Hojarasca	43%
Helecho de pozo	2%
Helecho común	55%
Sub-Parcela D_2 (2 x 0.5 m)	
% estimado de cobertura en el suelo	
Hojarasca	**87%**
Orquídea terrestre	13%
Sub-Parcela D_3 (2 x 0.5 m)	
% estimado de cobertura en el suelo	
Hojarasca	5%
Gengibre	95%
Sub-Parcela D_4 (2 x 0.5 m)	
% estimado de cobertura en el suelo	
Hojarasca	75%
Plántulas de Camasey	25%
Sub-Parcela D_5 (2 x 0.5 m)	
% estimado de cobertura en el suelo	
Hojarasca	90%
Rabo de rata	10%
Sub-Parcela D_6 (2 x 0.5 m)	
% estimado de cobertura en el suelo	
Hojarasca	93%
Higuillo	7%
Sub-Parcela D_7 (2 x 0.5 m)	
% estimado de cobertura en el suelo	
Hojarasca	35%
Helecho común	55%
Plántulas de quiebra-hacha	10%
Sub-Parcela D_8 (2 x 0.5 m)	
% estimado de cobertura en el suelo	
Hojarasca	94%
Plántulas de María	6%
Sub-Parcela D_9 (2 x 0.5 m)	
% estimado de cobertura en el suelo	
Hojarasca	72%
Plántulas de Palma real	18%
Plántulas de Laurel	10%
Sub-Parcela D_{10} (2 x 0.5 m)	

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% estimado de cobertura en el suelo	
Hojarasca	51%
Plántulas de Mata-ratón	4%
Jengibre	45%

Tabla 4. Parcela 4

Parcela 4A (50 x 20 m)			
Especie	**Diámetro (cm)**	**Altura (pies)**	**Condición**
Guarea guidonia	10	20	B
Zanthoxylum martinicense	26	32	B
Cupania americana	30 MT	25	B
Guarea guidonia	12	25	B
Guarea guidonia	10 MT	20	B
Mangifera indica	30 MT	25	B
Guarea guidonia	10	25	B
Guarea guidonia	10	20	B
Guarea guidonia	11	22	B
Guarea guidonia	12	23	B
Guarea guidonia	10	22	B
Guarea guidonia	12	22	P
Guarea guidonia	12	21	B
Guarea guidonia	12	20	P
Guarea guidonia	13	25	R
Guarea guidonia	14	25	B
Guarea guidonia	12	23	B
Guarea guidonia	12	22	R
Guarea guidonia	10	23	B
Guarea guidonia	10	26	R
Guarea guidonia	11	25	B
Guarea guidonia	12	20	R
Guarea guidonia	11	26	B
Guarea guidonia	11	26	P
Guarea guidonia	10	25	B
Guarea guidonia	13	21	P
Guarea guidonia	12	25	B

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Guarea guidonia	11	23	P
Guarea guidonia	12	25	B
Guarea guidonia	12	26	B
Guarea guidonia	13	24	B
Guarea guidonia	12	25	B
Guarea guidonia	13	20	B
Cupania americana	30 MT	25	B
Cupania americana	29 MT	20	B
Cupania americana	30	21	B
Cupania americana	30	25	B
Cupania americana	28	23	B
Cupania americana	28	26	B
Cupania americana	29	23	B
Cupania americana	23	25	B
Cupania americana	29	24	B
Mangifera indica	30	30	B
Mangifera indica	29	25	B
Mangifera indica	28	25	B
Mangifera indica	29	23	B
Mangifera indica	30	22	B
Mangifera indica	26 MT	26	B
Mangifera indica	25	30	B
Mangifera indica	26	20	B
Mangifera indica	26	25	P
Zanthoxylum martinicense	26	23	B
Zanthoxylum martinicense	26	32	B
Zanthoxylum martinicense	25	32	R
Zanthoxylum martinicense	26	30	B
Zanthoxylum martinicense	25	31	R
Zanthoxylum martinicense	24	25	B
Zanthoxylum martinicense	24	26	R
Zanthoxylum martinicense	23	28	B

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Zanthoxylum martinicense	25	28	P
% estimado de cobertura del dosel			
Guarea guidonia		50%	
Mangifera indica		16.7%	
Zanthoxylum martinicense		16.7%	
Cupania americana		16.7%	
Sub-Parcela B (20 x 5m)			
Especie	**Diámetro (cm)**	**Altura (pies)**	**Condición**
Guarea guidonia	7	22	B
Guarea guidonia	8 MT	20	B
Guarea guidonia	6	18	B
Guarea guidonia	8 MT	16	B
Guarea guidonia	6 MT	13	B
Guarea guidonia	6	12	B
Guarea guidonia	5	20	B
Guarea guidonia	6	15	B
Guarea guidonia	8	20	B
Guarea guidonia	6	20	P
Cupania americana	6	25	B
Guarea guidonia	8	20	R
Guarea guidonia	6	25	B
Cupania americana	6	20	B
Cupania americana	6	20	R
Guarea guidonia	8	22	B
Guarea guidonia	8	17	R
Zanthoxylum martinicense	5	18	R
Guarea guidonia	8	20	B
Sub-Parcela C_1 (5 x 2 m)			
Especie	**Diámetro (cm)**	**Altura (pies)**	**Condición**
Guarea guidonia	3	15	B
Sub-Parcela C_2 (5 x 2 m)			
Especie	**Diámetro (cm)**	**Altura (pies)**	**Condición**
Cupania americana	4	14	R

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Guarea guidonia	3	14	B
Sub-Parcela D_1 (2 x 0.5 m)			
% estimado de cobertura en el suelo			
Hojarasca	65%		
Orquídea Angelito del cafetal	35%		
Sub-Parcela D_2 (2 x 0.5 m)			
% estimado de cobertura en el suelo			
Hojarasca	80%		
Bejuco de puerco	15%		
Bromelia	5%		
Sub-Parcela D_3 (2 x 0.5 m)			
% estimado de cobertura en el suelo			
Hojarasca	17%		
Helecho común	83%		
Sub-Parcela D_4 (2 x 0.5 m)			
% estimado de cobertura en el suelo			
Hojarasca	80%		
Bambuilla	20%		
Sub-Parcela D_5 (2 x 0.5 m)			
% estimado de cobertura en el suelo			
Hojarasca	56%		
Helecho común	40%		
Nidos de gungulen	4%		
Sub-Parcela D_6 (2 x 0.5 m)			
% estimado de cobertura en el suelo			
Hojarasca	85%		
Bejuco de puerco	15%		
Sub-Parcela D_7 (2 x 0.5 m)			
% estimado de cobertura en el suelo			
Hojarasca	59%		
Orquídea angelito del cafetal	6%		
Cohitre	35%		
Sub-Parcela D_8 (2 x 0.5 m)			
% estimado de cobertura en el suelo			
Hojarasca	75%		
Plántulas de Laurel espada	10%		
Orquídea africana	15%		
Sub-Parcela D_9 (2 x 0.5 m)			

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% estimado de cobertura en el suelo	
Hojarasca	90%
Plántulas de Mata-ratón	10%
Sub-Parcela D_{10} (2 x 0.5 m)	
% estimado de cobertura en el suelo	
Hojarasca	55%
Plántulas de Camasey	45%

En este estudio se documentaron un total de 273 árboles con diámetro mayor de 10 cm. en unos 4,000 metros cuadrados. De esta manera se estimaría que existe un total de 269 árboles por cuerda para este predio. Adicionalmente, se observaron otras especies arbóreas y arbustivas comunes y de amplia distribución, aunque la ocurrencia de éstas no coincidió con las cuatro parcelas que se realizaron, sino que se documentaron como flora de la finca en general y de las zonas colindantes a la quebrada que existe dentro del predio (**véase Tablas 5 y 6**). De las especies no documentadas en las cuatro parcelas se observaron siete (7) especies de árboles y arbustos en su mayoría de amplia distribución; dos (2) especies de herbáceas, una (1) especie de pasto y una (1) especie de bejuco. Además, como era de esperarse en el estudio de fauna lo que se observó con mayor frecuencia fue avifauna. En el área de estudio se observaron veintiocho (28) especies de aves residentes comunes. En el caso de los reptiles, anfibios y mamíferos se observaron siete (7) especies de reptiles, cuatro (4) especies de anfibios y tres (3) especies de mamíferos. En cuanto a artrópodos terrestres se identificaron cuatro (4). No se identificaron especies vulnerables o en peligro de extinción en el área de estudio.

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Tabla 5. Resumen de Flora en General

Finca en general			
Familia	**Nombre científico**	**Nombre común**	**Hábito**
Anacardiaceae	*Mangifera indica* L.	Mangó	A
Araceae	*Anthurium crenatum* (L.) Kunth	Rabo de rata	H
	Colocasia esculenta (L.)	Malanga	H
Arecaceae	*Roystonea borinquena* O.F. Cook	Palma real	A
Bignonaceae	*Spathodea campanulata* Beauv.	Tulipán africano	A
	Tabebuia heterophylla (DC.) Britton	Roble nativo	A
Boragináceae	*Cordia alliodora* (Ruiz & Pav)	Capá prieto	A
	Cordia sulcata DC.	Moral	A
Bromeliaceae	*Tillandsia recurvata* L.	Nidos de gungulén	Br
Bromeliaceae	*Tillandsia setaceae* Sw.	Bromelia	Br
Clusiaceae	*Calophyllum calaba* Jacq., non L.	María	A
	Clusia rosea Jacq.	Cupey	A
Commelinaceae	*Commelina elegans* Kunth	Cohitre	H
Convolvulaceae	*Ipomoea tiliaceae* (Willd.)	Bejuco de Puerco	B
Flacourtiaceae	*Casearia sylvestris* Sw.	Cafeillo	A
Lauraceae	*Ocotea floribunda* (Sw.) Mez.	Laurel	A
Leguminosae	*Gliricidia sepium* (Jacq.) Kunth ex Walp.	Mata-ratón	A

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Melastomataceae	*Heterotrichum cymosum* (Wendl.) Urban	Camasey peludo	A
	Miconia prasina (Sw.) DC	Camasey	A
Meliaceae	*Guarea guidonea* (L.) Sleumer	Guaraguao	A
Mimosoideae	*Mimosa ceratonia* L.	Zarza	B
Mimosoideae	*Mimosa pudica* L.	Moriviví	H
Mirtaceae	*Eugenia procera* (Sw.) Poir.	Hoja menuda	A
Moraceae	*Cecropia Schreberiana* Miq.	Yagrumo Hembra	A
Orchidaceae	*Oeceoclades maculate* Lindley	Orquidea terrestre	Or
Orchidaceae	*Tolumnia variegata* (Sw.) Braem	Angelito del Cafetal	Or
Piperaceae	*Piper aduncum* L.	Higuillo	Ar
Poaceae	*Arthrostylidium sarmentosum* Pilg.	Bambuilla	P
Pteridaceae	*Adiantum pyramidale* L. Willd	Helecho de Pozo	He
	Anopteris sp. Prantl ex Diels	Helecho común	He
Rutaceae	*Zanthoxylum martinicense* (Lam.) DC.	Espino rubial	A
Sapindaceae	*Cupania americana* L.	Guara	A
Solanaceae	*Solanum torvum Sw.*	Berenjena cimarrona	Ar
Verbenaceae	*Petitia domingensis Jacq.*	Capá blanco	A
Zingiberaceae	*Renealmia alpina* L.f.	Gengibre	H

Abreviatura de Estado

A= Árbol Ar= Arbusto B= Bejuco Br= Bromelia H= Herbácea
P= Pastos Pl= Palma Or=Orquídea

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Tabla 6. Resumen de Flora en áreas colindantes a la quebrada

Vegetación colindante a la quebrada			
Familia	**Nombre científico**	**Nombre común**	**Hábito**
Araceae	*Colocasia esculenta (L.)*	Malanga	H
Araliaceae	*Schefflera morototonii* (Aubl.) Maguire, Steyermark & Frodin	Yagrumo Macho	A
Bombaceae	*Ochroma pyramidale* (Cav.) Urban	Guano	A
Bromeliaceae	*Tillandsia setaceae* Sw.	Bromelia	Br
Commelinaceae	*Commelina elegans* Kunth	Cohitre	H
Convolvulaceae	*Ipomoea tiliaceae* (Willd.)	Bejuco de Puerco	B
Fabaceae	*Gliricidia sepium* (Jacq.) Kunth ex Walp.	Mata-ratón	A
Melastomataceae	*Miconia prasina* (Sw.) DC	Camasey	A
Meliaceae	*Guarea guidonea* (L.) Sleumer	Guaraguao	A
Moraceae	*Cecropia Schreberiana* Miq.	Yagrumo Hembra	A
Orchidaceae	*Oeceoclades maculate* Lindley	Orquidea terrestre	Or
Piperaceae	*Piper aduncum* L.	Higuillo	Ar
Poaceae	*Arthrostylidium sarmentosum* Pilg.	Bambuilla	H
	Bambusa vulgaris Schrad. ex J.C. Wendl.	Bambú	P
Sapindaceae	*Cupania americana* L.	Guara	A
	Thouinia striata Radlk.	Quiebra-hacha	A
Solanaceae	*Solanum torvum*	Berenjena	Ar

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	Sw.	cimarrona	
Zingiberaceae	*Renealmia alpina* L.f.	Gengibre	H

Abreviatura de Estado

A= Árbol Ar= Arbusto B= Bejuco Br= Bromelia H= Herbácea
P= Pastos Pl= Palma Or=Orquídea

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Tabla 7. Resumen de Fauna

Fauna			
Familia	**Nombre Científico**	**Nombre Común**	**Estado**
Aves			
Accipitridae	*Buteo jamaicensis*	Guaraguao	C
Columbidae	*Columba squamosa*	Paloma turca	C
	Columbina passerina	Rolita	C
	Zenaida asiatica	Tórtola aliblanca	C
	Zenaida aurita	Tórtola cardosantera	C
Cuculidae	*Crotophaga ani*	Judío	C
	Coccyzus minor	Pájaro bobo menor	C
	Saurothera vieilloti	Pájaro bobo mayor	C, E
Emberizidae	*Coereba flaveola*	Reina común	C
	Loxigilla portoricensis	Comeñame	C, E
	Quiscalus Níger	Chango	C
	Spindalis portoricensis	Reina Mora	C, E
	Tiaris bicolor	Chamorro Prieto	C
	Tiaris oliviacea	Gorrión	C
Estrildidae	*Estrilda melpoda*	Veterano	C, Ex
	Lonchura punctulata	Gorrión Canela	C, Ex
Falconidae	*Falco spaverius*	Falcón común	C
Mimidae	*Margarops fuscastus*	Zorzal	C
	Mimus polyglottos	Ruiseñor	C
Muscicapidae	*Turdus plumbeus*	Zorzal de patas coloradas	C
Picidae	*Melanerpes portoricensis*	Carpintero	C, E
Todidae	*Todus mexicanus*	San Pedrito	C, E
Trochilidae	*Anthracothorax vidris*	Zumbador verde	C, E
	Chlorostibon maugaeus	Zumbadorcito de Puerto Rico	C, E
Tyrannidae	*Tyrannus dominicensis*	Pitirre	C
	Myiarchus antillarum	Jui	C, E
Vireonidaae	*Vireo altiloqus*	Julián Chiví	C, M
	Vireo latimeri	Bien-te-veo	C, E
Reptiles			
Colubridae	*Alsophis portoricensis*	Culebrita de jardín	C, E
Polychrotidae	*Anolis cristatellus*	Lagartijo común	C

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	Anolis krugii	Lagartijo	C
	Anolis gundlachii	Lagartijo	C
	Anolis pulchellus	Lagartijo jardinero	C
	Anolis stratulus	Lagartijo manchado	C
Teiidae	*Ameiva exsul*	Siguana	C
Anfibios			
Bufonidae	*Bufo marino*	Sapo común	C, Ex
Leptodactylidae	*Eleutherodactylus coqui*	Coquí Común	C, E
	Eleutheorodactylus antillensis	Churrí	C, E
	Leptodactylus albilabris	Ranita de labio blanco	C, E
Mamíferos			
	Herpestes javanicus	Mangosta	C
	Mus musculus	Arriero	C
Phyllostomidae	*Artibeus jamaicensis*	Murciélago Frutero	C
Artrópodos Acuáticos			
Pseodothelphusidea	*Epilobocera sinuatifrons*	Buruquena	C

Abreviatura de Estado
C = Común E = Endémico Ex = Exótico

9. Impacto sobre la Flora y la Fauna

La flora y fauna presente en el área de estudio es típica de la región Central de Puerto Rico. La variedad de especies es limitada y está compuesta mayormente por especies de amplia distribución. Estas especies se adaptan fácilmente a su entorno e inclusive pueden coexistir en áreas desarrolladas. Ninguna especie listada como protegida o en peligro de extinción se verá afectada por el desarrollo de este proyecto (**véase Anejo 6. Environmental Sensitivity Index**).

El proyecto según diseñado tampoco tendrá impactos negativos sobre sistemas naturales sensitivos, humedales o cuerpos de agua.

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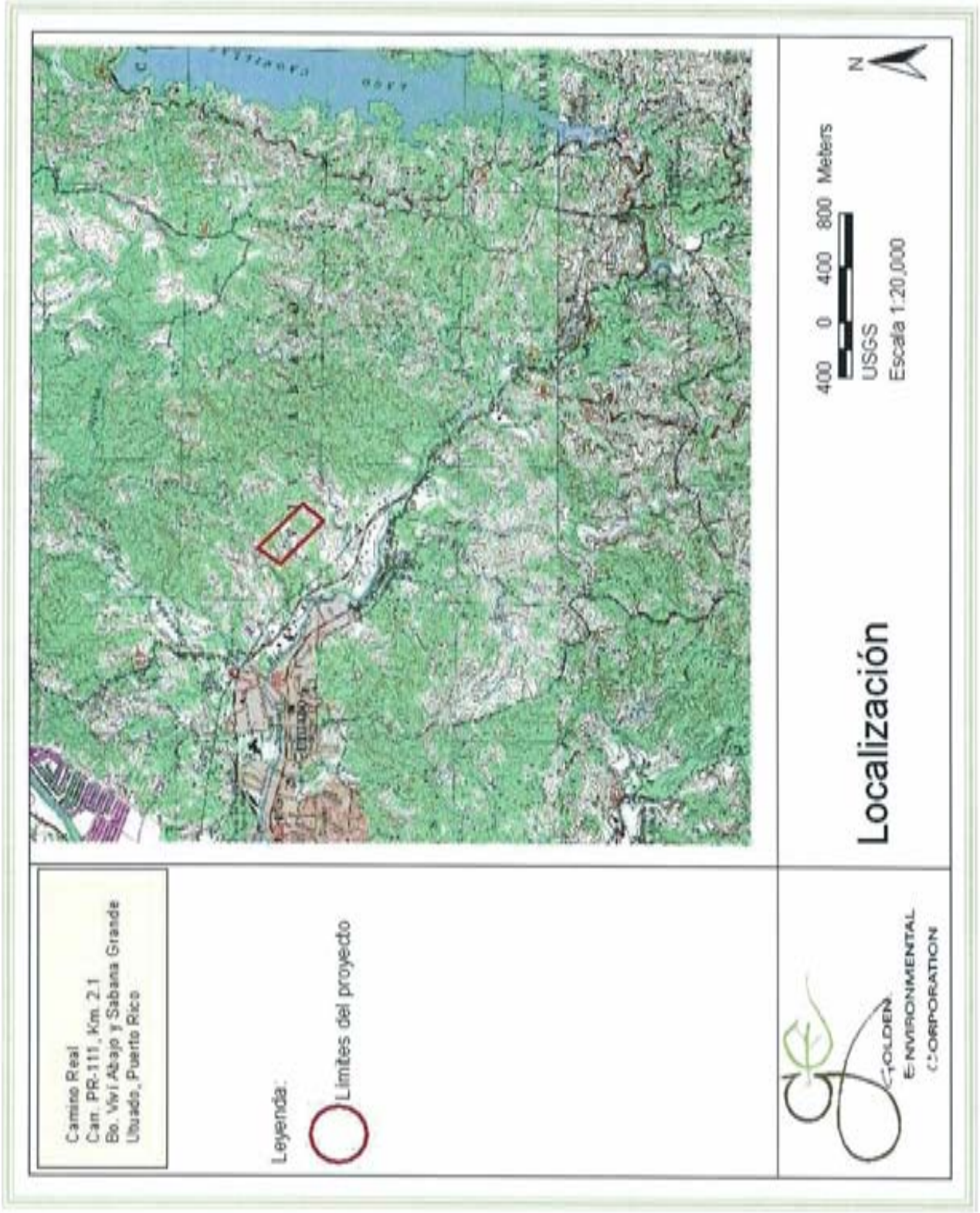
Anejo 1. Mapa de Localización



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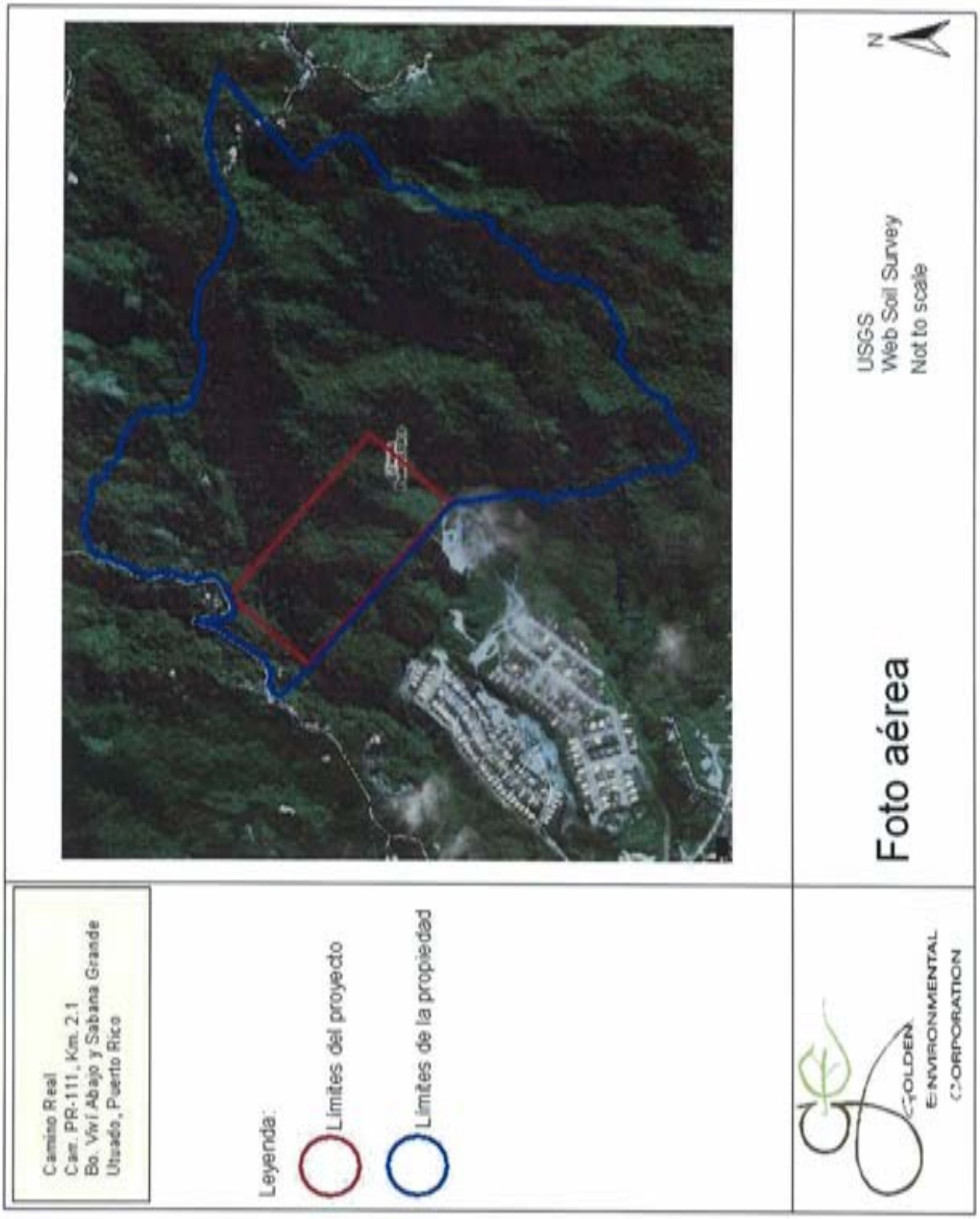
Anejo 2. Foto aérea



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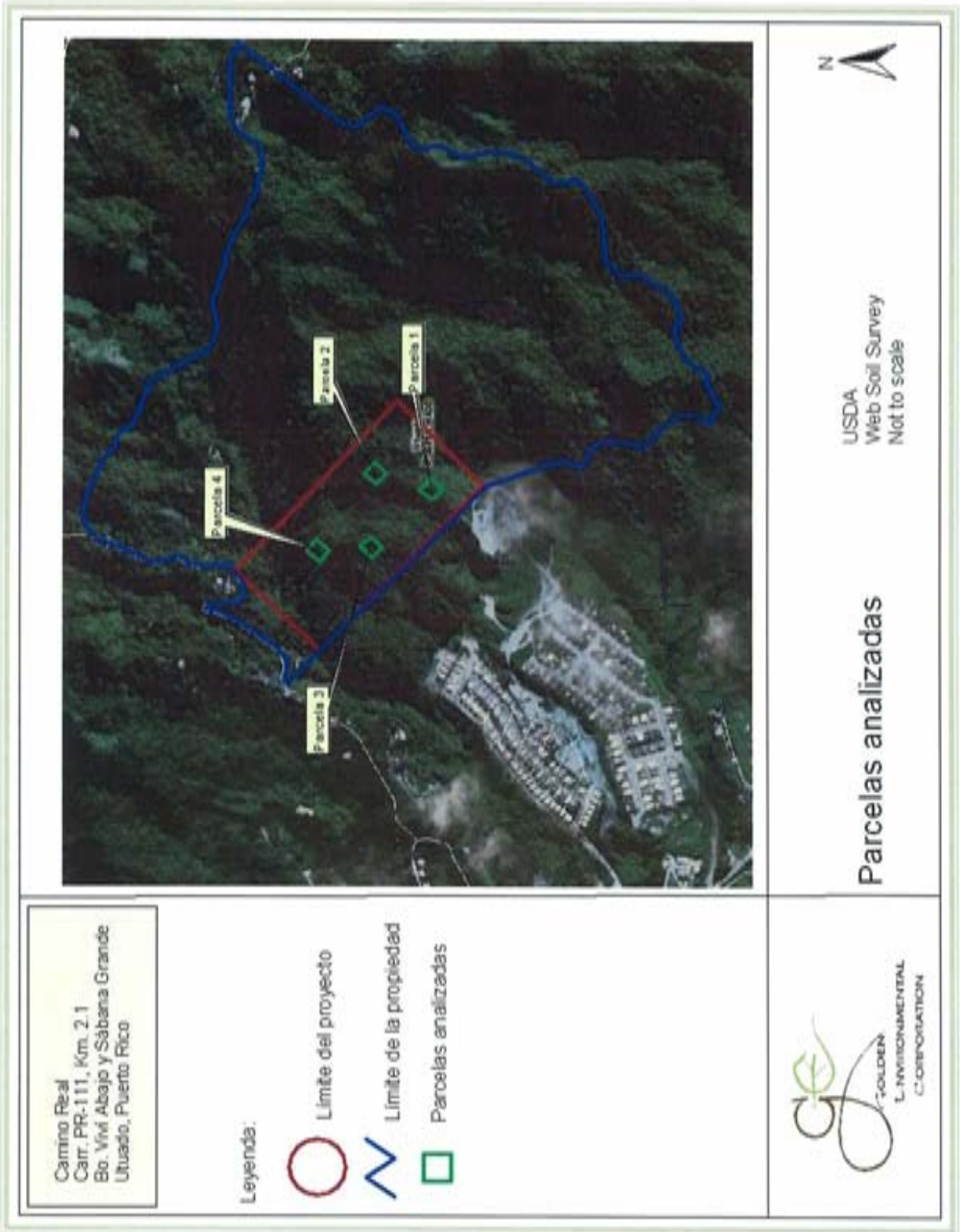
Anejo 3. Parcelas analizadas



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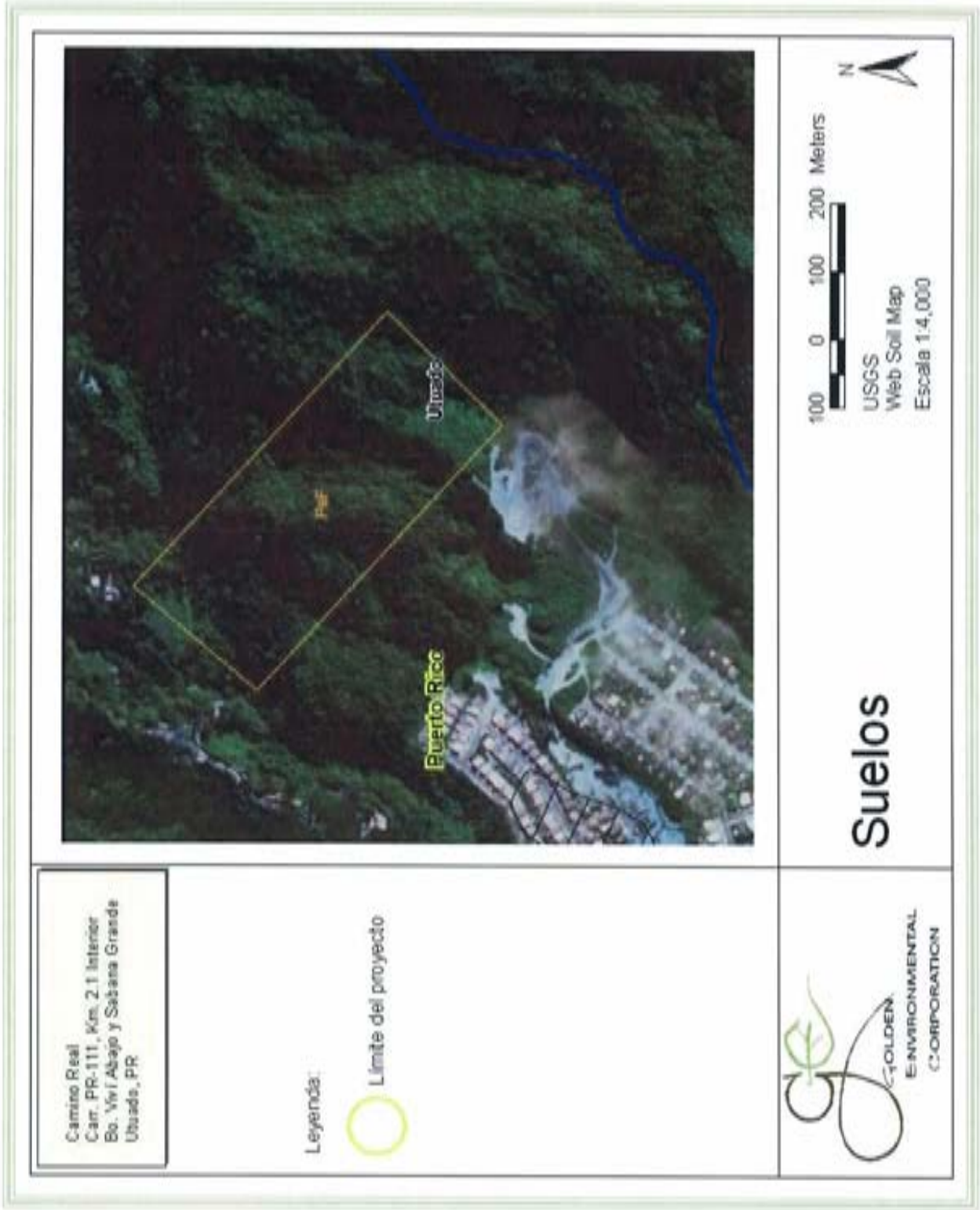
Anejo 4. Tipos de Suelo



