Traffic Study for the Highway System in Samaná Province, Dominican Republic

Draft Report

Presented by:

THE Louis Berger Group, INC.
Washington, D.C. USA

August 2007

THE **Louis Berger Group,** INC.
2445 M Street, NW, Suite 400, Washington, DC 20037 USA
Tel 202 331 7775 Fax 202 293 0787 www.louisberger.com

Washington DC, August 29, 2007

Luis R. Mejía Brache
Vice President
Emerging Markets Corporate Banking (EMCB)
Citigroup
Dominican Republic

Re. Traffic Study for the Highway System in the Province of Samaná

Dear Luis:

We are very pleased to submit the Draft Final Report for the Traffic Study for the Highway System in the Province of Samaná.

Please feel free to let us know if you have any questions regarding our analysis and/or if you need any additional information.

Sincerely,
The Louis Berger Group

Nikhil Bhandari
Director

Traffic Study for the Highway System in Samaná Province, Dominican Republic

DRAFT REPORT

The **Louis Berger Group**, Inc.

August 29, 2007

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DISCLAIMER

The assignment was conducted in a manner consistent with the level of care and skill exercised by professionals currently practicing under similar conditions and is based on information made available to the Louis Berger Group. We have relied on traffic and revenue forecasts, socio-economic forecasts, construction schedule and other information provided to us by the Client, national and state agencies as well as data from publicly available information sources. We have checked the reliability of this information prior to using them in our analysis. However, our opinions could vary materially, should some of these sources of information prove to be inaccurate.

We have undertaken this analysis using methodologies and assumptions that are reasonable. However, certain assumptions regarding future trends and forecasts may not materialize which may affect actual future performance and market demand, so actual results are uncertain and may vary significantly from the projections developed as part of this assignment.

The opinions presented as a result of our analysis cannot be taken as an endorsement or inducement for any financial transaction. We do not accept any responsibility for damages, if any, that may result from decisions made or actions taken by any third parties, based on our analysis. Any use that a third party makes of our analysis and opinions will be the sole responsibility of the third party.

1. Introduction

The Louis Berger Group (LBG) was retained to conduct the Traffic and Revenue Study for the Nagua – Sánchez - Samaná - Las Terrenas highway in the Dominican Republic. This report presents the results of our analysis and documents the methodology used for developing the forecasts.

The Project involves the rehabilitation of the existing highway between Nagua and Samaná, continuing on to the El Valle to Las Terrenas on Route 5 of the Dominican Republic. The final section of the project will be a new construction between Punta Bonita to the International Airport of Catey. The project is a natural extension of the Autopista del Nordeste and will provide a direct connection between Santo Domingo and the tourist resorts of Samaná. The following figures show the location of the highways under consideration.

Exhibit 1: Location of the Study Area

Exhibit 2: Road Network in Samaná Province

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This report is organized in five sections. The following section discusses the evolution of traffic on the highway as well as parallel roads and the current traffic conditions in the study area. Section III presents the review of historic socio-economic trends and the socio-economic forecasts used by LBG. Section IV discusses the traffic model development process and the final section presents the results of our analysis.

The LBG forecasts are presented for three scenarios: most likely, optimistic and conservative. In the different sections of this report, we discuss assumptions for the scenarios. The assumptions are summarized in Section V.

In the remainder of this report, several abbreviations are used. These are listed in the following table.

Exhibit 3: Abbreviations Used in this Report

Abbreviation	Description
AADT	Average Annual Daily Traffic
AWT	Average Weekday Traffic
CAGR	Compound Average Annual Growth Rate
Consultant	The Louis Berger Group
LBG	The Louis Berger Group
GDP	Gross Domestic Product
OD	Origin – Destination
SP	Stated Preference
VOT	Value of Time

2. Traffic Conditions

This chapter describes the current condition for the Samaná – Sánchez – Terrenas highway in the Dominican Republic.

2.1 Data Collection Plan

To gain further insight on traffic on the highways and study the current traffic conditions we conducted a data collection exercise along the highways segments in the province of Samaná. The data collection exercise included the definition of different data types required, analysis of data collection methods and development of a plan. These steps are discussed in the following sub-sections.

Data Types

Several types of data are needed to support the development of a travel demand forecasting model. This data would be very important in deriving the value of time and calibrate/validate the traffic model flows. The following data types are required:

- Origin-Destination (OD) Survey
    - Origin of the Trip
    - Destination of the Trip
    - Trip Purpose
    - Frequency of the Trip
    - Socioeconomic indicators of the driver

- Stated Preference (SP) Survey
    - Behavioral Experiment that through random selection of several hypothetical scenarios determines the Value of Time for different trip purposes and vehicle types.

- Traffic Counts
    - Classified traffic counts used to expand the samples obtained through the OD and SP surveys.

Data Collection Methods

The OD and SP surveys can be collected though different methods depending on the specific information that needs to be collected. Among the most common are the following:

OD Surveys

1. Video recording of vehicles at the Highways.
   - Pros
     - Not expensive
     - Non-intrusive
   - Cons
     - Does not include the full trip. Only indicates general direction of the trips.
     - Does not include other information required for the OD surveys.

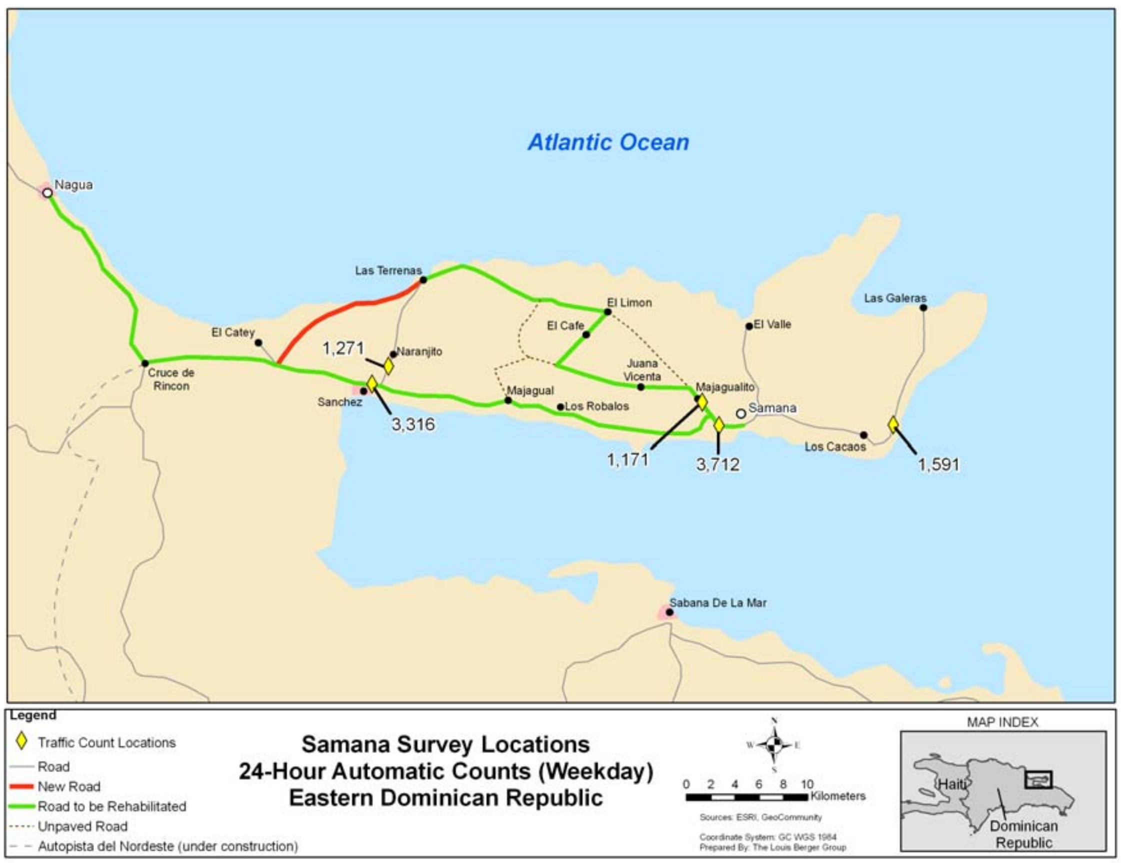
2. Direct survey at different locations along the highway
   - Pros
     - It's possible to get all the information needed.
     - It's possible to select a few people to also answer the SP survey.
     - Proven method where we have ample experience
   - Cons
     - Expensive to collect.
     - Response level from people is uncertain.
     - May need to create an incentive structure that would attract people to respond our survey.
     - Sample may not be representative of the whole universe of highway users since some may not frequent the survey locations.
     - Require permission from operating organizations like the toll authority, government and police.

3. Postcards direction people to a web-based survey.
   - Pros
     - Directly distributed to highway users at the toll booths on the Highways and on competing routes.
     - Most cost effective of the methods.
     - It's possible to select some people to also answer the SP survey.
   - Cons
     - May need to create an incentive structure to increase the responsiveness of the highway users. May skew the sample, making it only representative of segments of the highway users.

2.2 Survey Locations

Based on past experience and the current ground condition in the Dominican Republic the second data collection method was found most appropriate. The data collection plan included both an Origin-Destination (OD) survey and automatic traffic counts. Sanchez and Samaná were chosen as the OD survey locations because they were the two major towns and primary tourist destinations in the province. Automatic counts were taken at 5 locations as shown in Exhibit 4. The exhibit also shows the weekday 24 hour counts at these locations.

Exhibit 4: Data Collection Locations and Weekday 24 Hour Counts (June 2007)



2.3 Data Analysis

This section presents the data obtained on implementation of the data collection plan outlined in the previous section.

Traffic Volume

Manual traffic counts (including vehicle classification) were taken at all the survey locations. In addition, automatic counts were taken using tube and radar equipment. The manual counts were taken from 7am to 7pm (12 hour period), while the automatic counts were for 24 hours. The exhibit below shows the AADT calculated based on these traffic counts at 9 different locations. The shaded portion shows the locations on highways. It is important to note that this is not the average traffic on the entire highway, but a volume at specific locations.

Exhibit 5: Existing Traffic Volume (based on Traffic Counts in June 2007)

Location	Weekday	Weekend
Limon	1,171	1,120
Samaná	3,712	3,439
Las Galeras	1,591	1,718
Las Terrenas	1,271	1,028
Sánchez	3,316	2,872

Vehicle Classification

Exhibit 6 and Exhibit 7 show the shares for different vehicle types for each of the survey locations for an average weekday and weekend respectively.

Exhibit 6: Weekday Vehicle Type Shares (based on 12 hour counts)

Location	Auto + Jeeps	SUVs	2 Axle Heavy Vehicles	3 Axle Heavy Vehicles	4 Axle Heavy Vehicles	Dump Vehicles	Vehicles + 2G	Total
Limon	86%	1%	7%	1%	3%	0%	2%	100%
Samaná	80%	2%	8%	4%	5%	0%	2%	100%
Las Galeras	85%	1%	8%	1%	3%	0%	1%	100%
Las Terrenas	87%	1%	6%	4%	2%	0%	0%	100%
Sánchez	81%	0%	10%	5%	2%	0%	2%	100%

Exhibit 7: Weekend Vehicle Type Shares (based on 12 hour counts)

Location	Auto + Jeeps	SUVs	2 Axle Heavy Vehicles	3 Axle Heavy Vehicles	4 Axle Heavy Vehicles	Dump Vehicles	Vehicles + 2G	Total
Limon	89%	1%	5%	1%	4%	0%	1%	100%
Samaná	80%	2%	7%	4%	6%	0%	2%	100%
Las Galeras	86%	1%	7%	0%	4%	0%	1%	100%
Las Terrenas	90%	2%	4%	2%	2%	0%	0%	100%
Sánchez	86%	1%	7%	2%	2%	0%	2%	100%

Hourly Traffic Distribution

The following exhibits show the hourly auto traffic variation on a weekday and weekend at six different survey locations. The traffic shows a stable trend throughout the day without a strong peaking characteristic either in the morning or the evening.

Traffic counts were conducted and recorded for 7 days between Tuesday, June 19th, 2007 and Monday, June 25th, 2007 in five locations: Samaná (city), Cruce del Limon, Sánchez, Las Galeras, and Las Terrenas.

2.3.1 Samaná

For the town of Samaná, the busiest days in terms of total traffic were Tuesday, June 19th (3867 vehicles) and Friday, June 22nd (3746 vehicles). The peak hour of traffic for all days was between 10:00-11:00, with 2 clusters of heavy traffic between 8:00-12:00 and 14:00-19:00, with 29% and 39% of traffic activity occurring during these 2 intervals, respectively.

Exhibit 8: Total Daily Traffic, Samaná (June 2007)

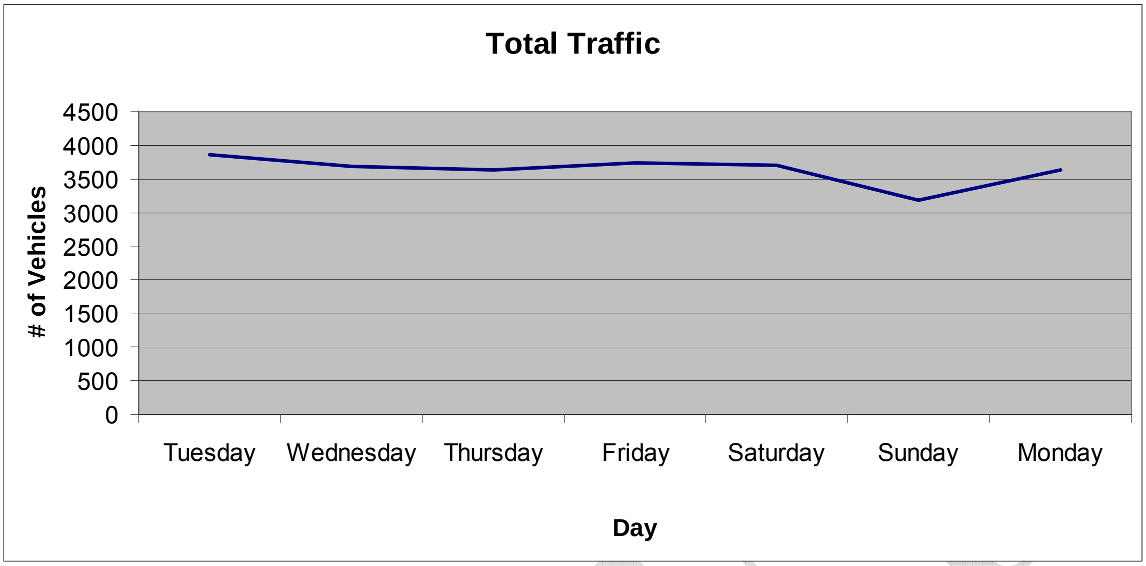
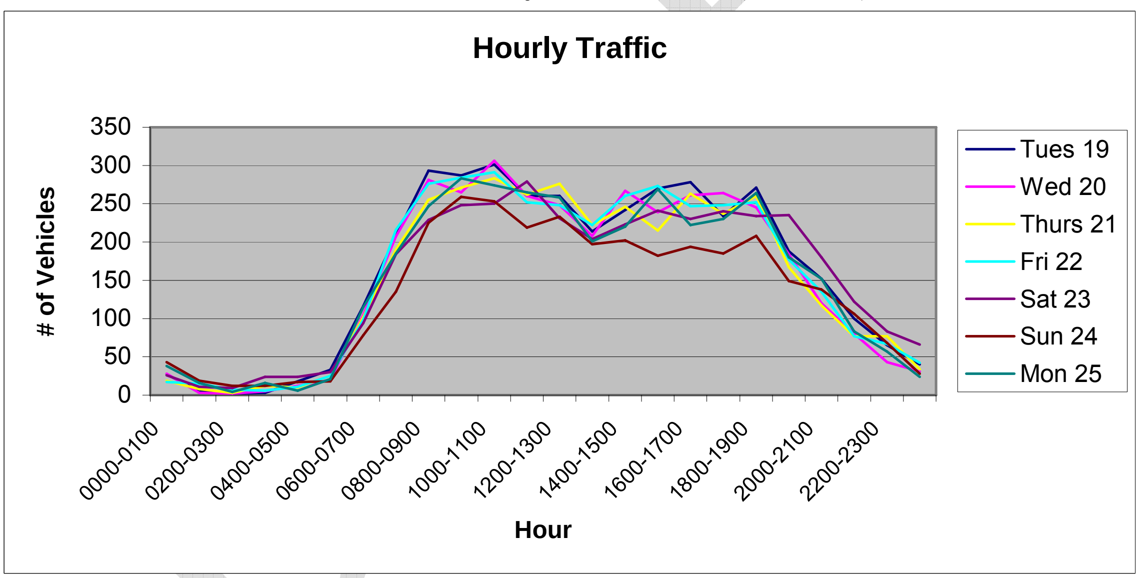


Exhibit 9: Total Hourly Traffic, Samaná (June 2007)



Regardless of the day (weekday or weekend), cars made up represented the majority of vehicles on the road (81% of total share).

Exhibit 10: **Weekday/Weekend Average Type of Vehicle, Samaná**

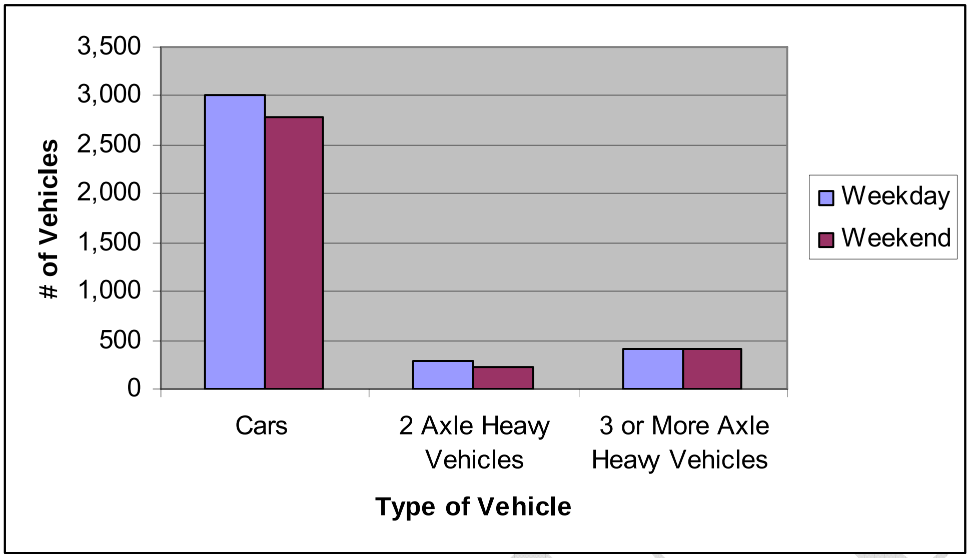
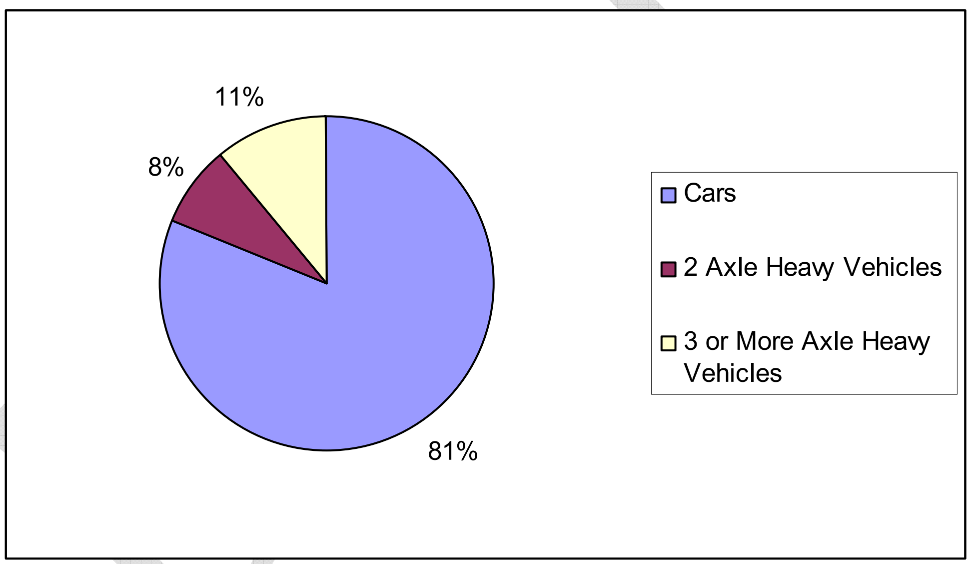


Exhibit 11: **Total Share of Traffic by Vehicle Type, Samaná**



2.3.2 Cruce del Limon

In Cruce del Limon, the busiest days were Saturday, June 23rd (1217 vehicles) and Tuesday, June 19th (1201). Peak traffic hour occurred on Wednesday, June 20th, between 16:00 and 17:00 (109 vehicles). The busiest time clusters for all days are between 8:00-13:00 and 14:00-20:00, with 35% and 40% of vehicles traveling during those time frames, respectively.

Exhibit 12: Total Daily Traffic, Cruce de Limon (June 2007)

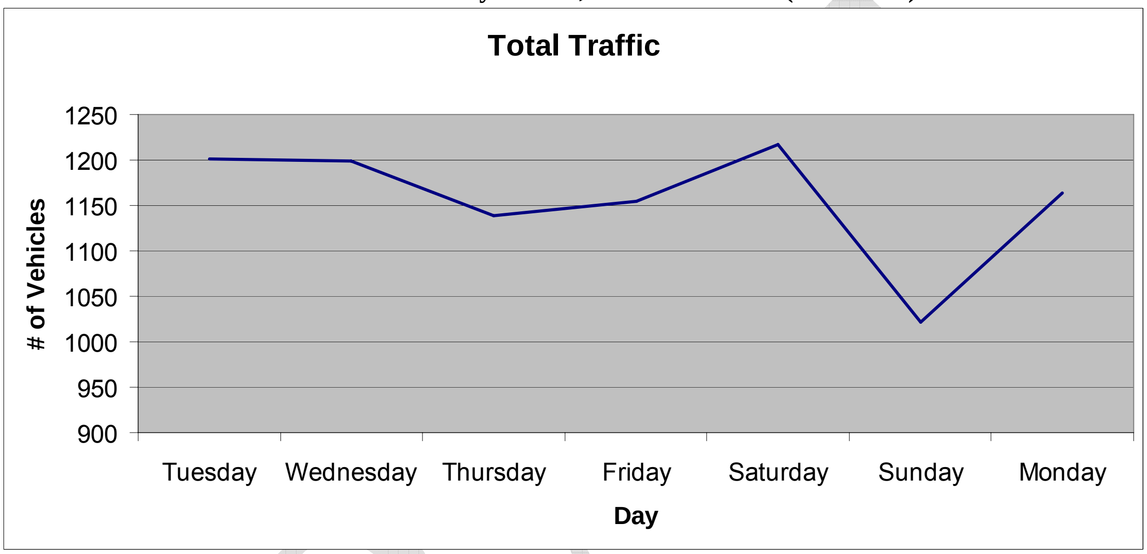
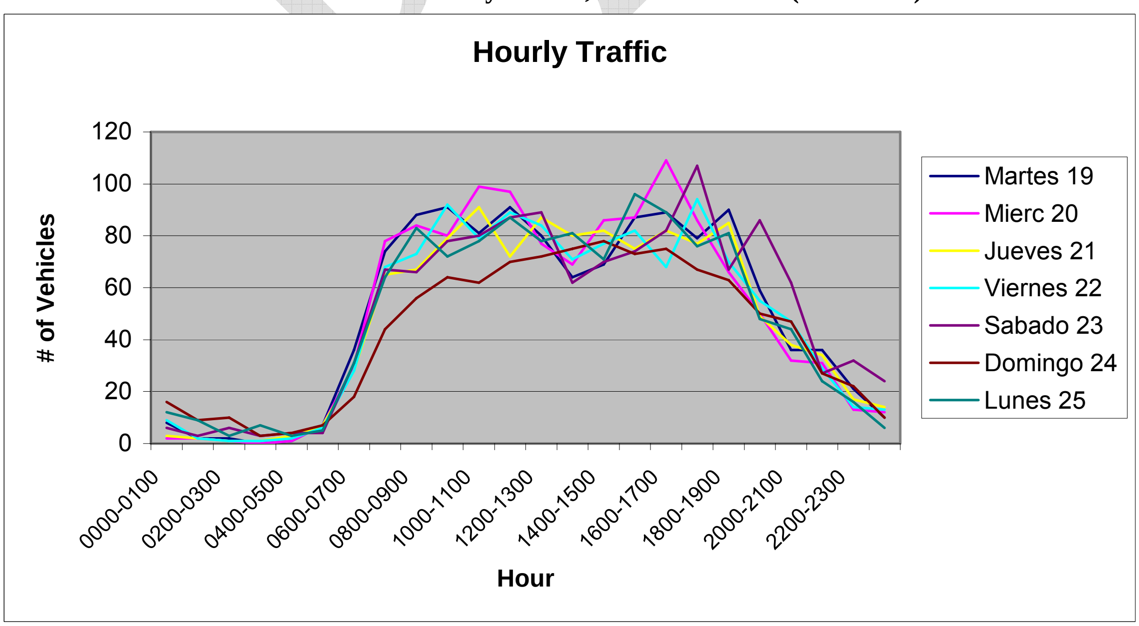


Exhibit 13: Total Hourly Traffic, Cruce de Limon (June 2007)



Similarly to Samaná, cars make up the vast majority of vehicular traffic regardless of the weekday with an 87% total share of traffic.

