

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																																																																																																			
<table border="1"> <thead> <tr> <th colspan="9">Calidad del Aire - CAMPO GEOTERMICO BORINQUEN</th> </tr> <tr> <th>Sitio</th> <th>CO2 Min</th> <th>CO2 Prm</th> <th>CO2 Max</th> <th>CO2 Std</th> <th>H2S Min</th> <th>H2S Prm</th> <th>H2S Max</th> <th>H2S Std</th> </tr> </thead> <tbody> <tr> <td>CAÑAS DULCES</td> <td>234</td> <td>267</td> <td>391</td> <td>5,000</td> <td>0.000</td> <td>0.000</td> <td>0.001</td> <td>0.010</td> </tr> <tr> <td>CASA MAQUINAS BORINQUEN</td> <td>221</td> <td>249</td> <td>360</td> <td>5,000</td> <td>0.000</td> <td>0.000</td> <td>0.001</td> <td>0.010</td> </tr> <tr> <td>HOTEL BORINQUEN</td> <td>220</td> <td>248</td> <td>370</td> <td>5,000</td> <td>0.000</td> <td>0.001</td> <td>0.005</td> <td>0.010</td> </tr> <tr> <td>HOTEL BUENA VISTA</td> <td>219</td> <td>251</td> <td>370</td> <td>5,000</td> <td>0.000</td> <td>0.000</td> <td>0.001</td> <td>0.010</td> </tr> <tr> <td>PLB-02</td> <td>211</td> <td>248</td> <td>361</td> <td>5,000</td> <td>0.000</td> <td>0.001</td> <td>0.005</td> <td>0.010</td> </tr> <tr> <td>PLB-03</td> <td>223</td> <td>240</td> <td>270</td> <td>5,000</td> <td>0.000</td> <td>0.000</td> <td>0.002</td> <td>0.010</td> </tr> <tr> <td>PLB-05</td> <td>207</td> <td>224</td> <td>233</td> <td>5,000</td> <td>0.000</td> <td>0.000</td> <td>0.001</td> <td>0.010</td> </tr> <tr> <td>PLB-09</td> <td>219</td> <td>249</td> <td>368</td> <td>5,000</td> <td>0.000</td> <td>0.000</td> <td>0.001</td> <td>0.010</td> </tr> <tr> <td>POBLADO BUENA VISTA</td> <td>217</td> <td>251</td> <td>368</td> <td>5,000</td> <td>0.000</td> <td>0.000</td> <td>0.001</td> <td>0.010</td> </tr> </tbody> </table>						Calidad del Aire - CAMPO GEOTERMICO BORINQUEN									Sitio	CO2 Min	CO2 Prm	CO2 Max	CO2 Std	H2S Min	H2S Prm	H2S Max	H2S Std	CAÑAS DULCES	234	267	391	5,000	0.000	0.000	0.001	0.010	CASA MAQUINAS BORINQUEN	221	249	360	5,000	0.000	0.000	0.001	0.010	HOTEL BORINQUEN	220	248	370	5,000	0.000	0.001	0.005	0.010	HOTEL BUENA VISTA	219	251	370	5,000	0.000	0.000	0.001	0.010	PLB-02	211	248	361	5,000	0.000	0.001	0.005	0.010	PLB-03	223	240	270	5,000	0.000	0.000	0.002	0.010	PLB-05	207	224	233	5,000	0.000	0.000	0.001	0.010	PLB-09	219	249	368	5,000	0.000	0.000	0.001	0.010	POBLADO BUENA VISTA	217	251	368	5,000	0.000	0.000	0.001	0.010
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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																																																																																																			

Ruido - CAMPO GEOTERMICO BORINQUEN

Sitio	Ruido Min	Ruido Prm	Ruido Max	Ruido Std
CAÑAS DULCES	37	41	45	65
CASA MAQUINAS BORINQUEN	35	38	46	65
HOTEL BORINQUEN	32	34	37	65
HOTEL BUENA VISTA	34	37	41	65
PLB-02	61	69	73	65
PLB-03	33	37	45	65
PLB-05	36	47	53	65
PLB-09	34	37	40	65
POBLADO BUENA VISTA	34	36	39	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

Attachment 2

Geothermal Field	CG-BRQ
Monitored variable	pH Lab.

