Herpetofauna

Tabela 1 – Lista de espécies de répteis com registros na área de influência.

Ordem	Nome popular	Hábito
ordem Testudines		
sub-ordem Cryptodira		
família Cheloniidae		
Caretta caretta	Tartaruga-cabeçuda	Aq
Chelonia mydas	Tartaruga-verde	Aq
Eretmochelys imbricata	Tartaruga-de-pente	Aq
Lepdochelys olivacea	Tartaruga-marinha	Aq
família Dermochelyidae		
Dermochelys coriacea	Tartaruga-de-couro	Aq
família Chelidae		
Hydromedusa tectifera	Cágado	Aq
ordem Crocodylia		
família Alligatoridae		
Caiman latirostris	Jacaré-de-papo-amarelo	Aq
ordem Squamata		
sub-ordem Lagartos		
família Polychrotidae		
Enyalius iheringii	Camaleão	Sab
família Gekkonidae		
Hemidactylus mabouia	Lagartixa-de-parede	Sab
família Anguidae		
Ophiodes fragilis	Cobra-de-vidro	Sf
família Teiidae		
Tupinambis merianae	Lagarto, teiú	Ter
sub-ordem Amphisbaenia		
família Amphisbaenidae		
Leposternum microcephalum	Cobra-cega	Flo
sub-ordem Serpentes		
família Colubridae		
Chironius exoletus	Cobra-cipó, voadeira	Sab
Chironius leavicollis	Cobra-cipó, voadeira	Sab
Dipsas indica	Dormideira	Sab
Erythrolamprus aesculapii	Coral-falsa	Ter
Helicops carinicaudus	Cobra-d'água	Saq
Liophis amarali	-	Ter

Ordem	Nome popular	Hábito
Liophis miliaris	Coral-falsa	Saq
Oxyrhopus clathratus	Cobra-d'água	Ter
Sibynomorphus neuwiedi	Dormideira	Ter
Spilotes pullatus	Caninana	Sab
Uromacerina ricardinii	Cobra-cipó	Ab
Xenodon neuwiedii	Jararaca-falsa	Ter
família Elapidae		
Micrurus corallinus	Coral-verdadeira	Sf
família Viperidae		
Bothrops jararaca	Jararaca	Ter
Bothrops jararacussu	Jararacuçu	Ter

Legenda: Hábito – Ter: terrestre, Saq: semi-aquático, Aq: aquático, Ab: arbustivo, Sab: semi-arbustivo, Sf: semi-florestal. Fonte: Morato et al 1995, Cia Ambiental 2013.

Tabela 2 – Lista de espécies com ocorrência na região litorânea do Paraná.

Ordem	Popular	Ambiente	Status
família Bufonidae			
Rhinella. *Crucifer*	sapo-galinha	A	C
Rhinella icterica	sapo	A	C
Dendrophryniscus leucomystax	sapinho	F	RA
família Centrolenidae			
Hyalinobatrachium uranoscopum	perereca-de-vidro	F	RA
família Hylidae			
Hypsiboas albomarginatus	perereca-verde	A	C
Dendropsophus elegans	perereca-amerela	A	C
Hypsiboas faber	sapo-ferreiro	A	C
Hyla minuta	perereca	A	C
Osteocephalus langsdorffii	perereca-grande	F	RA
Plyllomedusa distincta	rã-macaco	F,A	C
Phrynohyas mesophaea	perereca-cola	F	C
Scinax aff. *Altera*	perereca	A	C
Scinax argyreornata	perereca	F	C
Scinax aff.*catharinae*	perereca	F	C
Scinax aff. Cuspidata	perereca	A	C
Scinax fuscovarius	perereca-de-casa	A	C
Scinax litoralis	perereca	F	RA
Scinax perereca	perereca	F	C
Scinax aff. *Rubra*	perereca	A	C
família Leptodactylidae			
Adenomera bokermani	rãnzinha	F	C

Ordem	Popular	Ambiente	Status
Eleutherodactylu binotatus	rã	F	C
Eleutherodactylu guentheri	rã	F	C
Eleutherodactylu sambaqui	rã	F	IND
Hylodes aff. *heyeri*	rã-de-cachoeira	F	C
Leptodactylus notoaktites	rã	A	C
Leptodactylus ocellatus	rã-manteiga	F,A	C
Physalaemus aff. *Olfersii*	rãnzinha	F	C
Physalaemus spiniger	rãnzinha	F	IND
família Mycrohilidae			
Elachlistocleis bicolor	rã-de-barriga-amarela	A	C

Legenda: Ambientes: A – área aberta; F – Ambiente florestal; Status: C – Comum. RA – Raro; IND – indeterminado. Fonte: Haddad et al 2008, IZECKSOHN et al 2001, Morato et al, 1995.

Avifauna

Tabela 3 – Listagem das espécies de aves com provável ocorrência para a região de estudo.

Taxa	Nome vulgar	Amb.	Obs.
ANSERIFORMES			
Anatidae			
Dendrocygna bicolor	marreca-caneleira	A L	
Dendrocygna viduata	irerê	A L	
Coscoroba coscoroba	capororoca	A M	AC
Cairina moschata	pato-do-mato	A L	
Amazonetta brasiliensis	pé-vermelho	A L	
SPHENISCIFORMES			
Spheniscidae			
Spheniscus magellanicus	pinguim-magalhães	M	AC
SULIFORMES			
Fregatidae			
Fregata magnificens	tesourão	M	
Sulidae			
Sula leucogaster	atobá-pardo	M	
Phalacrocoracidae			
Phalacrocorax brasilianus	biguá	A M	
PELECANIFORMES			
Ardeidae			

