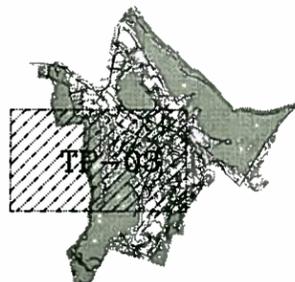




GRAPHIC SCALE



NOTE:  
1. FOR LEGEND & NOTES SEE DWG TP-01.



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TOPOGRAPHIC PLAN

TP-03

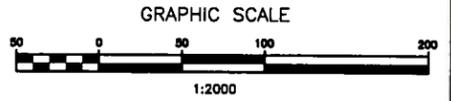
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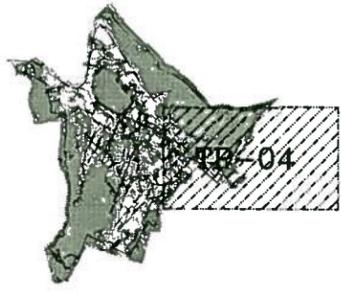
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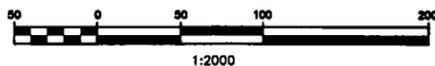
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DATE: 10/08/2012

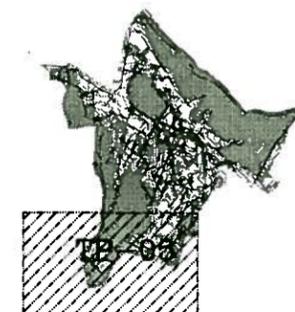
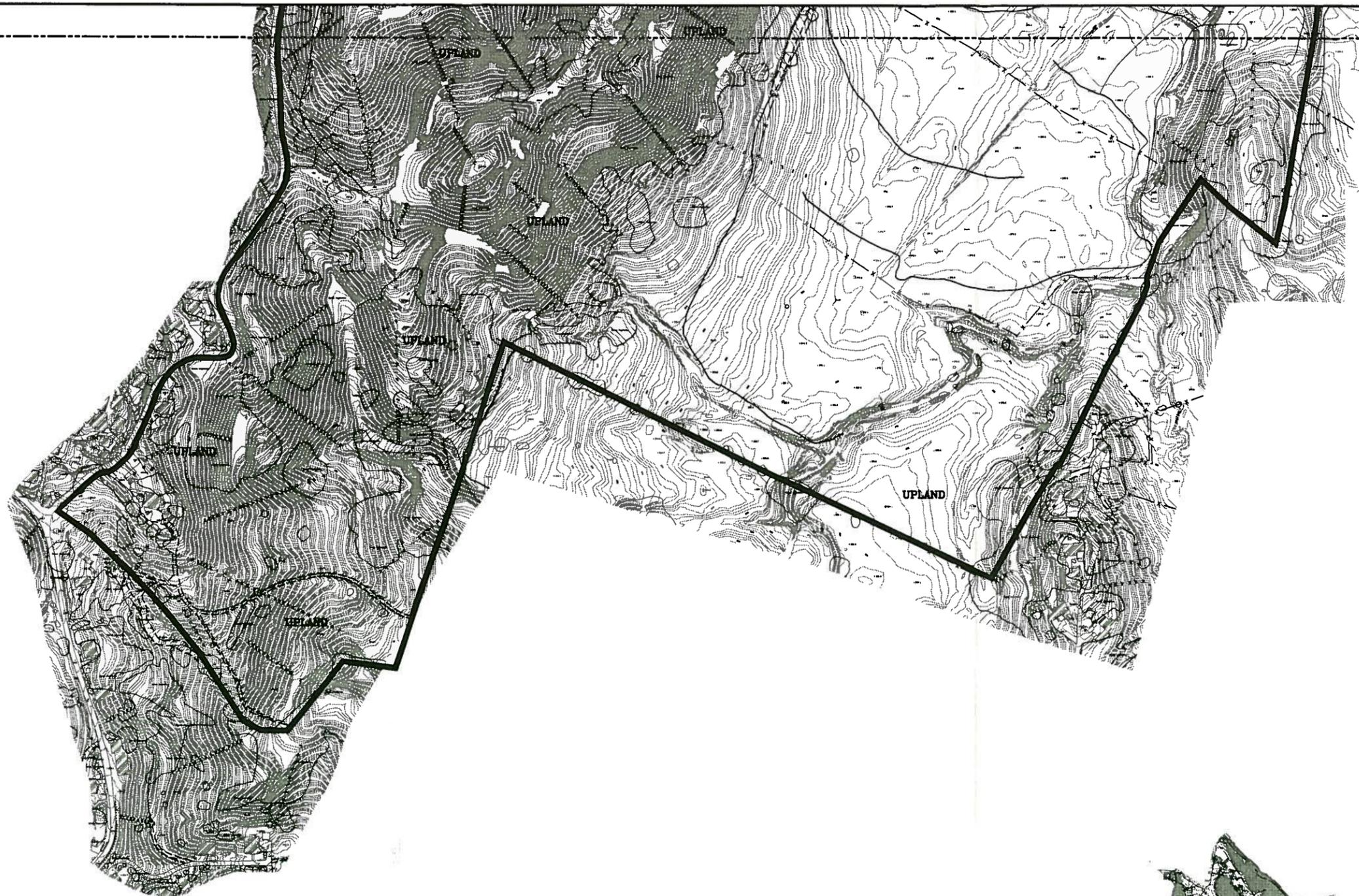


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TP-05

TITLE

REVISION No. 0

**Apéndice H – Cómputos Generación de Despedicios Sólidos No Peligrosos**

**COMPUTOS GENERACION DESPERDICIOS SÓLIDOS NO  
PELIGROSOS**

SITIO

**PREPARADO PARA:**

**NRG SOLAR JUNCOS LLC  
JUNCOS – LAS PIEDRAS, PUERTO RICO**



**PREPARADO POR:**



**SEPTIEMBRE 2012**

**NRG Juncos Solar Project**  
 Juncos-Las Piedras, Puerto Rico

**Cómputos de Generación Promedio de Desperdicios Sólidos No Peligrosos Durante Etapa de Construcción**

**1. Generación Promedio de Desperdicios Domésticos**

Empleos durante la Construcción 225

Generación desperdicios domésticos 2.5 lb/persona por día  
 Generación de desperdicios domésticos => 4.9 libras por persona por día<sup>1</sup>.  
 Usamos 2.5 libras por persona por día basándonos en que los empleados están solo  
 ocho horas en el área de trabajo.

Densidad Desperdicios Domésticos<sup>2</sup>: 100 lb/yd<sup>3</sup>

Duración Construcción: 12 meses  
264 días  
52 semanas

<b>Generación Estimada Desperdicios Sólidos No Peligrosos</b>	<b>1485 yd<sup>3</sup> totales</b>
---	------------------------------------

<b>Generación Estimada por semana</b>	<b>28.58 yd<sup>3</sup>/sem</b>
---	---------------------------------

**2. Generación Promedio de Desperdicios de Construcción**

Generación de Desperdicios<sup>3</sup> 1.2 lb/empleado - día

Empleos durante la Construcción 225

Composición Estimada Desperdicios de Construcción

		Densidad
Madera	15 %	<u>37 lb/ft<sup>3</sup></u>
Metales	10 %	<u>25 lb/ft<sup>3</sup></u>
Materiales de empaque	25 %	<u>43 lb/ft<sup>3</sup></u>
Asfalto	10 %	<u>45 lb/ft<sup>3</sup></u>
Hormigón	40 %	<u>150 lb/ft<sup>3</sup></u>
Total	100 %	

Densidad Promedio: 83.30 lb/ft<sup>3</sup>  
2,249.10 lb/yd<sup>3</sup>

<b>Desperdicios Totales</b>	<b>27.45 yd<sup>3</sup></b>
-----------------------------	-----------------------------

<b>Generación Estimada Desperdicios Sólidos No Peligrosos</b>	<b>0.5282 yd<sup>3</sup>/sem</b>
---	----------------------------------



NRG Juncos Solar Project  
Juncos-Las Piedras, Puerto Rico

Cómputos de Generación Promedio de Desperdicios Sólidos No Peligrosos Durante Etapa de Construcción

3. Generación Promedio Actividades de Demolición

<b>Demolición Total</b>	<b>0.00 yd<sup>3</sup></b>
Duración Actividad	52 semanas

<b>Demolición Promedio</b>	<b>0.00 yd<sup>3</sup>/sem</b>
----------------------------	--------------------------------

4. Terreno a Disponerse Fuera del Proyecto

Movimiento de Terreno	600000 yd <sup>3</sup>
Terreno Usado como Relleno	600000 yd <sup>3</sup>
Duración de la Actividad	52 semanas

<b>Generacion Total</b>	<b>0 yd<sup>3</sup></b>
-------------------------	-------------------------

<b>Terreno a Disponerse</b>	<b>0 yd<sup>3</sup>/sem</b>
-----------------------------	-----------------------------

5. Promedio Generación Desperdicios Sólidos No Peligrosos por Semana

<b>Desperdicios Semanales</b>	<b>29.11 yd<sup>3</sup>/sem</b>
-------------------------------	---------------------------------

<b>Desperdicios Totales</b>	<b>1512.45 yd<sup>3</sup></b>
-----------------------------	-------------------------------

Usamos un factor de seguridad de 25% para cubrir generación de desperdicios no esperadas.

<b>Desperdicios Semanales</b>	<b>36.38 yd<sup>3</sup>/sem</b>
-------------------------------	---------------------------------

<b>Desperdicios Totales</b>	<b>1890.56 yd<sup>3</sup></b>
-----------------------------	-------------------------------

Notas:

<sup>1</sup> Tomado de: "Plan of Regional Infrastructure for Recycling and Disposal of Solid Wastes in Puerto Rico" Autoridad de Desperdicios Sólidos, 1995.

<sup>2</sup> Tomado de: "Handbook of Environmental Engineering", Robert A. Corbitt, página 8.28, McGraw Hill, 1990.

<sup>3</sup> Tomado de: "Handbook of Environmental Engineering", Robert A. Corbitt, página 8.6, McGraw Hill, 1990.



## Apéndice I – Cómputos de Emisión



# COMPUTOS EMISIONES ATMOSFERICAS

SITIO

PREPARADO PARA:

NRG SOLAR JUNCOS LLC  
JUNCOS – LAS PIEDRAS, PUERTO RICO



PREPARADO POR:



SEPTIEMBRE 2012



**NRG Juncos Solar Project  
Juncos-Las Piedras, Puerto Rico**

**30 kW Generator - Construction Phase  
Air Emissions Calculation**

Quantity	1
Capacity	30 kW 40.23 hp
Operation	8 hr/yr
Sulfur %	0.5

Parameter	Emission Factor [lb/hp-hr]	Emission per Generator [lb/hr]	Total Emissions [lb/hr]	Annual Emissions [ton/yr]
NOx	0.0310	1.2472	1.2472	0.0050
CO	0.00668	0.2687	0.2687	0.0011
SOx	0.00205	0.0825	0.0825	0.0003
PM	0.0022	0.0885	0.0885	0.0004
Aldehydes	0.000463	0.0186	0.0186	0.0001
TOC	0.00247	0.0994	0.0994	0.0004
Lead	-	-	-	-

**Combustion gases total emissions 0.007 ton/yr**

Calculations

NOx:	EF * Capacity * Quantity * Operation =	0.031	*	40.231	*	1	*	8 / 2,000 =	0.004989 ton/yr
CO	EF * Capacity * Quantity * Operation =	0.00668	*	40.231	*	1	*	8 / 2,000 =	0.001075 ton/yr
SOx:	EF * Capacity * Quantity * Operation =	0.00205	*	40.231	*	1	*	8 / 2,000 =	0.00033 ton/yr
PM:	EF * Capacity * Quantity * Operation =	0.0022	*	40.231	*	1	*	8 / 2,000 =	0.000354 ton/yr
Aldehydes	EF * Capacity * Quantity * Operation =	0.000463	*	40.231	*	1	*	8 / 2,000 =	7.45E-05 ton/yr
TOC:	EF * Capacity * Quantity * Operation =	0.00247	*	40.231	*	1	*	8 / 2,000 =	0.000397 ton/yr
Lead	EF * Capacity * Quantity * Operation =	0	*	40.231	*	1	*	8 / 2,000 =	0 ton/yr

**Total: 0.007 ton/yr**

**NRG Juncos Solar Project**  
Juncos-Las Piedras, Puerto Rico

**450 kW Emergency Generator - Operation Phase**  
**Air Emissions Calculation**

Quantity	1
Capacity	450 kW 603.46 hp
Operation	500 hr/yr
Sulfur %	0.5

Parameter	Emission Factor [lb/hp-hr]	Emission per Generator [lb/hr]	Total Emissions [lb/hr]	Annual Emissions [ton/yr]
NOx	0.0240	14.4830	14.4830	3.6208
CO	0.0055	3.3190	3.3190	0.8298
SOx	0.0040	2.4410	2.4410	0.6102
PM	0.0007	0.4224	0.4224	0.1056
TOC	0.0007	0.4254	0.4254	0.1064
Lead	-	-	-	-

**Combustion gases total emissions 5.273 ton/yr**

Calculations

NOx:	EF * Capacity * Quantity * Operation =	0.0240 * 603.5 * 1 * 500 / 2,000 =	3.620759 ton/yr
CO	EF * Capacity * Quantity * Operation =	0.0055 * 603.5 * 1 * 500 / 2,000 =	0.829757 ton/yr
SOx:	EF * Capacity * Quantity * Operation =	0.0040 * 603.5 * 1 * 500 / 2,000 =	0.610249 ton/yr
PM:	EF * Capacity * Quantity * Operation =	0.0007 * 603.5 * 1 * 500 / 2,000 =	0.105605 ton/yr
TOC:	EF * Capacity * Quantity * Operation =	0.0007 * 603.5 * 1 * 500 / 2,000 =	0.10636 ton/yr
Lead	EF * Capacity * Quantity * Operation =	- * 603.5 * 1 * 500 / 2,000 =	0 ton/yr

**Total: 5.273 ton/yr**

**NRG Juncos Solar  
Electric Generators for Run-Down Process**

**Tier 4i Emissions**

Quantity	10
Capacity	450 kW
Fuel Consumption	30.5 gph
Operation	5750 hours/yr

Parameter	Emission Factor [g/kW-hr]	Hourly Emissions per Set [g/hr]	Total Hourly Emissions [g/hr]	Annual Emissions per set [ton/yr]	Total Annual Emissions [ton/yr]
NOx	2	900.00	9,000.00	5.6925	56.925
HC	0.19	85.50	855.00	0.5408	5.407875
CO	3.5	1,575.00	15,750.00	9.9619	99.61875
PM	0.02	9.00	90.00	0.0569	0.56925
<b>Total</b>		<b>2,569.50</b>	<b>25,695.00</b>	<b>16.2521</b>	<b>162.52088</b>

**Notes:**

- 1) Emissions factors from "Tier 4i EPA Emissions Requirements for Diesel Generator Sets, Caterpillar.
- 2) Air Emissions = Emission Factor (g/kW-hr) \* Capacity (kW) \* Hours of Operation (hr/yr) \*0.000011 (ton/g)



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**APPENDIX A**  
**AIR EMISSIONS FACTORS**

---



### 3.3 Gasoline And Diesel Industrial Engines

#### 3.3.1 General

The engine category addressed by this section covers a wide variety of industrial applications of both gasoline and diesel internal combustion (IC) engines such as aerial lifts, fork lifts, mobile refrigeration units, generators, pumps, industrial sweepers/scrubbers, material handling equipment (such as conveyors), and portable well-drilling equipment. The three primary fuels for reciprocating IC engines are gasoline, diesel fuel oil (No.2), and natural gas. Gasoline is used primarily for mobile and portable engines. Diesel fuel oil is the most versatile fuel and is used in IC engines of all sizes. The rated power of these engines covers a rather substantial range, up to 250 horsepower (hp) for gasoline engines and up to 600 hp for diesel engines. (Diesel engines greater than 600 hp are covered in Section 3.4, "Large Stationary Diesel And All Stationary Dual-fuel Engines".) Understandably, substantial differences in engine duty cycles exist. It was necessary, therefore, to make reasonable assumptions concerning usage in order to formulate some of the emission factors.