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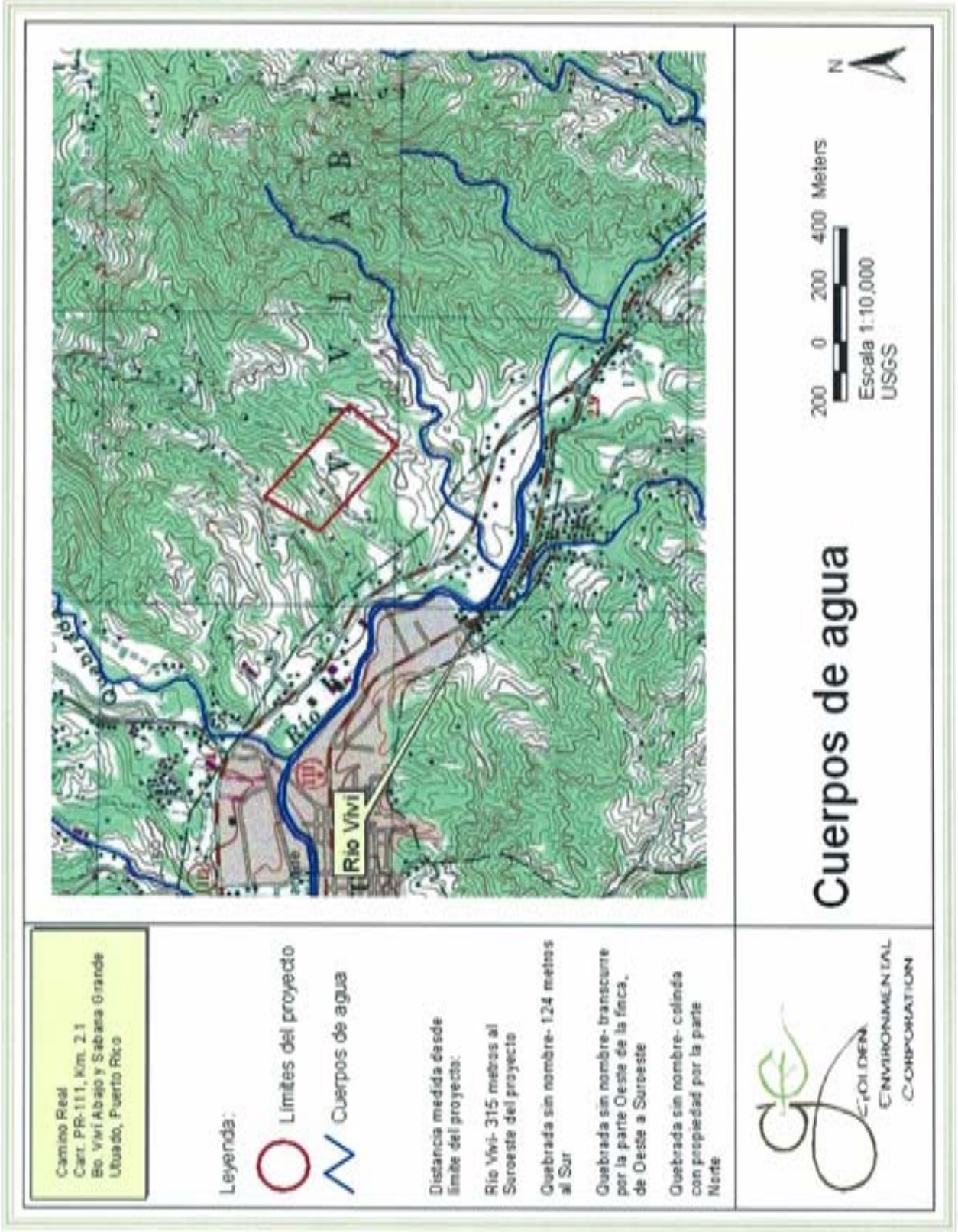
Anejo 5. Cuerpos de agua



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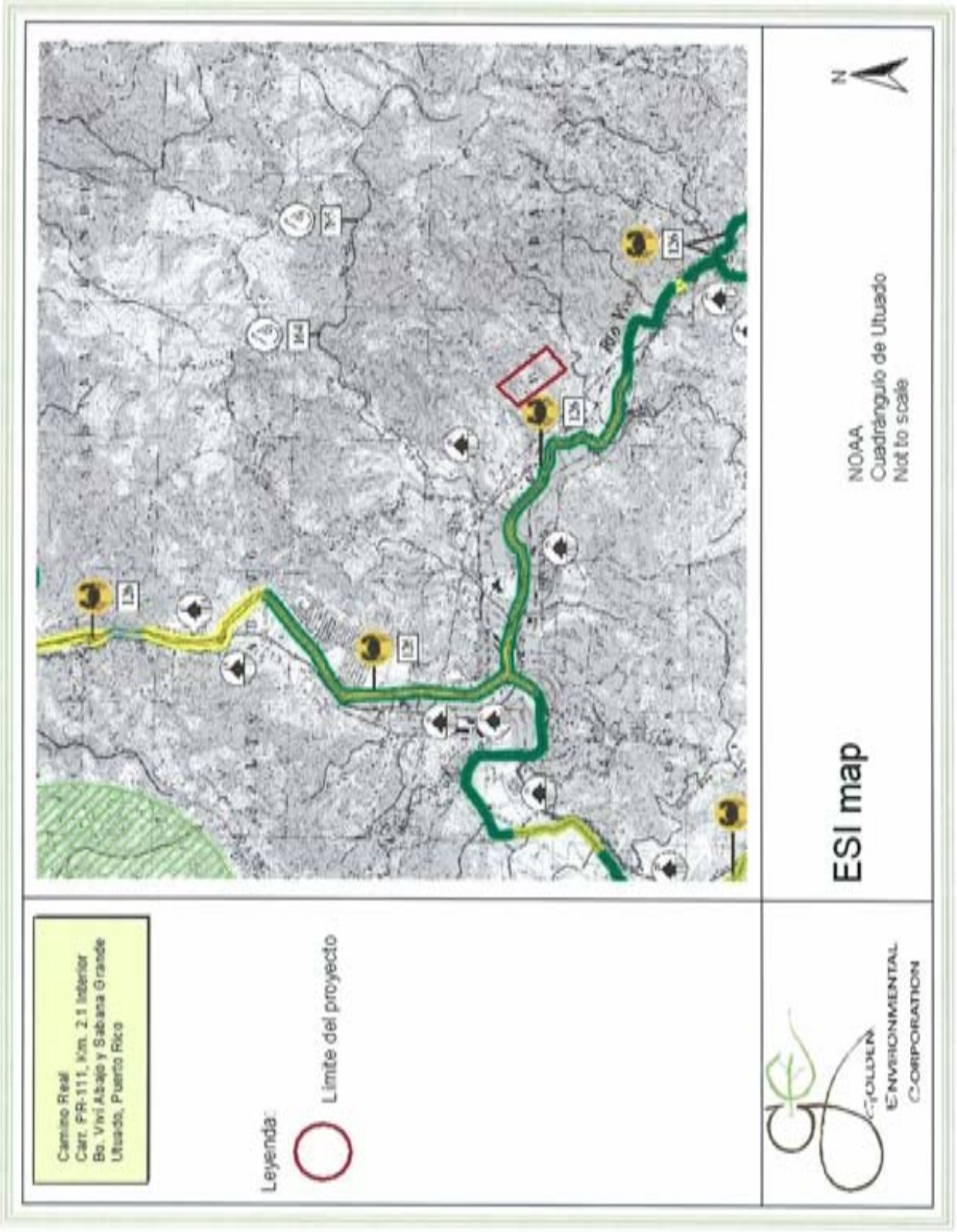
Anejo 6. Environmental Sensitivity Index



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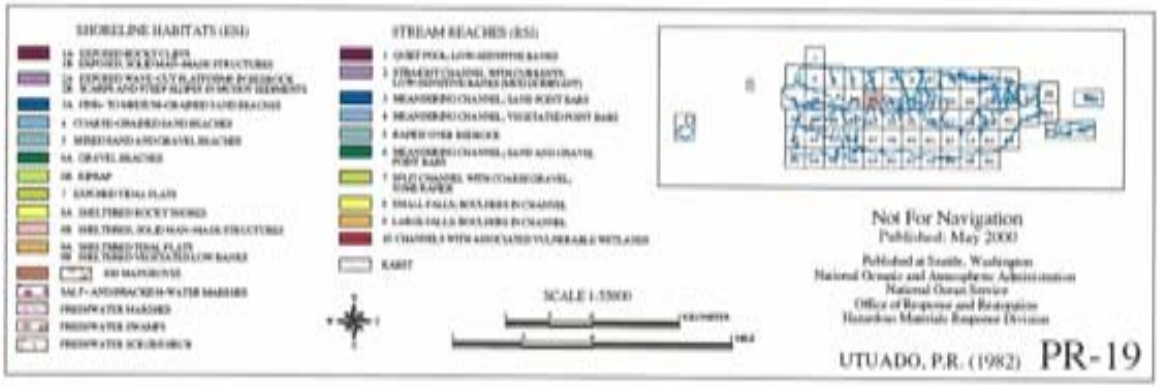

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PUERTO RICO - ESIMAP 19

BIOLOGICAL RESOURCES:

BIRD:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Nesting
37	Passerine birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Scaly-naped pigeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN
	White-crowned pigeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-SEP
129	Passerine birds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Puerto Rican broad-winged hawk	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X	JAN-JUN
	Scaly-naped pigeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN
	White-crowned pigeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-SEP
132	Common moorhen			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Pied-billed grebe			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
133	Common moorhen			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Pied-billed grebe			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
135	Puerto Rican broad-winged hawk	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X	JAN-JUN
136	Puerto Rican plain pigeon	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUN

FISH:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
29	Native stream fish				X	X	X	X	X	X	X	X	X	X	X	X	APR-MAY AUG-NOV	APR-MAY AUG-NOV	APR-MAY AUG-NOV	JAN-DEC	JAN-DEC
132	Channel catfish				X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	FEB-AUG	FEB-AUG	JAN-DEC	JAN-DEC
	Largemouth bass				X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	FEB-AUG	FEB-AUG	JAN-DEC	JAN-DEC
	Redear sunfish				X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	FEB-AUG	FEB-AUG	JAN-DEC	JAN-DEC
	Tilapia				X	X	X	X	X	X	X	X	X	X	X	X	DEC-JUL	DEC-JUL	DEC-JUL	JAN-DEC	JAN-DEC
	White catfish				X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	FEB-AUG	FEB-AUG	JAN-DEC	JAN-DEC
133	Channel catfish				X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	FEB-AUG	FEB-AUG	JAN-DEC	JAN-DEC
	Largemouth bass				X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	FEB-AUG	FEB-AUG	JAN-DEC	JAN-DEC
	Redear sunfish				X	X	X	X	X	X	X	X	X	X	X	X	FEB-AUG	FEB-AUG	FEB-AUG	JAN-DEC	JAN-DEC
	Tilapia				X	X	X	X	X	X	X	X	X	X	X	X	DEC-JUL	DEC-JUL	DEC-JUL	JAN-DEC	JAN-DEC

PLANT:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D
49	Calyptronoma rivalis	S/F	T/T		X	X	X	X	X	X	X	X	X	X	X	X
128	Cornutia obovata	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X
130	Cornutia obovata	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X
131	Tectaria estrellensis	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X
134	Solanum drymophilum	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X
137	Flaudendron massanthum	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X
138	Cornutia obovata	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X
	Flaudendron massanthum	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X

INVERTEBRATE:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
29	Freshwater crab				X	X	X	X	X	X	X	X	X	X	X	X	APR-MAY AUG-NOV	APR-MAY AUG-NOV	-	JAN-DEC	JAN-DEC
	Native stream shrimp				X	X	X	X	X	X	X	X	X	X	X	X	APR-MAY AUG-NOV	APR-MAY AUG-NOV	APR-MAY AUG-NOV	JAN-DEC	JAN-DEC
126	Freshwater crab				X	X	X	X	X	X	X	X	X	X	X	X	APR-MAY AUG-NOV	APR-MAY AUG-NOV	-	JAN-DEC	JAN-DEC

REPTILE:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Hatching	Internesting	Juveniles	Adults
27	Puerto Rican boa	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC
129	Puerto Rican boa	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC

TERRESTRIAL MAMMAL:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D
37	Bats			HIGH	X	X	X	X	X	X	X	X	X	X	X	X
129	Bats			HIGH	X	X	X	X	X	X	X	X	X	X	X	X

HUMAN USE RESOURCES:

FOREST:

HUR#	Name	Owner/Manager	Contact	Phone
69	BOSQUE RIO ABAJO	DRNA	DIVISION DE MANEJO BOSQUES ESTATALES	787/721-5494

LOCK AND DAM:

HUR#	Name	Owner/Manager	Contact	Phone
69	CAONILLAS DAM	PREPA	JOSE DUPREY	787/721-4444
78	DOS BOCAS DAM	PREPA	JOSE DUPREY	787/721-4444

WATER INTAKE:

HUR#	Name	Owner/Manager	Location	Phone
144	CERTADILLO CHLORINATION PLANT	PRASA		
274	RIO ARRIBA PACKAGE PLANT	PRASA		
316	SABANA GRANDE CHLORINATION PLANT	PRASA		

Biological information shown on the maps represents known concentration areas or occurrences, but does not necessarily represent the full distribution or range of each species. This is particularly important to recognize when considering potential impacts to protected species.

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Anejo 7. Fotos Representativas

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Anejo 8. Comunicación del Departamento de Recursos Naturales

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Se anejan los siguientes datos:

- Documento en formato .pdf
- Capas (shapefile) de la ubicación del proyecto y los plots de muestreo
- Foto aérea georeferenciada

Personal que realizó los trabajos:

- **Daniel J. Galán Kercadó**
  Biólogo
- Ivelisse Minguela
  Técnico Ambiental
- Sirena Dávila
  Biólogo
- Banery Mujica
  Geografó
- Otro personal de campo

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5

ANEJO 5:
Routine Jurisdictional Determination

GOLDEN
ENVIRONMENTAL
CORPORATION

ROUTINE JURISDICTIONAL DETERMINATION
CAMINO REAL
ROAD PR-111, VIVÍ ABAJO AND SABANA GRANDE WARD
MUNICIPALITY OF UTUADO, PUERTO RICO

SUBMITTED TO:

US ARMY CORPS OF ENGINNEERS
ANTILLES REGULATORY SECTION
400 FERNANDEZ JUNCOS AVE.
SAN JUAN, PR 00901-3299

SUBMITTED BY:

UTUADO MANAGEMENT DEVELOPMENT COMPANY, INC.

OCTOBER, 2006

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1. INTRODUCTION

Utuado Management Development Company, Inc. is proposing the development of 23.47 cuerdas of a total 110 cuerdas parcel of land for the construction of 150 residences and its facilities. Each lot will cover an average area of 300 square meters. The proposed parcel is located at Road PR-111, Viví Abajo and Sabana Grande Wards in the Municipality of Utuado (**see Appendix 1. Topographic Quadrangle**).

The developer requested Golden Environmental Corp. to perform a Routine Jurisdictional Determination for the 23.47 cuerdas area as a planning and environmental assessment tool.

2. SITE DESCRIPTION

Currently, the land is abandoned. The parcel abuts the Angel Matos succession and an unnamed stream to the North, Urbanización Altura de Utuado to the Southwest, and the remnant of the parcel of land to the East and South. Another unnamed stream abuts the parcel towards the project's East corner. The parcel is covered mainly by arborous vegetation. Amongst the present species, the most dominant ones are *Guarea guidonia, Cupania americana, Cecropia schreberiana* and *Spathodea campanulata.*

The parcel topography is generally abrupt with contour lines between 180 and 210 meters above mean sea level (MSL). There are several significant depressions within the proposed site. The parcel lies within an X Zone according to the FEMA Flood Insurance Rate Maps, number 72000C0615H and 72000C0620H, effective April 19, 2005 (**see Appendix**

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7. FIRM MAP). This zone includes areas determined to be outside the 0.2% annual chance floodplain.

3. METHODOLOGY

a. Base Line Data

Following the steps set forth in the U.S. Corps of Engineers Wetlands Delineation Manual (1987) essential baseline data was gathered for the referenced parcel. The following available data was compiled and analyzed:

i. U.S.G.S. Topographical (Utuado Quadrangle)
ii. U.S. Fish and Wildlife Service National Wetlands Inventory Maps (GIS).
iii. U.S.G.S. Soil Survey Maps (Arecibo Area).
iv. Environmental Sensitivity Index Map (Utuado Quadrangle)
v. U.S.G.S. Hydric Soils of Puerto Rico.
vi. Flood Maps (FEMA)
vii. Historical and recent aerial photographs.

b. Field Data Gathering Design

Based on the information encountered during the baseline data analysis we decided to perform an Onsite Inspection and designed a field data gathering design as follows:

i. The study area was analyzed based on the gathered data and several walk through sessions.
ii. Identification of plant community types.

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iii. Selection of representative observation points.

iv. Characterization of each community type.

v. A total of 4 plots were examined. All plots were marked and numbered with a stake and flagging tape. At each plot a 30 feet radius was established if trees were present otherwise a 10 feet radius was established for the identification of shrubs and herbs. The percent of dominant species that were classified as OBL, FACW, of FAC was further determined and documented. In addition, when possible, a soil pit 16 inches deep was dug and observed in the center of every established plot regardless of the recorded vegetation. Finally, any indication of wetland hydrology was noted on the plot log. Additionally, all plots were also located using a Garmin 76CSx GPS (~9feet).

vi. Once all plots were observed for the three wetland indicators, the compiled data was analyzed by itself and compared with the baseline data for a final wetland determination. The wetland boundaries were then plotted on the development drawings for the COE's review and approval (**see Appendix 5. Observation Points**).

4. BASELINE DATA

a. Topographical Quadrangle (TQ)

The U.S.G.S Topographic Quadrangle for the Municipality of Utuado (**see Appendix 1. Topographic Quadrangle**) shows the elevation contours for the parcel as lines between 180 and 210 meters above MSL. In terms of water bodies the TQ shows the Viví River at 202 meters to the Southwest of the property and an

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unnamed creek abutting the northern property limit. Another unnamed stream flows at approximately 50 meters towards the West, and at approximately 279 meters south of the property one more unnamed stream exists. There are several tributaries of this last stream that are near the parcel, one is at approximately 50 meters Southwest and another abuts the property at the eastern corner (**see Appendix 3. Water Bodies and Appendix 4. Water Bodies within and abutting the Land Parcel**). In terms of urban development the TQ and aerial photos show a residential development to the Southwest side of the parcel. No water lines, marshes or significant depressions are noted. No other significant features can be observed on the TQ.

b. U.S. Fish and Wildlife National Wetland Inventory (NWI)

The NWI map does not cover the project area.

c. U.S.G.S. Soil Survey Maps (SS)
(see Appendix 6. USGS Soil Survey Map)

The soil survey map for the parcel includes only one soil type: "Pellejas clay (PeF)". This soil type is not included among the list of hydric soils of Puerto Rico as revised December 22nd, 2005.

The Pellejas series consists of very deep, somewhat excessively drained, rapidly permeable soils on side slopes and narrow ridges. They formed in coarse textured residuum that weathered from plutonic rocks. Near the type location, the mean annual temperature is about 77 degrees F., and the mean annual

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precipitation is about 80 inches. Slopes range from 40 to 60 percent.

TAXONOMIC CLASS: Fine-loamy over sandy or sandy-skeletal, mixed, subactive, isohyperthermic Typic Dystrudepts.

TYPICAL PEDON: Pellejas clay loam - native pasture (colors are for moist soil unless otherwise stated).

Ap--0 to 5 inches; dark grayish brown (10YR 4/2) clay loam; moderate fine granular structure; firm, slightly sticky, slightly plastic; many fine roots; many fine quartz grains; strongly acid; clear smooth boundary (4 to 6 inches thick).

Bw1--5 to 11 inches; brown (10YR 4/3) clay loam; weak medium subangular blocky structure; firm, slightly sticky, plastic; many fine roots; common fine and few medium quartz grains; strongly acid; clear wavy boundary.

Bw2--11 to 15 inches; pale brown (10YR 6/3) sandy loam; weak fine and medium subangular blocky structure; friable, nonsticky, slightly plastic, common fine roots; many fine quartz grains; many fine black (10YR 2/1) and white (10YR 8/1) specks; common medium distinct dark yellowish brown (10YR 4/4) streaks and splotches; strongly acid; clear wavy boundary (combined thickness of the Bw horizons range from 7 to 14 inches in thickness).

C--15 to 65 inches; light brownish gray (2.5Y 6/2) loamy sand; single grained; very friable; strongly acid.

TYPE LOCATION: Sur SCD, Puerto Rico. Approximately 100 meters north of kilometer marker 44.5 of P.R. Highway No. 10.

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RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 11 to 20 inches. Reaction is very strongly acid or strongly acid throughout except where the surface has been limed.

The A or Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4. Texture is sandy clay loam or clay loam.

The Bw horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. Steaks and splotches in shades of brown range from none to common in the lower Bw horizons. Texture of the upper Bw horizons is loam or clay loam and loamy sand or sandy loam in the lower Bw horizons.

The BC horizon, where present, has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. Steaks and splotches in shades of brown range from none to common. Texture is loamy sand or sandy loam.

The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6. Steaks and splotches in shades of brown range from none to common. Texture is loamy sand or sandy loam.

COMPETING SERIES: There no other known series in the same family.

GEOGRAPHIC SETTING: Pellejas soils are on side slopes and narrow ridges. They formed in coarse textured residuum that weathered from plutonic rocks. The climate is humid tropical. Slopes range from 40 to 60 percent. The average annual temperature ranges from 76 to 78 degrees F., and the average annual precipitation ranges from 70 to 90 inches.

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GEOGRAPHICALLY ASSOCIATED SOILS: These include the Lirios soils. The well drained Lirios soils are on similar positions but have clayey argillic horizons.

DRAINAGE AND PERMEABILITY: Somewhat excessively drained; rapid permeability.

USE AND VEGETATION: Most areas are used for coffee and pasture. Vegetation consists of native and introduced species.

DISTRIBUTION AND EXTENT: Humid uplands of Puerto Rico. The series is of large extent.

Soil Survey of Arecibo Area, Puerto Rico Northern Part

Map Unit Legend Summary

Arecibo Area, Puerto Rico Northern Part

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
PeF	Pellejas clay loam, 40 to 60 percent slopes	21.2	100.0

d. Flood Maps (FM)

The parcel lies within an X Zone according to the FEMA Flood Insurance Rate Maps, number 72000C0615H and 72000C0620H, effective April 19, 2005 (**see Appendix 7. FIRM MAP**). This zone includes areas determined to be outside the 0.2% annual chance floodplain.

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e. Historical and recent aerial photographs.

i. 2000 and 2004 USGS aerial photographs show a residential development to the Southwest of the project's site. It's also evident that the area is dominated by arborous vegetation. Additionally, several significant depressions are observed within the parcel. No marsh areas are visible (**see Appendix 2. Aerial Photograph**). No other significant features can be observed in the aerial photographs.

5. FIELD GATHERED DATA

Due to the parcel topography, it's obvious that only a few segments of the parcel can feature hydrological characteristics. According to the Flora and Fauna Study and our field visit we confirmed that the vegetation present is characteristic of up-land areas; additionally, according to the Arecibo Area Soil Survey the soil type within the area is not considered hydric soil, and no hydrology indicators were found outside of the unnamed streams that abut the property. The soil type (Pellejas clay) that surrounds the jurisdictional waters abutting the parcel is not classified as a hydric soil. Furthermore, the vegetation found on the majority of the parcel, as indicated before, is characteristic of upland areas, and there is no significant wetland vegetation present within the parcel.

a. As designed, 4 plots were established. It is evident that the rest of the parcel is considered upland based on the flora and fauna study findings, topography and soil types. The following table resumes the information gathered on the plots:

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Plot #	Hydrophytic vegetation	Wetland hydrology	Hydric soils
1	NO	NO	NO
2	NO	NO	NO
3	NO	NO	NO
4	NO	NO	NO

6. WETLAND DETERMINATION

As stated on the Corps Regulatory Guidance Letter No. 05-05, the lateral limits of Jurisdiction over non-tidal water bodies extend to the ordinary high water mark (OHWM), in the absence of wetlands. When adjacent wetlands are present, the Clean Water Act jurisdiction extends beyond the OHWM to the limits of the adjacent wetlands.

Corps regulations define the term "Ordinary high water mark" for the purposes of the Clean Water Act lateral jurisdiction at 33 CFR 328.3(e) which states: "The term *ordinary high water mark* means that line on the shore established by fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

On the other hand, "Wetlands" are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

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There was no evident indication of wetland areas near or within the property. The entire property fails to meet the criteria as to what is considered to be a wetland. Therefore, we can conclude that there are no wetlands present within the proposed project site.

7. CONCLUSION

The gathered data confirms the absence of wetlands or jurisdictional waters within the parcel of land to be developed. On the other hand, the jurisdictional waters of the unnamed streams and creeks are located outside of the project limits and are going to be protected by a mandatory 5 meters protection fringe as required by Puerto Rico Public Law #49 dated January 4th, 2003. Several superficial waters drainages are found within the project limit, although those drainages are not considered jurisdictional waters they are to be managed following applicable laws and regulations.