Exhibit 14: Weekday/Weekend Average Type of Vehicle, Cruce de Limon

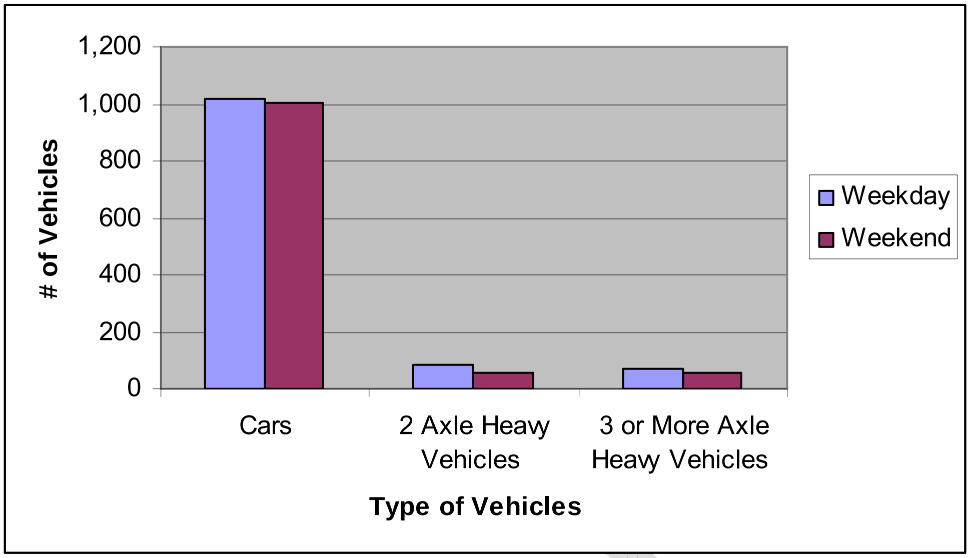
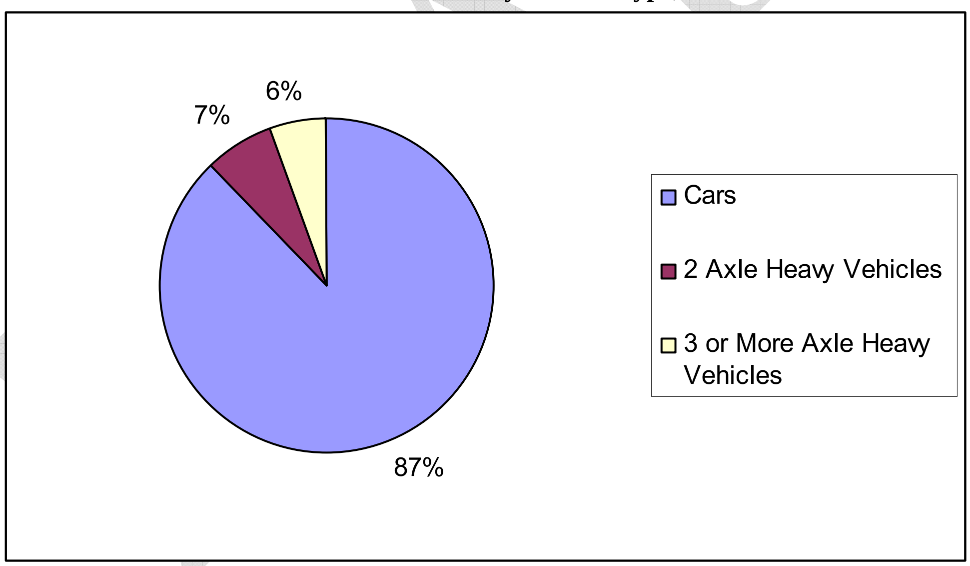


Exhibit 15: Total Share of Traffic by Vehicle Type, Cruce de Limon



2.3.3 Sánchez

The busiest days in Sánchez were Friday, June 22nd (3499 vehicles) and Thursday, June 21st (3420 vehicles). Peak traffic hours were Thursday, June 21st, from 10:00-11:00 and Friday, June 22nd, from 14:00-15:00, with 279 vehicles for both periods. Traffic was steadily heavy from 7:00 until 19:00, with 82% of traffic occurring during those hours.

Exhibit 16: Total Daily Traffic, Sánchez (June 2007)

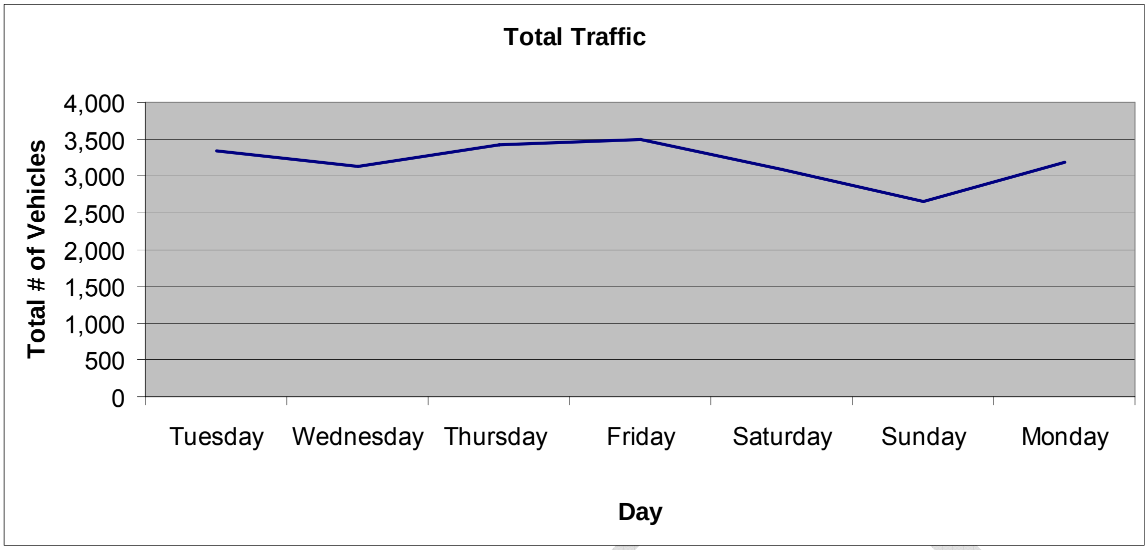
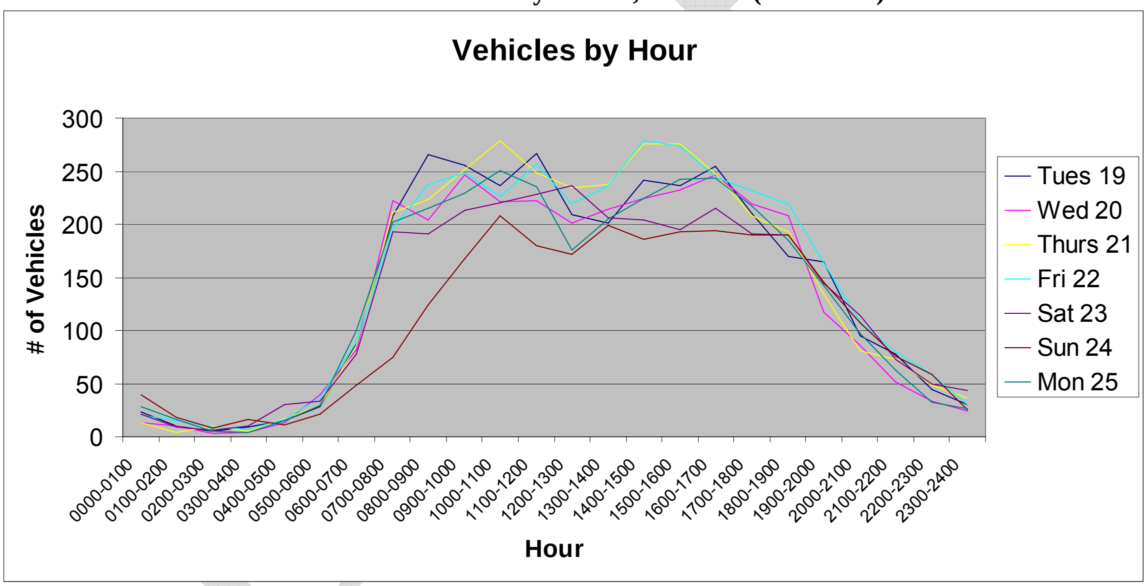


Exhibit 17: Total Hourly Traffic, Sánchez (June 2007)



Whether on weekdays or weekends, cars and jeeps make up the great majority of vehicles in Sánchez with 83% of total vehicular traffic.

Exhibit 18: Weekday/Weekend Average Type of Vehicle, Sánchez

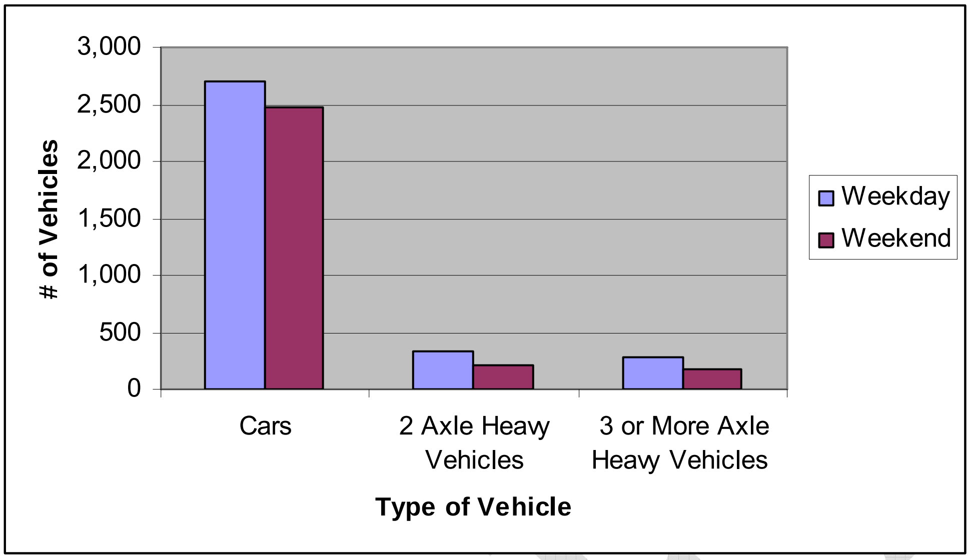
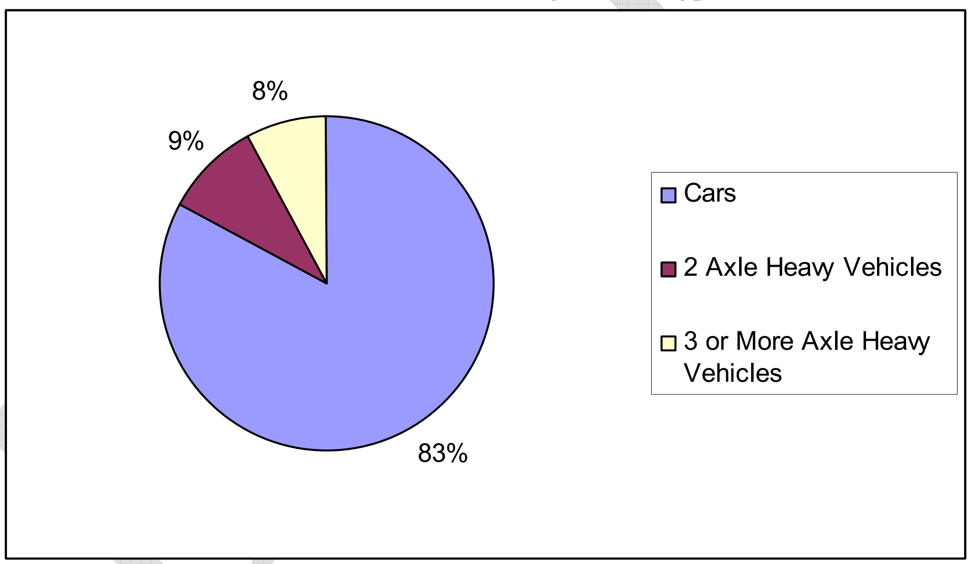


Exhibit 19: Total Share of Traffic by Vehicle Type, Sánchez



2.3.4 Las Galeras

The busiest days in Las Galeras were Sunday, June 24th (1789 vehicles) and Tuesday, June 19th (1665 vehicles). Peak traffic hour was between 17:00-18:00 on Sunday, June 24th (156 vehicles). Traffic was clearly heaviest on Sunday, but overall all days saw busy activity between 9:00-19:00, with 71% of all traffic occurring during that time interval.

Exhibit 20: Total Daily Traffic, Las Galeras (June 2007)

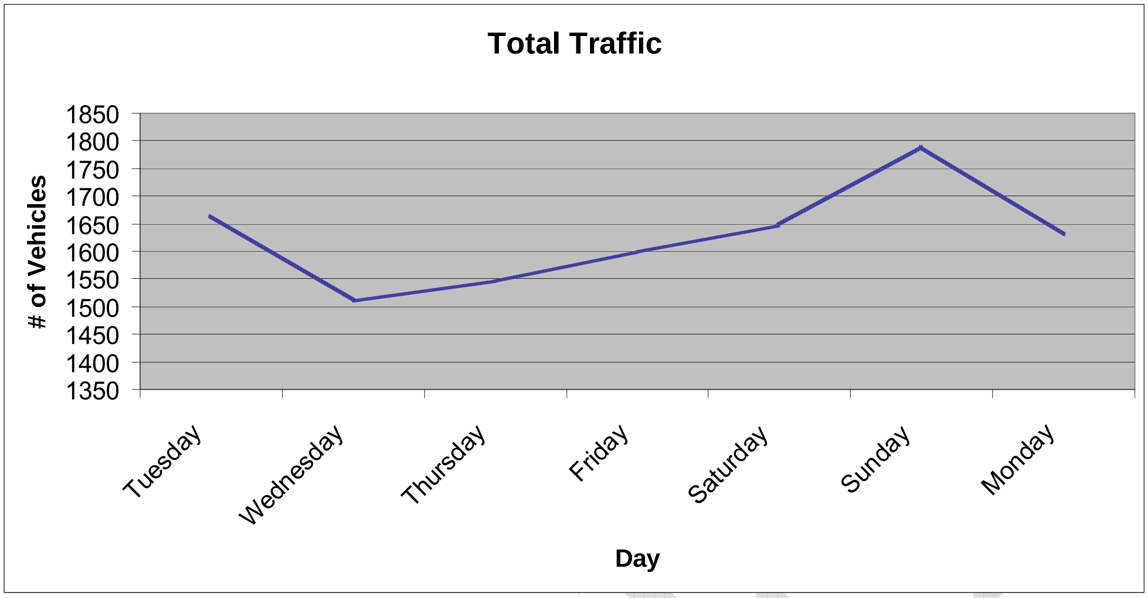
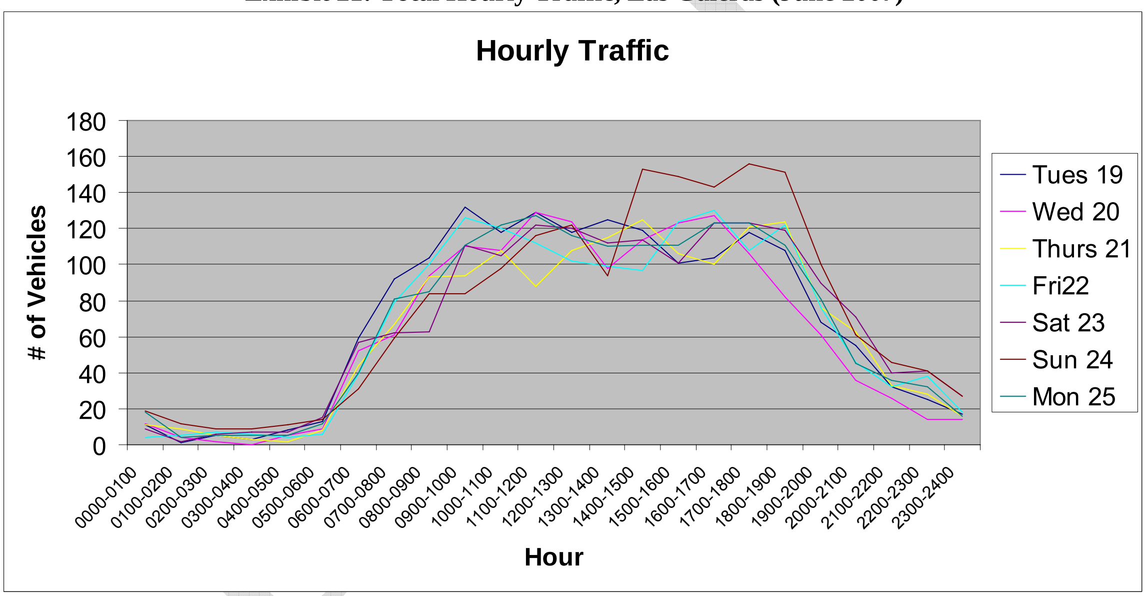


Exhibit 21: Total Hourly Traffic, Las Galeras (June 2007)



As with previous locations, cars and jeeps make up the overwhelming majority of vehicular traffic, with an 86% share of overall traffic.

Exhibit 22: Weekday/Weekend Average Type of Vehicle, Las Galeras

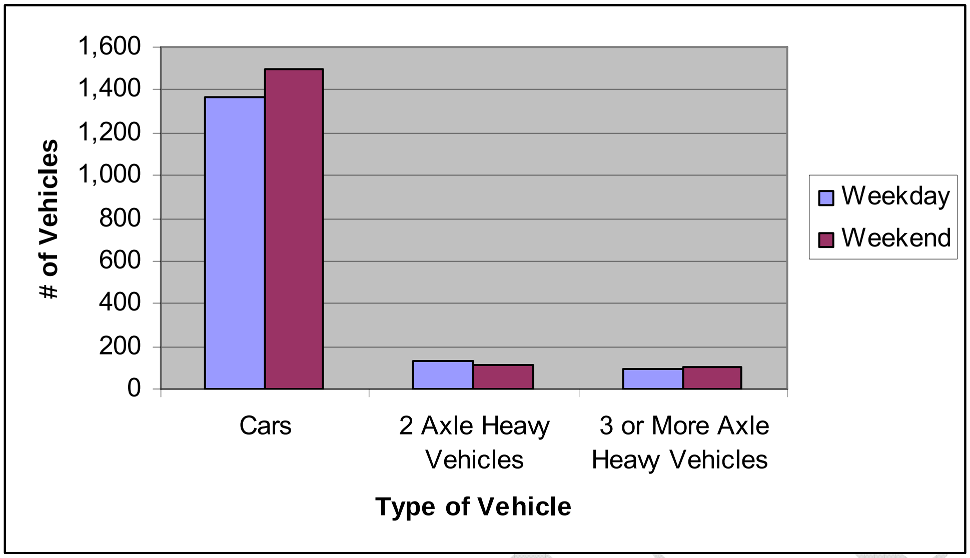
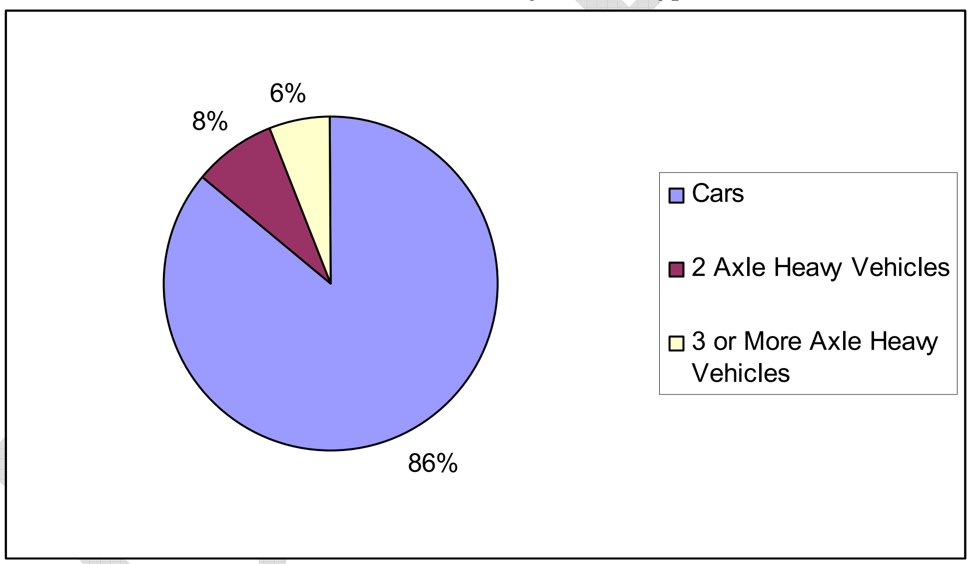


Exhibit 23: Total Share of Traffic by Vehicle Type, Las Galeras



2.3.5 Las Terrenas

The busiest days in Las Terrenas were Tuesday, June 19th (1302 vehicles) and Thursday, June 21st (1290 vehicles). Peak traffic hour occurred on Thursday, June 21st, between 16:00-17:00 (116 vehicles). Traffic was heavy and fairly evenly distributed between the hours of 7:00 and 19:00, with 82% of total traffic occurring during that interval.

Exhibit 24: Total Daily Traffic, Las Terrenas (June 2007)

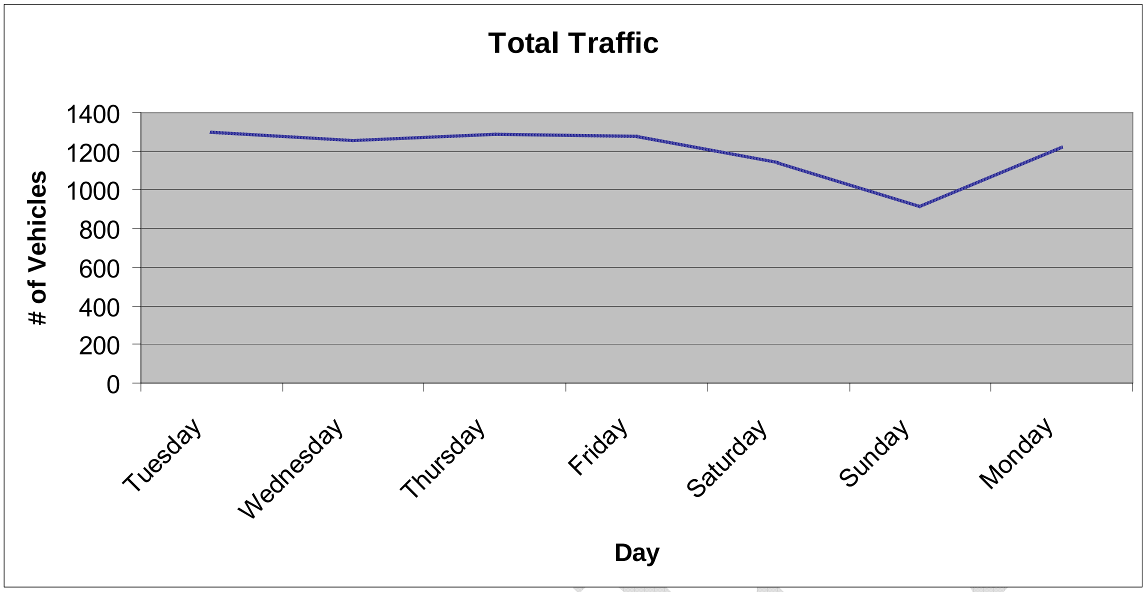
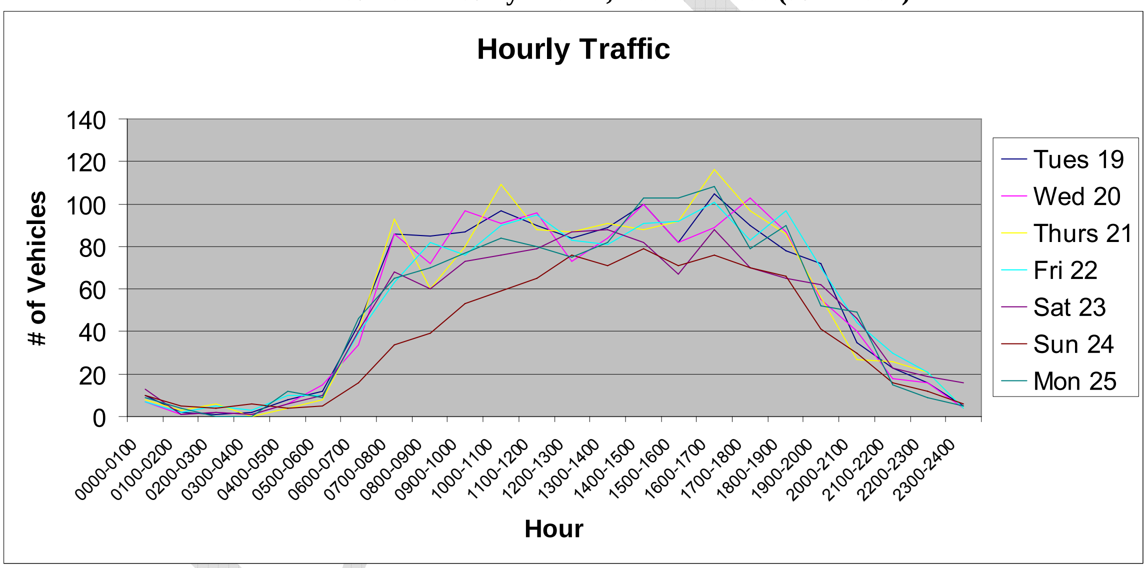


Exhibit 25: Total Hourly Traffic, Las Terrenas (June 2007)



Cars and Jeeps by far took the biggest share of total vehicular activity in Las Terrenas, with 88% of all types of vehicles recorded on weekdays and weekends.

