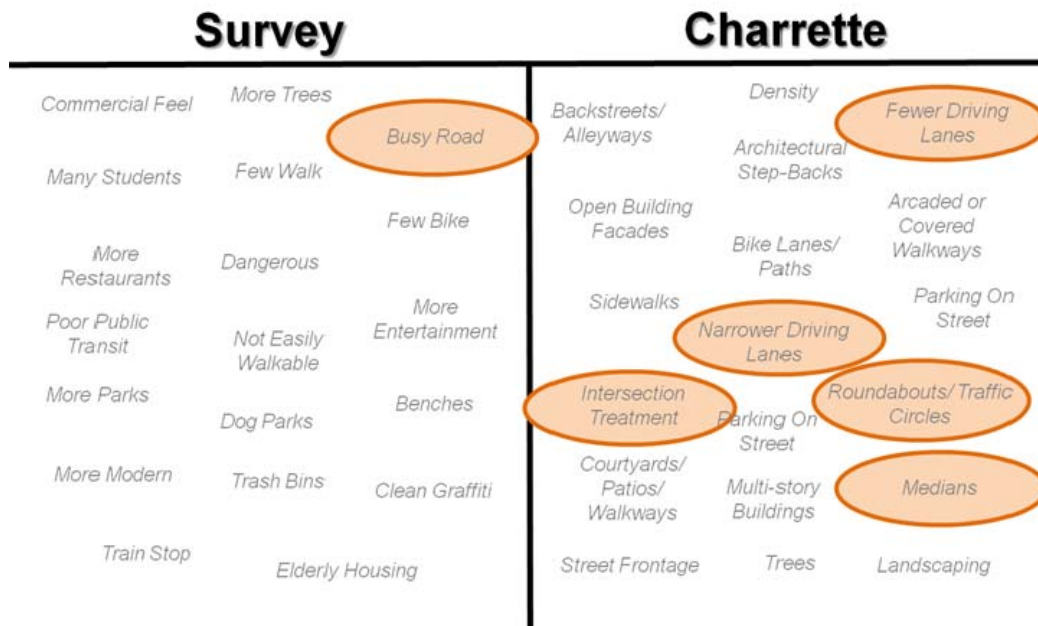


Figure 27 Grouping the Common Themes

With the grouping completed, the group has finalized a list of nine indicators, namely walkability, green public space, vehicular mobility, business vitality, public mobility, housing availability, job availability, parkability, and visual appearance.



Figure 28 Common Theme Groups

4.3.3 The Measurability of Identified indicators

Since the key attribute of the indicators is measurability, it is essential for the group to prove that they are measurable, and thereby, develop a method of measurement for each of them. To accomplish this task, the group has broken each indicator down to several elementary factors, all of which can be easily measured.

INDICATORS
Walkability
Green Public Space
Vehicular Mobility
Business Vitality
Public Mobility
Housing Availability
Job Availability
Parkability
Visual Appearance

Figure 29 Indicators

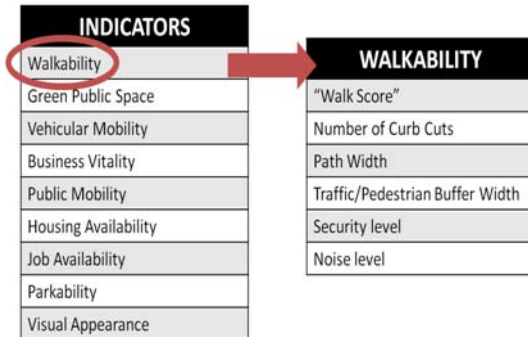


Figure 31 Measurable Attributes for Walkability

First, using this approach, the group examined the five factors of which walkability consists: Walk Score, number of curb cuts, path width, traffic/pedestrian buffer width, security level and noise level. Specifically, Walk Score is an online service at <http://www.walkscore.com> that allows users to grade their walking experience on any road – St. Michael’s Drive in this case based on the availability of retail and commercial stores along the way. As shown in figure 31, Walk Score gives St. Michael’s Drive an 80 out of 100 for the diverse stores in the area.



Figure 30 Walkscore

Moving on to the number of curb cuts – a ramp leading smoothly down from a sidewalk to a street where pedestrian is very likely to meet vehicles (see Figure 32) – the group found out that St. Michael’s Drive has an average number of curb cuts per path segment compared to the norm, hence graded this factor with a 5.

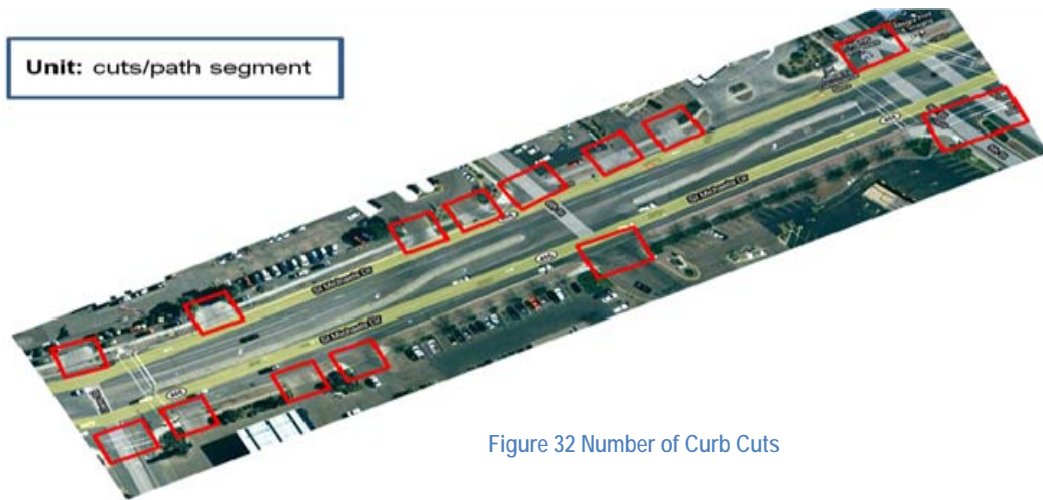


Figure 32 Number of Curb Cuts

Similarly, the average sidewalk width per path segment on St. Michael’s Drive is only a little bit below the norm (see Figure 33), so after research, the team graded it 4 out of 10.