Site	Max.	Min.	Avg.
CG-BRQ --- NACIENTE DOS QUEBRADAS	7.86	5.99	6.8
CG-BRQ --- NACIENTE NAVARIT	7.83	5.71	6.8
CG-BRQ --- QUEBRADA GATA	8.12	5.36	7.3
CG-BRQ --- QUEBRADA TENCHA (PBR11)	7.81	5.76	7.0
CG-BRQ --- RIO SALITRAL	8.34	6.04	7.5
CG-BRQ --- RIO TIZATE	8.39	6.72	7.8
CG-BRQ --- TERMAL LOS PEDERNALES	7.28	5.95	6.7
CG-BRQ --- TOMA AGUA LAS LILAS	7.01	5.9	6.7
CG-BRQ --- TOMA DE AGUA PLB-02	7.97	4.66	7.3
CG-BRQ --- TOMA DE AGUA PLB-05	7.55	5.8	7.1
CG-BRQ --- LAGUNA DE ALMACENAMIENTO	7.84	7.64	7.74
Total general	8.39	4.66	7.3

Geothermal Field	CG-BRQ
Monitored variable	Cond. (μ S/cm)

Site	Max.	Min.	Avg.
CG-BRQ --- NACIENTE DOS QUEBRADAS	210.9	97	156.3
CG-BRQ --- NACIENTE NAVARIT	245.4	148.9	184.2
CG-BRQ --- QUEBRADA GATA	348	115.4	215.4
CG-BRQ --- QUEBRADA TENCHA (PBR11)	263	74.5	143.4
CG-BRQ --- RIO SALITRAL	328	80.8	170.2
CG-BRQ --- RIO TIZATE	306.5	102.6	220.0
CG-BRQ --- TERMAL LOS PEDERNALES	185.9	138.7	161.6
CG-BRQ --- TOMA AGUA LAS LILAS	189	141.5	178.1
CG-BRQ --- TOMA DE AGUA PLB-02	432.3	70.6	131.2
CG-BRQ --- TOMA DE AGUA PLB-05	241.1	78.8	134.0
CG-BRQ --- LAGUNA DE ALMACENAMIENTO	558	102.6	330.3
Total general	558	70.6	173.0

Attachment 2

Geothermal Field	CG-BRQ
Monitored variable	Cl- (ppm)

Site	Max.	Min.	Avg.
CG-BRQ --- NACIENTE DOS QUEBRADAS	8	2.5	4.3
CG-BRQ --- NACIENTE NAVARIT	7.8	2	4.2
CG-BRQ --- QUEBRADA GATA	12.2	1.31	5.9
CG-BRQ --- QUEBRADA TENCHA (PBR11)	11.3	1.64	4.8
CG-BRQ --- RIO SALITRAL	157.3	2.41	6.9
CG-BRQ --- RIO TIZATE	16.1	4.06	9.0
CG-BRQ --- TERMAL LOS PEDERNALES	188.8	2.64	9.4
CG-BRQ --- TOMA AGUA LAS LILAS	174.9	3.79	11.1
CG-BRQ --- TOMA DE AGUA PLB-02	7.49	2.76	4.6
CG-BRQ --- TOMA DE AGUA PLB-05	13.1	2.38	4.6
CG-BRQ --- LAGUNA DE ALMACENAMIENTO	7.69	4.06	5.875
Total general	188.8	1.31	6.5

<p>Water quality</p>	<p>2) Oils and grease,</p>	<p>Outlet of the settling basin (construction work effluents). Only in the presence of machinery in the project area (AP)</p>	<p>2) Oils and grease, every six months (semester) After 2 years, the continuation of monitoring will be reconsidered based on opinions of professional experts.)</p>	<p>Laboratory analysis of collected samples</p>	<p>ICE and External laboratory to hire by ICE</p>
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Attachment 2

Site	Oils and grease (mg/L)		
	Standard 50 mg/L	Min	Max
Q. Gata Abajo	<0,2		8
Q. Gata Arriba	<0,2		<1
Río Salitral Abajo	<0,2		4
Río Salitral Arriba	<0,2		<1
Río Tizate Abajo	<0,2		<1
Río Tizate Arriba	<0,2		<1
Tencha Abajo	<0,2		<1
Tencha Arriba	<0,2		<1
Toma PLB-02	<0,2		<1
Toma PLB-05	<0,2		<1

Water quality	3) Hexavalent chrome (Cr+6), and Mercury (Hg) and COD	NOT APPLICABLE (NA)	NOT APPLICABLE (NA)	-----	

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

Site	Arsenic (mg/L)	
Standard 0,01 mg/L	Min	Max
Plantel Curubandé	<1	<2

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

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
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

Results of monitoring and state of conservation of species. October, november and december 2020.