Taxa	Nome vulgar	Amb.	Obs.
Nycticorax nycticorax	savacu	A M	
Nyctanassa violacea	savacu-de-coroa	M	PR
Butorides striata	socozinho	A M	
Ardea cocoi	garça-moura	A M	
Ardea alba	garça-branca-grande	A M	
Egretta thula	garça-branca-pequena	A M	
Egretta caerulea	garça-azul	A M	
Threskiornithidae			
Eudocimus ruber	guará	A M	PR
Plegadis chihi	caraúna-cara-branca	A M L	
Phimosus infuscatus	tapicuru-cara-pelada	A M L	
Platalea ajaja	colhereiro	A M L	
GRUIFORMES			
Rallidae			
Rallus longirostris	saracura-matraca	A L	
Aramides mangle	saracura-do-mangue	A L	#
Aramides cajanea	saracura-três-potes	A L	
Aramides saracura	saracura-do-mato	A L	
CHARADRIIFORMES			
Charadriidae			
Vanellus chilensis	quero-quero	A L	
Pluvialis dominica	batuiruçu	A M L	*
Pluvialis squatarola	batuiruçu-axila-preta	A M	*
Charadrius semipalmatus	batuíra-de-bando	A M L	*
Charadrius collaris	batuíra-de-coleira	A M L	*
Haematopodidae			
Haematopus palliatus	piru-piru	M	
Recurvirostridae			
Himantopus melanurus	Pernilongo	A L M	
Scolopacidae			
Actitis macularius	maçarico-pintado	M L	*
Tringa solitaria	maçarico-solitário	A L	*
Tringa melanoleuca	maçarico-grande	A M L	*
Tringa flavipes	maçarico	A M L	*

Taxa	Nome vulgar	Amb.	Obs.
Arenaria interpres	vira-pedra	M L	*
Calidris Alba	maçarico-branco	M L	*
Calidris fuscicollis	maçarico	A M L	*
Calidris melanotos	maçarico-de-colete	A M L	*
Stercorariidae			
Stercorarius maccormicki	mandrião-do-sul	M	AC *
Stercorarius antarcticus	mandrião-antártico	M	AC *
Stercorarius pomarinus	mandrião-pomarino	M	AC *
Stercorarius parasiticus	mandrião-parasítico	M	AC *
Stercorarius longicaudus	mandrião	M	AC *
Laridae			
Chroicocephalus maculipennis	gaivota-maria-velha	M	
Chroicocephalus cirrocephalus	gaivota-cabeça-cinza	M	
Larus dominicanus	gaivotão	M	
Sternidae			
Sternula superciliaris	trinta-réis-anão	M	*
Sterna hirundinacea	trinta-réis	M	*
Thalasseus acuflavidus	trinta-réis-de-bando	M	*
Thalasseus maximus	trinta-réis-real	M	BR PR *
Rynchopidae			
Rynchops niger	talha-mar	M	
CORACIIFORMES			
Alcedinidae			
Megaceryle torquata	martim-pescador	A M	
Chloroceryle amazona	martim-pescador	A M	
Chloroceryle aenea	martinho	A	
Chloroceryle americana	martim-pescador	A M	
Chloroceryle inda	martim-pescador	A	

Ambiente de ocorrência: (A) Aquática; (M) Marinha; L (Limícola). Observações: # espécie endêmica do Brasil; (AC) ocorrência acidental na região; * espécie migratória; (BR) espécie ameaçada de extinção no Brasil (MMA, 2003); (PR) espécie ameaçada de extinção no Estado do Paraná (STRAUBE et al., 2004).

Mastofauna

Tabela 4 – Lista de espécies da mastofauna com registro na formação de floresta ombrófila densa na região de Paranaguá.

Ordem	Família	Espécie	Nome popular	END	VU	CR
DIDELPHIMORPHIA	Didelphidae	*Caluromys philander*	cuíca-lanosa	-	-	-
DIDELPHIMORPHIA	Didelphidae	*Chironectes minimus*	cuíca-d'água	-	-	-
DIDELPHIMORPHIA	Didelphidae	*Didelphis albiventris*	gambá	-	-	-
DIDELPHIMORPHIA	Didelphidae	*Didelphis aurita*	saurê	-	-	-
DIDELPHIMORPHIA	Didelphidae	*Gracilinanus microtarsus*	cuíca, catita	-	-	-
DIDELPHIMORPHIA	Didelphidae	*Marmosa* sp.	marmosa	-	-	-
DIDELPHIMORPHIA	Didelphidae	*Metachirus nudicaudatus*	cuíca-de-quatro-olhos	-	-	-
DIDELPHIMORPHIA	Didelphidae	*Micoureus paragayanus*	cuíca	-	-	-
DIDELPHIMORPHIA	Didelphidae	*Monodelphis* sp.	catita	-	-	-
DIDELPHIMORPHIA	Didelphidae	*Philander frenatus*	gambá-cinza-de-quatro-olhos	-	-	-
PILOSA	Myrmecophagidae	*Tamandua tetradactyla*	tamanduá-mirin	-	-	-
CINGULATA	Dasypodidae	*Dasypus* sp.	tatú	-	-	-
PRIMATAS	Cebidae	*Cebus apela*	macaco-prego	-	-	-
PRIMATAS	Cebidae	*Leontopithecus caissara*	mico-leão-de-cara-preta	-	-	x
PRIMATAS	Atelidae	*Alouatta guariba*	bugio	-	x	-
LAGOMORPHA	Leporidae	*Sylvilagus brasiliensis*	tapeti	-	x	-
LAGOMORPHA	Leporidae	*Lepus europaeus (exótica)*	lebre europeia	-	-	-
CHIROPTERA	Phyllostomidae	*Desmodus rotundus*	morcego	-	-	-
CHIROPTERA	Phyllostomidae	*Anoura caudifer*	morcego	-	-	-
CHIROPTERA	Phyllostomidae	*Glossophaga soricina*	morcego	-	-	-
CHIROPTERA	Phyllostomidae	*Carollia perspicillata*	morcego	-	-	-
CHIROPTERA	Phyllostomidae	*Artibeus* sp.	morcego	-	-	-