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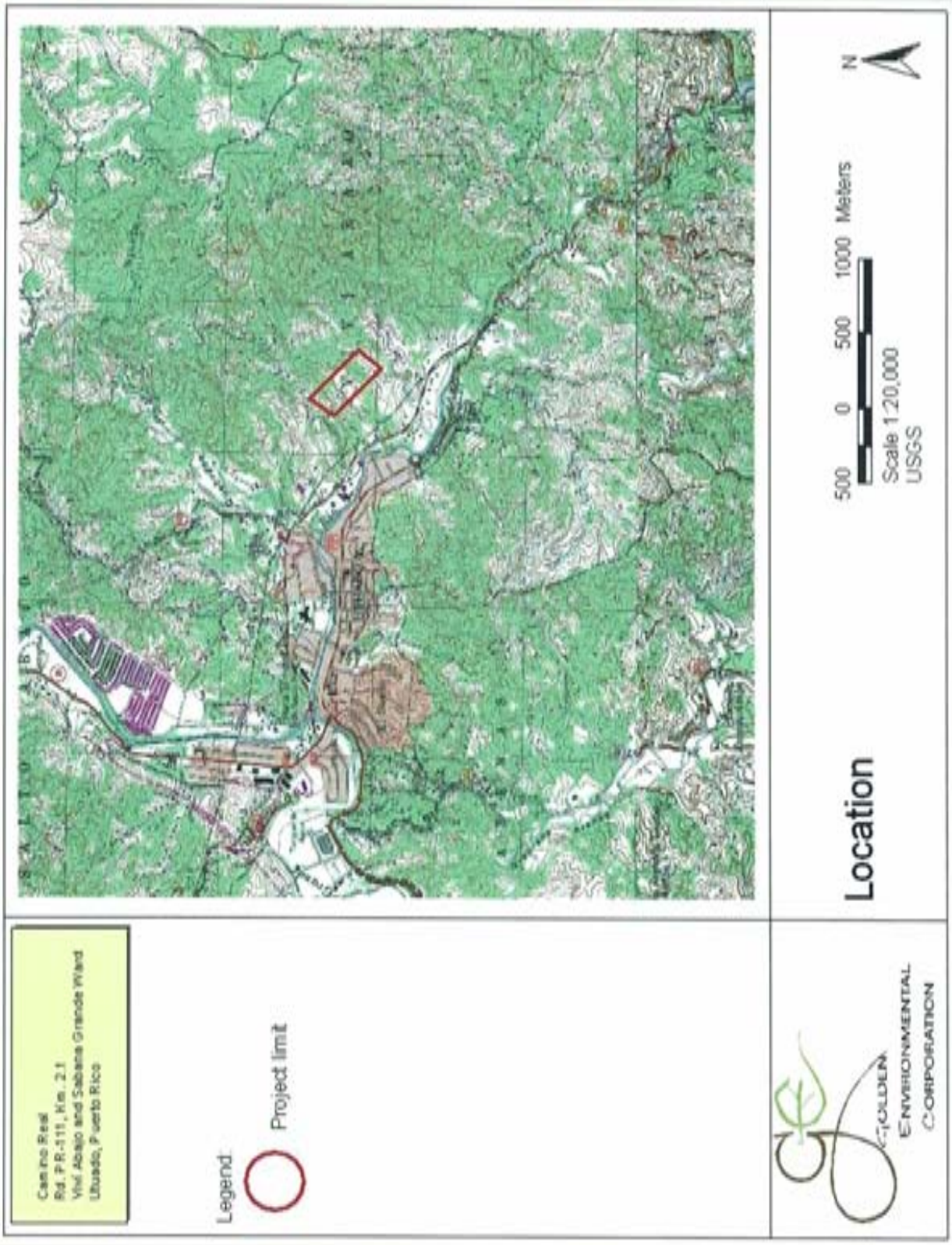
Appendix 1. Topographic Quadrangle



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Appendix 2. 2004 USGS Aerial Photograph

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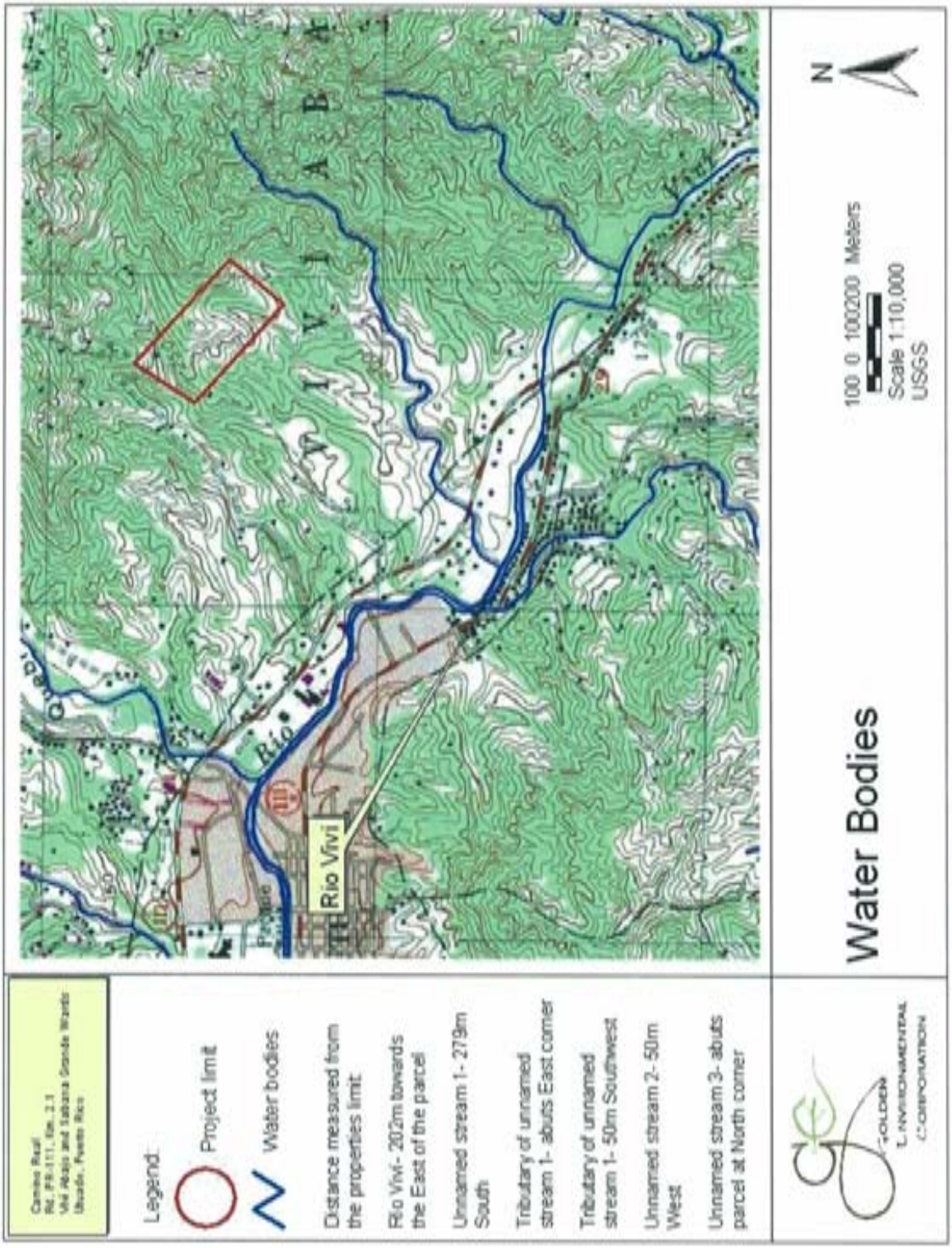
Appendix 3. Water Bodies



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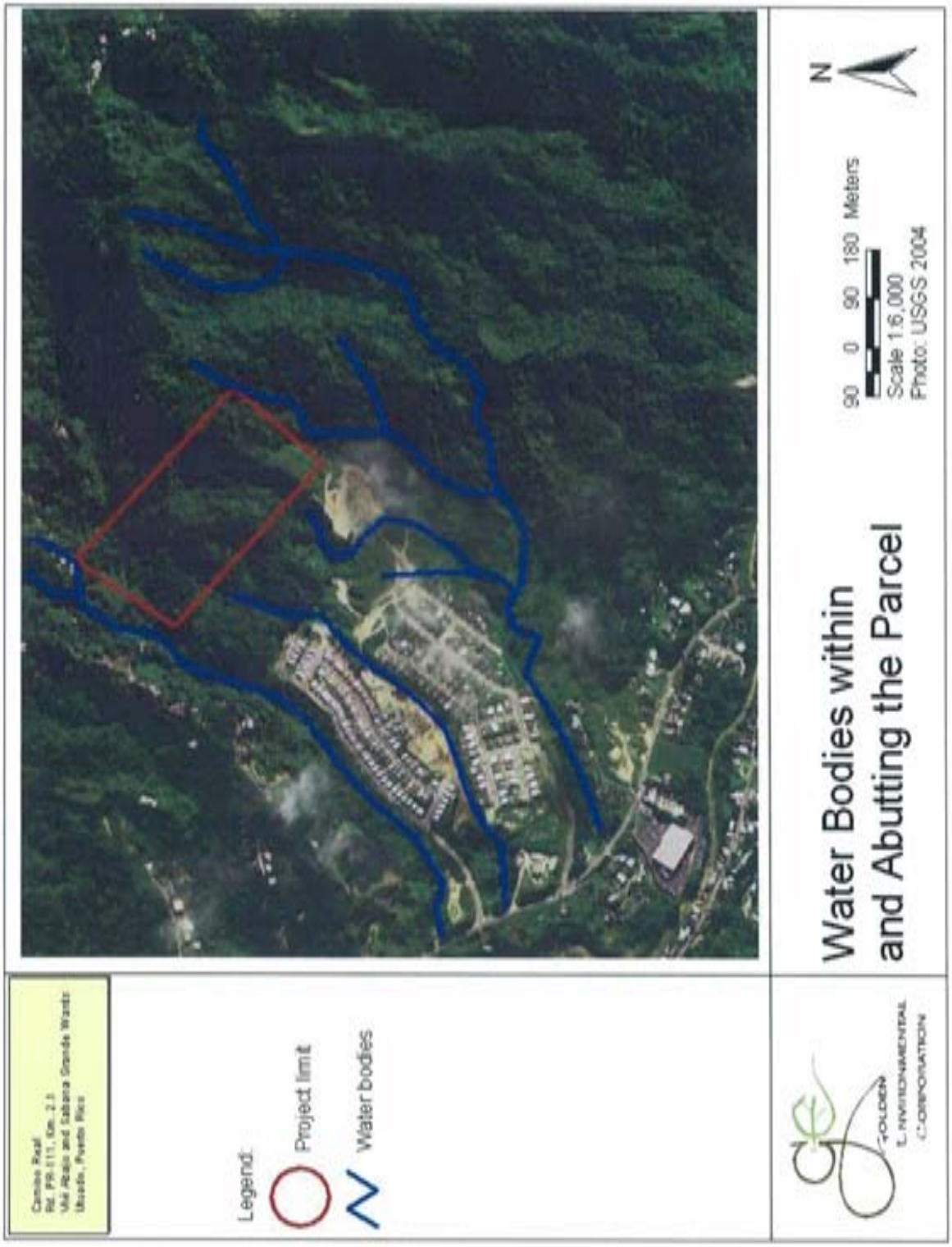
Appendix 4. Water Bodies within and abutting the Land Parcel



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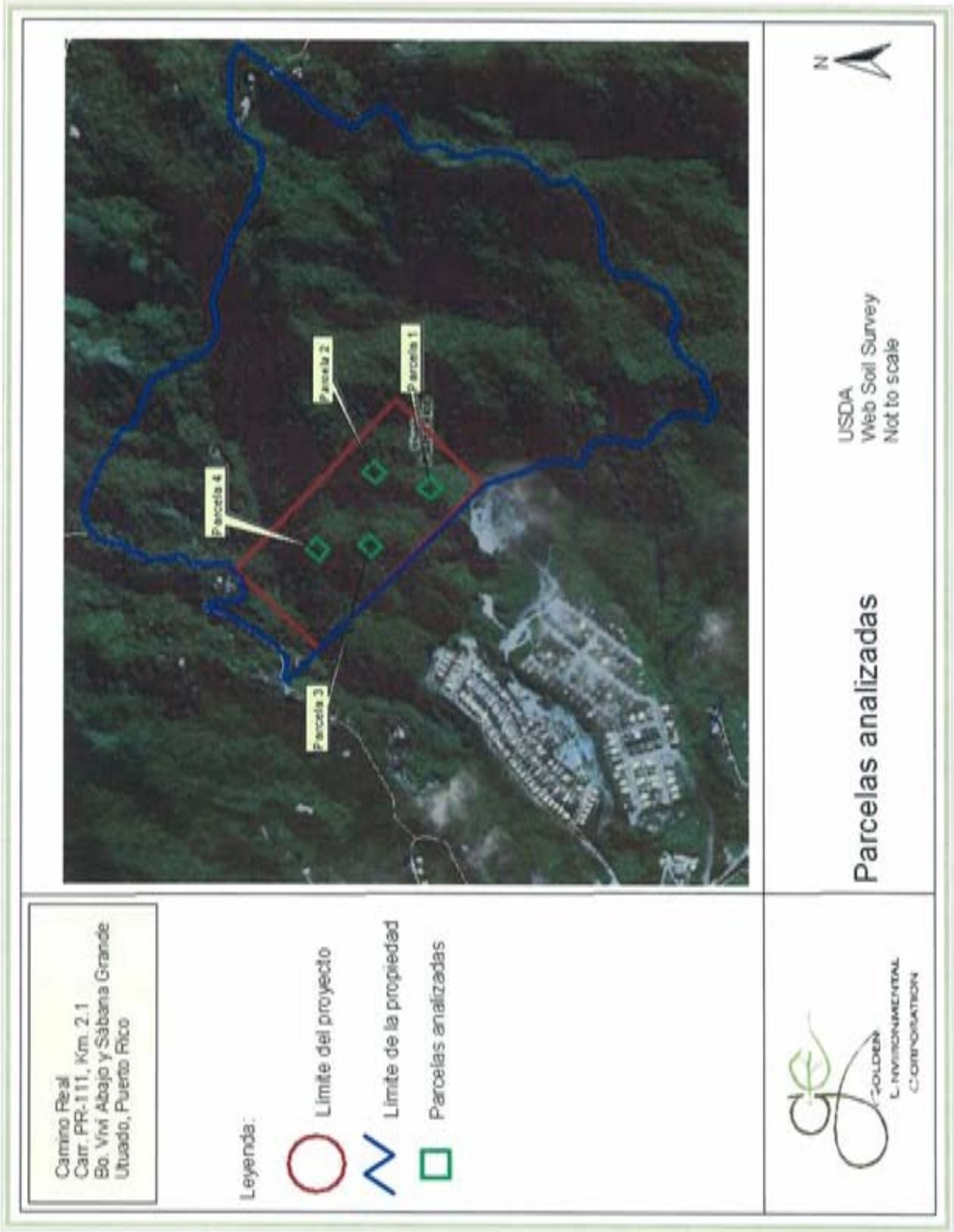
Appendix 5. Observation Points



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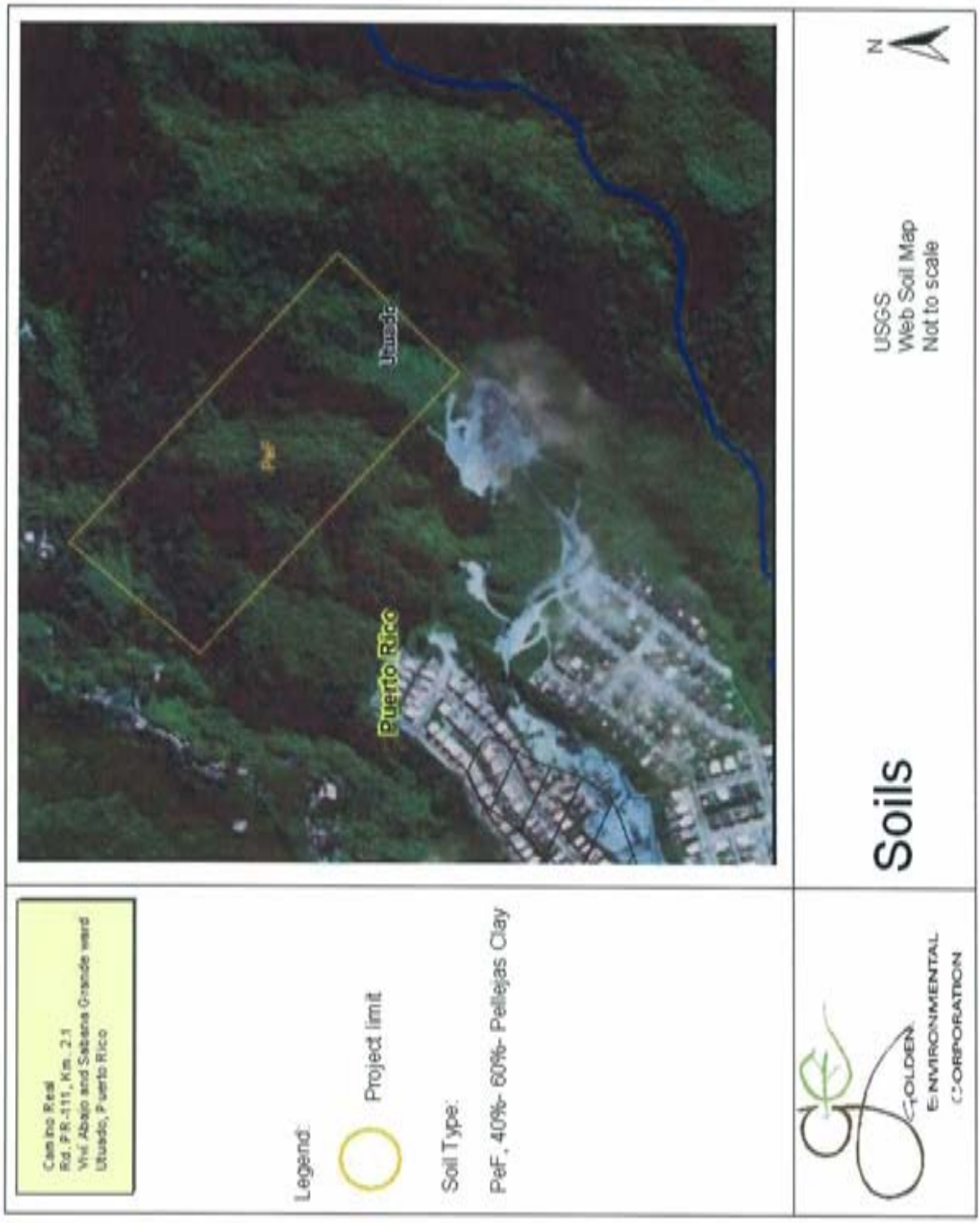
Appendix 6. USGS Soil Survey Map



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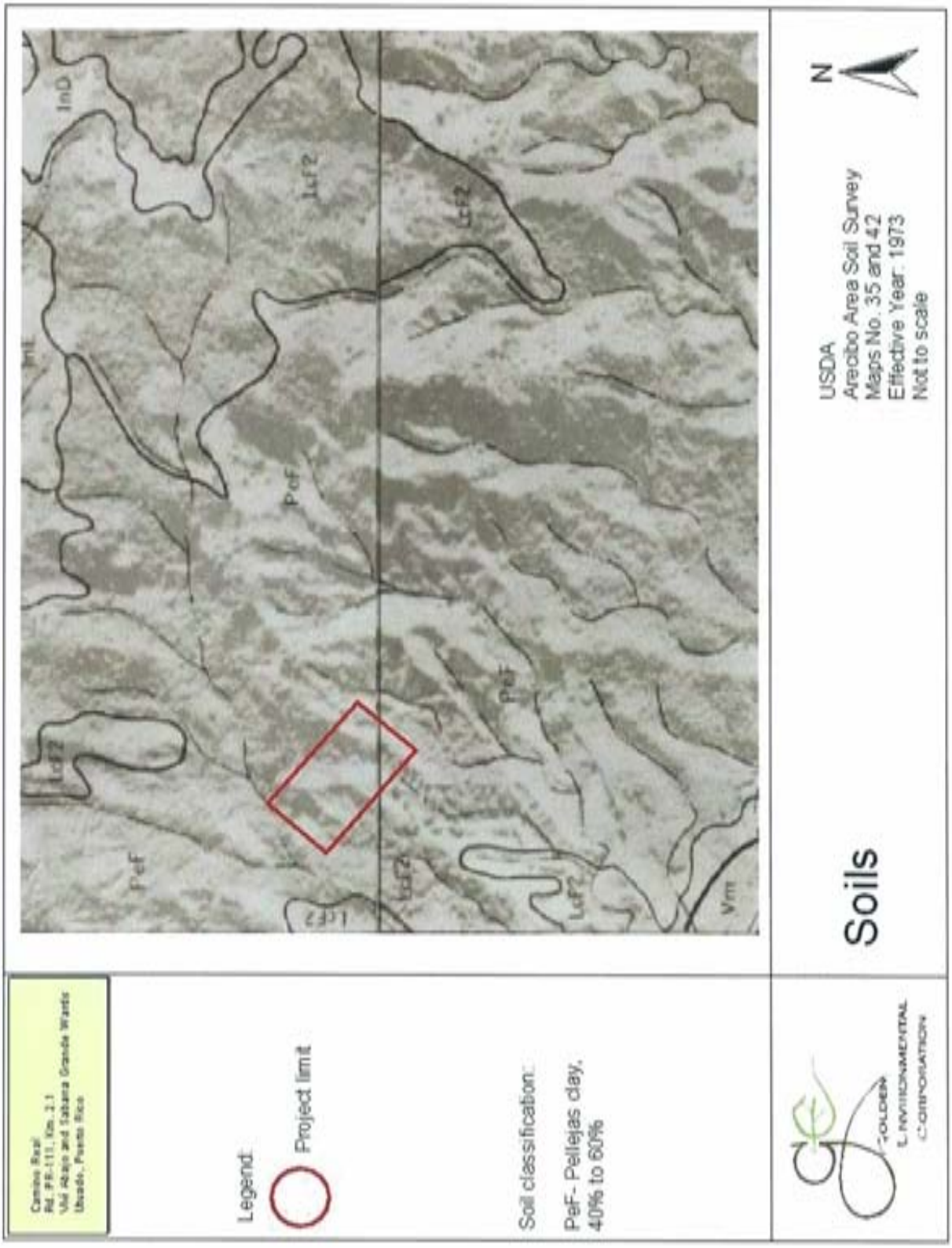

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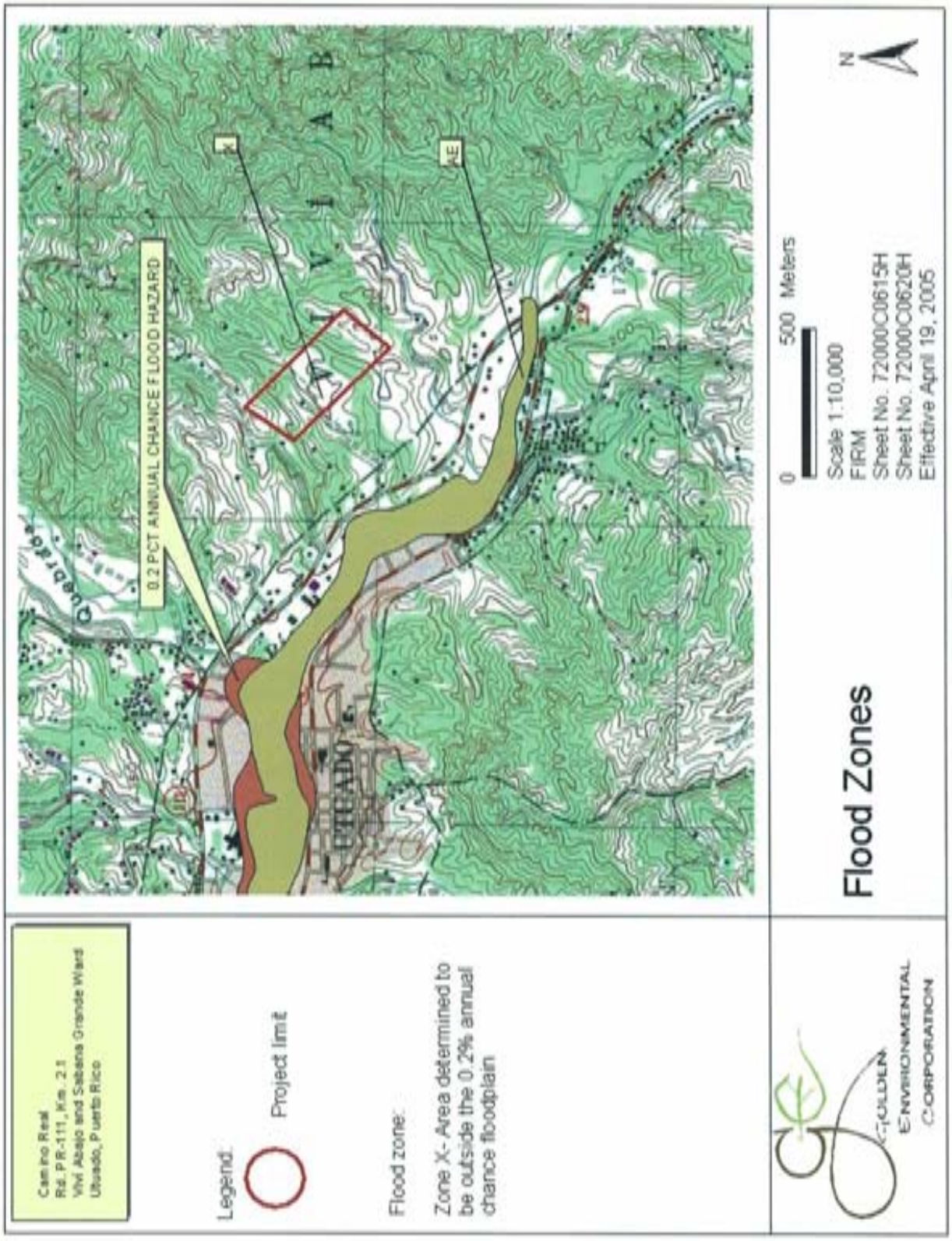
Appendix 7. FIRM Map



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Appendix 8. Descriptive photographs

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Appendix 9. Data Forms

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DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Camino Real	Date:	Septiembre, 2006
Applicant/Owner:	Utuado Management Development	County:	Utuado, PR
Investigator:	Golden Env/D. Galán	State:	
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	Highly Forested
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse.)	☐Yes ☒No	Plot ID:	1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Cupania americana	NL	T	9.		
2. Guarea guidonia	FAC	T	10.		
3. Spathodea campanulata	FACU	T	11.		
4. Comelina elegans	NL	H	12.		
5. Cordia sulcata	NL	T	13.		
6. Manguifera indica	FAC-	T	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 50%

Remarks:

HYDROLOGY

☒ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: +16 (in.)

Depth to Saturated Soil: +10 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): Pellejas

Drainage Class: Excessively drained

Field Observations Confirm Mapped Type? ☒Yes ☐ No

Taxonomy (Subgroup): Clay loam

Profile Descriptions:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-5	A	10YR 4/2			
5-11	B	10YR 4/3			
12-16	B	10YR 6/3			

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks: Not listed

WETLAND DETERMINATION

Hydrophytic Vegetation Present? ☐Yes ☒No (Check)

Wetland Hydrology Present? ☐Yes ☒No

Hydric Soils Present? ☐Yes ☒No

(Check)

Is this Sampling Point Within a Wetland? ☐Yes ☒No

Remarks Plot 1

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DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Camino Real	Date:	Septiembre, 2006
Applicant/Owner:	Utuado Management Development	County:	Utuado, PR
Investigator:	Golden Env/D. Galán	State:	
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	Highly Forested
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse.)	☐Yes ☒No	Plot ID:	2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Cecropia schreberania	FAC	T	9.		
2. Guarea guidonia	FAC	T	10.		
3. Spathodea campanulata	FACU	T	11.		
4. Comelina elegans	NL	H	12.		
5. Cordia sulcata	NL	T	13.		
6. Manguifera indica	FAC-	T	14.		
7. Tabebuia heterophylla	FAC	T	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 50%

Remarks:

HYDROLOGY

☒ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: +16 (in.)

Depth to Saturated Soil: +10 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): Pellejas

Drainage Class: Excessively drained

Field Observations Confirm Mapped Type? ☒Yes ☐ No

Taxonomy (Subgroup): Clay loam

Profile Descriptions:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc,
0-5	A	10YR 4/2			
5-11	B	10YR 4/3			
12-16	B	10YR 6/3			

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks: Not listed

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	☐Yes ☒No	(Check)
Wetland Hydrology Present?	☐Yes ☒No	
Hydric Soils Present?	☐Yes ☒No	

(Check)

Is this Sampling Point Within a Wetland? ☐Yes ☒No

RemarksPlot 2

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Forms version 1/02

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Camino Real	Date:	Septiembre, 2006
Applicant/Owner:	Utuado Management Development	County:	Utuado, PR
Investigator:	Golden Env/D. Galán	State:	
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	Highly Forested
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse.)	☐Yes ☒No	Plot ID:	3

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Cecropia schreberania	FAC	T	9.		
2. Guarea guidonia	FAC	T	10.		
3. Spathodea campanulata	FACU	T	11.		
4. Comelina elegans	NL	H	12.		
5. Cordia sulcata	NL	T	13.		
6. Manguifera indica	FAC-	T	14.		
7. Tabebuia heterophylla	FAC	T	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 50%

Remarks:

HYDROLOGY

☒ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: +16 (in.)

Depth to Saturated Soil: +10 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): Pellejas

Drainage Class: Excessively drained

Field Observations Confirm Mapped Type? ☒Yes ☐ No

Taxonomy (Subgroup): Clay loam

Profile Descriptions:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-5	A	10YR 4/2			
5-11	B	10YR 4/3			
12-16	B	10YR 6/3			

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks: Not listed

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	☐Yes ☒No	(Check)
Wetland Hydrology Present?	☐Yes ☒No	
Hydric Soils Present?	☐Yes ☒No	

(Check)

Is this Sampling Point Within a Wetland? ☐Yes ☒No

Remarks Plot 3

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DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	Camino Real	Date:	Septiembre, 2006
Applicant/Owner:	Utuado Management Development	County:	Utuado, PR
Investigator:	Golden Env/D. Galán	State:	
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	Highly Forested
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse.)	☐Yes ☒No	Plot ID:	4

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Cecropia schreberania	FAC	T	9.		
2. Guarea guidonia	FAC	T	10.		
3. Spathodea campanulata	FACU	T	11.		
4. Comelina elegans	NL	H	12.		
5. Cordia sulcata	NL	T	13.		
6. Anopteris sp.	NL	T	14.		
7. Tabebuia heterophylla	FAC	T	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 20%

Remarks:

HYDROLOGY

☒ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other

☐ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)

Depth to Free Water in Pit: +16 (in.)

Depth to Saturated Soil: +10 (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in Upper 12 Inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☐ Oxidized Root Channels in Upper 12 Inches
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): Pellejas

Drainage Class: Excessively drained

Field Observations Confirm Mapped Type? ☒Yes ☐ No

Taxonomy (Subgroup): Clay loam

Profile Descriptions:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-5	A	10YR 4/2			
5-11	B	10YR 4/3			
12-16	B	10YR 6/3			

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks: Not listed

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	☐Yes ☒No (Check)	
Wetland Hydrology Present?	☐Yes ☒No	
Hydric Soils Present?	☐Yes ☒No	
		(Check)
		Is this Sampling Point Within a Wetland? ☐Yes ☒No

Remarks Plot 4

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Appendix 10. GPS LOG

- Point 1: N 18 15.99 W 66 40.992
- Point 2: N 18 16.007 W 66 40.981
- Point 3: N 18 16.007 W 66 40.998
- Point 4: N 18 16.014 W 66 40.986

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6

ANEJO 6:
Estudio de Tránsito

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Estudio de Tránsito
Camino Real
Utuado, P.R.

Preparado para
Utuado Managent Development Company
noviembre de 2006

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Tabla 15 Resultados modelación SIDRA Intersección de la Carretera PR-111 con acceso al desarrollo (2011)

20

1 Introducción

La Autoridad de Carreteras y Transportación en su documento titulado Guías para la Preparación de Estudios Operacionales de Acceso y de Tránsito para Puerto Rico establece la necesidad y ámbito de los estudios relacionados al tema del tránsito según el tamaño del desarrollo. El documento establece dos (2) tipos de estudios para determinar el efecto que un desarrollo tendrá en su área de influencia; estudio de acceso y el de tránsito. El primero se define como aquel recomendable para proyectos pequeños, los cuales podrán tener un impacto significativo en las intersecciones formadas por los accesos propuestos y no, necesariamente, en el sistema vial. El segundo es aquel que incluye la evaluación operacional de las intersecciones formadas por los accesos propuestos y por las intersecciones más importantes que están localizadas cerca del desarrollo. Según establecido en el mencionado documento, un desarrollo con menos unidades de vivienda, número de habitaciones o pies cuadrados de área comercial u oficinas que el valor mínimo de la tabla I (página 5), no requerirá la preparación de estudio operacional alguno.

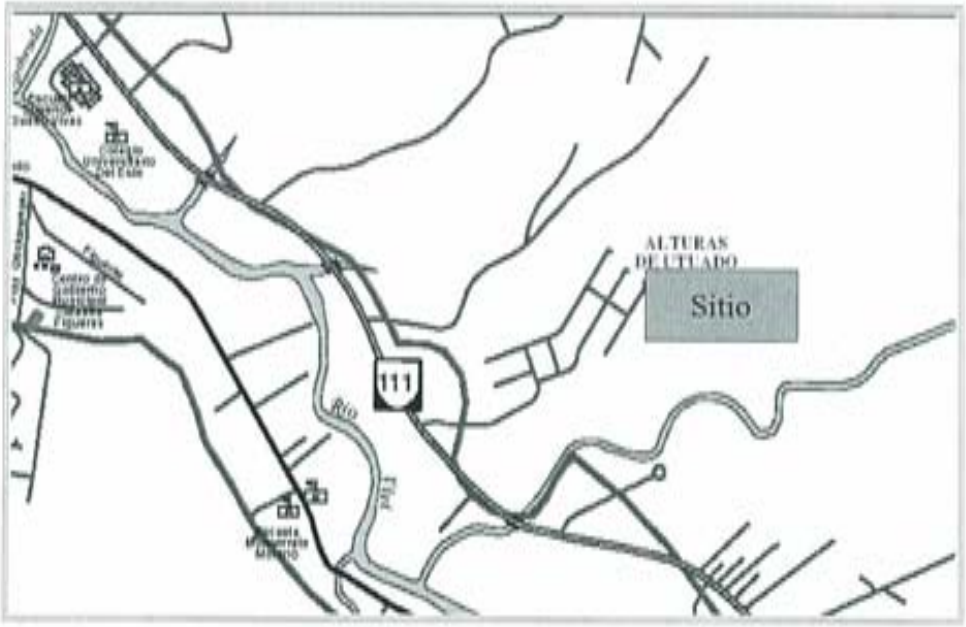
El desarrollo sujeto de este informe constará de 150 unidades de vivienda unifamiliar. Proyectos de este tamaño están sujetos a la preparación estudios de tránsito, según las mencionadas guías.

