

1.1 MONITORING PLAN

Construction period

Environmental item	Item to be monitored	Monitoring site	Frequency	Method	Party in charge
Air quality	H ₂ S - CO ₂	Borinquen Hotel and 4 sites (north, south, east and west) on the well base boundary	During testing period (weeks-one month): every three month (quarterly) and permanent monitoring station	Field measurement	ICE

	Min CO2 (ppm)	Prom CO2 (ppm)	Max CO2 (ppm)	Standard CO2	Min H2S (ppm)	Prom H2S2 (ppm)	Max H2S (ppm)	Standard H2S
▬ CAMPO GEOTERMICO BORINQUEN	127	306	415	5000	0.000	0.001	0.021	0.014
CAÑAS DULCES	264	341	372	5000	0.000	0.001	0.002	0.014
CASA MAQUINAS BORINQUEN	145	289	362	5000	0.000	0.000	0.001	0.014
HOTEL BORINQUEN	174	312	415	5000	0.000	0.000	0.002	0.014
HOTEL BUENA VISTA	208	301	367	5000	0.000	0.000	0.002	0.014
PLB-02	200	298	372	5000	0.000	0.001	0.003	0.014
PLB-03	153	308	346	5000	0.000	0.001	0.003	0.014
PLB-04	188	276	378	5000	0.000	0.000	0.002	0.014
PLB-05	127	290	344	5000	0.000	0.003	0.021	0.014
PLB-09	156	303	374	5000	0.000	0.001	0.004	0.014
POBLADO BUENA VISTA	265	338	399	5000	0.000	0.000	0.001	0.014

Environmental item	Item to be monitored	Monitoring site	Frequency	Method	Party in charge
Noise	Noise level	Borinquen Hotel, one site on the well base boundary (in the hotel direction), and 4 sites (north, south, east and west) in the vicinity of the power plant site.	During testing period (weeks-one month): once/week During power plant construction: monthly (with peak time for each construction job taken into account)	Field measurement	ICE

	Min Ruido (dB)	Prom Ruido (dB)	Max Ruido (dB)	Standard Ruido
CAMPO GEOTERMICO BORINQUEN	32	41	64	65
CAÑAS DULCES	36	44	62	65
CASA MAQUINAS BORINQUEN	33	37	49	65
HOTEL BORINQUEN	34	38	45	65
HOTEL BUENA VISTA	34	40	56	65
PLB-02	32	38	59	65
PLB-03	36	40	46	65
PLB-04	32	37	52	65
PLB-05	33	42	64	65
PLB-09	34	53	63	65
POBLADO BUENA VISTA	32	37	46	65

Environmental item	Item to be monitored	Monitoring site	Frequency	Method	Party in charge
Water quality	1) pH, Electric conductivity (EC), Chlorides (Cl-)	Upper and lower streams of the Salitral rivers, upper and lower streams within the project area (AP) of the creek running.	1) During testing period: twice/testing period (weeks-one month)	Laboratory analysis of collected samples	ICE and External laboratory to hire by ICE

Site	pH			Conductivity (µS/cm)			Chlorides (ppm)		
Standard	5-9			N/A			500		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
SALITRAL - PUENTE HOTEL	6.50	8.06	7.55	101.90	265.00	178.32	2.49	15.60	7.23
SALITRAL PGB-03	6.04	8.34	7.52	100.30	283.00	169.15	2.91	17.00	6.57
TOMA DE AGUA PGB-01 AGUAS ARRIBA	6.30	8.00	7.37	120.50	387.00	238.44	2.79	18.80	11.40
RIO SALITRAL ABAJO - POZO 4	6.30	8.20	7.56	100.70	323.00	168.48	2.41	19.00	6.40
NACIENTE NARAVIT	5.71	7.83	6.74	150.90	245.40	185.19	2.00	7.80	4.19
NACIENTE DOS QUEBRADAS	5.99	7.72	6.74	97.00	210.90	156.32	2.50	8.00	4.10
QUEBRADA PACAYALES	6.86	7.93	7.47	86.50	258.20	154.26	3.04	11.70	5.43
QUEBRADA GATA	5.36	8.12	7.20	122.50	348.00	210.68	1.31	12.20	5.75
TERMAL LOS PEDERNALES	5.95	7.28	6.63	138.70	181.70	158.67	2.64	4.72	3.16
TOMA AGUA LAS LILAS	5.90	7.01	6.65	141.50	189.00	177.11	3.79	11.50	5.53
Q. GALLINON	6.84	8.48	7.59	158.10	336.00	242.73	4.82	14.10	8.27
R. TIZATE ARRIBA	6.36	8.02	7.59	127.80	345.00	225.69	4.50	15.00	8.80
R. TIZATE ABAJO	7.59	8.27	0.00	127.40	273.00	218.35	5.20	16.10	8.84
PBR11 ARRIBA	5.76	7.81	6.98	74.50	263.00	147.28	1.80	11.30	5.17