Ordem	Família	Espécie	Nome popular	END	VU	CR
CHIROPTERA	Phyllostomidae	*Sturnira lillium*	morcego	-	-	-
CHIROPTERA	Phyllostomidae	*Chiroderma dorie*	morcego	-	x	-
CHIROPTERA	Noctilionidae	*Noctilio leporinus*	morcego	-	-	-
CHIROPTERA	Molossidae	*Molossus* sp.	morcego	-	-	-
CHIROPTERA	Vespertilionidae	*Lasiurus cinereus*	morcego	-	-	-
CHIROPTERA	Vespertilionidae	*Myotis* sp.	morcego	-	-	-
CARNIVORA	Felidae	*Leopardus pardalis*	jaguatirica	-	x	-
CARNIVORA	Felidae	*Leopardus tigrinus*	gato-do-mato-pequeno	-	x	-
CARNIVORA	Felidae	*Leopardus wiedii*	gato-maracaja	-	x	-
CARNIVORA	Felidae	*Puma concolor*	onça-parda	-	x	-
CARNIVORA	Felidae	*Puma yagouarundi*	jaguarundi	-	-	-
CARNIVORA	Felidae	*Panthera onca*	onça-pintada	-	-	x
CARNIVORA	Mustelidae	*Lontra longicaudis*	lontra	-	x	-
CARNIVORA	Mustelidae	*Eira barbara*	irara	-	-	-
CARNIVORA	Mustelidae	*Galictis cuja*	furão-pequeno	-	-	-
CARNIVORA	Canidae	*Cerdocyon thous*	cachorro-do-mato	-	-	-
CARNIVORA	Procyonidae	*Nasua nasua*	quati	-	-	-
CARNIVORA	Procyonidae	*Procyon cancrivorus*	mão-pelada	-	-	-
PERISSODACTYLA	Tapiridae	*Tapirus terrestris*	anta	x	-	-
ARTIODACTYLA	Tayassuidae	*Pecari tajacu*	cateto	-	x	-
ARTIODACTYLA	Tayassuidae	*Tayassu pecari*	queixada	-	-	x
ARTIODACTYLA	Cervidae	*Mazama nana*	veado	-	x	-
CETACEA	Delphinidae	*Sotalia guianensis*	boto-cinza	-	x	-
RODENTIA	Sciuridae	*Guerlinguetus ingrami*	serelepe	-	-	-
RODENTIA	Cricetidae	*Akodon* sp.	rato	-	-	-
RODENTIA	Cricetidae	*Holochilus brasiliensis*	rato-de-cana	-	-	-
RODENTIA	Cricetidae	*Delomys dorsalis*		-	-	-

Ordem	Família	Espécie	Nome popular	END	VU	CR
RODENTIA	Cricetidae	*Nectomys squamipes*	rato-d'agua	-	-	-
RODENTIA	Cricetidae	*Oxymicterus* sp.	rato	-	-	-
RODENTIA	Muridae	*Mus musculus (exotica)*	camundongo	-	-	-
RODENTIA	Muridae	*Rattus* sp.	gabirú	-	-	-
RODENTIA	Caviidae	*Cavia aperea*	preá	-	-	-
RODENTIA	Caviidae	*Hydrochoerus hydrochaeris*	capivara	-	-	-
RODENTIA	Cuniculidae	*Cuniculus paca*	paca	x	-	-
RODENTIA	Dasyproctidae	*Dasyprocta azare*	cutia	-	-	-
RODENTIA	Erethizontidae	*Sphigurus villosus*	ouriços-caxeiros	-	-	-
RODENTIA	Myocastoridae	*Myocastor coypus*	ratão-do-banhado	-	-	-

Legenda: END – em perigo de extinção, VU – vulnerável, CR – criticamente ameaçada. Fonte: Paglia et al 2012, Cia Ambiental 2013, Reis et al 2006.

1.1. Ano de 2015 com o empreendimento

HCS+: Multilane Highways Release 5.3

OPERATIONAL ANALYSIS

Analyst: PRM
Agency/Co: BARLEY
Date: 28/01/2015
Analysis Period: PICO
Highway: BR-277
From/To:
Jurisdiction:
Analysis Year: 2015
Project ID: Verificação do NS do Tramo Com Empreendimento

FREE-FLOW SPEED

Direction	1		2	
Lane width	3.6	m	3.6	m
Lateral clearance:				
Right edge	1.8	m	1.8	m
Left edge	1.8	m	1.8	m
Total lateral clearance	3.6	m	3.6	m
Access points per km	0		0	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	80.0	km/h	80.0	km/h
Lane width adjustment, FLW	0.0	km/h	0.0	km/h
Lateral clearance adjustment, FLC	0.0	km/h	0.0	km/h
Median type adjustment, FM	0.0	km/h	0.0	km/h
Access points adjustment, FA	0.0	km/h	0.0	km/h
Free-flow speed	80.0	km/h	80.0	km/h

VOLUME

Direction	1		2	
Volume, V	822	vph	586	vph
Peak-hour factor, PHF	0.87		0.99	
Peak 15-minute volume, v15	236		148	
Trucks and buses	25	%	25	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	km	0.00	km
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.889		0.889	
Flow rate, vp	531	pcphpl	332	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	531	pcphpl	332	pcphpl
Free-flow speed, FFS	80.0	km/h	80.0	km/h
Avg. passenger-car travel speed, S	80.0	km/h	80.0	km/h
Level of service, LOS	A		A	
Density, D	6.6	pc/km/ln	4.2	pc/km/ln

Overall results are not computed when free-flow speed is less than 70 km/h.