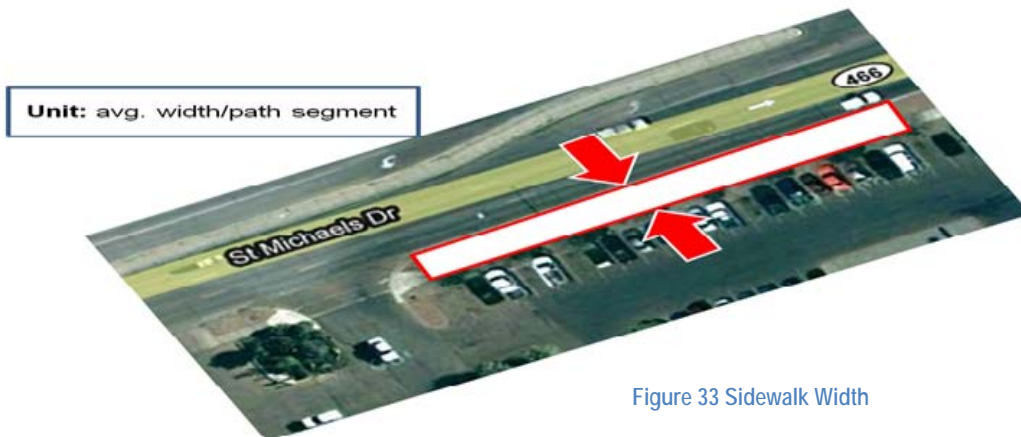


Figure 33 Sidewalk Width

The average width of the buffer between pedestrian and traffic in the area, however, is in a worse condition. The buffers are small on St. Michael’s Drive and virtually non-existent in some parts of the street. Therefore, this factor is only graded 3 (see Figure 34).

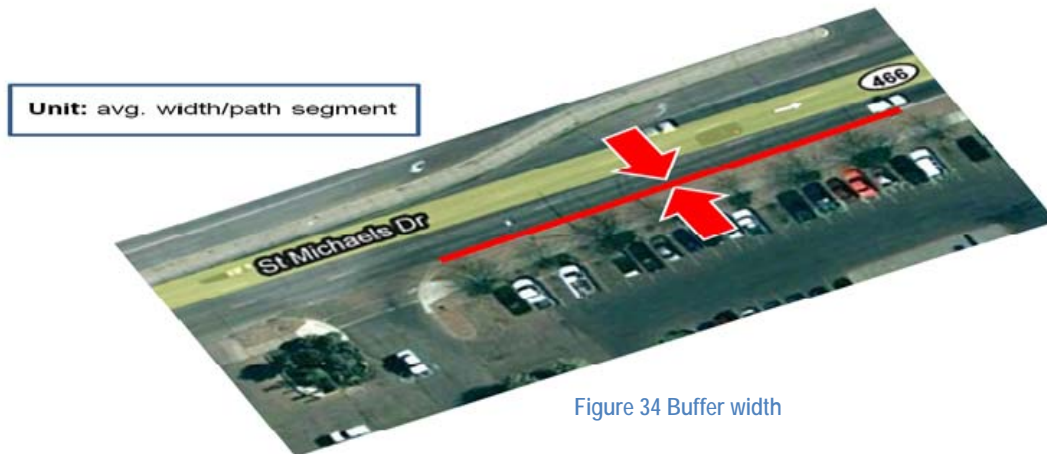


Figure 34 Buffer width

For the rest of the factors that make up walkability on St. Michael's Drive, i.e. Security Level and Noise level, they could be easily measured by the number of crimes in the data and decibel level, respectively, once the relevant data are available. From the locals' opinion, the group presumably decided that the conditions of these two factors on St. Michael's Drive are close to the average, hence a 5 and 4 respectively.

INDICATORS		WALKABILITY				
Walkability	→	"Walk Score"				
Green Public Space		Number of Curb Cuts				
Vehicular Mobility		Path Width				
Business Vitality		Traffic/Pedestrian Buffer Width				
Public Mobility		Security level				
Housing Availability		Noise level				
Job Availability						
Parkability						
Visual Appearance						
		Walkability	1-10 Score	Weight	Final Score	Goal Score
		"Walk Score"	8	2	16	20
		Curb Cuts	5	2	10	20
		Path Width	4	1.5	6	15
		Traffic/Pedestrian Buffer Width	3	1.5	4.5	15
		Security Level	5	1.5	7.5	15
		Noise Level	4	1	4	10
				TOTAL	48	95

Figure 35 Walkability Score in a Nutshell

To sum up, Figure 35 is the measurement of walkability on St. Michael's Drive in a nutshell. The group assigned each of the attributes a weight based on its relative importance to the grand scheme of walkability. These weights were extracted directly from the survey results and the previous research. For example, since local residents had stressed the importance of keeping the retail stores in the area as diverse as they are now, the Walk Score factor was weighed 2. On the other hand, as there were very few mentions of noise level, this factor was weighted 1. The final score demonstrates the current state of St. Michael's Drive (48 out of 100) and the goal score is the desirable state, which means the street is only functioning at half of its potential right now.

Similarly, the other indicators pertinent to the project are decomposed in the same manner, as shown in Figure 36, 37 and 38. The measurable factors (attributes) of green public space are availability, which can be further decomposed as distance from location, park amenities, security level, and noise level, as well as accessibility, which is determined by the number of feet square of park per person in the area. For vehicular mobility, the measurable factors are level of service and safety level. Finally, number of businesses and number of each type made up make up business vitality.

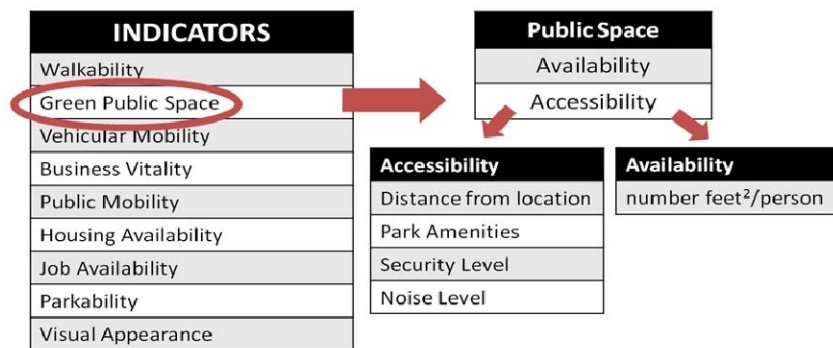


Figure 36 Measurable Attributes for Green Public Space

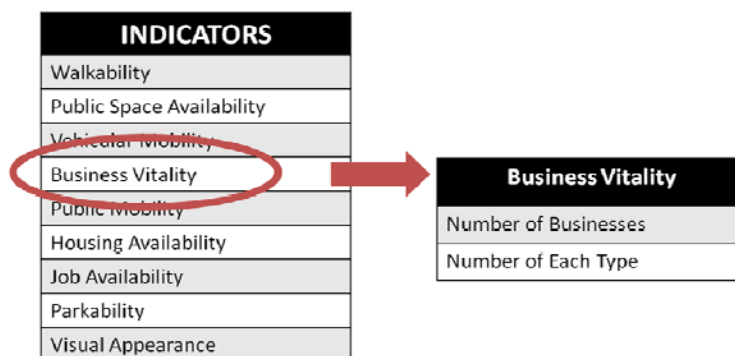


Figure 37 Measurable Attributes for Business Vitality

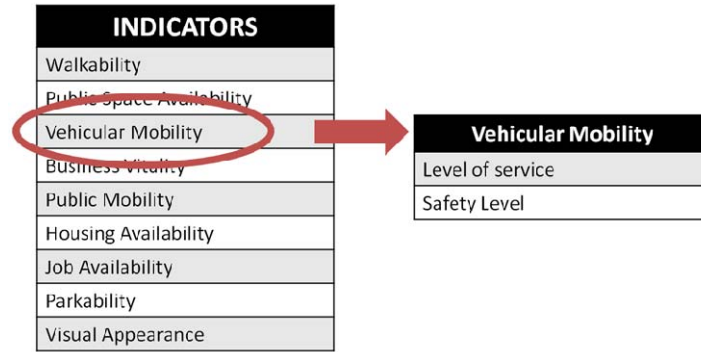


Figure 38 Measurable Attributes for Vehicular Mobility

The measurement of every factor not only determines the value of each indicator individually but also provides a numerical gateway to connect all indicators into a complex urban model that will help professional planners to visualize the impact of their design choices in real time. This is essentially the idea of the project’s second state, and shall be demonstrated in the following section.