Water quality	2) Oils and grease,	Outlet of the settling basin (construction work effluents). Only in the presence of machinery in the project area (AP)	2) Oils and grease, every six months (semester) After 2 years, the continuation of monitoring will be reconsidered based on opinions of professional experts.)	Laboratory analysis of collected samples	ICE and External laboratory to hire by ICE
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Site	Oils and grease (ppm)	
Standard	50	
	Min	Max
SALITRAL PGB-03	<1	4.00
QUEBRADA GATA	<1	4.00

Water quality	3) Hexavalent chrome (Cr+6), and Mercury (Hg) and COD	NOT APPLICABLE (NA)	NOT APPLICABLE (NA)	-----	
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Water quality	4) Arsenic (As)	Only in drinking water intakes	every six months (semester) After 2 years, the continuation of monitoring will be reconsidered based on opinions of professional experts.)	Laboratory analysis of collected samples	ICE and External laboratory to hire by ICE
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Site	Arsenic (mg/L)	
Standard	0,01	
	Min	Max
CAMPAMENTO CURUBANDE	<0.001	<0.002

Environmental item	Item to be monitored	Monitoring site	Frequency	Method	Party in charge
Soil	Complete analysis - Cadmium (Cd), Lead (Pb), As, Cr ⁺⁶ , Hg, etc.	Four points in the vicinity of a representative geothermal field	One year before construction starts, and once five years after operation starts	Laboratory analysis of collected samples	ICE
		Four points in the vicinity of the power plant site	One year before construction starts, and once five years after operation starts		
Not applicable for this period. Monitoring in 2020.					

Environmental item	Item to be monitored	Monitoring site	Frequency	Method	Party in charge
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Attachment 2

Fauna and flora	Plants and animals (birds, amphibians, reptiles, and mammals)	Area in the vicinity of wells and power plant site, the project site side of the national park, and gallery forest along the Salitral river	Monthly (with rainy and dry seasons, breeding seasons, etc. taken into account)	Visual observation records and photographs	ICE
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Species	Individuals	State of conservation		
		Wildlife Law	CITES	UICN
Amphibians	87	Wildlife Law	CITES	UICN
<i>Agalychnis callidryas</i>	2	A	II	PM
<i>Bolitoglossa striatula</i>	1	S.I	N.C	PM
<i>Craugastor fitzingeri</i>	12	S.I	N.C	PM
<i>Craugastor megacephalus</i>	2	S.I	N.C	PM
<i>Craugastor mimus</i>	2	A	N.C	PM
<i>Craugastor persimilis</i>	2	S.I	N.C	VU
<i>Dendropsophus microcephalus</i>	3	A	N.C	PM
<i>Engystomops pustulosus</i>	8	A	N.C	PM
<i>Hypopachus variolosus</i>	2	S.I	N.C	PM
<i>Incilius coccifer</i>	3	S.I	N.C	PM
<i>Incilius luetkenii</i>	1	A	N.C	PM
<i>Incilius melanochlorus</i>	3	A	N.C	PM
<i>Lithobates forreri</i>	14	S.I	N.C	PM
<i>Lithobates taylori</i>	1	S.I	N.C	PM
<i>Lithobates warszewitschii</i>	9	S.I	N.C	PM
<i>Rhaebo haematiticus</i>	1	S.I	N.C	PM
<i>Rhinella horribilis</i>	11	S.I	N.C	PM
<i>Scinax elaeochroa</i>	1	S.I	N.C	PM
<i>Smilisca baudinii</i>	3	S.I	N.C	PM
<i>Smilisca sordida</i>	4	S.I	N.C	PM
<i>Trachycephalus typhonius</i>	2	S.I	N.C	PM
Birds		1290		
<i>Amazilia rutila</i>	2	A	II	PM
<i>Amazilia saucerrottei</i>	14	A	II	PM
<i>Amazilia tzacatl</i>	1	A	II	PM
<i>Amazona albifrons</i>	28	A	II	PM
<i>Amazona auropalliata</i>	1	P.E	II	VU
<i>Amazona autumnalis</i>	1	A	II	PM
<i>Ammodramus savannarum</i>	2	S.I	N.C	PM
<i>Aramides cajanea</i>	1	S.I	N.C	PM
<i>Archilochus colubris</i>	7	A	II	PM
<i>Arremonops rufivirgatus</i>	10	S.I	N.C	PM