1.2. Ano de 2020 com o empreendimento

HCS+: Multilane Highways Release 5.3

OPERATIONAL ANALYSIS

Analyst: PRM
Agency/Co: BARLEY
Date: 28/01/2015
Analysis Period: PICO
Highway: BR-277
From/To:
Jurisdiction:
Analysis Year: 2020
Project ID: Verificação do NS do Tramo Com Empreendimento

FREE-FLOW SPEED

Direction	1		2	
Lane width	3.6	m	3.6	m
Lateral clearance:				
Right edge	1.8	m	1.8	m
Left edge	1.8	m	1.8	m
Total lateral clearance	3.6	m	3.6	m
Access points per km	0		0	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	80.0	km/h	80.0	km/h
Lane width adjustment, FLW	0.0	km/h	0.0	km/h
Lateral clearance adjustment, FLC	0.0	km/h	0.0	km/h
Median type adjustment, FM	0.0	km/h	0.0	km/h
Access points adjustment, FA	0.0	km/h	0.0	km/h
Free-flow speed	80.0	km/h	80.0	km/h

VOLUME

Direction	1		2	
Volume, V	973	vph	693	vph
Peak-hour factor, PHF	0.87		0.99	
Peak 15-minute volume, v15	280		175	
Trucks and buses	25	%	25	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	km	0.00	km
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.889		0.889	
Flow rate, vp	629	pcphpl	393	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	629	pcphpl	393	pcphpl
Free-flow speed, FFS	80.0	km/h	80.0	km/h
Avg. passenger-car travel speed, S	80.0	km/h	80.0	km/h
Level of service, LOS	B		A	
Density, D	7.9	pc/km/ln	4.9	pc/km/ln

Overall results are not computed when free-flow speed is less than 70 km/h.

1.3. Ano de 2025 com o empreendimento

HCS+: Multilane Highways Release 5.3

OPERATIONAL ANALYSIS

Analyst:	PRM
Agency/Co:	BARLEY
Date:	28/01/2015
Analysis Period:	PICO
Highway:	BR-277
From/To:	
Jurisdiction:	
Analysis Year:	2025
Project ID:	Verificação do NS do Tramo Com Empreendimento

FREE-FLOW SPEED

Direction	1		2	
Lane width	3.6	m	3.6	m
Lateral clearance:				
Right edge	1.8	m	1.8	m
Left edge	1.8	m	1.8	m
Total lateral clearance	3.6	m	3.6	m
Access points per km	0		0	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	80.0	km/h	80.0	km/h
Lane width adjustment, FLW	0.0	km/h	0.0	km/h
Lateral clearance adjustment, FLC	0.0	km/h	0.0	km/h
Median type adjustment, FM	0.0	km/h	0.0	km/h
Access points adjustment, FA	0.0	km/h	0.0	km/h
Free-flow speed	80.0	km/h	80.0	km/h

VOLUME

Direction	1		2	
Volume, V	1153	vph	820	vph
Peak-hour factor, PHF	0.87		0.99	
Peak 15-minute volume, v15	331		207	
Trucks and buses	25	%	25	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	km	0.00	km
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.889		0.889	
Flow rate, vp	745	pcphpl	465	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	745	pcphpl	465	pcphpl
Free-flow speed, FFS	80.0	km/h	80.0	km/h
Avg. passenger-car travel speed, S	80.0	km/h	80.0	km/h
Level of service, LOS	B		A	
Density, D	9.3	pc/km/ln	5.8	pc/km/ln

Overall results are not computed when free-flow speed is less than 70 km/h.

1.4. Ano de 2035 com o empreendimento

HCS+: Multilane Highways Release 5.3

OPERATIONAL ANALYSIS

Analyst: PRM
Agency/Co: BARLEY
Date: 28/01/2015
Analysis Period: PICO
Highway: BR-277
From/To:
Jurisdiction:
Analysis Year: 2035
Project ID: Verificação do NS do Tramo Com Empreendimento

FREE-FLOW SPEED

Direction	1		2	
Lane width	3.6	m	3.6	m
Lateral clearance:				
Right edge	1.8	m	1.8	m
Left edge	1.8	m	1.8	m
Total lateral clearance	3.6	m	3.6	m
Access points per km	0		0	
Median type	Divided		Divided	
Free-flow speed:	Base		Base	
FFS or BFFS	80.0	km/h	80.0	km/h
Lane width adjustment, FLW	0.0	km/h	0.0	km/h
Lateral clearance adjustment, FLC	0.0	km/h	0.0	km/h
Median type adjustment, FM	0.0	km/h	0.0	km/h
Access points adjustment, FA	0.0	km/h	0.0	km/h
Free-flow speed	80.0	km/h	80.0	km/h

VOLUME

Direction	1		2	
Direction	1		2	
Volume, V	1621	vph	1151	vph
Peak-hour factor, PHF	0.87		0.99	
Peak 15-minute volume, v15	466		291	
Trucks and buses	25	%	25	%
Recreational vehicles	0	%	0	%
Terrain type	Level		Level	
Grade	0.00	%	0.00	%
Segment length	0.00	km	0.00	km
Number of lanes	2		2	
Driver population adjustment, fP	1.00		1.00	
Trucks and buses PCE, ET	1.5		1.5	
Recreational vehicles PCE, ER	1.2		1.2	
Heavy vehicle adjustment, fHV	0.889		0.889	
Flow rate, vp	1048	pcphpl	653	pcphpl

RESULTS

Direction	1		2	
Flow rate, vp	1048	pcphpl	653	pcphpl
Free-flow speed, FFS	80.0	km/h	80.0	km/h
Avg. passenger-car travel speed, S	80.0	km/h	80.0	km/h
Level of service, LOS	C		B	
Density, D	13.1	pc/km/ln	8.2	pc/km/ln

Overall results are not computed when free-flow speed is less than 70 km/h.

2.1. – Ano de 2015 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Diverge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO ATUAL
Freeway/Dir of Travel:	BR-277 > PR-407
Junction:	
Jurisdiction:	
Analysis Year:	2015
Description:	Verificação NS rampa Com Empreendimento

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	522	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	60.0	km/h
Volume on ramp	300	vph
Length of first accel/decel lane	90	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	522		300			vph
Peak-hour factor, PHF	0.87		0.99			
Peak 15-min volume, v15	150		76			v
Trucks and buses	25		25			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	km	0.00	km		km
Trucks and buses PCE, ET	3.0*		3.0*			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.667		0.667			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	900		455			pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 900 pcph

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	900	4500	No
$v_{FO} = v_F - v_R$	445	4500	No
v_R	455	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 $v_{12}/2$	No	

If yes, $v_{12A} = 900$ (Equation 25-18)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	900	4400	No

Level of Service Determination (if not F)