#### 3.3.2 Process Description

All reciprocating IC engines operate by the same basic process. A combustible mixture is first compressed in a small volume between the head of a piston and its surrounding cylinder. The mixture is then ignited, and the resulting high-pressure products of combustion push the piston through the cylinder. This movement is converted from linear to rotary motion by a crankshaft. The piston returns, pushing out exhaust gases, and the cycle is repeated.

There are 2 methods used for stationary reciprocating IC engines: compression ignition (CI) and spark ignition (SI). This section deals with both types of reciprocating IC engines. All diesel-fueled engines are compression ignited, and all gasoline-fueled engines are spark ignited.

In CI engines, combustion air is first compression heated in the cylinder, and diesel fuel oil is then injected into the hot air. Ignition is spontaneous because the air temperature is above the autoignition temperature of the fuel. SI engines initiate combustion by the spark of an electrical discharge. Usually the fuel is mixed with the air in a carburetor (for gasoline) or at the intake valve (for natural gas), but occasionally the fuel is injected into the compressed air in the cylinder.

CI engines usually operate at a higher compression ratio (ratio of cylinder volume when the piston is at the bottom of its stroke to the volume when it is at the top) than SI engines because fuel is not present during compression; hence there is no danger of premature autoignition. Since engine thermal efficiency rises with increasing pressure ratio (and pressure ratio varies directly with compression ratio), CI engines are more efficient than SI engines. This increased efficiency is gained at the expense of poorer response to load changes and a heavier structure to withstand the higher pressures.<sup>1</sup>

#### 3.3.3 Emissions

Most of the pollutants from IC engines are emitted through the exhaust. However, some total organic compounds (TOC) escape from the crankcase as a result of blowby (gases that are vented from the oil pan after they have escaped from the cylinder past the piston rings) and from the fuel tank and carburetor because of evaporation. Nearly all of the TOCs from diesel CI engines enter the

atmosphere from the exhaust. Evaporative losses are insignificant in diesel engines due to the low volatility of diesel fuels.

The primary pollutants from internal combustion engines are oxides of nitrogen ( $\text{NO}_x$ ), total organic compounds (TOC), carbon monoxide (CO), and particulates, which include both visible (smoke) and nonvisible emissions. Nitrogen oxide formation is directly related to high pressures and temperatures during the combustion process and to the nitrogen content, if any, of the fuel. The other pollutants, HC, CO, and smoke, are primarily the result of incomplete combustion. Ash and metallic additives in the fuel also contribute to the particulate content of the exhaust. Sulfur oxides ( $\text{SO}_x$ ) also appear in the exhaust from IC engines. The sulfur compounds, mainly sulfur dioxide ( $\text{SO}_2$ ), are directly related to the sulfur content of the fuel.<sup>2</sup>

#### 3.3.3.1 Nitrogen Oxides -

Nitrogen oxide formation occurs by two fundamentally different mechanisms. The predominant mechanism with internal combustion engines is thermal  $\text{NO}_x$  which arises from the thermal dissociation and subsequent reaction of nitrogen ( $\text{N}_2$ ) and oxygen ( $\text{O}_2$ ) molecules in the combustion air. Most thermal  $\text{NO}_x$  is formed in the high-temperature region of the flame from dissociated molecular nitrogen in the combustion air. Some  $\text{NO}_x$ , called prompt  $\text{NO}_x$ , is formed in the early part of the flame from reaction of nitrogen intermediary species, and HC radicals in the flame. The second mechanism, fuel  $\text{NO}_x$ , stems from the evolution and reaction of fuel-bound nitrogen compounds with oxygen. Gasoline, and most distillate oils have no chemically-bound fuel  $\text{N}_2$  and essentially all  $\text{NO}_x$  formed is thermal  $\text{NO}_x$ .

#### 3.3.3.2 Total Organic Compounds -

The pollutants commonly classified as hydrocarbons are composed of a wide variety of organic compounds and are discharged into the atmosphere when some of the fuel remains unburned or is only partially burned during the combustion process. Most unburned hydrocarbon emissions result from fuel droplets that were transported or injected into the quench layer during combustion. This is the region immediately adjacent to the combustion chamber surfaces, where heat transfer outward through the cylinder walls causes the mixture temperatures to be too low to support combustion.

Partially burned hydrocarbons can occur because of poor air and fuel homogeneity due to incomplete mixing, before or during combustion; incorrect air/fuel ratios in the cylinder during combustion due to maladjustment of the engine fuel system; excessively large fuel droplets (diesel engines); and low cylinder temperature due to excessive cooling (quenching) through the walls or early cooling of the gases by expansion of the combustion volume caused by piston motion before combustion is completed.<sup>2</sup>

#### 3.3.3.3 Carbon Monoxide -

Carbon monoxide is a colorless, odorless, relatively inert gas formed as an intermediate combustion product that appears in the exhaust when the reaction of CO to  $\text{CO}_2$  cannot proceed to completion. This situation occurs if there is a lack of available oxygen near the hydrocarbon (fuel) molecule during combustion, if the gas temperature is too low, or if the residence time in the cylinder is too short. The oxidation rate of CO is limited by reaction kinetics and, as a consequence, can be accelerated only to a certain extent by improvements in air and fuel mixing during the combustion process.<sup>2-3</sup>

#### 3.3.3.4 Smoke and Particulate Matter -

White, blue, and black smoke may be emitted from IC engines. Liquid particulates appear as white smoke in the exhaust during an engine cold start, idling, or low load operation. These are formed in the quench layer adjacent to the cylinder walls, where the temperature is not high enough to ignite the fuel. Blue smoke is emitted when lubricating oil leaks, often past worn piston rings, into the combustion chamber and is partially burned. Proper maintenance is the most effective method of preventing blue smoke emissions from all types of IC engines. The primary constituent of black smoke is agglomerated carbon particles (soot) formed in regions of the combustion mixtures that are oxygen deficient.<sup>2</sup>

#### 3.3.3.5 Sulfur Oxides -

Sulfur oxides emissions are a function of only the sulfur content in the fuel rather than any combustion variables. In fact, during the combustion process, essentially all the sulfur in the fuel is oxidized to  $\text{SO}_2$ . The oxidation of  $\text{SO}_2$  gives sulfur trioxide ( $\text{SO}_3$ ), which reacts with water to give sulfuric acid ( $\text{H}_2\text{SO}_4$ ), a contributor to acid precipitation. Sulfuric acid reacts with basic substances to give sulfates, which are fine particulates that contribute to PM-10 and visibility reduction. Sulfur oxide emissions also contribute to corrosion of the engine parts.<sup>2-3</sup>

### 3.3.4 Control Technologies

Control measures to date are primarily directed at limiting  $\text{NO}_x$  and CO emissions since they are the primary pollutants from these engines. From a  $\text{NO}_x$  control viewpoint, the most important distinction between different engine models and types of reciprocating engines is whether they are rich-burn or lean-burn. Rich-burn engines have an air-to-fuel ratio operating range that is near stoichiometric or fuel-rich of stoichiometric and as a result the exhaust gas has little or no excess oxygen. A lean-burn engine has an air-to-fuel operating range that is fuel-lean of stoichiometric; therefore, the exhaust from these engines is characterized by medium to high levels of  $\text{O}_2$ . The most common  $\text{NO}_x$  control technique for diesel and dual-fuel engines focuses on modifying the combustion process. However, selective catalytic reduction (SCR) and nonselective catalytic reduction (NSCR) which are post-combustion techniques are becoming available. Controls for CO have been partly adapted from mobile sources.<sup>4</sup>

Combustion modifications include injection timing retard (ITR), preignition chamber combustion (PCC), air-to-fuel ratio adjustments, and derating. Injection of fuel into the cylinder of a CI engine initiates the combustion process. Retarding the timing of the diesel fuel injection causes the combustion process to occur later in the power stroke when the piston is in the downward motion and combustion chamber volume is increasing. By increasing the volume, the combustion temperature and pressure are lowered, thereby lowering  $\text{NO}_x$  formation. ITR reduces  $\text{NO}_x$  from all diesel engines; however, the effectiveness is specific to each engine model. The amount of  $\text{NO}_x$  reduction with ITR diminishes with increasing levels of retard.<sup>4</sup>

Improved swirl patterns promote thorough air and fuel mixing and may include a precombustion chamber (PCC). A PCC is an antechamber that ignites a fuel-rich mixture that propagates to the main combustion chamber. The high exit velocity from the PCC results in improved mixing and complete combustion of the lean air/fuel mixture which lowers combustion temperature, thereby reducing  $\text{NO}_x$  emissions.<sup>4</sup>

The air-to-fuel ratio for each cylinder can be adjusted by controlling the amount of fuel that enters each cylinder. At air-to-fuel ratios less than stoichiometric (fuel-rich), combustion occurs under conditions of insufficient oxygen which causes NO<sub>x</sub> to decrease because of lower oxygen and lower temperatures. Derating involves restricting the engine operation to lower than normal levels of power production for the given application. Derating reduces cylinder pressures and temperatures, thereby lowering NO<sub>x</sub> formation rates.<sup>4</sup>

SCR is an add-on NO<sub>x</sub> control placed in the exhaust stream following the engine and involves injecting ammonia (NH<sub>3</sub>) into the flue gas. The NH<sub>3</sub> reacts with NO<sub>x</sub> in the presence of a catalyst to form water and nitrogen. The effectiveness of SCR depends on fuel quality and engine duty cycle (load fluctuations). Contaminants in the fuel may poison or mask the catalyst surface causing a reduction or termination in catalyst activity. Load fluctuations can cause variations in exhaust temperature and NO<sub>x</sub> concentration which can create problems with the effectiveness of the SCR system.<sup>4</sup>

NSCR is often referred to as a three-way conversion catalyst system because the catalyst reactor simultaneously reduces NO<sub>x</sub>, CO, and HC and involves placing a catalyst in the exhaust stream of the engine. The reaction requires that the O<sub>2</sub> levels be kept low and that the engine be operated at fuel-rich air-to-fuel ratios.<sup>4</sup>

The most accurate method for calculating such emissions is on the basis of "brake-specific" emission factors (pounds per horsepower-hour [lb/hp-hr]). Emissions are the product of the brake-specific emission factor, the usage in hours, the rated power available, and the load factor (the power actually used divided by the power available). However, for emission inventory purposes, it is often easier to assess this activity on the basis of fuel used.

Once reasonable usage and duty cycles for this category were ascertained, emission values were aggregated to arrive at the factors for criteria and organic pollutants presented. Factors in Table 3.3-1 are in pounds per million British thermal unit (lb/MMBtu). Emission data for a specific design type were weighted according to estimated material share for industrial engines. The emission factors in these tables, because of their aggregate nature, are most appropriately applied to a population of industrial engines rather than to an individual power plant. Table 3.3-2 shows unweighted speciated organic compound and air toxic emission factors based upon only 2 engines. Their inclusion in this section is intended for rough order-of-magnitude estimates only.

Table 3.3-3 summarizes whether the various diesel emission reduction technologies (some of which may be applicable to gasoline engines) will generally increase or decrease the selected parameter. These technologies are categorized into fuel modifications, engine modifications, and exhaust after-treatments. Current data are insufficient to quantify the results of the modifications. Table 3.3-3 provides general information on the trends of changes on selected parameters.

### 3.3.5 Updates Since the Fifth Edition

The Fifth Edition was released in January 1995. Revisions to this section since that date are summarized below. For further detail, consult the memoranda describing each supplement or the background report for this section.

#### Supplement A, February 1996

No changes.

#### Supplement B, October 1996

- Text was revised concerning emissions and controls.
- The CO<sub>2</sub> emission factor was adjusted to reflect 98.5 percent conversion efficiency.

Table 3.3-1. EMISSION FACTORS FOR UNCONTROLLED GASOLINE AND DIESEL INDUSTRIAL ENGINES<sup>a</sup>

Pollutant	Gasoline Fuel (SCC 2-02-003-01, 2-03-003-01)		Diesel Fuel (SCC 2-02-001-02, 2-03-001-01)		EMISSION FACTOR RATING
	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	
NO <sub>x</sub>	0.011	1.63	0.031	4.41	D
CO	6.96 E-03 <sup>d</sup>	0.99 <sup>d</sup>	6.68 E-03	0.95	D
SO <sub>x</sub>	5.91 E-04	0.084	2.05 E-03	0.29	D
PM-10 <sup>b</sup>	7.21 E-04	0.10	2.20 E-03	0.31	D
CO <sub>2</sub> <sup>c</sup>	1.08	154	1.15	164	B
Aldehydes	4.85 E-04	0.07	4.63 E-04	0.07	D
TOC					
Exhaust	0.015	2.10	2.47 E-03	0.35	D
Evaporative	6.61 E-04	0.09	0.00	0.00	E
Crankcase	4.85 E-03	0.69	4.41 E-05	0.01	E
Refueling	1.08 E-03	0.15	0.00	0.00	E

<sup>a</sup> References 2,5-6,9-14. When necessary, an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr. To convert from lb/hp-hr to kg/kw-hr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code. TOC = total organic compounds.

<sup>b</sup> PM-10 = particulate matter less than or equal to 10 µm aerodynamic diameter. All particulate is assumed to be ≤ 1 µm in size.

<sup>c</sup> Assumes 99% conversion of carbon in fuel to CO<sub>2</sub> with 87 weight % carbon in diesel, 86 weight % carbon in gasoline, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and gasoline heating value of 20,300 Btu/lb.

<sup>d</sup> Instead of 0.439 lb/hp-hr (power output) and 62.7 lb/mmBtu (fuel input), the correct emissions factors values are 6.96 E-03 lb/hp-hr (power output) and 0.99 lb/mmBtu (fuel input), respectively. This is an editorial correction. March 24, 2009

Table 3.3-2. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR UNCONTROLLED DIESEL ENGINES<sup>a</sup>

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (Fuel Input) (lb/MMBtu)
Benzene <sup>b</sup>	9.33 E-04
Toluene <sup>b</sup>	4.09 E-04
Xylenes <sup>b</sup>	2.85 E-04
Propylene	2.58 E-03
1,3-Butadiene <sup>b,c</sup>	<3.91 E-05
Formaldehyde <sup>b</sup>	1.18 E-03
Acetaldehyde <sup>b</sup>	7.67 E-04
Acrolein <sup>b</sup>	<9.25 E-05
Polycyclic aromatic hydrocarbons (PAH)	
Naphthalene <sup>b</sup>	8.48 E-05
Acenaphthylene	<5.06 E-06
Acenaphthene	<1.42 E-06
Fluorene	2.92 E-05
Phenanthrene	2.94 E-05
Anthracene	1.87 E-06
Fluoranthene	7.61 E-06
Pyrene	4.78 E-06
Benzo(a)anthracene	1.68 E-06
Chrysene	3.53 E-07
Benzo(b)fluoranthene	<9.91 E-08
Benzo(k)fluoranthene	<1.55 E-07
Benzo(a)pyrene	<1.88 E-07
Indeno(1,2,3-cd)pyrene	<3.75 E-07
Dibenz(a,h)anthracene	<5.83 E-07
Benzo(g,h,l)perylene	<4.89 E-07
TOTAL PAH	1.68 E-04

<sup>a</sup> Based on the uncontrolled levels of 2 diesel engines from References 6-7. Source Classification Codes 2-02-001-02, 2-03-001-01. To convert from lb/MMBtu to ng/J, multiply by 430.