El siguiente informe presenta el estudio de tránsito asociado al proyecto denominado Camino Real. El mismo evalúa las condiciones del tránsito en las intersecciones que servirán de conexión para el mencionado desarrollo a la red vial junto a las intersecciones adyacentes de mayor importancia. Se modelará el funcionamiento de las mencionadas intersecciones mediante el uso del programa de computadoras para el análisis de intersecciones "Signalised & unsignalised Intersection Design & Research Aid".

2 Localización y descripción de la acción propuesta

El proyecto propuesto es uno de tipo residencial unifamiliar. El mismo constará de 150 unidades de vivienda en solares individuales de 350 m.c. El proyecto tendrá lugar en un solar ubicado en el Km 2.1 de la carretera PR-111 de los Barrios Viví Abajo y Sabana Grande pertenecientes al municipio de Utuado. El desarrollo planifica utilizar una intersección, en forma de "T", existente como acceso a la parcela desde la mencionada carretera.

Figura 1 Diagrama esquemático de localización del proyecto



3 METODOLOGÍA PARA LA EVALUACIÓN DEL IMPACTO EN EL TRÁNSITO DEBIDO A LA ACCIÓN PROPUESTA

1) El miércoles, 1 de noviembre de 2006 se realizaron conteos de vehículos en el área de estudio durante las 12 horas de mayor afluencia vehicular. Los horarios de conteos realizados fueron de 6:00 AM a 6:00 PM. Estos conteos se realizaron para determinar el número de vehículos que utilizan las vías de tránsito cercanas al área del proyecto. Las intersecciones medidas fueron:

   a) Carretera PR-111 con la carretera PR-611

   b) Carretera PR-111 con la carretera Ramal PR-111

   c) Carretera PR-111 con calle municipal

2) Dado que el proyecto no estará completado hasta aproximadamente el año 2011, los flujos del año 2006 fueron expandidos cinco (5) años usando un factor de crecimiento anual de 1.5%.

3) Utilizando como referencia el Manual de Generación de Viajes del ITE se estimó el número de viajes que se generarían desde y hacia el proyecto propuesto y proyectos adyacentes.

4) Con todos los datos recopilados se procedió a analizar las intersecciones en cuestión. Para realizar este análisis se utilizó el programa de computadoras SIDRA INTERSECTION 3.0. Las situaciones estudiadas fueron los períodos pico de la mañana y de la tarde con los flujos existentes, y las mismas situaciones al añadirse el crecimiento anual esperado y los flujos generados por el proyecto. Las intersecciones estudiadas son las mencionadas anteriormente.

4 Teoría

4.1 Evaluación sobre el Nivel de Servicio (LOS) para una intersección:

El nivel de servicio es la metodología más conocida utilizada para la evaluación de una facilidad. El nivel de servicio representa las condiciones de operación de las intersecciones: el nivel de servicio "A" representa las condiciones excelentes de tránsito y el nivel "F", las peores condiciones. Tanto las intersecciones semaforizadas como las no semaforizadas pueden ser categorizadas utilizando esta metodología. Estos niveles de servicio a su vez se encuentran basados en las demoras promedio que tienen los vehículos en las intersecciones. A continuación se definen las categorías para cada nivel de servicio.

LOS A: Excelente

Esta es una condición de flujo libre, acompañada por bajos volúmenes de tránsito y altas velocidades. Hay poca o ninguna restricción en maniobrabilidad del conductor y los conductores pueden mantener sus deseadas velocidades con poco o ningún retraso.

LOS B: Muy Buena

En esta condición, las velocidades de operación comienzan a estar restringidas un tanto por las condiciones del tránsito. Los conductores aún tienen una libertad considerable para seleccionar su velocidad y carril de operación.

LOS C: Buena

Las velocidades y maniobrabilidad se vuelven más controladas por volúmenes de tránsito más altos. La mayoría de los conductores están restringidos en su libertad para seleccionar su propia velocidad, cambiar de carril o pasar.

LOS D: Aceptable

Este nivel de servicio se acerca a un flujo inestable, con velocidades operacionales tolerables siendo mantenidas, aunque considerablemente afectadas por los cambios en las condiciones operacionales. Los conductores tienen poca libertad para maniobrar y la comodidad y conveniencia son bajas.

LOS E: Capacidad

El flujo de tránsito se vuelve inestable y podría haber paradas momentáneas.

LOS F: Mala

En esta condición, la velocidad operacional podría bajar a cero y resultar en colas de tránsito.

4.2 Relación entre demoras y Nivel de Servicio

La tabla #1, muestra las diferentes relaciones entre el nivel de servicio y las demoras promedio por cada vehículo en las intersecciones controladas ya sea por semáforo, señales de PARE o CEDA, o en rotondas. (Manual de Capacidad para Carreteras-"HCM"). Estas demoras tienen como componentes la demora de viajar a través de la intersección más la demora de la detención como consecuencia de la intersección.

Tabla 1 Criterio del Nivel de Servicio para intersecciones

NIVEL DE SERVICIO	DEMORA DE VEHÍCULOS (SEG.)	
	SEMÁFORO Y ROTONDA	PARE y CEDA
A	$d \leq 10$	$d \leq 10$
B	$10 < d \leq 20$	$10 < d \leq 15$
C	$20 < d \leq 35$	$15 < d \leq 25$
D	$35 < d \leq 55$	$25 < d \leq 35$
E	$55 < d \leq 80$	$35 < d \leq 50$
F	$80 < d$	$50 < d$

5 Análisis de Tránsito

5.1 Afluencia vehicular

Con el propósito de determinar el patrón de viajes actuales del sector se realizaron conteos manuales en tres (3) intersecciones. Dichos conteos se realizaron en períodos de quince (15) minutos de 6:00 AM a 6:00 PM, el miércoles, 1 de noviembre de 2006. Las siguientes intersecciones fueron seleccionadas de los alrededores del proyecto:

a) Carretera PR-111 con la carretera PR-611

b) Carretera PR-111 con la carretera Ramal PR-111 este

c) Carretera PR-111 con calle municipal

Las tablas en el apéndice 1 ilustran el flujo vehicular obtenido mediante dichos conteos manuales. Para determinar la hora pico se buscaron los cuatro períodos consecutivos de 15 minutos con más flujo. Una vez se encontraba esta hora en los períodos AM y PM, se buscaba el período de 15 minutos con mayor flujo, y este valor multiplicado por cuatro era el que se utilizaba para la modelación. Dado que ya se está usando el valor del período de 15 minutos más alto, el factor de hora pico a utilizarse es 1.0.

Los flujos mostrados están identificados con dos letras separadas por un guión. La primera representa el acceso de procedencia del movimiento en inglés: North, South, East & West. La segunda letra representa el tipo de movimiento: Left, Thru & Right.

Las siguientes tablas muestran los flujos vehiculares por acceso de las intersecciones estudiadas:

Tabla 2 Flujos de la carretera PR-111 con la PR-611 (Condición Presente)

Resumen 2006	MOVIMIENTOS												Totales
	S-L	S-T	S-R	E-L	E-T	E-R	N-L	N-T	N-R	W-L	W-T	W-R	
Pico AM	16	88	116	120	456	32	116	48	176	72	344	28	1612
Pico PM	48	116	88	68	788	20	80	108	100	72	272	4	1764

Tabla 3 Flujos de la carretera PR-111 con el Ramal PR-111 (Condición Presente)

Resumen 2006	MOVIMIENTOS						Totales
	S-L	S-R	E-L	E-T	W-T	W-R	
Pico AM	104	28	100	504	452	84	1272
Pico PM	76	40	36	800	348	72	1372

Tabla 4 Flujos de la carretera PR-111 con calle municipal (acceso a futuro desarrollo) (Condición Presente)

Resumen 2006	MOVIMIENTOS						Totales
	E-T	E-R	N-L	N-R	W-L	W-T	
Pico AM	608	4	4	4	4	536	1160
Pico PM	876	8	4	4	8	420	1320

5.2 Crecimiento Anual

Los flujos obtenidos en el año 2006 fueron expandidos al año 2011, cuando entendemos que el proyecto estará operando. Los flujos de la zona fueron expandidos utilizando un factor de 1.5% de crecimiento anual.

5.3 Generación de viajes de proyecto Camino Real

Para el cómputo de la generación de viajes utilizamos las categorías 210 (Unifamiliar Residencial) del Manual de Generación de Viajes de ITE como clasificación del uso del terreno. La variable independiente utilizada fue el número de viviendas a ser construidas. La siguiente tabla muestra los resultados obtenidos.

Tabla 5 Generación de viajes del proyecto Camino Real

Uso	Categoría	Unidades	ADT			Pico AM			Pico PM		
			Total	Entrada	Salida	Total	Entrada	Salida	Total	Entrada	Salida
Unifamiliar Residencial	210	150	1510	755	755	114	29	86	154	97	57

La tabla anterior muestra los flujos que estarían accediendo la carretera PR-111 desde y hacia la intersección con el desarrollo propuesto. En adición a esto se identificaron dos proyectos de desarrollos en las cercanías del área de estudio. Estos comprenden un proyecto residencial unifamiliar de 50 unidades de vivienda y uno de apartamentos o multifamiliar de 48 unidades de vivienda. Para el cómputo de la generación de viajes utilizamos las categorías 210 (Unifamiliar Residencial) y 230 (Condominio/Townhouse) del Manual de Generación de Viajes de ITE como clasificación del uso del terreno, respectivamente. La variable independiente

utilizada fue el número de viviendas a ser construidas. La siguiente tabla muestra los resultados obtenidos.

Tabla 6 Generación de viajes de proyectos adyacentes

Uso	Categoría	Unidades	ADT			Pico AM			Pico PM		
			Total	Entrada	Salida	Total	Entrada	Salida	Total	Entrada	Salida
Unifam. Residen.	210	50	550	275	275	44	11	34	57	36	21
Condominio/Townhouse	230	48	344	172	172	29	5	24	33	22	11
Total			893	447	447	73	16	58	90	58	32

5.4 Distribución de viajes

Para realizar la distribución de los viajes que generará el proyecto bajo estudio, presumimos que un 60% de los viajes generados se dirigirían desde y hacia el desarrollo en dirección Oeste a través de la PR-111 y 40% desde y hacia el Este a través de la PR-111. Esta distribución es consistente con los flujos presentes en las intersecciones en cada dirección. Los flujos fueron luego distribuidos en las siguientes intersecciones: carretera PR-111 con la PR-611 y carretera PR-111 con Ramal PR-111, según se comportan las mismas actualmente.

5.5 Tránsito Futuro

Para la modelación de la situación futura se tomaron los flujos de la situación base, se multiplicaron por el factor de crecimiento anual y se le añadieron los flujos que se

obtuvieron en la etapa de generación de viajes, repartidos de acuerdo a la distribución que se explicó anteriormente.

Las siguientes tablas muestran los flujos que se utilizaron en el análisis de los escenarios futuros.

Tabla 7 Flujos de la carretera PR-111 con PR-611 (Futuro 2011)

Resumen 2011	MOVIMIENTOS												Totales
	S-L	S-T	S-R	E-L	E-T	E-R	N-L	N-T	N-R	W-L	W-T	W-R	
Pico AM	17	95	130	145	556	39	127	52	190	78	391	30	1850
Pico PM	52	125	113	84	889	25	91	116	108	78	363	4	2047

Tabla 8 Flujos de la PR-111 con Ramal PR-111 (Futuro 2011)

Resumen 2011	MOVIMIENTOS						Totales
	S-L	S-R	E-L	E-T	W-T	W-R	
Pico AM	115	30	108	557	532	102	1444
Pico PM	95	43	39	911	403	86	1576

Tabla 9 Flujos de la PR-111 con entrada al futuro desarrollo (Futuro 2011)

Resumen 2011	MOVIMIENTOS						Totales
	E-T	E-R	N-L	N-R	W-L	W-T	
Pico AM	689	15	38	56	21	587	1408
Pico PM	963	48	27	38	67	487	1630

5.6 Modelación de Tránsito

Para la evaluación de las intersecciones afectadas se utilizó el programa SIDRA INTERSECTION 3.0. Este modelo permite la evaluación de intersecciones semaforizadas y de prioridad, además de la optimización de las operadas por semáforo, y es preferido debido a su capacidad de predicción, aún en situaciones de sobresaturación. Se realizaron modelaciones para los períodos pico de la mañana y de la tarde para la situación actual y la situación futura.

5.6.1 Intersección de la carretera PR-111 con la PR-611

Esta intersección tiene una configuración en cruz y está controlada por sistema de semáforos. La misma consiste al presente de un carril de acceso y uno de egreso en los accesos Norte y Sur (PR-611), un carril de acceso y dos carriles de egreso en el acceso Oeste y dos carriles de acceso (uno corto para viraje a la izquierda) y uno de egreso en el acceso Este de la PR-111. Las siguientes figuras muestran la geometría y sistema de fases de la intersección antes descrita.

Figura 2 Diagrama esquemático de la geometría existente

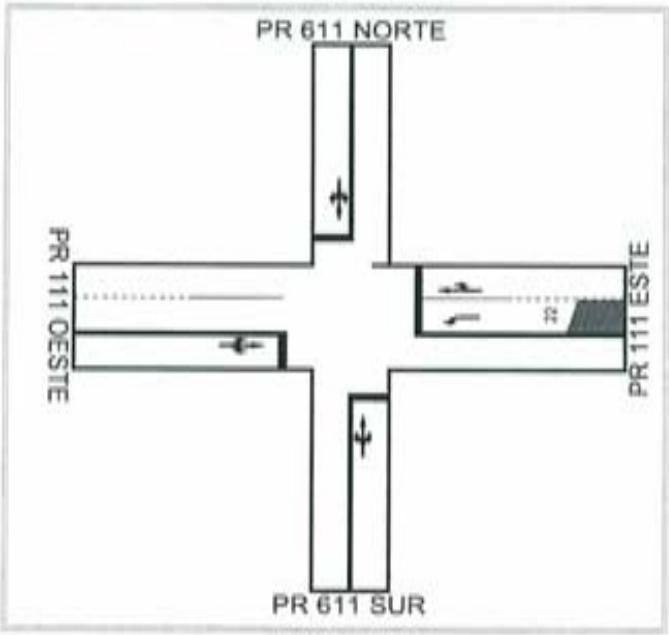


Figura 3 Diagrama esquemático del sistema de fases existente

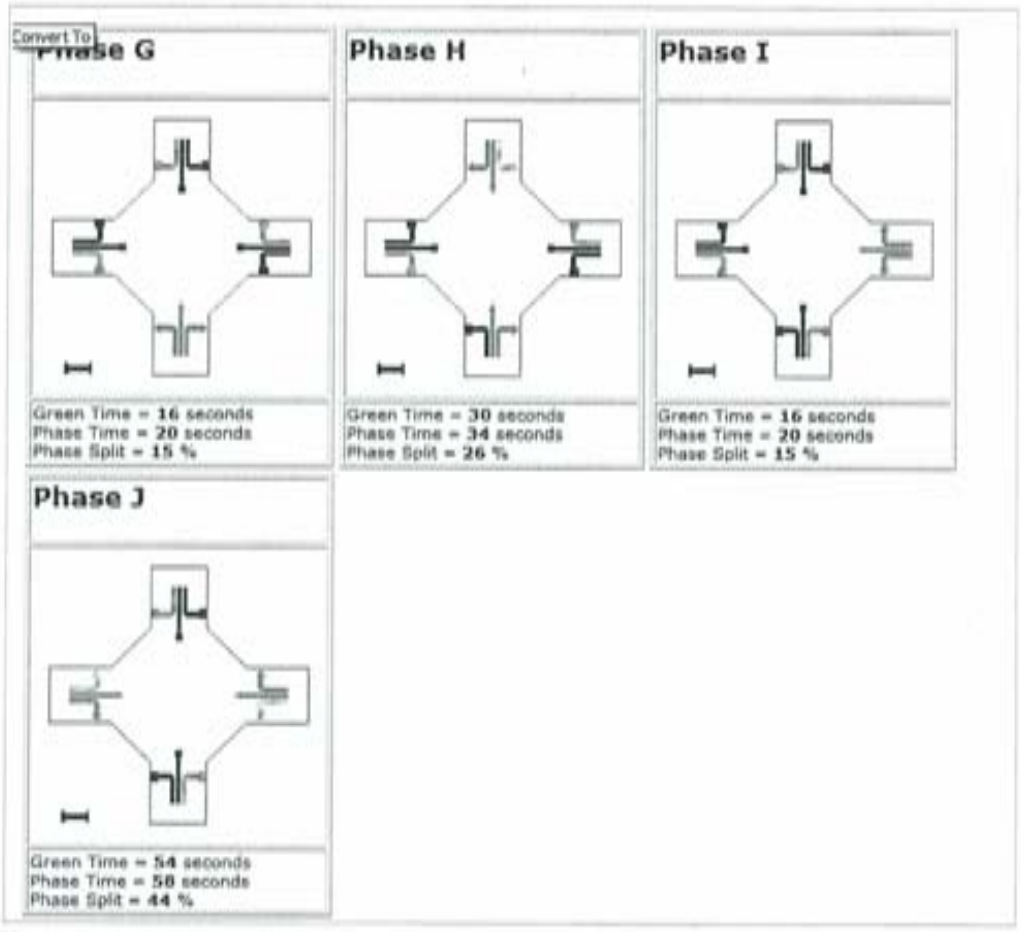


Tabla 10 Resultados modelación SIDRA Intersección carretera PR-111 con la PR-611 (2006)

Periodo Pico	Acceso	Viraje	Demora Prom.	Nivel de servicio	Cola Prom.
		L	47.0	LOS D	18
		T	41.4	LOS D	18
		R	49.5	LOS D	19
	PR-611 Sur	Acceso	46.1	LOS D	18
		L	35.1	LOS D	6
		T	17.9	LOS B	17
		R	26.1	LOS C	17
	PR-111 Este	Acceso	21.8	LOS C	17
		L	62.1	LOS E	37
		T	56.5	LOS E	37
		R	60.9	LOS E	37
	PR-611 Norte	Acceso	60.6	LOS E	37
		L	252.3	LOS F	211
		T	244.0	LOS F	211
		R	56.6	LOS E	42
	PR-111 Oeste	Acceso	233.5	LOS F	211
AM	Intersección		91.6	LOS F	211
		L	58.0	LOS E	26
		T	52.4	LOS D	26
		R	60.7	LOS E	27
	PR-611 Sur	Acceso	56.4	LOS E	26
		L	23.3	LOS C	2
		T	24.1	LOS C	38
		R	32.3	LOS C	38
	PR-111 Este	Acceso	24.2	LOS C	38
		L	56.0	LOS E	28
		T	50.4	LOS D	28
		R	55.7	LOS E	28
	PR-611 Norte	Acceso	53.8	LOS D	28
		L	81.5	LOS F	50
		T	73.2	LOS E	50
		R	49.5	LOS D	28
	PR-111 Oeste	Acceso	74.6	LOS E	50
PM	Intersección		43.6	LOS D	50

Tabla 11 Resultados modelación SIDRA Intersección carretera PR-111 con la PR-611 (2011)

Periodo Pico	Acceso	Viraje	Demora Prom.	Nivel de servicio	Cola Prom.
		L	23.5	LOS C	8
		T	17.9	LOS B	8
		R	25.0	LOS C	9
	PR-611 Sur	Acceso	22.1	LOS C	8
		L	22.8	LOS C	4
		T	14.9	LOS B	17
		R	23.1	LOS C	17
	PR-111 Este	Acceso	16.9	LOS B	17
		L	32.8	LOS C	20
		T	27.2	LOS C	20
		R	31.8	LOS C	19
	PR-611 Norte	Acceso	31.5	LOS C	19
		L	53.6	LOS D	44
		T	45.3	LOS D	44
		R	37.2	LOS D	28
	PR-111 Oeste	Acceso	46.1	LOS D	44
AM	Intersección		28.4	LOS C	44
		L	30.6	LOS C	14
		T	25.0	LOS C	14
		R	32.9	LOS C	15
	PR-611 Sur	Acceso	29.1	LOS C	14
		L	17.4	LOS B	1
		T	23.5	LOS C	42
		R	31.7	LOS C	42
	PR-111 Este	Acceso	23.2	LOS C	42
		L	41.1	LOS D	22
		T	35.5	LOS D	22
		R	40.7	LOS D	22
	PR-611 Norte	Acceso	38.9	LOS D	22
		L	54.9	LOS D	40
		T	46.6	LOS D	40
		R	36.8	LOS D	25
	PR-111 Oeste	Acceso	48.0	LOS D	40
PM	Intersección		31.8	LOS C	42

Los resultados correspondientes a esta intersección muestran que la programación actual del semáforo no aparenta ser la mejor para manejar el tránsito presente. Al estudiar la misma bajo los efectos del tránsito futuro y el generado por el desarrollo

la misma mejora significativamente su nivel de servicio. Este resultado se logra mediante la optimización de los tiempos asignado a cada fase. Se desprende del análisis realizado que esta intersección tiene capacidad para manejar el aumento en tránsito esperado.

5.6.2 Intersección Carretera PR-111 con la Ramal PR-111

Esta intersección tiene una configuración en "T" y está controlada por PARE. Los accesos este y oeste, correspondientes a la PR-111 y consisten de un carril para acceso y uno de egreso. El acceso sur consiste de un carril por dirección e incluye un viraje a derecha canalizado de gran tamaño. En lado norte de la misma se observó un acceso a lo que aparenta ser un proyecto de construcción abandonado. Nuestra oficina se dio a la tarea de investigar lo referente al mencionado proyecto y no se halló expediente alguno en la Junta de Planificación o la ARPE. Por esta razón, analizamos la misma como una "T". La siguiente figura muestra la geometría de la misma.

Figura 4 Diagrama esquemático de la geometría existente

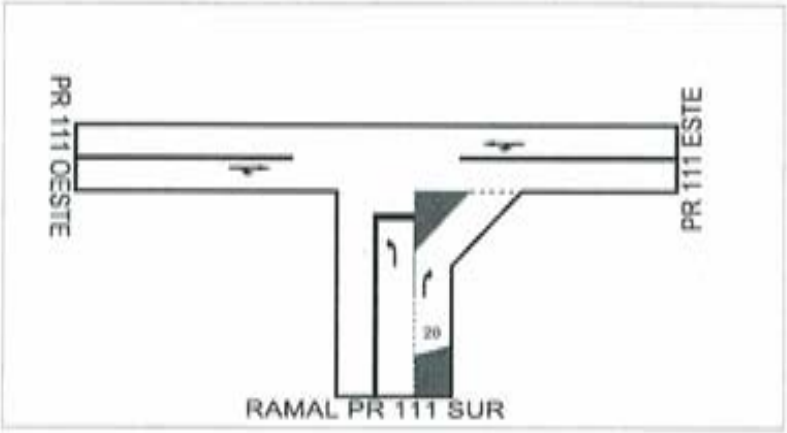


Tabla 12 Resultados modelación SIDRA Intersección de la Carretera PR-111 con la RAMAL PR-111 (2006)

Periodo Pico	Acceso	Viraje	Demora Prom.	Nivel de servicio	Cola Prom.
		L	19.9	LOS C	2
		R	7.0	LOS A	0
	RAMAL PR 111 SUR	Acceso	17.2	LOS C	2
		L	13.6	LOS B	6
		T	5.4	LOS A	6
	PR-111 Este	Acceso	6.8	LOS A	6
		T	0.0	LOS A	0
		R	8.2	LOS A	0
	PR-111 Oeste	Acceso	1.3	LOS A	
AM	Intersección		5.5		6
		L	22.1	LOS C	2
		R	6.3	LOS A	0
	RAMAL PR 111 SUR	Acceso	16.7	LOS C	2
		L	12.6	LOS B	7
		T	4.5	LOS A	7
	PR-111 Este	Acceso	4.8	LOS A	7
		T	0.0	LOS A	0
		R	8.2	LOS A	0
	PR-111 Oeste	Acceso	1.4	LOS A	
PM	Intersección		4.8		7

Tabla 13 Resultados modelación SIDRA Intersección de la Carretera PR-111 con la RAMAL PR-111 (2011)

Periodo Pico	Acceso	Viraje	Demora Prom.	Nivel de servicio	Cola Prom.
		L	25.1	LOS D	3
		R	7.7	LOS A	0
	RAMAL PR 111 SUR	Acceso	21.5	LOS C	3
		L	16.2	LOS C	10
		T	8.1	LOS A	10
	PR-111 Este	Acceso	9.4	LOS A	10
		T	0.0	LOS A	0
		R	8.2	LOS A	0
	PR-111 Oeste	Acceso	1.3	LOS A	
AM	Intersección		7.1		10
		L	30.7	LOS D	4
		R	6.7	LOS A	0
	RAMAL PR 111 SUR	Acceso	23.2	LOS C	4
		L	14.7	LOS B	12
		T	6.6	LOS A	12
	PR-111 Este	Acceso	6.9	LOS A	12
		T	0.0	LOS A	0
		R	8.2	LOS A	0
	PR-111 Oeste	Acceso	1.4	LOS A	
PM	Intersección		6.6		12

Como se puede observar de la tabla anterior, esta intersección operará bajo buenos niveles de servicio en el escenario existente. La demora promedio de la intersección correspondiente a ambos escenarios de la mañana y tarde resultó menor de 6.0 segundos. El análisis futuro mostró un incremento en la demora de la intersección, aunque se mantuvo por debajo del valor requerido por ACT para solicitar mejoras. Se desprende del análisis realizado que esta intersección tiene capacidad para manejar el tránsito esperado.

5.6.3 Intersección Carretera PR-111 con Acceso al Desarrollo

Esta intersección tiene una configuración en "T" y está controlada por PARE. Sus accesos este y oeste (PR-111) consisten de un carril para acceso y uno para egreso. El acceso norte consiste de un carril de egreso y uno de acceso. La siguiente figura muestra la geometría de la misma.

Figura 4 Diagrama esquemático de la geometría existente

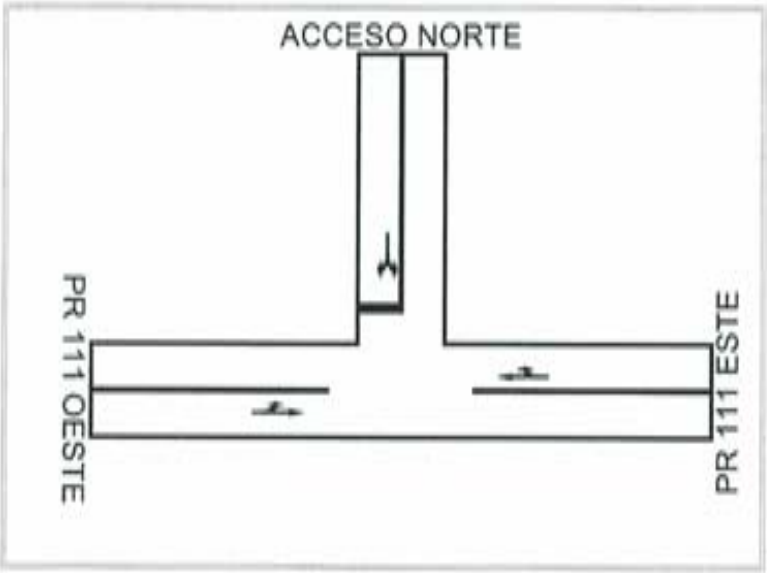


Tabla 14 Resultados modelación SIDRA Intersección de la Carretera PR-111 con acceso al desarrollo (2006)

Periodo Pico	Acceso	Viraje	Demora Prom.	Nivel de servicio	Cola Prom.
		T	0.0	LOS A	0
		R	8.2	LOS A	0
	PR 111 ESTE	Acceso	0.1	LOS A	
		L	16.7	LOS C	0
		R	16.9	LOS C	0
	ACCESO NORTE	Acceso	16.8	LOS C	0
		L	13.7	LOS B	5
		T	5.2	LOS A	5
	PR 111 OESTE	Acceso	5.3	LOS A	5
AM	Intersección		2.6		5
		T	0.0	LOS A	0
		R	8.2	LOS A	0
	PR -111 ESTE	Acceso	0.1	LOS A	
		L	20.2	LOS C	0
		R	20.4	LOS C	0
	ACCESO NORTE	Acceso	20.3	LOS C	0
		L	18.7	LOS C	9
		T	10.2	LOS B	9
	PR - 111 OESTE	Acceso	10.4	LOS B	9
PM	Intersección		3.5		9

Tabla 15 Resultados modelación SIDRA Intersección de la Carretera PR-111 con acceso al desarrollo (2011)

Periodo Pico	Acceso	Viraje	Demora Prom.	Nivel de servicio	Cola Prom.
		T	0.0	LOS A	0
		R	8.2	LOS A	0
	PR-111 ESTE	Acceso	0.2	LOS A	
		L	19.4	LOS C	2
		R	19.6	LOS C	2
	ACCESO NORTE	Acceso	19.5	LOS C	2
		L	16.2	LOS C	9
		T	7.7	LOS A	9
	PR - 111 OESTE	Acceso	8.0	LOS A	9
AM	Intersección		4.9		9
		T	0.0	LOS A	0
		R	8.2	LOS A	0
	PR-111 ESTE	Acceso	0.4	LOS A	
		L	27.3	LOS D	2
		R	27.5	LOS D	2
	ACCESO NORTE	Acceso	27.4	LOS D	2
		L	30.4	LOS D	24
		T	21.9	LOS C	24
	PR-111 OESTE	Acceso	22.9	LOS C	24
PM	Intersección		9.1		24

Como se puede observar de la tabla anterior, esta intersección operará bajo buenos niveles de servicio en el escenario existente. La demora promedio de la intersección correspondiente a ambos escenarios de la mañana y tarde resultó menor de 4.0 segundos. El análisis futuro mostró un incremento en la demora de la intersección, aunque se mantuvo por debajo del valor requerido por ACT para solicitar mejoras. Se desprende del análisis realizado que esta intersección tiene capacidad para manejar el tránsito esperado.