Density, $D_R = 2.642 + 0.0053\ v_{12} - 0.0183\ L_D = 5.8$ pc/km/ln

Level of service for ramp-freeway junction areas of influence A

Speed Estimation

Intermediate speed variable,	$D_S = 0.444$	
Space mean speed in ramp influence area,	$S_R = 79.8$	km/h
Space mean speed in outer lanes,	S_O = N/A	km/h
Space mean speed for all vehicles,	$S = 79.8$	km/h

2.2. Ano de 2020 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Diverge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO ATUAL
Freeway/Dir of Travel:	BR-277 > PR-407
Junction:	
Jurisdiction:	
Analysis Year:	2020
Description:	Verificação NS rampa Com Empreendimento

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	620	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	60.0	km/h
Volume on ramp	353	vph
Length of first accel/decel lane	90	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	620		353			vph
Peak-hour factor, PHF	0.87		0.99			
Peak 15-min volume, v15	178		89			v
Trucks and buses	25		25			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	km	0.00	km		km
Trucks and buses PCE, ET	3.0*		3.0*			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.667		0.667			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	1069		535			pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1069 pcph

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1069	4500	No

$v_{FO} = v_F - v_R$	534	4500	No
v_R	535	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 $v_{12}/2$	No	

If yes, $v_{12A} = 1069$ (Equation 25-18)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1069	4400	No

Level of Service Determination (if not F)

Density, $D_R = 2.642 + 0.0053\ v_{12} - 0.0183\ L_D$ = 6.7 pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.451	
Space mean speed in ramp influence area,	S_R = 79.6	km/h
Space mean speed in outer lanes,	S_0 = N/A	km/h
Space mean speed for all vehicles,	S = 79.6	km/h

2.3. Ano de 2025 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Diverge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO ATUAL
Freeway/Dir of Travel:	BR-277 > PR-407
Junction:	
Jurisdiction:	
Analysis Year:	2025
Description:	Verificação NS rampa Com Empreendimento

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	736	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	60.0	km/h
Volume on ramp	417	vph
Length of first accel/decel lane	90	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	736		417			vph
Peak-hour factor, PHF	0.87		0.99			
Peak 15-min volume, v15	211		105			v
Trucks and buses	25		25			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	km	0.00	km		km
Trucks and buses PCE, ET	3.0*		3.0*			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.667		0.667			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	1269		632			pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1269 pcph

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1269	4500	No
$v_{Fi} = v_F - v_R$	637	4500	No

FO F R
v 632 2000 No
R
v v 0 pc/h (Equation 25-15 or 25-16)
3 or av34
Is v v > 2700 pc/h? No
3 or av34
Is v v > 1.5 v /2 No
3 or av34 12
If yes, v = 1269 (Equation 25-18)
12A

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v 12	1269	4400	No

Level of Service Determination (if not F)

Density, $D_R = 2.642 + 0.0053\ v_{12} - 0.0183\ L_D$ = 7.7 pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, D_S = 0.460

Space mean speed in ramp influence area, S_R = 79.4 km/h

Space mean speed in outer lanes, S_0 = N/A km/h

Space mean speed for all vehicles, S = 79.4 km/h

2.4. Ano de 2035 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Diverge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO ATUAL
Freeway/Dir of Travel:	BR-277 > PR-407
Junction:	
Jurisdiction:	
Analysis Year:	2035
Description:	Verificação NS rampa Com Empreendimento

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	1039	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	60.0	km/h
Volume on ramp	582	vph
Length of first accel/decel lane	90	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1039		582			vph
Peak-hour factor, PHF	0.87		0.99			
Peak 15-min volume, v15	299		147			v
Trucks and buses	25		25			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%	%	
Length	0.00	km	0.00	km	km	
Trucks and buses PCE, ET	3.0*		3.0*			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.667		0.667			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	1791		882			pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1791 pcph

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1791	4500	No

$v_{FO} = v_F - v_R$	909	4500	No
v_R	882	2000	No
v_3 or v_{av34}	0 pc/h	(Equation 25-15 or 25-16)	
Is v_3 or v_{av34}	> 2700 pc/h?	No	
Is v_3 or v_{av34}	> 1.5 $v_{12}/2$	No	

If yes, v_{12A} = 1791 (Equation 25-18)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1791	4400	No

Level of Service Determination (if not F)

Density, $D_R = 2.642 + 0.0053\ v_{12} - 0.0183\ L_D$ = 10.5 pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.482	
Space mean speed in ramp influence area,	S_R = 78.9	km/h
Space mean speed in outer lanes,	S_0 = N/A	km/h
Space mean speed for all vehicles,	S = 78.9	km/h

3.1. Ano de 2015 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Merge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO
Freeway/Dir of Travel:	PR-407>BR-277
Junction:	
Jurisdiction:	
Analysis Year:	2015
Description:	Análise do NS da Junção Com Empreendimento

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	485	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	60.0	km/h
Volume on ramp	101	vph
Length of first accel/decel lane	100	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	485	101		vph
Peak-hour factor, PHF	0.90	0.61		
Peak 15-min volume, v15	135	41		v
Trucks and buses	25	25		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	km	km	km	
Trucks and buses PCE, ET	3.0*	3.0*		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.667	0.667		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	808	248		pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 808 pcph

Capacity Checks

	Actual	Maximum	LOS F?

v 1056 4500 No
FO
v v 0 pc/h (Equation 25-4 or 25-5)
3 or av34
Is v v > 2700 pc/h? No
3 or av34
Is v v > 1.5 v /2 No
3 or av34 12
If yes, v = 808 (Equation 25-8)
12A

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v R12	808	4600	No

Level of Service Determination (if not F)

Density, $D = 3.402 + 0.00456\ v_R + 0.0048\ v_{12} - 0.01278\ L_A$ = 7.1 pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.308	
Space mean speed in ramp influence area,	S_R = 82.9	km/h
Space mean speed in outer lanes,	S_0 = N/A	km/h
Space mean speed for all vehicles,	S = 82.9	km/h