Exhibit 26: Weekday/Weekend Average Type of Vehicle, Las Terrenas

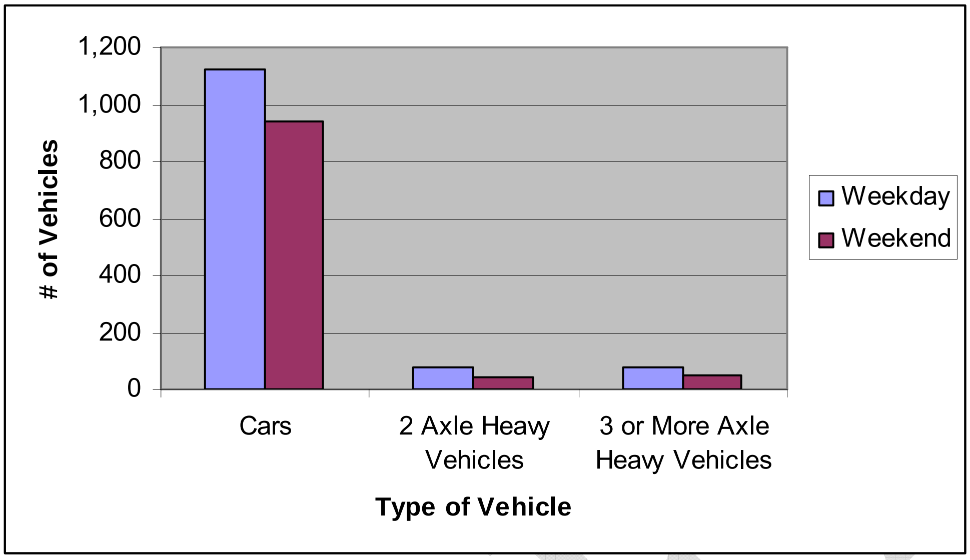
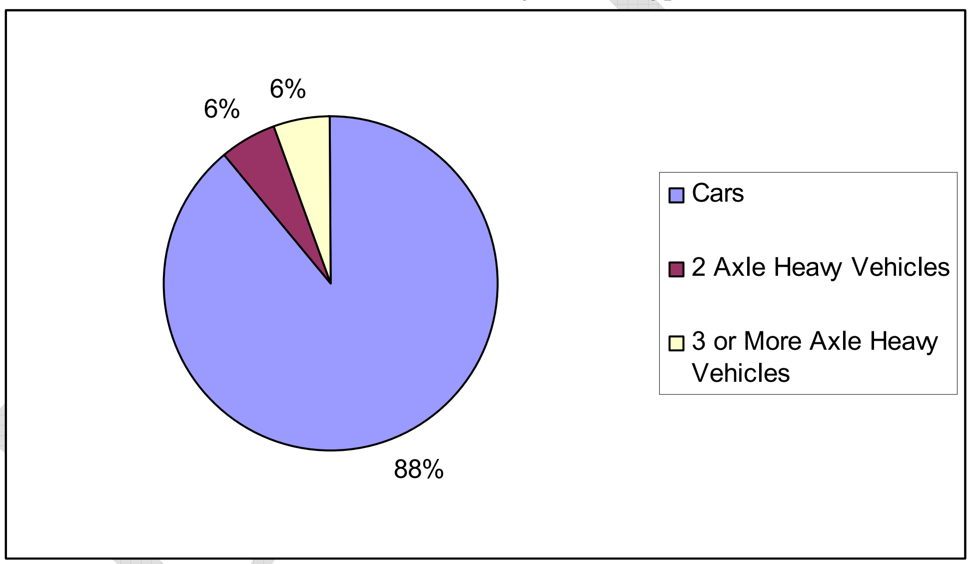


Exhibit 27: Total Share of Traffic by Vehicle Type, Las Terrenas



2.3.6 Summary

The busiest days were Tuesday, June 19th, and Friday, June 22nd, with 11,380 and 11,278 total vehicles, respectively. Peak traffic hour was on Thursday, June 21st, from 10:00-11:00 (870 total vehicles). The busiest traffic period was between 8:00 and 19:00, with 76% of all traffic occurring during that time interval.

Exhibit 28: Total Daily Traffic, all 5 Locations (June 2007)

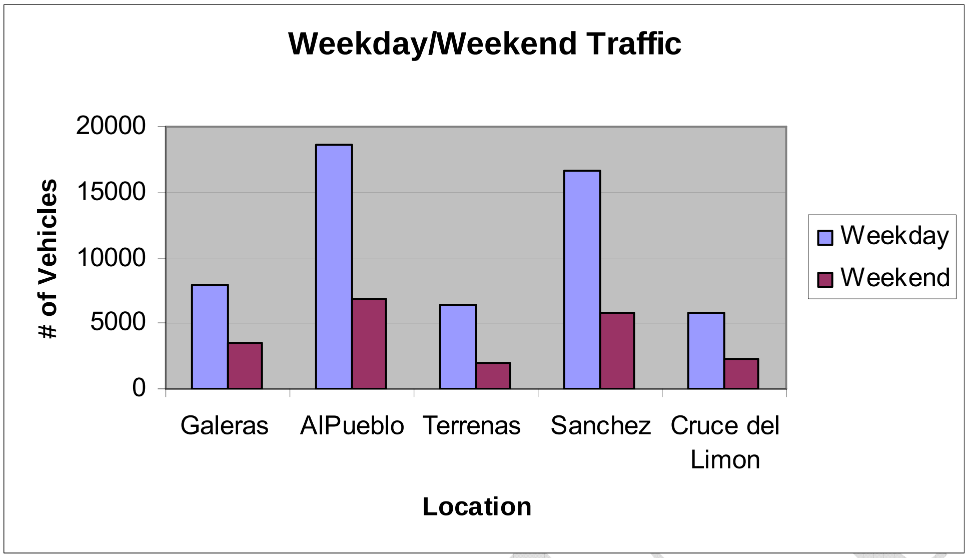
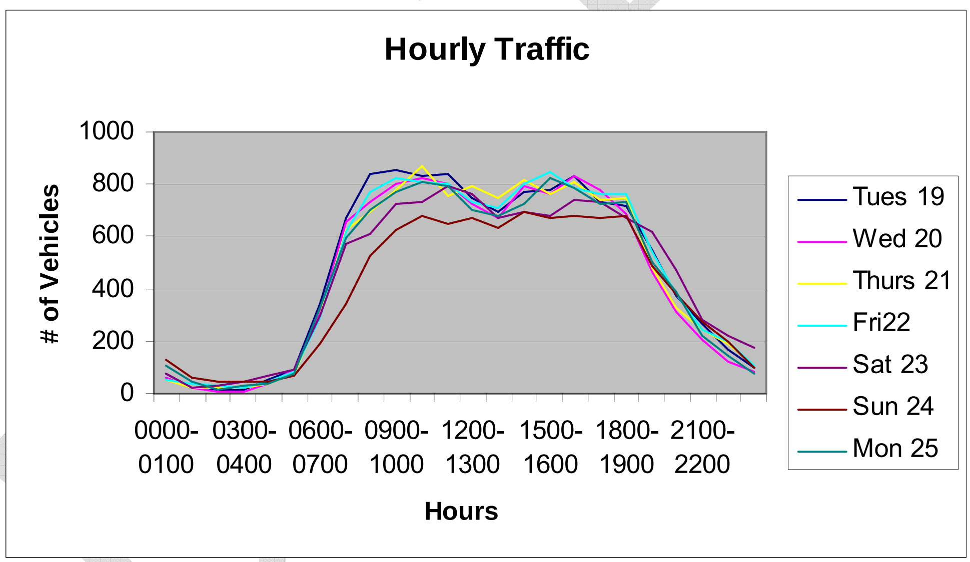


Exhibit 29: Total Hourly traffic, all 5 Locations (June 2007)



Aggregate data shows that cars and jeeps made up the great majority of vehicles in all 5 locations, with an 84% share of total vehicular types recorded.

Exhibit 30: Weekday/Weekend Average Type of vehicle, all 5 Locations

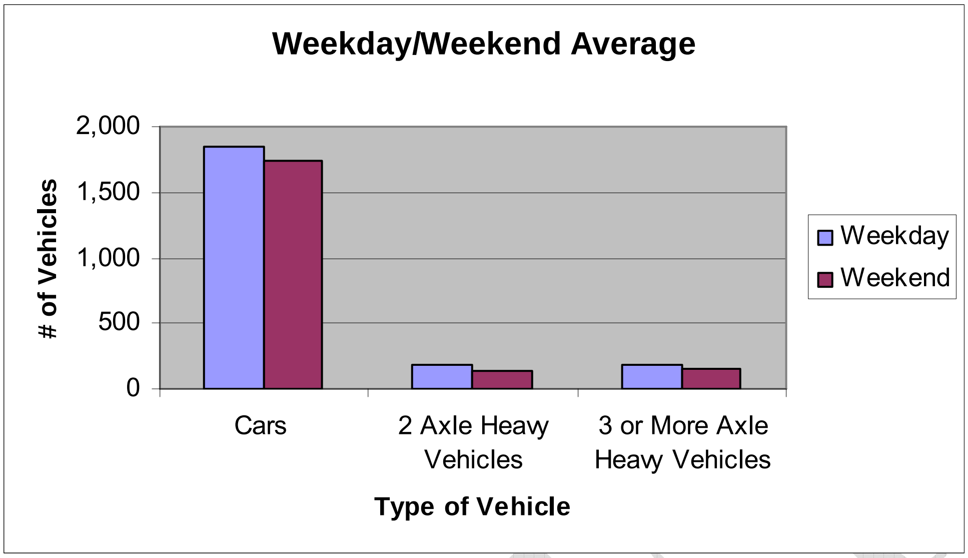
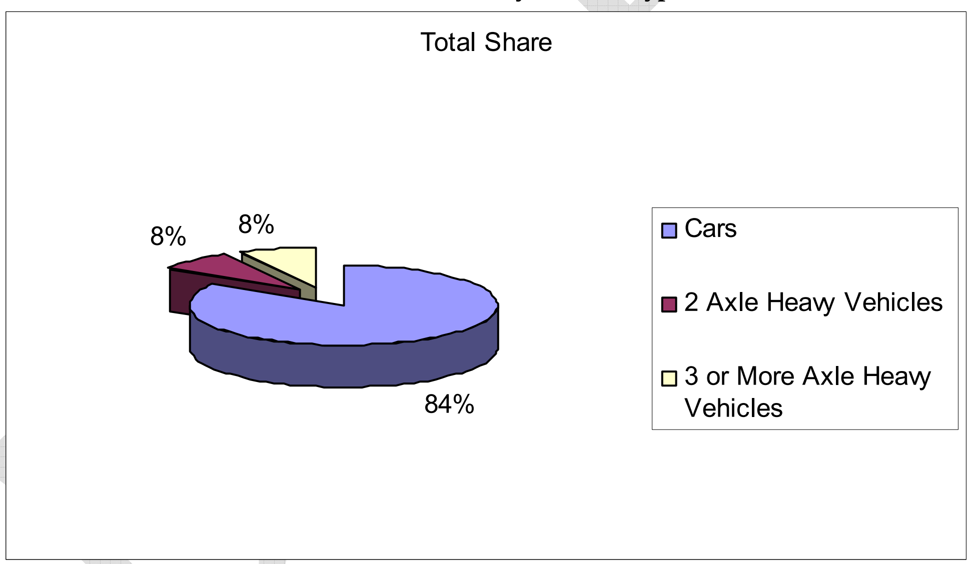


Exhibit 31: Total Share of Traffic by Vehicle Type, all 5 Locations



3. Socioeconomic Analysis

3.1 Population Growth Projections

Total population in the Dominican Republic has almost quadrupled over the past 60 years, from 2.43 million in 1950 to just over 9 million nowadays. The population growth rate has been rather steady over that period (CAGR 1950-2005: 2.50%).

Exhibit 32: Total Population in the Dominican Republic, 1950-2005

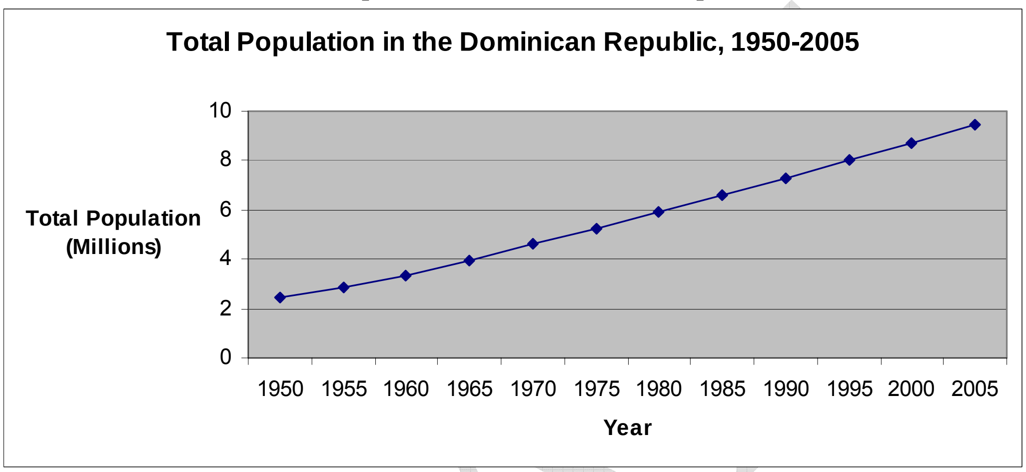


Exhibit 33: CAGRs Population growth in the Dominican Republic (1950-2005)

PERIOD	CAGR
1950-1960	3.26%
1960-1970	3.22%
1970-1980	2.57%
1980-1990	2.09%
1990-2000	1.83%
1950-2005	2.50%

The current population of the Dominican Republic is slightly more than 9.1 million. Relying on past growth trends and future forecasts from the World Bank and United Nations, we recommend using 1.5% as both the Most Likely Scenario and optimistic case scenario and 1.25% for the pessimistic case.

Exhibit 34: Projected Yearly Population Growth, 2006-2030

POPULATION GROWTH, PROJECTED				
	Most Likely Scenario /Optimistic Scenario		Pessimistic Scenario	
YEAR	POPULATION (millions)	GROWTH RATE	POPULATION (millions)	GROWTH RATE
2006	9.02	1.50%	9.02	1.25%
2007	9.15	1.50%	9.15	1.25%
2008	9.29	1.50%	9.26	1.25%

POPULATION GROWTH, PROJECTED				
	Most Likely Scenario /Optimistic Scenario		Pessimistic Scenario	
2009	9.43	1.50%	9.38	1.25%
2010	9.57	1.50%	9.50	1.25%
2011	9.71	1.50%	9.62	1.25%
2012	9.86	1.50%	9.74	1.25%
2013	10.00	1.50%	9.86	1.25%
2014	10.16	1.50%	9.98	1.25%
2015	10.31	1.50%	10.11	1.25%
2016	10.46	1.50%	10.23	1.25%
2017	10.62	1.50%	10.36	1.25%
2018	10.78	1.50%	10.49	1.25%
2019	10.94	1.50%	10.62	1.25%
2020	11.14	1.50%	10.75	1.25%
2021	11.27	1.50%	10.89	1.25%
2022	11.44	1.50%	11.02	1.25%
2023	11.61	1.50%	11.16	1.25%
2024	11.79	1.50%	11.30	1.25%
2025	11.96	1.50%	11.44	1.25%
2026	12.14	1.50%	11.59	1.25%
2027	12.32	1.50%	11.73	1.25%
2028	12.51	1.50%	11.88	1.25%
2029	12.70	1.50%	12.03	1.25%
2030	12.89	1.50%	12.18	1.25%

The most up-to-date census data available from the National Statistics Office (Oficina Nacional de Estadistica) for the Dominican Republic dates back to 2002. Using the total population of 8,382,165 in 2002 and growing it at a yearly rate of 1.5%, we get a population of 9,165,422 for 2007 which is certainly close enough to the current World Bank and United Nations estimate of 9,150,000 which we will use hereafter as our base population for that year.

Exhibit 35: Total Population by Town/Province, 2002

TOWN/PROVINCE	MEN	WOMEN	TOTAL
Distrito Nacional	430,698	482,842	913,540
Santo Domingo	887,437	930,317	1,817,754
Peravia	84,391	85,474	169,865
San Cristobal	266,120	266,760	532,880
San Jose de Ocoa	32,630	29,738	62,368
El Seibo	47,313	41,948	89,261
La Altagracia	92,703	89,317	182,020
La Romana	107,264	112,548	219,812
San Pedro de Macoris	148,900	152,844	301,744
Hato Mayor	45,217	42,414	87,631
Duarte	143,108	140,697	283,805
Maria Trinidad Sánchez	70,198	65,529	135,727

TOWN/PROVINCE	MEN	WOMEN	TOTAL
Samaná	45,773	46,102	**91,875**
Salcedo	48,679	47,677	96,356
La Vega	195,307	189,794	385,101
Sánchez Ramirez	77,560	73,619	151,179
Monsenor Nouel	84,292	83,326	167,618
Espaillat	113,437	111,654	225,091
Puerto Plata	157,161	155,545	312,706
Santiago	448,791	459,459	908,250
Dajabon	31,443	30,603	62,046
Monte Cristi	57,676	53,338	111,014
Santiago Rodriguez	30,522	29,107	59,629
Valverde	81,647	76,646	158,293
Azua	108,145	100,712	208,857
Elias Pina	32,986	30,893	63,879
San Juan	125,854	115,251	241,105
Baoruco	46,904	44,576	91,480
Barahona	91,636	87,603	179,239
Independencia	26,257	24,576	50,833
Pedernales	11,067	10,140	21,207
TOTAL POPULATION (2002)			**8,382,165**

(Source: Oficina Nacional de Estadistica, Censo 2002)

Using the above information for Samaná, we can project population growth for a Most Likely Scenario and optimistic scenario of 1.5% growth and a pessimistic scenario of 1.25% for the years 2002-2030. The 2002 population of 91,875 would grow to 139,395 by 2030 for both the base and optimistic scenarios, and to 130,094 for the pessimistic growth scenario as shown hereafter.

Exhibit 36: Projected Population growth for the Samaná Province, 2002-2030

SAMANÁ PROVINCE POPULATION GROWTH, PROJECTED						
	Most Likely Scenario		Pessimistic		Optimistic	
Year	Population	Growth Rate	Population	Growth Rate	Population	Growth Rate
2002	91,875	1.50%	91,875	1.25%	91,875	1.50%
2003	93,253	1.50%	93,023	1.25%	93,253	1.50%
2004	94,652	1.50%	94,186	1.25%	94,652	1.50%
2005	96072	1.50%	95,364	1.25%	96,072	1.50%
2006	97,513	1.50%	96,556	1.25%	97,513	1.50%
2007	98,975	1.50%	97,763	1.25%	98,975	1.50%
2008	100,460	1.50%	98,985	1.25%	100,460	1.50%
2009	101,967	1.50%	100,222	1.25%	101,967	1.50%
2010	103,497	1.50%	101,475	1.25%	103,497	1.50%
2011	105,049	1.50%	102,743	1.25%	105,049	1.50%
2012	106,625	1.50%	104,027	1.25%	106,625	1.50%
2013	108,224	1.50%	105,328	1.25%	108,224	1.50%
2014	109,847	1.50%	106,644	1.25%	109,847	1.50%

SAMANÁ PROVINCE POPULATION GROWTH, PROJECTED						
	Most Likely Scenario		Pessimistic		Optimistic	
2015	111,495	1.50%	107,977	1.25%	111,495	1.50%
2016	113,168	1.50%	109,327	1.25%	113,168	1.50%
2017	114,865	1.50%	110,694	1.25%	114,865	1.50%
2018	116,588	1.50%	112,077	1.25%	116,588	1.50%
2019	118,337	1.50%	113,478	1.25%	118,337	1.50%
2020	120,112	1.50%	114,897	1.25%	120,112	1.50%
2021	121,914	1.50%	116,333	1.25%	121,914	1.50%
2022	123,742	1.50%	117,787	1.25%	123,742	1.50%
2023	125,598	1.50%	119,260	1.25%	125,598	1.50%
2024	127,482	1.50%	120,750	1.25%	127,482	1.50%
2025	129,395	1.50%	122,260	1.25%	129,395	1.50%
2026	131,336	1.50%	123,788	1.25%	131,336	1.50%
2027	133,306	1.50%	125,335	1.25%	133,306	1.50%
2028	135,305	1.50%	126,902	1.25%	135,305	1.50%
2029	137,335	1.50%	128,488	1.25%	137,335	1.50%
2030	139,395	1.50%	130,094	1.25%	139,395	1.50%

3.2 GDP Projections

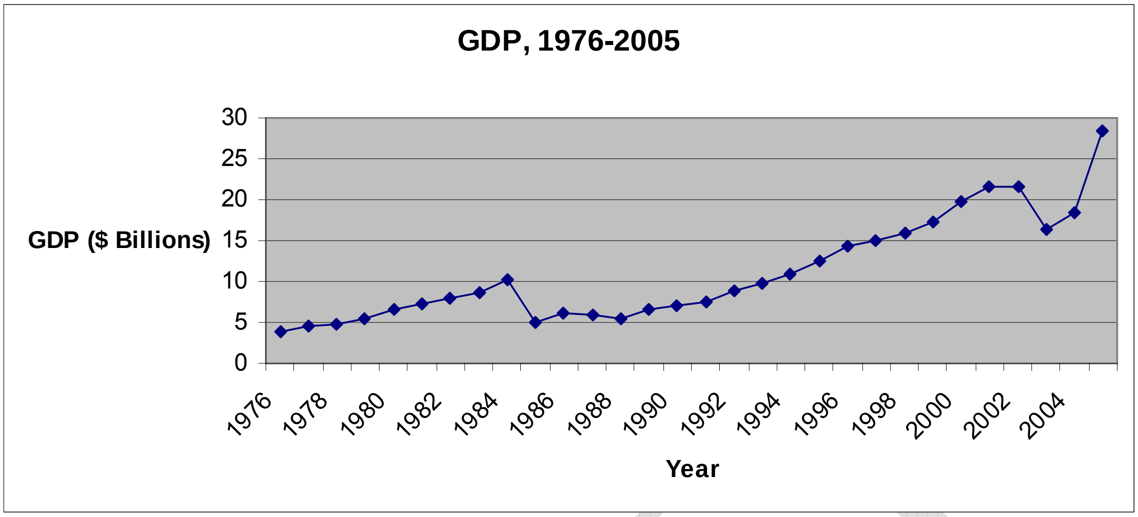
The country's GDP has grown fairly steadily over the past 30 years except on two notable occasions:

- The economic crisis in 1984 which caused the GDP to plunge from $10.33 Billion in 1984 to $5.04 Billion in 1985;
- The aftermath of September 11th and hurricanes in Caribbean which cut GDP from $21.62 Billion in 2002 to $16.32 Billion in 2003.

In both cases, however, the economy experienced a rather quick recovery immediately following the setbacks.

Exhibit 37: GDP Annual Growth Rate, 1985-2006

Exhibit 38: GDP (Official Exchange Rate) for the Dominican Republic, 1976-2005



We have two possible measures for GDP in the Dominican Republic: Purchasing Power Parity (PPP) GDP and Official Exchange Rate (OER) GDP. We used the most up-to-date information available from the World Bank and United Nations and obtained a GDP (PPP) of $70,090,000,000 and a GDP (OER) of $20,550,000,000 for the DR in 2006. In order to project GDP growth in the DR from 2006 until 2010, and then from 2010-2030, we used the following three scenarios:

- Pessimistic Scenario: 4% growth from 2006-2010, 3% growth from 2010-2030
- Most Likely Scenario: 5.5% growth from 2006-2010, 4% growth from 2010-2030
- Optimistic Scenario: 6.5% growth from 2006-2010, 5.5% growth from 2010-2030

GDP/Capita Projections

In spite of the two serious economic setbacks of 1984 and 2002, the country's GDP/Capita (PPP) has grown steadily over the past 30 years from $1294.6 in 1975 to $7578.5 in 2005. CAGR for GDP/Capita (PPP) over the period 1975-2005 is 6.07%.

Exhibit 39: GDP (PPP)/Capita ($), 1975-2005

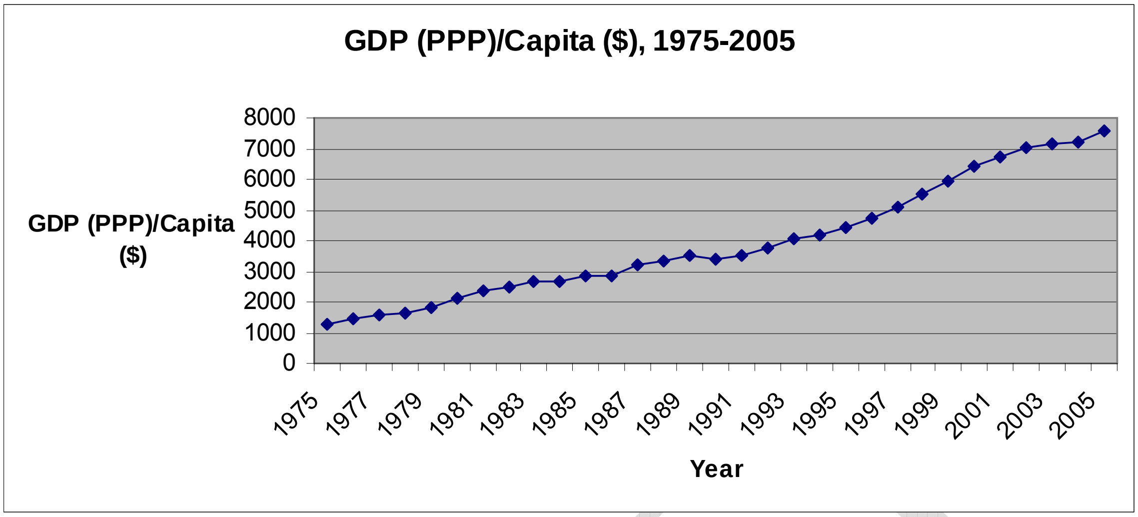


Exhibit 40: CAGRs for GDP/Capita (PPP), 1975-2005

PERIOD	CAGR
1975-1985	8.12%
1985-1995	4.60%
1995-2005	5.51%
1975-2005	6.07%

For GDP/Capita projections, we used our GDP and GDP Projections information and combined it with our Population growth data to obtain a projected GDP/Capita growth for the period 2006-2030 (see Exhibit 48 and Exhibit 49 for GDP (PPP)/Capita and GDP (OER)/Capita projections).

GDP/Capita Distribution

The most up-to-date information we found on GDP distribution in the Dominican Republic dates from 2005[1]. It stipulates the following GDP distribution for the DR:

Exhibit 41: Percentage of GDP owned by each Population Quintile in the DR, 2005

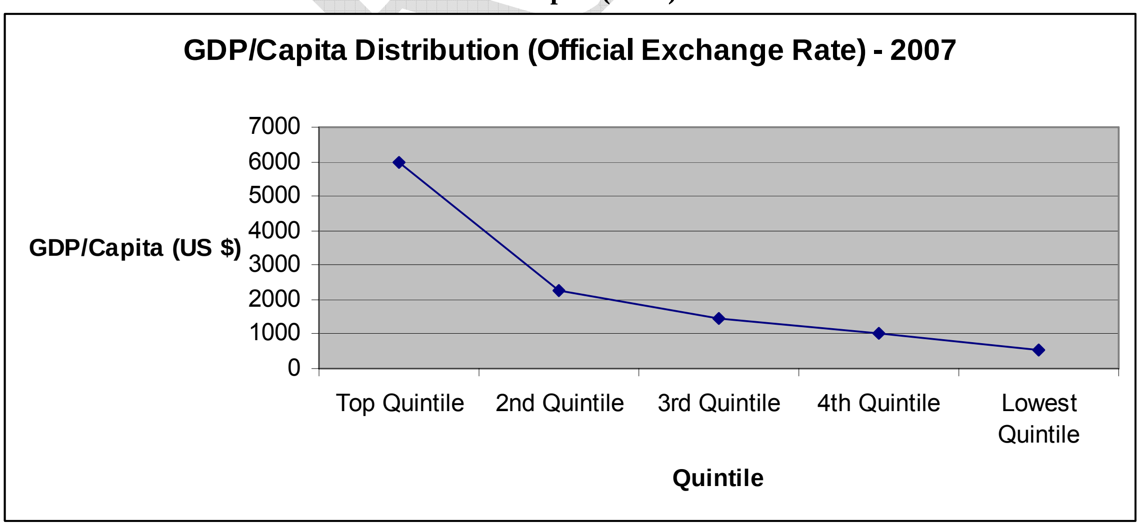
Top Quintile	53%
Second Quintile	20%
Third Quintile	13%
Fourth Quintile	9%
Lowest Quintile	5%

We calculated a quintile of the Dominican Population to include 1,830,000 people (2007 population: 9,150,000/5 = 1,830,000). Using this number, we were able to further split GDP/Capita into each quintile as follows:

Exhibit 42: GDP/Capita (OER) Distribution, 2007

GDP/CAPITA DISTRIBUTION (OER) - 2007		
	Total Wealth ($ Billions)	GDP/Capita ($)
Top Quintile	10.89	5,952
2nd Quintile	4.11	2,246
3rd Quintile	2.67	1,460
4th Quintile	1.85	1,011
Lowest Quintile	1.03	561

Exhibit 43: GDP/Capita (OER) Distribution



[1] Source: http://earthtrends.wri.org/pdf_library/country_profiles/eco_cou_214.pdf.