Attachment 2

<i>Attila spadiceus</i>	5	S.I	N.C	PM
<i>Aulacorhynchus prasinus</i>	3	S.I	N.C	PM
<i>Basileuterus culicivorus</i>	1	S.I	N.C	PM
<i>Basileuterus rufifrons</i>	70	S.I	N.C	PM
<i>Brotogeris jugularis</i>	21	A	II	PM
<i>Buteo plagiatus</i>	10	A	II	PM
<i>Calocitta formosa</i>	76	S.I	N.C	PM
<i>Campephilus guatemalensis</i>	5	S.I	N.C	PM
<i>Campylopterus hemileucurus</i>	6	S.I	N.C	PM
<i>Campylorhynchus rufinucha</i>	5	S.I	N.C	PM
<i>Cantorchilus modestus</i>	33	S.I	N.C	PM
<i>Caracara cheriway</i>	1	A	II	PM
<i>Cardellina canadensis</i>	1	S.I	N.C	PM
<i>Cathartes aura</i>	43	S.I	N.C	PM
<i>Catharus ustulatus</i>	13	S.I	N.C	PM
<i>Chiroxiphia linearis</i>	75	S.I	N.C	PM
<i>Chlorophonia callophrys</i>	1	S.I	N.C	PM
<i>Chlorostilbon canivetii</i>	11	A	II	PM
<i>Ciccaba nigrolineata</i>	1	A	II	PM
<i>Ciccaba virgata</i>	4	A	II	PM
<i>Colinus cristatus</i>	2	S.I	N.C	PM
<i>Columbina inca</i>	10	S.I	N.C	PM
<i>Coragyps atratus</i>	17	S.I	N.C	PM
<i>Crax rubra</i>	10	A	III	VU
<i>Crotophaga sulcirostris</i>	21	S.I	N.C	PM
<i>Crypturellus cinnamomeus</i>	12	S.I	N.C	PM
<i>Dendrocincla homochroa</i>	3	S.I	N.C	PM
<i>Dryocopus lineatus</i>	1	S.I	N.C	D.I
<i>Elaenia frantzii</i>	2	S.I	N.C	PM
<i>Empidonax sp</i>	1			
<i>Eucometis penicillata</i>	21	S.I	N.C	PM
<i>Eumomota superciliosa</i>	32	S.I	N.C	PM
<i>Eupherusa eximia</i>	1	A	II	PM
<i>Euphonia affinis</i>	8	S.I	N.C	PM
<i>Euphonia gouldi</i>	1	S.I	N.C	PM
<i>Euphonia hirundinacea</i>	3	S.I	N.C	PM
<i>Euphonia luteicapilla</i>	2	S.I	N.C	PM