3.2. Ano de 2020 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Merge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO
Freeway/Dir of Travel:	PR-407>BR-277
Junction:	
Jurisdiction:	
Analysis Year:	2020
Description:	Análise do NS da Junção Com Empreendimento

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	576	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	60.0	km/h
Volume on ramp	117	vph
Length of first accel/decel lane	100	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	576	117		vph
Peak-hour factor, PHF	0.90	0.61		
Peak 15-min volume, v15	160	48		v
Trucks and buses	25	25		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	km	km	km	
Trucks and buses PCE, ET	3.0*	3.0*		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.667	0.667		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	960	288		pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 960 pcph

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1248	4500	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	

Is $v_{3 \text{ or } av34}$ > 2700 pc/h? No

Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2 No

If yes, v_{12A} = 960 (Equation 25-8)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	960	4600	No

Level of Service Determination (if not F)

Density, $D_R = 3.402 + 0.00456\ v_R + 0.0048\ v_{12} - 0.01278\ L_A$ = 8.0 pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, M_S = 0.311

Space mean speed in ramp influence area, S_R = 82.9 km/h

Space mean speed in outer lanes, S_0 = N/A km/h

Space mean speed for all vehicles, S = 82.9 km/h

3.3. Ano de 2025 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Merge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO
Freeway/Dir of Travel:	PR-407>BR-277
Junction:	
Jurisdiction:	
Analysis Year:	2025
Description:	Análise do NS da Junção Com Empreendimento

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	684	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	60.0	km/h
Volume on ramp	136	vph
Length of first accel/decel lane	100	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	684	136		vph
Peak-hour factor, PHF	0.90	0.61		
Peak 15-min volume, v15	190	56		v
Trucks and buses	25	25		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	km	km	km	
Trucks and buses PCE, ET	3.0*	3.0*		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.667	0.667		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	1140	334		pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_{F}(P_{FM})$ = 1140 pcph

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1474	4500	No
v_{3} or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	
Is v_{3} or v_{av34} > 2700 pc/h?		No	

Is $v_{3 \text{ or } av34} + v_{12} > 1.5\ v_{12}/2$ No

If yes, $v_{12A} = 1140$ (Equation 25-8)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1140	4600	No

Level of Service Determination (if not F)

Density, $D_R = 3.402 + 0.00456\ v_R + 0.0048\ v_{12} - 0.01278\ L_A$ = 9.1 pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, M_S = 0.314

Space mean speed in ramp influence area, S_R = 82.8 km/h

Space mean speed in outer lanes, S_0 = N/A km/h

Space mean speed for all vehicles, S = 82.8 km/h

3.4. Ano de 2035 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Merge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO
Freeway/Dir of Travel:	PR-407>BR-277
Junction:	
Jurisdiction:	
Analysis Year:	2035
Description:	Análise do NS da Junção Com Empreendimento

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	965	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	60.0	km/h
Volume on ramp	186	vph
Length of first accel/decel lane	100	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	965	186		vph
Peak-hour factor, PHF	0.90	0.61		
Peak 15-min volume, v15	268	76		v
Trucks and buses	25	25		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	km	km	km	
Trucks and buses PCE, ET	3.0*	3.0*		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.667	0.667		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	1608	457		pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1608 pcph

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2065	4500	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	

Is $v_{3 \text{ or } av34}$ v_{12} > 2700 pc/h? No

Is $v_{3 \text{ or } av34}$ v_{12} > 1.5 v_{12} /2 No

If yes, v_{12A} = 1608 (Equation 25-8)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1608	4600	No

Level of Service Determination (if not F)

Density, $D_R = 3.402 + 0.00456\ v_R + 0.0048\ v_{12} - 0.01278\ L_A$ = 11.9 pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.328	
Space mean speed in ramp influence area,	S_R = 82.5	km/h
Space mean speed in outer lanes,	S_0 = N/A	km/h
Space mean speed for all vehicles,	S = 82.5	km/h

4.1. Ano 2015 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Diverge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO ATUAL
Freeway/Dir of Travel:	BR-277 > Barley
Junction:	
Jurisdiction:	
Analysis Year:	2015
Description:	Verificação NS rampa Com Empreendimento

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	821	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	60.0	km/h
Volume on ramp	15	vph
Length of first accel/decel lane	100	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	821		15			vph
Peak-hour factor, PHF	0.87		0.99			
Peak 15-min volume, v15	236		4			v
Trucks and buses	25		25			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%		%
Length	0.00	km	0.00	km		km
Trucks and buses PCE, ET	3.0*		3.0*			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.667		0.667			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	1416		23			pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1416 pcph

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1416	4500	No
$v_{FO} = v_F - v_R$	1393	4500	No
v_R	23	2000	No
$v_{3 \text{ or } av34}$	0 pc/h	(Equation 25-15 or 25-16)	
Is $v_{3 \text{ or } av34}$ > 2700 pc/h?		No	
Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2		No	
If yes, v_{12A} = 1416		(Equation 25-18)	

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1416	4400	No

Level of Service Determination (if not F)

Density, $D_R = 2.642 + 0.0053\ v_{12} - 0.0183\ L_D$ = 8.3 pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.405	
Space mean speed in ramp influence area,	S_R = 80.7	km/h
Space mean speed in outer lanes,	S_0 = N/A	km/h
Space mean speed for all vehicles,	S = 80.7	km/h

4.2. Ano de 2020 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Diverge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO ATUAL
Freeway/Dir of Travel:	BR-277 > Barley
Junction:	
Jurisdiction:	
Analysis Year:	2020
Description:	Verificação NS rampa Com Empreendimento

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	972	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	60.0	km/h
Volume on ramp	15	vph
Length of first accel/decel lane	100	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	972		15			vph
Peak-hour factor, PHF	0.87		0.99			
Peak 15-min volume, v15	279		4			v
Trucks and buses	25		25			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%	%	
Length	0.00	km	0.00	km	km	
Trucks and buses PCE, ET	3.0*		3.0*			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.667		0.667			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	1676		23			pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1676 pcph