Exhibit 44: GDP/Capita (PPP) Distribution, 2007

GDP/CAPITA DISTRIBUTION (PPP) - 2007		
	Total Wealth ($ Billions)	GDP/Capita ($)
Top Quintile	40.86	22,327
2nd Quintile	15.42	8,425
3rd Quintile	10.02	5,476
4th Quintile	6.94	3,791
Lowest Quintile	3.85	2,106

Exhibit 45: GDP/Capita (PPP) Distribution

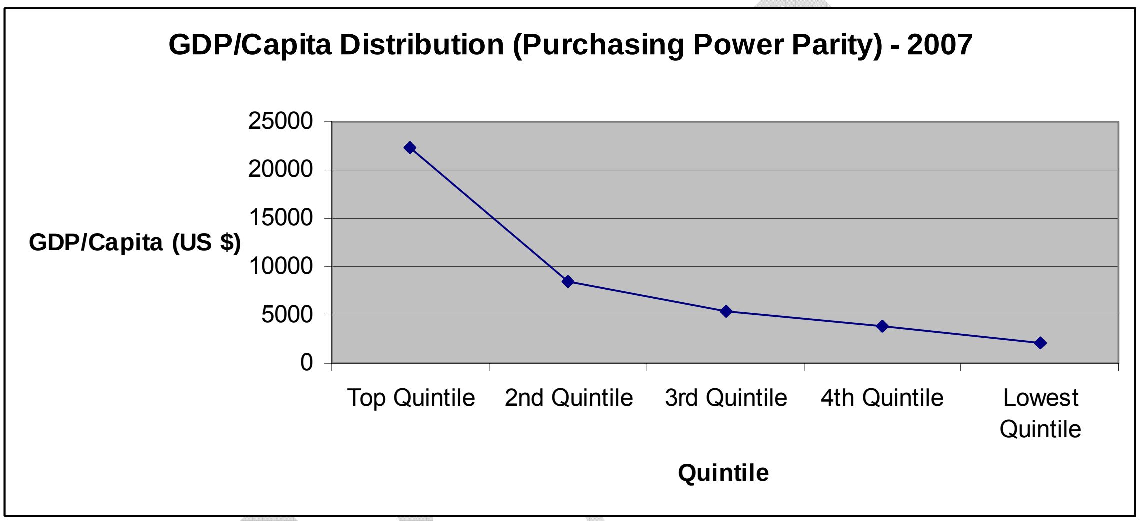


Exhibit 46: Projected GDP (PPP) Growth Rate, 2006-2030

GDP (PURCHASING POWER PARITY) GROWTH RATE, PROJECTED ($)						
	Most Likely Scenario		Pessimistic		Optimistic	
YEAR	GROWTH RATE	GDP ($ Billions)	GROWTH RATE	GDP ($ Billions)	GROWTH RATE	GDP ($ Billions)
2006	5.50%	77.09	4.00%	77.09	6.50%	77.09
2007	5.50%	81.33	4.00%	80.17	6.50%	82.10
2008	5.50%	85.80	4.00%	83.38	6.50%	87.44
2009	5.50%	90.52	4.00%	86.72	6.50%	93.12
2010	5.50%	95.50	4.00%	90.18	6.50%	99.17
2011	4.00%	100.75	3.00%	93.79	5.50%	105.62
2012	4.00%	104.78	3.00%	96.61	5.50%	111.43
2013	4.00%	108.96	3.00%	99.50	5.50%	117.56
2014	4.00%	113.33	3.00%	102.49	5.50%	124.02
2015	4.00%	117.87	3.00%	105.56	5.50%	130.84
2016	4.00%	122.52	3.00%	108.73	5.50%	138.04
2017	4.00%	127.49	3.00%	111.99	5.50%	145.63
2018	4.00%	132.58	3.00%	115.35	5.50%	153.64
2019	4.00%	137.89	3.00%	118.81	5.50%	162.09
2020	4.00%	143.40	3.00%	122.38	5.50%	171.01
2021	4.00%	149.13	3.00%	126.05	5.50%	180.41
2022	4.00%	155.11	3.00%	129.83	5.50%	190.34
2023	4.00%	161.31	3.00%	133.72	5.50%	200.81
2024	4.00%	167.76	3.00%	137.74	5.50%	211.85
2025	4.00%	174.47	3.00%	141.87	5.50%	223.50
2026	4.00%	181.45	3.00%	146.12	5.50%	235.79
2027	4.00%	188.71	3.00%	150.51	5.50%	248.76
2028	4.00%	196.26	3.00%	155.02	5.50%	262.44
2029	4.00%	204.11	3.00%	159.67	5.50%	276.88
2030	4.00%	212.27	3.00%	164.46	5.50%	292.11

Exhibit 47: Projected GDP (OER) Growth Rate, 2006-2030

GDP (OFFICIAL EXCHANGE RATE) GROWTH RATE, PROJECTED ($)						
	Most Likely Scenario		Pessimistic		Optimistic	
YEAR	GROWTH RATE	GDP ($ Billions)	GROWTH RATE	GDP ($ Billions)	GROWTH RATE	GDP ($ Billions)
2006	5.50%	20.55	4.00%	20.55	6.50%	20.55
2007	5.50%	21.68	4.00%	21.37	6.50%	21.89
2008	5.50%	22.87	4.00%	22.23	6.50%	23.31
2009	5.50%	24.13	4.00%	23.12	6.50%	24.82
2010	5.50%	25.46	4.00%	24.04	6.50%	26.44
2011	4.00%	26.86	3.00%	25.00	5.50%	28.16
2012	4.00%	27.93	3.00%	25.75	5.50%	29.70
2013	4.00%	29.05	3.00%	26.52	5.50%	31.34
2014	4.00%	30.21	3.00%	27.32	5.50%	33.06
2015	4.00%	31.42	3.00%	28.14	5.50%	34.88
2016	4.00%	32.68	3.00%	28.98	5.50%	36.80
2017	4.00%	33.93	3.00%	29.85	5.50%	38.82
2018	4.00%	35.34	3.00%	30.60	5.50%	40.96
2019	4.00%	36.76	3.00%	31.67	5.50%	43.21
2020	4.00%	38.23	3.00%	32.62	5.50%	45.59
2021	4.00%	39.76	3.00%	33.60	5.50%	48.09
2022	4.00%	41.35	3.00%	34.61	5.50%	50.74
2023	4.00%	43.00	3.00%	35.65	5.50%	53.53
2024	4.00%	44.72	3.00%	36.72	5.50%	56.47
2025	4.00%	46.51	3.00%	37.82	5.50%	59.58
2026	4.00%	48.37	3.00%	38.95	5.50%	62.86
2027	4.00%	50.30	3.00%	40.12	5.50%	66.31
2028	4.00%	52.32	3.00%	41.32	5.50%	69.96
2029	4.00%	54.41	3.00%	42.56	5.50%	73.81
2030	4.00%	56.59	3.00%	43.84	5.50%	77.87

Exhibit 48: Projected GDP (PPP)/Capita Growth Rate, 2006-2030

GDP/CAPITA (PURCHASING POWER PARITY) GROWTH RATE, PROJECTED ($)									
	Most Likely Scenario			Pessimistic			Optimistic		
YEAR	GDP ($ Billions)	POPULATION (millions)	GDP/CAPITA ($)	GDP ($ Billions)	POPULATION (millions)	GDP/CAPITA ($)	GDP ($ Billions)	POPULATION (millions)	GDP/CAPITA ($)
2006	77.09	9.02	8,547	77.09	9.02	8,547	77.09	9.02	8,547
2007	81.33	9.15	8,889	80.17	9.15	8,762	82.10	9.15	8,973
2008	85.80	9.25	9,280	83.38	9.25	9,018	87.44	9.25	9,457
2009	90.52	9.34	9,689	86.72	9.34	9,281	93.12	9.34	9,967
2010	95.50	9.44	10,115	90.18	9.44	9,552	99.17	9.44	10,504
2011	100.75	9.54	10,561	93.79	9.54	9,831	105.62	9.54	11,071
2012	104.78	9.64	10,869	96.61	9.64	10,021	111.43	9.64	11,558
2013	108.96	9.74	11,186	99.50	9.74	10,214	117.56	9.74	12,067
2014	113.33	9.84	11,513	102.49	9.84	10,411	124.02	9.84	12,599
2015	117.87	9.95	11,849	105.56	9.95	10,612	130.84	9.95	13,154
2016	122.52	10.05	12,195	108.73	10.05	10,817	138.04	10.05	13,733
2017	127.49	10.16	12,551	111.99	10.16	11,026	145.63	10.16	14,338
2018	132.58	10.26	12,917	115.35	10.26	11,238	153.64	10.26	14,969
2019	137.89	10.37	13,294	118.81	10.37	11,455	162.09	10.37	15,628
2020	143.40	10.48	13,683	122.38	10.48	11,676	171.01	10.48	16,316
2021	149.14	10.59	14,082	126.05	10.59	11,902	180.41	10.59	17,035
2022	155.11	10.70	14,493	129.83	10.70	12,131	190.34	10.70	17,785
2023	161.31	10.81	14,916	133.72	10.81	12,365	200.81	10.81	18,568
2024	167.76	10.93	15,352	137.74	10.93	12,604	211.85	10.93	19,386
2025	174.47	11.04	15,800	141.87	11.04	12,847	223.50	11.04	20,240
2026	181.45	11.16	16,261	146.12	11.16	13,095	235.79	11.16	21,131
2027	188.71	11.28	16,736	150.51	11.28	13,348	248.76	11.28	22,062
2028	196.26	11.39	17,224	155.02	11.39	13,605	262.44	11.39	23,033
2029	204.11	11.51	17,727	159.67	11.51	13,868	276.88	11.51	24,048
2030	212.27	11.63	18,245	164.46	11.63	14,136	292.11	11.63	25,107

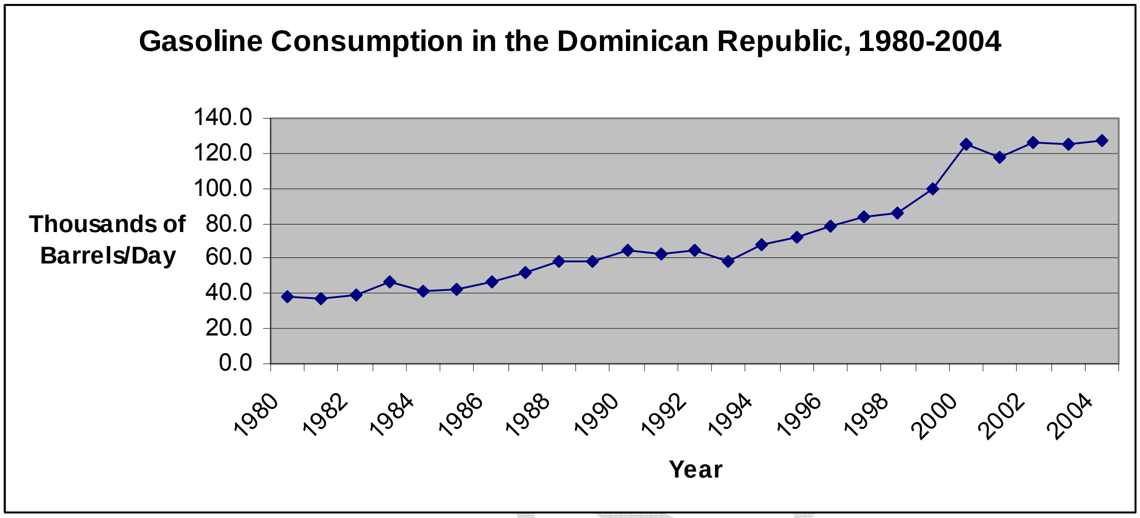
Exhibit 49: Projected GDP (OER)/Capita Growth Rate, 2006-2030

GDP/CAPITA (OFFICIAL EXCHANGE RATE) GROWTH RATE, PROJECTED ($)									
	Most Likely Scenario			Pessimistic			Optimistic		
YEAR	GDP ($ Billions)	POPULATION (millions)	GDP/CAPITA ($)	GDP ($ Billions)	POPULATION (millions)	GDP/CAPITA ($)	GDP ($ Billions)	POPULATION (millions)	GDP/CAPITA ($)
2006	20.55	9.02	2278	20.55	9.02	2,278	20.55	9.02	2,278
2007	21.68	9.15	2,369	21.37	9.15	2,336	21.89	9.15	2,392
2008	22.87	9.25	2,474	22.23	9.25	2,404	23.31	9.25	2,521
2009	24.13	9.34	2,583	23.16	9.34	2,474	24.82	9.34	2,657
2010	25.46	9.44	2,696	24.04	9.44	2,546	26.44	9.44	2,800
2011	26.86	9.54	2,815	25.00	9.54	2,621	28.16	9.54	2,951
2012	27.93	9.64	2,897	25.75	9.64	2,671	29.70	9.64	3,081
2013	29.05	9.74	2,982	26.52	9.74	2,723	31.34	9.74	3,217
2014	30.21	9.84	3,069	27.32	9.84	2,775	33.06	9.84	3,358
2015	31.42	9.95	3,159	28.14	9.95	2,829	34.88	9.95	3,506
2016	32.68	10.05	3,251	28.98	10.05	2,883	36.80	10.05	3,661
2017	33.98	10.16	3,346	29.85	10.16	2,939	38.82	10.16	3,822
2018	35.34	10.26	3,443	30.75	10.26	2,996	40.96	10.26	3,990
2019	36.76	10.37	3,544	31.67	10.37	3,054	43.21	10.37	4,166
2020	38.23	10.48	3,647	32.62	10.48	3,113	45.59	10.48	4,349
2021	39.76	10.59	3,754	33.60	10.59	3,173	48.09	10.59	4,541
2022	41.35	10.70	3,863	34.61	10.70	3,234	50.74	10.70	4,741
2023	43.00	10.81	3,976	35.65	10.81	3,296	53.53	10.81	4,950
2024	44.72	10.93	4,092	36.72	10.93	3,360	56.47	10.93	5,168
2025	46.51	11.04	4,212	37.82	11.04	3,425	59.58	11.04	5,395
2026	48.37	11.16	4,335	38.95	11.16	3,491	62.86	11.16	5,633
2027	50.30	11.28	4,461	40.12	11.28	3,558	66.31	11.28	5,881
2028	52.32	11.39	4,592	41.32	11.39	3,627	69.96	11.39	6,140
2029	54.41	11.51	4,726	42.56	11.51	3,697	73.81	11.51	6,410
2030	56.59	11.63	4,864	43.84	11.63	3,768	77.87	11.63	6,693

3.3 Gasoline Consumption

Consumption of Gasoline in the Dominican Republic is correlated to the country's overall economic situation: in periods of economic growth, gasoline consumption increases; during economic slowdowns, however, consumption decreases.

Exhibit 50: Yearly Gasoline Consumption in the Dominican Republic, 1980-2004



(Source: US Department of Energy, http://www.eia.doe.gov/emeu/international/oilconsumption.html)

3.4 Hotel Room Projections

The best and most up-to-date data available from ASONAHORES (Asociación Nacional de Hoteles y Restaurantes) says that there were 1235 hotel rooms available in the Samaná Region in 2006 (See Exhibit 51 and Exhibit 52) and that construction for a further 989 rooms was initiated in that year (See Exhibit 53) . We assume that these rooms will be constructed over the next 2-3 years. Based on these numbers, we were able to project the region's hotel rooms growth by using the growth rates recorded in the Punta Cana-Bávaro region when it was being developed as heavily as the Samaná region currently is. According to the historic trends observed in the Punta Cana/Bavaro area, shown in Exhibit 54, Punta Cana's hotel capacity grew at a rate of 38% per year for the first ten years, 22% per year for the next ten years, and by 7% annually for the next five years. Applying these growth rates to the Samaná region gives us the following projections shown in Exhibit 55.

Exhibit 51: Hotel Rooms in the Samaná Area

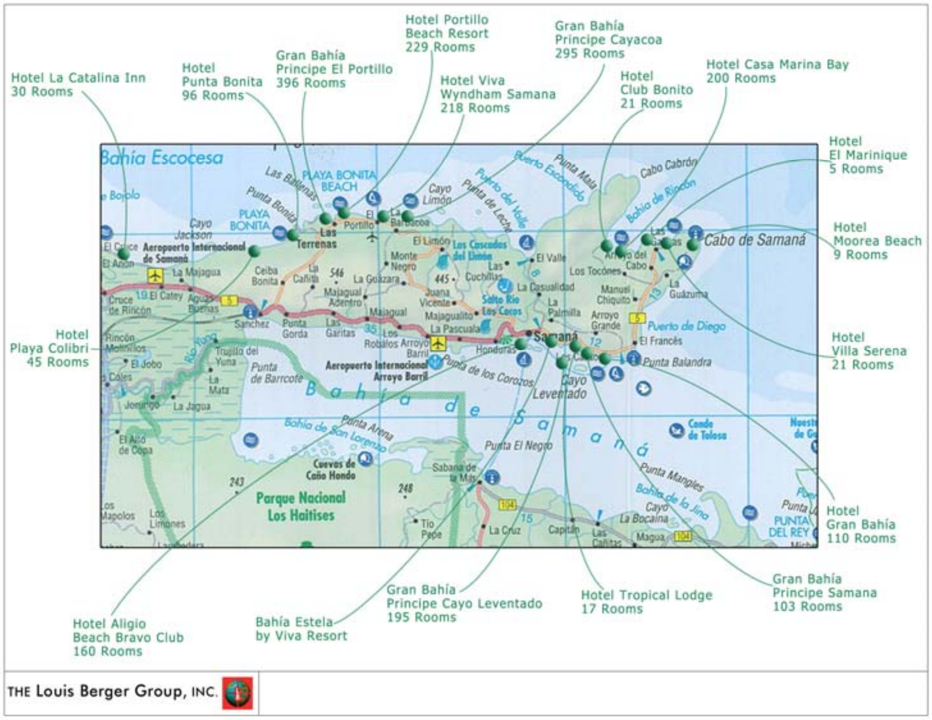


Exhibit 52: Number of Existing Rooms in the Samaná Area

Hotel Name	# of Rooms
Gran Bahia	110
El Portillo Beach Resort	229
Punta Bonita	90
Bahia Estela	80
Villa Serena	21
Casa Marina Bay	200
Aligio Beach Bravo Club	160
Viva Wyndham Samaná	218
El Marinique	5
La Catalina Inn	30
Playa Colibri	45
Club Bonito	21
Moorea Beach	9
Tropical Lodge	17
Total	**1235**

Exhibit 53: Number of New Rooms in the Samaná Area

Hotel Name	# of Rooms
Gran Bahia Principe Cayacoa	295
Gran Bahia Principe Samana	103
Gran Bahia Principe El Portillo	396
Gran Bahia Principe Cayo Levantado	195
Total	**989**

Exhibit 54: Evolution of Hotel Rooms in Punta Cana

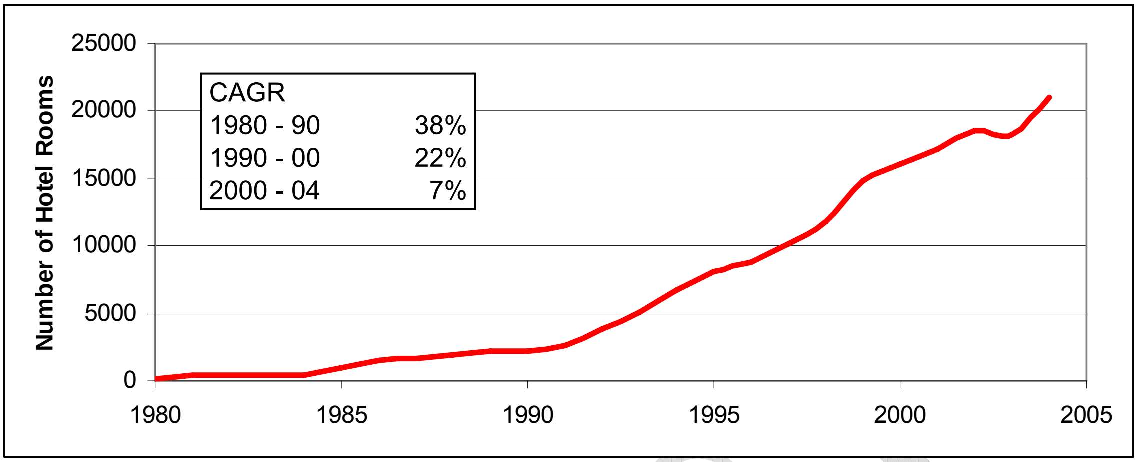


Exhibit 55: Projected Growth in Total Hotel Rooms, Samaná Region

YEAR	% GROWTH	TOTAL ROOMS	CHANGE
Year 1	38%	50	19
Year 2		69	26
Year 3		95	36
Year 4		131	50
Year 5		181	69
Year 6		250	95
Year 7		345	131
Year 8		477	181
Year 9		658	250
Year 10		908	345
Year 11	22%	**1252**	276
Year 12		1528	336
Year 13		1864	410
Year 14		2274	500
Year 15		2775	610
Year 16		3385	745
Year 17		4130	909
Year 18		5038	1108
Year 19		6147	1352
Year 20		7499	1650
Year 21	7%	9149	640
Year 22		9789	685
Year 23		10474	733
Year 24		11208	785
Year 25		11992	839

Source: Louis Berger Group Analysis

Based on our growth rate projections and the data available from ASONAHORES, it would seem reasonable to assume that the Samaná region is currently in Year 11 of its development; therefore, should the annual growth rates resemble those of Punta Cana, we can expect that the hotel room capacity in the Samaná region will almost ten-fold over the next 15 years (more than 11,990 rooms expected in 15 years).

4. Traffic Forecasting Model

4.1 Highway Network

One of the most important aspects of transport modeling is the method used to represent the transportation system. To develop realistic transport demand models it is essential to have an accurate representation of the transportation system serving the region. The most direct method is to develop an abstract model of the system elements: this is called a network. The network is basically a map of highways, arterials, streets, roads, intersections that make up the regional transportation system defined in such a way that can be read, stored, and manipulated by standard transportation planning software.

The process of translating the highway system into a digital format is called network coding. The various segments of the highway system are represented in transportation models using two basic data descriptors called links and nodes. A link is defined as the roadway segment connecting two nodes.

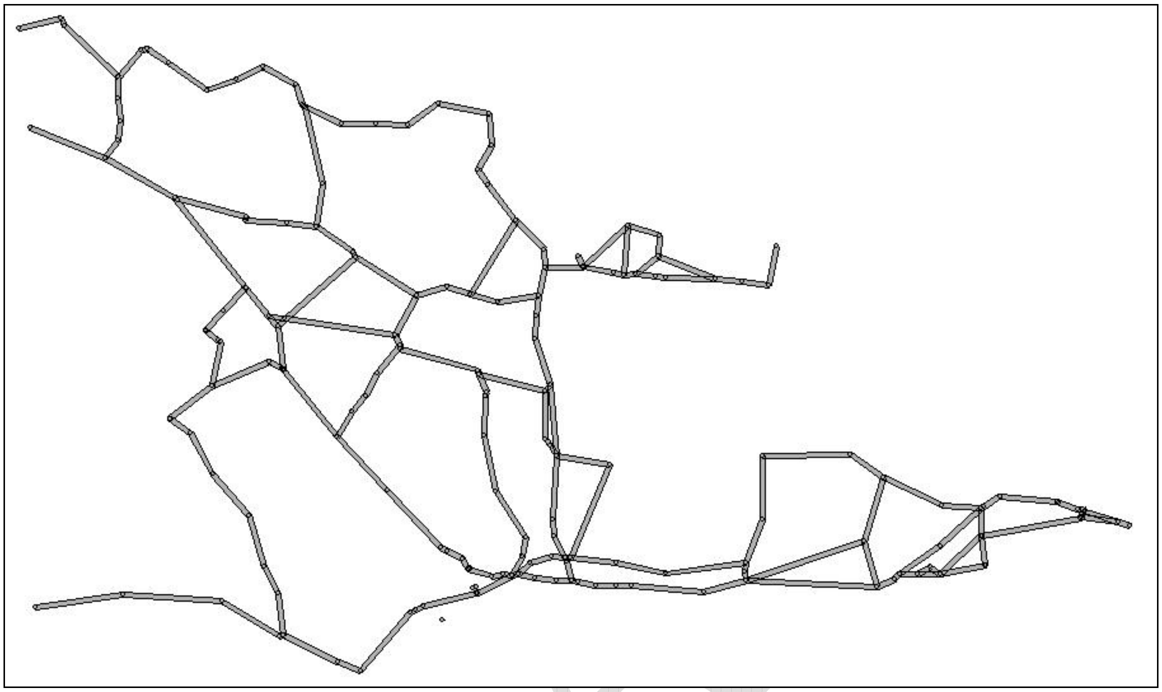
It is essential to code the relevant highway network in an appropriate computer platform so that it can be used to produce impedance matrices for use in the model development and application process. The development of the highway network involves the following tasks: selection of a computer platform to code the network; selection of an appropriate scale for the network i.e., what level of detail will be represented by the network; identification of relevant routes linking different cities/towns; collection of link specific data such as speeds (speed limits, average speeds), distances, tolls and other charges (if applicable), and any other special feature of the roads; and, coding and checking of the network.

The traffic network for this study is coded in the transportation planning software EMME. Since an important fraction of traffic on the concession roads is between the major cities/towns in the Study Area, it is important that the coded network reflect all the major highways connecting different cities/towns in the area of influence of the toll highway. The network is implemented as an "spider-web" network with highways linking the major cities and towns in the region. Note that arterials and other lower level urban roads are not coded as part of the network.