4.4 Visualize Impacts of Current and Future Design Choices

The group examined the possibilities of an urban platform to help professional planners make their decisions more effectively regarding the redevelopment of St, Michael’s Drive and in general. The explanation demonstrates that how to translate the baseline for current state of St. Michael’s Drive into quantitative urban factors that could be modeled, and also discusses some strategies to build a possible interactive urban platform based on these factors and provide a demonstration.

4.4.1 Interactive Platform – Ambient Computing

Ambient computing is a technology that allows users to interact with real-time models in physical surfaces. For example, professional urban planners will be able to sit in a room whose walls are all interactive computational surfaces, preloaded with complex models of St. Michael’s Drive. They will be able to change the setup of this model based on their design choices, such as widening the sidewalk, and see the impact these choices bring about in real time. This interactive urban platform, therefore, will increase the accuracy of the design choices made, yet decrease the time delayed in making them. The next section contains the demonstration for the use of this platform.

4.4.2 Demonstration of the Platform

Figure 39 shows the current state of a portion of St. Michael's Drive with 4 curb cuts. The walkability is close to 1 as it is dangerous for pedestrian to encounter vehicles running in and out through these curb cuts.

However, if urban planners would like to see the impact of crossing out a few curb cuts, they could do that with a laser pointer as show in Figure 39, and the increase of walkability will be seen right away in the color scale.



Figure 39 Crossing off 2 Curb Cuts



Ultimately, the result of crossing out all the curb cuts is an average walkability indicating that other factors need changing as well. Therefore, as shown in Figure 40, if the sidewalk width is widened along with all the curb cuts crossed out, the walkability will be highly desirable.



Figure 40 St. Michael's Drive with 4 Curb Cuts



Hypothetically, if there were then a buffer between pedestrian and traffic added in this case, the walkability will be very close to a perfect 10.

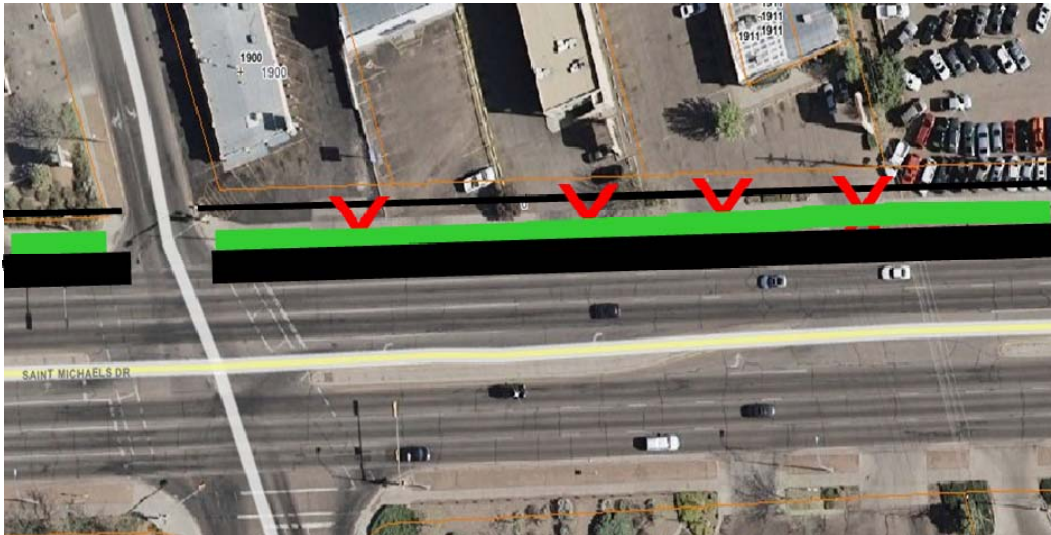


Figure 41 Buffer Added



Following is another example of how this interactive urban platform could help professional planners to make decisions better. Figure 42 shows that the availability of parks around Saint. Michael's Drive is below average, confirming the local needs for more green public space in the area. It also highlights the land owned by the city which could be turned into parks as a solution. If the city followed this strategy and built two more parks on St. Michael's Drive, the level of community space availability would increase to 7 as shown in Figure 43. The advantage of this platform is that urban planners can use tokens such as some quarters and dimes to make

the location of the new parks directly on the interactive surface supported by ambient computing and see the impacts immediately. Ideally, the city could buy private lands to increase the availability of green public space as shown in the scale in figure 43.