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1676	4500	No
$v_R = v_F - v_{FD}$	1653	4500	No

FO F R

v_R	23	2000	No

v_3 or v_{av34} 0 pc/h (Equation 25-15 or 25-16)

Is v_3 or v_{av34} > 2700 pc/h? No

Is v_3 or v_{av34} > 1.5 v_{12}/2 No

If yes, v_{12A} = 1676 (Equation 25-18)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	1676	4400	No

Level of Service Determination (if not F)

Density, $D_R = 2.642 + 0.0053\, v_{12} - 0.0183\, L_D$ = 9.7 pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	D_S = 0.405	
Space mean speed in ramp influence area,	S_R = 80.7	km/h
Space mean speed in outer lanes,	S_0 = N/A	km/h
Space mean speed for all vehicles,	S = 80.7	km/h

4.3. Ano de 2025 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Diverge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO ATUAL
Freeway/Dir of Travel:	BR-277 > Barley
Junction:	
Jurisdiction:	
Analysis Year:	2025
Description:	Verificação NS rampa Com Empreendimento

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	1152	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	60.0	km/h
Volume on ramp	15	vph
Length of first accel/decel lane	100	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1152		15			vph
Peak-hour factor, PHF	0.87		0.99			
Peak 15-min volume, v15	331		4			v
Trucks and buses	25		25			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%	%	
Length	0.00	km	0.00	km	km	
Trucks and buses PCE, ET	3.0*		3.0*			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.667		0.667			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	1986		23			pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 1986 pcph

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	1986	4500	No
$v_{Fi} = v_F - v_R$	1963	4500	No

FO F R
v 23 2000 No
R
v v 0 pc/h (Equation 25-15 or 25-16)
3 or av34
Is v v > 2700 pc/h? No
3 or av34
Is v v > 1.5 v /2 No
3 or av34 12
If yes, v = 1986 (Equation 25-18)
12A

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v 12	1986	4400	No

Level of Service Determination (if not F)

Density, $D = 2.642 + 0.0053\ v_{R} - 0.0183\ L_{D} = 11.3$ pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	$D_S = 0.405$	
Space mean speed in ramp influence area,	$S_R = 80.7$	km/h
Space mean speed in outer lanes,	S_0 = N/A	km/h
Space mean speed for all vehicles,	$S = 80.7$	km/h

4.4. Ano de 2035 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Diverge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO ATUAL
Freeway/Dir of Travel:	BR-277 > Barley
Junction:	
Jurisdiction:	
Analysis Year:	2035
Description:	Verificação NS rampa Com Empreendimento

Freeway Data

Type of analysis	Diverge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	1620	vph

Off Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-Flow speed on ramp	60.0	km/h
Volume on ramp	15	vph
Length of first accel/decel lane	100	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent ramp		vph
Position of adjacent ramp		
Type of adjacent ramp		
Distance to adjacent ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway		Ramp		Adjacent Ramp	
Volume, V (vph)	1620		15			vph
Peak-hour factor, PHF	0.87		0.99			
Peak 15-min volume, v15	466		4			v
Trucks and buses	25		25			%
Recreational vehicles	0		0			%
Terrain type:	Level		Level			
Grade	0.00	%	0.00	%	%	
Length	0.00	km	0.00	km	km	
Trucks and buses PCE, ET	3.0*		3.0*			
Recreational vehicle PCE, ER	1.2		1.2			
Heavy vehicle adjustment, fHV	0.667		0.667			
Driver population factor, fP	1.00		1.00			
Flow rate, vp	2793		23			pcph

Estimation of V12 Diverge Areas

L_{EQ} = (Equation 25-8 or 25-9)

P_{FD} = 1.000 Using Equation 0

$v_{12} = v_R + (v_F - v_R) P_{FD}$ = 2793 pcph

Capacity Checks

	Actual	Maximum	LOS F?
$v_{Fi} = v_F$	2793	4500	No
$v_{Fi} = v_F - v_R$	2770	4500	No

FO F R
v_{R} 23 2000 No

v_{3} or v_{av34} v_{0} 0 pc/h (Equation 25-15 or 25-16)

Is v_{3} or v_{av34} > 2700 pc/h? No

Is v_{3} or v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 2793 (Equation 25-18)

Flow Entering Diverge Influence Area

	Actual	Max Desirable	Violation?
v_{12}	2793	4400	No

Level of Service Determination (if not F)

Density, $D_R = 2.642 + 0.0053\ v_{12} - 0.0183\ L_D$ = 15.6 pc/km/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, D_S = 0.405

Space mean speed in ramp influence area, S_R = 80.7 km/h

Space mean speed in outer lanes, S_0 = N/A km/h

Space mean speed for all vehicles, S = 80.7 km/h

5.1. Ano de 2015 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Phone: Fax:
E-mail:

Merge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO
Freeway/Dir of Travel:	Barley > BR-277
Junction:	
Jurisdiction:	
Analysis Year:	2015
Description:	Análise do NS da Junção Com Empreendimento

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	807	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	60.0	km/h
Volume on ramp	15	vph
Length of first accel/decel lane	180	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	807	15		vph
Peak-hour factor, PHF	0.90	0.61		
Peak 15-min volume, v15	224	6		v
Trucks and buses	25	25		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	km	km	km	
Trucks and buses PCE, ET	3.0*	3.0*		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.667	0.667		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	1345	37		pcph

Estimation of V12 Merge Areas

L = (Equation 25-2 or 25-3)
EQ
P = 1.000 Using Equation 0
FM
v = v (P) = 1345 pcph
12 F FM

Capacity Checks

		Actual	Maximum	LOS F?
v		1382	4500	No
FO				
v	v	0 pc/h	(Equation 25-4 or 25-5)	
3 or	av34			
Is v	v	> 2700 pc/h?	No	
3 or	av34			
Is v	v	> 1.5 v /2	No	
3 or	av34	12		
If yes, v	= 1345		(Equation 25-8)	
12A				

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v	1345	4600	No
R12			

Level of Service Determination (if not F)