Highway links are assigned attributes representing level of service provided by the segments and intersections of the highway systems. The most common attributes assigned to links for intercity travel demand studies generally include distance, travel time, speed and any delays attributable to travel time, tolls and other out-of-the-pocket costs; depending on the scope of the study other link attributes such as capacity on links, existing volumes, energy consumption, air and noise pollutant emissions may be coded in as part of the traffic network.

The toll booths ("casetas") were identified specifically because the traffic on those links will be reported as part of the traffic and revenue forecasts to be prepared in this study.

Exhibit 56: Network Link Plot



4.2 Zonal Structure

Zones are geographic areas dividing the planning region into relatively similar areas of land-use and land activity. Zones represent the origins and destinations of travel activity within the region. A centroid is a point that represents all travel origins and destinations in a zone. Zone centroids can be placed in the center of activity of the zone; the center of activity is not necessarily the geographic center -- it is the midpoint of activity.

For the purposes of analyses, the study area is divided into 76 zones. The zone sizes are quite small near the project location with the zones adjacent to the project comprising of a town. The zones far from the project location are quite large with some comprising of a number of towns. For each zone a zone centroid is identified which generally is the main population center of the zone or the geometric center of the zone.

The zoning system adopted in this study addressed the following issues:

- The system should come up with a balanced zoning system that identifies the principal traffic movements. The primary movement of traffic in Samaná is for tourism. Samaná, Las Terrenas, Las Galeras, Sánchez , El Limon and near by airports are important locations in this regard. The zoning system should clearly represent movements between these locations.

- The main long distance traffic is between Santo Domingo and Samaná. Most of the other long distance traffic is from/to the nearby provinces.

In order to take into account the inter-town traffic, the consultant has defined small zones on the town areas (district level) and near to the project site. The zones further away from the Study corridor are progressively larger and are represented as external zones. The following exhibit lists the zones.

Exhibit 57: Zone System Developed for this Study

COD	Zone	COD	Zone
1	BONAO	39	LA PASCUALA
2	COTUÍ	40	LAS GARITAS
3	LA VEGA	41	LOS CACAOS
4	MOCA	42	LOS CORRALES
5	NAGUA	43	LOS ROBALOS
6	PUERTO PLATA	44	MAJAGUA
7	SAN FCO. DE MACORÍS	45	MAJAGUAL
8	SANTIAGO	46	NARANJITO
9	SANTO DOMINGO	47	PUNTA VALANDA
10	OTRO LUGAR	48	EL FRANCE
11	SANCHEZ	49	HORMIGA
12	ARROYO BARRIL	50	EL SEIBO
13	SAMANÁ	51	BAVARO
14	LAS GALERAS	52	MONTE ROJO
15	RINCÓN	53	COYOTE
16	LAS TERRENAS	54	PALMILLAS
17	PORTILLO	55	EL CRUCE
18	EL LIMON	56	PLANTA GAS
19	MORRON	57	JARABACOA
20	OTRO LUGAR	58	RIO SAN JUAN
21	ALEMANIA	59	RANCHO ESPAÑOL
22	ARGENTINA	60	LA ALTAGRACIA
23	CANADA	61	ZAPATICO
24	CHILE	62	LOS MANGOS
25	ESPAÑA	63	VILLA SALMO
26	ESTADOS UNIDOS	64	CONTANZA
27	FRANCIA	65	EL VALLE
28	INGLATERRA	66	BANI
29	ITALIA	67	AZUA
30	OTRO PAÍS	68	SALCEDO
31	LA ROMANA	69	NEYBA
32	SOSUA	70	NADER
33	SAN PEDRO DE MACORIS	71	LA BATIDA
34	PIMENTEL	72	VILLA CLARA
35	MAO	73	ESPERANZA

COD	Zone	COD	Zone
36	CATEY	74	MERCADO
37	HONDURAS	75	AGUA BUENA
38	JUANA VICENTE	76	CABRERA

4.3 Market Segmentation

The data collected during the surveys needs to be organized in a satisfactory way that suits the modeling objectives. The Consultant intended to identify homogenous groups and to represent their characteristics.

4.3.1 Vehicle Types

The vehicles are clustered into four groups according to the current toll structure, one for the Autos; another for Bus; and the remaining two for trucks: Light (2 axles) and Heavy (more than 2 axles). Exhibit 58 summarizes these:

Exhibit 58: Vehicle Categories Used in This Study

Category	Description
Auto	Autos/pick-up trucks with 2 axles
Buses	Micros and Buses
Light	Trucks with 2 axles
Heavy	Trucks with 3 or more axles

Source: LBG

These categories are so defined because of the following concerns:

- The autos are expected to be more sensitive to out of pocket costs than the vehicles of the other categories.

- Buses include both fixed and variable route operations. The fixed route operation is comprised of public transport buses whose routes are fixed by the terms of their contract or license from the State. Such buses have to pass through a fixed route stopping on all bus stops along the way. The variable route operation is comprised of tourist buses that do not follow any regular route. Such buses use different routes (and time of operation) based on the requirements of the tourists.

- Trucks are charged twice or more than Autos and have different trip characteristics. They need to be associated to separate groups so as to correctly calculate the revenues.

4.3.2 Day types

Two days types were considered: the weekday and weekends. The volumes and the trips purposes of trips in these two types of day were found to be different.

4.3.3 Trip Purpose

The motives defined during the surveys were grouped into three categories: Resident Tourist, Resident Non-Tourist and Foreigner Tourist. Note that the group "Non-Tourist" includes all other purpose types (i.e., work, business, shopping, education, leisure, social and other) not covered by the first category.

4.4 OD Matrix Development

4.4.1 Expansion factors

The daily OD matrices are calculated for each OD station. These matrices reflect the daily number of trips between each origin/destination pair. The main assumption in this process is that OD data are representative of the counted trips. The OD data are expanded using the counts data collected at the same stations to reflect the full daily trip table. Note that the OD matrices developed by the Consultant only reflect trips taking place in the Study corridor – further, local trips within the Study corridor on rural or urban streets are not included in the matrices. The OD matrices in essence summarize the trips passing through the OD survey points.

The daily capture rate of the OD survey for each day is the total number of surveys divided by the total daily counts. It measures the proportion of the traffic that is described by OD data. The following OD matrices were prepared for each station:

- weekday resident tourist trips using car
- weekday resident non-tourist trips using car
- weekday foreigner tourist trips using car
- weekday tourist trips using bus
- weekday non-tourist trips using bus
- weekday trips for light trucks (2 axles)
- weekday trips for heavy trucks (3 or more axles)
- weekend resident tourist trips using car
- weekend resident non-tourist trips using car
- weekend foreigner tourist trips using car
- weekend tourist trips using bus
- weekend non-tourist trips using bus
- weekend trips for light trucks (2 axles)
- weekend trips for heavy trucks (3 or more axles)

The expansion factors are presented in Exhibit 59.

Exhibit 59: Expansion Factors Used

	East to West						West to East					
	Sánchez			Samaná			Sánchez			Samaná		
	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
AUTOS	5.4	5.4	5.0	6.1	5.6	4.4	8.3	5.5	2.7	7.6	6.9	6.0
TAXI	6.2	4.0	2.3	4.8	8.0	8.5	4.7			5.0	17.0	9.0
JEEP (SUV)	5.8	6.2	5.0	5.3	4.9	4.0	12.6	7.7	8.3	7.4	4.4	6.1
Pick-Up Trucks	6.1	4.7	5.7	6.3	4.1	5.2	5.3	5.3	7.5	7.5	6.1	6.2
BUS Non-Tourist	8.5	11.0	15.5	54.3	11.1	142.0	9.7	10.9	15.0	60.7	12.2	25.8
BUS Tourist	6.7	16.5		42.5	11.6	44.5	11.3	11.2		48.0	18.8	19.4
2 Axle Trucks	19.0	7.4	11.1	13.4	17.0	15.9	8.9	6.6	17.1	11.4	10.3	13.1
Trucks > 2 Axles	12.5	19.3	-	4.7	7.0	17.0	5.6	9.1	15.7	4.8	3.2	3.5

(Note: Day 1 and 2 are weekdays and Day 3 is weekend)

4.4.2 Matrices Combination

For each survey station, OD matrices for each vehicle type, day type and trip purpose are prepared. These matrices describe the flows that were passing by the survey locations. Therefore, these individual matrices cannot represent the overall traffic flows in the Study Area. Once the OD matrices are prepared for each survey station, they need to be combined so that the resulting matrices represent the traffic flows in the Study Area.

The combined matrix is calculated for each origin/destination pair by taking the maximum of trips by cell for all the trip tables or by adding the trips by cell for the trip tables. This process was undertaken for the two day types (weekday and weekend), four vehicle types (Auto, Bus, Light and Heavy Trucks) and three trip purposes (Resident Tourist, Resident Non-Tourist, Foreigner Tourist).

Several the stations capture the traffic on the same roads. Some trips are surveyed on all sites and the process should not double count them. On the other hand, some trips are short distance ones and should not be overlooked. Taking the maximum number of trips by cell for each origin/destination pair addresses these two issues. The following stations were combined with the resulting matrices from the above step taking the maximum number of trips: Samaná and Sánchez.

4.4.3 Desire Lines

To describe graphically the trip flows represented by each origin-destination pair in the trip tables, we plot the desire lines. The desire lines are created for each trip table for 2007 are shown in Exhibit 60 through Exhibit 65. All the desire lines are for weekday trips.

Exhibit 60: Weekday Desire Lines: Auto Traffic FROM Samaná

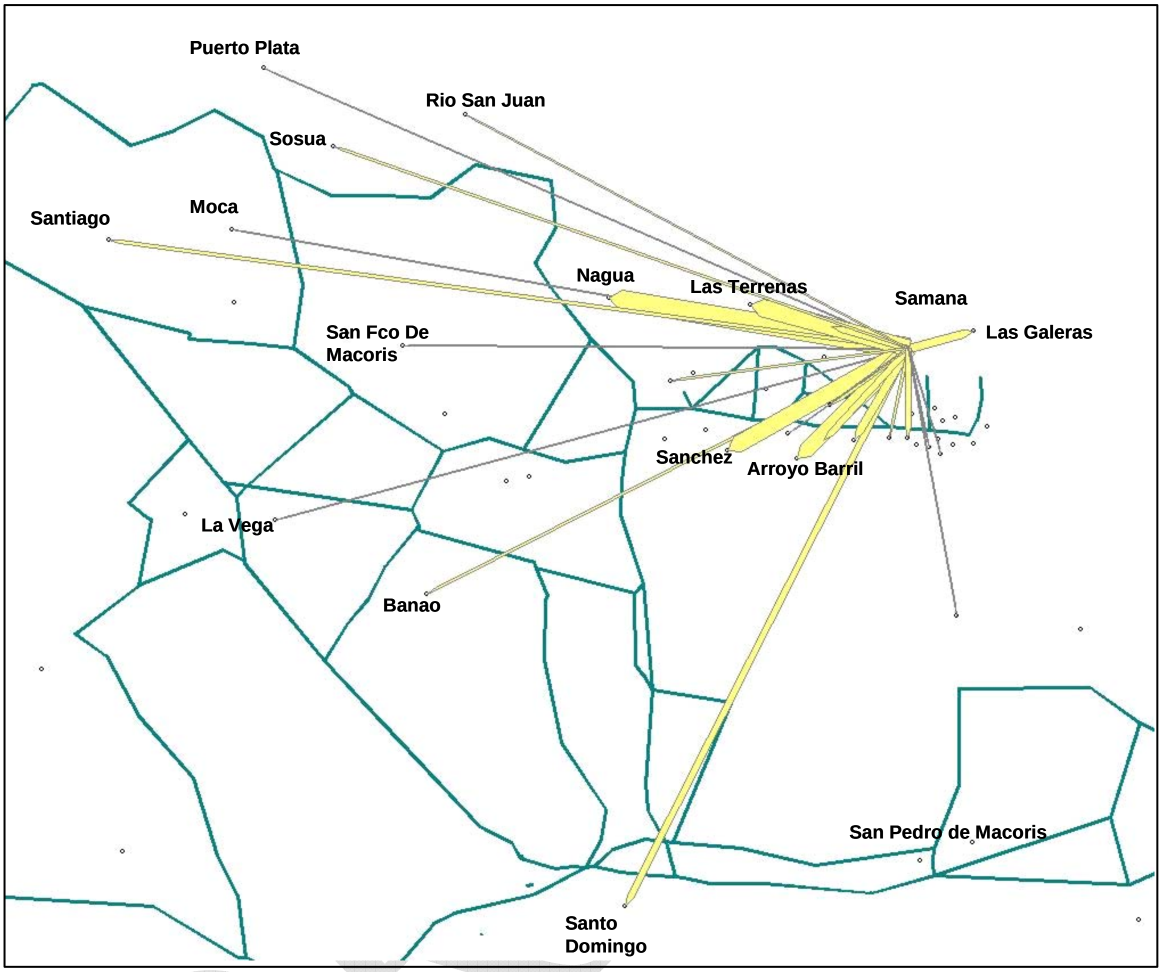


Exhibit 61: Weekday Desire Lines: Auto Traffic TO Samaná

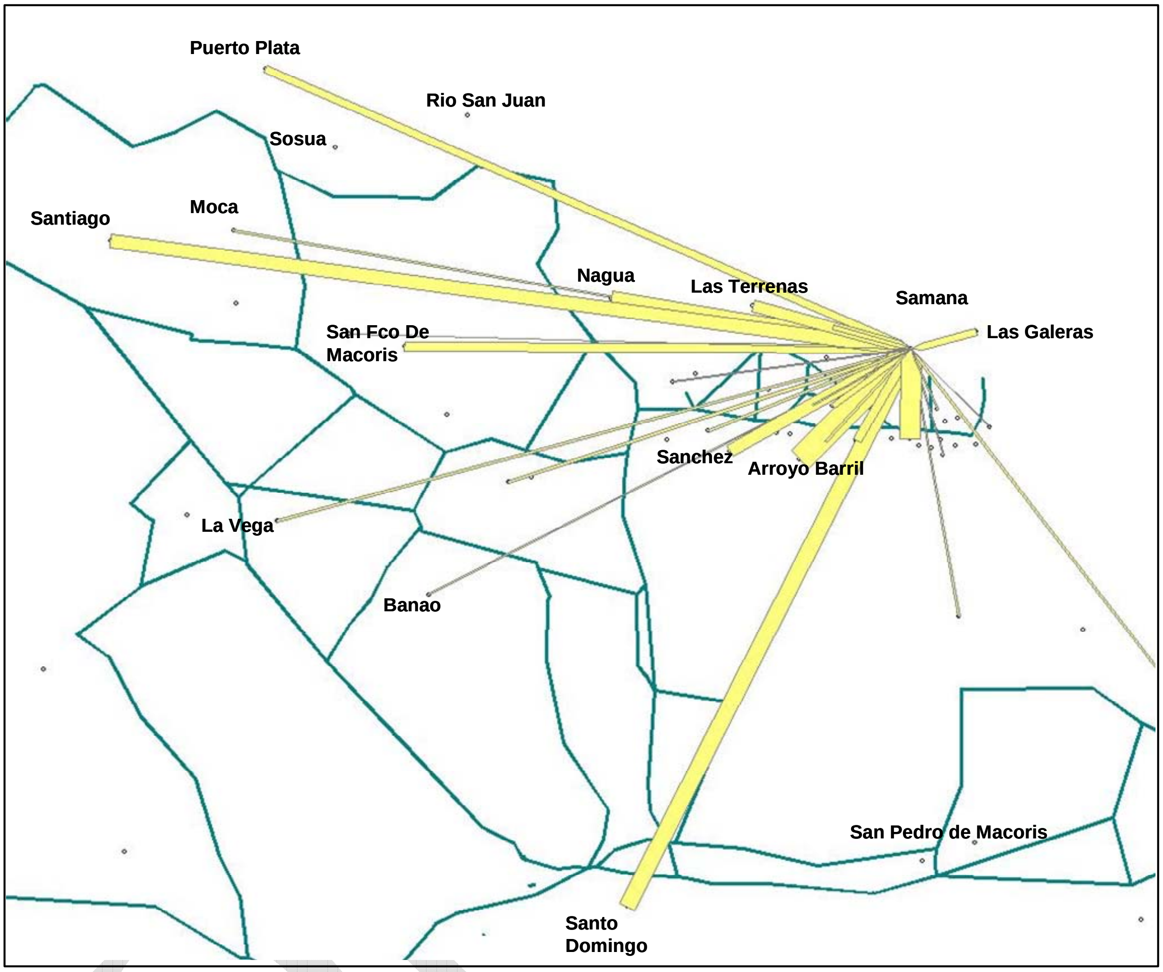


Exhibit 62: Weekday Desire Lines: Bus Traffic FROM Samaná

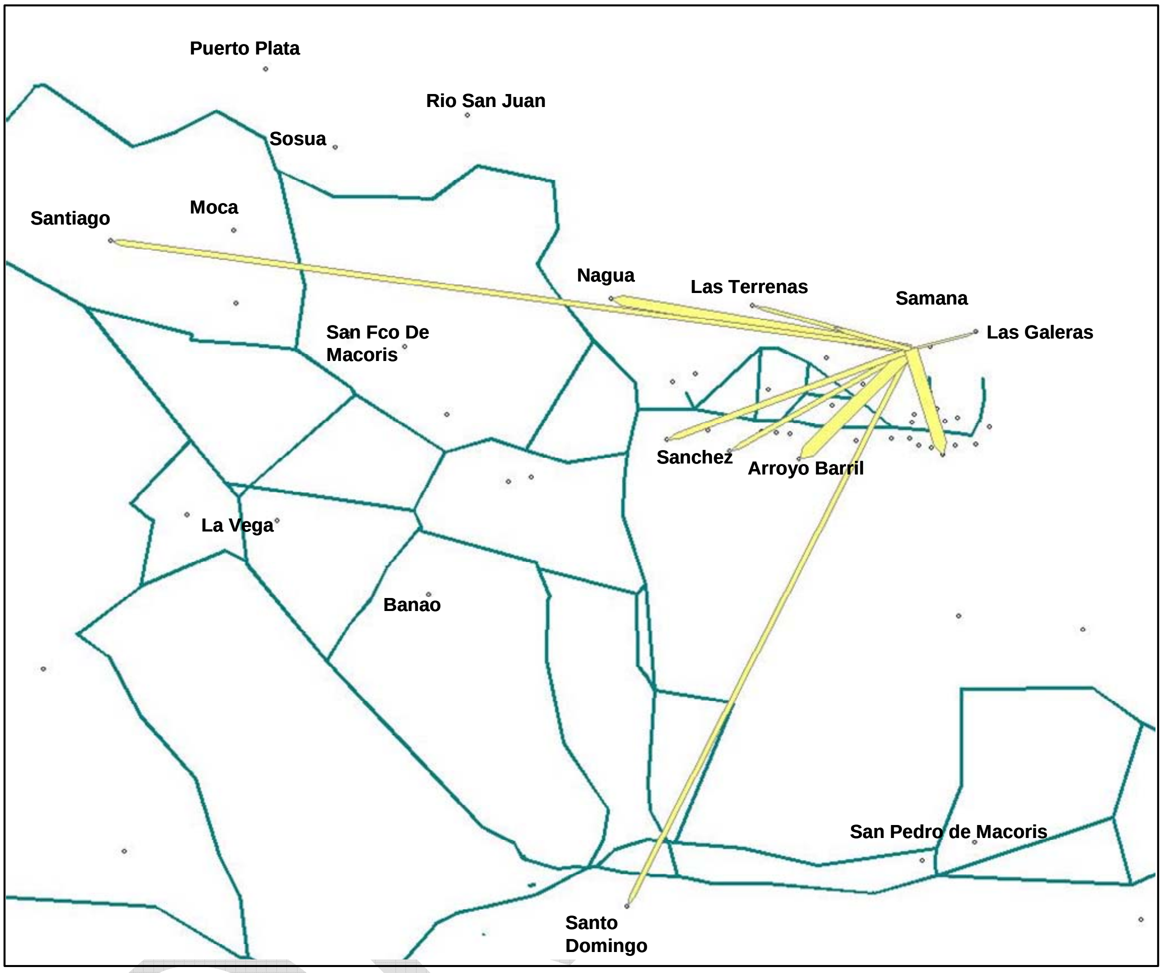


Exhibit 63: Weekday Desire Lines: Bus Traffic TO Samaná

Exhibit 64: Weekday Desire Lines: Truck Traffic FROM Samaná

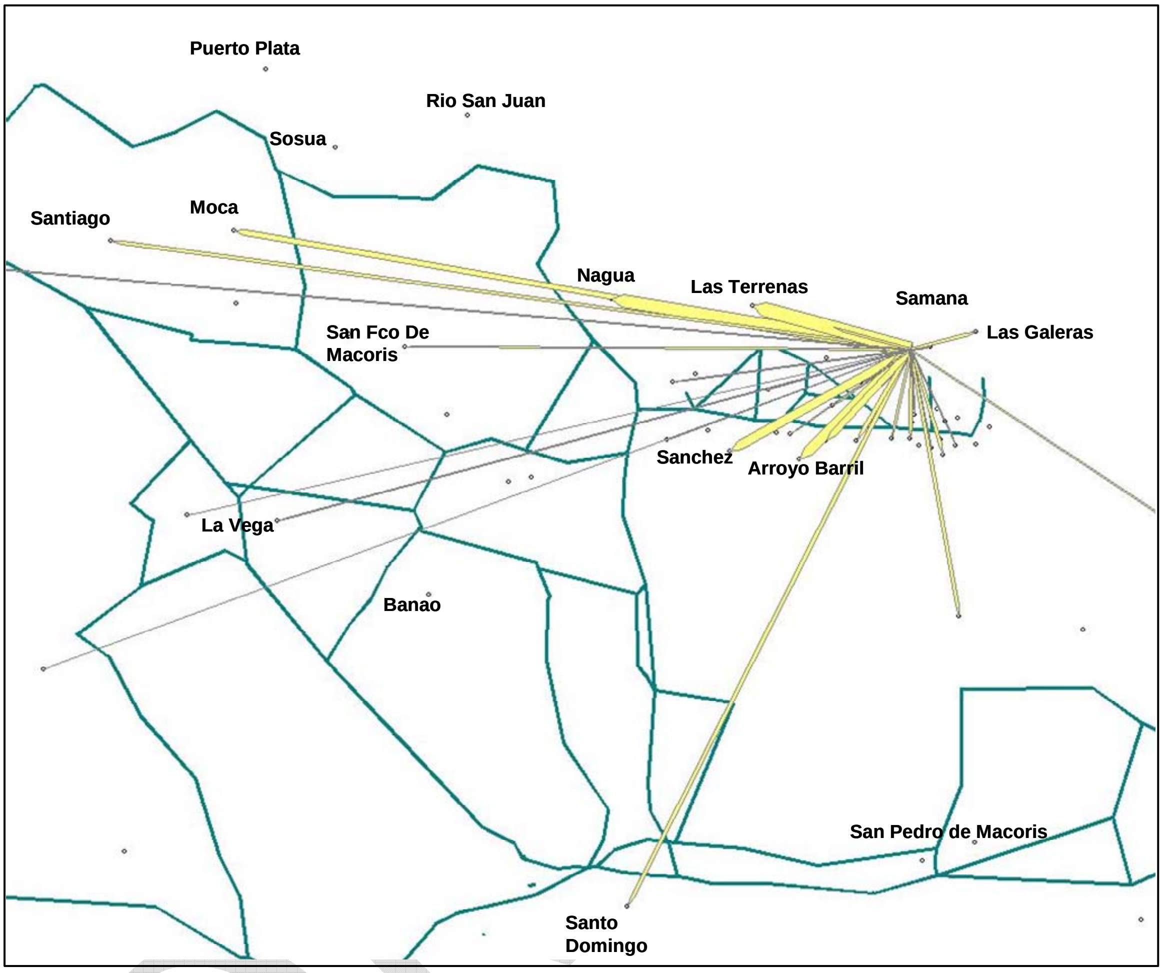
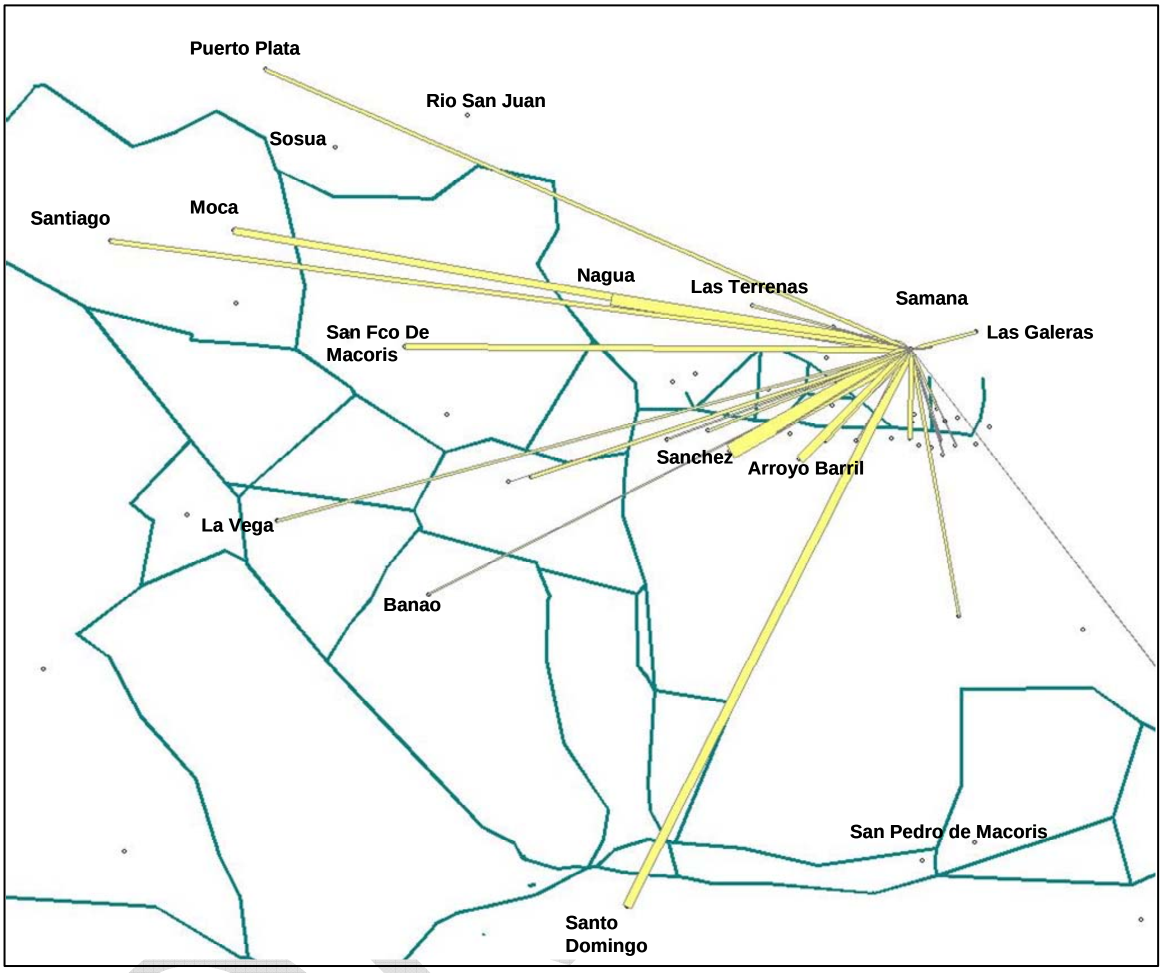


Exhibit 65: Weekday Desire Lines: Truck Traffic TO Samaná



4.5 Seasonality Factors

In order to describe the whole year, the Consultant needs to make seasonal adjustment to the OD matrices obtained from the collected data in June to represent the whole year. This is done through seasonality factors for autos and heavy vehicles.