<sup>b</sup> Hazardous air pollutant listed in the *Clean Air Act*.

<sup>c</sup> Based on data from 1 engine.

Table 3.3-3. EFFECT OF VARIOUS EMISSION CONTROL TECHNOLOGIES ON DIESEL ENGINES<sup>a</sup>

Technology	Affected Parameter	
	Increase	Decrease
<b>Fuel modifications</b>		
Sulfur content increase	PM, wear	
Aromatic content increase	PM, NO <sub>x</sub>	
Cetane number		PM, NO <sub>x</sub>
10% and 90% boiling point		PM
Fuel additives		PM, NO <sub>x</sub>
Water/Fuel emulsions		NO <sub>x</sub>
<b>Engine modifications</b>		
Injection timing retard	PM, BSFC	NO <sub>x</sub> , power
Fuel injection pressure	PM, NO <sub>x</sub>	
Injection rate control		NO <sub>x</sub> , PM
Rapid spill nozzles		PM
Electronic timing & metering		NO <sub>x</sub> , PM
Injector nozzle geometry		PM
Combustion chamber modifications		NO <sub>x</sub> , PM
Turbocharging	PM, power	NO <sub>x</sub>
Charge cooling		NO <sub>x</sub>
Exhaust gas recirculation	PM, power, wear	NO <sub>x</sub>
Oil consumption control		PM, wear
<b>Exhaust after-treatment</b>		
Particulate traps		PM
Selective catalytic reduction		NO <sub>x</sub>
Oxidation catalysts		TOC, CO, PM

<sup>a</sup> Reference 8. PM = particulate matter. BSFC = brake-specific fuel consumption.

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## Apéndice J – Estudio de Justicia Ambiental



ESTUDIO JUSTICIA AMBIENTAL

SITIO

PREPARADO PARA:

NRG SOLAR JUNCOS LLC  
JUNCOS – LAS PIEDRAS, PUERTO RICO



PREPARADO POR:



DICIEMBRE 2012





**Leaders in  
Economic  
Consulting  
in Puerto Rico**

**ENVIRONMENTAL JUSTICE AND ECONOMIC IMPACT STUDY  
FOR A SOLAR PANELS FARM IN JUNCOS AND LAS PIEDRAS,  
P.R.**

**Presented to  
CMA Architects and Engineers LLP**

**November 2012**



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## **I. INTRODUCTION**

NRG Solar Juncos (NRG) is evaluating the development of a photovoltaic panel project in a 700-acre farm bridging the municipalities of Juncos and Las Piedras, on Puerto Rico's southeastern region. A part of the site for the proposed project lies in the Ceiba Norte Ward of Juncos and the rest is in the Quebrada Arenas ward of Las Piedras.

The permitting process requires an Environmental Impact Statement (EIS), which must include an assessment of the project's impact from the viewpoints of environmental justice and the economics of the proposed operation.

Advantage Business Consulting (Advantage) was commissioned to carry out a two-part study to be included in the EIS. The two parts of the study are:

1. An environmental justice evaluation of the project, and
2. A study of the economic impact of the project's development and operation.

Analysis of the socioeconomic data for the project's impact area leads to two major conclusions: 1) There is no reason for an environmental justice concern in this project, and 2) the project will make a positive contribution to the local economy and the Puerto Rico economy as a whole.

The data show that the two wards in the impact area are not disadvantaged from a socioeconomic standpoint, which means that the project's site selection does not entail discrimination against socioeconomically weaker communities. In addition, much of the economic benefits from the project will accrue to the local area and the two municipalities in which the site is located.

## **II. ENVIRONMENTAL JUSTICE ASSESSMENT**

The environmental justice study seeks to establish whether the proposed project will or will not have a disproportionate impact on communities with low socio-economic indicators in the area surrounding the proposed site (the “impact area”). Environmental justice also focuses on ethnicity, due to the concern that ethnic minorities could be selectively subjected to unfavorable environmental impacts by project proponents or developers. In Puerto Rico, ethnicity is not a key issue, due to the virtually homogenous distribution of the ethnic Hispanic population throughout the island’s municipalities and wards. Consequently, environmental justice in Puerto Rico is evaluated almost entirely on the basis of the potential for socioeconomic discrimination. In any event, census data regarding the racial composition of the population in the impact area do not show any significant variation from the rest of the two municipalities concerned.

The environmental justice methodology used in Puerto Rico consists of analyzing socioeconomic data for the impact area and comparing that to surrounding communities and the municipalities in which both the impact area and surrounding communities are located. To allow for systematic comparison between areas, the socioeconomic data are summarized for each ward in a socio-economic index calculated with eleven (11) social and economic indicators.

Due to the fact that two adjoining but separate municipalities are impacted in this project, the socioeconomic analysis is presented in two parts: first for the Ceiba Norte ward in Juncos and then for the Quebrada Arenas ward in Las Piedras. Results of the analysis are summarized in the following two tables, which show the rank of each ward in each of the 11 socioeconomic indicators. The Ceiba Norte ward in Juncos has an average rank of 4.7 out of 10 wards in the municipality, falling slightly below the midpoint of socioeconomic ranking towards the most favorable side.

<b>Ceiba Norte Ward: Municipality of Juncos</b>										
<b>Socioeconomic Index Rankings</b>										
<b>VARIABLE</b>	<b>R A N K</b>									
	<b>Most Favorable</b>									<b>Least Favorable</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
Median Household Income					■					
Per Capita Income					■					
Households Below Poverty Level				■						
Households With Public Assistance					■					
Households With Social Security			■							
Unemployment Rate					■					
25 Years+ High School Graduates			■							
25 Years+ Seventh Grade							■			
Median Value of Housing Units					■					
Substandard Housing Conditions					■					
Housing Tenure					■					
<b>AVERAGE RANK: 4.7</b>										

<b>Quebrada Arenas Ward: Municipality of Las Piedras</b>								
<b>Socioeconomic Index Rankings</b>								
<b>VARIABLE</b>	<b>R A N K</b>							
	<b>Most Favorable</b>							<b>Least Favorable</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
Median Household Income			■					
Per Capita Income				■				
Households Below Poverty Level	■							
Households With Public Assistance			■					
Households With Social Security		■						
Unemployment Rate		■						
25 Years+ High School Graduates								
25 Years+ Seventh Grade		■						
Median Value of Housing Units				■				
Substandard Housing Conditions	■							
Housing Tenure	■							
<b>AVERAGE RANK: 2.3</b>								

The Quebrada Arenas ward in Las Piedras is in an even better socioeconomic condition compared to surrounding wards in the municipality. Out of a total of eight wards, it has a rank of 2.3, thus placing very close to the most favorable standing in the ranking. Taken as a whole, the two-ward impact area emerges as a better-than-average community in terms of socioeconomic standing. *Thus, the analysis leads to the conclusion that the NRG project will not impose a disproportionate/discriminatory environmental impact on a disadvantaged community. **There is no reason for an environmental justice concern in this project.***

As shown in the summary tables above, the variables included in the socioeconomic index are:

1. Median household income
2. Per capita income
3. Number of households below the poverty line
4. Number of households receiving public assistance
5. Number of households receiving social security benefits
6. Unemployment rate
7. Persons 25 years of age or older with a high school degree
8. Persons 25 years of age or older with at least a seventh grade education
9. Median value of housing units
10. Number of housing units with substandard conditions
11. Housing tenure: own or rent

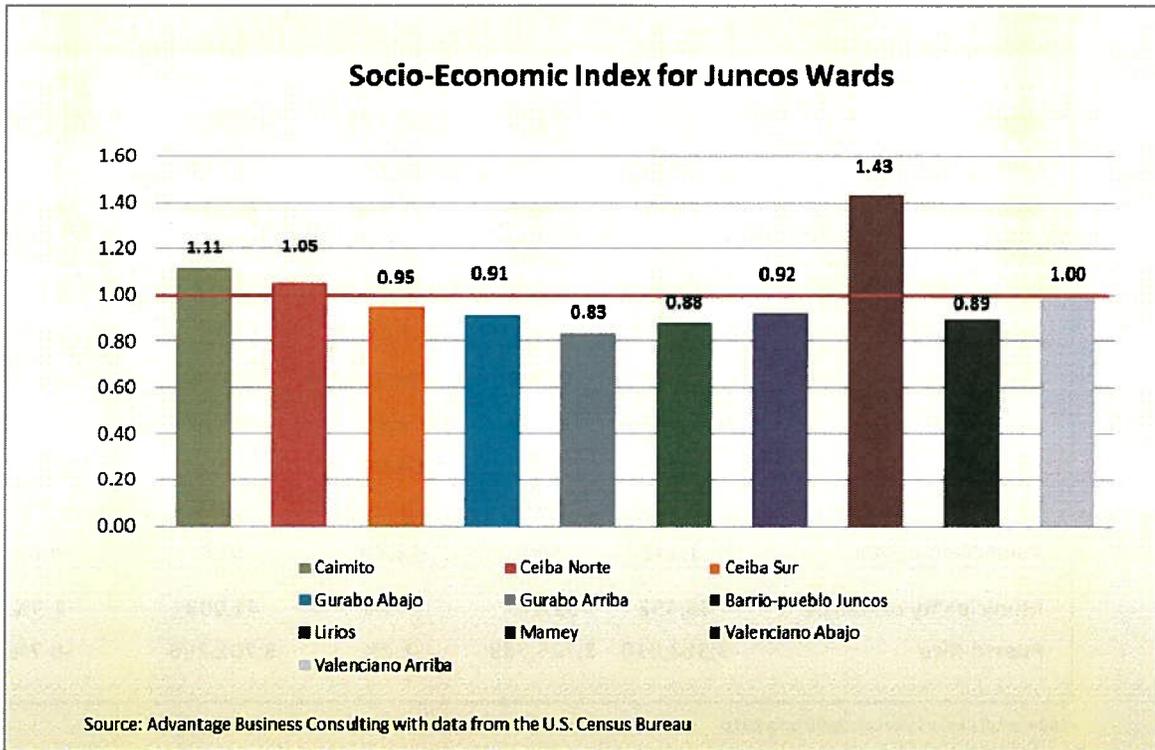
The value for each of these variables is converted to an index number by comparison to the municipality's average, which is given a value of 100. The eleven indexes are then averaged geometrically to produce the socioeconomic index. Values above 100 indicate a better-than-average socioeconomic standing, and vice versa. For variables with an inverse impact on socioeconomic standing, such as the unemployment

rate or the incidence of poverty, the relevant variable index is constructed taking the reciprocal of the value. For example, if a municipality's unemployment rate is 10% (or 0.10), then the reciprocal of that number ( $1/0.1 = 10$ ) will be set to the index value of 100. A ward in the municipality with a 15% unemployment rate will have an index for that variable of 66.7 ( $1/0.15$  divided by  $1/0.1$  and multiplied by 100). Thus, a higher unemployment rate produces a lower value for the index; as it should be, because more unemployment means a lower socioeconomic rank.

## II.1 Socio-Economic Index: Ceiba Norte ward, Juncos

The following table and chart show the socioeconomic index for the 10 wards in the municipality of Juncos. As may be seen in the table and chart, the ward in the impact area, Ceiba Norte, has an index value of 1.05, placing it third of ten in socioeconomic ranking and slightly better than the average for the municipality. Thus, this is certainly not a disadvantaged community in its region.

<b>Socio-Economic Index for Juncos Wards</b>		
<b>Wards</b>	<b>Index</b>	<b>Rank</b>
Caimito	1.11	2
<b>Ceiba Norte</b>	<b>1.05</b>	<b>3</b>
Ceiba Sur	0.95	5
Gurabo Abajo	0.91	7
Gurabo Arriba	0.83	10
Barrio-pueblo Juncos	0.88	9
Lirios	0.92	6
Mamey	1.43	1
Valenciano Abajo	0.89	8
Valenciano Arriba	1.00	4
<b>Municipality of Juncos</b>	<b>1.00</b>	<b>-</b>



#### II.1.a Population

Census data for 2000 and 2010, as well as projections for 2013, indicate that Ceiba Norte ward has the largest population in the Juncos municipality. Also, the ward has the higher rate of population growth in the group. Other things being equal, population growth is a sign of a healthy and dynamic community.

#### II.1.b Median household income

Median household income in the Ceiba Norte ward was \$17,746 in 2010, higher than but close to the average for the municipality. Median household income in the ward increased 32.4% between 2000 and 2010, compared to a 35.4% increase in the municipality and 30.4% in all of Puerto Rico. This variable is projected to increase 8.8% between 2010 and 2013.

<b>Population Growth in the Municipality of Juncos</b>					
<u>Wards</u>	<u>2000</u>	<u>2010</u>	<u>% Growth</u>		
			<u>2000-2010</u>	<u>2013*</u>	
			<u>2010-2013</u>		
Caimito	2,684	3,053	13.7%	3,173	3.9%
<b>Ceiba Norte</b>	<b>7,875</b>	<b>9,602</b>	<b>21.9%</b>	<b>10,190</b>	<b>6.1%</b>
Ceiba Sur	4,726	4,579	-3.1%	4,536	-0.9%
Gurabo Abajo	3,731	4,099	9.9%	4,216	2.9%
Gurabo Arriba	563	554	-1.6%	551	-0.5%
Barrio-pueblo Juncos	2,669	2,290	-14.2%	2,187	-4.5%
Lirios	5,433	6,130	12.8%	6,356	3.7%
Mamey	3,701	4,610	24.6%	4,924	6.8%
Valenciano Abajo	3,928	3,915	-0.3%	3,911	-0.1%
Valenciano Arriba	1,142	997	-12.7%	957	-4.0%
<b>Municipality of Juncos</b>	<b>36,452</b>	<b>39,829</b>	<b>9.3%</b>	<b>41,003</b>	<b>2.9%</b>
<b>Puerto Rico</b>	<b>3,808,610</b>	<b>3,725,789</b>	<b>-2.2%</b>	<b>3,701,296</b>	<b>-0.7%</b>

Source: US Census Bureau 2000 and 2010

\*Projected by Advantage Business Consulting

<b>Household Median Income</b>					
<u>Wards</u>	<u>Household MI</u>	<u>Household MI</u>	<u>Household MI</u>	<u>% Change</u>	<u>% Change</u>
	<u>2000</u>	<u>2010</u>	<u>Estimated 2013*</u>	<u>2000 / 2010</u>	<u>2010 / 2013</u>
Caimito	\$12,385	\$19,201	\$21,900	55.0%	14.1%
<b>Ceiba Norte</b>	<b>\$13,401</b>	<b>\$17,746</b>	<b>\$19,306</b>	<b>32.4%</b>	<b>8.8%</b>
Ceiba Sur	\$13,834	\$16,888	\$17,929	22.1%	6.2%
Gurabo Abajo	\$10,448	\$17,768	\$20,836	70.1%	17.3%
Gurabo Arriba	\$15,298	\$11,174	\$10,169	(27.0)%	(9.0)%
Barrio-pueblo Juncos	\$11,386	\$13,167	\$13,754	15.6%	4.5%
Lirios	\$11,171	\$14,021	\$15,010	25.5%	7.1%
Mamey	\$18,818	\$35,087	\$42,298	86.5%	20.6%
Valenciano Abajo	\$17,424	\$16,750	\$16,553	(3.9)%	(1.2)%
Valenciano Arriba	\$13,854	\$21,307	\$24,244	53.8%	13.8%
<b>Municipality of Juncos</b>	<b>\$13,072</b>	<b>\$17,694</b>	<b>\$19,376</b>	<b>35.4%</b>	<b>9.5%</b>
<b>Puerto Rico</b>	<b>\$14,412</b>	<b>\$18,791</b>	<b>\$20,348</b>	<b>30.4%</b>	<b>8.3%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\*Projected by Advantage Business Consulting

### II.1.c Per capita income

As in median household income, per capita income places the Ceiba Norte ward in the middle of the distribution of Juncos' ten wards. As of 2010, per capita income in the ward essentially tied the average for the municipality, but it is projected to pass above the average by 2013, with an 11.7% increase compared to 2010.