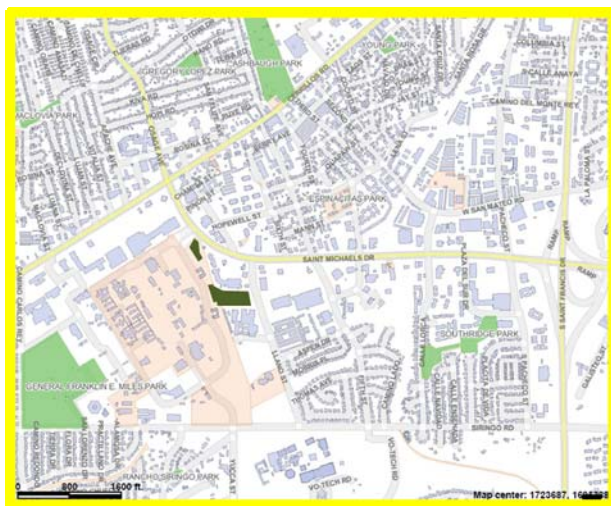


Figure 42 Community Space Availability



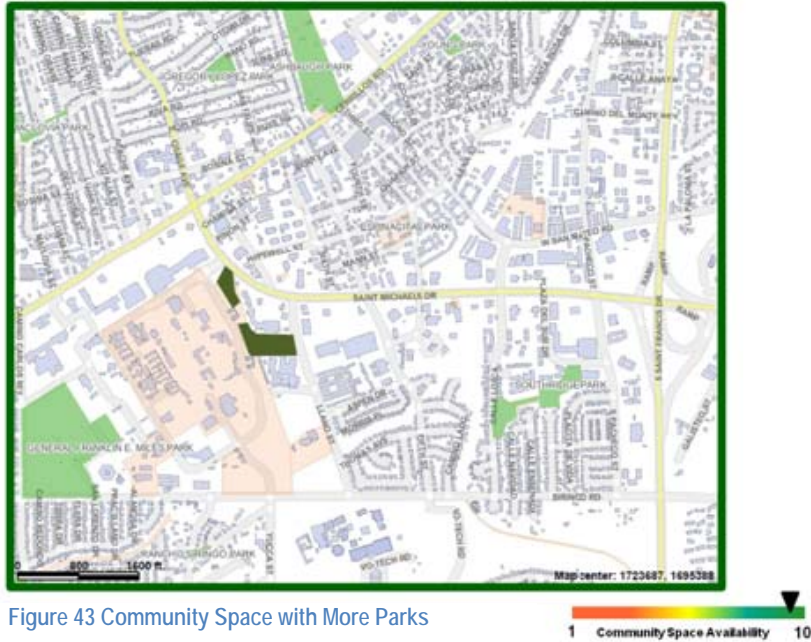


Figure 43 Community Space with More Parks

Figure 44 illustrates a powerful feature of ambient computing when used in conjunction with this interactive urban platform – the realization of an ambient room. Instead of a single interactive surface with an urban model as in the two previous examples, an ambient room will allow users to interact with multiple surfaces to see the impacts of their design choices from many different aspects and levels. This technology is being developed by the group’s sponsor – the Santa Fe Complex.

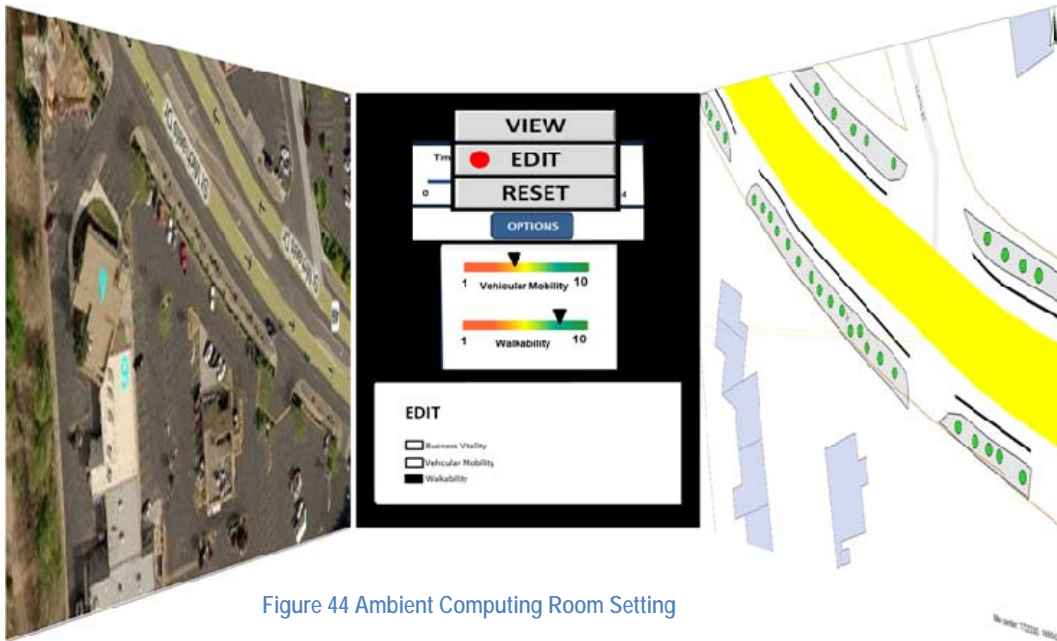


Figure 44 Ambient Computing Room Setting

For example, as shown, a setup of an ambient room with three walls turned into interactive surfaces by several projectors, loaded with a model of St. Michael's Drive. The direct wall consists of a control interface where urban planners can choose the functions with which they want to manipulate the model. Specifically, they can change the time of the day with a slider on the top box to see the change in traffic and pedestrians, indicated by two scales from 1 to 10 right below. The wall on the right allows users to directly change the feature of the model such as widening the sidewalk or showing building profiles and changing building type. On the other hand, the last wall will show a satellite photo of this model with the exact location where changes will happen accordingly to the other two walls.

4.4.3 Implementation Method

After examining the possibilities of an urban platform and its usage as described in the previous section, the group has developed an actual implementation method for this platform. It shall be explained in two parts – an implementing strategy with pseudo code and a demonstration of the end-model concerning traffic on St. Michael's drive and its influencing factors.

Here is how the model was built in pseudo code for agent based modeling with NetLogo. It is useful to note beforehand that the strategy is reusable and expandable on a city scale instead of only focusing on St. Michael's Drive.

1. Load GIS vector layer of the road system in Santa Fe.
 - Initiate a path graph to translate the road system into intelligent agent
 - For EACH polyline // each polyline represents a road or a part of a road
 - ✓ Put a node as an agent in an end of THIS polyline
 - ✓ Read in data associated with this polyline // such as how busy this road is
 - Load these data into THIS node
 - ✓ Put THIS node into the path graph
2. Initiate car as an agent
 - Specify size, color, maximum speed, tendency // maximum speed is the speed limit of St. Michael's Drive; tendency is a car preference toward a more or less busy road. Car with preference for less busy road is a minority.
 - Create links between car and the nodes in part 1 // agents in NetLogo can communicate with each other
3. Read in traffic factor
 - Time of the day, day of the week, week of the year
 - ✓ Read in traffic data associated with this factor

- Building availability // how many restaurants, retails, etc.
 - ✓ Recalculate the number of cars on the street and the speed variation accordingly based on the complexity of indicators mentioned in section 4
4. Show traffic
- Calculate level of service and speed efficiency based on actual average speed of cars on the road and the speed limit.