The seasonality factor is calculated based on the Gasoline consumption and the number of vehicles in Dominican Republic. The seasonality factors are shown in Exhibit 66, 100% refers to AADT. The seasonality factors for June are 101% and 99% for gasoline and number of vehicles respectively. We use 100%, an average of these two values.

Exhibit 66: Seasonality Factors

4.6 GDP and Population Elasticity Values

The only source of historical traffic data in the Samaná region is "Secretaria de Estado de Obras Publicas y Comunicaciones" in the Dominican Republic. We were able to obtain traffic on the following roads for 2005 and 1995/2003.

1. Sánchez to (Entrance to) Samaná, length 11.70 km
2. Samaná (Exit) to Las Galeras, length 26.78 km
3. Sánchez to Las Terrenas, length 16.84 km

Exhibit 67: Elasticity Calculations

Year	Population	GDP	Average Daily Traffic		
	(Million)	(Billion RD$)	Sanchez – Samaná	Samaná – Las Galeras	Sanchez – Las Terrenas
1995	7.39	4.58		2,001	782
1996	7.50	4.91			
1997	7.60	5.31			
1998	7.71	5.70			
1999	7.83	6.17			
2000	7.94	6.67			

2001	8.05	6.91			
2002	8.17	7.22			
2003	8.29	7.08	2,251		
2004	8.41	7.22			
2005	8.53	7.89	2,355	2,511	960
	Population Elasticity		1.59	1.66	1.48
	GDP Elasticity		0.41	0.35	0.31

(Note: 2005 Population is an International Monetary Fund estimate;
Source: Pop and GDP: International Monetary Fund[2])

Exhibit 67 shows the elasticity calculations based on the traffic on these road sections. We decided to use an average value for the elasticity as follows:

Population Elasticity: 1.58
GDP Elasticity: 0.36

4.7 Value of Time

The value of time (VOT) is normally calculated through stated or revealed preference surveys. We, however, used an alternative method to calculate the VOT because such survey data was not available due to time and resource constraints. We calculated the VOT using the relationship between VOT and income per capita for different trip purposes.

First, for each case, the average income level of the potential highway users was assumed. Because of the low level of motorization in the country, the average income was set above the mean at the 70th percentile.

Once the income levels were estimated, the value of time was calculated according to the trip purpose. The values of time for residents were estimated using percentages of the hourly value of time, taken from research papers for each trip purpose.

These percentages were:

- Work trips: 50%
- Tourism trips: 75%
- Non-Work Non-Tourist trips: 100%

The value of time for Non-Tourist trips was calculated by using a weighted average of work and non-work non-tourist trips. The value of time for foreigners was assumed to be $12 per hour. As a result of these assumptions the value of time for each trip purpose is presented in Exhibit 68.

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[2] Available from http://www.imf.org/external/pubs/ft/weo/2007/01/data/weoselgr.aspx accessed on August 13, 2007.

Exhibit 68: Value of Time[3]

Trip Purpose	VOT
Auto Resident Tourist	$0.87
Auto Resident Non-Tourist	$0.79
Auto Foreigner Tourist	$12.00
Bus All Tourist	$1.59
Bus All Non-Tourist	$1.74
LightTrucks (2 Axles)	$2.38
Heavy Trucks (3 or more Axles)	$3.18

4.8 Traffic Assignment and Validation

4.8.1 Traffic Assignment

One of the most important parts of a study of this kind is the traffic assignment. The Consultant utilized the traffic assignment routines of EMME to perform this task. In this Section we briefly describe the algorithms used for assignment. The interested reader is referred to the EMME user's manual (INRO Consultants, Montreal, Canada) for more technical details for the assignment algorithms implemented in EMME. Another useful reference is the textbook by Ortúzar and Willumsen[4].

A number of different traffic assignment algorithms are available to the modeler. These include all-or-nothing method, stochastic methods, and congested assignment method. All-or-nothing assignment is probably the simplest method. It assumes that there are no congestion effects i.e., the link costs are fixed, resulting in all drivers between a particular zone pair choosing the same route. Stochastic methods of traffic assignment emphasize the variability in driver's perception of costs and the measure (i.e., cost, time, distance, etc.) they are trying to minimize.

The congested assignment methods assume that there are several different routes that a driver can use to travel between a particular zone pair and that the cost associated to each link of the route varies depending on the congestion level created by the traffic at the link.

The particular method selected for this study is known as the equilibrium (capacity constrained) auto assignment. The behavioral assumption is that each driver will choose the route with the least perceived cost associated. Each segment (link) of a route has it own implicit travel time that varies depending on the capacity of the link and the number of vehicles traveling on it. This process runs a number of iterations until the traffic flows satisfy Wardrop's user optimal principle in which "no user can improve his travel time by

[3] Buses, Light trucks and Heavy trucks were assumed have VOT 2, 3 and 4 times Auto VOT respectively.
[4] J. de D. Ortúzar and L.G. Willumsen, Modelling Transport, John Wiley and Sons, Second Edition 1995.

changing routes". The consequence is that the equilibrium traffic assignment corresponds to a set of flows such that all routes used between an origin-destination pair are of equal time.

A multiclass assignment was performed in the study. This is a true equilibrium assignment in which several classes of users perceive or use the network differently. All classes that are allowed to use a given link perceive the same travel time but may perceive a different cost if a generalized cost assignment is specified.

Volume-delay functions are used in the assignment procedures to reflect the congestion effects on travel time. The volume delay functions used in this study are based on the BPR (Bureau of Public Roads – the precursor to the Federal Highway Administration of USA) function. This function can be expressed as:

$$t = t_o * \left(1 + \alpha \left(\frac{v}{c}\right)^{\beta}\right)$$

Where:

t	=	link travel time
t_o	=	free flow travel time on the link
v/c	=	volume over capacity ratio
α and β	=	model coefficients.

4.8.2 Estimation of Daily Traffic

The origin destination matrices contained the 12 hour traffic that was converted to peak hour during the model run. The flows obtained were for the peak hour. It was important to obtain the annual and average daily traffic from the model output.

The following steps were taken to estimate the daily weekday and weekend traffic from the model output:

- The model uses the demand in "passenger car units", the first step is therefore to convert the traffic from PCU to vehicles. The passenger car equivalents for buses, light and heavy trucks were 3, 3 and 4 respectively.
- The resultant traffic is adjusted based on the calibration factor. Calibration factor is the error between the model and actual traffic during the calibration process.
- The traffic obtained in the previous step was for the peak hour and was converted to daily traffic by multiplying it with a 24 hour conversion factor.

- The annual traffic was calculated by multiplying the weekday daily traffic by 261 and the weekend daily traffic by 104. The AADT was obtained by dividing the annual traffic by 365.

4.8.3 Validation

After the matrix development process and coding of the highway network, the matrices for the base year are assigned to the network. Validation checks were carried out and are shown below.

The most important check of validation is to test whether the assignment model is able to replicate the traffic levels at the origin-destination survey sites.

Exhibit 69 shows the comparison between modeled traffic levels and observed traffic levels at 5 sites (2 OD survey sites and 3 automatic count sites). The results show a good overall match for all the vehicle types with the errors within the acceptable range.

Exhibit 69: Comparison of Daily Traffic Counts and Assigned Volumes

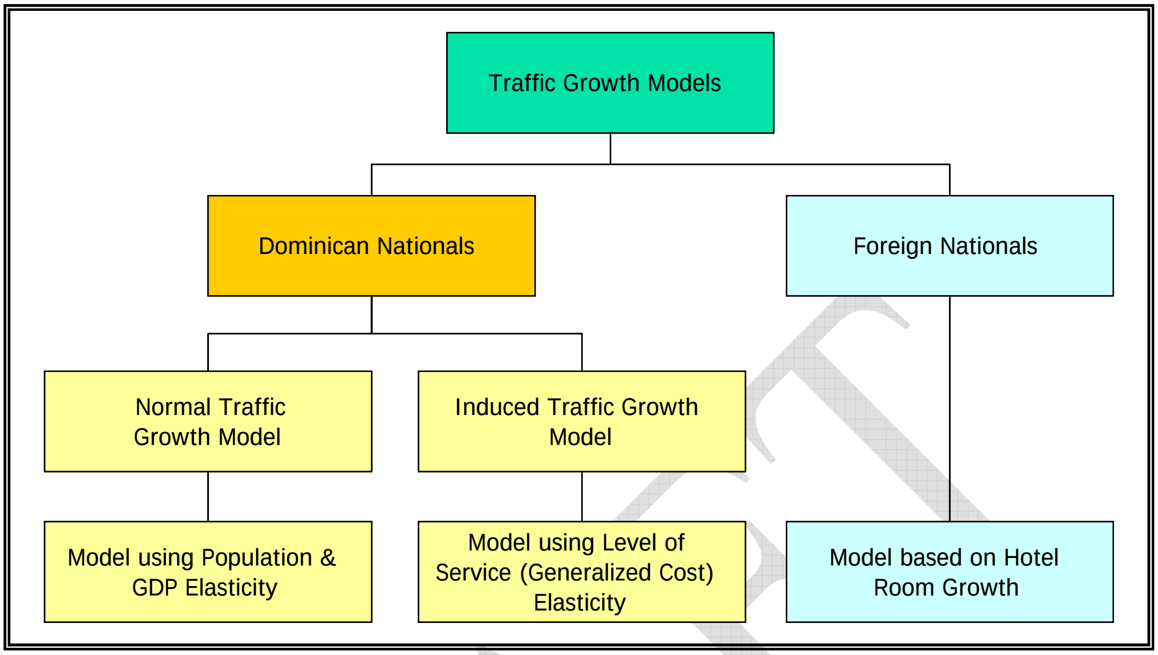
	Weekday			Weekend		
Location	Count	Model	ERROR	Count	Model	ERROR
Sanchez	291	287	**-1%**	274	272	**-1%**
El Limon	96	96	**-1%**	92	92	**0%**
Las Galeras	129	129	**0%**	139	139	**0%**
Samaná	298	314	**5%**	275	281	**2%**
Las Terrenas	107	107	**0%**	84	85	**1%**

4.9 Forecasting Methodology

A set of Future Demand Matrices was developed for each future year by mode, trip purpose and day type. In total 14 matrices were created for the base year and 18 for each future year. The methodology followed to estimate each of these matrices is explained in this section.

The future year traffic is assumed to be comprised of three parts: Normal traffic growth, induced traffic and tourist traffic. Exhibit 70 illustrates these three parts of future traffic growth.

Exhibit 70: Future Traffic Growth



4.9.1 Normal Traffic Growth

The models developed for the normal traffic growth in this is study can be classified as "Elasticity based Travel Demand Models." These models predict the growth of base year trips as a function of growth in explanatory variables such as the GDP, population, employment, etc. The functional form of the model can be expressed as:

$$Trips^{FutureYear} = \int \left(Trips^{BaseYear}, \Delta GDP, \Delta Population\right)$$

where:

$Trips^{Future\ Year}$	Future year trips
$Trips^{Base\ Year}$	Base year trips
ΔGDP	Growth in GDP between the future and base year
$\Delta Population$	Growth in Population between the future and base year

The advantage of using this form of the elasticity model are its simplicity and the constraint that the future year trips always be related to the base year trips.

After testing a number of possible alternatives, the Consultant decided to use a model that used GDP growth rates to predict the future year trip matrices. The model application can be summarized as (see the accompanying exhibit):

- The production of trips from each origin (i.e., row totals of the OD matrix) is a function of Population growth:

$$Trips^{Future}_{Producción} = Trips^{Base}_{Producción} * \left(1 + \varepsilon_{Population} * \Delta Population\right)$$

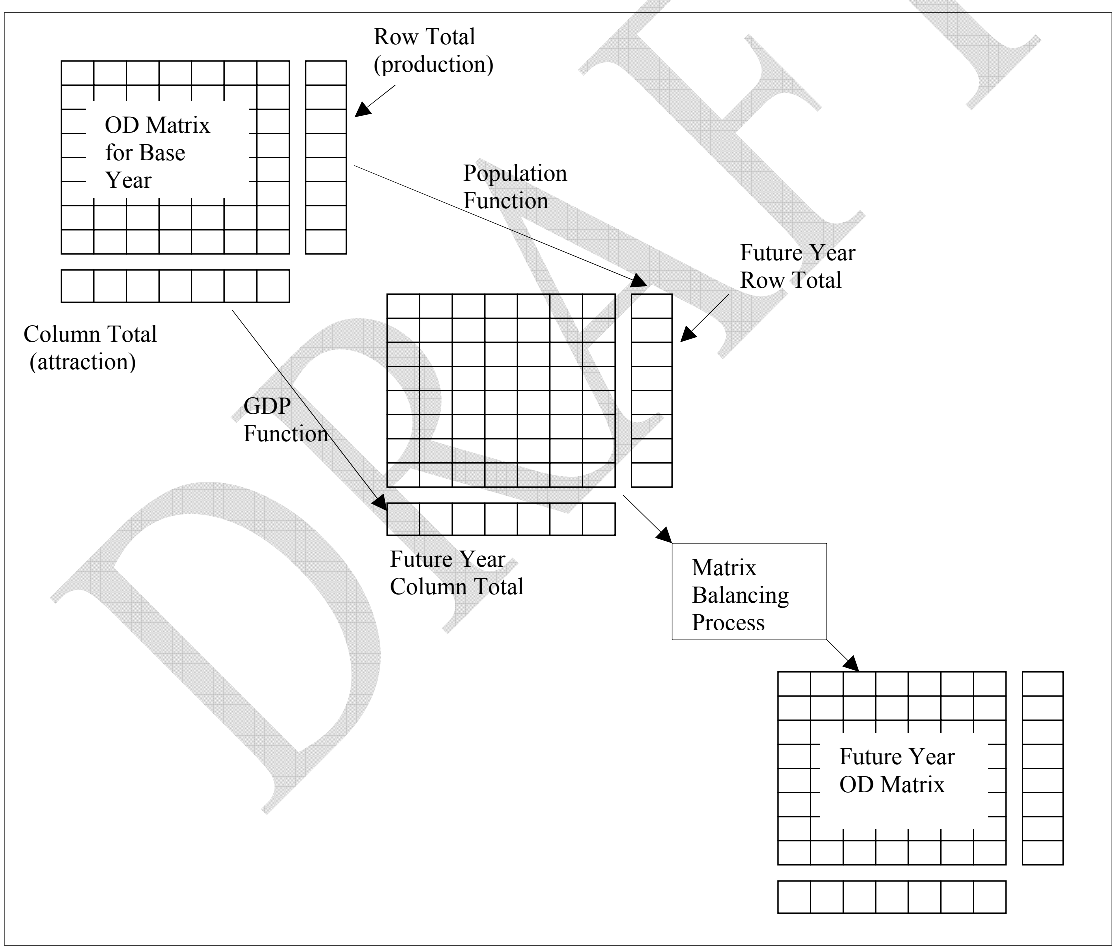
where ε_{GDP} is the GDP elasticity of trips.

- The attraction of trips to each destination (i.e., column totals of the OD matrix) is a function of GDP growth:

$$Trips^{Future}_{Attraction} = Trips^{Base}_{Attraction} * \left(1 + \varepsilon_{GDP} * \Delta GDP\right)$$

where ε_{GDP} is the GDP elasticity of trips.

Exhibit 71: Two Dimensional Matrix Balancing Process



- Model Estimation: To estimate the elasticity values, a data set was developed based on historic traffic, population and the GDP for Dominican Republic and its regions. For details regarding this estimation process see Section IV.

- After calculating the future year production and attraction for each zone (i.e., future year row and column totals for the OD matrix), the base year OD matrix is "balanced". Matrix balancing is a process in which the individual cells in the matrix are calculated so that the sum of the cells for each row and for each column equals the new row and column totals (i.e., the production and attraction for each zone for the future year). This is done using a process called the "two-dimensional matrix balancing", as shown below.

- The balanced matrix represents the future year OD matrix.

In addition to the normal traffic growth we considered induced traffic because of availability of more and/or better options to travel between certain locations.

4.9.2 Induced Traffic Growth

The induced traffic for the future years is further comprised of two parts: Additional traffic due to reduction in the transportation cost because of the new highway and additional traffic because of the growth in tourist population.

The induced traffic as a result of the reduction of the cost of transport is calculated using the following expression:

$$\Delta t_{ij} = e * t_{ij} * \Delta C_{ij} / C_{ij0}$$

where,

Δt_{ij}	is the traffic induced between zones i and j
e	is the elasticity
t_{ij}	is the existing traffic between zones i and j
C_{ij0}	is the cost of the trip between zones i and j
ΔC_{ij}	is the change in the trip cost between zones i and j by the highway improvement

The elasticity values used in the expression above is -0.2.

4.9.3 Tourist Traffic Growth

To estimate the foreign traffic generated by the tourist infrastructure being developed in Samaná, a model that estimates the likely trips from Samaná to Santo Domingo and from the tourist areas in Punta Cana/ Bavaro to Samaná is used. This model is based on the hypothesis that of the total hotel rooms in Samaná, a certain percentage will be occupied by foreign tourists. Some of these tourists will make a trip to Santo Domingo – this trip could be a one or two day excursion arranged by the hotels using luxury buses or the tourists could rent a car to drive to Santo Domingo. Similar hypothesis is assumed for hotel rooms in Punta Cana/Bavaro for tourist making trips to Samaná.

For modeling, the following equation is used to estimate this tourist traffic (assuming the average length of stay for foreign tourists is one week):

$$V_{dc} = 2 \times \left(\frac{N_h \times O_h \times O_{he} \times V_a \times C \times N_{veh/h}}{7} \right)$$

$$V_{db} = 2 \times \left(\frac{N_h \times O_h \times O_{he} \times V_a \times B \times N_{veh/h}}{7} \right)$$

where:

V_{dc} daily trips made by car

V_{db} daily trips made by bus

N_h number of rooms of the zone

O_h ratio of occupation of the rooms

O_{he} % of occupation of the rooms by foreign tourists

V_a % of foreigners goes who will make a trip using the new one freeway

C % of foreigners who will make the trip by car

B % of foreigners who will make the trip by bus

$N_{veh/h}$ number of vehicles that move by room

The assumptions made for these parameters are given in Exhibit 72.

Exhibit 72: Tourist Trip Assumptions

	Samana	Punta Cana
O_h	80%	80%
O_{he}	85%	85%
V_a	75%	25%
C	30%	30%
B	70%	70%
$N_{car/h}$	1	1
$N_{bus/h}$	0.07	0.07

5. Traffic Forecast and Sensitivity Analysis

The traffic forecasts for the Samaná toll highway is based on several factors. Among these include assumptions regarding the socio-economic growth of the Samaná region, the value of time of users, the toll rates on the new highway, the toll multiplication factors used for the heavy vehicles, etc. The uncertainty surrounding the large number of factors/parameters that are used during the forecasting process inevitably results in forecasts that have an inherent level of unreliability associated with them.

On the basis of the existing traffic and the adopted macro-economic assumptions, a set of traffic forecasts was developed for years 2010, 2015, 2020, 2025 and 2030. Using the EMME transportation software, a series of model runs were undertaken in order to model the assignment of each class of vehicles over the road network.

The principal assumptions are given in the next sub-section.

5.1 *General Assumptions*

5.1.1 Annualization Factors

To convert the daily traffic and revenue figures to annual figures, a set of annualization factors is required. These factors are estimated using number of holidays and weekends per year. In total, 261 days are considered weekdays and 104 are considered weekends.

5.1.2 Toll Levels

The highway development in Samaná province includes 24 km of new highway and 99 km of rehabilitation of existing highway. The auto toll rate for the new highway is 9 cents[5] per km and for the rehabilitated highway is 4.5 cents per km. The average auto toll rate for the entire 123 km of highways is thus 5.4 cents per km. The resultant toll schedule on the Samaná highway is indicated in Exhibit 73. Tolls will be adjusted according to inflation. For the purpose of this study, we do not consider inflation thereby keeping the toll levels constant over the forecast horizon. The effect of these assumptions is that the revenues computed are all expressed in constant Dollars of 2007.

Exhibit 73: Toll Levels used for Analysis (in USD)

Vehicle Type[6]	Autos	Bus	Light Trucks	Heavy Trucks
Tolls in USD	$6.62	$12.87	$16.55	$25.74

[5] Cents of US Dollar.
[6] Motorcycles used by the residents are not charged any tolls.

5.1.3 Changes to Road Network

The primary change in the Samaná road network from the 2007 network is the addition of the Samaná highway that extends from Las Terrenas to El Catey in the Samaná province. Other network changes considered are as follows:

- Rehabilitation of the National Route 5 from Nagua to Las Galeras.
- The new tollway Autopista del Nordeste (currently under construction) between Santo Domingo and Cruce del Rincon is also considered.
- The new El Coral toll road (expected to be completed by 2010) between La Romana and Punta Cana/ Bavaro is also considered.

5.1.4 Ramp Up

The ramp-up period reflects a toll facility's traffic performance during early years. This period reflects the user's lack of familiarity with the new facility and its benefits – an information lag – and a community's general reluctance to pay tolls, particularly high tolls[7]. It is important to note that there are no alternatives to the toll road for traffic entering/exiting Samaná province. In such cases, the ramp up reflects the reduction in frequency of trip making and more efficient trip making (for example, consolidating two or three trips into one) through the toll booth locations as people realize that they have to pay a toll. This frequency reduction gradually dissipates as people become more familiar with the tolls and the tolls are internalized.

A correction is applied to the traffic projection for the ramp-up period, typically 2-3 years after the opening of the facility. The estimated traffic is reduced by a correction factor that accounts for the ramp-up period. We have used a ramp up factor of 85% for the first year, 95% for the second year and 100% for the subsequent years.

5.1.5 Marketing Programs to Promote the Toll Highways

The majority of Project highways are currently operating in the Province of Samaná without tolls. The conditions of these roads will improve significantly after the Concessionaire finishes the rehabilitation works. Also, the new link between Las Terrenas and the El Catey airport will provide an important connection for folks visiting Las Terrenas.

It is important that the Concessionaire engage in marketing programs that explain to the residents of Samaná about the works that are being undertaken to improve the road system. Such programs will help improve the acceptance of tolls on roads which currently operate without any tolls. Further, such programs will help mitigate against the ramp-up during the initial years of the operation.

[7] Source: Standard & Poor's, Traffic Risk in Start-Up Toll Facilities, September 2002.

In addition to the marketing efforts targeted to the residents of the Samaná province, the Concessionaire should work with the hotel industry to promote tours/trips by the tourists to and from Samaná. This tourist traffic (between Samaná and Santo Domingo, and between Punta Cana/Bavaro and Samaná) contributes towards the overall traffic at the toll plazas (see Section 5.4 for more details) and therefore it is important that the Concessionaire devises programs that encourage such trips.

An important assumption that is implicitly made in our forecasts is that there will be such marketing efforts undertaken by the concessionaire which not only minimize the initial reluctance of the residents to pay tolls but also promotes the use of the highways by tourists who currently may not be willing to drive to visit other parts of Dominican Republic.

5.2 Forecast Scenarios

5.2.1 Most Likely Scenario

This scenario reflects the Consultant's view of the Most Likely traffic and revenue forecasts for the Samaná toll highway. The assumptions underlying this scenario are:

- The macro-economic growth for the Samaná region is based on the most-likely economic forecasts discussed in Section 3 of this report. The forecasted growth of GDP for Samaná is 5.5% per year till 2010 and 4% per years after 2010.
- The GDP elasticity to traffic assumed under this scenario is assumed to be 0.36.
- The Population elasticity to traffic assumed under this scenario is assumed to be 1.58.
- The Base Year values of time are held constant over the forecast horizon.
- The vehicle operating costs for different vehicles are assumed to be constant throughout the period of concession and are same for all link types.

5.2.2 Summary of Assumptions

The principal scenario specific assumptions are summarized in the following table:

Exhibit 74: Scenario Assumptions

Factor	Most Likely	Optimistic	Conservative
Population Growth	1.5%	1.5%	1.25%
GDP Growth			
• 2005 – 2010	5.5%	6.5%	4%
• 2010 – 2030	4.0%	5%	3%
Elasticity Values			
• GDP	0.36	0.36	0.36
• Population	1.58	1.58	1.58
Samaná Hotel Room Growth			
• 2007 – 2017	22%	25%	15%
• 2017 – 2030	7%	10%	5%
Punta Cana/ Bavaro Hotel Room Growth			
• 2007 – 2010	9%	10%	7%
• 2010 – 2015	6%	8%	5%
• 2015 – 2030	5%	6%	3%
Tolls levels	Same for all scenarios see Exhibit 73		
Value of Time	Same for all scenarios see Exhibit 68		
Ramp Up	Year 1: 85% Year 2: 95% Year 2: 100%	Year 1: 90% Year 2: 100%	Year 1: 70% Year 2: 80% Year 1: 90% Year 2: 100%
Percentage of Tourist traffic from Punta Cana going to Samaná	25%	40%	10%

Note: All assumptions from 2010-2030 unless stated otherwise; Source: LBG

5.3 Most Likely Scenario Results

Traffic and revenue forecasts using the methodology described in the earlier Sections are presented below for the Most Likely scenario.