Per Capita Income					
<u>Wards</u>	<u>Per Capita Income</u> <u>2000</u>	<u>Per Capita Income</u> <u>2010</u>	<u>Per Capita Income</u> <u>2013*</u>	<u>% Change</u> <u>2010</u>	<u>% Change</u> <u>2010 / 2013</u>
Caimito	\$6,189	\$11,284	\$13,512	82.3%	19.7%
<b>Ceiba Norte</b>	<b>\$6,231</b>	<b>\$8,999</b>	<b>\$10,048</b>	<b>44.4%</b>	<b>11.7%</b>
Ceiba Sur	\$6,403	\$9,568	\$10,793	49.4%	12.8%
Gurabo Abajo	\$4,513	\$6,838	\$7,746	51.5%	13.3%
Gurabo Arriba	\$8,087	\$4,694	\$3,987	(42.0)%	(15.1)%
Barrio-pueblo Juncos	\$6,496	\$7,270	\$7,520	11.9%	3.4%
Lirios	\$5,385	\$7,376	\$8,106	37.0%	9.9%
Mamey	\$7,863	\$12,830	\$14,860	63.2%	15.8%
Valenciano Abajo	\$8,229	\$7,940	\$7,855	(3.5)%	(1.1)%
Valenciano Arriba	\$5,970	\$9,820	\$11,401	64.5%	16.1%
<b>Municipality of Juncos</b>	<b>\$6,369</b>	<b>\$8,968</b>	<b>\$9,938</b>	<b>40.8%</b>	<b>10.8%</b>
<b>Puerto Rico</b>	<b>\$8,185</b>	<b>\$10,355</b>	<b>\$11,112</b>	<b>26.5%</b>	<b>7.3%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\* Projected by Advantage Business Consulting

### II.1.d Households below the poverty line

Juncos as a whole experienced a decline in the incidence of poverty between 2000 and 2010, with the percentage of households below the poverty line falling from 52.7% to 46.4%. The Ceiba Norte ward experienced and even greater improvement, with a 10.2-percentage-point decline in the number of poor households. In this variable, the ward ranks fourth among the ten wards in the municipality. As shown below, continued improvement is projected for 2013.

Households Below Poverty Level							
Wards	Households Below Poverty Level 2000			Households Below Poverty Level 2010			% Change
	Households	#	%	Households	#	%	# of Households
Caimito	784	432	55.1%	847	326	38.5%	-24.5%
<b>Ceiba Norte</b>	<b>2,500</b>	<b>1,338</b>	<b>53.5%</b>	<b>2,841</b>	<b>1,230</b>	<b>43.3%</b>	<b>-8.1%</b>
Ceiba Sur	1,573	783	49.8%	1,540	741	48.1%	-5.4%
Gurabo Abajo	1,123	690	61.4%	1,198	655	54.7%	-5.1%
Gurabo Arriba	185	105	56.8%	155	101	65.2%	-3.8%
Barrio-pueblo Juncos	1,109	647	58.3%	840	460	54.8%	-28.9%
Lirios	1,796	1,084	60.4%	1,791	1,017	56.8%	-6.2%
Mamey	1,211	479	39.6%	1,435	397	27.7%	-17.1%
Valenciano Abajo	1,234	526	42.6%	1,183	611	51.6%	16.2%
Valenciano Arriba	426	214	50.2%	311	100	32.2%	-53.3%
<b>Municipality of Juncos</b>	<b>11,941</b>	<b>6,298</b>	<b>52.7%</b>	<b>12,141</b>	<b>5,638</b>	<b>46.4%</b>	<b>-10.5%</b>
<b>Puerto Rico</b>	<b>1,261,816</b>	<b>596,466</b>	<b>47.3%</b>	<b>1,227,039</b>	<b>548,785</b>	<b>44.7%</b>	<b>-8.0%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

Households Below Poverty Level							
Wards	Households	Households Below Poverty Level 2010		Households Below Poverty Level 2013*			% Change
		#	%	Households	#	%	# of Households
Caimito	847	326	38.5%	867	300	34.6%	(8.1)%
<b>Ceiba Norte</b>	<b>2,841</b>	<b>1,230</b>	<b>43.3%</b>	<b>2,897</b>	<b>1,199</b>	<b>41.4%</b>	<b>(2.5)%</b>
Ceiba Sur	1,540	741	48.1%	1,460	729	49.9%	(1.6)%
Gurabo Abajo	1,198	655	54.7%	1,102	645	58.5%	(1.5)%
Gurabo Arriba	155	101	65.2%	153	99	64.9%	(1.6)%
Barrio-pueblo Juncos	840	460	54.8%	884	453	51.2%	(1.5)%
Lirios	1,791	1,017	56.8%	1,630	1,005	61.7%	(1.2)%
Mamey	1,435	397	27.7%	1,361	375	27.6%	(5.5)%
Valenciano Abajo	1,183	611	51.6%	1,229	639	52.0%	4.6%
Valenciano Arriba	311	100	32.2%	309	80	25.8%	(20.4)%
<b>Municipality of Juncos</b>	<b>12,141</b>	<b>5,638</b>	<b>46.4%</b>	<b>11,892</b>	<b>5,524</b>	<b>46.5%</b>	<b>(2.0)%</b>
<b>Puerto Rico</b>	<b>1,227,039</b>	<b>548,785</b>	<b>44.7%</b>	<b>1,216,794</b>	<b>535,238</b>	<b>44.0%</b>	<b>(2.5)%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\*Projected by Advantage Business Consulting

### II.1.e Households receiving public assistance

The percentage of households receiving public assistance in Juncos declined markedly between 2000 and 2010; from 21.8% to 4.8%. It is projected to fall further to 3.1% in 2013.

The Ceiba Norte ward stands out positively in this respect. Although it has a comparatively high number of households in public assistance, due to its being the most populous ward in the municipality, it had the lowest percentage of households in public assistance programs in 2000 and has maintained a good rank in this respect. By 2013, only 2.4% of Ceiba Norte households are projected to receive public assistance benefits.

Households Receiving Public Assistance							
Barrios	Households with Public Assistance 2000			Households with Public Assistance 2010			% Change
	Households	#	%	Households	#	%	# of Households
Caimito	784	176	22.4%	847	14	1.7%	(92.0)%
<b>Ceiba Norte</b>	<b>2,500</b>	<b>364</b>	<b>14.6%</b>	<b>2,841</b>	<b>104</b>	<b>3.7%</b>	<b>(71.4)%</b>
Ceiba Sur	1,573	266	16.9%	1,540	107	6.9%	(59.8)%
Gurabo Abajo	1,123	226	20.1%	1,198	71	5.9%	(68.6)%
Gurabo Arriba	185	26	14.1%	155	0	0.0%	(100.0)%
Barrio-pueblo Juncos	1,109	334	30.1%	840	44	5.2%	(86.8)%
Lirios	1,796	573	31.9%	1,791	107	6.0%	(81.3)%
Mamey	1,211	212	17.5%	1,435	45	3.1%	(78.8)%
Valenciano Abajo	1,234	329	26.7%	1,183	87	7.4%	(73.6)%
Valenciano Arriba	426	92	21.6%	311	0	0.0%	(100.0)%
<b>Municipality of Juncos</b>	<b>11,941</b>	<b>2,598</b>	<b>21.8%</b>	<b>12,141</b>	<b>579</b>	<b>4.8%</b>	<b>(77.7)%</b>
<b>Puerto Rico</b>	<b>1,261,816</b>	<b>253,358</b>	<b>20.1%</b>	<b>1,227,039</b>	<b>66,401</b>	<b>5.4%</b>	<b>(73.8)%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

Households Receiving Public Assistance							
Barrios	Households with Public Assistance 2010			Households with Public Assistance 2013*			% Change
	Households	#	%	Households	#	%	# of Households
Caimito	847	14	1.7%	867	7	0.8%	(53.2)%
<b>Ceiba Norte</b>	<b>2,841</b>	<b>104</b>	<b>3.7%</b>	<b>2,952</b>	<b>71</b>	<b>2.4%</b>	<b>(31.3)%</b>
Ceiba Sur	1,540	107	6.9%	1,530	81	5.3%	(23.9)%
Gurabo Abajo	1,198	71	5.9%	1,221	50	4.1%	(29.3)%
Gurabo Arriba	155	0	0.0%	147	0	0.0%	-
Barrio-pueblo Juncos	840	44	5.2%	773	24	3.1%	(45.6)%
Lirios	1,791	107	6.0%	1,790	65	3.6%	(39.6)%
Mamey	1,435	45	3.1%	1,510	28	1.9%	(37.2)%
Valenciano Abajo	1,183	87	7.4%	1,168	58	5.0%	(32.9)%
Valenciano Arriba	311	0	0.0%	283	0	0.0%	-
<b>Municipality of Juncos</b>	<b>12,141</b>	<b>579</b>	<b>4.8%</b>	<b>12,241</b>	<b>385</b>	<b>3.1%</b>	<b>(33.5)%</b>
<b>Puerto Rico</b>	<b>1,227,039</b>	<b>66,401</b>	<b>5.4%</b>	<b>1,216,794</b>	<b>44,433</b>	<b>3.7%</b>	<b>(33.1)%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\*Projected by Advantage Business Consulting

## II.1.f Households receiving social security benefits

Virtually all the wards in Juncos experienced an increase in the percentage of households receiving social security benefits, seemingly as a result of the ageing of the population in the past decade. Ceiba Norte ward was not the exception.

In this respect, Ceiba Norte ward is in a more favorable position than most wards, ranking third out of the ten in the municipality. By 2013, it is projected that 38.5% of the Ceiba Norte households will be receiving social security benefits, as opposed to 39.8% for the municipality as a whole and 53% for Ceiba Sur, an adjoining ward.

Households Receiving Social Security							
Wards	Households with Social Security 2000			Households with Social Security 2010			% Change
	Households	#	%	Households	#	%	# of Households
Caimito	784	247	31.5%	847	377	44.5%	52.6%
Ceiba Norte	2,500	732	29.3%	2,841	1,027	36.1%	40.3%
Ceiba Sur	1,573	504	32.0%	1,540	727	47.2%	44.2%
Gurabo Abajo	1,123	367	32.7%	1,198	483	40.3%	31.6%
Gurabo Arriba	185	78	42.2%	155	104	67.1%	33.3%
Barrio-pueblo Juncos	1,109	440	39.7%	840	362	43.1%	(17.7)%
Lirios	1,796	503	28.0%	1,791	447	25.0%	(11.1)%
Mamey	1,211	349	28.8%	1,435	403	28.1%	15.5%
Valenciano Abajo	1,234	450	36.5%	1,183	487	41.2%	8.2%
Valenciano Arriba	426	183	43.0%	311	169	54.3%	(7.7)%
<b>Municipality of Juncos</b>	<b>11,941</b>	<b>3,853</b>	<b>32.3%</b>	<b>12,141</b>	<b>4,586</b>	<b>37.8%</b>	<b>19.0%</b>
<b>Puerto Rico</b>	<b>1,261,816</b>	<b>426,429</b>	<b>33.8%</b>	<b>1,227,039</b>	<b>500,463</b>	<b>40.8%</b>	<b>17.4%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

Households Receiving Social Security							
Wards	Households with Social Security 2010			Households with Social Security 2013*			% Change
	Households	#	%	Households	#	%	# of Households
Caimito	847	377	44.5%	867	428	49.4%	13.5%
<b>Ceiba Norte</b>	<b>2,841</b>	<b>1,027</b>	<b>36.1%</b>	<b>2,952</b>	<b>1,137</b>	<b>38.5%</b>	<b>10.7%</b>
Ceiba Sur	1,540	727	47.2%	1,530	811	53.0%	11.6%
Gurabo Abajo	1,198	483	40.3%	1,221	524	42.9%	8.6%
Gurabo Arriba	155	104	67.1%	147	113	77.1%	9.0%
Barrio-pueblo Juncos	840	362	43.1%	773	341	44.2%	(5.7)%
Lirios	1,791	447	25.0%	1,790	431	24.1%	(3.5)%
Mamey	1,435	403	28.1%	1,510	421	27.9%	4.4%
Valenciano Abajo	1,183	487	41.2%	1,168	499	42.7%	2.4%
Valenciano Arriba	311	169	54.3%	283	165	58.3%	(2.4)%
<b>Municipality of Juncos</b>	<b>12,141</b>	<b>4,586</b>	<b>37.8%</b>	<b>12,241</b>	<b>4,871</b>	<b>39.8%</b>	<b>6.2%</b>
<b>Puerto Rico</b>	<b>1,227,039</b>	<b>500,463</b>	<b>40.8%</b>	<b>1,216,794</b>	<b>525,085</b>	<b>43.2%</b>	<b>4.9%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\*Projected by Advantage Business Consulting

## II.1.g Unemployment rate

A long-lasting recession (2007 through 2012) has caused a sustained increase in unemployment in all of Puerto Rico, including the municipality of Juncos. The unemployment rate in the municipality rose from 22.5% in 2000 to 34.6% in 2010. The Ceiba Norte ward also experienced a rise in unemployment, but the ward's unemployment rate increased by 7.9 percentage points, as opposed to 12 percentage points for all of Juncos. The ward ranks fifth out of ten in this variable.

Unemployment Rate									
Wards	Labor		Unemployment 2000		Labor		Unemployment 2010		% Change
	Force	Employed	#	Rate	Force	Employed	#	Rate	# of Unemployed
Caimito	723	563	160	22.1%	859	375	485	56.4%	202.8%
<b>Ceiba Norte</b>	<b>2,295</b>	<b>1,734</b>	<b>561</b>	<b>24.4%</b>	<b>3,525</b>	<b>2,384</b>	<b>1,141</b>	<b>32.4%</b>	<b>103.4%</b>
Ceiba Sur	1,442	1,176	266	18.4%	1,583	1,152	432	27.3%	62.2%
Gurabo Abajo	1,024	749	275	26.9%	1,368	944	424	31.0%	54.2%
Gurabo Arriba	161	139	22	13.7%	122	122	0	0.0%	(100.0)%
Barrio-pueblo Juncos	725	603	122	16.8%	834	466	368	44.1%	201.3%
Lirios	1,599	1,152	447	28.0%	1,991	1,117	874	43.9%	95.6%
Mamey	1,287	1,026	261	20.3%	2,025	1,691	335	16.5%	28.3%
Valenciano Abajo	1,176	939	237	20.2%	1,351	706	645	47.8%	172.2%
Valenciano Arriba	400	310	90	22.5%	425	257	168	39.5%	86.3%
<b>Municipality of Juncos</b>	<b>10,832</b>	<b>8,391</b>	<b>2,441</b>	<b>22.5%</b>	<b>14,083</b>	<b>9,213</b>	<b>4,870</b>	<b>34.6%</b>	<b>99.5%</b>
<b>Puerto Rico</b>	<b>1,151,863</b>	<b>930,865</b>	<b>220,998</b>	<b>19.2%</b>	<b>1,383,734</b>	<b>894,150</b>	<b>489,584</b>	<b>35.4%</b>	<b>121.5%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

Unemployment Rate									
Wards	Labor		Unemployment 2010		Labor		Unemployment 2013*		% of Change
	Force	Employed	#	Rate	Force	Employed	#	Rate	# of Unemployed
Caimito	859	375	485	56.4%	905	332	676	74.6%	39.4%
<b>Ceiba Norte</b>	<b>3,525</b>	<b>2,384</b>	<b>1,141</b>	<b>32.4%</b>	<b>4,009</b>	<b>2,623</b>	<b>1,412</b>	<b>35.2%</b>	<b>23.7%</b>
Ceiba Sur	1,583	1,152	432	27.3%	1,629	1,145	499	30.6%	15.6%
Gurabo Abajo	1,368	944	424	31.0%	1,492	1,012	483	32.4%	13.9%
Gurabo Arriba	122	122	0	0.0%	112	117	0	0.0%	-
Barrio-pueblo Juncos	834	466	368	44.1%	870	432	512	58.9%	39.2%
Lirios	1,991	1,117	874	43.9%	2,126	1,106	1,069	50.3%	22.3%
Mamey	2,025	1,691	335	16.5%	2,321	1,964	361	15.5%	7.8%
Valenciano Abajo	1,351	706	645	47.8%	1,408	648	871	61.9%	35.0%
Valenciano Arriba	425	257	168	39.5%	432	243	202	46.8%	20.5%
<b>Municipality of Juncos</b>	<b>14,083</b>	<b>9,213</b>	<b>4,870</b>	<b>34.6%</b>	<b>15,304</b>	<b>9,621</b>	<b>6,084</b>	<b>39.8%</b>	<b>24.9%</b>
<b>Puerto Rico</b>	<b>1,151,863</b>	<b>930,865</b>	<b>220,998</b>	<b>19.2%</b>	<b>1,217,016</b>	<b>919,695</b>	<b>280,556</b>	<b>23.1%</b>	<b>26.9%</b>

Source: US Census Bureau and American Community Survey

\* Projected by Advantage Business Consulting

## II.1.h Education: Years of schooling

The Ceiba Norte ward is essentially average within the Juncos municipality in educational attainment as measured by years of schooling. Census data indicate the number of adults 25 years of age and older that have a high school degree and those that completed at least a seventh grade education. In both variables, the Ceiba Norte ward is close to the Juncos average, with about 70% and 85% for these two measures, respectively.