Group	State of conservation		
	CITES	IUCN	MINAE N° 40548- Regulations
Amphibian			
<i>Bolitoglossa striatula</i>			
<i>Cochranella granulosa</i>			
<i>Craugastor fitzingeri</i>			
<i>Craugastor noblei</i>			RP
<i>Dendropsophus microcephalus</i>			RP
<i>Engystomops pustulosus</i>			RP
<i>Hypopachus variolosus</i>			
<i>Lithobates warszewitschii</i>			
<i>Smilisca baudinii</i>			
<i>Smilisca sordida</i>			
Birds			
<i>Amazilia saucerrottei</i>	II		RP
<i>Arremon aurantirostris</i>			
<i>Arremonops conirostris</i>			
<i>Arremonops rufivirgatus</i>			
<i>Aulacorhynchus prasinus</i>			
<i>Basileuterus rufifrons</i>			
<i>Brotogeris jugularis</i>	II		RP
<i>Buteo plagiatus</i>	II		RP
<i>Calocitta formosa</i>			
<i>Campylopterus hemileucurus</i>	II		RP
<i>Cantorchilus modestus</i>			
<i>Cathartes aura</i>			
<i>Chaetura vauxi</i>			
<i>Chiroxiphia linearis</i>			
<i>Ciccaba virgata</i>	II		RP
<i>Columbina inca</i>			
<i>Coragyps atratus</i>			
<i>Crax rubra</i>	III	VU	RP
<i>Dendrocolaptes sanctithomae</i>			
<i>Eucometis penicillata</i>			

Attachment 2

<i>Euphonia hirundinacea</i>			
<i>Eupsittula canicularis</i>	II		RP
<i>Geothlypis poliocephala</i>			
<i>Habia rubica</i>			
<i>Henicorhina leucosticta</i>			
<i>Hylocharis eliciae</i>	II		RP
<i>Hylocichla mustelina</i>			
<i>Megarynchus pitangua</i>			
<i>Melanerpes hoffmannii</i>			
<i>Microcerculus philomela</i>			
<i>Momotus lessonii</i>			
<i>Morococcyx erythropygus</i>			
<i>Myiarchus nuttingi</i>			
<i>Myiarchus tuberculifer</i>			
<i>Myiarchus tyrannulus</i>			
<i>Myiothlypis fulvicauda</i>			
<i>Myiozetetes similis</i>			
<i>Nyctidromus albicollis</i>			
<i>Onychorhynchus coronatus</i>			
<i>Pachysylvia decurtatus</i>			
<i>Passerina caerulea</i>			
<i>Penelope purpurascens</i>	III		RP
<i>Peucaea ruficauda</i>			
<i>Phaethornis longirostris</i>	II		RP
<i>Piaya cayana</i>			
<i>Piranga rubra</i>			
<i>Pitangus sulphuratus</i>			
<i>Psilorhinus morio</i>			
<i>Ramphastos sulfuratus</i>	II		RP
<i>Ramphocaenus melanurus</i>			
<i>Setophaga petechia</i>			
<i>Thryophilus pleurostictus</i>			
<i>Thryophilus rufalbus</i>			
<i>Trogon caligatus</i>			
<i>Trogon melanocephalus</i>			
<i>Tyrannus melancholicus</i>			
<i>Volatinia jacarina</i>			
<i>Xiphorhynchus lachrymosus</i>			