Exhibit 75: AADT Forecasts Including Ramp-Up (Most Likely Scenario)

Toll Booth	2010	2015	2020	2025	2030
From Sánchez	1,940	2,880	3,300	3,680	4,100
From Nagua/Sto Domingo	2,360	3,450	4,070	4,740	5,630
From El Catey Airport	130	340	460	560	650
From Las Terrenas	550	860	1,110	1,330	1,610
Total Toll Traffic	**4,980**	**7,540**	**8,950**	**10,320**	**11,990**

Exhibit 76: Revenue Forecasts Including Ramp-Up (Most Likely Scenario, in 2007 USD)

Toll Booth	2010	2015	2020	2025	2030
Westbound from Sánchez	$6,683,000	$9,754,000	$11,142,000	$12,385,000	$13,783,000
Eastbound from Nagua/Sto Domingo	$7,923,000	$11,354,000	$13,290,000	$15,450,000	$18,290,000
From El Catey Airport	$411,000	$1,106,000	$1,499,000	$1,816,000	$2,106,000
Southbound from Las Terrenas	$1,750,000	$2,720,000	$3,444,000	$4,123,000	$4,961,000
TOTAL	**$16,767,000**	**$24,933,000**	**$29,375,000**	**$33,774,000**	**$39,141,000**

Exhibit 77: Revenue Forecasts Annual Growth Rates (Including Ramp-Up, Most Likely Scenario)

Highway	2010-2015	2015-2020	2020-2025	2025-2030
Westbound from Sánchez	8%	3%	2%	2%
Eastbound from Nagua/Sto Domingo	7%	3%	3%	3%
From El Catey Airport	22%	6%	4%	3%
Southbound from Las Terrenas	9%	5%	4%	4%
Total Toll Traffic	**8%**	**3%**	**3%**	**3%**

The El Catey airport shows the highest growth rate, which is because the airport started its operations in 2007 and it is expected to grow at a high rate in the initial years. The growth rates from 2010-2015 are higher than others because of the ramp up. We applied a ramp up factor of 80%, 90% and 100% to the first, second and third year after the opening of the toll booth (in 2010). The primary movement is in the east west direction between Nagua/Santo Domingo and Sánchez /Samaná.

The traffic and revenue from 2030-2037 was assumed to grow at the annual growth rate between 2025 and 2030. 2009 traffic was obtained by extrapolating backwards using the growth rate between 2010 and 2015. Exhibit 78 through Exhibit 81 provide illustrations for the traffic and revenue forecasts for the Most Likely scenario.

Exhibit 78: Traffic at Toll Booths (Including Ramp-Up, Most Likely Scenario)

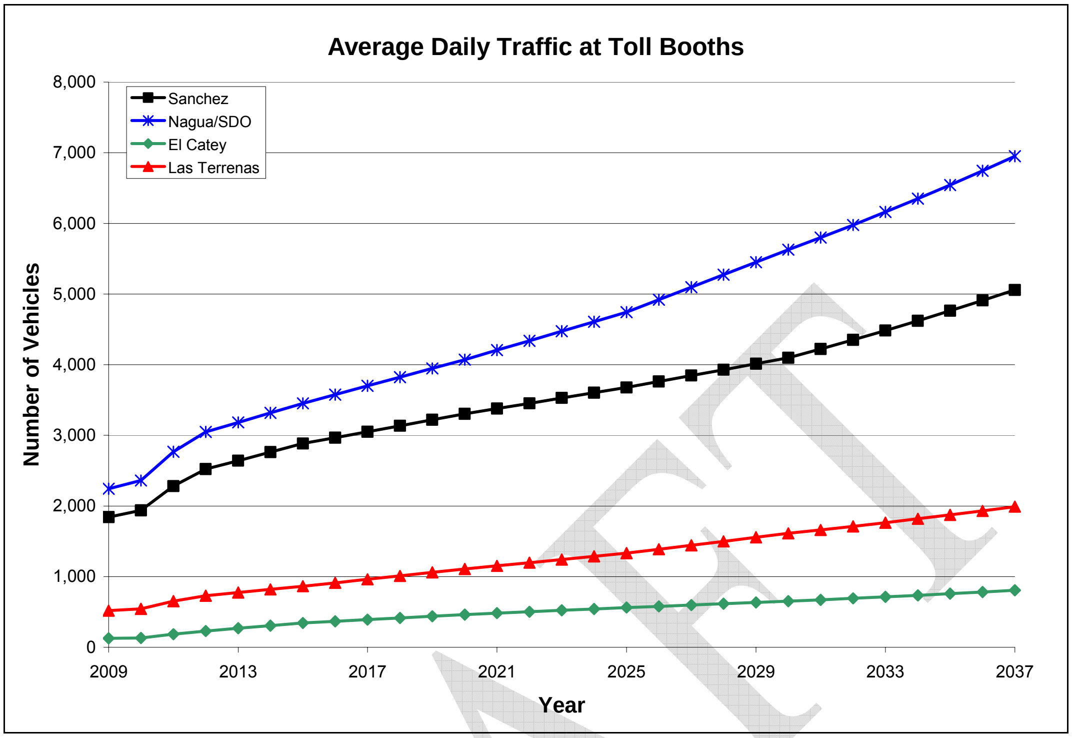


Exhibit 79: Annual Revenue Including Ramp-UP (Most Likely Scenario, Millions of USD of 2007)

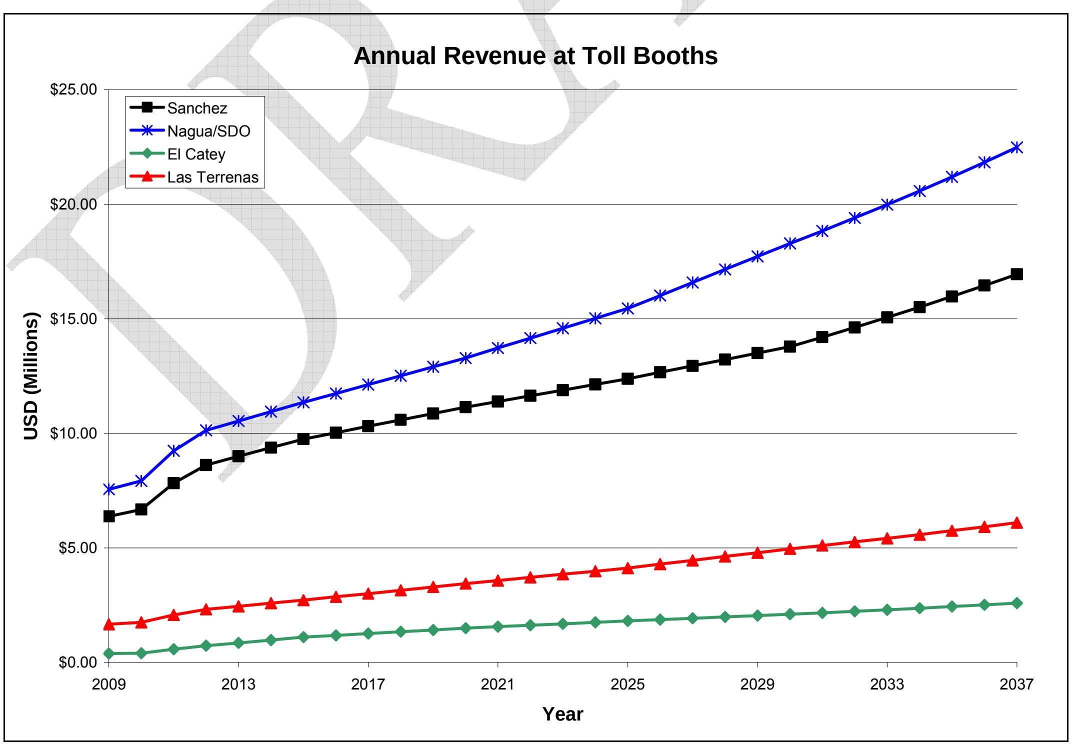


Exhibit 80: Total Average Daily Toll Traffic
(Most Likely Scenario, Including Ramp-Up)

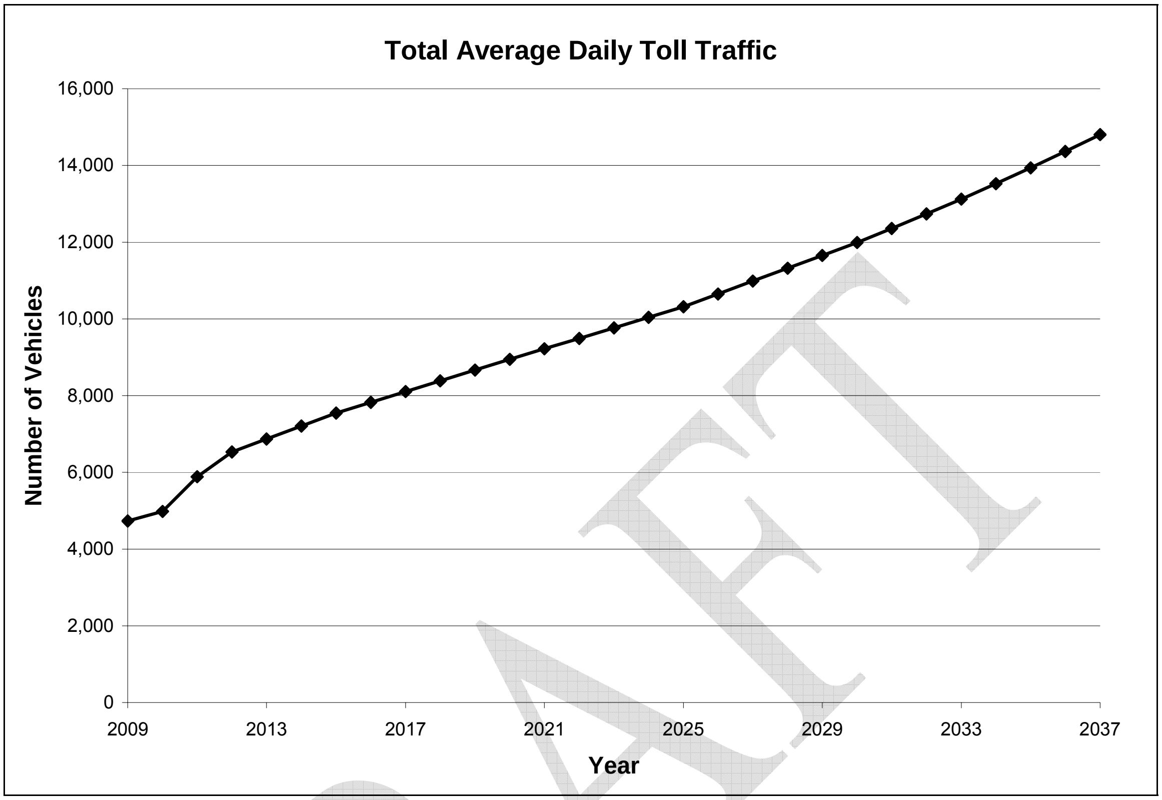
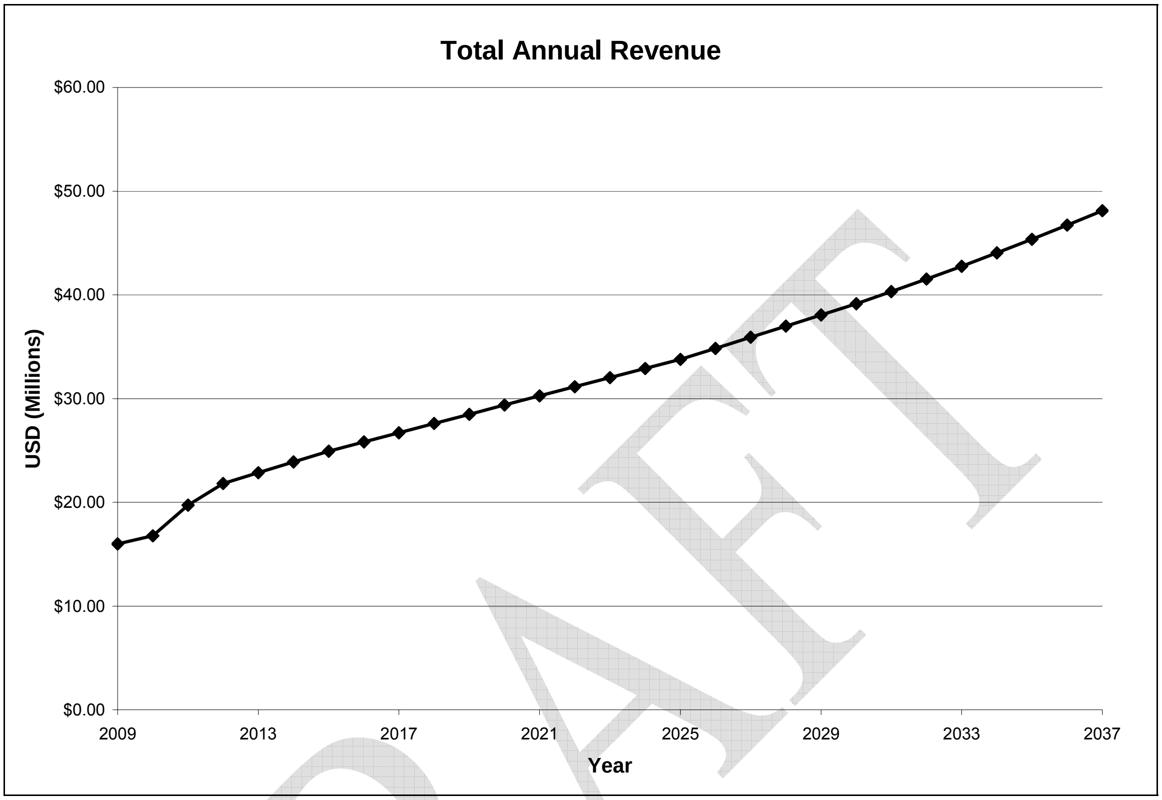


Exhibit 81: Total Annual Revenue Including Ramp-Up
(Most Likely Scenario, Millions of USD of 2007)



5.4 Normal, Induced and Tourist Traffic

As described earlier the future traffic consists of Normal, Induced and Tourist traffic. Exhibit 82 shows the shares of these different types of traffic for the Most Likely scenario in 2015. The induced traffic is assumed only for autos, while the tourist traffic is for both autos and buses.

Exhibit 82: Normal, Induced and Tourist Traffic Shares (Most Likely Scenario, 2015)

Traffic	Autos	Buses	Light Trucks	Heavy Trucks
Normal	78.3%	85.5%	100.0%	100.0%
Induced	0.6%	0.0%	0.0%	0.0%
Tourist	21.0%	14.5%	0.0%	0.0%
TOTAL	100.0%	100.0%	100.0%	100.0%

5.5 Sensitivity Analysis

Traffic forecasting is a complicated process that simultaneously considers the socio-economic growth, the current and the future land use conditions and the future characteristics of the highway network to determine the traffic levels on a given highway in the future. The traffic forecasts for the proposed toll highways are, therefore, based on several assumptions. Among these include assumptions regarding:

- Socio-economic growth of Dominican Republic;
- Growth of traffic in the future years;
- Value of time of users;
- Vehicle operating costs perceived by the users;
- Toll rates on the project highway;
- Toll structure, etc.

The uncertainty surrounding the large number of factors/parameters that are used during the forecasting process inevitably results in forecasts that have an inherent level of unreliability associated with them.

There are no options for completely eliminating this uncertainty associated with the traffic and revenue forecasts. One can, however, run a number of sensitivity tests to evaluate the effect of certain key variables on the traffic / revenue forecasts. As part of this analysis, the modeling system is run with different levels of the selected variable. The results of the model then indicate the sensitivity of forecasts to the particular variable.

We tested the model for toll sensitivity and found that the traffic levels remain similar at toll levels of -50% to +50% of the base toll levels. This is because all the traffic that enters the Samaná province has to go through the toll booth. There are no alternate routes available making the traffic insensitive to toll. We did, however, find that the induced traffic reduces steadily as the toll levels are increased to a very high value. Appendix B presents the results of changes in traffic and revenue levels when the toll rates are changed.

5.6 Select Link Analysis

Select link analysis is the analysis of the origin-destinations of the traffic using a "selected link". This method can be used for any link in the network. The links that are of interest to us are the toll road links. We want to determine which origins/destinations are associated with the traffic using the toll road. This is used to test if the model is working well and to find out where the toll road customers come from. The results for the select link analysis for the links containing the toll booths are illustrated in the following Exhibits.

We find that the primary movement of traffic is between the Samaná province and Nagua, Santo Domingo and the interior Dominican Republic. The autos and buses also have tourist traffic from Punta Cana/Bavaro region (South East Dominican Republic). It would be important for the concessionaire to market the development of this highway system in the Punta Cana region and also work with the hotels to attract the tourists to Samaná.

Exhibit 83: Select Link Analysis of vehicles passing through toll booths: Autos

	Samaná	Las Terrenas	Arroyo Barril	Sanchez	El Catey	Nagua	Santo Domingo	South East DR	Interior DR	North West DR	South West DR
Samaná					1%	4%	4%	16%	1%		
Las Terrenas				0%	2%	4%	4%	0%	1%		
Arroyo Barril					0%	1%					
Sanchez		0%			3%	5%	1%		1%		
El Catey	2%	2%	0%	2%							
Nagua	4%	4%	0%	4%							
Santo Domingo	6%	6%	0%	1%							
South East DR	17%	0%									
Interior DR	3%	1%	0%	1%							
North West DR											
South West DR											

Exhibit 84: Select Link Analysis of vehicles passing through toll booths: Buses

	Samaná	Las Terrenas	Arroyo Barril	Sanchez	El Catey	Nagua	Santo Domingo	South East DR	Interior DR	North West DR	South West DR
Samaná					8%	8%	6%	10%	0%		
Las Terrenas				0%	1%	2%	4%	0%	0%		
Arroyo Barril					0%	1%					
Sanchez		0%			0%	14%	0%		0%		
El Catey	6%	4%	3%	0%							
Nagua	2%	2%	0%	12%							
Santo Domingo	2%	3%	0%	1%							
South East DR	10%	0%									
Interior DR	1%	0%	0%	0%							
North West DR											
South West DR											

Exhibit 85: Select Link Analysis of vehicles passing through toll booths: Trucks

	Samaná	Las Terrenas	Arroyo Barril	Sanchez	El Catey	Nagua	Santo Domingo	South East DR	Interior DR	North West DR	South West DR
Samaná					0%	12%	6%	2%	3%		
Las Terrenas				1%	0%	9%	0%	0%	0%		
Arroyo Barril					0%	1%					
Sanchez		3%			7%	5%	0%		1%		
El Catey	0%	0%	0%	0%							
Nagua	12%	6%	0%	6%							
Santo Domingo	6%	5%	2%	3%							
South East DR	0%	0%									
Interior DR	7%	2%	0%	1%							
North West DR											
South West DR											

5.7 Optimistic and Conservative Scenario Results

Traffic and revenue forecasts for the Optimistic and Conservative scenarios as described in Exhibit 74 are given in this section. Exhibit 86 shows the average daily traffic for the three scenarios and Exhibit 87 shows the corresponding annual revenue (in USD of 2007). Ramp up is included in these forecasts.

Exhibit 86: AADT Forecasts Including Ramp-Up (Most Likely Scenario)

Scenario	2010	2015	2020	2025	2030
Most Likely	4,980	7,540	8,950	10,320	11,990
Optimistic	6,080	9,150	10,980	12,980	15,710
Conservative	3,450	6,100	7,090	8,020	9,070

Exhibit 87: Revenue Forecasts Including Ramp-Up (Most Likely Scenario, in 2007 USD)

Scenario	2010	2015	2020	2025	2030
Most Likely	$16,767,000	$24,933,000	$29,375,000	$33,774,000	$39,141,000
Optimistic	$19,961,000	$29,400,000	$35,107,000	$41,506,000	$50,104,000
Conservative	$12,002,000	$20,820,000	$23,987,000	$27,018,000	$30,410,000

The difference between the Optimistic scenario forecasts and Most Likely scenario forecasts increases from 2010 to 2030. In 2015, the Optimistic scenario had 21% higher toll traffic than the most likely, but in 2030 this value had increased to 31%. Similar behavior is observed for the Conservative scenario.

Similar to the Most Likely scenario, the traffic and revenue for the Optimistic and Conservative scenarios from 2030-2037 was assumed to grow at the annual growth rate between 2025 and 2030 of their respective scenarios. 2009 traffic was obtained by extrapolating backwards using the growth rate of their respective scenarios between 2010 and 2015.

Exhibit 88The following Exhibits illustrate the traffic and revenue projections for the three scenarios.

Exhibit 88: Traffic at Toll Booths Including Ramp-Up

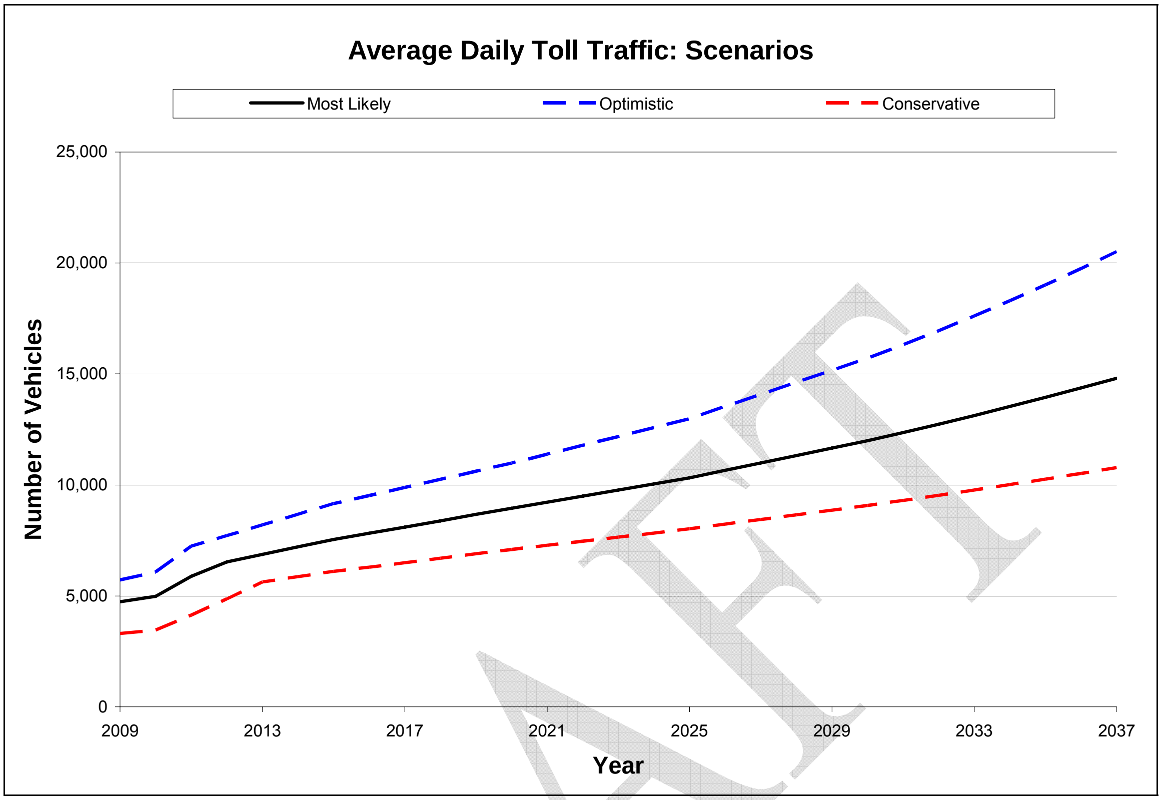
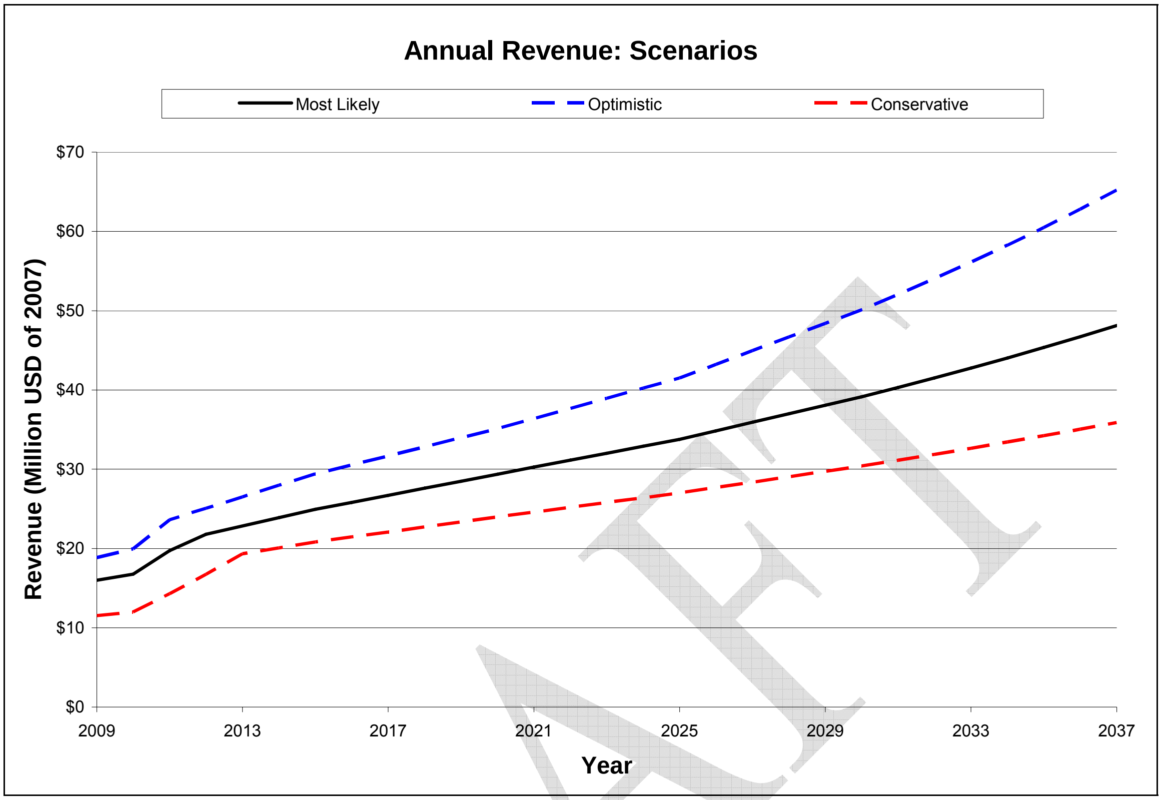


Exhibit 89: Annual Revenue Including Ramp-Up (Millions of USD of 2007)



Appendix A: Traffic and Revenue Tables

This appendix contains annual traffic and revenue tables from 2009 – 2037.