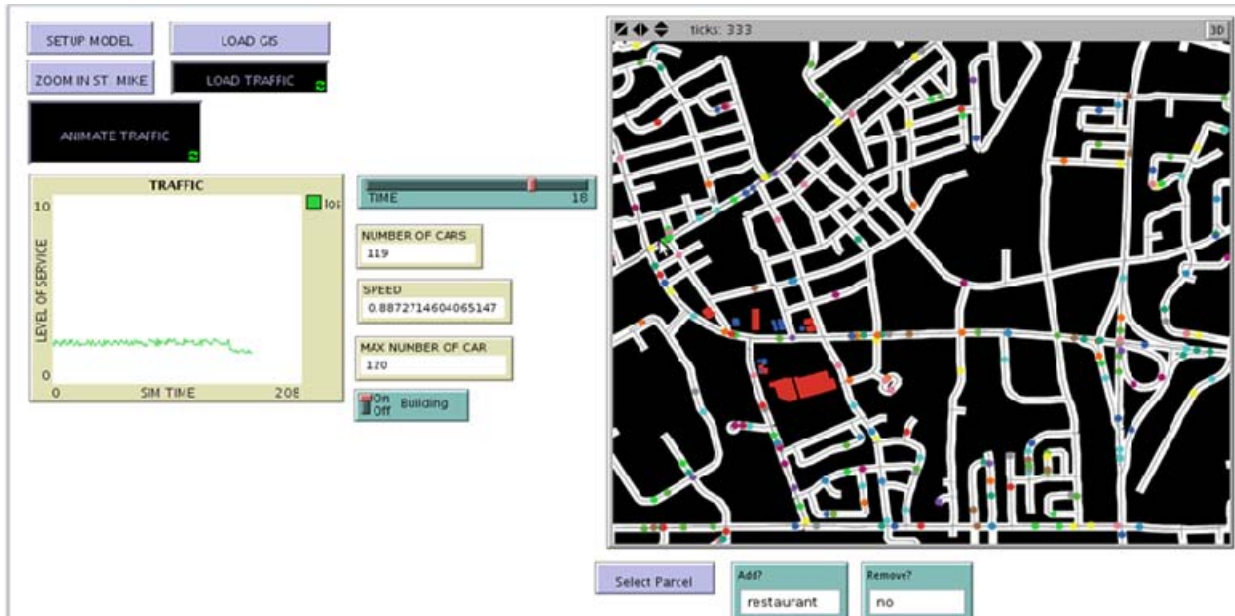


Figure 45 Sample NetLogo Operating Page

A sample NetLogo operating page is shown in Figure 45. After loading in the GIS information of the city, zooming into St. Michael’s Drive and reading in all the traffic data associated with it, the user can choose the time of day to show traffic. Assume at 3 am, the average number of cars entering Saint. Michael’s Drive in one hour is only around 14 (very few cars – colored dots - appear) and the speed efficiency is around 0.9 as drivers are comfortable driving up and down the street, hence a high level of service. However, at 5pm, the average number of cars is around 60 (more cars appear), the speed efficiency is around 0.7, hence a low level of service. It can be also demonstrated that a restaurant is added, which increases the number of cars and decreases the level of service, and then remove a retail store, which bring the condition of traffic on Saint. Michael’s Drive back to normal. All these changes will be made interactively with physical objects such as selecting the location to build a new restaurant with a token.

5. Conclusions and Recommendations

A wealth of data and analysis is presented in the report. Therefore, it is of utmost importance that all the data and analysis is brought together with efficient and helpful suggestions for the City of Santa Fe. There are a number of factors of redevelopment of Saint Michael's Drive and its management that need to be considered. Based on the analytical results and social observations we are able to make a range of recommendations to help improve the designs of Saint Michael's Drive. These recommendations may help to provide the means to get the redevelopment project underway, allowing the evaluation of Charrette designs to start.

According to the issues presented in results and analysis, the recommended solutions in this section are divided into several categories, each addressing one of the problematic factors surrounding the redevelopment of the area:

- Transportation Design
- Community Space
- Visual Satisfaction
- Business Variety
- Innovation and Integration of Technology

5.1 Transportation Design

One of the most troubling issues at Saint Michael's Drive is the deficient transportation service level. While vehicular transportation was not a problematic topic in the area, other various components in transportation at Saint Michael's Drive, including walkability, bicycle transportation, public transportation availability, and general safety levels were targeted as obstacles the city may have to deal with during redevelopment. Each of these transportation factors also corresponds to a measurement scoring method. According to the conducted studies, the existing public transit service Santa Fe Trails Bus System needs to be upgraded to a better service level, meaning the increasing bus frequency, timely stops, and the more reliable security. Moreover, a train stop of Rail Runner is also recommended here. Additional public transit stops would be beneficial alleviating the traffic problems seen at Saint Michael's Drive.

It has been noted that issues regarding safety are concerning locals specifically because of the large amount of students from De Vargas Middle School, College of Santa Fe, and other public schools in the Saint Michael's Drive area. There are also many senior residents in the area. First, the authorities should understand the risks involved with dangerous environment Saint Michael's Drive could create. Basic solutions directed toward the residents and students should be implemented to enhance their sense of safety, and the authorities may be expected to strengthen the police force in the area. On the other hand, we are also concerned that Saint Michael's Drive is not pedestrian or bicycle friendly since our analysis pointed the lack walkable

or bikable paths. Based on this knowledge, we researched the best road management strategies and developed a series of viable factors of indicators for a walkability and transportation evaluation such as number of curb cuts, path width, and traffic/pedestrian buffer width. By reducing the number of curb cuts, widening the sidewalks, and adding a buffer between traffic and paths, the optimal walkability situation can be obtained.

5.2 Green Amenities

The residents interviewed for this project stated that they are in favor of more public green amenities such as parks, dog grounds, benches, as well as trash bins. Government officials and city planners responsible for the designing need to consider the public green amenities of Saint Michael's Drive as well as its effects on surrounding communities. Currently the City of Santa Fe owns the land of College of Santa Fe and its surrounding area. The group proposed if the city can build two small parks out of the college area, the park availability would advance to a more ideal level. To accomplish the most ideal standard, the city could examine the possibility of buying a new land to develop more park area.

5.3 Visual Satisfaction

During the local surveys, most people did not consider Saint Michael's Drive to have an appealing landscape because of its lack of green amenities, commercial feel, high volumes of traffic, and some even desire modern designs in the area. We also received several complaints about the graffiti and litter in the area. To guarantee the most satisfactory visual appearance, engineers and architects need to seek an environmentally friendly design corresponding with more green landscape and less commercial oriented buildings. On the other hand, city authorities should also propose to clean the street graffiti and litter regularly.

5.4 Business Variety

According to the conducted local interviews, it appears that the existing businesses and retails more or less meet people's necessity. The desire for additional restaurants and entertainment typed businesses have been expressed by interviewees including frequenters on Saint Michael's Drive and students of De Vargas Middle School. More restaurants and entertainment businesses would not only optimize the business variety of the surroundings, but the addition would also make Saint Michael's Drive a better community for locals and students.

5.5 Innovation and Integration of Technology

Focusing on innovation and integration of technology, involving projections of visualizations of data in urban planning, while integrating cause and effect analysis, may be beneficial. As analyzed in section 5, an interactive urban platform constructed with ambient computing would allow professional planner to experience the impact of design choices in real time. We recommend that scientists at the Santa Fe Complex as well as the city authorities and technicians help develop this innovative computer application technology, and hold ambient

computing workshops and conferences for computer operators and city planners to promote the use of this tool. The interactive urban platform is expected to advance in parallel with the Saint Michael's Drive redevelopment and the long term plan for the city in general.

The proposed recommendations intend to tackle all of the threats we disclosed in data collection and discussion, in order to make Saint Michael's Drive a better community serving residents, tourists and local students. We feel that our recommendations should not only be considered with the current project associated with Saint Michael's Drive, but also can be applied to future projects which involve other agencies and/or communities.

Appendix A

Figure 1: Saint Michael's Drive Resident Survey

12. Saint Michael's Drive is easily accessible without a car.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Disagree Slightly Disagree Neutral Slightly Agree Agree

Comment b:

13. Saint Michael's Drive lacks community spaces like small parks and picnic areas.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Disagree Slightly Disagree Neutral Slightly Agree Agree

Comment b:

14. Saint Michael's Drive's architecture is culturally consistent with the rest of Santa Fe.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Disagree Slightly Disagree Neutral Slightly Agree Agree

Comment b:

15. Redeveloping Saint Michael's Drive is a good idea.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Disagree Slightly Disagree Neutral Slightly Agree Agree

Comment b:

16. Additional Comments:

Thank you for your time, and we appreciate your feedback!