Persons 25 Years or Older With a High School Degree							
Wards	Persons with High School			Persons with High School			% Change # of Graduated
	Population 25 years +	Diploma or more (2000) #	%	Population 25 years +	Diploma or more (2010) #	%	
Caimito	1,702	818	48.1%	2,170	1,448	66.7%	77.0%
<b>Ceiba Norte</b>	<b>4,602</b>	<b>2,621</b>	<b>57.0%</b>	<b>6,136</b>	<b>4,098</b>	<b>66.8%</b>	<b>56.4%</b>
Ceiba Sur	2,764	1,791	64.8%	2,932	1,946	66.4%	8.7%
Gurabo Abajo	2,155	955	44.3%	2,577	1,535	59.6%	60.7%
Gurabo Arriba	359	185	51.5%	345	168	48.7%	(9.2)%
Barrio-pueblo Juncos	1,772	958	54.1%	1,559	1,008	64.7%	5.2%
Lirios	3,054	1,648	54.0%	3,414	2,163	63.4%	31.3%
Mamey	2,104	1,473	70.0%	2,875	2,185	76.0%	48.3%
Valenciano Abajo	2,332	1,302	55.8%	2,439	1,670	68.5%	28.3%
Valenciano Arriba	783	360	46.0%	717	441	61.5%	22.5%
<b>Municipality of Juncos</b>	<b>21,627</b>	<b>12,111</b>	<b>56.0%</b>	<b>25,164</b>	<b>16,662</b>	<b>66.2%</b>	<b>37.6%</b>
<b>Puerto Rico</b>	<b>2,288,326</b>	<b>1,371,922</b>	<b>60.0%</b>	<b>2,429,729</b>	<b>1,641,529</b>	<b>67.6%</b>	<b>19.7%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

Persons 25 Years or Older With a High School Degree							
Wards	Persons with High School			Persons with High School			% of Change # of Graduated
	Population 25 years +	Diploma or more (2010) #	%	Population 25 years +	Diploma or more (2013)* #	%	
Caimito	2,170	1,448	66.7%	2,334	1,719	73.6%	18.7%
<b>Ceiba Norte</b>	<b>6,136</b>	<b>4,098</b>	<b>66.8%</b>	<b>6,689</b>	<b>4,686</b>	<b>70.1%</b>	<b>14.3%</b>
Ceiba Sur	2,932	1,946	66.4%	2,984	1,995	66.9%	2.5%
Gurabo Abajo	2,577	1,535	59.6%	2,719	1,770	65.1%	15.3%
Gurabo Arriba	345	168	48.7%	341	163	47.9%	(2.9)%
Barrio-pueblo Juncos	1,559	1,008	64.7%	1,500	1,024	68.2%	1.5%
Lirios	3,414	2,163	63.4%	3,530	2,347	66.5%	8.5%
Mamey	2,875	2,185	76.0%	3,157	2,459	77.9%	12.6%
Valenciano Abajo	2,439	1,670	68.5%	2,472	1,799	72.8%	7.8%
Valenciano Arriba	717	441	61.5%	698	469	67.1%	6.3%
<b>Municipality of Juncos</b>	<b>25,164</b>	<b>16,662</b>	<b>66.2%</b>	<b>26,425</b>	<b>18,431</b>	<b>69.7%</b>	<b>10.6%</b>
<b>Puerto Rico</b>	<b>2,429,729</b>	<b>1,641,529</b>	<b>67.6%</b>	<b>2,473,830</b>	<b>1,732,305</b>	<b>70.0%</b>	<b>5.5%</b>

Source: US Census Bureau and American Community Survey

\*Projected by Advantage Business Consulting

Persons 25 Years or Older With At Least a Seventh Grade Education							
Wards	Seventh Grade			Seventh Grade			% Change # of Graduated
	Population	Education or More (2000)		Population	Education or More (2010)		
	25 years +	#	%	25 years +	#	%	
Caimito	1,702	1,243	73.0%	2,170	1,845	85.0%	48.4%
<b>Ceiba Norte</b>	<b>4,602</b>	<b>3,693</b>	<b>80.2%</b>	<b>6,136</b>	<b>5,123</b>	<b>83.5%</b>	<b>38.7%</b>
Ceiba Sur	2,764	2,283	82.6%	2,932	2,521	86.0%	10.4%
Gurabo Abajo	2,155	1,531	71.0%	2,577	1,965	76.3%	28.3%
Gurabo Arriba	359	285	79.4%	345	227	65.8%	(20.4)%
Barrio-pueblo Juncos	1,772	1,377	77.7%	1,559	1,343	86.1%	(2.5)%
Lirios	3,054	2,334	76.4%	3,414	2,927	85.7%	25.4%
Mamey	2,104	1,821	86.5%	2,875	2,580	89.7%	41.7%
Valenciano Abajo	2,332	1,862	79.8%	2,439	2,091	85.7%	12.3%
Valenciano Arriba	783	564	72.0%	717	527	73.5%	(6.6)%
<b>Municipality of Juncos</b>	<b>21,627</b>	<b>16,993</b>	<b>78.6%</b>	<b>25,164</b>	<b>21,149</b>	<b>84.0%</b>	<b>24.5%</b>
<b>Puerto Rico</b>	<b>2,288,326</b>	<b>1,867,257</b>	<b>81.6%</b>	<b>2,429,729</b>	<b>2,041,547</b>	<b>84.0%</b>	<b>9.3%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

Persons 25 Years or Older With At Least a Seventh Grade Education							
Wards	Seventh Grade			Seventh Grade			% of Change # of Graduated
	Population	Education or More (2010)		Population	Education or More (2013)*		
	25 years +	#	% Percentage	25 years +	#	% Percentage	
Caimito	2,170	1,845	85.0%	2,334	2,077	89.0%	12.6%
<b>Ceiba Norte</b>	<b>6,136</b>	<b>5,123</b>	<b>83.5%</b>	<b>6,689</b>	<b>5,652</b>	<b>84.5%</b>	<b>10.3%</b>
Ceiba Sur	2,932	2,521	86.0%	2,984	2,597	87.0%	3.0%
Gurabo Abajo	2,577	1,965	76.3%	2,719	2,118	77.9%	7.8%
Gurabo Arriba	345	227	65.8%	341	212	62.2%	(6.6)%
Barrio-pueblo Juncos	1,559	1,343	86.1%	1,500	1,333	88.9%	(0.7)%
Lirios	3,414	2,927	85.7%	3,530	3,133	88.7%	7.0%
Mamey	2,875	2,580	89.7%	3,157	2,864	90.7%	11.0%
Valenciano Abajo	2,439	2,091	85.7%	2,472	2,165	87.6%	3.5%
Valenciano Arriba	717	527	73.5%	698	516	73.9%	(2.0)%
<b>Municipality of Juncos</b>	<b>25,164</b>	<b>21,149</b>	<b>84.0%</b>	<b>26,425</b>	<b>22,667</b>	<b>85.8%</b>	<b>7.2%</b>
<b>Puerto Rico</b>	<b>2,429,729</b>	<b>2,041,547</b>	<b>84.0%</b>	<b>2,473,830</b>	<b>2,096,940</b>	<b>84.8%</b>	<b>2.7%</b>

Source: US Census Bureau and American Community Survey

\*Projected by Advantage Business Consulting

### II.1.i Value of housing

The Ceiba Norte ward has the highest number of households among the ten wards in the municipality. It has also experienced significant growth in the number of households. This necessarily translates into growth in the number of housing units, since each household must, by definition, occupy at least one housing unit.

<b>Households</b>					
<b>Wards</b>	<b>Households</b> <b>2000</b>	<b>Households</b> <b>2010</b>	<b>Households</b> <b>2013*</b>	<b>% Change</b> <b>2000/2010</b>	<b>% Change</b> <b>2010 / 2013</b>
Caimito	855	919	939	7.5%	2.2%
<b>Ceiba Norte</b>	<b>2,707</b>	<b>3,152</b>	<b>3,299</b>	<b>16.4%</b>	<b>4.7%</b>
Ceiba Sur	1,688	1,782	1,811	5.6%	1.6%
Gurabo Abajo	1,220	1,426	1,494	16.9%	4.8%
Gurabo Arriba	224	205	200	(8.5)%	(2.6)%
Barrio-pueblo Juncos	1,281	1,196	1,172	(6.6)%	(2.0)%
Lirios	1,942	2,238	2,335	15.2%	4.3%
Mamey	1,343	1,651	1,757	22.9%	6.4%
Valenciano Abajo	1,368	1,403	1,414	2.6%	0.8%
Valenciano Arriba	436	435	435	(0.2)%	(0.1)%
<b>Municipality of Juncos</b>	<b>13,064</b>	<b>14,407</b>	<b>14,855</b>	<b>10.3%</b>	<b>3.1%</b>
<b>Puerto Rico</b>	<b>1,418,476</b>	<b>1,474,026</b>	<b>1,491,111</b>	<b>3.9%</b>	<b>1.2%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\* Projected by Advantage Business Consulting

Between 2000 and 2010, the median value of housing units in the ward increased 60.4%. Housing in the ward is projected to appreciate an additional 15.2% by 2013. In 2000, the median value of housing in the ward was lower than that for the Juncos municipality, but by 2010 the ward caught up with the municipal median and is projected to rise above that mark by 2013.

As in the US mainland, housing prices in Puerto Rico have been affected by negative trends in the overall real estate market. However, mid-to-low priced residences, such as those in a municipality like Juncos, have been affected less than higher priced units in municipalities like San Juan and Guaynabo.

<b>Median Value of Housing Units</b>					
<b>Wards</b>	<b>Median Value 2000</b>	<b>Median Value 2010</b>	<b>Median Value 2013*</b>	<b>% Change 2000/2010</b>	<b>% Change 2010 /2013</b>
Caimito	\$63,700	\$115,300	\$137,764	81.0%	19.5%
<b>Ceiba Norte</b>	<b>\$68,700</b>	<b>\$110,200</b>	<b>\$126,984</b>	<b>60.4%</b>	<b>15.2%</b>
Ceiba Sur	\$79,700	\$104,900	\$113,912	31.6%	8.6%
Gurabo Abajo	\$59,800	\$91,100	\$103,363	52.3%	13.5%
Gurabo Arriba	\$80,500	\$76,700	\$75,595	(4.7)%	(1.4)%
Barrio-pueblo Juncos	\$62,200	\$125,900	\$155,559	102.4%	23.6%
Lirios	\$80,400	\$127,000	\$145,669	58.0%	14.7%
Mamey	\$79,500	\$126,900	\$146,012	59.6%	15.1%
Valenciano Abajo	\$60,900	\$97,200	\$111,836	59.6%	15.1%
Valenciano Arriba	\$66,200	\$95,600	\$106,743	44.4%	11.7%
<b>Municipality of Juncos</b>	<b>\$70,600</b>	<b>\$109,800</b>	<b>\$125,355</b>	<b>55.5%</b>	<b>14.2%</b>
<b>Puerto Rico</b>	<b>\$77,000</b>	<b>\$112,600</b>	<b>\$126,198</b>	<b>46.2%</b>	<b>12.1%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\*Projected by Advantage Business Consulting

## II.1.j Housing with substandard conditions

The population census identifies inadequate housing units by the number of substandard conditions present the units. For example, lacking plumbing facilities totally or partially is a substandard condition.

<b>Housing With Substandard Conditions - 2000</b>			
<b>Wards</b>	<b>Housing Units</b>	<b>Housing with one or two conditions</b>	<b>%</b>
Caimito	761	281	36.9%
<b>Ceiba Norte</b>	<b>2,517</b>	<b>1,271</b>	<b>50.5%</b>
Ceiba Sur	1,552	765	49.3%
Gurabo Abajo	1,129	577	51.1%
Gurabo Arriba	206	89	43.2%
Barrio-pueblo Juncos	1,101	444	40.3%
Lirios	1,792	954	53.2%
Mamey	1,216	555	45.6%
Valenciano Abajo	1,238	493	39.8%
Valenciano Arriba	421	164	39.0%
<b>Municipality of Juncos</b>	<b>11,933</b>	<b>5,593</b>	<b>46.9%</b>
<b>Puerto Rico</b>	<b>1,261,325</b>	<b>576,082</b>	<b>45.7%</b>

Source: US Census Bureau

In the 2010 census, the percentage of units with one or two substandard conditions in the Ceiba Norte ward was 49.5%; one percentage point less than for Juncos as a whole. In this variable, the ward ranked fifth among the ten wards in the municipality.

The ward's relative position is projected to improve somewhat in 2013, moving up to the fourth rank in the municipality in the percentage of units with one or two substandard conditions.

<b>Housing With Substandard Conditions - 2010</b>			
<b><u>Wards</u></b>	<b><u>Housing Units</u></b>	<b><u>Housing with one or two conditions</u></b>	<b><u>%</u></b>
Caimito	847	377	44.5%
<b>Ceiba Norte</b>	<b>2,841</b>	<b>1,406</b>	<b>49.5%</b>
Ceiba Sur	1,540	851	55.3%
Gurabo Abajo	1,198	666	55.6%
Gurabo Arriba	155	32	20.6%
Barrio-pueblo Juncos	840	445	53.0%
Lirios	1,791	1,108	61.9%
Mamey	1,435	450	31.4%
Valenciano Abajo	1,183	645	54.5%
Valenciano Arriba	311	146	46.9%
<b>Municipality of Juncos</b>	<b>12,141</b>	<b>6,126</b>	<b>50.5%</b>
<b>Puerto Rico</b>	<b>1,227,039</b>	<b>519,871</b>	<b>42.4%</b>

Source: American Community Survey 2006-2010

<b>Housing With Substandard Conditions - 2013*</b>			
<b>Wards</b>	<b>Housing Units</b>	<b>Housing with one or two conditions</b>	<b>%</b>
Caimito	875	412	47.1%
<b>Ceiba Norte</b>	<b>2,946</b>	<b>1,449</b>	<b>49.2%</b>
Ceiba Sur	1,536	879	57.2%
Gurabo Abajo	1,220	695	57.0%
Gurabo Arriba	142	24	16.5%
Barrio-pueblo Juncos	775	445	57.5%
Lirios	1,791	1,159	64.7%
Mamey	1,508	423	28.0%
Valenciano Abajo	1,167	699	59.9%
Valenciano Arriba	284	141	49.6%
<b>Municipality of Juncos</b>	<b>12,243</b>	<b>6,325</b>	<b>51.7%</b>
<b>Puerto Rico</b>	<b>1,216,936</b>	<b>504,103</b>	<b>41.4%</b>

\*Projected by Advantage Business Consulting

### II.1.k Housing tenure

As is typical in Puerto Rico, Juncos has a high rate of homeownership. In the 2010 census, 75.7% of housing units in the municipality were occupied by owners. In the Ceiba Norte ward, the rate was four percentage points higher: 79.7%.