En el apéndice 3 se muestran los resultados de las modelaciones de SIDRA. La versión electrónica de dichas modelaciones esta disponible para la revisión de las agencias concernientes comunicandose a nuestra oficina via telefónica ó a la dirección ***info@trafficpr.com.***

6 Conclusiones y Recomendaciones

Basados en los análisis de las modelaciones realizadas para este estudio podemos concluir que el desarrollo es uno viable en el área donde se propone. Es importante resaltar que este tipo de desarrollo típicamente genera un alto porciento de los viajes como nuevos en el área.

El análisis del impacto generado por el propuesto desarrollo residencial se realizó analizando las dos intersecciones de mayor importancia en el área. A estas se les unió el análisis de la intersección que formará la entrada al desarrollo. En la actualidad las intersecciones existentes operan bajo buenos niveles de servicio. El aumento en el volumen vehicular impuesto por el desarrollo en cuestión, así como el crecimiento típico a través del tiempo; puede ser manejado por las intersecciones analizadas manteniendo su nivel de servicio presente.

7 Certificación

Certifico que la información presentada en este estudio es cierta, correcta y completa, y que fue obtenida utilizando los criterios de la practica usual y aceptada de la ingeniería de tránsito

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8 Referencias

1. Trip Generation Manual, Institute of Transportation Engineers, 7th edition, 2003
2. Trip Generation Handbook: An ITE Recommended Practice, Institute of Transportation Engineers, March 2001
3. "Signalised & unsignalised Intersection Design & Research Aid".
4. Guías para la preparación de estudios operacionales de accesos y de tránsito para Puerto Rico, Autoridad de Carreteras y Transportación, diciembre 2004

9 Apéndices

APÉNDICE 1:

Flujos Obtenidos Mediante Conteos

Conteo de tránsito

Fecha: 1 de noviembre 2006 Dia: Miercoles Clima:

Nombre de intersección: PR-11 con PR-611

Descripción del movimiento:

1	S Left	2	S Through
3	S Right	4	E Left
5	E Through	6	E Right
7	N Left	8	N Through
9	N Right	10	W Left
11	W Through	12	W Right

Comienzo del Periodo	Movimiento										
	1	2	3	4	5	6	7	8	9	10	11
06:00	3	8	7	20	43	2	8	4	17	8	23
06:15	2	7	8	24	50	2	9	5	20	7	28
06:30	2	11	11	25	54	5	10	7	22	8	29
06:45	5	10	17	32	59	4	11	8	21	10	33
07:00	6	17	15	33	65	5	14	10	26	11	48
07:15	7	14	21	41	85	8	15	13	36	18	51
07:30	4	17	20	37	93	5	18	13	40	17	38
07:45	4	22	29	30	114	8	20	12	44	18	86
08:00	8	12	10	25	61	8	24	25	42	23	57
08:15	9	14	13	19	73	12	13	33	30	38	62
08:30	2	15	24	22	96	3	10	12	35	25	74
08:45	3	12	23	18	88	10	9	14	27	31	65
09:00	2	5	10	15	60	6	17	14	32	20	57
09:15	5	14	19	24	69	8	13	18	29	30	48
09:30	10	14	30	20	71	4	16	12	22	28	52
09:45	3	15	25	29	73	6	14	12	19	24	48
10:00	5	11	21	23	75	4	13	12	22	20	45
10:15	7	10	27	27	74	5	16	17	20	19	44
10:30	4	8	25	25	68	2	14	20	28	18	41
10:45	10	9	22	20	65	5	17	14	32	22	58
11:00	8	12	20	22	69	4	15	11	33	21	65
11:15	7	11	19	29	63	2	20	12	37	20	66
11:30	6	16	12	26	59	3	23	17	36	17	67
11:45	6	15	23	36	55	3	33	16	39	15	69
12:00	15	14	23	39	78	2	32	22	35	18	71
12:15	14	12	21	30	82	0	28	23	38	17	73
12:30	22	19	13	28	85	9	23	19	47	26	64
12:45	19	13	17	24	75	10	23	14	41	27	69
13:00	16	14	19	23	74	7	22	10	41	27	65
13:15	14	11	13	22	73	8	20	12	40	24	62
13:30	12	13	16	23	82	9	28	14	33	25	63
13:45	13	19	17	20	80	9	23	11	38	20	59
14:00	16	12	14	23	89	3	39	19	38	21	54
14:15	5	7	17	27	82	5	39	13	32	19	49
14:30	9	13	15	37	122	7	33	18	29	25	64
14:45	21	17	14	27	82	4	23	25	28	31	79
15:00	25	11	16	21	90	3	32	30	45	24	69
15:15	12	29	22	17	197	5	20	27	25	18	68
15:30	11	19	19	32	133	9	12	19	34	19	60
15:45	16	7	20	19	87	5	16	11	22	25	49
16:00	12	6	23	42	106	3	15	15	53	23	74
16:15	10	9	15	22	92	5	10	24	42	25	69
16:30	6	2	21	22	100	10	28	32	38	28	67
16:45	6	10	24	20	87	7	29	28	53	32	81
17:00	3	4	29	27	78	5	21	25	52	38	78
17:15	8	5	26	20	77	4	19	20	49	33	74
17:30	9	4	23	21	76	3	12	22	52	28	64
17:45	10	2	20	17	69	3	11	17	47	22	62
18:00											
18:15											
18:30											
18:45											

Conteo de tránsito

Fecha: 1 de noviembre de 2006 Dia: Miercoles Clima:

Nombre de intersección: PR-111 con Ramal PR-111

Descripción del movimiento:

1	S Left	2	S Through
3	S Right	4	E Left
5	E Through	6	E Right
7	N Left	8	N Through
9	N Right	10	W Left
11	W Through	12	W Right

Comienzo del Periodo	Movimiento											
	1	2	3	4	5	6	7	8	9	10	11	12
06:00	8	0	2	21	67	0	0	0	0	0	38	5
06:15	8	0	2	27	68	0	0	0	0	0	40	4
06:30	10	0	5	33	74	0	0	0	0	0	50	3
06:45	11	0	4	38	84	0	0	0	0	0	56	3
07:00	14	0	5	39	89	0	0	0	0	0	72	8
07:15	19	0	7	44	115	0	0	0	0	0	80	14
07:30	14	0	1	50	121	0	0	0	0	0	60	22
07:45	26	0	7	25	126	0	0	0	0	0	113	21
08:00	18	0	8	11	76	0	0	0	0	0	101	6
08:15	7	0	1	9	97	0	0	0	0	0	98	5
08:30	14	0	7	9	107	0	0	0	0	0	100	11
08:45	17	0	9	11	99	0	0	0	0	0	90	5
09:00	5	0	3	8	76	0	0	0	0	0	79	12
09:15	8	0	7	10	93	0	0	0	0	0	77	5
09:30	7	0	8	9	88	0	0	0	0	0	68	15
09:45	5	0	7	5	103	0	0	0	0	0	61	9
10:00	9	0	5	5	93	0	0	0	0	0	62	10
10:15	8	0	7	4	98	0	0	0	0	0	63	8
10:30	7	0	8	5	88	0	0	0	0	0	64	9
10:45	9	0	9	9	81	0	0	0	0	0	90	10
11:00	8	0	5	8	87	0	0	0	0	0	95	11
11:15	11	0	5	11	83	0	0	0	0	0	99	11
11:30	11	0	5	10	77	0	0	0	0	0	96	13
11:45	15	0	3	8	79	0	0	0	0	0	102	12
12:00	13	0	7	6	106	0	0	0	0	0	107	14
12:15	20	0	7	5	92	0	0	0	0	0	107	18
12:30	14	0	8	7	108	0	0	0	0	0	125	8
12:45	19	0	5	8	90	0	0	0	0	0	119	10
13:00	10	0	5	6	94	0	0	0	0	0	111	11
13:15	14	0	7	7	89	0	0	0	0	0	102	14
13:30	10	0	5	8	104	0	0	0	0	0	96	12
13:45	13	0	7	10	98	0	0	0	0	0	99	11
14:00	14	0	11	9	101	0	0	0	0	0	93	15
14:15	11	0	6	8	103	0	0	0	0	0	70	16
14:30	15	0	9	9	151	0	0	0	0	0	92	10
14:45	19	0	11	13	94	0	0	0	0	0	104	24
15:00	20	0	12	11	94	0	0	0	0	0	121	18
15:15	19	0	10	9	200	0	0	0	0	0	87	18
15:30	9	0	12	11	165	0	0	0	0	0	93	12
15:45	16	0	8	6	95	0	0	0	0	0	88	19
16:00	9	0	5	9	142	0	0	0	0	0	126	13
16:15	7	0	17	5	112	0	0	0	0	0	104	17
16:30	10	0	11	16	122	0	0	0	0	0	98	13
16:45	10	0	11	5	104	0	0	0	0	0	127	13
17:00	10	0	10	8	100	0	0	0	0	0	121	12
17:15	10	0	8	7	91	0	0	0	0	0	117	14
17:30	8	0	7	5	92	0	0	0	0	0	117	8
17:45	8	0	7	5	81	0	0	0	0	0	112	7
18:00												
18:15												
18:30												
18:45												

Conteo de tránsito

Fecha: 1 de noviembre 2006 Dia: Miercoles Clima:

Nombre de intersección: PR-111 con entrada al desarrollo

Descripción del movimiento:

1	S Left	2	S Through
3	S Right	4	E Left
5	E Through	6	E Right
7	N Left	8	N Through
9	N Right	10	W Left
11	W Through	12	W Right

Comienzo del Periodo	Movimiento											
	1	2	3	4	5	6	7	8	9	10	11	12
06:00	0	0	0	0	65	0	0	0	0	0	43	0
06:15	0	0	0	0	76	0	1	0	1	0	50	0
06:30	0	0	0	0	84	0	1	0	0	0	53	0
06:45	0	0	0	0	95	0	0	0	0	0	59	0
07:00	0	0	0	0	103	0	1	0	1	0	80	0
07:15	0	0	0	0	134	1	2	0	0	1	94	0
07:30	0	0	0	0	135	1	0	0	1	1	82	0
07:45	0	0	0	0	152	1	1	0	1	1	134	0
08:00	0	0	0	0	94	0	1	0	1	0	107	0
08:15	0	0	0	0	104	0	0	0	0	0	101	0
08:30	0	0	0	0	121	0	0	0	0	0	111	0
08:45	0	0	0	0	116	0	0	0	0	0	95	0
09:00	0	0	0	0	81	0	0	0	0	0	91	0
09:15	0	0	0	0	101	0	0	0	0	0	82	0
09:30	0	0	0	0	95	0	0	0	0	0	84	0
09:45	0	0	0	0	108	0	0	0	0	0	70	0
10:00	0	0	0	0	102	0	0	0	0	0	72	0
10:15	0	0	0	0	106	0	0	0	0	0	71	0
10:30	0	0	0	0	95	0	0	0	0	0	73	0
10:45	0	0	0	0	90	0	0	0	0	0	100	0
11:00	0	0	0	0	95	0	0	0	0	0	106	0
11:15	0	0	0	0	94	0	0	0	0	0	110	0
11:30	0	0	0	0	88	0	0	0	0	0	109	0
11:45	0	0	0	0	94	0	0	0	1	0	114	0
12:00	0	0	0	0	119	0	0	0	0	0	121	0
12:15	0	0	0	0	112	0	0	0	0	0	125	0
12:30	0	0	0	0	122	0	3	0	3	0	133	0
12:45	0	0	0	0	109	0	0	0	0	0	129	0
13:00	0	0	0	0	104	0	0	0	0	0	122	0
13:15	0	0	0	0	103	0	0	0	0	0	116	0
13:30	0	0	0	0	114	0	0	0	0	0	108	0
13:45	0	0	0	0	109	0	0	0	0	0	110	0
14:00	0	0	0	0	115	0	0	0	0	0	108	0
14:15	0	0	0	0	114	0	0	0	0	0	86	0
14:30	0	0	0	0	166	0	1	0	1	0	102	0
14:45	0	0	0	0	113	0	1	0	1	0	128	0
15:00	0	0	0	0	114	0	1	0	1	0	139	0
15:15	0	0	0	0	219	2	1	0	1	2	105	0
15:30	0	0	0	0	174	1	1	0	1	1	105	0
15:45	0	0	0	0	111	2	1	0	1	2	87	0
16:00	0	0	0	0	151	1	1	0	1	1	139	0
16:15	0	0	0	0	119	1	1	0	1	1	121	0
16:30	0	0	0	0	132	1	1	0	1	1	111	0
16:45	0	0	0	0	114	1	1	0	1	1	140	0
17:00	0	0	0	0	110	1	1	0	1	1	133	0
17:15	0	0	0	0	101	0	0	0	0	0	131	0
17:30	0	0	0	0	100	0	0	0	0	0	125	0
17:45	0	0	0	0	89	0	0	0	0	0	119	0
18:00												
18:15												
18:30												
18:45												

APÉNDICE 2:

Fotos de intersecciones

PR-111 con entrada al futuro desarrollo Acceso Norte

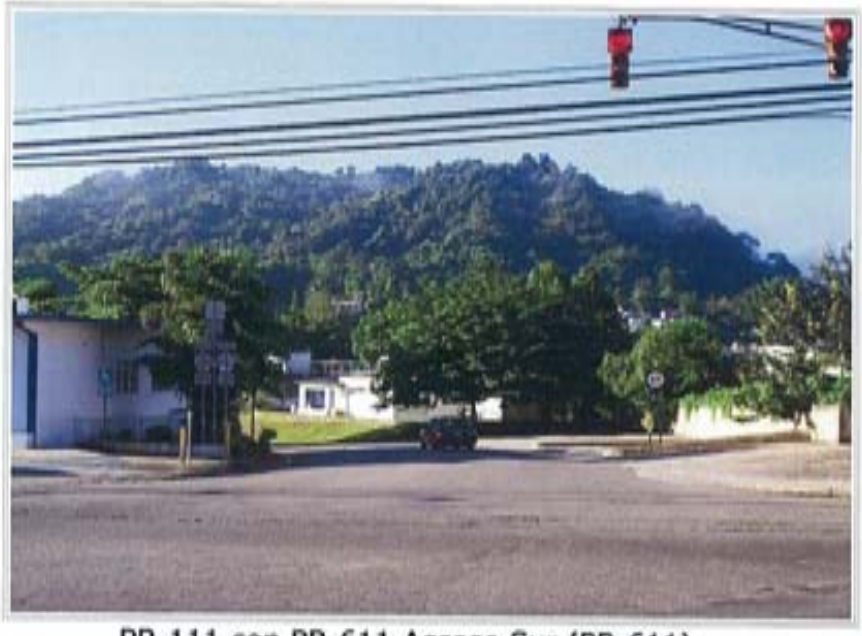
PR-111 con entrada al futuro desarrollo Acceso Este

PR-111 con entrada al futuro desarrollo Acceso Oeste

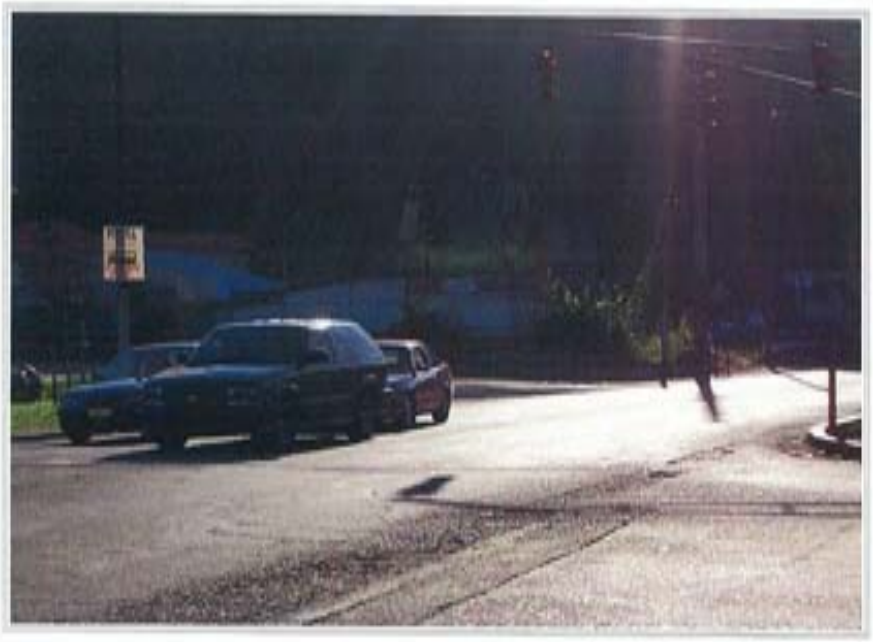
PR-111 con Ramal PR-111 Acceso Oeste

PR-111 con Ramal PR-111 Acceso Este

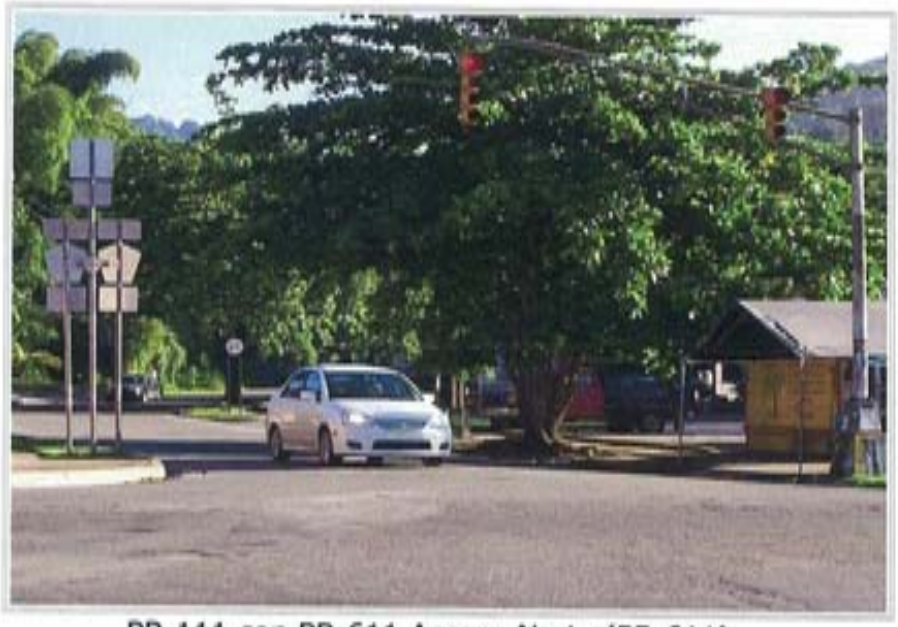
PR-111 con Ramal PR-111 Acceso Sur



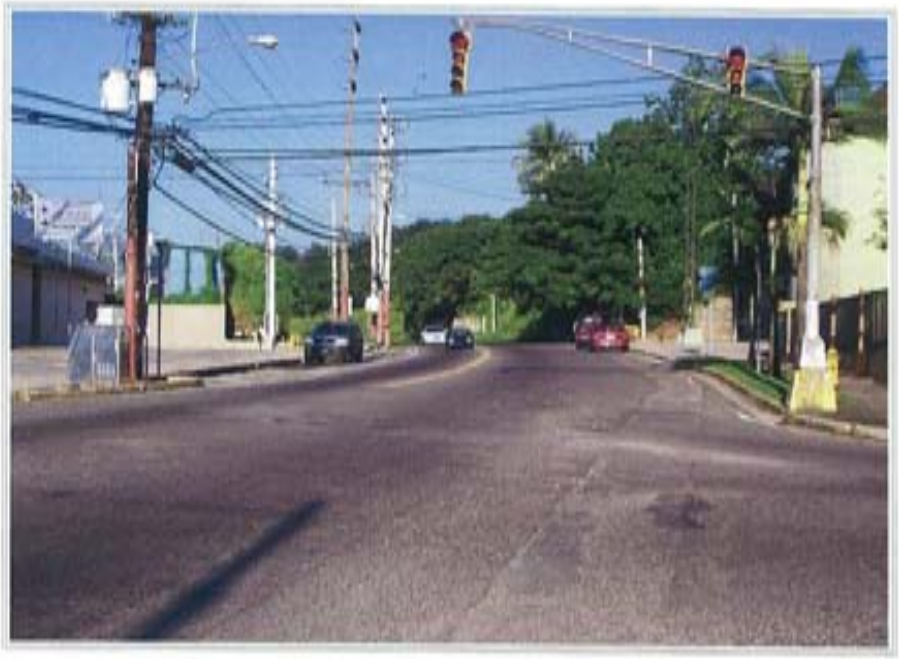
PR-111 con PR-611 Acceso Sur (PR-611)



PR-111 con PR-611 Acceso Este (PR-111)



PR-111 con PR-611 Acceso Norte (PR-611)



PR-111 con PR-611 Acceso Oeste (PR-111)

APÉNDICE 3:

Resultados modelaciones SIDRA

Matriz del Estudio

Archivo	Lugar	Año	Periodo
Corridas de utuado.aap	PR-111 con PR-611 PR-111 con acceso al desarrollo PR-111 con ramal PR-111	2006 2011	AM PM

Output Tables
Output Tables
PR 111 -- ACCESO AL DESARROLLO
2006, AM

Run Information
* Basic Parameters:
Intersection Type: Unsignalised - Two-Way Stop Control
Driving on the right-hand side of the road
Input data specified in Metric units
Model Defaults: TCG Standard Right
Peak Flow Period (for performance): 15 minutes
Unit time (for volumes): 60 minutes.
Delay definition: Control delay
Geometric delay included
SIDRA Standard Delay model used
SIDRA Standard Queue model used
Level of Service based on: Delay (HCM method)
Queue definition: Cycle average queue, Average

Table S.3 - Intersection Parameters
PR 111 -- ACCESO AL DESARROLLO
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Intersection Level of Service	=	NA
Worst movement Level of Service	=	C
Average intersection delay (s)	=	2.6
Largest average movement delay (s)	=	16.9
Largest cycle-average queue, mean (m)	=	5
Performance Index	=	13.44
Degree of saturation (highest)	=	0.314
Practical Spare Capacity (lowest)	=	155 %
Effective intersection capacity, (veh/h)	=	3696
Total vehicle flow (veh/h)	=	1160
Total person flow (pers/h)	=	1740
Total vehicle delay (veh-h/h)	=	0.84
Total person delay (pers-h/h)	=	1.26
Total effective vehicle stops (veh/h)	=	14
Total effective person stops (pers/h)	=	21
Total vehicle travel (veh-km/h)	=	703.4
Total cost ($/h)	=	432.99
Total fuel (L/h)	=	61.6
Total CO2 (kg/h)	=	154.12

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections. See Table S.15 or Movement Displays for individual movement LOS values.

Table S.6 - Intersection Performance
PR 111 -- ACCESO AL DESARROLLO
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (m)	Perf. Index	Aver. Speed (km/h)
East: PR 111 ESTE									

612	0.314	0.01	0.01	0.1	0.00	0.00	0	6.21	59.9
North: ACCESO NORTE									
8	0.017	0.04	0.06	16.8	0.65	0.91	0	0.17	42.0
West: PR 111 OESTE									
540	0.286	0.79	1.19	5.3	0.78	0.01	5	7.06	50.6
ALL VEHICLES:									
1160	0.314	0.84	1.26	2.6	0.37	0.01	5	13.44	55.0
INTERSECTION (persons):									
1740	0.314		1.26	2.6	0.37	0.01		13.44	55.0

Queue values in this table are mean cycle-average queue (metres).

Table S.7 - Lane Performance
PR 111 -- ACCESO AL DESARROLLO
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue Cycle Aver. (vehs)	(m)	Lane Length (m)
East: PR 111 ESTE								
1 TR	612	1949	0.314	0.1	0.00	0.0	0.0	500.0
North: ACCESO NORTE								
1 LR	8	466	0.017	16.8	0.91	0.0	0.1	500.0
West: PR 111 OESTE								
1 LT	540	1924	0.281	5.3	0.01	0.8	5.5	500.0

Table S.10 - Movement Capacity and Performance Summary
PR 111 -- ACCESO AL DESARROLLO
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Dem Flow (veh /h)	Total Cap. (veh /h)	Lane Util (%)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Cycle Average Queue (veh)	Perf. Index
East: PR 111 ESTE									
5	T	608	1937	100	0.314*	0.0	0.00	0.0	6.15
6	R	4	13	100	0.308	8.2	0.67	0.0	0.06
North: ACCESO NORTE									
7	L	4	233	100	0.017	16.7	0.96	0.0	0.09
9	R	4	233	100	0.017	16.9	0.86	0.0	0.09
West: PR 111 OESTE									
10	L	4	14	100	0.286	13.7	0.95	0.8	0.08
11	T	536	1910	100	0.281	5.2	0.00	0.8	6.97

* Maximum degree of saturation

Table S.12A - Fuel Consumption, Emissions and Cost (TOTAL)
PR 111 -- ACCESO AL DESARROLLO

2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Fuel Total L/h	Cost Total $/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h
INTERSECTION:	61.6	432.99	0.241	8.74	0.329	154.1

PARAMETERS USED IN COST CALCULATIONS

Pump price of fuel ($/L)	=	1.200
Fuel resource cost factor	=	0.50
Ratio of running cost to fuel cost	=	3.0
Average income ($/h)	=	28.00
Time value factor	=	0.60
Light vehicle mass (1000 kg)	=	1.4
Heavy vehicle mass (1000 kg)	=	11.0
Light vehicle idle fuel rate (L/h)	=	1.350
Heavy vehicle idle fuel rate (L/h)	=	2.000

Table S.14 - Summary of Input and Output Data
PR 111 -- ACCESO AL DESARROLLO
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: PR 111 ESTE												
1 TR		608	4	612	0				0.314	0.1	0	500
	0	608	4	612	0				0.314	0.1		
North: ACCESO NORTE												
1 LR	4		4	8	0				0.017	16.8	0	500
	4	0	4	8	0				0.017	16.8	0	
West: PR 111 OESTE												
1 LT	4	536		540	0				0.281	5.3	5	500
	4	536	0	540	0				0.281	5.3	5	
ALL VEHICLES				Total Flow 1160	% HV 0				Max X 0.314	Aver. Delay 2.6	Max Queue 5	

Peak flow period = 15 minutes.

Queue values in this table are mean cycle-average queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Table S.15 - Capacity and Level of Service
PR 111 -- ACCESO AL DESARROLLO
2006, AM

Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue Cycle (vehs)	Aver. (m)
East: PR 111 ESTE								
5	T	608	1937	0.314*	0.0	A	0.0	0
6	R	4	13	0.308	8.2	A	0.0	0
North: ACCESO NORTE								
7	L	4	233	0.017	16.7	C	0.0	0
9	R	4	233	0.017	16.9	C	0.0	0
West: PR 111 OESTE								
10	L	4	14	0.286	13.7	B	0.8	5
11	T	536	1910	0.281	5.2	A	0.8	5
ALL VEHICLES:		1160		0.314	2.6	NA	0.8	5

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

NA Not Applicable - Intersection Level of Service is not calculated at
two-way stop control or give-way/yield controlled intersections.

* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

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Output Tables
Output Tables
PR 111 -- ACCESO AL DESARROLLO
2006, PM

Run Information
* Basic Parameters:
Intersection Type: Unsignalised - Two-Way Stop Control
Driving on the right-hand side of the road
Input data specified in Metric units
Model Defaults: TCG Standard Right
Peak Flow Period (for performance): 15 minutes
Unit time (for volumes): 60 minutes.
Delay definition: Control delay

Geometric delay included
SIDRA Standard Delay model used
SIDRA Standard Queue model used
Level of Service based on: Delay (HCM method)
Queue definition: Cycle average queue, Average

Table S.3 - Intersection Parameters
PR 111 -- ACCESO AL DESARROLLO
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Intersection Level of Service	=	NA
Worst movement Level of Service	=	C
Average intersection delay (s)	=	3.5
Largest average movement delay (s)	=	20.4
Largest cycle-average queue, mean (m)	=	9
Performance Index	=	15.99
Degree of saturation (highest)	=	0.454
Practical Spare Capacity (lowest)	=	76 %
Effective intersection capacity, (veh/h)	=	2910
Total vehicle flow (veh/h)	=	1320
Total person flow (pers/h)	=	1980
Total vehicle delay (veh-h/h)	=	1.30
Total person delay (pers-h/h)	=	1.95
Total effective vehicle stops (veh/h)	=	21
Total effective person stops (pers/h)	=	32
Total vehicle travel (veh-km/h)	=	800.4
Total cost ($/h)	=	491.73
Total fuel (L/h)	=	68.3
Total CO2 (kg/h)	=	170.76

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections. See Table S.15 or Movement Displays for individual movement LOS values.

Table S.6 - Intersection Performance
PR 111 -- ACCESO AL DESARROLLO
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (m)	Perf. Index	Aver. Speed (km/h)
East: PR -111 ESTE									
884	0.454	0.02	0.03	0.1	0.00	0.01	0	8.98	59.9
North: ACCESO NORTE									
8	0.024	0.05	0.07	20.3	0.77	0.98	0	0.19	39.5
West: PR - 111 OESTE									
428	0.235	1.23	1.85	10.4	0.92	0.02	9	6.82	46.7
ALL VEHICLES:									
1320	0.454	1.30	1.95	3.5	0.30	0.02	9	15.99	54.7
INTERSECTION (persons):									
1980	0.454		1.95	3.5	0.30	0.02		15.99	54.7

Queue values in this table are mean cycle-average queue (metres).