St. Michael's Drive Satisfaction Survey

1. Gender: Male Female

2. Age Range: Under 18 18 - 30 31 - 50 51 - 70 71 or above

3. Employed: No Yes, how many years? _____ By: _____

4. Student: No Yes, what grade? _____

5. Do you work in the area? Yes No

6. Do you drive close by? Yes No

7. Why did you come here today? _____

8. Saint Michael's Drive has an appealing landscape.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Disagree Slightly Disagree Neutral Slightly Agree Agree

Comment b:

9. Saint Michael's Drive is pedestrian friendly.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Disagree Slightly Disagree Neutral Slightly Agree Agree

Comment b:

10. Saint Michael's Drive is bicycle friendly.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Disagree Slightly Disagree Neutral Slightly Agree Agree

Comment b:

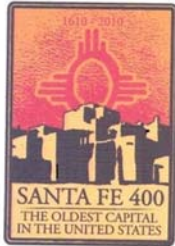
11. Saint Michael's Drive has all the retail and businesses I desire.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Disagree Slightly Disagree Neutral Slightly Agree Agree

Comment b:

Figure 2: Letter from the City Regarding Saint Michael's Drive Redevelopment Research



City of Santa Fe, New Mexico

200 Lincoln Avenue, P.O. Box 909, Santa Fe, N.M. 87504-0909

David Coss, *Mayor*

Councilors:

Rebecca Wurzbarger, Mayor Pro Tem, Dist. 2
Patti J. Bushee, Dist. 1
Chris Calvert, Dist. 1
Rosemary Romero, Dist. 2
Miguel M. Chavez, Dist. 3
Carmichael A. Dominguez, Dist. 3
Matthew E. Ortiz, Dist. 4
Ronald S. Trujillo, Dist. 4

March 15, 2010

Business Owners/Business Operators
St. Michael's Drive
Santa Fe, NM

Re: St. Michael's Drive Proposed Redevelopment Project

Dear Business Owner and/or Business Operator:

This letter will serve as the official City of Santa Fe introduction to the following Worcester Polytechnic Institute (WPI) students Nghia Hoang, Krister Leigher John Mulhern and Xiyang Zhang. Their professor is Fabio Carrera.

These four students are working with City Staff in an effort to gather information about what people want to see and not see developed in the neighborhood. We need your help to gather and process ideas from the community, for the community.

The students have a list of questions they would like to ask you as part of this outreach process. Answering these questions will take less than 5 minutes. We promise! Your input is extremely valuable as we continue to work on preparing a community based plan for the use of the St. Michael's Drive area from Cerrillos to St. Francis and Siringo to San Mateo.

We thank you in advance for your cooperation and desire to make St. Mike's a community that serves everyone. If you have any questions or concerns about this letter, kindly contact Lee DePietro, Special Projects Manager at the City # 955-6662.

Sincerely,

Kathy McCormick, Director
Housing and Community Development Department



Figure 3: Complete List of Collected GIS Layers

SFGIS\DEMOG - Demographic Data

DEMOG\DEMCEN - DEMOGRAPHIC CENSUS DATA

COBG90 - 1990 Census Geography to Block Group Level

COBG00 - 2000 Census Geography to Block Group Level

COBLK90 - 1990 Census Geography to Block Level

COBLK00 - 2000 Census Geography to Block Level

COTRT90 - 1990 Census Geography to Tract Level

COTRT00 - 2000 Census Geography to Tract Level

DEMOG\DEMEMP - DEMOGRAPHIC EMPLOYMENT DATA

COEMP - County Places of Employment

TAZEMP00 - 2000 List of Employers within TAZ

DEMOG\DEMPRMT - PERMIT DATA

SFBP9497 - Building Permit Point Locations (1994-97)

SFGIS\FACIL - Facility Data

FACIL\BLDGFOOTPRINT

SFBLDG2005

FACIL\FACILITY DATA

SFFACIL - Santa Fe City Facilities

SFFITSPL - Future Telecommunications Infrastructure System

SFSCH - Santa Fe Schools

SFGIS\IMAGE - Image Data

IMAGE\IMAGE DATA

AP00INDX - Aerial Photo Index for 2000 Low Altitude Flight

IMAGE\DOQQ - DIGITAL ORTHO QUARTER QUAD DATA

SANTAF-NE,NW,SE,SW.TWF - Digital Ortho Quarter Quad of Santa Fe

IMAGE\MRSID01 - 2001 IMAGE DATA OF SANTA FE

CITYOFSANTAFE – Entire City

SF01NORTH - North Side of Santa Fe

SF01SOUTH - South Side of Santa Fe

IMAGE\MRSID05 - 2005 IMAGE DATA OF SANTA FE

SANTAFE_CITY – Entire City

IMAGE\SF00LO - 2000 Image Low Altitude Flight

IMAGE\SF01LO - 2001 Image Low Altitude Flight

IMAGE\SF05LO – 2005 Image Low Altitude Flight

IMAGE\SF92LO - 1992 Image Low Altitude Flight

IMAGE\SF96LO - 1996 Image Low Altitude Flight

SFGIS\JURIS - Jurisdictional Data

JURIS\JURISDICTIONAL DATA

SFEZ2 - Santa Fe EZ 2 Mile (Polygon)

SFEZ2L - Santa Fe EZ 2 Mile (Line Only)

SFEZ5 - Santa Fe EZ 5 Mile (Polygon)

SFEZ5L - Santa Fe EZ 5 Mile (Line Only)

SFJUR - Santa Fe Jurisdictional Limits

SFJURL - Santa Fe Jurisdictional Limits (Line Only)
 SFNA - Santa Fe Neighborhood Associations
 SFZIP - Santa Fe Zip Code Boundary
 SFZON - Santa Fe Zoning Districts
JURIS\JURCO - JURISDICTIONAL COUNTY (SANTA FE) DATA
 COBND - County Boundary
 COOWN - County Land Ownership
JURIS\JURGP - JURISDICTIONAL GENERAL PLAN DATA
 SFLU20 - Santa Fe Future Land Use (Year 2020)
 SFURBGP - Santa Fe Urban General Plan (Poly)
JURIS\JURHST - JURISDICTIONAL HISTORICAL DATA
 BADIST - Barrio del Analco Historic District (1968)
 HBRDG - Historic Bridges
 HCRBSTON - Historical Curb Stones
 HDSTBLDG - Historic Buildings
 HDIST - Santa Fe Historical Districts
 HDSTHGT - Santa Fe Historical Height Amendment Area
 NHRBND - National Historic Boundary
 HISTCOMP – Historical Compounds
SFGIS\MSTR - Master Administrative Data
MSTR\MSTANO - MASTER ANNOTATION DATA
 SFLUANNO – Santa Fe Land Use Map Annotation
 SFMJRDAN - Santa Fe Major Road Annotation
 SFMJSIZE - Santa Fe Major Road Annotation (To Scale)
 SFRDSPA - Santa Fe Road Name Annotation
MSTR\MSTINDX - MASTER INDEX DATA
 PLSSREF - PLSS Reference Grid for NM State
 ROADMAPBOOK – Santa Fe Road Map Book
 SFEZSCT - Santa Fe EZ Section Map Index
 SFPLSS – Santa Fe Public Land Survey System (City)
 SFQTRSCT - Santa Fe Quarter Section Index
SFGIS\NARES - Natural Resources Data
NARES\NATURAL RESOURCES DATA
 STBND – New Mexico State Boundary
 STCITIES – New Mexico State Cities
 STCNTY - New Mexico State County Boundaries
 STCOUNTIES – New Mexico County Boundaries
 STDRAIN – New Mexico State Drainage Basins
 WATERBOD – New Mexico State Water Bodies
NARES\NRPRK - NATURAL RESOURCES PARK DATA
 CITYPARKS – City Parks Locations
 FOREST - National Forest in Santa Fe Area
 OPSPINDX - Open Space Index
 PARKS - Santa Fe Parks