<b>Housing Tenure - 2000</b>					
<b>Wards</b>	<b>Housing</b>	<b>Owner Occupied</b>		<b>Renter Occupied</b>	
	<b>Units</b>	<b>Units</b>	<b>% of Total</b>	<b>Units</b>	<b>% of Total</b>
Caimito	761	636	83.6%	125	16.4%
<b>Ceiba Norte</b>	<b>2,517</b>	<b>2,185</b>	<b>86.8%</b>	<b>332</b>	<b>13.2%</b>
Ceiba Sur	1,552	1,132	72.9%	420	27.1%
Gurabo Abajo	1,129	979	86.7%	150	13.3%
Gurabo Arriba	206	190	92.2%	16	7.8%
Barrio-pueblo Juncos	1,101	584	53.0%	517	47.0%
Lirios	1,792	1,137	63.4%	655	36.6%
Mamey	1,216	930	76.5%	286	23.5%
Valenciano Abajo	1,238	1,034	83.5%	204	16.5%
Valenciano Arriba	421	347	82.4%	74	17.6%
<b>Municipality of Juncos</b>	<b>11,933</b>	<b>9,154</b>	<b>76.7%</b>	<b>2,779</b>	<b>23.3%</b>
<b>Puerto Rico</b>	<b>1,261,325</b>	<b>919,711</b>	<b>72.9%</b>	<b>341,614</b>	<b>27.1%</b>

Source: US Census Bureau

<b>Housing Tenure - 2010</b>					
<b>Wards</b>	<b>Housing</b>	<b>Owner Occupied</b>		<b>Renter Occupied</b>	
	<b>Units</b>	<b>Units</b>	<b>% of Total</b>	<b>Units</b>	<b>% of Total</b>
Caimito	847	699	82.5%	148	17.5%
<b>Ceiba Norte</b>	<b>2,841</b>	<b>2,265</b>	<b>79.7%</b>	<b>576</b>	<b>20.3%</b>
Ceiba Sur	1,540	1,053	68.4%	487	31.6%
Gurabo Abajo	1,198	1,006	84.0%	192	16.0%
Gurabo Arriba	155	122	78.7%	33	21.3%
Barrio-pueblo Juncos	840	432	51.4%	408	48.6%
Lirios	1,791	1,208	67.4%	583	32.6%
Mamey	1,435	1,211	84.4%	224	15.6%
Valenciano Abajo	1,183	937	79.2%	246	20.8%
Valenciano Arriba	311	260	83.6%	51	16.4%
<b>Municipality of Juncos</b>	<b>12,141</b>	<b>9,193</b>	<b>75.7%</b>	<b>2,948</b>	<b>24.3%</b>
<b>Puerto Rico</b>	<b>1,227,039</b>	<b>888,755</b>	<b>72.4%</b>	<b>338,284</b>	<b>27.6%</b>

Source: American Community Survey 2006-2010

<b>Housing Tenure - 2013*</b>					
<b>Wards</b>	<b>Housing</b>	<b>Owner Occupied</b>		<b>Renter Occupied</b>	
	<b>Units</b>	<b>Units</b>	<b>% of Total</b>	<b>Units</b>	<b>% of Total</b>
Caimito	875	719	82.2%	156	17.8%
<b>Ceiba Norte</b>	<b>2,946</b>	<b>2,290</b>	<b>77.7%</b>	<b>680</b>	<b>23.1%</b>
Ceiba Sur	1,536	1,030	67.1%	509	33.1%
Gurabo Abajo	1,220	1,014	83.2%	207	17.0%
Gurabo Arriba	142	107	75.1%	41	28.8%
Barrio-pueblo Juncos	775	395	51.0%	380	49.1%
Lirios	1,791	1,230	68.7%	563	31.4%
Mamey	1,508	1,311	86.9%	208	13.8%
Valenciano Abajo	1,167	910	78.0%	260	22.3%
Valenciano Arriba	284	238	84.0%	46	16.1%
<b>Municipality of Juncos</b>	<b>12,243</b>	<b>9,244</b>	<b>75.5%</b>	<b>3,049</b>	<b>24.9%</b>
<b>Puerto Rico</b>	<b>1,510,662</b>	<b>888,755</b>	<b>58.8%</b>	<b>338,284</b>	<b>22.4%</b>

\*Projected by Advantage Business Consulting

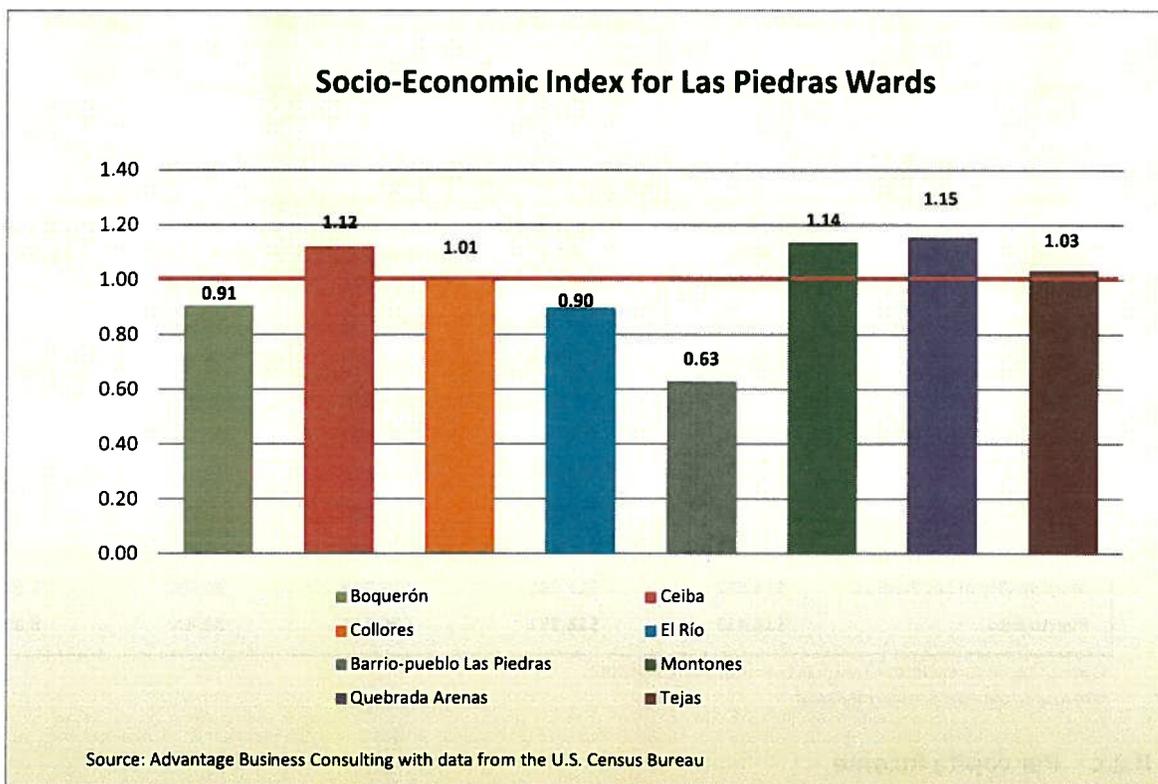
## II.2 Socio-Economic Index: Quebrada Arenas ward, Las Piedras

The Quebrada Arenas ward in Las Piedras is in an even better socioeconomic condition than the Ceiba Norte ward of Juncos. The following table and chart show the socioeconomic index for the eight (8) wards in the municipality of Las Piedras. As may be seen in the table and chart, the ward in the impact area, Quebrada Arenas, has an index value of 1.15, placing it first of eight in socioeconomic ranking and significantly better than the average for the municipality. Like Ceiba Norte in Juncos, this is certainly not a disadvantaged community in its region.

<b>Socio-Economic Index for Las Piedras Wards</b>		
<b><u>Wards</u></b>	<b><u>Index</u></b>	<b><u>Rank</u></b>
Boquerón	0.91	6
Ceiba	1.12	3
Collares	1.01	5
El Río	0.90	7
Barrio-pueblo Las Piedras	0.63	8
Montones	1.14	2
<b>Quebrada Arenas</b>	<b>1.15</b>	<b>1</b>
Tejas	1.03	4
<b>Municipality of Las Piedras</b>	<b>1.00</b>	<b>-</b>

### II.2.a Population

Quebrada Arenas is a medium-size ward in Las Piedras, in terms of population. Between 2000 and 2010 it experienced a 19.3% increase in population, nearly twice as much as the percentage gain in the municipality as a whole. By 2013, the ward is projected to have 5,525 inhabitants.



### Population Growth in the Municipality of Las Piedras

Wards	2000	2010	% Growth 2000-2010	2013*	% Growth 2010-2013
Boquerón	1,930	2,609	35.2%	2,856	9.5%
Ceiba	1,544	2,521	63.3%	2,920	15.8%
Collores	4,647	4,252	-8.5%	4,140	-2.6%
El Río	4,974	4,872	-2.1%	4,842	-0.6%
Barrio-pueblo Las Piedras	1,974	1,880	-4.8%	1,853	-1.5%
Montones	6,024	8,163	35.5%	8,942	9.5%
<b>Quebrada Arenas</b>	<b>4,391</b>	<b>5,240</b>	<b>19.3%</b>	<b>5,525</b>	<b>5.4%</b>
Tejas	9,001	8,609	-4.4%	8,495	-1.3%
<b>Municipality of Las Piedras</b>	<b>34,485</b>	<b>38,146</b>	<b>10.6%</b>	<b>39,573</b>	<b>3.7%</b>
<b>Puerto Rico</b>	<b>3,808,610</b>	<b>3,725,789</b>	<b>-2.2%</b>	<b>3,701,296</b>	<b>-0.7%</b>

Source: US Census Bureau 2000 and 2010

\*Projected by Advantage Business Consulting

## II.2.b Median household income

Median household income in the Quebrada Arenas ward is significantly higher than in the municipality as a whole. In this variable, the ward ranks third among the Las Piedras' eight wards.

<b>Household Median Income</b>					
<b>Wards</b>	<b>Household MI 2000</b>	<b>Household MI 2010</b>	<b>Household MI Estimated 2013*</b>	<b>% Change 2000 / 2010</b>	<b>% Change 2010 / 2013</b>
Boquerón	\$16,359	\$15,417	\$15,145	(5.8)%	(1.8)%
Ceiba	\$13,684	\$16,313	\$17,196	19.2%	5.4%
Collores	\$16,189	\$19,886	\$21,152	22.8%	6.4%
El Río	\$11,686	\$19,853	\$23,274	69.9%	17.2%
Barrio-pueblo Las Piedras	\$6,901	\$9,269	\$10,127	34.3%	9.3%
Montones	\$12,864	\$19,048	\$21,428	48.1%	12.5%
<b>Quebrada Arenas</b>	<b>\$18,859</b>	<b>\$19,614</b>	<b>\$19,846</b>	<b>4.0%</b>	<b>1.2%</b>
Tejas	\$16,285	\$17,202	\$17,487	5.6%	1.7%
<b>Municipality of Las Piedras</b>	<b>\$14,622</b>	<b>\$17,680</b>	<b>\$18,717</b>	<b>20.9%</b>	<b>5.9%</b>
<b>Puerto Rico</b>	<b>\$14,412</b>	<b>\$18,791</b>	<b>\$20,348</b>	<b>30.4%</b>	<b>8.3%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\*Projected by Advantage Business Consulting

## II.2.c Per capita income

In per capita income, the Quebrada Arena ward ranks fourth and is projected to stay in that position by 2013.

<b>Per Capita Income</b>					
<b>Wards</b>	<b>Per Capita Income 2000</b>	<b>Per Capita Income 2010</b>	<b>Per Capita Income 2013*</b>	<b>% Change 2010</b>	<b>% Change 2010 / 2013</b>
Boquerón	\$5,933	\$8,288	\$9,162	39.7%	10.5%
Ceiba	\$6,791	\$10,384	\$11,795	52.9%	13.6%
Collores	\$6,747	\$8,274	\$8,796	22.6%	6.3%
El Río	\$5,020	\$7,519	\$8,488	49.8%	12.9%
Barrio-pueblo Las Piedras	\$4,649	\$4,910	\$4,991	5.6%	1.7%
Montones	\$6,623	\$10,358	\$11,845	56.4%	14.4%
<b>Quebrada Arenas</b>	<b>\$7,567</b>	<b>\$9,161</b>	<b>\$9,702</b>	<b>21.1%</b>	<b>5.9%</b>
Tejas	\$6,786	\$9,861	\$11,031	45.3%	11.9%
<b>Municipality of Las Piedras</b>	<b>\$6,427</b>	<b>\$9,078</b>	<b>\$10,069</b>	<b>41.2%</b>	<b>10.9%</b>
<b>Puerto Rico</b>	<b>\$8,185</b>	<b>\$10,355</b>	<b>\$11,112</b>	<b>26.5%</b>	<b>7.3%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\* Projected by Advantage Business Consulting

## II.2.d Households below the poverty line

In 2000 and 2010, the Quebrada Arena ward had the lowest percentage in Las Piedras of households below the poverty line.

Households Below Poverty Level							
Wards	Households Below Poverty Level 2000			Households Below Poverty Level 2010			% Change
	Households	#	%	Households	#	%	# of Households
Boquerón	598	276	46.2%	730	338	46.3%	22.5%
Ceiba	498	225	45.2%	839	409	48.7%	81.8%
Collones	1,557	689	44.3%	1,258	593	47.1%	-13.9%
El Río	1,526	859	56.3%	1,300	685	52.7%	-20.3%
Barrio-pueblo Las Piedras	715	489	68.4%	599	425	71.0%	-13.1%
Montones	1,998	1,010	50.6%	2,510	1,137	45.3%	12.6%
<b>Quebrada Arenas</b>	<b>1,363</b>	<b>520</b>	<b>38.2%</b>	<b>1,379</b>	<b>590</b>	<b>42.8%</b>	<b>13.5%</b>
Tejas	2,915	1,317	45.2%	2,680	1,175	43.8%	-10.8%
<b>Municipality of Las Piedras</b>	<b>11,170</b>	<b>5,385</b>	<b>48.2%</b>	<b>11,295</b>	<b>5,352</b>	<b>47.4%</b>	<b>-0.6%</b>
<b>Puerto Rico</b>	<b>1,261,816</b>	<b>596,466</b>	<b>47.3%</b>	<b>1,227,039</b>	<b>548,785</b>	<b>44.7%</b>	<b>-8.0%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

Households Below Poverty Level							
Wards	Households Below Poverty Level 2010			Households Below Poverty Level 2013*			% Change
	Households	#	%	Households	#	%	# of Households
Boquerón	730	338	46.3%	775	359	46.3%	6.3%
Ceiba	839	409	48.7%	981	489	49.9%	19.6%
Collones	1,258	593	47.1%	1,180	567	48.0%	(4.4)%
El Río	1,300	685	52.7%	1,239	640	51.7%	(6.6)%
Barrio-pueblo Las Piedras	599	425	71.0%	568	407	71.7%	(4.1)%
Montones	2,510	1,137	45.3%	2,688	1,178	43.8%	3.6%
<b>Quebrada Arenas</b>	<b>1,379</b>	<b>590</b>	<b>42.8%</b>	<b>1,384</b>	<b>613</b>	<b>44.3%</b>	<b>3.9%</b>
Tejas	2,680	1,175	43.8%	2,613	1,135	43.5%	(3.4)%
<b>Municipality of Las Piedras</b>	<b>11,295</b>	<b>5,352</b>	<b>47.4%</b>	<b>11,428</b>	<b>5,389</b>	<b>47.2%</b>	<b>0.7%</b>
<b>Puerto Rico</b>	<b>1,227,039</b>	<b>548,785</b>	<b>44.7%</b>	<b>1,216,794</b>	<b>535,238</b>	<b>44.0%</b>	<b>(2.5)%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\*Projected by Advantage Business Consulting

## II.2.e Households receiving public assistance

The percentage of households receiving public assistance in the Quebrada Arenas ward was only 12.8% in 2000, the lowest in Las Piedras. In 2010, the percentage dropped sharply to 3.7%, and it is projected to decline further to 2.5% in 2013.