<i>Eupsittula canicularis</i>	29	A	II	PM
<i>Eurypyga helias</i>	3	A	N.C	PM
<i>Falco ruficularis</i>	1	A	II	PM
<i>Falco sparverius</i>	1	A	II	PM
<i>Galbula ruficauda</i>	6	S.I	N.C	PM
<i>Geothlypis poliocephala</i>	28	S.I	N.C	PM
<i>Geotrygon montana</i>	1	S.I	N.C	PM
<i>Harpagus bidentatus</i>	1	A	II	PM
<i>Henicorhina leucosticta</i>	11	S.I	N.C	PM
<i>Herpetotheres cachinnans</i>	6	A	II	PM
<i>Hylocharis eliciae</i>	9	A	II	PM
<i>Hylocichla mustelina</i>	15	S.I	N.C	C.A
<i>Hylomanes momotula</i>	2	A	N.C	PM
<i>Hylophilus decurtatus</i>	9	S.I	N.C	PM
<i>Hylophylax naevioides</i>	8	S.I	N.C	PM
<i>Leiothlypis peregrina</i>	7	S.I	N.C	PM
<i>Lepidocolaptes souleyetii</i>	7	S.I	N.C	PM
<i>Leptotila cassini</i>	1	S.I	N.C	PM
<i>Leptotila verreauxi</i>	23	S.I	N.C	PM
<i>Megarynchus pitangua</i>	1	S.I	N.C	PM
<i>Megascops cooperi</i>	2	A	II	PM
<i>Melanerpes hoffmannii</i>	61	S.I	N.C	PM
<i>Micrastur semitorquatus</i>	3	A	II	PM
<i>Microcerculus philomela</i>	11	S.I	N.C	PM
<i>Mionectes oleagineus</i>	2	S.I	N.C	PM
<i>Mniotilta varia</i>	3	S.I	N.C	PM
<i>Momotus coeruliceps</i>	11	S.I	N.C	PM
<i>Morococcyx erythropygus</i>	13	S.I	N.C	PM
<i>Myiarchus crinitus</i>	3	S.I	N.C	PM
<i>Myiarchus tuberculifer</i>	6	S.I	N.C	PM
<i>Myiodynastes luteiventris</i>	2	S.I	N.C	PM
<i>Myiodynastes maculatus</i>	1	S.I	N.C	PM
<i>Myiozetetes granadensis</i>	1	S.I	N.C	PM
<i>Myiozetetes similis</i>	11	S.I	N.C	PM
<i>Nyctidromus albicollis</i>	8	S.I	N.C	PM
<i>Onychorhynchus coronatus</i>	1	S.I	N.C	PM
<i>Passerina caerulea</i>	7	S.I	N.C	PM
<i>Patagioenas flavirostris</i>	9	S.I	N.C	PM

	<i>Penelope purpurascens</i>	23	A	III	PM
	<i>Peucaea ruficauda</i>	7	S.I	N.C	PM
	<i>Phaeothlypis fulvicauda</i>	1	S.I	N.C	PM
	<i>Phaethornis longirostris</i>	2	A	II	PM
	<i>Phaethornis striigularis</i>	1	A	II	PM
	<i>Piaya cayana</i>	18	S.I	N.C	PM
	<i>Piranga flava</i>	1	S.I	N.C	PM
	<i>Piranga rubra</i>	5	S.I	N.C	PM
	<i>Pitangus sulphuratus</i>	20	S.I	N.C	PM
	<i>Polioptila albiloris</i>	1	S.I	N.C	PM
	<i>Psarocolius montezuma</i>	5	S.I	N.C	PM
	<i>Pseudastur albicollis</i>	4	A	II	PM
	<i>Psilorhinus morio</i>	23	S.I	N.C	PM
	<i>Pteroglossus torquatus</i>	3	S.I	N.C	PM
	<i>Pyrilia haematotis</i>	2	A	II	PM
	<i>Ramphastos sulfuratus</i>	47	A	II	PM
	<i>Ramphocaenus melanurus</i>	3	S.I	N.C	PM
	<i>Saltator maximus</i>	1	S.I	N.C	PM
	<i>Seiurus aurocapillus</i>	1	S.I	N.C	PM
	<i>Setophaga magnolia</i>	1	S.I	N.C	D.I
	<i>Setophaga pensylvanica</i>	1	S.I	N.C	D.I
	<i>Setophaga petechia</i>	6	S.I	N.C	PM
	<i>Stelgidopteryx serripennis</i>	1	S.I	N.C	PM
	<i>Sturnella magna</i>	12	S.I	N.C	PM
	<i>Thamnophilus atrinucha</i>	2	S.I	N.C	PM
	<i>Thamnophilus doliatus</i>	1	S.I	N.C	PM
	<i>Thraupis episcopus</i>	4	S.I	N.C	PM
	<i>Thryophilus pleurostictus</i>	47	S.I	N.C	PM
	<i>Thryophilus rufalbus</i>	32	S.I	N.C	PM
	<i>Tinamus major</i>	2	A	N.C	C.A
	<i>Tityra semifasciata</i>	9	S.I	N.C	PM
	<i>Troglodytes aedon</i>	2	S.I	N.C	PM
	<i>Trogon caligatus</i>	1	S.I	N.C	PM
	<i>Trogon melanocephalus</i>	18	S.I	N.C	PM
	<i>Trogon rufus</i>	3	S.I	N.C	PM
	<i>Turdus assimilis</i>	5	S.I	N.C	PM
	<i>Turdus grayi</i>	12	S.I	N.C	PM
	<i>Turdus obsoletus</i>	3	S.I	N.C	PM