Table S.7 - Lane Performance

PR 111 -- ACCESO AL DESARROLLO
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue Cycle (vehs)	Queue Aver. (m)	Lane Length (m)
East: PR -111 ESTE								
1 TR	884	1949	0.454	0.1	0.01	0.0	0.0	500.0
North: ACCESO NORTE								
1 LR	8	328	0.024	20.3	0.98	0.0	0.2	500.0
West: PR - 111 OESTE								
1 LT	428	1827	0.234	10.4	0.02	1.2	8.5	500.0

Table S.10 - Movement Capacity and Performance Summary
PR 111 -- ACCESO AL DESARROLLO
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Dem Flow (veh /h)	Total Cap. (veh /h)	Lane Util (%)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Cycle Average Queue (veh)	Perf. Index
East: PR -111 ESTE									
5	T	876	1931	100	0.454*	0.0	0.00	0.0	8.85
6	R	8	18	100	0.444	8.2	0.67	0.0	0.13
North: ACCESO NORTE									
7	L	4	164	100	0.024	20.2	1.00	0.0	0.10
9	R	4	164	100	0.024	20.4	0.96	0.0	0.10
West: PR - 111 OESTE									
10	L	8	34	100	0.235	18.7	1.00	1.2	0.19
11	T	420	1793	100	0.234	10.2	0.00	1.2	6.63

* Maximum degree of saturation

Table S.12A - Fuel Consumption, Emissions and Cost (TOTAL)
PR 111 -- ACCESO AL DESARROLLO
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Fuel Total L/h	Cost Total $/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h
INTERSECTION:	68.3	491.73	0.263	8.97	0.355	170.8

PARAMETERS USED IN COST CALCULATIONS

Pump price of fuel ($/L)	=	1.200
Fuel resource cost factor	=	0.50
Ratio of running cost to fuel cost	=	3.0
Average income ($/h)	=	28.00
Time value factor	=	0.60
Light vehicle mass (1000 kg)	=	1.4
Heavy vehicle mass (1000 kg)	=	11.0
Light vehicle idle fuel rate (L/h)	=	1.350
Heavy vehicle idle fuel rate (L/h)	=	2.000

Table S.14 - Summary of Input and Output Data
PR 111 -- ACCESO AL DESARROLLO
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: PR -111 ESTE												
1 TR		876	8	884	0				0.454	0.1	0	500
	0	876	8	884	0				0.454	0.1		
North: ACCESO NORTE												
1 LR	4		4	8	0				0.024	20.3	0	500
	4	0	4	8	0				0.024	20.3	0	
West: PR - 111 OESTE												
1 LT	8	420		428	0				0.234	10.4	9	500
	8	420	0	428	0				0.234	10.4	9	
ALL VEHICLES				Total Flow 1320	% HV 0				Max X 0.454	Aver. Delay 3.5	Max Queue 9	

Peak flow period = 15 minutes.

Queue values in this table are mean cycle-average queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Table S.15 - Capacity and Level of Service
PR 111 -- ACCESO AL DESARROLLO
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue Cycle (vehs)	Aver. (m)
East: PR -111 ESTE								
5	T	876	1931	0.454*	0.0	A	0.0	0
6	R	8	18	0.444	8.2	A	0.0	0
North: ACCESO NORTE								
7	L	4	164	0.024	20.2	C	0.0	0
9	R	4	164	0.024	20.4	C	0.0	0

West: PR - 111 OESTE							
10	L	8	34	0.235	18.7	C	1.2	9
11	T	420	1793	0.234	10.2	B	1.2	9
ALL VEHICLES:		1320		0.454	3.5	NA	1.2	9

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections.

* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane v/c ratio rather than short lane v/c ratio (v/c=1.0)

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Output Tables
Output Tables
PR 111 -- ACCESO AL DESARROLLO
2011, AM

Run Information
* Basic Parameters:
Intersection Type: Unsignalised - Two-Way Stop Control
Driving on the right-hand side of the road
Input data specified in Metric units
Model Defaults: TCG Standard Right
Peak Flow Period (for performance): 15 minutes
Unit time (for volumes): 60 minutes.
Delay definition: Control delay
Geometric delay included
SIDRA Standard Delay model used
SIDRA Standard Queue model used
Level of Service based on: Delay (HCM method)
Queue definition: Cycle average queue, Average

Table S.3 - Intersection Parameters
PR 111 -- ACCESO AL DESARROLLO
2011, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Intersection Level of Service	=	NA
Worst movement Level of Service	=	C
Average intersection delay (s)	=	4.9
Largest average movement delay (s)	=	19.6

Largest cycle-average queue, mean (m)	=	9
Performance Index	=	18.35
Degree of saturation (highest)	=	0.361
Practical Spare Capacity (lowest)	=	121 %
Effective intersection capacity, (veh/h)	=	3889
Total vehicle flow (veh/h)	=	1406
Total person flow (pers/h)	=	2109
Total vehicle delay (veh-h/h)	=	1.90
Total person delay (pers-h/h)	=	2.85
Total effective vehicle stops (veh/h)	=	128
Total effective person stops (pers/h)	=	191
Total vehicle travel (veh-km/h)	=	852.2
Total cost ($/h)	=	545.75
Total fuel (L/h)	=	78.3
Total CO2 (kg/h)	=	195.73

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections. See Table S.15 or Movement Displays for individual movement LOS values.

Table S.6 - Intersection Performance
PR 111 -- ACCESO AL DESARROLLO
2011, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (m)	Perf. Index	Aver. Speed (km/h)
East: PR-111 ESTE									
704	0.361	0.03	0.05	0.2	0.00	0.01	0	7.20	59.7
North: ACCESO NORTE									
94	0.235	0.51	0.76	19.5	0.75	1.02	2	2.22	40.0
West: PR - 111 OESTE									
608	0.339	1.36	2.03	8.0	0.88	0.04	9	8.93	49.2
ALL VEHICLES:									
1406	0.361	1.90	2.85	4.9	0.43	0.09	9	18.35	53.0
INTERSECTION (persons):									
2109	0.361		2.85	4.9	0.43	0.09		18.35	53.0

Queue values in this table are mean cycle-average queue (metres).

Table S.7 - Lane Performance
PR 111 -- ACCESO AL DESARROLLO
2011, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue Cycle (vehs)	Queue Aver. (m)	Lane Length (m)
East: PR-111 ESTE								
1 TR	704	1948	0.361	0.2	0.01	0.0	0.0	500.0
North: ACCESO NORTE								
1 LR	94	402	0.234	19.5	1.02	0.2	1.6	500.0

West: PR - 111 OESTE									
1	LT	608	1809	0.336	8.0	0.04	1.3	9.1	500.0

Table S.10 - Movement Capacity and Performance Summary
PR 111 -- ACCESO AL DESARROLLO
2011, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Dem Flow (veh /h)	Total Cap. (veh /h)	Lane Util (%)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Cycle Average Queue (veh)	Perf. Index
East: PR-111 ESTE									
5	T	689	1906	100	0.361*	0.0	0.00	0.0	6.96
6	R	15	42	100	0.357	8.2	0.67	0.0	0.24
North: ACCESO NORTE									
7	L	38	162	100	0.235	19.4	1.02	0.2	0.89
9	R	56	239	100	0.234	19.6	1.02	0.2	1.33
West: PR - 111 OESTE									
10	L	21	62	100	0.339	16.2	1.04	1.3	0.47
11	T	587	1747	100	0.336	7.7	0.00	1.3	8.45

* Maximum degree of saturation

Table S.12A - Fuel Consumption, Emissions and Cost (TOTAL)
PR 111 -- ACCESO AL DESARROLLO
2011, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Fuel Total L/h	Cost Total $/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h
INTERSECTION:	78.3	545.75	0.313	12.03	0.427	195.7

PARAMETERS USED IN COST CALCULATIONS

Pump price of fuel ($/L)	=	1.200
Fuel resource cost factor	=	0.50
Ratio of running cost to fuel cost	=	3.0
Average income ($/h)	=	28.00
Time value factor	=	0.60
Light vehicle mass (1000 kg)	=	1.4
Heavy vehicle mass (1000 kg)	=	11.0
Light vehicle idle fuel rate (L/h)	=	1.350
Heavy vehicle idle fuel rate (L/h)	=	2.000

Table S.14 - Summary of Input and Output Data
PR 111 -- ACCESO AL DESARROLLO
2011, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: PR-111 ESTE												
1 TR		689	15	704	0				0.361	0.2	0	500
	0	689	15	704	0				0.361	0.2		
North: ACCESO NORTE												
1 LR	38		56	94	0				0.234	19.5	2	500
	38	0	56	94	0				0.234	19.5	2	
West: PR - 111 OESTE												
1 LT	21	587		608	0				0.336	8.0	9	500
	21	587	0	608	0				0.336	8.0	9	
ALL VEHICLES				Total Flow 1406	% HV 0				Max X 0.361	Aver. Delay 4.9	Max Queue 9	

Peak flow period = 15 minutes.

Queue values in this table are mean cycle-average queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Table S.15 - Capacity and Level of Service
PR 111 -- ACCESO AL DESARROLLO
2011, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue Cycle (vehs)	Aver. (m)
East: PR-111 ESTE								
5	T	689	1906	0.361*	0.0	A	0.0	0
6	R	15	42	0.357	8.2	A	0.0	0
North: ACCESO NORTE								
7	L	38	162	0.235	19.4	C	0.2	2
9	R	56	239	0.234	19.6	C	0.2	2
West: PR - 111 OESTE								
10	L	21	62	0.339	16.2	C	1.3	9
11	T	587	1747	0.336	7.7	A	1.3	9
ALL VEHICLES:		1406		0.361	4.9	NA	1.3	9

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections.

```
   *  Maximum v/c ratio, or critical green periods
   "  Movement Level of service has been determined using adjacent lane
      v/c ratio rather than short lane v/c ratio (v/c=1.0)
```

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Output Tables
Output Tables
PR 111 -- ACCESO AL DESARROLLO
2011, PM


Run Information
 * Basic Parameters:
   Intersection Type: Unsignalised - Two-Way Stop Control
   Driving on the right-hand side of the road
   Input data specified in Metric units
   Model Defaults: TCG Standard Right
   Peak Flow Period (for performance): 15 minutes
   Unit time (for volumes): 60 minutes.
   Delay definition: Control delay
                     Geometric delay included
   SIDRA Standard Delay model used
   SIDRA Standard Queue model used
   Level of Service based on: Delay (HCM method)
   Queue definition: Cycle average queue, Average
Table S.3 - Intersection Parameters
 PR 111 -- ACCESO AL DESARROLLO
 2011, PM
 Intersection ID: 02
 Stop Sign Controlled Intersection

 ---------------------------------------------------------
    Intersection Level of Service                =       NA
    Worst movement Level of Service              =        D
    Average intersection delay (s)               =      9.1
    Largest average movement delay (s)           =     30.4
    Largest cycle-average queue, mean (m)        =       24
    Performance Index                            =    25.25
    Degree of saturation (highest)               =    0.522
    Practical Spare Capacity (lowest)            =       53 %
    Effective intersection capacity, (veh/h)     =     3124
    Total vehicle flow (veh/h)                   =     1630
    Total person flow (pers/h)                   =     2445
    Total vehicle delay (veh-h/h)                =     4.13
    Total person delay (pers-h/h)                =     6.20
    Total effective vehicle stops (veh/h)        =      176
    Total effective person stops (pers/h)        =      264
    Total vehicle travel (veh-km/h)              =    987.8
    Total cost ($/h)                             =   682.68
    Total fuel (L/h)                             =     91.3
    Total CO2 (kg/h)                             =   228.31
```

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections. See Table S.15 or Movement Displays for individual movement LOS values.

Table S.6 - Intersection Performance
PR 111 -- ACCESO AL DESARROLLO
2011, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (m)	Perf. Index	Aver. Speed (km/h)
East: PR-111 ESTE									
1011	0.522	0.11	0.16	0.4	0.00	0.03	0	10.50	59.4
North: ACCESO NORTE									
65	0.273	0.49	0.74	27.4	0.87	1.03	2	1.82	35.1
West: PR-111 OESTE									
554	0.462	3.53	5.29	22.9	1.00	0.14	24	12.92	36.8
ALL VEHICLES:									
1630	0.522	4.13	6.20	9.1	0.37	0.11	24	25.25	48.0
INTERSECTION (persons):									
2445	0.522		6.20	9.1	0.37	0.11		25.25	48.0

Queue values in this table are mean cycle-average queue (metres).

Table S.7 - Lane Performance
PR 111 -- ACCESO AL DESARROLLO
2011, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue Cycle (vehs)	Queue Aver. (m)	Lane Length (m)
East: PR-111 ESTE								
1 TR	1011	1945	0.520	0.4	0.03	0.0	0.0	500.0
North: ACCESO NORTE								
1 LR	65	238	0.273	27.4	1.03	0.3	2.1	500.0
West: PR-111 OESTE								
1 LT	554	1201	0.461	22.9	0.14	3.4	23.6	500.0

Table S.10 - Movement Capacity and Performance Summary
PR 111 -- ACCESO AL DESARROLLO
2011, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Dem Flow (veh /h)	Total Cap. (veh /h)	Lane Util (%)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Cycle Average Queue (veh)	Perf. Index

East: PR-111 ESTE								
5	T	963	1853	100	0.520	0.0	0.00	0.0	9.73
6	R	48	92	100	0.522*	8.2	0.67	0.0	0.77
North: ACCESO NORTE									
7	L	27	99	100	0.273	27.3	1.03	0.3	0.75
9	R	38	139	100	0.273	27.5	1.03	0.3	1.07
West: PR-111 OESTE									
10	L	67	145	100	0.462	30.4	1.15	3.4	2.07
11	T	487	1056	100	0.461	21.9	0.00	3.4	10.85

* Maximum degree of saturation

Table S.12A - Fuel Consumption, Emissions and Cost (TOTAL)
PR 111 -- ACCESO AL DESARROLLO
2011, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Fuel Total L/h	Cost Total $/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h
INTERSECTION:	91.3	682.68	0.366	13.04	0.479	228.3

PARAMETERS USED IN COST CALCULATIONS

Pump price of fuel ($/L)	=	1.200
Fuel resource cost factor	=	0.50
Ratio of running cost to fuel cost	=	3.0
Average income ($/h)	=	28.00
Time value factor	=	0.60
Light vehicle mass (1000 kg)	=	1.4
Heavy vehicle mass (1000 kg)	=	11.0
Light vehicle idle fuel rate (L/h)	=	1.350
Heavy vehicle idle fuel rate (L/h)	=	2.000

Table S.14 - Summary of Input and Output Data
PR 111 -- ACCESO AL DESARROLLO
2011, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
East: PR-111 ESTE												
1 TR		963	48	1011	0				0.520	0.4	0	500
	0	963	48	1011	0				0.520	0.4		
North: ACCESO NORTE												
1 LR	27		38	65	0				0.273	27.4	2	500
	27	0	38	65	0				0.273	27.4	2	
West: PR-111 OESTE												
1 LT	67	487		554	0				0.461	22.9	24	500

67	487	0	554	0	0.461	22.9	24

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	1630	0	0.522	9.1	24

Peak flow period = 15 minutes.

Queue values in this table are mean cycle-average queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Table S.15 - Capacity and Level of Service
PR 111 -- ACCESO AL DESARROLLO
2011, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue Cycle (vehs)	Aver. (m)
East: PR-111 ESTE								
5	T	963	1853	0.520	0.0	A	0.0	0
6	R	48	92	0.522*	8.2	A	0.0	0
North: ACCESO NORTE								
7	L	27	99	0.273	27.3	D	0.3	2
9	R	38	139	0.273	27.5	D	0.3	2
West: PR-111 OESTE								
10	L	67	145	0.462	30.4	D	3.4	24
11	T	487	1056	0.461	21.9	C	3.4	24
ALL VEHICLES:		1630		0.522	9.1	NA	3.4	24

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections.

* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane v/c ratio rather than short lane v/c ratio (v/c=1.0)

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Output Tables
Output Tables
PR-111 con PR-611
2006 AM

Run Information
Cycle Time = 132 (Sum of User-given Phase Times)

* Basic Parameters:
  Intersection Type: Signalised - Fixed Time
  Driving on the right-hand side of the road
  Input data specified in Metric units
  Model Defaults: Copy of Standard Right
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                Geometric delay included
  SIDRA Standard Delay model used
  SIDRA Standard Queue model used
  Level of Service based on: Delay (HCM method)
  Queue definition: Cycle average queue, Average

* Iteration Data:
  No. of Main (Timing-Capacity) Iterations = 1
  Comparison of last two iterations:
    Difference in intersection degree of satn = 0.0 %
    Largest difference in eff. green times = 0 secs
    (max. value for stopping = 0 secs)

Table S.3 - Intersection Parameters
PR-111 con PR-611
2006 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

Critical Movements: 1, 9(1st), 4(1st), 12(2nd)

L= 22 Y= 0.530 U= 0.589 T= 99.8

Cycle Time:

Minimum	Maximum	Practical	Chosen
40	150	54	132

(Phase times user specified, cycle time = sum of phase times)

Intersection Level of Service	=	F
Worst movement Level of Service	=	F
Average intersection delay (s)	=	91.6
Largest average movement delay (s)	=	252.3
Largest cycle-average queue, mean (m)	=	211
Performance Index	=	105.66
Degree of saturation (highest)	=	0.808
Practical Spare Capacity (lowest)	=	11 %
Effective intersection capacity, (veh/h)	=	1995
Total vehicle flow (veh/h)	=	1612
Total person flow (pers/h)	=	2418
Total vehicle delay (veh-h/h)	=	41.02
Total person delay (pers-h/h)	=	61.52
Total effective vehicle stops (veh/h)	=	1303
Total effective person stops (pers/h)	=	1954
Total vehicle travel (veh-km/h)	=	951.9
Total cost ($/h)	=	1750.55
Total fuel (L/h)	=	151.5

Total CO2 (kg/h) = 378.70

Table S.4 - Phase Information
PR-111 con PR-611
2006 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

Phase Change Times: 0, 20, 54, 74
Phase Green Times: 16, 30, 16, 54

(Phase times specified by the user)
Current Phase Sequence: Presente
Input phase sequence: G H I J
Output phase sequence: G H I J

Table S.6 - Intersection Performance
PR-111 con PR-611
2006 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (m)	Perf. Index	Aver. Speed (km/h)
South: PR-611 Sur									
220	0.265	2.81	4.22	46.1	0.87	0.76	19	9.11	22.2
East: PR-11 Este									
608	0.808	3.67	5.51	21.8	0.62	0.63	17	15.25	37.5
North: PR-611 Norte									
340	0.791	5.73	8.59	60.6	1.00	0.93	37	17.02	19.2
West: PR-111 Oeste									
444	0.524	28.80	43.20	233.5	0.99	0.99	211	64.28	8.1
ALL VEHICLES:									
1612	0.808	41.02	61.52	91.6	0.83	0.81	211	105.66	16.2
INTERSECTION (persons):									
2418	0.808		61.52	91.6	0.83	0.81		105.66	16.2

Queue values in this table are mean cycle-average queue (metres).

Table S.7 - Lane Performance
PR-111 con PR-611
2006 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

Lane Lane No.	Effective Green Times (sec) R1	G1	R2	G2	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue Cycle (vehs)	Queue Aver. (m)	Lane Length (m)

```
  South: PR-611 Sur
  1 LTR   98  34    0   0    220  831 0.265   44.7  0.76   2.5   17.7
500.0
 ---------------------------------------------------------------------
---
  East: PR-11 Este
  1 L     58  16    9  49    120  148 0.809   35.1r 0.80   0.9    6.2
20.0T
  2 TR     6   1   51  74    488 1092 0.447   18.5  0.58   2.4   17.0
500.0
 ---------------------------------------------------------------------
---
  North: PR-611 Norte
  1 LTR  102  30    0   0    340  429 0.792   60.1  0.93   5.2   36.6
500.0
 ---------------------------------------------------------------------
---
  West: PR-111 Oeste
  1 LTR   78  54    0   0    444  848 0.524  245.8  0.99  30.1  210.6
500.0
 ---------------------------------------------------------------------
---
   r  Delay, stops and queue length for this lane have been cut down to
fit in
      the queuing space.  The amount cut may not be accounted for fully in
the
      adjacent lane performance statistics.  You may wish to change the
short
      lane to a full lane to investigate the extent of this effect.
   T  Short lane due to specification of Turn Slot
Table S.10 - Movement Capacity and Performance Summary
 PR-111 con PR-611
 2006 AM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

 ---------------------------------------------------------------------
---
  Mov     Mov  Dem   Total  Lane  Deg.  Eff. Grn  Aver.  Eff.   Cycle
Perf.
  ID      Typ  Flow   Cap.  Util  Satn  -------- Delay  Stop  Average
Index
               (veh  (veh                 1st  2nd         Rate   Queue
                /h)   /h)   (%)     x    Grn  Grn  (sec)         (veh)
 ---------------------------------------------------------------------
---
 South: PR-611 Sur
    1 L          16    60   100  0.265   16*        47.0  0.79    2.5
0.66
    2 T          88   333   100  0.265   50         41.4  0.69    2.5
3.46
    3 R         116   439   100  0.264   50   74    49.5  0.81    2.7
4.99
 ---------------------------------------------------------------------
---
 East: PR-11 Este
    4 L         120   148<  100  0.808*  16*  49    35.1  0.80    0.9
3.80
    5 T         456  1020   100  0.447   74         17.9  0.57    2.4
10.59
    6 R          32    71   100  0.449   48   74    26.1  0.81    2.4
0.86
 ---------------------------------------------------------------------
---
```

```
 North: PR-611 Norte
    7 L          116   147   100  0.791   30         62.1  0.93    5.3
5.87
    8 T           48    61   100  0.791   30         56.5  0.93    5.3
2.35
    9 R          176   222   100  0.791   30*  76    60.9  0.93    5.2
8.80
 ----------------------------------------------------------------------
---
 West: PR-111 Oeste
   10 L           72   137   100  0.524   54        252.3  1.00   30.1
11.05
   11 T          344   657   100  0.524   54        244.0  1.00   30.1
52.02
   12 R           28    54   100  0.523   67   54*  56.6  0.76    6.0
1.22
 ----------------------------------------------------------------------
---
   < Reduced capacity due to a short lane effect
   * Maximum degree of saturation, or critical green periods
Table S.12A - Fuel Consumption, Emissions and Cost (TOTAL)
 PR-111 con PR-611
 2006 AM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

 ------------------------------------------------------------
   Mov            Fuel    Cost     HC      CO     NOX     CO2
   ID             Total   Total   Total   Total   Total   Total
                   L/h    $/h     kg/h    kg/h    kg/h    kg/h
 ------------------------------------------------------------
  INTERSECTION:  151.5  1750.55   0.731   21.15   0.646   378.7
 ------------------------------------------------------------


 PARAMETERS USED IN COST CALCULATIONS
 ------------------------------------

    Pump price of fuel ($/L)                    =     1.200
    Fuel resource cost factor                   =      0.50
    Ratio of running cost to fuel cost          =       3.0
    Average income ($/h)                        =     28.00
    Time value factor                           =      0.60
    Light vehicle mass (1000 kg)                =       1.4
    Heavy vehicle mass (1000 kg)                =      11.0
    Light vehicle idle fuel rate (L/h)          =     1.350
    Heavy vehicle idle fuel rate (L/h)          =     2.000
Table S.14 - Summary of Input and Output Data
 PR-111 con PR-611
 2006 AM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

 ----------------------------------------------------------------------
 Lane   Demand Flow (veh/h)        Adj.  Eff Grn   Deg   Aver. Longest Shrt
 No.   -------------------- %HV   Basic  (secs)   Sat   Delay  Queue  Lane
         L    T    R   Tot        Satf. 1st 2nd    x    (sec)   (m)   (m)
 ----------------------------------------------------------------------
 South: PR-611 Sur
1 LTR    16   88  116   220    0  2020   34       0.265   47.3    19   500
         ---------------------------------------------------------------
         16   88  116   220    0                  0.265   44.7    18
 ----------------------------------------------------------------------
 East: PR-11 Este
```

1 L	120			120	0	1970	16	49	0.809	35.1r	6	20
2 TR		456	32	488	0	1950	1	74	0.447	18.5	17	500
	120	456	32	608	0				0.809	21.8	17	

North: PR-611 Norte

1 LTR	116	48	176	340	0	1980	30		0.792	60.1	37	500
	116	48	176	340	0				0.792	60.1	37	

West: PR-111 Oeste

1 LTR	72	344	28	444	0	2091	54		0.524	50.3	42	500
	72	344	28	444	0				0.524	245.8	211	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	1612	0	132	0.808	91.6	211

Peak flow period = 15 minutes.

Queue values in this table are mean cycle-average queue (metres).

Note: Basic Saturation Flows (in through car units) have been adjusted for grade, lane widths, parking manoeuvres and bus stops.

r Delay, stops and queue length for this lane have been cut down to fit in the queuing space. The amount cut may not be accounted for fully in the adjacent lane performance statistics. You may wish to change the short lane to a full lane to investigate the extent of this effect.

Table S.15 - Capacity and Level of Service
PR-111 con PR-611
2006 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

Mov ID	Mov Typ	Green Time Ratio (g/C) 1st grn	2nd grn	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue Aver. (m)	Cycle (vehs)
South: PR-611 Sur										
1 L		0.121*		16	60	0.265	47.0	D	2.5	18
2 T		0.379		88	333	0.265	41.4	D	2.5	18
3 R		0.379	0.561	116	439	0.264	49.5	D	2.7	19
East: PR-11 Este										
4 L		0.121*	0.371	120	148<	0.808*	35.1	D	0.9	6

```
    5 T        0.561            456   1020   0.447    17.9    B       2.4
17
    6 R        0.364  0.561      32     71   0.449    26.1    C       2.4
17
 ---------------------------------------------------------------------------
----
 North: PR-611 Norte
    7 L        0.227            116    147   0.791    62.1    E       5.3
37
    8 T        0.227             48     61   0.791    56.5    E       5.3
37
    9 R        0.227* 0.576     176    222   0.791    60.9    E       5.2
37
 ---------------------------------------------------------------------------
----
 West: PR-111 Oeste
   10 L        0.409             72    137   0.524   252.3    F      30.1
211
   11 T        0.409            344    657   0.524   244.0    F      30.1
211
   12 R        0.508  0.409*     28     54   0.523    56.6    E       6.0
42
 ---------------------------------------------------------------------------
----
   ALL VEHICLES:               1612          0.808    91.6    F      30.1
211
 ---------------------------------------------------------------------------
----
   INTERSECTION (persons):     2418                   91.6           30.1
211
 ---------------------------------------------------------------------------
----
      Level of Service calculations are based on
      average control delay including geometric delay (HCM criteria),
      independent of the current delay definition used.
      For the criteria, refer to the "Level of Service" topic in the
      SIDRA Output Guide or the Output section of the on-line help.
   <  Reduced capacity due to a short lane effect
   *  Maximum v/c ratio, or critical green periods
   "  Movement Level of service has been determined using adjacent lane
      v/c ratio rather than short lane v/c ratio (v/c=1.0)
Table D.5 - Progression Factors and Actuated Signal Parameters
 PR-111 con PR-611
 2006 AM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

 ---------------------------------------------------------------------------
                                   Delay   Queue   Disp. Grn. Settings
  Mov                     Arrival  Prog.   Prog.    1st Grn   2nd Grn
  ID      Control  Coord.   Type   Factor  Factor  Gmin Gmax Gmin Gmax
 ---------------------------------------------------------------------------
 South: PR-611 Sur
    1 L     FT      No       3     1.000   1.000     6   NA
    2 T     FT      No       3     1.000   1.000     6   NA
    3 R     FT      No       3     1.000   1.000     6   NA     6   NA
 ---------------------------------------------------------------------------
 East: PR-11 Este
    4 L     FT      No       3     1.000   1.000     6   NA     6   NA
    5 T     FT      No       3     1.000   1.000     6   NA
    6 R     FT      No       3     1.000   1.000     6   NA     6   NA
 ---------------------------------------------------------------------------
 North: PR-611 Norte
    7 L     FT      No       3     1.000   1.000     6   NA
```

```
    8 T     FT      No        3      1.000   1.000     6   NA
    9 R     FT      No        3      1.000   1.000     6   NA     6   NA
 ---------------------------------------------------------------------
  West: PR-111 Oeste
   10 L     FT      No        3      1.000   1.000     6   NA
   11 T     FT      No        3      1.000   1.000     6   NA
   12 R     FT      No        3      1.000   1.000     6   NA     6   NA
 ---------------------------------------------------------------------
```

```
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Output Tables
Output Tables
PR-111 con PR-611
2006 PM


Run Information
 Cycle Time =  132  (Sum of User-given Phase Times)

 * Basic Parameters:
   Intersection Type: Signalised - Fixed Time
   Driving on the right-hand side of the road
   Input data specified in Metric units
   Model Defaults: Copy of Standard Right
   Peak Flow Period (for performance): 15 minutes
   Unit time (for volumes): 60 minutes.
   Delay definition: Control delay
                     Geometric delay included
   SIDRA Standard Delay model used
   SIDRA Standard Queue model used
   Level of Service based on: Delay (HCM method)
   Queue definition: Cycle average queue, Average

 * Iteration Data:
   No. of Main (Timing-Capacity) Iterations =  1
   Comparison of last two iterations:
     Difference in intersection degree of satn =  0.0 %
     Largest difference in eff. green times =  0 secs
     (max. value for stopping = 0 secs)
Table S.3 - Intersection Parameters
 PR-111 con PR-611
 2006 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

 ---------------------------------------------------------
    Critical Movements: 1, 9(1st), 6(2nd)

    L=   12  Y=  0.627  U=  0.697  T=    104.0

    Cycle Time:
      Minimum   Maximum   Practical   Chosen
```

```
        40        150         40         132
     (Phase times user specified, cycle time = sum of phase times)

    Intersection Level of Service                =        D
    Worst movement Level of Service              =        F
    Average intersection delay (s)               =     43.6
    Largest average movement delay (s)           =     81.5
    Largest cycle-average queue, mean (m)        =       50
    Performance Index                            =    68.87
    Degree of saturation (highest)               =    0.740
    Practical Spare Capacity (lowest)            =       22 %
    Effective intersection capacity, (veh/h)     =     2384
    Total vehicle flow (veh/h)                   =     1764
    Total person flow (pers/h)                   =     2646
    Total vehicle delay (veh-h/h)                =    21.36
    Total person delay (pers-h/h)                =    32.04
    Total effective vehicle stops (veh/h)        =     1425
    Total effective person stops (pers/h)        =     2137
    Total vehicle travel (veh-km/h)              =   1044.9
    Total cost ($/h)                             =  1263.96
    Total fuel (L/h)                             =    135.8
    Total CO2 (kg/h)                             =   339.43
Table S.4 - Phase Information
 PR-111 con PR-611
 2006 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

 ----------------------------------------------------------------------
--
    Phase Change Times: 0,  20,  54,  74
    Phase Green Times: 16,  30,  16,  54
 ----------------------------------------------------------------------
--
             (Phase times specified by the user)
   Current Phase Sequence: Presente
   Input phase sequence: G H I J
   Output phase sequence: G H I J
Table S.6 - Intersection Performance
 PR-111 con PR-611
 2006 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

 ----------------------------------------------------------------------
  Total   Deg.   Total    Total   Aver.  Prop.  Eff.  Longest Perf.   Aver.
  Flow    Satn   Delay    Delay   Delay Queued  Stop  Queue  Index   Speed
 (veh/h)   x   (veh-h/h)(pers-h/h)(sec)         Rate   (m)          (km/h)
 ----------------------------------------------------------------------
 South: PR-611 Sur
   252   0.504    3.95     5.92    56.4   0.97  0.81    27   11.97    20.0
 ----------------------------------------------------------------------
 East: PR-11 Este
   876   0.740    5.90     8.85    24.2   0.79  0.75    38   24.10    36.0
 ----------------------------------------------------------------------
 North: PR-611 Norte
   288   0.648    4.30     6.45    53.8   0.97  0.83    28   13.26    20.5
 ----------------------------------------------------------------------
 West: PR-111 Oeste
   348   0.495    7.21    10.82    74.6   1.00  0.92    50   19.55    19.7
 ----------------------------------------------------------------------
 ALL VEHICLES:
  1764   0.740   21.36    32.04    43.6   0.89  0.81    50   68.87    25.8
 ----------------------------------------------------------------------
```