Households Receiving Public Assistance							
Barrios	Households	Households with Public Assistance 2000		Households with Public Assistance 2010		% Change	
		#	%	Households	#	%	# of Households
Boquerón	598	119	19.9%	730	61	8.4%	(48.7)%
Ceiba	498	173	34.7%	839	31	3.7%	(82.1)%
Collores	1,557	260	16.7%	1,258	80	6.4%	(69.2)%
El Río	1,526	364	23.9%	1,300	121	9.3%	(66.8)%
Barrio-pueblo Las Piedras	715	246	34.4%	599	145	24.2%	(41.1)%
Montones	1,998	503	25.2%	2,510	70	2.8%	(86.1)%
Quebrada Arenas	1,363	175	12.8%	1,379	51	3.7%	(70.9)%
Tejas	2,915	642	22.0%	2,680	123	4.6%	(80.8)%
Municipality of Las Piedras	11,170	2,482	22.2%	11,295	682	6.0%	(72.5)%
Puerto Rico	1,261,816	253,358	20.1%	1,227,039	66,401	5.4%	(73.8)%

Source: US Census Bureau 2000 and American Community Survey 2006-2010

Households Receiving Public Assistance							
Barrios	Households	Households with Public Assistance 2010		Households with Public Assistance 2013*		% Change	
		#	%	Households	#	%	# of Households
Boquerón	730	61	8.4%	775	50	6.4%	(18.2)%
Ceiba	839	31	3.7%	981	19	1.9%	(40.3)%
Collores	1,258	80	6.4%	1,180	56	4.8%	(29.8)%
El Río	1,300	121	9.3%	1,239	87	7.0%	(28.1)%
Barrio-pueblo Las Piedras	599	145	24.2%	568	124	21.8%	(14.7)%
Montones	2,510	70	2.8%	2,688	39	1.4%	(44.7)%
Quebrada Arenas	1,379	51	3.7%	1,384	35	2.5%	(30.9)%
Tejas	2,680	123	4.6%	2,613	75	2.9%	(39.1)%
Municipality of Las Piedras	11,295	682	6.0%	11,428	484	4.2%	(29.0)%
Puerto Rico	1,227,039	66,401	5.4%	1,216,794	44,433	3.7%	(33.1)%

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\*Projected by Advantage Business Consulting

## II.2.f Households receiving social security benefits

About one-third of households in the Quebrada Arenas ward were receiving social security benefits in 2010, compared to more than 43% for the municipality as a whole. The ward ranked second in this variable in the 2010 census. Little change is projected in this variable for the ward in 2013.

Households Receiving Social Security							
Wards	Households	Households with Social Security 2000		Households with Social Security 2010		% Change	
		#	%	Households	#	%	# of Households
Boquerón	598	204	34.1%	730	313	42.9%	53.4%
Ceiba	498	208	41.8%	839	264	31.5%	26.9%
Collores	1,557	632	40.6%	1,258	509	40.5%	(19.5)%
El Río	1,526	496	32.5%	1,300	641	49.3%	29.2%
Barrio-pueblo Las Piedras	715	275	38.5%	599	309	51.6%	12.4%
Montones	1,998	669	33.5%	2,510	910	36.3%	36.0%
Quebrada Arenas	1,363	485	35.6%	1,379	441	32.0%	(9.1)%
Tejas	2,915	898	30.8%	2,680	1,499	55.9%	66.9%
Municipality of Las Piedras	11,170	3,867	34.6%	11,295	4,886	43.3%	26.4%
Puerto Rico	1,261,816	426,429	33.8%	1,227,039	500,463	40.8%	17.4%

Source: US Census Bureau 2000 and American Community Survey 2006-2010

Households Receiving Social Security							
Wards	Households	Households with Social Security 2010		Households with Social Security 2013*		% Change	
		#	%	Households	#	%	# of Households
Boquerón	730	313	42.9%	775	356	45.9%	13.7%
Ceiba	839	264	31.5%	981	284	28.9%	7.4%
Collores	1,258	509	40.5%	1,180	477	40.4%	(6.3)%
El Río	1,300	641	49.3%	1,239	692	55.9%	8.0%
Barrio-pueblo Las Piedras	599	309	51.6%	568	320	56.3%	3.6%
Montones	2,510	910	36.3%	2,688	998	37.1%	9.7%
Quebrada Arenas	1,379	441	32.0%	1,384	429	31.0%	(2.8)%
Tejas	2,680	1,499	55.9%	2,613	1,748	66.9%	16.6%
Municipality of Las Piedras	11,295	4,886	43.3%	11,428	5,303	46.4%	8.5%
Puerto Rico	1,227,039	500,463	40.8%	1,216,794	525,085	43.2%	4.9%

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\*Projected by Advantage Business Consulting

## II.2.g Unemployment rate

As in Juncos, the Las Piedras municipality experienced an increase in unemployment between 2000 and 2010, owing to the prolonged recession that has plagued Puerto Rico's economy since 2006. The municipality's unemployment rate almost doubled, from 22.5% in 2000 to 40.9% in 2010. The Quebrada Arenas ward also had an increase in unemployment, but it fared better in this respect than all but one of the municipality's eight wards.

<b>Unemployment Rate</b>									
<b>Wards</b>	<b>Labor</b>		<b>Unemployment 2000</b>		<b>Labor</b>		<b>Unemployment 2010</b>		<b>% Change</b>
	<b>Force</b>	<b>Employed</b>	<b>#</b>	<b>Rate</b>	<b>Force</b>	<b>Employed</b>	<b>#</b>	<b>Rate</b>	<b># of Unemployed</b>
Boquerón	593	486	107	18.0%	776	450	326	42.1%	204.9%
Ceiba	430	310	120	27.9%	1,047	501	546	52.1%	354.8%
Collores	1,384	1,061	323	23.3%	1,356	801	555	40.9%	71.8%
El Río	1,411	1,031	380	26.9%	1,785	1,010	775	43.4%	103.9%
Barrio-pueblo Las Piedras	482	320	162	33.6%	520	48	472	90.8%	191.6%
Montones	1,862	1,482	380	20.4%	2,982	1,957	1,025	34.4%	169.7%
<b>Quebrada Arenas</b>	<b>1,317</b>	<b>1,047</b>	<b>270</b>	<b>20.5%</b>	<b>1,881</b>	<b>1,228</b>	<b>653</b>	<b>34.7%</b>	<b>141.8%</b>
Tejas	2,871	2,282	589	20.5%	2,988	1,884	1,104	36.9%	87.4%
<b>Municipality of Las Piedras</b>	<b>10,350</b>	<b>8,019</b>	<b>2,331</b>	<b>22.5%</b>	<b>13,334</b>	<b>7,879</b>	<b>5,455</b>	<b>40.9%</b>	<b>134.0%</b>
<b>Puerto Rico</b>	<b>1,151,863</b>	<b>930,865</b>	<b>220,998</b>	<b>19.2%</b>	<b>1,383,734</b>	<b>894,150</b>	<b>489,584</b>	<b>35.4%</b>	<b>121.5%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

<b>Unemployment Rate</b>									
<b>Wards</b>	<b>Labor</b>		<b>Unemployment 2010</b>		<b>Labor</b>		<b>Unemployment 2013*</b>		<b>% of Change</b>
	<b>Force</b>	<b>Employed</b>	<b>#</b>	<b>Rate</b>	<b>Force</b>	<b>Employed</b>	<b>#</b>	<b>Rate</b>	<b># of Unemployed</b>
Boquerón	776	450	326	42.1%	841	385	456	54.2%	39.7%
Ceiba	1,047	501	546	52.1%	1,367	507	860	62.9%	57.5%
Collores	1,356	801	555	40.9%	1,347	695	653	48.4%	17.6%
El Río	1,785	1,010	775	43.4%	1,915	956	959	50.1%	23.8%
Barrio-pueblo Las Piedras	520	48	472	90.8%	532	0	651	122.3%	37.9%
Montones	2,982	1,957	1,025	34.4%	3,435	2,055	1,380	40.2%	34.7%
<b>Quebrada Arenas</b>	<b>1,881</b>	<b>1,228</b>	<b>653</b>	<b>34.7%</b>	<b>2,093</b>	<b>1,242</b>	<b>851</b>	<b>40.7%</b>	<b>30.3%</b>
Tejas	2,988	1,884	1,104	36.9%	3,024	1,691	1,333	44.1%	20.7%
<b>Municipality of Las Piedras</b>	<b>13,334</b>	<b>7,879</b>	<b>5,455</b>	<b>40.9%</b>	<b>14,554</b>	<b>7,531</b>	<b>7,142</b>	<b>49.1%</b>	<b>30.9%</b>
<b>Puerto Rico</b>	<b>1,151,863</b>	<b>930,865</b>	<b>220,998</b>	<b>19.2%</b>	<b>1,217,016</b>	<b>936,460</b>	<b>280,556</b>	<b>23.1%</b>	<b>26.9%</b>

Source: US Census Bureau and American Community Survey

\* Projected by Advantage Business Consulting

## II.2.h Education: Years of schooling

In 2010, the Quebrada Arenas ward was second only to the Ceiba ward in the percentage of persons 25 years of age and older with a high school degree. The percentage for the ward was seven percentage points higher than for Las Piedras as a whole. In addition, educational attainment as measured by this variable was higher in the Quebrada Arenas ward than the average for all of Puerto Rico.

<b>Persons 25 Years or Older With a High School Degree</b>							
<b>Wards</b>	<b>Population 25 years +</b>	<b>Persons with High School Diploma or more (2000)</b>		<b>Population 25 years +</b>	<b>Persons with High School Diploma or more (2010)</b>		<b>% Change # of Graduated</b>
		<b>#</b>	<b>%</b>		<b>#</b>	<b>%</b>	
Boquerón	1,163	540	46.4%	1,760	836	47.5%	54.8%
Ceiba	924	538	58.2%	1,556	1,210	77.8%	124.9%
Collares	2,872	1,766	61.5%	2,741	1,853	67.6%	4.9%
El Río	2,927	1,363	46.6%	3,158	1,710	54.1%	25.5%
Barrio-pueblo Las Piedras	1,120	493	44.0%	1,138	691	60.7%	40.2%
Montones	3,523	1,874	53.2%	5,023	3,584	71.4%	91.2%
Quebrada Arenas	2,505	1,688	67.4%	3,219	2,336	72.6%	38.4%
Tejas	5,290	3,327	62.9%	5,898	3,850	65.3%	15.7%
<b>Municipality of Las Piedras</b>	<b>20,324</b>	<b>11,589</b>	<b>57.0%</b>	<b>24,493</b>	<b>16,070</b>	<b>65.6%</b>	<b>38.7%</b>
<b>Puerto Rico</b>	<b>2,288,326</b>	<b>1,371,922</b>	<b>60.0%</b>	<b>2,429,729</b>	<b>1,641,529</b>	<b>67.6%</b>	<b>19.7%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

<b>Persons 25 Years or Older With a High School Degree</b>							
<b>Wards</b>	<b>Population 25 years +</b>	<b>Persons with High School Diploma or more (2010)</b>		<b>Population 25 years +</b>	<b>Persons with High School Diploma or more (2013)*</b>		<b>% of Change # of Graduated</b>
		<b>#</b>	<b>%</b>		<b>#</b>	<b>%</b>	
Boquerón	1,760	836	47.5%	1,993	953	47.8%	14.0%
Ceiba	1,556	1,210	77.8%	1,819	1,543	84.8%	27.5%
Collares	2,741	1,853	67.6%	2,703	1,880	69.6%	1.5%
El Río	3,158	1,710	54.1%	3,231	1,830	56.7%	7.0%
Barrio-pueblo Las Piedras	1,138	691	60.7%	1,143	765	66.9%	10.7%
Montones	5,023	3,584	71.4%	5,587	4,354	77.9%	21.5%
<b>Quebrada Arenas</b>	<b>3,219</b>	<b>2,336</b>	<b>72.6%</b>	<b>3,471</b>	<b>2,575</b>	<b>74.2%</b>	<b>10.2%</b>
Tejas	5,898	3,850	65.3%	6,094	4,022	66.0%	4.5%
<b>Municipality of Las Piedras</b>	<b>24,493</b>	<b>16,070</b>	<b>65.6%</b>	<b>26,041</b>	<b>17,922</b>	<b>68.8%</b>	<b>11.5%</b>
<b>Puerto Rico</b>	<b>2,429,729</b>	<b>1,641,529</b>	<b>67.6%</b>	<b>2,473,830</b>	<b>1,732,305</b>	<b>70.0%</b>	<b>5.5%</b>

Source: US Census Bureau and American Community Survey

\*Projected by Advantage Business Consulting

<b>Persons 25 Years or Older With At Least a Seventh Grade Education</b>							
<b>Wards</b>	<b>Seventh Grade</b>			<b>Seventh Grade</b>			<b>% Change # of Graduated</b>
	<b>Population</b>	<b>Education or More (2000)</b>		<b>Population</b>	<b>Education or More (2010)</b>		
	<b>25 years +</b>	<b>#</b>	<b>%</b>	<b>25 years +</b>	<b>#</b>	<b>%</b>	
Boquerón	1,163	864	74.3%	1,760	1,314	74.7%	52.1%
Ceiba	924	754	81.6%	1,556	1,503	96.6%	99.3%
Collores	2,872	2,420	84.3%	2,741	2,384	87.0%	(1.5)%
El Río	2,927	2,133	72.9%	3,158	2,351	74.4%	10.2%
Barrio-pueblo Las Piedras	1,120	834	74.5%	1,138	994	87.3%	19.2%
Montones	3,523	2,685	76.2%	5,023	4,244	84.5%	58.1%
<b>Quebrada Arenas</b>	<b>2,505</b>	<b>2,199</b>	<b>87.8%</b>	<b>3,219</b>	<b>2,830</b>	<b>87.9%</b>	<b>28.7%</b>
Tejas	5,290	4,257	80.5%	5,898	4,789	81.2%	12.5%
<b>Municipality of Las Piedras</b>	<b>20,324</b>	<b>16,146</b>	<b>79.4%</b>	<b>24,493</b>	<b>20,409</b>	<b>83.3%</b>	<b>26.4%</b>
<b>Puerto Rico</b>	<b>2,288,326</b>	<b>1,867,257</b>	<b>81.6%</b>	<b>2,429,729</b>	<b>2,041,547</b>	<b>84.0%</b>	<b>9.3%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

<b>Persons 25 Years or Older With At Least a Seventh Grade Education</b>							
<b>Wards</b>	<b>Seventh Grade</b>			<b>Seventh Grade</b>			<b>% of Change # of Graduated</b>
	<b>Population</b>	<b>Education or More (2010)</b>		<b>Population</b>	<b>Education or More (2013)*</b>		
	<b>25 years +</b>	<b>#</b>	<b>% Percentage</b>	<b>25 years +</b>	<b>#</b>	<b>% Percentage</b>	
Boquerón	1,760	1,314	74.7%	1,993	1,490	74.8%	13.4%
Ceiba	1,556	1,503	96.6%	1,819	1,849	101.6%	23.0%
Collores	2,741	2,384	87.0%	2,703	2,373	87.8%	(0.4)%
El Río	3,158	2,351	74.4%	3,231	2,421	74.9%	3.0%
Barrio-pueblo Las Piedras	1,138	994	87.3%	1,143	1,048	91.6%	5.4%
Montones	5,023	4,244	84.5%	5,587	4,869	87.1%	14.7%
<b>Quebrada Arenas</b>	<b>3,219</b>	<b>2,830</b>	<b>87.9%</b>	<b>3,471</b>	<b>3,052</b>	<b>88.0%</b>	<b>7.9%</b>
Tejas	5,898	4,789	81.2%	6,094	4,961	81.4%	3.6%
<b>Municipality of Las Piedras</b>	<b>24,493</b>	<b>20,409</b>	<b>83.3%</b>	<b>26,041</b>	<b>22,063</b>	<b>84.7%</b>	<b>8.1%</b>
<b>Puerto Rico</b>	<b>2,429,729</b>	<b>2,041,547</b>	<b>84.0%</b>	<b>2,473,830</b>	<b>2,096,940</b>	<b>84.8%</b>	<b>2.7%</b>

Source: US Census Bureau and American Community Survey

\*Projected by Advantage Business Consulting

## II.2.i Value of housing

The Quebrada Arenas ward experienced small growth in the number of households and housing units between the 2000 and 2010 censuses. The limited growth in the number of new housing units may explain why the ward didn't experience as much appreciation in the median value of housing during that decade as other wards in Las Piedras.