PARKTRLS - Santa Fe Park Trails

SFOSP - Santa Fe Open Space

NARES\NRSTR - NATURAL RESOURCES STREAM DATA

ARROYO - Santa Fe Arroyos

RIOGINSFC - Rio Grande in Santa Fe

RIOGRIV - Rio Grande River

SFHVD - Santa Fe River Hydrology

SFHVBSN - Santa Fe River Hydrologic Basin

SFHYSBSN - Santa Fe Hydrologic Sub Basin

SFRESERV – Santa Fe Reservoirs

SFRESVR - Santa Fe Reservoirs

SFRIV - Santa Fe Rivers

SFRIVERS - Rivers In and Around Santa Fe

SFSTR - Santa Fe Stream Hydrology

SFGIS\PARCL - Parcel Data

PARCL\Parcel Data

LANDOWN - Land Ownership for the State

PRCSFCO – Santa Fe County Parcels (Polygon)

PRESMTS – Easements

SFLU - Santa Fe Existing Land Use (1999)

SFPARCL - Santa Fe Parcels (Polygon EZ5 Boundary)

PARCL\PARADD - PARCEL ADDRESS DATA

ADDPNT – Santa Fe Address Points

PARCL\PARCEL_HISTORY

PARCELS060928

PLATDATA – Plata Data

SF_DEVS050801

SFGIS\TOPO - Topography Data

TOPO\SLPSCT - SLOPE DATA

SLPSCT - SL170924 – EX: Tnshp 17N Rng 9E Section 24 Slope

SFGIS\TRNS - Transportation Data

TRNS\Transportation Data

SFBIKE - Bicycle Trails in Santa Fe

SFBRDG – Santa Fe Bridge Locations

SFEOR - Santa Fe Street Edge of Road

SFMAJRD - Santa Fe Major Roads

SFRDLN - Santa Fe Road Centerlines

SFTRUCK - Truck Routes in Santa Fe

STREETS – Santa Fe County Road Centerline

TRNS\TRNACC - TRANSPORTATION TRAFFIC ACCIDENT DATA

COACC96 - County Traffic Accidents for Years 1996

COACC97 - County Traffic Accidents for Years 1997

COACC98 - County Traffic Accidents for Years 1998

COACC99 - County Traffic Accidents for Years 1999

COACC00 - County Traffic Accidents for Years 2000

TRNS\TRNBUS - TRANSPORTATION BUS (TRANSIT) DATA

BUSTRE - City Bus Routes

BUSSYS - City Bus System

BUSTIME - Bus Route Time Points

SFADARMP - Santa Fe ADA Ramps

SFBUSSA - Santa Fe Transit Service Area

SFBUSSTP - Santa Fe Bus Stop Locations

TRNS\TRNBUS - GPSDATA

BENCH – Point Locations of Benches

POLE2 – Point Locations of Poles

POLE – Point Locations of Poles

SHELTER – Point Locations for Shelters

SHELTERS – Point Locations for Shelters

TRASH – Point Locations for Trash Bins

TRNS\TRNCO - COUNTY TRANSPORTATION DATA

CORDMJR - County Major Roads

CORIAL - County Railroads

TRNS\TRNMPO - METROPOLITAN PLANNING ORGANIZATION

SFTAZ - Santa Fe Transportation Analysis Zones

SFTAZOL – Santa Fe Transportation Analysis Zones Boundary (Polygon)

SFFRC - Santa Fe Functional Road Classification (Traffic Counts)

TRNS\TRNPRJ\SNOW - TRANSPORTATION SNOW REMOVAL DATA

SFSNWRD - Santa Fe Snow Removal Districts

SFSNWRDA - Santa Fe Snow Removal Road Priorities

SFSNWSA - Santa Fe Snow Removal Service Area

TRNS\TRNPKG - TRANSPORTATION PARKING DATA

BUSLOADING – Santa Fe Parking Bus Loading Zones/Spaces

FIRSPAC - Santa Fe Parking Fire Trucks Zones/Spaces

HANDSPAC - Santa Fe Parking Handicap Zones/Spaces

LOADSPAC - Santa Fe Parking Loading Zones/Spaces

SFPKGLOT - Santa Fe Parking Lots

SFPRKMTR - Santa Fe Parking Meters

RESVDSPCSS - Santa Fe Parking Reserve Zones/Spaces

SFGIS\UTILS - Utility Data

UTILS\UTLELE - UTILITY ELECTRIC DATA

DROPBOXES – Santa Fe Electric Drop Boxes

SF46KV - Santa Fe Electric 46KV Lines

SF115KV - Santa Fe Electric 115KV Lines

CONDUIT – City Conduit (Not Confirmed)

UTILS\UTLGAS - UTILITY GAS DATA

SFGASPIP - Santa Fe Gas Line Distribution

UTILS\UTLWTR - UTILITY WATER DISTRIBUTION DATA

SFWTMOD - Santa Fe Modeled Water Pipes

SFWTPIPE - Santa Fe Water Pipe Distribution

Appendix B

1. ¡YouthWorks!