```
 INTERSECTION (persons):
  2646   0.740            32.04    43.6   0.89  0.81         68.87    25.8
 ---------------------------------------------------------------------------
 Queue values in this table are mean cycle-average queue (metres).
Table S.7 - Lane Performance
 PR-111 con PR-611
 2006 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

 ---------------------------------------------------------------------------
---
         Effective Red and   Dem                          Q u e u e
         Green Times (sec)  Flow  Cap  Deg.  Aver.  Eff.  Cycle Aver.
Lane
  Lane   -----------------  (veh (veh  Satn  Delay  Stop  -----------
Length
  No.     R1  G1   R2  G2     /h)  /h)   x   (sec)  Rate  (vehs) (m)
(m)
 ---------------------------------------------------------------------------
---
  South: PR-611 Sur
  1 LTR  108  24    0   0    252  501 0.503   55.4  0.81   3.7   25.7
500.0
 ---------------------------------------------------------------------------
---
  East: PR-11 Este
  1 L     58  16   10  48     68  149 0.458   23.3  0.73   0.3    2.0
20.0T
  2 TR     9   1   48  74    808 1093 0.740   24.3  0.75   5.4   37.9
500.0
 ---------------------------------------------------------------------------
---
  North: PR-611 Norte
  1 LTR  102  30    0   0    288  444 0.648   53.6  0.83   4.0   28.1
500.0
 ---------------------------------------------------------------------------
---
  West: PR-111 Oeste
  1 LTR   92  40    0   0    348  703 0.495   75.0  0.92   7.1   49.5
500.0
 ---------------------------------------------------------------------------
---
   T  Short lane due to specification of Turn Slot
Table S.10 - Movement Capacity and Performance Summary
 PR-111 con PR-611
 2006 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

 ---------------------------------------------------------------------------
---
  Mov     Mov  Dem   Total  Lane  Deg.  Eff. Grn  Aver.  Eff.   Cycle
Perf.
  ID      Typ  Flow   Cap.  Util  Satn  --------  Delay  Stop  Average
Index
               (veh  (veh                1st  2nd         Rate   Queue
                /h)   /h)   (%)     x   Grn  Grn  (sec)         (veh)
 ---------------------------------------------------------------------------
---
 South: PR-611 Sur
    1 L          48    95   100  0.503   16*       58.0  0.82    3.7
2.29
```

2	T	116	231	100	0.503	50		52.4	0.79	3.7 5.33
3	R	88	175	100	0.504	50	70	60.7	0.84	3.9 4.35

East: PR-11 Este

4	L	68	148<	100	0.458	16	48	23.3	0.73	0.3 1.68
5	T	788	1066	100	0.739	74		24.1	0.75	5.4 21.81
6	R	20	27	100	0.740*	45	74*	32.3	0.88	5.4 0.61

North: PR-611 Norte

7	L	80	123	100	0.648	30		56.0	0.84	4.0 3.74
8	T	108	167	100	0.648	30		50.4	0.82	4.0 4.86
9	R	100	154	100	0.648	30*	52	55.7	0.84	4.0 4.66

West: PR-111 Oeste

10	L	72	146<	100	0.495	33		81.5	0.92	7.1 4.19
11	T	272	549<	100	0.495	54		73.2	0.92	7.1 15.20
12	R	4	8<	100	0.477	68	54	49.5	0.81	4.0 0.16

< Reduced capacity due to a short lane effect
* Maximum degree of saturation, or critical green periods

Table S.12A - Fuel Consumption, Emissions and Cost (TOTAL)
PR-111 con PR-611
2006 PM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

Mov ID	Fuel Total L/h	Cost Total $/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h
INTERSECTION:	135.8	1263.96	0.621	22.73	0.678	339.4

PARAMETERS USED IN COST CALCULATIONS

Pump price of fuel ($/L)	=	1.200
Fuel resource cost factor	=	0.50
Ratio of running cost to fuel cost	=	3.0
Average income ($/h)	=	28.00
Time value factor	=	0.60
Light vehicle mass (1000 kg)	=	1.4
Heavy vehicle mass (1000 kg)	=	11.0
Light vehicle idle fuel rate (L/h)	=	1.350
Heavy vehicle idle fuel rate (L/h)	=	2.000

Table S.14 - Summary of Input and Output Data
PR-111 con PR-611

2006 PM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
South: PR-611 Sur												
1 LTR	48	116	88	252	0	2020	24		0.503	58.2	27	500
	48	116	88	252	0				0.503	55.4	26	
East: PR-11 Este												
1 L	68			68	0	1970	16	48	0.458	23.3	2	20
2 TR		788	20	808	0	1950	1	74	0.740	24.3	38	500
	68	788	20	876	0				0.740	24.2	38	
North: PR-611 Norte												
1 LTR	80	108	100	288	0	1980	30		0.648	53.6	28	500
	80	108	100	288	0				0.648	53.6	28	
West: PR-111 Oeste												
1 LTR	72	272	4	348	0	2091	40		0.495	43.1	28	500
	72	272	4	348	0				0.495	75.0	50	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	1764	0	132	0.740	43.6	50

Peak flow period = 15 minutes.

Queue values in this table are mean cycle-average queue (metres).

Note: Basic Saturation Flows (in through car units) have been adjusted for
grade, lane widths, parking manoeuvres and bus stops.

Table S.15 - Capacity and Level of Service
PR-111 con PR-611
2006 PM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

Mov ID	Mov Typ	Green Time Ratio (g/C) 1st grn	2nd grn	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue Aver. (m)	Cycle (vehs)
South: PR-611 Sur										
1 L		0.121*		48	95	0.503	58.0	E	3.7	26
2 T		0.379		116	231	0.503	52.4	D	3.7	26

3	R	0.379	0.530	88	175	0.504	60.7	E	3.9
27									
East: PR-11 Este									
4	L	0.121	0.364	68	148<	0.458	23.3	C	0.3
2									
5	T	0.561		788	1066	0.739	24.1	C	5.4
38									
6	R	0.341	0.561*	20	27	0.740*	32.3	C	5.4
38									
North: PR-611 Norte									
7	L	0.227		80	123	0.648	56.0	E	4.0
28									
8	T	0.227		108	167	0.648	50.4	D	4.0
28									
9	R	0.227*	0.394	100	154	0.648	55.7	E	4.0
28									
West: PR-111 Oeste									
10	L	0.250		72	146<	0.495	81.5	F	7.1
50									
11	T	0.409		272	549<	0.495	73.2	E	7.1
50									
12	R	0.515	0.409	4	8<	0.477	49.5	D	4.0
28									
ALL VEHICLES:				1764		0.740	43.6	D	7.1
50									
INTERSECTION (persons):				2646			43.6		7.1
50									

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

< Reduced capacity due to a short lane effect
* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane v/c ratio rather than short lane v/c ratio (v/c=1.0)

Table D.5 - Progression Factors and Actuated Signal Parameters
PR-111 con PR-611
2006 PM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 132 (Sum of User-given Phase Times)

Mov ID	Control	Coord.	Arrival Type	Delay Prog. Factor	Queue Prog. Factor	Disp. Grn. Settings 1st Grn Gmin	1st Grn Gmax	2nd Grn Gmin	2nd Grn Gmax
South: PR-611 Sur									
1 L	FT	No	3	1.000	1.000	6	NA		
2 T	FT	No	3	1.000	1.000	6	NA		
3 R	FT	No	3	1.000	1.000	6	NA	6	NA

East: PR-11 Este										
4	L	FT	No	3	1.000	1.000	6	NA	6	NA
5	T	FT	No	3	1.000	1.000	6	NA		
6	R	FT	No	3	1.000	1.000	6	NA	6	NA
North: PR-611 Norte										
7	L	FT	No	3	1.000	1.000	6	NA		
8	T	FT	No	3	1.000	1.000	6	NA		
9	R	FT	No	3	1.000	1.000	6	NA	6	NA
West: PR-111 Oeste										
10	L	FT	No	3	1.000	1.000	6	NA		
11	T	FT	No	3	1.000	1.000	6	NA		
12	R	FT	No	3	1.000	1.000	6	NA	6	NA

```
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Output Tables
Output Tables
PR-111 con PR-611
2011 AM


Run Information
 Cycle Time =   65  (Optimum Cycle Time)

 * Basic Parameters:
   Intersection Type: Signalised - Fixed Time
   Driving on the right-hand side of the road
   Input data specified in Metric units
   Model Defaults: Copy of Standard Right
   Peak Flow Period (for performance): 15 minutes
   Unit time (for volumes): 60 minutes.
   Specified performance measure for "best" cycle time in variable run -
      Delay
   Delay definition: Control delay
                     Geometric delay included
   SIDRA Standard Delay model used
   SIDRA Standard Queue model used
   Level of Service based on: Delay (HCM method)
   Queue definition: Cycle average queue, Average

 * Iteration Data:
   No. of Main (Timing-Capacity) Iterations =  5
   Comparison of last two iterations:
     Difference in intersection degree of satn =  0.0 %
     Largest difference in eff. green times =  0 secs
     (max. value for stopping = 0 secs)

 * If an "optimum" cycle time solution is adopted for actuated signal
purposes
```

ensure that vehicle-actuated settings reflect this solution in real life.

Consider using the "sensitivity analysis" facility to optimise maximum green settings for actuated signals.

Table S.3 - Intersection Parameters
PR-111 con PR-611
2011 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Critical Movements: 1, 9(1st), 4(1st), 10

L= 32 Y= 0.355 U= 0.394 T= 57.6

Cycle Time:

Minimum	Maximum	Practical	Chosen
40	150	53	65

(Program-determined Optimum Cycle Time)

Intersection Level of Service	=	C
Worst movement Level of Service	=	D
Average intersection delay (s)	=	28.4
Largest average movement delay (s)	=	53.6
Largest cycle-average queue, mean (m)	=	44
Performance Index	=	56.54
Degree of saturation (highest)	=	0.732
Practical Spare Capacity (lowest)	=	23 %
Effective intersection capacity, (veh/h)	=	2526
Total vehicle flow (veh/h)	=	1850
Total person flow (pers/h)	=	2775
Total vehicle delay (veh-h/h)	=	14.57
Total person delay (pers-h/h)	=	21.86
Total effective vehicle stops (veh/h)	=	1555
Total effective person stops (pers/h)	=	2332
Total vehicle travel (veh-km/h)	=	1093.8
Total cost ($/h)	=	1113.86
Total fuel (L/h)	=	132.6
Total CO2 (kg/h)	=	331.48

Table S.4 - Phase Information
PR-111 con PR-611
2011 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Phase Change Times: 0, 10, 31, 42
Phase Green Times: 6, 17, 7, 19

Current Phase Sequence: Presente
Input phase sequence: G H I J
Output phase sequence: G H I J

Table S.6 - Intersection Performance
PR-111 con PR-611
2011 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (m)	Perf. Index	Aver. Speed (km/h)

```
 ---------------------------------------------------------------------------
 South: PR-611 Sur
   242   0.211    1.49     2.23    22.1   0.81  0.73     9    6.75    30.2
 ---------------------------------------------------------------------------
 East: PR-11 Este
   740   0.661    3.47     5.20    16.9   0.82  0.76    17   17.10    41.0
 ---------------------------------------------------------------------------
 North: PR-611 Norte
   369   0.732    3.23     4.84    31.5   0.99  0.92    20   12.47    26.5
 ---------------------------------------------------------------------------
 West: PR-111 Oeste
   499   0.707    6.39     9.59    46.1   1.00  0.95    44   20.21    26.4
 ---------------------------------------------------------------------------
 ALL VEHICLES:
  1850   0.732   14.57    21.86    28.4   0.90  0.84    44   56.54    31.5
 ---------------------------------------------------------------------------
 INTERSECTION (persons):
  2775   0.732            21.86    28.4   0.90  0.84         56.54    31.5
 ---------------------------------------------------------------------------
 Queue values in this table are mean cycle-average queue (metres).
Table S.7 - Lane Performance
 PR-111 con PR-611
 2011 AM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time =  65 (Optimum Cycle Time)

 ---------------------------------------------------------------------------
---
         Effective Red and   Dem                            Q u e u e
         Green Times (sec)  Flow  Cap  Deg.  Aver.  Eff.  Cycle Aver.
Lane
  Lane   -----------------  (veh (veh  Satn  Delay  Stop  -----------
Length
  No.     R1  G1   R2  G2     /h)  /h)   x   (sec)  Rate  (vehs) (m)
(m)
 ---------------------------------------------------------------------------
---
  South: PR-611 Sur
  1 LTR   45  20    0   0    242 1147 0.211   21.2  0.73   1.2    8.4
500.0
 ---------------------------------------------------------------------------
---
  East: PR-11 Este
  1 L     35   7    8  15    145  223 0.651   22.8  0.81   0.6    4.1
20.0T
  2 TR     5   1   29  30    595  901 0.660   15.4  0.75   2.5   17.2
500.0
 ---------------------------------------------------------------------------
---
  North: PR-611 Norte
  1 LTR   48  17    0   0    369  504 0.732   31.1  0.92   2.7   18.9
500.0
 ---------------------------------------------------------------------------
---
  West: PR-111 Oeste
  1 LTR   46  19    0   0    499  706 0.707   47.1  0.95   6.3   44.0
500.0
 ---------------------------------------------------------------------------
---
   T  Short lane due to specification of Turn Slot
Table S.10 - Movement Capacity and Performance Summary
 PR-111 con PR-611
 2011 AM
 Intersection ID: 0
```

Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Mov ID	Mov Typ	Dem Flow (veh /h)	Total Cap. (veh /h)	Lane Util (%)	Deg. Satn x	Eff. Grn 1st Grn	Eff. Grn 2nd Grn	Aver. Delay (sec)	Eff. Stop Rate	Cycle Average Queue (veh)	Perf. Index
South: PR-611 Sur											
1	L	17	81	100	0.211	6*		23.5	0.76	1.2	0.48
2	T	95	450	100	0.211	27		17.9	0.64	1.2	2.46
3	R	130	616	100	0.211	27	28	25.0	0.80	1.3	3.81
East: PR-11 Este											
4	L	145	223<	100	0.650	7*	15	22.8	0.81	0.6	3.60
5	T	556	842	100	0.660	30		14.9	0.74	2.5	12.51
6	R	39	59	100	0.661	26	30	23.1	0.85	2.5	0.99
North: PR-611 Norte											
7	L	127	173	100	0.732*	17		32.8	0.93	2.8	4.36
8	T	52	71	100	0.731	17		27.2	0.93	2.8	1.70
9	R	190	260	100	0.731	17*	26	31.8	0.92	2.7	6.42
West: PR-111 Oeste											
10	L	78	110	100	0.707	15*		53.6	0.96	6.3	3.34
11	T	391	553	100	0.707	19		45.3	0.96	6.3	15.87
12	R	30	42	100	0.707	36	19	37.2	0.86	4.0	1.00

< Reduced capacity due to a short lane effect
* Maximum degree of saturation, or critical green periods

Table S.12A - Fuel Consumption, Emissions and Cost (TOTAL)
PR-111 con PR-611
2011 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Mov ID	Fuel Total L/h	Cost Total $/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h
INTERSECTION:	132.6	1113.86	0.594	23.91	0.702	331.5

PARAMETERS USED IN COST CALCULATIONS

Pump price of fuel ($/L)	=	1.200
Fuel resource cost factor	=	0.50
Ratio of running cost to fuel cost	=	3.0
Average income ($/h)	=	28.00
Time value factor	=	0.60
Light vehicle mass (1000 kg)	=	1.4
Heavy vehicle mass (1000 kg)	=	11.0
Light vehicle idle fuel rate (L/h)	=	1.350
Heavy vehicle idle fuel rate (L/h)	=	2.000

Table S.14 - Summary of Input and Output Data
PR-111 con PR-611
2011 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
South: PR-611 Sur												
1 LTR	17	95	130	242	0	2020	20		0.211	22.8	9	500
	17	95	130	242	0				0.211	21.2	8	
East: PR-11 Este												
1 L	145			145	0	1970	7	15	0.651	22.8	4	20
2 TR		556	39	595	0	1950	1	30	0.660	15.4	17	500
	145	556	39	740	0				0.660	16.9	17	
North: PR-611 Norte												
1 LTR	127	52	190	369	0	1980	17		0.732	31.1	19	500
	127	52	190	369	0				0.732	31.1	19	
West: PR-111 Oeste												
1 LTR	78	391	30	499	0	2091	19		0.707	30.8	28	500
	78	391	30	499	0				0.707	47.1	44	

ALL VEHICLES	Total Flow	% HV	Cycle Time	Max X	Aver. Delay	Max Queue
	1850	0	65	0.732	28.4	44

Peak flow period = 15 minutes.

Queue values in this table are mean cycle-average queue (metres).

Note: Basic Saturation Flows (in through car units) have been adjusted for
grade, lane widths, parking manoeuvres and bus stops.

Table S.15 - Capacity and Level of Service
PR-111 con PR-611
2011 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Mov ID	Mov Typ	Green Time Ratio (g/C) 1st grn	2nd grn	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue Aver. (m)	Cycle (vehs)
South: PR-611 Sur										
1	L	0.092*		17	81	0.211	23.5	C	1.2	8
2	T	0.415		95	450	0.211	17.9	B	1.2	8
3	R	0.415	0.431	130	616	0.211	25.0	C	1.3	9
East: PR-11 Este										
4	L	0.108*	0.231	145	223<	0.650	22.8	C	0.6	4
5	T	0.462		556	842	0.660	14.9	B	2.5	17
6	R	0.400	0.462	39	59	0.661	23.1	C	2.5	17
North: PR-611 Norte										
7	L	0.262		127	173	0.732*	32.8	C	2.8	20
8	T	0.262		52	71	0.731	27.2	C	2.8	20
9	R	0.262*	0.400	190	260	0.731	31.8	C	2.7	19
West: PR-111 Oeste										
10	L	0.231*		78	110	0.707	53.6	D	6.3	44
11	T	0.292		391	553	0.707	45.3	D	6.3	44
12	R	0.554	0.292	30	42	0.707	37.2	D	4.0	28
ALL VEHICLES:				1850		0.732	28.4	C	6.3	44
INTERSECTION (persons):				2775			28.4		6.3	44

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

< Reduced capacity due to a short lane effect
* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane v/c ratio rather than short lane v/c ratio (v/c=1.0)

Table S.21 - Optimum Cycle Time Results

PR-111 con PR-611
2011 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Performance Measure	Smallest Value	Cycle Time
Degree of Satn	0.705	75
Average Delay	28.4	65
Stop Rate	0.79	150
Max. Queue for Any Movement	6.3	65
Perf. Index	56.5	65
Cost	1113.9	65

Performance Measure	Largest Value	Cycle Time
Eff. Inters. Cap.	2623	75
Prac. Spare Cap.	28	75

If an "optimum" cycle time solution is adopted for actuated signal purposes
ensure that vehicle-actuated settings reflect this solution in real life.
Consider using the "sensitivity analysis" facility to optimise maximum green settings for actuated signals.

Table D.5 - Progression Factors and Actuated Signal Parameters
PR-111 con PR-611
2011 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Mov ID	Control	Coord.	Arrival Type	Delay Prog. Factor	Queue Prog. Factor	Disp. Grn. Settings 1st Grn Gmin	1st Grn Gmax	2nd Grn Gmin	2nd Grn Gmax
South: PR-611 Sur									
1 L	FT	No	3	1.000	1.000	6	NA		
2 T	FT	No	3	1.000	1.000	6	NA		
3 R	FT	No	3	1.000	1.000	6	NA	6	NA
East: PR-11 Este									
4 L	FT	No	3	1.000	1.000	6	NA	6	NA
5 T	FT	No	3	1.000	1.000	6	NA		
6 R	FT	No	3	1.000	1.000	6	NA	6	NA
North: PR-611 Norte									
7 L	FT	No	3	1.000	1.000	6	NA		
8 T	FT	No	3	1.000	1.000	6	NA		
9 R	FT	No	3	1.000	1.000	6	NA	6	NA
West: PR-111 Oeste									
10 L	FT	No	3	1.000	1.000	6	NA		
11 T	FT	No	3	1.000	1.000	6	NA		
12 R	FT	No	3	1.000	1.000	6	NA	6	NA

Table V.21 - Intersection Summary for Optimum Cycle Time
PR-111 con PR-611

2011 AM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Cycle Time (sec)	Eff. Int. Cap.	Intersn Deg. of Satn	Prac. Spare Cap.	Aver. Delay (sec)	Stop Rate	Longest Queue (veh)	Perf. Index	Cost Total $/h	Unsett
65	2526	0.732	23	28.4	0.84	6.3	56.5	1113.9	
70	2598	0.712	26	29.8	0.83	6.8	58.0	1134.5	
75	2623	0.705	28	31.4	0.83	7.2	59.6	1156.1	
80	2523	0.733	23	34.4	0.83	8.3	62.7	1198.7	*
85	2496	0.741	21	37.9	0.83	9.7	66.3	1247.8	*
90	2505	0.739	22	42.2	0.83	11.8	70.7	1308.3	
95	2478	0.747	21	71.4	0.82	27.1	100.6	1722.6	
100	2443	0.757	19	75.6	0.82	28.8	104.9	1781.0	
105	2408	0.768	17	79.8	0.82	30.6	109.2	1840.6	
110	2390	0.774	16	83.0	0.81	31.9	112.4	1885.4	
115	2339	0.791	14	87.0	0.81	33.6	116.5	1942.6	
120	2343	0.789	14	90.9	0.80	35.4	120.4	1996.5	*
125	2318	0.798	13	95.3	0.80	37.1	124.9	2058.9	
130	2290	0.808	11	99.5	0.80	38.9	129.2	2117.9	
135	2273	0.814	11	103.4	0.79	40.7	133.2	2173.7	
140	2238	0.827	9	107.6	0.79	42.4	137.5	2232.9	
145	2203	0.840	7	111.8	0.79	44.2	141.8	2292.4	
150	2165	0.854	5	116.2	0.79	45.9	146.3	2354.4	

* UNSETTLED RESULTS - Solution for this case has some uncertainty.
Refer to the HELP system or the User Guide for further information.

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Output Tables
Output Tables
PR-111 con PR-611
2011 PM

Run Information
Cycle Time = 65 (Optimum Cycle Time)

* Basic Parameters:
Intersection Type: Signalised - Fixed Time
Driving on the right-hand side of the road
Input data specified in Metric units

```
   Model Defaults: Copy of Standard Right
   Peak Flow Period (for performance): 15 minutes
   Unit time (for volumes): 60 minutes.
   Specified performance measure for "best" cycle time in variable run =
      Delay
   Delay definition: Control delay
                     Geometric delay included
   SIDRA Standard Delay model used
   SIDRA Standard Queue model used
   Level of Service based on: Delay (HCM method)
   Queue definition: Cycle average queue, Average

 * Iteration Data:
   No. of Main (Timing-Capacity) Iterations =  2
   Comparison of last two iterations:
     Difference in intersection degree of satn =  0.0 %
     Largest difference in eff. green times =  0 secs
     (max. value for stopping = 0 secs)

 * If an "optimum" cycle time solution is adopted for actuated signal
purposes
   ensure that vehicle-actuated settings reflect this solution in real
life.
   Consider using the "sensitivity analysis" facility to optimise maximum
   green settings for actuated signals.
Table S.3 - Intersection Parameters
 PR-111 con PR-611
 2011 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time =  65 (Optimum Cycle Time)

 ---------------------------------------------------------
    Critical Movements: 1, 9(1st), 6(2nd)

    L=   18  Y=  0.626  U=  0.695  T=     63.2

    Cycle Time:
      Minimum   Maximum   Practical   Chosen
         40       150         59         65
      (Program-determined Optimum Cycle Time)

    Intersection Level of Service              =         C
    Worst movement Level of Service            =         D
    Average intersection delay (s)             =      31.8
    Largest average movement delay (s)         =      54.9
    Largest cycle-average queue, mean (m)      =        42
    Performance Index                          =     68.13
    Degree of saturation (highest)             =     0.870
    Practical Spare Capacity (lowest)          =         3 %
    Effective intersection capacity, (veh/h)   =      2353
    Total vehicle flow (veh/h)                 =      2048
    Total person flow (pers/h)                 =      3072
    Total vehicle delay (veh-h/h)              =     18.11
    Total person delay (pers-h/h)              =     27.16
    Total effective vehicle stops (veh/h)      =      1942
    Total effective person stops (pers/h)      =      2912
    Total vehicle travel (veh-km/h)            =    1214.2
    Total cost ($/h)                           =   1294.50
    Total fuel (L/h)                           =     154.3
    Total CO2 (kg/h)                           =    385.72
Table S.4 - Phase Information
 PR-111 con PR-611
 2011 PM
 Intersection ID: 0
```

Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

--
Phase Change Times: 0, 10, 26, 36
Phase Green Times: 6, 12, 6, 25

--
Current Phase Sequence: Presente
Input phase sequence: G H I J
Output phase sequence: G H I J

Table S.6 - Intersection Performance
PR-111 con PR-611
2011 PM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (m)	Perf. Index	Aver. Speed (km/h)
South: PR-611 Sur									
290	0.430	2.34	3.51	29.1	0.95	0.80	15	9.34	27.3
East: PR-11 Este									
998	0.870	6.43	9.65	23.2	0.91	0.98	42	28.13	36.6
North: PR-611 Norte									
315	0.850	3.40	5.10	38.9	1.00	1.04	22	12.25	24.1
West: PR-111 Oeste									
445	0.670	5.93	8.90	48.0	1.00	0.91	40	18.41	25.9
ALL VEHICLES:									
2048	0.870	18.11	27.16	31.8	0.95	0.95	42	68.13	30.2
INTERSECTION (persons):									
3072	0.870		27.16	31.8	0.95	0.95		68.13	30.2

Queue values in this table are mean cycle-average queue (metres).

Table S.7 - Lane Performance
PR-111 con PR-611
2011 PM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Lane Length (m)	Lane No.	Effective Red and Green Times (sec) R1	G1	R2	G2	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue Cycle (vehs)	Queue Aver. (m)
South: PR-611 Sur												
500.0	1 LTR	52	13	0	0	290	674	0.430	28.1	0.80	2.0	14.1

East: PR-11 Este

```
  1 L      30   6    8  21     84  254 0.330   17.4  0.74   0.2    1.5
20.0T
  2 TR      6   1   23  35    914 1050 0.870   23.7  1.00   6.0   41.8
500.0
 ---------------------------------------------------------------------
---
  North: PR-611 Norte
  1 LTR    53  12    0   0    315  371 0.850   38.7  1.04   3.1   21.6
500.0
 ---------------------------------------------------------------------
---
  West: PR-111 Oeste
  1 LTR    49  16    0   0    445  664 0.670   48.2  0.91   5.8   40.4
500.0
 ---------------------------------------------------------------------
---
   T  Short lane due to specification of Turn Slot
Table S.10 - Movement Capacity and Performance Summary
 PR-111 con PR-611
 2011 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time =  65 (Optimum Cycle Time)

 ---------------------------------------------------------------------
---
  Mov      Mov  Dem   Total  Lane  Deg.  Eff. Grn  Aver.  Eff.   Cycle
Perf.
  ID       Typ  Flow   Cap.  Util  Satn  -------- Delay  Stop  Average
Index
                (veh  (veh                 1st  2nd         Rate   Queue
                 /h)   /h)   (%)     x    Grn  Grn  (sec)         (veh)
 ---------------------------------------------------------------------
---
 South: PR-611 Sur
    1 L          52   121   100  0.430    6*        30.6  0.80    2.0
1.68
    2 T         125   290   100  0.430   22         25.0  0.76    2.0
3.82
    3 R         113   263   100  0.430   22   30    32.9  0.84    2.2
3.84
 ---------------------------------------------------------------------
---
 East: PR-11 Este
    4 L          84   254<  100  0.330    6   21    17.4  0.74    0.2
1.80
    5 T         889  1021   100  0.870*  35         23.5  1.00    6.0
25.55
    6 R          25    29   100  0.862   20   35*   31.7  1.04    6.0
0.78
 ---------------------------------------------------------------------
---
 North: PR-611 Norte
    7 L          91   107   100  0.850   12         41.1  1.04    3.1
3.60
    8 T         116   136   100  0.850   12         35.5  1.04    3.1
4.40
    9 R         108   127   100  0.849   12*  19    40.7  1.04    3.1
4.25
 ---------------------------------------------------------------------
---
 West: PR-111 Oeste
   10 L          78   116<  100  0.670    9         54.9  0.91    5.8
3.38
```

```
   11 T          363   542<  100  0.670   25         46.6  0.91    5.8
14.90
   12 R            4     6<  100  0.662   31   25    36.8  0.86    3.5
0.13
 ---------------------------------------------------------------------
---
   <  Reduced capacity due to a short lane effect
   *  Maximum degree of saturation, or critical green periods
Table S.12A - Fuel Consumption, Emissions and Cost (TOTAL)
 PR-111 con PR-611
 2011 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time =  65 (Optimum Cycle Time)

 ------------------------------------------------------------
   Mov            Fuel    Cost     HC      CO     NOX     CO2
   ID             Total   Total   Total   Total   Total   Total
                   L/h    $/h     kg/h    kg/h    kg/h    kg/h
 ------------------------------------------------------------
  INTERSECTION:  154.3  1294.50   0.701   28.82   0.828   385.7
 ------------------------------------------------------------


 PARAMETERS USED IN COST CALCULATIONS
 ------------------------------------

    Pump price of fuel ($/L)                    =     1.200
    Fuel resource cost factor                   =      0.50
    Ratio of running cost to fuel cost          =       3.0
    Average income ($/h)                        =     28.00
    Time value factor                           =      0.60
    Light vehicle mass (1000 kg)                =       1.4
    Heavy vehicle mass (1000 kg)                =      11.0
    Light vehicle idle fuel rate (L/h)          =     1.350
    Heavy vehicle idle fuel rate (L/h)          =     2.000
Table S.14 - Summary of Input and Output Data
 PR-111 con PR-611
 2011 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time =  65 (Optimum Cycle Time)

 ---------------------------------------------------------------------------
  Lane   Demand Flow (veh/h)        Adj.  Eff Grn   Deg   Aver. Longest Shrt
  No.   ---------------------  %HV  Basic  (secs)   Sat   Delay  Queue  Lane
          L    T    R   Tot         Satf. 1st 2nd    x    (sec)   (m)   (m)
 ---------------------------------------------------------------------------
  South: PR-611 Sur
 1 LTR    52  125  113   290    0  2020   13       0.430   30.6    15   500
         ---------------------------------------------------------------------
          52  125  113   290    0                  0.430   28.1    14
 ---------------------------------------------------------------------------
  East: PR-11 Este
 1 L      84              84    0  1970    6  21  0.330   17.4     1    20
 2 TR         889   25   914    0  1950    1  35  0.870   23.7    42   500
         ---------------------------------------------------------------------
          84  889   25   998    0                  0.870   23.2    42
 ---------------------------------------------------------------------------
  North: PR-611 Norte
 1 LTR    91  116  108   315    0  1980   12       0.850   38.7    22   500
         ---------------------------------------------------------------------
          91  116  108   315    0                  0.850   38.7    22
 ---------------------------------------------------------------------------
  West: PR-111 Oeste
 1 LTR    78  363    4   445    0  2091   16       0.670   30.1    25   500
```

```
          ----------------------------------------------------------------
           78  363    4   445    0                    0.670   48.2    40
 ================================================================================
  ALL VEHICLES            Total   %        Cycle       Max   Aver.   Max
                          Flow   HV        Time        X    Delay  Queue
                          2048    0          65      0.870   31.8    42
 ================================================================================
 Peak flow period = 15 minutes.