<i>Tyrannus melancholicus</i>	4	S.I	N.C	PM
<i>Tyto alba</i>	1	A	II	PM
<i>Vermivora chrysoptera</i>	1	S.I	N.C	C.A
<i>Vireo flavifrons</i>	8	S.I	N.C	PM
<i>Vireo olivaceus</i>	6	S.I	N.C	PM
<i>Vireo philadelphicus</i>	2	S.I	N.C	PM
<i>Volatinia jacarina</i>	6	S.I	N.C	PM
<i>Xiphorhynchus susurrans</i>	1	S.I	N.C	PM
<i>Zenaida asiatica</i>	8	S.I	N.C	PM
Mammals	127			
<i>Alouatta palliata</i>	7	PE	I	PM
<i>Artibeus jamaicensis</i>	5	S.I	N.C	PM
<i>Artibeus lituratus</i>	2	S.I	N.C	PM
<i>Ateles geoffroyi</i>	19	PE	I	P
<i>Caluromys derbianus</i>	3	S.I	N.C	PM
<i>Carollia castanea</i>	1	S.I	N.C	PM
<i>Carollia perspicillata</i>	5	S.I	N.C	PM
<i>Carollia sowelli</i>	6	S.I	N.C	PM
<i>Carollia subrufa</i>	2	S.I	N.C	PM
<i>Cebus capucinus</i>	14	A	II	PM
<i>Conepatus semistriatus</i>	2	S.I	N.C	PM
<i>Dasyprocta punctata</i>	3	S.I	III	PM
<i>Dermanura aztecus</i>	1	S.I	N.C	PM
<i>Dermanura phaeotis</i>	2	S.I	N.C	PM
<i>Dermanura toltecus</i>	2	S.I	N.C	PM
<i>Dermanura watsoni</i>	2	S.I	N.C	PM
<i>Desmodus rotundus</i>	3	S.I	N.C	PM
<i>Didelphis virginiana</i>	2	S.I	N.C	PM
<i>Enchisthenes hartii</i>	1	S.I	N.C	PM
<i>Glossophaga soricina</i>	4	S.I	N.C	PM
<i>Micronycteris microtis</i>	2	S.I	N.C	PM
<i>Micronycteris schmidtorum</i>	1	S.I	N.C	PM
<i>Myotis keaysi</i>	1	S.I	N.C	PM
<i>Nasua narica</i>	4	S.I	III	PM
<i>Nyctomys sumichrasti</i>	1	S.I	N.C	PM
<i>Odocoileus virginianus</i>	3	S.I	N.C	PM
<i>Panthera onca</i>	2	PE	I	C.A
<i>Philander opossum</i>	1	S.I	N.C	PM