Santa Fe **¡YouthWorks!** is a nonprofit organization that serves disadvantaged and at risk youth in Santa Fe and northern New Mexico. They specialize in a full spectrum of culturally appropriate programs that assist high-risk youth—predominantly Hispanic and Native American—to develop job skill training, build educational skills, and develop healthy attitudes and behaviors necessary to assure a successful future. **¡YouthWorks!** has numerous programs that focus on environmental issues such as sustainability and conservation, and currently serves more than 3,000 children, youth, and young adults. We will incorporate **¡YouthWorks!** into the redevelopment of St. Michael’s by working closely with members to refine the methods with which we will conduct our field observations. The “barrio” is within walking distance of St. Michael’s Drive, therefore the input of **¡YouthWorks!** members from that area will not only help our redevelopment project, but it will also serve to revitalize the troubled community that they come from.³⁷

Work Cited

- ¹ Figures, Traffic Accident report in Vietnam
www.easts.info/on-line/proceedings_05/1923.pdf
- ² Figures, NPG Facts &. Fast Facts about U.S. Population Growth.
<http://www.npg.org/facts/uspopfax.htm> (accessed March 18, 2010).
- ³ Table 1060. State Motor Vehicle Registrations: 1990 to 2007.
- ⁴ Martin Chourre and Stewart Wright. *Population Growth of the Southwest United States, 1900-1990*: U.S. Geological Survey, 2003
<http://geochange.er.usgs.gov/sw/changes/anthropogenic/population/>.
- ⁵ Martin Chourre and Stewart Wright. *Population Growth of the Southwest United States, 1900-1990*: U.S. Geological Survey, 2003
<http://geochange.er.usgs.gov/sw/changes/anthropogenic/population/>.
- ⁶ "One Half of the World's Population, Approximately 3 Billion People on Six Continents, Lives Or Works in Buildings Constructed of Earth." New Mexico - Earth Architecture -.
<http://www.eartharchitecture.org/index.php?/categories/60-New-Mexico> (accessed March 18, 2010).
- ⁷ History of the Railyard in Santa Fe
<http://railyardsantafe.com/index.php?page=history>
- ⁸ All About Cities. *Random thoughts from Santa Fe*. 2007 [cited March 18 2010].
<http://allaboutcities.blogspot.com/2007/05/random-thoughts-from-santa-fe.html>.
- ⁹ The City of Santa Fe Government. *St.Micheal's Boulevards*. Accessed 3/18/2010.
<http://www.santafenm.gov/index.aspx?NID=1766>
- ¹⁰ The City of Santa Fe Government. *Santa Fe Trends 2010*. Accessed 3/18/2010
<http://www.santafenm.gov/DocumentView.aspx?DID=5493>
- ¹¹ The City of Santa Fe Government. *Downtown Vision Plan*. Accessed 3/18/2010
<http://www.santafenm.gov/DocumentView.aspx?DID=1408>
- ¹² The City of Santa Fe Government. *Downtown Vision Plan*. Accessed 3/18/2010
<http://www.santafenm.gov/DocumentView.aspx?DID=1408>
- ¹³ The City of Santa Fe Government. *Downtown Vision Plan*. Accessed 3/18/2010
<http://www.santafenm.gov/DocumentView.aspx?DID=1408>
- ¹⁴ Santa Fe, NM Convention and Visitors Bureau. *About Santa Fe*. 2010 [cited 03/18 2010].
http://santafe.org/Visiting_Santa_Fe/About_Santa_Fe/index.html.
- ¹⁵ Wikipedia. *Santa Fe, New Mexico*. 2009[cited 03/21 2010]
http://en.wikipedia.org/wiki/Santa_fe,_nm.html.
- ¹⁶ Santa Fe, NM Convention and Visitors Bureau. *About Santa Fe*. 2010 [cited 03/18 2010].
http://santafe.org/Visiting_Santa_Fe/About_Santa_Fe/index.html.
- ¹⁷ Simmons, Marc. *Origins of Santa Fe*. Accessed 3/18/2010. Copyright © 2000-2007 Santa Fe Always Online, Inc.
<http://www.sfaol.com/history/origins.html>
- ¹⁸ Simmons, Marc. *Origins of Santa Fe*. Accessed 3/18/2010. Copyright © 2000-2007 Santa Fe Always Online, Inc.
<http://www.sfaol.com/history/origins.html>
- ¹⁹ Simmons, Marc. *Origins of Santa Fe*. Accessed 3/18/2010. Copyright © 2000-2007 Santa Fe

-
- Always Online, Inc.
<http://www.sfaol.com/history/origins.html>
- ²⁰ Frantz, Laurie. *El camino real national scenic byway*. 2009 [cited 03/20 2010].
http://www.newmexico.org/explore/scenic_byways/camino_real.php.
- ²¹ Ellick, Carol J. "The Grand Adventure! El Camino Real de Tierra Adentro; the Royal Road from Mexico City to Santa Fe". SRI Foundation Rio Rancho, NM, 2003.
<http://www.srifoundation.org/library.html>
- ²² Virtual Library. *Santa Fe Trail: William Becknell*. 2009 [cited 03/21 2010].
http://www.vlib.us/old_west/trails/sfbhist.html.
- ²³ Virtual Library. *Santa Fe Trail: William Becknell*. 2009 [cited 03/21 2010].
http://www.vlib.us/old_west/trails/sfbhist.html.
- ²⁴ Magoffin, Susan Shelby and Lamar, Howard R. 1982. *Down the Santa Fe Trail and Into Mexico: The Diary of Susan Shelby Magoffin, 1846-1847*. Edited by Drumm, Stella Madeleine. ISBN 9780803281165
- ²⁵ U.S Department of Transportation: *National Scenic Byways Program. El camino real overview*. 2009 [cited March 18 2010].
<http://www.byways.org/explore/byways/2065/stories/46941>.
- ²⁶ Santa Fe Railyard. *Santa Fe Railyard-A History* 2009[cited 03/20 2010]
<http://railyardsantafe.com/index.php?page=history>
- ²⁷ The City of Santa Fe Government. *Santa Fe Trends 2010*. Accessed 3/18/2010
<http://www.santafenm.gov/DocumentView.aspx?DID=5493>
- ²⁸ U.S Census Bureau. *Santa Fe, NM Profile of General Demographic Characteristics*. 2000 [cited 3/10/2010 2010].
http://factfinder.census.gov/servlet/QTTTable?_bm=n&_lang=en&_qr_name=DEC_2000_SF3_U_DP3&ds_name=DEC_2000_SF3_U&geo_id=16000US3570500.
- ²⁹ The City of Santa Fe Government. *Cultivating Santa Fe's Future Economy: Target Industry Report*. [cited February 22, 2010]
<http://www.santafenm.gov/DocumentView.aspx?DID=1291>
- ³⁰ Simmons, Marc. *Santa fe's street names*. 2007 [cited March 18 2010].
<http://www.sfaol.com/history/street.html>.
- ³¹ Liming, Reed. 2010. *Boulevard redevelopment project: St. michael's drive existing conditions*. 03/02/2010.
- ³² The City of Santa Fe Government. *Santa Fe Trends 2010*. Accessed 3/18/2010
<http://www.santafenm.gov/DocumentView.aspx?DID=5493>
- ³³ Liming, Reed. 2010. *Boulevard redevelopment project: St. michael's drive existing conditions*. 03/02/2010.
- ³⁴ The City of Santa Fe Government. *Downtown Vision Plan*. Accessed 3/18/2010
<http://www.santafenm.gov/DocumentView.aspx?DID=1408>
- ³⁵ The City of Santa Fe Government. *Downtown Vision Plan*. Accessed 3/18/2010
<http://www.santafenm.gov/DocumentView.aspx?DID=1408>
- ³⁶ Liming, Reed. 2010. *Boulevard redevelopment project: St. michael's drive existing conditions*. 03/02/2010.
- ³⁷ YouthWorks!. *Youth programs*. 2010 [cited March 18 2010].
<http://www.santafeyouthworks.org/programs.php>.