<b>Households</b>					
<b>Wards</b>	<b>Households 2000</b>	<b>Households 2010</b>	<b>Households 2013*</b>	<b>% Change 2000/2010</b>	<b>% Change 2010 / 2013</b>
Boquerón	785	899	936	14.5%	4.2%
Ceiba	538	972	1,161	80.7%	19.4%
Collores	1,731	1,570	1,525	(9.3)%	(2.9)%
El Río	1,754	1,574	1,524	(10.3)%	(3.2)%
Barrio-pueblo Las Piedras	859	831	823	(3.3)%	(1.0)%
Montones	2,180	2,800	3,018	28.4%	7.8%
<b>Quebrada Arenas</b>	<b>1,494</b>	<b>1,611</b>	<b>1,648</b>	<b>7.8%</b>	<b>2.3%</b>
Tejas	3,080	3,249	3,301	5.5%	1.6%
<b>Municipality of Las Piedras</b>	<b>12,421</b>	<b>13,506</b>	<b>13,936</b>	<b>8.7%</b>	<b>3.2%</b>
<b>Puerto Rico</b>	<b>1,418,476</b>	<b>1,474,026</b>	<b>1,491,111</b>	<b>3.9%</b>	<b>1.2%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\*Projected by Advantage Business Consulting

<b>Median Value of Housing Units</b>					
<b>Wards</b>	<b>Median Value 2000</b>	<b>Median Value 2010</b>	<b>Median Value 2013*</b>	<b>% Change 2000/2010</b>	<b>% Change 2010 / 2013</b>
Boquerón	\$66,200	\$105,000	\$120,584	58.6%	14.8%
Ceiba	\$72,500	\$168,200	\$216,507	132.0%	28.7%
Collores	\$71,800	\$122,200	\$143,336	70.2%	17.3%
El Río	\$57,100	\$106,600	\$128,556	86.7%	20.6%
Barrio-pueblo Las Piedras	\$45,300	\$89,600	\$109,944	97.8%	22.7%
Montones	\$72,500	\$114,500	\$131,324	57.9%	14.7%
<b>Quebrada Arenas</b>	<b>\$78,100</b>	<b>\$113,400</b>	<b>\$126,824</b>	<b>45.2%</b>	<b>11.8%</b>
Tejas	\$75,500	\$112,900	\$127,385	49.5%	12.8%
<b>Municipality of Las Piedras</b>	<b>\$70,400</b>	<b>\$114,400</b>	<b>\$132,337</b>	<b>62.5%</b>	<b>15.7%</b>
<b>Puerto Rico</b>	<b>\$77,000</b>	<b>\$112,600</b>	<b>\$126,198</b>	<b>46.2%</b>	<b>12.1%</b>

Source: US Census Bureau 2000 and American Community Survey 2006-2010

\*Projected by Advantage Business Consulting

## II.2.j Housing with substandard conditions

In 2010, the Quebrada Arenas ward had the lowest incidence of substandard housing conditions in Las Piedras, with 43.8% of units presenting one or two such conditions. For the municipality as a whole, the percentage was 50.6%. It is noteworthy that the ward improved in this respect between 2000 and 2010, whereas the municipality and several of its wards were set back.

<b>Housing With Substandard Conditions - 2000</b>			
<b>Wards</b>	<b>Housing Units</b>	<b>Housing with one or two conditions</b>	<b>%</b>
Boquerón	624	290	46.5%
Ceiba	500	219	43.8%
Collones	1,573	569	36.2%
El Río	1,499	577	38.5%
Barrio-pueblo Las Piedras	716	337	47.1%
Montones	1,997	691	34.6%
<b>Quebrada Arenas</b>	<b>1,375</b>	<b>647</b>	<b>47.1%</b>
Tejas	2,861	1,149	40.2%
<b>Municipality of Las Piedras</b>	<b>11,145</b>	<b>4,479</b>	<b>40.2%</b>
<b>Puerto Rico</b>	<b>1,261,325</b>	<b>576,082</b>	<b>45.7%</b>

Source: US Census Bureau

<b>Housing With Substandard Conditions - 2010</b>			
<b>Wards</b>	<b>Housing Units</b>	<b>Housing with one or two conditions</b>	<b>%</b>
Boquerón	730	408	55.9%
Ceiba	839	433	51.6%
Collones	1,258	677	53.8%
El Río	1,300	677	52.1%
Barrio-pueblo Las Piedras	599	383	63.9%
Montones	2,510	1,351	53.8%
<b>Quebrada Arenas</b>	<b>1,379</b>	<b>604</b>	<b>43.8%</b>
Tejas	2,680	1,179	44.0%
<b>Municipality of Las Piedras</b>	<b>11,295</b>	<b>5,712</b>	<b>50.6%</b>
<b>Puerto Rico</b>	<b>1,227,039</b>	<b>519,871</b>	<b>42.4%</b>

Source: American Community Survey 2006-2010

<b>Housing With Substandard Conditions - 2013*</b>			
<b>Wards</b>	<b>Housing Units</b>	<b>Housing with one or two conditions</b>	<b>%</b>
Boquerón	765	452	59.1%
Ceiba	980	531	54.2%
Collares	1,176	713	60.6%
El Río	1,246	710	57.0%
Barrio-pueblo Las Piedras	568	398	70.1%
Montones	2,688	1,652	61.5%
<b>Quebrada Arenas</b>	<b>1,380</b>	<b>592</b>	<b>42.9%</b>
Tejas	2,628	1,188	45.2%
<b>Municipality of Las Piedras</b>	<b>11,431</b>	<b>6,237</b>	<b>54.6%</b>
<b>Puerto Rico</b>	<b>1,216,936</b>	<b>504,103</b>	<b>41.4%</b>

\*Projected by Advantage Business Consulting

## II.2.k Housing tenure

The Quebrada Arenas ward has a very high rate of homeownership, with about 85% of housing units occupied by owners in the decade between 2000 and 2010.

<b>Housing Tenure - 2000</b>					
<b>Wards</b>	<b>Housing Units</b>	<b>Owner Occupied</b>		<b>Renter Occupied</b>	
		<b>Units</b>	<b>% of Total</b>	<b>Units</b>	<b>% of Total</b>
Boquerón	624	575	92.1%	49	7.9%
Ceiba	500	407	81.4%	93	18.6%
Collares	1,573	1,284	81.6%	289	18.4%
El Río	1,499	1,217	81.2%	282	18.8%
Barrio-pueblo Las Piedras	716	390	54.5%	326	45.5%
Montones	1,997	1,481	74.2%	516	25.8%
<b>Quebrada Arenas</b>	<b>1,375</b>	<b>1,169</b>	<b>85.0%</b>	<b>206</b>	<b>15.0%</b>
Tejas	2,861	2,180	76.2%	681	23.8%
<b>Municipality of Las Piedras</b>	<b>11,145</b>	<b>8,703</b>	<b>78.1%</b>	<b>2,442</b>	<b>21.9%</b>
<b>Puerto Rico</b>	<b>1,261,325</b>	<b>919,711</b>	<b>72.9%</b>	<b>341,614</b>	<b>27.1%</b>

Source: US Census Bureau

<b>Housing Tenure - 2010</b>					
<b>Wards</b>	<b>Housing</b>	<b>Owner Occupied</b>		<b>Renter Occupied</b>	
	<b>Units</b>	<b>Units</b>	<b>% of Total</b>	<b>Units</b>	<b>% of Total</b>
Boquerón	730	595	81.5%	135	18.5%
Ceiba	839	631	75.2%	208	24.8%
Collores	1,258	907	72.1%	351	27.9%
El Río	1,300	1,002	77.1%	298	22.9%
Barrio-pueblo Las Piedras	599	259	43.2%	340	56.8%
Montones	2,510	1,911	76.1%	599	23.9%
<b>Quebrada Arenas</b>	<b>1,379</b>	<b>1,181</b>	<b>85.6%</b>	<b>198</b>	<b>14.4%</b>
Tejas	2,680	2,083	77.7%	597	22.3%
<b>Municipality of Las Piedras</b>	<b>11,295</b>	<b>8,569</b>	<b>75.9%</b>	<b>2,726</b>	<b>24.1%</b>
<b>Puerto Rico</b>	<b>1,227,039</b>	<b>888,755</b>	<b>72.4%</b>	<b>338,284</b>	<b>27.6%</b>

Source: American Community Survey 2006-2010

<b>Housing Tenure - 2013*</b>					
<b>Wards</b>	<b>Housing</b>	<b>Owner Occupied</b>		<b>Renter Occupied</b>	
	<b>Units</b>	<b>Units</b>	<b>% of Total</b>	<b>Units</b>	<b>% of Total</b>
Boquerón	765	601	78.6%	183	23.9%
Ceiba	980	720	73.4%	265	27.0%
Collores	1,176	817	69.5%	372	31.6%
El Río	1,143	891	78.0%	253	22.1%
Barrio-pueblo Las Piedras	467	165	35.3%	395	84.6%
Montones	1,143	891	78.0%	253	22.1%
<b>Quebrada Arenas</b>	<b>467</b>	<b>165</b>	<b>35.3%</b>	<b>395</b>	<b>84.6%</b>
Tejas	2,413	1,837	76.1%	576	23.9%
<b>Municipality of Las Piedras</b>	<b>8,554</b>	<b>6,087</b>	<b>71.2%</b>	<b>2,692</b>	<b>31.5%</b>
<b>Puerto Rico</b>	<b>1,216,936</b>	<b>879,673</b>	<b>72.3%</b>	<b>337,291</b>	<b>27.7%</b>

\*Projected by Advantage Business Consulting

<b>Variables Included In the Socioeconomic Index</b>	
<b><i>Directly Related to Socioeconomic Status</i></b>	<b><i>Inversely Related to Socioeconomic Status</i></b>
Household Median Income Per Capita Income 25 Years+ With High School Degree 25 Years+ With At Least Seventh Grade Housing Tenure Housing Units Median Value	Housing With Substandard Conditions Households Below Poverty Level Households Receiving Public Assistance Households Receiving Social Security Unemployment Rate

**Data from the US Census Bureau 2000 and the American Community Survey 2006-2010**



Apéndice K – Carta Comentarios Municipio de Juncos





ESTADO LIBRE ASOCIADO DE PUERTO RICO  
**MUNICIPIO AUTÓNOMO DE JUNCOS**  
*Oficina de Ordenación Territorial y Planificación-CRIM*



Hon. Alfredo Alejandro Carrión  
Alcalde

Tel (787) 713-1922 / 713-2315 Fax (787) 713-0862

Susan Polliza Velázquez  
Directora

22 de agosto de 2012

**SR. SEBASTIAN BANUCHI**

Director

*Planificación y Protección Ambiental*

**Autoridad de Energía Eléctrica de Puerto Rico**

PO Box 364267

San Juan, Puerto Rico 00936-4267

**RE: PROYECTO DE ENERGIA SOLAR NRG  
VIABILIDAD DE LA RUTA DE INTERCONEXION DE NRG**

Estimado señor Banuchi:

Reciba un saludo cordial de todos los que laboramos en el Municipio Autónomo de Juncos, el cual me honro en dirigir.

El propósito de esta carta es para comentar sobre la viabilidad de la ruta de interconexión que está siendo explorada por NRG Solar Caribe, LLC, para el desarrollo de un proyecto de energía solar de 52 MW de AC que se estaría desarrollando sobre una propiedad, localizada en el Sector Santana del barrio Ceiba Norte del Municipio Autónomo de Juncos. El Municipio Autónomo de Juncos, ha evaluado el proyecto y apoya los esfuerzos de NRG para desarrollar el mismo.

NRG le ha informado al Municipio que, como parte del desarrollo del Proyecto, tiene la intención de utilizar las carreteras identificadas como PR-935 y la PR-31 para llevar la línea de transmisión ("gen-tie") del Proyecto a la Central de Transmisión de Juncos, ubicada en la Carretera PR-31, cerca de la Carretera PR-189. NRG tiene la intención de construir una línea de transmisión bajo tierra a través de la ruta delineada y, en apoyo a este esfuerzo, el municipio le ha proporcionado a NRG todos los mapas y datos necesarios sobre la infraestructura existente subterránea en las tres alternativas de las rutas propuestas que han sido evaluadas por NRG y el Departamento de Planificación. El Municipio está de acuerdo con la ruta identificada por NRG y entiende que es factible el que NRG construya la línea de transmisión dentro de la ruta seleccionada entre la PR-31 y la PR-935.

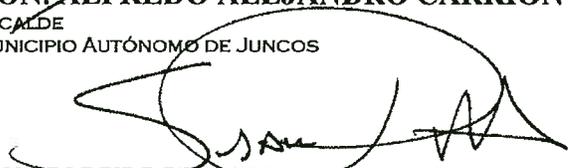
El Municipio autoriza a NRG a diligenciar la obtención de los permisos y/o derechos necesarios para la construcción de la línea de transmisión a través de la ruta propuesta y asistirá a NRG en sus esfuerzos para obtener los permisos correspondientes para este proyecto.

*"Juntos, por el futuro de Juncos"*

En la eventualidad de que la Autoridad de Energía Eléctrica y/o las demás agencias aquí notificadas necesiten alguna información adicional de parte del Municipio con respecto a este proyecto, se pueden comunicar a la Oficina de Ordenación Territorial y Planificación del Municipio Autónomo de Juncos al (787) 713-1922/2315. Nos encontramos en la mejor disposición de poder servirles.

Cordialmente,

  
**HON. ALFREDO ALEJANDRO CARRION**  
ALCALDE  
MUNICIPIO AUTÓNOMO DE JUNCOS

  
**SUSAN PULLIZA VELAZQUEZ, B.S.I.E., M.E.M.**  
DIRECTORA  
ORDENACIÓN TERRITORIAL Y PLANIFICACIÓN

CC: JOSÉ LUIS VALENZUELA  
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