<i>Zenaida asiatica</i>			
Mammals (Visual, Sherman, Mist nets and Camera trap)			
<i>Alouatta palliata</i>	I		EN
<i>Ateles geoffroyi</i>	I	EN	EN
<i>Dasyprocta punctata</i>	III		
<i>Didelphis marsupialis</i>			
<i>Didelphis virginiana</i>			
<i>Lontra longicaudis</i>	I		EN
<i>Nasua narica</i>	III		
<i>Ototylomys phyllotis</i>			
<i>Proechimys semispinosus</i>			
<i>Puma yagouaroundi</i>	I		EN
<i>Sciurus variegatoides</i>			
<i>Sigmodon hirsutus</i>			
<i>Conepatus semistriatus</i>			
<i>Cuniculus paca</i>	III		RP
<i>Dasypus novemcinctus</i>			
<i>Puma concolor</i>	I		EN
<i>Leopardus pardalis</i>	I		EN
<i>Odocoileus virginianus</i>	III		
<i>Panthera onca</i>	I	NT	PE
Reptiles			
<i>Atropoides mexicanus</i>			
<i>Boa imperator</i>	II		RP
<i>Bothrops asper</i>			
<i>Clelia clelia</i>	II		RP
<i>Corytophanes cristatus</i>			
<i>Ctenosaura similis</i>			
<i>Holcosus festivus</i>			
<i>Holcosus undulatus</i>			
<i>Kinosternon scorpioides</i>			
<i>Lampropeltis abnorma</i>			
<i>Leptodeira rhombifera</i>			
<i>Micrurus nigrocinctus</i>	III		
<i>Ninia sebae</i>			
<i>Norops biporcatus</i>			

Attachment 2

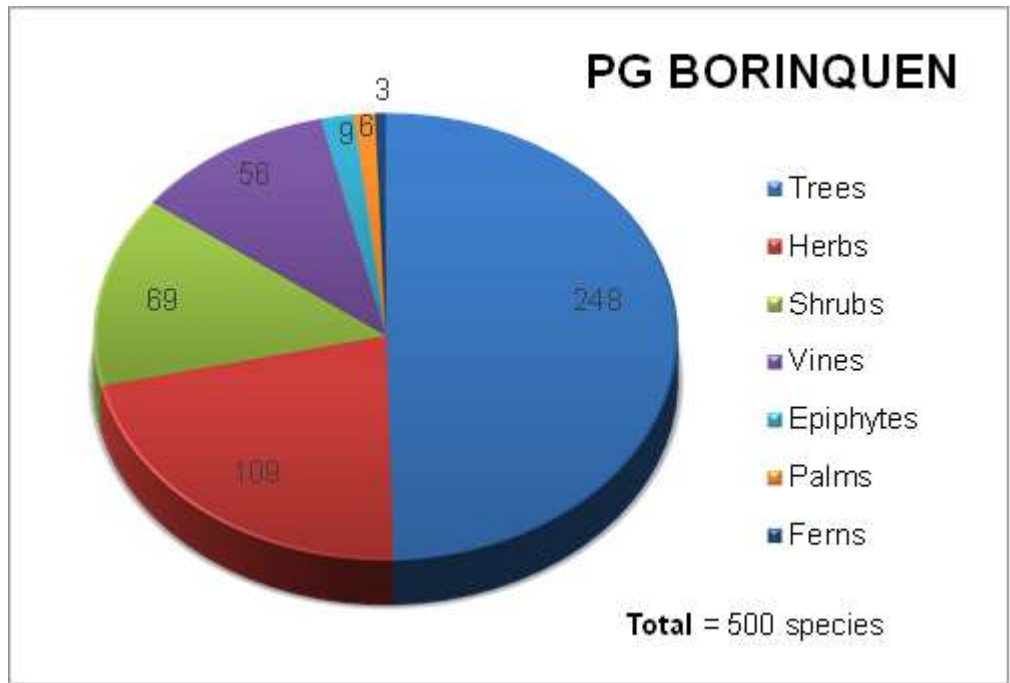
<i>Norops cupreus</i>			
<i>Norops oxylophus</i>			
<i>Oxybelis fulgidus</i>			
<i>Scolecophis atrocinctus</i>			
<i>Senticolis triaspis</i>			
<i>Sibon nebulatus</i>			
<i>Stenorrhina freminvillei</i>			
<i>Trimorphodon quadruplex</i>			

I=Appendix I CITES, II=Appendix II CITES, III=Appendix III CITES, IUCN= The International Union for Conservation of Nature, CITES=The Convention on International Trade in Endangered Species of Wild Fauna and Flora, NT= Near Threatened, EN= endangered species, RP= species with reduced or threatened populations, VU= Vulnerable.

Wild animals monitoring, October 2020.
Daytime monitoring



Distribution of flora species by habits registered in the Borinquen Geothermal Field. March 2014 – September 2020.



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).