Most Likely Scenario

Exhibit 90: Average Daily Traffic at Toll Booths: Most Likely Scenario (Including Ramp Up)

Year	From Sanchez	From Nagua/ St. DO	From El Catey	From Las Terrenas	TOTAL
2009	1,840	2,240	130	520	**4,730**
2010	1,940	2,360	130	550	**4,980**
2011	2,280	2,770	180	650	**5,880**
2012	2,520	3,050	230	730	**6,530**
2013	2,640	3,180	270	780	**6,870**
2014	2,760	3,320	310	820	**7,210**
2015	2,880	3,450	340	860	**7,540**
2016	2,970	3,580	370	910	**7,820**
2017	3,050	3,700	390	960	**8,100**
2018	3,140	3,820	420	1,010	**8,380**
2019	3,220	3,950	440	1,060	**8,670**
2020	3,300	4,070	460	1,110	**8,950**
2021	3,380	4,200	480	1,150	**9,220**
2022	3,450	4,340	500	1,200	**9,490**
2023	3,530	4,470	520	1,240	**9,770**
2024	3,600	4,610	540	1,290	**10,040**
2025	3,680	4,740	560	1,330	**10,320**
2026	3,760	4,920	580	1,390	**10,650**
2027	3,850	5,100	600	1,440	**10,990**
2028	3,930	5,270	620	1,500	**11,320**
2029	4,010	5,450	630	1,560	**11,660**
2030	4,100	5,630	650	1,610	**11,990**
2031	4,220	5,800	670	1,660	**12,360**
2032	4,350	5,980	690	1,710	**12,740**
2033	4,480	6,160	710	1,760	**13,120**
2034	4,620	6,350	740	1,820	**13,530**
2035	4,760	6,540	760	1,870	**13,940**
2036	4,910	6,740	780	1,930	**14,370**
2037	5,060	6,950	810	1,990	**14,800**

Exhibit 91: Average Daily Toll Traffic by Vehicle Type: Most Likely Scenario (Including Ramp Up)

Year	Autos	Buses	Light Trucks	Heavy Trucks	TOTAL
2009	3,280	750	620	80	**4,730**
2010	3,450	790	660	80	**4,980**
2011	4,100	940	750	90	**5,880**
2012	4,570	1,050	810	100	**6,530**
2013	4,830	1,110	830	100	**6,870**
2014	5,090	1,170	850	110	**7,210**
2015	5,340	1,230	870	110	**7,540**
2016	5,550	1,270	890	110	**7,820**
2017	5,760	1,320	920	110	**8,100**
2018	5,960	1,360	940	120	**8,380**
2019	6,170	1,410	960	120	**8,670**
2020	6,380	1,460	990	120	**8,950**
2021	6,580	1,500	1,010	130	**9,220**
2022	6,780	1,540	1,040	130	**9,490**
2023	6,980	1,590	1,060	130	**9,770**
2024	7,180	1,630	1,090	140	**10,040**
2025	7,380	1,670	1,120	140	**10,320**
2026	7,630	1,730	1,150	150	**10,650**
2027	7,880	1,780	1,180	150	**10,990**
2028	8,130	1,830	1,210	150	**11,320**
2029	8,370	1,880	1,250	160	**11,660**
2030	8,620	1,930	1,280	160	**11,990**
2031	8,890	1,990	1,320	170	**12,360**
2032	9,160	2,050	1,360	170	**12,740**
2033	9,440	2,110	1,400	180	**13,120**
2034	9,720	2,180	1,440	180	**13,530**
2035	10,020	2,240	1,490	190	**13,940**
2036	10,330	2,310	1,530	190	**14,370**
2037	10,640	2,380	1,580	200	**14,800**

Exhibit 92: Annual Revenue (USD of 2007): Most Likely Scenario (Including Ramp Up)

Year	From Sanchez	From Nagua/ St. DO	From El Catey	From Las Terrenas	TOTAL
2009	$6,378,000	$7,560,000	$392,000	$1,669,000	**$15,999,000**
2010	$6,683,000	$7,923,000	$411,000	$1,750,000	**$16,767,000**
2011	$7,829,000	$9,241,000	$578,000	$2,081,000	**$19,729,000**
2012	$8,619,000	$10,134,000	$732,000	$2,323,000	**$21,809,000**
2013	$8,998,000	$10,541,000	$857,000	$2,455,000	**$22,850,000**
2014	$9,376,000	$10,947,000	$981,000	$2,587,000	**$23,892,000**
2015	$9,754,000	$11,354,000	$1,106,000	$2,720,000	**$24,933,000**
2016	$10,032,000	$11,741,000	$1,184,000	$2,864,000	**$25,822,000**
2017	$10,309,000	$12,128,000	$1,263,000	$3,009,000	**$26,710,000**
2018	$10,587,000	$12,516,000	$1,342,000	$3,154,000	**$27,598,000**
2019	$10,864,000	$12,903,000	$1,420,000	$3,299,000	**$28,487,000**
2020	$11,142,000	$13,290,000	$1,499,000	$3,444,000	**$29,375,000**
2021	$11,390,000	$13,722,000	$1,562,000	$3,580,000	**$30,255,000**
2022	$11,639,000	$14,154,000	$1,626,000	$3,716,000	**$31,134,000**
2023	$11,888,000	$14,586,000	$1,689,000	$3,851,000	**$32,014,000**
2024	$12,136,000	$15,018,000	$1,752,000	$3,987,000	**$32,894,000**
2025	$12,385,000	$15,450,000	$1,816,000	$4,123,000	**$33,774,000**
2026	$12,665,000	$16,018,000	$1,874,000	$4,291,000	**$34,847,000**
2027	$12,944,000	$16,586,000	$1,932,000	$4,458,000	**$35,920,000**
2028	$13,224,000	$17,154,000	$1,990,000	$4,626,000	**$36,994,000**
2029	$13,504,000	$17,722,000	$2,048,000	$4,794,000	**$38,067,000**
2030	$13,783,000	$18,290,000	$2,106,000	$4,961,000	**$39,141,000**
2031	$14,196,000	$18,837,000	$2,169,000	$5,110,000	**$40,312,000**
2032	$14,621,000	$19,401,000	$2,234,000	$5,263,000	**$41,519,000**
2033	$15,059,000	$19,982,000	$2,301,000	$5,420,000	**$42,762,000**
2034	$15,509,000	$20,580,000	$2,370,000	$5,583,000	**$44,042,000**
2035	$15,974,000	$21,196,000	$2,441,000	$5,750,000	**$45,361,000**
2036	$16,452,000	$21,831,000	$2,514,000	$5,922,000	**$46,718,000**
2037	$16,944,000	$22,484,000	$2,589,000	$6,099,000	**$48,117,000**

Optimistic Scenario

Exhibit 93: Average Daily Traffic at Toll Booths: Optimistic Scenario (Including Ramp Up)

Year	From Sanchez	From Nagua/ St. DO	From El Catey	From Las Terrenas	TOTAL
2009	2,300	2,740	130	540	**5,720**
2010	2,450	2,910	140	580	**6,080**
2011	2,900	3,450	200	690	**7,230**
2012	3,090	3,660	240	730	**7,710**
2013	3,270	3,870	280	780	**8,190**
2014	3,460	4,080	320	820	**8,670**
2015	3,640	4,290	360	870	**9,150**
2016	3,750	4,460	380	920	**9,520**
2017	3,870	4,640	410	970	**9,880**
2018	3,980	4,810	440	1,020	**10,250**
2019	4,090	4,990	470	1,070	**10,620**
2020	4,200	5,160	500	1,120	**10,980**
2021	4,320	5,370	530	1,170	**11,380**
2022	4,430	5,580	550	1,220	**11,780**
2023	4,550	5,790	580	1,270	**12,180**
2024	4,670	5,990	610	1,310	**12,580**
2025	4,780	6,200	630	1,360	**12,980**
2026	4,940	6,500	660	1,430	**13,530**
2027	5,100	6,800	690	1,490	**14,070**
2028	5,250	7,100	720	1,550	**14,620**
2029	5,410	7,390	750	1,610	**15,160**
2030	5,570	7,690	780	1,670	**15,710**
2031	5,790	7,990	810	1,730	**16,320**
2032	6,010	8,300	840	1,800	**16,950**
2033	6,240	8,620	870	1,870	**17,610**
2034	6,490	8,960	900	1,940	**18,290**
2035	6,740	9,310	940	2,020	**19,000**
2036	7,000	9,670	980	2,100	**19,740**
2037	7,270	10,040	1,010	2,180	**20,510**

Exhibit 94: Average Daily Toll Traffic by Vehicle Type: Optimistic Scenario (Including Ramp Up)

Year	Autos	Buses	Light Trucks	Heavy Trucks	TOTAL
2009	4,100	880	660	80	**5,720**
2010	4,360	940	700	90	**6,080**
2011	5,210	1,120	800	100	**7,230**
2012	5,590	1,200	820	100	**7,710**
2013	5,960	1,280	840	110	**8,190**
2014	6,340	1,360	870	110	**8,670**
2015	6,710	1,440	890	110	**9,150**
2016	6,990	1,500	920	110	**9,520**
2017	7,270	1,550	950	120	**9,880**
2018	7,540	1,610	970	120	**10,250**
2019	7,820	1,670	1,000	120	**10,620**
2020	8,100	1,730	1,030	130	**10,980**
2021	8,390	1,790	1,070	130	**11,380**
2022	8,690	1,850	1,100	140	**11,780**
2023	8,980	1,920	1,140	140	**12,180**
2024	9,280	1,980	1,180	150	**12,580**
2025	9,570	2,040	1,210	150	**12,980**
2026	9,980	2,120	1,260	160	**13,530**
2027	10,390	2,200	1,310	170	**14,070**
2028	10,800	2,280	1,360	170	**14,620**
2029	11,210	2,360	1,410	180	**15,160**
2030	11,620	2,440	1,460	180	**15,710**
2031	12,070	2,540	1,520	190	**16,320**
2032	12,540	2,640	1,580	200	**16,950**
2033	13,030	2,740	1,640	210	**17,610**
2034	13,530	2,850	1,700	210	**18,290**
2035	14,060	2,960	1,770	220	**19,000**
2036	14,610	3,070	1,840	230	**19,740**
2037	15,170	3,190	1,910	240	**20,510**

Exhibit 95: Annual Revenue (USD of 2007): Optimistic Scenario (Including Ramp Up)

Year	From Sanchez	From Nagua/ St. DO	From El Catey	From Las Terrenas	TOTAL
2009	$7,707,000	$8,998,000	$411,000	$1,751,000	**$18,867,000**
2010	$8,153,000	$9,520,000	$435,000	$1,852,000	**$19,961,000**
2011	$9,610,000	$11,204,000	$615,000	$2,194,000	**$23,623,000**
2012	$10,161,000	$11,831,000	$746,000	$2,329,000	**$25,067,000**
2013	$10,712,000	$12,457,000	$878,000	$2,464,000	**$26,511,000**
2014	$11,263,000	$13,084,000	$1,009,000	$2,600,000	**$27,955,000**
2015	$11,813,000	$13,710,000	$1,141,000	$2,735,000	**$29,400,000**
2016	$12,168,000	$14,251,000	$1,236,000	$2,886,000	**$30,541,000**
2017	$12,524,000	$14,791,000	$1,332,000	$3,036,000	**$31,682,000**
2018	$12,879,000	$15,332,000	$1,427,000	$3,186,000	**$32,824,000**
2019	$13,234,000	$15,872,000	$1,523,000	$3,336,000	**$33,965,000**
2020	$13,589,000	$16,413,000	$1,618,000	$3,487,000	**$35,107,000**
2021	$13,961,000	$17,084,000	$1,704,000	$3,637,000	**$36,386,000**
2022	$14,333,000	$17,755,000	$1,790,000	$3,788,000	**$37,666,000**
2023	$14,705,000	$18,426,000	$1,876,000	$3,939,000	**$38,946,000**
2024	$15,077,000	$19,097,000	$1,962,000	$4,090,000	**$40,226,000**
2025	$15,449,000	$19,768,000	$2,048,000	$4,240,000	**$41,506,000**
2026	$15,941,000	$20,719,000	$2,139,000	$4,426,000	**$43,225,000**
2027	$16,433,000	$21,671,000	$2,229,000	$4,612,000	**$44,945,000**
2028	$16,924,000	$22,623,000	$2,319,000	$4,798,000	**$46,665,000**
2029	$17,416,000	$23,575,000	$2,410,000	$4,984,000	**$48,384,000**
2030	$17,908,000	$24,527,000	$2,500,000	$5,170,000	**$50,104,000**
2031	$18,595,000	$25,468,000	$2,596,000	$5,368,000	**$52,027,000**
2032	$19,309,000	$26,445,000	$2,696,000	$5,574,000	**$54,023,000**
2033	$20,049,000	$27,460,000	$2,799,000	$5,788,000	**$56,096,000**
2034	$20,819,000	$28,513,000	$2,907,000	$6,010,000	**$58,249,000**
2035	$21,618,000	$29,608,000	$3,018,000	$6,240,000	**$60,484,000**
2036	$22,447,000	$30,744,000	$3,134,000	$6,480,000	**$62,805,000**
2037	$23,309,000	$31,923,000	$3,254,000	$6,729,000	**$65,215,000**

Conservative Scenario

Exhibit 96: Average Daily Traffic at Toll Booths: Conservative Scenario (Including Ramp Up)

Year	From Sanchez	From Nagua/ St. DO	From El Catey	From Las Terrenas	TOTAL
2009	1,230	1,560	100	420	**3,310**
2010	1,290	1,620	100	440	**3,450**
2011	1,530	1,920	150	540	**4,130**
2012	1,790	2,230	200	640	**4,860**
2013	2,060	2,560	260	760	**5,630**
2014	2,130	2,640	300	800	**5,870**
2015	2,210	2,710	340	840	**6,100**
2016	2,260	2,790	360	880	**6,300**
2017	2,320	2,870	380	930	**6,500**
2018	2,370	2,950	400	970	**6,700**
2019	2,430	3,030	430	1,010	**6,890**
2020	2,480	3,110	450	1,060	**7,090**
2021	2,520	3,190	460	1,100	**7,280**
2022	2,570	3,280	480	1,140	**7,460**
2023	2,610	3,360	490	1,180	**7,650**
2024	2,660	3,450	510	1,230	**7,830**
2025	2,700	3,530	520	1,270	**8,020**
2026	2,740	3,630	530	1,320	**8,230**
2027	2,790	3,740	540	1,370	**8,440**
2028	2,840	3,840	550	1,420	**8,650**
2029	2,880	3,940	570	1,480	**8,860**
2030	2,930	4,040	580	1,530	**9,070**
2031	3,000	4,140	590	1,570	**9,300**
2032	3,080	4,240	610	1,610	**9,530**
2033	3,150	4,350	620	1,650	**9,770**
2034	3,230	4,460	640	1,690	**10,010**
2035	3,310	4,570	650	1,730	**10,260**
2036	3,390	4,680	670	1,770	**10,520**
2037	3,480	4,800	690	1,820	**10,780**

Exhibit 97: Average Daily Toll Traffic by Vehicle Type: Conservative Scenario (Including Ramp Up)

Year	Autos	Buses	Light Trucks	Heavy Trucks	TOTAL
2009	2,200	540	510	60	**3,310**
2010	2,300	560	530	70	**3,450**
2011	2,760	680	620	80	**4,130**
2012	3,260	800	710	90	**4,860**
2013	3,800	930	800	100	**5,630**
2014	3,970	980	820	100	**5,870**
2015	4,140	1,020	840	100	**6,100**
2016	4,290	1,050	850	110	**6,300**
2017	4,430	1,090	870	110	**6,500**
2018	4,580	1,130	890	110	**6,700**
2019	4,720	1,160	900	110	**6,890**
2020	4,860	1,200	920	110	**7,090**
2021	5,000	1,230	940	120	**7,280**
2022	5,130	1,260	960	120	**7,460**
2023	5,260	1,290	980	120	**7,650**
2024	5,390	1,320	990	120	**7,830**
2025	5,530	1,350	1,010	130	**8,020**
2026	5,680	1,390	1,030	130	**8,230**
2027	5,830	1,420	1,050	130	**8,440**
2028	5,990	1,460	1,070	130	**8,650**
2029	6,140	1,490	1,090	140	**8,860**
2030	6,290	1,520	1,110	140	**9,070**
2031	6,450	1,560	1,140	140	**9,300**
2032	6,610	1,600	1,170	150	**9,530**
2033	6,780	1,640	1,200	150	**9,770**
2034	6,950	1,680	1,230	150	**10,010**
2035	7,120	1,720	1,260	160	**10,260**
2036	7,300	1,770	1,290	160	**10,520**
2037	7,480	1,810	1,320	170	**10,780**

Exhibit 98: Annual Revenue (USD of 2007): Conservative Scenario (Including Ramp Up)

Year	From Sanchez	From Nagua/ St. DO	From El Catey	From Las Terrenas	TOTAL
2009	$4,458,000	$5,415,000	$311,000	$1,361,000	**$11,544,000**
2010	$4,634,000	$5,629,000	$324,000	$1,415,000	**$12,002,000**
2011	$5,493,000	$6,627,000	$468,000	$1,716,000	**$14,304,000**
2012	$6,400,000	$7,673,000	$638,000	$2,043,000	**$16,753,000**
2013	$7,357,000	$8,768,000	$832,000	$2,394,000	**$19,350,000**
2014	$7,602,000	$9,010,000	$955,000	$2,518,000	**$20,085,000**
2015	$7,847,000	$9,252,000	$1,078,000	$2,642,000	**$20,820,000**
2016	$8,037,000	$9,496,000	$1,152,000	$2,768,000	**$21,453,000**
2017	$8,226,000	$9,740,000	$1,227,000	$2,893,000	**$22,087,000**
2018	$8,416,000	$9,985,000	$1,301,000	$3,018,000	**$22,720,000**
2019	$8,606,000	$10,229,000	$1,376,000	$3,144,000	**$23,354,000**
2020	$8,795,000	$10,473,000	$1,450,000	$3,269,000	**$23,987,000**
2021	$8,953,000	$10,749,000	$1,496,000	$3,395,000	**$24,593,000**
2022	$9,110,000	$11,025,000	$1,542,000	$3,522,000	**$25,199,000**
2023	$9,268,000	$11,301,000	$1,589,000	$3,648,000	**$25,805,000**
2024	$9,426,000	$11,577,000	$1,635,000	$3,774,000	**$26,411,000**
2025	$9,584,000	$11,853,000	$1,681,000	$3,900,000	**$27,018,000**
2026	$9,748,000	$12,176,000	$1,718,000	$4,054,000	**$27,696,000**
2027	$9,912,000	$12,500,000	$1,754,000	$4,209,000	**$28,375,000**
2028	$10,076,000	$12,823,000	$1,791,000	$4,363,000	**$29,053,000**
2029	$10,240,000	$13,146,000	$1,828,000	$4,517,000	**$29,731,000**
2030	$10,404,000	$13,470,000	$1,865,000	$4,671,000	**$30,410,000**
2031	$10,654,000	$13,792,000	$1,909,000	$4,783,000	**$31,138,000**
2032	$10,909,000	$14,123,000	$1,955,000	$4,897,000	**$31,883,000**
2033	$11,170,000	$14,461,000	$2,002,000	$5,014,000	**$32,647,000**
2034	$11,437,000	$14,807,000	$2,050,000	$5,134,000	**$33,428,000**
2035	$11,711,000	$15,161,000	$2,099,000	$5,257,000	**$34,228,000**
2036	$11,991,000	$15,524,000	$2,149,000	$5,383,000	**$35,048,000**
2037	$12,278,000	$15,896,000	$2,201,000	$5,512,000	**$35,887,000**

Appendix B: Toll Sensitivity

The toll rate in the scenarios has been assumed to be 5.4 cents per km, which is equivalent to 60% of 9 cents per km. We varied this toll rate from the current level to 100% of 9 cents per km in 10% increments. The traffic and revenue for these toll levels are presented in this section.

Exhibit 99: Annual Revenue: Toll Levels 60% - 100% of 9 cents/km (Million 2007 USD)

Year	Toll Levels in % of 9 cents per km								
	60%	65%	70%	75%	80%	85%	90%	95%	100%
2009	$16.00	$17.30	$18.65	$19.89	$21.20	$22.42	$23.70	$24.94	$26.24
2010	$16.77	$18.12	$19.54	$20.84	$22.22	$23.51	$24.84	$26.14	$27.51
2011	$19.73	$21.32	$22.98	$24.52	$26.14	$27.68	$29.23	$30.77	$32.38
2012	$21.81	$23.56	$25.40	$27.11	$28.90	$30.62	$32.31	$34.02	$35.81
2013	$22.85	$24.68	$26.61	$28.41	$30.28	$32.10	$33.86	$35.66	$37.53
2014	$23.89	$25.80	$27.82	$29.70	$31.66	$33.58	$35.41	$37.29	$39.25
2015	$24.93	$26.92	$29.03	$31.00	$33.04	$35.06	$36.95	$38.92	$40.97
2016	$25.82	$27.88	$30.07	$32.11	$34.22	$36.32	$38.28	$40.33	$42.45
2017	$26.71	$28.84	$31.11	$33.22	$35.41	$37.58	$39.62	$41.74	$43.93
2018	$27.60	$29.80	$32.15	$34.33	$36.59	$38.84	$40.95	$43.14	$45.41
2019	$28.49	$30.77	$33.18	$35.44	$37.78	$40.10	$42.28	$44.55	$46.90
2020	$29.37	$31.73	$34.22	$36.55	$38.96	$41.36	$43.61	$45.95	$48.38
2021	$30.25	$32.68	$35.25	$37.65	$40.13	$42.60	$44.93	$47.35	$49.84
2022	$31.13	$33.64	$36.28	$38.75	$41.31	$43.85	$46.25	$48.74	$51.31
2023	$32.01	$34.59	$37.31	$39.85	$42.48	$45.09	$47.57	$50.13	$52.77
2024	$32.89	$35.54	$38.34	$40.95	$43.65	$46.34	$48.89	$51.53	$54.24
2025	$33.77	$36.49	$39.37	$42.05	$44.83	$47.59	$50.21	$52.92	$55.71
2026	$34.85	$37.66	$40.63	$43.39	$46.26	$49.11	$51.82	$54.62	$57.50
2027	$35.92	$38.82	$41.88	$44.74	$47.69	$50.63	$53.43	$56.32	$59.28
2028	$36.99	$39.98	$43.14	$46.08	$49.12	$52.15	$55.04	$58.02	$61.07
2029	$38.07	$41.15	$44.39	$47.42	$50.55	$53.67	$56.65	$59.72	$62.86
2030	$39.14	$42.31	$45.65	$48.76	$51.98	$55.19	$58.26	$61.42	$64.65
2031	$40.31	$43.58	$47.02	$50.23	$53.54	$56.85	$60.02	$63.27	$66.61
2032	$41.52	$44.89	$48.43	$51.73	$55.15	$58.56	$61.83	$65.19	$68.62
2033	$42.76	$46.23	$49.89	$53.29	$56.81	$60.32	$63.70	$67.16	$70.69
2034	$44.04	$47.62	$51.39	$54.89	$58.52	$62.14	$65.62	$69.19	$72.83
2035	$45.36	$49.05	$52.93	$56.54	$60.28	$64.01	$67.60	$71.28	$75.03
2036	$46.72	$50.52	$54.52	$58.24	$62.09	$65.93	$69.65	$73.43	$77.30
2037	$48.12	$52.04	$56.16	$59.99	$63.96	$67.92	$71.75	$75.65	$79.64

Exhibit 100: Average Daily Toll Traffic: Toll Levels 60% - 100% of 9 cents/km

Year	Toll Levels in % of 9 cents per km								
	60%	65%	70%	75%	80%	85%	90%	95%	100%
2009	4,733	4,720	4,706	4,695	4,693	4,660	4,649	4,631	4,627
2010	4,978	4,963	4,950	4,939	4,936	4,906	4,891	4,873	4,870
2011	5,885	5,865	5,849	5,839	5,835	5,806	5,783	5,763	5,760
2012	6,532	6,507	6,491	6,482	6,477	6,451	6,421	6,400	6,397
2013	6,869	6,841	6,825	6,818	6,811	6,790	6,754	6,733	6,731
2014	7,207	7,175	7,159	7,154	7,146	7,129	7,087	7,066	7,065
2015	7,544	7,509	7,493	7,490	7,481	7,468	7,421	7,399	7,399
2016	7,824	7,789	7,773	7,770	7,761	7,749	7,701	7,680	7,680
2017	8,105	8,069	8,054	8,050	8,041	8,029	7,981	7,960	7,960
2018	8,385	8,350	8,334	8,330	8,321	8,309	8,261	8,240	8,240
2019	8,665	8,630	8,614	8,610	8,602	8,589	8,542	8,520	8,520
2020	8,945	8,910	8,894	8,891	8,882	8,869	8,822	8,800	8,800
2021	9,219	9,184	9,168	9,165	9,156	9,143	9,096	9,074	9,074
2022	9,493	9,458	9,442	9,439	9,430	9,417	9,370	9,348	9,348
2023	9,767	9,732	9,716	9,713	9,704	9,691	9,644	9,622	9,622
2024	10,041	10,006	9,990	9,987	9,978	9,965	9,918	9,896	9,896
2025	10,315	10,280	10,264	10,261	10,252	10,239	10,192	10,170	10,170
2026	10,651	10,615	10,599	10,596	10,587	10,575	10,527	10,506	10,506
2027	10,986	10,950	10,935	10,931	10,922	10,910	10,862	10,841	10,841
2028	11,321	11,286	11,270	11,266	11,257	11,245	11,197	11,176	11,176
2029	11,656	11,621	11,605	11,601	11,593	11,580	11,532	11,511	11,511
2030	11,991	11,956	11,940	11,937	11,928	11,915	11,868	11,846	11,846
2031	12,358	12,323	12,307	12,303	12,294	12,282	12,235	12,213	12,213
2032	12,736	12,701	12,685	12,681	12,672	12,660	12,613	12,592	12,592
2033	13,125	13,090	13,074	13,071	13,062	13,050	13,003	12,982	12,982
2034	13,526	13,491	13,476	13,472	13,464	13,451	13,405	13,384	13,384
2035	13,939	13,905	13,890	13,886	13,878	13,866	13,819	13,798	13,798
2036	14,366	14,332	14,316	14,313	14,304	14,292	14,246	14,226	14,226
2037	14,805	14,771	14,756	14,752	14,744	14,732	14,687	14,666	14,666

Exhibit 101: Annual Revenue Chart: Toll Levels 60% - 100% of 9 cents/km