 Queue values in this table are mean cycle-average queue (metres).

 Note: Basic Saturation Flows (in through car units) have been adjusted
for
       grade, lane widths, parking manoeuvres and bus stops.
Table S.15 - Capacity and Level of Service
 PR-111 con PR-611
 2011 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time =  65 (Optimum Cycle Time)

 ---------------------------------------------------------------------------
----
  Mov      Mov     Green Time  Total  Total    Deg.   Aver.   LOS  Longest
Queue
  ID       Typ     Ratio (g/C) Flow   Cap.     of     Delay        Cycle
Aver.
                  ------------ (veh   (veh     Satn                (vehs)
(m)
                   1st   2nd     /h)    /h)    (v/c)  (sec)
 ---------------------------------------------------------------------------
----
 South: PR-611 Sur
    1 L         0.092*           52    121   0.430    30.6    C      2.0
14
    2 T         0.338           125    290   0.430    25.0    C      2.0
14
    3 R         0.338  0.462    113    263   0.430    32.9    C      2.2
15
 ---------------------------------------------------------------------------
----
 East: PR-11 Este
    4 L         0.092  0.323     84    254<  0.330    17.4    B      0.2
1
    5 T         0.538           889   1021   0.870*   23.5    C      6.0
42
    6 R         0.308  0.538*    25     29   0.862    31.7    C      6.0
42
 ---------------------------------------------------------------------------
----
 North: PR-611 Norte
    7 L         0.185            91    107   0.850    41.1    D      3.1
22
    8 T         0.185           116    136   0.850    35.5    D      3.1
22
    9 R         0.185* 0.292    108    127   0.849    40.7    D      3.1
22
 ---------------------------------------------------------------------------
----
 West: PR-111 Oeste
   10 L         0.138            78    116<  0.670    54.9    D      5.8
40
   11 T         0.385           363    542<  0.670    46.6    D      5.8
40
```

```
   12 R        0.477  0.385      4      6<  0.662    36.8    D      3.5
25
 ---------------------------------------------------------------------------
----
   ALL VEHICLES:                2048          0.870    31.8    C      6.0
42
 ---------------------------------------------------------------------------
----
   INTERSECTION (persons):      3072                   31.8           6.0
42
 ---------------------------------------------------------------------------
----
      Level of Service calculations are based on
      average control delay including geometric delay (HCM criteria),
      independent of the current delay definition used.
      For the criteria, refer to the "Level of Service" topic in the
      SIDRA Output Guide or the Output section of the on-line help.
   <  Reduced capacity due to a short lane effect
   *  Maximum v/c ratio, or critical green periods
   "  Movement Level of service has been determined using adjacent lane
      v/c ratio rather than short lane v/c ratio (v/c=1.0)
Table S.21 - Optimum Cycle Time Results
 PR-111 con PR-611
 2011 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time =  65 (Optimum Cycle Time)

 ---------------------------------------------
    Performance          Smallest       Cycle
      Measure             Value         Time
 ---------------------------------------------
   Degree of Satn        0.748          110
   Average Delay          31.8           65
   Stop Rate              0.81          110
   Max. Queue for
         Any Movement      6.0           65
   Perf. Index            66.9           90
   Cost                 1284.3           90
 ---------------------------------------------

    Performance          Largest        Cycle
      Measure             Value         Time
 ---------------------------------------------
   Eff. Inters. Cap.      2737          110
   Prac. Spare Cap.         20          110
 ---------------------------------------------

   If an "optimum" cycle time solution is adopted for actuated signal
purposes
   ensure that vehicle-actuated settings reflect this solution in real
life.
   Consider using the "sensitivity analysis" facility to optimise maximum
   green settings for actuated signals.
Table D.5 - Progression Factors and Actuated Signal Parameters
 PR-111 con PR-611
 2011 PM
 Intersection ID: 0
 Fixed-Time Signals, Cycle Time =  65 (Optimum Cycle Time)

 ---------------------------------------------------------------------------
                                   Delay   Queue   Disp. Grn. Settings
   Mov                      Arrival Prog.   Prog.    1st Grn   2nd Grn
   ID      Control  Coord.   Type   Factor  Factor  Gmin Gmax Gmin Gmax
 ---------------------------------------------------------------------------
```

South: PR-611 Sur									
1 L	FT	No	3	1.000	1.000	6	NA		
2 T	FT	No	3	1.000	1.000	6	NA		
3 R	FT	No	3	1.000	1.000	6	NA	6	NA
East: PR-11 Este									
4 L	FT	No	3	1.000	1.000	6	NA	6	NA
5 T	FT	No	3	1.000	1.000	6	NA		
6 R	FT	No	3	1.000	1.000	6	NA	6	NA
North: PR-611 Norte									
7 L	FT	No	3	1.000	1.000	6	NA		
8 T	FT	No	3	1.000	1.000	6	NA		
9 R	FT	No	3	1.000	1.000	6	NA	6	NA
West: PR-111 Oeste									
10 L	FT	No	3	1.000	1.000	6	NA		
11 T	FT	No	3	1.000	1.000	6	NA		
12 R	FT	No	3	1.000	1.000	6	NA	6	NA

Table V.21 - Intersection Summary for Optimum Cycle Time
PR-111 con PR-611
2011 PM
Intersection ID: 0
Fixed-Time Signals, Cycle Time = 65 (Optimum Cycle Time)

Cycle Time (sec)	Eff. Int. Cap.	Intersn Deg. of Satn	Prac. Spare Cap.	Aver. Delay (sec)	Stop Rate	Longest Queue (veh)	Perf. Index	Cost Total $/h	Unsett
60	1968	1.041	-14	54.8	1.15	15.5	96.6	1670.4	
65	2353	0.870	3	31.8	0.95	6.0	68.1	1294.5	
70	2414	0.848	6	32.9	0.91	6.8	69.0	1308.5	
75	2397	0.855	5	36.7	0.88	9.2	72.9	1364.3	*
80	2501	0.819	10	43.6	0.87	13.0	80.6	1472.3	
85	2550	0.803	12	69.8	0.85	28.0	110.3	1882.6	
90	2534	0.808	11	31.9	0.83	6.1	66.9	1284.3	*
95	2661	0.770	17	33.2	0.82	6.6	68.3	1303.9	*
100	2664	0.769	17	34.8	0.82	7.1	70.1	1329.5	*
105	2704	0.757	19	35.7	0.81	7.2	71.0	1342.8	*
110	2737	0.748	20	38.3	0.81	8.2	74.0	1382.8	*
115	2733	0.749	20	40.4	0.81	8.9	76.4	1416.0	*
120	2656	0.771	17	41.0	0.82	8.6	77.0	1425.7	*
125	2689	0.762	18	43.3	0.82	9.5	79.6	1461.2	*
130	2574	0.796	13	44.7	0.83	9.3	81.4	1485.4	*
135	2716	0.754	19	57.5	0.83	16.6	95.9	1684.3	*
140	2694	0.760	18	51.7	0.82	12.9	89.3	1593.8	*

145	2634	0.778	16	49.4	0.82	10.8	86.7	1558.5
*								
150	2633	0.778	16	51.5	0.82	11.4	89.1	1591.7
*								

* UNSETTLED RESULTS - Solution for this case has some uncertainty.
  Refer to the HELP system or the User Guide for further information.

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Processed Nov 28, 2006 09:45:19AM

Output Tables
Output Tables
PR 111 -- RAMAL PR 111
2006, AM

Run Information
* Basic Parameters:
  Intersection Type: Unsignalised - Two-Way Stop Control
  Driving on the right-hand side of the road
  Input data specified in Metric units
  Model Defaults: TCG Standard Right
  Peak Flow Period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes.
  Delay definition: Control delay
                    Geometric delay included
  SIDRA Standard Delay model used
  SIDRA Standard Queue model used
  Level of Service based on: Delay (HCM method)
  Queue definition: Cycle average queue, Average

Table S.3 - Intersection Parameters
PR 111 -- RAMAL PR 111
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Intersection Level of Service	=	NA
Worst movement Level of Service	=	C
Average intersection delay (s)	=	5.5
Largest average movement delay (s)	=	19.9
Largest cycle-average queue, mean (m)	=	6
Performance Index	=	17.60
Degree of saturation (highest)	=	0.387
Practical Spare Capacity (lowest)	=	107 %
Effective intersection capacity, (veh/h)	=	3291
Total vehicle flow (veh/h)	=	1272
Total person flow (pers/h)	=	1908
Total vehicle delay (veh-h/h)	=	1.96
Total person delay (pers-h/h)	=	2.94
Total effective vehicle stops (veh/h)	=	281
Total effective person stops (pers/h)	=	422
Total vehicle travel (veh-km/h)	=	765.4

Total cost ($/h)	=	506.60
Total fuel (L/h)	=	72.0
Total CO2 (kg/h)	=	179.95

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections. See Table S.15 or Movement Displays for individual movement LOS values.

Table S.6 - Intersection Performance
PR 111 -- RAMAL PR 111
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (m)	Perf. Index	Aver. Speed (km/h)
South: RAMAL PR 111 SUR									
132	0.273	0.63	0.94	17.2	0.73	0.95	2	2.97	38.5
East: PR 111 ESTE									
604	0.387	1.14	1.71	6.8	0.78	0.17	6	8.71	49.4
West: PR 111 OESTE									
536	0.277	0.19	0.29	1.3	0.00	0.10	0	5.92	58.0
ALL VEHICLES:									
1272	0.387	1.96	2.94	5.5	0.45	0.22	6	17.60	51.2
INTERSECTION (persons):									
1908	0.387		2.94	5.5	0.45	0.22		17.60	51.2

Queue values in this table are mean cycle-average queue (metres).

Table S.7 - Lane Performance
PR 111 -- RAMAL PR 111
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue Cycle (vehs)	Queue Aver. (m)	Lane Length (m)
South: RAMAL PR 111 SUR								
1 L	104	381	0.273	19.9	1.03	0.3	2.1	500.0
2 R	28	829	0.034	7.0	0.62	0.0	0.1	20.0T
East: PR 111 ESTE								
1 LT	604	1563	0.386	6.8	0.17	0.9	6.4	500.0
West: PR 111 OESTE								
1 TR	536	1935	0.277	1.3	0.10	0.0	0.0	500.0

T Short lane due to specification of Turn Slot

Table S.10 - Movement Capacity and Performance Summary
PR 111 -- RAMAL PR 111
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Dem Flow (veh /h)	Total Cap. (veh /h)	Lane Util (%)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Cycle Average Queue (veh)	Perf. Index
South: RAMAL PR 111 SUR									
1 L		104	381	100	0.273	19.9	1.03	0.3	2.44
3 R	(Slp)	28	829	100	0.034	7.0	0.62	0.0	0.53
East: PR 111 ESTE									
4 L		100	259	100	0.386	13.6	1.01	0.9	2.10
5 T		504	1304	100	0.387*	5.4	0.00	0.9	6.62
West: PR 111 OESTE									
11 T		452	1632	100	0.277	0.0	0.00	0.0	4.57
12 R		84	303	100	0.277	8.2	0.67	0.0	1.35

* Maximum degree of saturation

Table S.12A - Fuel Consumption, Emissions and Cost (TOTAL)
PR 111 -- RAMAL PR 111
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Fuel Total L/h	Cost Total $/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h
INTERSECTION:	72.0	506.60	0.291	11.47	0.395	179.9

PARAMETERS USED IN COST CALCULATIONS

Pump price of fuel ($/L)	=	1.200
Fuel resource cost factor	=	0.50
Ratio of running cost to fuel cost	=	3.0
Average income ($/h)	=	28.00
Time value factor	=	0.60
Light vehicle mass (1000 kg)	=	1.4
Heavy vehicle mass (1000 kg)	=	11.0
Light vehicle idle fuel rate (L/h)	=	1.350
Heavy vehicle idle fuel rate (L/h)	=	2.000

Table S.14 - Summary of Input and Output Data
PR 111 -- RAMAL PR 111
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
South: RAMAL PR 111 SUR												
1 L	104			104	0				0.273	19.9	2	500
2 R			28	28	0				0.034	7.0	0	20
	104	0	28	132	0				0.273	17.2	2	

```
 East: PR 111 ESTE
1 LT    100  504        604    0                  0.386    6.8     6   500
        ---------------------------------------------------------------------
        100  504    0   604    0                  0.386    6.8     6
-----------------------------------------------------------------------------
 West: PR 111 OESTE
1 TR         452   84   536    0                  0.277    1.3     0   500
        ---------------------------------------------------------------------
          0  452   84   536    0                  0.277    1.3
=============================================================================
 ALL VEHICLES           Total   %                  Max   Aver.   Max
                        Flow   HV                   X    Delay  Queue
                        1272    0                 0.387    5.5     6
=============================================================================
Peak flow period = 15 minutes.

Queue values in this table are mean cycle-average queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-
      controlled intersections and apply only to continuous lanes.
```

Table 5.15 - Capacity and Level of Service
PR 111 -- RAMAL PR 111
2006, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue Cycle (vehs)	Aver. (m)
South: RAMAL PR 111 SUR								
1 L		104	381	0.273	19.9	C	0.3	2
3 R	(Slp)	28	829	0.034	7.0	A	0.0	0
East: PR 111 ESTE								
4 L		100	259	0.386	13.6	B	0.9	6
5 T		504	1304	0.387*	5.4	A	0.9	6
West: PR 111 OESTE								
11 T		452	1632	0.277	0.0	A	0.0	0
12 R		84	303	0.277	8.2	A	0.0	0
ALL VEHICLES:		1272		0.387	5.5	NA	0.9	6

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections.

* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane v/c ratio rather than short lane v/c ratio (v/c=1.0)

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Output Tables
Output Tables
PR 111 -- RAMAL PR 111
2006, PM

Run Information
* Basic Parameters:
Intersection Type: Unsignalised - Two-Way Stop Control
Driving on the right-hand side of the road
Input data specified in Metric units
Model Defaults: TCG Standard Right
Peak Flow Period (for performance): 15 minutes
Unit time (for volumes): 60 minutes.
Delay definition: Control delay
Geometric delay included
SIDRA Standard Delay model used
SIDRA Standard Queue model used
Level of Service based on: Delay (HCM method)
Queue definition: Cycle average queue, Average

Table S.3 - Intersection Parameters
PR 111 -- RAMAL PR 111
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Intersection Level of Service	=	NA
Worst movement Level of Service	=	C
Average intersection delay (s)	=	4.8
Largest average movement delay (s)	=	22.1
Largest cycle-average queue, mean (m)	=	7
Performance Index	=	18.08
Degree of saturation (highest)	=	0.450
Practical Spare Capacity (lowest)	=	78 %
Effective intersection capacity, (veh/h)	=	3049
Total vehicle flow (veh/h)	=	1372
Total person flow (pers/h)	=	2058
Total vehicle delay (veh-h/h)	=	1.82
Total person delay (pers-h/h)	=	2.74
Total effective vehicle stops (veh/h)	=	184
Total effective person stops (pers/h)	=	276
Total vehicle travel (veh-km/h)	=	827.1
Total cost ($/h)	=	553.06
Total fuel (L/h)	=	80.2
Total CO2 (kg/h)	=	200.53

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections. See Table S.15 or Movement Displays for individual movement LOS values.

Table S.6 - Intersection Performance
PR 111 -- RAMAL PR 111
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (m)	Perf. Index	Aver. Speed (km/h)
South: RAMAL PR 111 SUR									
116	0.244	0.54	0.81	16.7	0.69	0.87	2	2.60	37.6
East: PR 111 ESTE									
836	0.450	1.12	1.68	4.8	0.78	0.04	7	10.81	50.4
West: PR 111 OESTE									
420	0.218	0.16	0.25	1.4	0.00	0.11	0	4.67	57.8
ALL VEHICLES:									
1372	0.450	1.82	2.74	4.8	0.54	0.13	7	18.08	51.0
INTERSECTION (persons):									
2058	0.450		2.74	4.8	0.54	0.13		18.08	51.0

Queue values in this table are mean cycle-average queue (metres).

Table S.7 - Lane Performance
PR 111 -- RAMAL PR 111
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue Cycle (vehs)	Queue Aver. (m)	Lane Length (m)
South: RAMAL PR 111 SUR								
1 L	76	311	0.244	22.1	1.02	0.3	1.8	500.0
2 R	40	812	0.049	6.3	0.58	0.0	0.1	20.0T
East: PR 111 ESTE								
1 LT	836	1860	0.450	4.8	0.04	1.0	7.3	500.0
West: PR 111 OESTE								
1 TR	420	1933	0.217	1.4	0.11	0.0	0.0	500.0

T Short lane due to specification of Turn Slot

Table S.10 - Movement Capacity and Performance Summary
PR 111 -- RAMAL PR 111
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Dem Flow (veh /h)	Total Cap. (veh /h)	Lane Util (%)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Cycle Average Queue (veh)	Perf. Index
South: RAMAL PR 111 SUR									
1 L		76	311	100	0.244	22.1	1.02	0.3	1.87
3 R	(Slp)	40	812<	100	0.049	6.3	0.58	0.0	0.73
East: PR 111 ESTE									
4 L		36	80	100	0.450*	12.6	0.97	1.0	0.73
5 T		800	1779	100	0.450*	4.5	0.00	1.0	10.08

West: PR 111 OESTE								
11 T	348	1602	100	0.217	0.0	0.00	0.0	3.52
12 R	72	331	100	0.218	8.2	0.67	0.0	1.16

< Reduced capacity due to a short lane effect

* Maximum degree of saturation

Table S.12A - Fuel Consumption, Emissions and Cost (TOTAL)
PR 111 -- RAMAL PR 111
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Fuel Total L/h	Cost Total $/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h
INTERSECTION:	80.2	553.06	0.329	13.54	0.449	200.5

PARAMETERS USED IN COST CALCULATIONS

Pump price of fuel ($/L)	=	1.200
Fuel resource cost factor	=	0.50
Ratio of running cost to fuel cost	=	3.0
Average income ($/h)	=	28.00
Time value factor	=	0.60
Light vehicle mass (1000 kg)	=	1.4
Heavy vehicle mass (1000 kg)	=	11.0
Light vehicle idle fuel rate (L/h)	=	1.350
Heavy vehicle idle fuel rate (L/h)	=	2.000

Table S.14 - Summary of Input and Output Data
PR 111 -- RAMAL PR 111
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
South: RAMAL PR 111 SUR												
1 L	76			76	0				0.244	22.1	2	500
2 R			40	40	0				0.049	6.3	0	20
	76	0	40	116	0				0.244	16.7	2	
East: PR 111 ESTE												
1 LT	36	800		836	0				0.450	4.8	7	500
	36	800	0	836	0				0.450	4.8	7	
West: PR 111 OESTE												
1 TR		348	72	420	0				0.217	1.4	0	500
	0	348	72	420	0				0.217	1.4		

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue

		1372	0		0.450	4.8	7

Peak flow period = 15 minutes.

Queue values in this table are mean cycle-average queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Table S.15 - Capacity and Level of Service
PR 111 -- RAMAL PR 111
2006, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue Cycle (vehs)	Aver. (m)
South: RAMAL PR 111 SUR								
1	L	76	311	0.244	22.1	C	0.3	2
3	R (Slp)	40	812<	0.049	6.3	A	0.0	0
East: PR 111 ESTE								
4	L	36	80	0.450*	12.6	B	1.0	7
5	T	800	1779	0.450*	4.5	A	1.0	7
West: PR 111 OESTE								
11	T	348	1602	0.217	0.0	A	0.0	0
12	R	72	331	0.218	8.2	A	0.0	0
ALL VEHICLES:		1372		0.450	4.8	NA	1.0	7

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections.

< Reduced capacity due to a short lane effect
* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane v/c ratio rather than short lane v/c ratio (v/c=1.0)

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Output Tables
Output Tables
PR 111 -- RAMAL PR 111
2011, AM

Run Information
* Basic Parameters:
Intersection Type: Unsignalised - Two-Way Stop Control
Driving on the right-hand side of the road
Input data specified in Metric units
Model Defaults: TCG Standard Right
Peak Flow Period (for performance): 15 minutes
Unit time (for volumes): 60 minutes.
Delay definition: Control delay
Geometric delay included
SIDRA Standard Delay model used
SIDRA Standard Queue model used
Level of Service based on: Delay (HCM method)
Queue definition: Cycle average queue, Average

Table S.3 - Intersection Parameters
PR 111 -- RAMAL PR 111
2011, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Intersection Level of Service	=	NA
Worst movement Level of Service	=	D
Average intersection delay (s)	=	7.1
Largest average movement delay (s)	=	25.1
Largest cycle-average queue, mean (m)	=	10
Performance Index	=	21.26
Degree of saturation (highest)	=	0.446
Practical Spare Capacity (lowest)	=	79 %
Effective intersection capacity, (veh/h)	=	3236
Total vehicle flow (veh/h)	=	1444
Total person flow (pers/h)	=	2166
Total vehicle delay (veh-h/h)	=	2.83
Total person delay (pers-h/h)	=	4.25
Total effective vehicle stops (veh/h)	=	331
Total effective person stops (pers/h)	=	497
Total vehicle travel (veh-km/h)	=	869.1
Total cost ($/h)	=	590.98
Total fuel (L/h)	=	84.5
Total CO2 (kg/h)	=	211.16

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections. See Table S.15 or Movement Displays for individual movement LOS values.

Table S.6 - Intersection Performance
PR 111 -- RAMAL PR 111
2011, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (m)	Perf. Index	Aver. Speed (km/h)
South: RAMAL PR 111 SUR									
145	0.389	0.87	1.30	21.5	0.80	0.98	3	3.63	35.7
East: PR 111 ESTE									
665	0.446	1.74	2.60	9.4	0.97	0.18	10	10.62	47.5

Stop Sign Controlled Intersection

Mov ID	Fuel Total L/h	Cost Total $/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h
INTERSECTION:	84.5	590.98	0.347	14.11	0.470	211.2

PARAMETERS USED IN COST CALCULATIONS

Pump price of fuel ($/L)	=	1.200
Fuel resource cost factor	=	0.50
Ratio of running cost to fuel cost	=	3.0
Average income ($/h)	=	28.00
Time value factor	=	0.60
Light vehicle mass (1000 kg)	=	1.4
Heavy vehicle mass (1000 kg)	=	11.0
Light vehicle idle fuel rate (L/h)	=	1.350
Heavy vehicle idle fuel rate (L/h)	=	2.000

Table S.14 - Summary of Input and Output Data
PR 111 -- RAMAL PR 111
2011, AM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (m)	Shrt Lane (m)
South: RAMAL PR 111 SUR												
1 L	115			115	0				0.388	25.1	3	500
2 R			30	30	0				0.041	7.7	0	20
	115	0	30	145	0				0.388	21.5	3	
East: PR 111 ESTE												
1 LT	108	557		665	0				0.446	9.4	10	500
	108	557	0	665	0				0.446	9.4	10	
West: PR 111 OESTE												
1 TR		532	102	634	0				0.328	1.3	0	500
	0	532	102	634	0				0.328	1.3		
ALL VEHICLES				Total Flow 1444	% HV 0				Max X 0.446	Aver. Delay 7.1	Max Queue 10	

Peak flow period = 15 minutes.

Queue values in this table are mean cycle-average queue (metres).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Table S.15 - Capacity and Level of Service
PR 111 -- RAMAL PR 111
2011, AM
Intersection ID: 02

Stop Sign Controlled Intersection

Mov ID	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS	Longest Queue Cycle (vehs)	Aver. (m)
South: RAMAL PR 111 SUR								
1	L	115	296	0.389	25.1	D	0.5	3
3	R (Slp)	30	729	0.041	7.7	A	0.0	0
East: PR 111 ESTE								
4	L	108	242	0.446*	16.2	C	1.5	10
5	T	557	1249	0.446*	8.1	A	1.5	10
West: PR 111 OESTE								
11	T	532	1623	0.328	0.0	A	0.0	0
12	R	102	311	0.328	8.2	A	0.0	0
ALL VEHICLES:		1444		0.446	7.1	NA	1.5	10

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

NA Not Applicable - Intersection Level of Service is not calculated at
two-way stop control or give-way/yield controlled intersections.

* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

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Output Tables
Output Tables
PR 111 -- RAMAL PR 111
2011, PM

Run Information
* Basic Parameters:
Intersection Type: Unsignalised - Two-Way Stop Control
Driving on the right-hand side of the road
Input data specified in Metric units
Model Defaults: TCG Standard Right
Peak Flow Period (for performance): 15 minutes
Unit time (for volumes): 60 minutes.
Delay definition: Control delay
Geometric delay included

SIDRA Standard Delay model used
SIDRA Standard Queue model used
Level of Service based on: Delay (HCM method)
Queue definition: Cycle average queue, Average

Table S.3 - Intersection Parameters
PR 111 -- RAMAL PR 111
2011, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Intersection Level of Service	=	NA
Worst movement Level of Service	=	D
Average intersection delay (s)	=	6.6
Largest average movement delay (s)	=	30.7
Largest cycle-average queue, mean (m)	=	12
Performance Index	=	22.48
Degree of saturation (highest)	=	0.514
Practical Spare Capacity (lowest)	=	56 %
Effective intersection capacity, (veh/h)	=	3069
Total vehicle flow (veh/h)	=	1577
Total person flow (pers/h)	=	2366
Total vehicle delay (veh-h/h)	=	2.91
Total person delay (pers-h/h)	=	4.36
Total effective vehicle stops (veh/h)	=	229
Total effective person stops (pers/h)	=	344
Total vehicle travel (veh-km/h)	=	950.4
Total cost ($/h)	=	657.30
Total fuel (L/h)	=	96.1
Total CO2 (kg/h)	=	240.22

NA Not Applicable - Intersection Level of Service is not calculated at two-way stop control or give-way/yield controlled intersections. See Table S.15 or Movement Displays for individual movement LOS values.

Table S.6 - Intersection Performance
PR 111 -- RAMAL PR 111
2011, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (m)	Perf. Index	Aver. Speed (km/h)
South: RAMAL PR 111 SUR									
138	0.420	0.89	1.34	23.2	0.77	0.92	4	3.62	33.9
East: PR 111 ESTE									
950	0.514	1.82	2.73	6.9	0.93	0.05	12	13.40	48.9
West: PR 111 OESTE									
489	0.253	0.20	0.29	1.4	0.00	0.12	0	5.45	57.7
ALL VEHICLES:									
1577	0.514	2.91	4.36	6.6	0.63	0.15	12	22.48	49.5
INTERSECTION (persons):									
2366	0.514		4.36	6.6	0.63	0.15		22.48	49.5

Queue values in this table are mean cycle-average queue (metres).

Table S.7 - Lane Performance
PR 111 -- RAMAL PR 111

2011, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Lane No.	Dem Flow (veh /h)	Cap (veh /h)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Queue Cycle (vehs)	Queue Aver. (m)	Lane Length (m)
South: RAMAL PR 111 SUR								
1 L	95	226	0.420	30.7	1.06	0.6	3.9	500.0
2 R	43	788	0.055	6.7	0.61	0.0	0.2	20.0T
East: PR 111 ESTE								
1 LT	950	1849	0.514	6.9	0.05	1.7	12.1	500.0
West: PR 111 OESTE								
1 TR	489	1933	0.253	1.4	0.12	0.0	0.0	500.0

T Short lane due to specification of Turn Slot

Table S.10 - Movement Capacity and Performance Summary
PR 111 -- RAMAL PR 111
2011, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Mov Typ	Dem Flow (veh /h)	Total Cap. (veh /h)	Lane Util (%)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	Cycle Average Queue (veh)	Perf. Index
South: RAMAL PR 111 SUR									
1 L		95	226	100	0.420	30.7	1.06	0.6	2.82
3 R	(Slp)	43	788<	100	0.055	6.7	0.61	0.0	0.80
East: PR 111 ESTE									
4 L		39	76	100	0.513	14.7	1.13	1.7	0.87
5 T		911	1773	100	0.514*	6.6	0.00	1.7	12.53
West: PR 111 OESTE									
11 T		403	1593	100	0.253	0.0	0.00	0.0	4.07
12 R		86	340	100	0.253	8.2	0.67	0.0	1.38

< Reduced capacity due to a short lane effect

* Maximum degree of saturation

Table S.12A - Fuel Consumption, Emissions and Cost (TOTAL)
PR 111 -- RAMAL PR 111
2011, PM
Intersection ID: 02
Stop Sign Controlled Intersection

Mov ID	Fuel Total L/h	Cost Total $/h	HC Total kg/h	CO Total kg/h	NOX Total kg/h	CO2 Total kg/h
INTERSECTION:	96.1	657.30	0.401	17.15	0.548	240.2

PARAMETERS USED IN COST CALCULATIONS

East: PR 111 ESTE							
4	L	39	76	0.513	14.7	B	1.7	12
5	T	911	1773	0.514*	6.6	A	1.7	12
West: PR 111 OESTE							
11	T	403	1593	0.253	0.0	A	0.0	0
12	R	86	340	0.253	8.2	A	0.0	0
ALL VEHICLES:		1577		0.514	6.6	NA	1.7	12

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
SIDRA Output Guide or the Output section of the on-line help.

NA Not Applicable - Intersection Level of Service is not calculated at
two-way stop control or give-way/yield controlled intersections.

< Reduced capacity due to a short lane effect
* Maximum v/c ratio, or critical green periods
" Movement Level of service has been determined using adjacent lane
v/c ratio rather than short lane v/c ratio (v/c=1.0)

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