Density, D = 3.402 + 0.00456 v + 0.0048 v - 0.01278 L = 7.7 pc/km/ln
R R 12 A
Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M = 0.293 S	
Space mean speed in ramp influence area,	S = 83.3 R	km/h
Space mean speed in outer lanes,	S = N/A 0	km/h
Space mean speed for all vehicles,	S = 83.3	km/h

5.2. Ano de 2020 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Merge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO
Freeway/Dir of Travel:	Barley > BR-277
Junction:	
Jurisdiction:	
Analysis Year:	2020
Description:	Análise do NS da Junção Com Empreendimento

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	958	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	60.0	km/h
Volume on ramp	15	vph
Length of first accel/decel lane	180	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	958	15		vph
Peak-hour factor, PHF	0.90	0.61		
Peak 15-min volume, v15	266	6		v
Trucks and buses	25	25		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	km	km	km	
Trucks and buses PCE, ET	3.0*	3.0*		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.667	0.667		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	1597	37		pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1597 pcph

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1634	4500	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	

Is $v_{3 \text{ or } av34}$ > 2700 pc/h? No

Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2 No

If yes, v_{12A} = 1597 (Equation 25-8)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1597	4600	No

Level of Service Determination (if not F)

Density, $D_R = 3.402 + 0.00456\ v_R + 0.0048\ v_{12} - 0.01278\ L_A$ = 8.9 pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable,	M_S = 0.298	
Space mean speed in ramp influence area,	S_R = 83.2	km/h
Space mean speed in outer lanes,	S_0 = N/A	km/h
Space mean speed for all vehicles,	S = 83.2	km/h

5.3. Ano de 2025 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Merge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO
Freeway/Dir of Travel:	Barley > BR-277
Junction:	
Jurisdiction:	
Analysis Year:	2025
Description:	Análise do NS da Junção Com Empreendimento

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	1138	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	60.0	km/h
Volume on ramp	15	vph
Length of first accel/decel lane	180	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1138	15		vph
Peak-hour factor, PHF	0.90	0.61		
Peak 15-min volume, v15	316	6		v
Trucks and buses	25	25		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	km	km	km	
Trucks and buses PCE, ET	3.0*	3.0*		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.667	0.667		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	1897	37		pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 1897 pcph

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	1934	4500	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	

Is $v_{3 \text{ or } av34}$ > 2700 pc/h? No

Is $v_{3 \text{ or } av34}$ > 1.5 v_{12} /2 No

If yes, v_{12A} = 1897 (Equation 25-8)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	1897	4600	No

Level of Service Determination (if not F)

Density, $D_R = 3.402 + 0.00456\ v_R + 0.0048\ v_{12} - 0.01278\ L_A$ = 10.4 pc/km/ln

Level of service for ramp-freeway junction areas of influence B

Speed Estimation

Intermediate speed variable, M_S = 0.305

Space mean speed in ramp influence area, S_R = 83.0 km/h

Space mean speed in outer lanes, S_0 = N/A km/h

Space mean speed for all vehicles, S = 83.0 km/h

5.4. Ano de 2035 com o empreendimento

HCS+: Ramps and Ramp Junctions Release 5.3

Merge Analysis

Analyst:	PRM
Agency/Co.:	BARLEY
Date performed:	28/01/2015
Analysis time period:	PICO
Freeway/Dir of Travel:	Barley > BR-277
Junction:	
Jurisdiction:	
Analysis Year:	2035
Description:	Análise do NS da Junção Com Empreendimento

Freeway Data

Type of analysis	Merge	
Number of lanes in freeway	2	
Free-flow speed on freeway	90.0	km/h
Volume on freeway	1606	vph

On Ramp Data

Side of freeway	Right	
Number of lanes in ramp	1	
Free-flow speed on ramp	60.0	km/h
Volume on ramp	15	vph
Length of first accel/decel lane	180	m
Length of second accel/decel lane		m

Adjacent Ramp Data (if one exists)

Does adjacent ramp exist?	No	
Volume on adjacent Ramp		vph
Position of adjacent Ramp		
Type of adjacent Ramp		
Distance to adjacent Ramp		m

Conversion to pc/h Under Base Conditions

Junction Components	Freeway	Ramp	Adjacent Ramp	
Volume, V (vph)	1606	15		vph
Peak-hour factor, PHF	0.90	0.61		
Peak 15-min volume, v15	446	6		v
Trucks and buses	25	25		%
Recreational vehicles	0	0		%
Terrain type:	Level	Level		
Grade	%	%	%	
Length	km	km	km	
Trucks and buses PCE, ET	3.0*	3.0*		
Recreational vehicle PCE, ER	1.2	1.2		
Heavy vehicle adjustment, fHV	0.667	0.667		
Driver population factor, fP	1.00	1.00		
Flow rate, vp	2677	37		pcph

Estimation of V12 Merge Areas

L_{EQ} = (Equation 25-2 or 25-3)

P_{FM} = 1.000 Using Equation 0

$v_{12} = v_F (P_{FM})$ = 2677 pcph

Capacity Checks

	Actual	Maximum	LOS F?
v_{FO}	2714	4500	No
v_3 or v_{av34}	0 pc/h	(Equation 25-4 or 25-5)	

Is $v_{3 \text{ or } av34}$ v_{av34} > 2700 pc/h? No

Is $v_{3 \text{ or } av34}$ v_{av34} > 1.5 v_{12} /2 No

If yes, v_{12A} = 2677 (Equation 25-8)

Flow Entering Merge Influence Area

	Actual	Max Desirable	Violation?
v_{R12}	2677	4600	No

Level of Service Determination (if not F)

Density, $D_R = 3.402 + 0.00456\ v_R + 0.0048\ v_{12} - 0.01278\ L_A$ = 14.1 pc/km/ln

Level of service for ramp-freeway junction areas of influence C

Speed Estimation

Intermediate speed variable, M_S = 0.337

Space mean speed in ramp influence area, S_R = 82.3 km/h

Space mean speed in outer lanes, S_0 = N/A km/h

Space mean speed for all vehicles, S = 82.3 km/h