<i>Phyllostomus discolor</i>	1	S.I	N.C	PM
<i>Platyrrhinus helleri</i>	2	S.I	N.C	PM
<i>Potos flavus</i>	5	S.I	III	PM
<i>Pteronotus mesoamericanus</i>	1	S.I	N.C	PM
<i>Sciurus deppei</i>	2	A	III	PM
<i>Sciurus variegatoides</i>	3	S.I	N.C	PM
<i>Sylvilagus floridanus</i>	1	S.I	N.C	PM
<i>Tamandua mexicana</i>	1	S.I	III	PM
<i>Tapirus bairdii</i>	6	P.E	I	P
<i>Tayassu pecari</i>	2	P.E	II	VU
<i>Tylomys watsoni</i>	2	S.I	N.C	PM
Reptiles	120			
<i>Amerotyphlops costaricensis</i>	1	S.I	N.C	PM
<i>Boa constrictor</i>	1	A	II	N.E
<i>Bothriechis schlegelii</i>	2	S.I	N.C	N.E
<i>Bothrops asper</i>	6	S.I	N.C	PM
<i>Clelia clelia</i>	1	A	II	N.E
<i>Coleonyx mitratus</i>	4	A	N.C	PM
<i>Corallus annulatus</i>	2	A	II	PM
<i>Corytophanes cristatus</i>	1	S.I	N.C	PM
<i>Ctenosaura similis</i>	14	S.I	N.C	PM
<i>Dendrophidion percarinatum</i>	2	S.I	N.C	PM
<i>Dendrophidion sp.</i>	1			
<i>Erythrolamprus mimus</i>	1	S.I	N.C	PM
<i>Holcosus festivus</i>	18	S.I	N.C	PM
<i>Holcosus undulatus</i>	9	S.I	N.C	PM
<i>Kinosternon scorpioides</i>	1	S.I	N.C	C.A
<i>Lepidoblepharis xanthostigma</i>	2	S.I	N.C	PM
<i>Leptodeira annulata</i>	1	S.I	N.C	PM
<i>Liophis epinephelus</i>	1	S.I	N.C	D.I
<i>Mastigodryas melanolomus</i>	1	S.I	N.C	PM
<i>Norops biporcatus</i>	23	S.I	N.C	N.E
<i>Norops capito</i>	1	S.I	N.C	N.E
<i>Norops cupreus</i>	8	S.I	N.C	N.E
<i>Norops oxyllophus</i>	3	S.I	N.C	N.E

<i>Pseustes poecilonotus</i>	2	S.I	N.C	P.M
<i>Rhinoclemmys pulcherrima</i>	1	S.I	N.C	C.A
<i>Scaphiodontophis annulatus</i>	1	S.I	N.C	D.I
<i>Sceloporus malachiticus</i>	2	S.I	N.C	P.M
<i>Sceloporus variabilis</i>	4	S.I	N.C	P.M
<i>Scolecophis atrocinctus</i>	2	S.I	N.C	P.M
<i>Sibon nebulatus</i>	2	S.I	N.C	P.M
<i>Sphenomorphus cherriei</i>	2	S.I	N.C	P.M
Total	1683			

CATEGORIES OF CONSERVATION:**LAW OF WILDLIFE COSTA RICA:**

A: Species with reduced or threatened populations and those included in the appendix

II of CITES (art 26)

P.E: Endangered species (art 29)

S.I: No information

CITES

I: Danger of extinction

II: Threatened

III: Protegidas

N.C: No CITES

UICN

EX: Extinct

E.E.S: Extinct in the wild

P.C: In critical danger

P: In danger

VU: Vulnerable

C.A: Nearly threatened

P.M: Minor concern

D.I: Insufficient data

	N.E: Not rated				
Environmental item	Item to be monitored	Monitoring site	Frequency	Method	Party in charge
Waste*	Generated amount	Power plant construction site	Monthly	Total of generated amount (weight or volume)	Construction contractor
	Not applicable for this period. In 2021 starts the construction of plant.				

*Appropriate waste management including disposal of sludge will be implemented in accordance with Law for the Integrated Management of Residues (Law 8839), and in reference to Resolution No. 1948-2008-SETENA17 (page26).